



CUTTING TOOLS MAIN CATALOGUE

—
US

CUTTING TOOLS

MAIN CATALOG





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Welcome to the world of CERATIZIT ...

... a world of unique and consistently innovative solutions for wear parts, cutting tools and wood and stone machining. CERATIZIT is your partner for exceptional and highly personalized hard material products which guarantee cost efficiency, resistance and performance. Increasing both the productivity and service life of your products in a very diverse range of industrial sectors is the very essence of our business.

This fact makes CERATIZIT hard materials and carbides indispensable materials in order to significantly increase the service life of components which are subject to high stress. Ever more powerful machines, facilities and machining methods constantly create new challenges for the CERATIZIT development engineers. Intensive research and development activities which precisely match your requirements and work processes already today are able to provide the solutions for tomorrow.

... because 'hard material matters'

Hard materials in general and hard metals in particular are characterized by a range of interesting properties for all applications where maximum wear resistance is required. High pressure, high temperature and highly abrasive or aggressive conditions are factors to which hard materials or metals must be resistant. Our powder metallurgical production of parts for wear protection enables tailor-made adaptation of the material properties to your wear criteria.

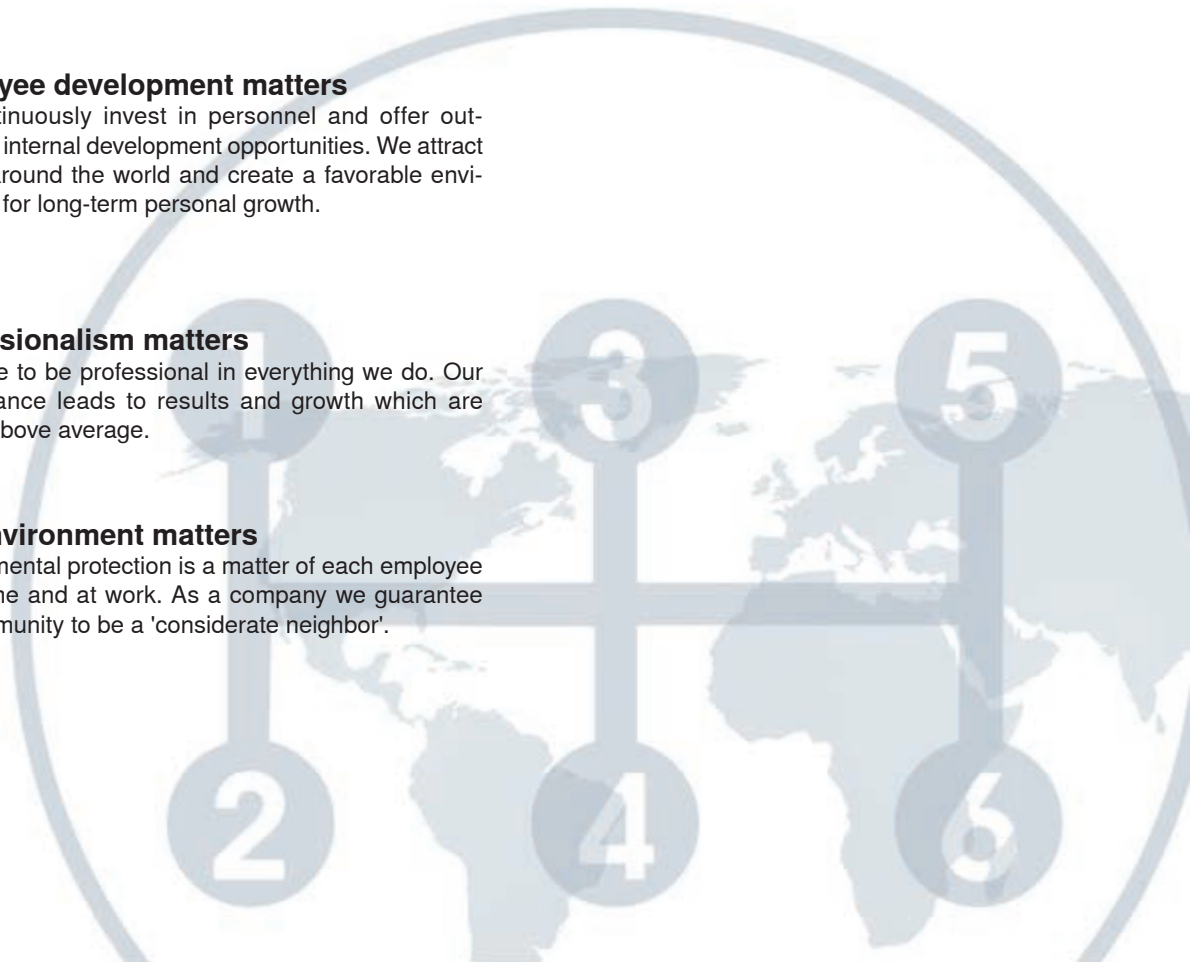




Guided by corporate values

We employ more than 5,500 people worldwide who are guided by our corporate values in their daily work:

- 1 The views and focus of our business partners matter**
Instead of talking product with customers, we work on real solutions for business partners.
- 2 Innovative and flexible thinking matters**
We challenge state-of-the-art technologies and develop intelligent alternatives. Our speed of thought and decisive actions give us a leading edge.
- 3 Communication matters**
Trust and respect enable open communication. We show who we are and what we feel. We keep our promises. We are open to and accept constructive criticism.
- 4 Employee development matters**
We continuously invest in personnel and offer outstanding internal development opportunities. We attract talents around the world and create a favorable environment for long-term personal growth.
- 5 Professionalism matters**
We strive to be professional in everything we do. Our performance leads to results and growth which are always above average.
- 6 Our environment matters**
Environmental protection is a matter of each employee – at home and at work. As a company we guarantee the community to be a 'considerate neighbor'.





Carbide – a composite material with valuable properties

Cemented carbides are composite materials consisting of a hard component, normally tungsten carbide (WC) and a comparatively soft binder metal, like cobalt (Co). The performance characteristics of carbide are determined by hardness, transverse rupture strength and fracture toughness. With regard to their application, important parameters for the optimization of these characteristics are the cobalt content and the grain size of the metal binder phase. The tungsten carbide grains have an average size of .5 up to several micrometers (μm). The cobalt fills the gaps between the carbide grains. When extremely high toughness is required, the cobalt content can amount up to 30%, whereas, for maximum wear resistance, the cobalt content is reduced and the grain size decreased to the submicron range (for example .3 μm).

CERATIZIT produces far above 100 different carbide grades particularly for wear parts, thus offering a customized solution for every application.





Carbide production

W-Ti-Ta oxides

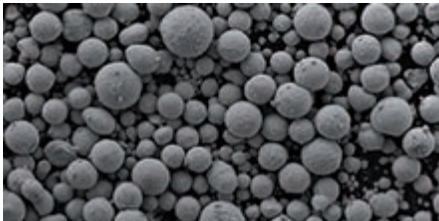


Reduction

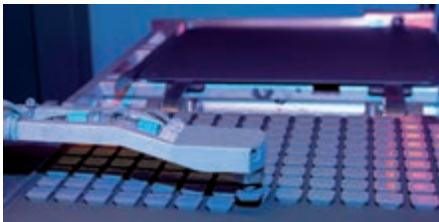
Carburizing,
mixing and
milling process



Granulation



Pressing



Presintering



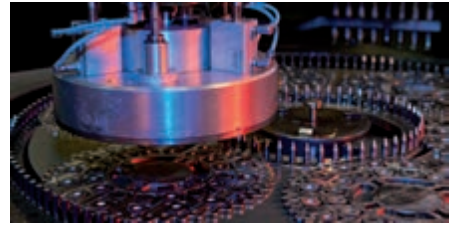
Forming



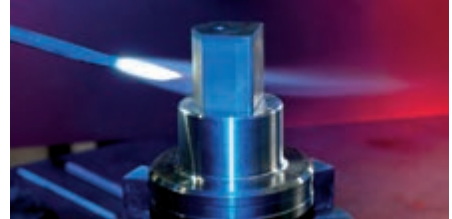
Final sintering



Finishing



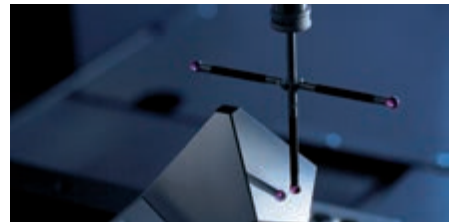
Tool and die
construction,
mechanical
engineering



Coating



Control



Testing (Tooling
Academy)



Packaging



Dispatch





CERATIZIT E-Techstore

The CERATIZIT online shop offers a comprehensive range of cutting tools, rods and products for wear protection. According to the application you may choose from a variety of inserts, geometries and grades. We promise you a well-structured navigation and easy user guide!



Speed

You have access to more than 20,000 products online. The extended rapid product search via the material number, ISO designation or characteristics allows you to find the product you need. After ordering you will immediately receive an order confirmation. You may inform yourself online at any time on the delivery status of your products. (Track & Trace)

Services

The CERATIZIT E-Techstore is available to you around the clock. You may check the offer, order, consignments and invoice online. Open orders can be changed at the last minute if you wish to correct them. For this purpose you always use your personal order templates. Should you have any questions, a personal contact partner will additionally be available.

Information

You will receive state-of-the-art detailed technical information and graphic illustrations for all products in the E-Techstore. You will also be informed about possible connections and suitable accessories. Thanks to the up-to-date availability check applicable to all standard articles you can immediately see when you will receive the requested products.

Business

All products are ordered at net prices and conditions. We guarantee optimal safety through SSL-encoding.

CERATIZIT linkage

Would you like to link your system with CERATIZIT? CERATIZIT supports all common link formats (EDI, XML, OCI, etc.).

Get in touch with your contact person! Our technical engineer will analyse your requirements together with you and will help you when choosing the suitable technology.





Tooling Academy

Inaugurating the Tooling Academy in the year 2007 CERATIZIT set new standards in the technical service field. From classical research, customer-oriented problem solutions to application-specific training courses and seminars both employees and customers make use of the Tooling Academy. New and optimized products are created, some of them are even developed tailored to the customer's needs!

We use seven machines to demonstrate all machining processes common in the field of cutting tools: turning, milling, drilling, parting and grooving. We assess tooling performance and the resulting work piece quality. Simultaneously we analyze the processes by means of cutting tools simulation and are thus able to evaluate their results as compared with practical tests.

The Tooling Academy is always up-to-date - not only in technology but also machinery systems. We apply the latest high-speed camera where the machining processes can be shown in extreme slow motion. In this way we receive detailed information about the entire machining process.




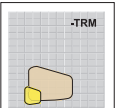
The proximity to our customers is a highly important matter. For this reason, in 2011 we inaugurated another Tooling Academy in Tianjin, China.



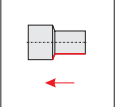





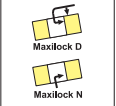

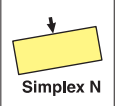
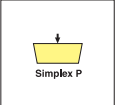
Introduction

	Designation system	A2-A7
	MasterGuide	A8
	Grade overview and description	A9
	Chip grooves	A39

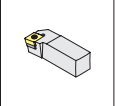
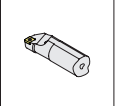
Application

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Inserts

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	Simplex S	A99

Tools

	External machining	A106
	Internal machining	A153

Technical information

	Types of wear	A178
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	Cutting data	A198



D

Retained from above and via bore

M

Retained from above and via bore

C

Retained from above

X Special version

Clamping method

S

Retained via center screw

P

Retained via the bore

Style

Style

R

L

N

Cutting direction

S
1

C
2

L
3

C
4

R
5

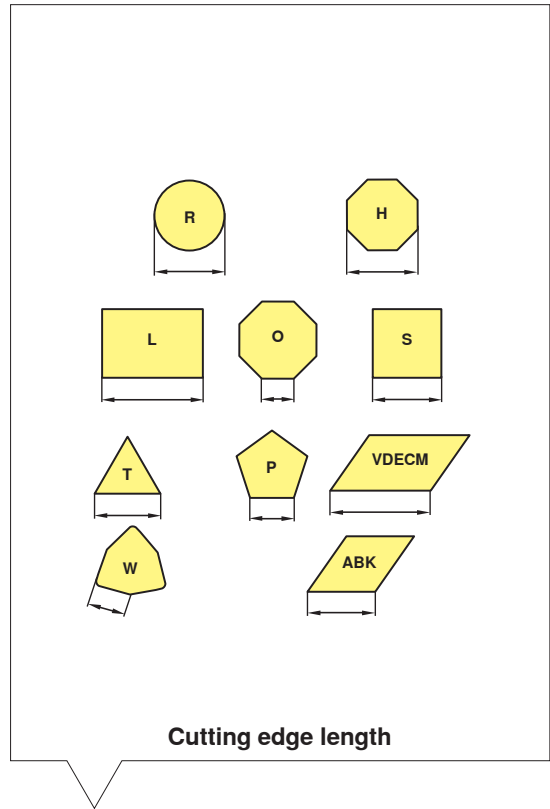
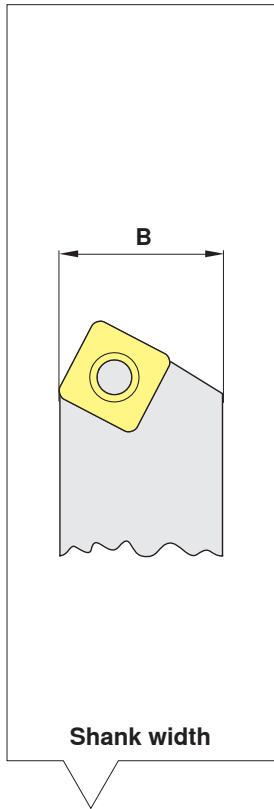
Insert shape

Included angle rhombus		35°	V			
		55°	D			
		75°	E			
		80°	C			
		86°	M			
Included angle rhomboid		55°	K			
		82°	B			
		85°	A			
Other shapes	90°	L	□	-	○	R
	108°	P	⬠	90°	□	S
	120°	H	⬡	60°	△	T
	135°	O	○	80°	△	W

Clearance angle

3°	A	25°	F
5°	B	30°	G
7°	C	0°	N
15°	D	11°	P
20°	E		

Clearance angles not included within the standard for which particular information is necessary } O



1₆ **6**₇ **4**₈ **D**₉

Shank height

Tool holder

Cartridge

Round shank

00

Cartridge

1st position:
C = cartridge

2nd position:
A = ISO 5611

Tool length

l_1 inch		l_1 inch	
4.000	A	4.500	N
4.500	B	5.000	P
5.000	C	—	Q
6.000	D	6.000	R
7.000	E	7.000	S
8.000	F	8.000	T
5.500	G	5.500	U
5.625	H	3.500	V
5.300	J	3.500	W
14.000	K	3.750	Y
6.800	L	Special	X
4.400	M		

Special tolerances

Qualified high-precision tools

Q

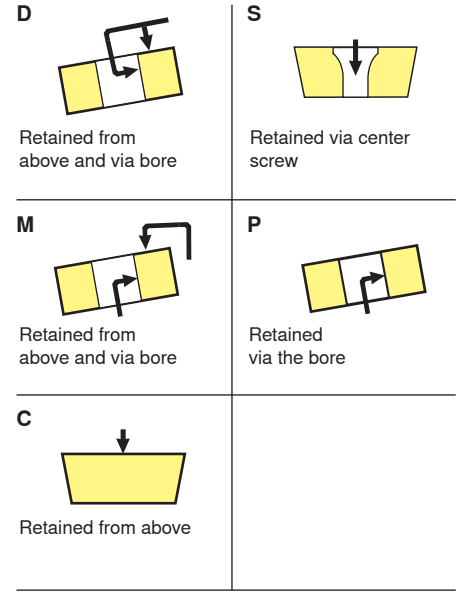
F

B



S Steel shank	E As C with coolant hole
A Steel shank with coolant hole	F As C with anti-vibration system
B Steel shank with anti-vibration system	G As C with coolant hole and anti-vibration system
D Steel shank with coolant hole and anti-vibration system	H Heavy metal
C Carbide shank with steel head	J Heavy metal with coolant hole

Shank version



X Special version

Clamping method



Shank Ø

d_1 inch

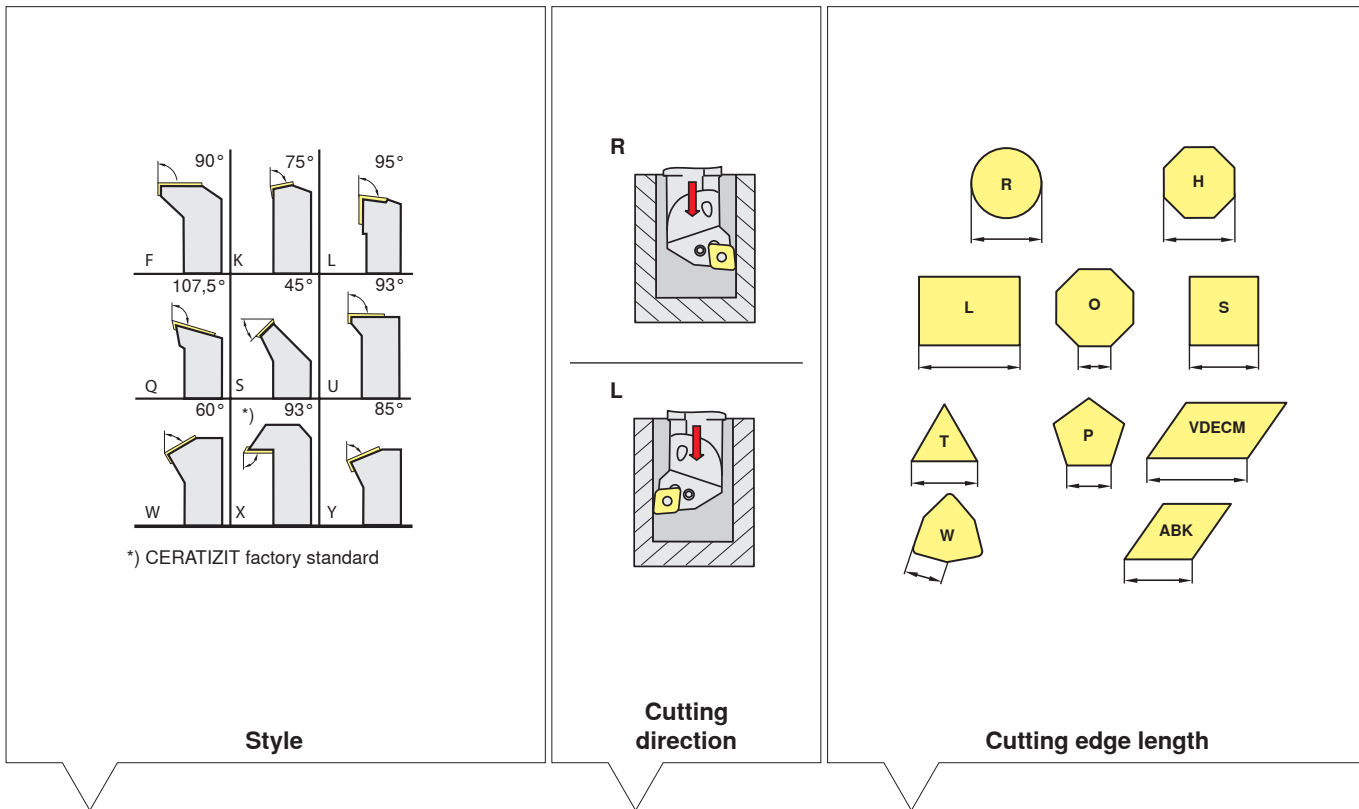
A two-digit number which indicates the bar diameter in 1/16-inch increments.

Tool length

l_1 inch	
3	F
3.5	G
4	H
4.5	J
5	K
5.5	L
6	M
6.6	N
6.75	P
7	Q
8	R
10	S
12	T
14	U
16	V
18	W
20	Y
	X

Insert shape

Included angle Rhombus	35°		V			
		55°	D			
Included angle Rhomboid		75°	E			
		80°	C			
		86°	M			
		55°	K			
Other shapes	90°	L		-		R
	108°	P		90°		S
	120°	H		60°		T
	135°	O		80°		W



K 6	C 7	R 8	3 9	
---------------	---------------	---------------	---------------	--

Clearance angle

3°	A	25°	F
5°	B	30°	G
7°	C	0°	N
15°	D	11°	P
20°	E		

Clearance angles not included within the standard for which particular information is necessary } **O**



CERATIZIT designation system

Inserts

Introduction

Tools and inserts for turning

Included angle rhombus	35°	V
	55°	D
	75°	E
	80°	C
	86°	M
Included angle rhomboid	55°	K
	82°	B
	85°	A
Other shapes	90°	L
	108°	P
	120°	H
	135°	O
	-	R
	90°	S
	60°	T
	80°	W

Insert shape

3°	A	25°	F
5°	B	30°	G
7°	C	0°	N
15°	D	11°	P
20°	E		

Clearance angles not included within the standard for which particular information is necessary } O

Clearance angles

	d ±	m ±	s ±
A	.025	.005	.025
F	.013	.005	.025
C	.025	.013	.025
H	.013	.013	.025
E	.025	.025	.025
G	.025	.025	.13
J	.05-.15*	.005	.025
K	.05-.15*	.013	.025
L	.05-.15*	.025	.025
M	.05-.15*	.08-.20	.13
N	.05-.15*	.08-.20	.025
U	.08-.25*	.013-.38	.013

Tolerances

N	
R	
F	
A	
M, P	
G, P	
W	
T	
Q	
U	
B	
H	
C	
J	
X	Special version

Form of top surface

T	1	P	2	U	3	N	4
----------	---	----------	---	----------	---	----------	---

Tolerances in inch

	d ±	m ±	s ±		d ±	m ±	s ±
A	.0010	.0002	.001	J	.002-.006*	.0002	.001
F	.0005	.0002	.001	K	.002-.006*	.0005	.001
C	.0010	.0005	.001	L	.002-.006*	.0010	.001
H	.0005	.0005	.001	M	.002-.006*	.003-.008*	.005
E	.0010	.0010	.001	N	.002-.006*	.003-.008*	.001
G	.0010	.0010	.005	U	.003-.010*	.005-.015*	.005

Form of top surface

Symbols as above. Changes at inscribed circle IC < 1/4"

IC > 1/4"	IC < 1/4"
N / R / F	E
A / M / G	D
X	X

* Depends on insert size
 ** ASA and BHMA deviation with regard to ISO
 X special version not according to ISO



Cutting edge length

d mm			
	06	16	
	08	20	
	10	25	
	12	32	

mm	inch	mm	mm
06	5/32	3,96	03
09	7/32	5,56	05
11	1/4	6,35	06
16	3/8	9,52	09
22	1/2	12,7	12
27	5/8	15,8	15
33	3/4	19,0	19
44	1	25,4	25

Insert thickness

Inch	mm	Index
1/16	1,59	01
3/32	2,38	02
1/8	3,18	03
5/32	3,97	T3
3/16	4,76	04
7/32	5,56	05
1/4	6,35	06
5/16	7,94	07
3/8	9,52	09

Corner radius

Code	Corner radius mm
00	≤ 0,05
01	0,1
02	0,2
04	0,4
08	0,8
12	1,2
16	1,6
24	2,4
32	3,2

RN 00
RC MO

Cutting edge

F Sharp

E Honed

T Chamfered

S Chamfered and honed

K Double chamfered

P Double chamfered & honed

Cutting direction

R

L

N

22₅

04₆

12₇

8₈

4_{5**}

3_{6**}

3_{7**}

025B_{10**}

Insert I.C.

Code	Inch
2	1/4
3	3/8
4	1/2
5	5/8
6	3/4
8	1

Insert thickness

Code	Inch
1	1/16
2	1/8
3	3/16
4	1/4
5	5/16
6	3/8

Corner radius

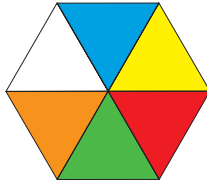
Code	Corner radius inch
X0	.0015
0	.004
.5	.008
1	1/64
2	1/32
3	3/64
4	1/16
5	5/64
6	3/32
7	7/64
8	1/8

RN 00
RC MO

Chamfer type

Code	mm	Code	Angle
015	.15 mm	A	05°
020	.20 mm	B	10°
025	.25 mm	C	15°
050	.50 mm	D	20°
075	.75 mm	E	25°
100	1.00 mm	F	30°

1) For double chamfered cutting edges two letters are used.
For example:
BE = chamfer angle 1 = 10°
chamfer angle 2 = 25°



Material

Based on VDI 3323 CERATIZIT's MasterGuide divides materials into six main groups (P, M, K, N, S, H). Each is given a color, according to the system partly adopted in ISO 513.



Steel



Stainless steel



Cast iron



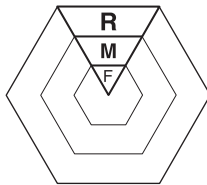
Non-ferrous metals and non-metals



Heat-resistant alloys, titanium



Hard materials



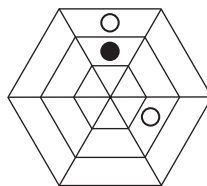
Machining application type

Each colored segment is divided into three sections, and each section indicates the relevant machining application type:

R = rough machining

M = medium machining

F = fine machining



Application

The ideal application area for the insert is indicated by a black circle. Extended applications are indicated by an open circle. The CERATIZIT MasterGuide provides you with an easily understandable structure for choosing a product and enables you to reduce grade and geometry stocks.

- Main application
- Extended application



CTC P335



1 Manufacturer: CERATIZIT

2 Cutting material

- W Uncoated carbide
- C CVD coated carbide
- P PVD coated carbide
- T Uncoated cermet
- E Coated cermet
- N Uncoated silicon nitride
- M Coated silicon nitride
- S Mixed ceramic
- I Sialon
- D PCD
- B CBN
- L CBN coated
- H Sintered HSS

**3 Main application (material)
Variant 1: number**

- 1 Steel
- 2 Stainless steel
- 3 Cast iron
- 4 Light and non-ferrous metals, non-metals
- 5 Heat-resistant alloys, titanium
- 6 Hard materials
- 7 Universal grade for a variety of applications

**Main application (material)
Variant 2: ISO letter**

- P Steel
- M Stainless steel
- K Cast iron
- N Light and non-ferrous metals, non-metals
- S Heat-resistant alloys, titanium
- H Hard materials
- X Universal grade for a variety of applications

**4 Main application
(machining method)**

- 1 Turning
- 2 Milling
- 3 Parting and grooving
- 4 Drilling
- 5 Threading
- 6 Others
- 7 Universal grade for a variety of applications

**5 ISO 513
Application range**

- For example:
- 05
 - 10
 - 15
 - 25
 - 35 ISO P35
 - ...



Carbide

- HW** Uncoated carbide, consisting mainly of tungsten carbide (WC)
- HT¹⁾** Uncoated carbide, consisting mainly of titanium carbide (TiC) or titanium nitride (TiN) or both
- HC** Carbides as above, but coated

Ceramic

- CA** Oxide ceramic, consisting mainly of aluminum oxide (Al_2O_3)
- CM** Mixed ceramic, based on aluminum oxide (Al_2O_3), but with different oxide components
- CN** Nitride ceramic, consisting mainly of silicon nitride (Si_3N_4)
- CC** Ceramics as above, but uncoated

Diamond

- DP** Polycrystalline diamond²⁾

Boron nitride

- BN** Cubic crystalline boron nitride (polycrystalline boron nitride)²⁾

¹⁾ These carbides are also called 'cermets'.

²⁾ Polycrystalline diamond and polycrystalline boron nitride are also called ultra-hard cutting materials.



Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H										
										Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials										
			01	05	10	15	20	25	30	35	40	45	50												
AMZ	HC-K10	P															○	○	○	●	○				
CM45	HC-P45	P															●	○	○	○	○				
	HC-M40	P															○	●	○	○	○				
	HC-K25	P															○	○	○	○	○				
CTC1135	HC-P35	C															●	○	○	○	○				
	HC-M25	C															○	○	○	○	○				
CTC1425	HC-P25	C															●	○	○	○	○				
	HC-M20	C															○	○	○	○	○				
	HC-K15	C															○	○	○	○	○				
CTC1435	HC-P35	C															●	○	○	○	○				
	HC-M30	C															○	○	○	○	○				
	HC-K20	C															○	○	○	○	○				
CTC2135	HC-P35	C															○	○	○	○	○				
	HC-M30	C															○	●	○	○	○				
CTC3110	HC-P10	C															○	○	○	○	○				
	HC-K10	C															○	○	○	○	○				
CTCK120	HC-P10	C															●	○	○	○	○				
	HC-K20	C															○	○	○	○	○				
CTCP115	HC-P15	C															●	○	○	○	○				
	HC-M10	C															○	○	○	○	○				
	HC-K25	C															○	○	○	○	○				
CTCP125	HC-P25	C															●	○	○	○	○				
	HC-M20	C															○	○	○	○	○				
	HC-K30	C															○	○	○	○	○				
CTP2120	HC-M20	P															○	○	○	○	○				
	HC-K20	P															○	○	○	○	○				
			01	05	10	15	20	25	30	35	40	45	50	●	Main application					○	Extended application				

*Type of cutting material



Introduction

Tools and inserts for turning



Grade overview

Introduction

Tools and inserts for turning

Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H							
										Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials							
			01	05	10	15	20	25	30	35	40	45	50									
CTP2440	HC-P40	P															●					
	HC-M35	P																●				
	HC-K25	P																			○	○
CTP4120	HC-K20	P																		●		
CTP5110	HC-M15	P															○					
	HC-S15	P																			●	
CTP5115	HC-M15	P															○					
	HC-S15	P																			●	
CTPM125	HC-P35	P														●						
	HC-M25	P															●				○	
CTW7120	HW-M20	W															○					
	HW-K20	W																		●	○	
H10T	HW-K15	W																	●	●		
H210T	HW-M10	W														○						
	HW-K10	W																	○	●	●	
H216T	HW-K15	W																	●	●		
S26T	HW-P20	W													●	○						
S40T	HW-P40	W													●							
	HW-M40	W														●						
U17T	HW-M15	W																			○	
	HW-K15	W																	●			

● Main application
○ Extended application

*Type of cutting material





Grade designation	Standard designation	* Cutting material	Application range							P	M	K	N	S	H	
			01	05	10	15	20	25	30	35	40	45	50	Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials
TCC410	HC-P10	E	[Blue bar from 05 to 15]							●						
	HC-M10	E	[Yellow bar from 05 to 15]								○					
	HC-K05	E	[Red bar from 05 to 10]									●				
TCM10	HT-P15	T	[Blue bar from 10 to 20]							●						
	HT-M10	T	[Yellow bar from 10 to 15]								●					
	HT-K10	T	[Red bar from 10 to 15]									○				
TCM407	HT-P10	T	[Blue bar from 05 to 15]							●						
	HT-M05	T	[Yellow bar from 05 to 10]								○					
	HT-K05	T	[Red bar from 05 to 10]									○				
TSM20	HW-K15	W	[Red bar from 10 to 20]									●	●	●		
TSM30	HW-K30	W	[Red bar from 20 to 40]									○	●	○		
U17T	HW-M15	W	[Yellow bar from 10 to 15]											○		
	HW-K15	W	[Red bar from 10 to 25]										●			
			01	05	10	15	20	25	30	35	40	45	50	● Main application ○ Extended application		

*Type of cutting material





Grade overview

Introduction

Tools and inserts for turning

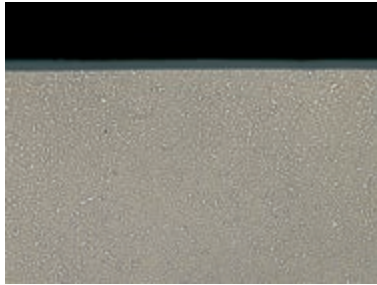
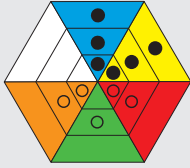
Grade designation	Standard designation	*Cutting material	Application range					P	M	K	N	S	H
			0	05	10	15	20	25	Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials
CTD4110	DP-K05	D		■							●		
CTD4125	DP-K01	D	■								●		
CTM3110	CC-K10	M			■					●			
CTN3105	CN-K05	N		■						●			
CTN3110	CN-K10	N			■					●			
CTS3105	CM-K05	S		■						●			●
TA100	BN-K03	B		■						●			●
TA120	BN-K05	B		■						○			●
TA201	BN-K10	B			■					○		○	●
			0	05	10	15	20	25	● Main application ○ Extended application				

*Type of cutting material



**CM45**

HC-P45
HC-M40
HC-K25

**Composition:**

Co 10.0%; WC balance

Grain size:

.7 μm (submicron grade)

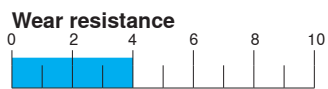
Hardness:

HV 1600

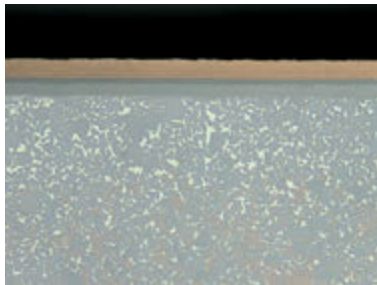
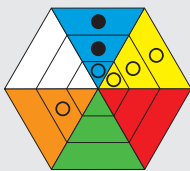
Coating specification:

PVD

TiAlN; 2 - 4 μm

**CTC1135**

HC-P35
HC-M25

**Composition:**

Co 9.6%; mixed carbides 7.4%; WC balance

Grain size:

1 - 2 μm

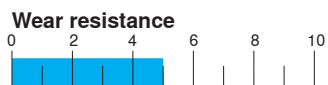
Hardness:

HV 1400

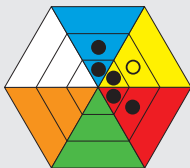
Coating specification:

CVD

Ti (C,N) + Ti (C,N) + TiN + Ti (N,B) + Ti (C,N) + TiN; 12 μm

**CTC1425**

HC-P25
HC-M20
HC-K15

**Composition:**

Co 7.0%; mixed carbides 8.0%; WC balance

Grain size:

1 - 2 μm

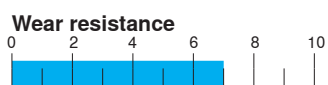
Hardness:

HV 1450

Layer specification:

CVD

TiN + Ti (C,N) + Ti (N,B) + Al_2O_3 + Ti (C,N,B);
6 μm



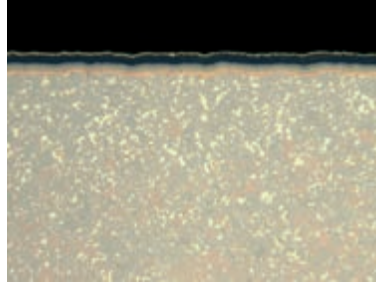
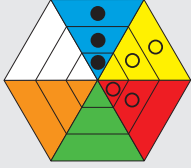


Grade description

Steel

CTC1435

HC-P35
HC-M30
HC-K20



Composition:

Co 9.6%; mixed carbides 7.4%; WC balance

Grain size:

1 - 2 μm

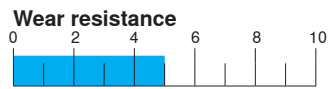
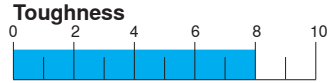
Hardness:

HV 1400

Coating specification:

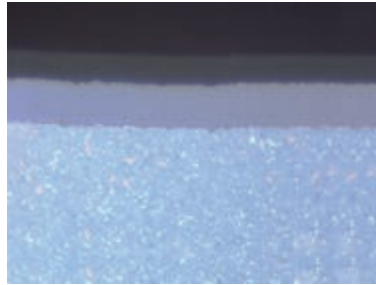
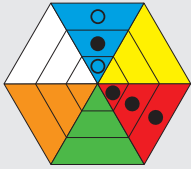
CVD

TiN + Ti (C,N) + Ti (N,B) + Al_2O_3 + Ti (C,N,B);
6 μm



CTCK120

HC-P10
HC-K20



Composition:

Co 6.0%; TaC 2.0%; WC balance

Grain size:

1 μm

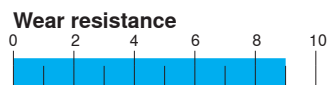
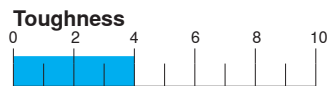
Hardness:

HV 1630

Coating specification:

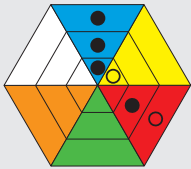
CVD

Ti (C,N) + Al_2O_3 ; 15.5 μm



CTCP115

HC-P15
HC-M10
HC-K25



Composition:

Co 5.8%; mixed carbides 6.4%; WC balance

Grain size:

1 - 2 μm

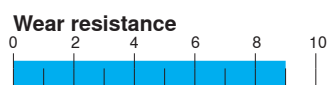
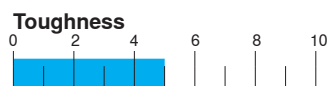
Hardness:

HV 1550

Coating specification:

CVD

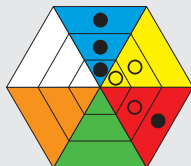
Ti (C,N) + Al_2O_3 ; 18.5 μm





CTCP125

HC-P25
HC-M20
HC-K30



Composition:

Co 7.0%; mixed carbides 8.0%; WC balance

Grain size:

1 - 2 μm

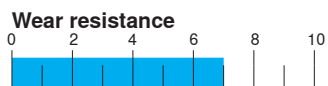
Hardness:

HV 1450

Coating specification:

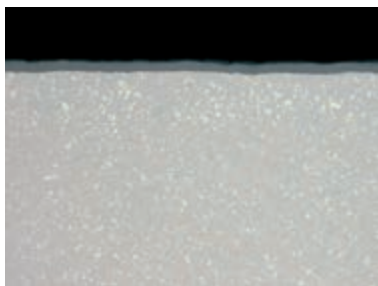
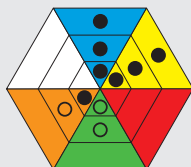
CVD

Ti (C,N) + Al_2O_3 ; 15 μm



CTP2440

HC-P40
HC-M35
HC-K25



Composition:

Co 9.6%; mixed carbides 7.4%; WC balance

Grain size:

1 - 2 μm

Hardness:

HV 1400

Coating specification:

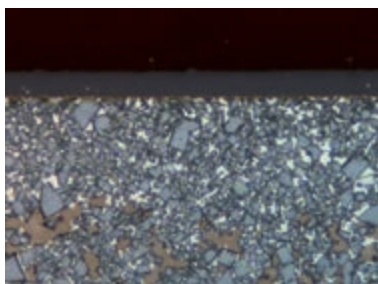
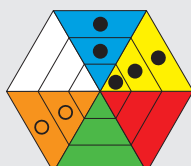
PVD

TiAlN; 3 - 5 μm



CTPM125

HC-P35
HC-M25



Composition:

Co 9.6%; mixed carbides 7.8%; other .4%; WC balance

Grain size:

1 - 2 μm

Hardness:

HV 1460

Coating specification:

PVD

TiN / TiAlN; 6 μm



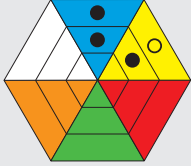


Grade description

Steel

S40T

HW-P40
HW-M40



Composition:

Co 11.0%; mixed carbides 12.0%; WC balance

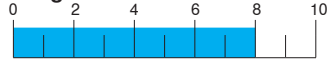
Grain size:

1 - 2 μm

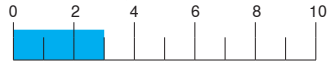
Hardness:

HV₃₀ 1420

Toughness



Wear resistance

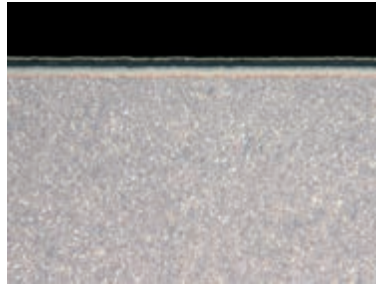
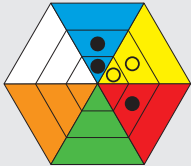


Properties, application:

- High toughness
- Medium to low cutting speed
- For universal application on steel

TCC410

HC-P10
HC-M10
HC-K05



Composition: cermet

Co/Ni 12.2%; WC 15.0%; TaNbC 10.0%; TiCN balance

Hardness:

HV 1620

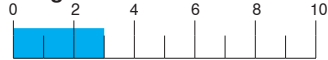
Coating specification:

CVD

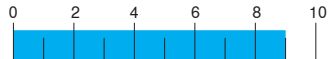
TiN + Ti (C,N) + Ti (C,N) + Al₂O₃ +

Ti (C,N,B); 6 μm

Toughness



Wear resistance

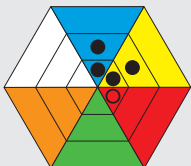


Properties, application:

- Excellent resistance to oxidation

TCM10

HT-P15
HT-M10
HT-K10



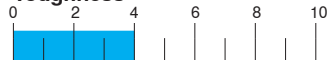
Composition: cermet

Co/Ni 12.2%; WC 15.0%; TaNbC 10.0%; TiCN balance

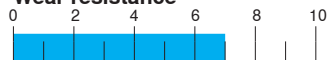
Hardness:

HV 1620

Toughness



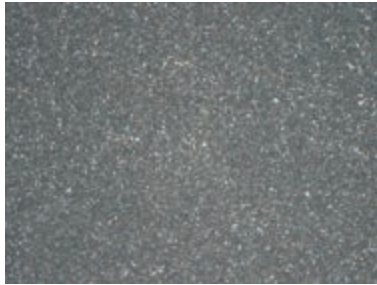
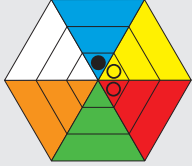
Wear resistance





TCM407

HT-P10
HT-M05
HT-K05



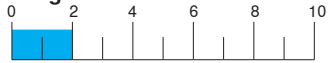
Composition: cermets

Co/Ni 8.0%; WC 16.0%; TaNbC 10.0%; TiCN balance

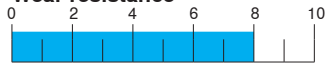
Hardness:

HV 1780

Toughness



Wear resistance



Properties, application:

- For very high cutting speeds
- Ideal for finishing

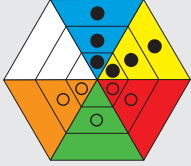


Grade description

Stainless steel

CM45

HC-P45
HC-M40
HC-K25



Composition:

Co 10.0%; WC balance

Grain size:

.7 μm (submicron grade)

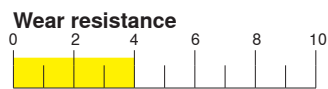
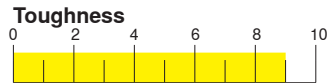
Hardness:

HV 1600

Coating specification:

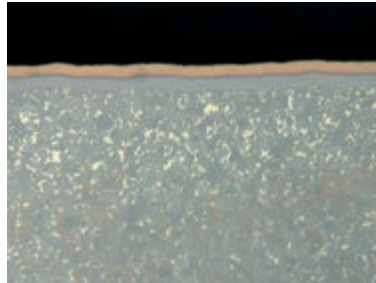
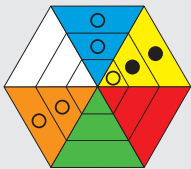
PVD

TiAlN; 2 - 4 μm



CTC2135

HC-P35
HC-M30



Composition:

Co 9.6%; mixed carbides 7.4%; WC balance

Grain size:

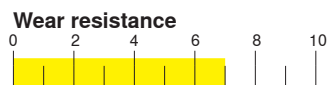
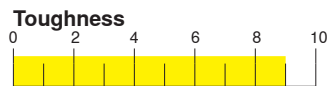
1 - 2 μm

Hardness:

HV 1400

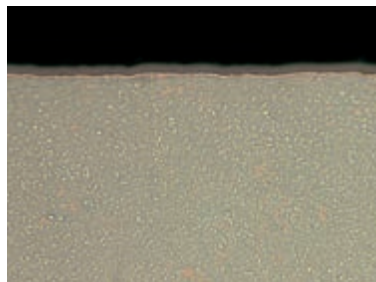
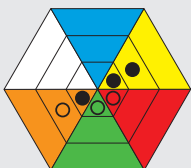
Coating specification:

CVD; Ti (C,N) + Ti (C,N) + TiN + Ti (N,B) + Ti (C,N) + TiN;
6 μm



CTP2120

HC-M20
HC-K20



Composition:

Co 10.0%; mixed carbides 2.0%; WC balance

Grain size:

1 μm

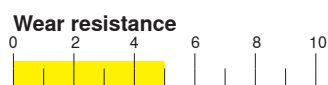
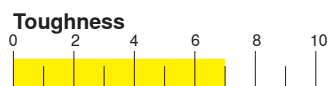
Hardness:

HV 1560

Coating specification:

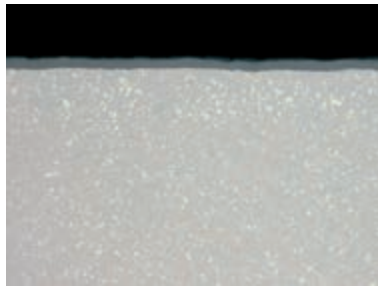
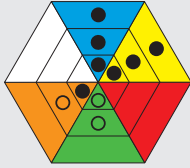
PVD

TiAlN; 2 - 5 μm



**CTP2440**

HC-P40
HC-M35
HC-K25

**Composition:**

Co 9.6%; mixed carbides 7.4%; WC balance

Grain size:

1 - 2 μm

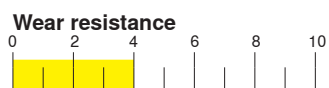
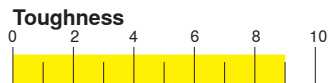
Hardness:

HV 1400

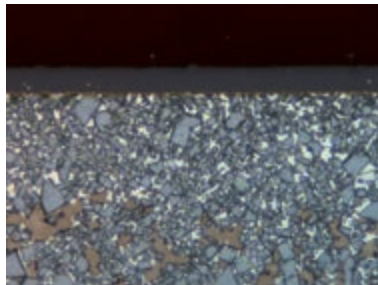
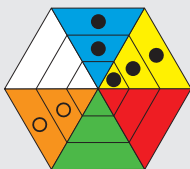
Coating specification:

PVD

TiAlN; 3 - 5 μm

**CTPM125**

HC-P35
HC-M25

**Composition:**

Co 9.6%; mixed carbides 7.8%; other .4%; WC balance

Grain size:

1 - 2 μm

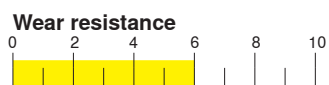
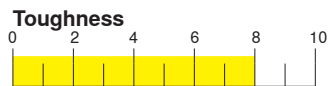
Hardness:

HV 1460

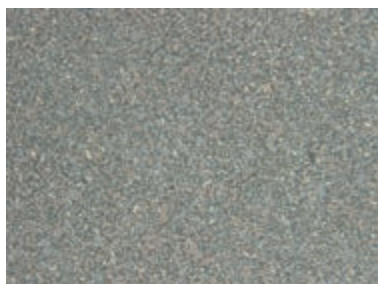
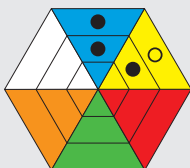
Coating specification:

PVD

TiN / TiAlN; 6 μm

**S40T**

HW-P40
HW-M40

**Composition:**

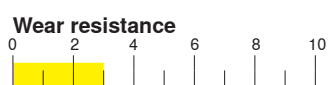
Co 11.0%; mixed carbides 12.0%; WC balance

Grain size:

1 - 2 μm

Hardness:

HV₃₀ 1420

**Properties, application:**

- High toughness
- Medium to low cutting speed
- For universal application on steel

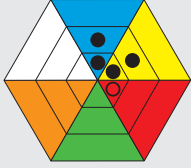


Grade description

Stainless steel

TCM10

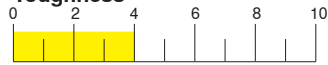
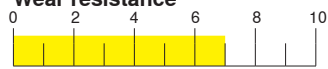
HT-P15
HT-M10
HT-K10

**Composition: cermet**

Co/Ni 12.2%; WC 15.0%; TaNbC 10.0%; TiCN balance

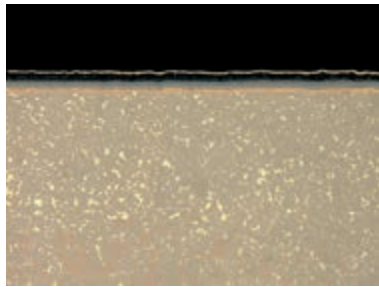
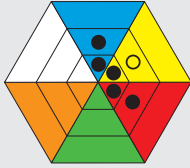
Hardness:

HV 1620

Toughness**Wear resistance**

**CTC1425**

HC-P25
HC-M20
HC-K15

**Composition:**

Co 7.0%; mixed carbides 8.0%; WC balance

Grain size:

1 - 2 μm

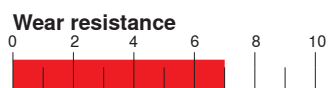
Hardness:

HV 1450

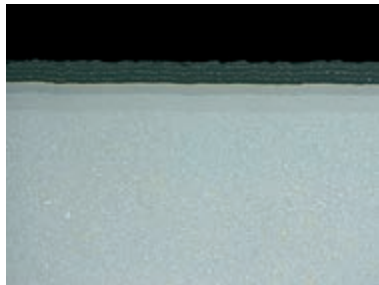
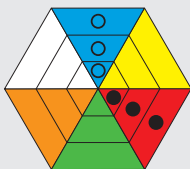
Layer specification:

CVD

TiN + Ti (C,N) + Ti (N,B) + Al_2O_3 + Ti (C,N,B);
6 μm

**CTC3110**

HC-P10
HC-K10

**Composition:**

Co 6.0%; TaC 2.0%; WC balance

Grain size:

1 μm

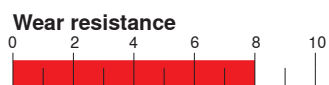
Hardness:

HV 1650

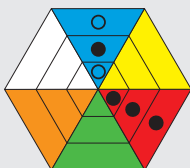
Coating specification:

CVD

Ti (C,N) Ti (C,N) Ti (C,N,B) + Al_2O_3 ; 16 μm

**CTCK120**

HC-P10
HC-K20

**Composition:**

Co 6.0%; TaC 2.0%; WC balance

Grain size:

1 μm

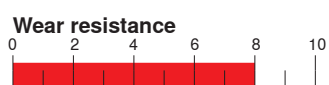
Hardness:

HV 1630

Coating specification:

CVD

Ti (C,N) + Al_2O_3 ; 15.5 μm



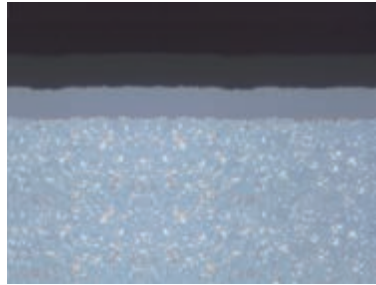
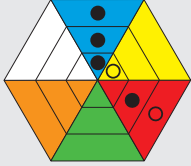


Grade description

Cast iron

CTCP115

HC-P15
HC-M10
HC-K25



Composition:

Co 5.8%; mixed carbides 6.4%; WC balance

Grain size:

1 - 2 μm

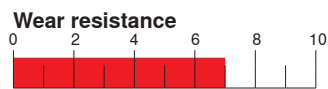
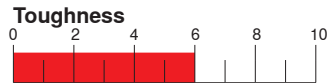
Hardness:

HV 1550

Coating specification:

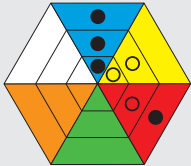
CVD

Ti (C,N) + Al_2O_3 ; 18.5 μm



CTCP125

HC-P25
HC-M20
HC-K30



Composition:

Co 7.0%; mixed carbides 8.0%; WC balance

Grain size:

1 - 2 μm

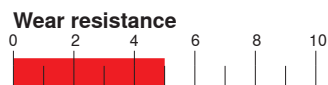
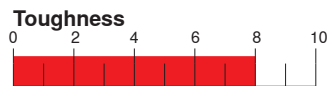
Hardness:

HV 1450

Coating specification:

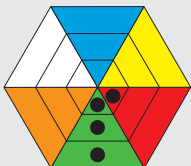
CVD

Ti (C,N) + Al_2O_3 ; 15 μm



H10T

HW-K15



Composition:

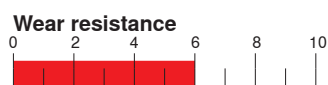
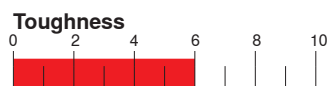
Co 6.0%; WC balance

Grain size:

1 μm

Hardness:

HV₃₀ 1630

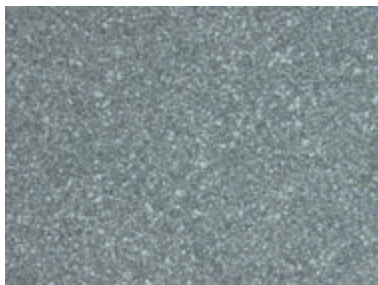
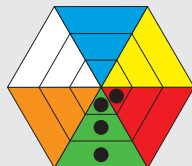


Properties, application:

- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

**H216T**

HW-K15

**Composition:**

Co 6.0%; WC balance

Grain size:1 μm **Hardness:**HV₃₀ 1630**Properties, application:**

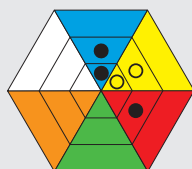
- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

TCC410

HC-P10

HC-M10

HC-K05

**Composition: cermet**

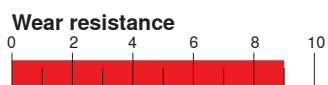
Co/Ni 12.2%; WC 15.0%; TaNbC 10.0%; TiCN balance

Hardness:

HV 1620

Coating specification:

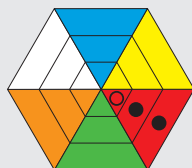
CVD

TiN + Ti (C,N) + Ti (C,N) + Al₂O₃ +Ti (C,N,B); 6 μm **Properties, application:**

- Excellent resistance to oxidation

CTM3110

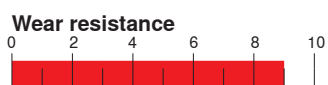
CC-K10

**Composition:**Si₃N₄;**Grain size:**> 2 μm **Hardness:**

HV 1550

Coating specification:

CVD

Ti (C,N) + TiN; > 2 μm **Properties, application:**

- For chromium cast alloys

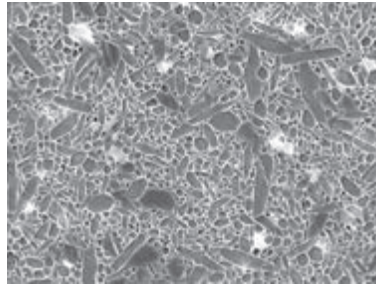
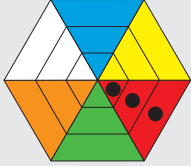


Grade description

Cast iron

CTN3105

CN-K05



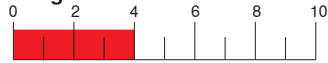
Composition:

β - Si_3N_4

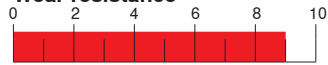
Hardness:

HV₁₀ 1620

Toughness



Wear resistance

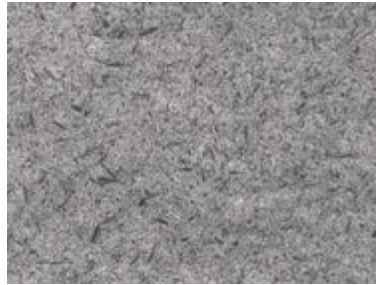
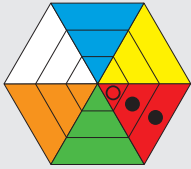


Properties, applications:

- Turning and milling of gray cast and spheroidal cast iron at high cutting speeds

CTN3110

CN-K10



Composition:

Si_3N_4

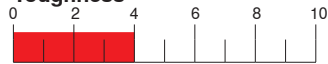
Grain size:

> 2 μm

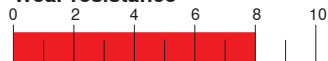
Hardness:

HV₁₀ 1500

Toughness



Wear resistance

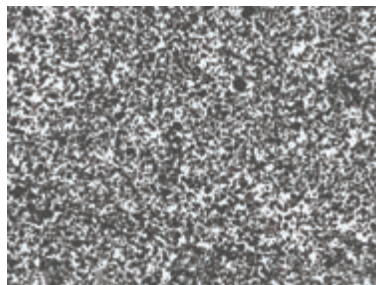
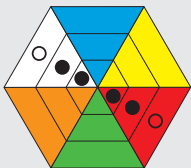


Properties, application:

- For roughing

CTS3105

CM-K05



Composition:

Al_2O_3 ; TiC

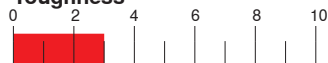
Grain size:

> 1 μm

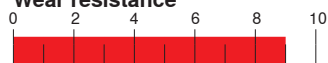
Hardness:

HV 2100

Toughness



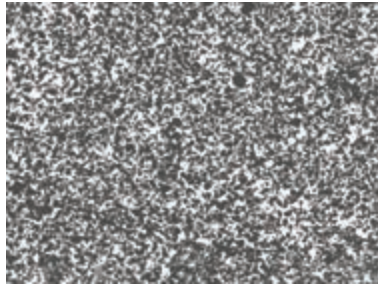
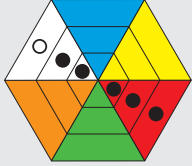
Wear resistance





CTS3110

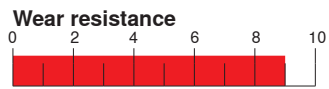
CM-K10



Composition:
 $Al_2O_3 + Ti (C,N)$

Grain size:
 $> 1 \mu m$

Hardness:
 $HV_{10} 2200$



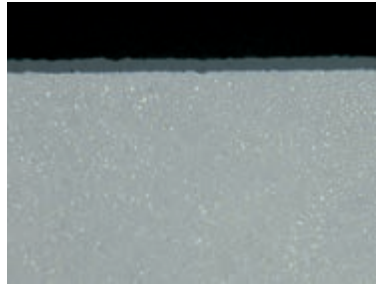
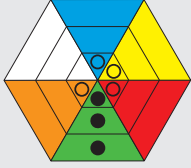


Grade description

Non-ferrous metals and non-metals

AMZ

HC-K10



Composition:

Co 6.0%; WC balance

Grain size:

1 μm

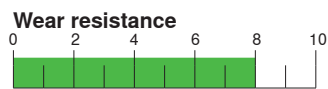
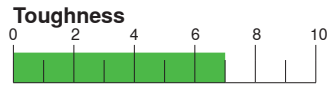
Hardness:

HV 1630

Coating specification:

PVD

TiAlN; 2 - 4 μm

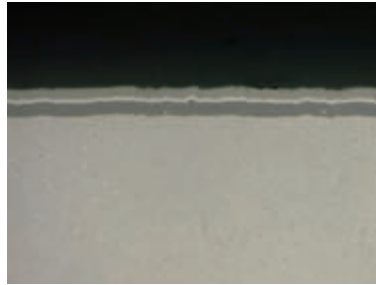
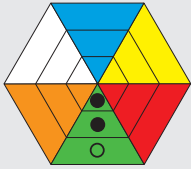


Properties, application:

- Ideal for aluminum and cast iron
- Low tendency for adhesion

CTP4115

HC-K15



Composition:

Co 6.0%; WC balance

Grain size:

.8 μm

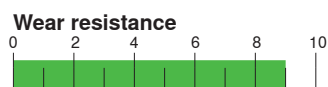
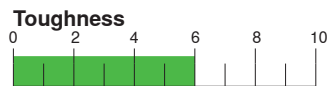
Hardness:

HV 1820

Coating specification:

PVD

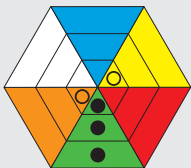
(Ti,Al)N; 5 μm



CTW7120

HW-M20

HW-K20



Composition:

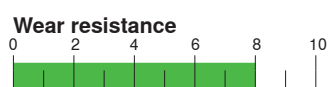
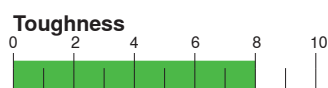
Co 10.0%; WC balance

Grain size:

.7 μm (submicron grade)

Hardness:

HV₃₀ 1550



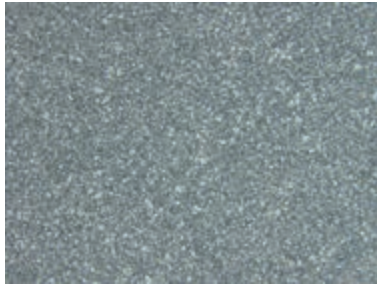
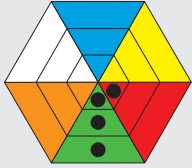
Properties, application:

- Ideal for non-ferrous metals
- Substrate for PVD coatings



H10T

HW-K15



Composition:

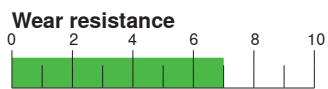
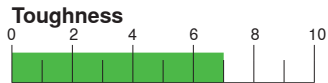
Co 6.0%; WC balance

Grain size:

1 μm

Hardness:

HV₃₀ 1630



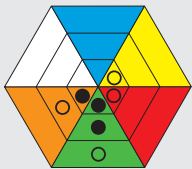
Properties, application:

- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

H210T

HW-M10

HW-K10



Composition:

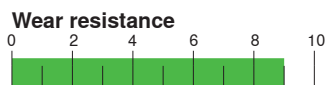
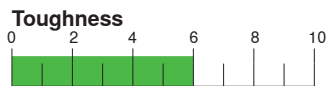
Co 6.0%; WC balance

Grain size:

.8 μm (submicron grade)

Hardness:

HV 1850

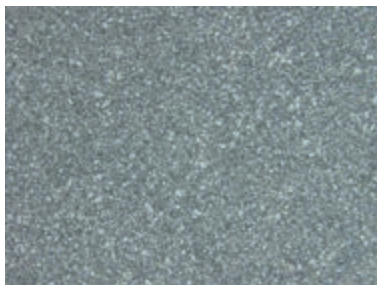
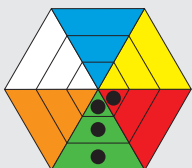


Properties, application:

- Ideal for heat-resistant alloys, titanium, refractory metals (W, Mo), aluminum and glass & carbon fiber reinforced plastics
- Low tendency for adhesion

H216T

HW-K15



Composition:

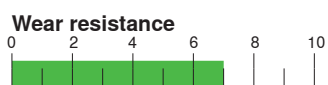
Co 6.0%; WC balance

Grain size:

1 μm

Hardness:

HV₃₀ 1630



Properties, application:

- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

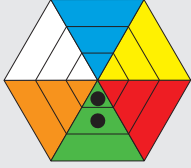


Grade description

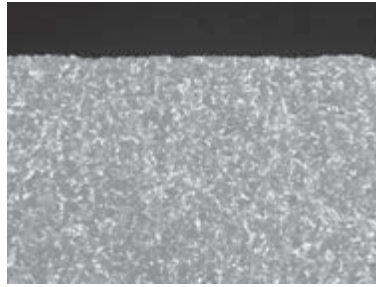
Non-ferrous metals and non-metals

CTD4110

DP-K05



For abrasive non-ferrous metals, plastic, graphite



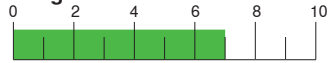
Composition:

Polycrystalline diamond (PCD)

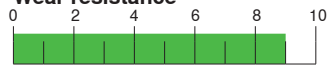
Polycrystalline diamond:

~ 5 μm

Toughness



Wear resistance

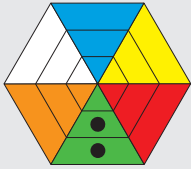


Properties, application:

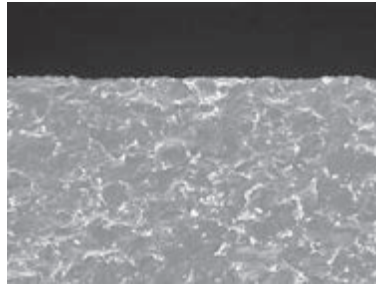
- Maximum wear resistance and hardness
- Low toughness

CTD4125

DP-K01



For non-ferrous metals, plastic



Composition:

Polycrystalline diamond (PCD)

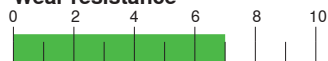
Grain size:

~ 25 μm

Toughness



Wear resistance



Properties, application:

- High wear resistance
- Good toughness
- Suitable for interrupted cut



CTP5110
HC-M15
HC-S15

Composition:
Co 6.0%; WC balance

Grain size:
.8 μm

Hardness:
HV 1820

Coating specification:
PVD
(Ti,Al)N; 4 μm

Toughness
0 2 4 6 8 10

Wear resistance
0 2 4 6 8 10

CTP5115
HC-M15
HC-S15

Composition:
Co 6.0%; WC balance

Grain size:
.8 μm

Hardness:
HV 1820

Coating specification:
PVD
TiN + (Ti,Al)N + TiN; 4 μm

Toughness
0 2 4 6 8 10

Wear resistance
0 2 4 6 8 10

H210T
HW-M10
HW-K10

Composition:
Co 6.0%; WC balance

Grain size:
.8 μm (submicron grade)

Hardness:
HV 1850

Properties, application:

- Ideal for heat-resistant alloys, titanium, refractory metals (W, Mo), aluminum and glass & carbon fiber reinforced plastics
- Low tendency for adhesion

Toughness
0 2 4 6 8 10

Wear resistance
0 2 4 6 8 10

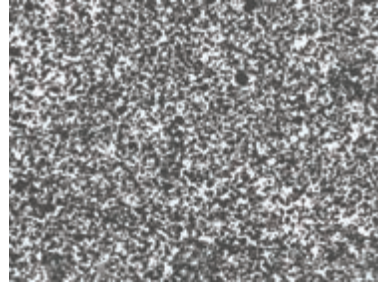
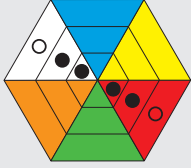


Grade description

Hard materials

CTS3105

CM-K05



Composition:

Al_2O_3 ; TiC

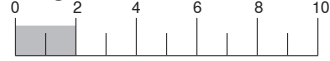
Grain size:

> 1 μm

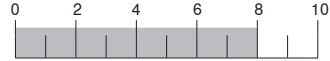
Hardness:

HV 2100

Toughness

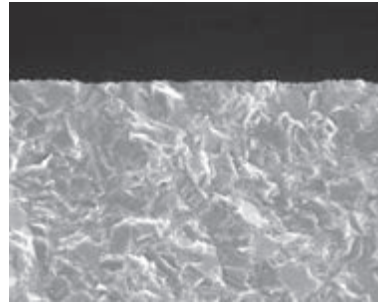
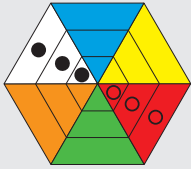


Wear resistance



TA100

BN-K03



Composition:

Cubic boron nitride (CBN), 90 vol.% + binder (Al-Si)

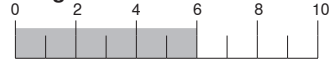
Grain size:

~ 20 μm

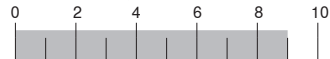
Insert form:

Solid CBN

Toughness



Wear resistance



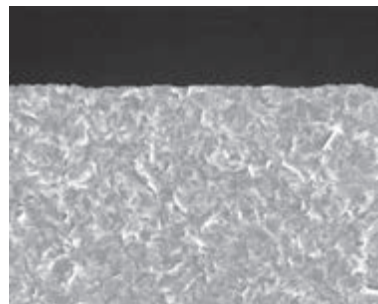
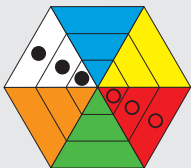
All tempered materials,
sintered metals

Properties, application:

- Very high hardness
- Very good suitability for dry machining

TA120

BN-K05



Composition:

Cubic boron nitride (CBN), 80 Vol.% + binder (ceramic)

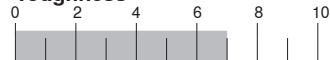
Grain size:

~ 15 μm

Insert form:

Solid CBN

Toughness



Wear resistance



Particularly suitable for
chilled castings

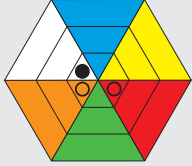
Properties, application:

- Very good suitability for dry machining

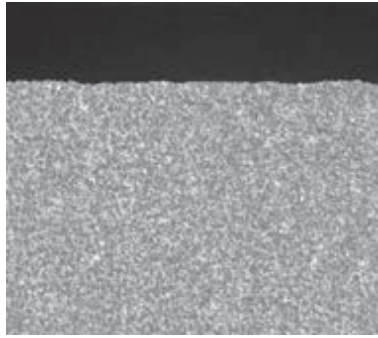


TA201

BN-K10



Particularly suitable for tempered steels



Composition:

Cubic boron nitride (CBN), 65 vol.% + binder (TiN)

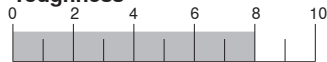
Grain size:

~ 2 μm

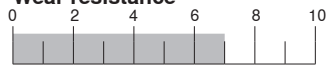
Insert type:

Brazed segment

Toughness



Wear resistance



Properties, application:

- Very good suitability for dry machining
- For finishing



Chip groove		Machining type	Material	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-CF				TCC410	-	-
				TCM10	-	-
				TCC410	-	-
				-	-	-
				-	-	-
-F30				CTPM125	CTPM125	-
				CTPM125	CTPM125	-
				-	-	-
				-	-	-
				-	-	-
-F32				CTP2120	CTP2120	-
				CTP2120	-	-
				CTP2120	CTP2120	-
				CTP2120	-	-
				CTP2120	-	-
-F34				CTP5115	-	-
				-	-	-
				CTP5115	-	-
				-	-	-
				-	-	-
-TF				CTCP115	CTCP125	CTC1135
				CTCP125	CTC1135	CTC1135
				CTCP125	CTCP125	CTCP125
				-	-	-
				CTCP125	CTC1135	-
-M30				CTPM125	CTPM125	CTPM125
				CTPM125	CTPM125	CTPM125
				-	-	-
				-	-	-
				-	CTPM125	-
-M34				CTP5110/CTP5115	CTP5115	-
				-	-	-
				-	-	-
				CTP5110/CTP5115	CTP5110/CTP5115	-
				-	-	-
-TFQ				TCC410	CTCP115	-
				TCC410	CTCP125	-
				TCC410	-	-
				-	-	-
				-	-	-
-TMQ				CTCP115	CTCP125	-
				CTCP115	CTCP125	-
				CTCP115	CTCP125	-
				-	-	-
				-	-	-
-TMF				CTCP115	CTCP125	CTC1135
				CTCP125	CTC1135	CTC1135
				-	-	-
				-	-	-
				CTC1135	-	-



Chip groove		Machining type	Material	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-M42				-	-	-
				CTP2120	CTC2135	CTC2135
				-	-	-
				-	-	-
-TM				CTCP115	CTCP125	CTC1135
				CTCP125	CTC1135	CTC2135
				-	-	-
				-	-	-
-M52				-	-	-
				CTP2120	CTP2120	-
				CTP2120	CTP2120	CTP2120
				-	-	-
-M50				CTCP125	CTCP125	CTCP125
				CTCP125	CTCP125	-
				-	CTCK120	CTCK120
				-	-	-
-M60				CTPM125	CTPM125	CTPM125
				CTPM125	CTPM125	CTPM125
				-	-	-
				-	-	-
-M70				CTCP115	CTCP125	CTCP135
				-	CTC2135	CTC2135
				-	CTCK120	CTCK120
				-	-	-
-TRM				CTCP115	CTCP125	CTC1135
				CTCP125	CTC1135	CTC1135
				-	-	-
				-	-	-
-TMR				CTCP115	CTCP125	CTC1135
				CTCP125	CTC1135	CTC1135
				-	-	-
				-	-	-
-TRR				CTCP125/CTCP115	CTC1135	CTC1135
				CTCP125	CTC1135	CTC1135
				-	-	-
				-	-	-
-TR				CTCP125/CTCP115	CTCP125	CTC1135
				CTCP125	CTC1135	CTC2135
				CTCP125	CTCP125	-
				-	-	-
				CTC1135	CTC2135	-



Chip groove		Machining type	Material	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-R80				CTCP125	CTCP125	CTCP125
				CTCP125	CTCP125	CTCP125
				-	-	-
				-	-	-
-R28				CTCP115	CTCP115/CTCP125	CTCP125
				CTCP115	CTCP115/CTCP125	CTCP125
				CTCP115	CTCP115/CTCP125	CTCP125
				-	-	-
-R58				CTCP115	CTCP115/CTCP125	CTCP125
				CTCP115	CTCP115/CTCP125	CTCP125
				CTCP115	CTCP115/CTCP125	CTCP125
				-	-	-
-R88				CTCP115	CTCP115/CTCP125	CTCP125
				CTCP115	CTCP115/CTCP125	CTCP125
				CTCP115	CTCP115/CTCP125	CTCP125
				-	-	-
				-	-	-


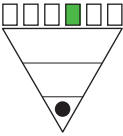
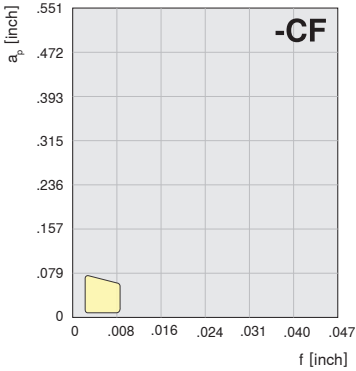


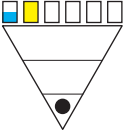
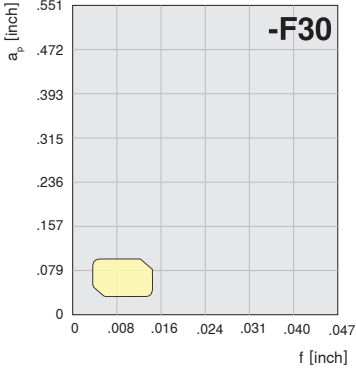

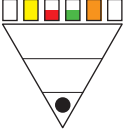
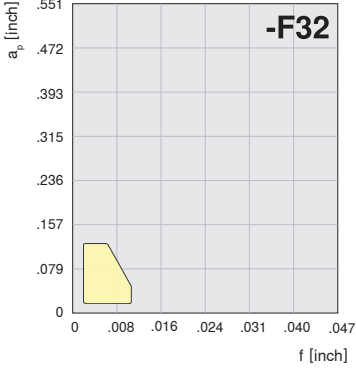

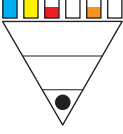
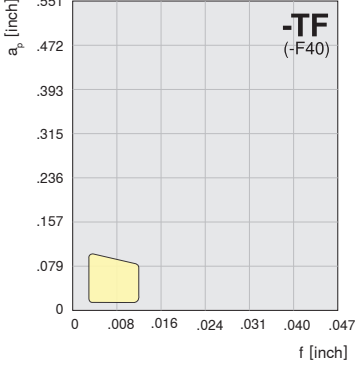


Chip groove		Machining type	Material	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-F23				-	-	-
				CTP2120	CTP2120	-
				CTP2120	-	-
				CTP2120	-	-
-SF				TCM407	TCM10	CTC1135
				CTCP125	CTC2135	CTC2135
				TCM410	CTCP125	CTCP125
				-	-	-
-SMF				TCC410/CTCP115	CTC1135	CTC1135
				CTCP125	CTC1135	CTC1135
				TCC410/CTCP115	-	-
				-	-	-
-F43				-	-	-
				CTC2135	CTC2135	CTC2135
				-	-	-
				-	-	-
-M25					CTPM125	
					CTPM125	
-M55					CTPM125	
					CTPM125	
-SM				CTCP115	CTCP125	CTC1135
				CTCP125	CTC2135	CTC2135
				CTC3110	CTC3110	CTC3110
				-	-	-
-SMQ				CTCP115	CTCP125	-
				CTCP115	CTCP125	-
				CTCP115	CTCP125	-
				-	-	-
				-	-	-



Chip groove		Machining type	Material	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-23P				-	-	-
				-	-	-
				-	-	-
				H216T	-	-
				-	-	-
-25Q				H210T	-	-
				H210T	H210T	-
				H210T	H210T	-
				H210T	H210T	H210T
				H210T	H210T	-
-25P				AMZ	AMZ	-
				AMZ	AMZ	-
				AMZ	AMZ	-
				H210T	H210T	H210T
				AMZ	AMZ	-
-27				AMZ	AMZ	-
				AMZ	AMZ	-
				AMZ	AMZ	H10T
				H10T	H10T	H10T
				-	-	-
-29				AMZ	AMZ	-
				AMZ	AMZ	-
				AMZ	AMZ	-
				H216T	H216T	H216T
				AMZ	AMZ	-



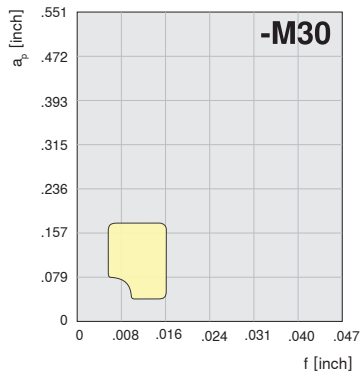
 		<p>Application range:</p> <p>CNMG 43..EN-CF doc.: .002 - .079 inch fpr: .002 - .008 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Steel in general <input type="radio"/> Stainless steels <input type="radio"/> Spheroidal cast iron (GGG) <input type="radio"/> Super alloys <p> For cermet only</p>
 		<p>Application range:</p> <p>CNMG 432EN-F30 doc.: .031 - .098 inch fpr: .004 - .014 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Stainless steels <input type="radio"/> Steel in general
 		<p>Application range:</p> <p>CNGP 432FN-F32 doc.: .004 - .157 inch fpr: .004 - .010 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Stainless steels <input type="radio"/> Super alloys <input type="radio"/> Titanium <input type="radio"/> Non-ferrous metals
 		<p>Application range:</p> <p>CNMG 43..EN-TF doc.: .008 - .098 inch fpr: .003 - .012 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Steel in general <input type="radio"/> Cementation steels <input type="radio"/> Stainless steels <input type="radio"/> Cast iron <input type="radio"/> Super alloys



Chip grooves

Introduction

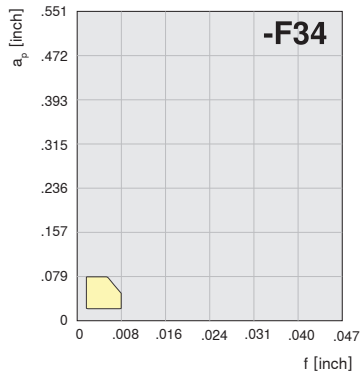
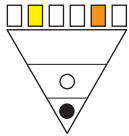
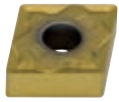
Tools and inserts for turning



Application range:

CNMG 432EN-M30
 doc.: .039 - .171 inch
 fpr: .006 - .016 inch

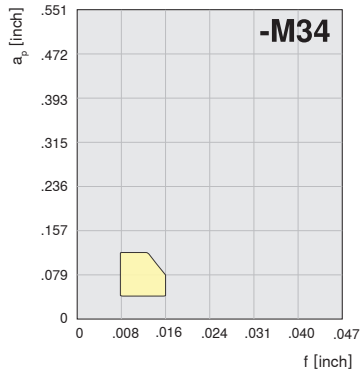
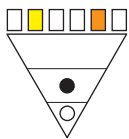
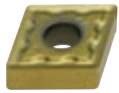
- Stainless steels
- Steel in general
- Super alloys



Application range:

CNMG 432EN-F34
 doc.: .031 - .118 inch
 fpr: .004 - .012 inch

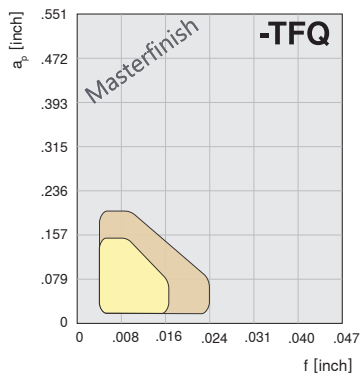
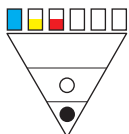
- Stainless steels
- Super alloys
- Titanium



Application range:

CNMG 432EN-M34
 doc.: .031 - .118 inch
 fpr: .004 - .012 inch

- Stainless steels
- Super alloys
- Titanium



Application range:

CNMG 432EN-TFQ
 doc.: .020 - .157 inch
 fpr: .004 - .016 inch


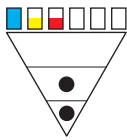
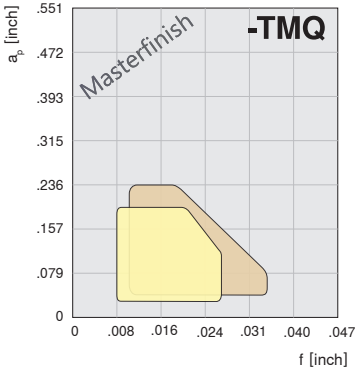

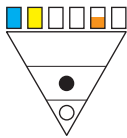
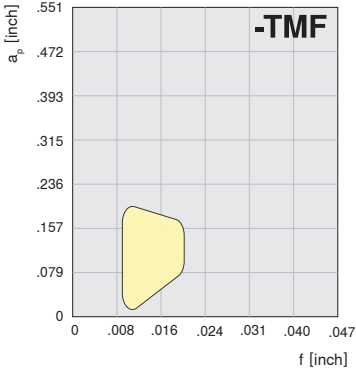

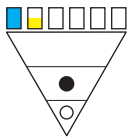
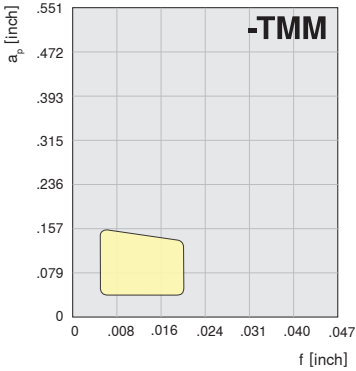

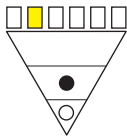
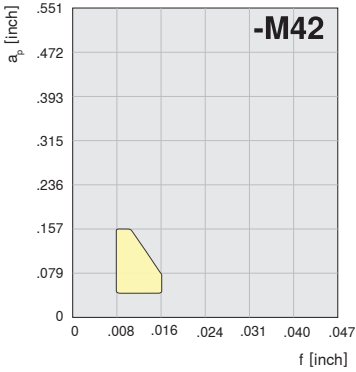
- Steel in general
- Stainless steel
- Gray cast iron (GG)

CNMG 433EN-TFQ
 doc.: .020 - .197 inch
 fpr: .004 - .024 inch



For more detailed information on **MASTERFINISH** see section 'Technical information'.



 		<p>Application range:</p> <p>CNMG 432EN-TMQ doc.: .030 - .200 inch fpr: .008 - .026 inch</p> <p>CNMG 433EN-TMQ doc.: .040 - .236 inch fpr: .010 - .033 inch</p> <ul style="list-style-type: none"> ○ Steel in general ○ Stainless steel ○ Gray cast iron (GG)
 		<p>Application range:</p> <p>CNMG 43..EN-TMF doc.: .020 - .197 inch fpr: .005 - .016 inch</p> <ul style="list-style-type: none"> ○ Cementation steels ○ Carbon steels ○ Steels with low to medium strength (up to approx. 700 N/mm²) ○ Stainless steels ○ Super alloys
 		<p>Application range:</p> <p>CNMG 43..EN-TMM doc.: .039 - .157 inch fpr: .006 - .020 inch</p> <ul style="list-style-type: none"> ○ Steel in general ○ Low alloyed steels (up to 900 N/mm²) ○ Stainless steels
 		<p>Application range:</p> <p>CCMT 32.51EN-F43 doc.: .039 - .157 inch fpr: .008 - .016 inch</p> <ul style="list-style-type: none"> ○ Stainless steels



For more detailed information on **MASTERFINISH** see section 'Technical information'.



For cementation steels



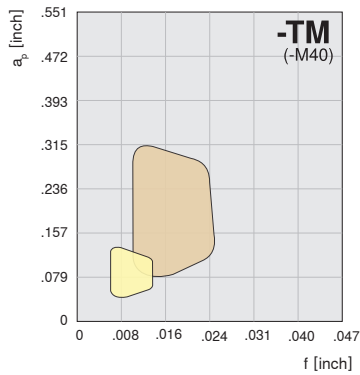
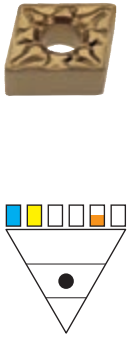
For profile boring



For stainless steels



Chip grooves

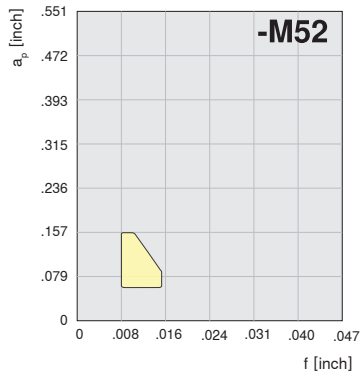


Application range:

CNMG 432EN-TM
 doc.: .039 - .138 inch
 fpr: .006 - .014 inch

- Steel in general
- Stainless steels
- Super alloys

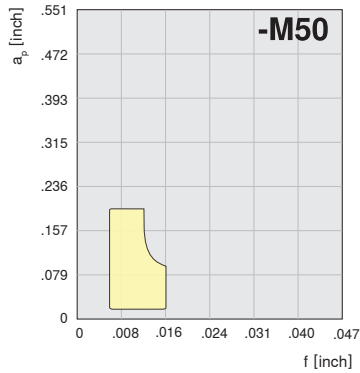
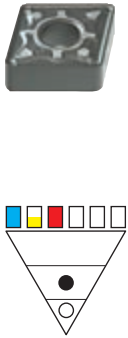
CNMG 644EN-TM
 doc.: .079 - .315 inch
 fpr: .010 - .024 inch



Application range:

CNMG 532EN-M52
 doc.: .059 - .157 inch
 fpr: .008 - .015 inch

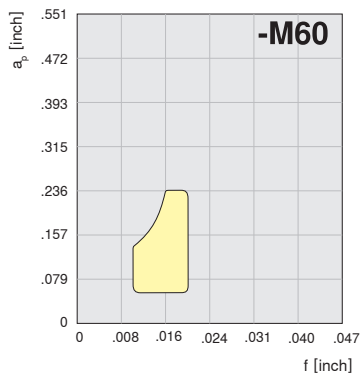
- Stainless steels
- Super alloys
- Spheroidal cast iron (GGG)



Application range:

CNMG 432EN-M34
 doc.: .020 - .197 inch
 fpr: .006 - .016 inch

- Steel in general
- Stainless steels
- GGG



Application range:

CNMG 432EN-M60
 doc.: .060 - .236 inch
 fpr: .010 - .020 inch

- Steel in general
- Stainless steels
- Super alloys



	<p>-TRM</p>	<p>Application range:</p>	<p>CNMG 432EN-TRM doc.: .020 - .118 inch fpr: .008 - .016 inch</p> <p>CNMG 544EN-TRM doc.: .039 - .236 inch fpr: .010 - .032 inch</p>	<ul style="list-style-type: none"> <input type="radio"/> Bearing steel <input type="radio"/> Steel in general <input type="radio"/> Stainless steels <input type="radio"/> Super alloys
	<p>-M70</p>	<p>Application range:</p>	<p>CNMG 432EN-M70 doc.: .059 - .197 inch fpr: .012 - .08 inch</p> <p>CNMG 544EN-M70 doc.: .098 - .394 inch fpr: .016 - .031 inch</p>	<ul style="list-style-type: none"> <input type="radio"/> Steel in general <input type="radio"/> Stainless steels <input type="radio"/> Cast iron <input type="radio"/> Bearing steel <input type="radio"/> Super alloys
	<p>-TMR</p>	<p>Application range:</p>	<p>CNMG 432EN-TMR doc.: .059 - .197 inch fpr: .012 - .020 inch</p> <p>CNMG 544EN-TMR doc.: .100 - .394 inch fpr: .016 - .032 inch</p>	<ul style="list-style-type: none"> <input type="radio"/> Steel in general <input type="radio"/> Bearing steel <input type="radio"/> Stainless steels <input type="radio"/> Cast iron <input type="radio"/> Super alloys
	<p>-TRR</p>	<p>Application range:</p>	<p>CNMM 433SN-TRR doc.: .039 - .236 inch fpr: .012 - .024 inch</p> <p>CNMM 644SN-TRR doc.: .118 - .472 inch fpr: .016 - 0.31 inch</p>	<ul style="list-style-type: none"> <input type="radio"/> Steels with low to medium strength (300-800 N/mm²) <input type="radio"/> Stainless steels <input type="radio"/> Super alloys



For roller bearing steels



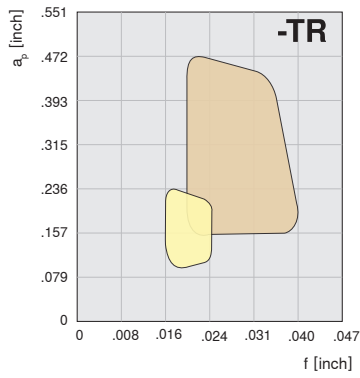
For steel and cast iron



For forged parts



Chip grooves

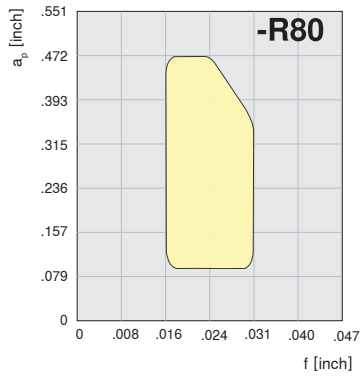
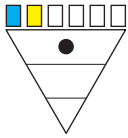


Application range:

CNMM 433EN-TR
 doc.: .098 - .236 inch
 fpr: .016 - .024 inch

- Steel in general
- Stainless steels
- Spheroidal cast iron (GGG)
- Super alloys

CNMM 644EN-TR
 doc.: .157 - .472 inch
 fpr: .020 - .039 inch



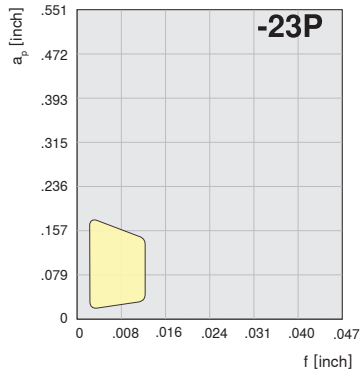
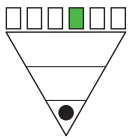
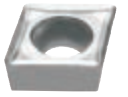
Application range:

CNMM 646SN-R80
 doc.: .098 - .472 inch
 fpr: .016 - .031 inch

- Bearing steel
- Stainless steels



For stainless steels



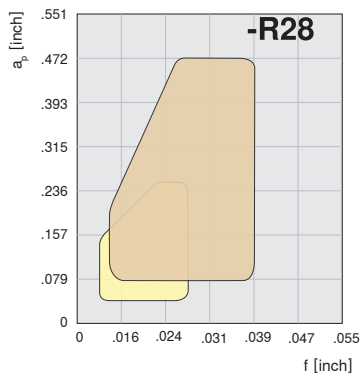
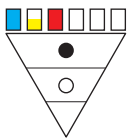
Application range:

CCGT 09T308FN-23P
 doc.: .020 - .177 inch
 fpr: .002 - .012 inch

- Soft aluminum wrought alloys (AlMn / AlMg)



Particularly suitable for extrusion molded work pieces





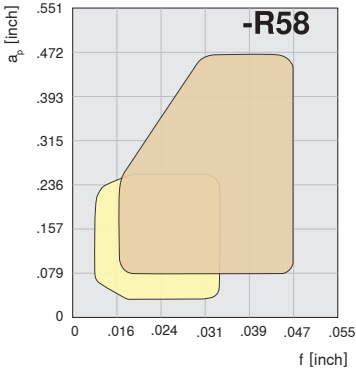

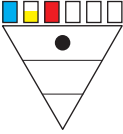
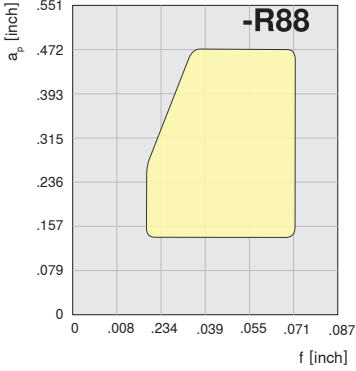

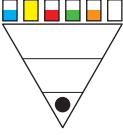
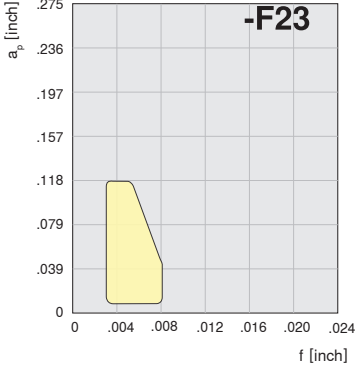

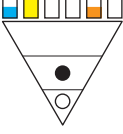
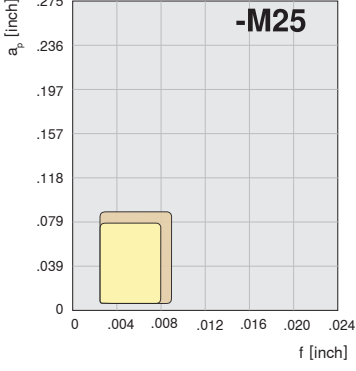
Application range:

CNMM 433EN-R28
 doc.: .040 - .276 inch
 fpr: .012 - .028 inch

- Steel in general
- Cast iron
- Stainless steel

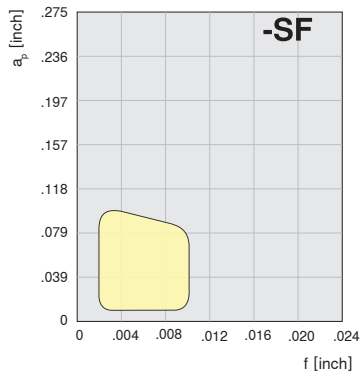
CNMM 646EN-R28
 doc.: .079 - .472 inch
 fpr: .014 - .040 inch



 	 <p>-R58</p>	<p>Application range:</p> <p>CNMM 433EN-R58 doc.: .039 - .276 inch fpr: .012 - .028 inch</p> <p>CNMM 646EN-R58 doc.: .098 - .472 inch fpr: .016 - .047 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Steel in general <input type="radio"/> Cast iron <input type="radio"/> Stainless steel
 	 <p>-R88</p>	<p>Application range:</p> <p>CNMM 646SN-R88 doc.: .138 - .472 inch fpr: .020 - .060 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Steel in general <input type="radio"/> Cast iron <input type="radio"/> Stainless steel
 	 <p>-F23</p>	<p>Application range:</p> <p>CCGT 32.5..FN-F23 doc.: .004 - .079 inch fpr: .002 - .005 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Stainless steels <input type="radio"/> Steel <input type="radio"/> Cast iron <input type="radio"/> Super alloys <input type="radio"/> Non-ferrous metals
 	 <p>-M25</p>	<p>Application range:</p> <p>CCMT 21.51EN-M25 doc.: .008 - .079 inch fpr: .002 - .008 inch</p> <p>CCMT 09T304EN-M25 doc.: .008 - .087 inch fpr: .002 - .009 inch</p> <ul style="list-style-type: none"> <input type="radio"/> Stainless steels <input type="radio"/> Steel in general <input type="radio"/> Super alloys



Chip grooves



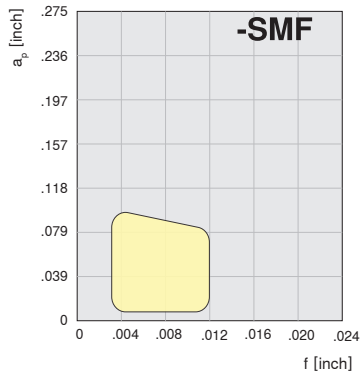
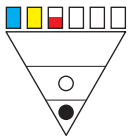
Application range:

CCMT 43..EN-SF

doc.: .002 - .100 inch

fpr: .002 - .010 inch

- Steel in general
- Stainless steels
- Spheroidal cast iron (GGG)
- Super alloys



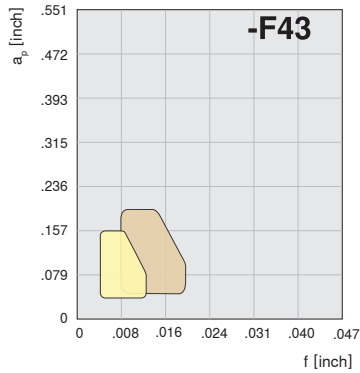
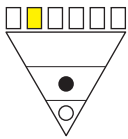
Application range:

CCMT 43..EN-SMF

doc.: .004 - .100 inch

fpr: .003 - .012 inch

- Steel in general
- Stainless steels
- Cast iron



Application range:

CNGP 432FN-F32

doc.: .020 - .079 inch

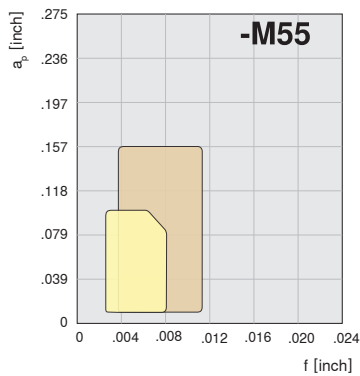
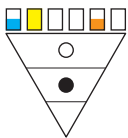
fpr: .002 - .006 inch

- Stainless steels

CCMT 32.52EN-F43

doc.: .026 - .100 inch

fpr: .004 - .010 inch



Application range:

CCMT 431EN-M55

doc.: .016 - .102 inch

fpr: .002 - .008 inch

- Stainless steels
- Steel in general
- Super alloys

CCMT 431EN-M55

doc.: .016 - .157 inch

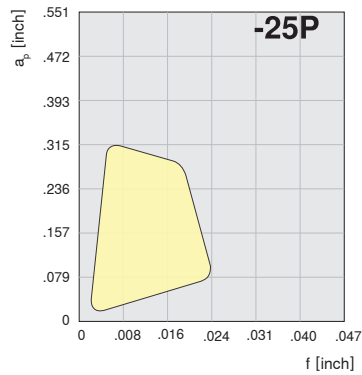
fpr: .003 - .011 inch



	<p>-SM</p>	<p>Application range:</p> <p>CNGP 432FN-F32 doc.: .002 - .079 inch fpr: .006 - .010 inch</p> <p>CCMT 433EN-SM doc.: .060 - .197 inch fpr: .006 - .018 inch</p> <ul style="list-style-type: none"> ○ Steel in general ○ Stainless steels ○ Cast iron ○ Super alloys
	<p>-SMQ</p> <p>Masterfinish</p>	<p>Application range:</p> <p>CCMT 432EN-SMQ doc.: .040 - .197 inch fpr: .006 - .022 inch</p> <ul style="list-style-type: none"> ○ Steel in general ○ Stainless steel ○ Gray cast iron (GG) <p> For more detailed information on MASTERFINISH see section 'Technical information'.</p>
	<p>-23P</p>	<p>Application range:</p> <p>CCGT 09T308FN-23P doc.: .020 - .177 inch fpr: .002 - .012 inch</p> <ul style="list-style-type: none"> ○ Soft aluminum wrought alloys (AlMn / AlMg) <p> Particularly suitable for extrusion molded work pieces</p>
	<p>-25Q</p> <p>Masterfinish</p>	<p>Application range:</p> <p>CCGT 432FN-25Q doc.: .039 - .256 inch fpr: .002 - .024 inch</p> <ul style="list-style-type: none"> ○ Aluminum cast and wrought alloys, also with a low content of Si (G-AlSi₂, AlMgSi) ○ Cast iron ○ Super alloys ○ Steel ○ Stainless steel <p> For more detailed information on MASTERFINISH see section 'Technical information'.</p>



Chip grooves



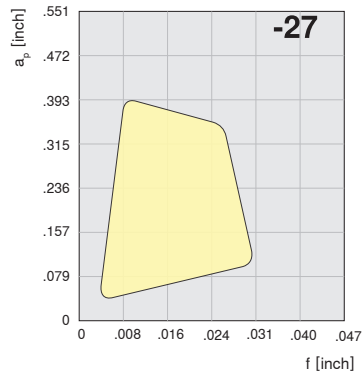
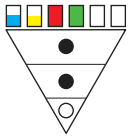
Application range:

CCGT 432FN-25P
 doc.: .020 - .315 inch
 fpr: .002 - .024 inch

- Aluminum cast and wrought alloys, also with a low content of Si (G- $AlSi_2$, AlMgSi)
- Cast iron
- Super alloys
- Steel
- Stainless steel



Well-suited for profile boring



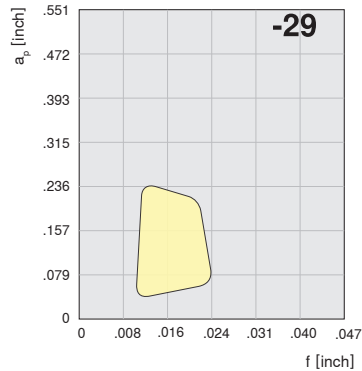
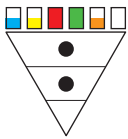
Application range:

CCGT 43..FN-27
 doc.: .039 - .394 inch
 fpr: .004 - .030 inch

- Aluminum cast and wrought alloys in general
- Non-ferrous metals
- Cast iron
- Steel
- Stainless steel



For universal application



Application range:

CCMT 32.52EN-29
 doc.: .039 - .236 inch
 fpr: .010 - .024 inch

- Aluminum cast and wrought alloys, also with a low content of Si (G- $AlSi_2$, AlMgSi)
- Cast iron
- Super alloys
- Steel
- Stainless steel



Application range

- Profile boring
- Small feed rates



Application range

- Profile boring
- Medium feed rates



Application range

- Super alloys
- Titanium
- Aluminum
- Stainless steels



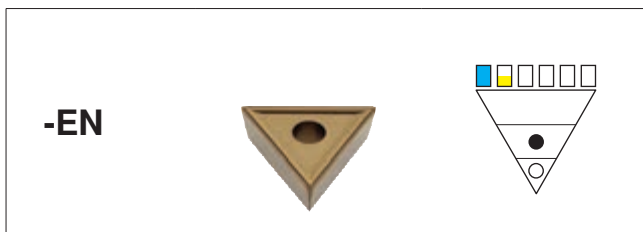
Application range

- Steel and cast iron in general



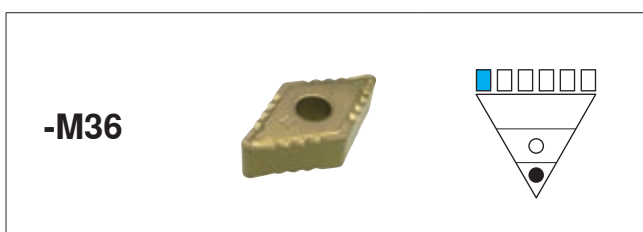
Application range

- Steel
- Stainless steels



Application range

- Steel in general

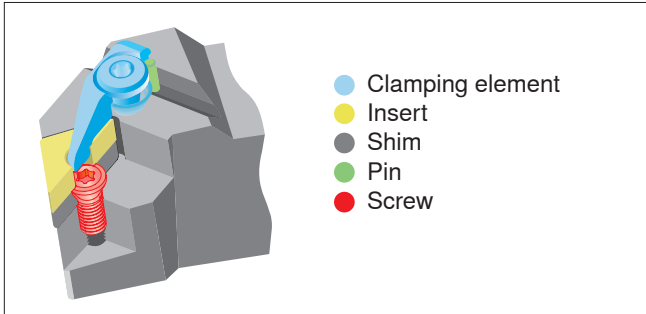


Application range

- Steel in general

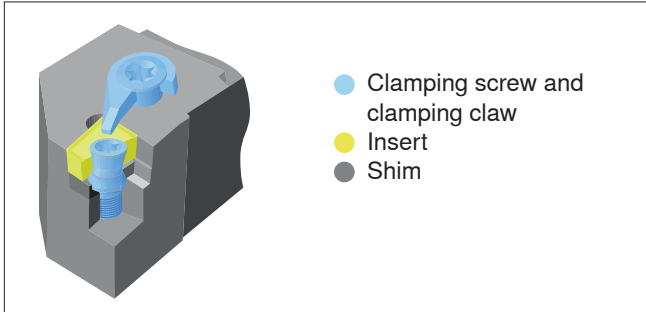


Clamping systems



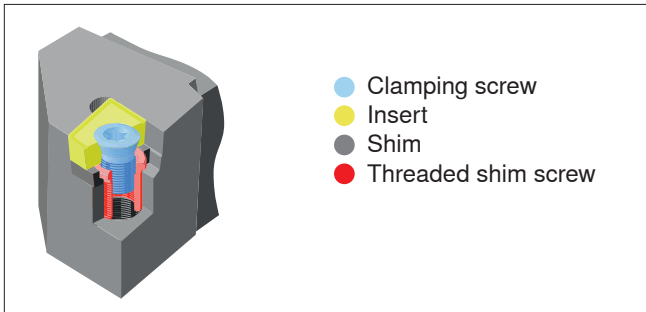
MaxiLock D

First choice for cutting with negative inserts with hole. **Safe and precise positioning** of the insert through **double clamping effect**.



MaxiLock M

The double lock system offers good rigidity in negative inserts clamping. During high feed or heavily interrupted machining it holds the insert securely clamped.



MaxiLock S

The form lock screw guarantees a safe connection of the insert and the tool holder. Chip evacuation is not hindered by obstructive clamping elements. Due to the neutral insert position the effective rake angle is identical to that of the insert form and geometry.



Clamping system	Cutting depth / feed rate (inch)						Insert shape	Insert form of top surface
	a_p	f	a_p	f	a_p	f		
	.012 - .078 	.003 - .011 	.078 - .236 	.008 - .023 	.197 - .591 	.020 - .059 		
MaxiLock D 	✓	✓	✓					
MaxiLock M 	✓	✓	✓					
MaxiLock S 	✓	✓						





Machining operation

	Overview	A54
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External machining

	Longitudinal turning	A55
	Face turning	A56
	Longitudinal/face turning	A57
	Profiling	A58

Internal machining

	Boring	A59
	Boring and face turning	A60
	Profile boring	A61

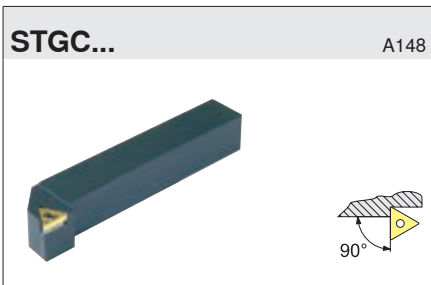
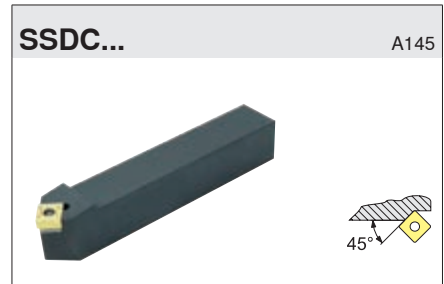
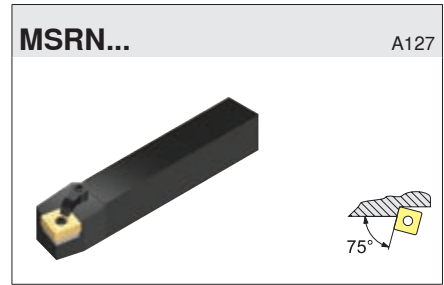
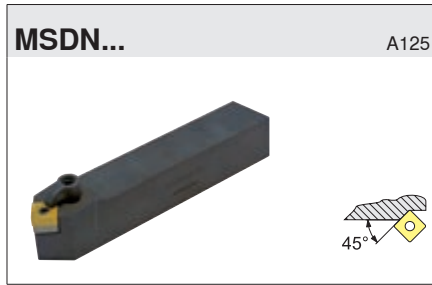
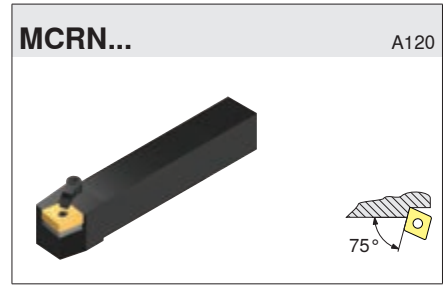


Overview of machining operations

Application

Tools and inserts for turning

	Maxilock D		Maxilock M		Maxilock S	





External machining

Face turning

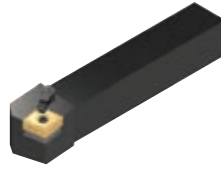
MCFN...

A115



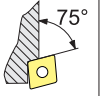
MCKN...

A117



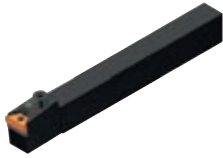
MSKN...

A126



MTCN...

A130



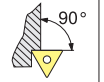
MTEN...

A131



MTFN...

A132



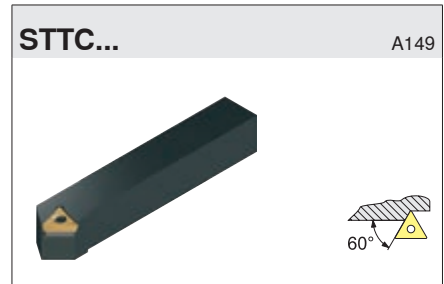
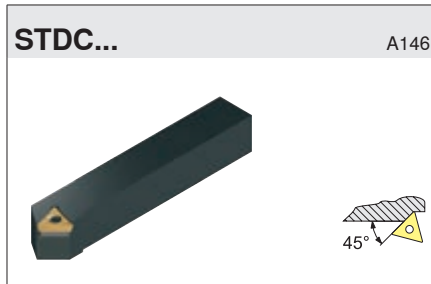
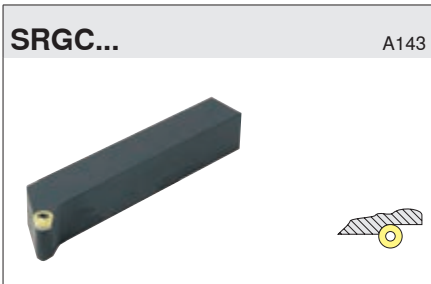
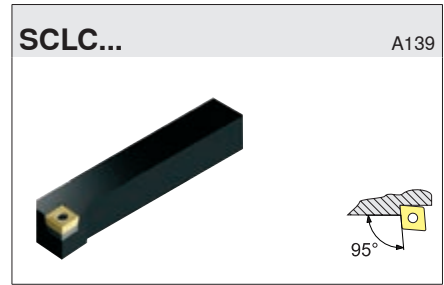
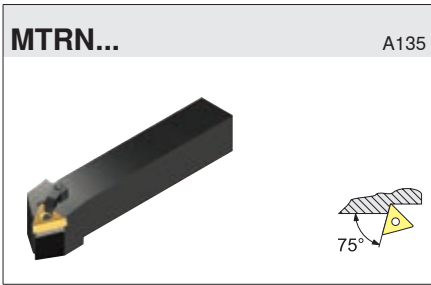
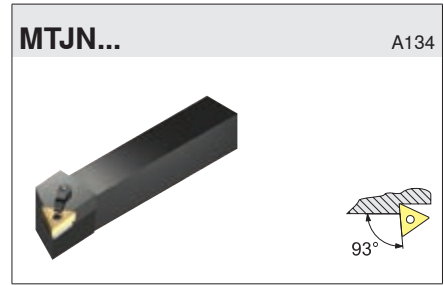
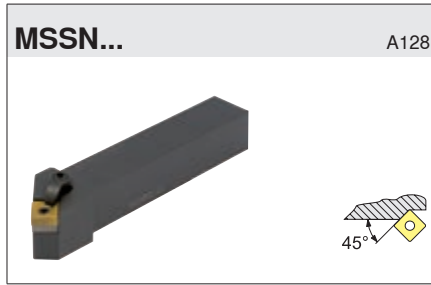
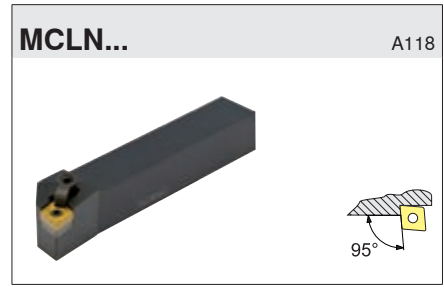
STFC...

A147



Application

Tools and inserts for turning



**DDJN...**

A107

**DTJN...**

A112

**DVJN...**

A113

**MDJN...**

A121

**MDPN...**

A122

**MDQN...**

A123

**MVJN...**

A136

**MVVN...**

A137

**SDJC...**

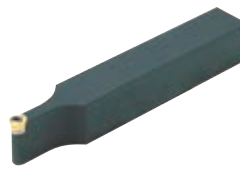
A140

**SDPC...**

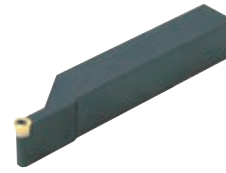
A141

**SRDC...**

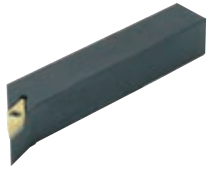
A142

**SRSC...**

A144

**SVHC...**

A150

**SVJC...**

A151

**SVVC...**

A152





MSKN...

A159



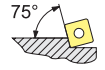
MTFN...

A160



SSKC...

A172



STFC...

A173





Internal machining

Boring and face turning

DCLN...

A153



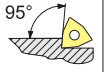
MCLN...

A155



MWLN...

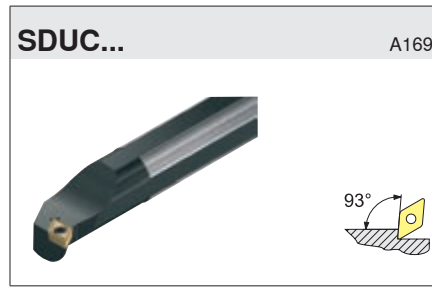
A165



SCLC...


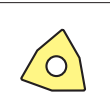
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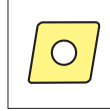
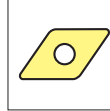
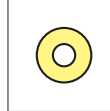
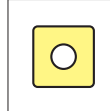

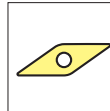





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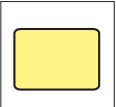
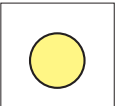
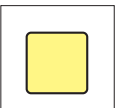
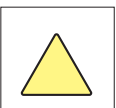
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	55°	A68-A70
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	35°	A77
	80°	A78-A79
	Others	A80-A81

MaxiLock S

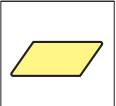
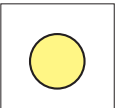
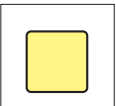
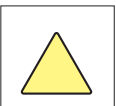
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	0°	A87
	90°	A88
	60°	A89
	35°	A90-A91
	Others	A92



Simplex N

	80°	A93
	55°	A94
	75°	A94
	90°	A94
	0°	A95
	90°	A96-A97
	60°	A98

Simplex P

	55°	A99
	0°	A100
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	60°	A102

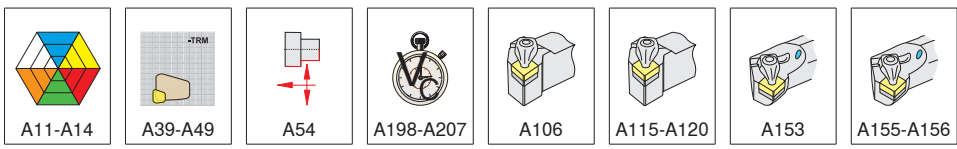
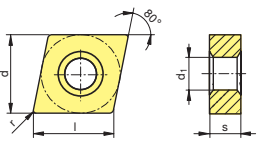


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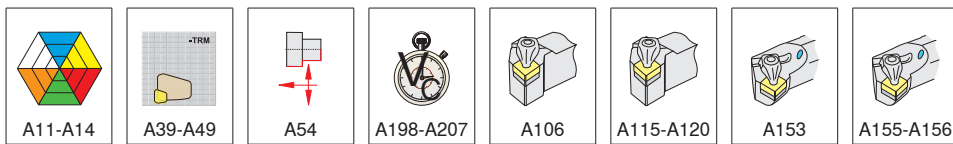
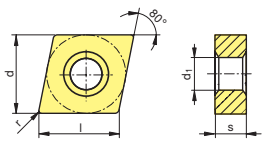
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M			O																				
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S																							
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Code	Image	Part Number	Material															d	l	s	r	d _t						
			H10T	TSM20	CTP5110	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTCP135	CTC1135	CTC2135	TCC410	TCM10											
			[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]						
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		CNMG 432EN-CF																	●	●				.500	.508	.187	.031	.203
		CNMG 433EN-CF																		●	●				.500	.508	.187	.047
-F32		CNGP 43.5FN-F32							●														.500	.508	.187	.008	.203	
		CNGP 431FN-F32							●															.500	.508	.187	.016	.203
		CNGP 432FN-F32							●															.500	.508	.187	.031	.203
-F30		CNMG 431EN-F30									●												.500	.508	.187	.016	.203	
		CNMG 432EN-F30									●													.500	.508	.187	.031	.203
-TF		CNMG 321EN-TF							●														.375	.382	.125	.016	.150	
		CNMG 431EN-TF							●				●	●									.500	.508	.187	.016	.203	
		CNMG 432EN-TF								●			●	●									.500	.508	.187	.031	.203	
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		CNMG 432EN-F34							●														.500	.508	.187	.031	.203	
		CNMG 433EN-F34							●														.500	.508	.187	.047	.203	
-M30		CNMG 432EN-M30										●											.500	.508	.187	.031	.203	
		CNMG 433EN-M30										●											.500	.508	.187	.047	.203	
		CNMG 434EN-M30										●											.500	.508	.187	.063	.203	
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		CNMG 432EN-M34			●			●															.500	.508	.187	.031	.203	
		CNMG 433EN-M34			●			●															.500	.508	.187	.047	.203	
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		CNMG 432EN-42		●										●	●	●							.500	.508	.187	.031	.203	
-TFQ		CNMG 431EN-TFQ										●											.500	.508	.187	.016	.203	
		CNMG 432EN-TFQ										●											.500	.508	.187	.031	.203	
		CNMG 433EN-TFQ										●											.500	.508	.187	.047	.203	
-TMF		CNMG 431EN-TMF										●			●	●							.500	.508	.187	.016	.203	
		CNMG 432EN-TMF										●			●	●							.500	.508	.187	.031	.203	





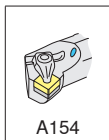
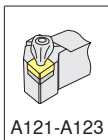
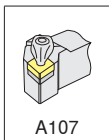
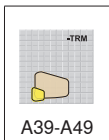
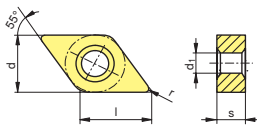
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M		○		○	○	○	○	○	○	○	○																																																																														
K	●		●	●	●	●	●	●	●	●	●																																																																														
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		H10T	TSM20	CTP5110	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTCP135	CTC1135	CTC2135	TCC410	TCM10	[inch]	[inch]	[inch]	[inch]	[inch]																																																																				
-M42									●					●			.500	.508	.187	.016	.203																																																																				
	CNMG 432EN-M42								●								.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-M42													●			.500	.508	.187	.047	.203																																																																				
-M52									●								.500	.508	.187	.016	.203																																																																				
	CNMG 432EN-M52								●								.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-M52																.500	.508	.187	.047	.203																																																																				
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	CNMG 433EN-M50								●	●							.500	.508	.187	.047	.203																																																																				
	CNMG 544EN-M50								●	●							.625	.634	.250	.063	.250																																																																				
-TM					●				●	●							.375	.382	.125	.031	.150																																																																				
	CNMG 432EN-TM							●	●	●	●	●	●				.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-TM								●	●	●	●	●	●			.500	.508	.187	.047	.203																																																																				
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	CNMG 542EN-TM								●	●	●	●	●	●			.625	.634	.250	.031	.250																																																																				
	CNMG 543EN-TM								●	●	●	●	●	●			.625	.634	.250	.047	.250																																																																				
	CNMG 643EN-TM								●	●	●	●	●	●			.750	.760	.250	.047	.313																																																																				
	CNMG 644EN-TM								●	●	●	●	●	●			.750	.760	.250	.063	.313																																																																				
-TMQ									●	●							.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-TMQ								●	●							.500	.508	.187	.047	.203																																																																				
-TRM									●	●				●			.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-TRM								●	●				●			.500	.508	.187	.047	.203																																																																				
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	CNMG 543EN-TRM								●	●							.625	.634	.250	.047	.250																																																																				
	CNMG 544EN-TRM								●	●		●					.625	.634	.250	.063	.250																																																																				
	CNMG 643EN-TRM								●	●		●					.750	.760	.250	.047	.313																																																																				
-M60										●	●						.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-M60									●	●						.500	.508	.187	.047	.203																																																																				
	CNMG 434EN-M60									●	●						.500	.508	.187	.063	.203																																																																				
	CNMG 543EN-M60									●	●						.625	.634	.250	.047	.250																																																																				
-M70					●	●			●	●				●			.500	.508	.187	.031	.203																																																																				
	CNMG 433EN-M70				●	●			●	●				●			.500	.508	.187	.047	.203																																																																				
	CNMG 543EN-M70								●	●				●			.625	.634	.250	.047	.250																																																																				
	CNMG 544EN-M70								●	●				●			.625	.634	.250	.063	.250																																																																				
	CNMG 643EN-M70								●	●				●			.750	.760	.250	.047	.313																																																																				
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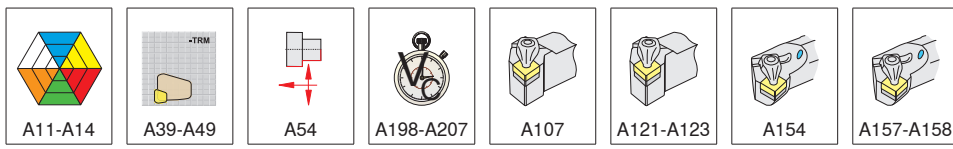
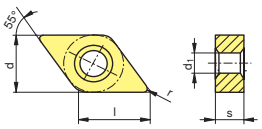
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M		O			O	O	O	O	O	O	O	O	O							
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	Image	Part Number	H10T	TSM20	CTP5110	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTCP135	CTC1135	CTC2135	TCC410	TCM10	Dimensions					
																		d [inch]	l [inch]	s [inch]	r [inch]	d _i [inch]	
-CF		DNMG 331EN-CF																.375	.457	.187	.016	.150	
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		DNGP 44.5FN-F32																	.500	.610	.250	.008	.203
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		DNMG 332EN-F30																	.375	.457	.187	.031	.150
		DNMG 441EN-F30																	.500	.610	.250	.016	.203
-TF		DNMG 442EN-F30																.500	.610	.250	.031	.203	
		DNMG 331EN-TF																	.375	.457	.187	.016	.150
		DNMG 332EN-TF																	.375	.457	.187	.031	.150
		DNMG 441EN-TF																	.500	.610	.250	.016	.203
-M30		DNMG 442EN-TF																.500	.610	.250	.031	.203	
		DNMG 443EN-TF																	.500	.610	.250	.047	.203
		DNMG 331EN-M30																	.375	.457	.187	.016	.150
		DNMG 332EN-M30																	.375	.457	.187	.031	.150
		DNMG 441EN-M30																	.500	.610	.250	.016	.203
-M34		DNMG 442EN-M30																.500	.610	.250	.031	.203	
		DNMG 443EN-M30																	.500	.610	.250	.047	.203
		DNMG 331EN-M34																	.500	.610	.187	.016	.203
		DNMG 431EN-M34																	.500	.610	.187	.031	.203
		DNMG 432EN-M34																	.500	.610	.187	.047	.203
-TFQ		DNMG 433EN-M34																.500	.610	.187	.047	.203	
		DNMG 442EN-M34																	.500	.610	.250	.031	.203
		DNMG 443EN-M34																	.500	.610	.250	.047	.203
		DNMG 441EN-TFQ																	.500	.610	.250	.016	.203
-TMF		DNMG 442EN-TFQ																.500	.610	.250	.031	.203	
		DNMG 331EN-TMF																	.375	.457	.187	.016	.150
		DNMG 332EN-TMF																	.375	.457	.187	.031	.150
		DNMG 333EN-TMF																	.375	.457	.187	.047	.150
		DNMG 441EN-TMF																	.500	.610	.250	.016	.203
-M42		DNMG 442EN-TMF																.500	.610	.250	.031	.203	
		DNMG 331EN-M42																	.375	.457	.187	.016	.150
		DNMG 332EN-M42																	.375	.457	.187	.031	.150
		DNMG 431EN-M42																	.500	.610	.187	.016	.203
		DNMG 432EN-M42																	.500	.610	.187	.031	.203
		DNMG 441EN-M42																	.500	.610	.250	.016	.203
DNMG 442EN-M42																	.500	.610	.250	.031	.203		





	P	M	K	N	S	H												d	l	s	r	d ₁
							H10T	TSM20	CTP5110	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTCP135	CTC1135	CTC2135	TCC410	TCM10	[inch]
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		DNMG 432EN-M52											.500	.610	.187	.031	.203					
		DNMG 441EN-M52											.500	.610	.250	.016	.203					
		DNMG 442EN-M52											.500	.610	.250	.031	.203					
-M50		DNMG 331EN-M50											.375	.457	.187	.016	.150					
		DNMG 332EN-M50											.375	.457	.187	.031	.150					
		DNMG 431EN-M50											.500	.610	.187	.016	.203					
		DNMG 432EN-M50											.500	.610	.187	.031	.203					
		DNMG 433EN-M50											.500	.610	.187	.047	.203					
		DNMG 441EN-M50											.500	.610	.250	.016	.203					
		DNMG 442EN-M50											.500	.610	.250	.031	.203					
		DNMG 443EN-M50											.500	.610	.250	.047	.203					
-TM		DNMG 332EN-TM											.375	.457	.187	.031	.150					
		DNMG 442EN-TM											.500	.610	.250	.031	.203					
		DNMG 443EN-TM											.500	.610	.250	.047	.203					
		DNMG 444EN-TM											.500	.610	.250	.063	.203					
-TMQ		DNMG 442EN-TMQ											.500	.610	.250	.031	.203					
		DNMG 443EN-TMQ											.500	.610	.250	.047	.203					
-TRM		DNMG 332EN-TRM											.375	.457	.187	.031	.150					
		DNMG 333EN-TRM											.375	.457	.187	.047	.150					
		DNMG 433EN-TRM											.500	.610	.187	.047	.203					
		DNMG 442EN-TMR											.500	.610	.250	.031	.203					
		DNMG 442EN-TRM											.500	.610	.250	.031	.203					
		DNMG 443EN-TRM											.500	.610	.250	.047	.203					
		DNMG 444EN-TRM											.500	.610	.250	.063	.203					
-M60		DNMG 442EN-M60											.500	.610	.250	.031	.203					
		DNMG 443EN-M60											.500	.610	.250	.047	.203					
-M70		DNMG 333EN-M70											.375	.457	.187	.047	.150					
		DNMG 442EN-M70											.500	.610	.250	.031	.203					
		DNMG 443EN-M70											.500	.610	.250	.047	.203					
-TMR		DNMG 332EN-TMR											.375	.457	.187	.031	.150					
		DNMG 333EN-TMR											.375	.457	.187	.047	.150					
		DNMG 442EN-TMR											.500	.610	.250	.031	.203					
		DNMG 443EN-TMR											.500	.610	.250	.047	.203					
		DNMG 444EN-TMR											.500	.610	.250	.063	.203					
-R28		DNMM 443EN-R28											.500	.610	.250	.047	.203					
		DNMM 444EN-R28											.500	.610	.250	.063	.203					



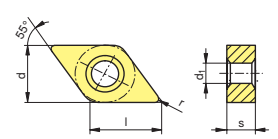


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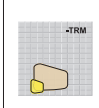
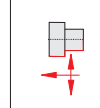

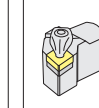
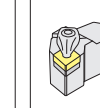
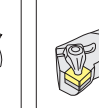
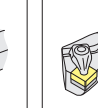
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	●	○	●	○	●	○	H10T	TSM20	CTP5110	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTCP135	CTC1135	CTC2135	TCC410	TCM10	[inch]	[inch]	[inch]	[inch]	[inch]
-R58	●	○	●	○	●	○						●	●									.500	.610	.250	.047	.203
-TR														●			●					.500	.610	.250	.031	.203
DN..A									●	●												.500	.610	.250	.031	.203

-R58		DNMM 443EN-R58 DNMM 444EN-R58											●	●														.500	.610	.250	.047	.203	.500	.610	.250	.063	.203	
-TR		DNMM 442EN-TR DNMM 443EN-TR												●			●												.500	.610	.250	.031	.203	.500	.610	.250	.047	.203
DN..A		DNMA 442EN DNMA 443EN									●	●																	.500	.610	.250	.031	.203	.500	.610	.250	.047	.203



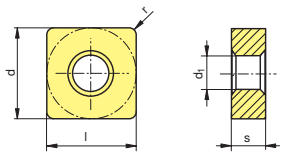
Inserts

Tools and inserts for turning

- 
A11-A14
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A39-A49
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A54
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A198-A207
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A107
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A121-A123
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A154
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A157-A158

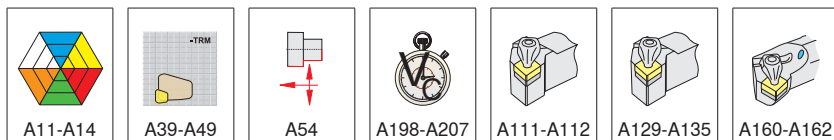
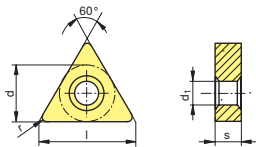


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SN..A		SNMA 432EN				●	●										.500	.500	.187	.031	.203																																																																											
		SNMA 433EN				●	●											.500	.500	.187	.047	.203																																																																										
		SNMA 434EN				●	●											.500	.500	.187	.063	.203																																																																										
		SNMA 544EN				●	●											.625	.625	.250	.063	.250																																																																										
		SNMA 644EN				●												.750	.750	.250	.063	.313																																																																										
EN		SNMG 322EN				●			●		●	●				.375	.375	.125	.031	.150																																																																												





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-TRM		TNMG 332EN-TRM															.375	.650	.187	.031	.150																																																																											
		TNMG 333EN-TRM																.375	.650	.187	.047	.150																																																																										
		TNMG 432EN-TRM																.500	.866	.187	.031	.203																																																																										
		TNMG 433EN-TRM																.500	.866	.187	.047	.203																																																																										
-M60		TNMG 332EN-M60															.375	.650	.187	.031	.150																																																																											
		TNMG 333EN-M60																.375	.650	.187	.047	.150																																																																										
-M70		TNMG 332EN-M70															.375	.650	.187	.031	.150																																																																											
		TNMG 333EN-M70																.375	.650	.187	.047	.150																																																																										
		TNMG 432EN-M70																.500	.866	.187	.031	.203																																																																										
		TNMG 433EN-M70																.500	.866	.187	.047	.203																																																																										
-TMR		TNMG 332EN-TMR															.375	.650	.187	.031	.150																																																																											
		TNMG 333EN-TMR																.375	.650	.187	.047	.150																																																																										
		TNMG 431EN-TMR																.500	.866	.187	.016	.203																																																																										
		TNMG 432EN-TMR																.500	.866	.187	.031	.203																																																																										
		TNMG 433EN-TMR																.500	.866	.187	.047	.203																																																																										
-R28		TNMG 434EN-TMR															.500	.866	.187	.063	.203																																																																											
		TNMM 434EN-R28																.500	.866	.187	.063	.203																																																																										
-TR		TNMM 333EN-TR															.375	.650	.187	.047	.150																																																																											
		TNMM 432EN-TR																.500	.866	.187	.031	.203																																																																										
		TNMM 433EN-TR																.500	.866	.187	.047	.203																																																																										
		TNMM 434EN-TR																.500	.866	.187	.063	.203																																																																										
-TRR		TNMM 544EN-TR															.625	1.083	.250	.063	.250																																																																											
		TNMM 332SN-TRR																.375	.650	.187	.031	.150																																																																										
-TRR		TNMM 433SN-TRR															.500	.866	.187	.047	.203																																																																											
TN..A		TNMA 332EN															.375	.650	.187	.031	.150																																																																											
		TNMA 333EN																.375	.650	.187	.047	.150																																																																										
		TNMA 334EN																.375	.650	.187	.063	.150																																																																										
		TNMA 432EN																.500	.866	.187	.031	.203																																																																										
		TNMA 433EN																.500	.866	.187	.047	.203																																																																										
		TNMA 434EN																.500	.866	.187	.063	.203																																																																										
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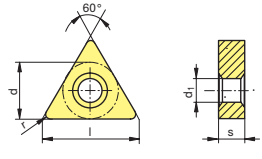


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ER-EL		TNMG 331ER																		.375	.650	.187	.016	.150	
		TNMG 332EL																			.375	.650	.187	.031	.150
		TNMG 332ER																			.375	.650	.187	.031	.150
EN		TNMG 666EN							●											.750	1.299	.375	.094	.313	
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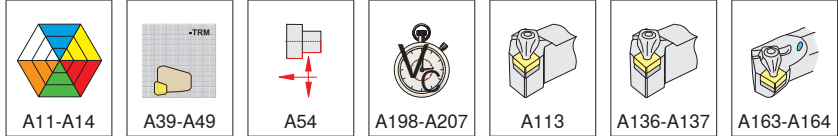
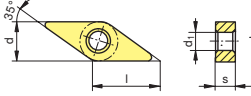
Inserts

Tools and inserts for turning

- A11-A14
- A39-A49
- A54
- A198-A207
- A111-A112
- A129-A135
- A160-A162



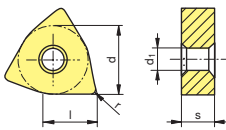
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																										[inch]	[inch]	[inch]	[inch]	[inch]		
-F32		VNGP 33.5FN-F32																								.375	.654	.187	.008	.150		
		VNGP 331FN-F32																									.375	.654	.187	.016	.150	
-F30		VNMG 331EN-F30																								.375	.654	.187	.016	.150		
		VNMG 332EN-F30																									.375	.654	.187	.031	.150	
-F40		VNMG 331EN-F40																								.375	.654	.187	.016	.150		
		VNMG 332EN-F40																									.375	.654	.187	.031	.150	
-M30		VNMG 332EN-M30																								.375	.654	.187	.031	.150		
-M34		VNMG 331EN-M34																								.375	.654	.187	.016	.150		
		VNMG 332EN-M34																								.375	.654	.187	.031	.150		
		VNMG 333EN-M34																									.375	.654	.187	.047	.150	
-M50		VNMG 331EN-M50																								.375	.654	.187	.016	.150		
		VNMG 332EN-M50																								.375	.654	.187	.031	.150		
		VNMG 333EN-M50																									.375	.654	.187	.047	.150	
-M40		VNMG 331EN-M40																								.375	.654	.187	.016	.150		
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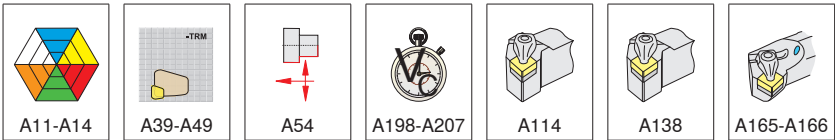
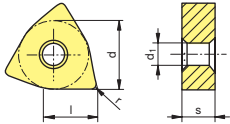
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			d	l	s	r	d _f																					
			[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]
-CF		WNMG 331EN-CF																	.375	.256	.187	.016	.150					
		WNMG 332EN-CF																	.375	.256	.187	.031	.150					
-F30		WNMG 331EN-F30																	.375	.256	.187	.016	.150					
		WNMG 332EN-F30																	.375	.256	.187	.031	.150					
		WNMG 431EN-F30																	.500	.342	.187	.016	.203					
		WNMG 432EN-F30																	.500	.342	.187	.031	.203					
-TF		WNMG 331EN-TF																	.375	.256	.187	.016	.150					
		WNMG 431EN-TF																	.500	.342	.187	.016	.203					
		WNMG 432EN-TF																	.500	.342	.187	.031	.203					
-F34		WNMG 432EN-F34																.500	.342	.187	.031	.203						
-M30		WNMG 332EN-M30																	.375	.256	.187	.031	.150					
		WNMG 333EN-M30																	.375	.256	.187	.047	.150					
		WNMG 432EN-M30																	.500	.342	.187	.031	.203					
		WNMG 433EN-M30																	.500	.342	.187	.047	.203					
-M34		WNMG 432EN-M34																	.500	.342	.187	.031	.203					
		WNMG 433EN-M34																	.500	.342	.187	.047	.203					
-TFQ		WNMG 331EN-TFQ																	.375	.256	.187	.016	.150					
		WNMG 332EN-TFQ																	.375	.256	.187	.031	.150					
		WNMG 431EN-TFQ																	.500	.342	.187	.016	.203					
		WNMG 432EN-TFQ																	.500	.342	.187	.031	.203					
		WNMG 433EN-TFQ																	.500	.342	.187	.047	.203					
-TMF		WNMG 331EN-TMF																	.375	.256	.187	.016	.150					
		WNMG 332EN-TMF																	.375	.256	.187	.031	.150					
		WNMG 431EN-TMF																	.500	.342	.187	.016	.203					
		WNMG 432EN-TMF																	.500	.342	.187	.031	.203					
-M42		WNMG 331EN-M42																	.375	.256	.187	.016	.150					
		WNMG 332EN-M42																	.375	.256	.187	.031	.150					
		WNMG 431EN-M42																	.500	.342	.187	.016	.203					
		WNMG 432EN-M42																	.500	.342	.187	.031	.203					
		WNMG 433EN-M42																	.500	.342	.187	.047	.203					
-M52		WNMG 331EN-M52																	.375	.256	.187	.016	.150					
		WNMG 332EN-M52																	.375	.256	.187	.031	.150					
		WNMG 431EN-M52																	.500	.342	.187	.016	.203					
		WNMG 432EN-M52																	.500	.342	.187	.031	.203					





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		H10T	TSM20	CTP5110	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTCP135	CTC1135	CTC2135	TCC410	TCM10	[inch]	[inch]	[inch]	[inch]	[inch]																																																													
-M50		WNNMG 332EN-M50						●		●							.375	.256	.187	.031	.150																																																													
		WNNMG 333EN-M50							●	●							.375	.256	.187	.047	.150																																																													
		WNNMG 432EN-M50						●		●	●						.500	.342	.187	.031	.203																																																													
		WNNMG 433EN-M50						●		●	●						.500	.342	.187	.047	.203																																																													
-TM		WNNMG 332EN-TM						●		●		●	●				.375	.256	.187	.031	.150																																																													
		WNNMG 432EN-TM						●		●	●	●	●				.500	.342	.187	.031	.203																																																													
		WNNMG 433EN-TM						●		●	●	●	●				.500	.342	.187	.047	.203																																																													
-TMQ		WNNMG 432EN-TMQ							●								.500	.342	.187	.031	.203																																																													
		WNNMG 433EN-TMQ						●		●							.500	.342	.187	.047	.203																																																													
-TRM		WNNMG 332EN-TRM								●							.375	.256	.187	.031	.150																																																													
		WNNMG 333EN-TRM								●							.375	.256	.187	.047	.150																																																													
		WNNMG 432EN-TRM								●							.500	.342	.187	.031	.203																																																													
		WNNMG 433EN-TRM								●							.500	.342	.187	.047	.203																																																													
		WNNMG 434EN-TRM								●							.500	.342	.187	.063	.203																																																													
-M60		WNNMG 332EN-M60								●	●						.375	.256	.187	.031	.150																																																													
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		WNNMG 432EN-M60								●	●	●					.500	.342	.187	.031	.203																																																													
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		WNNMG 433EN-M70			●	●				●							.500	.342	.187	.047	.203																																																													
		WNNMG 434EN-M70			●	●		●		●							.500	.342	.187	.063	.203																																																													
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		WNNMG 433EN-TMR			●	●				●			●	●			.500	.342	.187	.047	.203																																																													
		WNNMG 434EN-TMR			●	●		●		●							.500	.342	.187	.063	.203																																																													





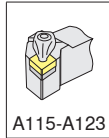
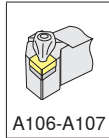
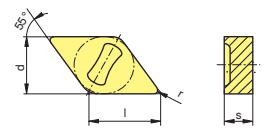
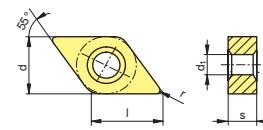
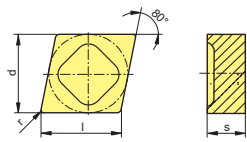
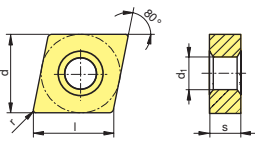
MaxiLock D/N

CN.. - DN.. (other cutting materials)

Tools and inserts for turning

Inserts

			P	M	K	N	S	H																			d	l	s	r	d _i		
					●	●	●	●																			[inch]	[inch]	[inch]	[inch]	[inch]		
CN...A		CNGA 432SN-025C			●																						.500	.508	.187	.031	.203		
		CNGA 432TN-020D																									.500	.508	.187	.031	.203		
		CNGA 433SN-020D				●																					.500	.508	.187	.047	.203		
		CNGA 433SN-025C					●																				.500	.508	.187	.047	.203		
		CNGA 542SN-028C						●																			.625	.634	.250	.031	.250		
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		CNGA 544TN-020D																									.625	.634	.250	.063	.250		
CN...X		CNGX 453TN-020D			●																					.500	.508	.313	.047				
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CN...A		CNMA 433FN						●																		.500	.508	.187	.047	.203			
		CNMA 433TN-020D						●																		.500	.508	.187	.047	.203			
		CNMA 434FN							●																		.500	.508	.187	.063	.203		
		CNMA 434TN-020D							●																		.500	.508	.187	.063	.203		
CN...X		CNMX 431SN			●																					.500	.508	.187	.016	.203			
		CNMX 432EN			●																					.500	.508	.187	.031	.203			
		CNMX 432SN			●																					.500	.508	.187	.031	.203			
		CNMX 433SN			●																					.500	.508	.187	.047	.203			
		CNNX 454TN-020D				●		●																			.500	.508	.313	.063			
DN...A		DNGA 441TN-020D																								.500	.610	.250	.016	.203			
		DNGA 442TN-020D																								.500	.610	.250	.031	.203			
		DNGA 443TN-020D																									.500	.610	.250	.047	.203		
		DNGA 444TN-020D																									.500	.610	.250	.063	.203		
DN...X		DNGX 354TN-020D																								.394	.484	.313	.047				
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A11-A14

A54

A204-A207







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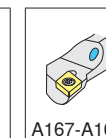
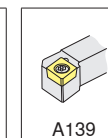
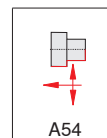
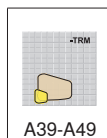
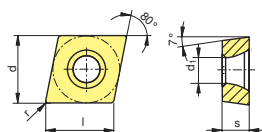
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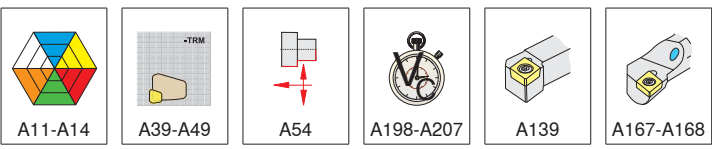
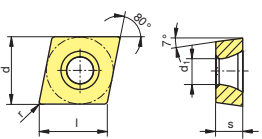


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		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]			
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		CCGT 21.51FN-23P			●																				.250	.252	.094	.016	.110
		CCGT 32.51FN-23P			●																				.375	.382	.156	.016	.173
		CCGT 32.52FN-23P			●																				.375	.382	.156	.031	.173
-25P		CCGT 21.5FN-25P		●				●																.250	.252	.094	.008	.110	
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		CCGT 43.5FN-25P			●																				.500	.508	.187	.008	.217
		CCGT 431FN-25P			●				●																.500	.508	.187	.016	.217
-25Q		CCGT 21.51FN-25Q		●																				.250	.252	.094	.016	.110	
		CCGT 32.51FN-25Q		●																				.375	.382	.156	.016	.173	
		CCGT 32.52FN-25Q		●																				.375	.382	.156	.031	.173	
		CCGT 431FN-25Q			●																				.500	.508	.187	.016	.217
		CCGT 432FN-25Q			●		●																		.500	.508	.187	.031	.217
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		CCGT 32.5FN-27			●																			.375	.382	.156	.008	.173	
		CCGT 32.51FN-27			●																				.375	.382	.156	.016	.173
		CCGT 32.52FN-27			●																				.375	.382	.156	.031	.173
		CCGT 43.5FN-27			●																				.500	.508	.187	.008	.217
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		CCMT 32.52EN-29			●																			.375	.382	.156	.031	.173	
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		CCGT 32.5X0FN-F23												●										.375	.382	.156	.000	.173	
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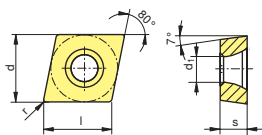
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H																																																																																																							
		H210T	H10T	H216T	U17T	CTW7120	S40T	AMZ	CTP4115	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTC1135	CTCP135	CTC2135	TCC410	TCM407	TCM10	[inch]	[inch]	[inch]	[inch]	[inch]																																																																												
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		CCGT 32.5.5EN-SF																			●	●	●		.375	.382	.156	.008	.173																																																																										
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		CCGT 32.52EN-SF																			●	●	●		.375	.382	.156	.031	.173																																																																										
		CCGT 431EN-SF																			●	●	●		.500	.508	.187	.016	.217																																																																										
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		CCMT 432EN-SMF											●				●		●		●			.500	.508	.187	.031	.217																																																																											
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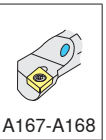
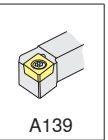
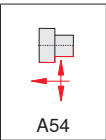
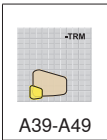


Inserts

Tools and inserts for turning

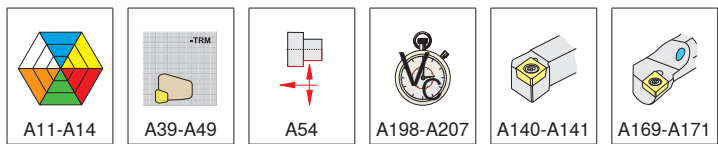
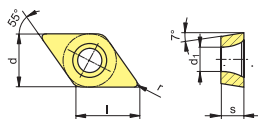


	-SMQ 	CCMT 32.51EN-SMQ CCMT 32.52EN-SMQ CCMT 431EN-SMQ CCMT 432EN-SMQ	CC.W 	CCGW 32.51FN	Material Compatibility Matrix																Dimensions															
					P	M	K	N	S	H	H210T	H10T	H216T	U17T	CTW7120	S40T	AMZ	CTP4115	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTC1135	CTCP135	CTC2135	TCC410	TCM407	TCM10	d	l	s	r	d ₁
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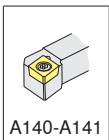
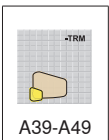
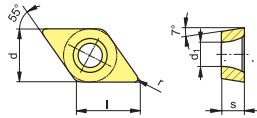


Tools and inserts for turning

Inserts

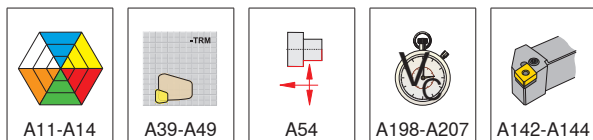
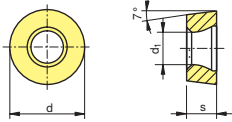
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		H210T	H10T	H216T	U17T	CTW7120	S40T	AMZ	CTP4115	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTC1135						CTCP135	CTC2135	TCC410	TCM407	TCM10	
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	DCMT 32.5.5EN-F43																			●				.375	.457	.156	.008	.173
	DCMT 32.51EN-F43																			●				.375	.457	.156	.016	.173
	DCMT 32.52EN-F43																			●				.375	.457	.156	.031	.173
-SMF	DCMT 21.5.5EN-SMF																				●			.250	.305	.094	.008	.110
	DCMT 21.51EN-SMF													●							●			.250	.305	.094	.016	.110
	DCMT 21.52EN-SMF																●				●			.250	.305	.094	.031	.110
	DCMT 32.51EN-SMF													●							●			.375	.457	.156	.016	.173
	DCMT 32.52EN-SMF													●							●			.375	.457	.156	.031	.173
-M55	DCMT 21.51EN-M55																							.250	.305	.094	.016	.110
	DCMT 21.52EN-M55																							.250	.305	.094	.031	.110
	DCMT 32.51EN-M55																							.375	.457	.156	.016	.173
	DCMT 32.52EN-M55																							.375	.457	.156	.031	.173
-SM	DCGT 21.5.5EN-SM																							.250	.305	.094	.008	.110
	DCMT 21.51EN-SM						●			●														.250	.305	.094	.016	.110
	DCMT 21.52EN-SM																							.250	.305	.094	.031	.110
	DCMT 32.51EN-SM												●											.375	.457	.156	.016	.173
	DCMT 32.52EN-SM												●											.375	.457	.156	.031	.173
	DCMT 32.53EN-SM																							.375	.457	.156	.047	.173
-SMQ	DCMT 21.51EN-SMQ																							.250	.305	.094	.016	.110
	DCMT 32.51EL-SMQ																							.375	.457	.156	.016	.173
	DCMT 32.51EN-SMQ																							.375	.457	.156	.016	.173
	DCMT 32.51ER-SMQ																							.375	.457	.156	.016	.173
	DCMT 32.52EN-SMQ																							.375	.457	.156	.031	.173
DC..W	DCGW 21.51FN																							.250	.305	.094	.016	.110





		P	M	K	N	S	H													d	s	d _i			
		H210T	H10T	H216T	U17T	CTW7120	S40T	AMZ	CTP4115	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTC1135	CTCP135	CTC2135	TCC410	TCM407	TCM10	[inch]	[inch]	[inch]
-25P		●																					.315	.125	.134
	RCMT 0803MOEN-25	●																						.315	.125	.134
-27			●																				.236	.094	.110
	RCGT 0803MOFN-27		●					●															.315	.125	.134
	RCGT 1003MOFN-27		●					●															.394	.125	.157
-SMF									●														.630	.250	.209
-SM																●	●	●					.236	.094	.110
	RCGT 0803MOEN-SM															●	●	●					.315	.125	.134
	RCMT 1003MOSN-SM															●	●	●					.394	.125	.157
	RCMT 1204MOSN-SM												●	●	●	●	●	●					.472	.187	.193
	RCMT 1606MOSN-SM												●	●	●	●	●	●					.630	.250	.209
	RCMT 2006MOSN-SM												●	●	●	●	●	●					.787	.250	.256
	RCMT 2507MOSN-SM												●	●	●	●	●	●					.984	.313	.283
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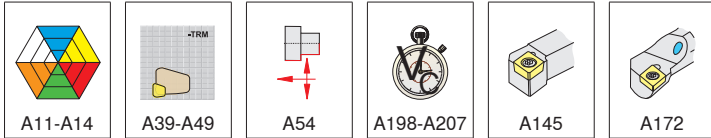
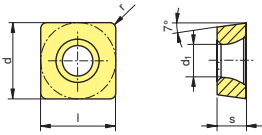


MaxiLock S

SC..

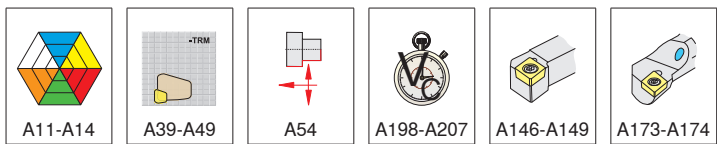
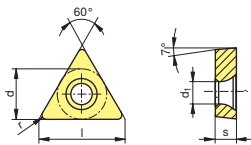
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	H210T	H10T	H216T	U17T	CTW7120	S40T	AMZ	CTP4115	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTC1135	CTCP135	CTC2135	TCC410	TCM407	TCM10													
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	[inch]	[inch]	[inch]	[inch]	[inch]																													
-25P	SCGT 432FN-25P	●					●																				.500	.500	.187	.031	.217			
-27P	SCGT 32.51FN-27		●																								.375	.375	.156	.016	.173			
	SCGT 32.52FN-27P		●																								.375	.375	.156	.031	.173			
	SCGT 32.52FN-27		●				●																				.375	.375	.156	.031	.173			
	SCGT 432FN-27		●																								.500	.500	.187	.031	.217			
-SF	SCGT 32.51EN-SF																			●	●	●				.375	.375	.156	.016	.173				
	SCGT 32.52EN-SF																			●	●					.375	.375	.156	.031	.173				
	SCMT 32.51EN-SF												●													.375	.375	.156	.016	.173				
	SCMT 32.52EN-SF												●													.375	.375	.156	.031	.173				
	SCMT 432EN-SF												●								●	●				.500	.500	.187	.031	.217				
-M25	SCMT 32.51EN-M25														●											.375	.375	.156	.016	.173				
-SMF	SCMT 32.51EN-SMF											●									●					.375	.375	.156	.016	.173				
	SCMT 32.52EN-SMF										●															.375	.375	.156	.031	.173				
	SCMT 432EN-SMF																●	●			●					.500	.500	.187	.031	.217				
-M55	SCMT 32.52EN-M55														●											.375	.375	.156	.031	.173				
	SCMT 432EN-M55														●											.500	.500	.187	.031	.217				
-SM	SCMT 32.51EN-SM												●		●		●	●								.375	.375	.156	.016	.173				
	SCMT 32.52EN-SM								●			●	●	●	●	●	●	●								.375	.375	.156	.031	.173				
	SCMT 432EN-SM								●		●	●	●	●	●	●	●	●								.500	.500	.187	.031	.217				
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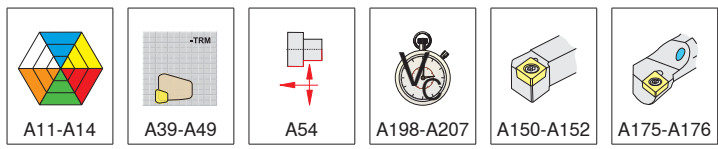
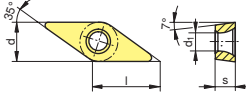


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		TCGT 32.5FN-27	●																						.375	.650	.156	.008	.173																																																																										
		TCGT 32.51FN-27	●																						.375	.650	.156	.016	.173																																																																										
-SF		TCGT 21.5EN-SF																							.250	.433	.094	.008	.110																																																																										
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		TCGT 21.52EN-SF																							.250	.433	.094	.031	.110																																																																										
		TCGT 32.5EN-SF																							.375	.650	.156	.016	.173																																																																										
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		TCMT 21.52EN-SF												●											.250	.433	.094	.031	.110																																																																										
		TCMT 32.5EN-SF												●											.375	.650	.156	.016	.173																																																																										
-M25		TCMT 1.81.51EN-M25													●										.219	.378	.094	.016	.098																																																																										
		TCMT 21.51EN-M25													●										.250	.433	.094	.016	.110																																																																										
		TCMT 32.51EN-M25													●										.375	.650	.156	.016	.173																																																																										
		TCMT 32.52EN-M25													●										.375	.650	.156	.031	.173																																																																										
-F43		TCMT 21.51EN-F43																							.250	.433	.094	.016	.110																																																																										
		TCMT 32.51EN-F43																							.375	.650	.156	.016	.173																																																																										
		TCMT 32.52EN-F43																							.375	.650	.156	.031	.173																																																																										
-SMF		TCMT 21.51EN-SMF																							.250	.433	.094	.016	.110																																																																										
		TCMT 21.52EN-SMF												●			●								.250	.433	.094	.031	.110																																																																										
		TCMT 32.51EN-SMF												●			●								.375	.650	.156	.016	.173																																																																										
		TCMT 32.52EN-SMF												●											.375	.650	.156	.031	.173																																																																										
-M55		TCMT 1.81.51EN-M55														●									.219	.378	.094	.016	.098																																																																										
		TCMT 21.51EN-M55													●										.250	.433	.094	.016	.110																																																																										
		TCMT 32.52EN-M55													●										.375	.650	.156	.031	.173																																																																										
-SM		TCGT 21.5EN-SM																							.250	.433	.094	.008	.110																																																																										
		TCMT 1.81.51EN-SM																							.219	.378	.094	.016	.098																																																																										
		TCMT 21.51EN-SM									●														.250	.433	.094	.016	.110																																																																										
		TCMT 21.52EN-SM									●														.250	.433	.094	.031	.110																																																																										
		TCMT 32.51EN-SM									●														.375	.650	.156	.016	.173																																																																										
		TCMT 32.52EN-SM									●														.375	.650	.156	.031	.173																																																																										
		TCMT 32.53EN-SM									●														.375	.650	.156	.047	.173																																																																										
TC..W		TCMW 32.51FN				●																			.500	.866	.187	.031	.209																																																																										
																									.375	.650	.156	.016	.173																																																																										





			Material													d	l	s	r	d ₁															
			P	M	K	N	S	H	H210T	H10T	H216T	U17T	CTW7120	S40T	AMZ						CTP4115	CTC3110	CTCK120	CTP5115	CTCP115	CTP2120	CTCP125	CTPM125	CTC1135	CTCP135	CTC2135	TCC410	TCM407	TCM10	
-SMF		VCMT 22.5EN-SMF																												.250	.437	.125	.008	.110	
		VCMT 221EN-SMF																													.250	.437	.125	.016	.114
		VCMT 331EN-SMF																													.375	.654	.187	.016	.173
		VCMT 332EN-SMF																													.375	.654	.187	.031	.173
-M55		VCMT 331EN-M55																												.375	.654	.187	.016	.173	
		VCMT 332EN-M55																												.375	.654	.187	.031	.173	
-SM		VCMT 331EN-SM																												.375	.654	.187	.016	.173	
		VCMT 331.5EN-SM																												.375	.654	.187	.024	.173	
		VCMT 332EN-SM																												.375	.654	.187	.031	.173	
		VCMT 333EN-SM																												.375	.654	.187	.047	.173	
VC..W		VCMW 331FN																											.375	.654	.187	.016	.173		





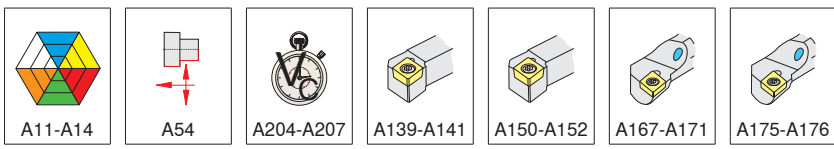
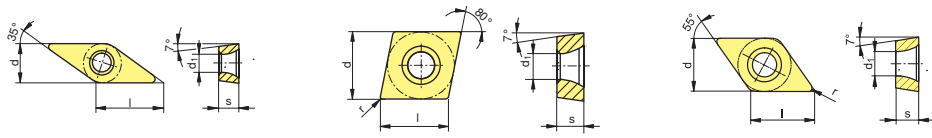
MaxiLock S

CC.. DC.. VC.. (other cutting materials)

Inserts

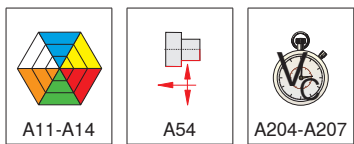
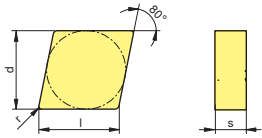
Tools and inserts for turning

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S	O																																																																																								
H	●																																																																																								
		TA201	CTD4110	CTD4125			[inch]	[inch]	[inch]	[inch]	[inch]																																																																														
-M4		VCUW 332FN-M4	●				.375	.654	.187	.031	.173																																																																														
		VCUW 333FN-M4	●				.375	.654	.187	.047	.173																																																																														
		VCUW 333TN-M4	●				.375	.654	.187	.047	.173																																																																														
		VCUW 43.57.5FN-M4	●				.500	.870	.219	.118	.217																																																																														
		VCUW 43.57.5TN-M4	●				.500	.870	.219	.118	.217																																																																														
		VPUW 43.54FN-M4	●				.500	.870	.219	.063	.217																																																																														
-M41		VPUW 43.54TN-M4	●				.500	.870	.219	.063	.217																																																																														
		VCUT 332FN-M41	●				.375	.654	.187	.031	.173																																																																														
		VCUT 332TN-M41	●				.375	.654	.187	.031	.173																																																																														
		VCUT 333FN-M41	●				.375	.654	.187	.047	.173																																																																														
		VCUT 333TN-M41	●				.375	.654	.187	.047	.173																																																																														
		VCUT 43.57.5FN-M41	●				.500	.870	.219	.118	.217																																																																														
		VCUT 43.57.5TN-M41	●				.500	.870	.219	.118	.217																																																																														
		VPUT 43.54FN-M41	●				.500	.870	.219	.063	.217																																																																														
CC..X		VPUT 43.54TN-M41	●				.500	.870	.219	.063	.217																																																																														
		CCMX 32.51SN	●				.375	.382	.156	.016	.173																																																																														
DC..X		CCMX 32.52SN	●				.375	.382	.156	.031	.173																																																																														
		DCMX 32.51SN	●				.375	.457	.156	.016	.173																																																																														
FN		DCMX 32.52SN	●				.375	.457	.156	.031	.173																																																																														
		VCUW 331FL		●			.375	.654	.187	.016	.173																																																																														
		VCUW 331FN		●			.375	.654	.187	.016	.173																																																																														
		VCUW 331FR		●			.375	.654	.187	.016	.173																																																																														
		VCUW 332FL		●			.375	.654	.187	.031	.173																																																																														
		VCUW 332FN		●			.375	.654	.187	.031	.173																																																																														
		VCUW 332FR		●			.375	.654	.187	.031	.173																																																																														
		VCUW 333FN		●			.375	.654	.187	.047	.173																																																																														
		VCUW 334FN		●			.375	.654	.187	.063	.173																																																																														
		VCUW 43.57.5FN		●			.500	.870	.219	.118	.217																																																																														
		TA201	CTD4110	CTD4125			d	l	s	r	d _i																																																																														








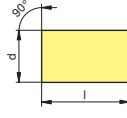
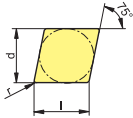
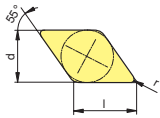
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	CN..N		CNGN 431TN-020D	●	○	●											.500	.508	.187	.016	
			CNGN 432TN-020D											●				.500	.508	.187	.031
			CNGN 453PN-100CF															.500	.508	.313	.047
			CNGN 453SN-025C													●		.500	.508	.313	.047
			CNGN 454PN-100CF															.500	.508	.313	.063
			CNGN 454PN-150CF															.500	.508	.313	.063
			CNGN 454SN-025C													●		.500	.508	.313	.063
			CNGN 554SN-025C													●		.625	.634	.313	.063
			CNGN 554SN-200C													●		.625	.634	.313	.063
			CNMN 322TN-020D									●	●					.375	.382	.125	.031
			CNMN 323TN-020D									●	●					.375	.382	.125	.047
			CNMN 324TN-020D										●					.375	.382	.125	.063
			CNMN 433TN-020D									●						.500	.508	.187	.047
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	FN		CNMN 322FN								●					.375	.382	.125	.031		
			CNMN 433FN								●						.500	.508	.187	.047	
			CNMN 434FN									●					.500	.508	.187	.063	





P	●	○	○																					
M	●																							
K	●	●	●	●	○	●	●	●	●	●														
N																								
S																								
H				●	●			●						●										

		S40T	CTC3110	CTCK120	TA100	TA120	CTN3105	CTS3105	CTN3110	CTM3110	CTS3110																d	l	s	r
																											[inch]	[inch]	[inch]	[inch]
DN..N																											.500	.610	.313	.016
							●																				.500	.610	.313	.031
							●																				.500	.610	.313	.047
							●																				.500	.610	.313	.047
							●																				.500	.610	.313	.063
							●																				.500	.610	.313	.063
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EN..N																											.500	.520	.313	.016
							●																				.500	.520	.313	.031
							●																				.500	.520	.313	.047
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							●																				.500	.520	.313	.126
LN..N									●																		.748	1.500	.500	.063
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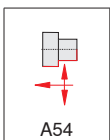
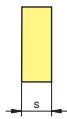
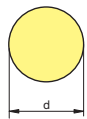
Inserts

Tools and inserts for turning



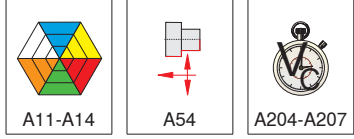
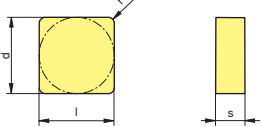


RN..N		<table border="1"> <tr><td>P</td><td>●</td><td>○</td><td>●</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>M</td><td>●</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>K</td><td>●</td><td>●</td><td>●</td><td>○</td><td>●</td><td>●</td><td>●</td><td>●</td><td>●</td><td>●</td></tr> <tr><td>N</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>S</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>H</td><td></td><td></td><td>●</td><td>●</td><td></td><td>●</td><td></td><td></td><td>●</td><td></td></tr> </table>										P	●	○	●								M	●										K	●	●	●	○	●	●	●	●	●	●	N											S											H			●	●		●			●		d	s
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H			●	●		●			●																																																																						
		S40T	CTC3110	CTCK120	TA100	TA120	CTN3105	CTS3105	CTN3110	CTM3110	CTS3110	[inch]	[inch]																																																																		
		S40T	CTC3110	CTCK120	TA100	TA120	CTN3105	CTS3105	CTN3110	CTM3110	CTS3110	d	s																																																																		
RNGN 23TN-020D							●					.250	.187																																																																		
RNGN 33TN-020D							●					.375	.187																																																																		
RNGN 43PN-150CF								●	●			.500	.187																																																																		
RNGN 45PN-100CF							●					.500	.313																																																																		
RNGN 45SN-020D						●						.500	.313																																																																		
RNGN 45SN-200C						●						.500	.313																																																																		
RNGN 45TN-020D						●						.500	.313																																																																		
RNGN 55PN-150CE							●					.622	.313																																																																		
RNGN 55SN-200C							●					.622	.313																																																																		
RNGN 65PN-100CF							●					.748	.313																																																																		
RNGN 65TN-020D							●					.748	.313																																																																		
RNGN 85PN-100CF							●			●		1.000	.313																																																																		
RNGN 85PN-200CE							●		●	●		1.000	.313																																																																		
RNGN 85TN-020D							●					1.000	.313																																																																		
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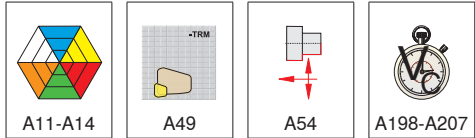
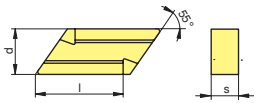


	Material	Material											d [inch]	l [inch]	s [inch]	r [inch]						
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FN		SNMN 322FN	●	○	●													.375	.375	.125	.031	
		SNMN 323FN	●																.375	.375	.125	.047
		SNMN 324FN	●																.375	.375	.125	.063
		SNMN 423FN										●							.500	.500	.125	.047
		SNMN 424FN										●	●						.500	.500	.125	.063
		SNMN 433FN										●	●						.500	.500	.187	.047
		SNMN 434FN										●	●						.500	.500	.187	.063
SNUN		SNUN 433EN	●	●														.500	.500	.187	.047	
		SNUN 434EN	●	●														.500	.500	.187	.063	





			Material											d [inch]	l [inch]	s [inch]	r [inch]	
			P	M	K	N	S	H	Al	St	Ti	In	Cu					
			H10T	S26T	S40T	CTC3110	CTCP125	CTC1135	CTCP135	CTD4110	CTD4125	CTS3105	CTN3110					
			-11		KNUX 160405EL-11 KNUX 160405ER-11 KNUX 160410EL-11 KNUX 160410ER-11			●	●	●	●	●						
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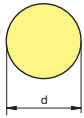
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M		●			○	○	○												
K	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N	●									●	●								
S					○	○													
H										●									

RC..X 	RCGX 070400SN-050C	H10T	S26T	S40T	CTC3110	CTCP125	CTC1135	CTCP135	CTD4110	CTD4125	CTS3105	CTN3110								d	s
	RCGX 090700PN-075CF										●	●								[inch]	[inch]
	RCGX 090700PN-100CF										●	●								.276	.187
	RCGX 090700SN-200C										●	●								.375	.315
	RCGX 090700TN-020D										●	●								.375	.315
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	RCGX 120700SN-200C										●	●	●							.500	.315
	RCGX 120700TN-020D										●	●	●							.500	.315
	RCGX 151000PN-100CF										●	●	●							.622	.394
	RCGX 151000SN-200C										●	●	●							.622	.394
	RCGX 191000PN-100CF										●	●	●							.750	.394
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	RCGX 251200PN-100CF										●	●	●							1.000	.472
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H10T	S26T	S40T	CTC3110	CTCP125	CTC1135	CTCP135	CTD4110	CTD4125	CTS3105	CTN3110										d	s
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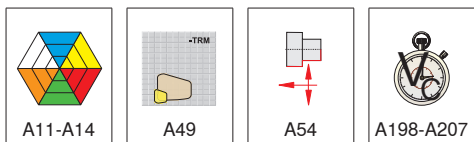
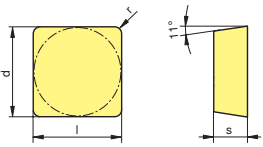
Inserts

Tools and inserts for turning





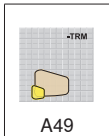
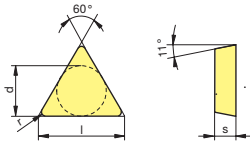
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-57																
SPMR																
	SPMR 322EN-57															
	SPMR 321EN															
	SPMR 421EN															
	SPMR 422EN															
SP.N																
	SPUN 422EN															
	SPUN 422FN															
													d	l	s	r
													[inch]	[inch]	[inch]	[inch]

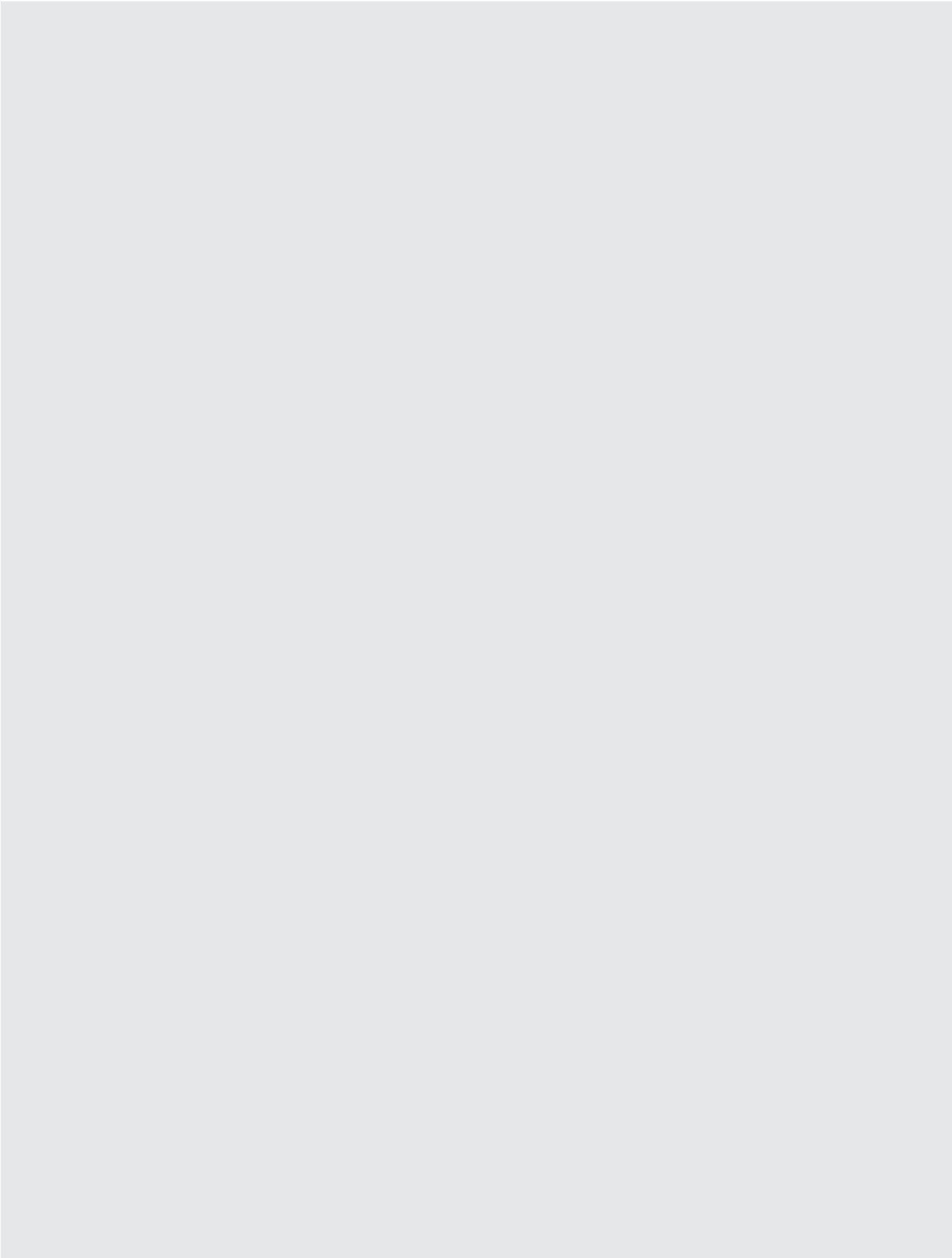




P		●	●	●	○	●	●										
M			●			○	○										
K	●			●	●	○	○		●	●							
N	●								●	●							
S					○	○											
H									●								

		H10T	S26T	S40T	CTC3110	CTCP125	CTC1135	CTCP135	CTD4110	CTD4125	CTS3105	CTN3110								d	l	s	r		
																				[inch]	[inch]	[inch]	[inch]		
-D		TPUN 321FN								●											.375	.650	.125	.016	
		TPUN 322FN									●											.375	.650	.125	.031
-57		TPMR 322EN-57					●	●													.375	.650	.125	.031	
TPGN		TPGN 321TN-020D								●											.375	.650	.125	.016	
TPMR		TPMR 221EL						●	●												.250	.433	.125	.016	
		TPMR 221EN					●	●	●													.250	.433	.125	.016
		TPMR 221ER						●	●	●												.250	.433	.125	.016
		TPMR 222EN						●	●	●												.250	.433	.125	.031
		TPMR 321EL							●	●	●											.375	.650	.125	.016
		TPMR 321EN						●	●	●												.375	.650	.125	.016
		TPMR 321ER						●	●	●												.375	.650	.125	.016
		TPMR 322EL							●	●	●											.375	.650	.125	.031
		TPMR 322EN						●	●	●												.375	.650	.125	.031
		TPMR 322ER							●	●	●											.375	.650	.125	.031
TP.N		TPUN 221EN																			.250	.433	.125	.016	
		TPUN 221FN			●																	.250	.433	.125	.016
		TPUN 222EN					●															.250	.433	.125	.031
		TPUN 321EN					●	●	●													.375	.650	.125	.016
		TPUN 321FN						●	●	●												.375	.650	.125	.016
		TPUN 322EN					●	●	●													.375	.650	.125	.031
		TPUN 322FN						●	●	●												.375	.650	.125	.031
		TPUN 323EN							●	●												.375	.650	.125	.047
		TPUN 432EN					●		●	●												.500	.866	.187	.031
		TPUN 433EN						●		●	●											.500	.866	.187	.047
			H10T	S26T	S40T	CTC3110	CTCP125	CTC1135	CTCP135	CTD4110	CTD4125	CTS3105	CTN3110							d	l	s	r		

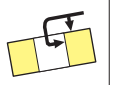
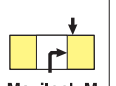





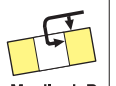
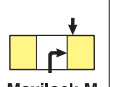



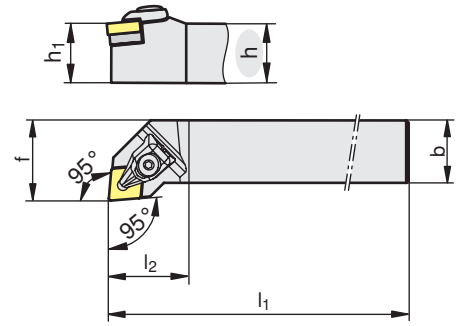
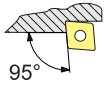


External machining

 <p>Maxilock D</p>	MaxiLock D	A106-A114
 <p>Maxilock M</p>	MaxiLock M	A115-A138
 <p>Maxilock S</p>	MaxiLock S	A139-A152

Internal machining

 <p>Maxilock D</p>	MaxiLock D	A153-A154
 <p>Maxilock M</p>	MaxiLock M	A155-A165
 <p>Maxilock S</p>	MaxiLock S	A167-A176



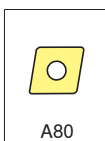
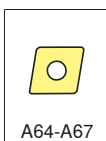
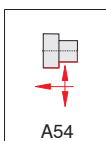
Picture shows right-hand version

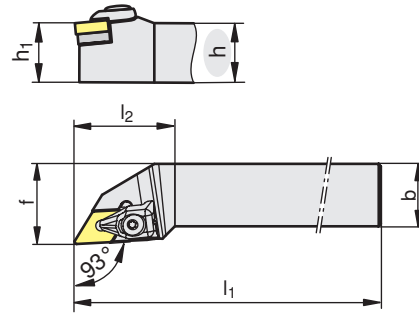
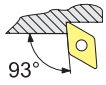
Tools

Tools and inserts for turning

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DCLNR 12-4BA-N	R	.750	.750	4.5	1.250	1.000	CN.. 43..	E01
.750	DCLNR 12-4B-N	R	.750	.750	4.5	1.250	1.000	CN.. 43..	E01
.750	DCLNL 12-4BA-N	L	.750	.750	4.5	1.250	1.000	CN.. 43..	E01
.750	DCLNL 12-4B-N	L	.750	.750	4.5	1.250	1.000	CN.. 43..	E01
1.000	DCLNR 16-4DA-N	R	1.000	1.000	6.0	1.250	1.250	CN.. 43..	E01
1.000	DCLNR 16-4D-N	R	1.000	1.000	6.0	1.250	1.250	CN.. 43..	E01
1.000	DCLNL 16-4DA-N	L	1.000	1.000	6.0	1.250	1.250	CN.. 43..	E01
1.000	DCLNL 16-4D-N	L	1.000	1.000	6.0	1.250	1.250	CN.. 43..	E01
1.250	DCLNR 20-4DA-N	R	1.250	1.250	6.0	1.250	1.500	CN.. 43..	E01
1.250	DCLNR 20-4D-N	R	1.250	1.250	6.0	1.250	1.500	CN.. 43..	E01
1.250	DCLNL 20-4DA-N	L	1.250	1.250	6.0	1.250	1.500	CN.. 43..	E01
1.250	DCLNL 20-4D-N	L	1.250	1.250	6.0	1.250	1.500	CN.. 43..	E01
1.250	DCLNR 20-5DA-N	R	1.250	1.250	6.0	1.375	1.500	CN.. 54..	E02
1.250	DCLNR 20-5D-N	R	1.250	1.250	6.0	1.375	1.500	CN.. 54..	E02
1.250	DCLNL 20-5DA-N	L	1.250	1.250	6.0	1.375	1.500	CN.. 54..	E02
1.250	DCLNL 20-5D-N	L	1.250	1.250	6.0	1.375	1.500	CN.. 54..	E02
1.500	DCLNR 24-5EA-N	R	1.500	1.500	7.0	1.375	2.000	CN.. 54..	E02
1.500	DCLNR 24-5E-N	R	1.500	1.500	7.0	1.375	2.000	CN.. 54..	E02
1.500	DCLNL 24-5EA-N	L	1.500	1.500	7.0	1.375	2.000	CN.. 54..	E02
1.500	DCLNL 24-5E-N	L	1.500	1.500	7.0	1.375	2.000	CN.. 54..	E02
1.250	DCLNR 20-6DA-N	R	1.250	1.250	6.0	1.653	1.500	CN.. 64..	E03
1.250	DCLNR 20-6D-N	R	1.250	1.250	6.0	1.653	1.500	CN.. 64..	E03
1.250	DCLNL 20-6DA-N	L	1.250	1.250	6.0	1.653	1.500	CN.. 64..	E03
1.250	DCLNL 20-6D-N	L	1.250	1.250	6.0	1.653	1.500	CN.. 64..	E03
1.500	DCLNR 24-6EA-N	R	1.500	1.500	7.0	1.653	2.000	CN.. 64..	E03
1.500	DCLNR 24-6E-N	R	1.500	1.500	7.0	1.653	2.000	CN.. 64..	E03
1.500	DCLNL 24-6EA-N	L	1.500	1.500	7.0	1.653	2.000	CN.. 64..	E03
1.500	DCLNL 24-6E-N	L	1.500	1.500	7.0	1.653	2.000	CN.. 64..	E03

E01	11830912	11830886	11830901	11830906	1349550	11830915
E02	11830912	1347266	11830902	11830907	1349550	11830915
E03	11830912	1340159	11830903	11830908	1349550	11830915



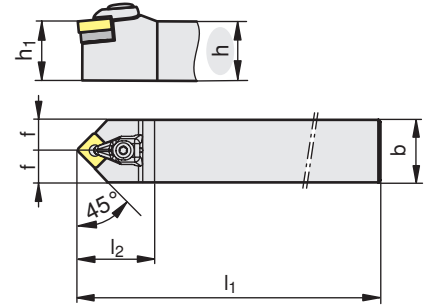
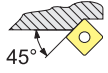


Picture shows right-hand version

h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DDJNR 12-4BA-N	R	.750	.750	4.5	1.535	1.000	DN.. 43..	E01
.750	DDJNR 12-4B-N	R	.750	.750	4.5	1.535	1.000	DN.. 43..	E01
.750	DDJNL 12-4BA-N	L	.750	.750	4.5	1.535	1.000	DN.. 43..	E01
.750	DDJNL 12-4B-N	L	.750	.750	4.5	1.535	1.000	DN.. 43..	E01
1.000	DDJNR 16-4DA-N	R	1.000	1.000	6.0	1.535	1.250	DN.. 43..	E01
1.000	DDJNR 16-4D-N	R	1.000	1.000	6.0	1.535	1.250	DN.. 43..	E01
1.000	DDJNL 16-4DA-N	L	1.000	1.000	6.0	1.535	1.250	DN.. 43..	E01
1.000	DDJNL 16-4D-N	L	1.000	1.000	6.0	1.535	1.250	DN.. 43..	E01
1.250	DDJNR 20-4DA-N	R	1.250	1.250	6.0	1.535	1.500	DN.. 43..	E01
1.250	DDJNR 20-4D-N	R	1.250	1.250	6.0	1.535	1.500	DN.. 43..	E01
1.250	DDJNL 20-4DA-N	L	1.250	1.250	6.0	1.535	1.500	DN.. 43..	E01
1.250	DDJNL 20-4D-N	L	1.250	1.250	6.0	1.535	1.500	DN.. 43..	E01
1.500	DDJNR 24-4EA-N	R	1.500	1.500	7.0	1.535	2.000	DN.. 43..	E01
1.500	DDJNR 24-4E-N	R	1.500	1.500	7.0	1.535	2.000	DN.. 43..	E01
1.500	DDJNL 24-4EA-N	L	1.500	1.500	7.0	1.535	2.000	DN.. 43..	E01
1.500	DDJNL 24-4E-N	L	1.500	1.500	7.0	1.535	2.000	DN.. 43..	E01

E01	11830912	11830887	11830901	11830906	1349550	11830915

A54	A68-A70	A80

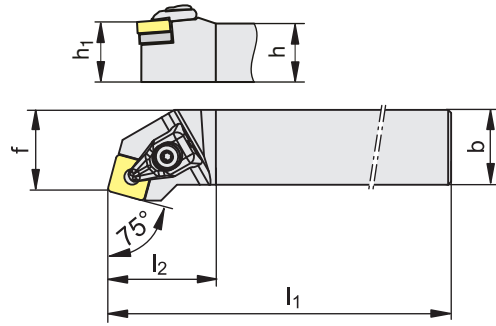
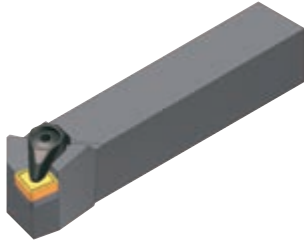
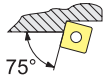


Picture shows right-hand version

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DSDNN 12-4BA-N	N	.750	.750	4.5	1.375	.375	SN.. 43..	E01
1.000	DSDNN 16-4DA-N	N	1.000	1.000	6.0	1.375	.500	SN.. 43..	E01
1.250	DSDNN 20-5DA-N	N	1.250	1.250	6.0	1.375	.625	SN.. 54..	E02
1.250	DSDNN 20-6DA-N	N	1.250	1.250	6.0	1.535	.625	SN.. 64..	E03
1.500	DSDNN 24-6EA-N	N	1.500	1.500	7.0	1.653	.750	SN.. 64..	E03

E01	11830912	11830888	11830901	11830906	1349550	11830915
E02	11830912	1340180	11830902	11830907	1349550	11830915
E03	11830912	1340181	11830903	11830908	1349550	11830915

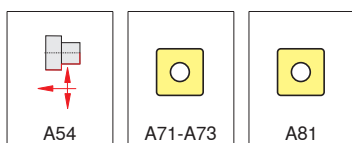
A54	A71-A73	A81

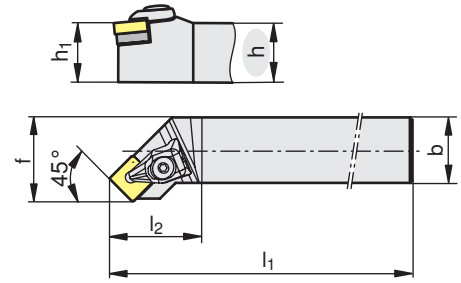
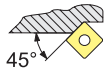


Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
								SN.. 43..	
.750	DSRNR 12-4BA-N	R	.750	.750	4.5	1.375	.880	SN.. 43..	E01
.750	DSRNL 12-4BA-N	L	.750	.750	4.5	1.375	.880	SN.. 43..	E01
1.000	DSRNR 16-4DA-N	R	1.000	1.000	6.0	1.375	1.130	SN.. 43..	E01
1.000	DSRNL 16-4DA-N	L	1.000	1.000	6.0	1.375	1.130	SN.. 43..	E01
1.250	DSRNR 20-5DA-N	R	1.250	1.250	6.0	1.375	1.353	SN.. 54..	E02
1.250	DSRNL 20-5DA-N	L	1.250	1.250	6.0	1.375	1.353	SN.. 54..	E02
1.250	DSRNR 20-6DA-N	R	1.250	1.250	6.0	1.375	1.321	SN.. 64..	E03
1.250	DSRNL 20-6DA-N	L	1.250	1.250	6.0	1.375	1.321	SN.. 64..	E03

E01	11830912	11830888	11830901	11830906	1349550	11830915
E02	11830912	1340180	11830902	11830907	1349550	11830915
E03	11830912	1340181	11830903	11830908	1349550	11830915





Picture shows right-hand version

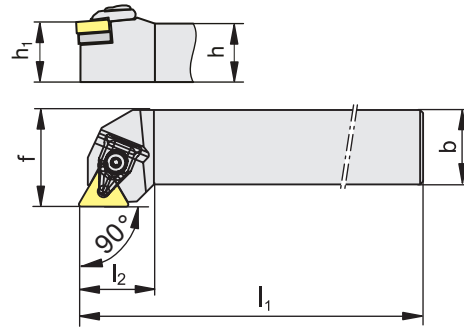
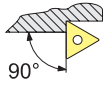
h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
								SN.. 43..	E01
.750	DSSNR 12-4B-N	R	.750	.750	4.5	1.457	1.000	SN.. 43..	E01
.750	DSSNL 12-4B-N	L	.750	.750	4.5	1.457	1.000	SN.. 43..	E01
1.000	DSSNR 16-4D-N	R	1.000	1.000	6.0	1.457	1.250	SN.. 43..	E01
1.000	DSSNL 16-4D-N	L	1.000	1.000	6.0	1.457	1.250	SN.. 43..	E01
1.250	DSSNR 20-4D-N	R	1.250	1.250	6.0	1.457	1.500	SN.. 43..	E01
1.250	DSSNL 20-4D-N	L	1.250	1.250	6.0	1.457	1.500	SN.. 43..	E01
1.250	DSSNR 20-6D-N	R	1.250	1.250	6.0	1.772	1.500	SN.. 64..	E02
1.250	DSSNL 20-6D-N	L	1.250	1.250	6.0	1.772	1.500	SN.. 64..	E02
1.500	DSSNR 24-6E-N	R	1.500	1.500	7.0	1.772	2.000	SN.. 64..	E02
1.500	DSSNL 24-6E-N	L	1.500	1.500	7.0	1.772	2.000	SN.. 64..	E02

Tools

Tools and inserts for turning

E01	11830912	11830888	11830901	11830906	1349550	11830915
E02	11830912	1340181	11830903	11830908	1349550	11830915

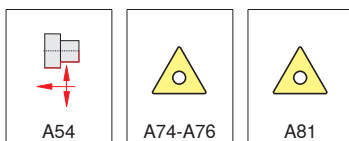
A54	A71-A73	A81

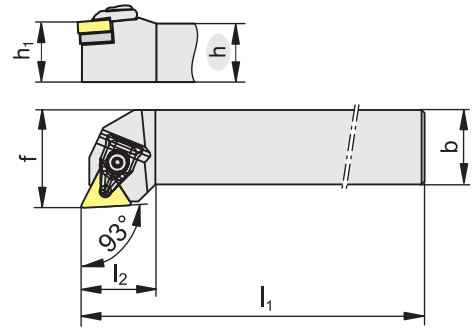
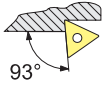


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DTGNR 12-3B-N	R	.750	.750	4.5	1.102	1.000	TN.. 33..	E01
.750	DTGNL 12-3B-N	L	.750	.750	4.5	1.102	1.000	TN.. 33..	E01
1.000	DTGNR 16-3D-N	R	1.000	1.000	6.0	1.102	1.250	TN.. 33..	E01
1.000	DTGNL 16-3D-N	L	1.000	1.000	6.0	1.102	1.250	TN.. 33..	E01
1.000	DTGNR 16-4D-N	R	1.000	1.000	6.0	1.338	1.250	TN.. 43..	E02
1.000	DTGNL 16-4D-N	L	1.000	1.000	6.0	1.338	1.250	TN.. 43..	E02
1.250	DTGNR 20-4D-N	R	1.250	1.250	6.0	1.338	1.500	TN.. 43..	E02
1.250	DTGNL 20-4D-N	L	1.250	1.250	6.0	1.338	1.500	TN.. 43..	E02

E01	11830911	11830891	11830900	11830905	11830913	11830915
E02	11830912	11830892	11830901	11830906	1349550	11830915



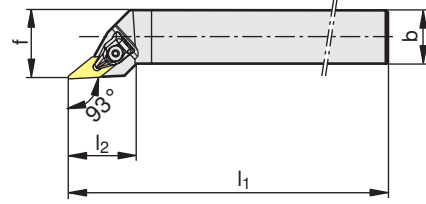
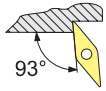


Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DTJNR 12-3BA-N	R	.750	.750	4.5	1.250	1.000	TN.. 33..	E01
.750	DTJNL 12-3BA-N	L	.750	.750	4.5	1.250	1.000	TN.. 33..	E01
1.000	DTJNR 16-3DA-N	R	1.000	1.000	6.0	1.250	1.250	TN.. 33..	E01
1.000	DTJNL 16-3DA-N	L	1.000	1.000	6.0	1.250	1.250	TN.. 33..	E01
1.000	DTJNR 16-4DA-N	R	1.000	1.000	6.0	1.375	1.250	TN.. 43..	E02
1.000	DTJNL 16-4DA-N	L	1.000	1.000	6.0	1.375	1.250	TN.. 43..	E02
1.250	DTJNR 20-4DA-N	R	1.250	1.250	6.0	1.250	1.500	TN.. 43..	E02
1.250	DTJNL 20-4DA-N	L	1.250	1.250	6.0	1.250	1.500	TN.. 43..	E02
1.500	DTJNR 24-4EA-N	R	1.500	1.500	7.0	1.375	2.000	TN.. 43..	E02
1.500	DTJNL 24-4EA-N	L	1.500	1.500	7.0	1.375	2.000	TN.. 43..	E02

E01	11830911	11830891	11830900	11830905	11830913	11830915
E02	11830912	11830892	11830901	11830906	1349550	11830915

A54	A74-A76	A81



Picture shows right-hand version

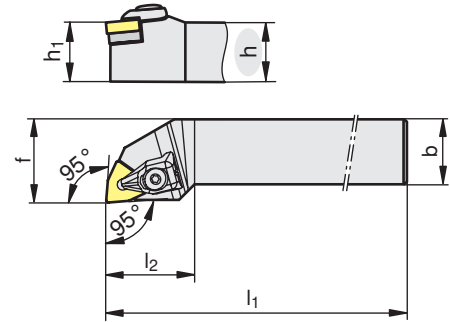
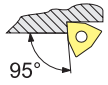
h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DVJNR 12-3BA-N	R	.750	.750	4.5	1.750	1.000	VN.. 33..	E01
.750	DVJNL 12-3BA-N	L	.750	.750	4.5	1.750	1.000	VN.. 33..	E01
1.000	DVJNR 16-3DA-N	R	1.000	1.000	6.0	1.750	1.250	VN.. 33..	E01
1.000	DVJNL 16-3DA-N	L	1.000	1.000	6.0	1.750	1.250	VN.. 33..	E01
1.250	DVJNR 20-3DA-N	R	1.250	1.250	6.0	1.750	1.500	VN.. 33..	E01
1.250	DVJNL 20-3DA-N	L	1.250	1.250	6.0	1.750	1.500	VN.. 33..	E02
1.500	DVJNR 24-3EA-N	R	1.500	1.500	7.0	1.750	2.000	VN.. 33..	E02
1.500	DVJNL 24-3EA-N	L	1.500	1.500	7.0	1.750	2.000	VN.. 33..	E02

Tools

Tools and inserts for turning

E01	11830911	11830894	11830900	11830905	11830913	11830915
E02	11830909	1340198	11830900	11830905	11830913	11830915

A54	A77	A81

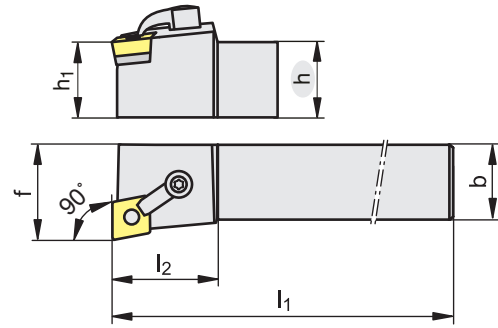
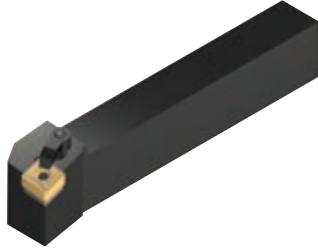
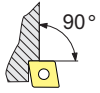


Picture shows right-hand version

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	DWLN R 12-4BA-N	R	.750	.750	4.5	1.250	1.000	WN.. 43..	E01
.750	DWLN R 12-4B-N	R	.750	.750	4.5	1.250	1.000	WN.. 43..	E01
.750	DWLN L 12-4BA-N	L	.750	.750	4.5	1.250	1.000	WN.. 43..	E01
.750	DWLN L 12-4B-N	L	.750	.750	4.5	1.250	1.000	WN.. 43..	E01
1.000	DWLN R 16-4DA-N	R	1.000	1.000	6.0	1.250	1.250	WN.. 43..	E01
1.000	DWLN R 16-4D-N	R	1.000	1.000	6.0	1.250	1.250	WN.. 43..	E01
1.000	DWLN L 16-4DA-N	L	1.000	1.000	6.0	1.250	1.250	WN.. 43..	E01
1.000	DWLN L 16-4D-N	L	1.000	1.000	6.0	1.250	1.250	WN.. 43..	E01
1.250	DWLN R 20-4DA-N	R	1.250	1.250	6.0	1.250	1.500	WN.. 43..	E01
1.250	DWLN R 20-4D-N	R	1.250	1.250	6.0	1.250	1.500	WN.. 43..	E01
1.250	DWLN L 20-4DA-N	L	1.250	1.250	6.0	1.250	1.500	WN.. 43..	E01
1.250	DWLN L 20-4D-N	L	1.250	1.250	6.0	1.250	1.500	WN.. 43..	E01
1.500	DWLN R 24-4EA-N	R	1.500	1.500	7.0	1.250	2.000	WN.. 43..	E01
1.500	DWLN R 24-4E-N	R	1.500	1.500	7.0	1.250	2.000	WN.. 43..	E01
1.500	DWLN L 24-4EA-N	L	1.500	1.500	7.0	1.250	2.000	WN.. 43..	E01
1.500	DWLN L 24-4E-N	L	1.500	1.500	7.0	1.250	2.000	WN.. 43..	E01

E01	1349542	1349549	1349540	11547013	1349550	11584910

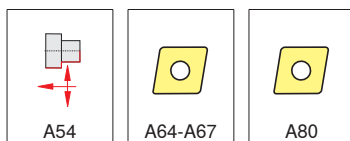
A54	A78-A79

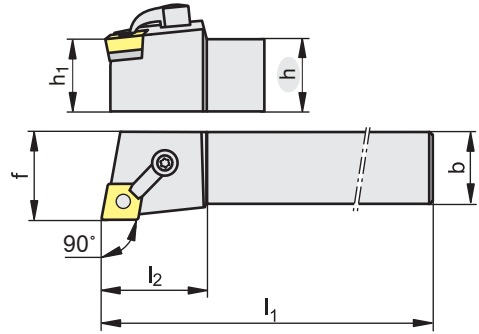
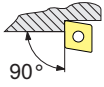


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MCFNR-12-4B	R	.750	.750	4.5	1.120	1.000	CN.. 43..	E01
.750	MCFNL 12-4B	L	.750	.750	4.5	1.120	1.000	CN.. 43..	E01
1.000	MCFNR 16-4D	R	1.000	1.000	6.0	1.120	1.250	CN.. 43..	E01
1.000	MCFNL 16-4D	L	1.000	1.000	6.0	1.120	1.250	CN.. 43..	E01
1.250	MCFNR 20-4D	R	1.250	1.250	6.0	1.120	1.500	CN.. 43..	E01
1.250	MCFNR 85-4D	R	1.250	1.000	6.0	1.120	1.250	CN.. 43..	E01
1.250	MCFNL 20-4D	L	1.250	1.250	6.0	1.120	1.500	CN.. 43..	E01
1.250	MCFNL 85-4D	L	1.250	1.000	6.0	1.120	1.250	CN.. 43..	E01
1.000	MCFNR 16-5D	R	1.000	1.000	6.0	1.250	1.250	CN.. 54..	E02
1.000	MCFNL 16-5D	L	1.000	1.000	6.0	1.250	1.250	CN.. 54..	E02
1.250	MCFNR 20-5D	R	1.250	1.250	6.0	1.250	1.500	CN.. 54..	E02
1.250	MCFNL 20-5D	L	1.250	1.250	6.0	1.250	1.500	CN.. 54..	E02
1.500	MCFNR 24-5D	R	1.500	1.500	6.0	1.250	2.000	CN.. 54..	E02
1.500	MCFNL 24-5D	L	1.500	1.500	6.0	1.250	2.000	CN.. 54..	E02
1.000	MCFNR 16-6D	R	1.000	1.000	6.0	1.310	1.250	CN.. 64..	E03
1.000	MCFNL 16-6D	L	1.000	1.000	6.0	1.310	1.250	CN.. 64..	E03
1.250	MCFNR 20-6D	R	1.250	1.250	6.0	1.310	1.500	CN.. 64..	E03
1.250	MCFNL 20-6D	L	1.250	1.250	6.0	1.310	1.500	CN.. 64..	E03
1.500	MCFNR 24-6D	R	1.500	1.500	6.0	1.250	2.000	CN.. 64..	E03
1.500	MCFNL 24-6D	L	1.500	1.500	6.0	1.250	2.000	CN.. 64..	E03

E01	1340838	1342059	1341230	1340157	1339450	11584909 / 11584912
E02	1340840	1342060	1347423	1347266	1339448	11584909 / 11584910
E03	1340842	1342060	1341233	1340159	1339448	11584914 / 11584910



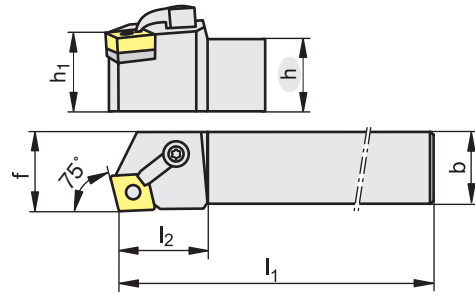
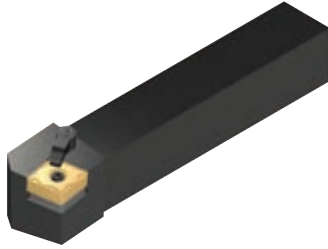


Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MCGNR 12-4B	R	.750	.750	4.5	1.120	1.000	CN.. 43..	E01
.750	MCGNL 12-4B	L	.750	.750	4.5	1.120	1.000	CN.. 43..	E01
1.000	MCGNR 16-4D	R	1.000	1.000	6.0	1.120	1.250	CN.. 43..	E01
1.000	MCGNL 16-4D	L	1.000	1.000	6.0	1.120	1.250	CN.. 43..	E01
1.250	MCGNR 20-4D	R	1.250	1.250	6.0	1.120	1.500	CN.. 43..	E01
1.250	MCGNR 85-4D	R	1.250	1.000	6.0	1.250	1.250	CN.. 43..	E01
1.250	MCGNL 20-4D	L	1.250	1.250	6.0	1.120	1.500	CN.. 43..	E01
1.250	MCGNL 85-4D	L	1.250	1.000	6.0	1.250	1.250	CN.. 43..	E01
1.500	MCGNR 24-4D	R	1.500	1.500	6.0	1.250	2.000	CN.. 43..	E01
1.500	MCGNL 24-4D	L	1.500	1.500	6.0	1.250	2.000	CN.. 43..	E01
1.000	MCGNR 16-5D	R	1.000	1.000	6.0	1.500	1.250	CN.. 54..	E02
1.000	MCGNL 16-5D	L	1.000	1.000	6.0	1.500	1.250	CN.. 54..	E02
1.250	MCGNR 20-5D	R	1.250	1.250	6.0	1.500	1.500	CN.. 54..	E02
1.250	MCGNL 20-5D	L	1.250	1.250	6.0	1.500	1.500	CN.. 54..	E02
1.500	MCGNR 24-5D	R	1.500	1.500	6.0	1.500	2.000	CN.. 54..	E02
1.500	MCGNL 24-5D	L	1.500	1.500	6.0	1.500	2.000	CN.. 54..	E02
1.250	MCGNR 20-6D	R	1.250	1.250	6.0	1.650	1.500	CN.. 64..	E03
1.250	MCGNL 20-6D	L	1.250	1.250	6.0	1.650	1.500	CN.. 64..	E03
1.500	MCGNR 24-6D	R	1.500	1.500	6.0	1.650	2.000	CN.. 64..	E03
1.500	MCGNL 24-6D	L	1.500	1.500	6.0	1.650	2.000	CN.. 64..	E03

E01	1340838	1342059	1341230	1340157	1339450	11584909 / 11584912
E02	1340840	1342060	1347423	1347266	1339448	11584909 / 11584910
E03	1340842	1342060	1341233	1340159	1339448	11584914 / 11584910

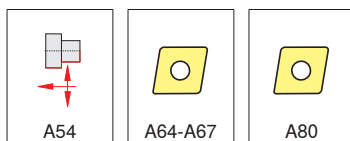
A54	A64-A67	A80

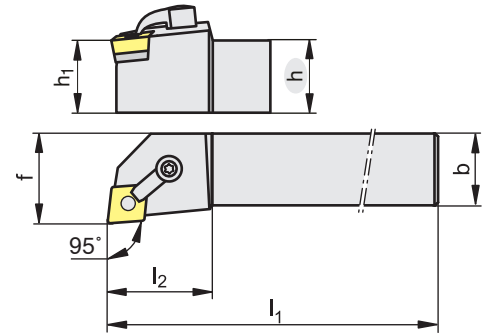
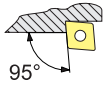


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MCKNR 12-4B	R	.750	.750	4.5	1.200	1.000	CN.. 43..	E01
.750	MCKNL 12-4B	L	.750	.750	4.5	1.200	1.000	CN.. 43..	E01
1.000	MCKNR 16-4D	R	1.000	1.000	6.0	1.200	1.250	CN.. 43..	E01
1.000	MCKNL 16-4D	L	1.000	1.000	6.0	1.200	1.250	CN.. 43..	E01
1.250	MCKNR 20-4D	R	1.250	1.250	6.0	1.200	1.500	CN.. 43..	E01
1.250	MCKNL 20-4D	L	1.250	1.250	6.0	1.200	1.500	CN.. 43..	E01
1.000	MCKNR 16-5D	R	1.000	1.000	6.0	1.350	1.250	CN.. 54..	E02
1.000	MCKNL 16-5D	L	1.000	1.000	6.0	1.350	1.250	CN.. 54..	E02
1.250	MCKNR 20-5D	R	1.250	1.250	6.0	1.350	1.500	CN.. 54..	E02
1.250	MCKNL 20-5D	L	1.250	1.250	6.0	1.350	1.500	CN.. 54..	E02
1.000	MCKNR 16-6D	R	1.000	1.000	6.0	1.470	1.250	CN.. 64..	E03
1.000	MCKNL 16-6D	L	1.000	1.000	6.0	1.470	1.250	CN.. 64..	E03
1.250	MCKNR 20-6D	R	1.250	1.250	6.0	1.470	1.500	CN.. 64..	E03
1.250	MCKNL 20-6D	L	1.250	1.250	6.0	1.470	1.500	CN.. 64..	E03
1.500	MCKNR 24-6D	R	1.500	1.500	6.0	1.470	2.000	CN.. 64..	E03
1.500	MCKNL 24-6D	L	1.500	1.500	6.0	1.470	2.000	CN.. 64..	E03

E01	1340838	1342059	1341230	1340157	1339450	11584909 / 11584912
E02	1340840	1342060	1347423	1347266	1339448	11584909 / 11584910
E03	1340842	1342060	1341233	1340159	1339448	11584914 / 11584910





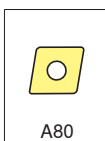
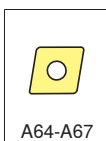
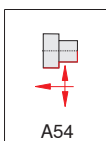
Picture shows right-hand version

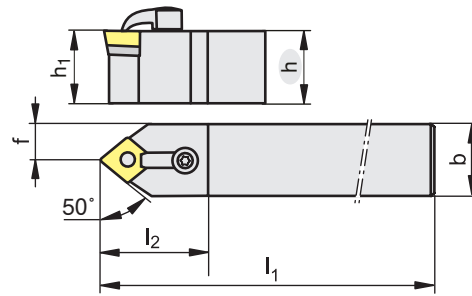
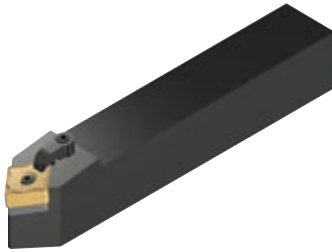
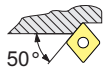
Tools

Tools and inserts for turning

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MCLNR 12-4B	R	.750	.750	4.5	1.130	1.000	CN.. 43..	E01
.750	MCLNL 12-4B	L	.750	.750	4.5	1.130	1.000	CN.. 43..	E01
1.000	MCLNR 16-4D	R	1.000	1.000	6.0	1.130	1.250	CN.. 43..	E01
1.000	MCLNL 16-4D	L	1.000	1.000	6.0	1.130	1.250	CN.. 43..	E01
1.250	MCLNR 20-4D	R	1.250	1.250	6.0	1.130	1.500	CN.. 43..	E01
1.250	MCLNR 85-4D	R	1.250	1.000	6.0	1.130	1.250	CN.. 43..	E01
1.250	MCLNL 20-4D	L	1.250	1.250	6.0	1.130	1.500	CN.. 43..	E01
1.250	MCLNL 85-4D	L	1.250	1.000	6.0	1.130	1.250	CN.. 43..	E01
1.000	MCLNR 16-5D	R	1.000	1.000	6.0	1.470	1.250	CN.. 54..	E02
1.000	MCLNL 16-5D	L	1.000	1.000	6.0	1.470	1.250	CN.. 54..	E02
1.250	MCLNR 20-5D	R	1.250	1.250	6.0	1.470	1.500	CN.. 54..	E02
1.250	MCLNL 20-5D	L	1.250	1.250	6.0	1.470	1.500	CN.. 54..	E02
1.500	MCLNR 24-5D	R	1.500	1.500	6.0	1.470	2.000	CN.. 54..	E02
1.500	MCLNL 24-5D	L	1.500	1.250	6.0	1.470	2.000	CN.. 54..	E02
1.000	MCLNR 16-6D	R	1.000	1.000	6.0	1.510	1.250	CN.. 64..	E03
1.000	MCLNL 16-6D	L	1.000	1.000	6.0	1.510	1.250	CN.. 64..	E03
1.250	MCLNR 20-6D	R	1.250	1.250	6.0	1.510	1.500	CN.. 64..	E03
1.250	MCLNR 85-6D	R	1.250	1.000	6.0	1.510	1.250	CN.. 64..	E03
1.250	MCLNL 20-6D	L	1.250	1.250	6.0	1.510	1.500	CN.. 64..	E03
1.250	MCLNL 85-6D	L	1.250	1.000	6.0	1.510	1.250	CN.. 64..	E03
1.500	MCLNR 24-6D	R	1.500	1.500	6.0	1.510	2.000	CN.. 64..	E03
1.500	MCLNR 24-6E	R	1.500	1.500	7.0	1.500	2.000	CN.. 64..	E03
1.500	MCLNR 86-6E	R	1.500	1.000	7.0	1.510	1.250	CN.. 64..	E03
1.500	MCLNL 24-6D	L	1.500	1.500	6.0	1.510	2.000	CN.. 64..	E03
1.500	MCLNL 24-6E	L	1.500	1.500	7.0	1.500	2.000	CN.. 64..	E03
1.500	MCLNL 86-6E	L	1.500	1.000	7.0	1.510	1.250	CN.. 64..	E03

E01	1340838	1342059	1341230	1340157	1339450	11584909 / 11584912
E02	1340840	1342060	1347423	1347266	1339448	11584909 / 11584910
E03	1340842	1342060	1341233	1340159	1339448	11584914 / 11584910

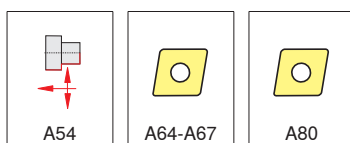


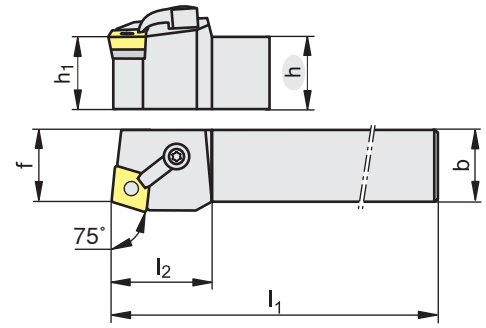
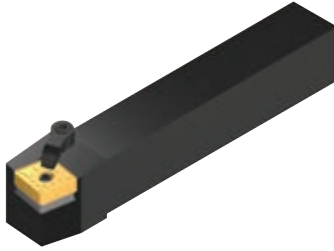
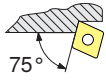


Picture shows right-hand version

h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MCMNN 12-4B	N	.750	.750	4.5	1.280	.375	CN.. 43..	E01
1.000	MCMNN 16-4D	N	1.000	1.000	6.0	1.280	.500	CN.. 43..	E01
1.250	MCMNN 20-4D	N	1.250	1.250	6.0	1.390	.625	CN.. 43..	E01
1.250	MCMNN 85-4D	N	1.250	1.000	6.0	1.280	.625	CN.. 43..	E01
1.000	MCMNN 16-5C	N	1.000	1.000	6.0	1.750	.500	CN.. 54..	E02
1.250	MCMNN 20-5D	N	1.250	1.250	6.0	1.610	.625	CN.. 54..	E02
1.500	MCMNN 24-5D	N	1.500	1.500	6.0	1.610	.750	CN.. 54..	E02
1.500	MCMNN 24-6D	N	1.500	1.500	6.0	1.670	.750	CN.. 64..	E03

E01	1340838	1342059	1341230	1340157	1339450	11584909 / 11584912
E02	1340840	1342060	1347423	1347266	1339448	11584909 / 11584910
E03	1340842	1342060	1341233	1340159	1339448	11584914 / 11584910



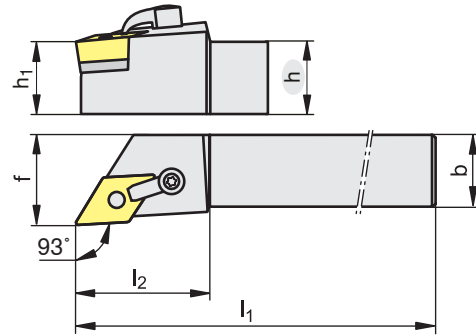
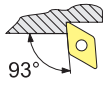


Picture shows right-hand version

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MCRNR 12-4B	R	.750	.750	4.5	1.180	.878	CN.. 43..	E01
.750	MCRNL 12-4B	L	.750	.750	4.5	1.180	.878	CN.. 43..	E01
1.000	MCRNR 16-4D	R	1.000	1.000	6.0	1.180	1.128	CN.. 43..	E01
1.000	MCRNL 16-4D	L	1.000	1.000	6.0	1.180	1.128	CN.. 43..	E01
1.250	MCRNR 20-4D	R	1.250	1.250	6.0	1.180	1.318	CN.. 43..	E01
1.250	MCRNL 20-4D	L	1.250	1.250	6.0	1.180	1.318	CN.. 43..	E01
1.000	MCRNR 16-5D	R	1.000	1.000	6.0	1.101	1.101	CN.. 54..	E02
1.000	MCRNL 16-5D	L	1.000	1.000	6.0	1.101	1.101	CN.. 54..	E02
1.250	MCRNR 20-5D	R	1.250	1.250	6.0	1.351	1.351	CN.. 54..	E02
1.250	MCRNL 20-5D	L	1.250	1.250	6.0	1.351	1.351	CN.. 54..	E02
1.250	MCRNR 20-6D	R	1.250	1.250	6.0	1.318	1.318	CN.. 64..	E03
1.250	MCRNL 20-6D	L	1.250	1.250	6.0	1.318	1.318	CN.. 64..	E03
1.500	MCRNR 24-6D	R	1.500	1.500	6.0	1.818	1.818	CN.. 64..	E03
1.500	MCRNL 24-6D	L	1.500	1.500	6.0	1.818	1.818	CN.. 64..	E03

E01	1340838	1342059	1341230	1340157	1339450	11584909 / 11584912
E02	1340840	1342060	1347423	1347266	1339448	11584909 / 11584910
E03	1340842	1342060	1341233	1340159	1339448	11584914 / 11584910

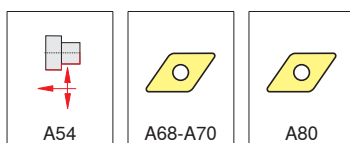
A54	A64-A67	A80

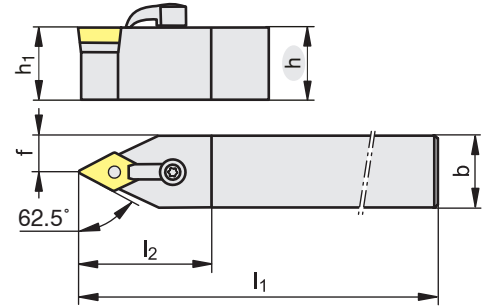
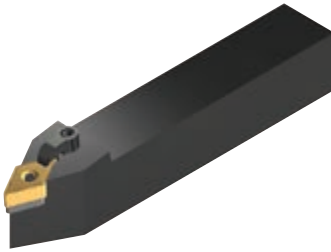
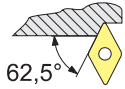


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MDJNR 12-4B	R	.750	.750	4.5	1.500	1.000	DN.. 43..	E02
.750	MDJNL 12-4B	L	.750	.750	4.5	1.500	1.000	DN.. 43..	E02
1.000	MDJNR 16-4D	R	1.000	1.000	6.0	1.500	1.250	DN.. 43..	E02
1.000	MDJNL 16-4D	L	1.000	1.000	6.0	1.500	1.250	DN.. 43..	E02
1.250	MDJNR 20-4D	R	1.250	1.250	6.0	1.500	1.500	DN.. 43..	E02
1.250	MDJNR 85-4D	R	1.250	1.000	6.0	1.500	1.250	DN.. 43..	E02
1.250	MDJNL 20-4D	L	1.250	1.250	6.0	1.500	1.500	DN.. 43..	E02
1.250	MDJNL 85-4D	L	1.250	1.000	6.0	1.500	1.250	DN.. 43..	E02
1.500	MDJNR 24-4D	R	1.500	1.500	6.0	1.500	2.000	DN.. 43..	E02
1.500	MDJNL 24-4D	L	1.500	1.500	6.0	1.500	2.000	DN.. 43..	E02
1.000	MDJNR 16-5D	R	1.000	1.000	6.0	1.440	1.250	DN.. 54..	E03
1.000	MDJNL 16-5D	L	1.000	1.000	6.0	1.440	1.250	DN.. 54..	E03
1.250	MDJNR 20-5D	R	1.250	1.250	6.0	1.440	1.500	DN.. 54..	E03
1.250	MDJNR 85-5D	R	1.250	1.000	6.0	1.440	1.250	DN.. 54..	E03
1.250	MDJNL 20-5D	L	1.250	1.250	6.0	1.440	1.500	DN.. 54..	E03
1.250	MDJNL 85-5D	L	1.250	1.000	6.0	1.440	1.250	DN.. 54..	E03
1.500	MDJNR 24-5D	R	1.500	1.500	6.0	1.440	2.000	DN.. 54..	E03
1.500	MDJNL 24-5D	L	1.500	1.500	6.0	1.440	2.000	DN.. 54..	E03
.500	MDJNR 08-3A	R	.500	.500	4.0	1.062	.625	DN.. 33..	E01
.500	MDJNL 08-3A	L	.500	.500	4.0	1.062	.625	DN.. 33..	E01
.625	MDJNR 10-3B	R	.625	.625	4.5	1.250	.875	DN.. 33..	E01
.625	MDJNL 10-3B	L	.625	.625	4.5	1.250	.875	DN.. 33..	E01

E01	1340833	1342056			1339455	11584907 / 11584912
E02	1340838	1342059	1341230	1347418	1339450	11584909 / 11584912
E03	1340840	1342060	1347423	1340163	1339448	11584909 / 11584910





Picture shows right-hand version

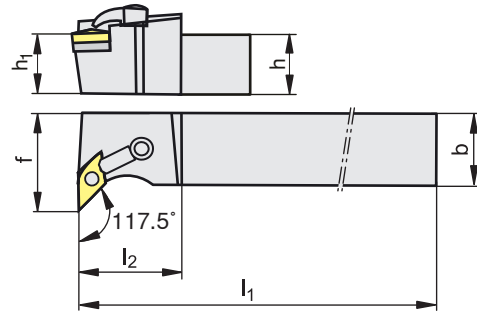
h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MDPNN 12-4B	N	.750	.750	4.5	1.620	.375	DN.. 43..	E01
1.000	MDPNN 16-4D	N	1.000	1.000	6.0	1.620	.500	DN.. 43..	E02
1.250	MDPNN 20-4D	N	1.250	1.250	6.0	1.620	.625	DN.. 43..	E02
1.000	MDPNN 16-5D	N	1.000	1.000	6.0	1.880	.500	DN.. 54..	E03
1.250	MDPNN 20-5D	N	1.250	1.250	6.0	1.880	.625	DN.. 54..	E03
1.250	MDPNN 85-5D	N	1.250	1.000	6.0	1.880	.625	DN.. 54..	E03
1.500	MDPNN 24-5E	N	1.500	1.500	7.0	1.880	.750	DN.. 54..	E03
1.500	MDPNN 86-5D	N	1.500	1.000	6.0	1.880	.750	DN.. 54..	E03

Tools

Tools and inserts for turning

E01	1340838	1342059	1341230	1347418	11558453	11584909 / 11584912
E02	1340838	1342059	1341230	1347418	1339450	11584909 / 11584912
E03	1340840	1342060	1347423	1340163	1339448	11584910 / 11584909

A54	A68-A70	A80



Picture shows right-hand version

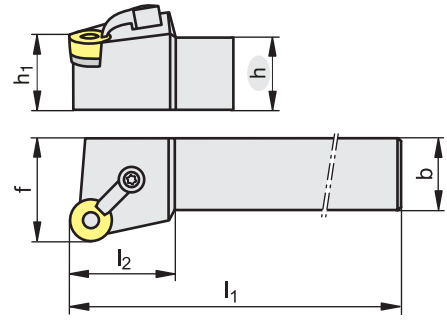
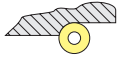
h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MDQNR 12-4B-N	R	.750	.750	4.5	1.370	1.000	DN.. 43..	E01
.750	MDQNL 12-4B-N	L	.750	.750	4.5	1.370	1.000	DN.. 43..	E01
1.000	MDQNR 16-4D-N	R	1.000	1.000	6.0	1.370	1.250	DN.. 43..	E01
1.000	MDQNL 16-4D-N	L	1.000	1.000	6.0	1.370	1.250	DN.. 43..	E01
1.250	MDQNR 20-4D-N	R	1.250	1.250	6.0	1.370	1.500	DN.. 43..	E01
1.250	MDQNL 20-4D-N	L	1.250	1.250	6.0	1.370	1.500	DN.. 43..	E01
1.500	MDQNR 24-4E-N	R	1.500	1.500	7.0	1.370	2.000	DN.. 43..	E01
1.500	MDQNL 24-4E-N	L	1.500	1.500	7.0	1.370	2.000	DN.. 43..	E01

Tools

Tools and inserts for turning

E01	1340838	1342059	11293762	1339450	11584909 / 11584912

A54	A68-A70	A80



Picture shows right-hand version

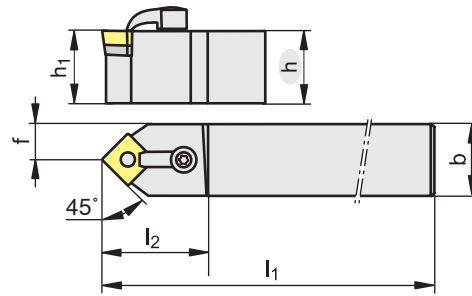
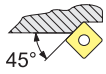
Tools

Tools and inserts for turning

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MRGNR 12-3B	R	.750	.750	4.5	.810	1.000	RN.. 32..	E01
.750	MRGNL 12-3B	L	.750	.750	4.5	.810	1.000	RN.. 32..	E01
.750	MRGNR 12-4B	R	.750	.750	4.5	1.060	1.000	RN.. 43..	E02
.750	MRGNL 12-4B	L	.750	.750	4.5	1.060	1.000	RN.. 43..	E02
1.000	MRGNR 16-4D	R	1.000	1.000	6.0	1.060	1.250	RN.. 43..	E02
1.000	MRGNL 16-4D	L	1.000	1.000	6.0	1.060	1.250	RN.. 43..	E02
1.250	MRGNR 20-4D	R	1.250	1.250	6.0	1.060	1.500	RN.. 43..	E02
1.250	MRGNR 85-4D	R	1.250	1.000	6.0	1.060	1.250	RN.. 43..	E02
1.250	MRGNL 20-4D	L	1.250	1.250	6.0	1.060	1.500	RN.. 43..	E02
1.250	MRGNL 85-4D	L	1.250	1.000	6.0	1.060	1.250	RN.. 43..	E02
1.500	MRGNR 86-4D	R	1.500	1.000	6.0	1.060	1.250	RN.. 43..	E02
1.500	MRGNL 86-4D	L	1.500	1.000	6.0	1.060	1.250	RN.. 43..	E02
1.000	MRGNR 16-5D	R	1.000	1.000	6.0	1.250	1.250	RN.. 54..	E03
1.000	MRGNL 16-5D	L	1.000	1.000	6.0	1.250	1.250	RN.. 54..	E03
1.250	MRGNR 20-5D	R	1.250	1.250	6.0	1.250	1.500	RN.. 54..	E03
1.250	MRGNL 20-5D	L	1.250	1.250	6.0	1.250	1.500	RN.. 54..	E03
1.000	MRGNR 16-6D	R	1.000	1.000	6.0	1.380	1.250	RN.. 64..	E04
1.000	MRGNL 16-6D	L	1.000	1.000	6.0	1.380	1.250	RN.. 64..	E04
1.250	MRGNR 20-6D	R	1.250	1.250	6.0	1.380	1.500	RN.. 64..	E04
1.250	MRGNL 20-6D	L	1.250	1.250	6.0	1.380	1.500	RN.. 64..	E04
1.500	MRGNR 24-6E	R	1.500	1.500	7.0	1.380	2.000	RN.. 64..	E04
1.500	MRGNL 24-6E	L	1.500	1.500	7.0	1.380	2.000	RN.. 64..	E04
1.500	MRGNR 24-8E	R	1.500	1.500	7.0	1.440	2.000	RN.. 86..	E05
1.500	MRGNL 24-8E	L	1.500	1.500	7.0	1.440	2.000	RN.. 86..	E05

E01	1340832	1342059			1339450	11584907 / 11584909
E02	1340838	1342059	1341230	1340166	1339450	11584912 / 11584909
E03	1340840	1342060		1340167	1339448	11584910 / 11584909
E04	1340842	1342060		1340168	1339448	11584910 / 11584914
E05	1340844	1342060		1340169	1339452	11584910

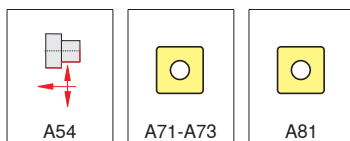


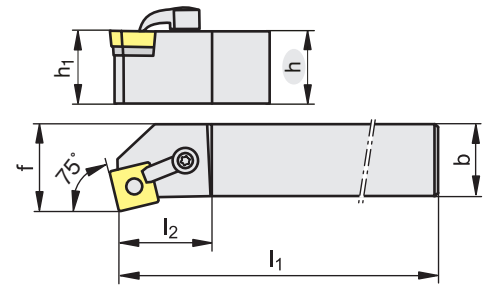
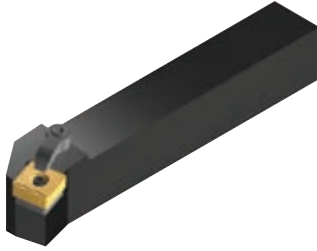


Picture shows right-hand version

h [inch]	Type, description	LNR 								
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]			
.750	MSDNN 12-4B	N	.750	.750	4.5	1.300	.375	SN.. 43..	E02	
1.000	MSDNN 16-4D	N	1.000	1.000	6.0	1.300	.500	SN.. 43..	E02	
1.250	MSDNN 85-4D	N	1.250	1.000	6.0	1.300	.625	SN.. 43..	E02	
1.000	MSDNN 16-5D	N	1.000	1.000	6.0	1.500	.500	SN.. 54..	E03	
1.250	MSDNN 20-5D	N	1.250	1.250	6.0	1.500	.625	SN.. 54..	E03	
1.250	MSDNN 85-5D	N	1.250	1.000	6.0	1.500	.625	SN.. 54..	E03	
1.000	MSDNN 16-6D	N	1.000	1.000	6.0	1.730	.500	SN.. 64..	E04	
1.250	MSDNN 20-6D	N	1.250	1.250	6.0	1.750	.625	SN.. 64..	E04	
1.250	MSDNN 85-6D	N	1.250	1.000	6.0	1.750	.625	SN.. 64..	E04	
1.500	MSDNN 24-6E	N	1.500	1.500	7.0	1.750	.750	SN.. 64..	E04	
.500	MSDNN 08-3A	N	.500	.500	4.0	1.000	.250	SN.. 32..	E01	
.625	MSDNN 10-3B	N	.625	.625	4.5	1.000	.313	SN.. 32..	E01	

E01	1340834	1342056		1340177	1339454	11584907 / 11584912
E02	1340838	1342059	1341230	1347419	1339450	11584912 / 11584909
E03	1340840	1342060	1347423	1340180	1339448	11584910 / 11584909
E04	1340842	1342060	1341233	1340181	1339448	11584910 / 11584914



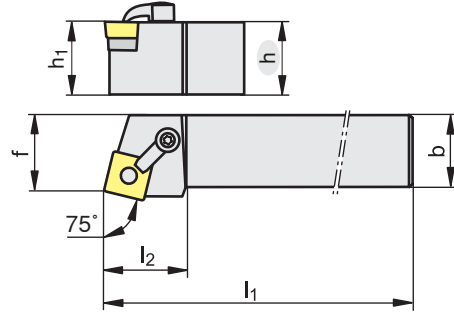
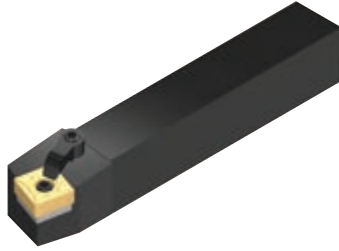
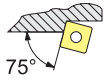


Picture shows right-hand version

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MSKNR 12-4B	R	.750	.750	4.5	1.220	1.000	SN.. 43..	E01
.750	MSKNL 12-4B	L	.750	.750	4.5	1.220	1.000	SN.. 43..	E01
1.000	MSKNR 16-4D	R	1.000	1.000	6.0	1.220	1.250	SN.. 43..	E01
1.000	MSKNL 16-4D	L	1.000	1.000	6.0	1.220	1.250	SN.. 43..	E01
1.000	MSKNR 16-5D	R	1.000	1.000	6.0	1.410	1.250	SN.. 54..	E02
1.000	MSKNL 16-5D	L	1.000	1.000	6.0	1.410	1.250	SN.. 54..	E02
1.250	MSKNR 20-5D	R	1.250	1.250	6.0	1.410	1.500	SN.. 54..	E02
1.250	MSKNR 85-5D	R	1.250	1.000	6.0	1.410	1.250	SN.. 54..	E02
1.250	MSKNL 20-5D	L	1.250	1.250	6.0	1.410	1.500	SN.. 54..	E02
1.250	MSKNL 85-5D	L	1.250	1.000	6.0	1.410	1.250	SN.. 54..	E02
1.250	MSKNR 20-6D	R	1.250	1.250	6.0	1.500	1.500	SN.. 64..	E03
1.250	MSKNL 20-6D	L	1.250	1.250	6.0	1.500	1.500	SN.. 64..	E03
1.500	MSKNR 24-6E	R	1.500	1.500	7.0	1.500	2.000	SN.. 64..	E03
1.500	MSKNL 24-6E	L	1.500	1.500	7.0	1.500	2.000	SN.. 64..	E03

E01	1340838	1342059	1341230	1347419	1339450	11584912 / 11584909	
E02	1340840	1342060	1347423	1340180	1339448	11584910 / 11584909	
E03	1340842	1342060	1341233	1340181	1339448	11584910 / 11584914	

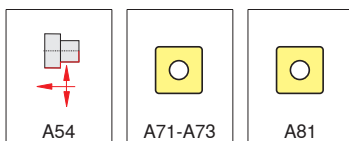
A54	A71-A73	A81

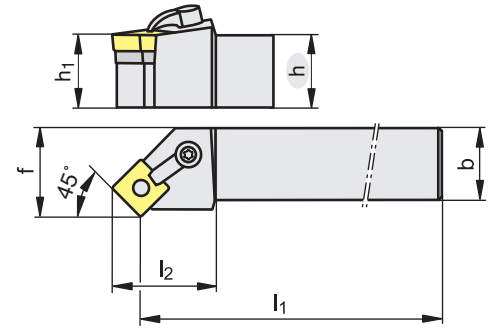
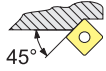


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MSRNR 12-4B	R	.750	.750	4.5	1.250	.880	SN.. 43..	E01
.750	MSRNL 12-4B	L	.750	.750	4.5	1.250	.880	SN.. 43..	E01
1.000	MSRNR 16-4D	R	1.000	1.000	6.0	1.250	1.130	SN.. 43..	E01
1.000	MSRNL 16-4D	L	1.000	1.000	6.0	1.250	1.130	SN.. 43..	E01
1.000	MSRNR 16-5D	R	1.000	1.000	6.0	1.500	1.103	SN.. 54..	E02
1.000	MSRNL 16-5D	L	1.000	1.000	6.0	1.500	1.103	SN.. 54..	E02
1.250	MSRNR 20-5D	R	1.250	1.250	6.0	1.500	1.353	SN.. 54..	E02
1.250	MSRNL 20-5D	L	1.250	1.250	6.0	1.500	1.353	SN.. 54..	E02
1.250	MSRNR 20-6D	R	1.250	1.250	6.0	1.590	1.321	SN.. 64..	E03
1.250	MSRNL 20-6D	L	1.250	1.250	6.0	1.590	1.321	SN.. 64..	E03
1.500	MSRNR 24-6E	R	1.500	1.500	7.0	1.590	1.821	SN.. 64..	E03
1.500	MSRNL 24-6E	L	1.500	1.500	7.0	1.590	1.821	SN.. 64..	E03

E01	1340838	1342059	1341230	1347419	1339450	11584912 / 11584909
E02	1340840	1342060	1347423	1340180	1339448	11584910 / 11584909
E03	1340842	1342060	1341233	1340181	1339448	11584910 / 11584914



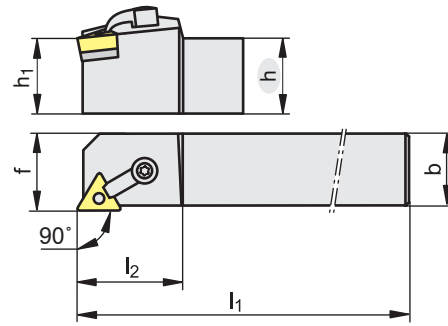
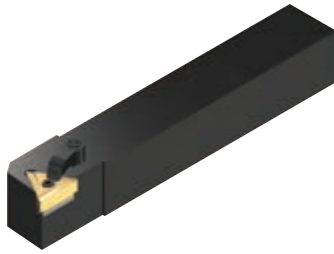
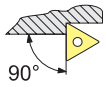


Picture shows right-hand version

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MSSNR 12-4B	R	.750	.750	4.5	1.230	.675	SN.. 43..	E01
.750	MSSNL 12-4B	L	.750	.750	4.5	1.230	.675	SN.. 43..	E01
1.000	MSSNR 16-4D	R	1.000	1.000	6.0	1.230	.925	SN.. 43..	E01
1.000	MSSNL 16-4D	L	1.000	1.000	6.0	1.230	.925	SN.. 43..	E01
1.000	MSSNR 16-5D	R	1.000	1.000	6.0	1.380	.847	SN.. 54..	E02
1.000	MSSNL 16-5D	L	1.000	1.000	6.0	1.380	.847	SN.. 54..	E02
1.250	MSSNR 20-5D	R	1.250	1.250	6.0	1.380	1.097	SN.. 54..	E02
1.250	MSSNL 20-5D	L	1.250	1.250	6.0	1.380	1.097	SN.. 54..	E02
1.250	MSSNR 20-6D	R	1.250	1.250	6.0	1.470	1.010	SN.. 64..	E03
1.250	MSSNL 20-6D	L	1.250	1.250	6.0	1.470	1.010	SN.. 64..	E03
1.500	MSSNR 24-6E	R	1.500	1.500	7.0	1.470	1.511	SN.. 64..	E03
1.500	MSSNR 86-6E	R	1.500	1.000	7.0	1.470	.761	SN.. 64..	E04
1.500	MSSNL 24-6E	L	1.500	1.500	7.0	1.470	1.511	SN.. 64..	E03
1.500	MSSNL 86-6E	L	1.500	1.000	7.0	1.470	.761	SN.. 64..	E04

E01	1340838	1342059	1341230	1347419	1339450	11584912 / 11584909
E02	1340840	1342060	1347423	1340180	1339448	11584910 / 11584909
E03	1340842	1342060	1341233	1340181	1339448	11584910 / 11584914
E04	1340842	1342060		1340181	1339448	11584914 / 11584910

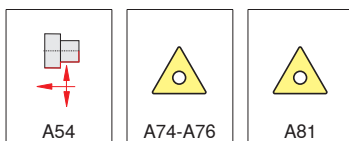
A54	A71-A73	A81

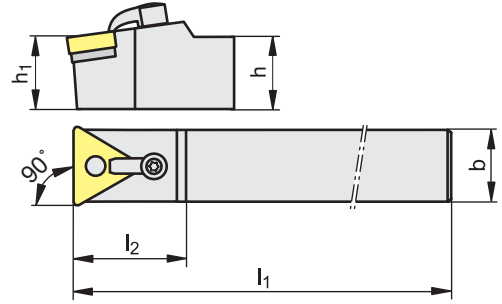


Picture shows right-hand version

h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MTANR 12-3B	R	.750	.750	4.5	1.060	.750	TN.. 33..	E02
.750	MTANL 12-3B	L	.750	.750	4.5	1.060	.750	TN.. 33..	E02
1.000	MTANR 16-3D	R	1.000	1.000	6.0	1.060	1.000	TN.. 33..	E02
1.000	MTANL 16-3D	L	1.000	1.000	6.0	1.060	1.000	TN.. 33..	E02
1.000	MTANR 16-4D	R	1.000	1.000	6.0	1.220	1.000	TN.. 43..	E03
1.000	MTANL 16-4D	L	1.000	1.000	6.0	1.220	1.000	TN.. 43..	E03
1.250	MTANR 20-5D	R	1.250	1.250	6.0	1.430	1.250	TN.. 54..	E04
1.250	MTANL 20-5D	L	1.250	1.250	6.0	1.430	1.250	TN.. 54..	E04
1.500	MTANR 24-5D	R	1.500	1.500	6.0	1.430	1.500	TN.. 54..	E04
1.500	MTANL 24-5D	L	1.500	1.500	6.0	1.430	1.500	TN.. 54..	E04
.500	MTANR 08-2A	R	.500	.500	4.0	.875	.500	TN.. 22..	E01
.500	MTANL 08-2A	L	.500	.500	4.0	.875	.500	TN.. 22..	E01

E01	1340831	1349597			1339455	11584912 / 11840750
E02	1340835	1342059	1341228	1340184	1339450	11584909 / 11584907
E03	1340838	1342059	1341230	1340189	1339450	11584912 / 11584909
E04	1340840	1342060	1347423	1340192	1339448	11584909 / 11584910



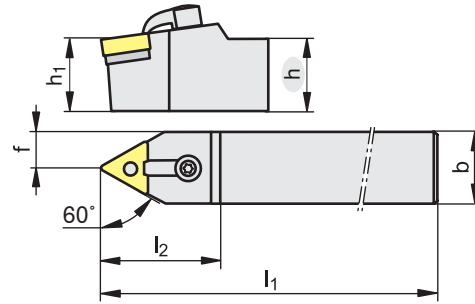
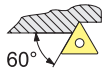


Picture shows right-hand version

h [inch]	Type, description	L N R 						
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]		
1.000	MTCNN 44-3F	N	1.000	.500	8.0	1.000	TN.. 33..	E02
.750	MTCNN 12-4B	N	.750	.750	4.5	1.375	TN.. 43..	E01
1.000	MTCNN 64-4F	N	1.000	.750	8.0	1.375	TN.. 43..	E03
1.500	MTCNN 66-4F	N	1.500	.750	8.0	1.375	TN.. 43..	E03

E01	1340838	1342061	1340190	1339448	11584912 / 11584910	
E02	1340835	1342059	1340184	1339450	11584909 / 11584907	
E03	1340838	1342060	1340190	1339448	11584910 / 11584912	

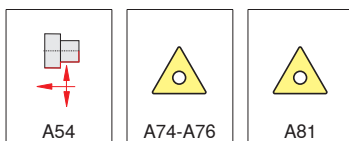
A54	A74-A76	A81

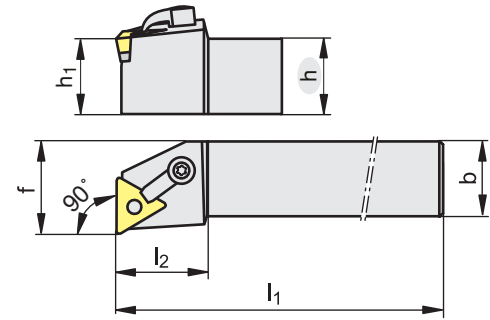


Picture shows right-hand version

h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.625	MTENNS 10-3B	N	.625	.625	4.5	1.125	.313	TN.. 33..	E02
.750	MTENNS 12-3B	N	.750	.750	4.5	1.300	.375	TN.. 33..	E03
1.000	MTENNS 16-3D	N	1.000	1.000	6.0	1.300	.500	TN.. 33..	E03
1.000	MTENNS 16-4D	N	1.000	1.000	6.0	1.500	.500	TN.. 43..	E04
1.250	MTENNS 20-5D	N	1.250	1.250	6.0	1.732	.625	TN.. 54..	E05
1.500	MTENNS 24-6E	N	1.500	1.500	7.0	2.086	.750	TN.. 66..	E06
.500	MTENNS 08-2A	N	.500	.500	4.0	1.000	.250	TN.. 22..	E01

E01	1340831	1349597				1339455
E02	1340834	1342056	1349547		1340184	1339454
E03	1340835	1342059	1341228		1340184	1339450
E04	1340838	1342059	1341230		1340189	1339450
E05	1340840	1342060	1347423		1340192	1339448
E06	1340842	1342060	1349546		1340197	1339448

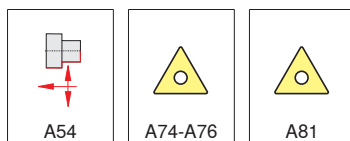


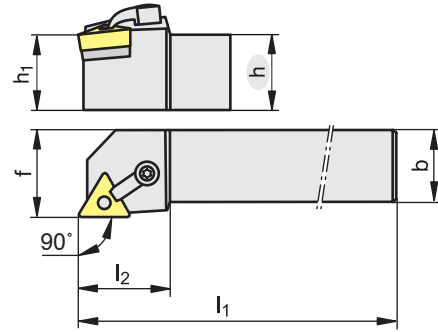
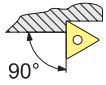


Picture shows right-hand version

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MTFNR 12-3B	R	.750	.750	4.5	1.000	1.000	TN.. 33..	E01
.750	MTFNL 12-3B	L	.750	.750	4.5	1.000	1.000	TN.. 33..	E01
1.000	MTFNR 16-3D	R	1.000	1.000	6.0	1.250	1.250	TN.. 33..	E01
1.000	MTFNL 16-3D	L	1.000	1.000	6.0	1.250	1.250	TN.. 33..	E01
1.000	MTFNR 16-4D	R	1.000	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.000	MTFNL 16-4D	L	1.000	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.250	MTFNR 20-4D	R	1.250	1.250	6.0	1.500	1.500	TN.. 43..	E02
1.250	MTFNR 85-4D	R	1.250	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.250	MTFNL 20-4D	L	1.250	1.250	6.0	1.500	1.500	TN.. 43..	E02
1.250	MTFNL 85-4D	L	1.250	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.500	MTFNR 86-4D	R	1.500	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.500	MTFNL 86-4D	L	1.500	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.000	MTFNR 16-5D	R	1.000	1.000	6.0	1.250	1.250	TN.. 54..	E03
1.000	MTFNL 16-5D	L	1.000	1.000	6.0	1.250	1.250	TN.. 54..	E03
1.250	MTFNR 20-5D	R	1.250	1.250	6.0	1.500	1.500	TN.. 54..	E03
1.250	MTFNR 85-5D	R	1.250	1.000	6.0	1.250	1.250	TN.. 54..	E03
1.250	MTFNL 20-5D	L	1.250	1.250	6.0	1.500	1.500	TN.. 54..	E03
1.250	MTFNL 85-5D	L	1.250	1.000	6.0	1.250	1.250	TN.. 54..	E03
1.500	MTFNR 24-5E	R	1.500	1.500	7.0	2.000	2.000	TN.. 54..	E03
1.500	MTFNR 86-5D	R	1.500	1.000	6.0	1.250	1.250	TN.. 54..	E03
1.500	MTFNL 24-5E	L	1.500	1.500	7.0	2.000	2.000	TN.. 54..	E03
1.500	MTFNL 86-5D	L	1.500	1.000	6.0	1.250	1.250	TN.. 54..	E03

E01	1340835	1342059	1341228	1340184	1339450	11584907 / 11584909
E02	1340838	1342059	1341230	1340189	1339450	11584912 / 11584909
E03	1340840	1342060	1347423	1340192	1339448	11584909 / 11584910

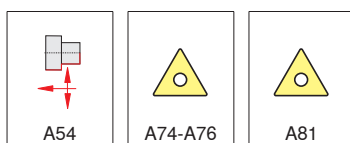


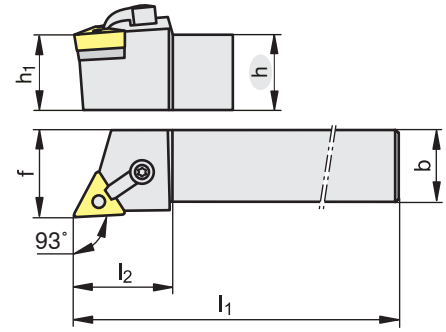
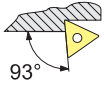


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.625	MTGNR 10-3B	R	.625	.625	4.5	1.000	.875	TN.. 33..	E02
.625	MTGNL 10-3B	L	.625	.625	4.5	1.000	.875	TN.. 33..	E02
.750	MTGNR 12-3B	R	.750	.750	4.5	1.060	1.000	TN.. 33..	E02
.750	MTGNL 12-3B	L	.750	.750	4.5	1.060	1.000	TN.. 33..	E02
1.000	MTGNR 16-3D	R	1.000	1.000	6.0	1.060	1.250	TN.. 33..	E02
1.000	MTGNL 16-3D	L	1.000	1.000	6.0	1.060	1.250	TN.. 33..	E02
1.000	MTGNR 16-4D	R	1.000	1.000	6.0	1.220	1.250	TN.. 43..	E03
1.000	MTGNL 16-4D	L	1.000	1.000	6.0	1.220	1.250	TN.. 43..	E03
1.250	MTGNR 20-4D	R	1.250	1.250	6.0	1.220	1.500	TN.. 43..	E03
1.250	MTGNR 85-4D	R	1.250	1.000	6.0	1.220	1.250	TN.. 43..	E03
1.250	MTGNL 20-4D	L	1.250	1.250	6.0	1.220	1.500	TN.. 43..	E03
1.250	MTGNL 85-4D	L	1.250	1.000	6.0	1.220	1.250	TN.. 43..	E03
1.500	MTGNR 86-4D	R	1.500	1.000	6.0	1.220	1.250	TN.. 43..	E03
1.500	MTGNL 86-4D	L	1.500	1.000	6.0	1.220	1.250	TN.. 43..	E03
1.000	MTGNR 16-5D	R	1.000	1.000	6.0	1.440	1.250	TN.. 54..	E04
1.000	MTGNL 16-5D	L	1.000	1.000	6.0	1.440	1.250	TN.. 54..	E04
1.250	MTGNR 20-5D	R	1.250	1.250	6.0	1.440	1.500	TN.. 54..	E04
1.250	MTGNR 85-5D	R	1.250	1.000	6.0	1.440	1.250	TN.. 54..	E04
1.250	MTGNL 20-5D	L	1.250	1.250	6.0	1.440	1.500	TN.. 54..	E04
1.250	MTGNL 85-5D	L	1.250	1.000	6.0	1.440	1.250	TN.. 54..	E04
1.500	MTGNR 24-5E	R	1.500	1.500	7.0	1.440	2.000	TN.. 54..	E04
1.500	MTGNR 86-5D	R	1.500	1.000	6.0	1.440	1.250	TN.. 54..	E04
1.500	MTGNL 24-5E	L	1.500	1.500	7.0	1.440	2.000	TN.. 54..	E04
1.500	MTGNL 86-5D	L	1.500	1.000	6.0	1.440	1.250	TN.. 54..	E04
1.500	MTGNR 24-6E	R	1.500	1.500	7.0	1.500	2.000	TN.. 66..	E05
1.500	MTGNL 24-6E	L	1.500	1.500	7.0	1.500	2.000	TN.. 66..	E05
.500	MTGNR 08-2A	R	.500	.500	4.0	.875	.625	TN.. 22..	E01
.500	MTGNL 08-2A	L	.500	.500	4.0	.875	.625	TN.. 22..	E01

E01	1340831	1349597			1339455	11584912 / 11840750
E02	1340835	1342059	1341228	1340184	1339450	11584909 / 11584907
E03	1340838	1342059	1341230	1340189	1339450	11584909 / 11584912
E04	1340840	1342060	1347423	1340192	1339448	11584909 / 11584910
E05	1340843	1342060	1341233	1340197	1339448	11584909 / 11584910





Picture shows right-hand version

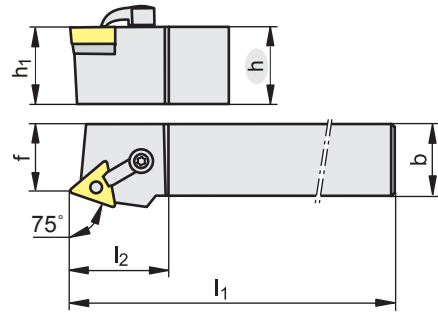
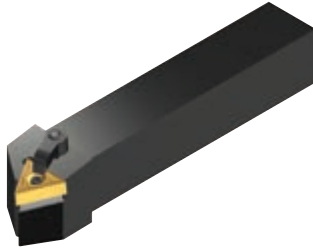
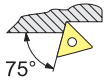
Tools

Tools and inserts for turning

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MTJNR 12-3B	R	.750	.750	4.5	1.030	1.000	TN.. 33..	E01
.750	MTJNL 12-3B	L	.750	.750	4.5	1.030	1.000	TN.. 33..	E01
1.000	MTJNR 16-3D	R	1.000	1.000	6.0	1.030	1.250	TN.. 33..	E01
1.000	MTJNL 16-3D	L	1.000	1.000	6.0	1.030	1.250	TN.. 33..	E01
1.000	MTJNR 16-4D	R	1.000	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.000	MTJNL 16-4D	L	1.000	1.000	6.0	1.250	1.250	TN.. 43..	E02
1.250	MTJNR 20-4D	R	1.250	1.250	6.0	1.250	1.500	TN.. 43..	E02
1.250	MTJNL 20-4D	L	1.250	1.250	6.0	1.250	1.500	TN.. 43..	E02
1.250	MTJNR 20-5D	R	1.250	1.250	6.0	1.440	1.500	TN.. 54..	E03
1.250	MTJNL 20-5D	L	1.250	1.250	6.0	1.440	1.500	TN.. 54..	E03
1.500	MTJNR 24-6E	R	1.500	1.500	7.0	1.625	2.000	TN.. 66..	E04
1.500	MTJNL 24-6E	L	1.500	1.500	7.0	1.625	2.000	TN.. 66..	E04

E01	1340835	1342059	1341228	1340184	1339450	11584907 / 11584909
E02	1340838	1342059	1341230	1340189	1339450	11584909 / 11584912
E03	1340840	1342060	1347423	1340192	1339448	11584909 / 11584910
E04	1340843	1342060		1340197	1339448	11584910 / 11584914

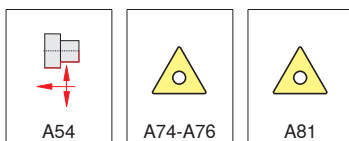
A54	A74-A76	A81

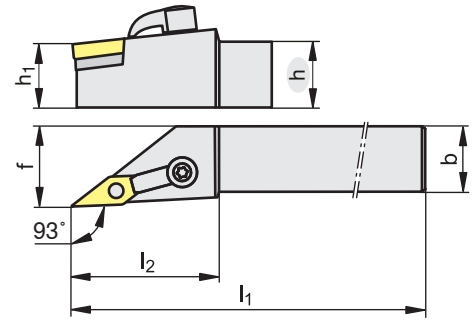
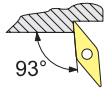


Picture shows right-hand version

h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MTRNR 12-3B	R	.750	.750	4.5	1.160	.855	TN.. 33..	E01
.750	MTRNL 12-3B	L	.750	.750	4.5	1.160	.855	TN.. 33..	E01
1.000	MTRNR 16-3D	R	1.000	1.000	6.0	1.160	1.105	TN.. 33..	E01
1.000	MTRNL 16-3D	L	1.000	1.000	6.0	1.160	1.105	TN.. 33..	E01
1.000	MTRNR 16-4D	R	1.000	1.000	6.0	1.380	1.048	TN.. 43..	E02
1.000	MTRNL 16-4D	L	1.000	1.000	6.0	1.380	1.048	TN.. 43..	E02
1.250	MTRNR 20-4D	R	1.250	1.250	6.0	1.380	1.298	TN.. 43..	E02
1.250	MTRNL 20-4D	L	1.250	1.250	6.0	1.380	1.298	TN.. 43..	E02
1.250	MTRNR 20-5D	R	1.250	1.250	6.0	1.560	1.252	TN.. 54..	E03
1.250	MTRNL 20-5D	L	1.250	1.250	6.0	1.560	1.252	TN.. 54..	E03
1.500	MTRNR 24-5E	R	1.500	1.500	7.0	1.560	1.752	TN.. 54..	E03
1.500	MTRNL 24-5E	L	1.500	1.500	7.0	1.560	1.752	TN.. 54..	E03

E01	1340835	1342059	1341228	1340184	1339450	11584907 / 11584909
E02	1340838	1342059	1341230	1340189	1339450	11584912 / 11584909
E03	1340840	1342060	1347423	1340192	1339448	11584909 / 11584910





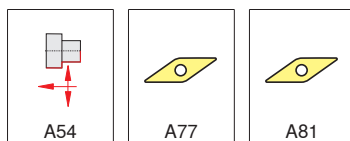
Picture shows right-hand version

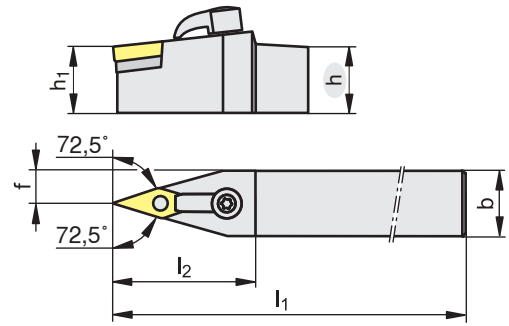
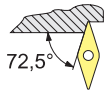
Tools

Tools and inserts for turning

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MVJNR 12-3B	R	.750	.750	4.5	1.620	1.000	VN.. 33..	E01
.750	MVJNL 12-3B	L	.750	.750	4.5	1.620	1.000	VN.. 33..	E01
1.000	MVJNR 16-3D	R	1.000	1.000	6.0	1.620	1.250	VN.. 33..	E01
1.000	MVJNL 16-3D	L	1.000	1.000	6.0	1.620	1.250	VN.. 33..	E01
1.250	MVJNR 20-3D	R	1.250	1.250	6.0	1.620	1.500	VN.. 33..	E01
1.250	MVJNL 20-3D	L	1.250	1.250	6.0	1.620	1.500	VN.. 33..	E01
1.000	MVJNR 16-4D	R	1.000	1.000	6.0	1.880	1.250	VN.. 43..	E02
1.000	MVJNL 16-4D	L	1.000	1.000	6.0	1.880	1.250	VN.. 43..	E02
1.250	MVJNR 20-4D	R	1.250	1.250	6.0	1.880	1.500	VN.. 43..	E02
1.250	MVJNL 20-4D	L	1.250	1.250	6.0	1.880	1.500	VN.. 43..	E02
1.250	MVJNR 85-4D	R	1.250	1.000	6.0	1.880	1.250	VN.. 43..	E02
1.250	MVJNL 85-4D	L	1.250	1.000	6.0	1.880	1.250	VN.. 43..	E02
1.500	MVJNR 24-4E	R	1.500	1.500	7.0	1.880	2.000	VN.. 43..	E02
1.500	MVJNR 86-4D	R	1.500	1.000	6.0	1.880	1.250	VN.. 43..	E02
1.500	MVJNL 24-4E	L	1.500	1.500	7.0	1.880	2.000	VN.. 43..	E02
1.500	MVJNL 86-4D	L	1.500	1.000	6.0	1.880	1.250	VN.. 43..	E02

E01	1340835	1342059	1341228	1340198	11558453	11584909 / 11584907	
E02	1340838	1342060	1341230	1340199	1339452	11584912 / 11584910	

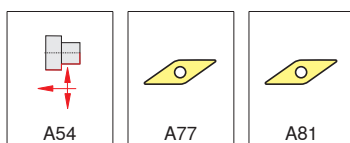


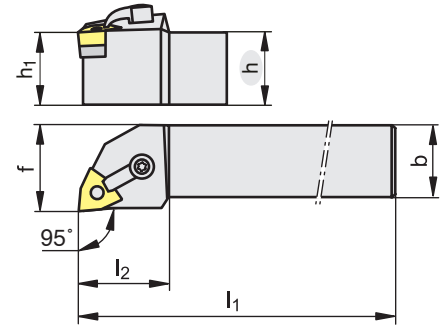
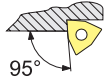


Picture shows right-hand version

h [inch]	Type, description	LNR 								
			h_1 [inch]	b [inch]	l_1 [inch]	l_2 [inch]	f [inch]			
.750	MVVNN 12-3B	N	.750	.750	4.5	1.620	.375	VN.. 33..	E01	
1.000	MVVNN 16-3B	N	1.000	1.000	4.5	1.620	.500	VN.. 33..	E01	
1.250	MVVNN 20-3D	N	1.250	1.250	6.0	1.620	.625	VN.. 33..	E01	
1.500	MVVNN 24-3E	N	1.500	1.500	7.0	1.620	.750	VN.. 33..	E01	
1.000	MVVNN 16-4D	N	1.000	1.000	6.0	2.060	.500	VN.. 43..	E02	
1.250	MVVNN 20-4D	N	1.250	1.250	6.0	2.060	.625	VN.. 43..	E02	
1.500	MVVNN 24-4E	N	1.500	1.500	7.0	2.060	.750	VN.. 43..	E02	

E01	1340835	1342059	1341228	1340198	11558453	11584909 / 11584907
E02	1340838	1342060	1341230	1340199	1339452	11584912 / 11584910





Picture shows right-hand version

Tools

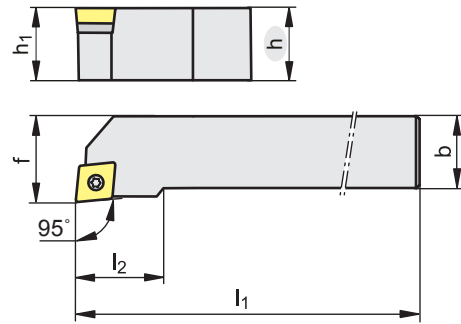
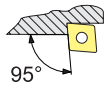
Tools and inserts for turning

h [inch]	Type, description	L N R 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	MWLN R 12-4B	R	.750	.750	4.5	1.070	1.000	WN.. 43..	E02
.750	MWLN L 12-4B	L	.750	.750	4.5	1.070	1.000	WN.. 43..	E02
1.000	MWLN R 16-4D	R	1.000	1.000	6.0	1.070	1.250	WN.. 43..	E02
1.000	MWLN L 16-4D	L	1.000	1.000	6.0	1.070	1.250	WN.. 43..	E02
1.250	MWLN R 20-4D	R	1.250	1.250	6.0	1.070	1.500	WN.. 43..	E02
1.250	MWLN L 20-4D	L	1.250	1.250	6.0	1.070	1.500	WN.. 43..	E02
1.500	MWLN R 24-4E	R	1.500	1.500	7.0	1.070	2.000	WN.. 43..	E02
1.500	MWLN L 24-4E	L	1.500	1.500	7.0	1.070	2.000	WN.. 43..	E02
.750	MWLN R 12-3B	R	.750	.750	4.5	1.000	1.000	WN.. 33..	E01
.750	MWLN L 12-3B	L	.750	.750	4.5	1.000	1.000	WN.. 33..	E01
1.000	MWLN R 16-3D	R	1.000	1.000	6.0	1.000	1.250	WN.. 33..	E01
1.000	MWLN L 16-3D	L	1.000	1.000	6.0	1.000	1.250	WN.. 33..	E01

E01	1340835	1342056		1340200	1339454	11584907 / 11584912
E02	1340838	1342059	1341230	1340202	1339450	11584912 / 11584909

A54

A78-A79



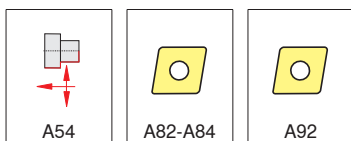
Picture shows right-hand version

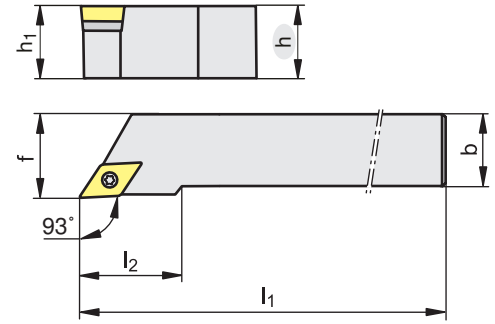
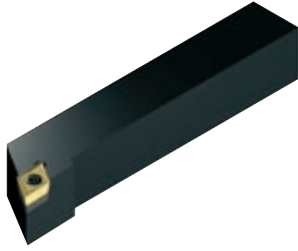
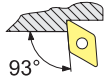
h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.375	SCLCR 06-2	R	.375	.375	2.5	.390	.500	CC.. 21.5..	E01
.375	SCLCL 06-2	L	.375	.375	2.5	.390	.500	CC.. 21.5..	E01
.500	SCLCR 08-3	R	.500	.500	3.5	.630	.625	CC.. 32.5..	E02
.500	SCLCL 08-3	L	.500	.500	3.5	.630	.625	CC.. 32.5..	E02
.625	SCLCR 10-3	R	.625	.625	4.0	.630	.750	CC.. 32.5..	E03
.625	SCLCL 10-3	L	.625	.625	4.0	.630	.750	CC.. 32.5..	E03
.750	SCLCR 12-3B	R	.750	.750	4.5	.630	1.000	CC.. 32.5..	E03
.750	SCLCL 12-3B	L	.750	.750	4.5	.630	1.000	CC.. 32.5..	E03
1.000	SCLCR 16-3D	R	1.000	1.000	6.0	.630	1.250	CC.. 32.5..	E03
1.000	SCLCL 16-3D	L	1.000	1.000	6.0	.630	1.250	CC.. 32.5..	E03
.750	SCLCR 12-4B	R	.750	.750	4.5	1.000	1.000	CC.. 43..	E04
.750	SCLCL 12-4B	L	.750	.750	4.5	1.000	1.000	CC.. 43..	E04
1.000	SCLCR 16-4D	R	1.000	1.000	6.0	1.000	1.250	CC.. 43..	E04
1.000	SCLCL 16-4D	L	1.000	1.000	6.0	1.000	1.250	CC.. 43..	E04
1.250	SCLCR 20-4D	R	1.250	1.250	6.0	1.000	1.500	CC.. 43..	E04
1.250	SCLCL 20-4D	L	1.250	1.250	6.0	1.000	1.500	CC.. 43..	E04

Tools

Tools and inserts for turning

E01	6227154			6232672
E02	6219404			6219402
E03	6219378			6219402
E04	1347422	1347421	1347426	1347425





Picture shows right-hand version

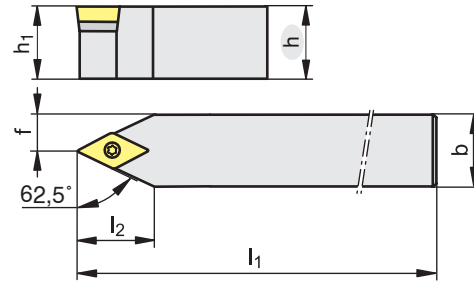
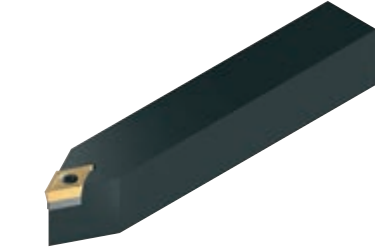
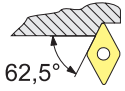
h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.375	SDJCR 06-2	R	.375	.375	2.5	.590	.500	DC.. 21.5..	E01
.375	SDJCL 06-2	L	.375	.375	2.5	.590	.500	DC.. 21.5..	E01
.500	SDJCR 08-2	R	.500	.500	3.5	.670	.625	DC.. 21.5..	E01
.500	SDJCL 08-2	L	.500	.500	3.5	.670	.625	DC.. 21.5..	E01
.625	SDJCR 10-2	R	.625	.625	4.0	.670	.750	DC.. 21.5..	E01
.625	SDJCL 10-2	L	.625	.625	4.0	.670	.750	DC.. 21.5..	E01
.750	SDJCR 12-2B	R	.750	.750	4.5	.708	1.000	DC.. 21.5..	E01
.750	SDJCL 12-2B	L	.750	.750	4.5	.708	1.000	DC.. 21.5..	E01
.750	SDJCR 12-3B	R	.750	.750	4.5	1.000	1.000	DC.. 32.5..	E02
.750	SDJCL 12-3B	L	.750	.750	4.5	1.000	1.000	DC.. 32.5..	E02
1.000	SDJCR 16-3D	R	1.000	1.000	6.0	1.100	1.250	DC.. 32.5..	E02
1.000	SDJCL 16-3D	L	1.000	1.000	6.0	1.100	1.250	DC.. 32.5..	E02

Tools

Tools and inserts for turning

E01	6227154			6232672
E02	6213482	6219422	6213484	6213485

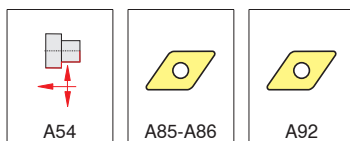
A54	A85-A86	A92

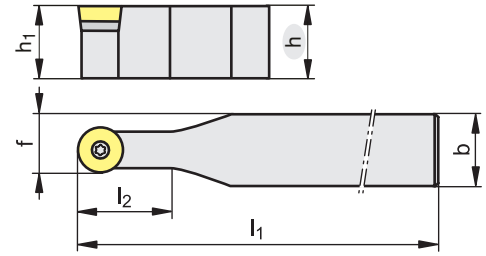
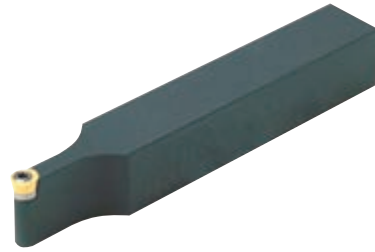
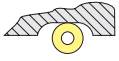


Picture shows right-hand version

h [inch]	Type, description	LNR 							
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.375	SDPCN 06-2	N	.375	.375	2.5	.370	.197	DC.. 21.5..	E01
.500	SDPCN 08-2	N	.500	.500	3.5	.492	.260	DC.. 21.5..	E01
.625	SDPCN 10-3	N	.625	.625	4.0	.630	.232	DC.. 32.5..	E02
.750	SDPCN 12-3B	N	.750	.750	4.5	.744	.382	DC.. 32.5..	E02
1.000	SDPCN 16-3D	N	1.000	1.000	6.0	.984	.520	DC.. 32.5..	E02

E01	6227154			6232672
E02	6213482	6219422	6213484	6213485





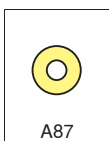
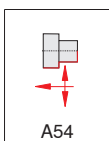
Picture shows right-hand version

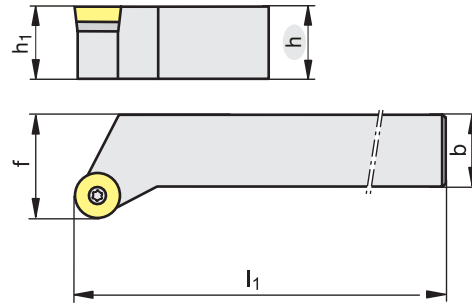
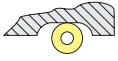
h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.500	SRDCN 08-2	N	.500	.500	3.5	.500	.407	RC.. 0803M0	E01
.625	SRDCN 10-3	N	.625	.625	4.0	.630	.510	RC.. 10T3M0	E02
.750	SRDCN 12-3B	N	.750	.750	4.5	1.000	.570	RC.. 10T3M0	E02
1.000	SRDCN 16-4D	N	1.000	1.000	6.0	1.000	.756	RC.. 1204M0	E03
1.250	SRDCN 20-4D	N	1.250	1.250	6.0	1.000	.861	RC.. 1204M0	E03



Insert RC.. 10T3.. is not compatible with tools insert size 3

E01	1336708			1336701
E02	6213482	6219421	6213484	6213485
E03	6213482	6228370	6213484	6213485





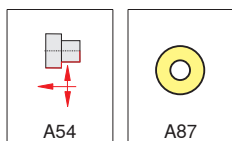
Picture shows right-hand version

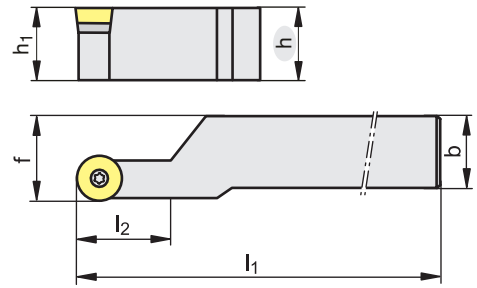
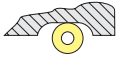
h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	f [inch]		
.750	SRGCR 12-3B	R	.750	.750	4.5	1.000	RC.. 10T3M0	E01
.750	SRGCL 12-3B	L	.750	.750	4.5	1.000	RC.. 10T3M0	E01
1.000	SRGCR 16-3D	R	1.000	1.000	6.0	1.250	RC.. 10T3M0	E01
1.000	SRGCL 16-3D	L	1.000	1.000	6.0	1.250	RC.. 10T3M0	E01
1.000	SRGCR 16-4D	R	1.000	1.000	6.0	1.250	RC.. 1204M0	E02
1.000	SRGCL 16-4D	L	1.000	1.000	6.0	1.250	RC.. 1204M0	E02
1.250	SRGCR 20-4D	R	1.250	1.250	6.0	1.500	RC.. 1204M0	E02
1.250	SRGCR 85-4D	R	1.250	1.000	6.0	1.250	RC.. 1204M0	E02
1.250	SRGCL 20-4D	L	1.250	1.250	6.0	1.500	RC.. 1204M0	E02
1.250	SRGCL 85-4D	L	1.250	1.000	6.0	1.250	RC.. 1204M0	E02



Insert RC.. 10T3.. is not compatible
with tools insert size 3

E01	6213482	6219421	6213484	6213485
E02	6213482	6228370	6213484	6213485





Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
1.000	SRSCR 16-3D	R	1.000	1.000	6.0	.750	1.250	RC.. 10T3M0	E02
1.000	SRSC L 16-3D	L	1.000	1.000	6.0	.750	1.250	RC.. 10T3M0	E02
1.250	SRSCR 20-3D	R	1.250	1.250	6.0	.750	1.500	RC.. 10T3M0	E02
1.250	SRSC L 20-3D	L	1.250	1.250	6.0	.750	1.500	RC.. 10T3M0	E02
.750	SRSCR 12-4B	R	.750	.750	4.5	.750	1.000	RC.. 1204M0	E01
.750	SRSC L 12-4B	L	.750	.750	4.5	.750	1.000	RC.. 1204M0	E01
1.000	SRSCR 16-4D	R	1.000	1.000	6.0	1.000	1.250	RC.. 1204M0	E01
1.000	SRSC L 16-4D	L	1.000	1.000	6.0	1.000	1.250	RC.. 1204M0	E01
1.250	SRSCR 20-4D	R	1.250	1.250	6.0	1.000	1.500	RC.. 1204M0	E01
1.250	SRSC L 20-4D	L	1.250	1.250	6.0	1.000	1.500	RC.. 1204M0	E01

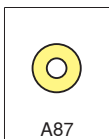
Tools

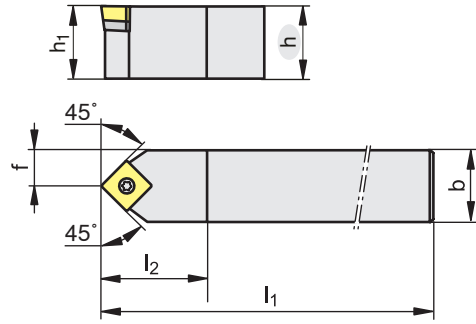
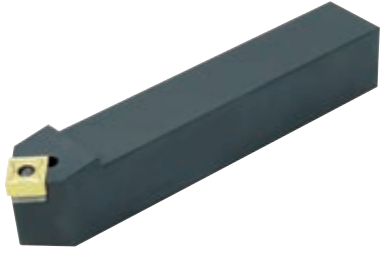
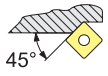


Insert RC.. 10T3.. is not compatible with tools insert size 3

Tools and inserts for turning

E01	6213482	6228370	6213484	6213485
E02	6213482	6219421	6213484	6213485

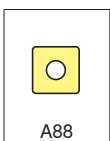
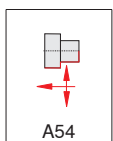


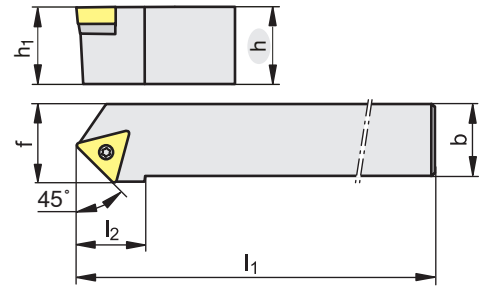
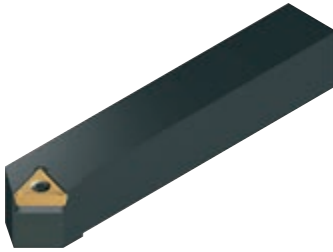


Picture shows right-hand version

h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	f [inch]		
.500	SSDCN 08-3	N	.500	.500	3.5	.263	SC.. 32.5..	E01
.625	SSDCN 10-3	N	.625	.625	4.0	.325	SC.. 32.5..	E01
.750	SSDCN 12-4B	N	.750	.750	4.5	.388	SC.. 43..	E02

E01	6219378				6219402
E02	1347422	1347420		1347426	1347425





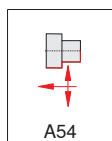
Picture shows right-hand version

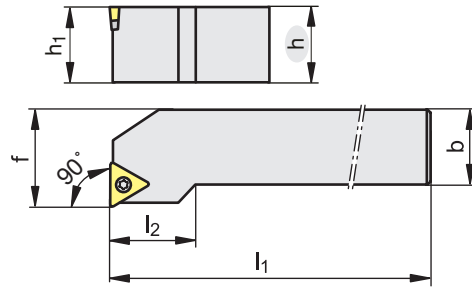
h [inch]	Type, description	L N R 								
			h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]			
.375	STDCR 06-2	R	.375	.375	2.5	.410	.433	TC.. 21.5..	E01	
.375	STDCL 06-2	L	.375	.375	2.5	.410	.433	TC.. 21.5..	E01	
.500	STDCR 08-2	R	.500	.500	3.5	.570	.512	TC.. 21.5..	E01	
.500	STDCL 08-2	L	.500	.500	3.5	.570	.512	TC.. 21.5..	E01	
.625	STDCR 10-3	R	.625	.625	4.0	1.000	.669	TC.. 32.5..	E02	
.625	STDCL 10-3	L	.625	.625	4.0	1.000	.669	TC.. 32.5..	E02	
.750	STDCR 12-3B	R	.750	.750	4.5	1.000	.866	TC.. 32.5..	E02	
.750	STDCL 12-3B	L	.750	.750	4.5	1.000	.866	TC.. 32.5..	E02	
1.000	STDCR 16-3D	R	1.000	1.000	6.0	1.000	1.063	TC.. 32.5..	E02	
1.000	STDCL 16-3D	L	1.000	1.000	6.0	1.000	1.063	TC.. 32.5..	E02	

Tools

Tools and inserts for turning

E01	6227154			6232672
E02	6213482	6225796	6213484	6213485





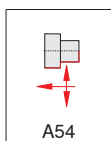
Picture shows right-hand version

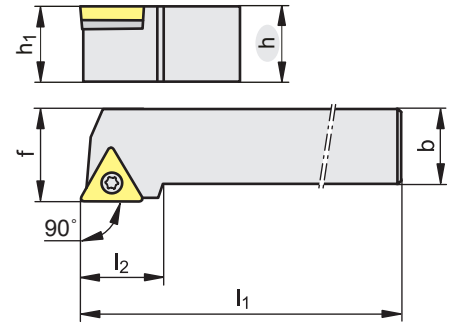
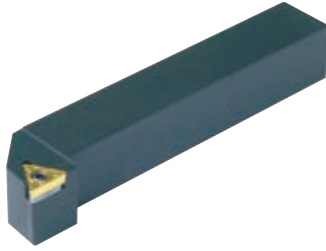
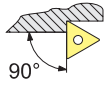
h [inch]	Type, description	LNR 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.375	STFCR 06-2	R	.375	.375	2.5	.400	.500	TC.. 21.5..	E01
.375	STFCL 06-2	L	.375	.375	2.5	.400	.500	TC.. 21.5..	E01
.500	STFCR 08-2	R	.500	.500	3.5	.689	.625	TC.. 21.5..	E01
.500	STFCL 08-2	L	.500	.500	3.5	.689	.625	TC.. 21.5..	E01
.625	STFCR 10-3	R	.625	.625	4.0	1.000	.750	TC.. 32.5..	E02
.625	STFCL 10-3	L	.625	.625	4.0	1.000	.750	TC.. 32.5..	E02
.750	STFCR 12-3B	R	.750	.750	4.5	1.000	1.000	TC.. 32.5..	E02
.750	STFCL 12-3B	L	.750	.750	4.5	1.000	1.000	TC.. 32.5..	E02
1.000	STFCR 16-3D	R	1.000	1.000	6.0	1.000	1.250	TC.. 32.5..	E02
1.000	STFCL 16-3D	L	1.000	1.000	6.0	1.000	1.250	TC.. 32.5..	E02

Tools

Tools and inserts for turning

E01	6227154			6232672
E02	6213482	6225796	6213484	6213485





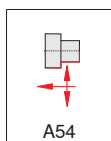
Picture shows right-hand version

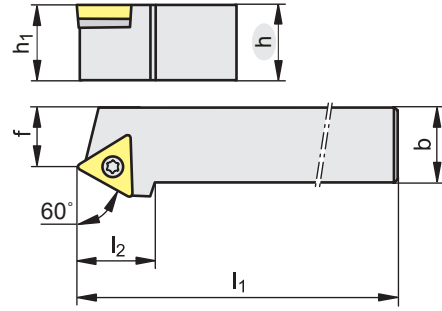
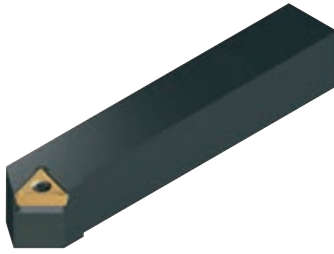
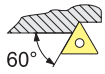
h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.375	STGCR 06-2	R	.375	.375	2.5	.500	.500	TC.. 21.5..	E01
.375	STGCL 06-2	L	.375	.375	2.5	.500	.500	TC.. 21.5..	E01
.500	STGCR 08-2	R	.500	.500	3.5	.560	.625	TC.. 21.5..	E01
.500	STGCL 08-2	L	.500	.500	3.5	.560	.625	TC.. 21.5..	E01
.625	STGCR 10-3	R	.625	.625	4.0	1.000	.750	TC.. 32.5..	E02
.625	STGCL 10-3	L	.625	.625	4.0	1.000	.750	TC.. 32.5..	E02
.750	STGCR 12-3B	R	.750	.750	4.5	1.000	1.000	TC.. 32.5..	E02
.750	STGCL 12-3B	L	.750	.750	4.5	1.000	1.000	TC.. 32.5..	E02
1.000	STGCR 16-3D	R	1.000	1.000	6.0	1.000	1.250	TC.. 32.5..	E02
1.000	STGCL 16-3D	L	1.000	1.000	6.0	1.000	1.250	TC.. 32.5..	E02

Tools

Tools and inserts for turning

E01	6227154			6232672
E02	6213482	6225796	6213484	6213485

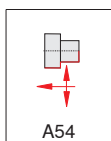


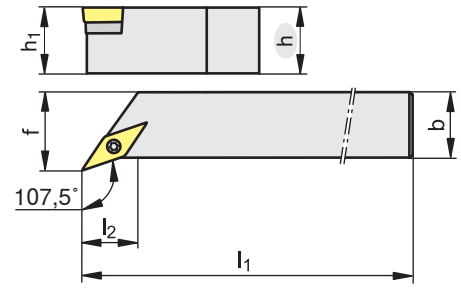
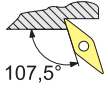


Picture shows right-hand version

h [inch]	Type, description	LNR 								
			h_1 [inch]	b [inch]	l_1 [inch]	l_2 [inch]	f [inch]			
.750	STTCR 12-3B	R	.750	.750	4.5	1.000	.718	TC.. 32.5..	E01	
.750	STTCL 12-3B	L	.750	.750	4.5	1.000	.718	TC.. 32.5..	E01	
1.000	STTCR 16-3D	R	1.000	1.000	6.0	1.000	.860	TC.. 32.5..	E01	
1.000	STTCL 16-3D	L	1.000	1.000	6.0	1.000	.860	TC.. 32.5..	E01	

E01	6213482	6225796	6213484	6213485



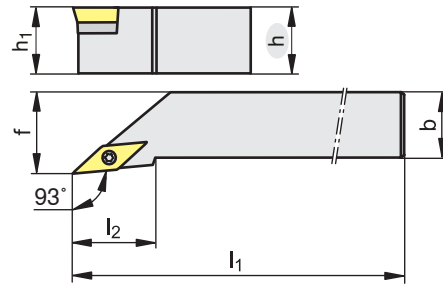
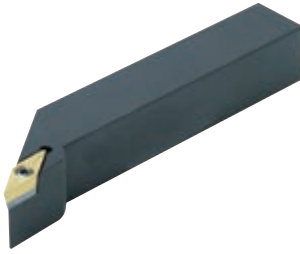
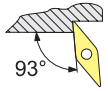


Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	SVHCR 12-3B	R	.750	.750	4.5	.740	1.000	VC.. 33..	E01
.750	SVHCL 12-3B	L	.750	.750	4.5	.740	1.000	VC.. 33..	E01
1.000	SVHCR 16-3D	R	1.000	1.000	6.0	.756	1.250	VC.. 33..	E01
1.000	SVHCL 16-3D	L	1.000	1.000	6.0	.756	1.250	VC.. 33..	E01

E01	6213482	6213486	6213484	6213485

A54	A90-A91	A92

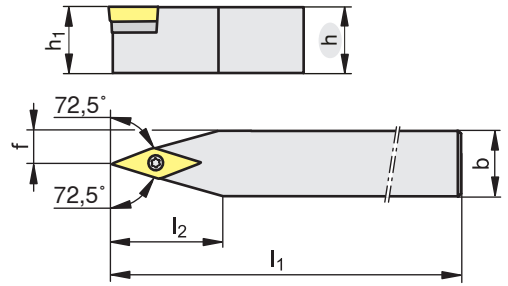
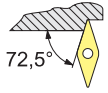


Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	SVJCR 12-3B	R	.750	.750	4.5	1.614	1.000	VC.. 33..	E01
.750	SVJCL 12-3B	L	.750	.750	4.5	1.614	1.000	VC.. 33..	E01
1.000	SVJCR 16-3D	R	1.000	1.000	6.0	1.614	1.250	VC.. 33..	E01
1.000	SVJCL 16-3D	L	1.000	1.000	6.0	1.614	1.250	VC.. 33..	E01
1.250	SVJCR 20-3D	R	1.250	1.250	6.0	1.614	1.500	VC.. 33..	E01
1.250	SVJCL 20-3D	L	1.250	1.250	6.0	1.614	1.500	VC.. 33..	E01

E01	6213482	6213486	6213484	6213485

A54	A90-A91	A92

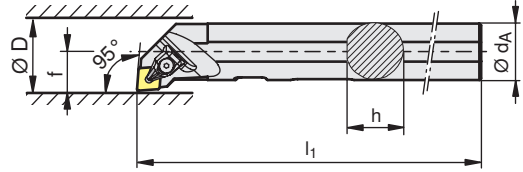
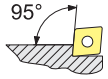


Picture shows right-hand version

h [inch]	Type, description	L N R 	h ₁ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	SVVCN 12-3B	N	.750	.750	4.5	1.212	.398	VC.. 33..	E01
1.000	SVVCN 16-3D	N	1.000	1.000	6.0	1.610	.523	VC.. 33..	E01
1.250	SVVCN 20-3D	N	1.250	1.250	6.0	2.008	.648	VC.. 33..	E01

E01	6213482	6213486	6213484	6213485

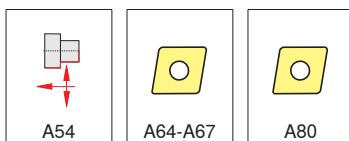
A54	A90-A91	A92

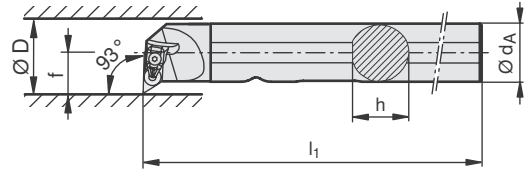
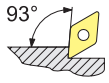


Picture shows right-hand version

d_A [inch]	Type, description	LNR 	h [inch]	l_1 [inch]	f [inch]	D_{min} [inch]		
1.000	S16T DCLNR 4	R	.900	12.0	.640	1.280	CN.. 43..	E01
1.000	S16T DCLNL 4	L	.900	12.0	.640	1.280	CN.. 43..	E01
1.250	S20U DCLNR 4	R	1.180	14.0	.765	1.530	CN.. 43..	E02
1.250	S20U DCLNL 4	L	1.180	14.0	.765	1.530	CN.. 43..	E02
1.500	S24U DCLNR 4	R	1.370	14.0	.890	1.780	CN.. 43..	E02
1.500	S24U DCLNL 4	L	1.370	14.0	.890	1.780	CN.. 43..	E02

E01	11830912	11830886	11830901	11830906	1349550	11830915
E02	11830912	1340157	11830901	11830906	1349550	11830915



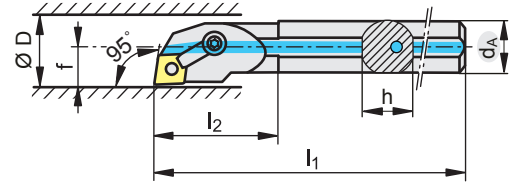
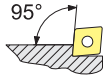


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	f [inch]	D _{min} [inch]		
							DN.. 43..	E01
1.250	S20U DDUNR 4	R	1.118	14.0	.765	1.530	DN.. 43..	E01
1.250	S20U DDUNL 4	L	1.118	14.0	.765	1.530	DN.. 43..	E01
1.500	S24U DDUNR 4	R	1.370	14.0	.890	1.780	DN.. 43..	E01
1.500	S24U DDUNL 4	L	1.370	14.0	.890	1.780	DN.. 43..	E01

E01	11830912	11830887	11830901	11830906	1349550	11830915

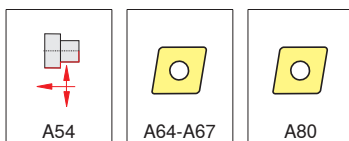
A54	A68-A70	A80

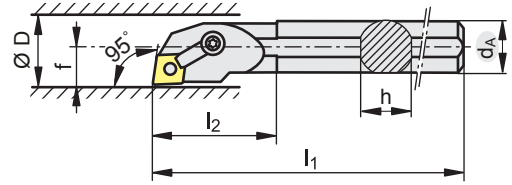
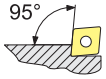


Picture shows right-hand version

d _A [inch]	Type, description	LNR 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.250	A20U MCLNR 4	R	1.118	14.0	3.000	.765	1.530	CN.. 43..	E02
1.250	A20U MCLNL 4	L	1.118	14.0	3.000	.765	1.530	CN.. 43..	E02
1.500	A24U MCLNR 4	R	1.370	14.0	3.000	.890	1.780	CN.. 43..	E02
1.500	A24U MCLNL 4	L	1.370	14.0	3.000	.890	1.780	CN.. 43..	E02
1.750	A28U MCLNR 4	R	1.630	14.0	4.000	1.015	2.030	CN.. 43..	E02
1.750	A28U MCLNL 4	L	1.630	14.0	4.000	1.015	2.030	CN.. 43..	E02
2.000	A32V MCLNR 5	R	1.870	16.0	4.000	1.281	2.562	CN.. 54..	E03
2.000	A32V MCLNL 5	L	1.870	16.0	4.000	1.281	2.562	CN.. 54..	E03
2.000	A32V MCLNR 6	R	1.870	16.0	4.000	1.281	2.562	CN.. 64..	E04
2.000	A32V MCLNL 6	L	1.870	16.0	4.000	1.281	2.562	CN.. 64..	E04
1.000	A16T MCLNR 4	R	.900	12.0	2.500	.640	1.280	CN.. 32..	E01
1.000	A16T MCLNL 4	L	.900	12.0	2.500	.640	1.280	CN.. 32..	E01

E01	1340837	1342058			1339450	11584909 / 11584912
E02	1340838	1342059	1349544	1340157	1339450	11584912 / 11584909
E03	1340840	1342060	1349545	1347266	1339448	11830915 / 11584909
E04	1340842	1342060	1349546	1340159	1339448	11584914 / 11830915





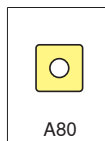
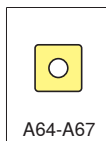
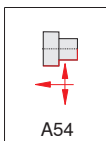
Picture shows right-hand version

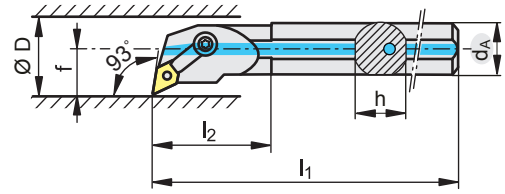
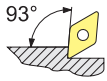
Tools

Tools and inserts for turning

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T MCLNR 4	R	.900	12.0	2.500	.640	1.280	CN.. 43..	E01
1.000	S16T MCLNL 4	L	.900	12.0	2.500	.640	1.280	CN.. 43..	E01
1.250	S20U MCLNR 4	R	1.118	14.0	3.000	.765	1.530	CN.. 43..	E02
1.250	S20U MCLNL 4	L	1.118	14.0	3.000	.765	1.530	CN.. 43..	E02
1.500	S24U MCLNR 4	R	1.370	14.0	3.000	.890	1.780	CN.. 43..	E02
1.500	S24U MCLNL 4	L	1.370	14.0	3.000	.890	1.780	CN.. 43..	E02
1.750	S28U MCLNR 4	R	1.630	14.0	4.000	1.015	2.030	CN.. 43..	E02
1.750	S28U MCLNL 4	L	1.630	14.0	4.000	1.015	2.030	CN.. 43..	E02
2.000	S32V MCLNR 4	R	1.870	16.0	4.000	1.281	2.562	CN.. 43..	E02
2.000	S32V MCLNL 4	L	1.870	16.0	4.000	1.281	2.562	CN.. 43..	E02
2.500	S40V MCLNR 4	R	2.380	16.0	4.000	1.531	3.062	CN.. 43..	E02
2.500	S40V MCLNL 4	L	2.380	16.0	4.000	1.531	3.062	CN.. 43..	E02
2.000	S32V MCLNR 5	R	1.870	16.0	4.000	1.281	2.562	CN.. 54..	E03
2.000	S32V MCLNL 5	L	1.870	16.0	4.000	1.281	2.562	CN.. 54..	E03
2.500	S40V MCLNR 5	R	2.380	16.0	4.000	1.531	3.062	CN.. 54..	E03
2.500	S40V MCLNL 5	L	2.380	16.0	4.000	1.531	3.062	CN.. 54..	E03
2.000	S32V MCLNR 6	R	1.870	16.0	4.000	1.281	2.562	CN.. 64..	E04
2.000	S32V MCLNL 6	L	1.870	16.0	4.000	1.281	2.562	CN.. 64..	E04
2.500	S40V MCLNR 6	R	2.380	16.0	4.000	1.531	3.062	CN.. 64..	E04
2.500	S40V MCLNL 6	L	2.380	16.0	4.000	1.531	3.062	CN.. 64..	E04

E01	1340837	1342058			1339450	11584909 / 11584912
E02	1340838	1342058	1341230	1340157	1339450	11584912 / 11584909
E03	1340840	1342060	1347423	1347266	1339448	11830915 / 11584910
E04	1340842	1342060	1341233	1340159	1339448	11584914 / 11830915

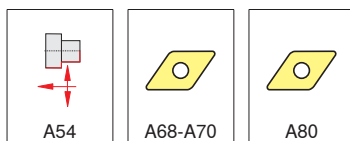


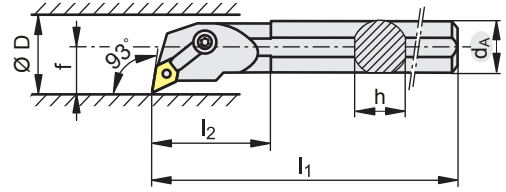
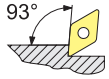


Picture shows right-hand version

d _A [inch]	Type, description	LNR 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	A16T MDUNR 4	R	.900	12.0	2.500	.875	1.750	DN.. 43..	E01
1.000	A16T MDUNL 4	L	.900	12.0	2.500	.875	1.750	DN.. 43..	E01
1.250	A20U MDUNR 4	R	1.118	14.0	3.000	1.000	2.000	DN.. 43..	E02
1.250	A20U MDUNL 4	L	1.118	14.0	3.000	1.000	2.000	DN.. 43..	E02
1.500	A24U MDUNR 4	R	1.370	14.0	3.000	1.125	2.250	DN.. 43..	E02
1.500	A24U MDUNL 4	L	1.370	14.0	3.000	1.125	2.250	DN.. 43..	E02
2.000	A32V MDUNR 4	R	1.870	16.0	4.000	1.375	3.000	DN.. 43..	E02
2.000	A32V MDUNL 4	L	1.870	16.0	4.000	1.375	3.000	DN.. 43..	E02

E01	1340837	1342058			1339450	11584909 / 11584912
E02	1340838	1342059	1341230	1347418	1339450	11584912 / 11584909





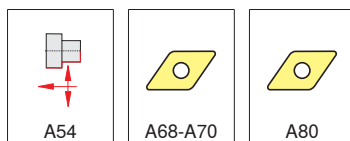
Picture shows right-hand version

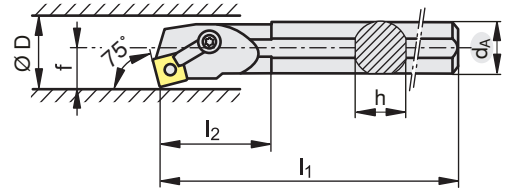
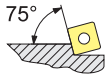
Tools

Tools and inserts for turning

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T MDUNR 4	R	.900	12.0	2.500	.875	1.750	DN.. 43..	E01
1.000	S16T MDUNL 4	L	.900	12.0	2.500	.875	1.750	DN.. 43..	E01
1.250	S20U MDUNR 4	R	1.118	14.0	3.000	1.000	2.000	DN.. 43..	E02
1.250	S20U MDUNL 4	L	1.118	14.0	3.000	1.000	2.000	DN.. 43..	E02
1.500	S24U MDUNR 4	R	1.370	14.0	3.000	1.125	2.250	DN.. 43..	E02
1.500	S24U MDUNL 4	L	1.370	14.0	3.000	1.125	2.250	DN.. 43..	E02
2.000	S32V MDUNR 4	R	1.870	16.0	4.000	1.375	3.000	DN.. 43..	E02
2.000	S32V MDUNL 4	L	1.870	16.0	4.000	1.375	3.000	DN.. 43..	E02
2.000	S32V MDUNR 5	R	1.870	16.0	4.000	1.500	3.000	DN.. 54..	E03
2.000	S32V MDUNL 5	L	1.870	16.0	4.000	1.500	3.000	DN.. 54..	E03
2.500	S40V MDUNR 5	R	2.380	16.0	4.000	1.750	3.500	DN.. 54..	E03
2.500	S40V MDUNL 5	L	2.380	16.0	4.000	1.750	3.500	DN.. 54..	E03

E01	1340837	1342058			1339450	11584909 / 11584912
E02	1340838	1342059	1341230	1347418	1339450	11584909 / 11584912
E03	1340840	1342060	1347423	1340163	1339448	11584909 / 11584910

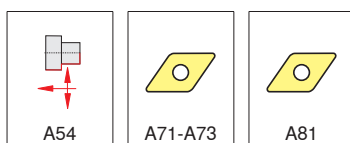


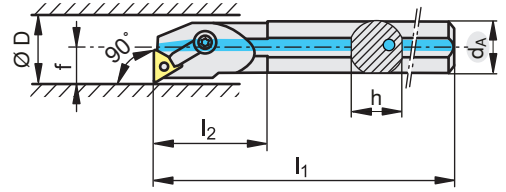
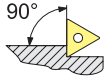


Picture shows right-hand version

d_A [inch]	Type, description	L N R 	h [inch]	l_1 [inch]	l_2 [inch]	f [inch]	D_{min} [inch]		
1.250	S20U MSKNR 4	R	1.180	14.0	3.000	.765	1.530	SN.. 43..	E01
1.250	S20U MSKNL 4	L	1.180	14.0	3.000	.765	1.530	SN.. 43..	E01
1.500	S24U MSKNR 4	R	1.370	14.0	3.000	.890	1.780	SN.. 43..	E01
1.500	S24U MSKNL 4	L	1.370	14.0	3.000	.890	1.780	SN.. 43..	E01
2.000	S32V MSKNR 5	R	1.870	16.0	4.000	1.281	2.562	SN.. 54..	E02
2.000	S32V MSKNL 5	L	1.870	16.0	4.000	1.281	2.562	SN.. 54..	E02
2.000	S32V MSKNR 6	R	1.870	16.0	4.000	1.281	2.562	SN.. 64..	E03
2.000	S32V MSKNL 6	L	1.870	16.0	4.000	1.281	2.562	SN.. 64..	E03
2.500	S40V MSKNR 6	R	2.380	16.0	4.000	1.531	3.062	SN.. 64..	E03
2.500	S40V MSKNL 6	L	2.380	16.0	4.000	1.531	3.062	SN.. 64..	E03

E01	1340838	1342059	1341230	1347419	1339450	11584912 / 11584909
E02	1340840	1342060	1347423	1340180	1339448	11584910 / 11584909
E03	1340842	1342060	1341233	1340181	1339448	11584910 / 11584914





Picture shows right-hand version

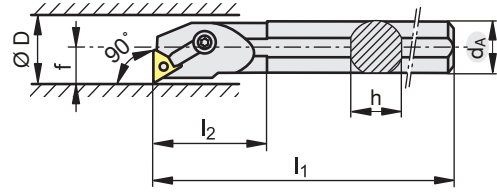
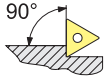
d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	A16T MTFNR 3	R	.900	12.0	2.500	.640	1.280	TN.. 33..	E01
1.000	A16T MTFNL 3	L	.900	12.0	2.500	.640	1.280	TN.. 33..	E01
1.250	A20U MTFNR 3	R	1.180	14.0	3.000	.765	1.530	TN.. 33..	E02
1.250	A20U MTFNL 3	L	1.180	14.0	3.000	.765	1.530	TN.. 33..	E02
1.500	A24U MTFNR 4	R	1.370	14.0	3.000	.890	1.780	TN.. 43..	E03
1.500	A24U MTFNL 4	L	1.370	14.0	3.000	.890	1.780	TN.. 43..	E03
1.750	A28U MTFNR 4	R	1.630	14.0	4.000	1.015	2.030	TN.. 43..	E03
1.750	A28U MTFNL 4	L	1.630	14.0	4.000	1.015	2.030	TN.. 43..	E03
2.000	A32V MTFNR 4	R	1.870	16.0	4.000	1.281	2.562	TN.. 43..	E03
2.000	A32V MTFNL 4	L	1.870	16.0	4.000	1.281	2.562	TN.. 43..	E03

Tools

Tools and inserts for turning

E01	1340833	1342058			1339450	11584907 / 11584909
E02	1340835	1342059		1340184	1339450	11584909 / 11584907
E03	1340838	1342059	1349544	1340189	1339450	11584909 / 11584912

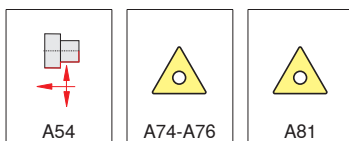
A54	A74-A76	A81

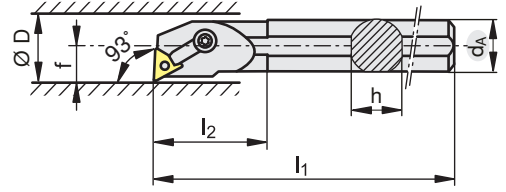
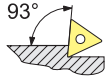


Picture shows right-hand version

d _A [inch]	Type, description	LNR 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T MTFNR 3	R	.900	12.0	2.500	.640	1.280	TN.. 33..	E01
1.000	S16T MTFNL 3	L	.900	12.0	2.500	.640	1.280	TN.. 33..	E01
1.250	S20U MTFNR 3	R	1.180	14.0	3.000	.765	1.530	TN.. 33..	E02
1.250	S20U MTFNL 3	L	1.180	14.0	3.000	.765	1.530	TN.. 33..	E02
1.500	S24U MTFNR 3	R	1.370	14.0	3.000	.890	1.780	TN.. 33..	E02
1.500	S24U MTFNL 3	L	1.370	14.0	3.000	.890	1.780	TN.. 33..	E02
1.250	S20U MTFNR 4	R	1.180	14.0	3.000	.765	1.530	TN.. 43..	E03
1.250	S20U MTFNL 4	L	1.180	14.0	3.000	.765	1.530	TN.. 43..	E03
1.500	S24U MTFNR 4	R	1.370	14.0	3.000	.890	1.780	TN.. 43..	E03
1.500	S24U MTFNL 4	L	1.370	14.0	3.000	.890	1.780	TN.. 43..	E03
1.750	S28U MTFNR 4	R	1.630	14.0	4.000	1.015	2.030	TN.. 43..	E03
1.750	S28U MTFNL 4	L	1.630	14.0	4.000	1.015	2.030	TN.. 43..	E03
2.000	S32V MTFNR 4	R	1.870	16.0	4.000	1.281	2.562	TN.. 43..	E03
2.000	S32V MTFNL 4	L	1.870	16.0	4.000	1.281	2.562	TN.. 43..	E03
2.500	S40V MTFNR 4	R	2.380	16.0	4.000	1.531	3.062	TN.. 43..	E03
2.500	S40V MTFNL 4	L	2.380	16.0	4.000	1.531	3.062	TN.. 43..	E03
2.000	S32V MTFNR 5	R	1.870	16.0	4.000	1.281	2.562	TN.. 54..	E04
2.000	S32V MTFNL 5	L	1.870	16.0	4.000	1.281	2.562	TN.. 54..	E04

E01	1340833	1342058			1339450	11584907 / 11584909
E02	1340835	1342059		1340184	1339450	11584909 / 11584907
E03	1340838	1342059	1341230	1340189	1339450	11584909 / 11584912
E04	1340840	1342060	1347423	1340192	1339448	11584909 / 11584910



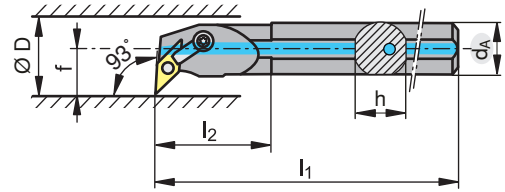
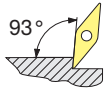


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T MTUNR 3	R	.900	12.0	2.500	.640	1.280	TN.. 33..	E01
1.000	S16T MTUNL 3	L	.900	12.0	2.500	.640	1.280	TN.. 33..	E01
1.250	S20U MTUNR 3E	R	1.180	14.0	3.000	.765	1.530	TN.. 33..	E02
1.250	S20U MTUNL 3E	L	1.180	14.0	3.000	.765	1.530	TN.. 33..	E02
1.500	S24U MTUNR 4	R	1.370	14.0	3.000	.890	1.780	TN.. 43..	E03
1.500	S24U MTUNL 4	L	1.370	14.0	3.000	.890	1.780	TN.. 43..	E03

E01	1340833	1342058			1339450	11584907 / 11584909
E02	1340835	1342059		1340184	1339450	11584909 / 11584907
E03	1340838	1342059	1341230	1340189	1339450	11584909 / 11584912

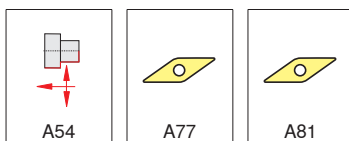
A54	A74-A76	A81

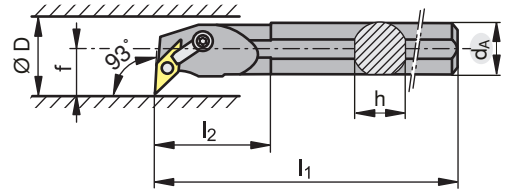
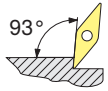


Picture shows right-hand version

d_A [inch]	Type, description	LNR 	h [inch]	l_1 [inch]	l_2 [inch]	f [inch]	D_{min} [inch]		
1.000	A16T MVUNR 3	R	.900	12.0	2.500	1.000	2.000	VN.. 33..	E01
1.000	A16T MVUNL 3	L	.900	12.0	2.500	1.000	2.000	VN.. 33..	E01
1.250	A20U MVUNR 3	R	1.180	14.0	3.000	1.125	2.250	VN.. 33..	E02
1.250	A20U MVUNL 3	L	1.180	14.0	3.000	1.125	2.250	VN.. 33..	E02
1.500	A24U MVUNR 3	R	1.370	14.0	3.000	1.250	2.500	VN.. 33..	E02
1.500	A24U MVUNL 3	L	1.370	14.0	3.000	1.250	2.500	VN.. 33..	E02

E01	1340835	1342058	1341228	1340198	11558453	11584909 / 11584907
E02	1340835	1342059	1341228	1340198	11558453	11584907 / 11584909





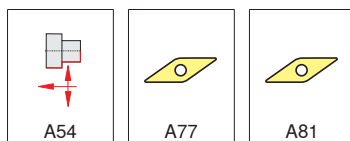
Picture shows right-hand version

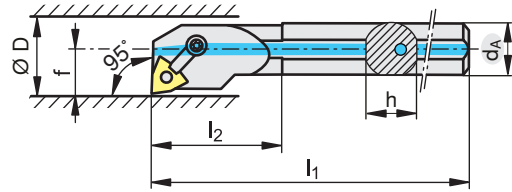
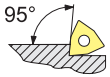
d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T MVUNR 3	R	.900	12.0	2.500	1.000	2.000	VN.. 33..	E01
1.000	S16T MVUNL 3	L	.900	12.0	2.500	1.000	2.000	VN.. 33..	E01
1.250	S20U MVUNR 3	R	1.180	14.0	3.000	1.125	2.250	VN.. 33..	E02
1.250	S20U MVUNL 3	L	1.180	14.0	3.000	1.125	2.250	VN.. 33..	E02
1.500	S24U MVUNR 3	R	1.370	14.0	3.000	1.250	2.500	VN.. 33..	E02
1.500	S24U MVUNL 3	L	1.370	14.0	3.000	1.250	2.500	VN.. 33..	E02
2.000	S32V MVUNR 4	R	1.870	16.0	4.000	1.500	3.250	VN.. 43..	E03
2.000	S32V MVUNL 4	L	1.870	16.0	4.000	1.500	3.250	VN.. 43..	E03
2.500	S40V MVUNR 4	R	2.380	16.0	4.000	1.750	3.750	VN.. 43..	E03
2.500	S40V MVUNL 4	L	2.380	16.0	4.000	1.750	3.750	VN.. 43..	E03

Tools

Tools and inserts for turning

E01	1340835	1342058	1341228	1340198	11558453	11584907 / 11584909
E02	1340835	1342059	1341228	1340198	11558453	11584907 / 11584909
E03	1340838	1342060	1341230	1340199	1339448	11584910 / 11584912

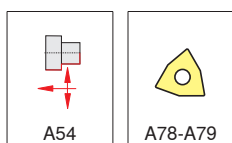


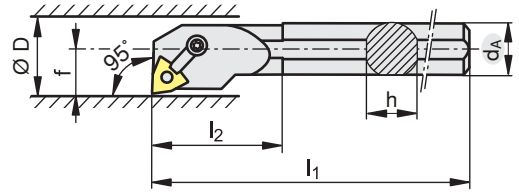
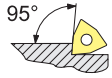


Picture shows right-hand version

d_A [inch]	Type, description	LNR 	h [inch]	l_1 [inch]	l_2 [inch]	f [inch]	D_{min} [inch]		
1.000	A16T MWLNR 4	R	.900	12.0	2.500	.640	1.280	WN.. 43..	E01
1.000	A16T MWLNL 4	L	.900	12.0	2.500	.640	1.280	WN.. 43..	E01
1.250	A20U MWLNR 4	R	1.180	14.0	3.000	.765	1.530	WN.. 43..	E02
1.250	A20U MWLNL 4	L	1.180	14.0	3.000	.765	1.530	WN.. 43..	E02
1.500	A24U MWLNR 4	R	1.370	14.0	3.000	.890	1.780	WN.. 43..	E02
1.500	A24U MWLNL 4	L	1.370	14.0	3.000	.890	1.780	WN.. 43..	E02

E01	1340837	1342058		1340202	1339450	11584909 / 11584912
E02	1340838	1342059	1341230		1339450	11584912 / 11584909

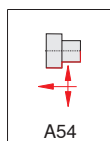


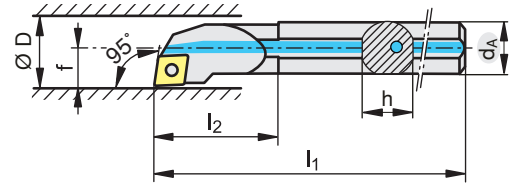
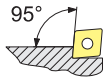


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T MWLNR 4	R	.900	12.0	2.500	.640	1.280	WN.. 43..	E01
1.000	S16T MWLNL 4	L	.900	12.0	2.500	.640	1.280	WN.. 43..	E01
1.250	S20U MWLNR 4	R	1.180	14.0	3.000	.765	1.530	WN.. 43..	E02
1.250	S20U MWLNL 4	L	1.180	14.0	3.000	.765	1.530	WN.. 43..	E02
1.500	S24U MWLNR 4	R	1.370	14.0	3.000	.890	1.780	WN.. 43..	E02
1.500	S24U MWLNL 4	L	1.370	14.0	3.000	.890	1.780	WN.. 43..	E02

E01	1340837	1342058			1339450	11584909 / 11584912
E02	1340838	1342059	1341230	1340202	1339450	11584912 / 11584909

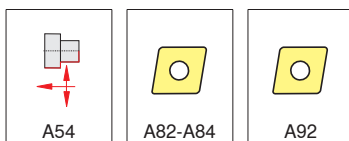


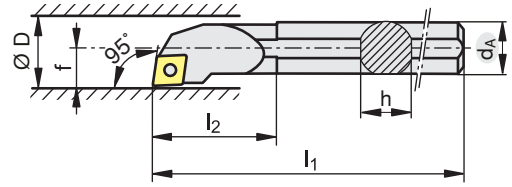
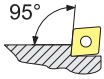


Picture shows right-hand version

d_A [inch]	Type, description	LNR 	h [inch]	l_1 [inch]	l_2 [inch]	f [inch]	D_{min} [inch]		
								CC.. 21.5..	E01
.375	A06M SCLCR 2	R	.340	6.0	.830	.250	.500	CC.. 21.5..	E01
.375	A06M SCLCL 2	L	.340	6.0	.830	.250	.500	CC.. 21.5..	E01
.500	A08M SCLCR 2	R	.460	6.0	.910	.312	.625	CC.. 21.5..	E01
.500	A08M SCLCL 2	L	.460	6.0	.910	.312	.625	CC.. 21.5..	E01
.625	A10R SCLCR 2	R	.580	8.0	1.060	.406	.812	CC.. 21.5..	E01
.625	A10R SCLCL 2	L	.580	8.0	1.060	.406	.812	CC.. 21.5..	E01
.625	A10R SCLCR 3	R	.580	8.0	1.060	.406	.812	CC.. 32.5..	E02
.625	A10R SCLCL 3	L	.580	8.0	1.060	.406	.812	CC.. 32.5..	E02
.750	A12S SCLCR 3M	R	.710	10.0	1.580	.500	1.000	CC.. 32.5..	E02
.750	A12S SCLCL 3M	L	.710	10.0	1.580	.500	1.000	CC.. 32.5..	E02

E01	1349548	1349551
E02	6219404	1349552

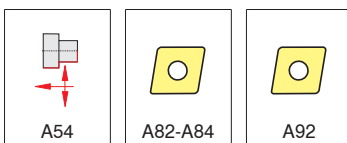


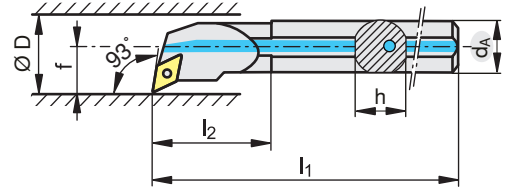
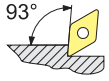


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
.375	S06M SCLCR 2	R	.340	6.0	.830	.250	.500	CC.. 21.5..	E01
.375	S06M SCLCL 2	L	.340	6.0	.830	.250	.500	CC.. 21.5..	E01
.500	S08M SCLCR 2	R	.460	6.0	.910	.312	.625	CC.. 21.5..	E01
.500	S08M SCLCL 2	L	.460	6.0	.910	.312	.625	CC.. 21.5..	E01
.625	S10R SCLCR 2	R	.580	8.0	1.060	.406	.812	CC.. 21.5..	E01
.625	S10R SCLCL 2	L	.580	8.0	1.060	.406	.812	CC.. 21.5..	E01
.625	S10R SCLCR 3	R	.580	8.0	1.060	.406	.812	CC.. 32.5..	E02
.625	S10R SCLCL 3	L	.580	8.0	1.060	.406	.812	CC.. 32.5..	E02
.750	S12S SCLCR 3M	R	.710	10.0	1.580	.500	1.000	CC.. 32.5..	E02
.750	S12S SCLCL 3M	L	.710	10.0	1.580	.500	1.000	CC.. 32.5..	E02
1.000	S16T SCLCR 3M	R	.900	12.0	1.810	.640	1.280	CC.. 32.5..	E02
1.000	S16T SCLCL 3M	L	.900	12.0	1.810	.640	1.280	CC.. 32.5..	E02
1.000	S16T SCLCR 4	R	.900	12.0	3.000	.640	1.280	CC.. 43..	E03
1.000	S16T SCLCL 4	L	.900	12.0	3.000	.640	1.280	CC.. 43..	E03
1.250	S20U SCLCR 4	R	1.180	14.0	3.000	.765	1.530	CC.. 43..	E04
1.250	S20U SCLCL 4	L	1.180	14.0	3.000	.765	1.530	CC.. 43..	E04
1.500	S24V SCLCR 4	R	1.370	15.7	3.000	.890	1.780	CC.. 43..	E04
1.500	S24V SCLCL 4	L	1.370	15.7	3.000	.890	1.780	CC.. 43..	E04

E01	1349548			1349551
E02	6219404			6219402
E03	6237249			6237250
E04	1347422	1347421	1347426	1347425

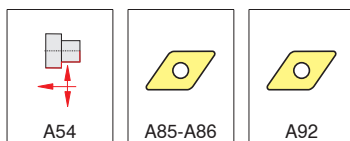


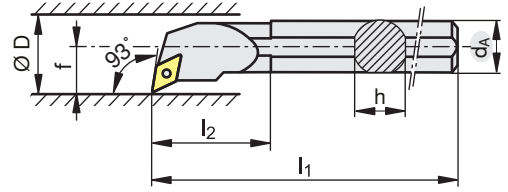
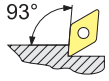


Picture shows right-hand version

d_A [inch]	Type, description	L N R 	h [inch]	l_1 [inch]	l_2 [inch]	f [inch]	D_{min} [inch]		
.375	A06M SDUCR 2	R	.340	6.0	.830	.375	.750	DC.. 21.5..	E01
.375	A06M SDUCL 2	L	.340	6.0	.830	.375	.750	DC.. 21.5..	E01
.500	A08M SDUCR 2	R	.460	6.0	.910	.438	.875	DC.. 21.5..	E02
.500	A08M SDUCL 2	L	.460	6.0	.910	.438	.875	DC.. 21.5..	E02
.625	A10R SDUCR 2	R	.580	8.0	1.060	.500	1.000	DC.. 21.5..	E02
.625	A10R SDUCL 2	L	.580	8.0	1.060	.500	1.000	DC.. 21.5..	E02
.750	A12S SDUCR 3M	R	.710	10.0	1.580	.625	1.250	DC.. 32.5..	E03
.750	A12S SDUCL 3M	L	.710	10.0	1.580	.625	1.250	DC.. 32.5..	E03

E01	1349548	1349551
E02	6227154	1349551
E03	6219378	1349552





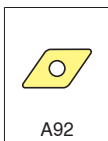
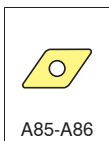
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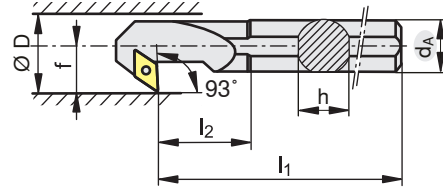
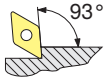
d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
.375	S06M SDUCR 2	R	.340	6.0	.830	.375	.750	DC.. 21.5..	E01
.375	S06M SDUCL 2	L	.340	6.0	.830	.375	.750	DC.. 21.5..	E01
.500	S08M SDUCR 2	R	.460	6.0	.910	.438	.875	DC.. 21.5..	E02
.500	S08M SDUCL 2	L	.460	6.0	.910	.438	.875	DC.. 21.5..	E02
.625	S10R SDUCR 2	R	.580	8.0	1.060	.500	1.000	DC.. 21.5..	E02
.625	S10R SDUCL 2	L	.580	8.0	1.060	.500	1.000	DC.. 21.5..	E02
.750	S12S SDUCR 3M	R	.710	10.0	1.580	.625	1.250	DC.. 32.5..	E03
.750	S12S SDUCL 3M	L	.710	10.0	1.580	.625	1.250	DC.. 32.5..	E03
1.000	S16T SDUCR 3M	R	.910	12.0	1.810	.750	1.500	DC.. 32.5..	E03
1.000	S16T SDUCL 3M	L	.910	12.0	1.810	.750	1.500	DC.. 32.5..	E03
1.250	S20U SDUCR 3M	R	1.180	14.0	1.890	.875	1.750	DC.. 32.5..	E04
1.250	S20U SDUCL 3M	L	1.180	14.0	1.890	.875	1.750	DC.. 32.5..	E04

Tools

Tools and inserts for turning

E01	6213483			6232672
E02	6227154			6232672
E03	6219378			6219402
E04	6213482	6219422	6213484	6213485

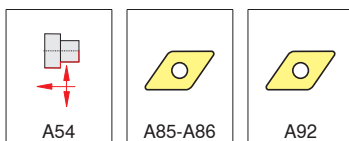


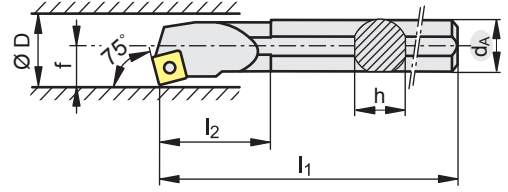
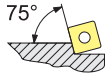


Picture shows right-hand version

d _A [inch]	Type, description	LNR 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
.750	S12S SDUCR 2EX	R	.710	10.0	.760	.625	1.250	DC.. 21.5..	E01
.750	S12S SDUCL 2EX	L	.710	10.0	.760	.625	1.250	DC.. 21.5..	E01
1.000	S16T SDUCR 2DX	R	.900	12.0	1.000	.750	1.500	DC.. 21.5..	E01
1.000	S16T SDUCL 2DX	L	.900	12.0	1.000	.750	1.500	DC.. 21.5..	E01
1.250	S20U SDUCR 3X	R	1.180	12.0	1.270	.765	1.750	DC.. 32.5..	E02
1.250	S20U SDUCL 3X	L	1.180	12.0	1.270	.765	1.750	DC.. 32.5..	E02

E01	6227154			6232672
E02	6213482	6219422	6213484	6213485

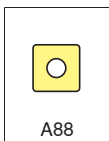


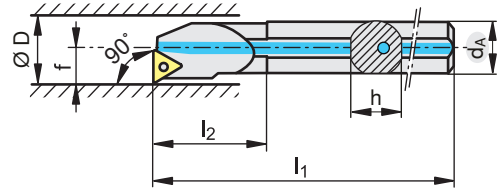
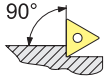


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
.625	S10R SSKCR 3	R	.580	8.0	1.060	.406	.812	SC.. 32.5..	E01
.625	S10R SSKCL 3	L	.580	8.0	1.060	.406	.812	SC.. 32.5..	E01
.750	S12S SSKCR 3	R	.710	10.0	1.580	.500	1.000	SC.. 32.5..	E02
.750	S12S SSKCL 3	L	.710	10.0	1.580	.500	1.000	SC.. 32.5..	E02
1.000	S16T SSKCR 3	R	.900	12.0	1.810	.640	1.280	SC.. 32.5..	E02
1.000	S16T SSKCL 3	L	.900	12.0	1.810	.640	1.280	SC.. 32.5..	E02

E01	6219404	6219402
E02	6219378	6219402

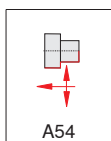


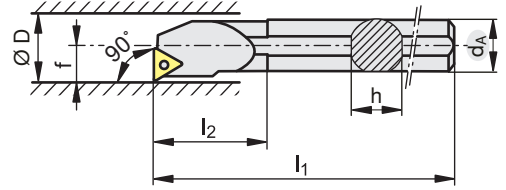
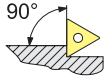


Picture shows right-hand version

d _A [inch]	Type, description	LNR 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
.375	A06M STFCR 2	R	.340	6.0	.850	.250	.500	TC.. 21.5..	E01
.375	A06M STFCL 2	L	.340	6.0	.850	.250	.500	TC.. 21.5..	E01
.500	A08M STFCR 2	R	.460	6.0	.800	.312	.625	TC.. 21.5..	E01
.500	A08M STFCL 2	L	.460	6.0	.800	.312	.625	TC.. 21.5..	E01
.625	A10R STFCR 2	R	.580	8.0	.960	.406	.812	TC.. 21.5..	E02
.625	A10R STFCL 2	L	.580	8.0	.960	.406	.812	TC.. 21.5..	E02
.750	A12S STFCR 2	R	.710	10.0	1.420	.500	1.000	TC.. 21.5..	E02
.750	A12S STFCL 2	L	.710	10.0	1.420	.500	1.000	TC.. 21.5..	E02

E01	1349548	1349551
E02	6227154	1349551

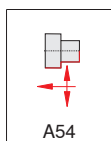


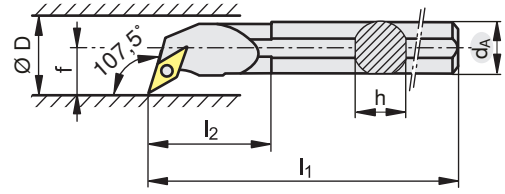
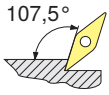


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
.375	S06M STFCR 2	R	.340	6.0	.850	.250	.500	TC.. 21.5..	E01
.375	S06M STFCL 2	L	.340	6.0	.850	.250	.500	TC.. 21.5..	E01
.500	S08M STFCR 2	R	.460	6.0	.800	.312	.625	TC.. 21.5..	E01
.500	S08M STFCL 2	L	.460	6.0	.800	.312	.625	TC.. 21.5..	E01
.625	S10R STFCR 2	R	.580	8.0	.960	.406	.812	TC.. 21.5..	E02
.625	S10R STFCL 2	L	.580	8.0	.960	.406	.812	TC.. 21.5..	E02
.750	S12S STFCR 2	R	.710	10.0	1.420	.500	1.000	TC.. 21.5..	E02
.750	S12S STFCL 2	L	.710	10.0	1.420	.500	1.000	TC.. 21.5..	E02
1.000	S16T STFCR 3	R	.900	12.0	1.930	.640	1.280	TC.. 32.5..	E03
1.000	S16T STFCL 3	L	.900	12.0	1.930	.640	1.280	TC.. 32.5..	E03
1.250	S20U STFCR 3	R	1.180	14.0	1.970	.765	1.530	TC.. 32.5..	E04
1.250	S20U STFCL 3	L	1.180	14.0	1.970	.765	1.530	TC.. 32.5..	E04
1.500	S24V STFCR 3	R	1.370	15.7	2.360	.890	1.780	TC.. 32.5..	E04
1.500	S24V STFCL 3	L	1.370	15.7	2.360	.890	1.780	TC.. 32.5..	E04

E01	6213483			6232672
E02	6227154			6232672
E03	6219378			1349552
E04	6213482	6225796	6213484	6213485

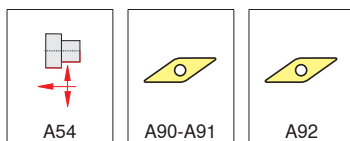


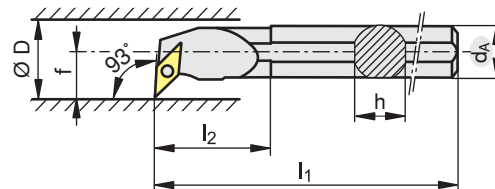
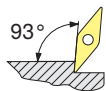


Picture shows right-hand version

d _A [inch]	Type, description	LNR 							
			h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.000	S16T SVQCR 3	R	.900	12.0	.910	.750	1.375	VC.. 33..	E01
1.000	S16T SVQCL 3	L	.900	12.0	.910	.750	1.375	VC.. 33..	E01
1.250	S20U SVQCR 3	R	1.180	14.0	1.060	.875	1.625	VC.. 33..	E02
1.250	S20U SVQCL 3	L	1.180	14.0	1.060	.875	1.625	VC.. 33..	E02
1.500	S24V SVQCR 3	R	1.370	15.7	1.370	1.063	2.000	VC.. 33..	E02
1.500	S24V SVQCL 3	L	1.370	15.7	1.370	1.063	2.000	VC.. 33..	E02

E01	6219378			6219402
E02	6213482	6213486	6213484	6213485

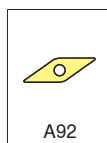
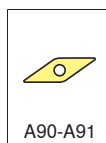
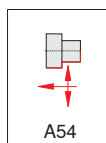


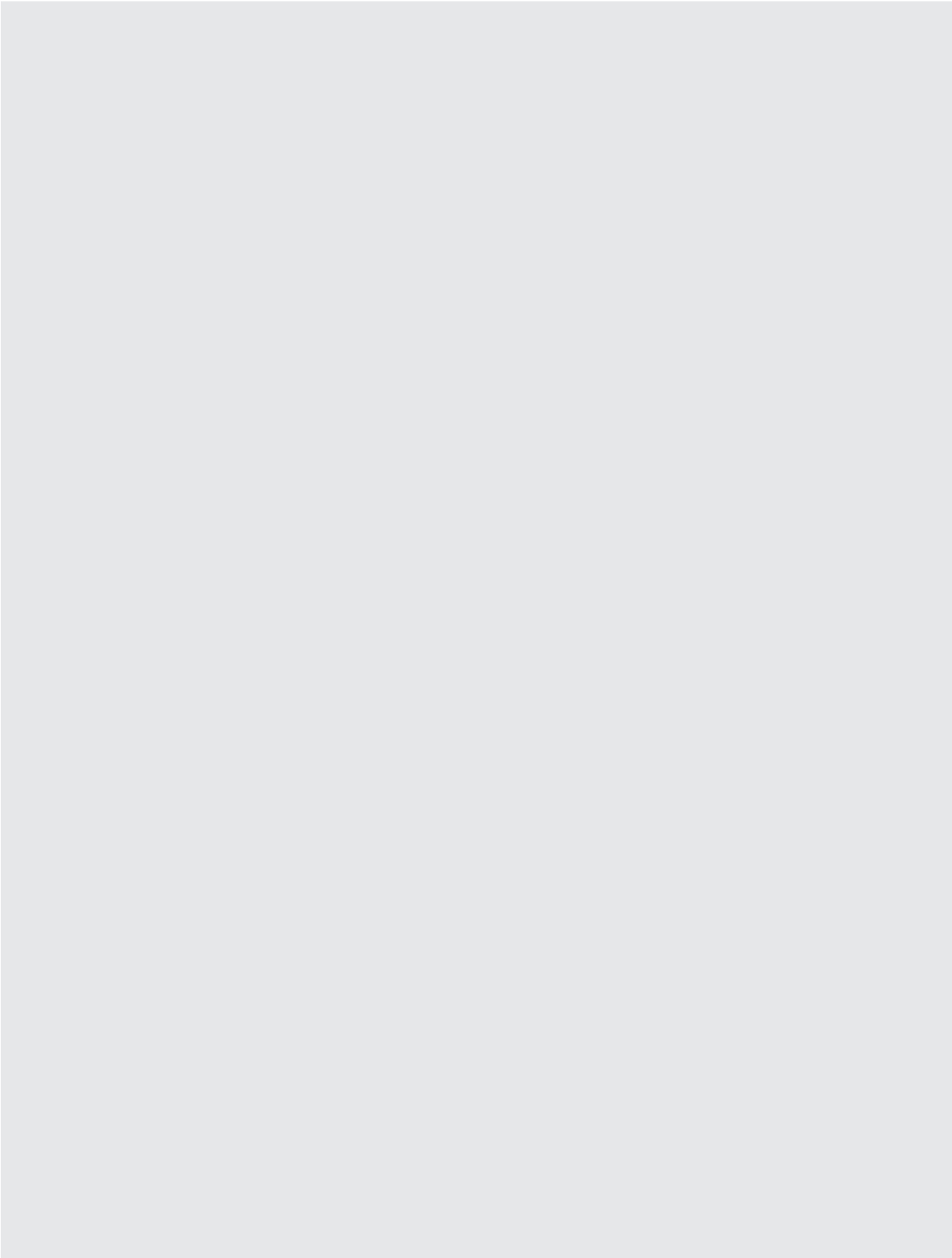


Picture shows right-hand version

d _A [inch]	Type, description	L N R 	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	D _{min} [inch]		
1.250	S20U SVUCR 3	R	1.180	14.0	3.000	1.000	2.000	VC.. 33..	E02
1.250	S20U SVUCL 3	L	1.180	14.0	3.000	1.000	2.000	VC.. 33..	E02
1.500	S24V SVUCR 3	R	1.370	15.7	3.000	1.250	2.250	VC.. 33..	E02
1.500	S24V SVUCL 3	L	1.370	15.7	3.000	1.250	2.250	VC.. 33..	E02
2.000	S32W SVUCR 3	R	1.870	17.7	4.000	1.375	2.750	VC.. 33..	E02
2.000	S32W SVUCL 3	L	1.870	17.7	4.000	1.375	2.750	VC.. 33..	E02
.625	S10R SVUCR 2E	R	.580	8.0	1.060	.500	.867	VC.. 22..	E01
.625	S10R SVUCL 2E	L	.580	8.0	1.060	.500	.867	VC.. 22..	E01
.750	S12S SVUCR 2E	R	.710	10.0	1.580	.625	1.060	VC.. 22..	E01
.750	S12S SVUCL 2E	L	.710	10.0	1.580	.625	1.060	VC.. 22..	E01
1.000	S16T SVUCR 2D	R	.900	12.0	1.810	.750	1.300	VC.. 22..	E01
1.000	S16T SVUCL 2D	L	.900	12.0	1.810	.750	1.300	VC.. 22..	E01

E01	6227154			6232672
E02	6213482	6213486	6213484	6213485



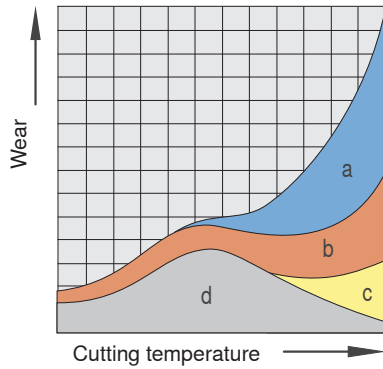




Wear is caused through simultaneous mechanical and thermal stress of the cutting edge.

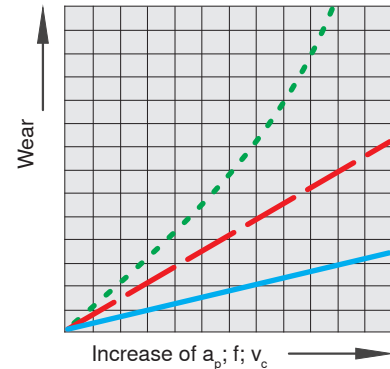
The most common causes are

- o Mechanical abrasion
- o Damage due to built-up edge (BUE)
- o Oxidation processes
- o Diffusion



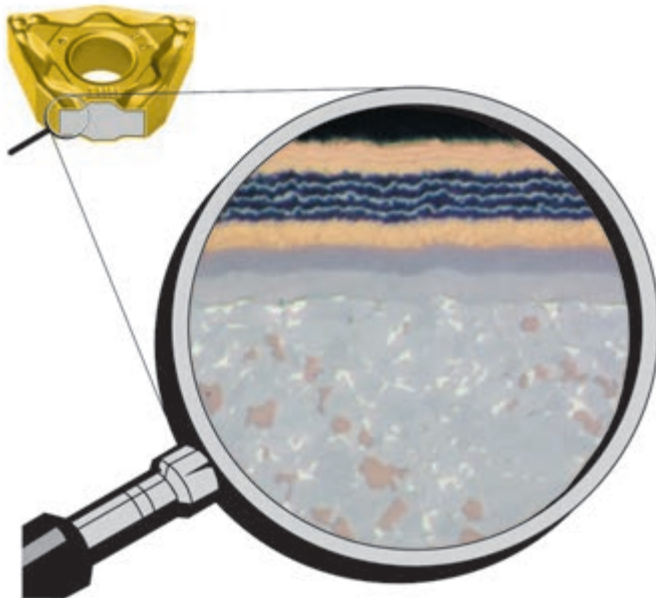
With increasing cutting temperature the thermally caused wear types of oxidation and diffusion prevail.

- a = diffusion
- b = mechanical abrasion
- c = oxidation
- d = damage due to built-up edge (BUE)



Cutting temperature and wear depend decisively upon the machining conditions.

- Cutting speed
- Feed rate
- Cutting depth

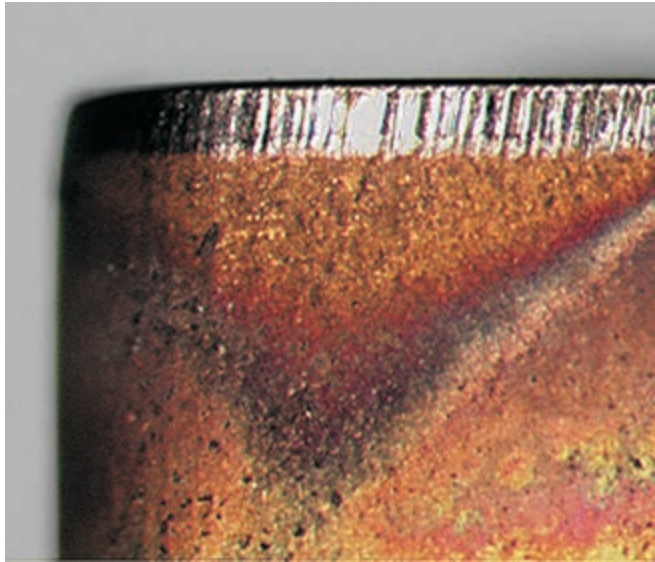


Benefits of hard material coatings

Depositing hard material layers on carbide tools positively influences wear characteristics.

The advantages of hard material layers consist in the reduction of

- o Friction
- o Temperature changes
- o Oxidation
- o Diffusion



Flank wear

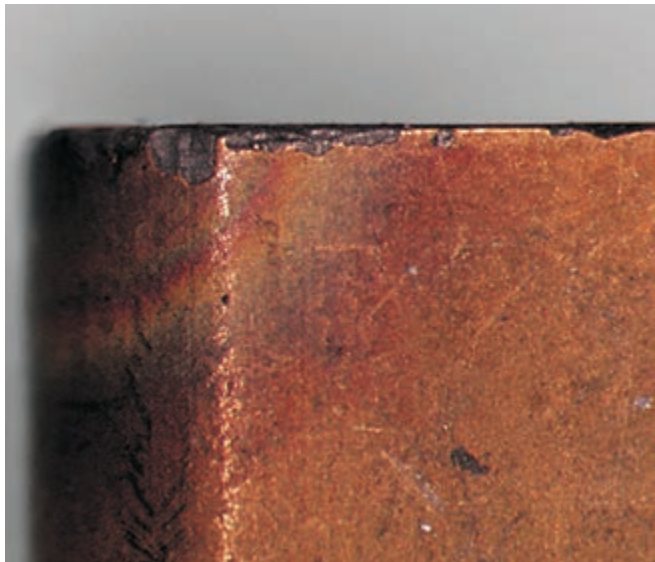
Reasons

- Cutting speed too high
- Carbide grade with insufficient wear resistance
- Incorrect feed rate

Remedies

- Reduce cutting speed
- Select more wear resistant carbide grade
- Adapt feed rate to cutting speed and cutting depth (increase feed rate)

Abrasion on flank, normal wear after a certain machining time.



Edge chipping

Reasons

- Grade with too high wear resistance
- Vibration
- Feed rate too high or excessive cutting depth
- Interrupted cut
- Swarf damage

Remedies

- Use tougher grade
- Use negative cutting edge geometry with chip groove
- Increase stability (tool, work piece)

Through excessive mechanical stress at the cutting edge fracture and chipping can occur.



Cratering

Reasons

- Cutting speed and / or feed rate too high
- Rake angle too shallow
- Grade with low wear resistance
- Insufficient coolant supply

Remedies

- Reduce cutting speed and / or feed rate
- Increase coolant quantity and / or pressure, optimize coolant supply
- Use grade with higher resistance to cratering

The hot chip which is being evacuated causes cratering at the rake face of the cutting edge.



Plastic deformation

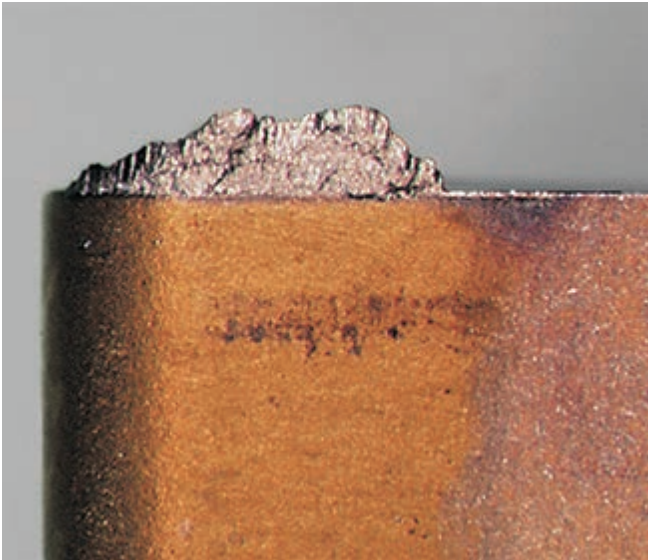
Reasons

- Too high machining temperature, resulting in softening of substrate
- Damaged coatings
- Chip groove too narrow

Remedies

- Reduce cutting speed
- Choose carbide grade with higher wear resistance
- Provide cooling

High machining temperature and simultaneous mechanical stress can lead to plastic deformation.



Built-up edge

Reasons

- Cutting speed too low
- Rake angle too small
- Wrong cutting material
- Lack of cooling / lubrication

Remedies

- Increase cutting speed
- Increase rake angle
- Apply TiN-coating
- Use emulsion with higher concentration

Built-up edge occurs when the chip is not evacuated properly due to insufficient cutting temperature.



Insert breakage

Reasons

- Excessive stress of cutting material
- Lack of stability
- Corner angle too small
- Excessive notching

Remedies

- Use tougher cutting material
- Use protective edge chamfer
- Increase honing of edge
- Use more stable geometry

Excessive stress of the insert causes breakage.



Type of problem												Corrective measures		
Type of wear						Work piece problems				Chip control				
Flank wear	Cratering	Edge chipping	Plastic deformation	Insert breakage	Built-up edge	Vibration	Formation of pits and burrs	Chattered surface	Surface quality	Chip too long (tangled swarf)	Chip too short (fragmented chip)			
↓	↓		↓		↑	↓			↑	↓		Cutting speed	Cutting values	
≈		↓	↓	↓		↑		↓	↓	↑	↓	Feed rate		
	↓	↓					↓	↓	↓			Feed - center area		
		↑	≈		↓	≈	↓	↓	↓	↓	↑	Chip groove	Selection of inserts	
↑		↑	↑			↓	↓	↓	↑			Corner radius		larger ↓ ↑ smaller
↑	↑	↓	↑	↓								Cutting material		wear resistance ↓ ↑ toughness
		≈		≈		≈	≈	≈	≈			Clamping of tool	General criteria	
		≈		≈		≈	≈	≈	≈			Clamping of work piece		
		≈		≈		≈			↓			Overhang		
≈		≈				≈	≈		≈			Tip height		
○	≈		○		○		○		○	○		Cooling lubricant		

↑ raise, increase, large influence

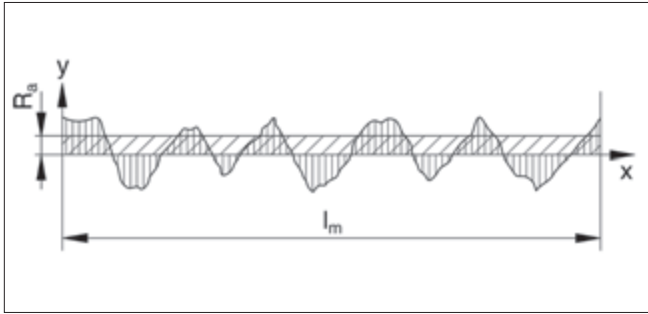
↓ avoid, reduce large influence

≈ check, optimize

↑ raise, increase low influence

↓ avoid, reduce low influence

○ use

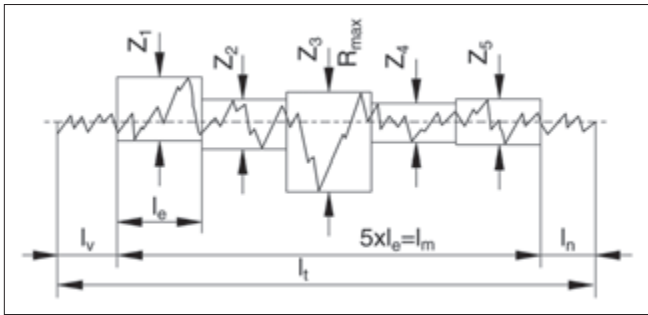


Average roughness value R_a DIN (4768)

This is defined as the arithmetical mean of the absolute sums of the roughness profile R within the entire measured length l_m .

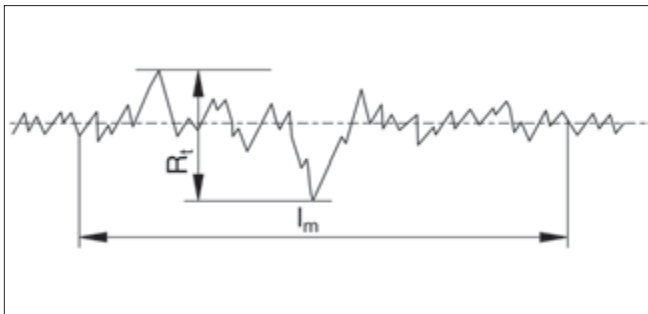
Average roughness depth R_z (DIN 4768)

This is defined as the average value resulting from the single roughness depths of five successive single measured lengths l_e .



Single surface roughness depth $Z_1 \dots Z_5$

This is the vertical distance between the highest and the lowest point of the roughness profile R within a single measured length l_e .



Maximum surface roughness depth R_t (DIN 4768/1)

This is the distance between the elevation and depression of the line within the measured length (reference distance) of profile filtered according to DIN 4768 sheet 1.

Surface quality according to manufacturing method

Surface symbol according to ISO 1302	new	.025	.05	.1	.2	.4	.8	1.6	3.2	6.3	12.5	25	50
Surface symbol according to ISO 3141	until now	▽▽▽▽					▽▽▽			▽▽		▽	
Roughness index		N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8	N 9	N 10	N 11	N 12
Arithmetic mean value	R_a [μm]	.025	.05	.1	.2	.4	.8	1.6	3.2	6.3	12.5	25	50
Surface roughness depth	R_z [μm]	.25	.63	1	1.6	2.5	4-6.3	10	16-25	40	63	100	160
Longitudinal turning Face turning													
Longitudinal turning Face turning													
Longitudinal grinding Surface grinding													

☐ \cong Surface roughness (produced through special methods)

☐ \cong Surface roughness (produced through normal workshop methods)

☐ \cong Surface roughness (produced through rough machining methods)



Surface and roughness

Table for the comparison of the measuring systems (metric compared to inch) of surface roughness

R_{tmax} [μm]	CLA/ R_a [μm]	CLA [μm]	RMS [μm]	RMS [μm]
.06	.02	.75	.02	.8
.1	.03	1.2	.04	13
.2	.06	2.5	.08	2.8
.3	.09	3.7	.1	4.2
.4	.13	5	.14	5.6
.5	.16	6.7	.18	6.9
.6	.19	7.5	.21	8.3
.7	.22	8.7	.25	9.7
.8	.25	10	.28	11.1
.9	.28	11.2	.32	12.5
1	.31	12.5	.35	14
1.2	.38	15.8	.42	16.7
1.5	.47	18.8	.53	20.9
1.8	.57	22.6	.64	25.5
2	.64	25.1	.78	27.9
2.4	.73	30.1	.85	33.4
2.8	.89	35.2	.99	39
3	.95	37.6	1.06	41.9
3.5	1.11	43.9	1.24	48.8
4	1.27	50.2	1.41	55.8
5	1.59	62.7	1.77	69.7
6	1.91	75.5	2.12	83.6
7	2.22	87.5	2.48	92.6
8	2.54	100	2.83	111.7
10	3.18	125.5	3.54	140
20	6.64	251.5	7.8	279
40	12.7	502	14.1	558
60	19.1	755	21.2	836
125	39.5	1560	43.5	1750
200	64	2510	78	2790

$$1 \mu\text{m} = .001 \text{ mm} = 39.37 \mu\text{m}$$

$$1 \mu\text{m} = .000001\text{m} = .0000254 \text{ mm}$$

CLA (center line average)

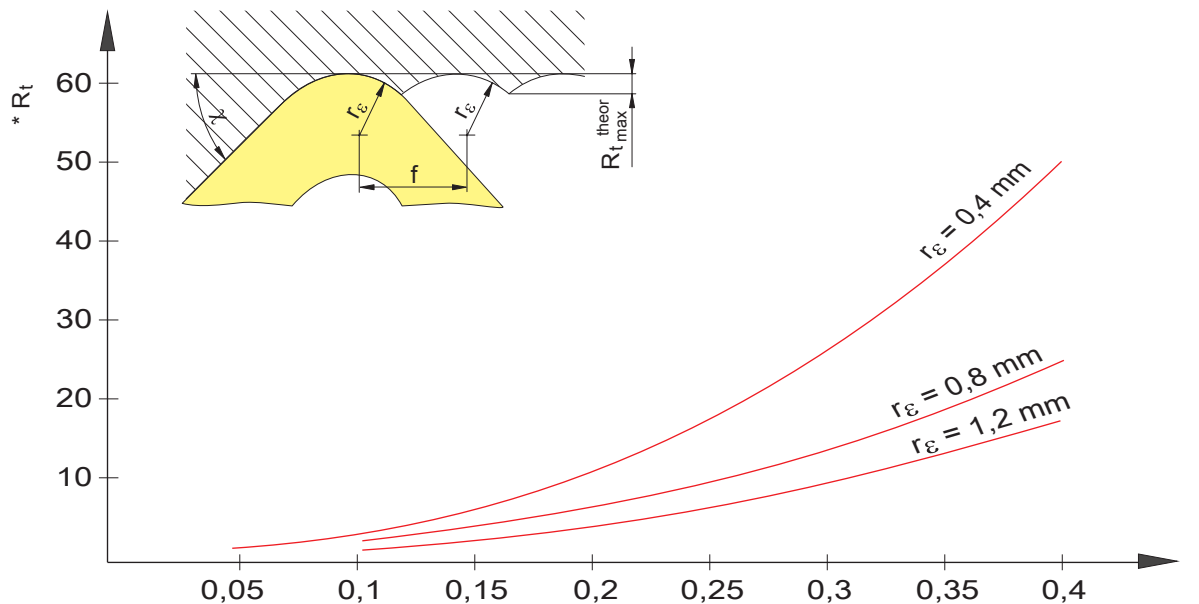
RMS (root mean square)



Theoretical surface finish

The maximum theoretical surface roughness with turning, $R_{t\text{ theor.}}$ is the combination of feed rate and corner radius.

$$R_{t\text{ theor.}} = \left(r_{\varepsilon} - \sqrt{r_{\varepsilon}^2 - \frac{f^2}{4}} \right) \cdot 1000 \quad \text{or approximately} \quad R_{t\text{ theor.}} = \frac{0.125 \cdot f^2}{r_{\varepsilon}}$$



* Theoretical surface roughness

f (mm/rev.)

Cutting data for feed rate

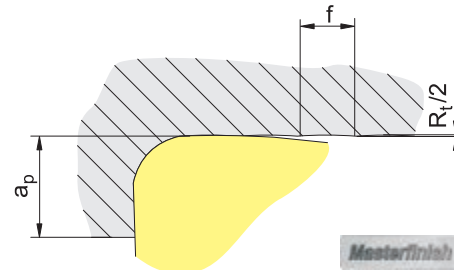
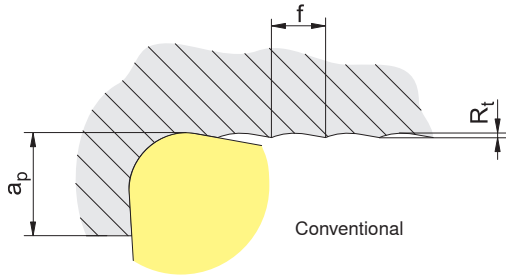
Roughness range R_z in μm	$R_{t\text{ max}}$	corresponds to R_a -value	Roughness index	ISO 1302	Corner radius r_{ε} (inch) and feed rate f (inch/rev.)			
					$r_{\varepsilon} = .4$	$r_{\varepsilon} = .8$	$r_{\varepsilon} = 1.2$	$r_{\varepsilon} = 1.6$
63 - 100	$\sqrt{R_t 100}$	12.5 - 25	N 11	$25\sqrt{\text{ }}$	–	.51	.69	.18
40 - 63	$\sqrt{R_t 63}$	6.3 - 25	N 10	$12.5\sqrt{\text{ }}$	.27	.43	.56	.68
31.5 - 40	$\sqrt{R_t 40}$	4.9 - 6.3	N 9	$6.3\sqrt{\text{ }}$	.25	.37	.49	.57
25 - 31.5	$\sqrt{R_t 31.5}$	4.0 - 4.9			.22	.32	.41	.47
16 - 25	$\sqrt{R_t 25}$	2.5 - 4.0	N 8	$3.2\sqrt{\text{ }}$	.20	.28	.36	.39
10 - 16	$\sqrt{R_t 16}$	1.6 - 2.5			0.15	.22	.29	.31
6.3 - 10	$\sqrt{R_t 10}$	1.0 - 1.6	N 7	$1.6\sqrt{\text{ }}$	.10	.13	.18	.20



Operating principle / benefit

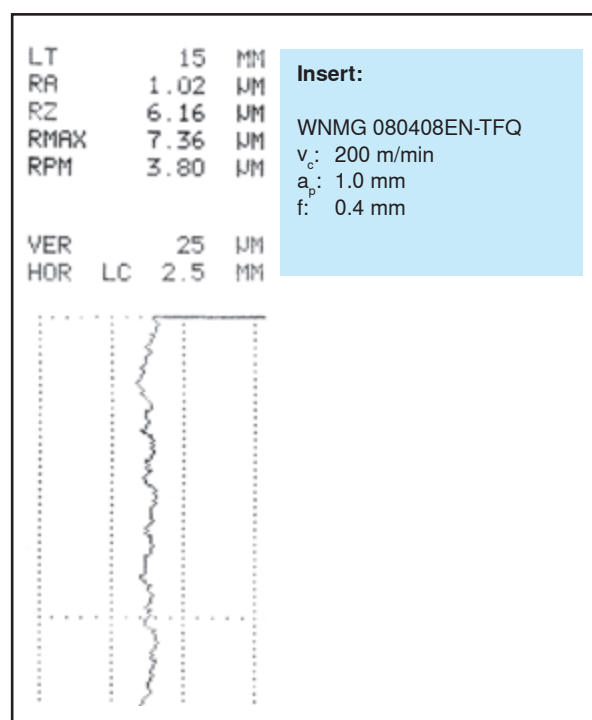
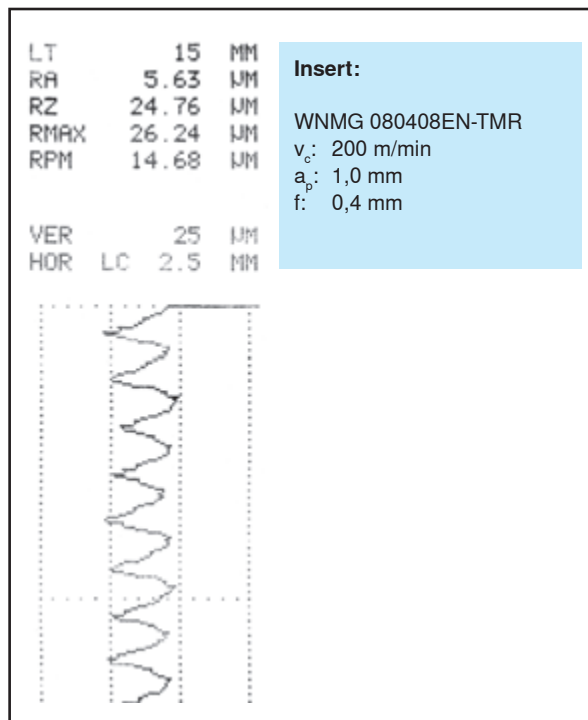
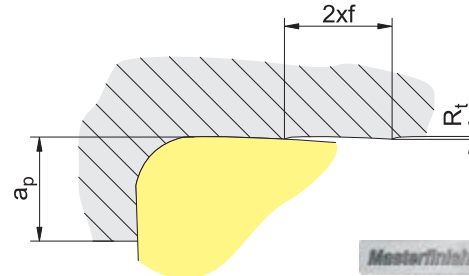
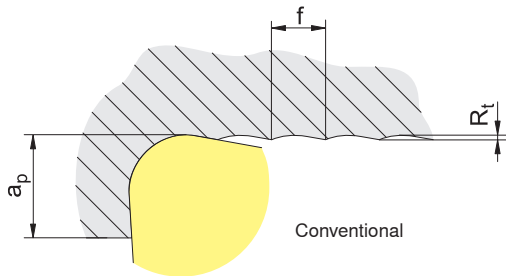
Improved surface finish

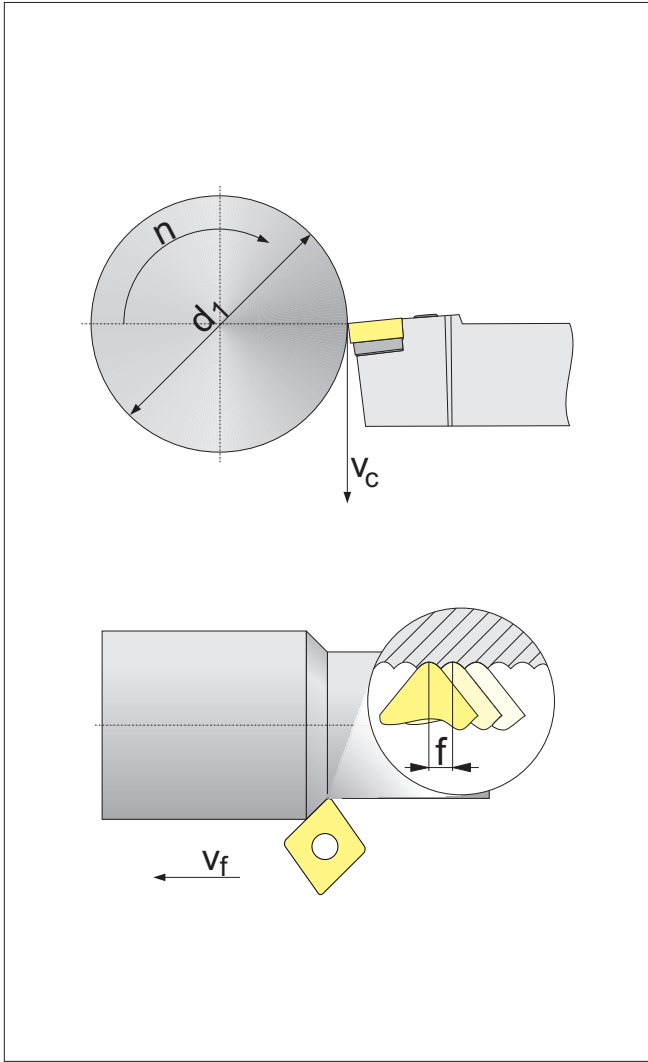
With the same feed rate an insert with 'Masterfinish' cutting edge reaches a roughness value R_a which is many times higher than the one of a conventional insert.



Shorter machining time

If you want to reach the same R_a -value as with a standard insert, a twice as high feed rate can be applied for the insert with 'Masterfinish' cutting edge (= shorter production time per component!).



**Cutting speed (v_c)**

$$v_c = \frac{d_1 \cdot \pi \cdot n}{12} \text{ [sfpm]}$$

Revolutions per minute (n)

$$n = \frac{v_c \cdot 12}{d_1 \cdot \pi} \text{ [rev./min]}$$

Feed rate (v_f)

$$v_f = f \cdot n \text{ [inch/min]}$$



Tensile strength N/mm ²	Vickers HV	Brinell HB	Rockwell HRC	Shore C
575	180	171		
595	185	176		
610	190	181		
625	195	185		
640	200	190	12	
660	205	195	13	
675	210	199	14	
690	215	204	15	
705	220	209	15	28
720	225	214	16	
740	230	219	17	29
755	235	223	18	
770	240	228	20.3	30
785	245	233	21.3	
800	250	238	22.2	31
820	255	242	23.1	32
835	260	247	24	33
850	265	252	24.8	
865	270	257	25.6	
880	275	261	26.4	34
900	280	268	27.1	
915	285	271	27.8	35
930	290	276	28.5	
950	295	280	29.2	36
965	300	285	29.8	37
995	310	295	31	38
1030	320	304	32.2	39
1060	330	314	33.3	40
1095	340	323	34.3	41
1125	350	333	35.5	42
1155	360	342	36.6	43
1190	370	352	37.7	44
1220	380	361	38.8	45
1255	390	371	39.8	46
1290	400	380	40.8	47
1320	410	390	41.8	48
1350	420	399	42.7	
1385	430	409	43.6	49
1420	440	418	44.5	
1455	450	428	45.3	51
1485	460	437	46.1	52
1520	470	447	46.9	53
1555	480	465	47.7	54
1595	490	466	48.4	
1630	500	475	49.1	57
1665	510	485	49.8	58
1700	520	494	50.5	59
1740	530	504	51.1	60
1775	540	513	51.7	61
1810	550	523	52.3	62

Tensile strength N/mm ²	Vickers HV	Brinell HB	Rockwell HRC	Shore C
1845	560	532	53	63
1880	570	542	53.6	64
1920	580	551	54.1	65
1955	590	561	54.7	66
1995	600	570	55.2	67
2030	610	580	55.7	68
2070	620	589	56.3	69
2105	630	599	56.8	70
2145	640	608	57.3	71
2180	650	618	57.8	72
2210	660	628	58.3	73
2240	665	633	58.8	74
2280	670	638	59.3	
2310	675	643	59.8	75
2350	680	648	60.3	76
2380	685	653	61.1	77
2410	690	658	61.3	78
2450	695	663	61.7	79
2480	710	668	62.2	80
2520	720	678	62.6	81
2550	730	683	63.1	82
2590	740	693	63.5	
2630	750	703	63.9	83
2660	760	708	64.3	84
2700	770	718	64.7	85
2730	780	723	65.1	
2770	790	733	65.5	86
2800	800	738	65.9	
2840	810	748	66.3	87
2870	820	753	66.7	88
2910	830	763	67	
2940	840	768	67.4	89
2980	850		67.7	
3010	860		68.1	90
3050	870		68.4	
3080	880		68.7	91
3120	890		69	
3150	900		69.3	92
3190	910		69.6	
3220	920		69.9	
3260	930		70.1	

The figures given are approximate according to DIN EN ISO18265 (02-2004)



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
10 SPb 20	1.0722		10 PbF 2		11 L 08		1350	.20	1
100 Cr 6	1.2067	BL 3	Y 100 C 6		L 3	SUJ2	1775	.24	6/9
105 WCr 6	1.2419		105 WC 13			SKS31	1775	.24	6/9
12 CrMo 9 10	1.7380	1501-622 Gr. 31; 45	10 CD 9.10	2218	A 182-F22	SPVA,SCMV4	1675	.24	6/7
12 Ni 19	1.5680		Z 18 N 5		2515		2450	.23	10/11
13 CrMo 4 4	1.7335	1501-620 Gr. 27	15 CD 3.5	2216	A 182-F11; F12	SPVAF12	1675	.24	6/7
14 MoV 6 3	1.7715	1503-660-440					1675	.24	6/7
14 Ni 6	1.5622		16 N 6		A 350-LF 5		1675	.24	6/7
14 NiCr 10	1.5732		14 NC 11		3415	SNC415(H)	1675	.24	6/7
14 NiCr 14	1.5752	655 M 13	12 NC 15		3310; 9314	SNC815(H)	1675	.24	6/7
14 NiCrMo 13 4	1.6657						1675	.24	6/7
15 Cr 3	1.7015	523 M 15	12 C 3		5015		1675	.24	6/7
15 CrMo 5	1.7262		12 CD 4			SCM415(H)	1675	.24	6/7
15 Mo 3	1.5415	1501-240	15 D 3	2912	A 204 Gr. A		1675	.24	6/7
16 MnCr 5	1.7131	527 M 17	16 MC 5	2511	5115	SCR415	1675	.24	6/7
16 Mo 5	1.5423	1503-245-420			4520	SB450M	1675	.24	6/7
17 CrNiMo 6	1.6587	820 A 16	18 NCD 6				1675	.24	6/7
21 NiCrMo 2	1.6523	805 M 20	20 NCD 2	2506	8620	SNM220(H)	1725	.24	6/8
25 CrMo 4	1.7218	1717 CDS 110	25 CD 4 S	2225	4130	SM420;SCM430	1725	.24	6/8
28 Mn 6	1.1170	150 M 28	20 M 5		1330		1500	.22	2
32 CrMo 12	1.7361	722 M 24	30 CD 12	2240			1775	.24	6/9
34 Cr 4	1.7033	530 A 32	32 C 4		5132	SCR430(H)	1725	.24	6/8
34 CrMo 4	1.7220	708 A 37	35 CD 4	2234	4135; 4137	SCM432;SCCRM3	1775	.24	6/9
34 CrNiMo 6	1.6582	817 M 40	35 NCD 6	2541	4340	SNM447	1775	.24	6/9
35 S 20	1.0726	212 M 36	35 MF 4	1957	1140		1525	.22	2/3
36 CrNiMo 4	1.6511	816 M 40	40 NCD 3		9840	SNM447	1775	.24	6/9
36 Mn 5	1.1167						1525	.22	2/3
36 NiCr 6	1.5710	640 A 35	35 NC 6		3135	SNC236	1800	.24	3/9
38 MnSi 4	1.5120						1800	.24	3/9
39 CrMoV 13 9	1.8523	897 M 39					1775	.24	6/9
40 Mn 4	1.1157	150 M 36	35 M 5		1039		1525	.22	2/3
40 NiCrMo 2 2	1.6546	311-Type 7	40 NCD 2		8740	SNM240	1775	.24	6/9
41 Cr 4	1.7035	530 M 40	42 C 4		5140	SCR440(H)	1775	.24	6/9
41 CrAlMo 7	1.8509	905 M 39	40 CAD 6.12	2940	A 355 Cl. A	SACM645	1775	.24	6/9
41 CrMo 4	1.7223	708 M 40	42 CD 4 TS	2244	4142; 4140	SCM440	1775	.24	6/9
42 Cr 4	1.7045	530 A 40	42 C 4 TS	2245	5140	SCR440	1775	.24	6/9
42 CrMo 4	1.7225	708 M 40	42 CD 4	2244	4142; 4140	SCM440(H)	1775	.24	6/9
45 WCrV 7	1.2542	BS 1		2710	S 1		1775	.24	6/9
50 CrV 4	1.8159	735 A 50	50 CV 4	2230	6150	SUP10	1775	.24	6/9
55 Cr 3	1.7176	527 A 60	55 C 3	2253	5155	SUP9(A)	1775	.24	6/9
55 NiCrMoV 6	1.2713		55 NCDV 7		L 6	SKH1;SKT4	1775	.24	6/9
55 Si 7	1.0904	250 A 53	55 S 7	2085; 2090	9255		1775	.24	6/9
58 CrV 4	1.8161						1775	.24	6/9
60 SiCr 7	1.0961		60 SC 7		9262		1775	.24	6/9
9 SMn 28	1.0715	230 M 07	S 250	1912	1213	SUM22	1350	.21	1
9 SMn 36	1.0736	240 M 07	S 300		1215		1350	.21	1
9 SMnPb 28	1.0718		S 250 Pb	1914	12 L 13	SUM22L	1350	.21	1
9 SMnPb 36	1.0737		S 300 Pb	1926	12 L 14		1350	.21	1
Al99	3.0205						700	.25	21
AlCuMg1	3.1325						700	.25	22
AlMg1	3.3315						700	.25	21



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
AlMgSi1	3.2315						700	.25	22
C 105 W1	1.1545		Y1 105	1880	W 110	SK3	1675	.24	3
C 125 W	1.1663		Y2 120		W 112		1675	.24	3
C 15	1.0401	080 M 15	AF3 7 C 12; XC 18	1350	1015	S15C	1350	.21	1
C 22	1.0402	050 A 20	AF 42 C 20	1450	1020	S20C, S22C	1350	.21	1
C 35	1.0501	060 A 35	AF 55 C 35	1550	1035	S35C	1525	.22	2/3
C 45	1.0503	080 M 46	AF 65 C 45	1650	1045	S45C	1525	.22	2/3
C 55	1.0535	070 M 55		1655	1055	S55C	1675	.24	3
C 60	1.0601	080 A 62	CC 55		1060	S60C	1675	.24	3
Cf 35	1.1183					S35C	1525	.22	2/3
Cf 53	1.1213					S50C	1525	.22	2/3
Ck 101	1.1274	060 A 96		1870	1095		1675	.24	3
Ck 15	1.1141	080 M 15	XC 15; XC 18	1370	1015	S15C	1350	.21	1
Ck 55	1.1203	070 M 55	XC 55		1055	S55C	1675	.24	3
Ck 60	1.1221	080 A 62	XC 60	1665; 1678	1060	S58C	1675	.24	3
CoCr20W15Ni	2.4764						3300	.24	35
CuZn15	2.0240						700	.27	27
CuZn36Pb3	2.0375						700	.27	26
E-Cu57	2.0060						700	.27	28
G-AlSi10Mg	3.2381						700	.25	24
G-AlSi12	3.2581						700	.25	23
G-AlSi9Cu3	3.2163						700	.25	23
G-CuSn5ZnPb	2.1096						700	.27	26
G-CuZn40Fe	2.0590						700	.27	28
G-X 120 Mn 12	1.3401	Z 120 M 12	Z 120 M 12		A 128 (A)		3300	.24	35
G-X 20 Cr 14	1.4027	420 C 29	Z 20 C 13 M			SCS2	1875	.21	12/13
G-X 40 NiCrSi 38 18	1.4865	330 C 40					2600	.24	31
G-X 45 CrSi 9 3	1.4718	401 S 45	Z 45 CS 9		HNV 3		2450	.23	10/11
G-X 5 CrNi 13 4	1.4313	425 C 11	Z 5 CN 13.4	2385	CA 6-NM		1875	.21	12/13
G-X 5 CrNiMoNb 18 10	1.4581	318 C 17	Z 4 CNDNb 18.12 M				2150	.2	14
G-X 6 CrNi 18 9	1.4308	304 C 15	Z 6 CN 18.10 M	2333	CF-8		2150	.2	14
G-X 6 CrNiMo 18 10	1.4408						2150	.2	14
G-X 7 Cr 13	1.4001						1875	.21	12/13
GG-10	.6010		Ft 10 D	01 10-00	A48-20 B	FC100	1150	.2	15
GG-15	.6015	Grade 150	Ft 15 D	01 15-00	A48-25 B	FC150	1150	.2	15
GG-20	.6020	Grade 220	Ft 20 D	01 20-00	A48-30 B	FC200	1150	.2	15
GG-25	.6025	Grade 260	Ft 25 D	01 25-00	A48-40 B	FC250	1250	.24	15/16
GG-30	.6030	Grade 300	Ft 30 D	01 30-00	A48-45 B	FC300	1350	.28	16
GG-35	.6035	Grade 350	Ft 35 D	01 35-00	A48-50 B	FC350	1350	.28	16
GG-40	.6040	Grade 400	Ft 40 D	01 40-00	A48-60 B	FC400	1350	.28	16
GGG-35.3	.7033					FCD350	1225	.25	17
GGG-40	.7040	SNG 420/12	FGS 400-12	0717-02	60-40-18	FCD400	1225	.25	17
GGG-40.3	.7043	SNG 370/17	FGS 370-17	0717-15		FCD400	1225	.25	17
GGG-50	.7050	SNG 500/7	FGS 500-7	0727-02	65-45-12	FCD500	1350	.28	18
GGG-60	.7060	SNG 600/3	FGS 600-3	0732-03	80-55-06	FCD600	1350	.28	18
GGG-70	.7070	SNG 700/2	FGS 700-2	0737-01	100-70-03	FCD700	1350	.28	18
GGG-NiCr 20 2	.7660	S-NiCr 20 2	S-NC 20 2		A 439 Type D-2		1350	.28	18
GGG-NiMn 13 7	.7652	S-NiMn 13 7	S-NM 13 7				1350	.28	18
GS-Ck 45	1.1191	080 M 46	XC 42	1672	1045	S45C	1525	.22	2/3
GTS-35-10	.8135	B 340/12	MN 35-10				1225	.25	19
GTS-45-06	.8145	P 440/7					1420	.3	20



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
GTS-55-04	.8155	P 510/4	MP 50-5				1420	.3	20
GTS-65-02	.8165	P 570/3	MP 60-3				1420	.3	20
GTS-70-02	.8170	P 690/2	IP 70-2				1420	.3	20
NiCr20TiAl	2.4631	HR 401; 601	Nimonic 80 A				3300	.24	33
NiCr22Mo9Nb	2.4856		Inconel 625				3300	.24	33
NiCu30Al	2.4375		Monel K 500				3300	.24	34
NiFe25Cr20NbTi	2.4955						3300	.24	34
S 18-0-1	1.3355	BT 1	Z 80 WCV 18-04-01		T 1		2450	.23	10/11
S 18-1-2-5	1.3255	BT 4	Z 80 WKCV 18-05-04-0		T 4		2450	.23	10/11
S 2-9-2	1.3348		Z 100 DCWV 09-04-02-	2782	M 7		2450	.23	10/11
S 6-5-2	1.3343	BM 2	Z 85 WDCV 06-05-04-0	2722	M 2	SKH9; SKH51	2450	.23	10/11
S 6-5-2-5	1.3243		Z 85 WDKCV 06-05-05-	2723		SKH55	2450	.23	10/11
TiAl6V4	3.7165	TA 10 bis TA 13	T-A 6 V				2110	.22	37
X 10 Cr 13	1.4006	410 S 21	Z 12 C 13	2302	410; CA-15	SUS410	1875	.21	12/13
X 10 CrNiMoNb 18 12	1.4583				318		2150	.2	14
X 10 CrNiS 18 9	1.4305	303 S 21	Z 10 CNF 18.09	2346	303		2150	.2	14
X 100 CrMoV 5 1	1.2363	BA 2	Z 100 CDV 5	2260	A 2		2450	.23	10/11
X 12 CrMoS 17	1.4104		Z 10 CF 17	2383	430 F	SUS430F	1875	.21	12/13
X 12 CrNi 17 7	1.4310	301 S 21	Z 12 CN 17.07		301		2150	.2	14
X 12 CrNi 22 12	1.4829					SUS301	1350	.28	16
X 12 CrNi 25 21	1.4845	310 S24	Z 12 CN 25.20	2361	310 S	SUH310; SUS310S	2150	.2	14
X 12 CrNiTi 18 9	1.4878	321 S 20	Z 6 CNT 18.12 (B)	2337	321		2150	.2	14
X 12 NiCrSi 36 16	1.4864	NA 17	Z 12 NCS 37.18		330	SUH330	2600	.24	31
X 15 CrNiSi 20 12	1.4828	309 S 24	Z 15 CNS 20.12		309	SUH309	1350	.28	16
X 165 CrMoV 12	1.2601			2310			2450	.23	10/11
X 2 CrNiMo 18 13	1.4440						2150	.2	14
X 2 CrNiMoN 17 13 3	1.4429	316 S 62	Z 2 CND 17.13 Az	2375	316 LN	SUS316LN	2150	.2	14
X 2 CrNiN 18 10	1.4311	304 S 62	Z 2 CN 18 .10	2371	304 LN	SUS304LN	2150	.2	14
X 20 CrNi 17 2	1.4057	431 S 29	Z 15 CN 16.02	2321	431	SUS431	1875	.21	12/13
X 210 Cr 12	1.2080	BD 3	Z 200 C 12		D 3		2450	.23	10/11
X 210 CrW 12	1.2436			2312			2450	.23	10/11
X 30 WCrV 9 3	1.2581	BH 21	Z 30 WCV 9		H 21	SKD5	2450	.23	10/11
X 40 CrMoV 5 1	1.2344	BH 13	Z 40 CDV 5	2242	H 13	SKD61	2450	.23	10/11
X 46 Cr 13	1.4034	420 S 45	Z 40 C 14				1875	.21	12/13
X 5 CrNi 18 9	1.4301	304 S 15	Z 6 CN 18.09	2332; 2333	304; 304 H	SUS304	2150	.2	14
X 5 CrNiMo 17 13 3	1.4436	316 S 16	Z 6 CND 17.12	2343	316	SUS316	2150	.2	14
X 5 CrNiMo 18 10	1.4401	316 S 16	Z 6 CND 17.11	2347	316	SUS316	2150	.2	14
X 53 CrMnNiN 21 9	1.4871	349 S 54	Z 52 CMN 21.09		EV 8		1875	.21	12/13
X 6 Cr 13	1.4000	403 S 17	Z 6 C 13	2301	403	SUS403	1875	.21	12/13
X 6 Cr 17	1.4016	430 S 15	Z 8 C 17	2320	430	SUS430	1875	.21	12/13
X 6 CrMo 17	1.4113	434 S 17	Z 8 CD 17.01	2325	434	SUS434	1875	.21	12/13
X 6 CrNiMoTi 17 12 2	1.4571	320 S 31	Z 6 CNT 17.12	2350	316 Ti		2150	.2	14
X 6 CrNiNb 18 10	1.4550	347 S 17	Z 6 CNNb 18.10	2338	347		2150	.2	14
X 6 CrNiTi 18 10	1.4541	321 S 12	Z 6 CNT 18.10	2337	321		2150	.2	14
X2 CrNi 18-8	1.4317						2150	.2	14



	ISO	ANSI
CCGT	CCGT 060200FN-F23	CCGT 21.5X0FN-F23
	CCGT 060201FN	CCGT 21.50FN
	CCGT 060201FN-F23	CCGT 21.50FN-F23
	CCGT 060202EN-SF	CCGT 21.5.5EN-SF
	CCGT 060202EN-SM	CCGT 21.5.5EN-SM
	CCGT 060202FN	CCGT 21.5.5FN
	CCGT 060202FN-23P	CCGT 21.5.5FN-23P
	CCGT 060202FN-25P	CCGT 21.5.5FN-25P
	CCGT 060202FN-27	CCGT 21.5.5FN-27
	CCGT 060204EN-SF	CCGT 21.51EN-SF
	CCGT 060204FN	CCGT 21.51FN
	CCGT 060204FN-23P	CCGT 21.51FN-23P
	CCGT 060204FN-25P	CCGT 21.51FN-25P
	CCGT 060204FN-25Q	CCGT 21.51FN-25Q
	CCGT 060204FN-27	CCGT 21.51FN-27
	CCGT 09T300FN-F23	CCGT 32.5X0FN-F23
	CCGT 09T301FN	CCGT 32.50FN
	CCGT 09T301FN-F23	CCGT 32.50FN-F23
	CCGT 09T302EN-SF	CCGT 32.5.5EN-SF
	CCGT 09T302FN	CCGT 32.5.5FN
	CCGT 09T302FN-25P	CCGT 32.50.5FN-25P
	CCGT 09T302FN-27	CCGT 32.5.5FN-27
	CCGT 09T304EN-SF	CCGT 32.51EN-SF
	CCGT 09T304FN	CCGT 32.51FN
	CCGT 09T304FN-23P	CCGT 32.51FN-23P
	CCGT 09T304FN-25P	CCGT 32.51FN-25P
	CCGT 09T304FN-25Q	CCGT 32.51FN-25Q
	CCGT 09T304FN-27	CCGT 32.51FN-27
	CCGT 09T308EN-SF	CCGT 32.52EN-SF
	CCGT 09T308FN	CCGT 32.52FN
	CCGT 09T308FN-23P	CCGT 32.52FN-23P
	CCGT 09T308FN-25P	CCGT 32.52FN-25P
	CCGT 09T308FN-25Q	CCGT 32.52FN-25Q
	CCGT 09T308FN-27	CCGT 32.52FN-27
	CCGT 120402FN-25P	CCGT 43.5FN-25P
	CCGT 120402FN-27	CCGT 43.5FN-27
	CCGT 120404EN-SF	CCGT 431EN-SF
	CCGT 120404FN	CCGT 431FN
	CCGT 120404FN-25P	CCGT 431FN-25P
	CCGT 120404FN-25Q	CCGT 431FN-25Q
	CCGT 120404FN-27	CCGT 431FN-27
	CCGT 120408FN	CCGT 432FN
CCGT 120408FN-25P	CCGT 432FN-25P	
CCGT 120408FN-25Q	CCGT 432FN-25Q	
CCGT 120408FN-27	CCGT 432FN-27	
CCGW	CCGW 060202FN	CCGW 21.5.5FN
	CCGW 060204FN	CCGW 21.51FN
	CCGW 09T301FN	CCGW 32.50FN
	CCGW 09T302FN	CCGW 32.5.5FN
	CCGW 09T304FN	CCGW 32.51FN
CCMT	CCMT 060204EN-29	CCMT 21.51EN-29
	CCMT 060204EN-SF	CCMT 21.51EN-SF

	ISO	ANSI	
CCMT	CCMT 060204EN-SM	CCMT 21.51EN-SM	
	CCMT 060204EN-SMF	CCMT 21.51EN-SMF	
	CCMT 060208EN-SM	CCMT 21.52EN-SM	
	CCMT 060208EN-SMF	CCMT 21.52EN-SMF	
	CCMT 09T304EN-29	CCMT 32.51EN-29	
	CCMT 09T304EN-F43	CCMT 32.51EN-F43	
	CCMT 09T304EN-SF	CCMT 32.51EN-SF	
	CCMT 09T304EN-SM	CCMT 32.51EN-SM	
	CCMT 09T304EN-SMF	CCMT 32.51EN-SMF	
	CCMT 09T304EN-SMQ	CCMT 32.51EN-SMQ	
	CCMT 09T308EN-29	CCMT 32.52EN-29	
	CCMT 09T308EN-F43	CCMT 32.52EN-F43	
	CCMT 09T308EN-SF	CCMT 32.52EN-SF	
	CCMT 09T308EN-SM	CCMT 32.52EN-SM	
	CCMT 09T308EN-SMF	CCMT 32.52EN-SMF	
	CCMT 09T308EN-SMQ	CCMT 32.52EN-SMQ	
	CCMT 120404EN-SF	CCMT 431EN-SF	
	CCMT 120404EN-SM	CCMT 431EN-SM	
	CCMT 120404EN-SMF	CCMT 431EN-SMF	
	CCMT 120404EN-SMQ	CCMT 431EN-SMQ	
	CCMT 120408EN-SF	CCMT 432EN-SF	
	CCMT 120408EN-SM	CCMT 432EN-SM	
	CCMT 120408EN-SMF	CCMT 432EN-SMF	
	CCMT 120408EN-SMQ	CCMT 432EN-SMQ	
	CCMT 120412EN-SM	CCMT 433EN-SM	
	CCMX	CCMX 09T304SN	CCMX 32.51SN
		CCMX 09T308SN	CCMX 32.52SN
		CCMX 120408EN	CCMX 432EN
	CNGA	CNGA 120408SN-025C	CNGA 432SN-025C
		CNGA 120408TN-020D	CNGA 432TN-020D
		CNGA 120412SN-020D	CNGA 433SN-020D
		CNGA 120412SN-025C	CNGA 433SN-025C
		CNGA 160608SN-028C	CNGA 542SN-028C
		CNGA 160616SN-028C	CNGA 544SN-028C
		CNGA 160616TN-020D	CNGA 544TN-020D
	CNGG	CNGG 120404EN-CF	CNGG 431EN-CF
		CNGM 190612FN-27	CNGM 643FN-27
	CNGN	CNGN 120404TN-020D	CNGN 431TN-020D
		CNGN 120408TN-020D	CNGN 432TN-020D
	CNGN	CNGN 120416SN-020D	CNGN 434SN-020D
		CNGN 120712PN-100CF	CNGN 453PN-100CF
		CNGN 120712SN-025C	CNGN 453SN-025C
CNGN 120716PN-100CF		CNGN 454PN-100CF	
CNGN 120716PN-150CF		CNGN 454PN-150CF	
CNGN 120716SN-025C		CNGN 454SN-025C	
CNGN 160716SN-025C		CNGN 554SN-025C	
CNGN 160716SN-200C		CNGN 554SN-200C	
CNGP		CNGP 120402FN-F32	CNGP 43.5FN-F32
		CNGP 120408FN-F32	CNGP 432FN-F32
CNMA	CNMA 120404EN	CNMA 431EN	
	CNMA 120408EN	CNMA 432EN	
	CNMA 120412EN	CNMA 433EN	
CNMA 120412FN	CNMA 433FN		



	ISO	ANSI
	CNMA 120412TN-020D	CNMA 433TN-020D
	CNMA 120416EN	CNMA 434EN
	CNMA 120416FN	CNMA 434FN
	CNMA 120416TN-020D	CNMA 434TN-020D
	CNMA 160608EN	CNMA 542EN
	CNMA 160612EN	CNMA 543EN
	CNMA 160616EN	CNMA 544EN
	CNMA 190612EN	CNMA 643EN
	CNMA 190616EN	CNMA 644EN
CNMG	CNMG 090304EN-TF	CNMG 321EN-TF
	CNMG 090308EN-TM	CNMG 322EN-TM
	CNMG 120404EN-42	CNMG 431EN-42
	CNMG 120404EN-CF	CNMG 431EN-CF
	CNMG 120404EN-M42	CNMG 431EN-M42
	CNMG 120404EN-M52	CNMG 431EN-M52
	CNMG 120404EN-TF	CNMG 431EN-TF
	CNMG 120404EN-TFQ	CNMG 431EN-TFQ
	CNMG 120404EN-TMF	CNMG 431EN-TMF
	CNMG 120408EN-42	CNMG 432EN-42
	CNMG 120408EN-CF	CNMG 432EN-CF
	CNMG 120408EN-M42	CNMG 432EN-M42
	CNMG 120408EN-M52	CNMG 432EN-M52
	CNMG 120408EN-TF	CNMG 432EN-TF
	CNMG 120408EN-TFQ	CNMG 432EN-TFQ
	CNMG 120408EN-TM	CNMG 432EN-TM
	CNMG 120408EN-TMF	CNMG 432EN-TMF
	CNMG 120408EN-TMM	CNMG 432EN-TMM
	CNMG 120408EN-TMQ	CNMG 432EN-TMQ
	CNMG 120408EN-TMR	CNMG 432EN-TMR
	CNMG 120412EN-CF	CNMG 433EN-CF
	CNMG 120412EN-M42	CNMG 433EN-M42
	CNMG 120412EN-M52	CNMG 433EN-M52
	CNMG 120412EN-TF	CNMG 433EN-TF
	CNMG 120412EN-TFQ	CNMG 433EN-TFQ
	CNMG 120412EN-TM	CNMG 433EN-TM
	CNMG 120412EN-TMF	CNMG 433EN-TMF
	CNMG 120412EN-TMM	CNMG 433EN-TMM
	CNMG 120412EN-TMQ	CNMG 433EN-TMQ
	CNMG 120412EN-TRM	CNMG 433EN-TRM
	CNMG 120416EN-TM	CNMG 434EN-TM
	CNMG 120416EN-TRM	CNMG 434EN-TRM
	CNMG 160608EN-TM	CNMG 542EN-TM
	CNMG 160612EN-TM	CNMG 543EN-TM
	CNMG 160612EN-TMR	CNMG 543EN-TMR
	CNMG 160616EN-TRM	CNMG 544EN-TRM
	CNMG 190612EN-TM	CNMG 643EN-TM
	CNMG 190612EN-TMR	CNMG 643EN-TMR
	CNMG 190616EN-TMR	CNMG 644EN-TMR
CNMM	CNMM 120408EN-TR	CNMM 432EN-TR
	CNMM 120408SN-TRR	CNMM 432SN-TRR
	CNMM 120412EN-TR	CNMM 433EN-TR
	CNMM 120412SN-TRR	CNMM 433SN-TRR
	CNMM 160612EN-TR	CNMM 543EN-TR

	ISO	ANSI
	CNMM 160612SN-TRR	CNMM 543SN-TRR
	CNMM 160616EN-TR	CNMM 544EN-TR
	CNMM 160616SN-TRR	CNMM 544SN-TRR
	CNMM 190612EN-TR	CNMM 643EN-TR
	CNMM 190612SN-TRR	CNMM 643SN-TRR
	CNMM 190616EN-TR	CNMM 644EN-TR
	CNMM 190616SN-R80	CNMM 644SN-R80
	CNMM 190616SN-TRR	CNMM 644SN-TRR
	CNMM 190624SN-R80	CNMM 646SN-R80
CNMN	CNMN 090308FN	CNMN 322FN
	CNMN 090308TN-020D	CNMN 322TN-020D
	CNMN 090312TN-020D	CNMN 323TN-020D
	CNMN 090316TN-020D	CNMN 324TN-020D
	CNMN 120412FN	CNMN 433FN
	CNMN 120412TN-020D	CNMN 433TN-020D
	CNMN 120416FN	CNMN 434FN
	CNMN 120416TN-020D	CNMN 434TN-020D
CNMX	CNMX 120404SN	CNMX 431SN
	CNMX 120408EN	CNMX 432EN
	CNMX 120408SN	CNMX 432SN
	CNMX 120412SN	CNMX 433SN
	CNMX 120712SN-020D	CNMX 453SN-020D
	CNMX 120716SN-020D	CNMX 454SN-020D
	CNMX 190740SN	CNMX 65XSN-020D
DCGT	DCGT 070200FN-F23	DCGT 21.5X0FN-F23
	DCGT 070201EN-SF	DCGT 21.50EN-SF
	DCGT 070201FN	DCGT 21.50FN
	DCGT 070201FN-F23	DCGT 21.50FN-F23
	DCGT 070202EN-SF	DCGT 21.5.5EN-SF
	DCGT 070202EN-SM	DCGT 21.5.5EN-SM
	DCGT 070202FN	DCGT 21.5.5FN
	DCGT 070202FN-25P	DCGT 21.5.5FN-25P
	DCGT 070202FN-27	DCGT 21.5.5FN-27
	DCGT 070204EN-SF	DCGT 21.51EN-SF
	DCGT 070204FN	DCGT 21.51FN
	DCGT 070204FN-23P	DCGT 21.51FN-23P
	DCGT 070204FN-25P	DCGT 21.51FN-25P
	DCGT 070204FN-27	DCGT 21.51FN-27
	DCGT 11T300FN-F23	DCGT 32.5X0FN-F23
	DCGT 11T302EN-SF	DCGT 32.5.5EN-SF
	DCGT 11T302FN	DCGT 32.5.5FN
	DCGT 11T302FN-25P	DCGT 32.5.5FN-25P
	DCGT 11T302FN-27	DCGT 32.5.5FN-27
	DCGT 11T304EN-SF	DCGT 32.51EN-SF
	DCGT 11T304FL-25Q	DCGT 32.51FL-25Q
	DCGT 11T304FN	DCGT 32.51FN
	DNMG 150608EN-TMF	DNMG 442EN-TMF
	DNMG 150608EN-TMR	DNMG 442EN-TMR
	DNMG 150612EN-CF	DNMG 443EN-CF
	DNMG 150612EN-TF	DNMG 443EN-TF
	DNMG 150612EN-TFQ	DNMG 443EN-TFQ
	DNMG 150612EN-TM	DNMG 443EN-TM
	DNMG 150612EN-TM	DNMG 443EN-TM



	ISO	ANSI
	DNMG 150612EN-TMM	DNMG 443EN-TMM
	DNMG 150612EN-TMQ	DNMG 443EN-TMQ
	DNMG 150612EN-TMR	DNMG 443EN-TMR
	DNMG 150616EN-TM	DNMG 444EN-TM
	DNMG 150616EN-TMM	DNMG 444EN-TMM
	DNMG 150616EN-TMR	DNMG 444EN-TMR
	DNMG 150616EN-TRM	DNMG 444EN-TRM
DNMM	DNMM 150608EN-TR	DNMM 442EN-TR
	DNMM 150612EN-TR	DNMM 443EN-TR
DNMX	DNMX 150608SN	DNMX 442SN
	DNMX 150708SN-020D	DNMX 452SN-020D
	DNMX 150712SN-020D	DNMX 453SN-020D
	DNMX 150716SN-020D	DNMX 454SN-020D
ENGN	ENGN 130704TN-020D	ENGN 451TN-020D
	ENGN 130708TN-020D	ENGN 452TN-020D
	ENGN 130712SN-025E	ENGN 453TN-025D
	ENGN 130712TN-020D	ENGN 453TN-020D
	ENGN 130716SN-025E	ENGN 454TN-025E
	ENGN 130716SN-200C	ENGN 454TN-200C
	ENGN 130732TN-020D	ENGN 458TN-020D
KNUX	KNUX 160405EL-11	
	KNUX 160405EL-12	
	KNUX 160405ER-11	
	KNUX 160405ER-12	
	KNUX 160410EL-11	
	KNUX 160410EL-12	
	KNUX 160410ER-11	
	KNUX 160410ER-12	
LNMM	LNMM 6688PN-150CE	
RCGT	RCGT 0602MOEN-SM	
	RCGT 0602MOFN-27	
	RCGT 0803MOEN-SM	
	RCGT 0803MOFN-25P	
	RCGT 0803MOFN-27	
	RCGT 1003MOFN-27	
RCGX	RCGX 070400SN-050C	RCGX 2.53SN-050C
	RCGX 090700PN-075CF	RCGX 35PN-075CF
	RCGX 090700PN-100CF	RCGX 35PN-100CF
	RCGX 090700SN-200C	RCGX 35SN-200C
	RCGX 090700TN-020D	RCGX 35TN-020D
	RCGX 120700PN-100CF	RCGX 45PN-100CF
	RCGX 120700PN-150CF	RCGX 45PN-150CF
	RCGX 120700SN-200C	RCGX 45SN-200C
	RCGX 120700TN-020D	RCGX 45TN-020D
	RCGX 151000PN-100CF	RCGX 5(6.3)PN-100CF
	RCGX 151000PN-150CF	RCGX 5(6.3)PN-150CF
	RCGX 151000SN-200C	RCGX 5(6.3)SN-200C
	RCGX 191000PN-100CF	RCGX 6(6.3)PN-100CF
	RCGX 191000PN-200CF	RCGX 6(6.3)PN-200CF
	RCGX 191000SN-200C	RCGX 6(6.3)SN-200C
	RCGX 251200PN-100CF	RCGX 88PN-100CF
	RCGX 251200PN-200CF	RCGX 88PN-200CF
	RCGX 251200SN-200C	RCGX 88SN-200C

	ISO	ANSI
RCMT	RCMT 0803MOEN-25	
	RCMT 1003MOSN-SM	
	RCMT 1204MOSN-SM	
	RCMT 1606MOSN-SM	
	RCMT 2006MOSN-SM	
	RCMT 2507MOSN-SM	
	RCMT 3209MOSN-SM	
RNGN	RNGN 060400TN-020D	RNGN 23TN-020D
	RNGN 120400PN-150CF	RNGN 43PN-150CF
	RNGN 120700PN-150CF	RNGN 45PN-150CF
	RNGN 120700SN-020D	RNGN 45SN-020D
	RNGN 120700SN-200C	RNGN 45SN-200C
	RNGN 120700TN-020D	RNGN 45TN-020D
	RNGN 150700PN-150CE	RNGN 55PN-150CE
	RNGN 150700SN-200C	RNGN 55SN-200C
	RNGN 190700PN-100CF	RNGN 65PN-100CF
	RNGN 190700PN-150CE	RNGN 65PN-150CE
	RNGN 190700SN-200C	RNGN 65SN-200C
	RNGN 190700TN-020D	RNGN 65TN-020D
	RNGN 250700PN-100CF	RNGN 85PN-100CF
	RNGN 250700PN-200CE	RNGN 85PN-200CE
	RNGN 250700TN-020D	RNGN 85TN-020D
	RNGN 310900PN-100CF	RNGN 106PN-100CF
	RNGN 310900PN-215CF	RNGN 106PN-215CF
RNMN	RNMN 090300FN	RNMN 32FN
	RNMN 090300TN-020D	RNMN 32TN-020D
	RNMN 120300TN-020D	RNMN 42TN-020D
	RNMN 120400FN	RNMN 43FN
	RNMN 120400TN-020D	RNMN 43TN-020D
	RNMN 250400TN-050D	RNMN 83TN-050D
	RNMN 250600TN-050D	RNMN 84TN-050D
SCGT	SCGT 09T304EN-SF	SCGT 32.51EN-SF
	SCGT 09T308FN-27P	SCGT 32.52FN-27P
	SCGT 120408FN-25P	SCGT 432FN-25P
	SCGT 120408FN-27	SCGT 432FN-27
SCMT	SCMT 09T304EN-SF	SCMT 32.51EN-SF
	SCMT 09T304EN-SM	SCMT 32.51EN-SM
	SCMT 09T304EN-SMF	SCMT 32.51EN-SMF
	SCMT 09T308EN-SF	SCMT 32.52EN-SF
	SCMT 09T308EN-SM	SCMT 32.52EN-SM
	SCMT 09T308EN-SMF	SCMT 32.52EN-SMF
	SCMT 120408EN-SF	SCMT 432EN-SF
	SCMT 120408EN-SM	SCMT 432EN-SM
	SCMT 120408EN-SMF	SCMT 432EN-SMF
	SCMT 120412EN-SM	SCMT 433EN-SM
SCMX	SCMX 120408EN	SCMX 432EN
	SCMX 120412EN	SCMX 433EN
	SCMX 190612EN	SCMX 643EN
	SCMX 190616EN	SCMX 644EN
SNGA	SNGA 120408SN-025C	SNGA 432SN-025C
	SNGA 120412SN-025C	SNGA 433SN-025C
SNGN	SNGN 090308SN-025C	SNGN 322SN-025C
	SNGN 120408SN-015D	SNGN 432SN-015D



ISO	ANSI
SNGN 120408TN-020D	SNGN 432TN-020D
SNGN 120412PN-150CF	SNGN 433PN-150CF
SNGN 120412SN-015D	SNGN 433SN-015D
SNGN 120412TN-020D	SNGN 433TN-020D
SNGN 120716PN-100CF	SNGN 454PN-100CF
SNGN 120716PN-150CF	SNGN 454PN-150CF
SNGN 120716SN-025C	SNGN 454SN-025C
SNGN 120716SN-200C	SNGN 454SN-200C
SNGN 120720PN-100CF	SNGN 455PN-100CF
SNGN 120720PN-150CF	SNGN 455PN-150CF
SNGN 120720SN-200C	SNGN 455SN-200C
SNGN 120730PN-028C	SNGN 457.5PN-028C
SNGN 150712TN-020D	SNGN 553TN-020D
SNGN 150716PN-150CF	SNGN 554PN-150CF
SNGN 150720SN-200C	SNGN 555SN-200C
SNGN 190716PN-150CF	SNGN 654PN-150CF
SNGN 190716SN-025E	SNGN 654SN-025E
SNGN 190716TN-020D	SNGN 654TN-020D
SNGN 190720PN-100CF	SNGN 655PN-100CF
SNGN 190720SN-200C	SNGN 655SN-200C
SNGN 190720TN-020D	SNGN 655TN-020D
SNGN 250724PN-100CF	SNGN 856PN-100CF
SNGN 250724PN-150CE	SNGN 856PN-150CE
SNGN 250724SN-050C	SNGN 856SN-050C
SNGN 250724SN-200C	SNGN 856SN-200C
SNGN 250924PN-100CF	SNGN 866PN-100CF
SNGN 250924PN-150CE	SNGN 866PN-150CE
SNGN 250924SN-030E	SNGN 866SN-030E
SNGN 250924SN-200C	SNGN 866SN-200C
SNGN 250924TN-020D	SNGN 866TN-020D
SNMA 120408EN	SNMA 432EN
SNMA 120412TN-020D	SNMA 433TN-020D
SNMA 120416EN	SNMA 434EN
SNMA 150616EN	SNMA 544EN
SNMA 190616EN	SNMA 644EN
SNMG 090308EN	SNMG 322EN
SNMG 120404EN-TF	SNMG 431EN-TF
SNMG 120408EN-M42	SNMG 432EN-M42
SNMG 120408EN-M52	SNMG 432EN-M52
SNMG 120408EN-TM	SNMG 432EN-TM
SNMG 120408EN-TMF	SNMG 432EN-TMF
SNMG 120412EN-M42	SNMG 433EN-M42
SNMG 120412EN-TM	SNMG 433EN-TM
SNMG 120412EN-TMF	SNMG 433EN-TMF
SNMG 120412EN-TMR	SNMG 433EN-TMR
SNMG 120412EN-TRM	SNMG 433EN-TRM
SNMG 120416EN-TM	SNMG 434EN-TM
SNMG 120416EN-TMR	SNMG 434EN-TMR
SNMG 150612EN-TMR	SNMG 543EN-TMR
SNMG 150616EN-TMR	SNMG 544EN-TMR
SNMG 190612EN-TMR	SNMG 643EN-TMR
SNMG 190616EN-TMR	SNMG 644EN-TMR
SNMM 120408EN-TR	SNMM 432EN-TR

ISO	ANSI
SNMM 120408EN-TUB	SNMM 432EN-TUB
SNMM 120412EN-TR	SNMM 433EN-TR
SNMM 150612EN-TR	SNMM 543EN-TR
SNMM 190612EN-TUB	SNMM 643EN-TUB
SNMM 190616EN-TR	SNMM 644EN-TR
SNMM 190616SN-TRR	SNMM 644SN-TRR
SNMM 250724EN-TR	SNMM 856EN-TR
SNMM 250724SN-TRR	SNMM 856SN-TRR
SNMN 090308FN	SNMN 322FN
SNMN 090308TN-020D	SNMN 322TN-020D
SNMN 090312FN	SNMN 323FN
SNMN 090312TN-020D	SNMN 323TN-020D
SNMN 090316FN	SNMN 324FN
SNMN 090316TN-020D	SNMN 324TN-020D
SNMN 120312FN	SNMN 423FN
SNMN 120312TN-020D	SNMN 423TN-020D
SNMN 120316FN	SNMN 424FN
SNMN 120316TN-020D	SNMN 424TN-020D
SNMN 120412FN	SNMN 433FN
SNMN 120412TN-020D	SNMN 433TN-020D
SNMN 120416FN	SNMN 434FN
SNMN 120416TN-020D	SNMN 434TN-020D
SNMX 120712SN-020D	SNMX 453SN-020D
SNMX 120716SN-020D	SNMX 454SN-020D
SNUN 120412EN	SNUN 433EN
SNUN 120416EN	SNUN 434EN
SPMR 090304EN	SPMR 321EN
SPMR 090308EN-57	SPMR 322EN-57
SPMR 120304EN	SPMR 421EN
SPMR 120308EN	SPMR 422EN
SPMR 120308ER	SPMR 422ER
SPUN 120308EN	SPUN 422EN
SPUN 120312EN	SPUN 423EN
TCGT 090202FN	TCGT 1.81.5FN
TCGT 090204FN	TCGT 1.81.51FN
TCGT 110202EN-SF	TCGT 21.5.5EN-SF
TCGT 110202EN-SM	TCGT 21.5.5EN-SM
TCGT 110202FN-27	TCGT 21.5.5FN-27
TCGT 110204EN-SF	TCGT 21.51EN-SF
TCGT 110204FN	TCGT 21.51FN
TCGT 110204FN-27	TCGT 21.51FN-27
TCGT 110208EN-SF	TCGT 21.52EN-SF
TCGT 110208FN	TCGT 21.52FN
TCGT 16T302FN-27	TCGT 32.5.5FN-27
TCGT 16T304EN-SF	TCGT 32.51EN-SF
TCGT 16T304FN	TCGT 32.51FN
TCGT 16T304FN-27	TCGT 32.51FN-27
TCGT 16T308EN-SF	TCGT 32.52EN-SF
TCGT 16T308FN	TCGT 32.52FN
TCGT 16T308FN-27	TCGT 32.52FN-27
TCMT 090204EN-SM	TCMT 1.81.51EN-SM
TCMT 110204EN-F43	TCMT 21.51EN-F43
TCMT 110204EN-SF	TCMT 21.51EN-SF



	ISO	ANSI
	TCMT 110204EN-SM	TCMT 21.51EN-SM
	TCMT 110204EN-SMF	TCMT 21.51EN-SMF
	TCMT 110208EN-SF	TCMT 21.52EN-SF
	TCMT 110208EN-SM	TCMT 21.52EN-SM
	TCMT 110208EN-SMF	TCMT 21.52EN-SMF
	TCMT 16T304EN-F43	TCMT 32.51EN-F43
	TCMT 16T304EN-SF	TCMT 32.51EN-SF
	TCMT 16T304EN-SM	TCMT 32.51EN-SM
	TCMT 16T304EN-SMF	TCMT 32.51EN-SMF
	TCMT 16T308EN-F43	TCMT 32.52EN-F43
	TCMT 16T308EN-SF	TCMT 32.52EN-SF
	TCMT 16T308EN-SM	TCMT 32.52EN-SM
	TCMT 16T308EN-SMF	TCMT 32.52EN-SMF
	TCMT 220408EN-SM	TCMT 432EN-SM
TCMW	TCMW 16T304FN	TCMW 32.51FN
TCMX	TCMX 160404EN	TCMX 331EN
	TCMX 160408EN	TCMX 332EN
	TCMX 160412EN	TCMX 333EN
	TCMX 220404EN	TCMX 431EN
	TCMX 220408EN	TCMX 432EN
	TCMX 220412EN	TCMX 433EN
TNGA	TNGA 160408TN-020D	TNGA 332TN-020D
TNGN	TNGN 110308TN-020D	TNGN 222TN-020D
	TNGN 160408TN-020D	TNGN 332TN-020D
	TNGN 220408TN-020D	TNGN 432TN-020D
TNMA	TNMA 160408EN	TNMA 332EN
	TNMA 160412EN	TNMA 333EN
	TNMA 220408EN	TNMA 432EN
	TNMA 220412EN	TNMA 433EN
	TNMA 220416EN	TNMA 434EN
TNMG	TNMG 110302EN	TNMG 22.5EN
	TNMG 110304EN-TF	TNMG 221EN-TF
	TNMG 160404EN-CF	TNMG 331EN-CF
	TNMG 160404EN-M42	TNMG 331EN-M42
	TNMG 160404EN-M52	TNMG 331EN-M52
	TNMG 160404EN-TF	TNMG 331EN-TF
	TNMG 160404EN-TMF	TNMG 331EN-TMF
	TNMG 160404ER	TNMG 331ER
	TNMG 160408EL	TNMG 332EL
	TNMG 160408EN-CF	TNMG 332EN-CF
	TNMG 160408EN-M42	TNMG 332EN-M42
	TNMG 160408EN-M52	TNMG 332EN-M52
	TNMG 160408EN-TF	TNMG 332EN-TF
	TNMG 160408EN-TM	TNMG 332EN-TM
	TNMG 160408EN-TMF	TNMG 332EN-TMF
	TNMG 160408EN-TMR	TNMG 332EN-TMR
	TNMG 160408ER	TNMG 332ER
	TNMG 160412EN-CF	TNMG 333EN-CF
	TNMG 160412EN-TF	TNMG 333EN-TF
	TNMG 160412EN-TM	TNMG 333EN-TM
	TNMG 160412EN-TMF	TNMG 333EN-TMF
	TNMG 160412EN-TMR	TNMG 333EN-TMR
	TNMG 160412EN-TRM	TNMG 333EN-TRM

	ISO	ANSI
	TNMG 220408EN-TM	TNMG 432EN-TM
	TNMG 220408EN-TMR	TNMG 432EN-TMR
	TNMG 220408EN-TRM	TNMG 432EN-TRM
	TNMG 220412EN-TM	TNMG 433EN-TM
	TNMG 220412EN-TMR	TNMG 433EN-TMR
	TNMG 220412EN-TRM	TNMG 433EN-TRM
	TNMG 220416EN-TM	TNMG 434EN-TM
	TNMG 220416EN-TMR	TNMG 434EN-TMR
	TNMG 220416EN-TRM	TNMG 434EN-TRM
TNMM	TNMM 160408EN-TR	TNMM 332EN-TR
	TNMM 160408SN-TRR	TNMM 332SN-TRR
	TNMM 160412EN-TR	TNMM 333EN-TR
	TNMM 220408EN-TR	TNMM 432EN-TR
	TNMM 220412EN-TR	TNMM 433EN-TR
	TNMM 220412SN-TRR	TNMM 433SN-TRR
	TNMM 220416EN-TR	TNMM 434EN-TR
	TNMM 270612EN-TUB	TNMM 543EN-TUB
	TNMM 270616EN-TR	TNMM 544EN-TR
TNMMN	TNMMN 110304FN	TNMMN 221FN
	TNMMN 110304TN-020D	TNMMN 221TN-020D
	TNMMN 110308FN	TNMMN 222FN
	TNMMN 110308TN-020D	TNMMN 222TN-020D
	TNMMN 110312TN-020D	TNMMN 223TN-020D
TNMX	TNMX 160408SN	TNMX 332SN
TNUN	TNUN 160308EN	TNUN 322EN
	TNUN 160412EN	TNUN 333EN
	TNUN 160416EN	TNUN 334EN
TPGN	TPGN 160304TN-020D	TPGN 321TN-020D
TPMR	TPMR 110304EL	TPMR 221EL
	TPMR 110304EN	TPMR 221EN
	TPMR 110304ER	TPMR 221ER
	TPMR 110308EN	TPMR 222EN
	TPMR 160304EL	TPMR 321EL
	TPMR 160304EN	TPMR 321EN
	TPMR 160304ER	TPMR 321ER
	TPMR 160308EL	TPMR 322EL
	TPMR 160308EN	TPMR 322EN
	TPMR 160308EN-57	TPMR 322EN-57
	TPMR 160308ER	TPMR 322ER
TPUN	TPUN 110304EN	TPUN 221EN
	TPUN 110308EN	TPUN 222EN
	TPUN 160304EN	TPUN 321EN
	TPUN 160304FN	TPUN 321FN
	TPUN 160308EN	TPUN 322EN
	TPUN 160308FN	TPUN 322FN
	TPUN 160312EN	TPUN 323EN
	TPUN 220408EN	TPUN 432EN
	TPUN 220412EN	TPUN 433EN
VCGT	VCGT 110300FN-F23	VCGT 22X0FN-F23
	VCGT 110301EN-SF	VCGT 220EN-SF
	VCGT 110301FN-F23	VCGT 220FN-F23
	VCGT 110302EN-SF	VCGT 220.5EN-SF
	VCGT 110302EN-SMF	VCGT 22.5EN-SMF



	ISO	ANSI
	VCGT 110302FN-25P	VCGT 220.5FN-25P
	VCGT 110302FN-27	VCGT 22.5FN-27
	VCGT 110304EN-SF	VCGT 221EN-SF
	VCGT 110304FL-25Q	VCGT 221FL-25Q
	VCGT 110304FN-25P	VCGT 221FN-25P
	VCGT 110304FN-27	VCGT 221FN-27
	VCGT 110304FR-25Q	VCGT 221FR-25Q
	VCGT 110308EN-SF	VCGT 222EN-SF
	VCGT 110308FN-27	VCGT 222FN-27
	VCGT 160400FN-F23	VCGT 33X0FN-F23
	VCGT 160401FN-F23	VCGT 330FN-F23
	VCGT 160404EN-SF	VCGT 331EN-SF
	VCGT 160404FN-25P	VCGT 331FN-25P
	VCGT 160404FN-27	VCGT 331FN-27
	VCGT 160408EN-SF	VCGT 332EN-SF
	VCGT 160408FN-25P	VCGT 332FN-25P
	VCGT 160408FN-27	VCGT 332FN-27
	VCGT 160412FN-25P	VCGT 333FN-25P
	VCGT 160412FN-27	VCGT 333FN-27
	VCGT 220530FN-25P	VCGT 43.57.5FN-25P
	VCGT 220530FN-27	VCGT 43.57.5FN-27
VCMT	VCMT 110304EN-SMF	VCMT 221EN-SMF
	VCMT 160404EN-29	VCMT 331EN-29
	VCMT 160404EN-SF	VCMT 331EN-SF
	VCMT 160404EN-SM	VCMT 331EN-SM
	VCMT 160404EN-SMF	VCMT 331EN-SMF
	VCMT 160406EN-SM	
	VCMT 160408EN-29	VCMT 332EN-29
	VCMT 160408EN-SF	VCMT 332EN-SF
	VCMT 160408EN-SM	VCMT 332EN-SM
	VCMT 160408EN-SMF	VCMT 332EN-SMF
	VCMT 160412EN-25	VCMT 333EN-25
	VCMT 160412EN-29	VCMT 333EN-29
	VCMT 160412EN-SM	VCMT 333EN-SM
	VCMT 220530EN-25	VCMT 447EN-25
VCMW	VCMW 160404FN	VCMW 331FN
VCUW	VCUW 160404FL	VCUW 331FL
	VCUW 160404FN	VCUW 331FN
	VCUW 160404FR	VCUW 331FR
	VCUW 160408FL	VCUW 332FL
	VCUW 160408FN	VCUW 332FN
	VCUW 160408FN-F3	VCUW 332FN-F3
	VCUW 160408FN-M4	VCUW 332FN-M4
	VCUW 160408FR	VCUW 332FR
	VCUW 160412FN	VCUW 333FN
	VCUW 160412FN-F3	VCUW 333FN-F3
	VCUW 160412FN-M4	VCUW 333FN-M4
	VCUW 160412TN-M4	VCUW 333TN-M4
	VCUW 160416FN	VCUW 334FN
	VCUW 220530FN	VCUW 43.57.5FN
	VCUW 220530FN-M4	VCUW 43.57.5FN-M4
VNGA	VNGA 160408TN-020D	VNGA 332TN-020D
	VNGA 160412TN-020D	VNGA 333TN-020D

	ISO	ANSI
VNGP	VNGP 160402FN-F32	VNGP 33.5FN-F32
	VNGP 160404FN-F32	VNGP 331FN-F32
VNMG	VNMG 160404EN-F40	VNMG 331EN-F40
	VNMG 160404EN-M40	VNMG 331EN-M40
	VNMG 160408EN-F40	VNMG 332EN-F40
	VNMG 160408EN-M40	VNMG 332EN-M40
VPGT	VPGT 220516FN-25P	VPGT 444FN-25P
	VPGT 220516FN-27	VPGT 43.54FN-27
VPMT	VPMT 220516EN-25	VPMT 43.54EN-25
VPUW	VPUW 220516FN-F3	VPUW 43.54FN-F3
	VPUW 220516FN-M4	VPUW 43.54FN-M4
	VPUW 220612FN-F3	VPUW443FN-F3
WNMG	WNMG 060404EN-CF	WNMG 231EN-CF
	WNMG 060404EN-M42	WNMG 231EN-M42
	WNMG 060404EN-M52	WNMG 231EN-M52
	WNMG 060404EN-TF	WNMG 231EN-TF
	WNMG 060404EN-TFQ	WNMG 331EN-TFQ
	WNMG 060404EN-TMF	WNMG 231EN-TMF
	WNMG 060408EN-CF	WNMG 232EN-CF
	WNMG 060408EN-M42	WNMG 232EN-M42
	WNMG 060408EN-M52	WNMG 232EN-M52
	WNMG 060408EN-TFQ	WNMG 332EN-TFQ
	WNMG 060408EN-TM	WNMG 232EN-TM
	WNMG 060408EN-TMF	WNMG 232EN-TMF
	WNMG 060408EN-TMM	WNMG 232EN-TMM
	WNMG 060408EN-TRM	WNMG 232EN-TRM
	WNMG 060412EN-TMF	WNMG 233EN-TMF
	WNMG 060412EN-TRM	WNMG 233EN-TRM
	WNMG 080404EN-M42	WNMG 431EN-M42
	WNMG 080404EN-M52	WNMG 431EN-M52
	WNMG 080404EN-TF	WNMG 431EN-TF
	WNMG 080404EN-TFQ	WNMG 431EN-TFQ
	WNMG 080404EN-TMF	WNMG 431EN-TMF
	WNMG 080408EN-CF	WNMG 432EN-CF
	WNMG 080408EN-M42	WNMG 432EN-M42
	WNMG 080408EN-M52	WNMG 432EN-M52
	WNMG 080408EN-TF	WNMG 432EN-TF
	WNMG 080408EN-TFQ	WNMG 432EN-TFQ
	WNMG 080408EN-TM	WNMG 432EN-TM
	WNMG 080408EN-TMF	WNMG 432EN-TMF
	WNMG 080408EN-TMM	WNMG 432EN-TMM
	WNMG 080408EN-TMQ	WNMG 432EN-TMQ
	WNMG 080408EN-TMR	WNMG 432EN-TMR
	WNMG 080408EN-TMR	WNMG 432EN-TMR
	WNMG 080412EN-CF	WNMG 433EN-CF
	WNMG 080412EN-M42	WNMG 433EN-M42
	WNMG 080412EN-TFQ	WNMG 433EN-TFQ
	WNMG 080412EN-TM	WNMG 433EN-TM
	WNMG 080412EN-TMF	WNMG 433EN-TMF
	WNMG 080412EN-TMM	WNMG 433EN-TMM
	WNMG 080412EN-TMQ	WNMG 433EN-TMQ
	WNMG 080412EN-TMR	WNMG 433EN-TMR
	WNMG 080412EN-TMR	WNMG 433EN-TMR
	WNMG 080412EN-TRM	WNMG 433EN-TRM



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
		pearlitic	20	230	
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Uncoated carbide			
H10T	H210T	H216T	CTW7120
v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
394 - 525	455 - 656	394 - 525	–
294 - 458	328 - 525	294 - 458	–
425 - 558	522 - 656	425 - 558	–
294 - 425	361 - 492	294 - 425	–
458 - 656	525 - 722	458 - 656	–
394 - 525	458 - 589	394 - 525	–
984 - 11480	984 - 9840	984 - 11480	328 - 1640
656 - 6560	656 - 8200	656 - 6560	328 - 984
1312 - 4920	1312 - 6560	1312 - 4920	328 - 1640
1312 - 4920	1312 - 5904	1312 - 4920	328 - 984
656 - 2624	656 - 3280	656 - 2624	328 - 984
820 - 1968	820 - 2624	820 - 1968	328 - 1640
656 - 1968	656 - 2624	656 - 1968	328 - 1640
492 - 1312	492 - 1968	492 - 1312	328 - 984
492 - 984	492 - 1312	492 - 984	328 - 984
261 - 589	328 - 7216	261 - 589	261 - 589
197 - 492	263 - 656	197 - 492	197 - 492
328 - 820	328 - 656	328 - 820	328 - 820
–	115 - 164	–	–
–	82 - 130	–	–
–	82 - 130	–	–
–	66 - 97	–	–
–	48 - 82	–	–
–	261 - 458	–	164 - 394
–	130 - 328	–	97 - 164
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Coated carbide							
AMZ v_c [sfpm]	CTP4115 v_c [sfpm]	CTP5110 v_c [sfpm]	CTC3110 v_c [sfpm]	CTCK120 v_c [sfpm]	CTP5115 v_c [sfpm]	CTCP115 v_c [sfpm]	CTP2120 v_c [sfpm]
361 - 525	–	–	–	754 - 1476	–	853 - 1640	–
294 - 458	–	–	–	656 - 1115	–	722 - 1312	–
261 - 394	–	–	–	525 - 886	–	590 - 984	–
294 - 425	–	–	–	656 - 1181	–	853 - 1312	–
261 - 394	–	–	–	492 - 951	–	656 - 1050	–
230 - 291	–	–	–	426 - 853	–	492 - 918	–
294 - 361	–	–	–	492 - 951	–	590 - 1050	–
230 - 294	–	–	–	328 - 853	–	394 - 918	–
525 - 722	–	–	–	525 - 951	–	656 - 1050	–
230 - 361	–	–	–	426 - 820	–	492 - 918	–
–	–	488 - 748	–	–	423 - 715	722 - 984	492 - 656
294 - 458	–	455 - 618	–	–	390 - 585	–	394 - 656
–	–	195 - 325	–	–	163 - 293	–	294 - 525
–	–	–	–	–	–	–	197 - 263
589 - 722	–	–	820 - 1476	492 - 1312	–	459 - 1214	394 - 525
458 - 589	–	–	722 - 1138	590 - 1148	–	459 - 1082	294 - 425
525 - 722	–	–	722 - 1235	656 - 1476	–	623 - 1410	394 - 525
394 - 589	–	–	650 - 4138	525 - 984	–	459 - 886	394 - 589
589 - 786	–	–	650 - 1312	656 - 1804	–	590 - 1706	458 - 722
525 - 656	–	–	589 - 1040	525 - 1148	–	492 - 1082	361 - 525
984 - 1050	975 - 11375	–	–	–	–	–	328 - 1968
656 - 9184	650 - 9100	–	–	–	–	–	328 - 1312
1312 - 6560	1300 - 9750	–	–	–	–	–	328 - 1968
1312 - 6560	1300 - 9700	–	–	–	–	–	328 - 1312
656 - 3936	650 - 6500	–	–	–	–	–	328 - 1312
82 - 3280	813 - 3250	–	–	–	–	–	328 - 1968
656 - 3280	650 - 3250	–	–	–	–	–	328 - 1968
492 - 2624	488 - 2600	–	–	–	–	–	328 - 1312
492 - 1640	488 - 1625	–	–	–	–	–	328 - 1312
261 - 656	260 - 650	–	–	–	–	–	–
261 - 722	260 - 715	–	–	–	–	–	–
328 - 1050	325 - 1040	–	–	–	–	–	–
97 - 164	–	260 - 390	–	–	260 - 390	–	66 - 164
66 - 130	–	195 - 325	–	–	195 - 325	–	66 - 164
57 - 130	–	114 - 293	–	–	114 - 293	–	48 - 130
58 - 97	–	98 - 163	–	–	98 - 163	–	66 - 115
48 - 82	–	98 - 146	–	–	98 - 146	–	33 - 82
261 - 458	–	228 - 390	–	–	228 - 390	–	261 - 455
130 - 328	–	130 - 228	–	–	130 - 228	–	82 - 145
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Coated carbide			
CTCP125	CTPM125	CTC1135	CTC2135
v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]
618 - 943	394 - 918	585 - 748	585 - 748
553 - 780	426 - 820	553 - 618	553 - 618
423 - 650	328 - 590	423 - 488	423 - 488
553 - 813	426 - 656	553 - 618	553 - 618
325 - 618	197 - 590	293 - 488	293 - 488
260 - 553	164 - 492	228 - 423	228 - 423
423 - 683	262 - 656	390 - 650	390 - 650
260 - 520	131 - 459	163 - 325	163 - 325
423 - 715	328 - 656	455 - 585	455 - 585
358 - 618	262 - 492	358 - 520	358 - 520
455 - 683	394 - 820	455 - 650	455 - 650
325 - 683	328 - 722	358 - 618	358 - 618
–	197 - 525	260 - 488	260 - 488
228 - 325	131 - 328	179 - 244	179 - 244
423 - 683	–	–	–
390 - 650	–	–	–
390 - 780	–	–	–
390 - 650	–	–	–
488 - 813	–	–	–
390 - 650	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
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–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	65 - 130
–	–	–	49 - 114
–	–	–	26 - 82
–	–	–	13 - 49
–	–	–	13 - 49
–	–	–	260 - 423
–	–	–	49 - 114
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Cermet			CBN			PCD	
TCC410	TCM407	TCM10	TA100	TA120	TA201	CTD4110	CTD4125
v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]
1312 - 1706	11141409	917 - 1148	-	-	-	-	-
1148 - 1312	950 - 1114	753 - 886	-	-	-	-	-
984 - 1148	786 - 950	622 - 786	-	-	-	-	-
1312 - 1440	1050 - 1181	853 - 984	-	-	-	-	-
984 - 1180	753 - 917	589 - 753	-	-	-	-	-
820 - 984	656 - 820	458 - 722	-	-	-	-	-
1017 - 1245	820 - 1017	525 - 656	-	-	-	-	-
917 - 1312	753 - 1081	525 - 656	-	-	-	-	-
1148 - 1312	917 - 1114	753 - 886	-	-	-	-	-
851 - 1017	689 - 820	558 - 820	-	-	-	-	-
820 - 1050	656 - 853	556 - 786	-	-	-	-	-
984 - 1148	820 - 917	656 - 786	-	-	-	-	-
-	-	-	-	-	-	-	-
689 - 820	525 - 656	425 - 525	-	-	-	-	-
1114 - 1573	-	-	-	-	-	-	-
853 - 1180	-	-	1640 - 4920	1640 - 4920	-	-	-
1181 - 1706	917 - 1398	722 - 984	-	-	-	-	-
984 - 1312	820 - 1245	589 - 820	**656 - 2296	**656 - 2296	**656 - 2296	-	-
1081 - 1640	820 - 1312	820 - 1148	-	-	-	-	-
589 - 1050	589 - 1050	525 - 820	-	-	-	-	-
-	-	-	-	-	-	984 - 13120	984 - 13120
-	-	-	-	-	-	984 - 4920	984 - 4920
-	-	-	-	-	-	984 - 13120	984 - 13120
-	-	-	-	-	-	984 - 6560	984 - 6560
-	-	-	-	-	-	656 - 2296	656 - 2296
-	-	-	-	-	-	-	-
-	-	-	-	-	-	328 - 2296	328 - 2296
-	-	-	-	-	-	328 - 4920	328 - 4920
-	-	-	-	-	-	984 - 9840	984 - 9840
-	-	-	-	-	-	261 - 984	261 - 984
-	-	-	-	-	-	261 - 984	261 - 984
-	-	-	-	-	-	164 - 656	164 - 656
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	328 - 820	-	-
-	-	-	-	-	328 - 820	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	230 - 820	-	-
-	-	-	-	-	230 - 820	-	-
-	-	-	-	-	-	-	-
-	-	-	130 - 394	130 - 394	-	-	-

** From cast iron GGG60 onwards



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC


* R_m = ultimate tensile strength, measured in MPa










Si ₃ N ₄			Sialon	Ceramic
CTN3105	CTN3110	CTM3110	CTI3105	CTS3105
v _c [sfpm]	v _c [sfpm]	v _c [sfpm]	v _c [sfpm]	v _c [sfpm]
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
984 - 4920	1640 - 3608	1640 - 3608	1950 - 3900	***1312-3936
656 - 2624	984 - 2624	984 - 2624	1950 - 3900	***492-1640
656 - 2296	656 - 1968	656 - 1968	975 - 2275	***820-1968
656 - 2296	820 - 1476	820 - 1476	-	-
984 - 3280	984 - 2624	984 - 2624	-	-
820 - 2296	820 - 1968	820 - 1968	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
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-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	1312 - 656
-	-	-	-	97 - 589
-	-	-	-	230 - 656
-	-	-	-	197 - 2306





*** Only for finishing



	Material	Type, description	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11149570	DMSD 3,2Nm/SORT T15	T15	3,2	28,3
	11149571	DMSD 4,0Nm/SORT T20	T20	4,0	35,4

	Material	Type, description	Key size
	154461	7802180/A 2,2	A2,2
	154463	7802181/A 3,1	A3,1
	154464	7802182/A 8,2	A8,2
	11366865	10005884/S12-3	S12-3
	11366866	10001365/S15-4	S15-4
	11206195	10002494/TORX 08IP F	T08IP
	11488748	10007404/TORX 07IP F	T07IP
	11843205	10014921/TORX 06IP F	T06IP
	11843208	10014922/TORX 09IP F	T09IP
	4496	7812301/SW 5	SW5
	4497	7812302/SW 6	SW6
	11450858	10006919/TORX 15IP	T15IP
	11816974	10013909/TORX 20IP	T20IP
	291576	7883306/TORX T10	T10
	56656	7724106/TORX T08	T08
	200317	7883304/TORX T25 T	T25
	220983	7897208/TORX T15 T	T15
	220985	7897207/TORX T20 T	T20

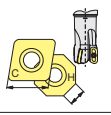



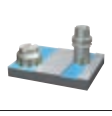
	Material	Type, description	Length	Thread size	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11227305	M3,0x7,0-09IP/10003007	7.0	M3,0	T09IP	2,2	19,5
	11610311	M3,5X8,6-15IP/10008749	8.6	M3,5	T15IP	3,2	28,3
	11684214	M2,2x5,0-07IP/10009244	5.0	M2,2	T07IP	1,0	8,9
	11684216	M2,5x6,0-08IP/10009243	6.0	M2,5	T08IP	1,2	10,6
	11801441	M4,5X10,5-20IP/10013040	10.5	M4,5	T20IP	5,0	44,3
	11807480	M2,0x4,3-06IP/10013332	4.3	M2,0	T06IP	0,7	6,2
	11807484	M1,8x3,6-06IP/10013338	3.6	M1,8	T06IP	0,4	3,6

	Material	Type, description	Length	Thread size	Key size
	310720	7897990/M8X1X8 DIN913	8.0	M8	SW4
	219981	7897209/M4,0X11/T15	11	M4	T15
	219982	7897210/M5,0X13,5/T20	13.5	M5	T20
	195068	7897203/M4,0X14/T15	14	M4	T15
	195069	7897205/M5,0X18/T20	18	M5	T20
	195070	7897206/M6,0X20/T25	20	M6	T25
	228617	7897200/M2,5X10/T08	10	M2,5	T08
	228619	7897201/M3,0X11/T10	11	M3	T15
	228620	7897202/M3,5X12,5/T15	12.5	M3,5	T15
	228621	7897204/M4,5X17/T20	17	M4,5	T20
	11007006	7897218/M4,0X18/T20	18	M4	T20
	11081190	7897221/M3,5X14,0/T15	16.5	M3,5	T15
	22485	7802115/M6X25 DIN 912	25	M6	SW5
	229126	7897213/M6X20 12.9 DIN 912	20	M6	SW5
	229131	7897211/M4X12 DIN 912 - 12.9	12	M4	SW3
	284518	7818319/M5,0X16,0/DIN912-12.9	16	M5	SW4
81158	7802133/M8X35 DIN 912	35	M8	SW6	

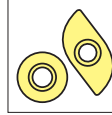
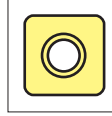

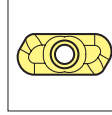
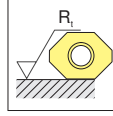








Introduction

	Designation system	B4-B9
	MasterGuide	B10-B11
	Grade overview and description	B12-B25
	Chip grooves	B26-B27
	Milling systems	B28

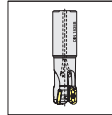
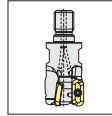
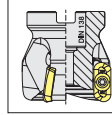
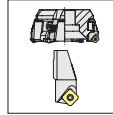
Inserts

	R	B49-B51
	S	B52-B56
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	X	B58-B61
	OD / SP / XA / XD	B62-B63

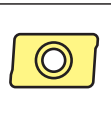
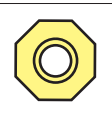
Application

	Face milling	B36-B37
	Shoulder milling	B38-B39
	Form milling	B40
	Profile milling	B41

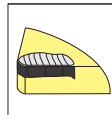

Tools

	MaxiMill end mills	B66-B74
	MaxiMill milling cutters with threaded shank	B75-B77
	MaxiMill shell milling cutters	B78
	MaxiMill cassette milling cutters	B102

Inserts


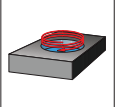

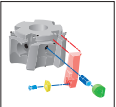
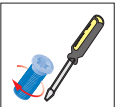

	A	B44
	O	B47-B48

Technical information

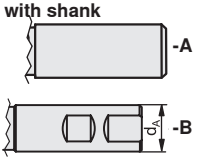
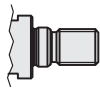
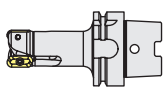
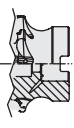

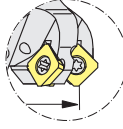
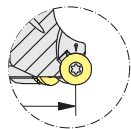
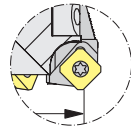
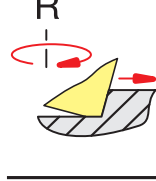
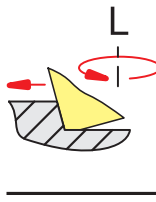
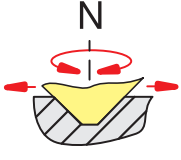
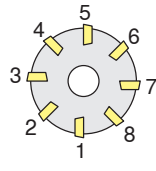
	Types of wear	B105-B111
	Comparison of materials	B113-B120



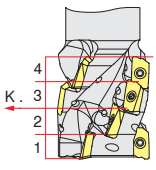
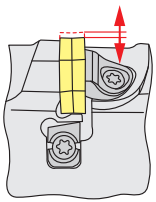
Technical information

	Cutting data	B121
	Application data	B134-B160
	High speed cutting (HSC)	B161-B169
	Setting possibilities	B170
	Spare parts	B171
	Guidelines	B172-B176



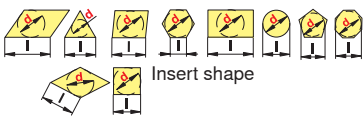
<p>C= with shank</p>  <p>G= with thread</p>  <p>M= monoblock</p>  <p>A= with hole</p>  <p>Connection, interface</p>	<p>shoulder/slot cutters</p>  <p>face milling cutters</p>  <p>button insert cutters</p>  <p>cassette cutters</p>  <p>Diameter</p>	<p>R</p>  <p>L</p>  <p>N</p>  <p>Cutting direction</p>	<p>Effective number of cutting edges</p> 	<p>* only when a distinction is necessary</p> <p>A = with adjustable inserts</p> <p>(B* = irregular pitch)</p>
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C 211 . 125 . R . 02 K 4 A 3 1

<p>System</p> <p>270 = face milling cutters 271 = face milling cutters 273 = face milling cutters 274 = face milling cutters 272 = chamfering cutters 251 = button insert cutters 252 = button insert cutters 260 = cassette cutters 211 = shoulder/slot cutters 141 = shoulder/slot cutters 241 = shoulder/slot cutters 490 = shoulder/slot cutters HSC = high-speed cutters HEC = high-efficiency cutters HFC = high-feed cutters</p>	<p>$d_1 = \text{inch}$</p> <ul style="list-style-type: none"> • • • 063 = 5/8" • • 100 = 1" • • 125 = 1 1/4" • • 250 = 2 1/2" • 350 = 3 1/2" • 500 = 5" • • • 1000 = 10" 	<p>Number of insert rows</p> <p>(only porcupine cutters)</p> 	<p>Number of adjustable inserts</p> <p>(only axially adjustable tools)</p> 
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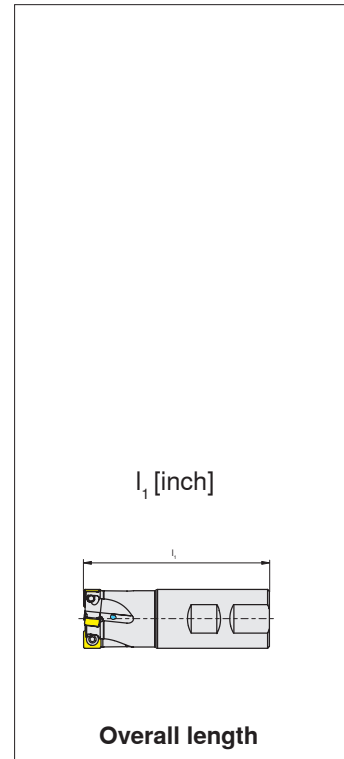
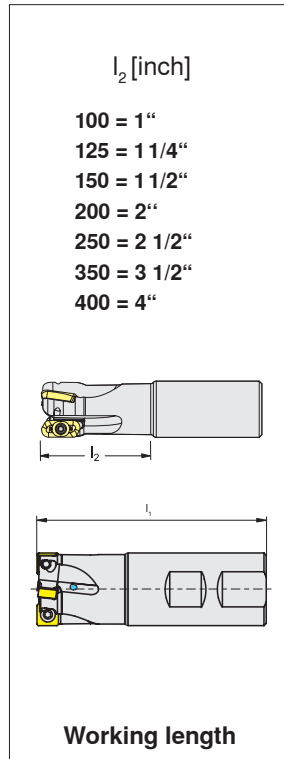
A T/V C/S H L R W



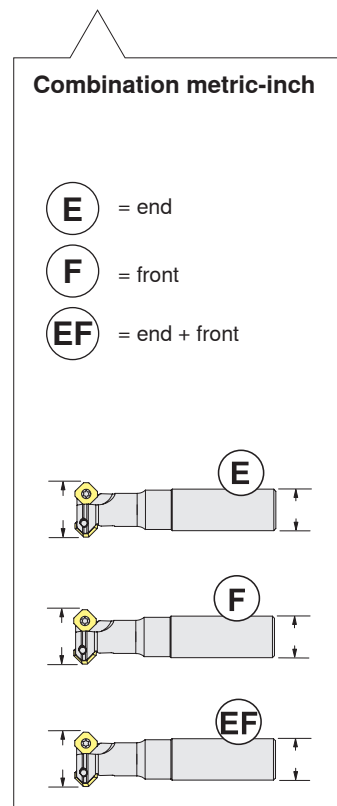
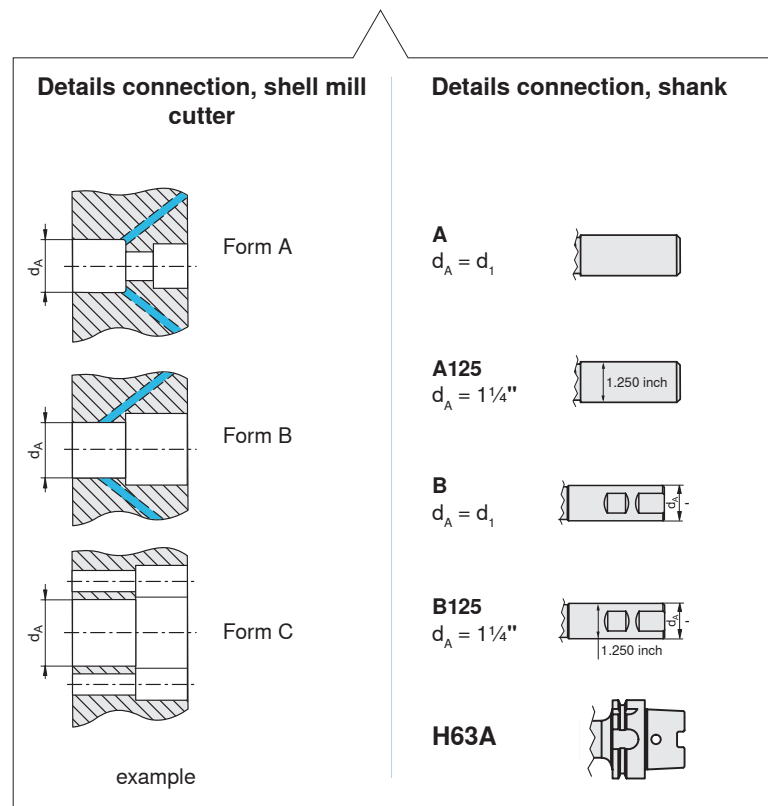
Insert shape

d[inch]	A	T/V	C/S	H	L	R	W	O
.197	-	-	-	-	-	05	-	-
7/32	-	09	05	-	08	-	03	-
.236	-	-	-	-	-	06	-	-
1/4	-	11	06	03	10	-	04	02
.262	10	-	-	-	-	-	-	-
.313	-	-	07	-	-	-	-	-
.315	-	-	-	-	-	08	-	-
.354	-	-	-	-	12	-	-	-
3/8	-	16	09	05	15	-	06	04
.377	15	-	-	-	-	-	-	-
.394	-	-	-	-	-	10	-	-
.472	-	-	-	-	-	12	-	-
1/2	22	12	07	20	-	-	08	05
5/8	27	15	09	-	-	-	10	06
.630	-	-	16	-	-	16	-	-
.659	-	-	16	-	-	-	-	-
3/4	33	19	11	-	-	-	13	07
.787	-	-	-	-	-	20	-	-

Cutting edge length



- 11 - B - 200 - EF - 650

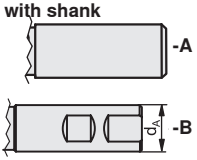
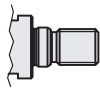
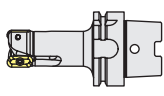
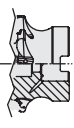

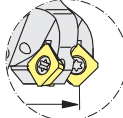
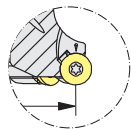
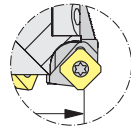
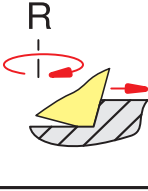
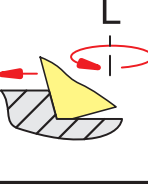
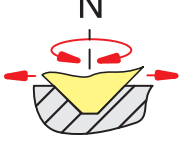
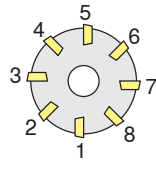




CERATIZIT designation system

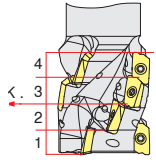
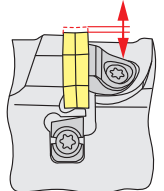
Milling tools - metric

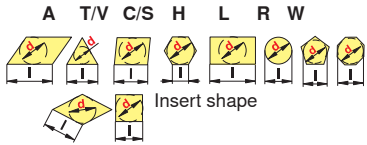
Introduction

<p>C= with shank</p>  <p>G= with thread</p>  <p>M= monoblock</p>  <p>A= with hole</p>  <p>Connection, interface</p>	<p>shoulder/slot cutters</p>  <p>face milling cutters</p>  <p>button insert cutters</p>  <p>cassette cutters</p>  <p>Diameter</p>	<p>R</p>  <p>L</p>  <p>N</p>  <p>Cutting direction</p>	 <p>Effective number of cutting edges</p>	<p>* only when a distinction is necessary</p> <p>A = with adjustable inserts</p> <p>(B* = irregular pitch)</p>
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C490.25.R.02K4A31

Tools and inserts for milling

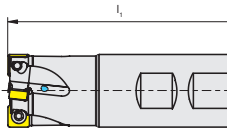
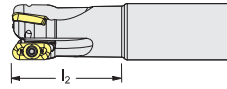
<p>System</p> <ul style="list-style-type: none"> 270 = face milling cutters 271 = face milling cutters 273 = face milling cutters 274 = face milling cutters 272 = chamfering cutters 251 = button insert cutters 252 = button insert cutters 260 = cassette cutters 211 = shoulder/slot cutters 210 = shoulder/slot cutters 141 = shoulder/slot cutters 241 = shoulder/slot cutters 490 = shoulder/slot cutters 212 = drill and slot cutters HDM = heavy duty milling cutters HSC = high-speed cutters HPC = high-performance cutters HEC = high-efficiency cutters HFC = high-feed cutters 	<p>Number of insert rows</p> <p>(only porcupine cutters)</p> 	<p>Number of adjustable inserts</p> <p>(only axially adjustable tools)</p> 
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d[mm]	A	T/V	C/S	H	L	R	W	O
5,00	-	-	-	-	-	05	-	-
5,56	-	09	05	-	08	-	03	-
6,00	-	-	-	-	-	06	-	-
6,35	-	11	06	03	10	-	04	02
6,65	10	-	-	-	-	-	-	-
7,94	-	-	07	-	-	-	-	-
8,00	-	-	-	-	-	08	-	-
9,00	-	-	-	-	12	-	-	-
9,52	-	16	09	05	15	-	06	04
9,57	15	-	-	-	-	-	-	-
10,00	-	-	-	-	-	10	-	-
12,00	-	-	-	-	-	12	-	-
12,70	22	12	07	20	-	08	05	-
15,87	27	15	09	-	-	10	06	-
16,00	-	-	-	-	-	16	-	-
16,74	-	-	16	-	-	-	-	-
19,05	33	19	11	-	-	13	07	-
20,00	-	-	-	-	20	-	-	-

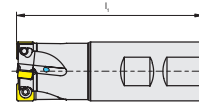
Cutting edge length

l_2 [mm]



Working length

l_1 [mm]



Overall length

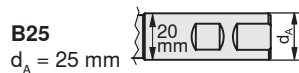
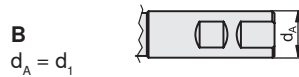
09

A20

40

165

Details connection, shank





CERATIZIT designation system

Inserts - Inch

Introduction

Insert shape

A	85°	
B	82°	
K	55°	
H	120°	
L	90°	
O	135°	
P	108°	
C	80°	
D	55°	
E	75°	
M	86°	
V	35°	
R	-	
S	90°	
T	60°	
W	80°	
X	Special shapes	

Tolerances

	d [±inch]	m [±inch]	s [±inch]	d=1/4 / 3/8	d=1/2	d=5/8 / 3/4
A	.0010	.0002	.001	●	●	●
C	.0010	.0005	.001	●	●	●
E	.0010	.0010	.001	●	●	●
F	.0005	.0002	.001	●	●	●
G	.0010	.0010	.005	●	●	●
H	.0005	.0005	.001	●	●	●
J	.0031	.0002	.001		●	
	.0039	.0002	.001			●
	.002	.0005	.001	●		
K	.0031	.0005	.0008		●	
	.0039	.0005	.0008			●

	d [±mm]	m [±mm]	s [±mm]	d=1/4 / 3/8	d=1/2	d=5/8 / 3/4
	.002	.0031	.0051	●		
M	.0031	.0051	.0051		●	
	.0039	.0059	.0051			●
	.002	.0031	.001	●		
N	.0031	.0051	.001		●	
	.0039	.0059	.001			●
	.0031	.0051	.0051	●		
U	.0051	.0079	.0051		●	
	.0071	.0106	.0051			●

Form of top surface

A	
F	
G	
M	
N	
Q	
R	
T	
U	
W	
X	Special shapes

S D N T 09

Tools and inserts for milling

Clearance angle

	α
A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
O	Special version

Cutting edge length

d[inch]	A	T/V	C/S	H	L	R	W	O
.197	-	-	-	-	-	05	-	-
7/32	-	09	05	-	08	-	03	-
.236	-	-	-	-	-	06	-	-
1/4	-	11	06	03	10	-	04	02
.262	10	-	-	-	-	-	-	-
.313	-	-	07	-	-	-	-	-
.315	-	-	-	-	-	08	-	-
.354	-	-	-	-	12	-	-	-
3/8	-	16	09	05	15	-	06	04
.377	15	-	-	-	-	-	-	-
.394	-	-	-	-	-	10	-	-
.472	-	-	-	-	-	12	-	-
1/2		22	12	07	20		08	05
5/8		27	15	09			10	06
.630						16		
.659			16					
3/4		33	19	11			13	07
.787						20		



	s [inch]
01	1/16
T1	5/64
02	3/32
03	1/8
T3	5/32
04	3/16
05	7/32
06	1/4
07	5/16
09	3/8

Insert thickness

1st sign		2nd sign	
	κ		α'_n
A	45°	A	3°
D	60°	B	5°
E	75°	C	7°
F	85°	D	15°
P	90°	E	20°
Z	Others	F	25°
		G	30°
		N	0°
		P	11°
		Z	

Radius	
	r [Inch]
M0*	
02	.008
04	.016
08	.031
12	.047

* Shape R only

Facet corner radius

Cutting direction

Manufacturer specific detail

particularly for:

- 27 Non-ferrous metals
- 29 Steel
- 31 Cast iron
- 33 Stainless steels

F50 Fine
M50 Medium
R50 Rough

additional characteristic:

- P Polished (Microfinish)
- R Rough
- M Medium
- F Fine

Chip groove

03 AE SN -29

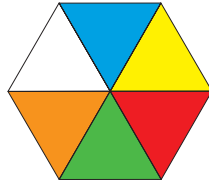
Cutting edge

F
Sharp

E
Honed

S
Chamfered and honed

T
Chamfered



Material

Based on VDI 3323 CERATIZIT's MasterGuide divides materials into six main groups (P, M, K, N, S, H). Each is given a color, according to the system partly adopted in ISO 513.

P Steel

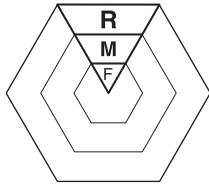
M Stainless steel

K Cast iron

N Non-ferrous metals and non-metals

S Heat-resistant alloys, titanium

H Hard materials



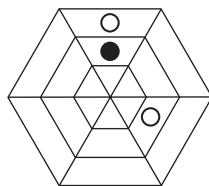
Machining application type

Each colored segment is divided into three sections, and each section indicates the relevant machining application type:

R = rough machining

M = medium machining

F = fine machining



Application

The ideal application area for the insert is indicated by a black circle. Extended applications are indicated by an open circle. The CERATIZIT MasterGuide provides you with an easily understandable structure for choosing a product and enables you to reduce grade and geometry stocks.

- Main application
- Extended application



CTC P335



1 Manufacturer: CERATIZIT

2 Cutting material

- W Uncoated carbide
- C CVD coated carbide
- P PVD coated carbide
- T Uncoated cermet
- E Coated cermet
- N Uncoated silicon nitride
- M Coated silicon nitride
- S Mixed ceramic
- I Sialon
- D PCD
- B CBN
- L CBN coated
- H Sintered HSS

**3 Main application (material)
Variant 1: number**

- 1 Steel
- 2 Stainless steel
- 3 Cast iron
- 4 Light and non-ferrous metals, non-metals
- 5 Heat-resistant alloys, titanium
- 6 Hard materials
- 7 Universal grade for a variety of applications

**Main application (material)
Variant 2: ISO letter**

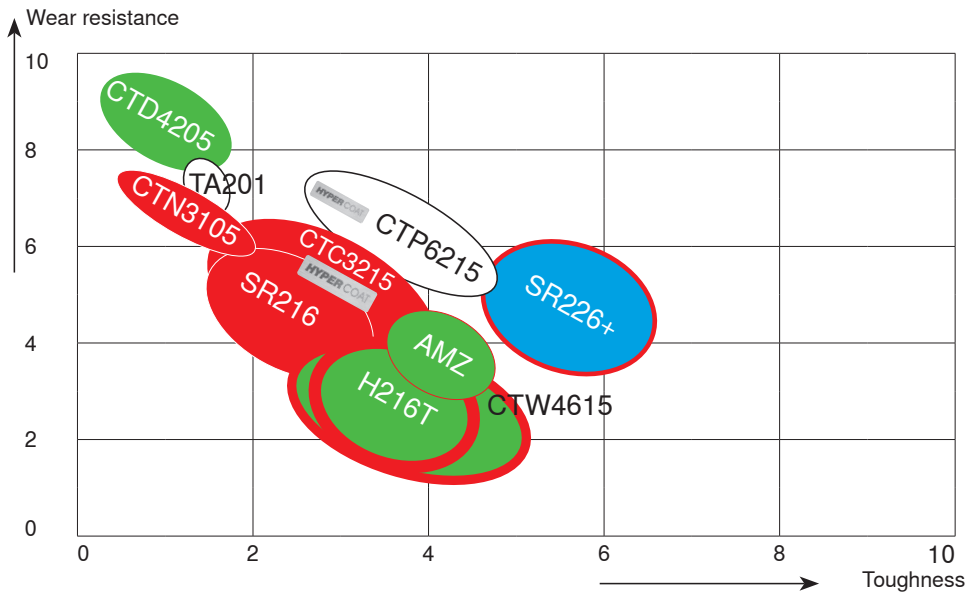
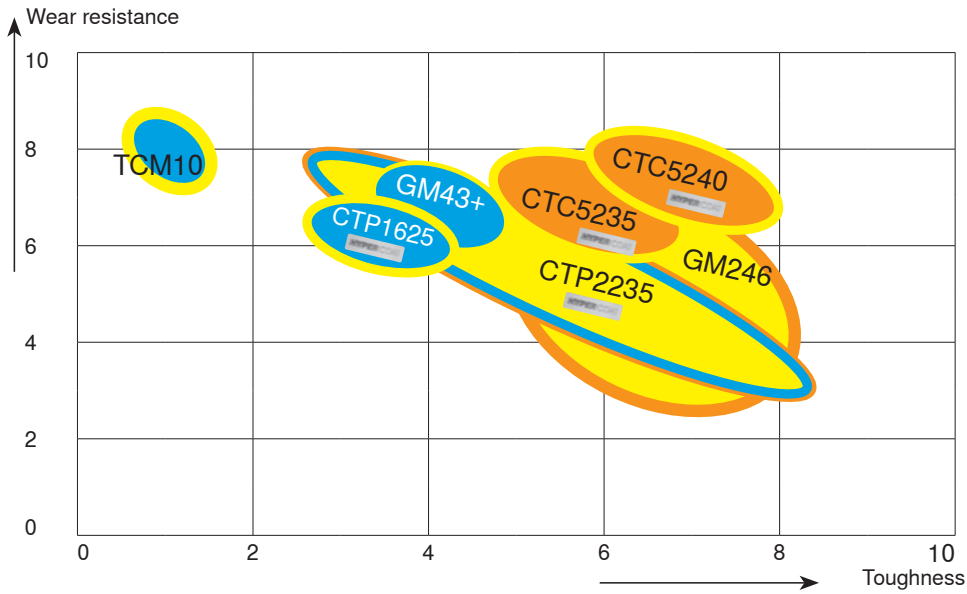
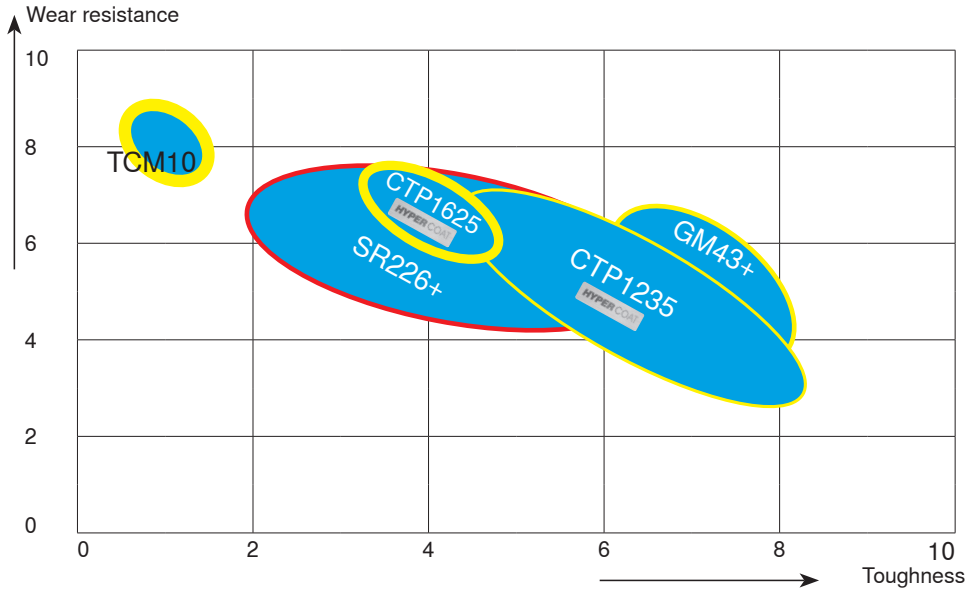
- P Steel
- M Stainless steel
- K Cast iron
- N Light and non-ferrous metals, non-metals
- S Heat-resistant alloys, titanium
- H Hard materials
- X Universal grade for a variety of applications

**4 Main application
(machining method)**

- 1 Turning
- 2 Milling
- 3 Parting and grooving
- 4 Drilling
- 5 Threading
- 6 Others
- 7 Universal grade for a variety of applications

**5 ISO 513
Application range**

- For example:
- 05
 - 10
 - 15
 - 25
 - 35 ISO P35
 -





Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H											
										Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials											
			01	05	10	15	20	25	30	35	40	45	50													
AMZ	HC-K10	P															○	○	○	●	○					
CTC3215	HC-K15	C															○	○	○	●	○					
CTC5235	HC-M35	C															○	●	○	○	●					
CTC5240	HC-M40	C															○	○	○	○	●					
CTP1235	HC-P35	P															●	○	○	○	○					
	HC-M30	P															○	○	○	○	○					
CTP1625	HC-P25	P															●	○	○	○	○					
	HC-M25	P															○	○	○	○	○					
	HC-K20	P															○	○	○	○	○					
CTP2235	HC-P40	P															○	○	○	○	○					
	HC-M40	P															○	○	○	○	○					
CTP3220	HC-K20	P															○	○	○	○	○					
CTP6215	HC-K15	P															○	○	○	○	○	●				
CTW4615	HW-K15	W															○	○	○	○	○					
GM246	HC-P40	C															○	○	○	○	○					
	HC-M40	C															○	○	○	○	○					
GM43+	HC-P35	C															○	○	○	○	○					
	HC-M35	C															○	○	○	○	○					
H216T	HW-K15	W															○	○	○	○	○					
S26T	HW-P20	W															○	○	○	○	○					
SR216	HC-K10	C															○	○	○	○	○					
SR226+	HC-P25	C															○	○	○	○	○					
	HC-M25	C															○	○	○	○	○					
	HC-K20	C															○	○	○	○	○					
			01	05	10	15	20	25	30	35	40	45	50	●	○	Main application					○	Extended application				

*Type of cutting material





Grade overview

Introduction

Tools and inserts for milling

Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H			
			01	05	10	15	20	25	30	35	40	45	50	Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials
TCC410	HC-P10	E	[Blue bar from 05 to 15]							●								
	HC-M10	E	[Yellow bar from 05 to 10]								○							
	HC-K05	E	[Red bar from 01 to 05]									●						
TCM10	HT-P15	T	[Blue bar from 10 to 20]							●								
	HT-M10	T	[Yellow bar from 05 to 15]								●							
	HT-K10	T	[Red bar from 05 to 10]									○						
			01	05	10	15	20	25	30	35	40	45	50	● Main application ○ Extended application				

Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H	
			0	05	10	15	20	25	Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials		
CTD4205	DP-K01	D	[Grey bar from 0 to 5]										●			
CTL3215	BN-K10	L	[Grey bar from 5 to 20]									●				○
CTN3105	CN-K05	N	[Grey bar from 5 to 15]									●				
			0	05	10	15	20	25	● Main application ○ Extended application							

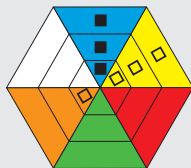
*Type of cutting material





CTP1235

HC-P35
HC-M30



Composition:

Co 9.0%; mixed carbides 4.0%; WC balance

Grain size:

1-1.5 μm

Hardness:

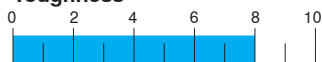
HV 1510

Coating specification:

PVD

(Ti,Al)N + TiN; 4 μm

Toughness



Wear resistance

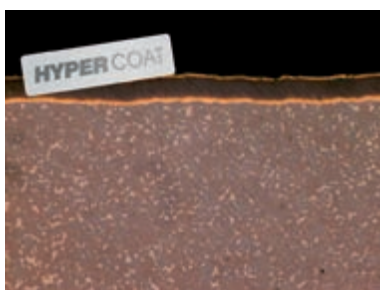
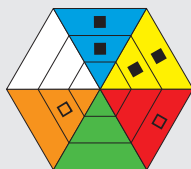


Wet / dry:



CTP1625

HC-P25
HC-M25
HC-K20



Composition:

Co 9.5%; mixed carbides 20.6%; WC balance

Grain size:

1.5 μm

Hardness:

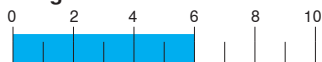
HV 1550

Coating specification:

PVD

TiN + TiAlN + TiN; 3-4 μm

Toughness



Wear resistance



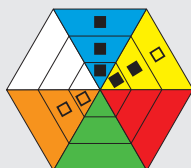
Wet / dry:



Carbide grade for milling with side and face milling cutters

GM43+

HC-P35
HC-M35



Composition:

Co 9.0%; mixed carbides 4.0%; WC balance

Grain size:

1 - 1.5 μm

Hardness:

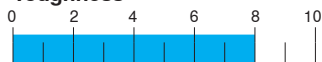
HV 1510

Coating specification:

CVD

TiN + Ti(C,N) + TiC; 3 μm

Toughness



Wear resistance



Wet / dry:





Grade description

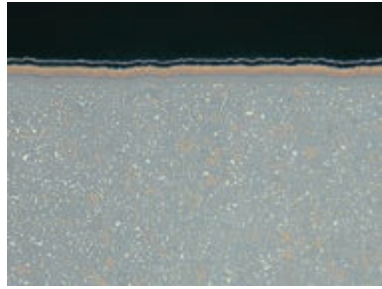
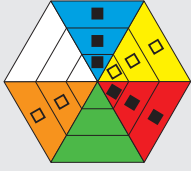
Steel

Introduction

Tools and inserts for milling

SR226+

HC-P25
HC-M25
HC-K20



Composition:

Co 9.0%; mixed carbides 4.0%; WC balance

Grain size:

1 - 1.5 μm

Hardness:

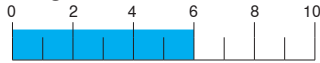
HV 1510

Coating specification:

CVD

$\text{Al}_2\text{O}_3 + \text{TiN} + \text{Ti (C,N)}$; 5.5 μm

Toughness



Wear resistance

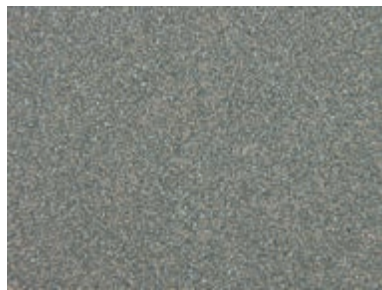
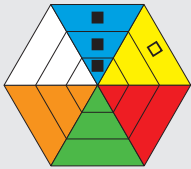


Wet / dry:



S26T

HW-P20



Composition:

Co 9.5%; mixed carbides 20.6%; WC balance

Grain size:

1.5 μm

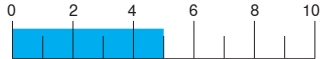
Hardness:

HV 1550

Toughness



Wear resistance

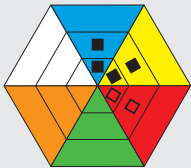


Wet / dry:



TCM10

HT-P15
HT-M10
HT-K10



Composition: cermet

Co/Ni 12.2%; WC 15.0%; TaNbC 10.0%; TiCN balance

Hardness:

HV 1620

Toughness



Wear resistance



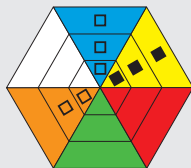
Wet / dry:





CTP2235

HC-P40
HC-M40



Composition:

Co 12.5%; mixed carbides 2.0%; WC balance

Grain size:

1 μ m

Hardness:

HV 1380

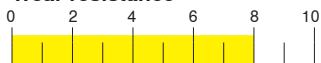
Coating specification:

PVD
(TiAl)N; 4 μ m

Toughness



Wear resistance

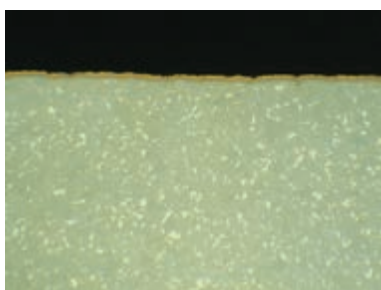
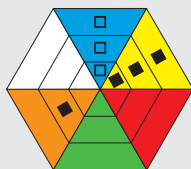


Wet / dry:



GM246

HC-P40
HC-M40



Composition:

Co 8.0%; WC balance

Grain size:

2 μ m

Hardness:

HV 1280

Coating specification:

CVD
TiN + Ti(C,N) + TiC; 3 μ m

Toughness



Wear resistance

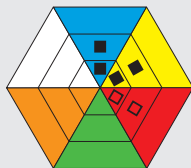


Wet / dry:



TCM10

HT-P15
HT-M10
HT-K10



Composition: cermet

Co/Ni 12.2%; WC 15.0%; TaNbC 10.0%; TiCN balance

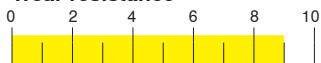
Hardness:

HV 1620

Toughness



Wear resistance



Wet / dry:



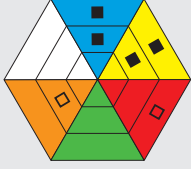


Grade description

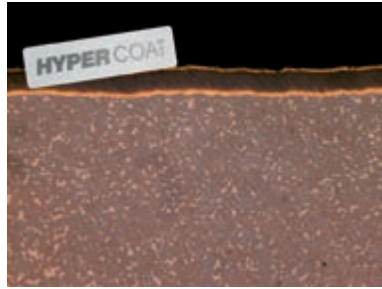
Stainless steel

CTP1625

HC-P25
HC-M25
HC-K20



Carbide grade for milling with side and face milling cutters



Composition:

Co 9.5%; mixed carbides 20.6%; WC balance

Grain size:

1.5 μm

Hardness:

HV 1550

Coating specification:

PVD

TiN + TiAlN + TiN; 3-4 μm

Toughness



Wear resistance



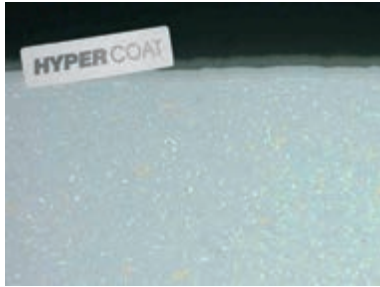
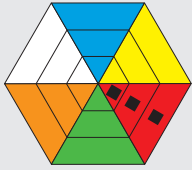
Wet / dry:





CTC3215

HC-K15



Composition:

Co 6.0%; mixed carbides 2.0%; WC balance

Grain size:

1 μm

Hardness:

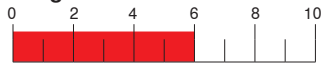
HV 1630

Coating specification:

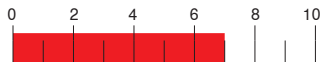
CVD

Ti(C,N) + Al₂O₃; 5 μm

Toughness



Wear resistance



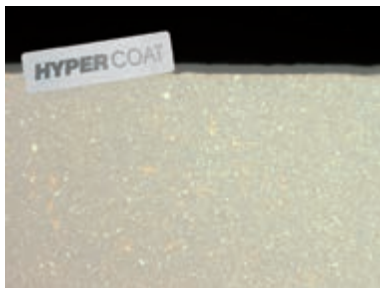
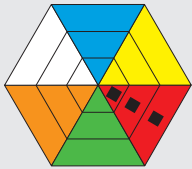
Wet / dry:



Special grade for the machining of cast iron

CTP3220

HC-K20



Composition:

Co 6.0%; TaC 2.0%; WC balance

Grain size:

1 μm

Hardness:

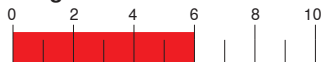
HV₃₀ 1630

Coating specification:

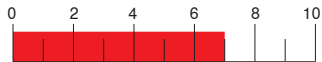
PVD

TiAlN; 3 μm

Toughness



Wear resistance



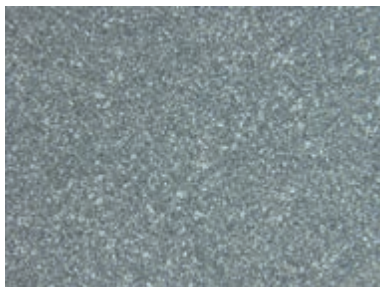
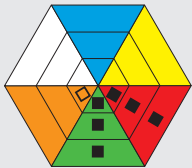
Wet / dry:



Special grade for the machining of cast iron

CTW4615

HW-K15



Composition:

Co 6.0%; WC balance

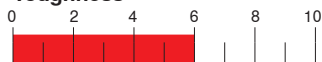
Grain size:

1 μm

Hardness:

HV 1630

Toughness



Wear resistance



Wet / dry:



Precision manufactured



Grade description

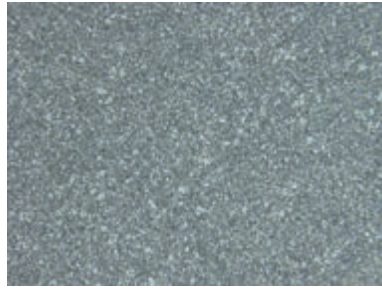
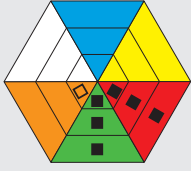
Cast iron

Introduction

Tools and inserts for milling

H216T

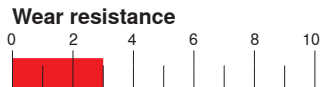
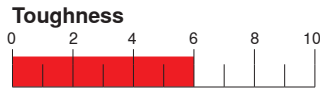
HW-K15



Composition:
Co 6.0%; WC balance

Grain size:
1 μm

Hardness:
HV₃₀ 1630



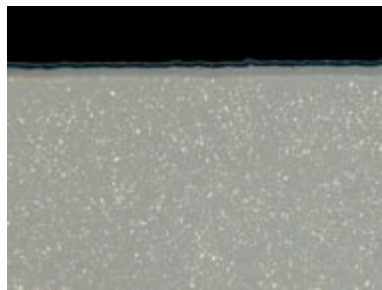
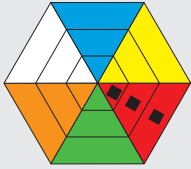
Microfinish

Wet / dry:



SR216

HC-K10

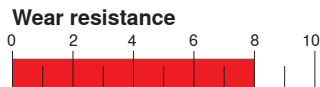
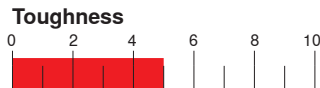


Composition:
Co 6.0%; WC balance

Grain size:
1 μm

Hardness:
HV 1630

Coating specification:
CVD
Al₂O₃ + Ti(C,N) + Ti(C,N); 5.5 μm

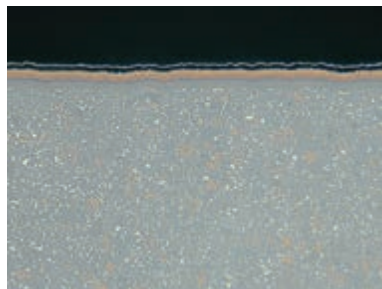
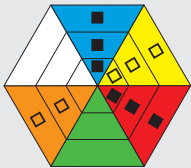


Wet / dry:



SR226+

HC-P25
HC-M25
HC-K20

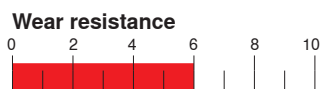
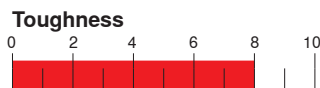


Composition:
Co 9.0%; mixed carbides 4.0%; WC balance

Grain size:
1 - 1.5 μm

Hardness:
HV 1510

Coating specification:
CVD
Al₂O₃ + TiN + Ti (C,N); 5.5 μm



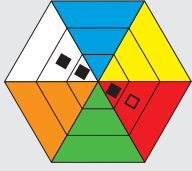
Wet / dry:





CTP6215

HC-K15



Carbide grade for hard material machining.



Composition:

Co 12.0%; WC balance

Grain size:

.4 μm

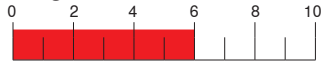
Hardness:

HV 1730

Coating specification:

PVD
(TiAl)N; 4 μm

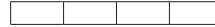
Toughness



Wear resistance



Wet / dry:





Grade description

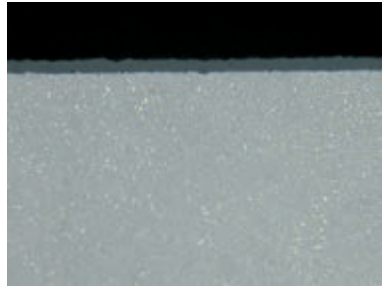
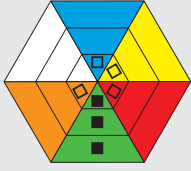
Non-ferrous metals and non-metals

Introduction

Tools and inserts for milling

AMZ

HC-K10

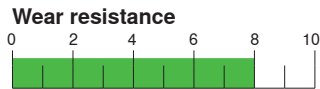
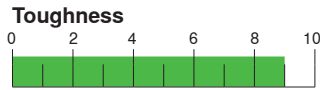


Composition:
Co 6.0%; WC balance

Grain size:
1 μm

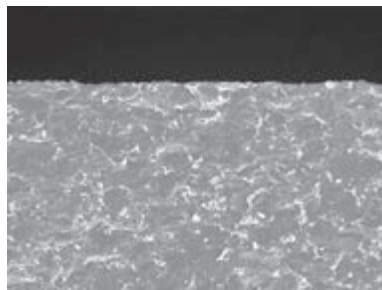
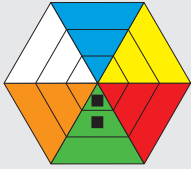
Hardness:
HV 1630

Coating specification:
PVD
TiAlN; 2 - 4 μm



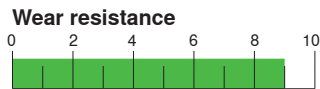
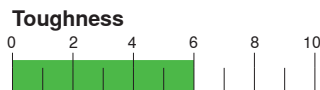
CTD4205

DP-K01



Composition:
Polycrystalline diamond (PCD)

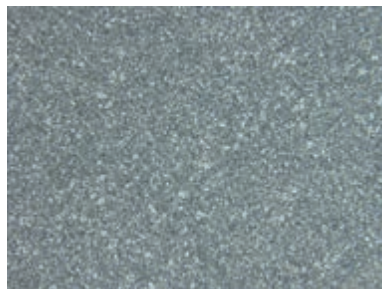
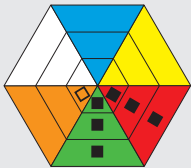
Grain size:
~ 25 μm



PCD for milling non-ferrous metals, plastics and graphite

CTW4615

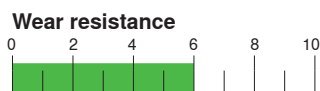
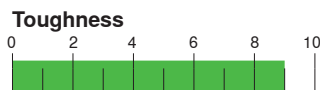
HW-K15



Composition:
Co 6.0%; WC balance

Grain size:
1 μm

Hardness:
HV 1630

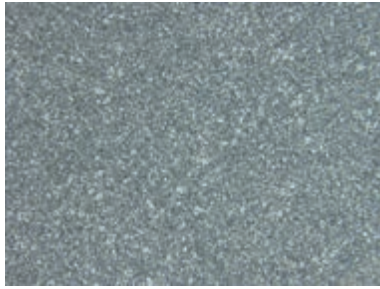
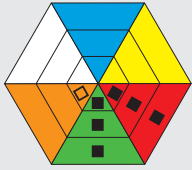


Precision manufactured



H216T

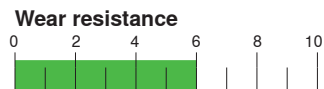
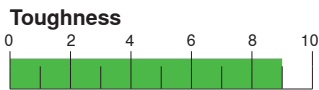
HW-K15



Composition:
Co 6.0%; WC balance

Grain size:
1 μm

Hardness:
HV₃₀ 1630



Microfinish



Grade description

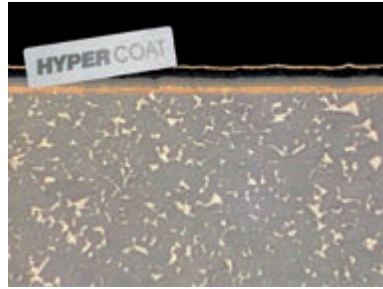
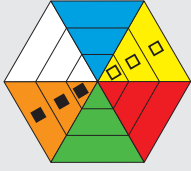
Heat-resistant alloys / titanium

Introduction

Tools and inserts for milling

CTC5235

HC-M35

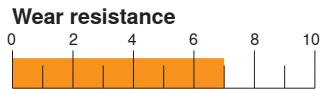
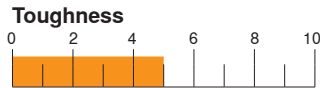


Composition:
10.0% binder; WC balance

Grain size:
2 μm

Hardness:
HV 1330

Coating specification:
CVD
TiN-Ti (C,N); Al_2O_3 ; Ti (N,B); 6 μm



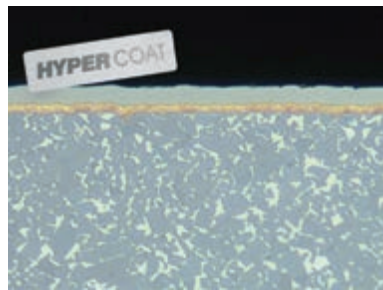
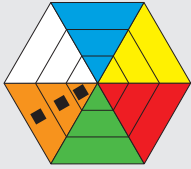
Carbide grade for milling heat-resistant alloys (e.g. turbine blades etc.)

Wet / dry:



CTC5240

HC-M40

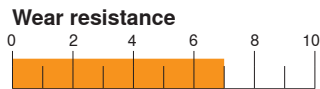
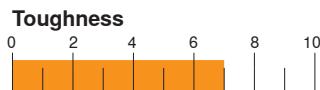


Composition:
10.0% binder; WC balance

Grain size:
2 μm

Hardness:
HV 1330

Coating specification:
CVD
TiN + TiB_2 ; 4 μm



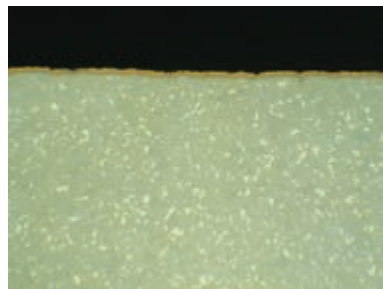
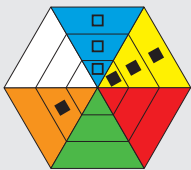
Carbide grade for milling titanium alloys

Wet / dry:



GM246

HC-P40
HC-M40

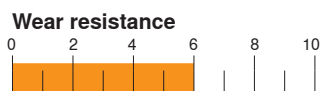
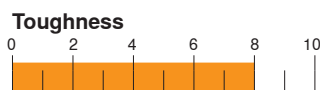


Composition:
Co 8.0%; WC balance

Grain size:
2 μm

Hardness:
HV 1280

Coating specification:
CVD
TiN + Ti(C,N) + TiC; 3 μm



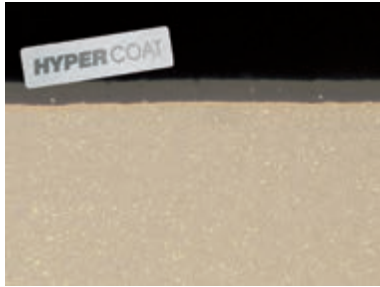
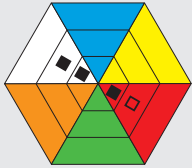
Wet / dry:





CTP6215

HC-K15

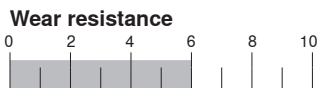
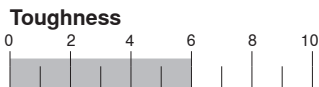


Composition:
Co 12.0%; WC balance

Grain size:
.4 μm

Hardness:
HV 1730

Coating specification:
PVD
(TiAl)N; 4 μm



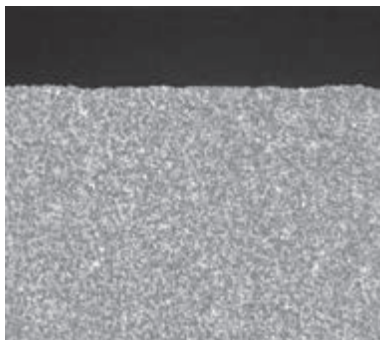
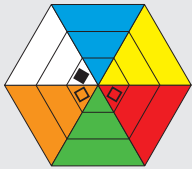
Wet / dry:



Carbide grade for hard material machining.

TA201

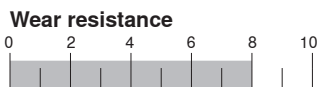
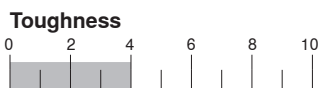
BN-K10



Composition:
Cubic boron nitride (CBN), 65 vol.% + binder (TiN)

Grain size:
~ 2 μm

Insert type:
Brazed segment



Wet / dry:



Particularly suitable for hard materials.



Chip grooves

Introduction

Tools and inserts for milling

	Chip groove	Chip groove code	Material	Machining situation and stability				Machining type F / M / R
				○	○	◐	◑	
<p>$\gamma = 12-30^\circ$</p>	27P F10 F20		 	x	x	x		<p>F</p>
	F40		Ti 	x	x			
	F50 33 29M		 	x	x	x		
<p>$\gamma = 10-18^\circ$</p>	M31 M32		Ti 	x	x			<p>M</p>
	M50 29 31		 		x	x		
<p>$\gamma = 0-12^\circ$</p>	R50		 			x	x	<p>R</p>
	R60		 			x	x	

- MasterGuide:**
- Steel
 - Stainless
 - Cast iron
 - Non-ferrous metals
 - Heat-resistant
 - Heat-resistant materials
 - Hard materials

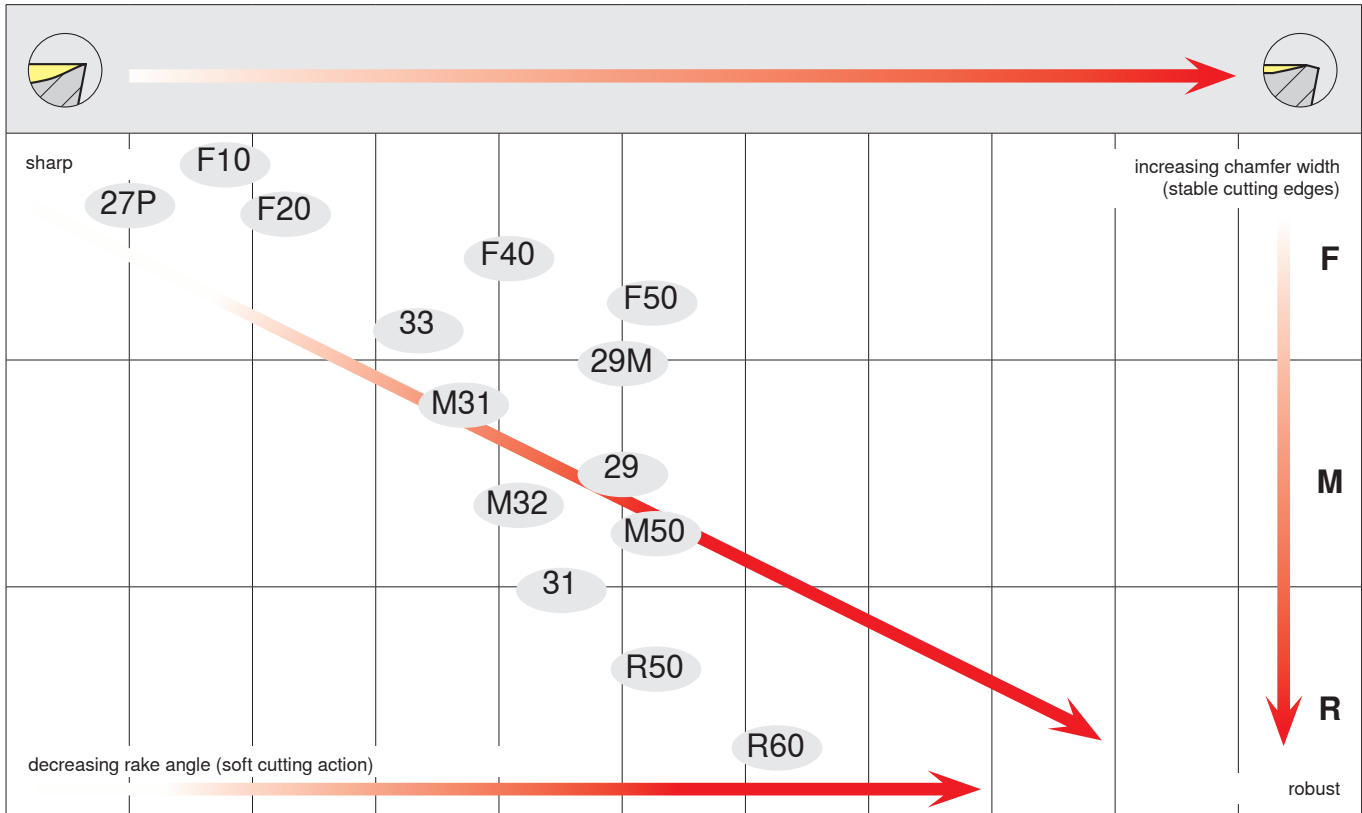
- Main application
- Extended application

Machining situation and stability:






- excellent
- good
- acceptable
- difficult

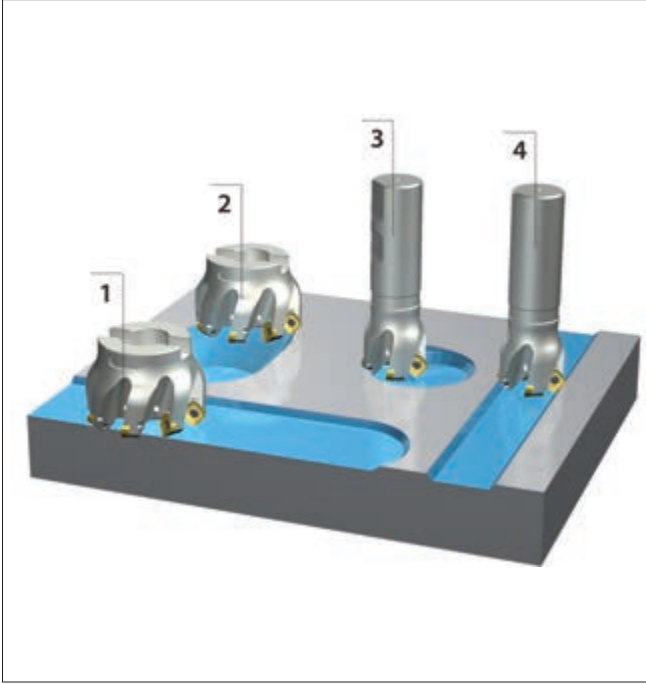
Machining type:

- F** Fine machining
- M** Medium machining
- R** Rough machining



Chip groove code

				Cutting edge			
				sharp 10-20	medium 30-40	stable 50-60	
Level of machining	Chip groove M50  	easy	F		●	● ●	● ● ●
		universal	M		●	● ●	● ● ●
		difficult	R		●	● ●	● ● ●

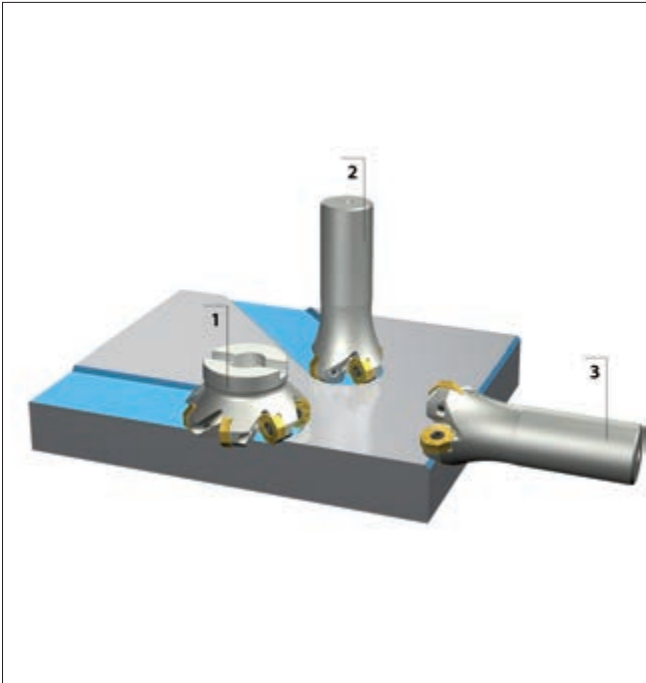


MaxiMill 270

- Maximal chip volume
- 45° approach angle
- Soft cutting action

Face milling (1)
 Angled ramping (2)
 Helical plunge milling (3)
 Slot milling (4)

Ø .5 – 6 inch		09 / 12

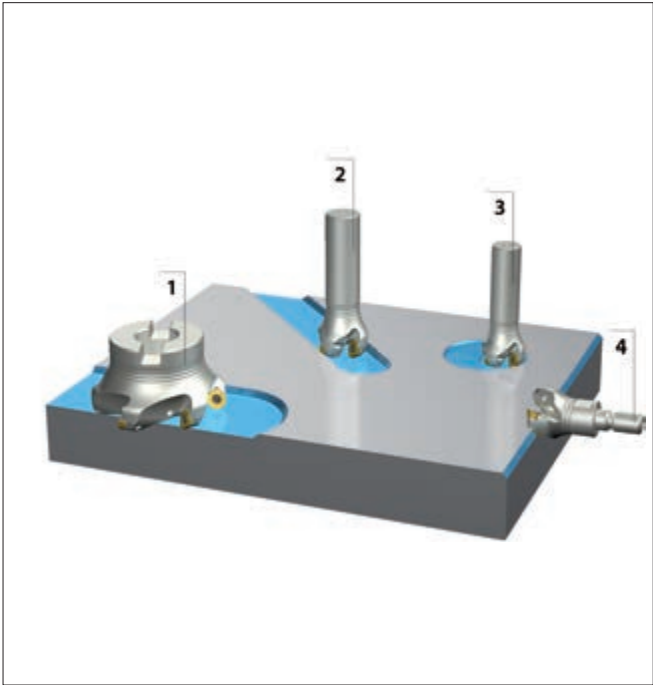


MaxiMill 273

- 16 cutting edges
- Approach angle 44.6°
- Positive cutting edge geometry

Face milling (1)
 Slot milling (2)
 Chamfering (3)



Ø 2 - 10 inch		06

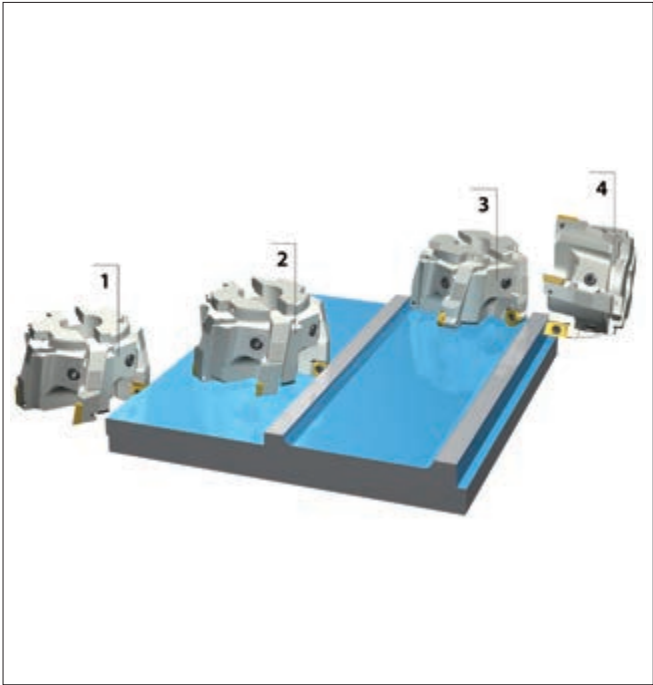


MaxiMill 274

- 8 cutting edges
- Approach angle 43°
- Extremely positive position of the insert when mounted

Face milling (1)
 Slot milling (2)
 Helical plunge milling (3)
 Chamfering (4)

	Ø 1.5 - 6 inch	  OF..04/05 SF..09/12

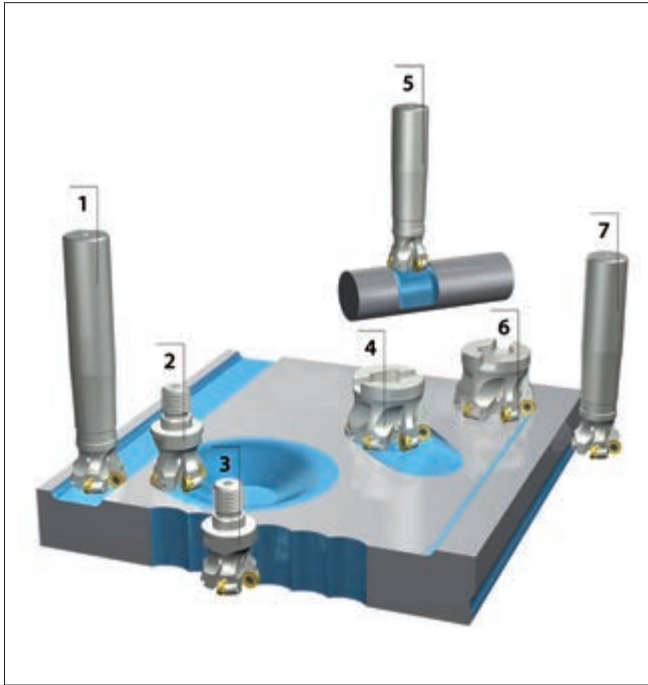


MaxiMill 260

- Universal application
- Adjustable Masterfinish edges
- Long tool life

Peripheral milling (1)
 Face milling (2)
 Slot milling (3)
 Shoulder milling (4)

Ø 3 - 10 inch	



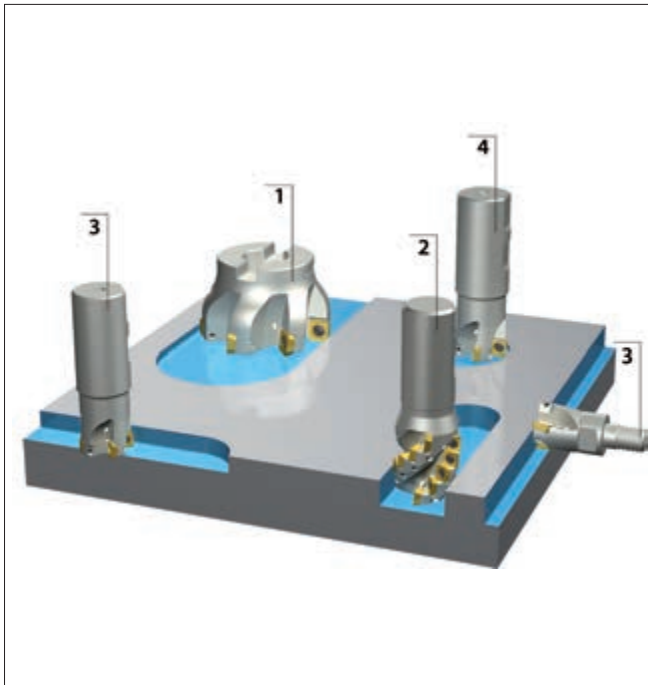
MaxiMill 251/251RS

- Very high feed rates
- Maximum stability
- 8 indexes

Slot milling (1)
 Profile milling (2)
 Plunging (3)
 Angled ramping (4)
 Turn milling (5)

Face milling (6)
 Reverse copy milling (7)

	Ø .75 - 6 inch	
		05/08/10/12/16/20

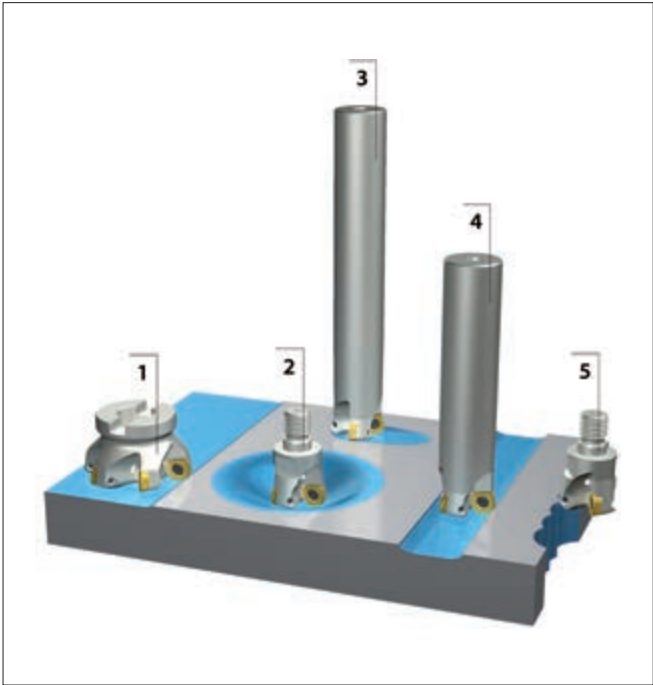


MaxiMill 490

- 4 cutting edges
- Optimum price-performance ratio
- 90° approach angle

Face milling (1)
 Slot milling (2)
 Shoulder milling (3)
 Angled ramping (4)

4 - 8	Ø 1 - 4 inch	
		09



MaxiMill HFC

- Extremely high feed rates
- Maximum chip removal rates

Face milling (1)
 Helical plunge milling (2)
 Angled ramping (3)
 Slot milling (4)
 Plunge milling (5)

	Ø .625 - 5 inch	

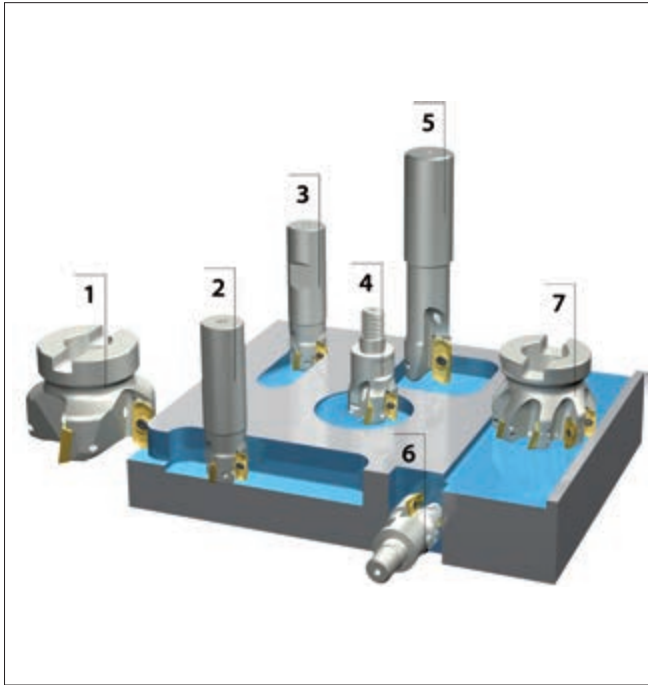


MaxiMill 211

- Milling with radial force compensation
- Minimum vibration
- Maximum chip removal rates

Peripheral milling (1)
 Shoulder milling (2)
 Angled ramping (3)
 Pocket milling (3)
 Axial plunging (4)
 Helical plunging (4)
 Trochoidal slot milling (5)
 Slot milling (6)
 Shoulder & face milling (7)






	Ø .375 - 6 inch	

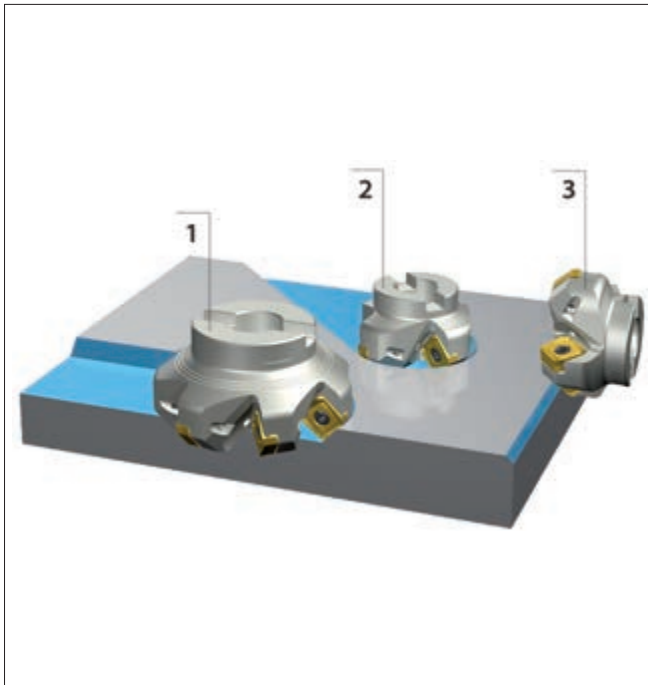


MaxiMill HSC

- Aluminium milling at high speed
- Maximum chip removal rates

- Peripheral milling (1)
- Shoulder milling (2)
- Angled ramping (3)
- Axial plunging (4)
- Helical plunge milling (4)
- Pocket milling (5)
- Slot milling (6)
- Shoulder & face milling (7)





		
	Ø 1 - 6 inch	
		19

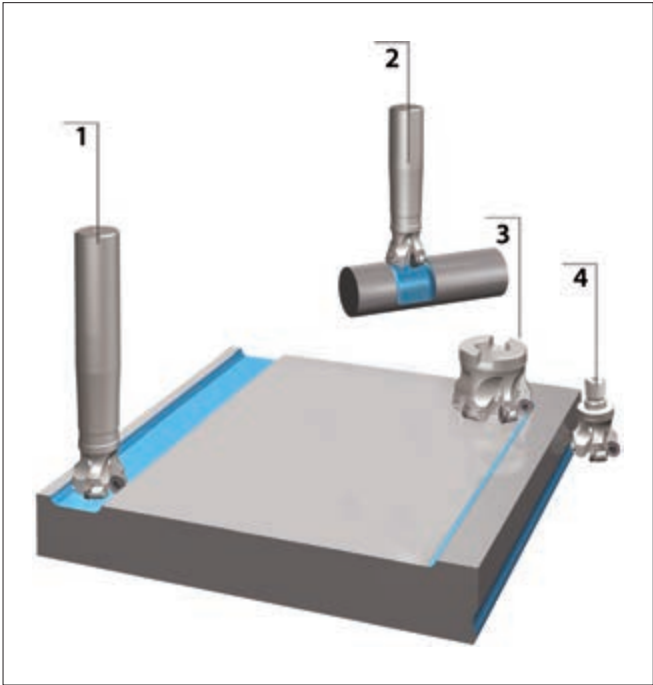


MaxiMill 271

- 8 effective cutting edges
- Maximum depth of cut 8.4 mm

- Face milling (1)
- Slot milling (2)
- Chamfering (3)

		
4 – 12	Ø 2 - 6.5 inch	
		17



MaxiMill 252

- Double the number of cutting edges combined with optimum depth of cut
- Optimized chip geometry

Slot milling (1)
 Turn milling (2)
 Face milling (3)
 Reverse copy milling (4)

	<p>Ø 1.5 - 3 inch</p>	<p>12</p>





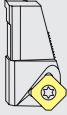




























Overview of machining operations

Application

Tools and inserts for milling



					
  X..	 	 	 	 	 
 Z..	 	 	 	 	
 XA/XD.  SP.  OD.					



Application

Face milling

Tools and inserts for milling

C270

$a_p \leq .157$ inch

$\varnothing = .5 - 1.5$ inch B66

C490

$a_p \leq .315$ inch

$\varnothing = 1 - 1.25$ inch B70

CHFC

$a_p \leq .039$ inch

$\varnothing = .625 - 1.5$ inch B69

C251

$a_p \leq .197$ inch

$\varnothing = .75 - 1.5$ inch B68

G490

$a_p \leq .315$ inch

$\varnothing = 1 - 1.25$ inch B76

G251

$a_p \leq .197$ inch

$\varnothing = 1 - 1.5$ inch B75

A211

$a_p \leq .551$ inch

$\varnothing = 1.5 - 6$ inch B87

A252

$a_p \leq .118$ inch

$\varnothing = 1.5 - 3$ inch B80

A270

$a_p \leq .236$ inch

$\varnothing = 2 - 6$ inch B78

A271

$a_p \leq .330$ inch

$\varnothing = 2 - 6.5$ inch B81

A273

$a_p \leq .138$ inch

$\varnothing = 2 - 10$ inch B82

A274

$a_p \leq .150$ inch

$\varnothing = 1.5 - 6$ inch B83-B84

A490

$a_p \leq .315$ inch

$\varnothing = 1.5 - 4$ inch B86

AHFC

$a_p \leq .079$ inch

$\varnothing = 1.5 - 5$ inch B85

AHSC

$a_p \leq .709$ inch

$\varnothing = 2 - 6$ inch B89

A251

$a_p \leq .394$ inch

$\varnothing = 1.5 - 6$ inch B79

A260/041

$a_p \leq .157$ inch

$\varnothing = 3 - 10$ inch B90

A260/031

$a_p \leq .236$ inch

$\varnothing = 3 - 10$ inch B90



A260/029

$a_p \leq .236$ inch

$\varnothing = 3 - 10$ inch B91

A260/032

$a_p \leq .354$ inch

$\varnothing = 3 - 10$ inch B91

A260/058

$a_p \leq .331$ inch

$\varnothing = 3 - 10$ inch B92

A260/057

$a_p \leq .138$ inch

$\varnothing = 3 - 10$ inch B93

A260/018

$a_p \leq .354$ inch

$\varnothing = 3 - 10$ inch B94

A260/055

$a_p \leq .315$ inch

$\varnothing = 3 - 10$ inch B99

A260/039

$a_p \leq .472$ inch

$\varnothing = 3 - 10$ inch B99

A260/052

$a_p \leq .236$ inch

$\varnothing = 3 - 10$ inch B95

A260/053

$a_p \leq .315$ inch

$\varnothing = 3 - 10$ inch B95




Application


Shoulder and slot milling

Application

Tools and inserts for milling

 **C141**

$a_p \leq .551$ inch




$\varnothing = .625 - 1.5$ inch **B73**

 **C211**


$a_p \leq .551$ inch




$\varnothing = .375 - 1.5$ inch **B71**

 **C211K**


$a_p \leq 1.430$ inch



$\varnothing = 1 - 1.5$ inch **B72**

 **C490**


$a_p \leq .315$ inch




$\varnothing = 1 - 1.25$ inch **B70**

 **CHSC**


$a_p \leq .709$ inch




$\varnothing = 1 - 1.5$ inch **B74**

 **G211**


$a_p \leq .394$ inch




$\varnothing = .625 - 1.25$ inch **B77**

 **G490**


$a_p \leq .315$ inch




$\varnothing = 1 - 1.25$ inch **B76**

 **A211**


$a_p \leq .551$ inch




$\varnothing = 1.5 - 6$ inch **B87**

 **A211K**


$a_p \leq 3.250$ inch




$\varnothing = 2 - 3$ inch **B88**

 **A490**


$a_p \leq .315$ inch




$\varnothing = 1.5 - 4$ inch **B86**

 **AHSC**


$a_p \leq .709$ inch




$\varnothing = 2 - 6$ inch **B89**

 **A260/042**


$a_p \leq .315$ inch




$\varnothing = 3 - 10$ inch **B98**

 **A260/054**


$a_p \leq .394$ inch




$\varnothing = 3 - 10$ inch **B97**

 **A260/056**


$a_p \leq .551$ inch




$\varnothing = 3 - 10$ inch **B97**

 **A260/055**


$a_p \leq .315$ inch




$\varnothing = 3 - 10$ inch **B99**

 **A260/039**


$a_p \leq .472$ inch




$\varnothing = 3 - 10$ inch **B99**

 **A260/051**


$a_p \leq .551$ inch



$\varnothing = 3 - 10$ inch **B98**


 **A260/026**

$a_p \leq .709$ inch




$\varnothing = 3 - 10$ inch **B101**



 **A260/025**

$a_p \leq .709$ inch



$\varnothing = 3 - 10$ inch B100



Application

Form milling



$a_p \leq .551$ inch



$\varnothing = .375 - 1.5$ inch

B71

C211



$a_p \leq .709$ inch



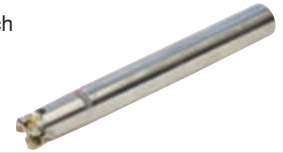
$\varnothing = 1 - 1.5$ inch

B74

CHSC



$a_p \leq .039$ inch



$\varnothing = .625 - 1.5$ inch

B69

CHFC



$a_p \leq .197$ inch



$\varnothing = .75 - 1.5$ inch

B68

C251



$a_p \leq .394$ inch



$\varnothing = .625 - 1.25$ inch

B77

G211



$a_p \leq .197$ inch



$\varnothing = 1 - 1.5$ inch

B75

G251



$a_p \leq .551$ inch



$\varnothing = 1.5 - 6$ inch

B87

A211



$a_p \leq .394$ inch



$\varnothing = 1.5 - 6$ inch

B79

A251



$a_p \leq .118$ inch



$\varnothing = 1.5 - 3$ inch

B80

A252



$a_p \leq .709$ inch



$\varnothing = 2 - 6$ inch

B89

AHSC



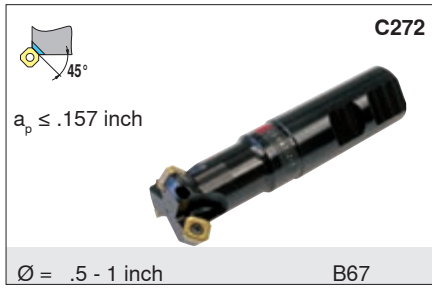
$a_p \leq .079$ inch



$\varnothing = 1.5 - 5$ inch

B85

AHFC







Inserts type A

	AD..	B44
	AP..	B44

Inserts type L

	LD..	B45
	LP..	B46

Inserts type O

	OA..	B47
	OD..	B48

Inserts type R

	RD..	B49-B50
	RP..	B49-B50
	RN..	B51

Inserts type S

	SA..	B52
	SD..	B53+B54
	SE..	B55
	SF..	B48
	SPEX..	B56+B62

Inserts type T

	TP..	B57
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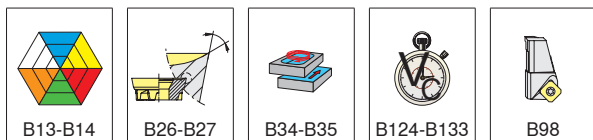
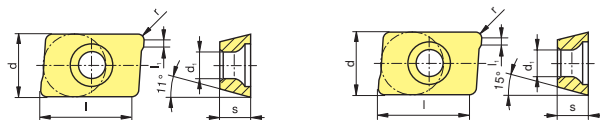
Inserts type X

	XD..	B58-B60
	XD../XO..	B61
	XA..	B63
	XD..	B63



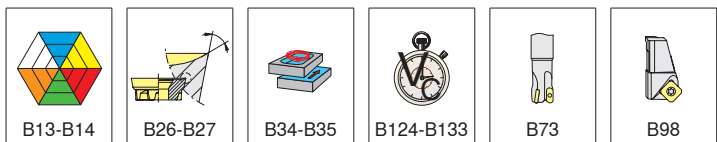
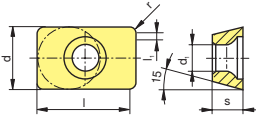
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○	○	○	○	○	
○	○	○	○	○	
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○	○	○	○	○	

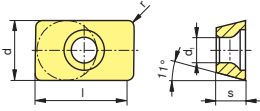
		d	l	s	l ₁	r	d ₁						
		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]						
-27P		●	●	●				.262	.386	.138	.067	.008	.110
	APHT 100304FR-27P	●	●	●				.262	.386	.138	.067	.016	.110
	APHT 100308FR-27P	●	●	●				.262	.386	.138	.067	.031	.110
-29			●			●	●	.377	.598	.222	.049	.031	.173
	APKT 1003PDSR-29		●			●	●	.262	.386	.138	.039	.020	.110
-29M						●	●	.262	.391	.150	.063	.020	.110
-31				●				.262	.386	.138	.039	.020	.110
-33								.262	.386	.138	.067	.031	.110
	APHT 100308SR-33							.262	.386	.138	.067	.031	.110
	APHT 100312SR-33							.262	.386	.138	.079	.047	.110
	APHT 100320SR-33							.262	.386	.138	.039	.079	.110
	APHT 100332SR-33							.262	.386	.138		.126	.110
APHW							●	.262	.398	.138	.057	.031	.110





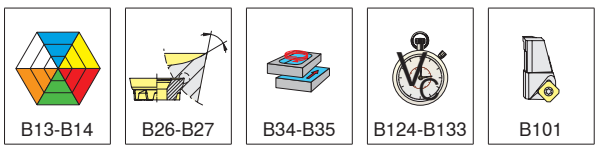
		P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	d	l	s	l ₁	r	d ₁			
		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]				
-27P		LDFT 150405FR-27P																															.375	.591	.187	.047	.020	.173
		LDFT 150408FR-27P																																.375	.591	.187	.047	.031	.173
-29		LDFT 1504PDSR-29																															.375	.591	.187	.047	.031	.173
		LDMT 1504PDSR-29																																.375	.591	.187	.047	.031	.173
-33		LDFT 1504PDSR-33																															.375	.591	.187	.031	.047	.173
		LDFT 150416SR-33																															.375	.591	.187	.035	.063	.173
		LDFT 150420SR-33																															.375	.591	.187	.035	.079	.173
		LDFT 150432SR-33																															.375	.591	.187	.039	.126	.173
		LDFT 150440SR-33																															.375	.591	.187	.157	.173	
LDFT		LDFT 150408ER																														.375	.591	.187		.031	.173	
LDFT-P		LDFT 150408FR-P																														.375	.591	.187	.047	.031	.173	
LDFW		LDFW 1504PDSR																														.375	.591	.187	.047	.031	.173	





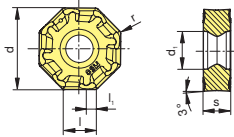
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																										d	l	s	r	d _i
																										[inch]	[inch]	[inch]	[inch]	[inch]
-29		LPHT 200408ER-29																								.500	.787	.187	.031	.217
LPHW		LPHW 200408ER	●																							.500	.787	.187	.031	.217
		LPHW 200408SR											●													.500	.787	.187	.031	.217

P			●	○						●	○	○	○	○	○	○	○	○	○	○	○	○	○	○						
M			○	○						○	○	○	○	○	○	○	○	○	○	○	○	○	○	○						
K	●	●	○	○	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○					
N	●	●		●																		●								
S			○										○	○	○	○	○	○	○	○	○	○	○	○						
H								●																○						



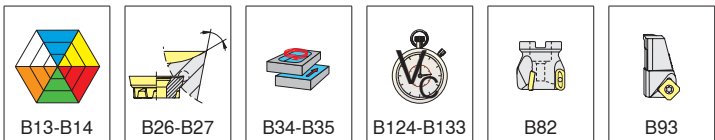


	P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	d	l	s	l _i	r	d _i
-F40	●	○	●	●	○															●	●								.676	.236	.219	.079	.031	.228
-F50																●						●							.676	.236	.219	.079	.031	.228
-M50											●				●														.676	.236	.219	.079	.031	.228
											●		●	●			●						●						.676	.236	.219	.079	.031	.228
-R50											●		●																.676	.236	.219	.079	.031	.228



Inserts

Tools and inserts for milling

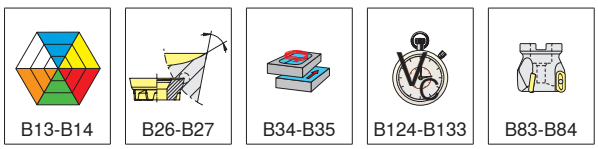
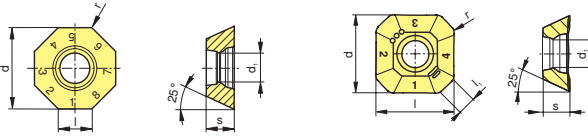




P	●	●	○	○					○	○		○	○					
M		○	○					○	○	○	○	○						
K	●	●	○	●	●	●	●	○	○	○	○	○	○	○	○		○	○
N	●	●	○												●			
S			○					○	○	○	○	○	○					
H						●											○	

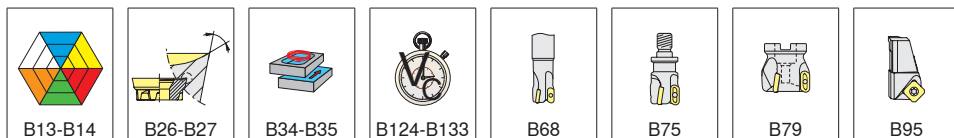
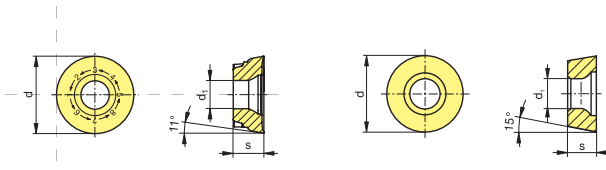
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OF..F10		OFHT 040305FN-F10	●																															d	l	s	l ₁	r	d ₁
SF..F10		SFHT 0903AFFR-F10	●																																				
SF..F40		SFHT 0903AFER-F40																			●																		
OF..F50		OFHT 040305SN-F50													●	●				●		●																	
-F50		SFHT 0903AFSR-F50													●	●						●																	
OF..M50		OFHT 040305SN-M50								●					●	●																							
SF..M50		SFKT 0903AFSR-M50													●	●																							
SF..R50		SFKT 1204AFSR-M50														●																							
SF..R50		SFKT 0903AFSR-R50								●		●																											
OFHW		OFHW 040302EN																																					

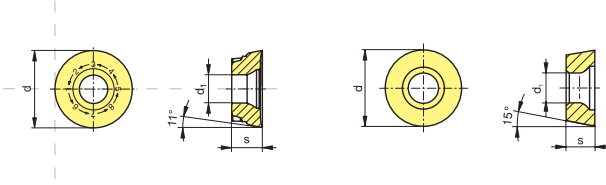
d [inch] l [inch] s [inch] l₁ [inch] r [inch] d₁ [inch]





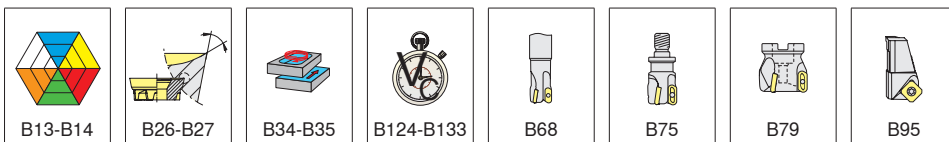
		P	M	K	N	S	H													d	s	d _i										
		CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215		[inch]	[inch]	[inch]					
-27P		RPHX 10T3MOFN-27P	●																							.394	.156	.134				
		RPHX 1204MOFN-27P	●																								.472	.187	.173			
		RPHX 1605MOFN-27P	●																									.630	.219	.217		
-29		RPNX 10T3MOSN-29								●			●														.394	.156	.134			
		RPNX 1204MOSN-29								●			●														.472	.187	.173			
		RPNX 1605MOSN-29								●			●															.630	.219	.217		
RDHX -33																			●	●						.315	.094	.110				
-33		RPHX 10T3MOEN-33																	●	●							.394	.156	.134			
		RPHX 1204MOEN-33																		●	●						.472	.187	.173			
		RPHX 1605MOEN-33																			●	●						.630	.219	.217		
-33M																			●	●						.787	.250	.236				
-33R																				●							.787	.250	.236			
RDHX -M31		RDHX 0501MOEN-M31																		●							.197	.063	.098			
		RDHX 0802MOEN-M31																			●	●						.315	.094	.110		
-M31		RDHX 0802M4EN-M31																		●	●						.315	.094	.110			
		RPHX 10T3M4EN-M31																			●	●						.394	.156	.134		
		RPHX 10T3M8EN-M31																				●	●						.394	.156	.134	
		RPHX 1204M4EN-M31																				●	●						.472	.187	.173	
		RPHX 1204M6EN-M31																					●	●					.472	.187	.173	
		RPHX 1204M8EN-M31																					●	●					.472	.187	.173	
		RPHX 1605M8EN-M31																						●	●				.630	.219	.217	
		RPHX 2006M4EN-M31																						●	●					.787	.250	.236
		RPNX 10T3M4EN-M31																						●	●					.394	.156	.134
		RPNX 10T3M8EN-M31																							●	●				.394	.156	.134
		RPNX 1204M4EN-M31																							●	●				.472	.187	.173
		RPNX 1204M8EN-M31																								●	●			.472	.187	.173
		RPNX 2006M8EN-M31																									●	●		.787	.250	.236





P																				
M																				
K																				
N																				
S																				
H																				

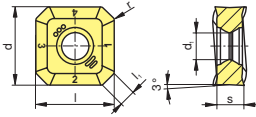
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																										d	s	d ₁			
																										[inch]	[inch]	[inch]			
-M32		RPHX 10T3M4EN-M32																									.394	.156	.134		
		RPHX 1204M4EN-M32																										.472	.187	.173	
-R60		RPNX 1204M8EN-R60																									.472	.187	.173		
RDHX		RDHX 0501MOFN			●																						.197	.063	.098		
		RDHX 0501MOSN										●			●													.197	.063	.098	
		RDHX 0802MOEN					●																					.315	.094	.110	
		RDHX 0802MOFN			●																							.315	.094	.110	
		RDHX 0802MOSN										●		●	●													.315	.094	.110	
RPHX		RPHX 10T3MOEN					●																				.394	.156	.134		
		RPHX 10T3MOSN										●		●	●													.394	.156	.134	
		RPHX 1204MOSN					●					●	●	●	●													.472	.187	.173	
		RPHX 1204M4EN										●		●	●													.472	.187	.173	
		RPHX 1605MOSN					●					●	●	●	●													.630	.219	.217	
		RPNX 1204MOSN										●		●	●													.472	.187	.173	
		RPNX 1605MOSN										●		●	●													.630	.219	.217	






Inserts


Tools and inserts for milling





	P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TGM10	CTD4205	CTN3105	CTL3215										
	●	○	○	○	○																																	
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	○	○	○	○	○	●																																


			d	l	s	l ₁	r	d ₁
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-M50		SAKU 1706ABSR-M50	.670	.670	.250	.146	.031	.228
-R50		SAKU 1706ABSR-R50	.670	.670	.250	.146	.031	.228


- 

B13-B14
- 

B26-B27
- 

B34-B35
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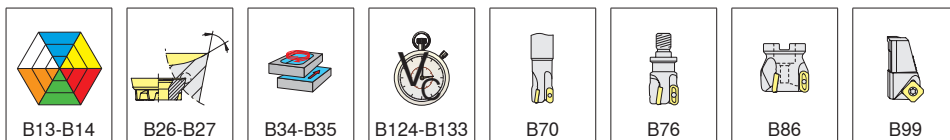
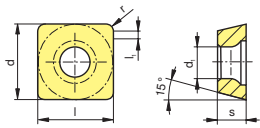
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B81
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B92

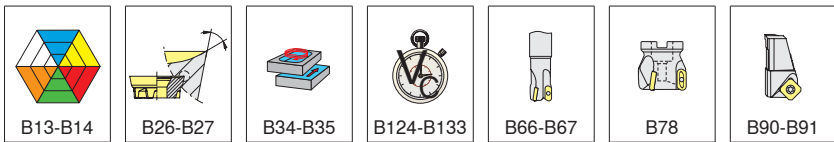
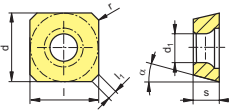


			Material Compatibility														Dimensions																				
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																															[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	
-27P		SDHT 09T308ER-27																																			
		SDHT 09T308FR-27P		●																																	
		SDHT 120508FR-27P		●																																	
		SDHT 120525FR-27P		●																																	
-29		SDMT 1205ZZSN-29																																			
		SDNT 09T308SR-29																																			
-31		SDMT 1205ZZSN-31																																			
		SDNT 09T308SR-31																																			
-33		SDHT 120512SR-33																																			
		SDHT 120520SR-33																																			
		SDNT 09T308SR-33																																			
-M31		SDMT 120508ER-M31																																			
		SDNT 09T308ER-M31																																			
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SD..W		SDHW 120508SR																																			





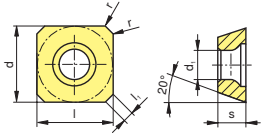
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		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]								
		d	l	s	l ₁	r	d ₁																								
-27P		SDHT 0903AEFN-27P	●																						.375	.375	.125	.066	.039	.134	
		SDHT 1204AEFN-27		●																					.500	.500	.187	.069	.008	.217	
		SDHT 1204AEFN-27P		●																						.500	.500	.187	.069	.008	.217
		SDHT 1504AEFN-27		●																						.625	.625	.187	.069	.008	.217
-29		SDMT 1204AESN-29R							●	●															.500	.500	.187	.069	.039	.217	
		SDNT 0903AESN-29							●		●														.375	.375	.125	.066	.039	.134	
-31		SDMT 1204AEEN-31				●	●																		.500	.500	.187	.069	.039	.217	
		SDNT 0903AESN-31				●																			.375	.375	.125	.063	.039	.134	
-33		SDHT 0903AESN-33															●								.375	.375	.125	.066	.039	.134	
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		SDHT 0903AESN-33															●								.375	.375	.125	.066	.039	.134	
		SDHT 1204AESN-33															●	●							.500	.500	.187	.069	.039	.217	
-M31		SDHT 0903AESN-M31														●	●								.375	.375	.125	.066	.039	.134	
		SDHT 1204AESN-M31														●	●								.500	.500	.187	.069	.039	.217	
SD..T		SDHT 1204AESN		●																		●			.500	.500	.187	.069	.008	.217	
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		SDHT 1504AESN											●												.625	.625	.187	.069	.008	.217	
SD..W		SDHW 0903AESN																				●			.375	.375	.125	.066	.039	.134	
		SDHW 1204AEEN		●																					.500	.500	.187	.069	.008	.217	
		SDHW 1204AEEN-R					●	●																	.500	.500	.187	.069	.039	.217	
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		SDHW 1504AEEN											●												.625	.625	.187	.069	.008	.217	
		SDHW 1504AESN											●												.625	.625	.187	.069	.008	.217	





		CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	
P			●	○	○						○	○	○	○	○	○	○	○	○	○	○	○	○	○
M			○	○						○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
K		●	●	○	○	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
N		●	●																		●			
S				○							○	○	○	○	○	○	○	○						
H							●																○	

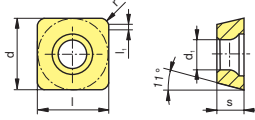
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		SEHT 1204AEFN-27	.500	.500	.187	.063	.008	.217
-33		SEHT 1204AFSN-33	.500	.500	.187	.063	.047	.217
SE..T		SEHT 1204AFSN	.500	.500	.187	.094	.008	.217
SE..W		SEHW 1204AFSN	.500	.500	.187	.090	.012	.217
		SEKW 1204AFSN	.500	.500	.187	.087	.094	.217





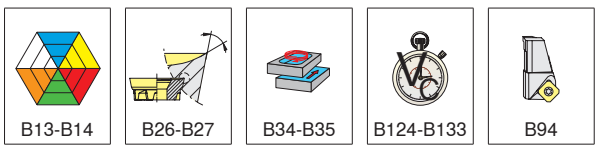
Inserts

Tools and inserts for milling




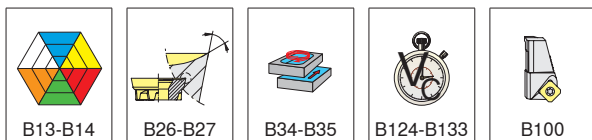
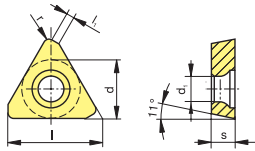
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																										d	l	s	l ₁	r	d ₁
																										[inch]	[inch]	[inch]	[inch]	[inch]	[inch]
-29		SPKT 1204EDSR-29								●																.500	.500	.187	.055	.010	.217
SP..W		SPKW 1204EDER SPKW 1204EDSR			●								●													.500	.500	.187	.073	.010	.217
																										.500	.500	.187	.073	.010	.217

P			●																											
M			○	○						○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○				
K	●	●	○	○		●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
N	●	●		●																		●								
S				○											○	○	○	○	○	○										
H								●																○						





TPKW	 TPKW 2204PDER TPKW 2204PDSR	Material Compatibility														Dimensions																					
		P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	d	l	s	l ₁	r	d ₁		
		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]		
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				○									●																		○						





System 211 / 260-054 / 260-056

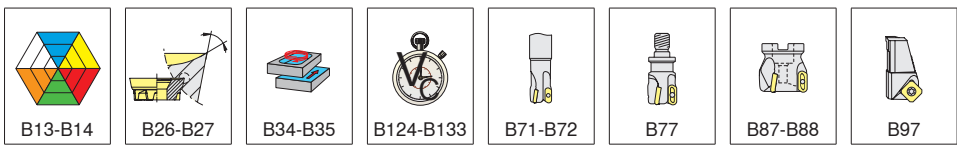
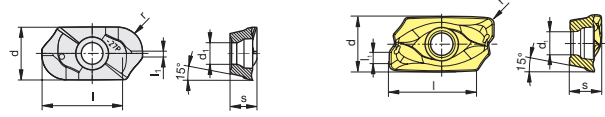
XD..

Tools and inserts for milling


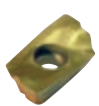

Inserts

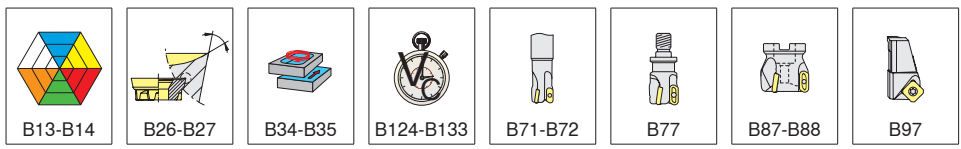
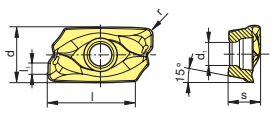
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N	●	●																					
S			○																				
H																							○

		CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215									
																										d	l	s	l ₁	r	d ₁	
																										[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	
-27P		XDHT 11T302FR-27P	●																							.268	.417	.138	.079	.008	.110	
		XDHT 11T304FR-27P	●																								.268	.417	.138	.071	.016	.110
		XDHT 11T308FR-27P	●																								.268	.417	.138	.055	.031	.110
		XDHT 11T312FR-27P	●																								.268	.417	.138	.055	.047	.110
		XDHT 11T316FR-27P	●																								.268	.417	.138	.055	.063	.110
		XDHT 11T320FR-27P	●																								.268	.417	.138	.055	.079	.110
		XDHT 11T325FR-27P	●																								.268	.417	.138	.055	.098	.110
		XDHT 11T332FR-27P	●																								.268	.417	.138	.031	.126	.110
		XDHT 11T340FR-27P	●																								.268	.417	.138		.157	.110
		XDHT 11T350FR-27P	●																								.268	.417	.138		.197	.110
-F20		XDKT 070304FR-F20	●																							.193	.307	.125	.059	.016	.098	
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		XDKT 11T302FR-F20	●																								.268	.417	.150	.079	.008	.110
		XDKT 11T304FR-F20	●																								.268	.417	.150	.071	.016	.110
		XDKT 11T308FR-F20	●																								.268	.417	.150	.055	.031	.110
		XDKT 11T320FR-F20	●																								.268	.417	.150	.067	.079	.110
		XDKT 11T325FR-F20	●																								.268	.417	.150	.047	.098	.110
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		XDKT 11T304ER-F40														●	●	●									.268	.417	.150	.067	.016	.110
		XDKT 11T308ER-F40														●	●	●									.268	.417	.150	.055	.031	.110
		XDKT 11T312ER-F40														●	●	●									.268	.417	.150	.043	.047	.110
		XDKT 11T316ER-F40														●	●	●									.268	.417	.150	.031	.063	.110
		XDKT 11T320ER-F40														●	●	●									.268	.417	.150	.012	.079	.110
		XDKT 11T325ER-F40														●	●	●									.268	.417	.150	.063	.098	.110
		XDKT 11T332ER-F40														●	●	●									.268	.417	.150	.059	.126	.110
		XDKT 11T340ER-F40														●	●	●									.268	.417	.150		.157	.110
		XDKT 150508ER-F40														●	●	●									.366	.583	.219	.063	.031	.177
		XDKT 150532ER-F40														●	●	●									.366	.583	.219	.075	.126	.177
	XDKT 150540ER-F40														●	●	●									.366	.583	.219	.047	.157	.177	
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		XDKT 11T304SR-F50							●										●								.268	.417	.150	.071	.016	.110
		XDKT 11T308SR-F50							●										●	●							.268	.417	.150	.055	.031	.110
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		XDKT 11T332SR-F50							●										●	●							.268	.417	.150	.059	.126	.110
		XDKT 150508SR-F50							●										●	●							.366	.583	.219	.063	.031	.177





		P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	d	l	s	l ₁	r	d ₁			
		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]					
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		XDKT 070308SR-M50																															.193	.307	.125	.039	.031	.098
		XDKT 11T304SR-M50																															.268	.417	.150	.071	.016	.110
		XDKT 11T308SR-M50																															.268	.417	.150	.055	.031	.110
		XDKT 11T312SR-M50																															.268	.417	.150	.039	.047	.110
		XDKT 11T320SR-M50																															.268	.417	.150	.083	.079	.110
		XDKT 11T325SR-M50																															.268	.417	.150	.063	.098	.110
		XDKT 11T332SR-M50																															.268	.417	.150	.059	.126	.110
		XDKT 150508SR-M50																															.366	.583	.219	.063	.031	.177
		XDKT 150520SR-M50																															.366	.583	.219	.063	.079	.177
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		XDKT 11T312SR-R50																															.268	.417	.150	.039	.047	.110
		XDKT 11T320SR-R50																															.268	.417	.150	.083	.079	.110
		XDKT 11T325SR-R50																															.268	.417	.150	.063	.098	.110
		XDKT 11T332SR-R50																															.268	.417	.150	.059	.126	.110
		XDKT 150508SR-R50																															.366	.583	.219	.063	.031	.177
		XDKT 150520SR-R50																															.366	.583	.219	.063	.079	.177
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XDHT



XDHT 190402FR-27P
 XDHT 190404FR-27P
 XDHT 190408FR-27P
 XDHT 190412FR-27P
 XDHT 190416FR-27P
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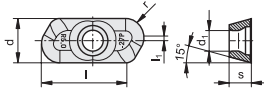
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N	●	●		○															●	
S				○						○	○	○								
H							●													○

CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	
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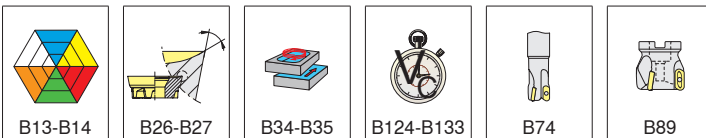
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.375	.748	.187	.079	.063	.183
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.375	.748	.187	.039	.157	.183
.375	.748	.187		.197	.183

d	l	s	l ₁	r	d ₁
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Inserts



Tools and inserts for milling



B13-B14

B26-B27

B34-B35

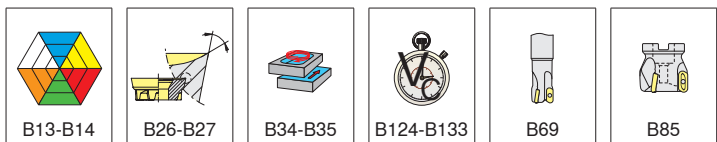
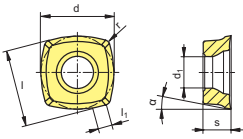
B124-B133

B74

B89



	Material	Part Number	Material														d	l	s	l ₁	r	d ₁															
			P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220							SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	
-F40		XDLX 09T308ER-F40			●	●															●	●									.378	.354	.156	.096	.031	.173	
		XOLX 120410ER-F40			●	●																●	●									.500	.472	.187	.087	.039	.217
		XPLX 060305ER-F40			○	○																○	○									.250	.236	.108	.041	.020	.110
-M50		XDLX 09T308SR-M50								●					●								●								.378	.354	.156	.059	.031	.173	
		XOLX 120410SR-M50								●					●									●								.500	.472	.187	.087	.039	.217
		XPLX 060305SR-M50								●						●								●								.250	.236	.108	.041	.020	.110
-R50		XOLX 120410SR-R50														●														.500	.472	.187	.087	.039	.217		

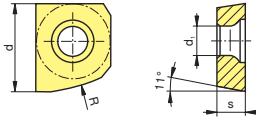




SPEX



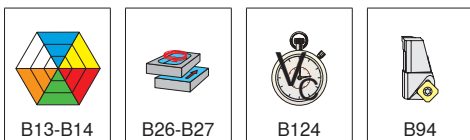
SPEX 1204EETR



	CTW4615	H216T	S26T	AMZ	CTC3215	SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215	
P																							
M																							
K																							
N																							
S																							
H																							

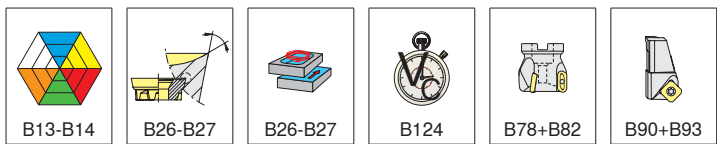
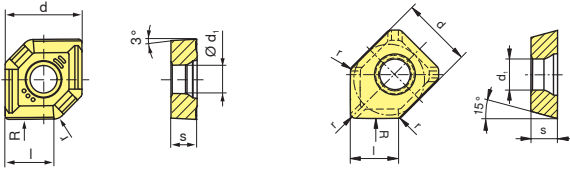
d	l	s	d ₁	R
[inch]	[inch]	[inch]	[inch]	[inch]
.500	.472	.187	.217	15.7

d	l	s	d ₁	R
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	Material	Tool	Material											d [inch]	l [inch]	s [inch]	r [inch]	R [inch]																					
			P	M	K	N	S	H	CTW4615	H216T	S26T	AMZ	CTC3215						SR216	CTP6215	CTP3220	SR226+	CTP1625	CTP1235	GM43+	GM43	CTC5235	CTC5240	CTP2235	GM246	TCC410	TCM10	CTD4205	CTN3105	CTL3215				
-M50	XAHT 060525SL-M50 XAHT 060525SR-M50																														.672	.393	.219	.100	25.2				
																																	.672	.393	.219	.100	25.2		
XDHW	XDHW 0903AEEN XDHW 0903AEFN XDHW 0903AESN XDHW 1204AEEN XDHW 1204AEFN XDHW 1204AESN																															.375	.217	.125	.039	4.9			
																																	.375	.217	.125	.039	4.9		
																																		.375	.217	.125	.039	4.9	
																																			.500	.295	.187	.039	5.9
																																			.500	.295	.187	.039	5.9
																																			.500	.295	.187	.039	5.9





MaxiMill end mills

	Face milling cutters C270	B66
	Face milling cutters C272	B67
	Button insert cutters C251 / C252	B68
	Face milling cutters CHFC	B69
	Shoulder & slot milling cutters C490	B70
	Shoulder & slot milling cutters C211	B71-B72
	Shoulder & slot milling cutters C141	B73
	Shoulder & slot milling cutters CHSC	B74

MaxiMill threaded shank milling cutters

	Button insert cutters G251	B75
	Shoulder & slot milling cutters G490	B76
	Shoulder & slot milling cutters G211	B77

MaxiMill shell milling cutters

	Face milling cutters A270	B78
	Button insert cutters A251 / A252	B79-B80
	Face milling cutters A271	B81
	Face milling cutters A273	B82
	Face milling cutters A274	B83+B84
	Face milling cutters AHFC	B85
	Shoulder & slot milling cutters A490	B86
	Shoulder & slot milling cutters A211	B87+B88
	Shoulder & slot milling cutters AHSC	B89



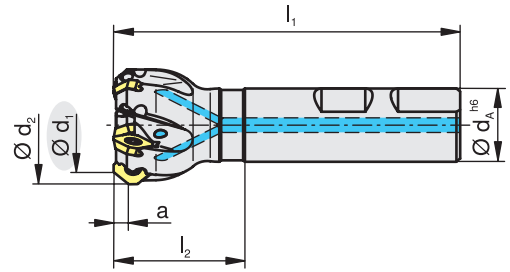
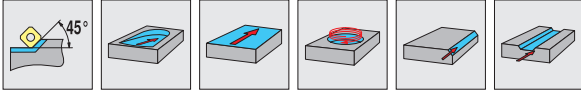
MaxiMill cassette cutters



	Face milling cutters A260	B90-B93
	Button insert cutters A260	B95
	Shoulder & slot milling cutters A260	B97-B101
	Cutter bodies A260	B102
	Cassettes A260	B103



MaxiMill C270





Face milling cutters







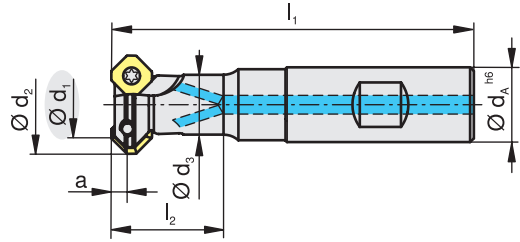
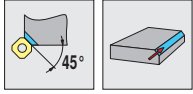
d_1 [inch]	Type, description	d_2 [inch]	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
.500	C270.0500.R.01-09-B0625-125-EF	.830	3.25	1.25	.625	.157	1	41,700	SD.. 0903..	E01
.500	C270.0500.R.01-09-B075-125-EF	.830	3.25	1.25	.750	.157	1	41,700	SD.. 0903..	E01
.750	C270.0750.R.03-09-B075-150-EF	1.080	3.50	1.50	.750	.157	3	33,500	SD.. 0903..	E02
.750	C270.0750.R.03-09-B100-150-EF	1.080	3.50	1.50	1.000	.157	3	33,500	SD.. 0903..	E02
1.000	C270.100.R.04-09-B075-150-EF	1.330	3.50	1.50	.750	.157	4	28,800	SD.. 0903..	E02
1.000	C270.100.R.04-09-B100-150-EF	1.330	3.50	1.50	1.000	.157	4	28,800	SD.. 0903..	E02
1.250	C270.125.R.05-09-B075-175-EF	1.580	3.75	1.75	.750	.157	5	25,600	SD.. 0903..	E02
1.250	C270.125.R.05-09-B100-175-EF	1.580	3.75	1.75	1.000	.157	5	25,600	SD.. 0903..	E02
1.500	C270.150.R.05-09-B075-200-EF	1.830	4.00	2.00	.750	.157	5	23,300	SD.. 0903..	E02
1.500	C270.150.R.05-09-B100-200-EF	1.830	4.00	2.00	1.000	.157	5	23,300	SD.. 0903..	E02

Tools

Tools and inserts for milling

			
E01	169857	11149541	56656
E02	77613	11149541	56656

			
B121-B123	B134-B151	B171	B54



d_1 [inch]	Type, description	d_2 [inch]	l_1 [inch]	l_2 [inch]	d_3 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
.500	C272.0500.R.01-09-B-100-EF	.830	3.25	1.00	.500	.625	.157	1	27,000	SD.. 0903..	E01
1.000	C272.100.R.03-09-B-125-EF	1.330	3.50	1.25	.843	1.000	.157	3	21,600	SD.. 0903..	E02

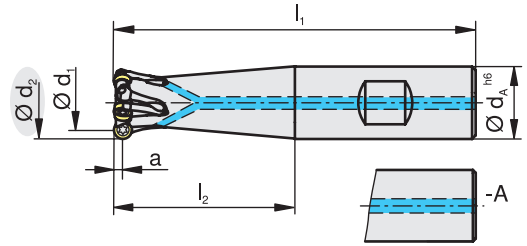
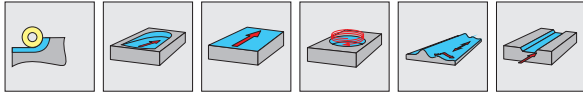
E01	169857	11149541	56656
E02	77613	11149541	56656





MaxiMill C251

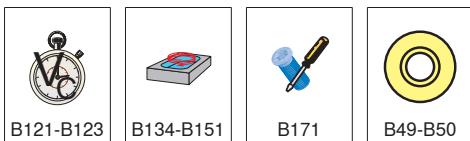
Button insert cutters

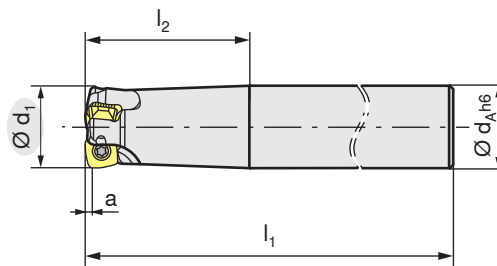
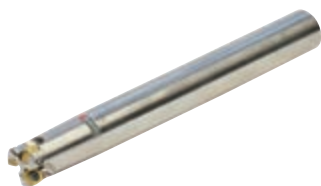
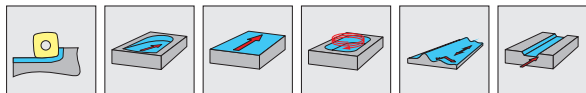


Tools and inserts for milling

d_2 [inch]	Type, description	d_1 [inch]	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
.750	C251.0750.R.03-08-B-125-RS-EF	.435	3.50	1.25	.750	.157	3	31,800	RD.. 08..	E01
.750	C251.0750.R.03-08-A-200-RS-EF-800	.435	8.00	2.00	.750	.157	3	22,260	RD.. 08..	E01
1.000	C251.100.R.04-08-B-225-RS-EF	.685	4.50	2.25	1.000	.157	4	25,450	RD.. 08..	E01
1.000	C251.100.R.04-08-A-300-RS-EF-800	.685	8.00	3.00	1.000	.157	4	18,000	RD.. 08..	E01
1.250	C251.125.R.05-08-B-275-RS-EF	.935	5.25	2.75	1.250	.157	5	19,850	RD.. 08..	E01
1.250	C251.125.R.05-08-A-325-RS-EF-1000	.935	10.00	3.25	1.250	.157	5	18,000	RD.. 08..	E01
1.000	C251.100.R.03-10-B-225-RS-EF	.606	4.50	2.25	1.000	.197	3	25,450	RP.. 10..	E02
1.000	C251.100.R.03-10-A-300-RS-EF-800	.606	8.00	3.00	1.000	.197	3	20,000	RP.. 10..	E02
1.250	C251.125.R.04-10-B-275-RS-EF	.857	5.25	2.75	1.250	.197	4	19,850	RP.. 10..	E02
1.250	C251.125.R.04-10-A-325-RS-EF-1000	.857	10.00	3.25	1.250	.197	4	18,000	RP.. 10..	E02
1.500	C251.150.R.05-10-B125-325-RS-EF	1.106	6.00	3.25	1.250	.197	5	15,100	RP.. 10..	E02
1.500	C251.150.R.05-10-A125-375-RS-EF-1000	1.106	10.00	3.75	1.250	.197	5	10,700	RP.. 10..	E02
1.250	C251.125.R.02-12-A-325-RS-EF-1000	.778	10.00	3.25	1.250	.236	2	8,500	RP.. 12..	E03
1.500	C251.150.R.03-12-A125-375-RS-EF-1000	1.028	10.00	3.75	1.250	.236	3	12,500	RP.. 12..	E03
1.500	C251.150.R.02-16-A125-375-RS-EF-1000	.870	10.00	3.75	1.250	.315	2	10,500	RP.. 16..	E04

E01	76913	11149541	56656
E02	11464141	11464183	291576
E03	165795	11149570	6274
E04	106022	11210490	6275





d_1 [inch]	Type, description	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
.625	CHFC.0625.R.02-06-A-150-EF-800	8.00	1.50	.625	.031	2	18,100	XP.. 06..	E01
.625	CHFC.0625.R.02-06-B-150-EF	3.50	1.50	.625	.031	2	18,100	XP.. 06..	E01
.750	CHFC.0750.R.03-06-A-200-EF-900	9.00	2.00	.750	.031	3	14,100	XP.. 06..	E01
.750	CHFC.0750.R.03-06-B-200-EF	4.20	2.00	.750	.031	3	14,100	XP.. 06..	E01
1.000	CHFC.100.R.04-06-A-200-EF-900	9.00	2.00	1.000	.031	4	15,400	XP.. 06..	E01
1.000	CHFC.100.R.04-06-B-200-EF	4.40	2.00	1.000	.031	4	15,400	XP.. 06..	E01
1.250	CHFC.125.R.05-06-A100-250-EF-900	9.00	2.50	1.000	.031	5	10,700	XP.. 06..	E01
1.250	CHFC.125.R.05-06-B100-250-EF	4.90	2.50	1.000	.031	5	10,700	XP.. 06..	E01
1.000	CHFC.100.R.03-09-A-200-EF-800	8.00	2.00	1.000	.039	3	9,000	XD.. 09..	E02
1.250	CHFC.125.R.03-09-A-250-EF-1000	10.00	2.50	1.250	.039	3	8,100	XD.. 09..	E03
1.250	CHFC.125.R.02-12-A-250-EF-1000	10.00	2.50	1.250	.079	2	6,480	XO.. 12..	E04
1.500	CHFC.150.R.03-12-A125-250-EF-1000	10.00	2.50	1.250	.079	3	6,100	XO.. 12..	E04

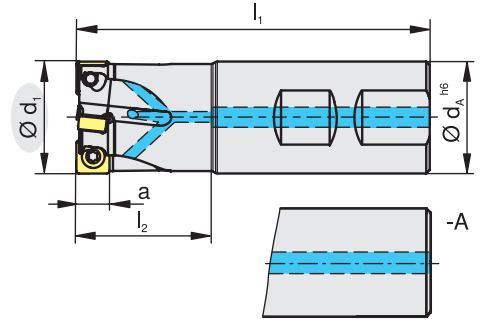
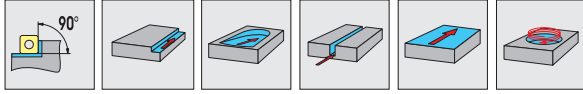
E01	76913	11149541	56656
E02	54976	11149570	6274
E03	165795	11149570	6274
E04	106022	11210490	6275





MaxiMill C490

Shoulder & slot milling cutters



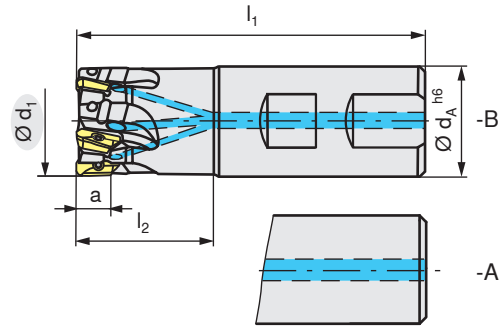
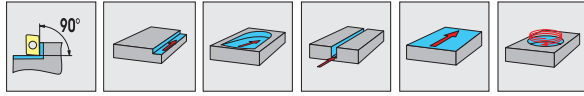
d_1 [inch]	Type, description	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.000	C490.100.R.03-09-B-125-EF	3.50	1.25	1.000	.315	3	23,700	SD.. 09T3..	E01
1.000	C490.100.R.02-09-A-150-EF-800	8.00	1.50	1.000	.315	2	19,700	SD.. 09T3..	E01
1.250	C490.125.R.04-09-B-150-EF	3.75	1.50	1.250	.315	4	22,000	SD.. 09T3..	E01
1.250	C490.125.R.03-09-A-200-EF-1000	10.00	2.00	1.250	.315	3	14,700	SD.. 09T3..	E01

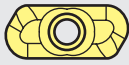

Tools





Tools and inserts for milling

E01	54976	11149570	6274

B121-B123	B134-B151	B171	B53



d_1 [inch]	Type, description	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
.375	C211.0375.R.01-07-A-0750-EF	3.00	.75	.375	.236	1	68,000	XD.. 07..	E01
.500	C211.0500.R.02-07-A-0750-EF	3.00	.75	.500	.236	2	66,600	XD.. 07..	E01
.625	C211.0625.R.03-07-A-125-EF-650	6.50	1.25	.625	.236	3	17,760	XD.. 07..	E01
.750	C211.0750.R.04-07-A-150-EF-800	8.00	1.50	.750	.236	4	12,600	XD.. 07..	E01
1.000	C211.100.R.06-07-A0875-125-EF	3.50	1.25	.875	.236	6	39,840	XD.. 07..	E01
1.250	C211.125.R.08-07-A100-150-EF	3.50	1.50	1.000	.236	8	36,240	XD.. 07..	E01
.625	C211.0625.R.02-11-B-100-EF	3.25	1.00	.625	.394	2	42,000	XD.. 11..	E02
.625	C211.0625.R.02-11-A-125-EF-650	6.50	1.25	.625	.394	2	14,800	XD.. 11..	E02
.750	C211.0750.R.03-11-B-100-EF	3.50	1.00	.750	.394	3	36,900	XD.. 11..	E02
.750	C211.0750.R.03-11-A-125-EF-650	6.50	1.25	.750	.394	3	15,800	XD.. 11..	E02
1.000	C211.100.R.04-11-B-125-EF	3.50	1.25	1.000	.394	4	33,200	XD.. 11..	E02
1.000	C211.100.R.04-11-A-150-EF-650	6.50	1.50	1.000	.394	4	19,900	XD.. 11..	E02
1.250	C211.125.R.05-11-B-150-EF	3.75	1.50	1.000	.394	5	30,200	XD.. 11..	E02
1.250	C211.125.R.05-11-A-200-EF-650	6.50	2.00	1.000	.394	5	20,900	XD.. 11..	E02
1.500	C211.150.R.06-11-B-200-EF	4.00	2.00	1.250	.394	6	27,700	XD.. 11..	E03
1.000	C211.100.R.02-15-A-200-EF-800	8.00	2.00	1.000	.551	2	7,520	XD.. 15..	E04
1.250	C211.125.R.03-15-B-150-EF-400	4.00	1.50	1.250	.551	3	24,160	XD.. 15..	E04
1.250	C211.125.R.03-15-A-250-EF-1000	10.00	2.50	1.250	.551	3	6,800	XD.. 15..	E04
1.500	C211.150.R.03-15-B125-200-EF-450	4.50	2.00	1.250	.551	3	22,160	XD.. 15..	E04
1.500	C211.150.R.04-15-B125-200-EF-450	4.50	2.00	1.250	.551	4	22,160	XD.. 15..	E04
1.500	C211.150.R.03-15-A125-300-EF-1000	10.00	3.00	1.250	.551	3	6,120	XD.. 15..	E04

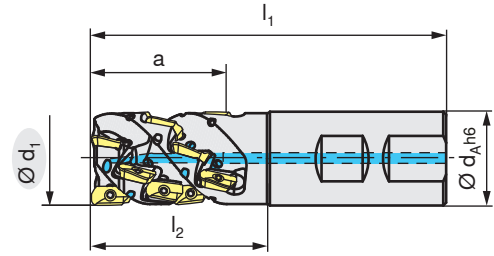
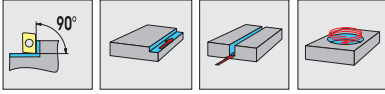
			
E01	11450028	11450898	11450849
E02	11114238	11254598	11114698
E03	11114242	11254598	11114698
E04	11450042	11450867	11450858

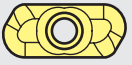





MaxiMill C211

Shoulder & slot milling cutters







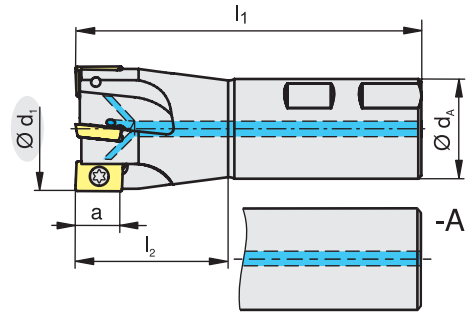
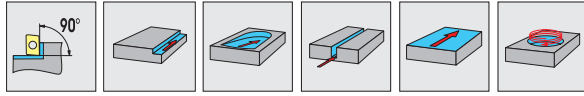
d_1 [inch]	Type, description	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n	n_{max} [RPM]		
1.000	C211.100.R.02K3-11-B-150-EF	3.75	1.50	1.000	1.060	2	6	22,200	XD.. 11..	E01
1.250	C211.125.R.02K4-11-B-200-EF	4.50	2.00	1.250	1.430	2	8	20,200	XD.. 11..	E01
1.500	C211.150.R.03K4-11-A-225-EF	5.10	2.25	1.500	1.420	3	12	18,500	XD.. 11..	E01

Tools

Tools and inserts for milling

			
E01	11114242	11254598	11114698

			
B121-B123	B134-B151	B171	B58-B59



d_1 [inch]	Type, description	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
.625	C141.0625.R.01-A-100-EF-600	6.00	1.00	.625	.551	1	13,500	LD.. 15..	E01
.625	C141.0625.R.01-B-100-EF	3.25	1.00	.625	.551	1	28,500	LD.. 15..	E01
.750	C141.0750.R.01-A-125-EF-800	8.00	1.25	.750	.551	1	10,700	LD.. 15..	E02
.750	C141.0750.R.01-B-125-EF	3.50	1.25	.750	.551	1	25,000	LD.. 15..	E02
1.000	C141.100.R.02-A-125-EF-800	8.00	1.25	1.000	.551	2	13,500	LD.. 15..	E02
1.000	C141.100.R.02-B-125-EF	3.50	1.25	1.000	.551	2	22,500	LD.. 15..	E02
1.250	C141.125.R.03-A-125-EF-1000	10.00	1.25	1.000	.551	3	14,000	LD.. 15..	E02
1.250	C141.125.R.03-B-125-EF	3.75	1.25	1.000	.551	3	20,400	LD.. 15..	E02
1.500	C141.150.R.04-A-125-EF-1000	10.00	1.25	1.250	.551	4	12,900	LD.. 15..	E02
1.500	C141.150.R.04-B-125-EF	4.00	1.25	1.250	.551	4	18,800	LD.. 15..	E02

Tools

Tools and inserts for milling

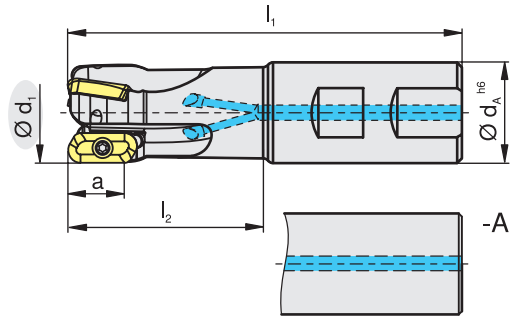
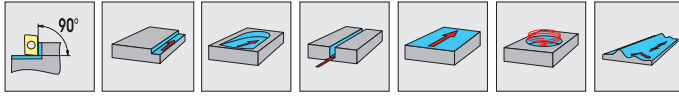
E01	228879	6274
E02	54976	6274

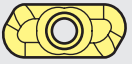





MaxiMill CHSC





Shoulder & slot milling cutters



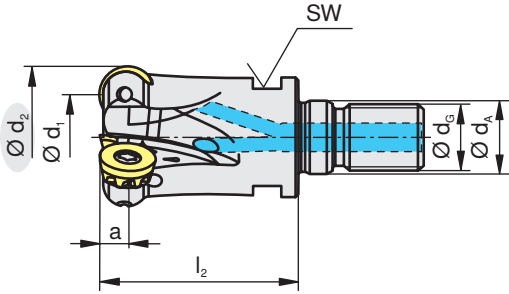
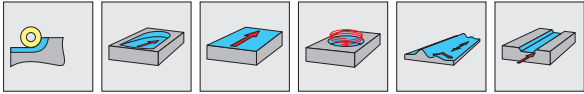
d_1 [inch]	Type, description	l_1 [inch]	l_2 [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.000	CHSC.100.R.02-19-A100-200-EF	4.50	2.00	1.000	.709	2	35,000	XD.. 19..	E01
1.000	CHSC.100.R.02-19-A-200-EF	4.50	2.00	1.000	.709	2	35,000	XD.. 19..	E01
1.000	CHSC.100.R.02-19-A100-250-EF	6.50	2.50	1.000	.709	2	32,800	XD.. 19..	E01
1.000	CHSC.100.R.02-19-A-250-EF	6.50	2.50	1.000	.709	2	32,800	XD.. 19..	E01
1.250	CHSC.125.R.02-19-A-250-EF	5.00	2.50	1.250	.709	2	29,100	XD.. 19..	E02
1.250	CHSC.125.R.02-19-A-325-EF	6.50	3.25	1.250	.709	2	27,200	XD.. 19..	E02
1.500	CHSC.150.R.03-19-A125-325-EF	5.75	3.25	1.250	.709	3	23,800	XD.. 19..	E02
1.500	CHSC.150.R.03-19-A125-400-EF	6.50	4.00	1.250	.709	3	21,900	XD.. 19..	E02

Tools

Tools and inserts for milling

			
E01	11042275	11149572	6274
E02	11037484	11149572	6274





d_2 [inch]	Type, description	d_1 [inch]	l_2 [inch]	a [inch]	d_G [mm]	d_A [mm]	z	n_{max} [RPM]		
1.000	G251.100.R.03-10-125-RS-F	.606	1.25	.197	12	12.5	3	25,450	RP.. 10..	E01
1.500	G251.150.R.05-10-175-RS-F	1.106	1.75	.197	16	17.0	5	15,150	RP.. 10..	E01

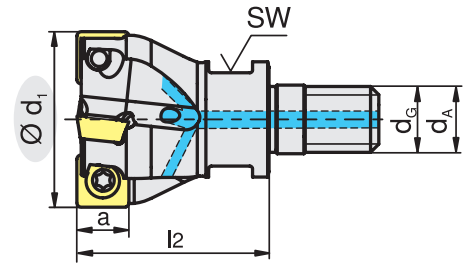
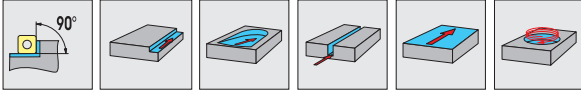
E01	11464141	11464183	291576

B121-B123	B134-B151	B171	B49-B50



MaxiMill G490

Shoulder & slot milling cutters



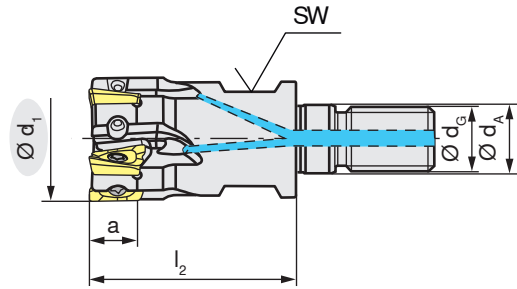
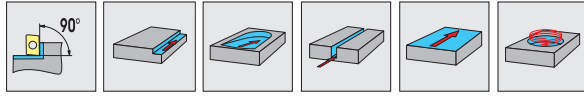
d_1 [inch]	Type, description	l_2 [inch]	a [inch]	d_G [mm]	d_A [mm]	z	n_{max} [RPM]		
1.000	G490.100.R.03-09-125-F	1.25	.315	12	12.5	3	23,700	SD.. 09T3..	E01
1.250	G490.125.R.04-09-150-F	1.50	.315	16	17.0	4	19,700	SD.. 09T3..	E01



Tools

Tools and inserts for milling


E01	54976	11149570	6274

B121-B123	B134-B151	B171	B53



d_1 [inch]	Type, description	l_2 [inch]	a [inch]	d_G [mm]	d_A [mm]	z	n_{max} [RPM]		
.625	G211.0625.R.02-11-125-F	1.25	.394	8	8.5	2	42,000	XD.. 11..	E01
.750	G211.0750.R.03-11-118-F	1.12	.394	10	10.5	3	36,900	XD.. 11..	E01
1.000	G211.100.R.04-11-150-F	1.50	.394	12	12.5	4	33,200	XD.. 11..	E01
1.250	G211.125.R.05-11-150-F	1.50	.394	16	17	5	30,200	XD.. 11..	E01

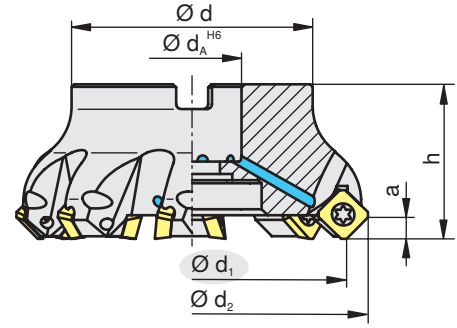
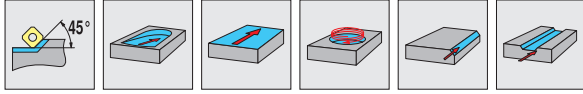
			
E01	11114238	11254598	11114698

			
B121-B123	B134-B151	B171	B58-B59



MaxiMill A270

Face milling cutters

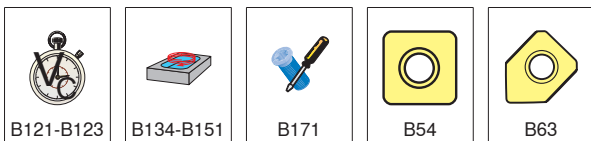


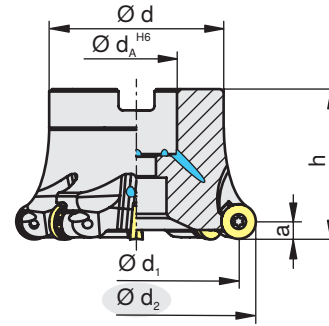
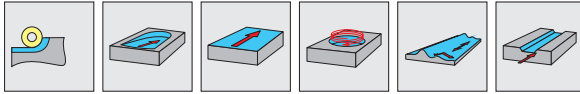
Tools

Tools and inserts for milling

d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
2.000	A270.200.R.06-09-A075-175-EF	2.330	1.75	1.75	.750	.157	6	10,700	SD/XD.. 0903..	E01
2.500	A270.250.R.08-09-A100-200-EF	2.830	2.00	2.25	1.000	.157	8	8,500	SD/XD.. 0903..	E01
3.000	A270.300.R.10-09-A100-200-EF	3.330	2.00	2.25	1.000	.157	10	6,700	SD/XD.. 0903..	E01
2.000	A270.200.R.04-12-A075-175-EF	2.550	1.75	1.75	.750	.236	4	10,700	SD/XD.. 1204..	E02
2.500	A270.250.R.05-12-A100-200-EF	3.050	2.00	2.25	1.000	.236	5	8,500	SD/XD.. 1204..	E02
3.000	A270.300.R.06-12-A100-200-EF	3.550	2.00	2.25	1.000	.236	6	6,700	SD/XD.. 1204..	E02
4.000	A270.400.R.06-12-B125-200-EF	4.550	2.00	2.75	1.250	.236	6	5,400	SD/XD.. 1204..	E02
5.000	A270.500.R.07-12-B150-200-EF	5.550	2.00	3.75	1.500	.236	7	4,300	SD/XD.. 1204..	E02
6.000	A270.600.R.08-12-B150-200-EF	6.660	2.00	3.75	1.500	.236	8	3,500	SD/XD.. 1204..	E02

E01	77613	11149541	56656
E02	106022	11210490	6275





d_2 [inch]	Type, description	d_1 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.500	A251.150.R.06-08-A050-175-RS-EF	1.185	1.75	1.42	.500	.157	6	15,150	RD.. 08..	E01
3.000	A251.300.R.12-08-A100-200-RS-IN-EF	2.685	2.00	2.25	1.000	.157	12	7,950	RD.. 08..	E01
1.500	A251.150.R.05-10-A050-175-RS-EF	1.106	1.75	1.42	.500	.197	5	15,900	RP.. 10..	E02
2.000	A251.200.R.06-10-A075-175-RS-EF	1.606	1.75	1.75	.750	.197	6	12,700	RP.. 10..	E02
2.000	A251.200.R.05-12-A075-175-RS-EF	1.528	1.75	1.75	.750	.236	5	12,700	RP.. 12..	E03
2.000	A251.200.R.06-12-A075-175-RS-EF	1.528	1.75	1.75	.750	.236	6	12,700	RP.. 12..	E03
2.500	A251.250.R.06-12-A100-200-RS-EF	2.028	2.00	2.25	1.000	.236	6	10,100	RP.. 12..	E03
3.000	A251.300.R.07-12-RS-A100-200-EF	2.528	2.00	2.25	1.000	.236	7	7,950	RP.. 12..	E03
4.000	A251.400.R.10-12-B125-200-RS-EF	3.528	2.00	2.75	1.250	.236	10	6,350	RP.. 12..	E03
6.000	A251.600.R.12-12-B150-200-RS-EF	5.528	2.00	3.75	1.500	.236	12	8,300	RP.. 12..	E03
2.000	A251.200.R.03-16-A075-175-RS-EF	1.370	1.75	1.75	.750	.315	3	12,700	RP.. 16..	E04
2.500	A251.250.R.05-16-A100-200-RS-EF	1.870	2.00	2.25	1.000	.315	5	10,100	RP.. 16..	E04
3.000	A251.300.R.06-16-A100-200-RS-EF	2.370	2.00	2.25	1.000	.315	6	7,950	RP.. 16..	E04
4.000	A251.400.R.07-16-B125-200-RS-EF	3.370	2.00	2.75	1.250	.315	7	6,350	RP.. 16..	E04
5.000	A251.500.R.08-16-B150-200-RS-EF	4.370	2.00	3.75	1.500	.315	8	5,400	RP.. 16..	E04
6.000	A251.600.R.10-16-B150-200-RS-EF	5.370	2.00	3.75	1.500	.315	10	7,200	RP.. 16..	E04
3.000	A251.300.R.05-20-A100-200-RS-EF	2.213	2.00	2.25	1.000	.394	5	8,600	RP.. 20..	E05
4.000	A251.400.R.06-20-B125-200-RS-EF	3.213	2.00	2.75	1.250	.394	6	6,350	RP.. 20..	E05
5.000	A251.500.R.07-20-B150-200-RS-EF	4.213	2.00	3.75	1.500	.394	7	5,400	RP.. 20..	E05
6.000	A251.600.R.08-20-B150-200-RS-EF	5.213	2.00	3.75	1.500	.394	8	6,500	RP.. 20..	E05

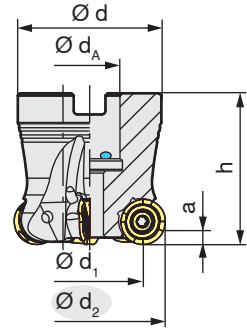
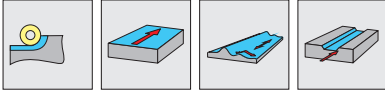
E01	76913	11149541	56656
E02	11464141	11464183	291576
E03	165795	11149570	6274
E04	106022	11210490	6275
E05	11107792	11210490	6275







MaxiMill A252




Button insert cutters



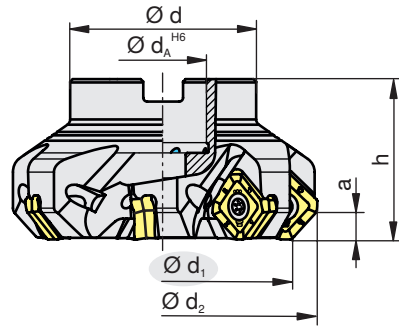
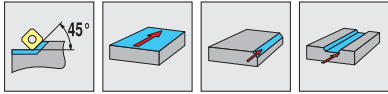
d_2 [inch]	Type, description	d_1 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.500	A252.150.R.04-12-A050-175-EF	1.027	1.75	1.50	.500	.118	4	15,900	RN.. 12..	E01
2.000	A252.200.R.05-12-A075-175-EF	1.527	1.75	1.75	.750	.118	5	12,700	RN.. 12..	E01
2.500	A252.250.R.06-12-A100-200-EF	2.027	2.00	2.25	1.000	.118	6	10,100	RN.. 12..	E01
3.000	A252.300.R.07-12-A100-200-EF	2.527	2.00	2.25	1.000	.118	7	7,950	RN.. 12..	E01



Tools




Tools and inserts for milling


		
E01	11610311	11450867





d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
2.000	A271.200.R.04-17-A075-175-EF	2.634	1.75	1.75	.750	.330	4	14,300	SA.. 17..	E01
2.500	A271.250.R.06-17-A100-200-EF	3.134	2.00	2.25	1.000	.330	6	12,700	SA.. 17..	E01
3.000	A271.300.R.07-17-A100-200-EF	3.634	2.00	2.25	1.000	.330	7	11,500	SA.. 17..	E01
4.000	A271.400.R.08-17-B125-200-EF	4.634	2.00	2.75	1.250	.330	8	9,800	SA.. 17..	E01
5.000	A271.500.R.10-17-B150-200-EF	5.634	2.00	3.75	1.500	.330	10	8,700	SA.. 17..	E01
6.500	A271.650.R.12-17-C250-250-EF	7.134	2.50	5.12	2.500	.330	12	7,600	SA.. 17..	E01

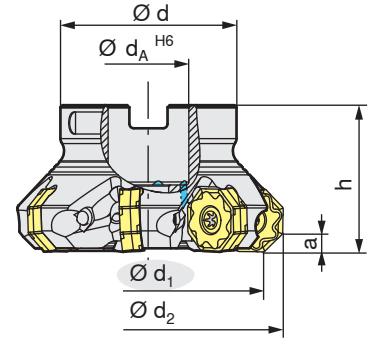
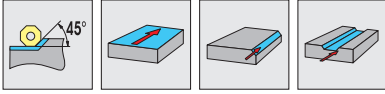
			
E01	11107792	11210490	6275



			
B121-B123	B134-B151	B171	B52



MaxiMill A273






Face milling cutters








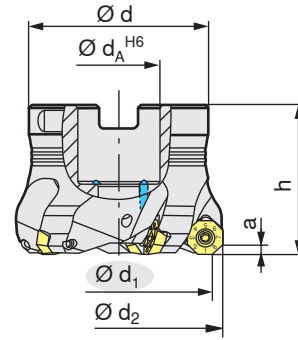
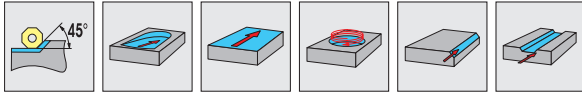
d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
2.000	A273.200.R.05-06-A075-175-EF	2.400	1.75	1.75	.750	.138	5	14,800	OA/XA.. 0605..	E01
2.500	A273.250.R.07-06-A100-200-EF	2.900	2.00	2.25	1.000	.138	7	13,000	OA/XA.. 0605..	E01
3.000	A273.300.R.08-06-A100-200-EF	3.400	2.00	2.25	1.000	.138	8	11,800	OA/XA.. 0605..	E01
4.000	A273.400.R.10-06-B125-200-EF	4.400	2.00	2.75	1.250	.138	10	10,100	OA/XA.. 0605..	E02
5.000	A273.500.R.12-06-B150-200-EF	5.400	2.00	3.75	1.500	.138	12	8,900	OA/XA.. 0605..	E02
6.000	A273.600.R.13-06-B150-250-EF	6.400	2.00	3.75	1.500	.138	13	7,900	OA/XA.. 0605..	E02
8.000	A273.800.R.25-06-C250-250-EF	8.400	2.50	6.50	2.500	.138	25	2,900	OA/XA.. 0605..	E03
10.000	A273.1000.R.31-06-C250-250-EF	10.400	2.50	6.50	2.500	.138	31	2,600	OA/XA.. 0605..	E03



Tools





Tools and inserts for milling

					
E01		11107792		11210490	6275
E02		11107792		11802576	6275
E03	11529282		11529276	11534870	6274

				
B121-B123	B134-B151	B171	B47	B63



d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.500	A274.150.R.05-09-A050-175-EF	1.740	1.75	1.42	.500	.098	5	29,200	OF.. 04..	E01
2.000	A274.200.R.07-09-A075-175-EF	2.230	1.75	1.75	.750	.098	7	25,000	OF.. 04..	E01
3.000	A274.300.R.09-09-A100-200-EF	3.230	2.00	2.25	1.000	.098	9	20,100	OF.. 04..	E01
4.000	A274.400.R.11-09-B125-200-EF	4.230	2.00	2.75	1.250	.098	11	17,300	OF.. 04..	E01
2.000	A274.200.R.04-12-A075-175-EF	2.320	1.75	1.75	.750	.126	4	18,900	OF.. 05..	E02
2.500	A274.250.R.05-12-A100-200-EF	2.820	2.00	2.19	1.000	.126	5	16,700	OF.. 05..	E02
3.000	A274.300.R.06-12-A100-200-EF	3.320	2.00	2.19	1.000	.126	6	15,200	OF.. 05..	E02
4.000	A274.400.R.07-12-A125-200-EF	4.320	2.00	2.75	1.250	.126	7	13,000	OF.. 05..	E02
5.000	A274.500.R.08-12-B150-200-EF	5.320	2.00	3.81	1.500	.126	8	11,600	OF.. 05..	E02
6.000	A274.600.R.10-12-B200-200-EF	6.320	2.00	4.88	2.000	.126	10	10,500	OF.. 05..	E02

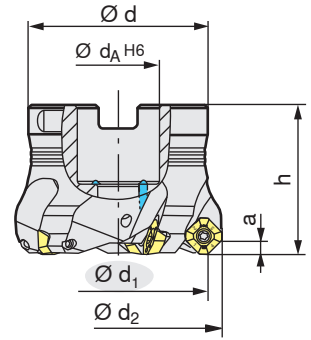
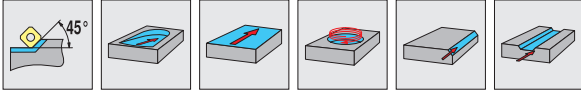
			
E01	11513168	11254598	11114698
E02	11803957	11450867	11450858





MaxiMill A274 SF..

Face milling cutters



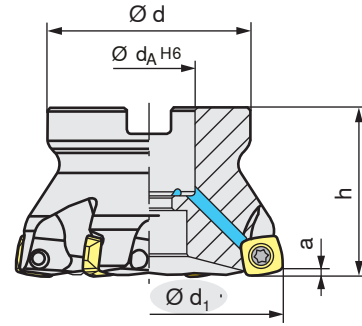
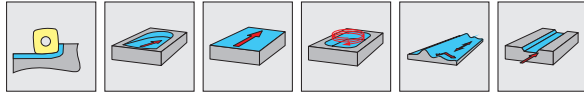
d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.45	A274.150.R.05-09-A050-175-EF	1.80	1.78	1.42	.500	.150	5	29,200	SF.. 0903..	E01
1.95	A274.200.R.07-09-A075-175-EF	2.30	1.78	1.75	.750	.150	7	25,000	SF.. 0903..	E01
2.95	A274.300.R.09-09-A100-200-EF	3.30	2.03	2.25	1.000	.150	9	20,100	SF.. 0903..	E01
3.95	A274.400.R.11-09-B125-200-EF	4.30	2.03	2.75	1.250	.150	11	17,300	SF.. 0903..	E01
1.88	A274.200.R.04-12-A075-175-EF	2.43	1.81	1.75	.750	.236	4	18,900	SF.. 1204..	E02
2.38	A274.250.R.05-12-A100-200-EF	2.93	2.06	2.19	1.000	.236	5	16,700	SF.. 1204..	E02
2.88	A274.300.R.06-12-A100-200-EF	3.43	2.06	2.19	1.000	.236	6	15,200	SF.. 1204..	E02
3.88	A274.400.R.07-12-A125-200-EF	4.43	2.06	2.75	1.250	.236	7	13,000	SF.. 1204..	E02
4.88	A274.500.R.08-12-B150-200-EF	5.43	2.06	3.81	1.500	.236	8	11,600	SF.. 1204..	E02
5.88	A274.600.R.10-12-B200-200-EF	6.43	2.06	4.88	2.000	.236	10	10,500	SF.. 1204..	E02



Tools





Tools and inserts for milling

E01	11513168	11254598	11114698
E02	11803957	11450867	11450858

B121-B123	B134-B151	B171	B48



d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.500	AHFC.150.R.04-09-A050-175-EF	1.75	1.42	.500	.039	4	26,400	XD.. 09..	E01
2.000	AHFC.200.R.05-09-A075-175-EF	1.75	1.75	.750	.039	5	23,500	XD.. 09..	E01
2.500	AHFC.250.R.06-09-A075-200-EF	2.00	1.75	.750	.039	6	20,500	XD.. 09..	E01
2.000	AHFC.200.R.04-12-A075-175-EF	1.75	1.75	.750	.079	4	18,800	XO.. 12..	E02
2.500	AHFC.250.R.05-12-A100-200-EF	2.00	2.25	1.000	.079	5	16,400	XO.. 12..	E02
3.000	AHFC.300.R.07-12-A100-200-EF	2.00	2.25	1.000	.079	7	14,000	XO.. 12..	E02
4.000	AHFC.400.R.08-12-A125-200-EF	2.00	2.75	1.250	.079	8	12,000	XO.. 12..	E02
5.000	AHFC.500.R.10-12-B150-250-EF	2.50	3.75	1.500	.079	10	9,800	XO.. 12..	E02

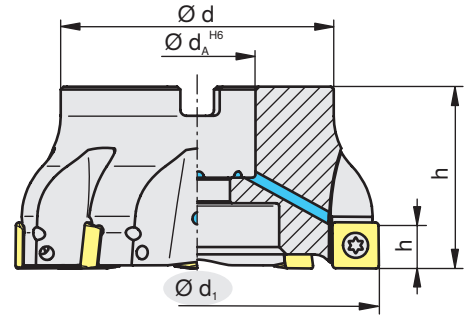
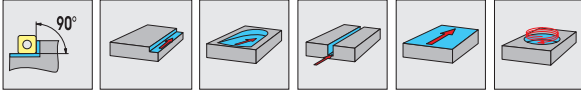
			
E01	165795	11149570	6274
E02	106022	11210490	6275





MaxiMill A490

Shoulder & slot milling cutters



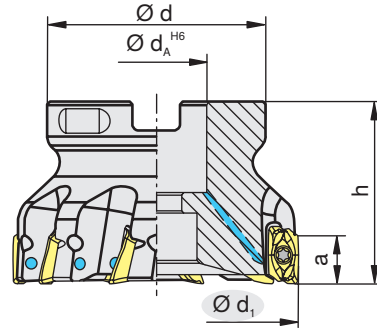
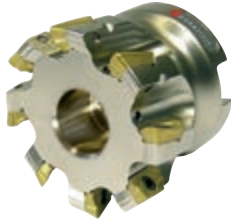
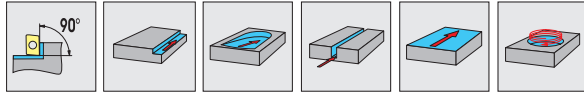
d_i [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.500	A490.150.R.05-09-A050-175-EF	1.75	1.25	.500	.315	5	17,000	SD.. 09T3..	E01
2.000	A490.200.R.06-09-A075-175-EF	1.75	1.65	.750	.315	6	14,800	SD.. 09T3..	E01
2.500	A490.250.R.07-09-A100-200-EF	2.00	1.97	1.000	.315	7	12,850	SD.. 09T3..	E01
3.000	A490.300.R.09-09-A100-200-EF	2.00	2.13	1.000	.315	9	11,250	SD.. 09T3..	E01
4.000	A490.400.R.10-09-A150-200E-F	2.00	2.87	1.500	.315	10	9,900	SD.. 09T3..	E01
4.000	A490.400.R.10-09-B125-200-EF	2.00	2.87	1.250	.315	10	9,900	SD.. 09T3..	E01



Tools





Tools and inserts for milling

E01	54976	11149570	6274

B121-B123	B134-B151	B171	B53



d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
1.500	A211.150.R.08-07-A050-175-EF	1.75	1.42	.500	.236	8	33,240	XD.. 07..	E01
2.000	A211.200.R.10-07-A075-175-EF	1.75	1.75	.750	.236	10	30,480	XD.. 07..	E01
1.500	A211.150.R.04-11-A050-175-EF	1.75	1.42	.500	.394	4	27,700	XD.. 11..	E02
1.500	A211.150.R.06-11-A050-175-EF	1.75	1.42	.500	.394	6	27,700	XD.. 11..	E02
2.000	A211.200.R.05-11-A075-175-EF	1.75	1.75	.750	.394	5	25,400	XD.. 11..	E02
2.000	A211.200.R.08-11-A075-175-EF	1.75	1.75	.750	.394	8	25,400	XD.. 11..	E02
2.500	A211.250.R.06-11-A100-200-EF	2.00	2.25	1.000	.394	6	23,300	XD.. 11..	E02
2.500	A211.250.R.10-11-A100-200-EF	2.00	2.25	1.000	.394	10	23,300	XD.. 11..	E02
3.000	A211.300.R.07-11-A100-200-EF	2.00	2.25	1.000	.394	7	21,300	XD.. 11..	E02
3.000	A211.300.R.12-11-A100-200-EF	2.00	2.25	1.000	.394	12	21,300	XD.. 11..	E02
4.000	A211.400.R.08-11-B125-200-EF	2.00	2.75	1.250	.394	8	19,600	XD.. 11..	E02
4.000	A211.400.R.14-11-B125-200-EF	2.00	2.75	1.250	.394	14	19,600	XD.. 11..	E02
5.000	A211.500.R.10-11-B150-200-EF	2.00	3.75	1.500	.394	10	17,900	XD.. 11..	E02
6.000	A211.600.R.12-11-B150-200-EF	2.00	3.75	1.500	.394	12	16,500	XD.. 11..	E02
1.500	A211.150.R.03-15-A050-175-EF	1.75	1.42	.500	.551	3	22,160	XD.. 15..	E03
2.000	A211.200.R.05-15-A075-175-EF	1.75	1.75	.750	.551	5	20,320	XD.. 15..	E03
2.500	A211.250.R.06-15-A100-200-EF	2.00	2.25	1.000	.551	6	18,640	XD.. 15..	E03
3.000	A211.300.R.05-15-A100-200-EF	2.00	2.25	1.000	.551	5	17,040	XD.. 15..	E03
3.000	A211.300.R.08-15-A100-200-EF	2.00	2.25	1.000	.551	8	17,040	XD.. 15..	E03
4.000	A211.400.R.06-15-B125-200-EF	2.00	2.75	1.250	.551	6	15,680	XD.. 15..	E03
4.000	A211.400.R.09-15-B125-200-EF	2.00	2.75	1.250	.551	9	15,680	XD.. 15..	E03
5.000	A211.500.R.10-15-B150-250-EF	2.50	3.75	1.500	.551	10	14,320	XD.. 15..	E03
6.000	A211.600.R.08-15-B200-250-EF	2.50	3.75	2.000	.551	8	13,200	XD.. 15..	E03
6.000	A211.600.R.10-15-B150-250-EF	2.50	3.75	1.500	.551	10	13,200	XD.. 15..	E03

			
E01	11450028	11450898	11450849
E02	11114242	11254598	11114698
E03	11450042	11450867	11450858



B121-B123

B134-B151

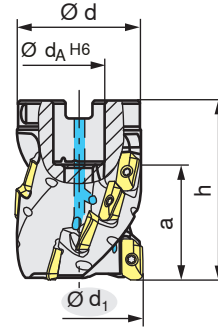
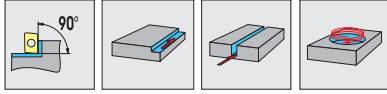
B171

B58-B59





MaxiMill A211






Shoulder & slot milling cutters

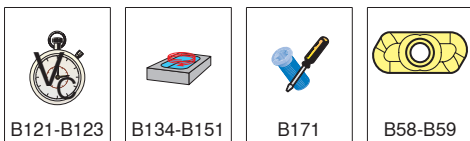


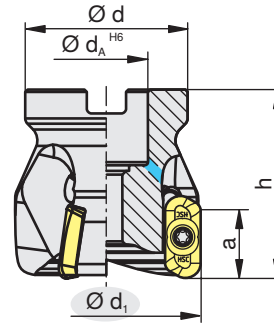
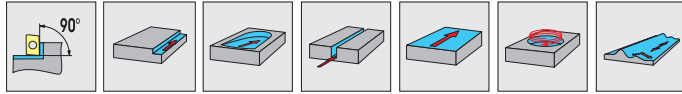
Tools

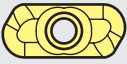

d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n	n_{max} [RPM]		
2.000	A211.200.R.04K5-11-A075-EF	2.50	1.75	.750	1.800	4	20	17,000	XD.. 11..	E01
2.500	A211.250.R.05K7-11-A100-EF	3.25	2.25	1.000	2.500	5	35	12,500	XD.. 11..	E02
3.000	A211.300.R.06K9-11-A100-EF	4.00	2.25	1.000	3.200	6	54	10,000	XD.. 11..	E02
2.000	A211.200.R.03K4-15-A075-EF	3.00	1.75	.750	2.000	3	12	13,600	XD.. 15..	E03
2.500	A211.250.R.04K5-15-A100-EF	3.50	2.25	1.000	2.500	4	20	12,500	XD.. 15..	E04
3.000	A211.300.R.04K6-15-A100-EF	4.00	2.25	1.000	3.000	4	24	11,360	XD.. 15..	E04
3.000	A211.300.R.04K6-15-A125-EF	4.00	2.75	1.250	3.000	4	24	11,360	XD.. 15..	E04
2.500	A211.250.R.04K4-20-A100-EF	3.75	2.25	1.000	2.650	4	16	14,300	XD.. 20..	E05
3.000	A211.300.R.05K5-20-A100-EF	4.25	2.25	1.000	3.250	5	25	12,800	XD.. 20..	E05





Tools and inserts for milling

				
E01	11114242	11528781	11254598	11114698
E02	11114242	11528790	11254598	11114698
E03	11450042	11528781	11450867	11450858
E04	11450042	11528790	11450867	11450858
E05	106022	11528790	11210490	6275





d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	n_{max} [RPM]		
2.000	AHSC.200.R.03-19-A075-175-EF	1.75	1.75	.750	.709	3	21,600	XD.. 19..	E01
2.500	AHSC.250.R.03-19-A100-200-EF	2.00	2.25	1.000	.709	3	18,800	XD.. 19..	E01
2.500	AHSC.250.R.04-19-A100-200-EF	2.00	2.25	1.000	.709	4	18,800	XD.. 19..	E01
3.000	AHSC.300.R.03-19-A100-200-EF	2.00	2.25	1.000	.709	3	16,400	XD.. 19..	E01
3.000	AHSC.300.R.04-19-A100-200-EF	2.00	2.25	1.000	.709	4	16,400	XD.. 19..	E01
4.000	AHSC.400.R.04-19-B125-200-EF	2.00	2.75	1.250	.709	4	14,500	XD.. 19..	E01
5.000	AHSC.500.R.05-19-B150-200-EF	2.00	3.75	1.500	.709	5	12,800	XD.. 19..	E01
6.000	AHSC.600.R.05-19-B150-200-EF	2.00	3.75	1.500	.709	5	11,500	XD.. 19..	E01

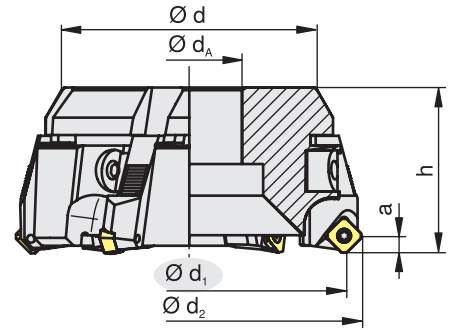
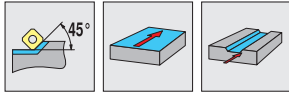
			
E01	11042274	11149572	6274

			
B121-B123	B134-B151	B171	B60



MaxiMill A260-031/-041

Face milling cutters



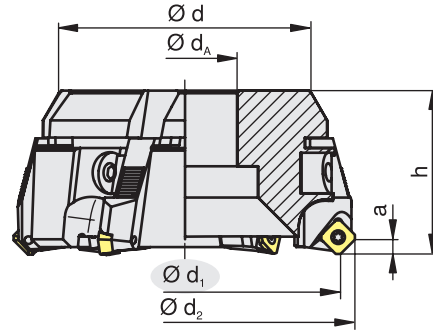
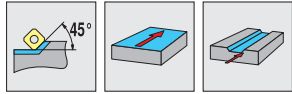
Tools


Tools and inserts for milling









d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.000	A260.300.R.05/041-EF	3.331	2.00	2.449	1.000	.157	5	2.9	SD/XD.. 0903..	E01
4.000	A260.400.R.06/041-EF	4.331	2.00	3.386	1.250	.157	6	4.3	SD/XD.. 0903..	E01
5.000	A260.500.R.07/041-EF	5.331	2.50	3.780	1.500	.157	7	7.7	SD/XD.. 0903..	E01
6.000	A260.600.R.10/041-EF	6.331	2.50	4.882	1.500	.157	10	13.3	SD/XD.. 0903..	E01
8.000	A260.800.R.12/041-EF	8.331	2.50	6.772	2.500	.157	12	21.8	SD/XD.. 0903..	E01
10.000	A260.1000.R.14/041-EF	10.331	2.50	8.898	2.500	.157	14	36.9	SD/XD.. 0903..	E01
3.000	A260.300.R.05/031-EF	3.571	2.00	2.449	1.000	.236	5	2.9	SD/XD.. 1204..	E02
4.000	A260.400.R.06/031-EF	4.571	2.00	3.386	1.250	.236	6	4.3	SD/XD.. 1204..	E02
5.000	A260.500.R.07/031-EF	5.571	2.50	3.78	1.500	.236	7	7.6	SD/XD.. 1204..	E02
6.000	A260.600.R.10/031-EF	6.571	2.50	4.882	1.500	.236	10	13.3	SD/XD.. 1204..	E02
8.000	A260.800.R.12/031-EF	8.571	2.50	6.772	2.500	.236	12	21.8	SD/XD.. 1204..	E02
10.000	A260.1000.R.14/031-EF	10.571	2.50	8.898	2.500	.236	14	36.8	SD/XD.. 1204..	E02







E01	106607	77613	106934	112188	11149541	56656	4425
E02	106607	106022	106934	112188	11149571	6275	4425

B121-B123	B170	B171	B54	B63	B103



d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
2.803	A260.300.R.05/032-EF	3.551	2.00	2.449	1.000	.354	5	2.9	SD.. 1504..	E01
3.803	A260.400.R.06/032-EF	4.551	2.00	3.386	1.250	.354	6	3.9	SD.. 1504..	E01
4.803	A260.500.R.07/032-EF	5.551	2.50	3.78	1.500	.354	7	7.4	SD.. 1504..	E01
5.803	A260.600.R.10/032-EF	6.551	2.50	4.882	1.500	.354	10	12.9	SD.. 1504..	E01
7.803	A260.800.R.12/032-EF	8.551	2.50	6.772	2.500	.354	12	27.9	SD.. 1504..	E01
9.803	A260.1000.R.14/032-EF	10.551	2.50	8.898	2.500	.354	14	36.0	SD.. 1504..	E01
3.000	A260.300.R.05/029-EF	3.512	2.00	2.449	1.000	.236	5	2.9	SE.. 12..	E01
4.000	A260.400.R.06/029-EF	4.512	2.00	3.386	1.250	.236	6	4.2	SE.. 12..	E01
5.000	A260.500.R.07/029-EF	5.512	2.50	3.78	1.500	.236	7	7.6	SE.. 12..	E01
6.000	A260.600.R.10/029-EF	6.512	2.50	4.882	1.500	.236	10	13.2	SE.. 12..	E01
8.000	A260.800.R.12/029-EF	8.512	2.50	6.772	2.500	.236	12	21.7	SE.. 12..	E01
10.000	A260.1000.R.14/029-EF	10.512	2.50	8.898	2.500	.236	14	36.8	SE.. 12..	E01

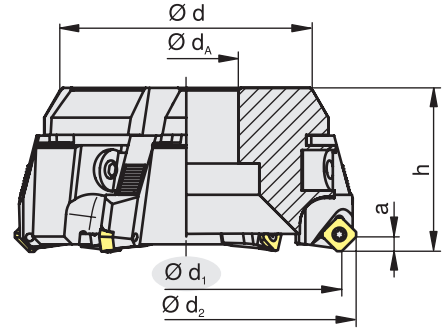
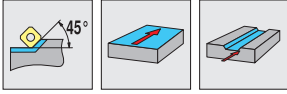
							
E01	106607	106022	106934	112188	11149571	6275	4425

					
B121-B123	B170	B171	B55	B54	B103



MaxiMill A260-058

Face milling cutters



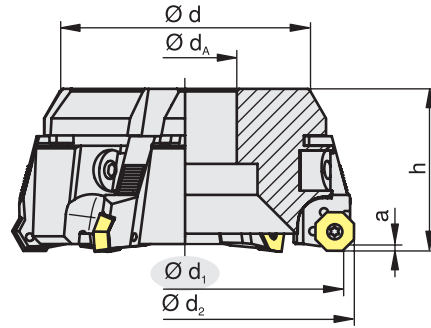
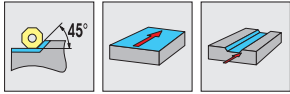
d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
2.882	A260.300.R.05/058-EF	3.516	2.16	2.449	1.000	.331	5	3.4	SA.. 17..	E01
3.882	A260.400.R.06/058-EF	4.516	2.16	3.386	1.250	.331	6	4.2	SA.. 17..	E01
4.882	A260.500.R.07/058-EF	5.520	2.66	3.78	1.500	.331	7	7.7	SA.. 17..	E01
5.882	A260.600.R.10/058-EF	6.520	2.66	4.882	1.500	.331	10	13.2	SA.. 17..	E01
7.882	A260.800.R.12/058-EF	8.520	2.66	6.772	2.500	.331	12	21.5	SA.. 17..	E01
9.882	A260.1000.R.14/058-EF	10.520	2.66	8.898	2.500	.331	14	34.6	SA.. 17..	E01



Tools






Tools and inserts for milling







E01	106607	11107792	106934	112188	11210490	6275	4425

B121-B123	B170	B171	B52	B103



d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.000	A260.300.R.05/057-EF	3.402	2.08	2.449	1.000	.138	5	3.4	OA/XA.. 0605..	E01
4.000	A260.400.R.06/057-EF	4.402	2.08	3.386	1.250	.138	6	4.2	OA/XA.. 0605..	E01
5.000	A260.500.R.07/057-EF	5.402	2.58	3.78	1.500	.138	7	7.7	OA/XA.. 0605..	E01
6.000	A260.600.R.10/057-EF	6.402	2.58	4.882	1.500	.138	10	13.2	OA/XA.. 0605..	E01
8.000	A260.800.R.12/057-EF	8.402	2.58	6.772	2.500	.138	12	21.5	OA/XA.. 0605..	E01
10.000	A260.1000.R.14/057-EF	10.402	2.58	8.898	2.500	.138	14	34.6	OA/XA.. 0605..	E01

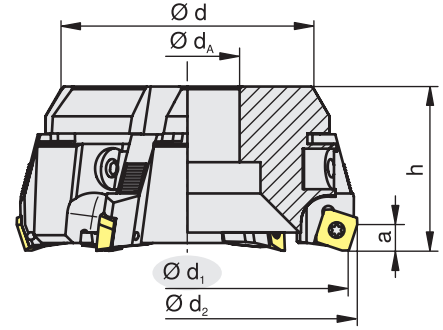
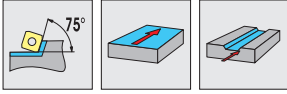
							
E01	106607	11107792	106934	112188	11210490	6275	4425

					
B121-B123	B170	B171	B47	B63	B103



MaxiMill A260-018

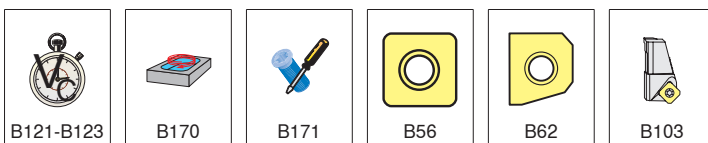
Face milling cutters

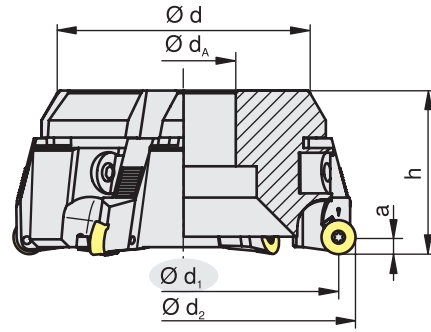
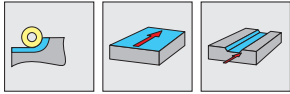




d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.079	A260.300.R.05/018-EF	3.315	2.00	2.449	1.000	.354	5	2.9	SP.. 12..	E01
4.079	A260.400.R.06/018-EF	4.315	2.00	3.386	1.250	.354	6	4.2	SP.. 12..	E01
5.079	A260.500.R.07/018-EF	5.315	2.50	3.78	1.500	.354	7	7.6	SP.. 12..	E01
6.079	A260.600.R.10/018-EF	6.315	2.50	4.882	1.500	.354	10	13.2	SP.. 12..	E01
8.079	A260.800.R.12/018-EF	8.315	2.50	6.772	2.500	.354	12	21.8	SP.. 12..	E01
10.079	A260.1000.R.14/018-EF	10.315	2.50	8.898	2.500	.354	14	36.8	SP.. 12..	E01





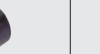
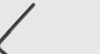



Tools






Tools and inserts for milling





d_1 [inch]	Type, description	d_2 [inch]	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.000	A260.300.R.05/052-EF	3.472	2.00	2.449	1.000	.236	5	2.9	RP.. 12..	E01
4.000	A260.400.R.06/052-EF	4.472	2.00	3.386	1.250	.236	6	4.3	RP.. 12..	E01
5.000	A260.500.R.07/052-EF	5.472	2.50	3.78	1.500	.236	7	7.7	RP.. 12..	E01
6.000	A260.600.R.10/052-EF	6.472	2.50	4.882	1.500	.236	10	13.3	RP.. 12..	E01
8.000	A260.800.R.12/052-EF	8.472	2.50	6.772	2.500	.236	12	21.8	RP.. 12..	E01
10.000	A260.1000.R.14/052-EF	10.472	2.50	8.898	2.500	.236	14	36.9	RP.. 12..	E01
3.000	A260.300.R.05/053-EF	3.472	2.00	2.449	1.000	.315	5	2.9	RP.. 16..	E02
4.000	A260.400.R.06/053-EF	4.472	2.00	3.386	1.250	.315	6	4.2	RP.. 16..	E02
5.000	A260.500.R.07/053-EF	5.472	2.50	3.78	1.500	.315	7	7.6	RP.. 16..	E02
6.000	A260.600.R.10/053-EF	6.472	2.50	4.882	1.500	.315	10	13.2	RP.. 16..	E02
8.000	A260.800.R.12/053-EF	8.472	2.50	6.772	2.500	.315	12	21.7	RP.. 16..	E02
10.000	A260.1000.R.14/053-EF	10.472	2.50	8.898	2.500	.315	14	36.8	RP.. 16..	E02

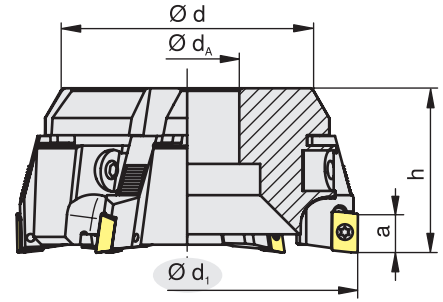
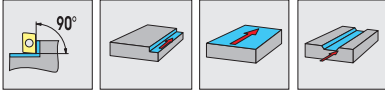
								
E01	106607	165795	106934	112188	11149570	6274	4425	
E02	106607	106022	106934	112188	11149571	6275	4425	

				
B121-B123	B170	B171	B49	B103



MaxiMill A260-040

Shoulder & slot milling cutters



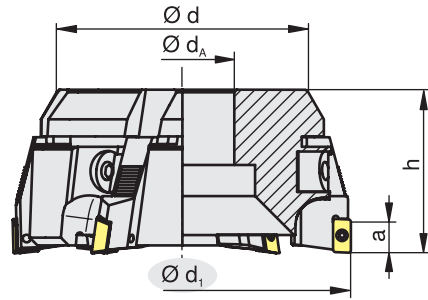
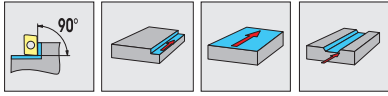
d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.354	A260.300.R.05/040-EF	2.00	2.449	1.000	.551	5	2.9	AD.. 15..	E01
4.354	A260.400.R.06/040-EF	2.00	3.386	1.250	.551	6	4.2	AD.. 15..	E01
5.354	A260.500.R.07/040-EF	2.50	3.78	1.500	.551	7	7.7	AD.. 15..	E01
6.354	A260.600.R.10/040-EF	2.50	4.882	1.500	.551	10	13.3	AD.. 15..	E01
8.354	A260.800.R.12/040-EF	2.50	6.772	2.500	.551	12	21.8	AD.. 15..	E01
10.354	A260.1000.R.14/040-EF	2.50	8.898	2.500	.551	14	36.8	AD.. 15..	E01



Tools





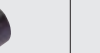
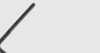



Tools and inserts for milling






E01	106607	165795	106934	112188	11149570	6274	4425

B121-B123	B170	B171	B44	B103



d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.354	A260.300.R.05/054-EF	2.00	2.449	1.000	.394	5	2.9	XD.. 11..	E01
4.354	A260.400.R.06/054-EF	2.00	3.386	1.250	.394	6	4.3	XD.. 11..	E01
5.354	A260.500.R.07/054-EF	2.50	3.78	1.500	.394	7	7.7	XD.. 11..	E01
6.354	A260.600.R.10/054-EF	2.43	4.882	1.500	.394	10	13.3	XD.. 11..	E01
8.354	A260.800.R.12/054-EF	2.43	6.772	2.500	.394	12	21.9	XD.. 11..	E01
10.354	A260.1000.R.14/054-EF	2.43	8.898	2.500	.394	14	36.9	XD.. 11..	E01
3.354	A260.300.R.05/056-EF	2.00	2.449	1.000	.551	5	2.9	XD.. 15..	E02
4.354	A260.400.R.06/056-EF	2.00	3.386	1.250	.551	6	4.3	XD.. 15..	E02
5.354	A260.500.R.07/056-EF	2.50	3.78	1.500	.551	7	7.7	XD.. 15..	E02
6.354	A260.600.R.10/056-EF	2.50	4.882	1.500	.551	10	13.3	XD.. 15..	E02
8.354	A260.800.R.12/056-EF	2.50	6.772	2.500	.551	12	21.9	XD.. 15..	E02
10.354	A260.1000.R.14/056-EF	2.50	8.898	2.500	.551	14	36.9	XD.. 15..	E02

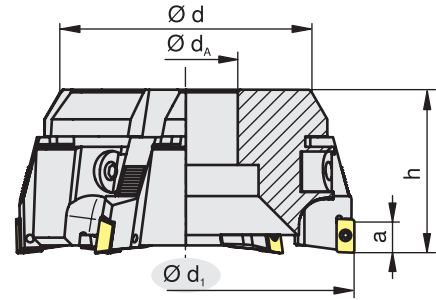
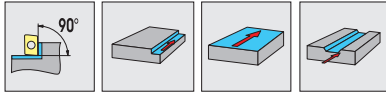
								
E01	106607	11114242	106934	112188	11254598	11114698	11114698	4425
E02	106607	11450042	106934	112188	11450867	11450858	11450858	4425

				
B121-B123	B170	B171	B58-B59	B103





MaxiMill A260-042/-051









Shoulder & slot milling cutters








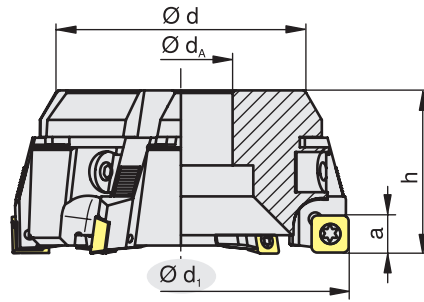
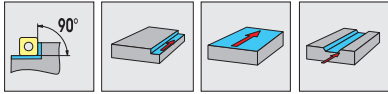
Tools

Tools and inserts for milling

d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.354	A260.300.R.05/042-EF	2.00	2.449	1.000	.315	5	2.9	AP.. 10..	E01
4.354	A260.400.R.06/042-EF	2.00	3.386	1.250	.315	6	4.3	AP.. 10..	E01
5.354	A260.500.R.07/042-EF	2.50	3.78	1.500	.315	7	7.7	AP.. 10..	E01
6.354	A260.600.R.10/042-EF	2.43	4.882	1.500	.315	10	13.3	AP.. 10..	E01
8.354	A260.800.R.12/042-EF	2.43	6.772	2.500	.315	12	21.8	AP.. 10..	E01
10.354	A260.1000.R.14/042-EF	2.43	8.898	2.500	.315	14	36.9	AP.. 10..	E01
3.354	A260.300.R.05/051-EF	2.00	2.449	1.000	.551	5	2.9	LD.. 15..	E02
4.354	A260.400.R.06/051-EF	2.00	3.386	1.250	.551	6	4.3	LD.. 15..	E02
5.354	A260.500.R.07/051-EF	2.50	3.78	1.500	.551	7	7.7	LD.. 15..	E02
6.354	A260.600.R.10/051-EF	2.50	4.882	1.500	.551	10	13.3	LD.. 15..	E02
8.354	A260.800.R.12/051-EF	2.50	6.772	2.500	.551	12	21.8	LD.. 15..	E02
10.354	A260.1000.R.14/051-EF	2.50	8.898	2.500	.551	14	36.9	LD.. 15..	E02

							
E01	106607	24645	106934	112188	11149541	56656	4425
E02	106607	165795	106934	112188	11149570	6274	4425

				
B121-B123	B170	B171	B44+B45	B103



d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.354	A260.300.R.05/055-EF	2.00	2.449	1.000	.315	5	3.0	SD.. 09T3..	E01
4.354	A260.400.R.06/055-EF	2.00	3.386	1.250	.315	6	4.3	SD.. 09T3..	E01
5.354	A260.500.R.07/055-EF	2.50	3.78	1.500	.315	7	7.7	SD.. 09T3..	E01
6.354	A260.600.R.10/055-EF	2.50	4.882	1.500	.315	10	13.4	SD.. 09T3..	E01
8.354	A260.800.R.12/055-EF	2.50	6.772	2.500	.315	12	21.9	SD.. 09T3..	E01
10.354	A260.1000.R.14/055-EF	2.50	8.898	2.500	.315	14	37.0	SD.. 09T3..	E01
3.354	A260.300.R.05/039-EF	2.00	2.449	1.000	.472	5	2.9	SD.. 1205..	E02
4.354	A260.400.R.06/039-EF	2.00	3.386	1.250	.472	6	4.3	SD.. 1205..	E02
5.354	A260.500.R.07/039-EF	2.50	3.78	1.500	.472	7	7.7	SD.. 1205..	E02
6.354	A260.600.R.10/039-EF	2.50	4.882	1.500	.472	10	13.3	SD.. 1205..	E02
8.354	A260.800.R.12/039-EF	2.50	6.772	2.500	.472	12	21.8	SD.. 1205..	E02
10.354	A260.1000.R.14/039-EF	2.50	8.898	2.500	.472	14	36.9	SD.. 1205..	E02

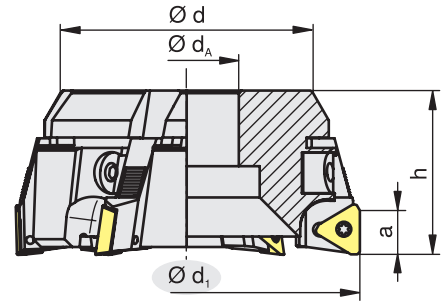
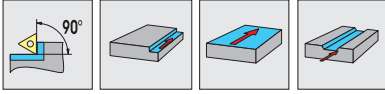
E01	106607	54976	106934	112188	11149570	6274	4425
E02	106607	106022	106934	112188	11149571	6275	4425

B121-B123	B170	B171	B53	B103



MaxiMill A260-025

Shoulder & slot milling cutters



d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.354	A260.300.R.05/025-EF	2.00	2.449	1.000	.709	5	2.9	TP. 22..	E01
4.354	A260.400.R.06/025-EF	2.00	3.386	1.250	.709	6	4.2	TP. 22..	E01
5.354	A260.500.R.07/025-EF	2.50	3.78	1.500	.709	7	7.7	TP. 22..	E01
6.354	A260.600.R.10/025-EF	2.50	4.882	1.500	.709	10	13.3	TP. 22..	E01
8.354	A260.800.R.12/025-EF	2.50	6.772	2.500	.709	12	21.8	TP. 22..	E01
10.354	A260.1000.R.14/025-EF	2.50	8.898	2.500	.709	14	36.8	TP. 22..	E01

Tools

Tools and inserts for milling

E01	106607	106022	106934	112188	11149571	6275	4425

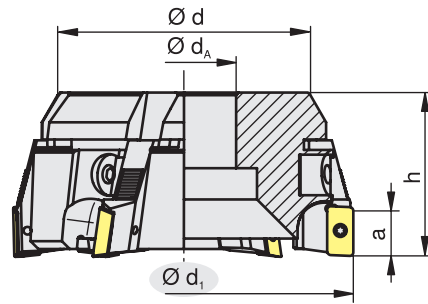
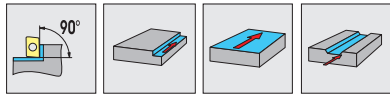
B121-B123	B170	B171	B57	B103



MaxiMill A260-026

Shoulder & slot milling cutters











B101








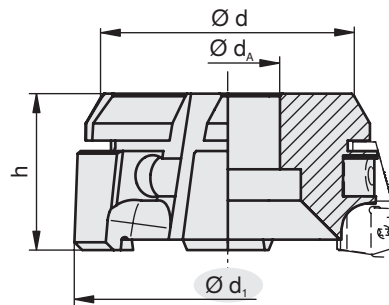
d_1 [inch]	Type, description	h [inch]	d [inch]	d_A [inch]	a [inch]	z	Weight [lb]		
3.354	A260.300.R.05/026-EF	2.00	2.449	1.000	.709	5	2.9	LP.. 20..	E01
4.354	A260.400.R.06/026-EF	2.00	3.386	1.250	.709	6	4.2	LP.. 20..	E01
5.354	A260.500.R.07/026-EF	2.50	3.78	1.500	.709	7	7.7	LP.. 20..	E01
6.354	A260.600.R.10/026-EF	2.50	4.882	1.500	.709	10	13.3	LP.. 20..	E01
8.354	A260.800.R.12/026-EF	2.50	6.772	2.500	.709	12	21.8	LP.. 20..	E01
10.354	A260.1000.R.14/026-EF	2.50	8.898	2.500	.709	14	36.8	LP.. 20..	E01



Tools






Tools and inserts for milling





							
E01	106607	106022	106934	112188	11149571	6275	4425

				
B121-B123	B170	B171	B46	B103



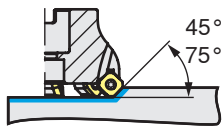
d_i [inch]	Type, description	h [inch]	d [inch]	Weight [lb]		
3.000	A260.300.R.05-EF	1.88	2.449	2.1	78180..	E01
3.921	A260.400.R.06-EF	1.88	3.386	3.3	78180..	E01
4.843	A260.500.R.07-EF	2.38	3.780	6.6	78180..	E01
5.843	A260.600.R.10-EF	2.38	4.882	11.8	78180..	E01
7.843	A260.800.R.12-EF	2.38	6.772	20.0	78180..	E01
9.843	A260.1000.R.14-EF	2.38	8.898	34.7	78180..	E01

				
E01	106607	106934	112188	4425

			
B121-B123	B134-B151	B171	B103



Cassettes for face milling

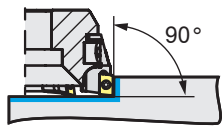


7818...



041 031 029 032 018 052 053 057 058

Cassettes for shoulder milling



7818...



054 056 055 039 051 025 026 040 042

Cassettes for finishing

7818...

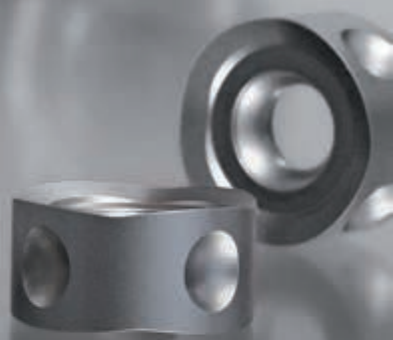


041 031 018 057



B112

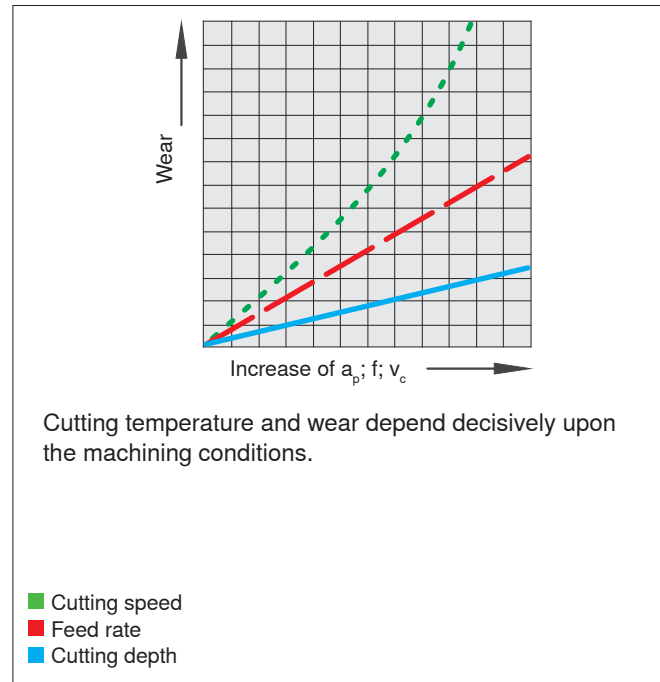
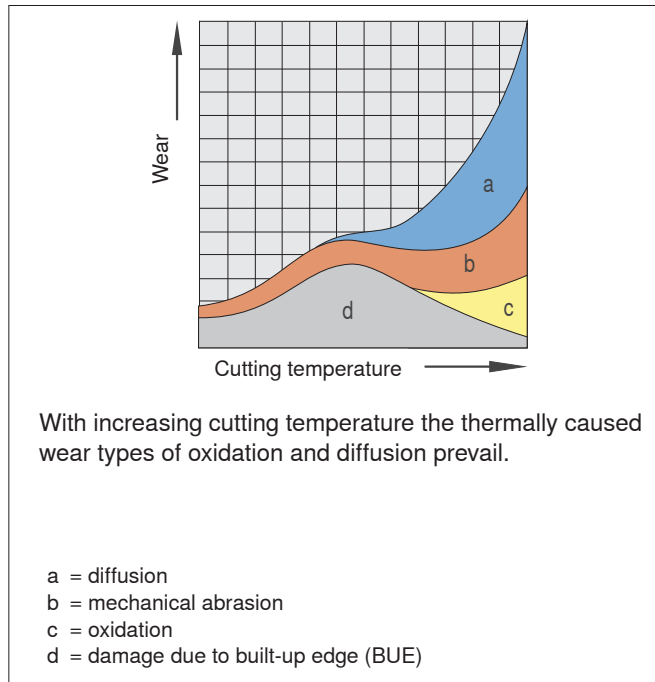
Type, description	Assembled cutter	Diameter range		
7818041/KA	270-09	3-10	SD/XD.. 0903..	↻ B90
7818031/KA	270-12	3-10	SD/XD.. 1204..	↻ B90
7818029/KA	-	3-10	SE.. 1204..	↻ B91
7818032/KA	270-15	2.8-9.8	SD.. 1504..	↻ B91
7818018/KA	-	3.1-10.1	SP.. 1204..	↻ B94
7818052/KA	251-12	3-10	RP.. 1204..	↻ B95
7818053/KA	251-16	3-10	RP.. 1605..	↻ B95
7818054/KA	211-11	3.4-10.4	XD.. 11T3..	↻ B97
7818039/KA	490-12	3.4-10.4	SD.. 1205..	↻ B99
7818055/KA	490-09	3.4-10.4	SD.. 09T3..	↻ B99
7818051/KA	241-15	3.4-10.4	LD.. 1504..	↻ B98
7818025/KA	-	3.4-10.4	TP.. 2204..	↻ B100
7818026/KA	-	3.4-10.4	LP.. 2004..	↻ B101
7818056/KA	211-15	3.4-10.4	XD.. 1505..	↻ B97
7818057/KA	273-06	3-10	OA/XA.. 0605..	↻ B93
7818058/KA	271-17	2.9-9.9	SA.. 1706..	↻ B92
7818040/KA	-	3.4-10.4	AD.. 1504..	↻ B96
7818042/KA	210-10	3.4-10.4	AP.. 1003..	↻ B98





Wear is caused through simultaneous mechanical and thermal stress of the cutting edge.
The most common causes are

- o Mechanical abrasion
- o Damage due to built-up edge (BUE)
- o Oxidation processes
- o Diffusion

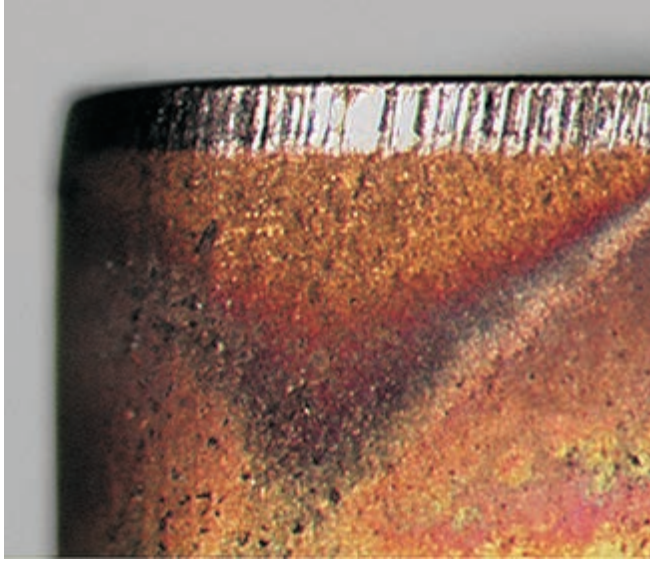


Benefits of hard material coatings

Depositing hard material layers on carbide tools positively influences wear characteristics.

The advantages of hard material layers consist in the reduction of

- o Friction
- o Temperature changes
- o Oxidation
- o Diffusion



Flank wear

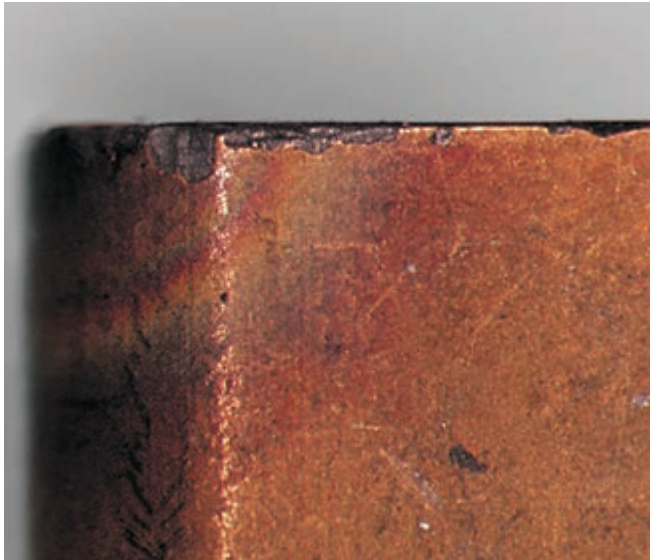
Reasons

- Cutting speed too high
- Carbide grade with insufficient wear resistance
- Incorrect feed rate

Remedies

- Reduce cutting speed
- Select more wear resistant carbide grade
- Adapt feed rate to cutting speed and cutting depth (increase feed rate)

Abrasion on flank, normal wear after a certain machining time.



Edge chipping

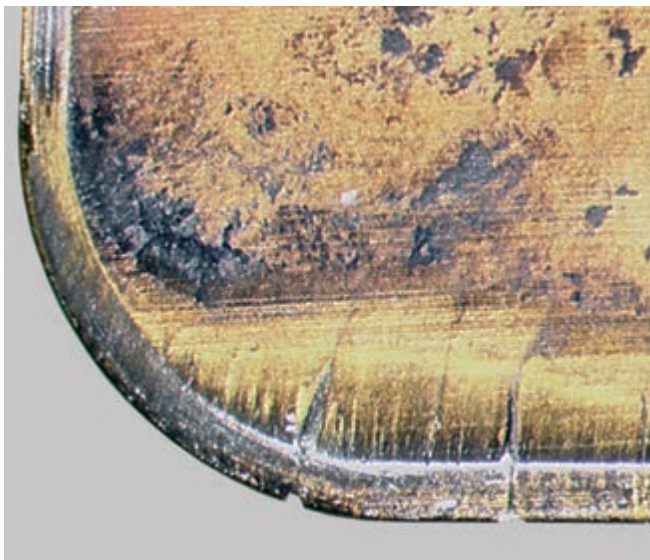
Reasons

- Grade with too high wear resistance
- Vibration
- Feed rate too high or excessive cutting depth
- Interrupted cut
- Swarf damage

Remedies

- Use tougher grade
- Use negative cutting edge geometry with chip groove
- Increase stability (tool, work piece)

Through excessive mechanical stress at the cutting edge fracture and chipping can occur.



Thermal cracking

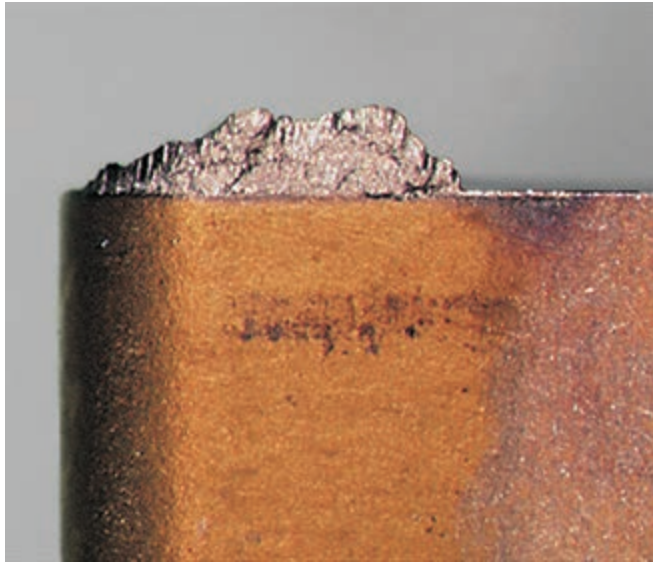
Reasons

- Varying temperature of cutting edge, thermal shock
- Incorrect cooling
- High tensile materials
- Cutting speed too high

Remedies

- Use grade that is resistant to thermal cracking
- Apply cooling lubricant abundantly or use dry milling
- Reduce cutting speed
- Decrease feed rate

Small cracks at 90° to cutting edge.



Built-up edge

Reasons

- Cutting speed too low
- Rake angle too small
- Wrong cutting material
- Lack of cooling / lubrication

Remedies

- Increase cutting speed
- Increase rake angle
- Apply TiN-coating
- Use emulsion with higher concentration

Built-up edge occurs when the chip is not evacuated properly due to insufficient cutting temperature.



Notching

Reasons

- Cold work hardening materials (e.g. super alloys)
- Cast and forging skin
- Formation of burrs

Remedies

- Decrease cutting speed
- Climb milling
- Change working orientation of the milling cutter
- Reduce approach angle

Notch at the maximum cutting depth.



Insert breakage

Reasons

- Excessive stress of the carbide grade
- Lack of stability
- Corner angle too small
- Excessive notching
- Sudden changes of cutting forces

Remedies

- Use tougher cutting material
- Use protective edge chamfer
- Increase edge hone
- Use more stable geometry
- Reduce feed rate

Excessive stress of the insert causes breakage.



Cratering

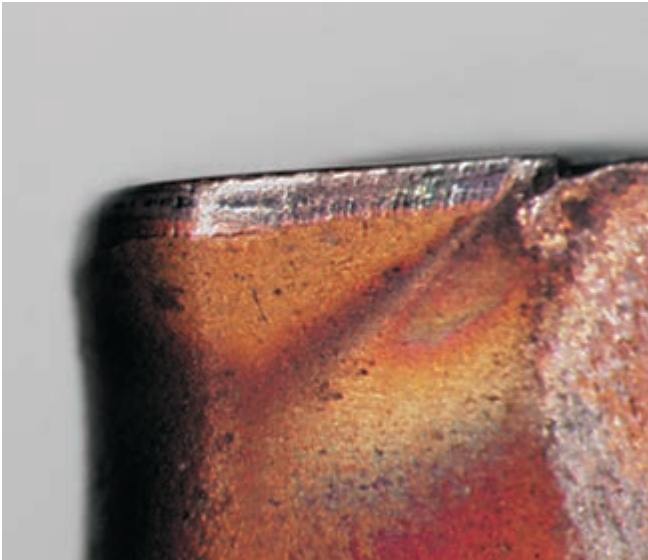
Reasons

- Cutting speed and / or feed rate too high
- Rake angle too shallow
- Grade with low wear resistance
- Insufficient coolant supply

Remedies

- Reduce cutting speed and / or feed rate
- Increase coolant quantity and / or pressure, optimize coolant supply
- Use grade with higher resistance to cratering

The hot chip which is being evacuated causes cratering at the rake face of the cutting edge.



Plastic deformation

Reasons

- Too high machining temperature, resulting in softening of substrate
- Damaged coatings
- Chip groove too narrow

Remedies

- Reduce cutting speed
- Choose carbide grade with higher wear resistance
- Provide cooling

High machining temperature and simultaneous mechanical stress can lead to plastic deformation.



Type of problem													Corrective measures
Flank wear	Edge chipping	Thermal cracks	Built-up edge	Notching	Insert breakage, edge chipping	Cratering	Deformation of cutting edge	Bad work piece surface	Chattering, vibration	Chip formation, chip jamming	Edge chipping on the work piece	Overstress of the machine	
↓	↑	↓	↑	↓		↓	↓	↑	≈			↓	Cutting speed
↑	↓	↓	↑	↓	↓	↓	↓	↓	≈		↓	↓	Feed rate per tooth
	↑	≈		↑	↑								Toughness of cutting material
↑				≈		↑	↑						Wear resistance of cutting material
		↓	≈	↓					↓	≈	↓	↓	Approach angle
	≈		↑	≈	≈		↑		↑	≈			Rake angle
	↑		≈	↑				↓			↓		Cutting edge facet
	↑				↑			↑	↑				Stability
								↑	↑		≈		Precision of axial & radial run-out
≈	≈				≈		≈	≈			≈		Wear of cutting edge
					≈			≈	≈		≈		Positioning of the milling tool
		↑	↑	↑		↑	≈	≈		≈			Cooling, chip removal
					≈			≈	≈				Insert, cassette clamping
	≈			≈	≈			≈	≈		↓	↓	Depth of cut

↑ raise, increase

↓ lower, decrease

≈ check, optimize



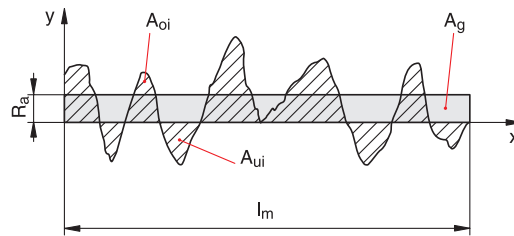
Definition of measured variables for surface quality

The surface quality of milled work pieces is influenced through

- o the machine tool (condition, stability)
- o the milling tool (cutting edge geometry, construction)
- o the application data (v_p , v_c , f_z)
- o the work piece (geometry, material, clamping)

The average roughness value R_a is the arithmetical mean of the roughness profile within the entire measured length l_m .

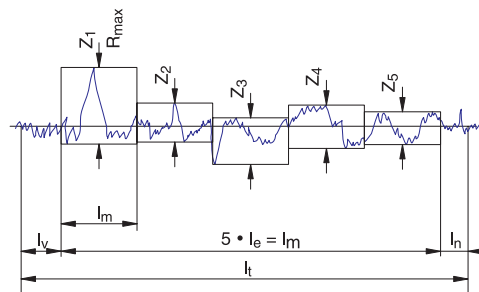
$$R_a = \frac{1}{l_m} \int_{x=0}^{x=l_m} |y| dx$$



Average roughness value R_a

Average roughness depth R_z is the arithmetic mean resulting from the single roughness depths Z_i of five successive single measured lengths.

$$R_z = \frac{\sum_{i=1}^5 Z_i}{5}$$



Determination of the average roughness depth R_z from the roughness profile

Maximum roughness depth R_{max} is the largest single roughness depth Z_i on the measured length l_m .

In order to produce an excellent surface finish with insert milling cutters, inserts with wiper facets are employed.



Maximum profile depth P_t

f [inch]	l_1 [inch]				
	.039	.055	.063	.098	.354
.012	.02	.02	.02	.02	.02
.018	.031	.031	.031	.031	.031
.024	.039	.039	.039	.039	.039
.03	.051	.051	.051	.051	.051
.039	.067	.067	.067	.067	.067
.059	.787	.197	.106	.106	.106
.079	1.181	.748	.512	.157	.157
.098	1.457	1.063	.906	.252	.173
.118	1.575	1.299	1.142	.472	.197

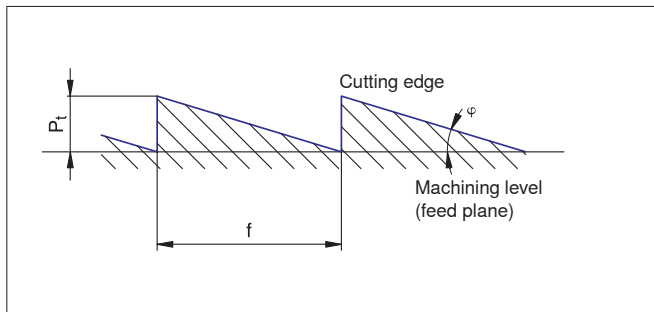
f [inch]	l_1 [inch]				
	.039	.055	.063	.098	.354
.138	1.732	1.457	1.339	.748	.236
.197	1.929	1.732	1.654	1.260	.343
.295	2.087	1.969	1.890	1.654	.512
.472	2.205	2.126	2.087	1.969	.906
.787	2.283	2.244	2.205	2.165	1.614
1.181	2.323	2.283	2.283	2.244	1.969
1.575	2.323	2.323	2.323	2.283	2.126
1.969	2.323	2.323	2.323	2.323	2.244
2.362	2.362	2.362	2.362	2.323	2.362

Calculation example:

Type of cutter: A260.500.R.07/018-EF
 Insert: SPKW 1504AE
 Cutter diameter d_1 : 5.079 inch
 Number of teeth z : 7
 Feed per tooth f_z : .4.921 inch
 Feed per revolution f : 1.4 Inch
 Facet length l_1 : \approx .004 Inch

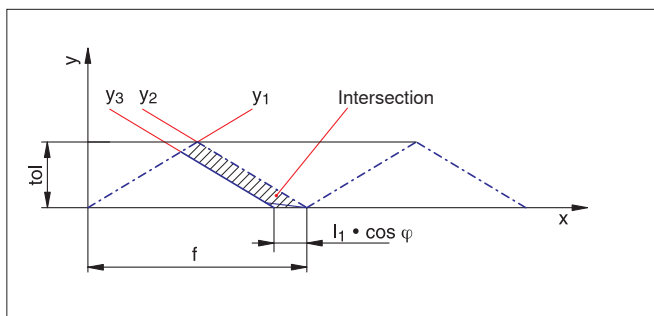
$f = f_z \cdot z = .005 \cdot 7 = .034$ inch

Maximum profile depth $P_t \approx 62.992 \mu\text{Inch}$



$f < l_1$:
 Profile is produced by the deepest cutting edge axially.

$$P_t = f \cdot \tan(\varphi)$$



$f > l_1$:
 Several cutting edges produce the surface

$$P_t = tol + l_1 \left(\frac{\sin \varphi}{z} - \frac{\cos \varphi \cdot tol}{f} \right)$$

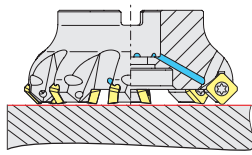
E.g.:
 $tol \approx$ axial run-out of cutter (62.992 μInch) + adapter run-out (70.866 μInch) = 94.488 μInch ($\varphi \approx 6'$ or $.1^\circ$)

E.g.:
 $P_t [\mu\text{m}] tol^* = 62.992 \mu\text{Inch} + 70.866 \mu\text{Inch}$
 Tool clamping
 Tool

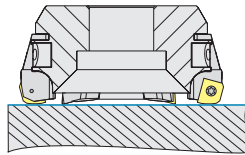
*) In most cases considerably more accurate axial run-out values will result. With .06 mm an excessive tolerance condition is assumed. If the cutting edges are precisely adjusted, the axial run-out will be negligible.



Conventional



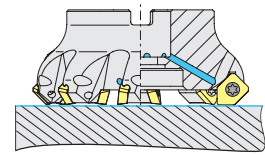
1) Roughing



2) Finishing



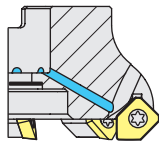
CERATIZIT Masterfinish



Roughing and finishing in a single operation

Application in the following CERATIZIT milling systems

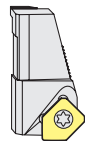
270-09



Ø 2 - 3 inch



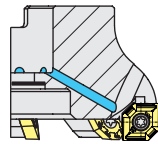
260-41



Ø 3 - 10 inch



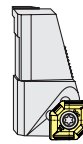
273-06



Ø 2 - 10 inch



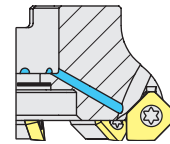
260-57



Ø 3 - 10 inch



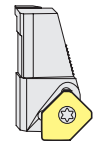
270-12



Ø 2 - 6 inch



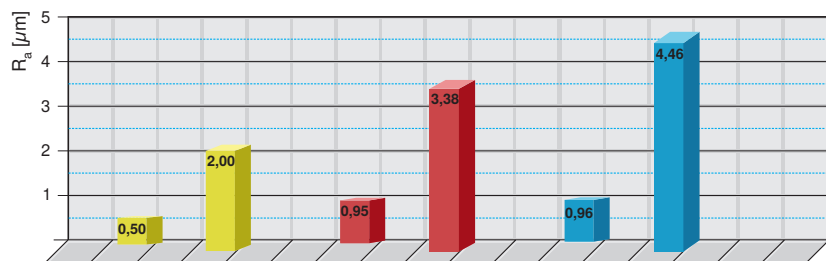
260-31



Ø 3 - 10 inch



Examples for economic application (finish milling with XDHW)



without XDHW

with XDHW

with XAHT

without XAHT

with XAHT

without XAHT

A273.400.R.10-06
OAKU 060508SR-M50 CTP2235
XAHT 060508SR-F50 CTP2235
1.4571 (stainless, tempered steel)
X6CrNiMoTi 17 12 2

A270.400.R.10-12
SDHT 1204AESN-R SR226+
XDHW 1204AESN SR226+
1.7225 (non alloyed, tempered steel)
42CrMo4

A270.400.R.06-12
SDHT 1204AESN-R SR226+
XDHW 1204AESN SR226+
1.7225 (non alloyed tempered steel)
42CrMo4

[woc] = 3.150 inch [ipt] = .010 inch
[doc] = .020 inch [sfm] = 7874 feet/min

[woc] = 3.780 inch [ipt] = .010 inch
[doc] = .020 inch [sfm] = 13779 feet/min

[woc] = 3.780 inch [ipt] = .010 inch
[doc] = .020 inch [sfm] = 15748 feet/min

**Cutting speed [sfm]**

$$v_c = \frac{d_1 \cdot \pi \cdot n}{12}$$

Revolutions of spindle [min⁻¹]

$$n = \frac{v_c \cdot 12}{d_1 \cdot \pi}$$

Feed per tooth [inch]

$$f_z = \frac{v_f}{n \cdot z}$$

Feed rate [inch/min]

$$v_f = f_z \cdot n \cdot z$$

Feed per revolution [inch]

$$f = f_z \cdot z$$

Metal removal rate [cm³/min]

$$Q = \frac{a_p \cdot a_e \cdot v_f}{12}$$

Medium chip thickness [inch]

$$h_m = \frac{\sin(\kappa) \cdot 180 \cdot a_e \cdot f_z}{\pi \cdot d_1 \cdot \arcsin\left(\frac{a_e}{d_1}\right)}$$

Specific cutting force

$$k_c = h_m^{-mc} \cdot k_{c1.1}$$

Power consumption [kW]

$$P_{\text{mot}} = \frac{a_p \cdot a_e \cdot v_f}{60 \cdot 10^6 \cdot \eta_m} \cdot k_c$$

Material designations & dimensions

a_e Cutting width [woc]

a_p Depth of cut [doc]

d_1 Cutter diameter [inch]

D_w Work piece diameter [inch]

f_z Feed per tooth [ipt]

h_m Medium chip thickness [inch]

k Number of insert rows

k_c Specific cutting force [N/inch²]

$k_{c1.1}$ Specific cutting force for 1 mm² chip cross section [N/inch²]

l_1 Length of wiper facet [inch]

m_c Increase of specific cutting force

n Revolutions of spindle [min⁻¹]

P_{mot} Power consumption [nsi]

Q Metal removal rate [inch³]

v_c Cutting speed [sfm]

v_f Feed rate [inch/min]

z Effective number of edges [pcs.]

η_m Mechanical efficiency [%]

γ_0 Perpendicular rake angle (effective rake angle) [°]

γ_f Lateral rake angle (radial rake angle) [°]

γ_p Tool back clearance (axial rake angle) [°]

γ_w Rake angle of the insert [°]

κ Cutting edge angle (approach angle) [°]

λ_s Inclination angle [°]

α Clearance angle [°]

α_1 Clearance angle of the corner facet [°]



Hardness values

Comparison table

Technical information

Tools and inserts for milling

Tensile strength N/mm ²	Vickers HV	Brinell HB	Rockwell HRC	Shore C
575	180	171		
595	185	176		
610	190	181		
625	195	185		
640	200	190	12	
660	205	195	13	
675	210	199	14	
690	215	204	15	
705	220	209	15	28
720	225	214	16	
740	230	219	17	29
755	235	223	18	
770	240	228	20.3	30
785	245	233	21.3	
800	250	238	22.2	31
820	255	242	23.1	32
835	260	247	24	33
850	265	252	24.8	
865	270	257	25.6	
880	275	261	26.4	34
900	280	268	27.1	
915	285	271	27.8	35
930	290	276	28.5	
950	295	280	29.2	36
965	300	285	29.8	37
995	310	295	31	38
1030	320	304	32.2	39
1060	330	314	33.3	40
1095	340	323	34.3	41
1125	350	333	35.5	42
1155	360	342	36.6	43
1190	370	352	37.7	44
1220	380	361	38.8	45
1255	390	371	39.8	46
1290	400	380	40.8	47
1320	410	390	41.8	48
1350	420	399	42.7	
1385	430	409	43.6	49
1420	440	418	44.5	
1455	450	428	45.3	51
1485	460	437	46.1	52
1520	470	447	46.9	53
1555	480	465	47.7	54
1595	490	466	48.4	
1630	500	475	49.1	57
1665	510	485	49.8	58
1700	520	494	50.5	59
1740	530	504	51.1	60
1775	540	513	51.7	61
1810	550	523	52.3	62

Tensile strength N/mm ²	Vickers HV	Brinell HB	Rockwell HRC	Shore C
1845	560	532	53	63
1880	570	542	53.6	64
1920	580	551	54.1	65
1955	590	561	54.7	66
1995	600	570	55.2	67
2030	610	580	55.7	68
2070	620	589	56.3	69
2105	630	599	56.8	70
2145	640	608	57.3	71
2180	650	618	57.8	72
2210	660	628	58.3	73
2240	665	633	58.8	74
2280	670	638	59.3	
2310	675	643	59.8	75
2350	680	648	60.3	76
2380	685	653	61.1	77
2410	690	658	61.3	78
2450	695	663	61.7	79
2480	710	668	62.2	80
2520	720	678	62.6	81
2550	730	683	63.1	82
2590	740	693	63.5	
2630	750	703	63.9	83
2660	760	708	64.3	84
2700	770	718	64.7	85
2730	780	723	65.1	
2770	790	733	65.5	86
2800	800	738	65.9	
2840	810	748	66.3	87
2870	820	753	66.7	88
2910	830	763	67	
2940	840	768	67.4	89
2980	850		67.7	
3010	860		68.1	90
3050	870		68.4	
3080	880		68.7	91
3120	890		69	
3150	900		69.3	92
3190	910		69.6	
3220	920		69.9	
3260	930		70.1	

The figures given are approximate according to DIN EN ISO18265 (02-2004)



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
10 SPb 20	1.0722		10 PbF 2		11 L 08		1350	.20	1
100 Cr 6	1.2067	BL 3	Y 100 C 6		L 3	SUJ2	1775	.24	6/9
105 WCr 6	1.2419		105 WC 13			SKS31	1775	.24	6/9
12 CrMo 9 10	1.7380	1501-622 Gr. 31; 45	10 CD 9.10	2218	A 182-F22	SPVA,SCMV4	1675	.24	6/7
12 Ni 19	1.5680		Z 18 N 5		2515		2450	.23	10/11
13 CrMo 4 4	1.7335	1501-620 Gr. 27	15 CD 3.5	2216	A 182-F11; F12	SPVAF12	1675	.24	6/7
14 MoV 6 3	1.7715	1503-660-440					1675	.24	6/7
14 Ni 6	1.5622		16 N 6		A 350-LF 5		1675	.24	6/7
14 NiCr 10	1.5732		14 NC 11		3415	SNC415(H)	1675	.24	6/7
14 NiCr 14	1.5752	655 M 13	12 NC 15		3310; 9314	SNC815(H)	1675	.24	6/7
14 NiCrMo 13 4	1.6657						1675	.24	6/7
15 Cr 3	1.7015	523 M 15	12 C 3		5015		1675	.24	6/7
15 CrMo 5	1.7262		12 CD 4			SCM415(H)	1675	.24	6/7
15 Mo 3	1.5415	1501-240	15 D 3	2912	A 204 Gr. A		1675	.24	6/7
16 MnCr 5	1.7131	527 M 17	16 MC 5	2511	5115	SCR415	1675	.24	6/7
16 Mo 5	1.5423	1503-245-420			4520	SB450M	1675	.24	6/7
17 CrNiMo 6	1.6587	820 A 16	18 NCD 6				1675	.24	6/7
21 NiCrMo 2	1.6523	805 M 20	20 NCD 2	2506	8620	SNCM220(H)	1725	.24	6/8
25 CrMo 4	1.7218	1717 CDS 110	25 CD 4 S	2225	4130	SM420;SCM430	1725	.24	6/8
28 Mn 6	1.1170	150 M 28	20 M 5		1330		1500	.22	2
32 CrMo 12	1.7361	722 M 24	30 CD 12	2240			1775	.24	6/9
34 Cr 4	1.7033	530 A 32	32 C 4		5132	SCR430(H)	1725	.24	6/8
34 CrMo 4	1.7220	708 A 37	35 CD 4	2234	4135; 4137	SCM432;SCCRM3	1775	.24	6/9
34 CrNiMo 6	1.6582	817 M 40	35 NCD 6	2541	4340	SNCM447	1775	.24	6/9
35 S 20	1.0726	212 M 36	35 MF 4	1957	1140		1525	.22	2/3
36 CrNiMo 4	1.6511	816 M 40	40 NCD 3		9840	SNCM447	1775	.24	6/9
36 Mn 5	1.1167						1525	.22	2/3
36 NiCr 6	1.5710	640 A 35	35 NC 6		3135	SNC236	1800	.24	3/9
38 MnSi 4	1.5120						1800	.24	3/9
39 CrMoV 13 9	1.8523	897 M 39					1775	.24	6/9
40 Mn 4	1.1157	150 M 36	35 M 5		1039		1525	.22	2/3
40 NiCrMo 2 2	1.6546	311-Type 7	40 NCD 2		8740	SNCM240	1775	.24	6/9
41 Cr 4	1.7035	530 M 40	42 C 4		5140	SCR440(H)	1775	.24	6/9
41 CrAlMo 7	1.8509	905 M 39	40 CAD 6.12	2940	A 355 Cl. A	SACM645	1775	.24	6/9
41 CrMo 4	1.7223	708 M 40	42 CD 4 TS	2244	4142; 4140	SCM440	1775	.24	6/9
42 Cr 4	1.7045	530 A 40	42 C 4 TS	2245	5140	SCr440	1775	.24	6/9
42 CrMo 4	1.7225	708 M 40	42 CD 4	2244	4142; 4140	SCM440(H)	1775	.24	6/9
45 WCrV 7	1.2542	BS 1		2710	S 1		1775	.24	6/9
50 CrV 4	1.8159	735 A 50	50 CV 4	2230	6150	SUP10	1775	.24	6/9
55 Cr 3	1.7176	527 A 60	55 C 3	2253	5155	SUP9(A)	1775	.24	6/9
55 NiCrMoV 6	1.2713		55 NCDV 7		L 6	SKH1;SKT4	1775	.24	6/9
55 Si 7	1.0904	250 A 53	55 S 7	2085; 2090	9255		1775	.24	6/9
58 CrV 4	1.8161						1775	.24	6/9
60 SiCr 7	1.0961		60 SC 7		9262		1775	.24	6/9
9 SMn 28	1.0715	230 M 07	S 250	1912	1213	SUM22	1350	.21	1
9 SMn 36	1.0736	240 M 07	S 300		1215		1350	.21	1
9 SMnPb 28	1.0718		S 250 Pb	1914	12 L 13	SUM22L	1350	.21	1
9 SMnPb 36	1.0737		S 300 Pb	1926	12 L 14		1350	.21	1
Al99	3.0205						700	.25	21
AlCuMg1	3.1325						700	.25	22
AlMg1	3.3315						700	.25	21



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
AlMgSi1	3.2315						700	.25	22
C 105 W1	1.1545		Y1 105	1880	W 110	SK3	1675	.24	3
C 125 W	1.1663		Y2 120		W 112		1675	.24	3
C 15	1.0401	080 M 15	AF3 7 C 12; XC 18	1350	1015	S15C	1350	.21	1
C 22	1.0402	050 A 20	AF 42 C 20	1450	1020	S20C, S22C	1350	.21	1
C 35	1.0501	060 A 35	AF 55 C 35	1550	1035	S35C	1525	.22	2/3
C 45	1.0503	080 M 46	AF 65 C 45	1650	1045	S45C	1525	.22	2/3
C 55	1.0535	070 M 55		1655	1055	S55C	1675	.24	3
C 60	1.0601	080 A 62	CC 55		1060	S60C	1675	.24	3
Cf 35	1.1183					S35C	1525	.22	2/3
Cf 53	1.1213					S50C	1525	.22	2/3
Ck 101	1.1274	060 A 96		1870	1095		1675	.24	3
Ck 15	1.1141	080 M 15	XC 15; XC 18	1370	1015	S15C	1350	.21	1
Ck 55	1.1203	070 M 55	XC 55		1055	S55C	1675	.24	3
Ck 60	1.1221	080 A 62	XC 60	1665; 1678	1060	S58C	1675	.24	3
CoCr20W15Ni	2.4764						3300	.24	35
CuZn15	2.0240						700	.27	27
CuZn36Pb3	2.0375						700	.27	26
E-Cu57	2.0060						700	.27	28
G-AlSi10Mg	3.2381						700	.25	24
G-AlSi12	3.2581						700	.25	23
G-AlSi9Cu3	3.2163						700	.25	23
G-CuSn5ZnPb	2.1096						700	.27	26
G-CuZn40Fe	2.0590						700	.27	28
G-X 120 Mn 12	1.3401	Z 120 M 12	Z 120 M 12		A 128 (A)		3300	.24	35
G-X 20 Cr 14	1.4027	420 C 29	Z 20 C 13 M			SCS2	1875	.21	12/13
G-X 40 NiCrSi 38 18	1.4865	330 C 40					2600	.24	31
G-X 45 CrSi 9 3	1.4718	401 S 45	Z 45 CS 9		HNV 3		2450	.23	10/11
G-X 5 CrNi 13 4	1.4313	425 C 11	Z 5 CN 13.4	2385	CA 6-NM		1875	.21	12/13
G-X 5 CrNiMoNb 18 10	1.4581	318 C 17	Z 4 CNDNb 18.12 M				2150	.2	14
G-X 6 CrNi 18 9	1.4308	304 C 15	Z 6 CN 18.10 M	2333	CF-8		2150	.2	14
G-X 6 CrNiMo 18 10	1.4408						2150	.2	14
G-X 7 Cr 13	1.4001						1875	.21	12/13
GG-10	.6010		Ft 10 D	01 10-00	A48-20 B	FC100	1150	.2	15
GG-15	.6015	Grade 150	Ft 15 D	01 15-00	A48-25 B	FC150	1150	.2	15
GG-20	.6020	Grade 220	Ft 20 D	01 20-00	A48-30 B	FC200	1150	.2	15
GG-25	.6025	Grade 260	Ft 25 D	01 25-00	A48-40 B	FC250	1250	.24	15/16
GG-30	.6030	Grade 300	Ft 30 D	01 30-00	A48-45 B	FC300	1350	.28	16
GG-35	.6035	Grade 350	Ft 35 D	01 35-00	A48-50 B	FC350	1350	.28	16
GG-40	.6040	Grade 400	Ft 40 D	01 40-00	A48-60 B	FC400	1350	.28	16
GGG-35.3	.7033					FCD350	1225	.25	17
GGG-40	.7040	SNG 420/12	FGS 400-12	0717-02	60-40-18	FCD400	1225	.25	17
GGG-40.3	.7043	SNG 370/17	FGS 370-17	0717-15		FCD400	1225	.25	17
GGG-50	.7050	SNG 500/7	FGS 500-7	0727-02	65-45-12	FCD500	1350	.28	18
GGG-60	.7060	SNG 600/3	FGS 600-3	0732-03	80-55-06	FCD600	1350	.28	18
GGG-70	.7070	SNG 700/2	FGS 700-2	0737-01	100-70-03	FCD700	1350	.28	18
GGG-NiCr 20 2	.7660	S-NiCr 20 2	S-NC 20 2		A 439 Type D-2		1350	.28	18
GGG-NiMn 13 7	.7652	S-NiMn 13 7	S-NM 13 7				1350	.28	18
GS-Ck 45	1.1191	080 M 46	XC 42	1672	1045	S45C	1525	.22	2/3
GTS-35-10	.8135	B 340/12	MN 35-10				1225	.25	19
GTS-45-06	.8145	P 440/7					1420	.3	20



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
GTS-55-04	.8155	P 510/4	MP 50-5				1420	.3	20
GTS-65-02	.8165	P 570/3	MP 60-3				1420	.3	20
GTS-70-02	.8170	P 690/2	IP 70-2				1420	.3	20
NiCr20TiAl	2.4631	HR 401; 601	Nimonic 80 A				3300	.24	33
NiCr22Mo9Nb	2.4856		Inconel 625				3300	.24	33
NiCu30Al	2.4375		Monel K 500				3300	.24	34
NiFe25Cr20NbTi	2.4955						3300	.24	34
S 18-0-1	1.3355	BT 1	Z 80 WCV 18-04-01		T 1		2450	.23	10/11
S 18-1-2-5	1.3255	BT 4	Z 80 WKCV 18-05-04-0		T 4		2450	.23	10/11
S 2-9-2	1.3348		Z 100 DCWV 09-04-02-	2782	M 7		2450	.23	10/11
S 6-5-2	1.3343	BM 2	Z 85 WDCV 06-05-04-0	2722	M 2	SKH9; SKH51	2450	.23	10/11
S 6-5-2-5	1.3243		Z 85 WDKCV 06-05-05-	2723		SKH55	2450	.23	10/11
TiAl6V4	3.7165	TA 10 bis TA 13	T-A 6 V				2110	.22	37
X 10 Cr 13	1.4006	410 S 21	Z 12 C 13	2302	410; CA-15	SUS410	1875	.21	12/13
X 10 CrNiMoNb 18 12	1.4583				318		2150	.2	14
X 10 CrNiS 18 9	1.4305	303 S 21	Z 10 CNF 18.09	2346	303		2150	.2	14
X 100 CrMoV 5 1	1.2363	BA 2	Z 100 CDV 5	2260	A 2		2450	.23	10/11
X 12 CrMoS 17	1.4104		Z 10 CF 17	2383	430 F	SUS430F	1875	.21	12/13
X 12 CrNi 17 7	1.4310	301 S 21	Z 12 CN 17.07		301		2150	.2	14
X 12 CrNi 22 12	1.4829					SUS301	1350	.28	16
X 12 CrNi 25 21	1.4845	310 S24	Z 12 CN 25.20	2361	310 S	SUH310; SUS310S	2150	.2	14
X 12 CrNiTi 18 9	1.4878	321 S 20	Z 6 CNT 18.12 (B)	2337	321		2150	.2	14
X 12 NiCrSi 36 16	1.4864	NA 17	Z 12 NCS 37.18		330	SUH330	2600	.24	31
X 15 CrNiSi 20 12	1.4828	309 S 24	Z 15 CNS 20.12		309	SUH309	1350	.28	16
X 165 CrMoV 12	1.2601			2310			2450	.23	10/11
X 2 CrNiMo 18 13	1.4440						2150	.2	14
X 2 CrNiMoN 17 13 3	1.4429	316 S 62	Z 2 CND 17.13 Az	2375	316 LN	SUS316LN	2150	.2	14
X 2 CrNiN 18 10	1.4311	304 S 62	Z 2 CN 18 .10	2371	304 LN	SUS304LN	2150	.2	14
X 20 CrNi 17 2	1.4057	431 S 29	Z 15 CN 16.02	2321	431	SUS431	1875	.21	12/13
X 210 Cr 12	1.2080	BD 3	Z 200 C 12		D 3		2450	.23	10/11
X 210 CrW 12	1.2436			2312			2450	.23	10/11
X 30 WCrV 9 3	1.2581	BH 21	Z 30 WCV 9		H 21	SKD5	2450	.23	10/11
X 40 CrMoV 5 1	1.2344	BH 13	Z 40 CDV 5	2242	H 13	SKD61	2450	.23	10/11
X 46 Cr 13	1.4034	420 S 45	Z 40 C 14				1875	.21	12/13
X 5 CrNi 18 9	1.4301	304 S 15	Z 6 CN 18.09	2332; 2333	304; 304 H	SUS304	2150	.2	14
X 5 CrNiMo 17 13 3	1.4436	316 S 16	Z 6 CND 17.12	2343	316	SUS316	2150	.2	14
X 5 CrNiMo 18 10	1.4401	316 S 16	Z 6 CND 17.11	2347	316	SUS316	2150	.2	14
X 53 CrMnNiN 21 9	1.4871	349 S 54	Z 52 CMN 21.09		EV 8		1875	.21	12/13
X 6 Cr 13	1.4000	403 S 17	Z 6 C 13	2301	403	SUS403	1875	.21	12/13
X 6 Cr 17	1.4016	430 S 15	Z 8 C 17	2320	430	SUS430	1875	.21	12/13
X 6 CrMo 17	1.4113	434 S 17	Z 8 CD 17.01	2325	434	SUS434	1875	.21	12/13
X 6 CrNiMoTi 17 12 2	1.4571	320 S 31	Z 6 CNT 17.12	2350	316 Ti		2150	.2	14
X 6 CrNiNb 18 10	1.4550	347 S 17	Z 6 CNNb 18.10	2338	347		2150	.2	14
X 6 CrNiTi 18 10	1.4541	321 S 12	Z 6 CNT 18.10	2337	321		2150	.2	14
X2 CrNi 18-8	1.4317						2150	.2	14



Alloy group	DIN 1725-2		DIN EN 1706	
	Material		Alloy designation	
	Short designation	Number	Numeric	Chem. symbol
AlCu	G-AlCu4TiMg	3.1371	EN AC-21000	EN AC-AI Cu4MgTi
	G-AlCu4Ti	3.1841	EN AC-21100	EN AC-AI Cu4Ti
AlSiMgTi	–	–	EN AC-4100	EN AC-AI Si2MgTi
AlSi7Mg	–	–	EN AC-42000	EN AC-AI Si7Mg
	G-AlSi7Mg	3.2371	EN AC-42100	EN AC-AI Si7Mg0,3
	–	–	EN AC-42200	EN AC-AI Si7Mg0,6
AlSi10Mg	G-AlSi10Mg	3.2381	EN AC-43000	EN AC-AI Si10Mg(a)
	–	–	EN AC-43100	EN AC-AI Si10Mg(b)
	G-AlSi10Mg(Cu)	3.2383	EN AC-43200	EN AC-AI Si10Mg(Cu)
	G-AlSi9Mg	3.2373	EN AC-43300	EN AC-AI Si9Mg
	GD-AlSi10Mg	3.2382	EN AC-43400	EN AC-AI Si10Mg(Fe)
AlSi	G-AlSi11	3.2211	EN AC-44000	EN AC-AI Si11
	–	–	EN AC-44100	EN AC-AI Si12(b)
	G-AlSi12	3.2581	EN AC-44200	EN AC-AI Si12(a)
	GD-AlSi12	3.2582	EN AC-44300	EN AC-AI Si12(Fe)
	–	–	EN AC-44400	EN AC-AI Si9
AlSi5Cu	G-AlSi6Cu4	3.2151	EN AC-45000	EN AC-AI Si6Cu4
	–	–	EN AC-45100	EN AC-AI Si5Cu3Mg
	–	–	EN AC-45200	EN AC-AI Si5Cu3Mn
	–	–	EN AC-45300	EN AC-AI Si5Cu1Mg
	–	–	EN AC-45400	EN AC-AI Si5Cu3
AlSi9Cu	GD-AlSi9Cu3	3.2163	EN AC-46000	EN AC-AI Si9Cu3(Fe)
	–	–	EN AC-46100	EN AC-AI Si11Cu2(Fe)
	G-AlSi9Cu3	3.2163	EN AC-46200	EN AC-AI Si8Cu3
	–	–	EN AC-46300	EN AC-AI Si7Cu3Mg
	–	–	EN AC-46400	EN AC-AI Si9Cu1Mg
	–	–	EN AC-46500	EN AC-AI Si9Cu3(Fe)(Zn)
	–	–	EN AC-46600	EN AC-AI Si7Cu2
AlSi(Cu)	G-AlSi12(Cu)	3.2583	EN AC-47000	EN AC-AI Si12(Cu)
	GD-AlSi12(Cu)	3.2982	EN AC-47100	EN AC-AI Si12Cu1(Fe)
AlSiCuNiMg	–	–	EN AC-48000	EN AC-AI Si12CuNiMg
AlMg	–	–	EN AC-51000	EN AC-AI Mg3(b)
	G-AlMg3	3.3541	EN AC-51100	EN AC-AI Mg3(a)
	GD-AlMg9	3.3292	EN AC-51200	EN AC-AI Mg9
	G-AlMg5	3.3561	EN AC-51300	EN AC-AI Mg5
	G-AlMg5Si	3.3261	EN AC-51400	EN AC-AI Mg5 (Si)
AlZnMg	–	–	EN AC-7100	EN AC-AI Zn5Mg



Aluminum wrought alloys - bar

DIN 1725-1/DIN 1712-3		DIN EN 573-3	
Material		Alloy designation	
Short designation	Number	Numeric	Chem. symbol
AlCuMgPb	3.1645	EN AW-2007	EN AW-Al Cu4PbMgM
AlCuBiPb	3.1655	EN AW-2011	EN AW-Al Cu6BiPb
-	-	EN AW-2030	EN AW-Al Cu4PbMg
AlMgSiPb	3.0615	EN AW-6012	EN AW-Al MgSiPb
-	-	EN AW-6262	EN AW-Al Mg1SiPb
AlMgSi0,5	3.3206	EN AW-6060	EN AW-Al MgSi
-	-	EN AW-6063	EN AW-Al Mg0,7Si
AlMgSi1	3.2315	EN AW-6082	EN AW-Al Si1MgMn
AlCuSiMn	3.1255	EN AW-2014	EN AW-Al Cu4SiMg
AlCuMg1	3.1325	EN AW-2017A	EN AW-Al Cu4MgSi(A)
AlCuMg2	3.1355	EN AW-2024	EN AW-Al Cu4Mg1
AlZn4,5Mg1	3.4335	EN AW-7020	EN AW-Al Zn4,5Mg1
AlZnMgCu0,5	3.4345	EN AW-7022	EN AW-Al Zn5Mg3Cu
AlZnMgCu1,5	3.4365	EN AW-7075	EN AW-Al Zn5,5MgCu
Al99,5	3.0255	EN AW-1050A	EN AW-Al 99,5
E-Al	3.0257	EN AW-1350	EN AW-Eal 99,5
AlMg3	3.3535	EN AW-5754	EN AW-Al Mg3
AlMg5	3.3555	EN AW-5019	EN AW-Al Mg5
AlMg4,5Mn	3.3547	EN AW-5083	EN AW-Al Mg4,5Mn0,7

Aluminum wrought alloys - sheet

DIN 1725-1/DIN 1712-3		DIN EN 573-3	
Material		Alloy designation	
Short designation	Number	Numeric	Chem. symbol
Al99,5	3.0255	EN AW-1050A	EN AW-Al 99,5
AlMg3	3.3535	EN AW-5754	EN AW-Al Mg3
AlMg4,5Mn	3.3547	EN AW-5083	EN AW-Al Mg4,5Mn0,7
AlMg1SiCu	3.3211	EN AW-6061	EN AW-Al Mg1SiCu
AlMgSi1	3.2315	EN AW-6082	EN AW-Al Si1MgMn
AlCuMg1	3.1325	EN AW-2017A	EN AW-Al Cu4MgSi(A)
AlCuMg2	3.1355	EN AW-2024	EN AW-Al Cu4Mg1
AlZn4,5Mg1	3.4335	EN AW-7020	EN AW-Al Zn4,5Mg1
AlZnMgCu0,5	3.4345	EN AW-7022	EN AW-Al Zn5Mg3Cu
AlZnMgCu1,5	3.4365	EN AW-7075	EN AW-Al Zn5,5MgCu

- = hardened materials
- = naturally hard materials



It depends on the type of alloy whether aluminium materials are easy to machine or not.

From the easily machined aluminium alloy to the problematic pure aluminium all levels of machinability can be found.

Group	Alloy type	Relative machinability
Pure Al	Al 99,9	5
Wrought alloys	non hardened	
	Al Mn	4 - 5
	Al Mg	3 - 5
	Al Mg Mn	3 - 4
	Al Mg Si	3 - 4
	hardened	
	Machining alloy stock	1 - 2
	Al Cu Mg	2 - 3
	Al Cu Si Mg	3
Cast alloys	Al Zn Mg Cu	2
	G - Al Si	3
	G - Al Si Mg	2 - 3
	G - Al Si Cu	2
	G - Al Mg	2
	G - Al Mg Si	2
	G - Al Cu Ti	2
	G - Al Si Cu Mg Ni	2 - 3

1 = very good machinability

5 = bad machinability

Machinability can be defined as the degree of difficulty that a material creates when being machined. In order to assess the machinability of a material basically four parameters have to be taken into consideration

- Cutting force
- Tool life
- Surface quality
- Chip formation



	v_c [sfm]	f_z [inch]	a_p [inch]	v_c [sfm]	f_z [inch]	a_p [inch]	v_c [sfm]	f_z [inch]	a_p [inch]	
MaxiMill 211-07				211-11 / 260-054				211-11K		
	197 - 984	.002 - .004	.008 - .240	197 - 1148	.002 - .008	.008 - .380	328 - 984	.002 - .008	≤ a	
	130 - 722	.002 - .004	.008 - .240	130 - 820	.002 - .008	.008 - .380	261 - 656	.002 - .008	≤ a	
	230 - 9840	.002 - .004	.008 - .240	230 - 1148	.002 - .008	.008 - .380	361 - 984	.002 - .008	≤ a	
	-	-	-	656 - 9840	.004 - .100	.008 - .380	975 - 6560	.004 - .100	≤ a	
	97 - 328	.002 - .002	.008 - .140	790 - 328	.002 - .006	.080 - .160	130 - 261	.002 - .006	≤ a	
	-	-	-	97 -	.002 - .006	.020 - .156	97 - 164	.002 - .006	≤ a	
MaxiMill 211-15 / 260-056				211-15K				211-20		
	238 - 1148	.002 - .014	.040 - .540	394 - 984	.002 - .014	≤ a	492 - 984	.005 - .016	≤ a	
	492 - 820	.002 - .014	.040 - .540	492 - 656	.002 - .014	≤ a	492 - 820	.005 - .014	≤ a	
	361 - 1148	.002 - .014	.040 - .540	3302 - 984	.002 - .014	≤ a	-	-	-	
	984 - 9840	.005 - .016	.040 - .540	1312 - 8200	.005 - .016	≤ a	-	-	-	
	82 - 294	.002 - .008	.004 - .300	82 - 261	.002 - .008	≤ a	82 -	.005 - .010	≤ a	
MaxiMill 210 / 260-042										
	328 - 1148	.002 - .008	.004 - .315							
	558 - 820	.002 - .008	.004 - .315							
	328 - 984	.002 - .008	.004 - .315							
	< 6560	.002 - .008	.004 - .315							
	82 - 246	.002 - .006	.008 - .158							
	492 - 1640	.002 - .004	.008 - .024							
MaxiMill 141 / 241 / 260-051										
	261 - 1148	.002 - .014	.002 - .550							
	261 - 820	.002 - .014	.002 - .550							
	261 - 1148	.002 - .014	.002 - .550							
	< 6560	.002 - .014	.002 - .550							
MaxiMill 490-09 / 260-055										
	260 - 1150	.002 - .010	.004 - .156							
	260 - 920	.002 - .010	.004 - .156							
	400 - 920	.002 - .010	.004 - .156							
	< 6560	.002 - .012	.004 - .156							
	50 - 360	.002 - .006	.004 - .156							
HSC-11 / 260-54				HSC-19						
	984 - 9840	.002 - .010	.002 - .394	984 - 6560	.002 - .010	.012 - .710				
MaxiMill 251RS-08 (RP.. 1204..)				251RS-10				251RS-12 / 260-052		
	589 - 1148	.004 - .014	.010 - .038	589 - 1148	.006 - .016	.020 - .059	589 - 1148	.006 - .020	.020 - .097	
	261 - 820	.002 - .006	.010 - .038	261 - 820	.002 - .008	.020 - .059	261 - 820	.004 - .012	.020 - .097	
	328 - 1148	.002 - .008	.010 - .038	328 - 1148	.002 - .008	.020 - .059	328 - 1148	.004 - .012	.020 - .097	
	< 6560	.004 - .008	.010 - .038	< 6560	.004 - .012	.020 - .059	< 6560	.004 - .016	.020 - .097	
	82 - 246	.002 - .006	.010 - .038	82 - 246	.002 - .006	.020 - .059	82 - 246	.002 - .010	.020 - .097	
































Cutting data

Tool, material

	V_c [sfm]	f_z [inch]	a_p [inch]	V_c [sfm]	f_z [inch]	a_p [inch]	V_c [sfm]	f_z [inch]	a_p [inch]
MaxiMill 251RS-16 / 260-053				251RS-20					
	589 - 1148	.008 - .030	.020 - .117	589 - 1148	.010 - .030	.059 - .156			
	261 - 820	.004 - .018	.020 - .117	261 - 820	.008 - .024	.059 - .156			
	328 - 1148	.004 - .018	.020 - .117	328 - 1148	.008 - .024	.059 - .156			
	< 6560	.004 - .018	.020 - .117	< 6560	.008 - .024	.059 - .156			
	82 - 246	.004 - .010	.020 - .117	82 - 246	.006 - .014	.059 - .156			
MaxiMill 252-12									
	262 - 850	.004 - .018	.020 - .118						
	82 - 246	.004 - .012	.020 - .118						
MaxiMill 270-09 / 260-041 (SD.. 0903..)						272-09			
	220 - 1150	.002 - .010	.004 - .160	490 - 1000	.002 - .010	.004 - .080	260 - 660	.002 - .006	.004 - .156
	220 - 660	.002 - .010	.004 - .160	360 - 660	.002 - .010	.004 - .080	260 - 590	.002 - .006	.004 - .156
	260 - 920	.002 - .010	.004 - .160	490 - 920	.002 - .010	.004 - .080	260 - 660	.002 - .006	.004 - .156
	< 6560	.002 - .010	.004 - .160	< 6560	.002 - .010	.004 - .080	< 6560	.002 - .008	.004 - .156
	80 - 250	.002 - .010	.004 - .160	-	-	-	80 - 200	.002 - .004	.004 - .156
MaxiMill 270-12 / 260-031 (SD.. 1204..)						260-029 (SE.. 1204..)			
	200 - 1150	.002 - .014	.004 - .235	260 - 1150	.004 - .018	.004 - .156	200 - 1150	.002 - .014	.004 - .235
	200 - 920	.002 - .014	.004 - .235	130 - 920	.004 - .018	.004 - .156	200 - 920	.002 - .014	.004 - .235
	590 - 920	.002 - .014	.004 - .235	260 - 920	.004 - .018	.004 - .156	590 - 920	.002 - .014	.004 - .235
	< 6560	.002 - .014	.004 - .235	< 6560	.004 - .018	.004 - .156	< 6560	.002 - .014	.004 - .235
	80 - 250	.004 - .010	.004 - .235	-	-	-	250 - 980	.004 - .010	.004 - .235
MaxiMill 271-17 / 260-058									
	200 - 1150	.004 - .020	.039 - .315						
	200 - 660	.004 - .014	.039 - .315						
	200 - 980	.004 - .016	.039 - .315						
	80 - 250	.004 - .010	.039 - .315						
MaxiMill 273-06 / 260-057 (OAKU..)									
	200 - 1150	.002 - .024	.008 - .138	330 - 1150	.002 - .024	.008 - .138			
	130 - 820	.002 - .016	.008 - .138	200 - 820	.002 - .024	.008 - .138			
	230 - 920	.002 - .016	.008 - .138	330 - 920	.002 - .024	.008 - .138			
	30 - 330	.002 - .006	.008 - .138	130 - 330	.002 - .024	.008 - .138			
MaxiMill 274-09									
	260 - 1150	.004 - .016	.004 - .150	260 - 1150	.004 - .014	.004 - .098			
	260 - 660	.002 - .014	.002 - .150	260 - 660	.002 - .010	.002 - .098			
	< 6560	.002 - .016	.002 - .150	< 6560	.002 - .016	.002 - .098			
	250 - 802	.002 - .010	.002 - .150	80 - 250	.002 - .008	.002 - .098			











	v_c [sfm]	f_z [inch]	a_p [inch]	v_c [sfm]	f_z [inch]	a_p [inch]	v_c [sfm]	f_z [inch]	a_p [inch]
MaxiMill HFC-09				HFC-12					
	330 - 920	.004 - .040	.004 - .038	330 - 920	.004 - .117	.020 - 0.78			
	460 - 850	.004 - .040	.004 - .038	460 - 850	.004 - .117	.020 - 0.78			
	360 - 750	.004 - .040	.004 - .038	360 - 750	.004 - .117	.020 - 0.78			
	80 - 250	.004 - .030	.004 - .020	80 - 250	.004 - .059	.020 - .059			
MaxiMill 260-018 (SP.. 1204..)				260-040 (AD.. 1505..)					
	260 - 722	.002 - .014	.004 - .353	261 - 656	.004 - .016	.038 - .550			
	294 - 656	.002 - .014	.004 - .353	261 - 656	.004 - .016	< .471			
	394 - 917	.002 - .014	.004 - .353	-	-	-			
	< 6560	.002 - .004	.004 - .079	-	-	-			
MaxiMill 260-026 (LP.. 2004..)				260-025 (TP.. 2204..)					
	197 - 589	.004 - .014	.079 - .709	197 - 589	.004 - .014	.079 - .709			
	197 - 589	.004 - .014	.079 - .709	197 - 589	.004 - .014	.079 - .709			
	261 - 820	.004 - .014	.079 - .709	261 - 589	.004 - .014	.079 - .709			
MaxiMill 260-32 (SD.. 1504..)									
	197 - 656	.004 - .016	.039 - .354						
	197 - 656	.004 - .016	.039 - .354						
	197 - 656	.004 - .016	.039 - .354						
	< 6562	.004 - .016	.039 - .354						
	82 - 245	.004 - .010	.039 - .354						
MaxiMill 260-39 (SD.. 1204..)									
	300 - 1150	.004 - .016	.039 - .236						
	300 - 820	.004 - .016	.039 - .236						
	300 - 920	.004 - .016	.039 - .236						
	< 6562	.004 - .016	.039 - .236						
	80 - 590	.004 - .016	.039 - .236						



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness
				HB	
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	-
	Malleable cast iron		ferritic	19	130
		pearlitic	20	230	
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	-
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	-
		fiber-reinforced plastics	29	-	
		hard rubber	30	-	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	-
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	-
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa




Uncoated carbide							
CTW4615		H216T		S26T		TSM30	
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v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]
-	-	-	-	252 - 722	328 - 525	-	-
-	-	-	-	328 - 459	295 - 492	-	-
-	-	-	-	394 - 591	262 - 459	-	-
-	-	-	-	394 - 591	262 - 459	-	-
-	-	-	-	361 - 558	262 - 459	-	-
-	-	-	-	328 - 525	230 - 361	-	-
-	-	-	-	328 - 525	197 - 328	-	-
-	-	-	-	295 - 492	197 - 328	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
295 - 525	295 - 525	295 - 525	295 - 525	-	-	-	-
262 - 427	262 - 427	262 - 427	262 - 427	-	-	-	-
328 - 525	328 - 525	328 - 525	328 - 525	-	-	-	-
295 - 492	295 - 492	295 - 492	295 - 492	-	-	-	-
328 - 525	328 - 525	328 - 525	328 - 525	-	-	-	-
230 - 492	230 - 492	230 - 492	230 - 492	-	-	-	-
-	656 - 9842	-	656 - 9842	-	-	-	328 - 8200
-	656 - 6562	-	656 - 6562	-	-	-	328 - 8200
-	656 - 6562	-	656 - 6562	-	-	-	328 - 5904
-	656 - 5905	-	656 - 5905	-	-	-	328 - 4920
-	656 - 3281	-	656 - 3281	-	-	-	328 - 2624
-	656 - 1968	-	656 - 1968	-	-	-	328 - 1640
820 - 3281	820 - 3281	820 - 3281	820 - 3281	-	-	-	328 - 2624
-	492 - 1312	-	492 - 1312	-	-	-	328 - 984
-	984 - 2625	-	984 - 2625	-	-	-	328 - 1968
262 - 3281	262 - 3281	262 - 3281	262 - 3281	-	-	-	261 - 3280
230 - 1640	230 - 1640	230 - 1640	230 - 1640	-	-	-	230 - 1640
262 - 984	262 - 984	262 - 984	262 - 984	-	-	-	-
-	-	-	-	-	-	-	230 - 917
-	-	-	-	-	-	-	66 - 115
-	-	-	-	-	-	-	66 - 97
-	-	-	-	-	-	-	66 - 115
-	-	-	-	-	-	-	66 - 97
-	-	-	-	-	-	-	66 - 97
-	-	-	-	-	-	-	230 - 361
-	-	-	-	-	-	-	66 - 130
-	-	-	-	-	-	-	-
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Technical information

Tools and inserts for milling

 Recommended application











 Possible application



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
		pearlitic	20	230	
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC



* R_m = ultimate tensile strength, measured in MPa





Coated carbide									
AMZ		CTC3215		CTP3220		SR216		CTP6215	
 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]	 v_c [sfm]
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
591 - 772	-	585 - 1148	585 - 1148	394 - 984	394 - 984	591 - 1148	591 - 1148	622 - 1148	622 - 1148
459 - 591	-	458 - 917	458 - 917	425 - 917	425 - 917	459 - 919	459 - 919	458 - 917	458 - 917
492 - 722	-	425 - 820	425 - 820	394 - 689	394 - 689	427 - 820	427 - 820	425 - 820	425 - 820
394 - 591	-	328 - 656	328 - 656	361 - 656	361 - 656	328 - 656	328 - 656	328 - 656	328 - 656
591 - 722	-	492 - 1050	492 - 1050	656 - 1114	656 - 1114	492 - 1050	492 - 1050	492 - 1050	492 - 1050
492 - 656	-	394 - 820	394 - 820	525 - 917	525 - 917	394 - 820	394 - 820	394 - 820	394 - 820
-	984 - 10499	-	-	-	-	-	-	-	-
-	656 - 9186	-	-	-	-	-	-	-	-
-	1312 - 6562	-	-	-	-	-	-	-	-
-	1312 - 6562	-	-	-	-	-	-	-	-
-	656 - 3937	-	-	-	-	-	-	-	-
-	820 - 3281	-	-	-	-	-	-	-	-
656 - 3281	656 - 3281	-	-	-	-	-	-	-	-
-	492 - 2625	-	-	-	-	-	-	-	-
-	492 - 1640	-	-	-	-	-	-	-	-
-	262 - 656	-	-	-	-	-	-	-	-
-	262 - 772	-	-	-	-	-	-	-	-
-	328 - 1050	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
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Technical information

Tools and inserts for milling

  Recommended application





















  Possible application




	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness
				HB	
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
		alpha + beta alloys	37	R _m 1050*	
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Coated carbide									
SR226+		CTP1625		TSC30		CTP1235		GM43+	
 	 	 	 	 	 	 	 	 	 
v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]
689 - 1148	427 - 656	295 - 427	558 - 656	492 - 820	656 - 984	328 - 722	230 - 590	656 - 919	427 - 689
558 - 1050	361 - 591	295 - 427	459 - 525	492 - 656	589 - 886	328 - 722	230 - 590	558 - 820	361 - 591
492 - 919	295 - 492	295 - 427	427 - 492	394 - 589	458 - 753	328 - 722	230 - 590	492 - 722	295 - 492
429 - 820	262 - 459	295 - 427	492 - 591	394 - 525	458 - 722	328 - 722	230 - 558	459 - 656	262 - 459
459 - 689	197 - 394	295 - 427	427 - 525	394 - 492	425 - 656	328 - 722	230 - 558	427 - 591	197 - 427
328 - 591	197 - 361	295 - 427	394 - 492	394 - 492	394 - 589	328 - 722	230 - 558	328 - 525	197 - 361
459 - 689	197 - 361	230 - 295	328 - 394	394 - 525	458 - 656	262 - 590	197 - 459	328 - 525	197 - 361
328 - 558	197 - 361	230 - 295	295 - 361	394 - 492	394 - 589	262 - 590	197 - 459	295 - 459	197 - 328
459 - 623	262 - 459	295 - 427	427 - 525	394 - 589	458 - 656	262 - 590	197 - 459	427 - 591	262 - 459
328 - 558	230 - 394	295 - 427	361 - 492	394 - 492	394 - 558	262 - 590	197 - 459	295 - 492	230 - 427
361 - 656	–	295 - 427	459 - 591	261 - 492	261 - 656	197 - 656	131 - 459	–	230 - 459
394 - 689	–	295 - 427	361 - 427	261 - 492	261 - 656	197 - 656	131 - 459	–	230 - 427
–	–	–	–	–	–	197 - 656	131 - 459	–	197 - 361
262 - 459	–	230 - 295	295 - 361	261 - 394	328 - 458	197 - 656	131 - 459	–	230 - 427
525 - 722	394 - 591	394 - 589	525 - 722	492 - 1312	–	–	–	–	–
328 - 558	262 - 492	261 - 492	328 - 558	425 - 656	–	–	–	–	–
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295 - 591	230 - 459	230 - 458	294 - 589	328 - 458	–	–	–	–	–
262 - 525	230 - 426	230 - 425	261 - 525	328 - 425	–	–	–	–	–
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–	197 - 295	–	–	–	66 - 130	–	–	–	197 - 328
–	–	–	–	–	66 - 115	–	–	–	164 - 262
–	–	–	–	–	66 - 130	–	–	–	131 - 246
–	–	164 - 294	–	–	66 - 115	–	–	–	148 - 246
–	–	115 - 164	–	–	–	–	–	–	66 - 1310
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230 - 427	–	–	–	–	–	–	–	–	–
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  Recommended application

  Possible application

Technical information
















Tools and inserts for milling



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
		pearlitic	20	230	
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
		alpha + beta alloys	37	R _m 1050*	
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Coated carbide								Cermet	
CTC5235		CTC5240		CTP2235		GM246		TCM10	
 		 		 		 		 	
v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]
492 - 853	294 - 589	-	-	492 - 853	295 - 590	525 - 853	459 - 591	492 - 1312	-
492 - 853	294 - 589	-	-	492 - 853	295 - 590	427 - 722	361 - 492	492 - 1148	-
492 - 853	294 - 589	-	-	492 - 853	295 - 590	295 - 525	230 - 427	492 - 1050	-
261 - 722	230 - 525	-	-	262 - 722	230 - 525	492 - 722	361 - 558	394 - 1247	-
261 - 722	230 - 525	-	-	262 - 722	230 - 525	361 - 623	262 - 492	394 - 1181	-
261 - 722	230 - 525	-	-	262 - 722	230 - 525	295 - 525	260 - 427	394 - 1115	-
294 - 589	230 - 458	-	-	295 - 590	230 - 459	394 - 656	328 - 492	394 - 1247	-
294 - 589	230 - 458	-	-	295 - 590	230 - 459	295 - 459	230 - 361	394 - 1050	-
230 - 589	197 - 458	-	-	230 - 590	197 - 459	361 - 722	295 - 459	394 - 1115	-
230 - 589	197 - 458	-	-	230 - 590	197 - 459	295 - 591	262 - 361	394 - 984	-
722 - 1148	-	-	-	197 - 656	197 - 459	295 - 820	197 - 459	394 - 984	-
492 - 786	-	-	-	197 - 656	197 - 459	328 - 525	197 - 394	394 - 1181	-
261 - 525	197 - 458	-	-	197 - 656	197 - 459	164 - 328	164 - 295	100 - 919	-
261 - 565	197 - 589	-	-	197 - 656	197 - 459	197 - 591	164 - 459	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	328 - 1575	-
-	-	-	-	-	-	-	-	328 - 1378	-
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-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness
				HB	
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
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			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
		pearlitic	20	230	
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		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
		alpha + beta alloys	37	R _m 1050*	
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



PCD		CBN				Cermet	
CTD4205		CTL3215		TA201		CTN3105	
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v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]	v_c [sfm]
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
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-	-	1640 - 3280	-	-	-	984 - 2624	-
-	-	-	-	-	-	-	-
-	-	1148 - 2132	-	656 - 2296**	-	-	-
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-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	984 - 13120	-	-	-	-	-	-
-	984 - 4920	-	-	-	-	-	-
-	984 - 16400	-	-	-	-	-	-
-	984 - 9840	-	-	-	-	-	-
-	984 - 3280	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	328 - 2296	-	-	-	-	-	-
-	328 - 4920	-	-	-	-	-	-
-	984 - 9840	-	-	-	-	-	-
-	261 - 984	-	-	-	-	-	-
-	261 - 984	-	-	-	-	-	-
-	261 - 984	-	-	-	-	-	-
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-	-	-	-	-	-	-	-
-	-	-	-	328 - 820	-	-	-
-	-	-	-	328 - 820	-	-	-
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-	-	-	-	-	-	-	-
-	-	-	-	230 - 820	-	-	-
-	-	3608 - 622	-	230 - 492	-	-	-
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Recommended application

Possible application

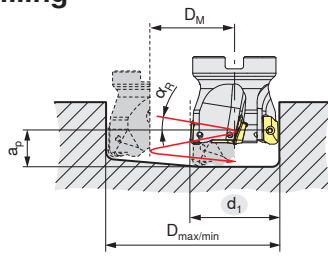
** From spheroidal cast iron (GGG 60) on

Technical information

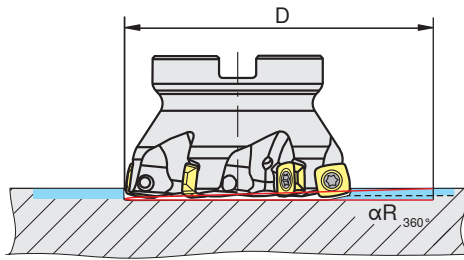
Tools and inserts for milling



Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_1$ or $D_{min} - d_1$

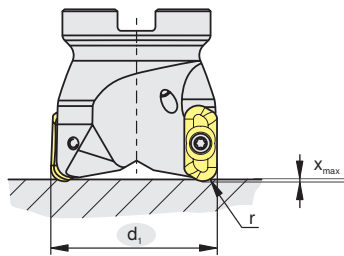


d_1 [inch]	D_{max} [inch]	D_{min} [inch]	$\alpha_{R\ max\ 360^\circ}$ [°]
1.000	1.535	1.299	6
1.250	2.047	1.811	4
1.500	3.559	2.323	3
2.000	3.543	3.268	2.1
2.500	4.567	4.252	1.6
3.000	5.551	5.276	1.3
4.000	7.559	7.203	.9
5.000	9.567	9.252	.7
6.000	11.535	11.260	.6

a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

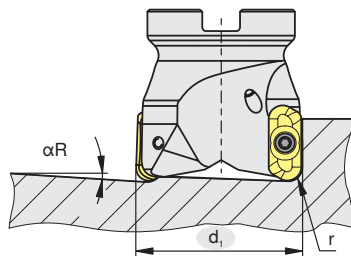
d_1 [inch]	D [mm]	$\alpha_{R\ max\ 360^\circ}$ [°]
1.000	1.299	6
1.250	1.811	4
1.500	2.323	3
2.000	3.268	2.1
2.500	4.252	1.6
3.000	5.276	1.3
4.000	7.283	.9
5.000	9.252	.7
6.000	11.260	.6

Axial plunging



d_1 [inch]	r 0,2 - 4,0 X_{max} [inch]	r 5,0 X_{max} [inch]
1.000	.0835	.0547
1.250	.0835	.0547
1.500	.0835	.0547
2.000	.0835	.0547
2.500	.0835	.0547
3.000	.0835	.0547
4.000	.0835	.0547
5.000	.0835	.0547
6.000	.0835	.0547

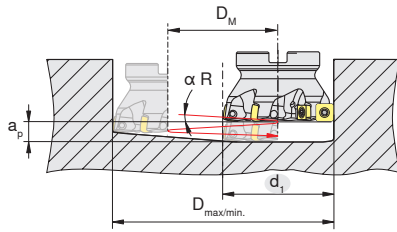
Angled ramping



d_1 [inch]	r 0,2 - 4,0 α_R [°]	r 5,0 α_R [°]
1.000	10.4	6.8
1.250	6.9	4.6
1.500	5.1	3.4
2.000	3.4	2.3
2.500	2.5	1.7
3.000	2	1.4
4.000	1.4	1
5.000	1.1	.8
6.000	.9	.9



Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

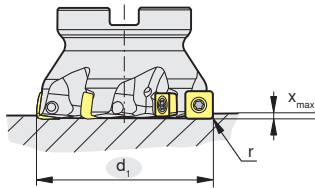
D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_1$ or $D_{min} - d_1$

MaxiMill 490-09

d_1 [inch]	D_{max} [inch]	D_{min} [inch]	$\alpha_{R_{max}}$ [°]
1.000	1.8998	1.4961	4.3
1.250	2.4016	1.8504	2.2
1.500	2.9134	2.3622	.75
2.000	3.8976	3.3465	.4
2.500	4.9213	4.3307	.3
3.000	5.9035	5.3573	.25
4.000	7.9134	7.3622	.1

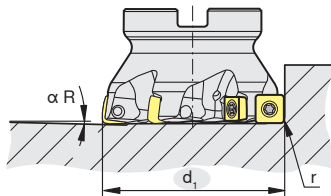
Axial plunging



MaxiMill 490-09

d_1 [inch]	X_{max} [inch]
1.000	.0197
1.250	.0197
1.500	.0118
2.000	.0118
2.500	.0118
3.000	.0118
4.000	.0118

Angled ramping

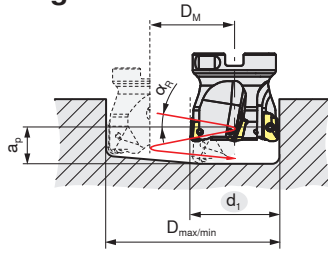


MaxiMill 490-09

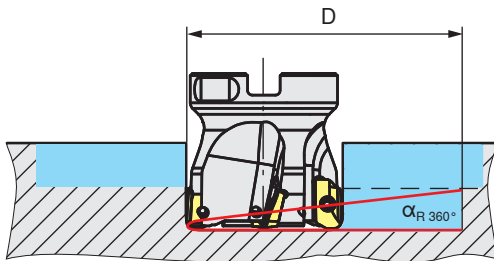
d_1 [inch]	$\alpha_{R_{max}}$ [°]
1.000	4.3
1.250	2.2
1.500	.75
2.000	.4
2.500	.3
3.000	.25
4.000	.1



Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_1$ or $D_{min} - d_1$

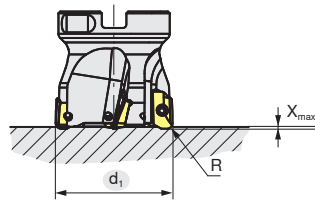


d_1 [inch]	$D_{max} / r.4$ [inch]	D_{min} [inch]	$\alpha_{R \max} 360^\circ$ [°]
.375	.7106	.4744	5.5
.500	.9606	.7244	6
.625	1.2106	.9744	3
.750	1.4606	1.2244	2
1.000	1.9606	1.7244	1.5
1.250	2.406	2.2244	1.2
1.500	2.9606	2.7244	.8
2.000	3.9606	3.7244	.7

a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

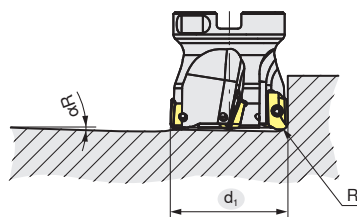
d_1 [inch]	D [inch]	$\alpha_{R \max} 360^\circ$ [°]
.375	.4744	5.5
.500	.7244	6
.625	.9744	3
.750	1.2244	2
1.000	1.7244	1.5
1.250	2.2244	1.2
1.500	2.7244	.8
2.000	3.7244	.7

Axial plunging



d_1 [inch]	X_{max} [mm]
.375	.0315
.500	.0315
.625	.0315
.750	.0315
1.000	.0315
1.250	.0315
1.500	.0315
2.000	.0315

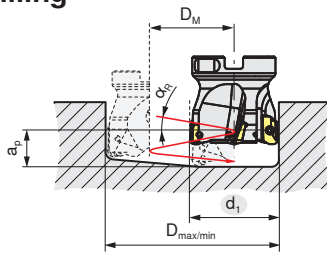
Angled ramping



d_1 [inch]	αR [°]
.375	11
.500	7.8
.625	4.3
.750	3
1.000	2.4
1.250	1.6
1.500	1.2
2.000	.9



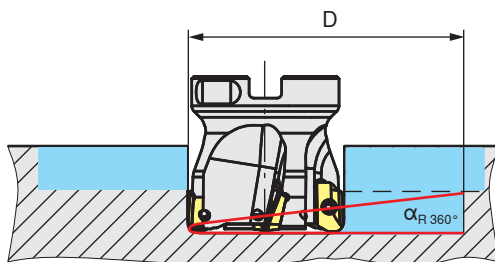
Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_1$ or $D_{min} - d_1$

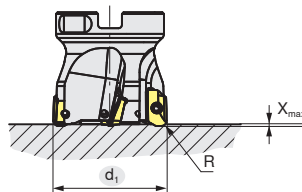


d_1 [inch]	$D_{max} / r 0,8$ [inch]	D_{min} [inch]	$\alpha_{R max}$ [°]
.625	1.187	.935	9.5
.750	1.437	1.185	7
1.000	1.937	1.685	4.4
1.250	2.437	2.185	3.2
1.500	2.937	2.685	2.2
2.000	3.937	3.685	1.6
2.500	4.937	4.685	1.4
3.000	5.937	5.685	1
4.000	7.937	7.685	.7
5.000	9.882	9.685	.5
6.000	11.882	11.685	.3

a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

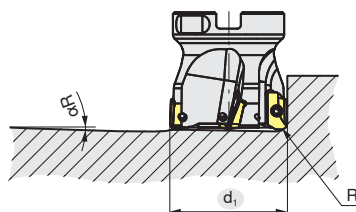
d_1 [inch]	D [inch]	$\alpha_{R max 360^\circ}$ [°]
.625	.935	9.5
.750	1.185	7
1.000	1.685	4.4
1.250	2.185	3.2
1.500	2.685	2.2
2.000	3.685	1.6
2.500	4.685	1.4
3.000	5.685	1
4.000	7.685	.7
5.000	9.685	.5
6.000	11.685	.3

Axial plunging



d_1 [inch]	X_{max} [inch]
.625	.0591
.750	.0787
1.000	.0787
1.250	.0709
1.500 - 6.000	.0630

Angled ramping



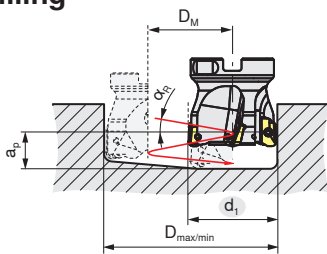
d_1 [inch]	α_R [°]
.625	10.8
.750	9.8
1.000	7.4
1.250	4.8
1.500	2.9
2.000	2.1
2.500	1.8
3.000	1.4
4.000	1
5.000	.8
6.000	.6



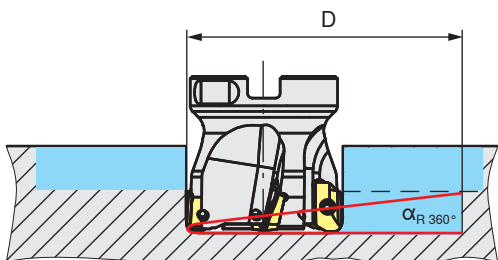
Application data

MaxiMill 211-15 / -15K

Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_i$ or $D_{min} - d_i$

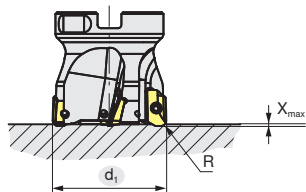


d_i [inch]	$D_{max} / r 0,8$ [inch]	D_{min} [inch]	$\alpha_{R max}$ [°]
1.000	1.921	1.488	7.4
1.250	2.421	1.988	5
1.500	2.921	2.488	3.2
2.000	3.921	3.488	2.4
2.500	4.921	4.488	1.4
3.000	5.921	5.488	1.3
4.000	7.921	7.488	1
5.000	9.921	9.606	.7
6.000	11.921	11.606	.5

$$a_p \text{ [inch]} = D_M \times \pi \times \tan \alpha_R$$

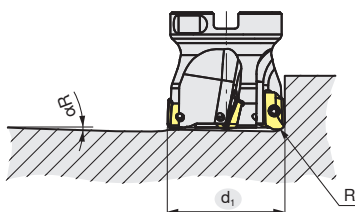
d_i [inch]	D [inch]	$\alpha_{R max 360^\circ}$ [°]
1.000	1.488	7.4
1.250	1.988	5
1.500	2.488	3.2
2.000	3.488	2.4
2.500	4.488	1.4
3.000	5.488	1.3
4.000	7.488	1
5.000	9.606	.7
6.000	11.606	.5

Axial plunging



d_i [inch]	X_{max} [inch]
1.000	.1063
1.250 - 6.000	.0984

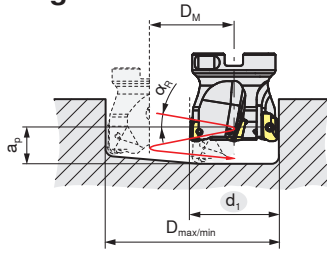
Angled ramping



d_i [inch]	α_R [°]
1.000	9.5
1.250	6.8
1.500	5.1
2.000	2.4
2.500	2.3
3.000	2
4.000	1.4
5.000	1.2
6.000	1.0



Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

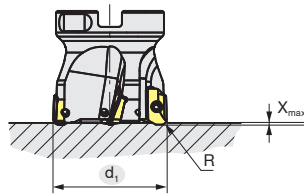
D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [inch]	$D_{max/r 0,8}$ [inch]	D_{min} [inch]	α_{Rmax} [°]
2.500	4.9213	4.2520	2.1
3.000	5.9213	5.3308	1.7

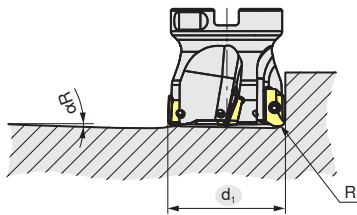
$$a_p \text{ [inch]} = D_M \times \pi \times \tan \alpha_R$$

Axial plunging



d_1 [inch]	X_{max} [inch]
2.500	.0787
3.000	.0787

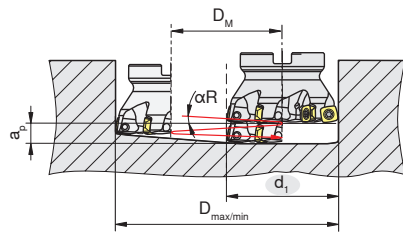
Angled ramping



d_1 [inch]	α_R [°]
2.500	2.1
3.000	1.7



Helical plunge milling

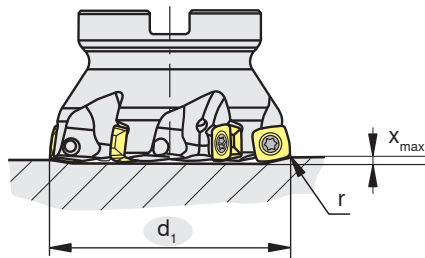


D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [inch]	D_{max} [inch]	D_{min} [inch]	$\alpha_{R,max}$ [°]
.625	1.211	.857	4.5
.750	1.461	1.107	2.3
1.000	1.961	1.607	1.2
1.250	2.461	2.107	.9

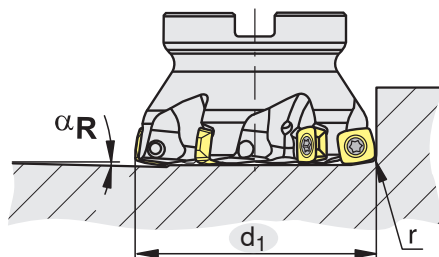
a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

Axial plunging



d_1 [inch]	X_{max} [inch]
.625 - 1.250	.020

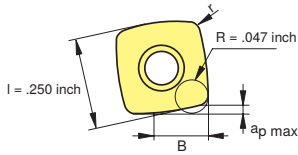
Angled ramping



d_1 [inch]	$\alpha_{R,max}$ [°]
.625	5.9
.750	3.2
1.000	2.0
1.250	1.3

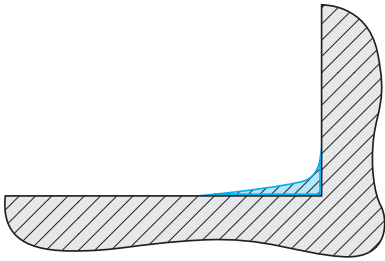


Depth of cut and remaining material



l [inch]	B [inch]	r [inch]	$a_{p \max}$ [inch]
.250	.169	.020	.031

Profile when shoulder and slot milling

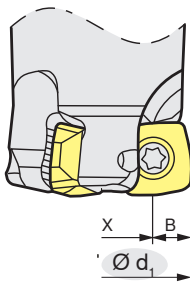


$ipt \geq .020$ / tooth



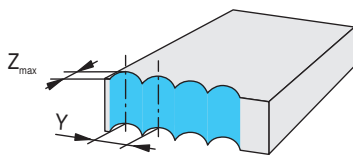
recommended

Width of cut for flat surfaces



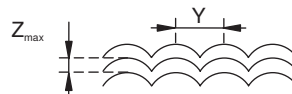
d_1 [inch]	X [inch]	B [inch]
.625 - 1.250	$d_1 - (2 \times B)$	.169

Engagement data when plunge milling



Z_{\max} [inch]	initial [inch]	f_z min [inch]	max [inch]	Y_{\max} [inch]
.209	.0039	.0031	.0059	$d_1 \times x < .0276$

Tool offset with optimum overlap

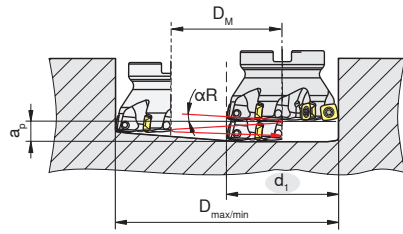


Tool offset for unstable conditions

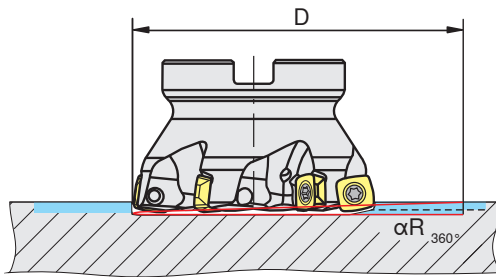




Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_1$ or $D_{min} - d_1$

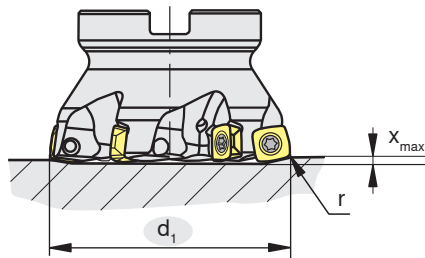


d_1 [inch]	D_{max} [inch]	D_{min} [inch]	$\alpha_{R,max}$ [°]
1.000	1.921	1.409	3
1.250	2.421	1.909	1.7
1.500	2.921	2.409	1
2.000	3.921	3.409	.7
2.500	4.913	4.402	.5

a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

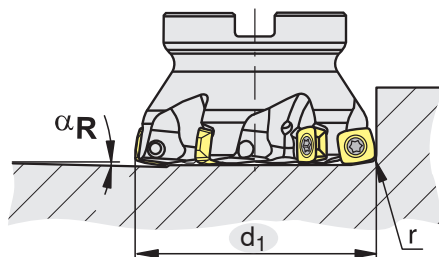
d_1 [inch]	D [inch]	$\alpha_{R,max} 360^\circ$ [°]
1.000	1.409	3
1.250	1.909	1.7
1.500	2.409	1
2.000	3.409	.7
2.500	4.402	.5

Axial plunging



d_1 [inch]	X_{max} [inch]
1.000 - 2.500	.0295

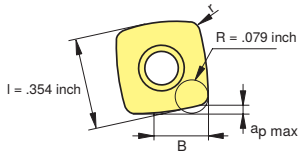
Angled ramping



d_1 [inch]	$\alpha_{R,max}$ [°]
1.000	3.5
1.250	1.9
1.500	1.2
2.000	.8
2.500	.6

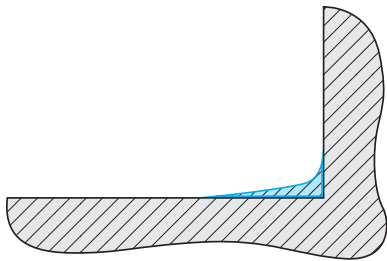


Depth of cut and remaining material



l [inch]	B [inch]	r [inch]	a _{p max} [inch]
.3543	.2323	.0315	.0394

Profile when shoulder and slot milling

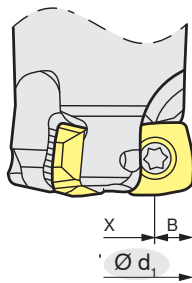


ipt ≥ .020 / tooth



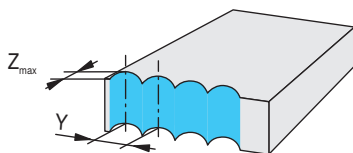
recommended

Width of cut for flat surfaces



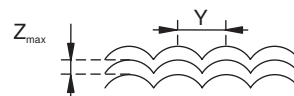
d ₁ [inch]	X [inch]	B [inch]
1.000 - 2.000	d ₁ · (2 x B)	.2323

Engagement data when plunge milling



Z _{max} [inch]	initial [inch]	f _z min [inch]	max [inch]	Y _{max} [inch]
.2953	.0039	.0031	.0059	d ₁ · x < .0276

Tool offset with optimum overlap

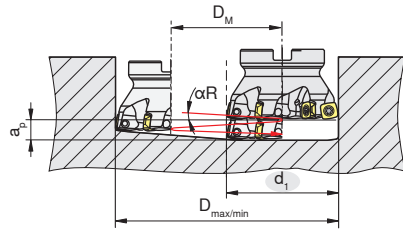


Tool offset for unstable conditions

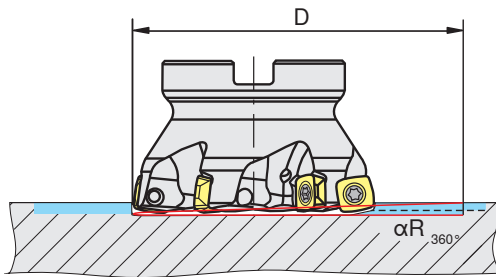




Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_1$ or $D_{min} - d_1$

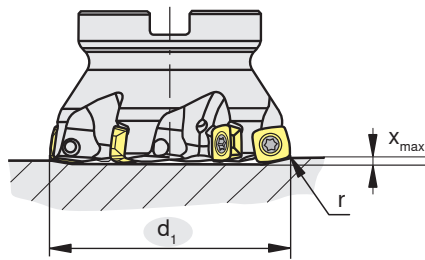


d_1 [inch]	D_{max} [inch]	D_{min} [inch]	$\alpha_{R,max}$ [°]
2.000	3.921	3.213	1.2
2.500	4.921	4.213	.9
3.000	5.921	5.213	.8
4.000	7.921	7.291	.7
5.000	9.921	9.291	.5

$$a_p \text{ [inch]} = D_M \times \pi \times \tan \alpha_R$$

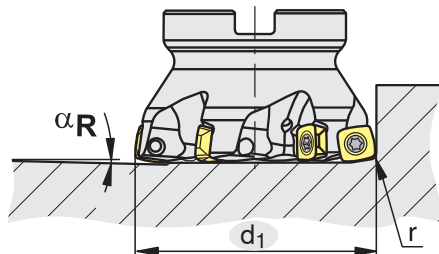
d_1 [inch]	D [mm]	$\alpha_{R,max} 360^\circ$ [°]
2.000	3.213	1.2
2.500	4.213	.9
3.000	5.213	.8
4.000	7.291	.7
5.000	9.291	.5

Axial plunging



d_1 [inch]	X_{max} [inch]
2.000 - 5.000	.0453

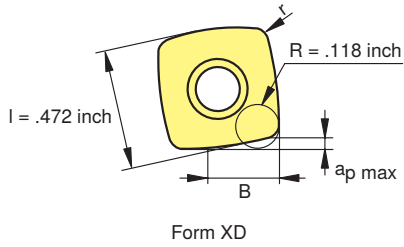
Angled ramping



d_1 [inch]	$\alpha_{R,max}$ [°]
2.000	1.4
2.500	1.1
3.000	1
4.000	.9
5.000	.8

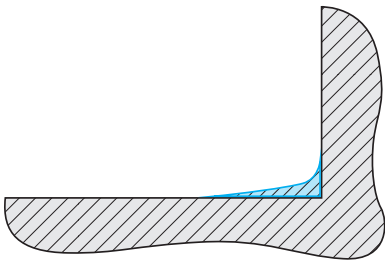


Depth of cut and remaining material



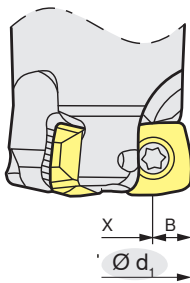
l [inch]	B [inch]	r [inch]	$a_{p \max}$ [inch]
.4724	.3268	.0394	.0787

$ipt \geq .020$ / tooth



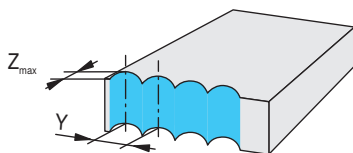
recommended

Width of cut for flat surfaces



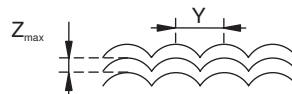
d_1 [inch]	X [inch]	B [inch]
2.000 - 3.000	$d_1 - (2 \times B)$	.3268

Engagement data when plunge milling



Z_{\max} [inch]	initial [inch]	f_z min [inch]	max [inch]	Y_{\max} [inch]
.3937	.0059	.0039	.0079	$d_1, x < .0276$

Tool offset with optimum overlap



Tool offset for unstable conditions

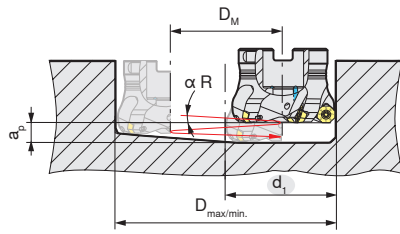




Application data

MaxiMill 274 OF04..

Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

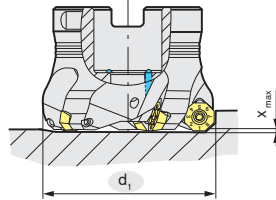
D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [inch]	$D_{max / r 0,8}$ [inch]	D_{min} [inch]	$\alpha_{R,max}$ [°]
1.500	3.1890	2.9528	1.2
2.000	4.2126	3.9764	.9
3.000	6.1811	5.9449	.6
4.000	8.1890	7.9528	.5

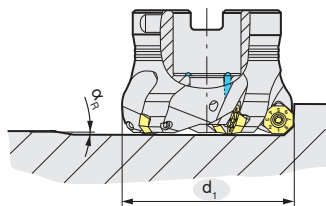
$$a_p \text{ [inch]} = D_M \times \pi \times \tan \alpha_R$$

Axial plunging



d_1 [inch]	X_{max} [inch]
1.500	.0984
2.000	.0984
3.000	.0984
4.000	.0984

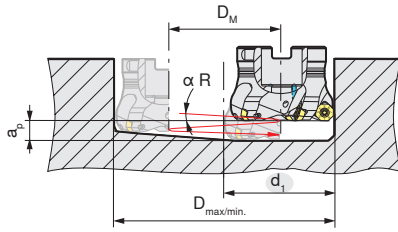
Angled ramping



d_1 [inch]	α_R [°]
1.500	5
2.000	3.4
3.000	2.1
4.000	1.6



Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

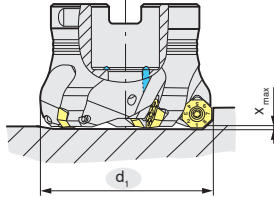
D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [inch]	$D_{max/r 0.8}$ [inch]	D_{min} [inch]	α_{Rmax} [°]
2.000	4.291	3.976	1.1
2.500	5.276	4.961	.9
3.000	6.260	5.945	.7
4.000	8.268	7.953	.5
5.000	10.276	9.961	.4
6.000	12.244	11.929	.3

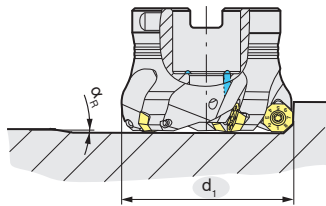
a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

Axial plunging



d_1 [inch]	X_{max} [inch]
2.000	.087
2.500	.075
3.000	.071
4.000	.063
5.000	.031
6.000	.024

Angled ramping



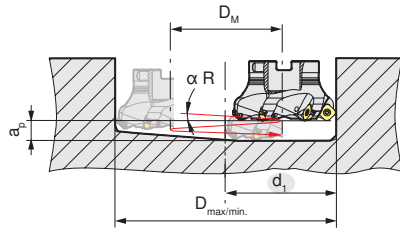
d_1 [Inch]	α_p [°]
2.000	3.2
2.500	2.0
3.000	1.5
4.000	1.0
5.000	.4
6.000	.2



Application data

MaxiMill 274 SF09..

Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

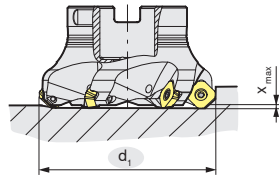
D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_i$ or $D_{min} - d_i$

d_i [inch]	$D_{max / r 0,8}$ [inch]	D_{min} [inch]	$\alpha_{R,max}$ [°]
1.45	3.1890	3.0709	.9
1.95	4.2126	4.0945	.7
2.95	6.1811	6.0630	.4
3.95	8.1890	8.0709	.3

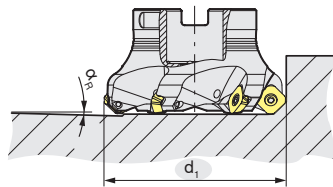
a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

Axial plunging



d_i [inch]	X_{max} [inch]
1.45	.1220
1.95	.1220
2.95	.1142
3.95	.1063

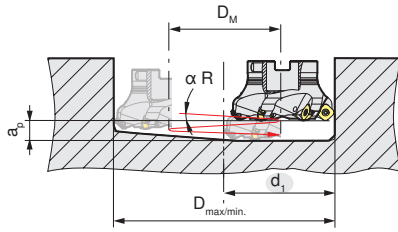
Angled ramping



d_i [inch]	α_R [°]
1.45	6.2
1.95	4.2
2.95	2.4
3.95	1.7



Helical plunge milling



D_{max} [inch] = maximum diameter for flat bottom ground

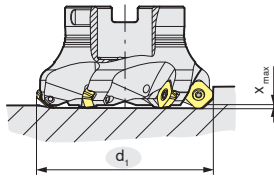
D_{min} [inch] = minimum hole diameter

$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [inch]	$D_{max/r 0.8}$ [inch]	D_{min} [inch]	α_{Rmax} [°]
1.878	4.252	4.213	.5
2.378	5.276	5.197	.4
2.878	6.260	6.181	.3
3.878	8.268	8.189	.2
4.878	10.276	10.197	.2
5.878	12.244	12.205	.2

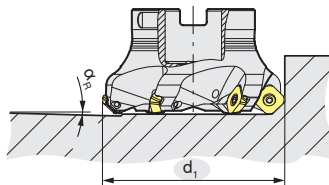
a_p [inch] = $D_M \times \pi \times \tan \alpha_R$

Axial plunging



d_1 [inch]	X_{max} [inch]
1.878	.134
2.378	.126
2.878	.118
3.878	.106
4.878	.083
5.878	.079

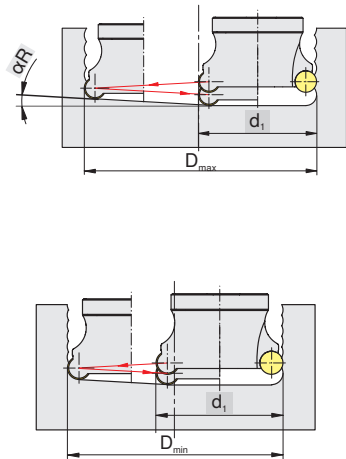
Angled ramping



d_1 [inch]	α_R [°]
1.878	4.8
2.378	3.4
2.878	2.5
3.878	1.7
4.878	1.0
5.878	.8



Helical plunge milling



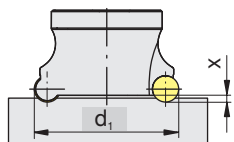
D_{max} [inch] = maximum diameter for flat bottom ground
 D_{min} [inch] = minimum hole diameter
 $D_M = D_{max} - d_1$ or $D_{min} - d_1$



Maximum possible hole diameter
 $r = 2 \times d_1 - 1 \text{ mm}$

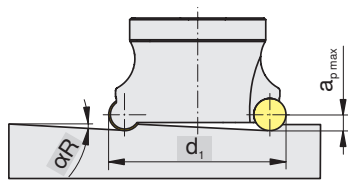
d_1 [inch]	D [inch]	8		10		12		16		20	
		[inch]	α_R [°]	[inch]	α_R [°]	[inch]	α_R [°]	[inch]	α_R [°]	[inch]	α_R [°]
.750	D_{min}	.988	1.9								
	D_{max}	1.185									
1.000	D_{min}	1.488	1.5	1.488	1.8						
	D_{max}	1.685		1.606							
1.250	D_{min}	1.988	1.2	1.988	1.5						
	D_{max}	2.185		2.106							
1.500	D_{min}	2.488	.9	2.488	1.1						
	D_{max}	2.685		2.606							
2.000	D_{min}			3.488	.9	3.252	1.1				
	D_{max}			3.606		3.528					
2.500	D_{min}					4.252	.9				
	D_{max}					4.528					
3.000	D_{min}					5.252	.7	5.016	.9		
	D_{max}					5.528		5.370			
4.000	D_{min}					7.252	.5			6.740	.9
	D_{max}					7.528				7.213	
5.000	D_{min}							9.016	.45	8.740	.6
	D_{max}							9.370		9.213	
6.000	D_{min}					11.291	.3	11.016	.35	10.740	.45
	D_{max}					11.528		11.370		11.213	

Axial plunging

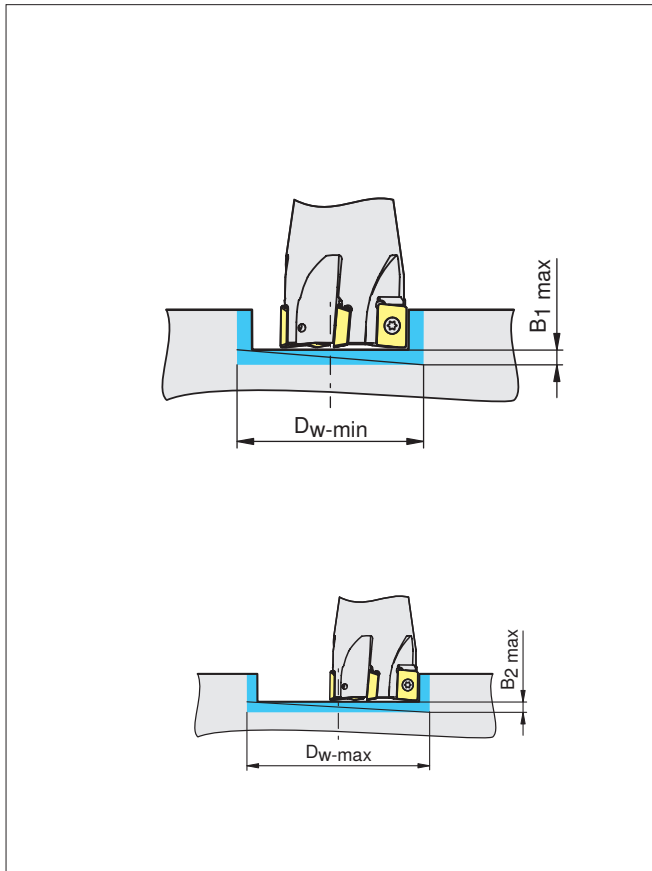


⊙	d_1 [inch]	X_{max} [inch]
8	.750 - 1.500	.106
	1.000	.016
10	1.250	.031
	1.500 - 2.000	.059
12	1.250 - 6.000	.059
16	1.500 - 6.000	.079
20	3.000 - 6.000	.118

Angled ramping



d_1 [inch]	⊙ 8 α_R [°]	⊙ 10 α_R [°]	⊙ 12 α_R [°]	⊙ 16 α_R [°]	⊙ 20 α_R [°]
.750	20	-	-	-	-
1.000	12	2	-	-	-
1.250	8	3	-	-	-
1.500	4.5	3.3	-	-	-
2.000	-	2.3	2.5	-	-
2.250	-	-	1.8	-	-
3.000	-	-	1.3	2	-
4.000	-	-	.9	-	2.3
5.000	-	-	-	1.1	1.7
6.000	-	-	.8	1.0	1.6



D [inch]	[inch]				
	D _{w-min}	B _{1-max}	D _{w-max}	B _{2-max}	α
270-09					
Ø .500	1.1811	.059	1.2598	.059	–
Ø .750	1.6929	.059	1.7717	.059	–
Ø 1.000	2.2047	.059	2.2441	.059	–
Ø 1.250	2.6722	.059	2.7559	.059	–
Ø 1.500	3.1890	.059	3.2677	.059	–
Ø 2.000	4.2126	.059	4.2520	.059	–
Ø 2.500	5.1969	.059	5.2756	.059	–
Ø 3.000	6.1811	.059	6.2598	.059	–
270-12					
Ø 2.000	4.4488	.059	4.5276	.059	8.3°
Ø 2.500	5.4331	.059	5.5512	.059	6.3°
Ø 3.000	6.4173	.059	6.5354	.059	5°
Ø 4.000	8.4252	.059	8.5433	.059	3.7°
Ø 5.000	10.4331	.059	10.5512	.059	2.8°
Ø 6.000	12.4409	.059	12.5197	.059	2.3°
141					
Ø .625	.778	.016	1.171	.059	2.0°
Ø .750	.870	.016	1.421	.075	2.0°
Ø 1.000	1.370	.035	1.921	.098	2.0°
Ø 1.250	1.870	.063	2.421	.122	2.0°
Ø 1.500	2.370	.071	2.921	.118	1.5°

α
Ramp angle

B
Calculated pitch / $D_w > D_{w-min}$ and $D_w < D_{w-max}$

B_{1max}
Max. pitch when plunging with minimum hole diameter

B_{2max}
Max. when plunging with maximum diameter

d₁
Milling cutter diameter

D_w
Diameter of hole

D_{w-max}
Largest hole diameter (without formation of pip)

D_{w-min}
Minimum hole diameter

$$B = (D_w - d_1) \cdot \pi \cdot \tan \alpha$$



MaxiMill 211 - starting parameters

for example materials

Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625



If $a_e < 50\%$ use correction list

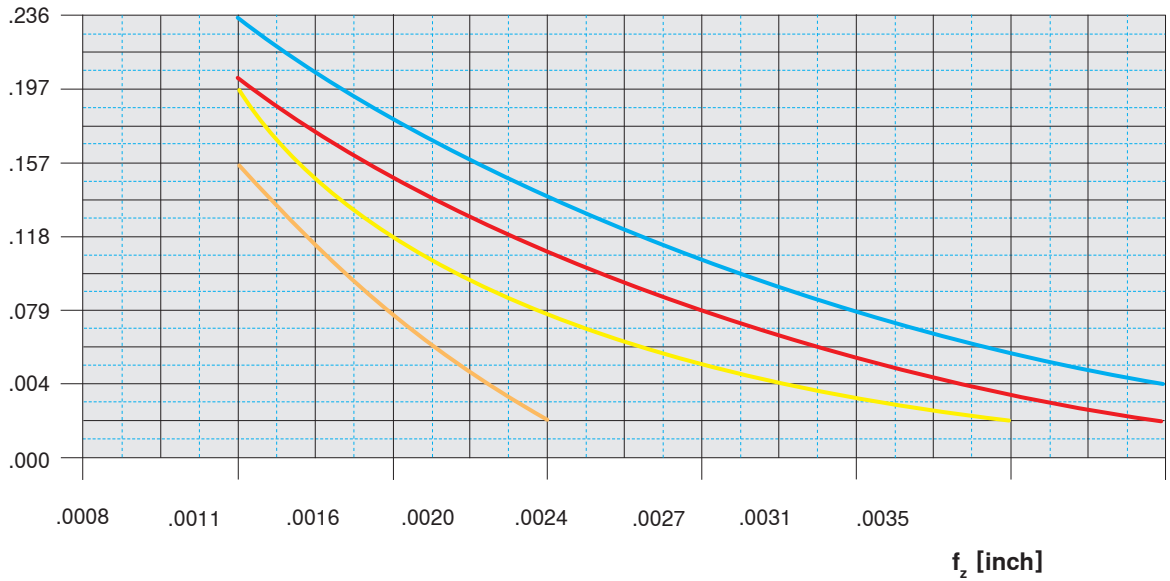


Technical information

Tools and inserts for milling

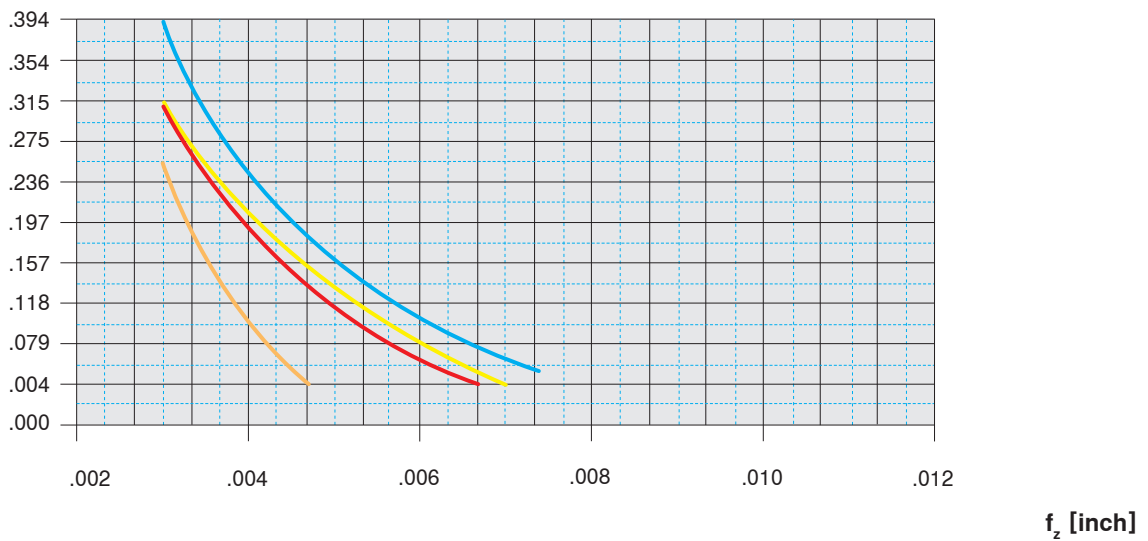
a_p [inch]

07



a_p [inch]

11



MaxiMill 211 - starting parameters

for example materials



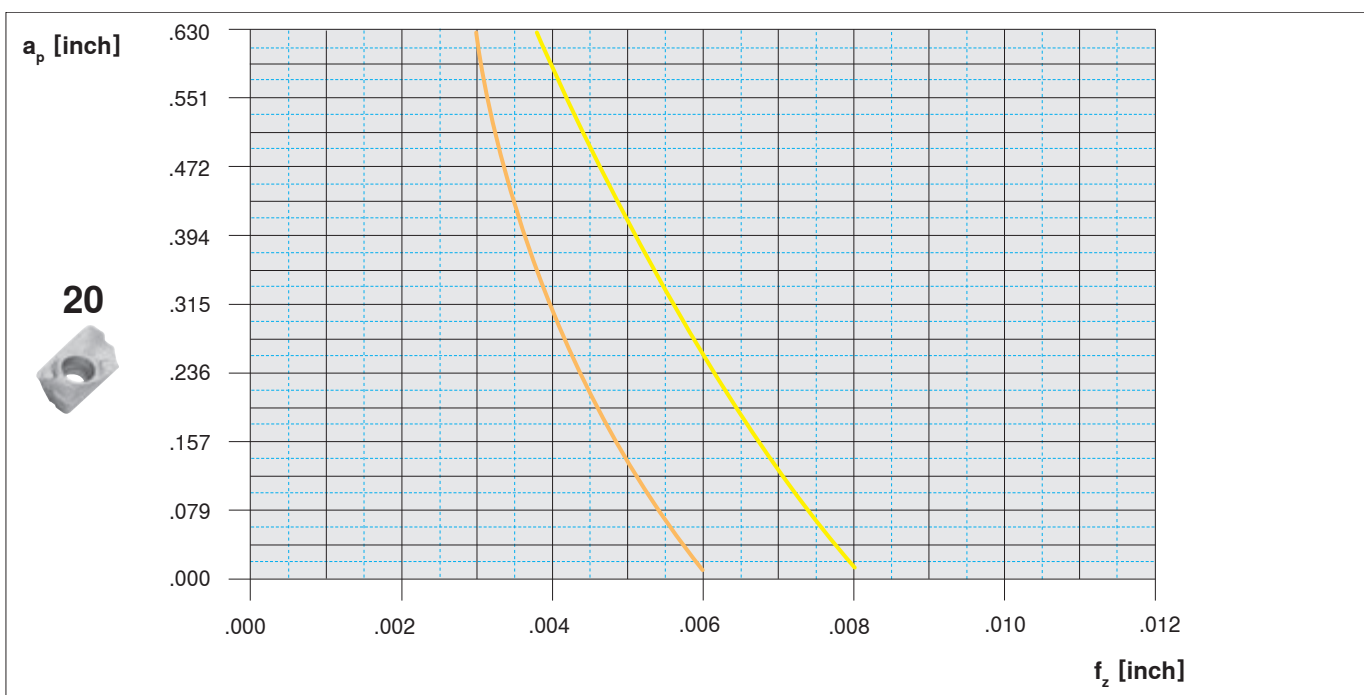
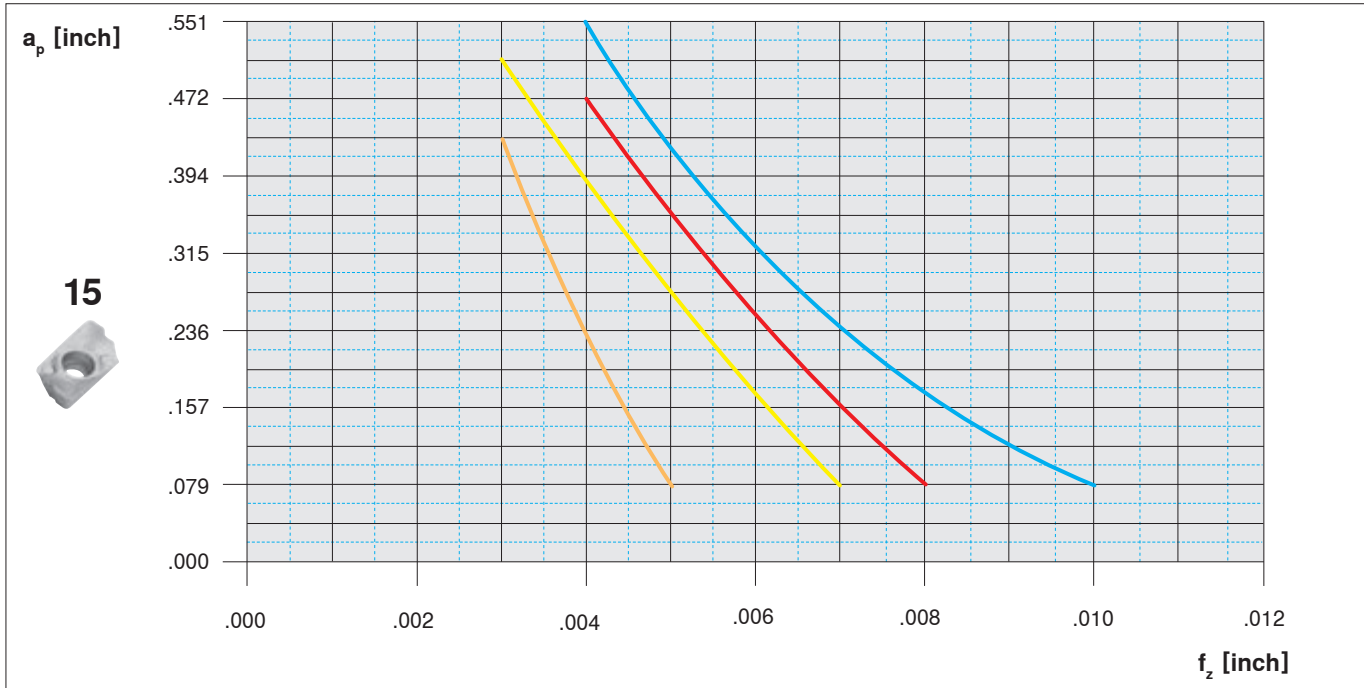
Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625



If $a_e < 50\%$ use correction list



B155





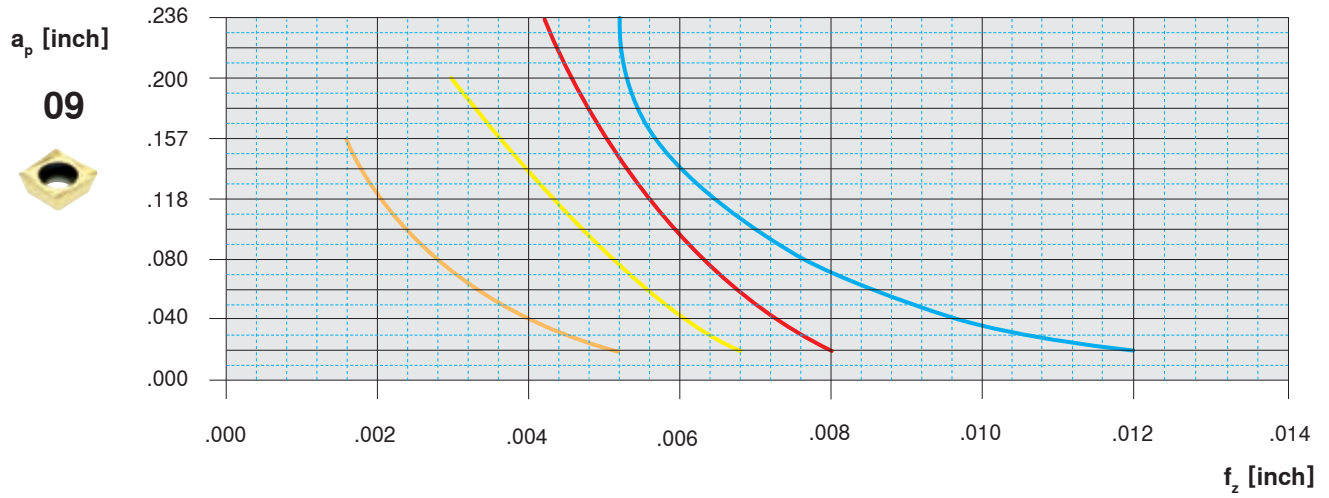
MaxiMill 490 - starting parameters

for example materials

Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625



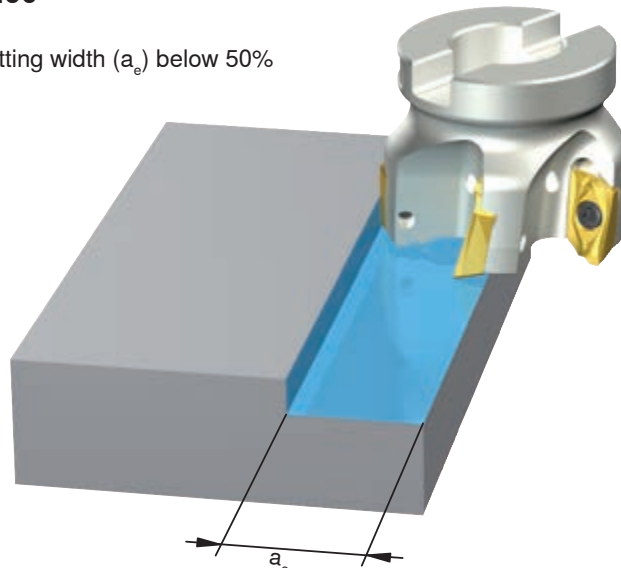
If $a_e < 50\%$ use correction list



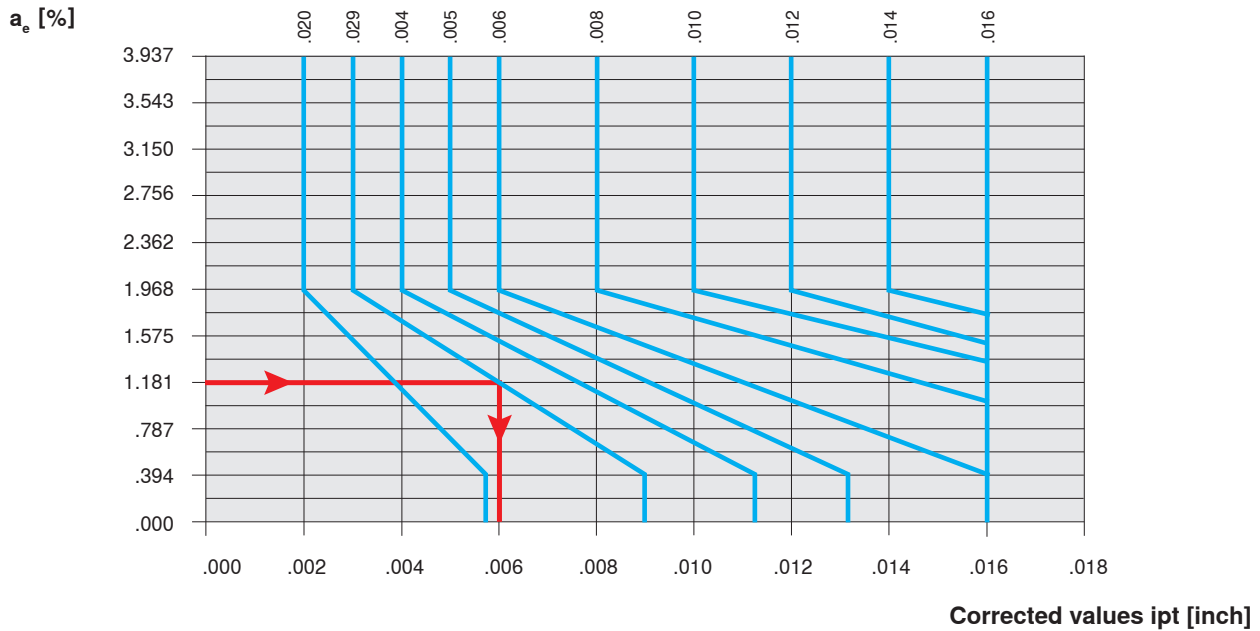


MaxiMill 211 / MaxiMill 490

These parameters apply for cutting width (a_e) below 50%



Starting values ipt [inch] from starting parameter diagram



Example:

Starting value [ipt] = .003 inch

a_e = 30%

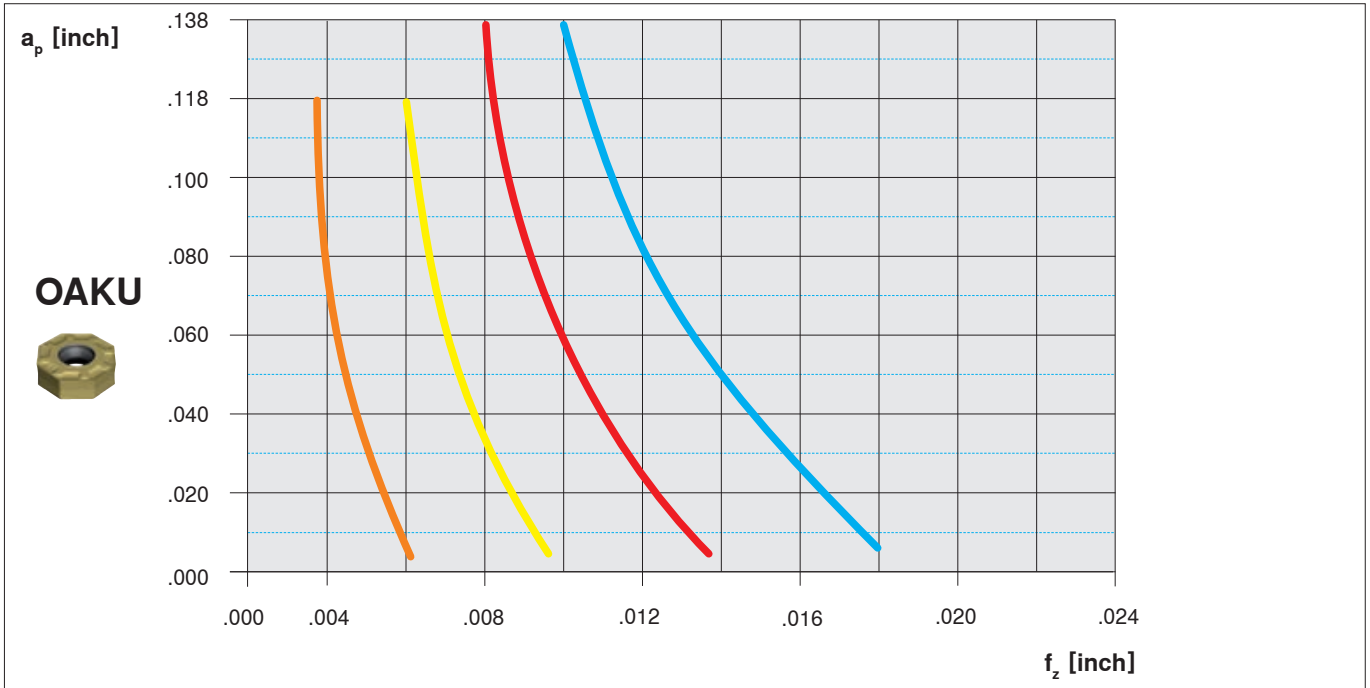
Corrected value [ipt] = .006 inch



MaxiMill 273 / -274 - starting parameters

for example material

Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625







Technical information

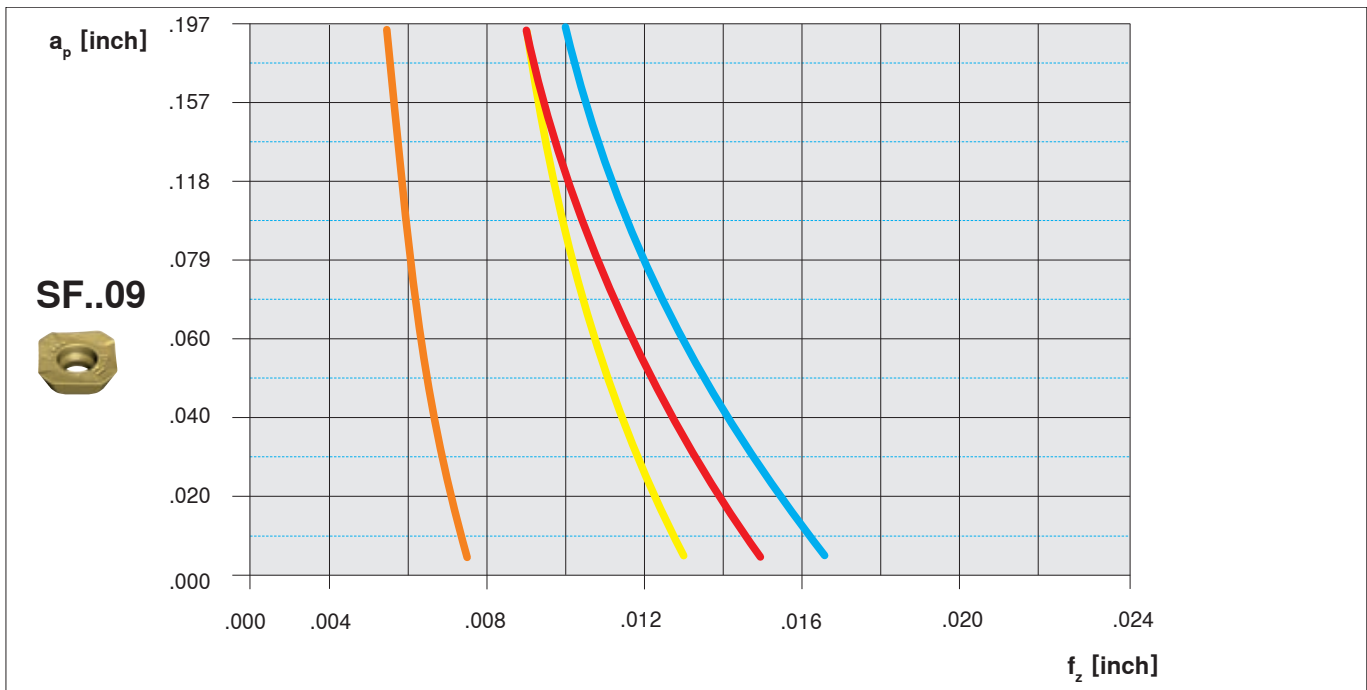
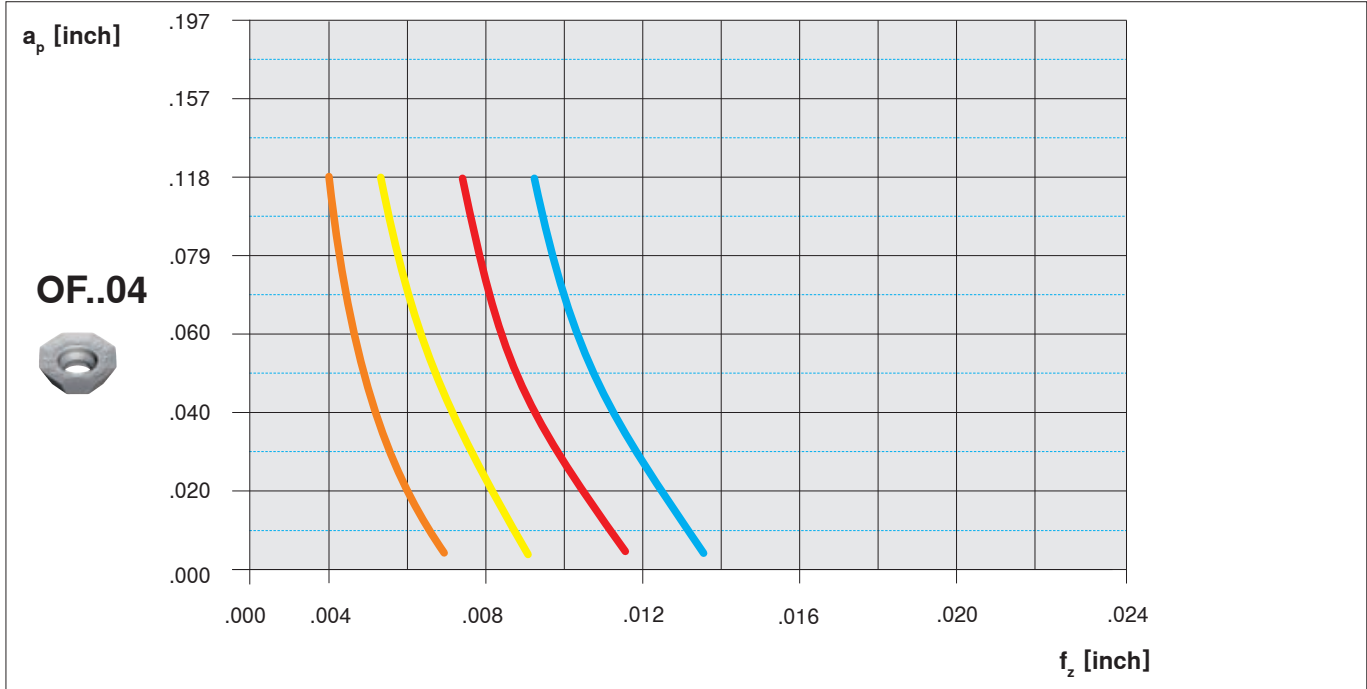
Tools and inserts for milling

MaxiMill 273 / -274 - starting parameters

for example material



Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625





MaxiMill HFC starting parameters

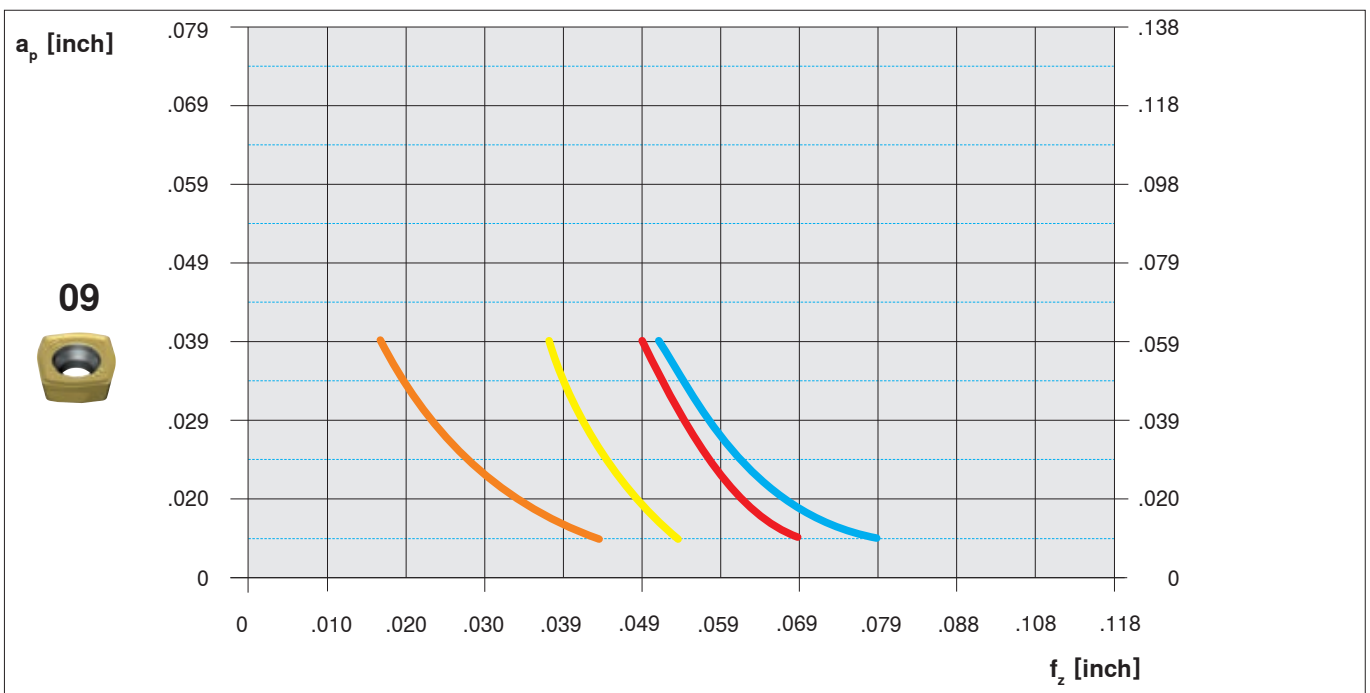
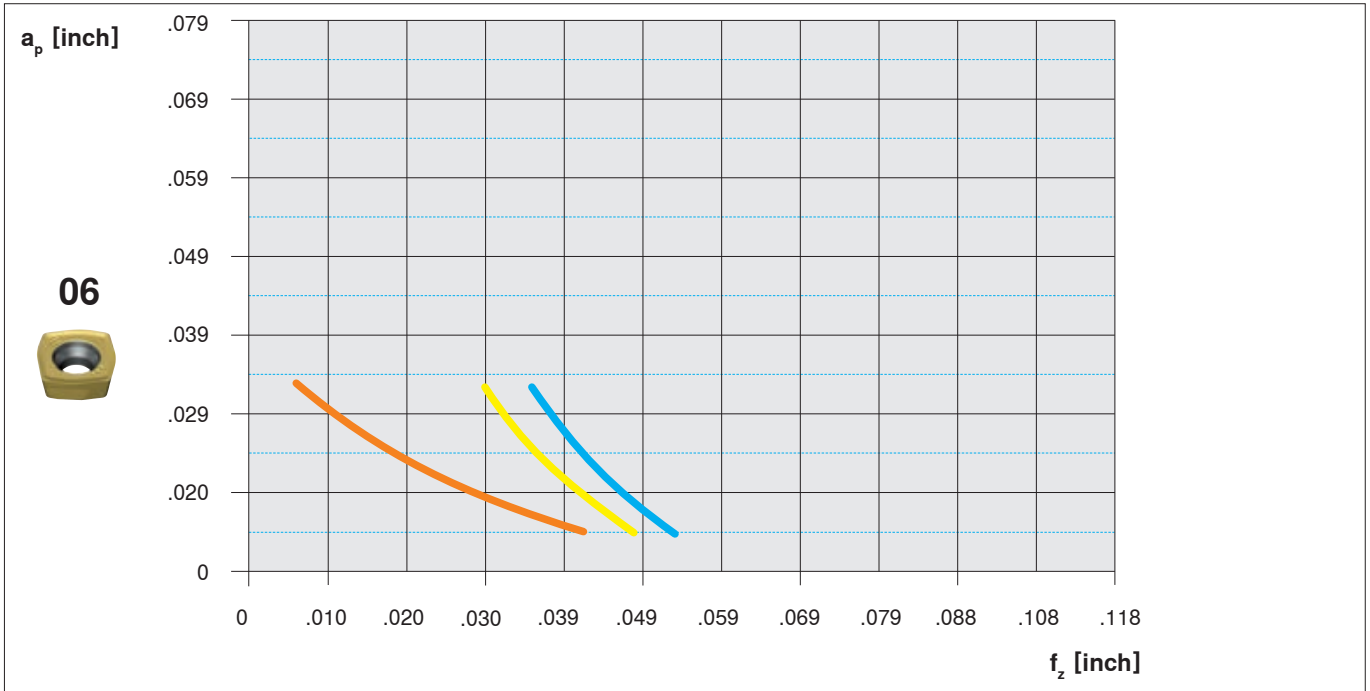
for example material

Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625

If $a_e < 50\%$ use correction list

Technical information

Tools and inserts for milling



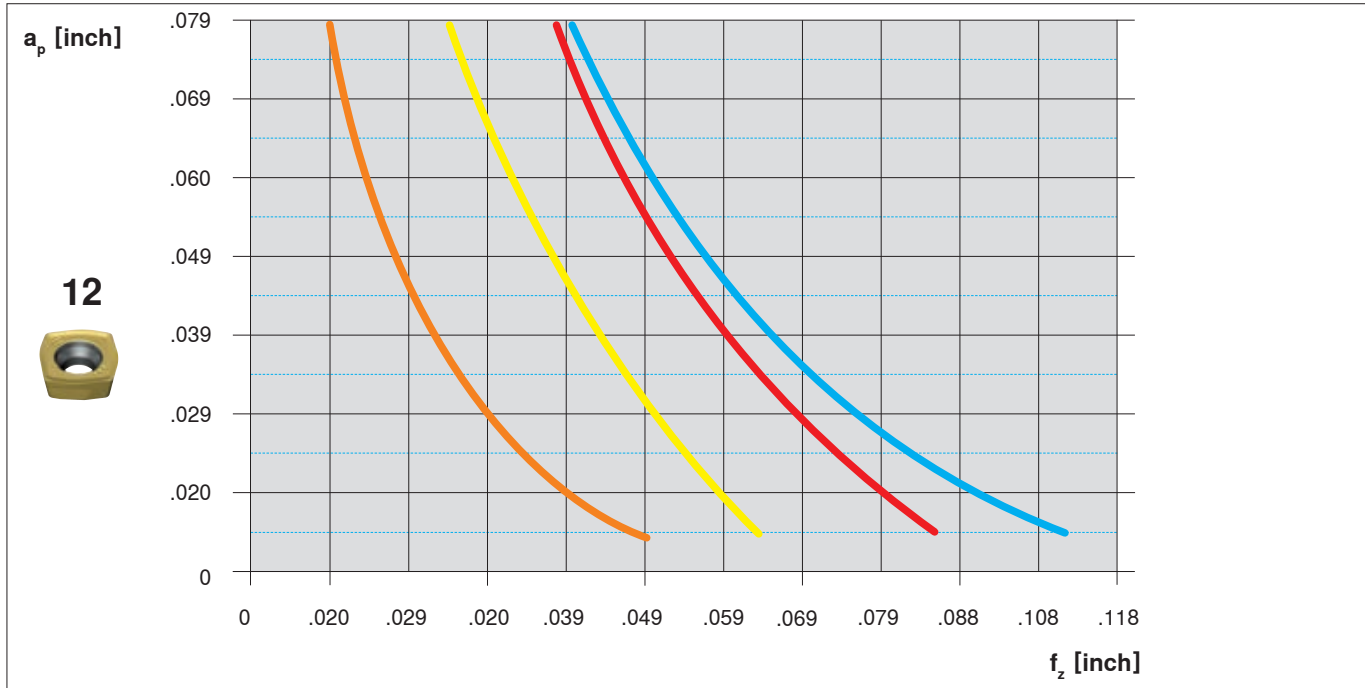
MaxiMill HFC starting parameters

for example material



Example materials				
	High alloyed steel	1.000 N/mm ² 145.037 psi	1.2312	40CrMnMoS 8-6
	Stainless steel, austenitic	600 N/mm ² 87.022 psi	1.4571	X6CrNiMoTi 1712 2
	Gray cast iron, pearlitic	HB 180	EN-JL-1040	EN-GJL-250 (GG25)
	Super alloys, Ni-base, hardened	1.450 N/mm ² 210.304 psi	2.4856	Inconel 625

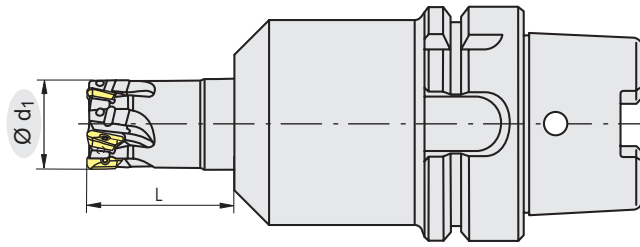
If $a_e < 50\%$ use correction list





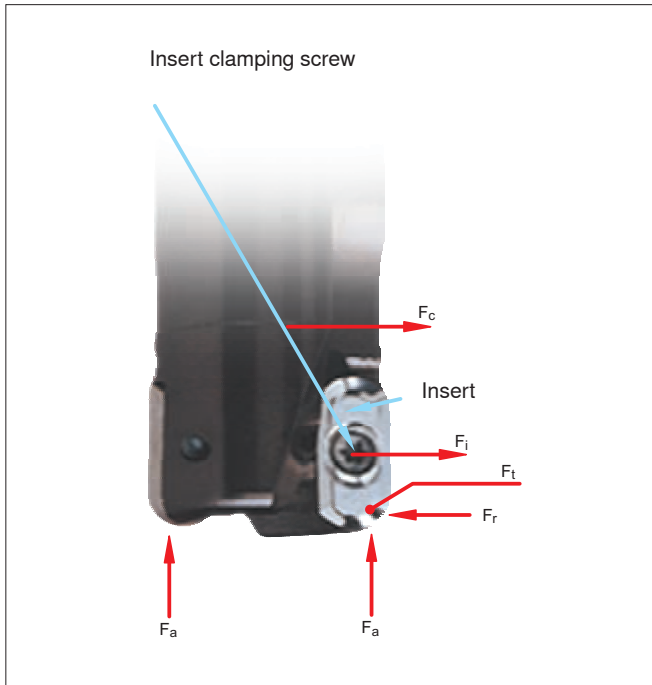
Maximum RPM in relation to overhang length L.

The revolution number must be adapted according to the machining situation and the selected tool shank.



\varnothing d_1 inch	211-07			211-11			211-15		
	n_{max} [min ⁻¹]			n_{max} [min ⁻¹]			n_{max} [min ⁻¹]		
	L = 2x \varnothing	L = 3x \varnothing	L = 5x \varnothing	L = 2x \varnothing	L = 3x \varnothing	L = 5x \varnothing	L = 2x \varnothing	L = 3x \varnothing	L = 5x \varnothing
.375	72.000	58.000	46.000	–	–	–	–	–	–
.500	67.000	54.000	38.000	56.000	45.000	32.000	–	–	–
.625	50.000	41.000	29.000	42.000	34.000	24.000	–	–	–
.750	44.000	34.000	23.000	37.000	29.000	20.000	–	–	–
1.000	40.000	29.000	18.000	33.000	24.000	15.000	27.000	20.000	12.000
1.250	36.000	25.000	14.000	30.000	21.000	12.000	24.000	17.000	10.000
1.500	33.000	22.000	11.000	28.000	18.000	9.000	22.000	14.000	7.000
2.500	30.000	18.000	7.000	25.000	15.000	6.000	20.000	12.000	5.000
3.000	–	–	–	23.000	13.000	4.000	19.000	10.000	3.000
4.000	–	–	–	21.000	11.000	–	17.000	8.000	–

\varnothing d_1 inch	HSC-19		
	n_{max} [min ⁻¹]		
	L = 2x \varnothing	L = 3x \varnothing	L = 5x \varnothing
1.000	33.000	30.000	22.000
1.250	27.000	25.000	18.000
1.500	23.500	22.000	16.000
2.000	20.000	18.500	13.500
2.500	17.000	16.500	–
3.000	15.500	14.500	–
4.000	13.000	–	–
5.000	12.500	–	–
6.000	10.000	–	–



Forces in the tooling system

F_a = axial force

F_r = radial force

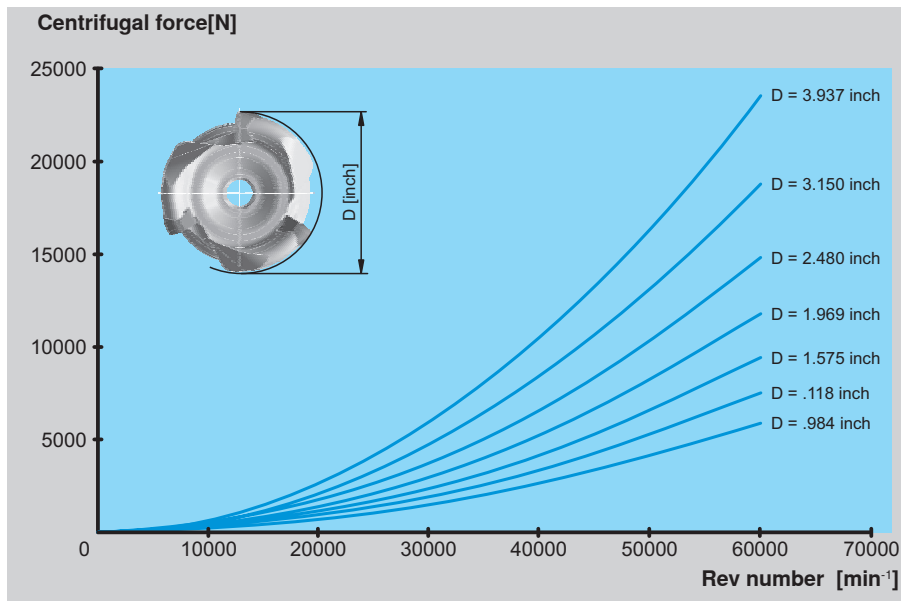
F_t = tangential force

F_c = centrifugal force (tool body)

F_i = centrifugal force (insert)

Forces present in the HSC milling cutter during machining. With HSC machining, the centrifugal forces produce considerably more stress on the tool than the cutting forces.

See also permissible residual unbalance: DIN 1940



Note safety rules enclosed to the tool.

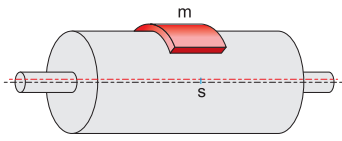


Centrifugal forces generated are dependant upon tool diameter and rotational speed (rpm), example: indexable insert of 12g.

Revolutions per minute increase times two = centrifugal force increase times four.

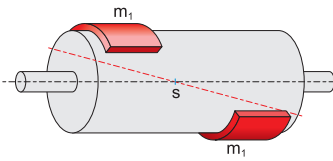


Balance types



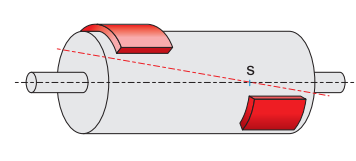
Static unbalance

+



Moment unbalance

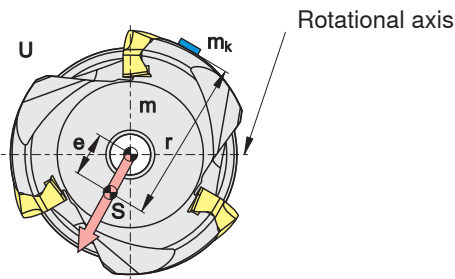
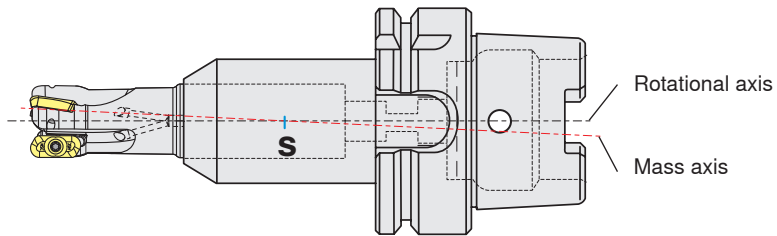
=



Dynamic unbalance is the sum of static unbalance and moment unbalance.

Unbalance is the state of a rotor in which the mass axis does not coincide with the rotational axis.

$$U = m \cdot e \text{ [gmm]}$$



Unbalance is produced by a centrifugal force F which rotates with the rotor.

$$F = m \cdot e \cdot \omega^2 = \frac{m \cdot e \cdot (2 \cdot \pi \cdot n)^2}{60^2} \text{ [N]}$$

$$m_k = \frac{m \cdot e}{r} \text{ [g]}$$

m = mass [g]
 e = radius of gravity center [mm]
 S = mass axis
 m_k = counter weight
 U = unbalance
 ω = angular velocity [s^{-1}]

Reasons for unsymmetric mass distribution regarding the rotational axis

- Manufacturing tolerance (tool and adapter)
- Driving grooves on the SK/BT flange
- Unprocessed ground of the groove
- Driving grooves at HSK A, B, C, D
- Position of radial clamping screw (Weldon, Whistle Notch)
- Collet chuck (radial position of slots)
- Collet and nut
- Shank detail with Weldon and Whistle Notch
- Differential pitch of milling cutter



What is a quality class? - Permissible residual unbalance

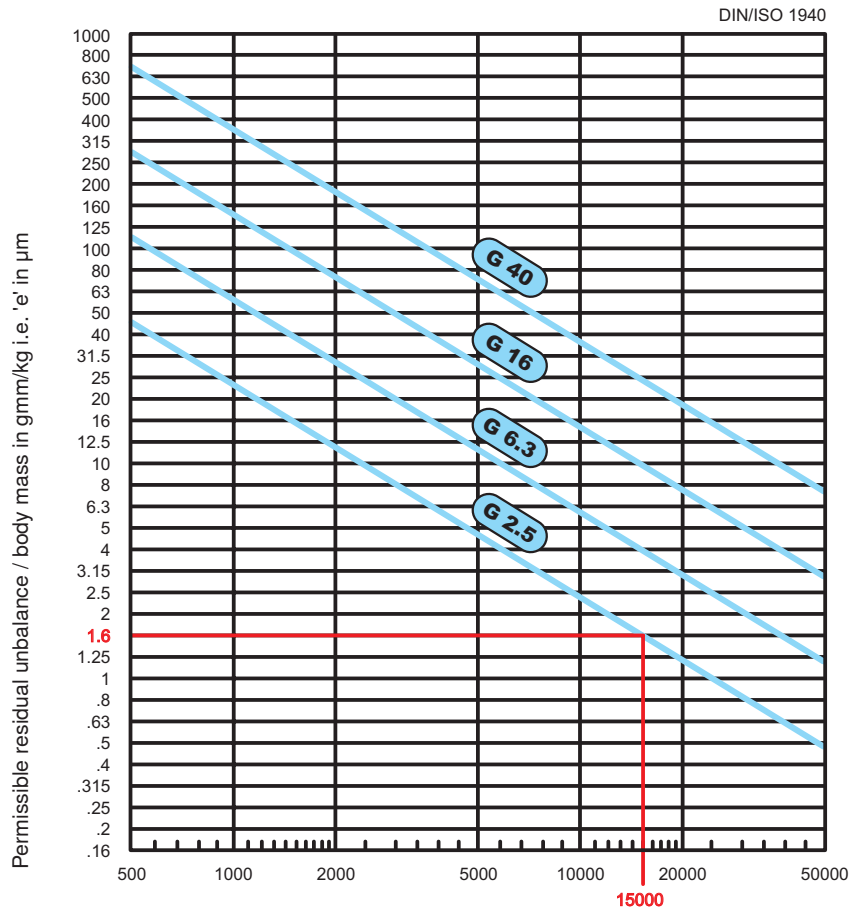
Quality class means the permissible speed of the gravity center

G = speed of gravity center [mm/s]

e = radius of gravity center [mm]

ω = angular velocity [s^{-1}]

$$G = e \cdot \omega \text{ [mm/s]}$$



The specific residual unbalance 'e' in μm results from the operating speed and the desired quality class.

As a standard, monoblock tools with HSK connection are precision balanced corresponding to quality class G6.3.

e.g.:

$m = 2 \text{ kg}$

$n = 15,000 \text{ min}^{-1}$

$G = 2.5$ results in

$e = 1.6 \mu\text{m}$

$U_{\text{tot}} = 1.6 \mu\text{m} \cdot 2 \text{ kg} = 3.2 \text{ g/mm}$



All monoblock tools with direct HSK connection are delivered with a test report.

Qualitätszertifikat Quality certificate


Bezeichnung:

Designation: / Désignation :

Denominazione: / Designación:

.....

Auftrags-Nr.:

Order no.: / Ordre n° :

Numero d'ordine: / Encargo n°:

.....

Protokoll-Nr.:

Report no.: / Protocole n° :

No. protocollo: / Protocolo n°:

.....

Gewuchtet nach DIN/ISO 1940

Balanced according to DIN/ISO 1940 / Équilibrage suivant DIN/ISO 1940

Equilibratura secondo DIN/ISO 1940 / Equilibrado según DIN/ISO 1940

Wuchtgüte Quality class / Classe d'équilibrage Classe di equilibratura / Clase de equilibrado	<input type="checkbox"/> ≤ G 2.5
	<input type="checkbox"/> ≤ G 6.3
Bezugsdrehzahl n [min⁻¹] Ref. number of revolutions / Vitesse de rotation de référence Numero di giri di riferimento / Número de revoluciones de referencia	<input type="checkbox"/> n = 20.000
	<input type="checkbox"/> n _{max} =

Datum:

Date: / Date :

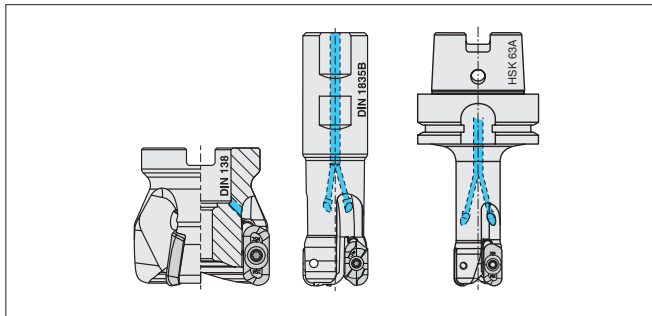
Data: / Fecha:

Prüfer:

Reporting person: / Vérificateur :

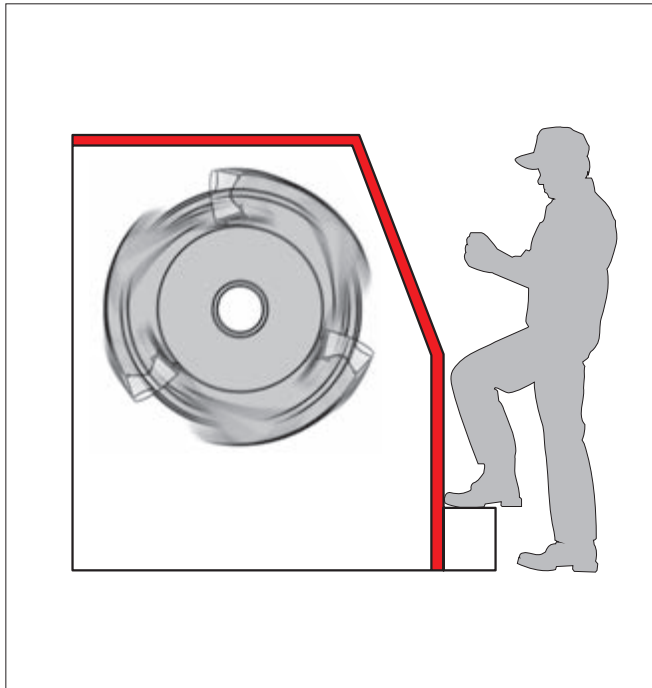
Collaudatore: / Verificador:

 2271²



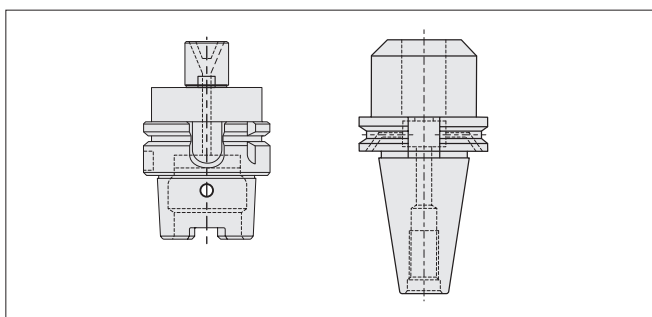
1. Suitability of the tool for HSC machining

HSC tools from CERATIZIT have been especially developed for this machining strategy and guarantee maximum machining safety. They are clearly marked as HSC or HPC tools.



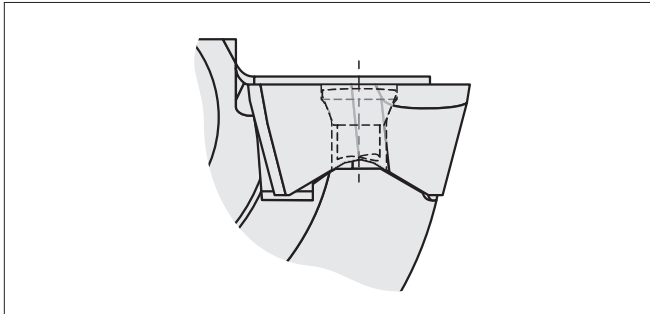
2. Observation of safety precautions of the machine manufacturer

Make sure that all safety precautions of the machine manufacturers are observed (e.g.: enclosed machining units).



3. Suitability of tool adapters for HSC machining

For fast-rotating milling applications it is necessary to balance tool and tool adapter together dynamically (see directives ISO 1940).



4. Mounting the indexable insert with the centrifugal force protection

Insert clamping: EURO-patent EP 1083017A1
 Make sure that the insert pocket is cleaned and the threaded bore for the clamping screw is in a top state. Check the axial and radial contact points of the insert in the pocket.

Torque moments and torque
 keys

 B171



Maximum permissible number of revolutions

Note the maximum permissible number of revolutions stated on the tool. This number is exclusively valid for the specific tool and must be adapted according to the selected tool shank, overhang length and the respective machining situation.

Maximum rpm determined in centrifugal force tests!

Optimum application area of the tool (a_e , a_p , f_z , n)

In order to guarantee productive milling, please observe the recommendations regarding the cutting parameters.

Rev numbers

 B160



Every HSC tool is provided with an information sheet ('Safety precautions'). Non observation of these safety precautions results automatically in exclusion of CERA-TIZIT's liability.



Load milling cutter in presetting device or mounting base.
Remove clamping screw of the insert.



Clean insert seat and check for damage.



Clean location and contact faces of the insert.

HSC (high speed cutting system): when mounting a new insert replace clamping screw with a new one!



Put insert into cleaned insert seat and press onto location face using two fingers.



Tighten clamping screw while holding the insert in place.

Clamp insert using recommended torque.



MaxiMill 274 – clamping the insert



Place the screw into the hole of the insert.



Push insert and screw into the insert pocket.
Tighten the screw slightly.



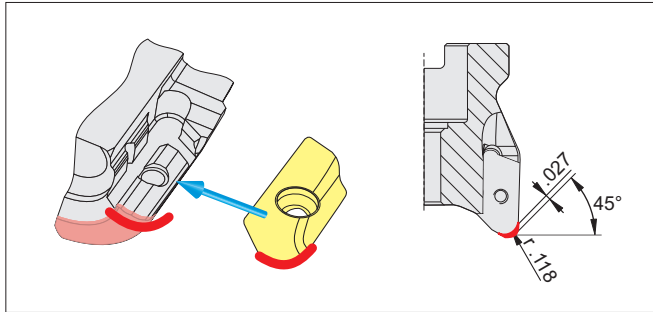
Align the face of the tool with the clearance face of the insert.



Tighten the screw. Position the screwdriver along the centerline of the screw.

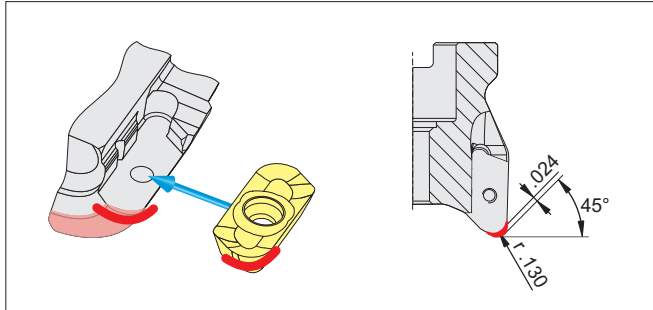


Use a torque screwdriver with 1.6 Nm/14.2 in.lbs.:
DMSD 1,6Nm/SORT 08IP



HSC-11

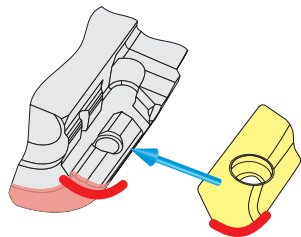
For insert radius $r > .126$ inch



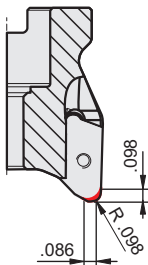
HSC/HPC-19

For insert radius $r > .157$ inch

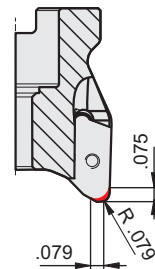
211-11 / 15



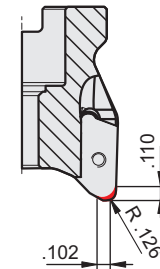
211-11
> r .063



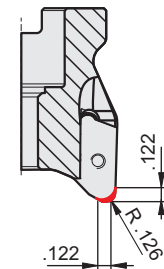
211-15
> r .098



211-15
> r .157

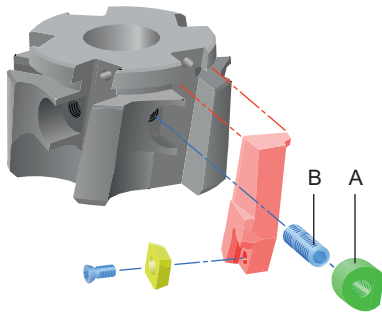


211-15
> r .197

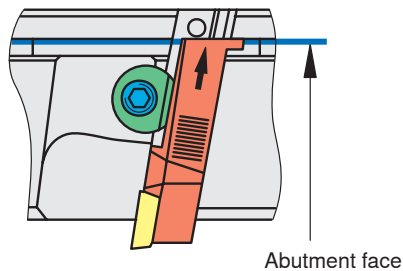


210

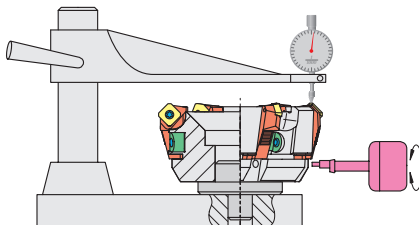
For insert radius $r > .063$ inch



The special construction of the clamping wedge connection ensures that there is no axial movement of the cassette during clamping.



Abutment face



Correct assembly and disassembly of the cassettes

- 1 Clean the milling tool.
- 2 Loosen clamping wedge (A) by turning the clamping screw (B) anti-clockwise until the cassette can be removed radially. Screw and wedge remain on the cutter body.
- 3 Clean all surfaces of both cassette and cutter body.
- 4 Mount cassette and ease it into the desired position along the groove (e.g. circlip groove).
- 5 Clamp cassette with wedge.
Screw torque setting: 10 Nm.
Correct assembly of clamping wedge: turn screw once into the clamping wedge with left-handed thread. Screw wedge into cutter body with help of S4 key. Take care to avoid turning of wedge before it is fully engaged with the cutter body.

Setting of axial run-out for roughing


For assembly, simply push cassettes to the ground abutment face. The total axial run-out will be a maximum of .0012 inch measured to a master insert (as delivered).







Setting of axial run-out with eccentric key and clock gauge or optical pre-setting equipment


Exact setting of axial run-out up to .00008 inch





- 1 Clean milling tool.
- 2 Mount cutter on appropriate setting equipment.
- 3 Loosen clamping wedge, push cassette to abutment and tighten wedge lightly.
- 4 Insert eccentric key into hole and turn until cassette is in desired position.
- 5 Keep eccentric key permanently in contact with the cassette so that it remains in position. Tighten clamping wedge (torque moment 7.38 ft-lbs).



	Material	Type, description	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11149570	DMSD 3,2Nm/SORT T15	T15	3,2	28,3
	11149571	DMSD 4,0Nm/SORT T20	T20	4,0	35,4

	Material	Type, description	Key size
	154461	7802180/A 2,2	A2,2
	154463	7802181/A 3,1	A3,1
	154464	7802182/A 8,2	A8,2
	11366865	10005884/S12-3	S12-3
	11366866	10001365/S15-4	S15-4
	11206195	10002494/TORX 08IP F	T08IP
	11488748	10007404/TORX 07IP F	T07IP
	11843205	10014921/TORX 06IP F	T06IP
	11843208	10014922/TORX 09IP F	T09IP
	4496	7812301/SW 5	SW5
	4497	7812302/SW 6	SW6
	11450858	10006919/TORX 15IP	T15IP
	11816974	10013909/TORX 20IP	T20IP
	291576	7883306/TORX T10	T10
	56656	7724106/TORX T08	T08
	200317	7883304/TORX T25 T	T25
	220983	7897208/TORX T15 T	T15
	220985	7897207/TORX T20 T	T20

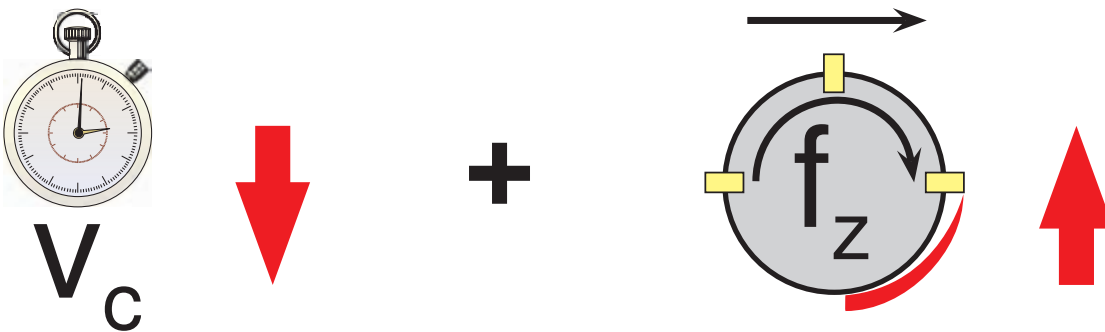
	Material	Type, description	Length	Thread size	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11227305	M3,0x7,0-09IP/10003007	7.0	M3,0	T09IP	2,2	19,5
	11610311	M3,5x8,6-15IP/10008749	8.6	M3,5	T15IP	3,2	28,3
	11684214	M2,2x5,0-07IP/10009244	5.0	M2,2	T07IP	1,0	8,9
	11684216	M2,5x6,0-08IP/10009243	6.0	M2,5	T08IP	1,2	10,6
	11801441	M4,5x10,5-20IP/10013040	10.5	M4,5	T20IP	5,0	44,3
	11807480	M2,0x4,3-06IP/10013332	4.3	M2,0	T06IP	0,7	6,2
	11807484	M1,8x3,6-06IP/10013338	3.6	M1,8	T06IP	0,4	3,6

	Material	Type, description	Length	Thread size	Key size
	310720	7897990/M8X1X8 DIN913	8.0	M8	SW4
	219981	7897209/M4,0X11/T15	11	M4	T15
	219982	7897210/M5,0X13,5/T20	13.5	M5	T20
	195068	7897203/M4,0X14/T15	14	M4	T15
	195069	7897205/M5,0X18/T20	18	M5	T20
	195070	7897206/M6,0X20/T25	20	M6	T25
	228617	7897200/M2,5X10/T08	10	M2,5	T08
	228619	7897201/M3,0X11/T10	11	M3	T15
	228620	7897202/M3,5X12,5/T15	12.5	M3,5	T15
	228621	7897204/M4,5X17/T20	17	M4,5	T20
	11007006	7897218/M4,0X18/T20	18	M4	T20
	11081190	7897221/M3,5X14,0/T15	16.5	M3,5	T15
	22485	7802115/M6X25 DIN 912	25	M6	SW5
	229126	7897213/M6X20 12.9 DIN 912	20	M6	SW5
	229131	7897211/M4X12 DIN 912 - 12.9	12	M4	SW3
	284518	7818319/M5,0X16,0/DIN912-12.9	16	M5	SW4
81158	7802133/M8X35 DIN 912	35	M8	SW6	



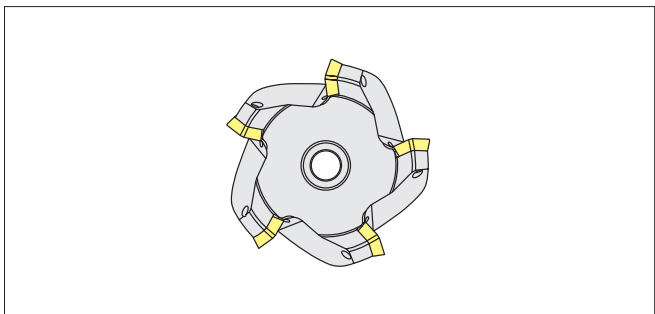
Optimize tool life of cutting edge

In most cases the following applies to carbide inserts:



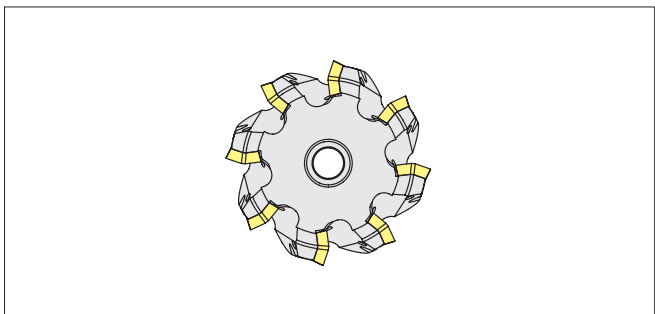
Technical information

Tools and inserts for milling



Coarse or normal pitch

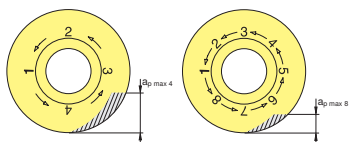
- For aluminum alloys
- Non-ferrous metals
- Plastic materials
- Low power machines
- Unstable working conditions



Close pitch

- Steel and cast iron
- High power machines
- Stable work holding
- Stable conditions
- Maximum chip removal rates

251 - recommended depth of cut



Depth of cut to achieve with 4 or 8 indexes of the insert

Ø [inch]	4 times		8 times
	doc [inch]	doc _{p max} [inch]	doc _{p max} [inch]
.197	.049	.079	.028
.315	.079	.138	.043
.394	.098	.177	.055
.472	.118	.217	.067
.630	.157	.295	.091
.787	.197	3.74	.114
⚠ recommended!			



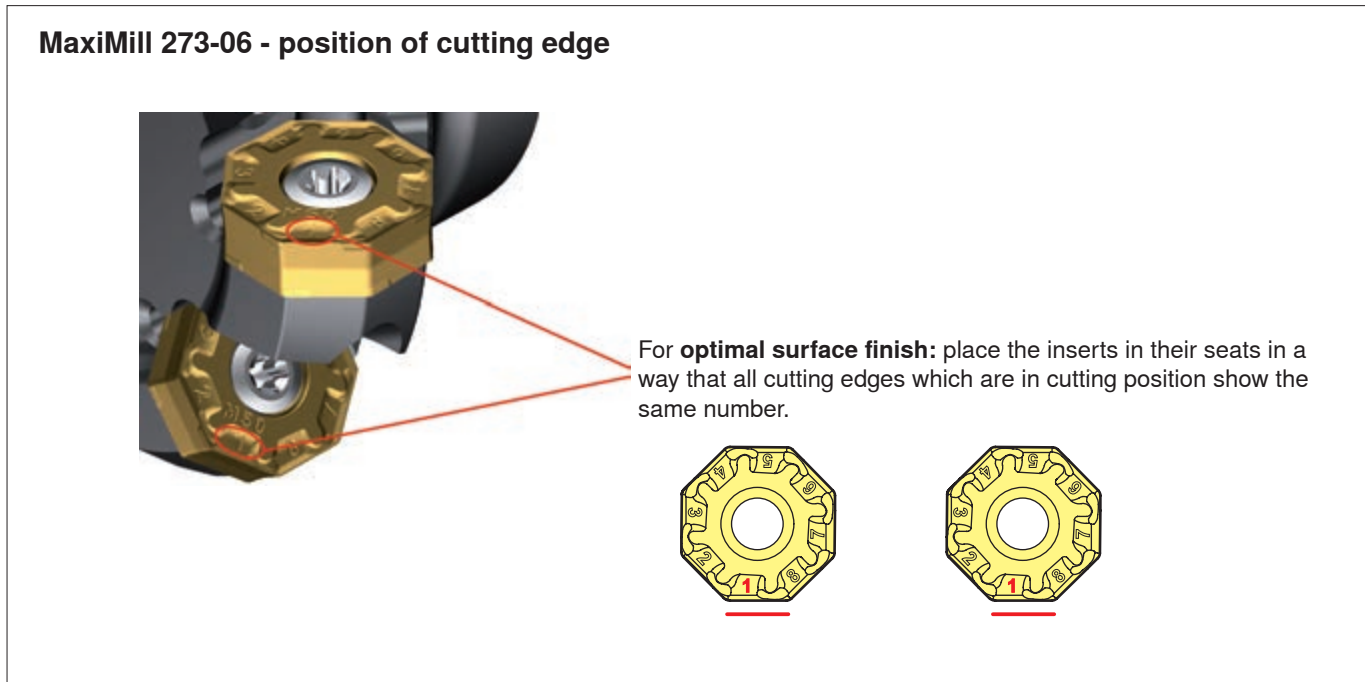
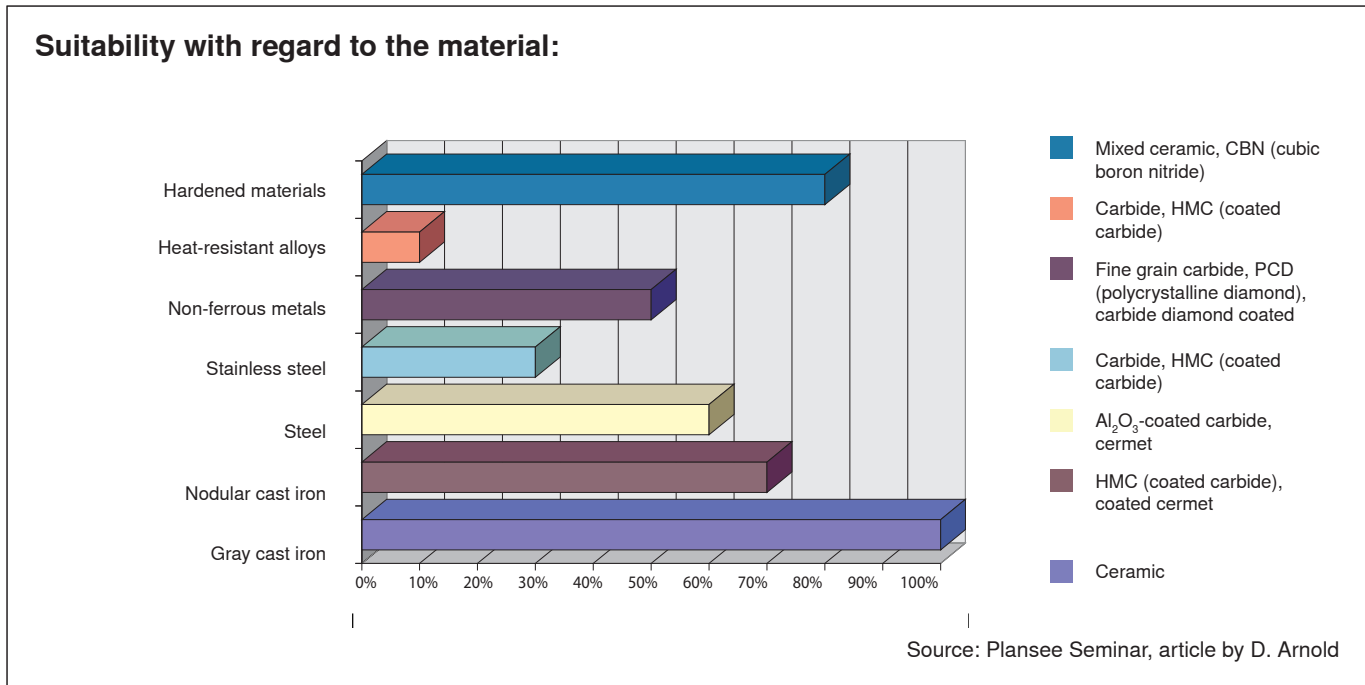
Dry machining

Dry machining is suitable for virtually all modern cutting materials.

Advantages compared to conventional cooling

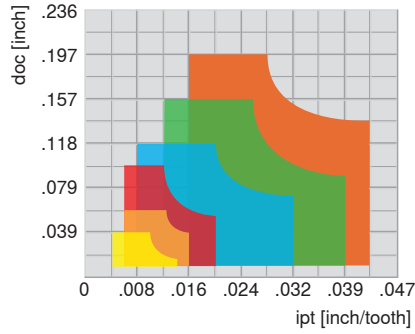
- Thanks to the reduced temperature shock when the cutting edge exits the work piece, higher cutting speeds are possible.
- Reduction in manufacturing costs.
- Production of dry swarf.

Suitable for single pieces, small and large batches



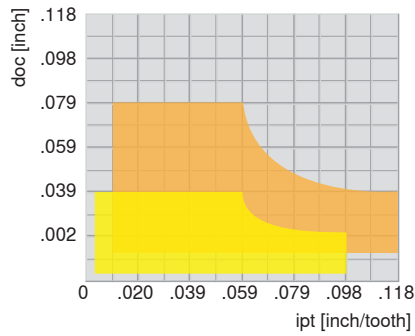


251/252



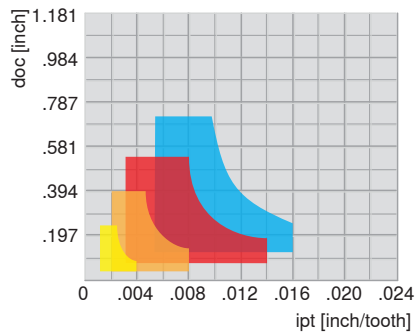
Ø [mm]	Ø [Inch]	doc	ipt
05	---	.001 - .040	.014 - .004
08	---	.001 - .060	.016 - .006
10	---	.001 - .098	.020 - .008
12	---	.001 - .118	.032 - .008
16	---	.001 - .158	.040 - .012
20	---	.001 - .197	.043 - .016

HFC



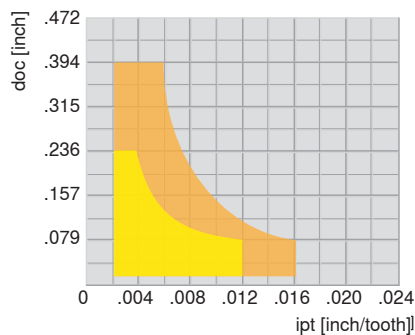
Ø [mm]	Ø [Inch]	doc	ipt
09	---	.004 - .040	.098 - .004
12	---	.012 - .0797	.118 - .010

211



Ø [mm]	Ø [Inch]	doc	ipt
07	---	.0039 - .2756	.0039 - .0012
11	---	.0079 - .3937	.0079 - .0020
15	---	.0394 - .5512	.0181 - .0031
20	---	.0984 - .0047	.0157 - .0047

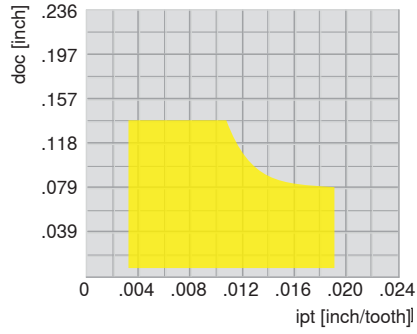
490



Ø [mm]	Ø [Inch]	doc	ipt
09	---	.0039 - .3150	.0118 - .0020
12	---	.0039 - .4330	.0157 - .0039



273



l [mm]
06

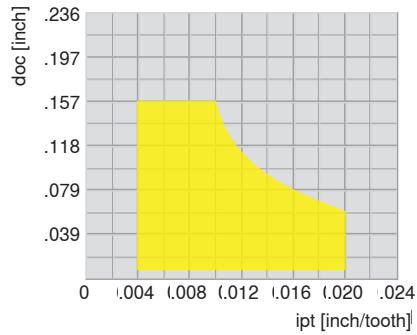
Ø [Inch]

doc

ipt

----- .004 8 .004 - .138 .018 - .002

271



l [mm]
17

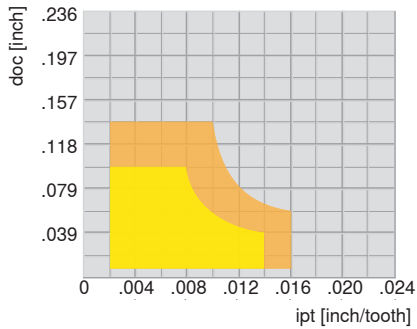
Ø [Inch]

doc

ipt

----- .669 .002 - .331 .004 - .016

274



l [mm] 4
 SF..T.09

l [mm]

Ø [Inch]

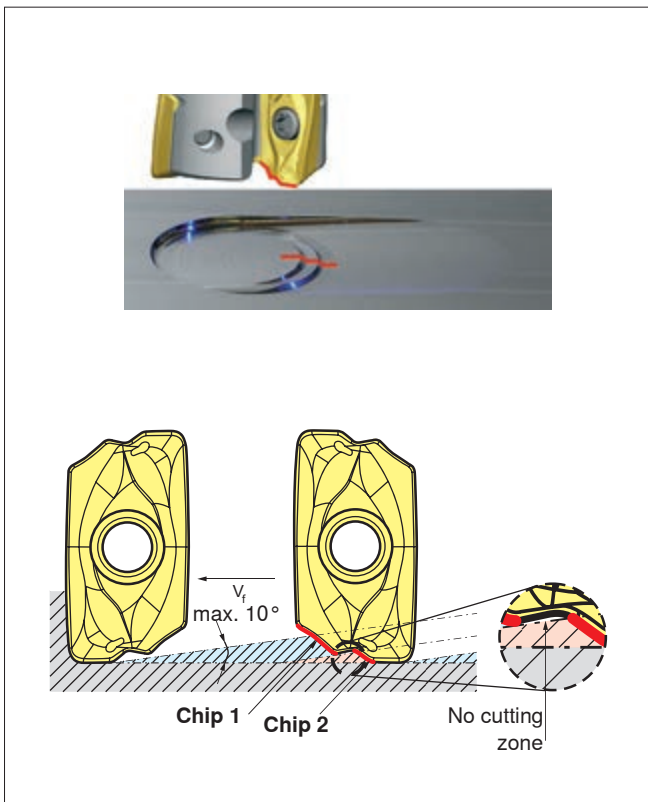
doc

ipt

----- .157 .002 - .098 .004 - .012
----- .354 .002 - .150 .004 - .016



Milling of hard materials (≥ 45 HRC)		
Recommendations for machining		
	😊	😞
l_2		
z		
$a_{e\ max} = 75\%$		
Adapter		
Coolant		
Plunging		
Starting values	ipt = .0020 inch sfm = 1.181 - 2.363 feet/min doc = .0197 - .098 inch	



MaxiMill 211-11

Radial force compensation through 'the notch' when helical plunging or ramping: ($r < .0787$ inch)

Radial force compensation

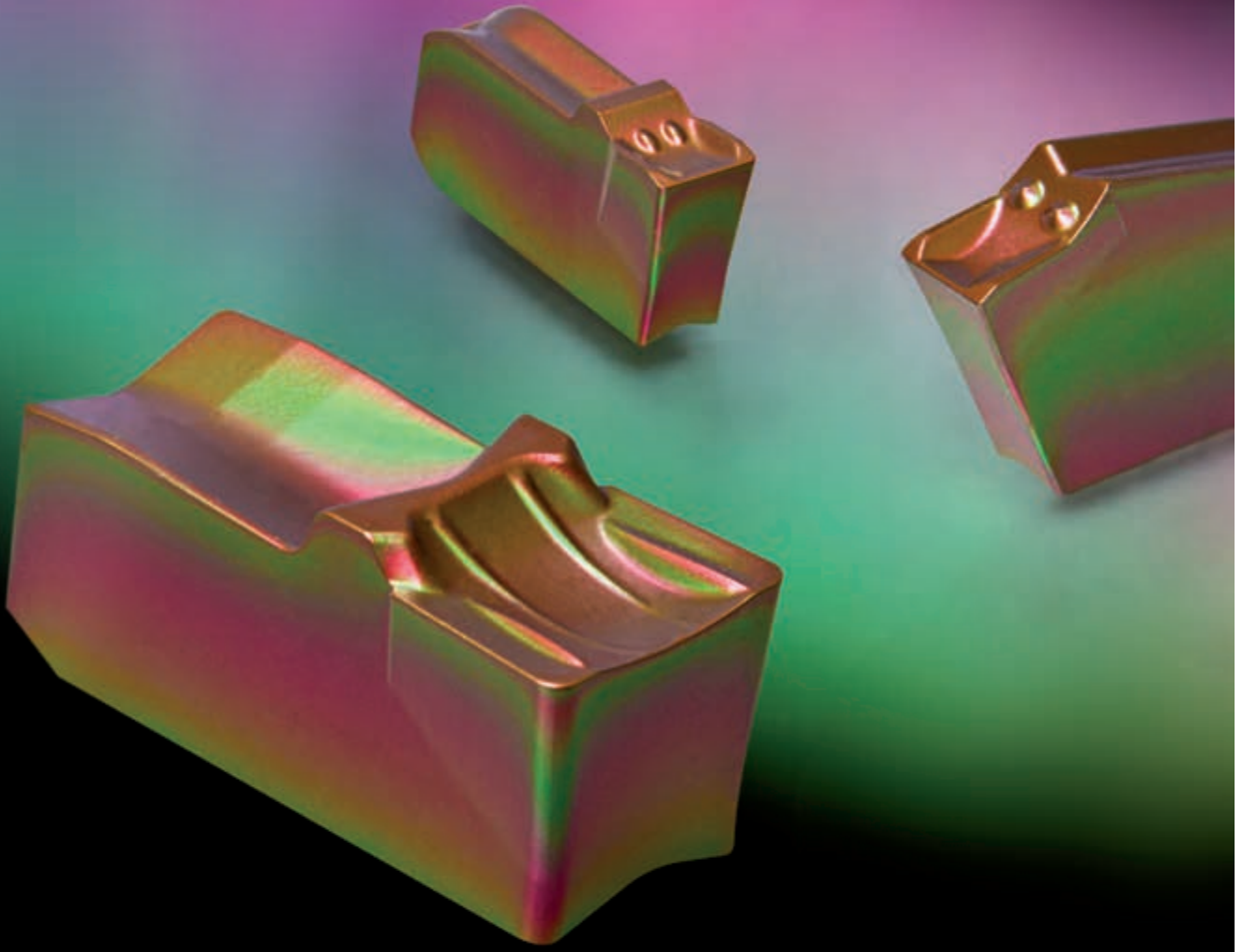
- The notch provides additional stability when plunging.
- Reduced machining noise and vibration are therefore guaranteed.

The ADVANTAGE for cutting tool experts

- Increased cutting performance
- Improved surface quality when machining pockets and slots

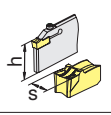
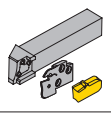


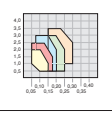
Swarf control

- Low cutting pressure
- Low power consumption
- Optimum chip evacuation
- Minimum vibration
- Very good chip formation

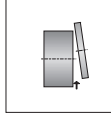
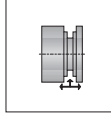
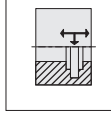
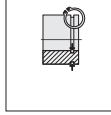
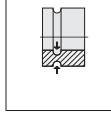
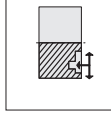
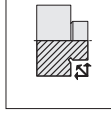
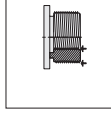
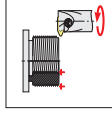




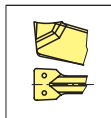

Introduction

	Designation system	C4-C6
	System overview	C7-C25
	MasterGuide	C26
	Grade overview and description	C27-C42
	Application	C43-C63

Application

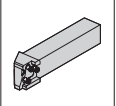
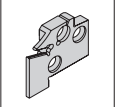
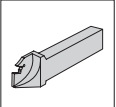
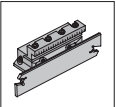
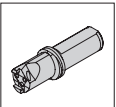
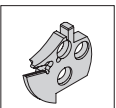
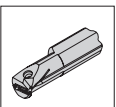
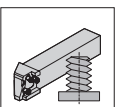
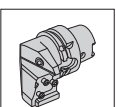
	Part-off	C68-C75
	Grooving and turning, external	C76-C81
	Grooving and turning, internal	C82-C87
	Circlip grooves	C88-C99
	Radius grooves	C100-C112
	Axial grooving	C113-C118
	External recessing	C120-C123
	Threading (turning)	C124-C132
	Threading (milling)	C134-C136

Inserts

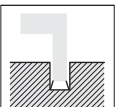
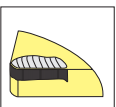

	Parting and grooving inserts	C140-C147
	Threading inserts	C148-C151




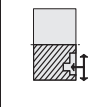
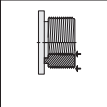

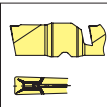
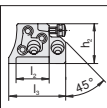

Tools

	Tool holders	C156-C159
	External modules	C160-C171
	Monoblock tool holders	C172-C174
	Blade, clamping block	C175-C182
	Boring bars	C183-C184
	Internal modules	C185-C189
	Monoblock boring bars	C190
	Monoblock tools and modules for threading	C191-C195
	HSK-T tool holders	C196-C197


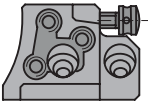
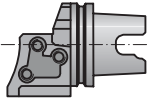
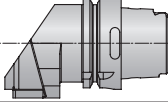



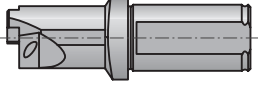
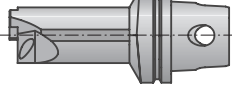
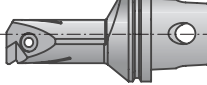

Technical information

	General	C200-C245
	Types of wear	C208-C210
	Comparison of materials	C211

Technical information

	Cutting data	C216-C219
	Application possibilities - axial grooving	C220-C225
	Threading (turning, milling)	C226-C239
	System features - how to use the system	C240-C241
	GX special tools	C242
	Application possibilities MSS adapters	C243-C244
	Spare part description	C207

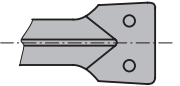
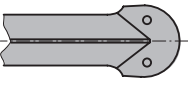
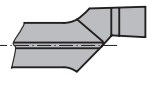
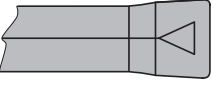
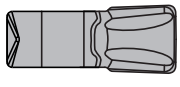
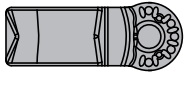
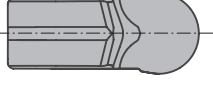

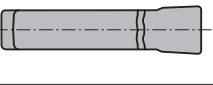
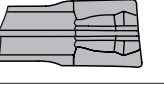

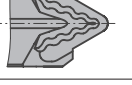


	UTS system	System assembly size	UTS system	E = external / I = internal	Assembly size	Hand	Approach angle	Parting and grooving depth	Shank section / execution	Shank length	Insert system
			MSS	E	25	R	00		2525	L	
			MSS	E	25	R	00		AD		
	UT	40	MSS	E	25	R	00				
	HSK	T63	MSS	E	32	L	90				
				E	16	R	00	21 (.827)	1616	K	GX24-1
			MC		05	R			1010	K	
				E	12	R	00	21 (.827)			TC16
			MSS	I	25	R	90	1.5D			
	UT	40	MSS	I	32	R	90	2D			
	UT	40	MSS	I	32	R	90	2D			TC16
				I	12	R	90	2.5D			GX09



	UTS system	E = external / I = internal	Assembly size	Hand	Maximum grooving depth	Insert system	Insert size	Width class	Axial diameter range $D_{min} - D_{max}$
	MSS	E	25	R	12	GX	16	2 (.079)	
	MSS	E	25	R	15	GX	24	3 (.118)	A70-100 (2.76-3.94)
	MSS	E	25	R	10	AX	10		
	MSS	E	25	R	25	SX	3		
	MSS	E	32	N	45	LX			
	MSS	E	25	R	20	FX	3.1		
	MSS	E	25	R		TC	16	2 (.079)	
	MSS	I	25	R	06	GX	09	1 (.039)	
	MSS	I	32	R		TC	16	2 (.079)	

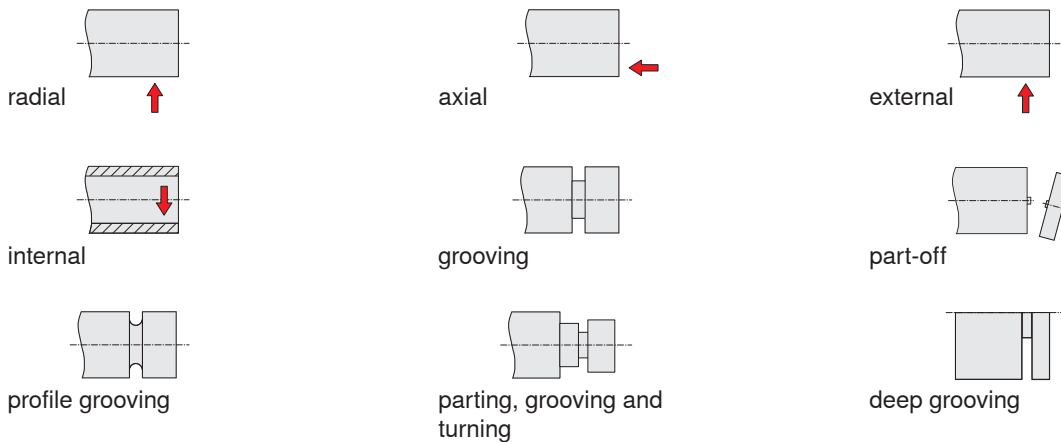


	Insert system	Insert size	Number of cutting edges	Width class	Insert shape / application	Width / pitch	Hand / thread standard	Corner radius / angle	Minimum axial grooving diameter	Chip groove code
	GX	16		2	E	3.00	N	0.30 (.012)		Code
	GX	16		2	R	1.50	N			Code
	GX	16		2	S	1.00	R			
	AX	10			E	3.00	N	0.30 (.012)	20 (.787)	Code
	SX				E	2.00	N	0.20 (.008)		Code
	SX				R	1.50	N			Code
	LX				E	8.00	N	0.80 (.031)		Code
	LX				R	4.00	N			Code
	FX					3.10	N	0.20 (.008)		Code
	PX	20		2	E	1.50	L	05 (.020)		Code
	MC	05	5			1.00	N	0.10 (.004)		Code
	TC	16		1	E	1.50	ISO			Code



Diverse range of applications

Parting and grooving covers a diverse range of applications and demands, advanced technology and intelligent tool design.



Advanced technology

- Chip formation
- Chip evacuation
- Parallel - flat parting and grooving surface
- Surface finish
- Formation of burrs when parting off tubes
- Formation of pips in part-off operations
- $v_c = 0$ in the center
- Entire main cutting edge applied



Intelligent tool design

- Narrow, long overhang
- Insert clamping
- Rigidity
- Resistant against breakage
- Easy handling
- Economy



MSS

- the modular parting, grooving and threading system

In order to be able to meet all demands, up-to-date tools have a modular structure.



System features

- Separate shank and tool holder
- Same interface for all parting, grooving and threading applications
- Stable, precise connection
- Extendable through new 'modules'
- Easy handling
- Clamping features optimized for the various applications

Flexibility

- Adaptable to machining task
- One system only for all parting, grooving and threading operations
- Particularly well-suited for semi-standard tools

Precision

- High accuracy and repeatability when changing the module
- Reduced set-up time
- High-quality work pieces

Stability

- Application security
- Parting, grooving and longitudinal turning possible

Simplicity

- Quick module change in case of tool breakage, short downtime

Economy

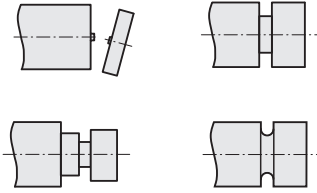
- Low stock inventory provides a large variety of combination possibilities
- In case of tool breakage only change module

Completeness

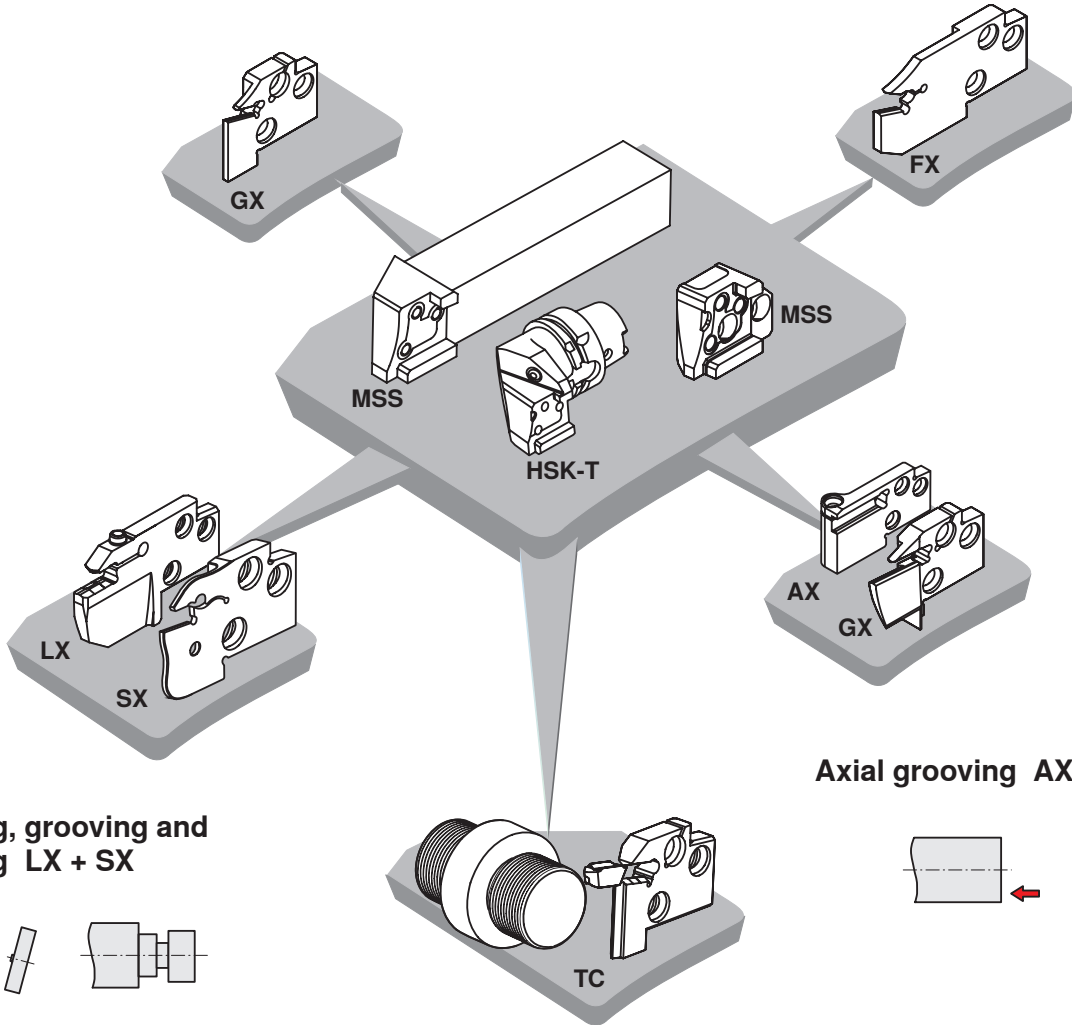
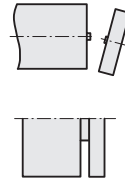
- Components for all work pieces and materials



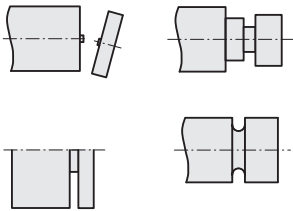
Parting, grooving and turning GX



Parting and grooving FX



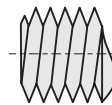
Parting, grooving and turning LX + SX

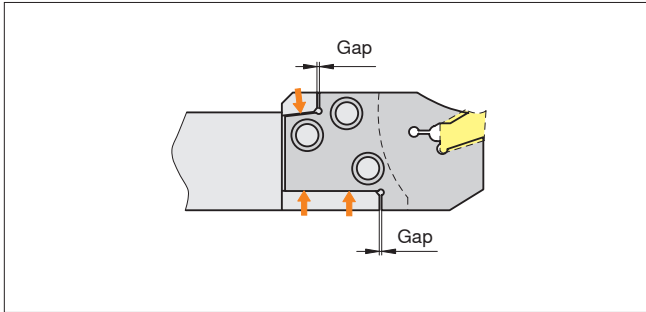


Axial grooving AX + GX



Thread turning TC

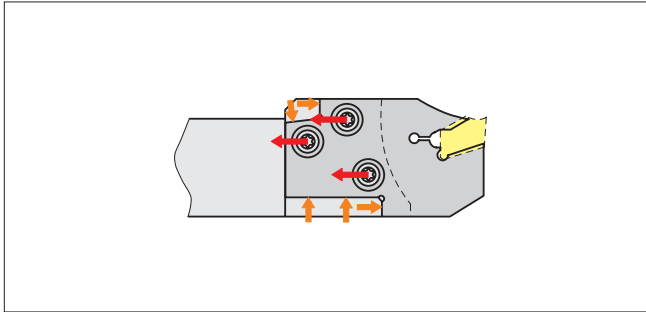




The strong connection

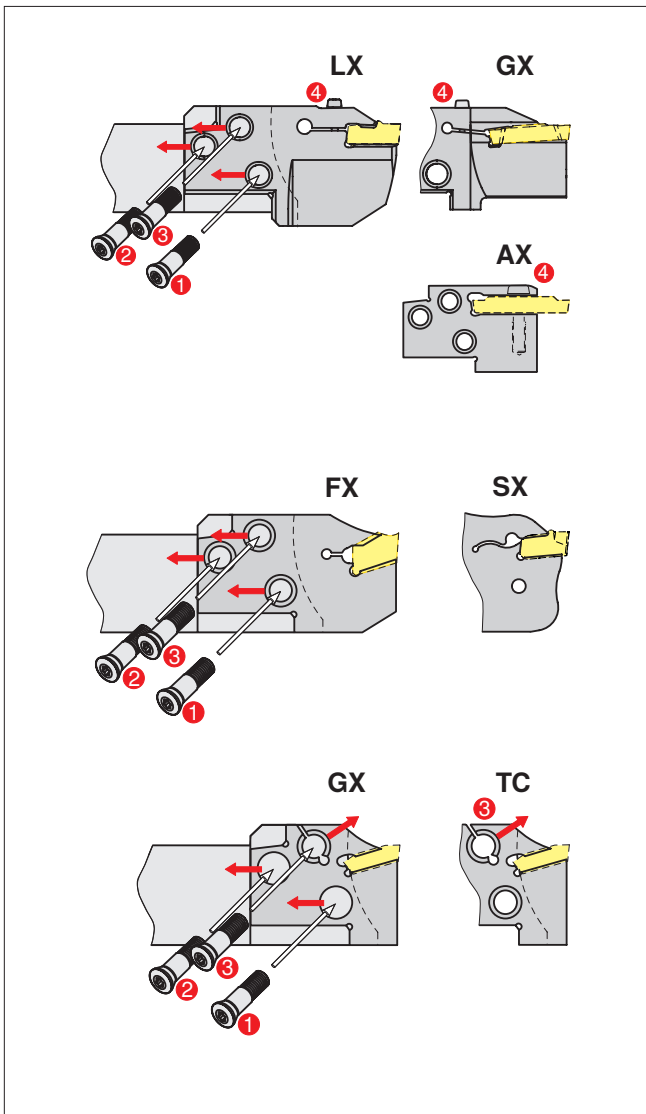
Unclamped module

- Gap between module and location face for axial clamping



Clamped module

- Axial clamping with location face
- Connection without clearance, therefore highest stability



Clamping features

LX / GX / AX

Active insert clamping

Screws 1, 2 and 3 are used to clamp the module. The insert is self-clamping. The insert is clamped through the elastic deformation of the module through the additional screw 4.

FX / SX

Self-clamping inserts

Screws 1, 2 and 3 are used to clamp the module. The insert is self-clamping.

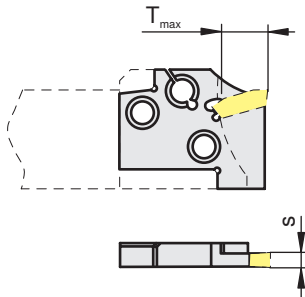
GX / TC

Active insert clamping

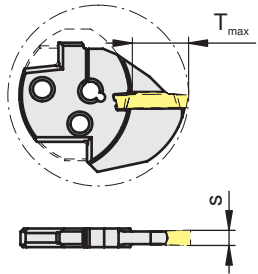
Screws 1, 2 and 3 are used to clamp the module. **Important:** clamp the module with screw 1, then screw 2. Afterwards the insert is clamped by means of screw 3.



GX external



GX internal



Parting, grooving, longitudinal turning, axial grooving

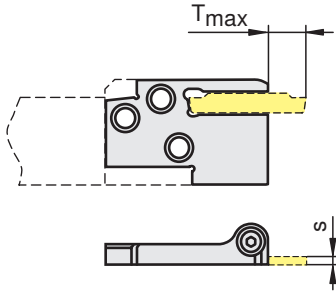
$T_{max} = .276 - .827$ inch
 $s = .079 - .315$ inch

Circlip grooves
 $T_{max} = .030 - .157$ inch
 $s = .0024 - .207$ inch

O-ring grooves
 $T_{max} = .070 - .102$ inch
 $s = .063 - .094$ inch

$T_{max} = .157 - .748$ inch
 $s = .079 - .236$ inch

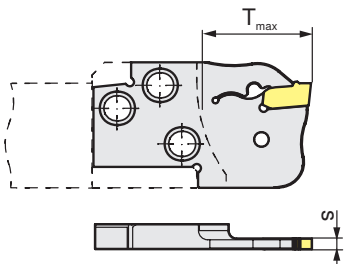
AX



Axial grooving

$T_{max} = .197 - .591$ inch
 $s = .118$ mm

SX

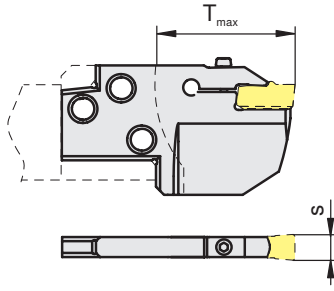


Parting, grooving, longitudinal turning

$T_{max} = .787 - 1.378$ inch
 $s = .079 - .157$ inch



LX

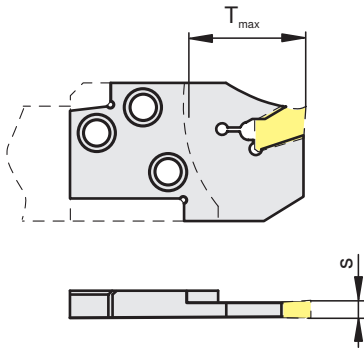


Parting, grooving, longitudinal turning, axial grooving

$$T_{\max} = .984 - 1.772 \text{ inch}$$

$$s = .315 - .394 \text{ inch}$$

FX

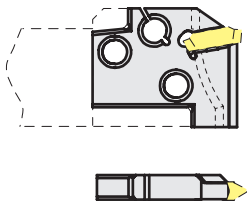


Parting, grooving

$$T_{\max} = .787 - 1.772 \text{ inch}$$

$$s = .087 - .256 \text{ inch}$$

TC



Thread turning and milling

Pitch
ISO .5 - 5.0 mm
BSW 28 - 5 TPI

System characteristics

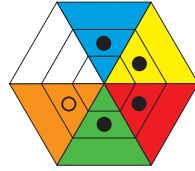
- Modules made of tempered steel with high strength
- Locating surfaces for MSS interface ground with highest precision
- Ground insert seat

Benefits

- Long tool life, high rigidity
- Accurate repeatability
- Secure and precise insert clamping



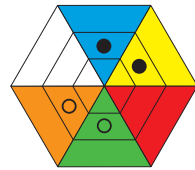
Parting, grooving, longitudinal turning, axial grooving



GX

Insert size					
09	.024-.128	.031-.047	.079-.138	.039-.047	
16	.024-.207	.031-.047	.079-.236	.059-.118	Upon request
24			.079-.236	.059-.118	

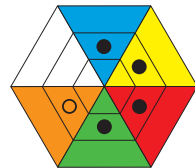
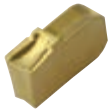
Axial grooving



AX

.118

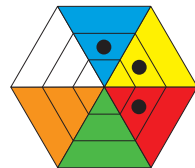
Parting, grooving, longitudinal turning



SX

.059-.118	.079-.236	.079-.157	.079-.157

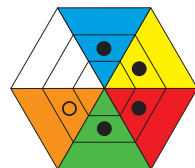
Parting, grooving, longitudinal turning, axial grooving



LX

.157	.315-.394

Parting and grooving



FX

.087-.382	.087-.256	.087-.256



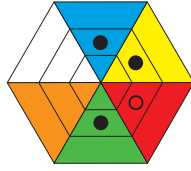
The inserts

Systems GX / AX / SX / LX / FX / TC

Thread turning and milling



TC



Full and partial profile
external, internal

Full and partial profile
external, internal

Pitch .5 - 5.0 mm

48 - 5 TPI

- According to the respective application either precision ground or sintered
- Optimized geometries for all important materials
- Security through ideal combination of substrate and coating
- All inserts for aluminum machining are microfinished



Width classes	1	2	3	4	5
Parting and grooving modules	 .051	 .079	 .116	 .165	 .232
Parting and grooving inserts	 .079 - .108	 .109 - .148	 .148 - .197	 .198 - .256	 .315
Inserts for circlip grooves	 .024 - .067	 .024 - .089			

Module designation

MSS-E20R12-GX16-

Insert designation

GX16-E3.00N0.30

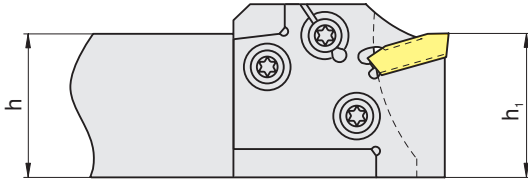
Width class ¹⁾

The parting and grooving widths of the MSS system are divided into width classes. Every width class represents a certain range of cutting widths.

¹⁾ Ideally the module and the insert have the same width class. This combination results in the best possible application security.



The assembly size



Tool designation

MSS- E25 R00-2525L

Module designation

MSS- E25 R25-GX16-2

Assembly size (h)

The assembly size is determined by the shank dimensions of the MSS tool holders. In this manner the correct tool holder can be assigned to the correct module size and vice versa. The following tables will give you an overview of the width classes and insert sizes for the available assembly sizes.

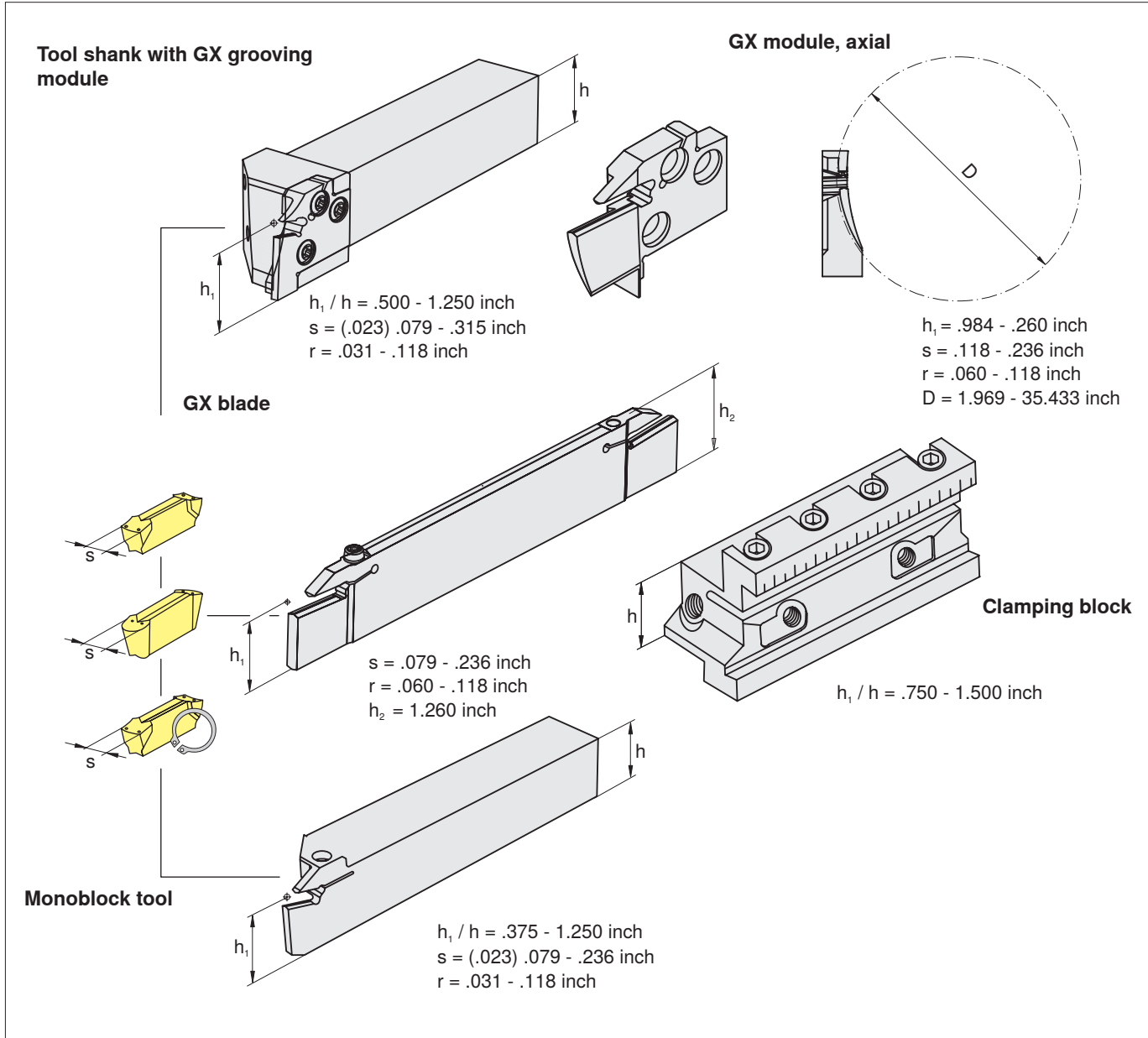
Assembly size (h)	external				GX		internal			
	Width class									
	1	2	3	4	1	2	3	4		
10										
12										
16										
20										
25										
32										
40										

Assembly size (h)	GX					
	09		16		24	
	Insert size					
10						
12						
16						
20						
25						
32						
40						



System GX is characterized by a double-ended insert with numerous application possibilities. It is mostly applied for radial grooving and turning. Thanks to special modules the system can easily be adapted for axial and circlip grooving. For GX inserts a range of modules and boring bars for internal

grooving is available.



System characteristics

- Double-ended insert
- Ground and directly pressed inserts

Benefits

- Good economy
- Optimum solution for all situations

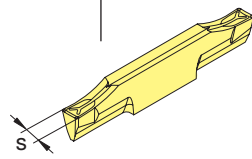
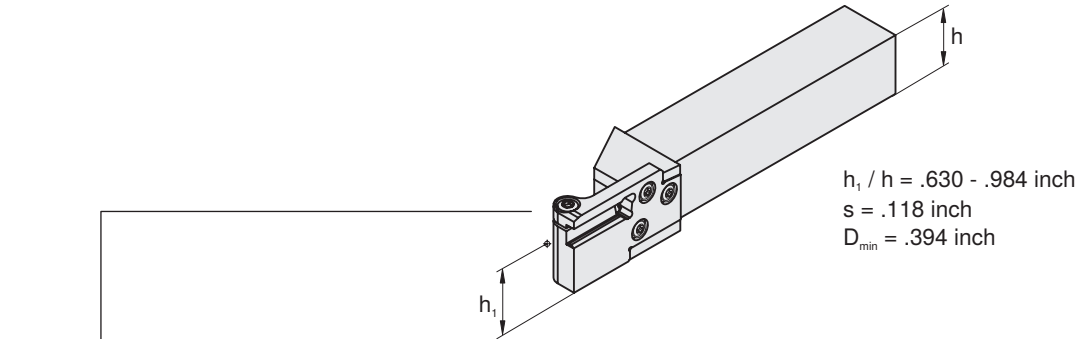


System overview

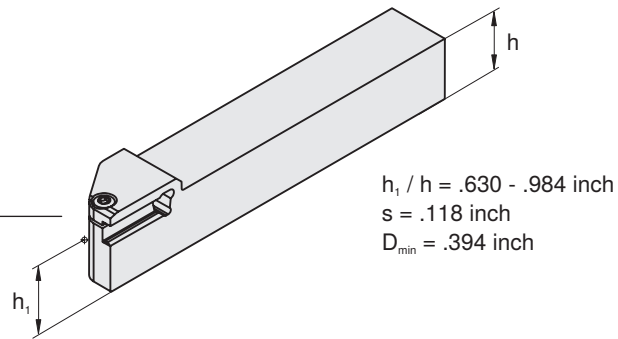
System AX

System AX is for axial grooving with small diameters. A special characteristic of the design is that the insert needs no support in the cutting area.

Tool shank with AX parting and grooving module



Monoblock tool



System characteristics

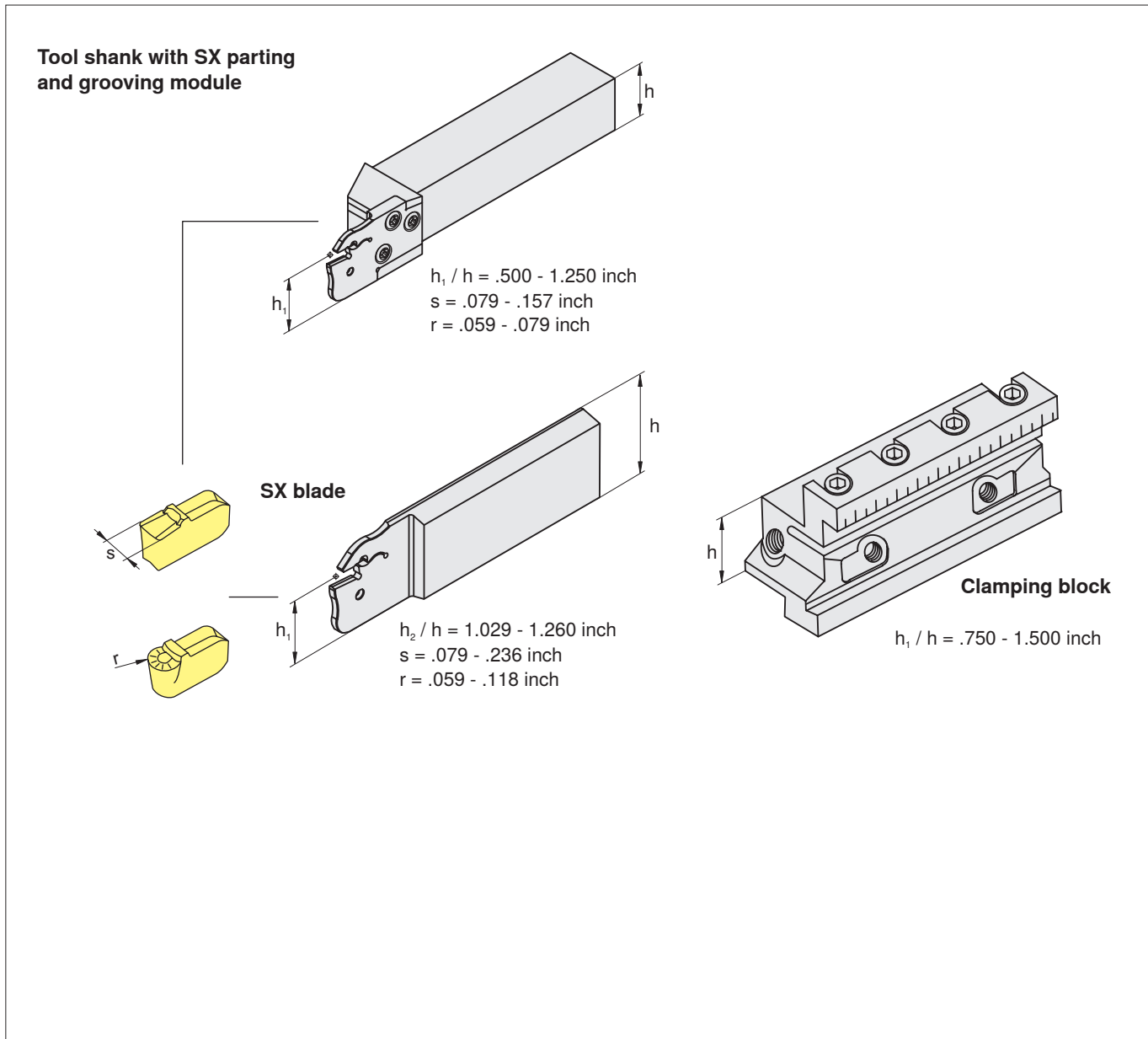
- Neutral insert
- Monoblock and modular tools

Benefits

- May be applied in left-hand and right-hand tools
- Optimum solution in terms of costs for every application



In system SX the insert is self-clamping and fixed with maximum clamping force in the insert seat. Precise cutting edge positioning and easy handling are guaranteed.



System characteristics

- Active clamping
- Insert seat with fixed stop
- Easy handling
- FEM optimized tool

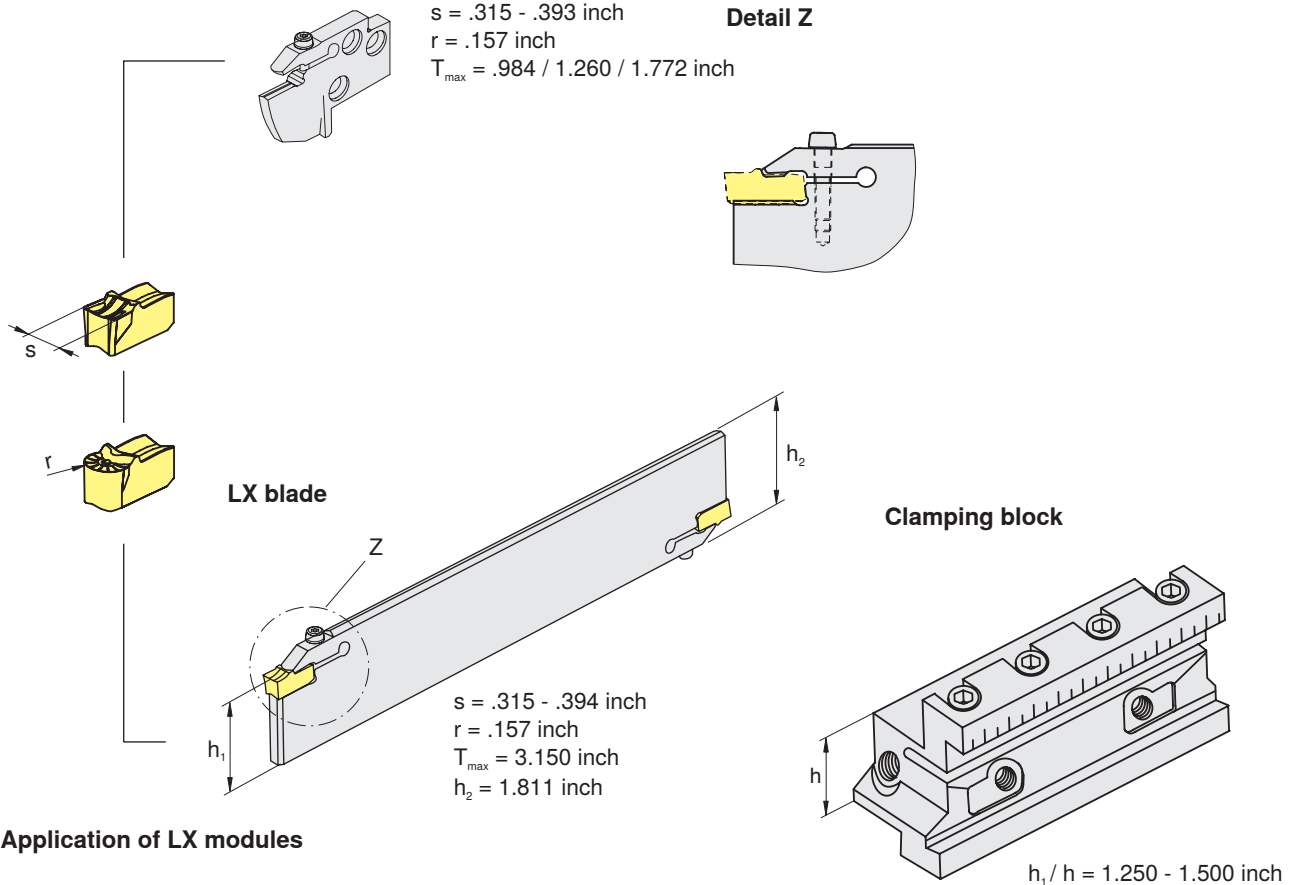
Benefits

- Inserts will not pull out of the cutting blade
- Exact positioning of the cutting edge
- Quick insert change
- Maximum stability also when longitudinal turning



System LX is characterized by high strength and stability. It is most suitable for the production of wide and deep grooves as well as for parting off large bar diameters.

Parting and grooving module LX



Application of LX modules

- Part-off
- Grooving and turning
- Axial grooving with $D > 19.7$ inch
- Internal grooving and turning with $D > 7.9$ inch

System characteristics

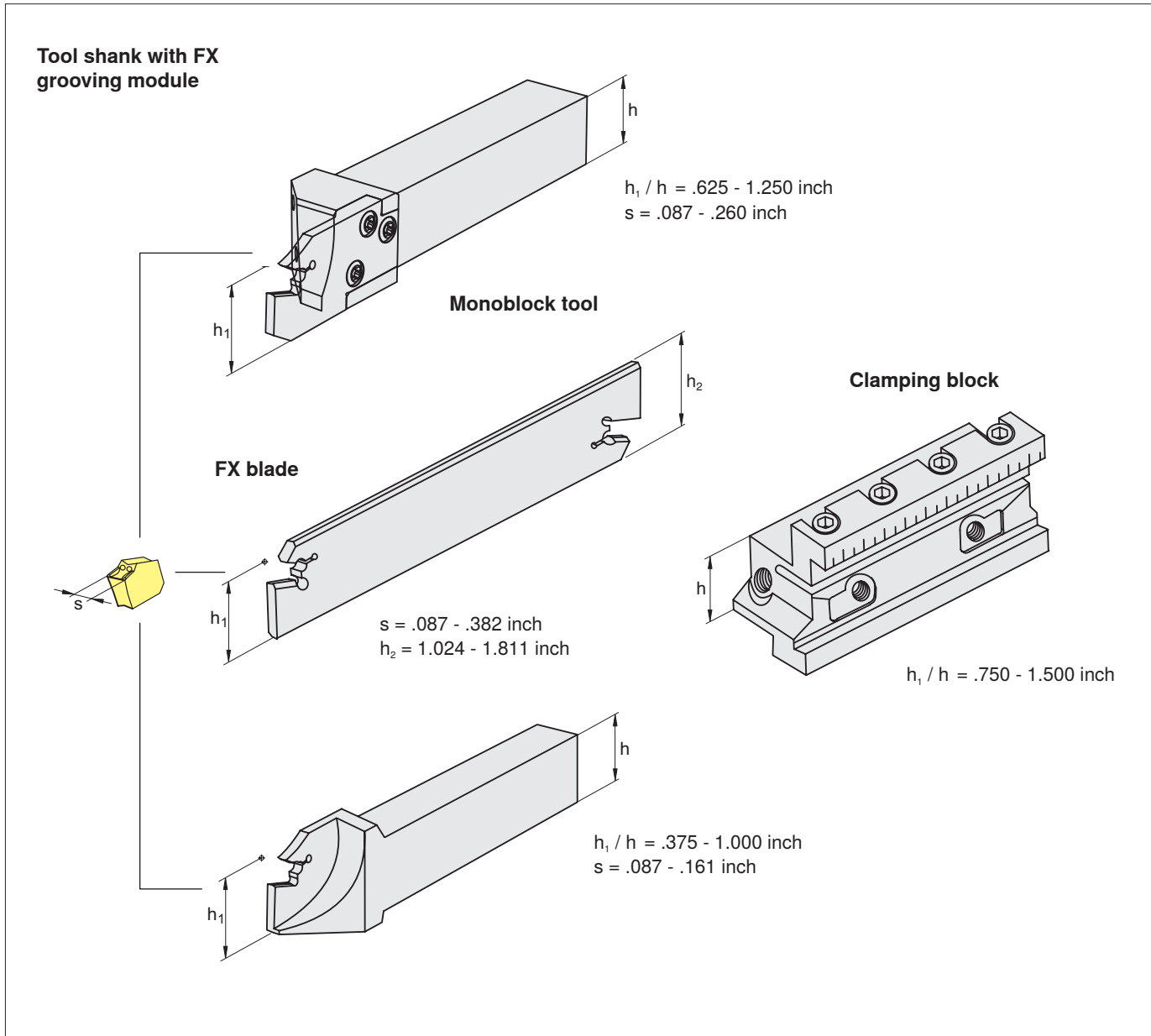
- Robust construction
- Active insert clamping
- Insert with full radius

Benefits

- Application security, high strength and stability
- Well-suited for copy turning



System FX is characterized by a self-clamping single blade insert for deep grooving of large diameters. FX is directly integrated in the MSS system by means of the respective modules. Additionally the tried and tested block/blade solutions and monoblock tools are available.



System characteristics

- Self-clamping insert
- Adjustable blade
- Single-blade insert, directly pressed

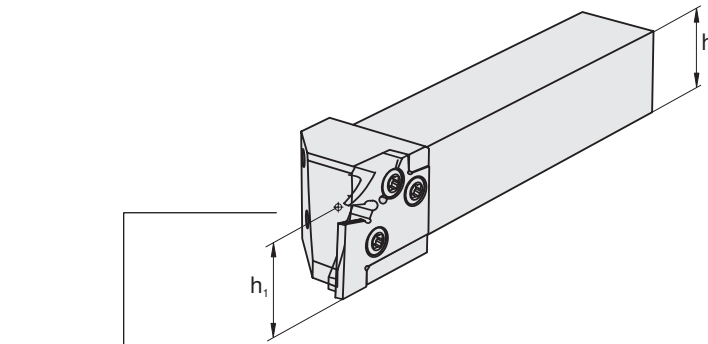
Benefits

- Easy handling, no clamping parts
- Parting and grooving depth, overhang optimally adjustable
- Economic for deep parting and grooving



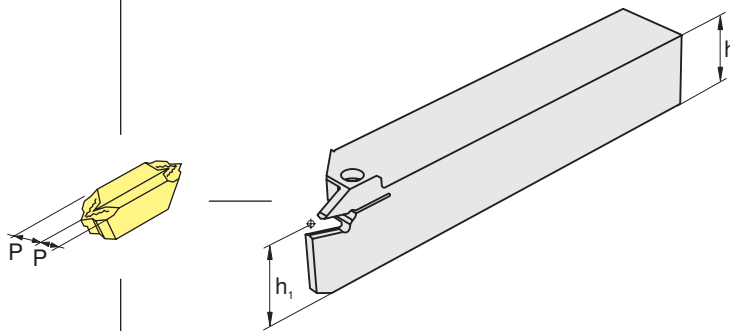
With system TC the same insert can be used to produce threads by turning or milling. TC offers numerous advantages which are of decisive importance for many threading applications.

Monoblock tool



$$h_1 / h = .625 - 1.000 \text{ inch}$$

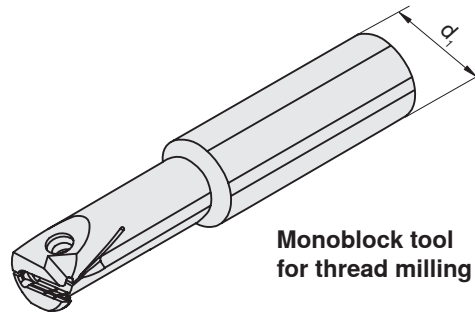
Pitch
 $P = .5 - 5.0 \text{ mm}$
 $P = 48 - 5 \text{ TPI}$



Monoblock tool

$$h_1 / h = .500 \text{ inch}$$

Pitch
 $P = .5 - 3.0 \text{ mm}$
 $P = 48 - 8 \text{ TPI}$



Monoblock tool for thread milling

$$d_1 = .750 - 1.250 \text{ inch}$$

Pitch
 $P = .5 - 5.0 \text{ mm}$
 $P = 48 - 5 \text{ TPI}$

System characteristics

- Turning and milling with the same insert
- Neutral configuration of insert

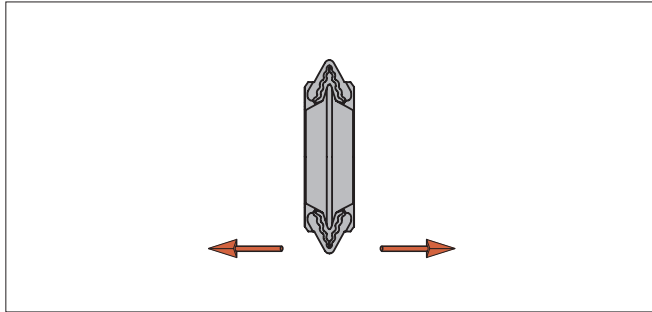
Benefits

- Flexibility, reduced variety and costs
- Right-hand and left-hand threads possible using one insert only
- Reduced storage

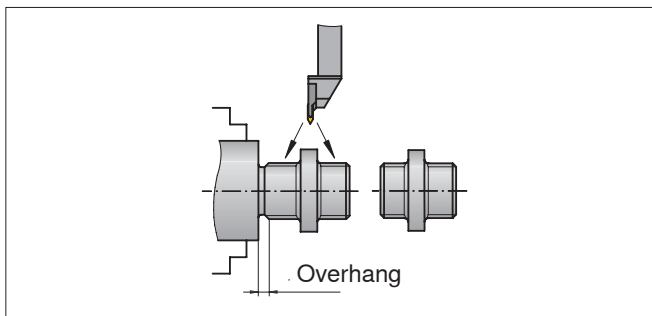


System TC for thread turning is an integrated part of the MSS system. Compared to traditional systems TC offers a series of advantages which are of decisive importance for many threading applications.

System TC

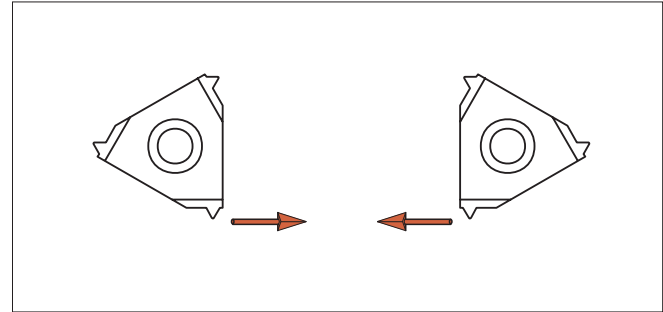


- Neutral configuration of insert makes operation in both directions possible
- Only one threading insert per pitch for partial profile and Whitworth thread; only two threading inserts (internal - external) per pitch for ISO threads
- Reduced storage
- Good chip formation through chip groove with rake angle $+10^\circ$

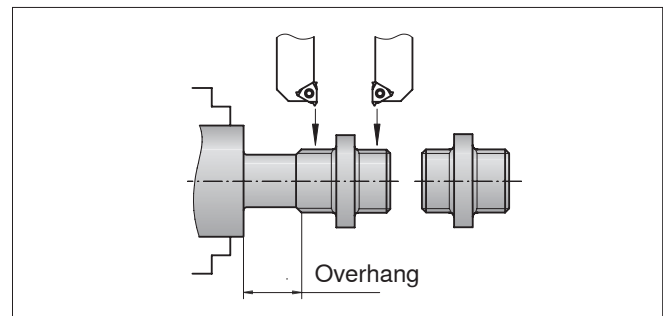


- Enhanced economy through
- reduced machining time
 - fewer tool changes
 - improved stability, small overhang
 - material saving
 - thread turning between shoulders possible
 - fewer tools and inserts

Conventional system



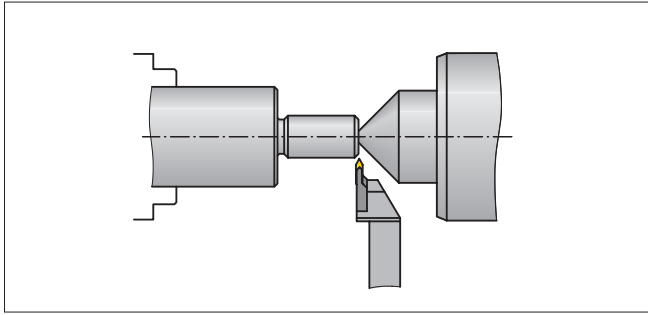
- Right-hand and left-hand version of insert, therefore operation only in one direction
- For every pitch 4 threading inserts are necessary (right- and - left-hand, internal - external)



- for this machining method 2 tools are necessary
- additional loss of stability and material caused by large overhangs

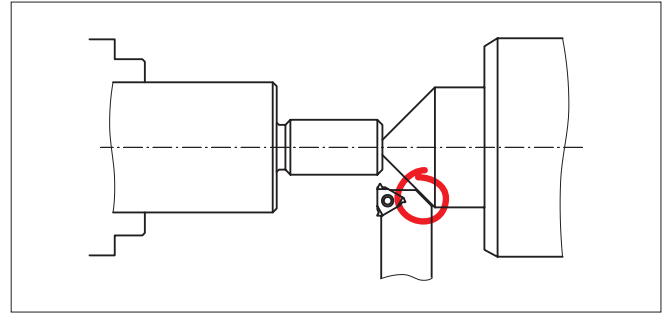


System TC

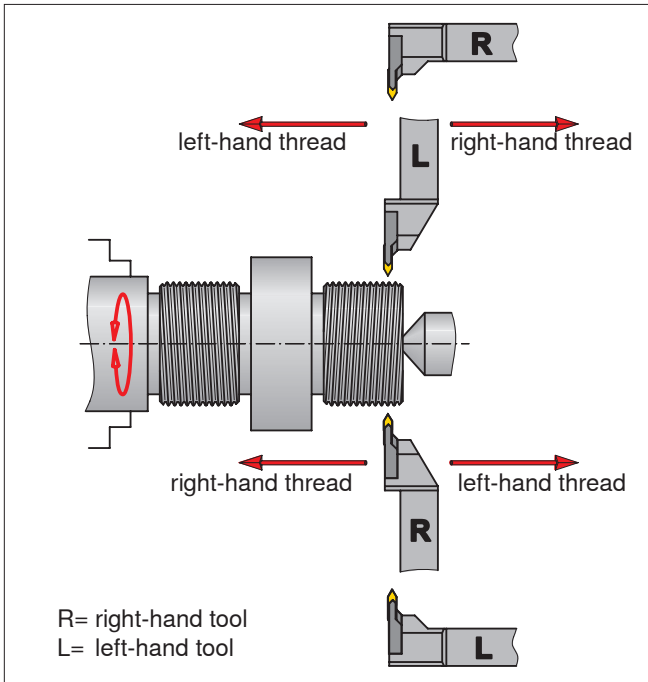


- o Easy access to work piece therefore use of tailstock also possible with small thread diameters

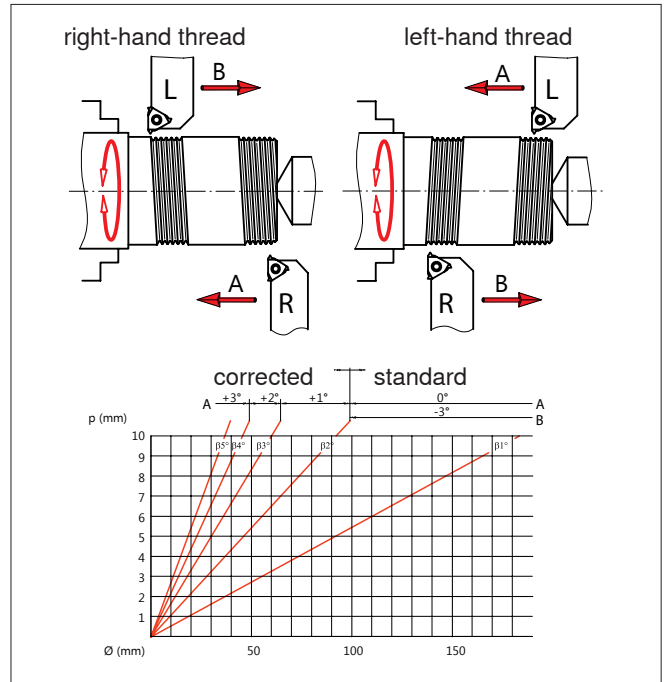
Conventional system



- o Difficult component access
- o Danger of collision



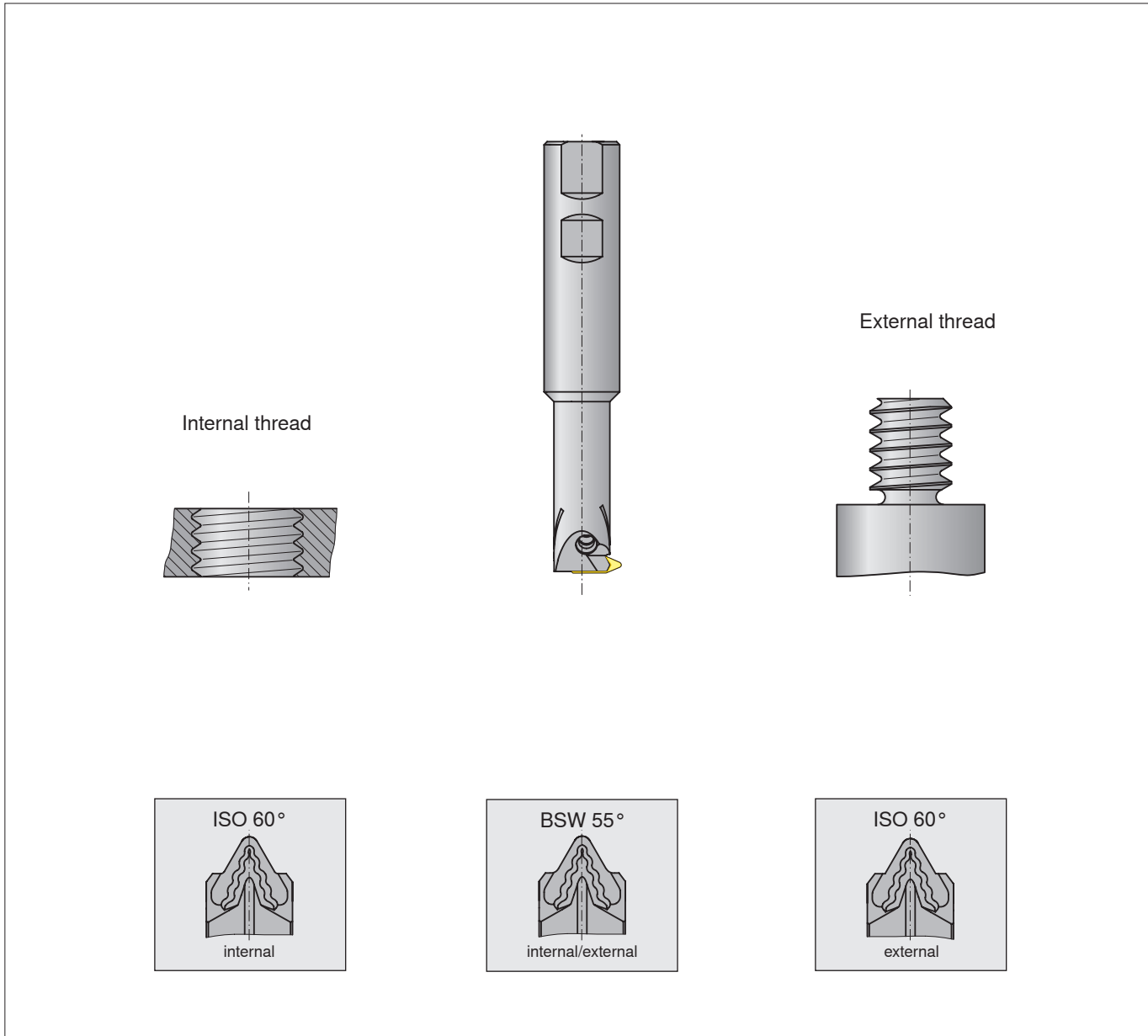
- o Easy to apply as the tools can be used in both directions without correcting the helix angle



- o Correction of helix angle necessary, therefore high degree of application know-how required
- o Can only be operated in one direction



For thread milling and turning the same inserts are applied. With special tool shanks, which are characterized by compact and modular construction, **external as well as internal threads** can be produced on all up-to-date machining centres.

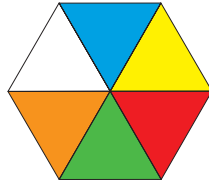


System characteristics

- Turning and milling with the same insert
- Single-tooth thread milling
- Thread is cut in one pass

Benefits

- Flexibility, reduced variety and costs
- Low machining forces, large overhang possible, high cutting data (v_c and f), easy programming
- No interruptions or steps in the thread



Material

Based on VDI 3323 CERATIZIT's MasterGuide divides materials into six main groups (P, M, K, N, S, H). Each is given a color, according to the system partly adopted in ISO 513.

P Steel

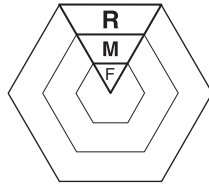
M Stainless steel

K Cast iron

N Non-ferrous metals and non-metals

S Heat-resistant alloys, titanium

H Hard materials



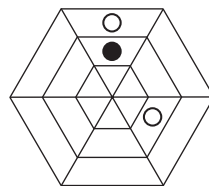
Machining application type

Each colored segment is divided into three sections, and each section indicates the relevant machining application type:

R = rough machining

M = medium machining

F = fine machining



Application

The ideal application area for the insert is indicated by a black circle. Extended applications are indicated by an open circle. The CERATIZIT MasterGuide provides you with an easily understandable structure for choosing a product and enables you to reduce grade and geometry stocks.

- Main application
- Extended application



CTC P335



1 Manufacturer: CERATIZIT

2 Cutting material

- W Uncoated carbide
- C CVD coated carbide
- P PVD coated carbide
- T Uncoated cermet
- E Coated cermet
- N Uncoated silicon nitride
- M Coated silicon nitride
- S Mixed ceramic
- I Sialon
- D PCD
- B CBN
- L CBN coated
- H Sintered HSS

**3 Main application (material)
Variant 1: number**

- 1 Steel
- 2 Stainless steel
- 3 Cast iron
- 4 Light and non-ferrous metals, non-metals
- 5 Heat-resistant alloys, titanium
- 6 Hard materials
- 7 Universal grade for a variety of applications

**Main application (material)
Variant 2: ISO letter**

- P Steel
- M Stainless steel
- K Cast iron
- N Light and non-ferrous metals, non-metals
- S Heat-resistant alloys, titanium
- H Hard materials
- X Universal grade for a variety of applications

**4 Main application
(machining method)**

- 1 Turning
- 2 Milling
- 3 Parting and grooving
- 4 Drilling
- 5 Threading
- 6 Others
- 7 Universal grade for a variety of applications

**5 ISO 513
Application range**

- For example:
- 05
 - 10
 - 15
 - 25
 - 35 ISO P35
 -



Carbide

- HW** Uncoated carbide, consisting mainly of tungsten carbide (WC)
HT¹⁾ Uncoated carbide, consisting mainly of titanium carbide (TiC) or titanium nitride (TiN) or both
HC Carbides as above, but coated

Ceramic

- CA** Oxide ceramic, consisting mainly of aluminum oxide (Al_2O_3)
CM Mixed ceramic, based on aluminum oxide (Al_2O_3), but with different oxide components
CN Nitride ceramic, consisting mainly of silicon nitride (Si_3N_4)
CC Ceramics as above, but uncoated

Diamond

- DP** Polycrystalline diamond²⁾

Boron nitride

- BN** Cubic crystalline boron nitride (polycrystalline boron nitride)²⁾

¹⁾ These carbides are also called 'cermets'.

²⁾ Polycrystalline diamond and polycrystalline boron nitride are also called ultra-hard cutting materials.



Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H				
										Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials				
			01	05	10	15	20	25	30	35	40	45	50						
CTC1325	HC-P25	C				15	20	25	30	35	40	45	50	●	○	●	○	○	
	HC-M20	C			10	15	20	25	30	35	40	45	50	○	○	○	○	○	
	HC-K30	C				15	20	25	30	35	40	45	50			●	○	○	
CTCP335	HC-P35	C				15	20	25	30	35	40	45	50	●	○	○	○	○	
	HC-M30	C				15	20	25	30	35	40	45	50		○	○	○	○	
	HC-K35	C				15	20	25	30	35	40	45	50			●	○	○	
CTP1340	HC-P30	P				15	20	25	30	35	40	45	50	●	○	○	○	○	
	HC-M25	P				15	20	25	30	35	40	45	50		●	○	○	○	●
	HC-K30	P				15	20	25	30	35	40	45	50			●	○	○	○
CTPP345	HC-P45	P							35	40	45	50	●	○	○	○	○		
	HC-M40	P							35	40	45	50		●	○	○	○		
	HC-S40	P							35	40	45	50			○	○	○	○	
CTW7120	HW-M20	W				15	20	25	30	35	40	45	50		○	○	○	○	
	HW-K20	W				15	20	25	30	35	40	45	50			○	○	○	○
GM127	HC-P30	C				15	20	25	30	35	40	45	50	●	○	○	○	○	
	HC-M25	C				15	20	25	30	35	40	45	50		○	○	○	○	
H216T	HW-K15	W				10	15	20	25	30	35	40	45			●	○	○	
S40T	HW-P40	W							25	30	35	40	45	●	○	○	○	○	
	HW-M40	W								35	40	45	50		●	○	○	○	
SR127	HC-P25	C				15	20	25	30	35	40	45	50	●	○	○	○	○	
	HC-M20	C				10	15	20	25	30	35	40	45		○	○	○	○	
	HC-K30	C				15	20	25	30	35	40	45	50			●	○	○	
TSM20	HW-K15	W				10	15	20	25	30	35	40	45			●	○	○	○

*Type of cutting material





Grade overview – threading

Grade designation	Standard designation	*Cutting material	Application range							P	M	K	N	S	H										
			01	05	10	15	20	25	30	35	40	45	50	Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials						
GM213	HC-P20	C											●												
	HC-M15	C												●											
	HC-K25	C													●										
GM240	HC-P35	C											●												
	HC-M25	C												●											
H216T	HW-K15	W													●	●									
			01	05	10	15	20	25	30	35	40	45	50	●	Main application					○	Extended application				

*Type of cutting material

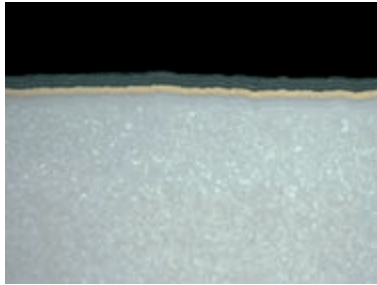
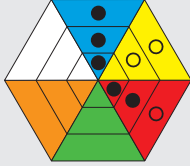


C27



CTC1325

HC-P25
HC-M20
HC-K30



Composition:

Co 7.0%; composite carbides 8.0%; WC balance

Grain size:

1 - 2 μm

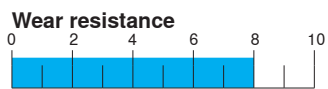
Hardness:

HV₃₀ 1450

Coating specification:

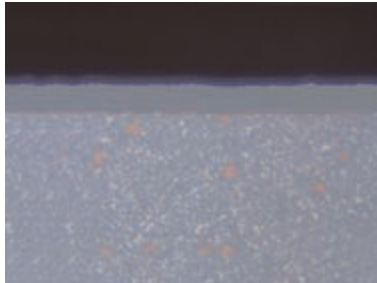
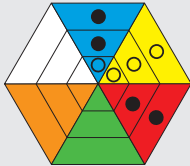
CVD

Ti(C,N) + Ti(C,N) + TiN + Al₂O₃; 12 μm



CTCP335

HC-P35
HC-M30
HC-K35



Composition:

Co 10.5%; mixed carbides 2.0%; WC balance

Grain size:

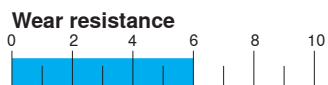
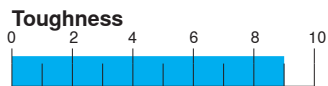
1 - 2 μm

Hardness:

HV₃₀ 1400

Coating specification:

Ti(C,N) + Al₂O₃; 7.5 μm

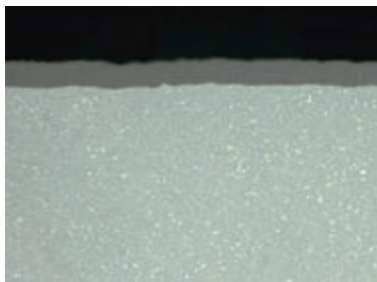
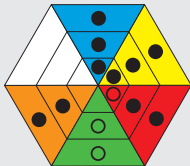


Properties, application:

- Excellent wear resistance
- Good resistance to oxidation
- High toughness
- Good heat resistance

CTP1340

HC-P30
HC-M25
HC-K30



Composition:

Co 9.0%; WC balance

Grain size:

.7 - 1 μm

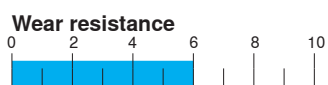
Hardness:

HV₃₀ 1590

Coating specification:

PVD

TiAlN; 4 μm



Properties, application:

- Excellent suitability for universal application
- Ideal for stainless steels
- High cutting edge stability

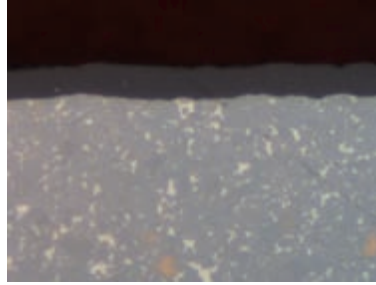
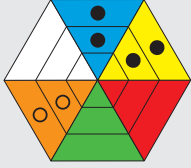


Grade description – parting and grooving

Steel

CTPP345

HC-P45
HC-M40
HC-S40



Composition:

Co 12.5%; mixed carbides 2.0%; WC balance

Grain size:

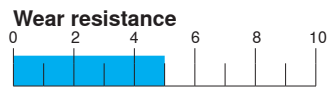
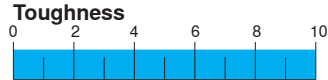
1 - 1.5 μm

Hardness:

HV₃₀ 1380

Coating specification:

TiAlN; 7 μm

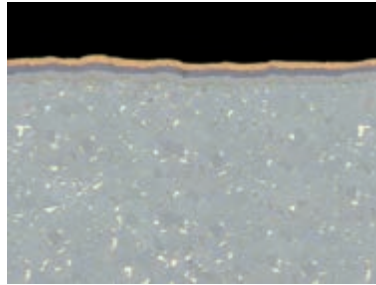
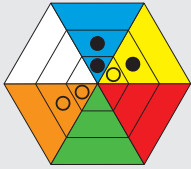


Properties, application:

- For universal application
- Excellent toughness
- Good wear resistance
- High application security

GM127

HC-P30
HC-M25



Composition:

Co 6.0%; composite carbides .6%; WC balance

Grain size:

2 μm

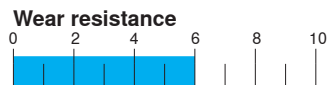
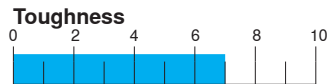
Hardness:

HV₃₀ 1460

Coating specification:

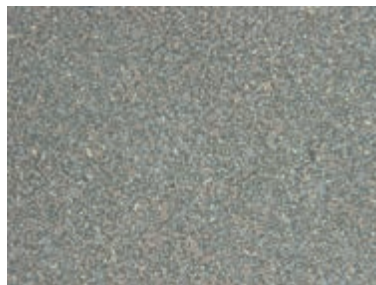
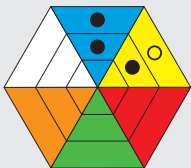
CVD

TiC + Ti(C,N) + TiN; 5 μm



S40T

HW-P40
HW-M40



Composition:

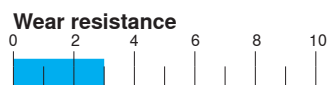
Co 11.0%; mixed carbides 12.0%; WC balance

Grain size:

1 - 2 μm

Hardness:

HV₃₀ 1420

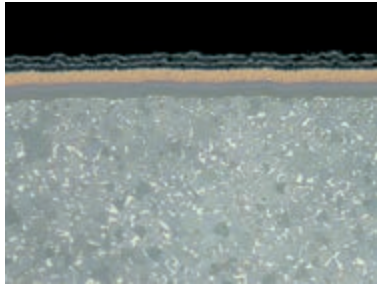
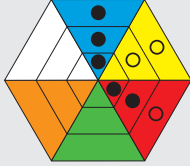


Properties, application:

- High toughness
- Medium to low cutting speed
- For universal application on steel

**SR127**

HC-P25
HC-M20
HC-K30

**Composition:**

Co 6.0%; composite carbides .6%; WC balance

Grain size:

2 μm

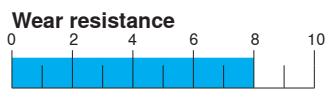
Hardness:

HV₃₀ 1460

Coating specification:

CVD

Ti(C,N) + TiN + Al₂O₃; 12 μm

**Properties, application:**

- Wide range of applications (steel and cast iron)
- Excellent resistance to oxidation
- Good toughness
- High wear resistance

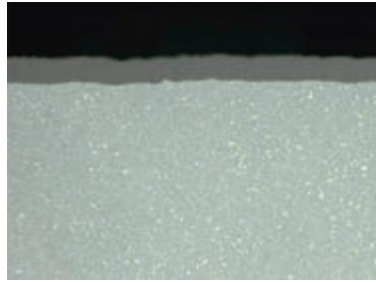
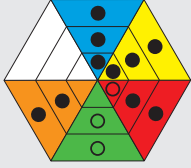


Grade description – parting and grooving

Stainless steel

CTP1340

HC-P30
HC-M25
HC-K30



Composition:

Co 9.0%; WC balance

Grain size:

.7 - 1 μm

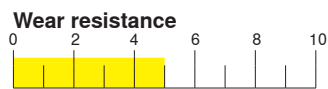
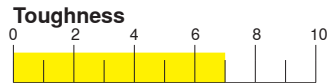
Hardness:

HV₃₀ 1590

Coating specification:

PVD

TiAlN; 4 μm

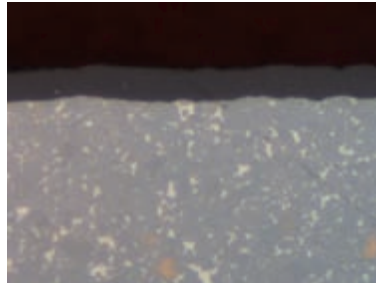
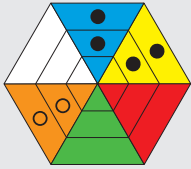


Properties, application:

- Excellent suitability for universal application
- Ideal for stainless steels
- High cutting edge stability

CTPP345

HC-P45
HC-M40
HC-S40



Composition:

Co 12.5%; mixed carbides 2.0%; WC balance

Grain size:

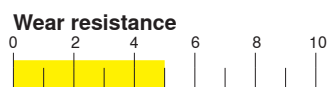
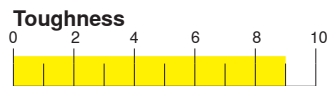
1 - 1.5 μm

Hardness:

HV₃₀ 1380

Coating specification:

TiAlN; 7 μm

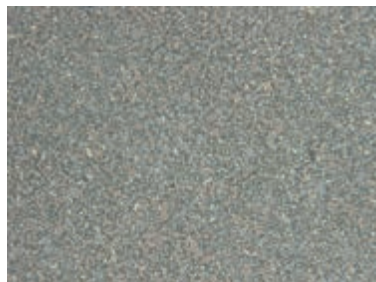
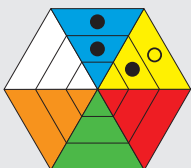


Properties, application:

- For universal application
- Excellent toughness
- Good wear resistance
- High application security

S40T

HW-P40
HW-M40



Composition:

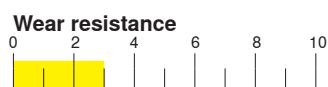
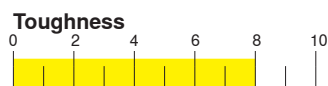
Co 11.0%; mixed carbides 12.0%; WC balance

Grain size:

1 - 2 μm

Hardness:

HV₃₀ 1420



Properties, application:

- High toughness
- Medium to low cutting speed
- For universal application on steel



CTC1325

HC-P25
HC-M20
HC-K30

Composition:
Co 7.0%; composite carbides 8.0%; WC balance

Grain size:
1 - 2 μm

Hardness:
HV₃₀ 1450

Coating specification:
CVD
Ti(C,N) + Ti(C,N) + TiN + Al₂O₃; 12 μm

Toughness

Wear resistance

CTCP335

HC-P35
HC-M30
HC-K35

Composition:
Co 10.5%; mixed carbides 2.0%; WC balance

Grain size:
1 - 2 μm

Hardness:
HV₃₀ 1400

Coating specification:
Ti(C,N) + Al₂O₃; 7.5 μm

Toughness

Wear resistance

Properties, application:

- Excellent wear resistance
- Good resistance to oxidation
- High toughness
- Good heat resistance

CTP1340

HC-P30
HC-M25
HC-K30

Composition:
Co 9.0%; WC balance

Grain size:
.7 - 1 μm

Hardness:
HV₃₀ 1590

Coating specification:
PVD
TiAlN; 4 μm

Toughness

Wear resistance

Properties, application:

- Excellent suitability for universal application
- Ideal for stainless steels
- High cutting edge stability

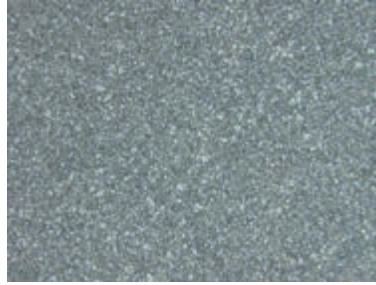
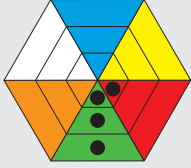


Grade description – parting and grooving

Cast iron

H216T

HW-K15



Composition:

Co 6.0%; WC balance

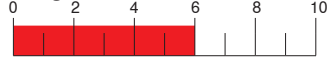
Grain size:

1 μm

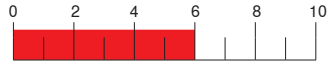
Hardness:

HV₃₀ 1630

Toughness



Wear resistance



Properties, application:

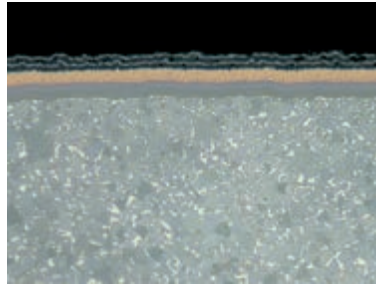
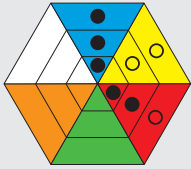
- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

SR127

HC-P25

HC-M20

HC-K30



Composition:

Co 6.0%; composite carbides .6%; WC balance

Grain size:

2 μm

Hardness:

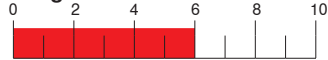
HV₃₀ 1460

Coating specification:

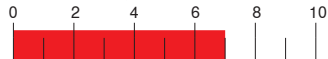
CVD

Ti(C,N) + TiN + Al₂O₃; 12 μm

Toughness



Wear resistance



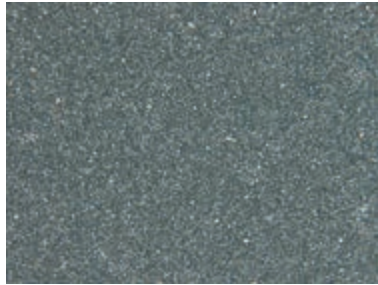
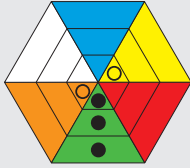
Properties, application:

- Wide range of applications (steel and cast iron)
- Excellent resistance to oxidation
- Good toughness
- High wear resistance



CTW7120

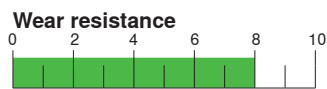
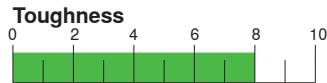
HW-M20
HW-K20



Composition:
Co 10.0%; WC balance

Grain size:
.7 μm (submicron grade)

Hardness:
HV₃₀ 1550

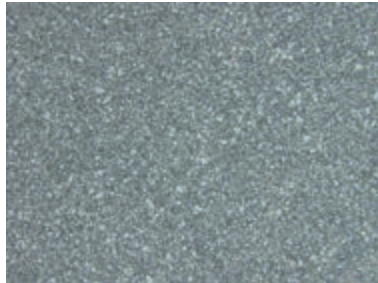
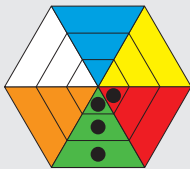


Properties, application:

- Ideal for non-ferrous metals
- Substrate for PVD coatings

H216T

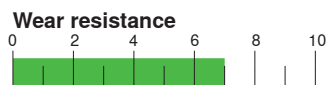
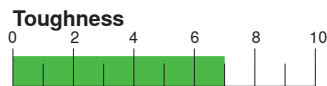
HW-K15



Composition:
Co 6.0%; WC balance

Grain size:
1 μm

Hardness:
HV₃₀ 1630



Properties, application:

- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

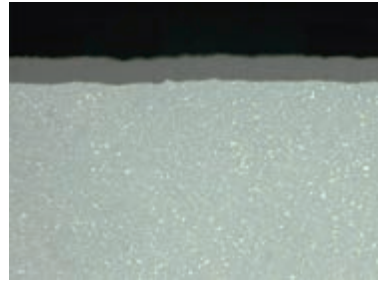
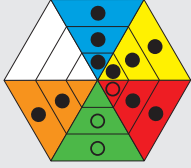


Grade description – parting and grooving

Heat-resistant alloys / titanium

CTP1340

HC-P30
HC-M25
HC-K30



Composition:

Co 9.0%; WC balance

Grain size:

.7 - 1 μm

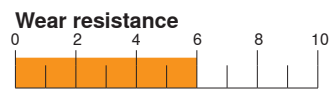
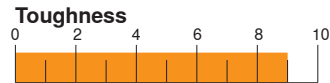
Hardness:

HV₃₀ 1590

Coating specification:

PVD

TiAlN; 4 μm

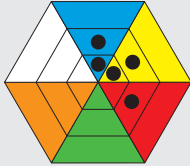


Properties, application:

- Excellent suitability for universal application
- Ideal for stainless steels
- High cutting edge stability

**GM213**

HC-P20
HC-M15
HC-K25

**Composition:**

Co 6.0%; WC balance

Grain size:

1 μm

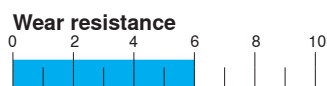
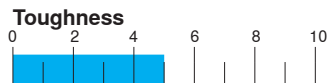
Hardness:

HV₃₀ 1630

Coating specification:

CVD

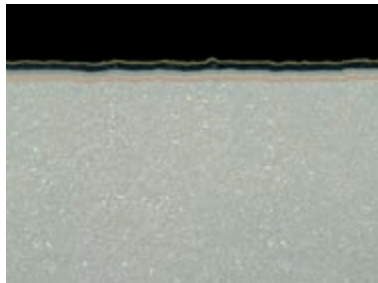
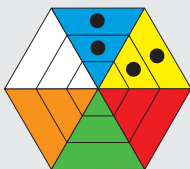
TiC + TiN; 3 μm

**Properties, application:**

- Suitable for high cutting speed
- Good heat resistance
- Good wear resistance

GM240

HC-P35
HC-M25

**Composition:**

Co 10.0%; composite carbides .6%; WC balance

Grain size:

.7 μm

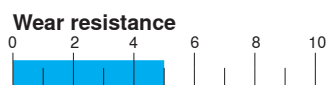
Hardness:

HV₃₀ 1590

Coating specification:

CVD

TiC + Ti(C,N) + Al₂O₃ + Ti(N,B); 6 μm

**Properties, application:**

- For universal application
- High toughness
- Good wear resistance
- Low tendency for adhesion

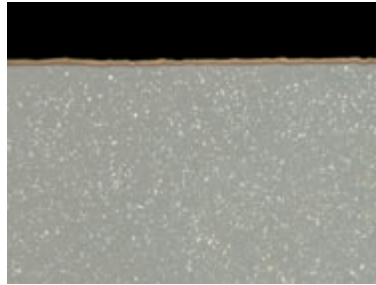


Grade description – threading

Stainless steel

GM213

HC-P20
HC-M15
HC-K25



Composition:

Co 6.0%; WC balance

Grain size:

1 μm

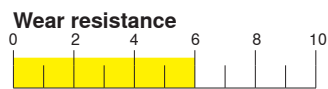
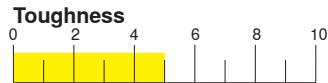
Hardness:

HV₃₀ 1630

Coating specification:

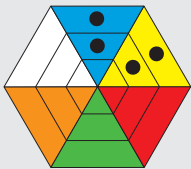
CVD

TiC + TiN; 3 μm



GM240

HC-P35
HC-M25



Composition:

Co 10.0%; composite carbides .6%; WC balance

Grain size:

.7 μm

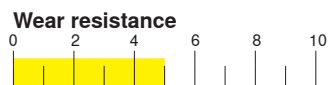
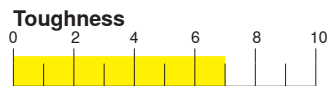
Hardness:

HV₃₀ 1590

Coating specification:

CVD

TiC + Ti(C,N) + Al₂O₃ + Ti(N,B); 6 μm



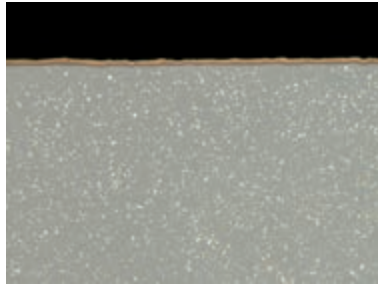
Properties, application:

- For universal application
- High toughness
- Good wear resistance
- Low tendency for adhesion



GM213

HC-P20
HC-M15
HC-K25



Composition:

Co 6.0%; WC balance

Grain size:

1 μm

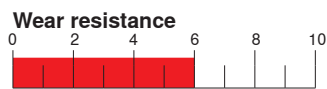
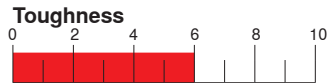
Hardness:

HV₃₀ 1630

Coating specification:

CVD

TiC + TiN; 3 μm

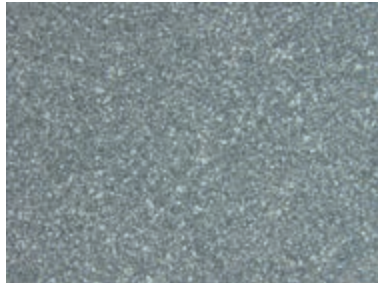
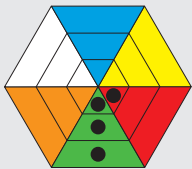


Properties, application:

- Suitable for high cutting speed
- Good heat resistance
- Good wear resistance

H216T

HW-K15



Composition:

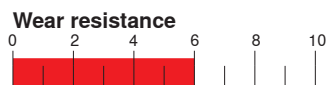
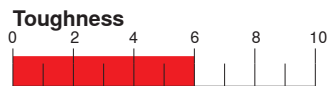
Co 6.0%; WC balance

Grain size:

1 μm

Hardness:

HV₃₀ 1630



Properties, application:

- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

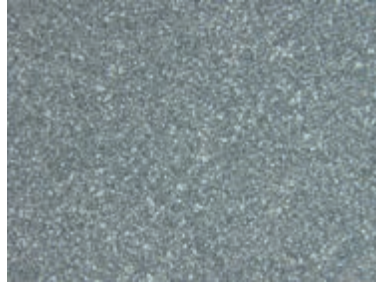
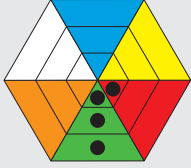


Grade description – threading

Non-ferrous metals and non-metals

H216T

HW-K15



Composition:

Co 6.0%; WC balance

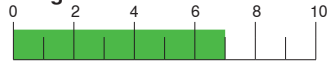
Grain size:

1 μm

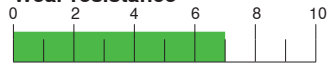
Hardness:

HV₃₀ 1630

Toughness



Wear resistance




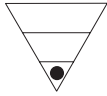






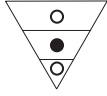












Properties, application:


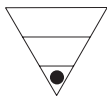





- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion







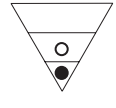





Chip groove	Machining type	Machining type	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-F2 			CTC1325	CTC1325 / CTP1340	CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325 / CTP1340	-
			-	-	-
			-	-	-
Standard 			CTC1325	CTC1325 / CTP1340	CTCP335
			CTP1340	CTP1340	CTP1340
			CTC1325	CTC1325 / CTP1340	CTP1340
			-	-	-
			-	-	-
-M40 			CTC1325	CTC1325 / CTP1340	CTP1340 / CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325	CTP1340
			-	-	-
			CTP1340	CTP1340	CTP1340 / CTPP345
-M1 			CTC1325	CTC1325 / CTP1340	CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325 / CTP1340	CTP1340
			-	-	-
			CTP1340	CTP1340	CTP1340 / CTPP345
-27P 			-	-	-
			-	-	-
			-	-	-
			H216T	H216T	H216T
			-	-	-



Chip groove	Machining type	Machining type	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
R/L 			CTC1325	CTC1325	–
			CTC1325	CTC1325	–
			CTC1325	CTC1325	–
			–	–	–
			–	–	–
Standard/ -M3 			CTC1325	CTC1325 / CTP1340	CTP1340 / CTCP335
			CTC1325 / GM127	CTP1340	CTP1340
			CTC1325	CTC1325	CTCP335
			–	–	–
			–	–	–
-27P 			–	–	–
			–	–	–
			–	–	–
			H216T	H216T	H216T
			–	–	–

L/N/R 			CTP1340	CTP1340	–
			CTP1340	CTP1340	–
			CTP1340	CTP1340	–
			CTP1340	CTP1340	–
			CTP1340	CTP1340	–



Chip groove	Machining type	Machining type	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
					
-F50 			CTP1340	CTP1340	-
			CTP1340	CTP1340	-
			CTP1340	CTP1340	-
			CTP1340	CTP1340	-
			CTP1340	CTP1340	-


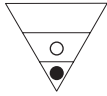













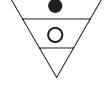














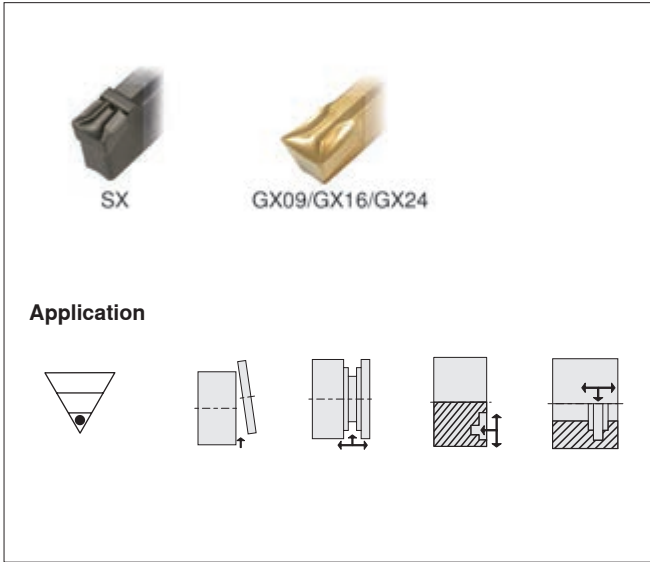
Chip groove	Machining type	Machining type	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-F2 			CTC1325	CTC1325 / CTP1340	CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325 / CTCP335	–
			–	–	–
			CTP1340	CTP1340 / CTPP345	–
-M2 			CTC1325	CTC1325 / CTP1340	CTCP335
			CTP1340	CTP1340 / CTPP345	CTCP335
			CTC1325	CTC1325 / CTP1340	CTCP335
			–	–	–
			CTP1340	CTP1340	CTP1340 / CTPP345
-M3 			CTP1340	CTP1340 / CTCP335	CTP1340 / CTCP335
			CTP1340	CTP1340	CTP1340 / CTCP335
			CTP1340	CTCP335	CTCP335
			CTP1340	CTP1340	CTP1340
			CTP1340	CTP1340	CTP1340
-M1 			CTC1325	CTP1340 / CTCP335	CTCP335 / CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325	CTCP335
			–	–	–
			CTP1340	CTP1340	CTP1340 / CTPP345
-27P 			–	–	–
			–	–	–
			–	–	–
			H216T	H216T	H216T
			–	–	–



Chip groove	Machining type	Machining type	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-M2 			CTC1325	CTC1325 / CTCP335	CTCP335
			CTCP335	CTCP335	CTCP335
			CTC1325	CTC1325	CTCP335
			-	-	-
			-	-	-
-M3 			CTC1325	CTC1325 / CTCP335	CTCP335
			CTCP335	CTCP335	CTCP335
			CTC1325	CTC1325	CTCP335
			-	-	-
			-	-	-



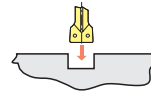
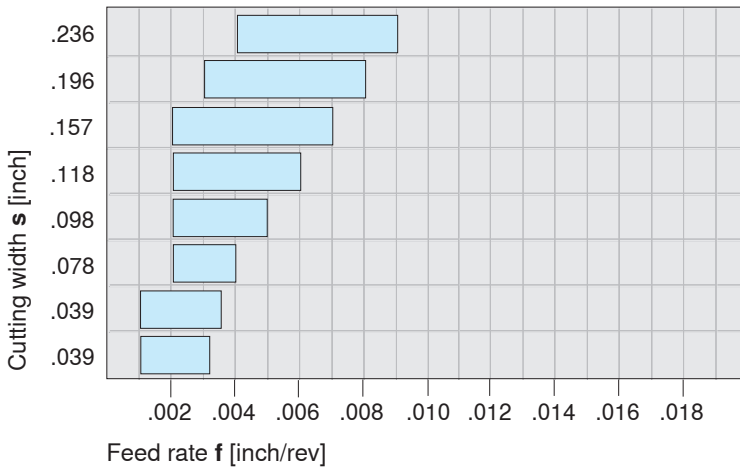
Chip groove	Machining type	Machining type	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
-F1 			CTC1325	CTC1325 / CTP1340	CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325 / CTP1340	-
			-	-	-
			-	-	-
-M1 			CTC1325	CTP1340 / CTCP335	CTCP335 / CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325	CTCP335
			-	-	-
			CTP1340	CTP1340	CTP1340 / CTPP345
-R2 			CTC1325	CTC1325 / CTP1340	CTPP345
			CTP1340	CTP1340 / CTPP345	CTPP345
			CTC1325	CTC1325	CTP1340
			-	-	-
			CTP1340	CTP1340	CTP1340 / CTPP345
-27P 			-	-	-
			-	-	-
			-	-	-
			H216T	H216T	H216T
			-	-	-



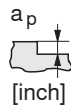
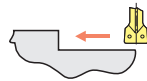
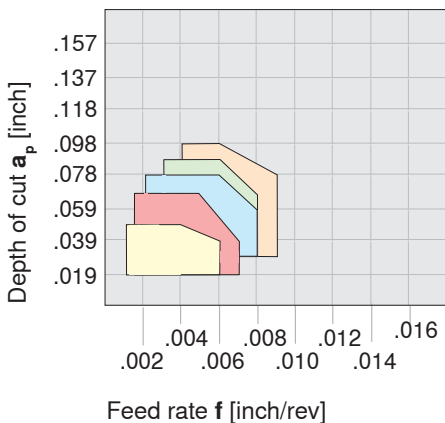
-F2

- For steels in general, particularly suitable for **stainless materials**
- Insert with ground periphery
- Tolerance cutting width $\pm .000787$ inch
- Suitable also for parting off tubes and thin-walled materials
- Special profiles (SX, GX) possible

Feed rate for parting and grooving

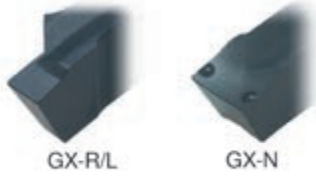


Feed rate for longitudinal turning



- = .236 inch
- = .196 inch
- = .157 inch
- = .118 inch
- = .078 inch

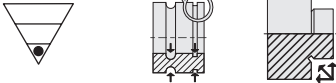
Cutting width s



GX-R/L

GX-N

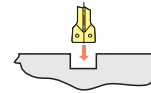
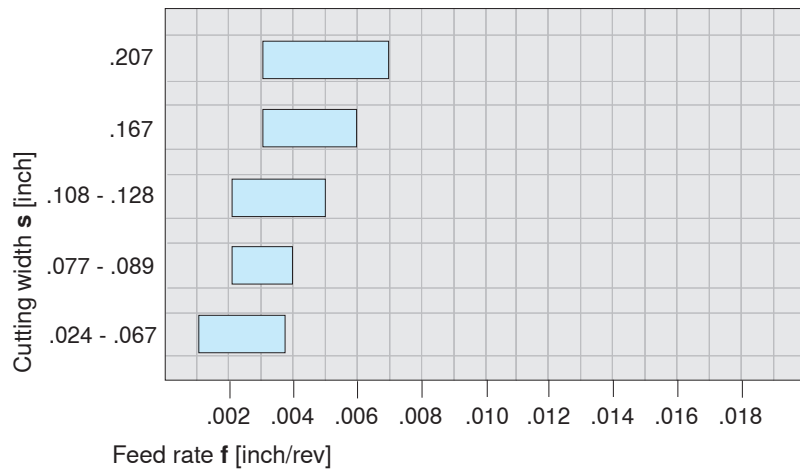
Application

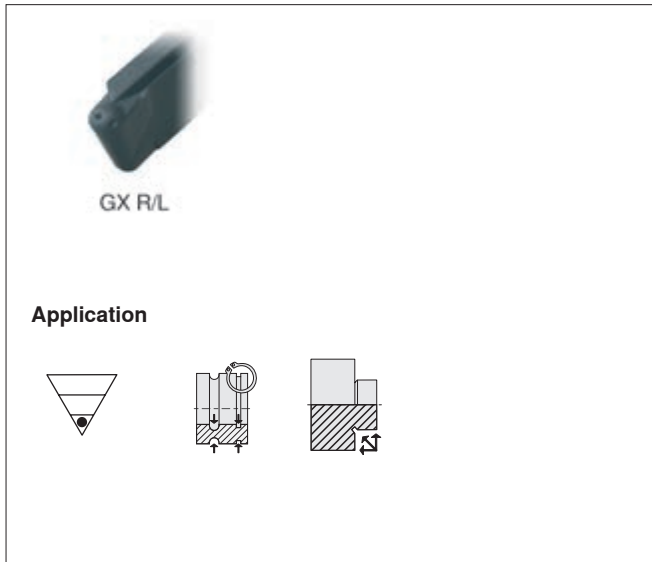


Circlip grooves L/N/R

- Insert for circlip grooves according to DIN 471-472
- For internal and external machining

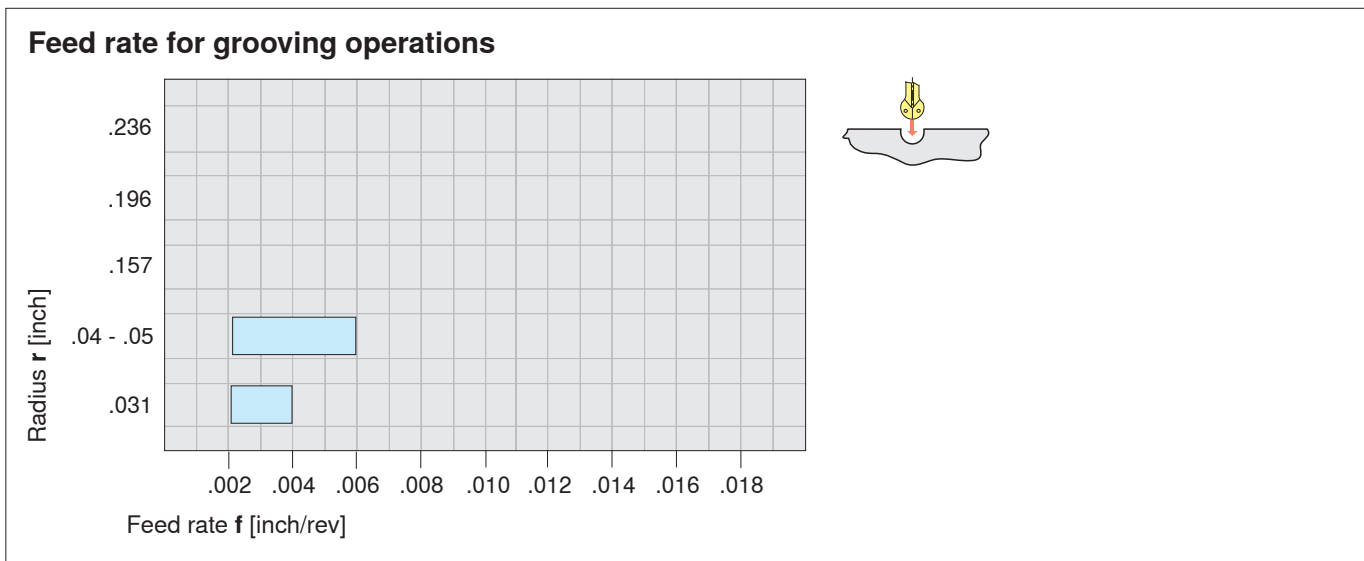
Feed rate for grooving operations






Radius grooves R/L


- Inserts for radius grooves and copy turning
- For all steel materials
- For internal and external machining












GX09/
GX16



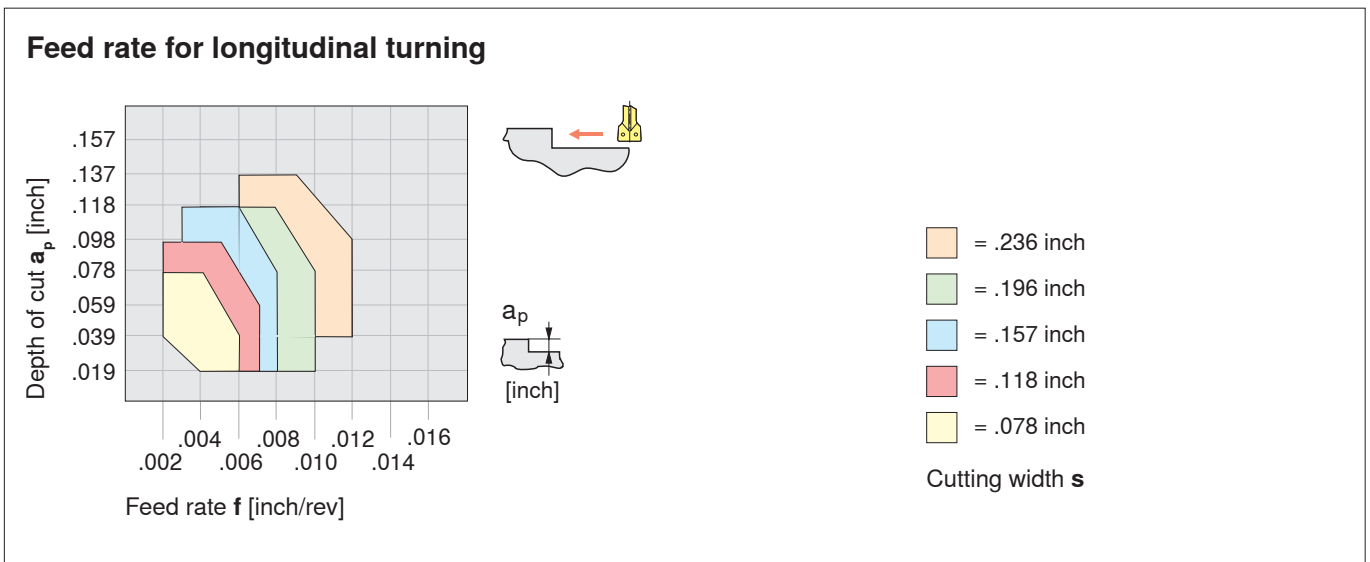
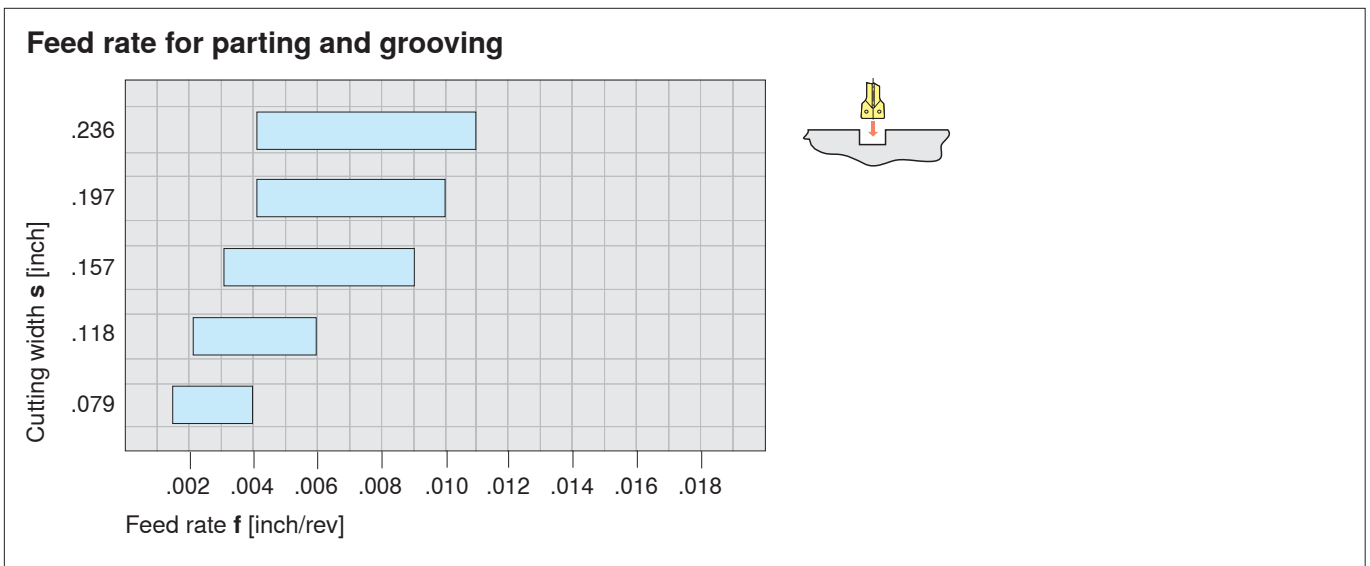
GX24

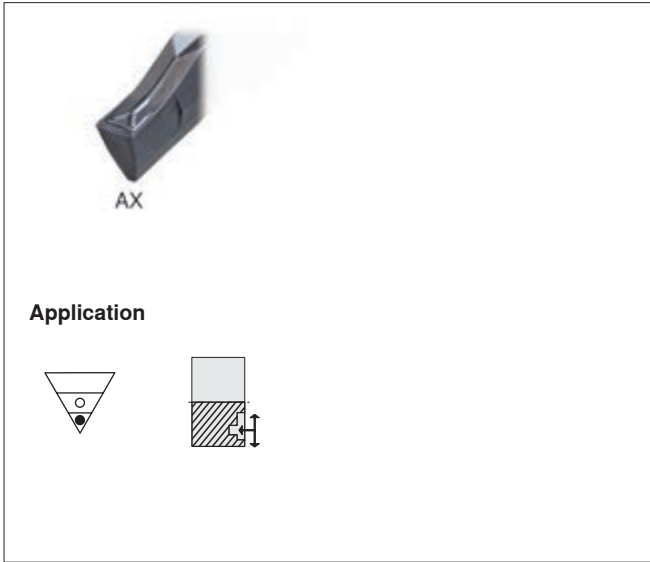
Application

Standard

- For all steel materials
- For universal application
- Wide application range

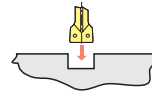
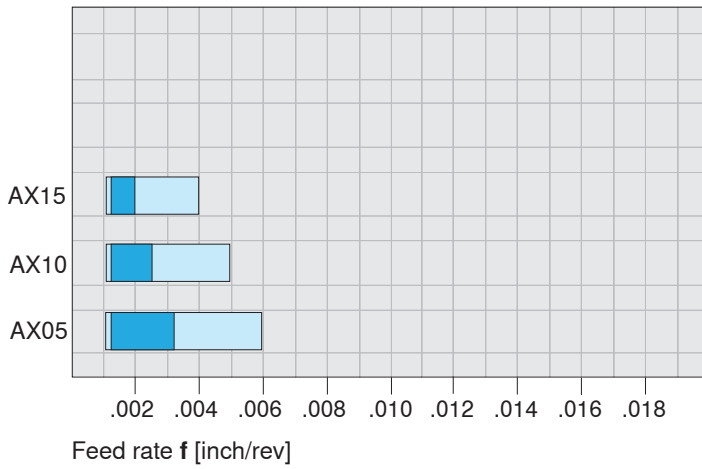




-F50

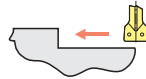
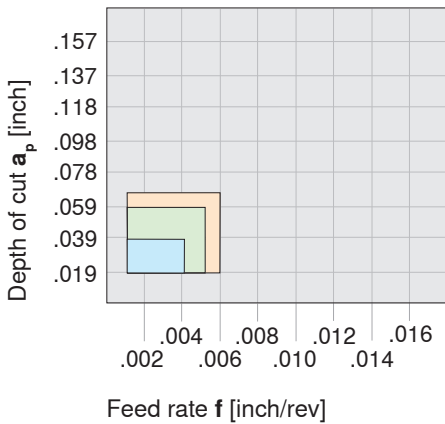
- Universal geometry for:
 - **Steel**
 - **Stainless steel**
 - Cast iron
 - Non-ferrous metals
- Insert with ground periphery
- Tolerance cutting width $\pm .000787$ inch

Feed rate axial grooving



- ... f feed rate for the first groove
- ... feed rate range f

Feed rate face turning

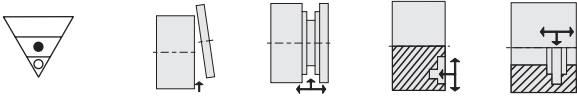


- = AX15
 - = AX10
 - = AX05
- Cutting width **s**



SX/LX

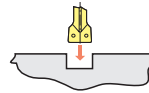
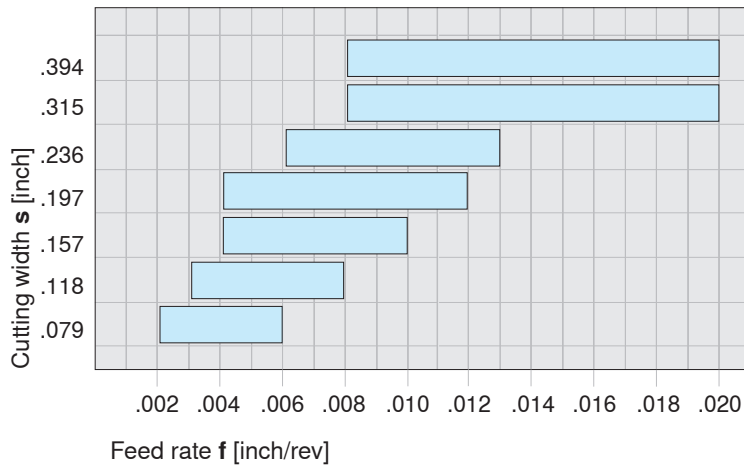
Application



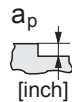
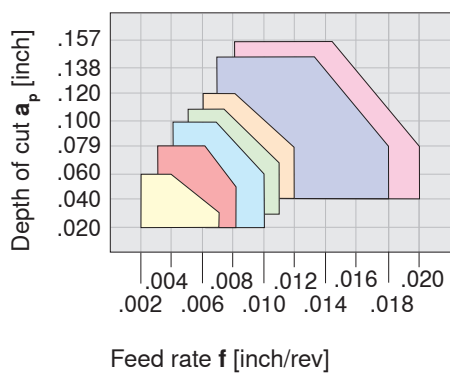
-M2

- For grooving and turning
- Suitable for all steel and cast iron materials
- Very good chip control

Feed rate for parting and grooving

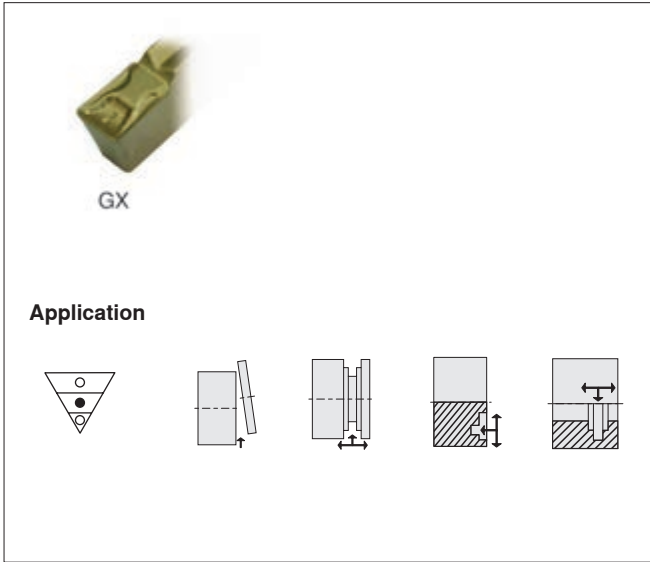


Feed rate for longitudinal turning



- = .393 inch
- = .315 inch
- = .236 inch
- = .197 inch
- = .157 inch
- = .118 inch
- = .079 inch

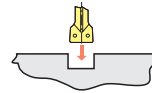
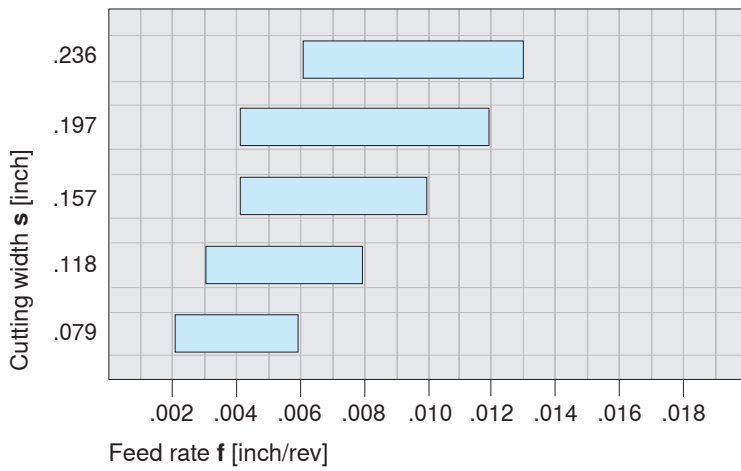
Cutting width s



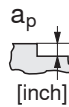
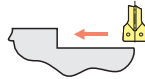
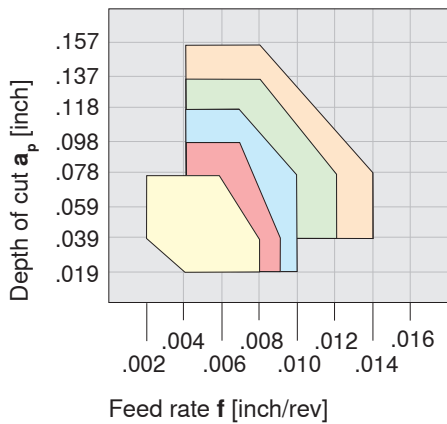
-M40

- For grooving and turning
- Suitable for all steel materials
- Very good chip control
- Tolerance cutting width $\pm .00196$ inch

Feed rate for parting and grooving




Feed rate for longitudinal turning




- = .236 inch
- = .196 inch
- = .157 inch
- = .118 inch
- = .078 inch

Cutting width s






GX16/
GX24







SX



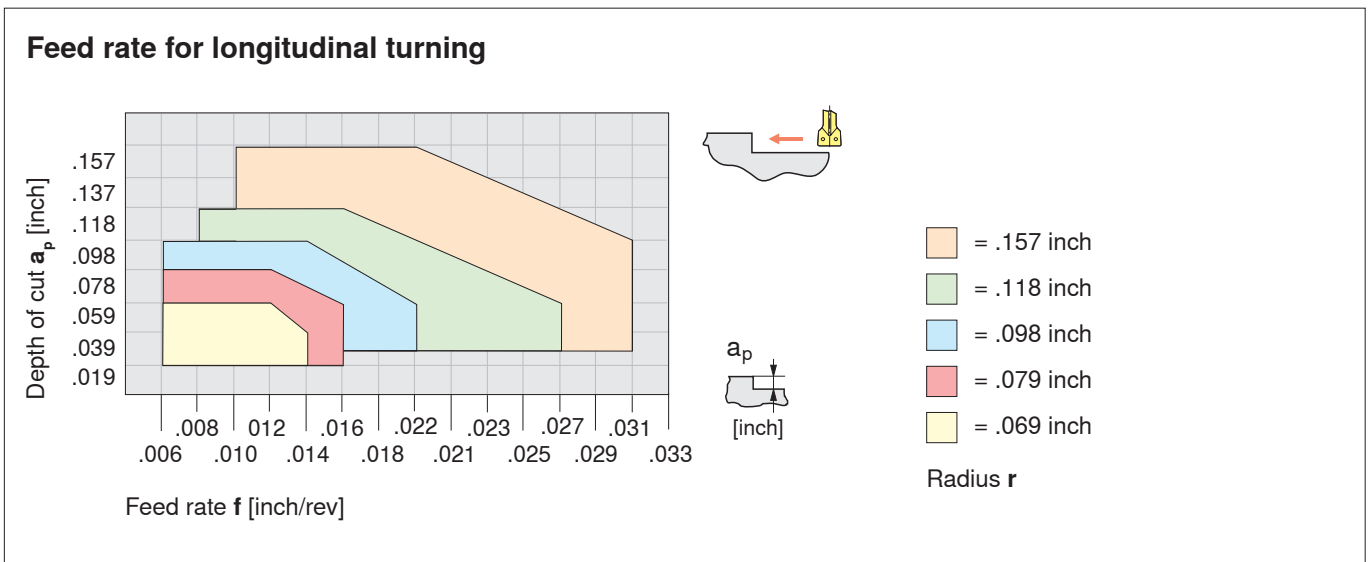
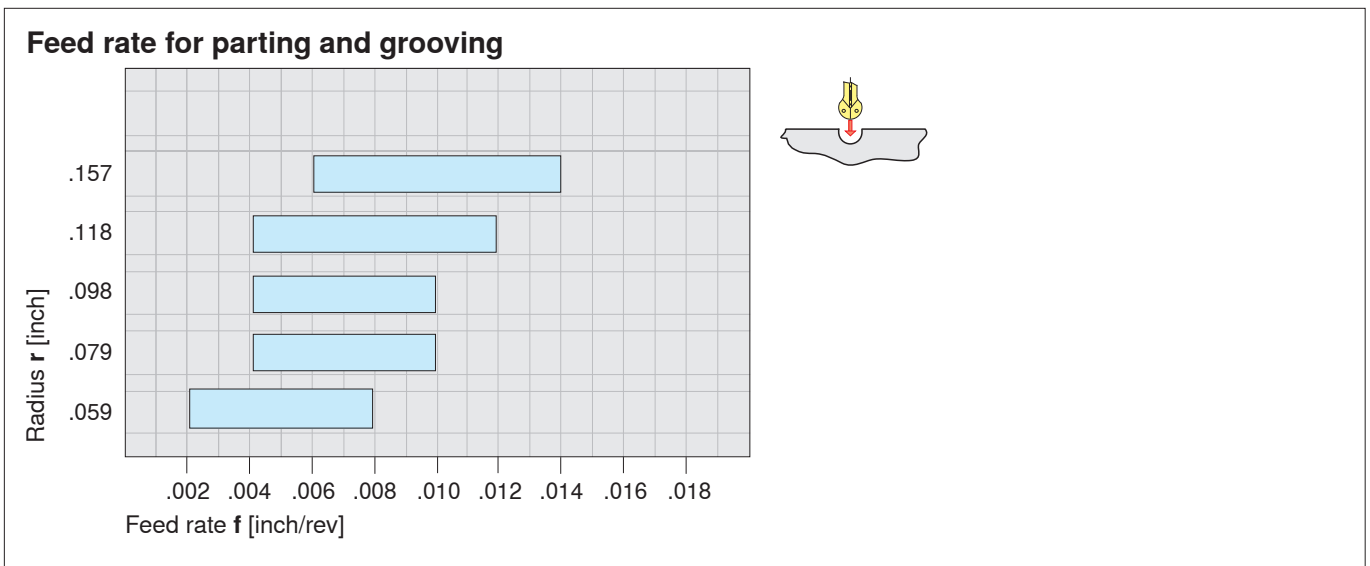
LX

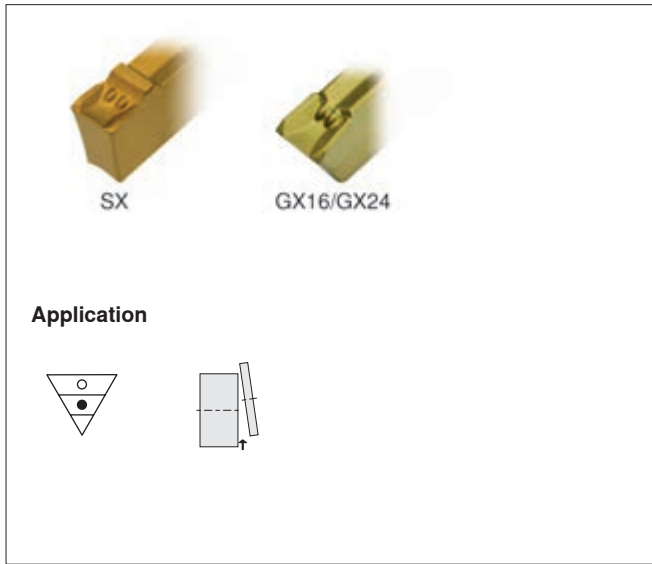
Application

-M3

- Insert for radius grooves and copy turning
- For all steel materials
- For internal and external machining

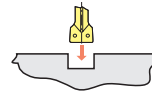
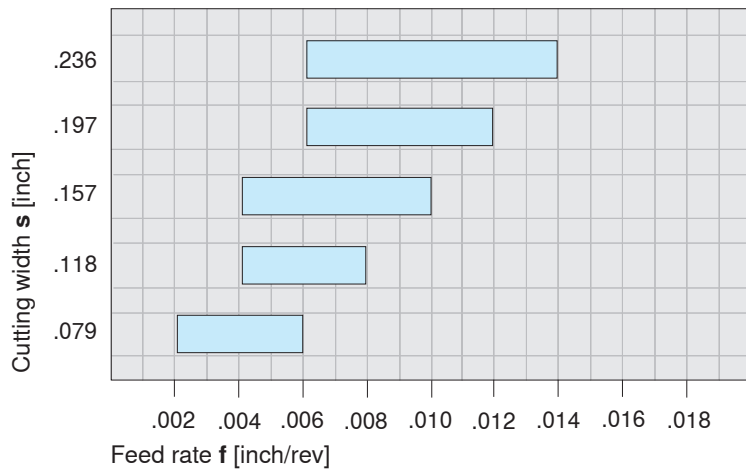




-M1

- Insert with narrow negative chamfer
- Suitable for all steel materials with high strength
- Universally applicable grade
- For steel and gray cast iron

Feed rate for parting and grooving





SX

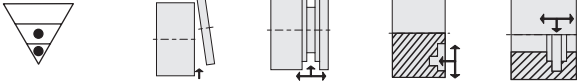


GX16



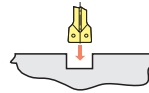
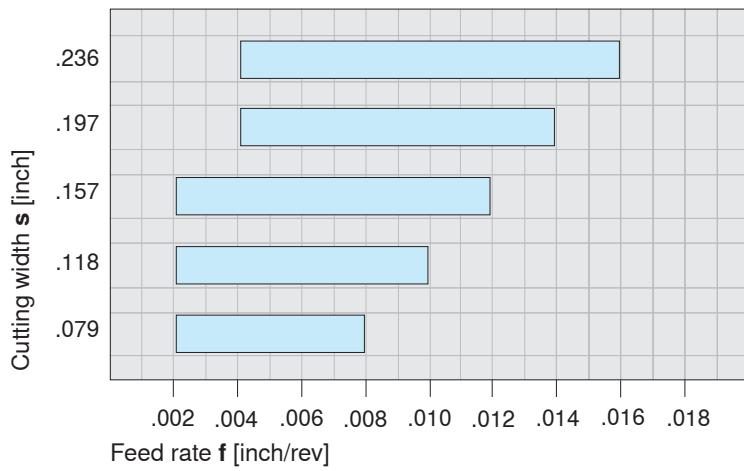
GX24

Application

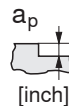
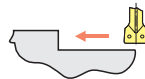
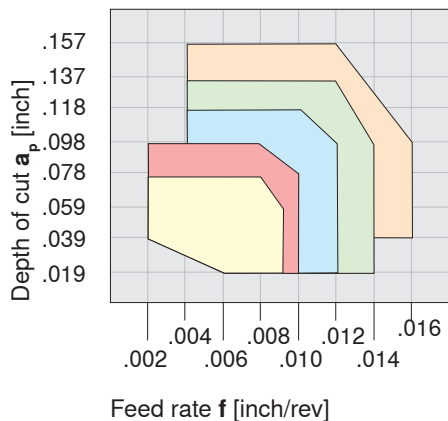


-27P

- Particularly suitable for **aluminum and non-ferrous metals**
- Insert with highly positive cutting geometry and sharp cutting edge
- Insert with ground periphery
- Tolerance cutting width $\pm .000787$ inch
- Extra-smooth rake face through 'microfinish'

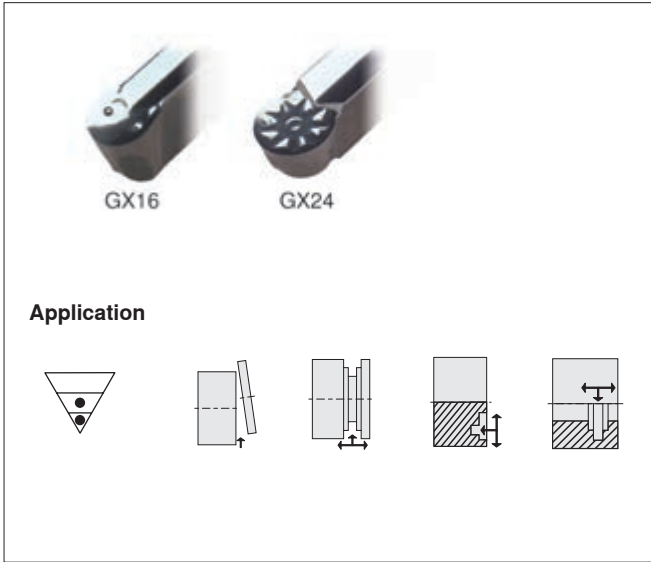


Feed rate for parting and grooving



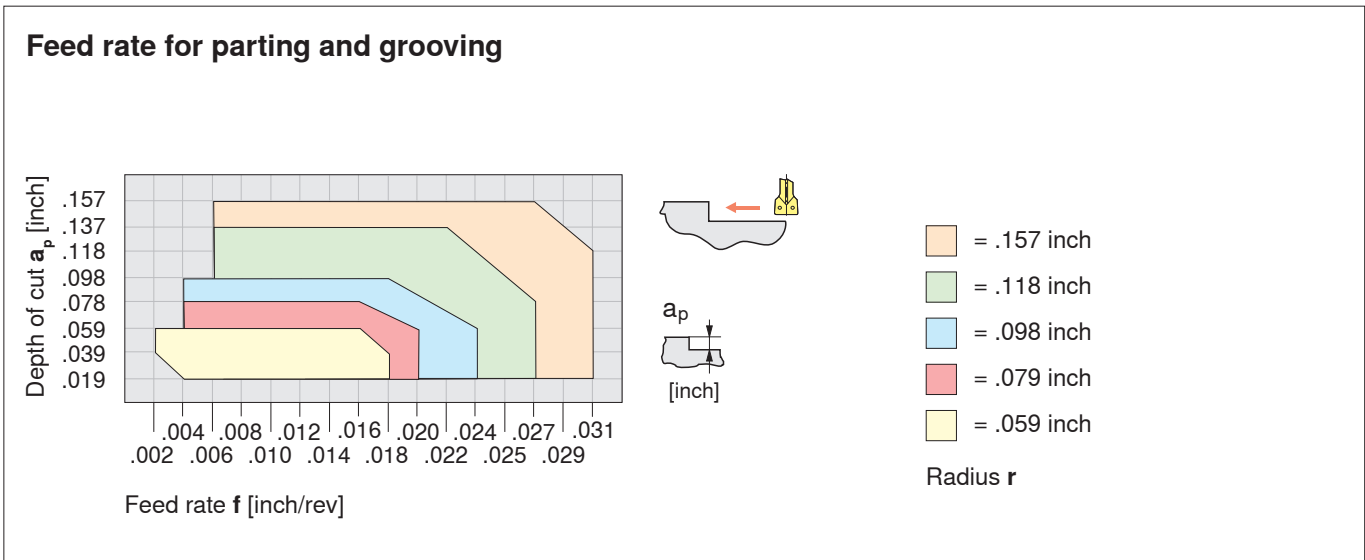
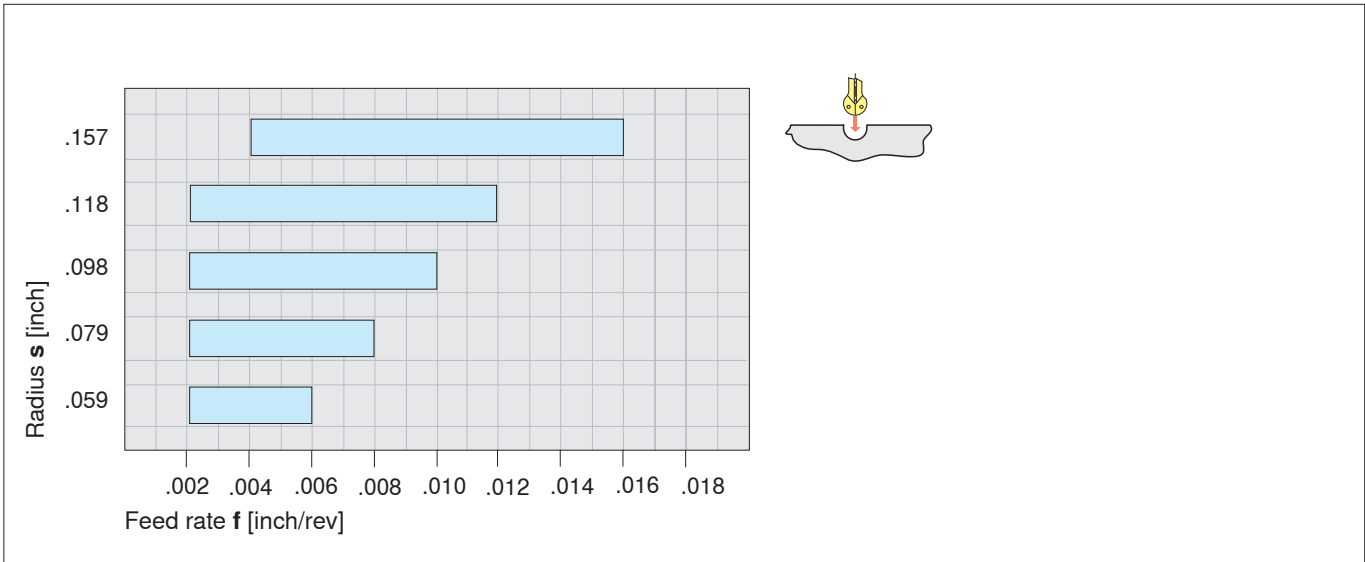
- = .236 inch
- = .197 inch
- = .157 inch
- = .118 inch
- = .079 inch

Cutting width s



-27P

- Particularly suitable for **aluminium and non-ferrous metals**
- Insert with highly positive cutting geometry and sharp cutting edge
- Insert with ground periphery
- Tolerance cutting width $\pm .000787$ inch
- Extra-smooth rake face through 'microfinish'





FX

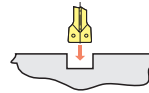
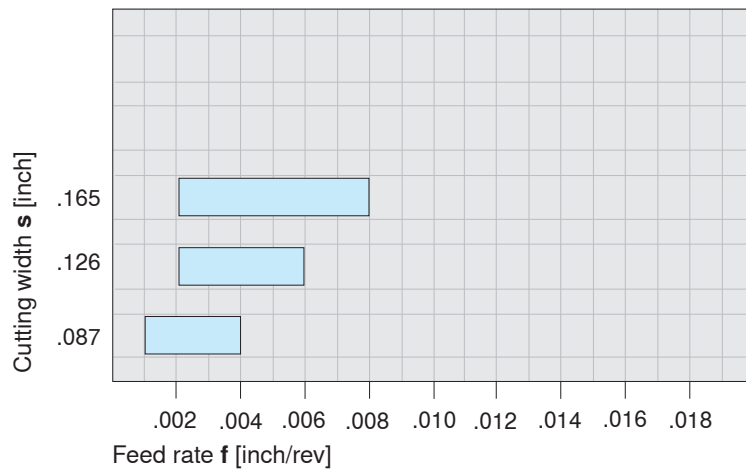
Application

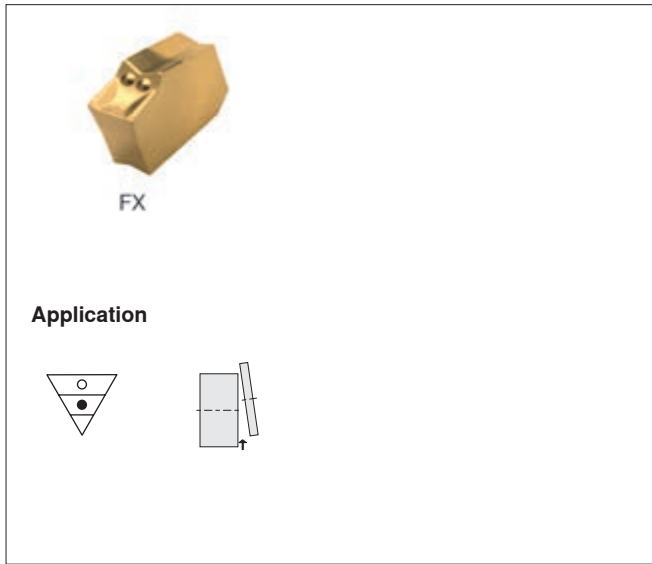


-F1

- Excellent cutting geometry with low cutting forces
- For low or medium strength materials
- Particularly suitable for parting off tubes and thin-walled work pieces
- Excellent chip control also with low feed
- Reduced built-up edge

Feed rate for parting and grooving

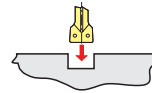
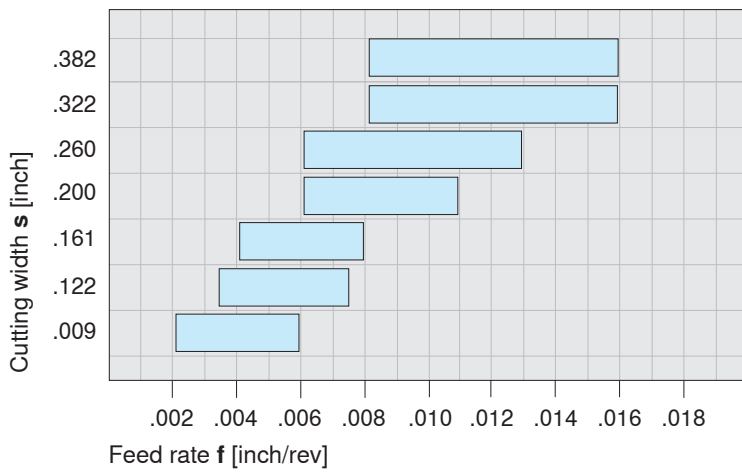




-M1

- Insert with narrow negative chamfer
- Suitable for all steel materials with high strength
- Universal application
- For steel and gray cast iron

Feed rate for parting and grooving





FX

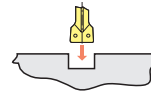
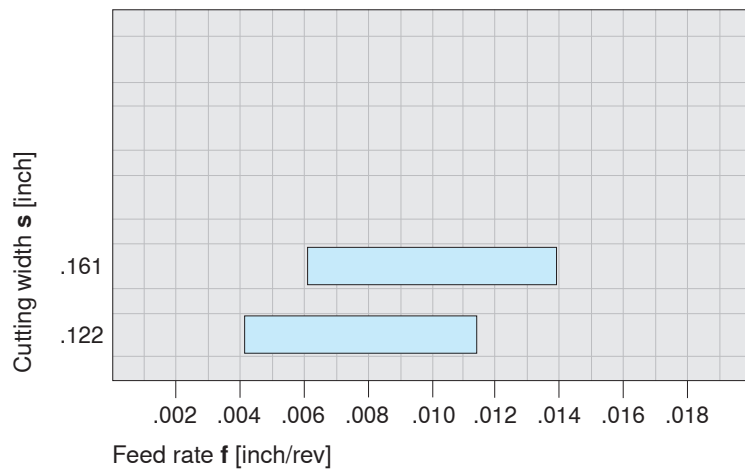
Application

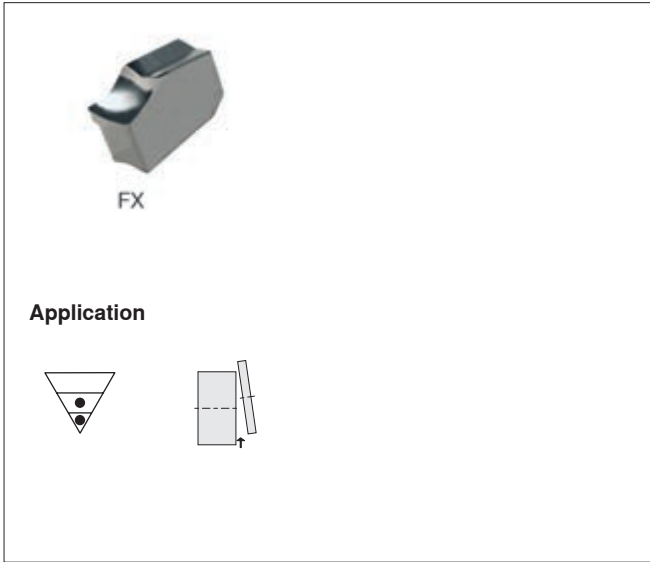


-R2

- Insert with excellent chip formation for a wide feed range
- Very stable cutting edge
- Particularly suitable for economic parting when rather intensive formation of burrs and chips does not cause any problems

Feed rate for parting and grooving

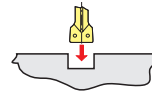
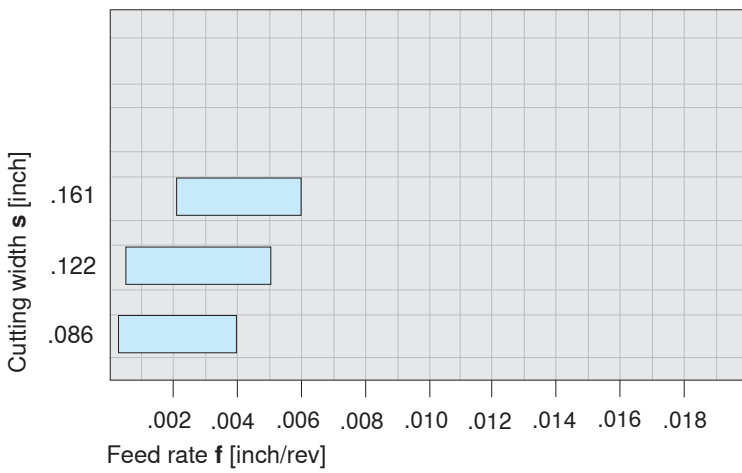


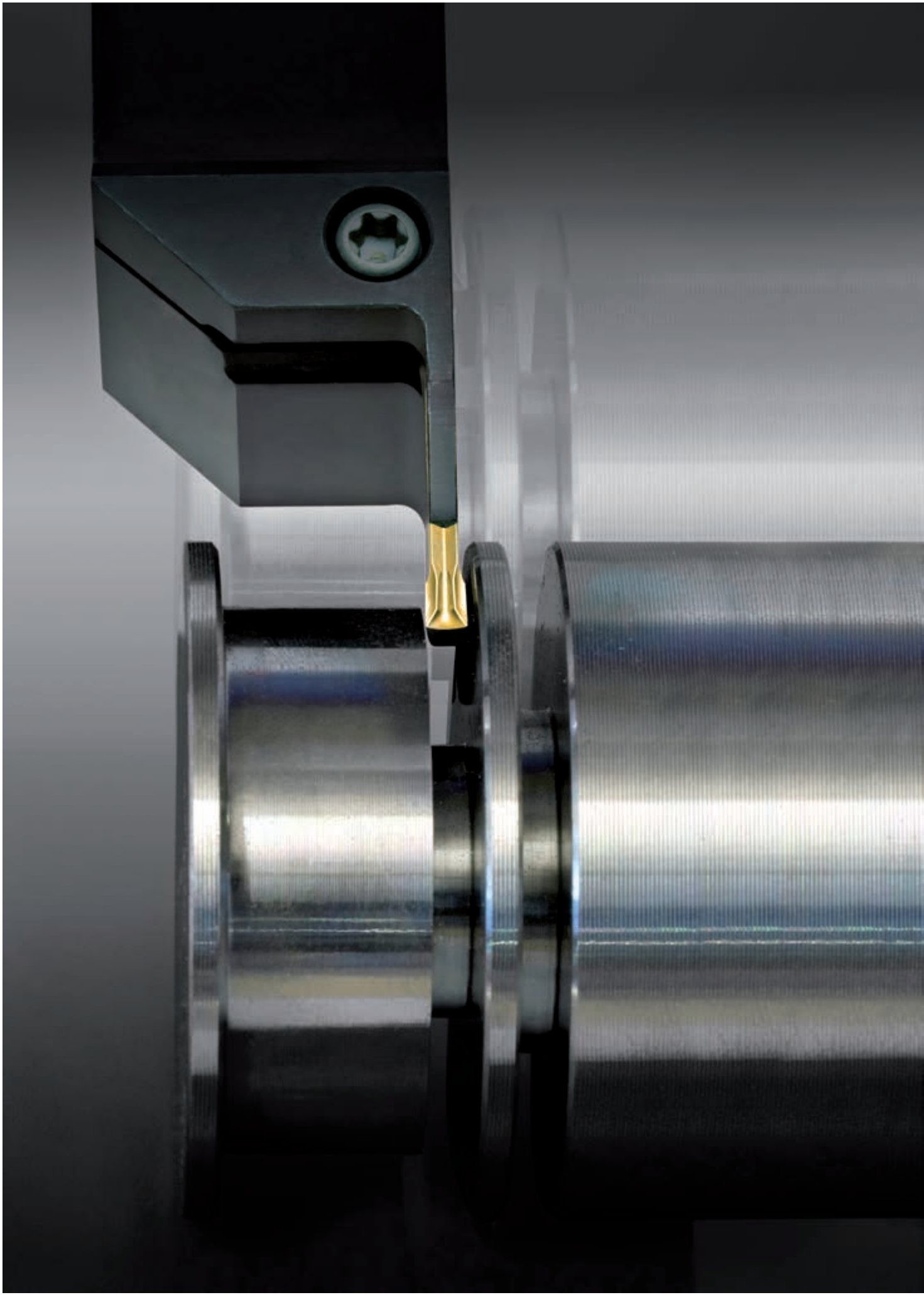


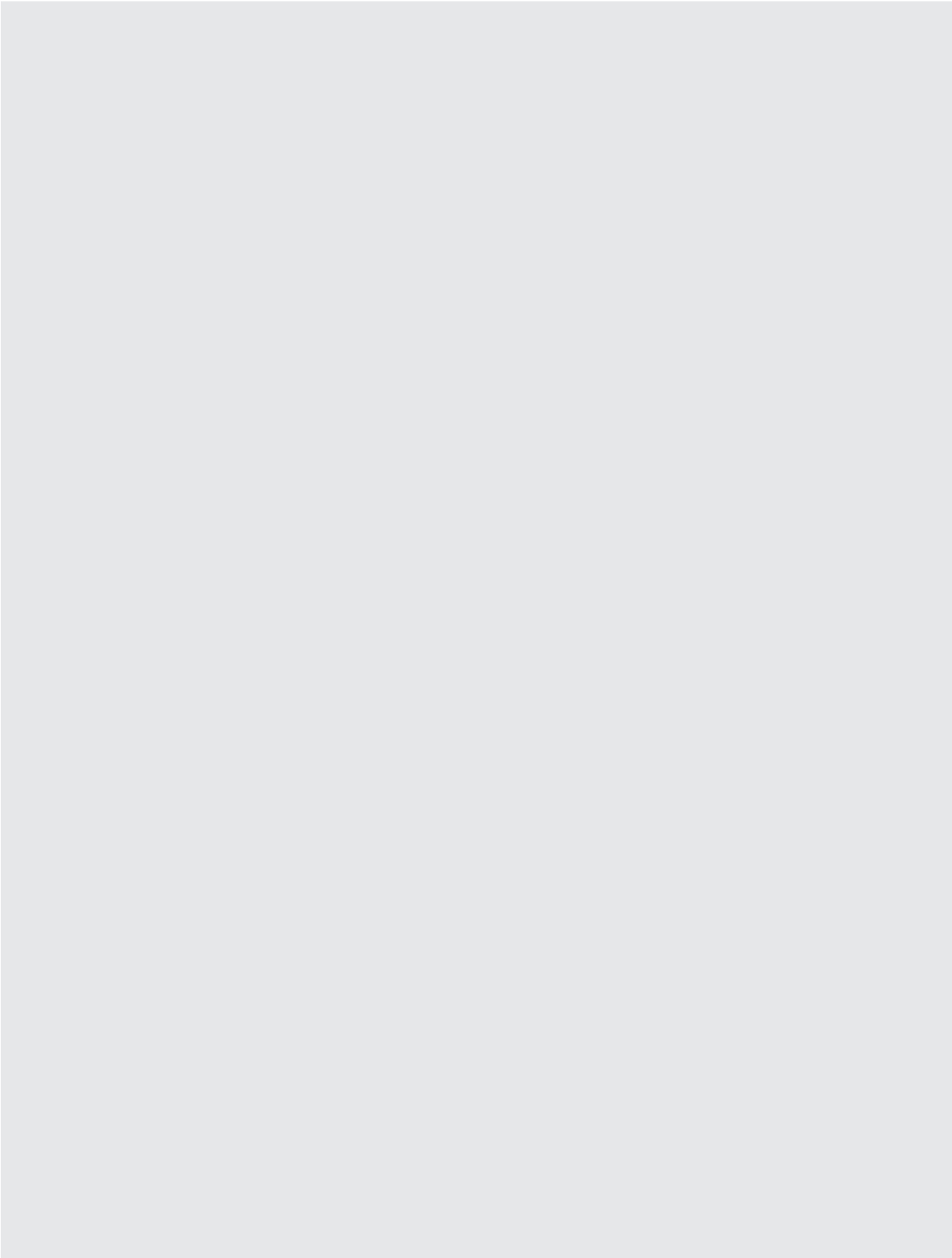
-27P

- Particularly suitable for **aluminum and non-ferrous metals**
- Insert with highly positive cutting geometry and sharp cutting edge
- Extra-smooth rake face through 'microfinish'
- Reduced built-up edge

Feed rate for parting and grooving












Part-off

	Modular system	C68-C70
	Clamping blocks, blades	C71-C73
	Monoblock	C74-C75

Grooving and turning

	Modular system - external	C76-C80
	Monoblock - external	C81
	Modular system - internal	C82-C86
	Monoblock boring bars – internal	C87


Circlip grooves

	Modular system - external	C88-C92
	Monoblock - external	C93
	Modular system - internal	C94-C98
	Monoblock boring bars – internal	C99


Radius grooves

	Modular system - external	C100-C104
	Monoblock - external	C105-C106
	Modular system - internal	C107-C111
	Monoblock boring bars – internal	C112

Axial grooving

	Modular system	C113-C119
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External recessing

	Modular system	C120-C123
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Threading (turning)

	Modular system - external	C124-C127
	Monoblock - external	C128
	Modular system - internal	C130-C131
	Monoblock boring bars – internal	C132



Threading (milling)



Modular system

C134-C135



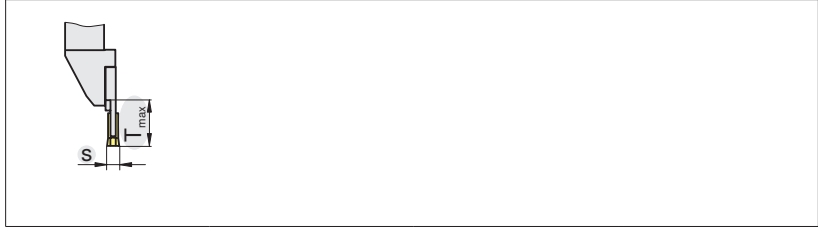
Monoblock

C136



Part-off

Modular system, assembly size 20



Application

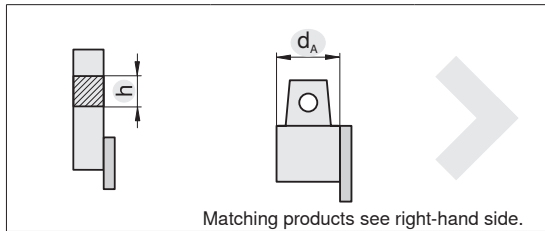
		h/d _A [inch]	L R	Type, description
C156		.625	R	MSS-E20R00-10-E
		.750	R	MSS-E20R00-12-E
	0			
C157		.750	L	MSS-E20L90-12-E
	90			

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description			
C161		.079	.108	.472	R	MSS-E20R12-GX16-1	GX16-1..	C140	
		.109	.147	.472	R	MSS-E20R12-GX16-2	GX16-2..	C140	
		.148	.197	.472	R	MSS-E20R12-GX16-3	GX16-3..	C140	
C162		.079	.108	.827	R	MSS-E20R21-GX24-1	GX24-1..	C140	
		.109	.147	.827	R	MSS-E20R21-GX24-2	GX24-2..	C140	
		.148	.197	.827	R	MSS-E20R21-GX24-3	GX24-3..	C140	
C168		.079		.787	R	MSS-E20R20-SX2	SX.2	C145	
		.118		.787	R	MSS-E20R20-SX3	SX.3	C145	
C170		.087		.787	R	MSS-E20R20-FX2.2	FX 2.2..	C147	
		.122		.787	R	MSS-E20R20-FX3.1	FX 3.1..	C147	
		.161		.787	R	MSS-E20R20-FX4.1	FX 4.1..	C147	

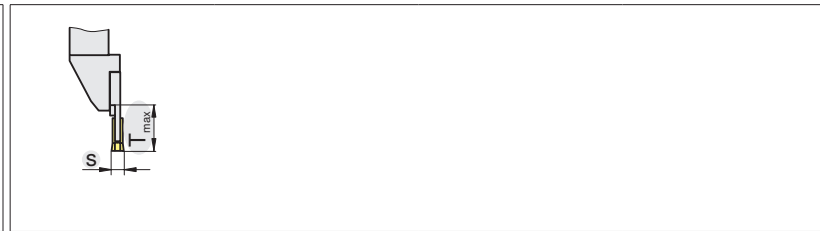
		h/d _A [inch]	L R	Type, description
C156		.625	L	MSS-E20L00-10-E
		.750	L	MSS-E20L00-12-E
	0			
C157		.750	R	MSS-E20R90-12-E
	90			

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description			
C161		.079	.108	.472	L	MSS-E20L12-GX16-1	GX16-1..	C140	
		.109	.147	.472	L	MSS-E20L12-GX16-2	GX16-2..	C140	
		.148	.197	.472	L	MSS-E20L12-GX16-3	GX16-3..	C140	
C162		.079	.108	.827	L	MSS-E20L21-GX24-1	GX24-1..	C140	
		.109	.147	.827	L	MSS-E20L21-GX24-2	GX24-2..	C140	
		.148	.197	.827	L	MSS-E20L21-GX24-3	GX24-3..	C140	
C168		.079		.787	L	MSS-E20L20-SX2	SX.2	C145	
		.118		.787	L	MSS-E20L20-SX3	SX.3	C145	
C170		.087		.787	L	MSS-E20L20-FX2.2	FX 2.2..	C147	
		.122		.787	L	MSS-E20L20-FX3.1	FX 3.1..	C147	
		.161		.787	L	MSS-E20L20-FX4.1	FX 4.1..	C147	

Tools and inserts for parting and grooving



Matching products see right-hand side.



		h/d _A [inch]	LR Type, description
C156		1.000	R MSS-E25R00-16-E
	0		
C157		1.000	L MSS-E25L90-16-E
	90		
C196		2.480	R HSK-T63-MSS-E25R00
	0		

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	LR Type, description		
C161		.079	.108	.472	R MSS-E25R12-GX16-1	GX16-1..	C140
		.109	.147	.472	R MSS-E25R12-GX16-2	GX16-2..	C140
		.148	.197	.472	R MSS-E25R12-GX16-3	GX16-3..	C140
		.198	.256	.472	R MSS-E25R12-GX16-4	GX16-4..	C140
C162		.079	.108	.827	R MSS-E25R21-GX24-1	GX24-1..	C140
		.109	.147	.827	R MSS-E25R21-GX24-2	GX24-2..	C140
		.148	.197	.827	R MSS-E25R21-GX24-3	GX24-3..	C140
		.198	.256	.827	R MSS-E25R21-GX24-4	GX24-4..	C140
C168		.079		.787	R MSS-E25R20-SX2	SX..2	C145
		.118		.984	R MSS-E25R25-SX3	SX..3	C145
		.118		1.378	R MSS-E25R35-SX3	SX..3	C145
		.157		.984	R MSS-E25R25-SX4	SX..4	C145
		.157		1.378	R MSS-E25R35-SX4	SX..4	C145
C170		.087		.787	R MSS-E25R20-FX2.2	FX 2.2..	C147
		.122		.984	R MSS-E25R25-FX3.1	FX 3.1..	C147
		.161		.984	R MSS-E25R25-FX4.1	FX 4.1..	C147
		.201		.984	R MSS-E25R25-FX5.1	FX 5.1..	C147
		.256		.984	R MSS-E25R25-FX6.5	FX 6.5..	C147
C171		.122		1.378	R MSS-E25R35-FX3.1	FX 3.1..	C147
		.161		1.378	R MSS-E25R35-FX4.1	FX 4.1..	C147
		.201		1.378	R MSS-E25R35-FX5.1	FX 5.1..	C147
		.256		1.378	R MSS-E25R35-FX6.5	FX 6.5..	C147

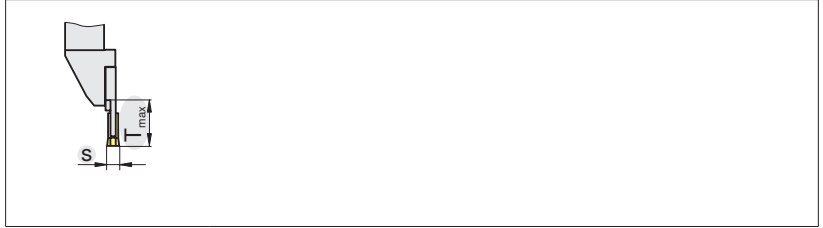
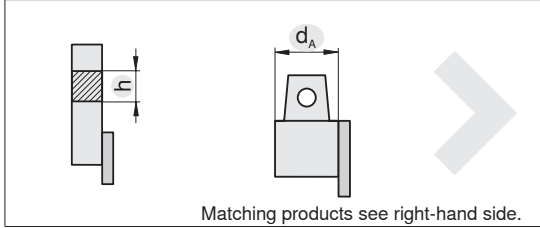
		h/d _A [inch]	LR Type, description
C156		1.000	L MSS-E25L00-16-E
	0		
C157		1.000	R MSS-E25R90-16-E
	90		
C196		2.480	L HSK-T63-MSS-E25L00
	0	3.937	L HSK-T100-MSS-E25L00

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	LR Type, description		
C161		.079	.108	.472	L MSS-E25L12-GX16-1	GX16-1..	C140
		.109	.147	.472	L MSS-E25L12-GX16-2	GX16-2..	C140
		.148	.197	.472	L MSS-E25L12-GX16-3	GX16-3..	C140
		.198	.256	.472	L MSS-E25L12-GX16-4	GX16-4..	C140
C162		.079	.108	.827	L MSS-E25L21-GX24-1	GX24-1..	C140
		.109	.147	.827	L MSS-E25L21-GX24-2	GX24-2..	C140
		.148	.197	.827	L MSS-E25L21-GX24-3	GX24-3..	C140
		.198	.256	.827	L MSS-E25L21-GX24-4	GX24-4..	C140
C168		.079		.787	L MSS-E25L20-SX2	SX..2	C145
		.118		1.378	L MSS-E25L35-SX3	SX..3	C145
		.118		.984	L MSS-E25L25-SX3	SX..3	C145
		.157		.984	L MSS-E25L25-SX4	SX..4	C145
		.157		1.378	L MSS-E25L35-SX4	SX..4	C145
C170		.087		.787	L MSS-E25L20-FX2.2	FX 2.2..	C147
		.122		.984	L MSS-E25L25-FX3.1	FX 3.1..	C147
		.161		.984	L MSS-E25L25-FX4.1	FX 4.1..	C147
		.201		.984	L MSS-E25L25-FX5.1	FX 5.1..	C147
		.256		.984	L MSS-E25L25-FX6.5	FX 6.5..	C147
C171		.122		1.378	L MSS-E25L35-FX3.1	FX 3.1..	C147
		.161		1.378	L MSS-E25L35-FX4.1	FX 4.1..	C147
		.201		1.378	L MSS-E25L35-FX5.1	FX 5.1..	C147
		.256		1.378	L MSS-E25L35-FX6.5	FX 6.5..	C147



Part-off

Modular system, assembly size 32



Matching products see right-hand side.

Application

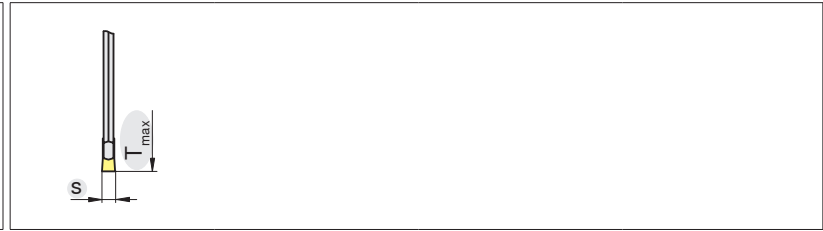
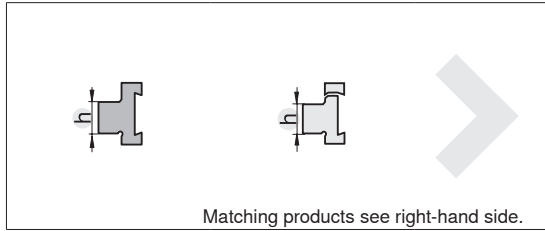
Tools and inserts for parting and grooving

		h/d _A [inch]	L R	Type, description
C156		1.250	R	MSS-E32R00-20-E
		1.250	R	MSS-E32R00-85-E
		0		
C157		1.250	L	MSS-E32L90-20-E
		1.250	L	MSS-E32L90-85-E
		90		
C196		3.937	R	HSK-T100-MSS-E32R00
		2.480	R	HSK-T63-MSS-E32R00
		0		
C197		3.937	L	HSK-T100-MSS-E32L90
		2.480	L	HSK-T63-MSS-E32L90
		90		

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description		
C161		.109	.147	.472	R	MSS-E32R12-GX16-2	GX16-2..	C140
		.148	.197	.472	R	MSS-E32R12-GX16-3	GX16-3..	C140
		.198	.256	.472	R	MSS-E32R12-GX16-4	GX16-4..	C140
C162		.109	.147	.827	R	MSS-E32R21-GX24-2	GX24-2..	C140
		.148	.197	.827	R	MSS-E32R21-GX24-3	GX24-3..	C140
		.198	.256	.827	R	MSS-E32R21-GX24-4	GX24-4..	C140
C168		.118		1.378	R	MSS-E32R35-SX3	SX..3	C145
		.157		1.378	R	MSS-E32R35-SX4	SX..4	C145
C169		.315	.394	.984	N	MSS-E32N25-LX	LX..	C146
		.315	.394	1.260	N	MSS-E32N32-LX	LX..	C146
		.315	.394	1.772	N	MSS-E32N45-LX	LX..	C146
C170		.122		1.260	R	MSS-E32R32-FX3.1	FX 3.1..	C147
		.161		1.260	R	MSS-E32R32-FX4.1	FX 4.1..	C147
		.201		1.260	R	MSS-E32R32-FX5.1	FX 5.1..	C147
		.256		1.260	R	MSS-E32R32-FX6.5	FX 6.5..	C147
C171		.122		1.772	R	MSS-E32R45-FX3.1	FX 3.1..	C147
		.161		1.772	R	MSS-E32R45-FX4.1	FX 4.1..	C147
		.201		1.772	R	MSS-E32R45-FX5.1	FX 5.1..	C147
		.256		1.772	R	MSS-E32R45-FX6.5	FX 6.5..	C147

		h/d _A [inch]	L R	Type, description
C156		1.250	L	MSS-E32L00-85-E
		1.250	L	MSS-E32L00-20-E
		0		
C157		1.250	R	MSS-E32R90-85-E
		1.250	R	MSS-E32R90-20-E
		90		
C196		2.480	L	HSK-T63-MSS-E32L00
		0		
C197		2.480	R	HSK-T63-MSS-E32R90
		3.937	R	HSK-T100-MSS-E32R90
		90		

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description		
C161		.109	.147	.472	L	MSS-E32L12-GX16-2	GX16-2..	C140
		.148	.197	.472	L	MSS-E32L12-GX16-3	GX16-3..	C140
		.198	.256	.472	L	MSS-E32L12-GX16-4	GX16-4..	C140
C162		.109	.147	.827	L	MSS-E32L21-GX24-2	GX24-2..	C140
		.148	.197	.827	L	MSS-E32L21-GX24-3	GX24-3..	C140
		.198	.256	.827	L	MSS-E32L21-GX24-4	GX24-4..	C140
C168		.118		1.378	L	MSS-E32L35-SX3	SX..3	C145
		.157		1.378	L	MSS-E32L35-SX4	SX..4	C145
C169		.315	.394	.984	N	MSS-E32N25-LX	LX..	C146
		.315	.394	1.260	N	MSS-E32N32-LX	LX..	C146
		.315	.394	1.772	N	MSS-E32N45-LX	LX..	C146
C170		.122		1.260	L	MSS-E32L32-FX3.1	FX 3.1..	C147
		.161		1.260	L	MSS-E32L32-FX4.1	FX 4.1..	C147
		.201		1.260	L	MSS-E32L32-FX5.1	FX 5.1..	C147
		.256		1.260	L	MSS-E32L32-FX6.5	FX 6.5..	C147
C171		.122		1.772	L	MSS-E32L45-FX3.1	FX 3.1..	C147
		.161		1.772	L	MSS-E32L45-FX4.1	FX 4.1..	C147
		.201		1.772	L	MSS-E32L45-FX5.1	FX 5.1..	C147
		.256		1.772	L	MSS-E32L45-FX6.5	FX 6.5..	C147



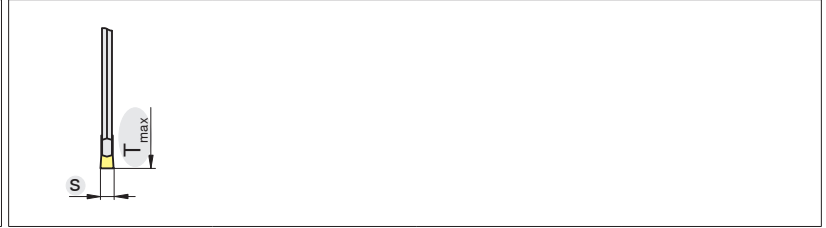
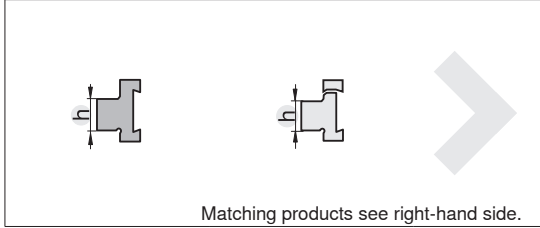
		h [inch]	^L _R	Type, description
C181		.750	N	SBN 12-26K-E
C182		.750	N	SBN 12-26KS-E




		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	^L _R	Type, description			
C176		.079		.984	R	XLCFR 2602-SX2	SX..2	C145	
		.079		.984	L	XLCFL 2602-SX2	SX..2	C145	
		.118		1.378	N	XLCFN 2603-SX3	SX..3	C145	
		.157		1.575	N	XLCFN 2604-SX4	SX..4	C145	
C177		.079		.866	R	XLCFR 2608-SX2	SX..2	C145	
		.079		.866	L	XLCFL 2608-SX2	SX..2	C145	
		.118		.866	R	XLCFR 2608-SX3	SX..3	C145	
		.118		.866	L	XLCFL 2608-SX3	SX..3	C145	
C180		.087		.984	N	XLCEN 2602 J22 FX	FX 2.2..	C147	
		.122		1.378	N	XLCFN 2603 J31 FX	FX 3.1..	C147	
		.161		1.575	N	XLCFN 2604 J41 FX	FX 4.1..	C147	








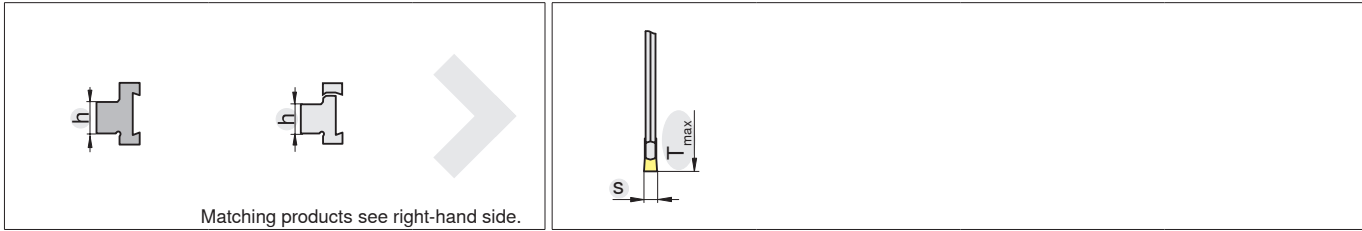
Part-off

Clamping blocks, blades, height 32



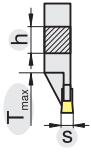
		h [inch]		Type, description
C181		1.000	N	SBN 16-32K-E
		1.250	N	SBN 20-32K-E
C182		1.250	N	SBN 20-32KS-E
		1.000	N	SBN 16-32KS-E




		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]		Type, description		
C175		.079	.108	.827	N	XLCFN 3202-GX24-1S	GX24-1..	C140
		.109	.147	.827	N	XLCFN 3203 GX24-2S	GX24-2..	C140
		.148	.197	.827	N	XLCFN 3204 GX24-3S	GX24-3..	C140
		.198	.256	.827	N	XLCFN 3206 GX24-4S	GX24-4..	C140
C176		.079		.984	R	XLCFR 3202-SX2	SX..2	C145
		.079		.984	L	XLCFR 3202-SX2	SX..2	C145
		.118		1.969	N	XLCFN 3203-SX3	SX..3	C145
		.157		1.969	N	XLCFN 3204-SX4	SX..4	C145
		.197		2.165	N	XLCFN 3205-SX5	SX..5	C145
		.236		2.362	N	XLCFN 3206-SX6	SX..6	C145
C178		.118		1.300	L	XLCFR 3208-SX3	SX..3	C145
		.118		1.300	R	XLCFR 3208-SX3	SX..3	C145
		.157		1.300	R	XLCFR 3208-SX4	SX..4	C145
		.157		1.300	L	XLCFR 3208-SX4	SX..4	C145
C180		.087		1.181	N	XLCFN 3202 M22 FX	FX 2.2..	C147
		.122		1.969	N	XLCFN 3203 M31 FX	FX 3.1..	C147
		.161		1.969	N	XLCFN 3204 M41 FX	FX 4.1..	C147
		.201		2.165	N	XLCFN 3205 M51 FX	FX 5.1..	C147
		.256		2.165	N	XLCFN 3206 M65 FX	FX 6.5..	C147

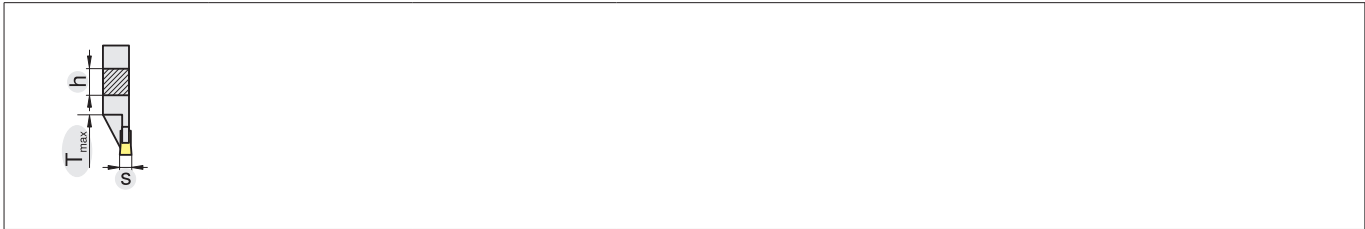


Matching products see right-hand side.

		h		Type, description		s/s _{min}	s _{max}	T _{max}		Type, description			
		[inch]				[inch]	[inch]	[inch]				[inch]	[inch]	[inch]	LX..	C146
C181		1.500	N	SBN 24-46K-E		.315	.394	3.150	N	XLCEN 4608 LX	LX..	C146	
		1.250	N	SBN 20-46K-E									
C180						.323		3.150	N	XLCEN 4608 S82 FX	FX 8.2..	C147	
							.382		3.150	N	XLCEN 4609 S97 FX	FX 9.7..	C147



		h [inch]	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]		Type, description		
C173		.625	.109	.147	.827	R	E16R0021-10C-GX24-2-E	GX24-2..	C140
		.750	.109	.147	.827	R	E20R0021-12C-GX24-2-E	GX24-2..	C140
		.750	.148	.197	.827	R	E20R0021-12C-GX24-3-E	GX24-3..	C140
		1.000	.109	.147	.827	R	E25R0021-16D-GX24-2-E	GX24-2..	C140
		1.000	.148	.197	.827	R	E25R0021-16D-GX24-3-E	GX24-3..	C140
		1.000	.198	.256	.827	R	E25R0021-16D-GX24-4-E	GX24-4..	C140
		1.250	.109	.147	.827	R	E32R0021-85D-GX24-2-E	GX24-2..	C140
		1.250	.148	.197	.827	R	E32R0021-85D-GX24-3-E	GX24-3..	C140
		1.250	.198	.256	.827	R	E32R0021-85D-GX24-4-E	GX24-4..	C140
		.625	.109	.147	.827	L	E16L0021-10C-GX24-2-E	GX24-2..	C140
		.750	.109	.147	.827	L	E20L0021-12C-GX24-2-E	GX24-2..	C140
		.750	.148	.197	.827	L	E20L0021-12C-GX24-3-E	GX24-3..	C140
		1.000	.109	.147	.827	L	E25L0021-16D-GX24-2-E	GX24-2..	C140
		1.000	.148	.197	.827	L	E25L0021-16D-GX24-3-E	GX24-3..	C140
		1.000	.198	.256	.827	L	E25L0021-16D-GX24-4-E	GX24-4..	C140
		1.250	.109	.147	.827	L	E32L0021-85D-GX24-2-E	GX24-2..	C140
		1.250	.148	.197	.827	L	E32L0021-85D-GX24-3-E	GX24-3..	C140
		1.250	.198	.256	.827	L	E32L0021-85D-GX24-4-E	GX24-4..	C140



		h [inch]	s [inch]	T _{max} [inch]	L R	Type, description		
C174		.375	.087	.591	R	XLCER 06 M22 FX-E	FX 2.2..	C147
		.500	.087	.591	R	XLCER 08 M22 FX-E	FX 2.2..	C147
		.500	.087	.591	R	XLCER 08 F22 FX-E	FX 2.2..	C147
		.563	.087	.591	R	XLCER 09 M22 FX-E	FX 2.2..	C147
		.625	.087	.591	R	XLCER 10 H22 FX-E	FX 2.2..	C147
		.625	.122	.689	R	XLCFR 10 H31 FX-E	FX 3.1..	C147
		.750	.122	.787	R	XLCFR 12 K31 FX-E	FX 3.1..	C147
		.750	.161	.787	R	XLCFR 12 K41 FX-E	FX 4.1..	C147
		1.000	.122	.984	R	XLCFR 64 M31 FX-E	FX 3.1..	C147
		1.000	.161	.984	R	XLCFR 64 M41 FX-E	FX 4.1..	C147
		.375	.087	.591	L	XLCEL 06 M22 FX-E	FX 2.2..	C147
		.500	.087	.591	L	XLCEL 08 F22 FX-E	FX 2.2..	C147
		.500	.087	.591	L	XLCEL 08 M22 FX-E	FX 2.2..	C147
		.563	.087	.591	L	XLCEL 09 M22 FX-E	FX 2.2..	C147
		.625	.087	.591	L	XLCEL 10 H22 FX-E	FX 2.2..	C147
		.625	.122	.689	L	XLCEL 10 H31 FX-E	FX 3.1..	C147
		.750	.122	.787	L	XLCEL 12 K31 FX-E	FX 3.1..	C147
		.750	.161	.787	L	XLCEL 12 K41 FX-E	FX 4.1..	C147
		1.000	.122	.984	L	XLCEL 64 M31 FX-E	FX 3.1..	C147
		1.000	.161	.984	L	XLCEL 64 M41 FX-E	FX 4.1..	C147

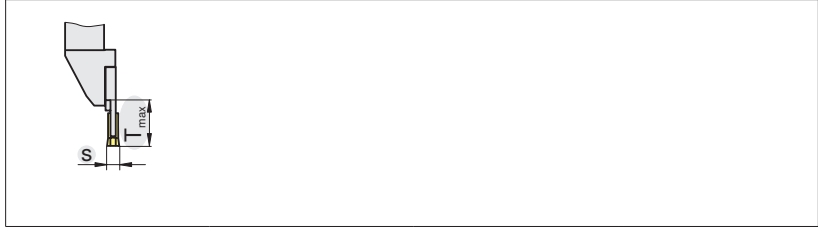
Application

Tools and inserts for parting and grooving








Grooving and turning – external


Modular system – external, assembly size 12







Matching products see right-hand side.

	h/d_A [inch]	$\begin{matrix} L \\ R \end{matrix}$	Type, description
C156  0	.500	R	MSS-E12R00-08-E

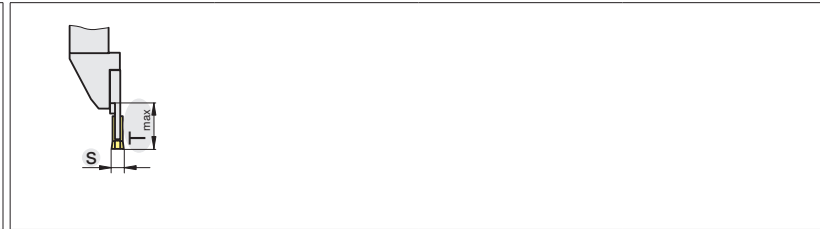
	s/s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	$\begin{matrix} L \\ R \end{matrix}$	Type, description		
C160 	.079	.108	.276	R	MSS-E12R07-GX09-1		GX09-1.. C140
	.109	.148	.276	R	MSS-E12R07-GX09-2		GX09-2.. C140

	h/d_A [inch]	$\begin{matrix} L \\ R \end{matrix}$	Type, description
C156  0	.500	L	MSS-E12L00-08-E

	s/s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	$\begin{matrix} L \\ R \end{matrix}$	Type, description		
C160 	.079	.108	.276	L	MSS-E12L07-GX09-1		GX09-1.. C140
	.109	.148	.276	L	MSS-E12L07-GX09-2		GX09-2.. C140

Grooving and turning – external

Modular system – external, assembly size 16



		h/d _A [inch]	L R	Type, description
C156		.625	R	MSS-E16R00-10-E

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description		
C160		.079	.108	.276	R	MSS-E16R07-GX09-1	GX09-1..	C140
		.109	.148	.276	R	MSS-E16R07-GX09-2	GX09-2..	C140

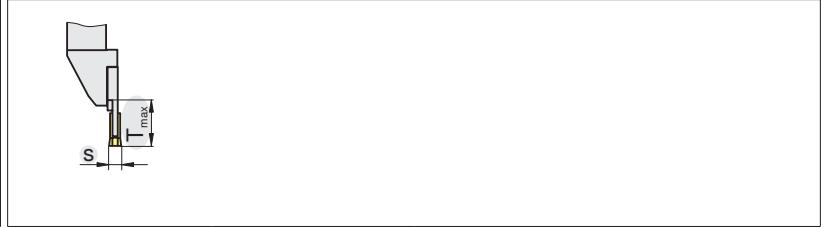
		h/d _A [inch]	L R	Type, description
C156		.625	L	MSS-E16L00-10-E

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description		
C160		.079	.108	.276	L	MSS-E16L07-GX09-1	GX09-1..	C140
		.109	.148	.276	L	MSS-E16L07-GX09-2	GX09-2..	C140



Grooving and turning – external

Modular system – external, assembly size 20



		h/d _A [inch]	L R	Type, description
C156		.625	R	MSS-E20R00-10-E
		.750	R	MSS-E20R00-12-E
	0			
C157		.750	L	MSS-E20L90-12-E
	90			

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description		
C161		.079	.108	.472	R	MSS-E20R12-GX16-1	GX16-1..	C140
		.109	.147	.472	R	MSS-E20R12-GX16-2	GX16-2..	C140
		.148	.197	.472	R	MSS-E20R12-GX16-3	GX16-3..	C140
C162		.079	.108	.827	R	MSS-E20R21-GX24-1	GX24-1..	C140
		.109	.147	.827	R	MSS-E20R21-GX24-2	GX24-2..	C140
		.148	.197	.827	R	MSS-E20R21-GX24-3	GX24-3..	C140
C168		.079		.787	R	MSS-E20R20-SX2	SX..2	C145
		.118		.787	R	MSS-E20R20-SX3	SX..3	C145

		h/d _A [inch]	L R	Type, description
C156		.625	L	MSS-E20L00-10-E
		.750	L	MSS-E20L00-12-E
	0			
C157		.750	R	MSS-E20R90-12-E
	90			

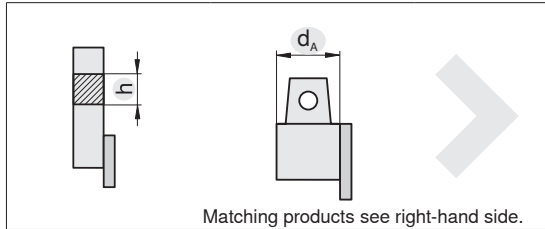
		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L R	Type, description		
C161		.079	.108	.472	L	MSS-E20L12-GX16-1	GX16-1..	C140
		.109	.147	.472	L	MSS-E20L12-GX16-2	GX16-2..	C140
		.148	.197	.472	L	MSS-E20L12-GX16-3	GX16-3..	C140
C162		.079	.108	.827	L	MSS-E20L21-GX24-1	GX24-1..	C140
		.109	.147	.827	L	MSS-E20L21-GX24-2	GX24-2..	C140
		.148	.197	.827	L	MSS-E20L21-GX24-3	GX24-3..	C140
C168		.079		.787	L	MSS-E20L20-SX2	SX..2	C145
		.118		.787	L	MSS-E20L20-SX3	SX..3	C145

Application

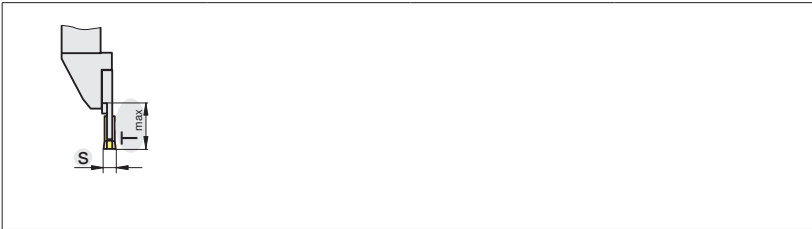
Tools and inserts for parting and grooving

Grooving and turning – external

Modular system – external, assembly size 25



Matching products see right-hand side.



		h/d _A [inch]	LR	Type, description
C156		1.000	R	MSS-E25R00-16-E
C157		1.000	L	MSS-E25L90-16-E
C196		2.480	R	HSK-T63-MSS-E25R00

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	LR	Type, description			
C161		.079	.108	.472	R	MSS-E25R12-GX16-1	GX16-1..	C140	
		.109	.147	.472	R	MSS-E25R12-GX16-2	GX16-2..	C140	
		.148	.197	.472	R	MSS-E25R12-GX16-3	GX16-3..	C140	
		.198	.256	.472	R	MSS-E25R12-GX16-4	GX16-4..	C140	
C162		.079	.108	.827	R	MSS-E25R21-GX24-1	GX24-1..	C140	
		.109	.147	.827	R	MSS-E25R21-GX24-2	GX24-2..	C140	
		.148	.197	.827	R	MSS-E25R21-GX24-3	GX24-3..	C140	
		.198	.256	.827	R	MSS-E25R21-GX24-4	GX24-4..	C140	
C168		.079		.787	R	MSS-E25R20-SX2	SX..2	C145	
		.118		1.378	R	MSS-E25R35-SX3	SX..3	C145	
		.118		.984	R	MSS-E25R25-SX3	SX..3	C145	
		.157		.984	R	MSS-E25R25-SX4	SX..4	C145	
		.157		1.378	R	MSS-E25R35-SX4	SX..4	C145	

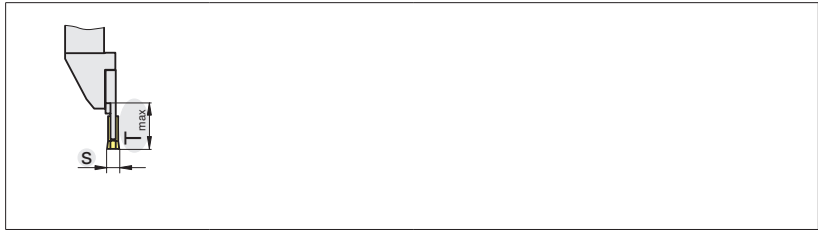
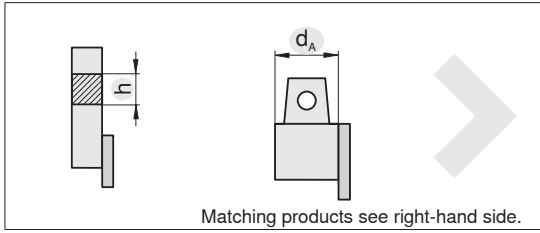
		h/d _A [inch]	LR	Type, description
C156		1.000	L	MSS-E25L00-16-E
C157		1.000	R	MSS-E25R90-16-E
C196		3.937	L	HSK-T100-MSS-E25L00
		2.480	L	HSK-T63-MSS-E25L00

		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	LR	Type, description			
C161		.079	.108	.472	L	MSS-E25L12-GX16-1	GX16-1..	C140	
		.109	.147	.472	L	MSS-E25L12-GX16-2	GX16-2..	C140	
		.148	.197	.472	L	MSS-E25L12-GX16-3	GX16-3..	C140	
		.198	.256	.472	L	MSS-E25L12-GX16-4	GX16-4..	C140	
C162		.079	.108	.827	L	MSS-E25L21-GX24-1	GX24-1..	C140	
		.109	.147	.827	L	MSS-E25L21-GX24-2	GX24-2..	C140	
		.148	.197	.827	L	MSS-E25L21-GX24-3	GX24-3..	C140	
		.198	.256	.827	L	MSS-E25L21-GX24-4	GX24-4..	C140	
C168		.079		.787	L	MSS-E25L20-SX2	SX..2	C145	
		.118		1.378	L	MSS-E25L35-SX3	SX..3	C145	
		.118		.984	L	MSS-E25L25-SX3	SX..3	C145	
		.157		.984	L	MSS-E25L25-SX4	SX..4	C145	
		.157		1.378	L	MSS-E25L35-SX4	SX..4	C145	



Grooving and turning – external

Modular system – external, assembly size 32



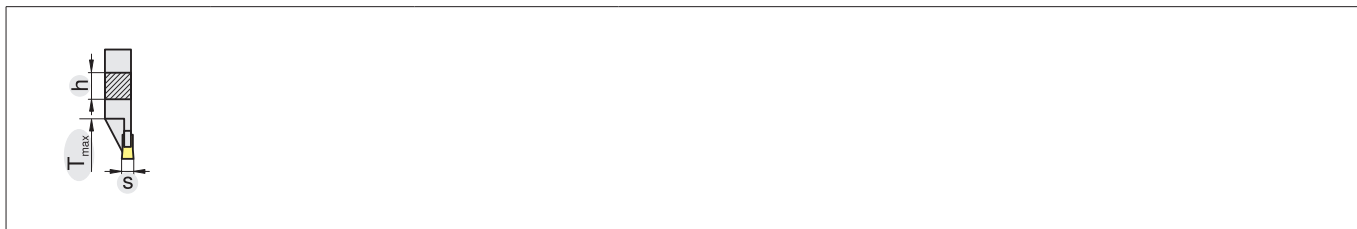
Matching products see right-hand side.




Application




		h/d _A [inch]	L/R	Type, description		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L/R	Type, description		
C156		1.250	R	MSS-E32R00-20-E		.109	.147	.472	R	MSS-E32R12-GX16-2	GX16-2..	C140
		1.250	R	MSS-E32R00-85-E		.148	.197	.472	R	MSS-E32R12-GX16-3	GX16-3..	C140
	0					.198	.256	.472	R	MSS-E32R12-GX16-4	GX16-4..	C140
C157		1.250	L	MSS-E32L90-20-E		.109	.147	.827	R	MSS-E32R21-GX24-2	GX24-2..	C140
		1.250	L	MSS-E32L90-85-E		.148	.197	.827	R	MSS-E32R21-GX24-3	GX24-3..	C140
	90					.198	.256	.827	R	MSS-E32R21-GX24-4	GX24-4..	C140
C196		3.937	R	HSK-T100-MSS-E32R00		.118		1.378	R	MSS-E32R35-SX3	SX..3	C145
		2.480	R	HSK-T63-MSS-E32R00		.157		1.378	R	MSS-E32R35-SX4	SX..4	C145
	0											
C197		3.937	L	HSK-T100-MSS-E32L90		.315	.394	1.772	N	MSS-E32N45-LX	LX..	C146
		2.480	L	HSK-T63-MSS-E32L90		.315	.394	1.260	N	MSS-E32N32-LX	LX..	C146
	90					.315	.394	.984	N	MSS-E32N25-LX	LX..	C146

Tools and inserts for parting and grooving

		h/d _A [inch]	L/R	Type, description		s/s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	L/R	Type, description		
C156		1.250	L	MSS-E32L00-85-E		.109	.147	.472	L	MSS-E32L12-GX16-2	GX16-2..	C140
		1.250	L	MSS-E32L00-20-E		.148	.197	.472	L	MSS-E32L12-GX16-3	GX16-3..	C140
	0					.198	.256	.472	L	MSS-E32L12-GX16-4	GX16-4..	C140
C157		1.250	R	MSS-E32R90-85-E		.109	.147	.827	L	MSS-E32L21-GX24-2	GX24-2..	C140
		1.250	R	MSS-E32R90-20-E		.148	.197	.827	L	MSS-E32L21-GX24-3	GX24-3..	C140
	90					.198	.256	.827	L	MSS-E32L21-GX24-4	GX24-4..	C140
C196		2.480	L	HSK-T63-MSS-E32L00		.118		1.378	L	MSS-E32L35-SX3	SX..3	C145
						.157		1.378	L	MSS-E32L35-SX4	SX..4	C145
	0											
C197		2.480	R	HSK-T63-MSS-E32R90		.315	.394	1.772	N	MSS-E32N45-LX	LX..	C146
		3.937	R	HSK-T100-MSS-E32R90		.315	.394	1.260	N	MSS-E32N32-LX	LX..	C146
	90					.315	.394	.984	N	MSS-E32N25-LX	LX..	C146



		h [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C172		.375	.024	.147	.276	R	E10R00-06-GX09-E	GX09..	C140
		.375	.024	.147	.276	L	E10L00-06-GX09-E	GX09..	C140

		h [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C173		.625	.109	.147	.827	R	E16R0021-10C-GX24-2-E	GX24-2..	C140
		.750	.109	.147	.827	R	E20R0021-12C-GX24-2-E	GX24-2..	C140
		.750	.148	.197	.827	R	E20R0021-12C-GX24-3-E	GX24-3..	C140
		1.000	.109	.147	.827	R	E25R0021-16D-GX24-2-E	GX24-2..	C140
		1.000	.148	.197	.827	R	E25R0021-16D-GX24-3-E	GX24-3..	C140
		1.000	.198	.256	.827	R	E25R0021-16D-GX24-4-E	GX24-4..	C140
		1.250	.109	.147	.827	R	E32R0021-85D-GX24-2-E	GX24-2..	C140
		1.250	.148	.197	.827	R	E32R0021-85D-GX24-3-E	GX24-3..	C140
		1.250	.198	.256	.827	R	E32R0021-85D-GX24-4-E	GX24-4..	C140
		.625	.109	.147	.827	L	E16L0021-10C-GX24-2-E	GX24-2..	C140
		.750	.109	.147	.827	L	E20L0021-12C-GX24-2-E	GX24-2..	C140
		.750	.148	.197	.827	L	E20L0021-12C-GX24-3-E	GX24-3..	C140
		1.000	.109	.147	.827	L	E25L0021-16D-GX24-2-E	GX24-2..	C140
		1.000	.148	.197	.827	L	E25L0021-16D-GX24-3-E	GX24-3..	C140
		1.000	.198	.256	.827	L	E25L0021-16D-GX24-4-E	GX24-4..	C140
		1.250	.109	.147	.827	L	E32L0021-85D-GX24-2-E	GX24-2..	C140
		1.250	.148	.197	.827	L	E32L0021-85D-GX24-3-E	GX24-3..	C140
		1.250	.198	.256	.827	L	E32L0021-85D-GX24-4-E	GX24-4..	C140

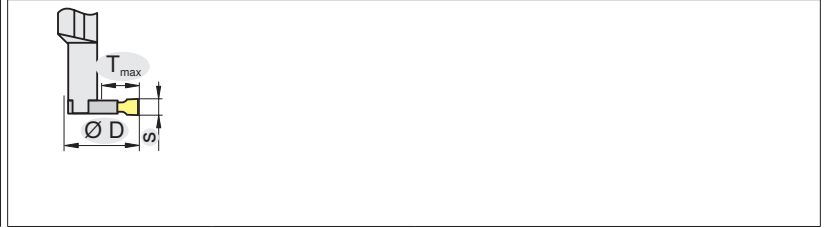


Grooving and turning – internal

Modular system – internal, assembly size 16



Matching products see right-hand side.



	d_A [inch]		Type, description
C183 1.5D	.750	R	MSS-I16R90-1.5D-E
C184 2.5D	.750	R	MSS-I16R90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C185 	.787	.079	.108	.157	R	MSS-I16R04-GX09-1	GX09-1..	C140
	.787	.109	.147	.157	R	MSS-I16R04-GX09-2	GX09-2..	C140

	d_A [inch]		Type, description
C183 1.5D	.750	L	MSS-I16L90-1.5D-E
C184 2.5D	.750	L	MSS-I16L90-2.5D-E

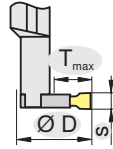
	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C185 	.787	.079	.108	.157	L	MSS-I16L04-GX09-1	GX09-1..	C140
	.787	.109	.147	.157	L	MSS-I16L04-GX09-2	GX09-2..	C140




Application




Tools and inserts for parting and grooving




Grooving and turning – internal




Modular system – internal, assembly size 20



	d_A [inch]		Type, description
C183  1.5D	.750	R	MSS-I20R90-1.5D-E
C184  2.5D	1.000	R	MSS-I20R90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C185 	.984	.079	.108	.197	R	MSS-I20R05-GX09-1	GX09-1..	C140
	.984	.109	.147	.197	R	MSS-I20R05-GX09-2	GX09-2..	C140

	d_A [inch]		Type, description
C183  1.5D	.750	L	MSS-I20L90-1.5D-E
C184  2.5D	1.000	L	MSS-I20L90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C185 	.984	.079	.108	.197	L	MSS-I20L05-GX09-1	GX09-1..	C140
	.984	.109	.147	.197	L	MSS-I20L05-GX09-2	GX09-2..	C140

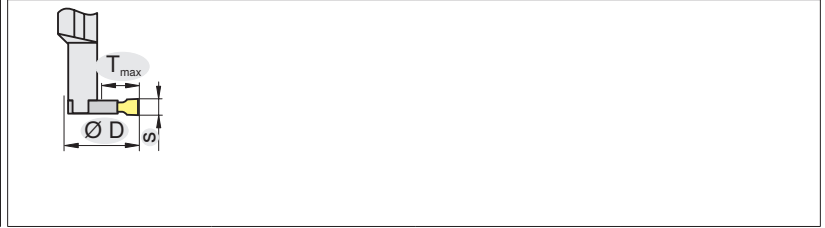





Grooving and turning – internal




Modular system – internal, assembly size 25









Matching products see right-hand side.



	d_A [inch]	 L R	Type, description
C183  1.5D	1.000	R	MSS-I25R90-1.5D-E
C184  2.5D	1.250	R	MSS-I25R90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	 L R	Type, description		
C185 	1.260	.079	.108	.236	R	MSS-I25R06-GX09-1	GX09-1..	C140
	1.260	.109	.147	.236	R	MSS-I25R06-GX09-2	GX09-2..	C140

	d_A [inch]	 L R	Type, description
C183  1.5D	1.000	L	MSS-I25L90-1.5D-E
C184  2.5D	1.250	L	MSS-I25L90-2.5D-E

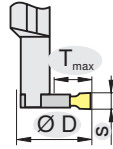
	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	 L R	Type, description		
C185 	1.260	.079	.108	.236	L	MSS-I25L06-GX09-1	GX09-1..	C140
	1.260	.109	.147	.236	L	MSS-I25L06-GX09-2	GX09-2..	C140




Grooving and turning – internal




Modular system – internal, assembly size 32









Matching products see right-hand side.



	d_A [inch]		Type, description
C183  1.5D	1.250	R	MSS-I32R90-1.5D-E
C184  2.5D	1.500	R	MSS-I32R90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C186 	1.575	.079	.108	.354	R	MSS-I32R09-GX16-1	GX16-1..	C140
	1.575	.109	.147	.354	R	MSS-I32R09-GX16-2	GX16-2..	C140
	1.575	.148	.197	.354	R	MSS-I32R09-GX16-3	GX16-3..	C140
	1.575	.198	.256	.354	R	MSS-I32R09-GX16-4	GX16-4..	C140

	d_A [inch]		Type, description
C183  1.5D	1.250	L	MSS-I32L90-1.5D-E
C184  2.5D	1.500	L	MSS-I32L90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C186 	1.575	.079	.108	.354	L	MSS-I32L09-GX16-1	GX16-1..	C140
	1.575	.109	.147	.354	L	MSS-I32L09-GX16-2	GX16-2..	C140
	1.575	.148	.197	.354	L	MSS-I32L09-GX16-3	GX16-3..	C140
	1.575	.198	.256	.354	L	MSS-I32L09-GX16-4	GX16-4..	C140

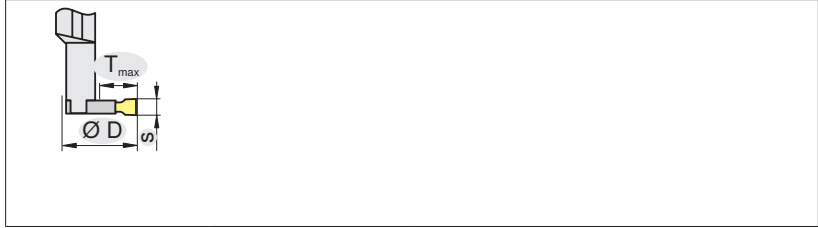





Grooving and turning – internal





Modular system – internal, assembly size 40










Matching products see right-hand side.



	d_A [inch]		Type, description
C183 	1.500	R	MSS-I40R90-1.5D-E
C184 	2.000	R	MSS-I40R90-2.5D-E

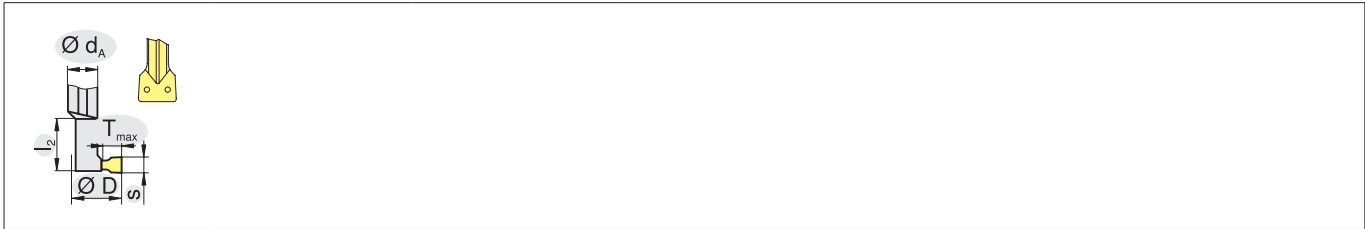
	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C186 	1.969	.079	.108	.394	R	MSS-I40R10-GX16-1	GX16-1..	C140
	1.969	.109	.147	.394	R	MSS-I40R10-GX16-2	GX16-2..	C140
	1.969	.148	.197	.394	R	MSS-I40R10-GX16-3	GX16-3..	C140
	1.969	.198	.256	.394	R	MSS-I40R10-GX16-4	GX16-4..	C140
C187 	2.362	.109	.147	.748	N	MSS-I40N19-GX24-2	GX24-2..	C140
	2.362	.148	.197	.748	N	MSS-I40N19-GX24-3	GX24-3..	C140
	2.362	.198	.256	.748	N	MSS-I40N19-GX24-4	GX24-4..	C140




	d_A [inch]		Type, description
C183 	1.500	L	MSS-I40L90-1.5D-E
C184 	2.000	L	MSS-I40L90-2.5D-E

	D_{min} [inch]	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]		Type, description		
C186 	1.969	.079	.108	.394	L	MSS-I40L10-GX16-1	GX16-1..	C140
	1.969	.148	.197	.394	L	MSS-I40L10-GX16-3	GX16-3..	C140
	1.969	.109	.147	.394	L	MSS-I40L10-GX16-2	GX16-2..	C140
	1.969	.198	.256	.394	L	MSS-I40L10-GX16-4	GX16-4..	C140
C187 	2.362	.109	.147	.748	N	MSS-I40N19-GX24-2	GX24-2..	C140
	2.362	.198	.256	.748	N	MSS-I40N19-GX24-4	GX24-4..	C140
	2.362	.148	.197	.748	N	MSS-I40N19-GX24-3	GX24-3..	C140

Application

Tools and inserts for parting and grooving

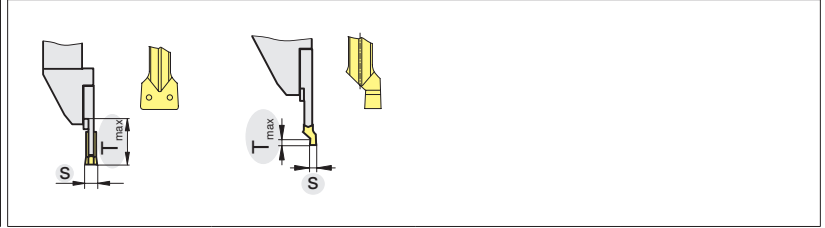


		d_A	l_2	D_{min}	s_{min}	s_{max}	T_{max}		Type, description		
		[inch]	[inch]	[inch]	[inch]	[inch]	[inch]				
C190		.625	1.181	.63	.024	.148	.118	R	I12R90-2.5D-GX09-E	GX09..	C140
		.625	1.181	.63	.024	.148	.118	L	I12L90-2.5D-GX09-E	GX09..	C140



Circlip grooving – external

Modular system – external, assembly size 12



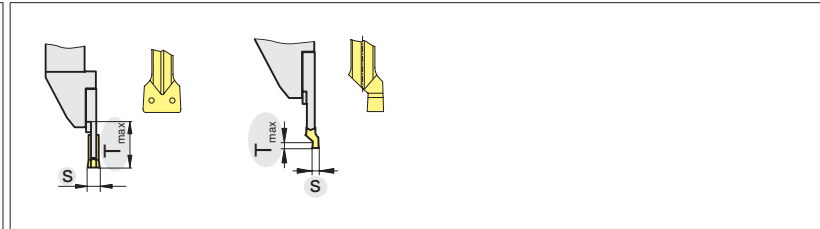
Matching products see right-hand side.

		h/d _A [inch]	LR	Type, description
C156		.500	R	MSS-E12R00-08-E
		0		

		s [inch]	T _{max} [inch]	LR	Type, description		
C160		.077	.276	R	MSS-E12R07-GX09-1	GX09-1..	C142
		.089	.276	R	MSS-E12R07-GX09-1	GX09-1..	C142
		.108	.276	R	MSS-E12R07-GX09-2	GX09-2..	C142
		.128	.276	R	MSS-E12R07-GX09-2	GX09-2..	C142
C163		.024	.030	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142
		.031	.037	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142
		.035	.041	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142
		.039	.045	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142
		.047	.053	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142
		.055	.060	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142
		.067	.072	R	MSS-E12R02-GX09-1	GX09-1..R/L	C142

		h/d _A [inch]	LR	Type, description
C156		.500	L	MSS-E12L00-08-E
		0		

		s [inch]	T _{max} [inch]	LR	Type, description		
C160		.077	.276	L	MSS-E12L07-GX09-1	GX09-1..	C142
		.089	.276	L	MSS-E12L07-GX09-1	GX09-1..	C142
		.108	.276	L	MSS-E12L07-GX09-2	GX09-2..	C142
		.128	.276	L	MSS-E12L07-GX09-2	GX09-2..	C142
C163		.024	.030	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142
		.031	.037	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142
		.035	.041	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142
		.039	.045	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142
		.047	.053	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142
		.055	.060	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142
		.067	.072	L	MSS-E12L02-GX09-1	GX09-1..R/L	C142



		h/d _A [inch]	LR	Type, description
C156		.625	R	MSS-E16R00-10-E
		0		

		s [inch]	T _{max} [inch]	LR	Type, description		
C160		.077	.276	R	MSS-E16R07-GX09-1	GX09-1..	C142
		.089	.276	R	MSS-E16R07-GX09-1	GX09-1..	C142
		.108	.276	R	MSS-E16R07-GX09-2	GX09-2..	C142
		.128	.276	R	MSS-E16R07-GX09-2	GX09-2..	C142
C163		.024	.030	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142
		.031	.037	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142
		.035	.041	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142
		.039	.045	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142
		.047	.053	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142
		.055	.060	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142
		.067	.072	R	MSS-E16R02-GX09-1	GX09-1..R/L	C142

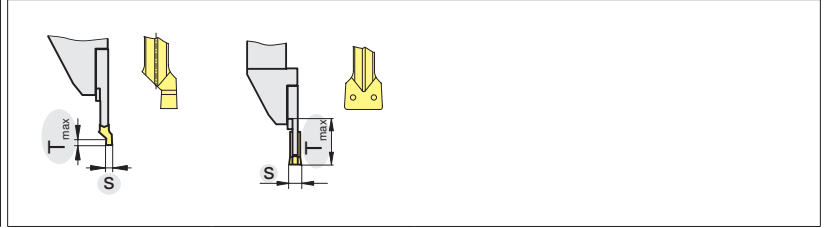
		h/d _A [inch]	LR	Type, description
C156		.625	L	MSS-E16L00-10-E
		0		

		s [inch]	T _{max} [inch]	LR	Type, description		
C160		.077	.276	L	MSS-E16L07-GX09-1	GX09-1..	C142
		.089	.276	L	MSS-E16L07-GX09-1	GX09-1..	C142
		.108	.276	L	MSS-E16L07-GX09-2	GX09-2..	C142
		.128	.276	L	MSS-E16L07-GX09-2	GX09-2..	C142
C163		.024	.030	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142
		.031	.037	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142
		.035	.041	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142
		.039	.045	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142
		.047	.053	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142
		.055	.060	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142
		.067	.072	L	MSS-E16L02-GX09-1	GX09-1..R/L	C142



Circlip grooving – external

Modular system – external, assembly size 20



		h/d _A [inch]	L R	Type, description
C156		.625	R	MSS-E20R00-10-E
		.750	R	MSS-E20R00-12-E
	0			
C157		.750	L	MSS-E20L90-12-E
	90			

		s [inch]	T _{max} [inch]	L R	Type, description		
C161		.108	.472	R	MSS-E20R12-GX16-2	GX16-2..	C142
		.128	.472	R	MSS-E20R12-GX16-2	GX16-2..	C142
		.167	.472	R	MSS-E20R12-GX16-3	GX16-3..	C142
C164		.024	.030	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.031	.037	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.035	.041	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.039	.045	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.047	.053	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.055	.060	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.067	.072	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.077	.081	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142
		.089	.093	R	MSS-E20R03-GX16-2	GX16-2..R/L	C142

		h/d _A [inch]	L R	Type, description
C156		.625	L	MSS-E20L00-10-E
		.750	L	MSS-E20L00-12-E
	0			
C157		.750	R	MSS-E20R90-12-E
	90			

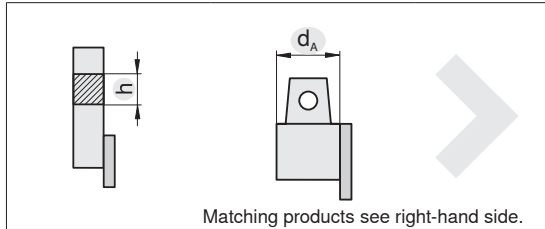
		s [inch]	T _{max} [inch]	L R	Type, description		
C161		.108	.472	L	MSS-E20L12-GX16-2	GX16-2..	C142
		.128	.472	L	MSS-E20L12-GX16-2	GX16-2..	C142
		.167	.472	L	MSS-E20L12-GX16-3	GX16-3..	C142
C164		.024	.030	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.031	.037	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.035	.041	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.039	.045	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.047	.053	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.055	.060	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.067	.072	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.077	.081	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142
		.089	.093	L	MSS-E20L03-GX16-2	GX16-2..R/L	C142

Application

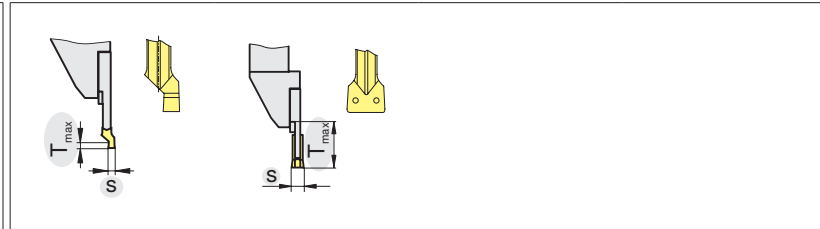
Tools and inserts for parting and grooving

Circlip grooving – external

Modular system – external, assembly size 25



Matching products see right-hand side.



		h/d _A [inch]	LR	Type, description
C156		1.000	R	MSS-E25R00-16-E
C157		1.000	L	MSS-E25L90-16-E
C196		2.480	R	HSK-T63-MSS-E25R00

		s [inch]	T _{max} [inch]	LR	Type, description		
C161		.108	.472	R	MSS-E25R12-GX16-2	GX16-2..	C142
		.128	.472	R	MSS-E25R12-GX16-2	GX16-2..	C142
		.167	.472	R	MSS-E25R12-GX16-3	GX16-3..	C142
		.207	.472	R	MSS-E25R12-GX16-4	GX16-4..	C142
C164		.024	.030	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.031	.037	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.035	.041	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.039	.045	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.047	.053	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.055	.060	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.067	.072	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.077	.081	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.089	.093	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142

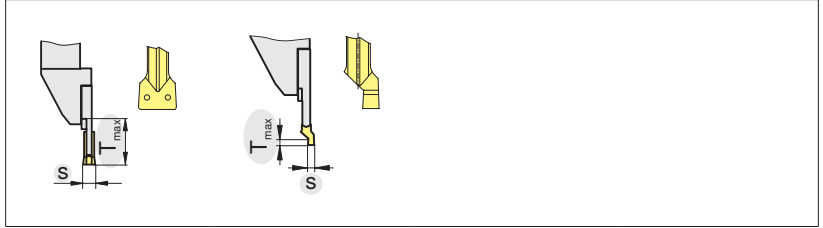
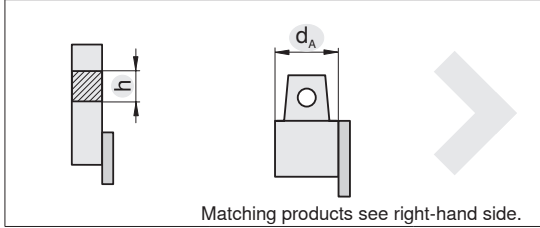
		h/d _A [inch]	LR	Type, description
C156		1.000	L	MSS-E25L00-16-E
C157		1.000	R	MSS-E25R90-16-E
C196		3.937	L	HSK-T100-MSS-E25L00
		2.480	L	HSK-T63-MSS-E25L00

		s [inch]	T _{max} [inch]	LR	Type, description		
C161		.108	.472	L	MSS-E25L12-GX16-2	GX16-2..	C142
		.128	.472	L	MSS-E25L12-GX16-2	GX16-2..	C142
		.167	.472	L	MSS-E25L12-GX16-3	GX16-3..	C142
		.207	.472	L	MSS-E25L12-GX16-4	GX16-4..	C142
C164		.024	.030	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.031	.037	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.035	.041	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.039	.045	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.047	.053	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.055	.060	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.067	.072	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.077	.081	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.089	.093	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142



Circlip grooving – external

Modular system – external, assembly size 32



Matching products see right-hand side.

Application

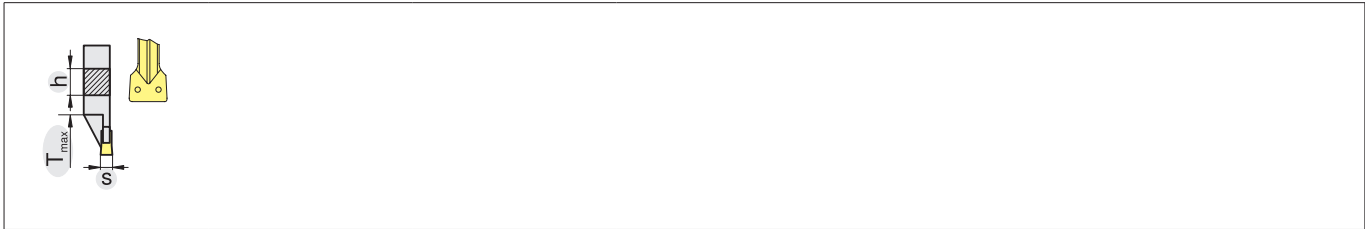
		h/d _A [inch]	LR	Type, description
C156		1.250	R	MSS-E32R00-20-E
		1.250	R	MSS-E32R00-85-E
	0			
C157		1.250	L	MSS-E32L90-20-E
		1.250	L	MSS-E32L90-85-E
	90			
C196		3.937	R	HSK-T100-MSS-E32R00
		2.480	R	HSK-T63-MSS-E32R00
	0			
C197		3.937	L	HSK-T100-MSS-E32L90
		2.480	L	HSK-T63-MSS-E32L90
	90			




		s [inch]	T _{max} [inch]	LR	Type, description	
C161		.108	.472	R	MSS-E32R12-GX16-2	GX16-2.. C142
		.128	.472	R	MSS-E32R12-GX16-2	GX16-2.. C142
		.167	.472	R	MSS-E32R12-GX16-3	GX16-3.. C142
		.207	.472	R	MSS-E32R12-GX16-4	GX16-4.. C142
C164		.024	.030	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.031	.037	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.035	.041	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.039	.045	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.047	.053	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.055	.060	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.067	.072	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.077	.081	R	MSS-E32R03-GX16-2	GX16-2..R/L C142
		.089	.093	R	MSS-E32R03-GX16-2	GX16-2..R/L C142

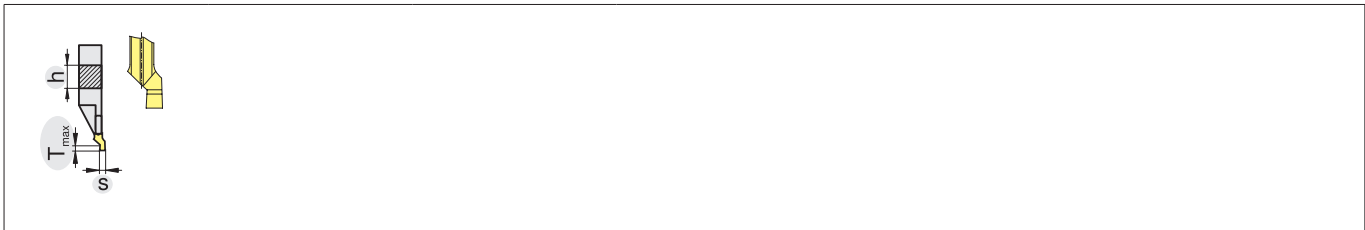
Tools and inserts for parting and grooving




		h/d _A [inch]	LR	Type, description
C156		1.250	L	MSS-E32L00-85-E
		1.250	L	MSS-E32L00-20-E
	0			
C157		1.250	R	MSS-E32R90-85-E
		1.250	R	MSS-E32R90-20-E
	90			
C196		2.480	L	HSK-T63-MSS-E32L00
	0			
C197		2.480	R	HSK-T63-MSS-E32R90
		3.937	R	HSK-T100-MSS-E32R90
	90			

		s [inch]	T _{max} [inch]	LR	Type, description	
C161		.108	.472	L	MSS-E32L12-GX16-2	GX16-2.. C142
		.128	.472	L	MSS-E32L12-GX16-2	GX16-2.. C142
		.167	.472	L	MSS-E32L12-GX16-3	GX16-3.. C142
		.207	.472	L	MSS-E32L12-GX16-4	GX16-4.. C142
C164		.024	.030	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.031	.037	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.035	.041	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.039	.045	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.047	.053	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.055	.060	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.067	.072	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.077	.081	L	MSS-E32L03-GX16-2	GX16-2..R/L C142
		.089	.093	L	MSS-E32L03-GX16-2	GX16-2..R/L C142



C172		h	s	T _{max}		Type, description		
		[inch]	[inch]	[inch]				
		.375	.077	.276	R	E10R00-06-GX09-E	GX09..	C142
		.375	.089	.276	R	E10R00-06-GX09-E	GX09..	C142
		.375	.108	.276	R	E10R00-06-GX09-E	GX09..	C142
		.375	.128	.276	R	E10R00-06-GX09-E	GX09..	C142
		.375	.077	.276	L	E10L00-06-GX09-E	GX09..	C142
		.375	.089	.276	L	E10L00-06-GX09-E	GX09..	C142
		.375	.108	.276	L	E10L00-06-GX09-E	GX09..	C142
		.375	.128	.276	L	E10L00-06-GX09-E	GX09..	C142

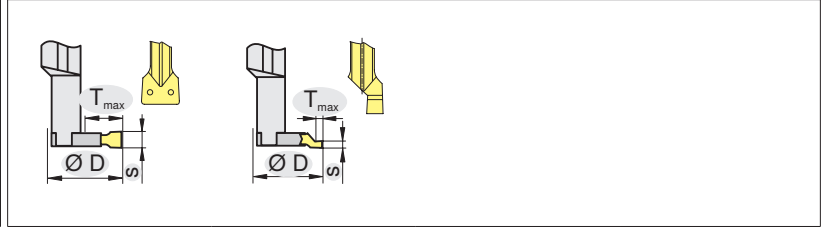




C172		h	s	T _{max}		Type, description		
		[inch]	[inch]	[inch]				
		.375	.024	.030	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.031	.037	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.035	.041	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.039	.045	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.047	.053	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.055	.060	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.067	.072	R	E10R00-06-GX09-E	GX09-1..R/L	C142
		.375	.024	.030	L	E10L00-06-GX09-E	GX09-1..R/L	C142
		.375	.031	.037	L	E10L00-06-GX09-E	GX09-1..R/L	C142
		.375	.035	.041	L	E10L00-06-GX09-E	GX09-1..R/L	C142
		.375	.039	.045	L	E10L00-06-GX09-E	GX09-1..R/L	C142
		.375	.047	.053	L	E10L00-06-GX09-E	GX09-1..R/L	C142
		.375	.055	.060	L	E10L00-06-GX09-E	GX09-1..R/L	C142
		.375	.067	.072	L	E10L00-06-GX09-E	GX09-1..R/L	C142








Circlip grooving – internal




Modular system – internal, assembly size 16



	d_A [inch]	L R	Type, description
C183  1.5D	.750	R	MSS-I16R90-1.5D-E
C184  2.5D	.750	R	MSS-I16R90-2.5D-E

	D_{min} [inch]	s [inch]	T_{max} [inch]	L R	Type, description	
C185 	.787	.108	.157	R	MSS-I16R04-GX09-2	GX09-2.. C142
	.787	.089	.157	R	MSS-I16R04-GX09-1	GX09-1.. C142
	.787	.077	.157	R	MSS-I16R04-GX09-1	GX09-1.. C142
	.787	.128	.157	R	MSS-I16R04-GX09-2	GX09-2.. C142
C188 	.787	.047	.053	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.067	.072	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.039	.045	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.035	.041	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.031	.037	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.024	.030	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.055	.060	R	MSS-I16R02-GX09-1	GX09-1..R/L C142
	.787	.067	.072	R	MSS-I16R02-GX09-1	GX09-1..R/L C142

	d_A [inch]	L R	Type, description
C183  1.5D	.750	L	MSS-I16L90-1.5D-E
C184  2.5D	.750	L	MSS-I16L90-2.5D-E

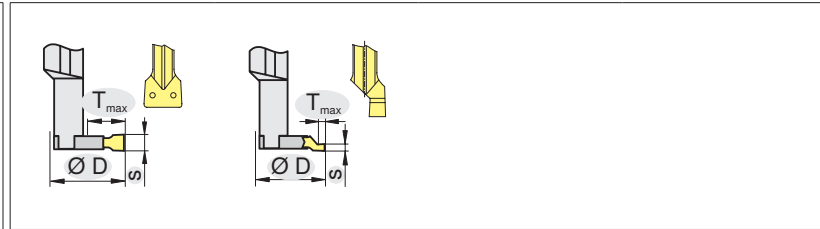
	D_{min} [inch]	s [inch]	T_{max} [inch]	L R	Type, description	
C185 	.787	.128	.157	L	MSS-I16L04-GX09-2	GX09-2.. C142
	.787	.108	.157	L	MSS-I16L04-GX09-2	GX09-2.. C142
	.787	.089	.157	L	MSS-I16L04-GX09-1	GX09-1.. C142
	.787	.077	.157	L	MSS-I16L04-GX09-1	GX09-1.. C142
C188 	.787	.055	.060	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.024	.030	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.047	.053	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.039	.045	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.035	.041	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.031	.037	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.067	.072	L	MSS-I16L02-GX09-1	GX09-1..R/L C142
	.787	.067	.072	L	MSS-I16L02-GX09-1	GX09-1..R/L C142




Application





Tools and inserts for parting and grooving




Circlip grooving – internal





Modular system – external, assembly size 20



	d_A [inch]		Type, description
C183 	.750	R	MSS-I20R90-1.5D-E
	1.5D		
C184 	1.000	R	MSS-I20R90-2.5D-E
	2.5D		

	D_{min} [inch]	s [inch]	T_{max} [inch]		Type, description		
C185 	.984	.108	.197	R	MSS-I20R05-GX09-2	GX09-2..	C142
	.984	.089	.197	R	MSS-I20R05-GX09-1	GX09-1..	C142
	.984	.077	.197	R	MSS-I20R05-GX09-1	GX09-1..	C142
	.984	.128	.197	R	MSS-I20R05-GX09-2	GX09-2..	C142
C188 	.984	.047	.053	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.067	.072	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.039	.045	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.035	.041	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.031	.037	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.024	.030	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.055	.060	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142
	.984	.055	.060	R	MSS-I20R02-GX09-1	GX09-1..R/L	C142

	d_A [inch]		Type, description
C183 	.750	L	MSS-I20L90-1.5D-E
	1.5D		
C184 	1.000	L	MSS-I20L90-2.5D-E
	2.5D		

	D_{min} [inch]	s [inch]	T_{max} [inch]		Type, description		
C185 	.984	.108	.197	L	MSS-I20L05-GX09-2	GX09-2..	C142
	.984	.089	.197	L	MSS-I20L05-GX09-1	GX09-1..	C142
	.984	.077	.197	L	MSS-I20L05-GX09-1	GX09-1..	C142
	.984	.128	.197	L	MSS-I20L05-GX09-2	GX09-2..	C142
C188 	.984	.047	.053	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.067	.072	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.039	.045	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.035	.041	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.031	.037	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.024	.030	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.055	.060	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142
	.984	.055	.060	L	MSS-I20L02-GX09-1	GX09-1..R/L	C142

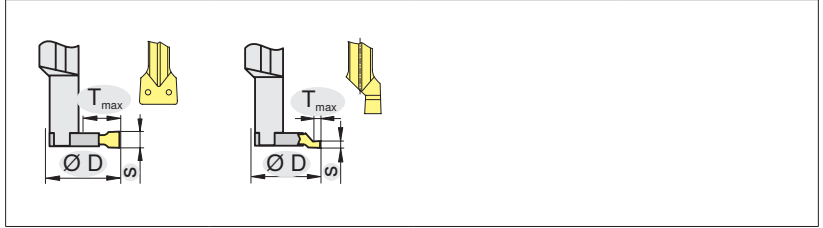





Circlip grooving – internal





Modular system – internal, assembly size 25










Matching products see right-hand side.



	d_A [inch]		Type, description
C183  1.5D	1.000	R	MSS-I25R90-1.5D-E
C184  2.5D	1.250	R	MSS-I25R90-2.5D-E

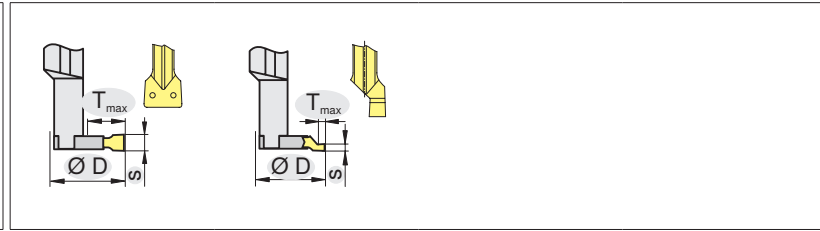
	D_{min} [inch]	s [inch]	T_{max} [inch]		Type, description		
C185 	1.260	.108	.236	R	MSS-I25R06-GX09-2	GX09-2..	C142
	1.260	.089	.236	R	MSS-I25R06-GX09-1	GX09-1..	C142
	1.260	.077	.236	R	MSS-I25R06-GX09-1	GX09-1..	C142
	1.260	.128	.236	R	MSS-I25R06-GX09-2	GX09-2..	C142
C188 	1.260	.047	.053	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142
	1.260	.067	.072	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142
	1.260	.039	.045	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142
	1.260	.035	.041	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142
	1.260	.031	.037	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142
	1.260	.024	.030	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142
	1.260	.055	.060	R	MSS-I25R02-GX09-1	GX09-1..R/L	C142

	d_A [inch]		Type, description
C183  1.5D	1.000	L	MSS-I25L90-1.5D-E
C184  2.5D	1.250	L	MSS-I25L90-2.5D-E

	D_{min} [inch]	s [inch]	T_{max} [inch]		Type, description		
C185 	1.260	.108	.236	L	MSS-I25L06-GX09-2	GX09-2..	C142
	1.260	.089	.236	L	MSS-I25L06-GX09-1	GX09-1..	C142
	1.260	.077	.236	L	MSS-I25L06-GX09-1	GX09-1..	C142
	1.260	.128	.236	L	MSS-I25L06-GX09-2	GX09-2..	C142
C188 	1.260	.047	.053	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142
	1.260	.067	.072	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142
	1.260	.039	.045	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142
	1.260	.035	.041	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142
	1.260	.031	.037	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142
	1.260	.024	.030	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142
	1.260	.055	.060	L	MSS-I25L02-GX09-1	GX09-1..R/L	C142

Circlip grooving – internal

Modular system – internal, assembly size 32



	d_A [inch]	LR	Type, description
C183	1.250	R	MSS-I32R90-1.5D-E
	1.500	R	MSS-I32R90-2.5D-E

	D_{min} [inch]	s [inch]	T_{max} [inch]	LR	Type, description		
C186	1.575	.207	.354	R	MSS-I32R09-GX16-4	GX16-4..	C142
	1.575	.167	.354	R	MSS-I32R09-GX16-3	GX16-3..	C142
	1.575	.128	.354	R	MSS-I32R09-GX16-2	GX16-2..	C142
	1.575	.108	.354	R	MSS-I32R09-GX16-2	GX16-2..	C142
C189	1.575	.055	.060	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.067	.072	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.035	.041	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.089	.093	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.047	.053	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.039	.045	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.031	.037	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.024	.030	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142
	1.575	.077	.081	R	MSS-I32R03-GX16-2	GX16-2..R/L	C142

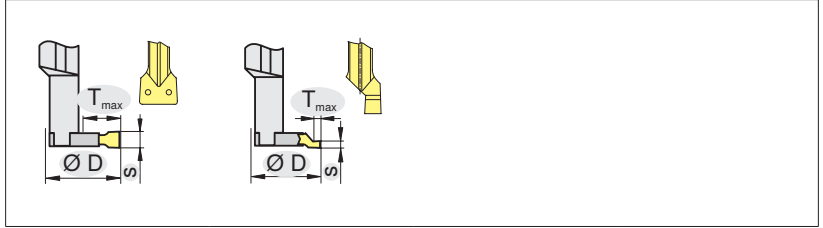
	d_A [inch]	LR	Type, description
C183	1.250	L	MSS-I32L90-1.5D-E
	1.500	L	MSS-I32L90-2.5D-E




	D_{min} [inch]	s [inch]	T_{max} [inch]	LR	Type, description		
C186	1.575	.167	.354	L	MSS-I32L09-GX16-3	GX16-3..	C142
	1.575	.128	.354	L	MSS-I32L09-GX16-2	GX16-2..	C142
	1.575	.108	.354	L	MSS-I32L09-GX16-2	GX16-2..	C142
	1.575	.207	.354	L	MSS-I32L09-GX16-4	GX16-4..	C142
C189	1.575	.047	.053	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.055	.060	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.077	.081	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.089	.093	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.039	.045	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.035	.041	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.031	.037	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.024	.030	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142
	1.575	.067	.072	L	MSS-I32L03-GX16-2	GX16-2..R/L	C142










Circlip grooving – internal





Modular system – internal, assembly size 40



	d_A [inch]		Type, description
C183 	1.500	R	MSS-I40R90-1.5D-E
C184 	2.000	R	MSS-I40R90-2.5D-E

	D_{min} [inch]	s [inch]	T_{max} [inch]		Type, description		
C186 	1.969	.167	.394	R	MSS-I40R10-GX16-3	GX16-3..	C142
	1.969	.128	.394	R	MSS-I40R10-GX16-2	GX16-2..	C142
	1.969	.108	.394	R	MSS-I40R10-GX16-2	GX16-2..	C142
	1.969	.207	.394	R	MSS-I40R10-GX16-4	GX16-4..	C142
C189 	1.969	.047	.053	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.055	.060	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.077	.081	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.089	.093	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.039	.045	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.035	.041	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.031	.037	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.024	.030	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142
	1.969	.067	.072	R	MSS-I40R03-GX16-2	GX16-2..R/L	C142

	d_A [inch]		Type, description
C183 	1.500	L	MSS-I40L90-1.5D-E
C184 	2.000	L	MSS-I40L90-2.5D-E

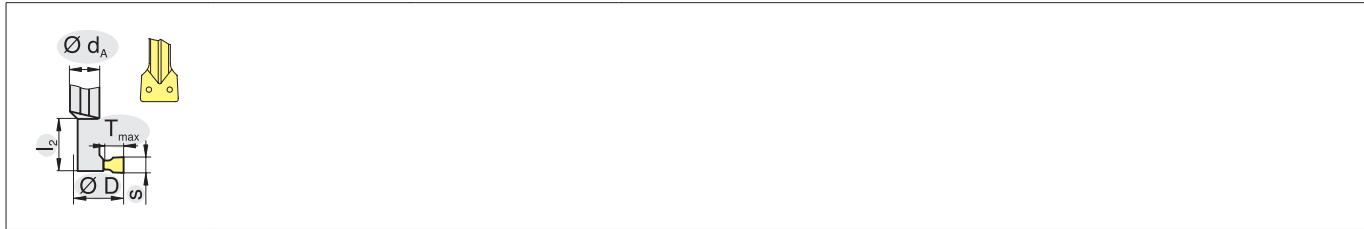
	D_{min} [inch]	s [inch]	T_{max} [inch]		Type, description		
C186 	1.969	.207	.394	L	MSS-I40L10-GX16-4	GX16-4..	C142
	1.969	.167	.394	L	MSS-I40L10-GX16-3	GX16-3..	C142
	1.969	.128	.394	L	MSS-I40L10-GX16-2	GX16-2..	C142
	1.969	.108	.394	L	MSS-I40L10-GX16-2	GX16-2..	C142
C189 	1.969	.055	.060	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.067	.072	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.024	.030	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.089	.093	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.047	.053	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.039	.045	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.035	.041	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.031	.037	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142
	1.969	.077	.081	L	MSS-I40L03-GX16-2	GX16-2..R/L	C142

Circlip grooving – internal

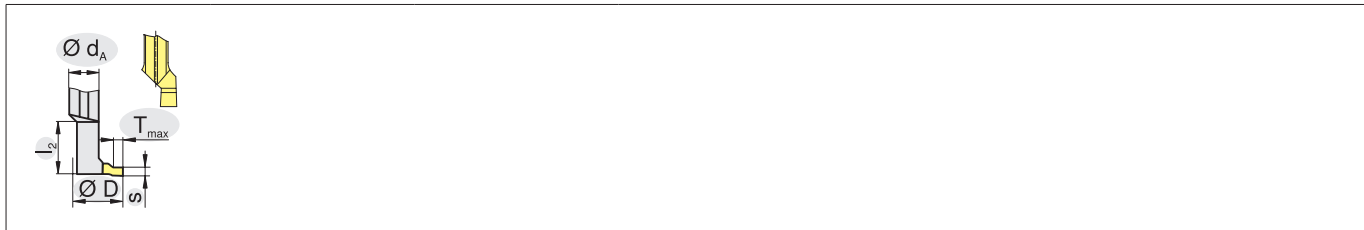
Monoblock boring bars – GX



C99



	d_A [inch]	l_2 [inch]	D_{min} [inch]	s [inch]	T_{max} [inch]	L R	Type, description	3D Model	
								GX09..	C142
C190 	.625	1.181	.63	.077	.276	R	I12R90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.089	.276	R	I12R90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.108	.276	R	I12R90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.128	.276	R	I12R90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.077	.276	L	I12L90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.089	.276	L	I12L90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.108	.276	L	I12L90-2.5D-GX09-E	GX09..	C142
	.625	1.181	.63	.128	.276	L	I12L90-2.5D-GX09-E	GX09..	C142



	d_A [inch]	l_2 [inch]	D_{min} [inch]	s [inch]	T_{max} [inch]	L R	Type, description	3D Model	
								GX09-1..R/L	C142
C190 	.625	1.181	.63	.024	.030	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.031	.037	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.035	.041	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.039	.045	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.047	.053	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.055	.060	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.067	.072	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.024	.030	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.031	.037	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.035	.041	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.039	.045	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.047	.053	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.055	.060	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142
	.625	1.181	.63	.067	.072	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C142

Application

Tools and inserts for parting and grooving

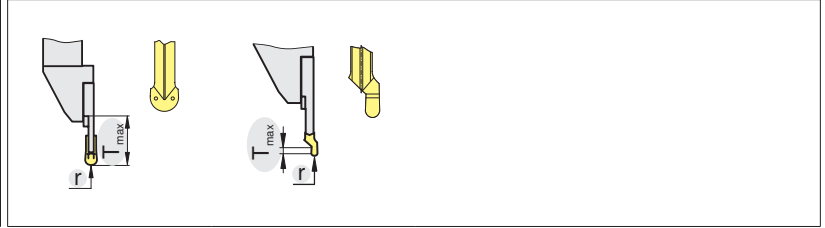




Radius grooves – external





Modular system – external, assembly size 12









Matching products see right-hand side.



		h/d _A [inch]		Type, description
C156		.500	R	MSS-E12R00-08-E
		0		

		r [inch]	T _{max} [inch]		Type, description		
C160		.039	.276	R	MSS-E12R07-GX09-1	GX09-1..	C143
		.047	.276	R	MSS-E12R07-GX09-1	GX09-1..	C143
C163		.031	.070	R	MSS-E12R02-GX09-1	GX09-1..R/L	C143

		h/d _A [inch]		Type, description
C156		.500	L	MSS-E12L00-08-E
		0		

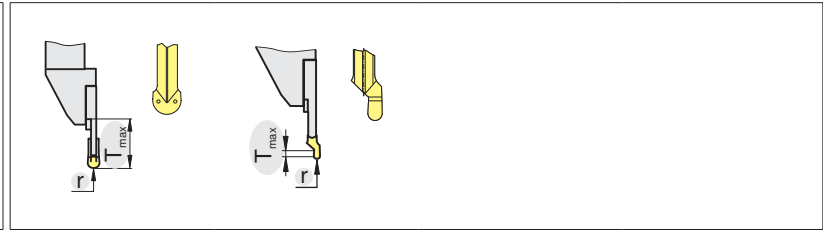
		r [inch]	T _{max} [inch]		Type, description		
C160		.039	.276	L	MSS-E12L07-GX09-1	GX09-1..	C143
		.047	.276	L	MSS-E12L07-GX09-1	GX09-1..	C143
C163		.031	.070	L	MSS-E12L02-GX09-1	GX09-1..R/L	C143


Application




Tools and inserts for parting and grooving


Radius grooves – external




Modular system – external, assembly size 16



		h/d _A [inch]	L R | |	Type, description
C156		.625	R	MSS-E16R00-10-E
		0		

		r [inch]	T _{max} [inch]	L R | |	Type, description			
C160		.039	.276	R	MSS-E16R07-GX09-1	GX09-1..	C143	
		.047	.276	R	MSS-E16R07-GX09-1	GX09-1..	C143	
C163		.031	.070	R	MSS-E16R02-GX09-1	GX09-1..R/L	C143	

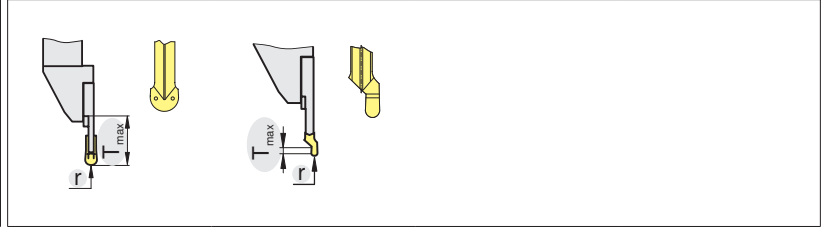
		h/d _A [inch]	L R | |	Type, description
C156		.625	L	MSS-E16L00-10-E
		0		

		r [inch]	T _{max} [inch]	L R | |	Type, description			
C160		.039	.276	L	MSS-E16L07-GX09-1	GX09-1..	C143	
		.047	.276	L	MSS-E16L07-GX09-1	GX09-1..	C143	
C163		.031	.070	L	MSS-E16L02-GX09-1	GX09-1..R/L	C143	



Radius grooves – external

Modular system – external, assembly size 20



		h/d _A [inch]	LR	Type, description
C156		.625	R	MSS-E20R00-10-E
		.750	R	MSS-E20R00-12-E
	0			
C157		.750	L	MSS-E20L90-12-E
	90			

		r [inch]	T _{max} [inch]	LR	Type, description		
C161		.059	.472	R	MSS-E20R12-GX16-2	GX16-2..	C143
		.079	.472	R	MSS-E20R12-GX16-3	GX16-3..	C143
		.098	.472	R	MSS-E20R12-GX16-3	GX16-3..	C143
C162		.059	.827	R	MSS-E20R21-GX24-2	GX24-2..	C143
		.079	.827	R	MSS-E20R21-GX24-3	GX24-3..	C143
		.098	.827	R	MSS-E20R21-GX24-3	GX24-3..	C143
C164		.031	.070	R	MSS-E20R03-GX16-2	GX16-2..R/L	C143
		.039	.086	R	MSS-E20R03-GX16-2	GX16-2..R/L	C143
		.047	.102	R	MSS-E20R03-GX16-2	GX16-2..R/L	C143
C168		.059	.787	R	MSS-E20R20-SX3	SX..3	C145

		h/d _A [inch]	LR	Type, description
C156		.625	L	MSS-E20L00-10-E
		.750	L	MSS-E20L00-12-E
	0			
C157		.750	R	MSS-E20R90-12-E
	90			

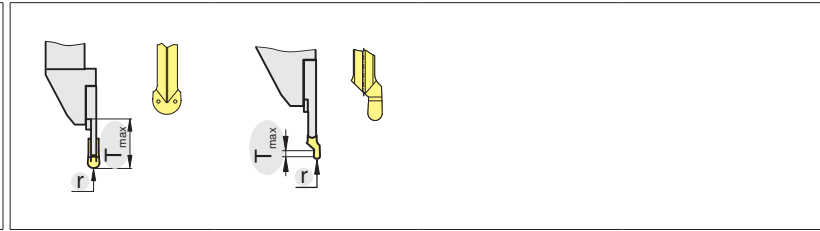
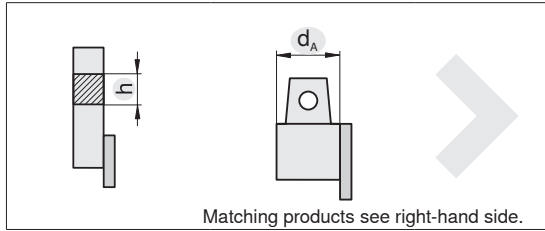
		r [inch]	T _{max} [inch]	LR	Type, description		
C161		.059	.472	L	MSS-E20L12-GX16-2	GX16-2..	C143
		.079	.472	L	MSS-E20L12-GX16-3	GX16-3..	C143
		.098	.472	L	MSS-E20L12-GX16-3	GX16-3..	C143
C162		.059	.827	L	MSS-E20L21-GX24-2	GX24-2..	C143
		.079	.827	L	MSS-E20L21-GX24-3	GX24-3..	C143
		.098	.827	L	MSS-E20L21-GX24-3	GX24-3..	C143
C164		.031	.070	L	MSS-E20L03-GX16-2	GX16-2..R/L	C143
		.039	.086	L	MSS-E20L03-GX16-2	GX16-2..R/L	C143
		.047	.102	L	MSS-E20L03-GX16-2	GX16-2..R/L	C143
C168		.059	.787	L	MSS-E20L20-SX3	SX..3	C145

Application

Tools and inserts for parting and grooving

Radius grooves – external

Modular system – external, assembly size 25



		h/d _A [inch]	LR Type, description
C156		1.000	R MSS-E25R00-16-E
	0		
C157		1.000	L MSS-E25L90-16-E
	90		
C196		2.480	R HSK-T63-MSS-E25R00
	0		

		r [inch]	T _{max} [inch]	LR Type, description		
C161		.059	.472	R MSS-E25R12-GX16-2	GX16-2..	C143
		.079	.472	R MSS-E25R12-GX16-3	GX16-3..	C143
		.098	.472	R MSS-E25R12-GX16-3	GX16-3..	C143
		.118	.472	R MSS-E25R12-GX16-4	GX16-4..	C143
C162		.059	.827	R MSS-E25R21-GX24-2	GX24-2..	C143
		.079	.827	R MSS-E25R21-GX24-3	GX24-3..	C143
		.098	.827	R MSS-E25R21-GX24-3	GX24-3..	C143
		.118	.827	R MSS-E25R21-GX24-4	GX24-4..	C143
C164		.031	.070	R MSS-E25R03-GX16-2	GX16-2..R/L	C143
		.039	.086	R MSS-E25R03-GX16-2	GX16-2..R/L	C143
		.047	.102	R MSS-E25R03-GX16-2	GX16-2..R/L	C143
C168		.059	.984	R MSS-E25R25-SX3	SX..3	C145
		.059	1.378	R MSS-E25R35-SX3	SX..3	C145
		.079	1.378	R MSS-E25R35-SX4	SX..4	C145
		.079	.984	R MSS-E25R25-SX4	SX..4	C145

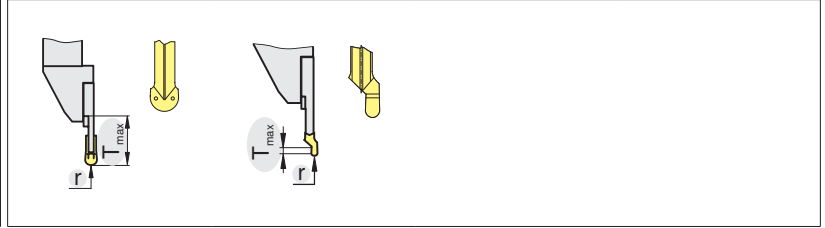
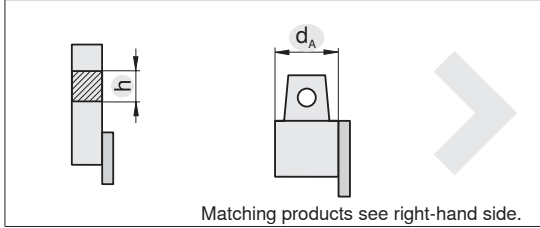
		h/d _A [inch]	LR Type, description
C156		1.000	L MSS-E25L00-16-E
	0		
C157		1.000	R MSS-E25R90-16-E
	90		
C196		3.937	L HSK-T100-MSS-E25L00
	0		L HSK-T63-MSS-E25L00

		r [inch]	T _{max} [inch]	LR Type, description		
C161		.059	.472	L MSS-E25L12-GX16-2	GX16-2..	C143
		.079	.472	L MSS-E25L12-GX16-3	GX16-3..	C143
		.098	.472	L MSS-E25L12-GX16-3	GX16-3..	C143
		.118	.472	L MSS-E25L12-GX16-4	GX16-4..	C143
C162		.059	.827	L MSS-E25L21-GX24-2	GX24-2..	C143
		.079	.827	L MSS-E25L21-GX24-3	GX24-3..	C143
		.098	.827	L MSS-E25L21-GX24-3	GX24-3..	C143
		.118	.827	L MSS-E25L21-GX24-4	GX24-4..	C143
C164		.031	.070	L MSS-E25L03-GX16-2	GX16-2..R/L	C143
		.039	.086	L MSS-E25L03-GX16-2	GX16-2..R/L	C143
		.047	.102	L MSS-E25L03-GX16-2	GX16-2..R/L	C143
C168		.059	.984	L MSS-E25L25-SX3	SX..3	C145
		.059	1.378	L MSS-E25L35-SX3	SX..3	C145
		.079	1.378	L MSS-E25L35-SX4	SX..4	C145
		.079	.984	L MSS-E25L25-SX4	SX..4	C145



Radius grooves – external

Modular system – external, assembly size 32



Matching products see right-hand side.

Application

Tools and inserts for parting and grooving

		h/d _A [inch]	L R	Type, description
C156		1.250	R	MSS-E32R00-20-E
		1.250	R	MSS-E32R00-85-E
	0			
C157		1.250	L	MSS-E32L90-20-E
		1.250	L	MSS-E32L90-85-E
	90			
C196		3.937	R	HSK-T100-MSS-E32R00
		2.480	R	HSK-T63-MSS-E32R00
	0			
C197		3.937	L	HSK-T100-MSS-E32L90
		2.480	L	HSK-T63-MSS-E32L90
	90			

		r [inch]	T _{max} [inch]	L R	Type, description		
C161		.059	.472	R	MSS-E32R12-GX16-2	GX16-2..	C143
		.079	.472	R	MSS-E32R12-GX16-3	GX16-3..	C143
		.098	.472	R	MSS-E32R12-GX16-3	GX16-3..	C143
		.118	.472	R	MSS-E32R12-GX16-4	GX16-4..	C143
C162		.059	.827	R	MSS-E32R21-GX24-2	GX24-2..	C143
		.079	.827	R	MSS-E32R21-GX24-3	GX24-3..	C143
		.098	.827	R	MSS-E32R21-GX24-3	GX24-3..	C143
		.118	.827	R	MSS-E32R21-GX24-4	GX24-4..	C143
C164		.031	.070	R	MSS-E32R03-GX16-2	GX16-2..R/L	C143
		.039	.086	R	MSS-E32R03-GX16-2	GX16-2..R/L	C143
		.047	.102	R	MSS-E32R03-GX16-2	GX16-2..R/L	C143
C168		.059	1.378	R	MSS-E32R35-SX3	SX..3	C145
		.079	1.378	R	MSS-E32R35-SX4	SX..4	C145
C169		.157	.984	N	MSS-E32N25-LX	LX..	C146
		.157	1.260	N	MSS-E32N32-LX	LX..	C146
		.157	1.772	N	MSS-E32N45-LX	LX..	C146

		h/d _A [inch]	L R	Type, description
C156		1.250	L	MSS-E32L00-85-E
		1.250	L	MSS-E32L00-20-E
	0			
C157		1.250	R	MSS-E32R90-85-E
		1.250	R	MSS-E32R90-20-E
	90			
C196		2.480	L	HSK-T63-MSS-E32L00
	0			
C197		2.480	R	HSK-T63-MSS-E32R90
		3.937	R	HSK-T100-MSS-E32R90
	90			

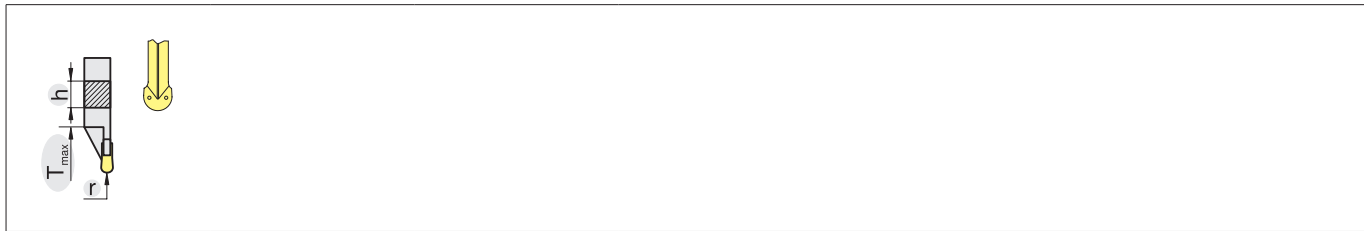
		r [inch]	T _{max} [inch]	L R	Type, description		
C161		.059	.472	L	MSS-E32L12-GX16-2	GX16-2..	C143
		.079	.472	L	MSS-E32L12-GX16-3	GX16-3..	C143
		.098	.472	L	MSS-E32L12-GX16-3	GX16-3..	C143
		.118	.472	L	MSS-E32L12-GX16-4	GX16-4..	C143
C162		.059	.827	L	MSS-E32L21-GX24-2	GX24-2..	C143
		.079	.827	L	MSS-E32L21-GX24-3	GX24-3..	C143
		.098	.827	L	MSS-E32L21-GX24-3	GX24-3..	C143
		.118	.827	L	MSS-E32L21-GX24-4	GX24-4..	C143
C164		.031	.070	L	MSS-E32L03-GX16-2	GX16-2..R/L	C143
		.039	.086	L	MSS-E32L03-GX16-2	GX16-2..R/L	C143
		.047	.102	L	MSS-E32L03-GX16-2	GX16-2..R/L	C143
C168		.059	1.378	L	MSS-E32L35-SX3	SX..3	C145
		.079	1.378	L	MSS-E32L35-SX4	SX..4	C145
C169		.157	.984	N	MSS-E32N25-LX	LX..	C146
		.157	1.260	N	MSS-E32N32-LX	LX..	C146
		.157	1.772	N	MSS-E32N45-LX	LX..	C146




Radius grooves – external

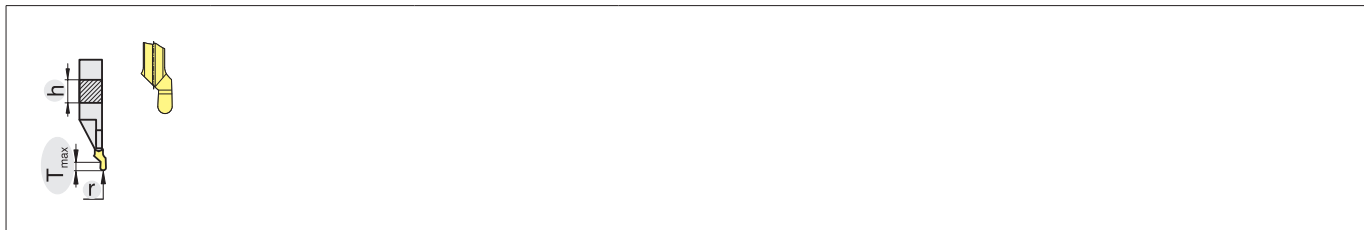
Monoblock tools – GX






C105



		h [inch]	r [inch]	T_{max} [inch]		Type, description		
C172		.375	.039	.276	R	E10R00-06-GX09-E	GX09..	C143
		.375	.047	.276	R	E10R00-06-GX09-E	GX09..	C143
		.375	.039	.276	L	E10L00-06-GX09-E	GX09..	C143
		.375	.047	.276	L	E10L00-06-GX09-E	GX09..	C143



		h [inch]	r [inch]	T_{max} [inch]		Type, description		
C172		.375	.031	.070	R	E10R00-06-GX09-E	GX09-1..R/L	C143
		.375	.031	.070	L	E10L00-06-GX09-E	GX09-1..R/L	C143

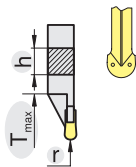
Application




Tools and inserts for parting and grooving



Radius grooves – external

Monoblock tools – GX



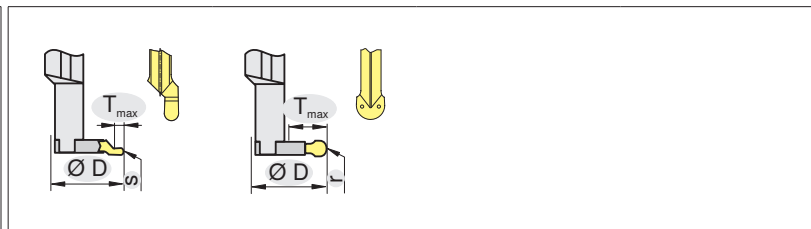
		h [inch]	r [inch]	T _{max} [inch]		Type, description		
C173		.625	.059	.827	R	E16R0021-10C-GX24-2-E	GX24-2..	C143
		.750	.059	.827	R	E20R0021-12C-GX24-2-E	GX24-2..	C143
		.750	.079	.827	R	E20R0021-12C-GX24-3-E	GX24-3..	C143
		.750	.098	.827	R	E20R0021-12C-GX24-3-E	GX24-3..	C143
		1.000	.059	.827	R	E25R0021-16D-GX24-2-E	GX24-2..	C143
		1.000	.079	.827	R	E25R0021-16D-GX24-3-E	GX24-3..	C143
		1.000	.098	.827	R	E25R0021-16D-GX24-3-E	GX24-3..	C143
		1.000	.118	.827	R	E25R0021-16D-GX24-4-E	GX24-4..	C143
		1.250	.059	.827	R	E32R0021-85D-GX24-2-E	GX24-2..	C143
		1.250	.079	.827	R	E32R0021-85D-GX24-3-E	GX24-3..	C143
		1.250	.098	.827	R	E32R0021-85D-GX24-3-E	GX24-3..	C143
		1.250	.118	.827	R	E32R0021-85D-GX24-4-E	GX24-4..	C143
		.625	.059	.827	L	E16L0021-10C-GX24-2-E	GX24-2..	C143
		.750	.059	.827	L	E20L0021-12C-GX24-2-E	GX24-2..	C143
		.750	.079	.827	L	E20L0021-12C-GX24-3-E	GX24-3..	C143
		.750	.098	.827	L	E20L0021-12C-GX24-3-E	GX24-3..	C143
		1.000	.059	.827	L	E25L0021-16D-GX24-2-E	GX24-2..	C143
		1.000	.079	.827	L	E25L0021-16D-GX24-3-E	GX24-3..	C143
		1.000	.098	.827	L	E25L0021-16D-GX24-3-E	GX24-3..	C143
		1.000	.118	.827	L	E25L0021-16D-GX24-4-E	GX24-4..	C143
		1.250	.059	.827	L	E32L0021-85D-GX24-2-E	GX24-2..	C143
		1.250	.079	.827	L	E32L0021-85D-GX24-3-E	GX24-3..	C143
		1.250	.098	.827	L	E32L0021-85D-GX24-3-E	GX24-3..	C143
		1.250	.118	.827	L	E32L0021-85D-GX24-4-E	GX24-4..	C143


Radius grooves – internal



Modular system – internal, assembly size 16






C107



	d_A [inch]		Type, description
C183	.750	R	MSS-I16R90-1.5D-E
			1.5D
C184	.750	R	MSS-I16R90-2.5D-E
			2.5D

	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C185	.787	.039	.157	R	MSS-I16R04-GX09-1	GX09-1..	C143
					R		MSS-I16R04-GX09-1	GX09-1..	C143
C188	.787	.031	.070	R	MSS-I16R02-GX09-1	GX09-1..R/L	C143

	d_A [inch]		Type, description
C183	.750	L	MSS-I16L90-1.5D-E
			1.5D
C184	.750	L	MSS-I16L90-2.5D-E
			2.5D

	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C185	.787	.039	.157	L	MSS-I16L04-GX09-1	GX09-1..	C143
					L		MSS-I16L04-GX09-1	GX09-1..	C143
C188	.787	.031	.070	L	MSS-I16L02-GX09-1	GX09-1..R/L	C143

Application

Tools and inserts for parting and grooving

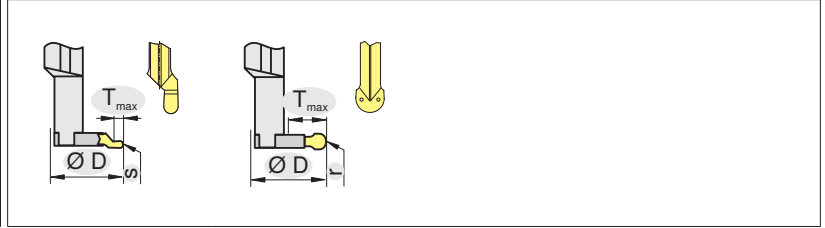


Radius grooves – internal

Modular system – external, assembly size 20



Matching products see right-hand side.



	d_A [inch]		Type, description
C183 1.5D	.750	R	MSS-I20R90-1.5D-E
C184 2.5D	1.000	R	MSS-I20R90-2.5D-E

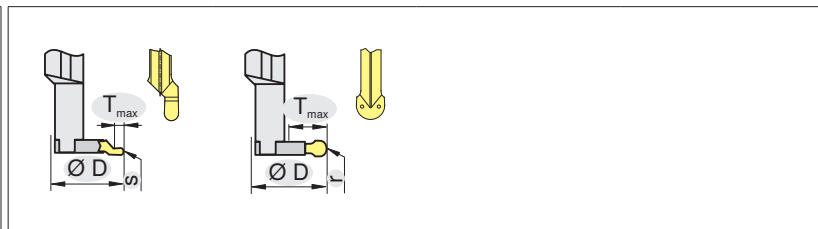
	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C185 	.984	.039	.197	R	MSS-I20R05-GX09-1	GX09-1..	C143
	.984	.047	.197	R	MSS-I20R05-GX09-1	GX09-1..	C143
C188 	.984	.031	.070	R	MSS-I20R02-GX09-1	GX09-1..R/L	C143




	d_A [inch]		Type, description
C183 1.5D	.750	L	MSS-I20L90-1.5D-E
C184 2.5D	1.000	L	MSS-I20L90-2.5D-E





	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C185 	.984	.039	.197	L	MSS-I20L05-GX09-1	GX09-1..	C143
	.984	.047	.197	L	MSS-I20L05-GX09-1	GX09-1..	C143
C188 	.984	.031	.070	L	MSS-I20L02-GX09-1	GX09-1..R/L	C143




Radius grooves – internal





Modular system – internal, assembly size 25



	d_A [inch]		Type, description
C183  1.5D	1.000	R	MSS-I25R90-1.5D-E
C184  2.5D	1.250	R	MSS-I25R90-2.5D-E

	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C185 	1.260	.039	.236	R	MSS-I25R06-GX09-1	GX09-1..	C143
	1.260	.047	.236	R	MSS-I25R06-GX09-1	GX09-1..	C143
C188 	1.260	.031	.070	R	MSS-I25R02-GX09-1	GX09-1..R/L	C143

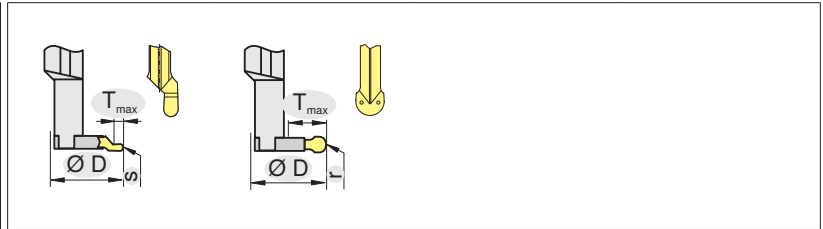
	d_A [inch]		Type, description
C183  1.5D	1.000	L	MSS-I25L90-1.5D-E
C184  2.5D	1.250	L	MSS-I25L90-2.5D-E




	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C185 	1.260	.039	.236	L	MSS-I25L06-GX09-1	GX09-1..	C143
	1.260	.047	.236	L	MSS-I25L06-GX09-1	GX09-1..	C143
C188 	1.260	.031	.070	L	MSS-I25L02-GX09-1	GX09-1..R/L	C143










Radius grooves – internal





Modular system – internal, assembly size 32



		d_A [inch]		Type, description
C183		1.250	R	MSS-I32R90-1.5D-E
C184		1.500	R	MSS-I32R90-2.5D-E

		D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C186		1.575	.059	.354	R	MSS-I32R09-GX16-2	GX16-2..	C143
		1.575	.079	.354	R	MSS-I32R09-GX16-3	GX16-3..	C143
		1.575	.098	.354	R	MSS-I32R09-GX16-3	GX16-3..	C143
		1.575	.118	.354	R	MSS-I32R09-GX16-4	GX16-4..	C143
C189		1.575	.031	.070	R	MSS-I32R03-GX16-2	GX16-2..R/L	C143
		1.575	.039	.086	R	MSS-I32R03-GX16-2	GX16-2..R/L	C143
		1.575	.047	.102	R	MSS-I32R03-GX16-2	GX16-2..R/L	C143

		d_A [inch]		Type, description
C183		1.250	L	MSS-I32L90-1.5D-E
C184		1.500	L	MSS-I32L90-2.5D-E

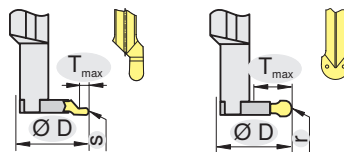
		D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C186		1.575	.059	.354	L	MSS-I32L09-GX16-2	GX16-2..	C143
		1.575	.079	.354	L	MSS-I32L09-GX16-3	GX16-3..	C143
		1.575	.098	.354	L	MSS-I32L09-GX16-3	GX16-3..	C143
		1.575	.118	.354	L	MSS-I32L09-GX16-4	GX16-4..	C143
C189		1.575	.031	.070	L	MSS-I32L03-GX16-2	GX16-2..R/L	C143
		1.575	.039	.086	L	MSS-I32L03-GX16-2	GX16-2..R/L	C143
		1.575	.047	.102	L	MSS-I32L03-GX16-2	GX16-2..R/L	C143




Radius grooves – internal






Modular system – internal, assembly size 40











C111



	d_A [inch]		Type, description
C183 	1.500	R	MSS-I40R90-1.5D-E
C184 	2.000	R	MSS-I40R90-2.5D-E

	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C186 	1.969	.079	.394	R	MSS-I40R10-GX16-3	GX16-3..	C143
	1.969	.098	.394	R	MSS-I40R10-GX16-3	GX16-3..	C143
	1.969	.118	.394	R	MSS-I40R10-GX16-4	GX16-4..	C143
	1.969	.059	.394	R	MSS-I40R10-GX16-2	GX16-2..	C143
C187 	2.362	.098	.748	N	MSS-I40N19-GX24-3	GX24-3..	C143
	2.362	.079	.748	N	MSS-I40N19-GX24-3	GX24-3..	C143
	2.362	.118	.748	N	MSS-I40N19-GX24-4	GX24-4..	C143
	2.362	.059	.748	N	MSS-I40N19-GX24-2	GX24-2..	C143
C189 	1.969	.047	.102	R	MSS-I40R03-GX16-2	GX16-2..R/L	C143
	1.969	.031	.070	R	MSS-I40R03-GX16-2	GX16-2..R/L	C143
	1.969	.039	.086	R	MSS-I40R03-GX16-2	GX16-2..R/L	C143

	d_A [inch]		Type, description
C183 	1.500	L	MSS-I40L90-1.5D-E
C184 	2.000	L	MSS-I40L90-2.5D-E

	D_{min} [inch]	r [inch]	T_{max} [inch]		Type, description		
C186 	1.969	.079	.394	L	MSS-I40L10-GX16-3	GX16-3..	C143
	1.969	.098	.394	L	MSS-I40L10-GX16-3	GX16-3..	C143
	1.969	.118	.394	L	MSS-I40L10-GX16-4	GX16-4..	C143
	1.969	.059	.394	L	MSS-I40L10-GX16-2	GX16-2..	C143
C187 	2.362	.098	.748	N	MSS-I40N19-GX24-3	GX24-3..	C143
	2.362	.079	.748	N	MSS-I40N19-GX24-3	GX24-3..	C143
	2.362	.118	.748	N	MSS-I40N19-GX24-4	GX24-4..	C143
	2.362	.059	.748	N	MSS-I40N19-GX24-2	GX24-2..	C143
C189 	1.969	.047	.102	L	MSS-I40L03-GX16-2	GX16-2..R/L	C143
	1.969	.031	.070	L	MSS-I40L03-GX16-2	GX16-2..R/L	C143
	1.969	.039	.086	L	MSS-I40L03-GX16-2	GX16-2..R/L	C143

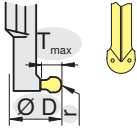
Application




Tools and inserts for parting and grooving

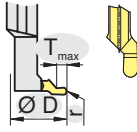





Radius grooves – internal

Monoblock boring bars – GX



C190		d_A	l_2	D_{min}	r	T_{max}		Type, description		
		[inch]	[inch]	[inch]	[inch]	[inch]				
		.625	1.181	.63	.039	.276	R	I12R90-2.5D-GX09-E	GX09..	C143
		.625	1.181	.63	.047	.276	R	I12R90-2.5D-GX09-E	GX09..	C143
		.625	1.181	.63	.039	.276	L	I12L90-2.5D-GX09-E	GX09..	C143
		.625	1.181	.63	.047	.276	L	I12L90-2.5D-GX09-E	GX09..	C143



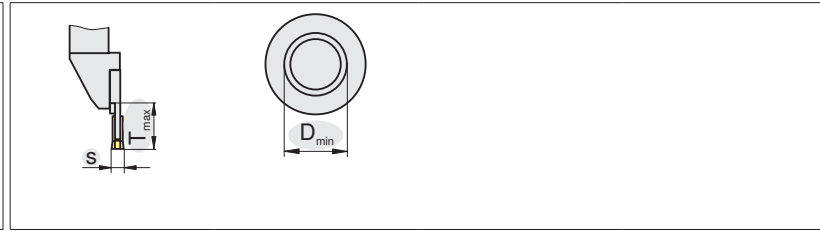
C190		d_A	l_2	D_{min}	r	T_{max}		Type, description		
		[inch]	[inch]	[inch]	[inch]	[inch]				
		.625	1.181	.63	.031	.070	R	I12R90-2.5D-GX09-E	GX09-1..R/L	C143
		.625	1.181	.63	.031	.070	L	I12L90-2.5D-GX09-E	GX09-1..R/L	C143

Axial grooving

Modular system – external, assembly size 16



C113



		h/d _A [inch]	L R 	Type, description
C156		.625	R	MSS-E16R00-10-E
	0			

		s/s _{min} [inch]	D _{min} [inch]	T _{max} [inch]	L R 	Type, description		
C167		.118	.39	.197	R	MSS-E16R05-AX05	AX05..	C144

		h/d _A [inch]	L R 	Type, description
C156		.625	L	MSS-E16L00-10-E
	0			

		s/s _{min} [inch]	D _{min} [inch]	T _{max} [inch]	L R 	Type, description		
C167		.118	.39	.197	L	MSS-E16L05-AX05	AX05..	C144

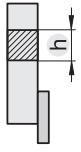
Application

Tools and inserts for parting and grooving









Axial grooving

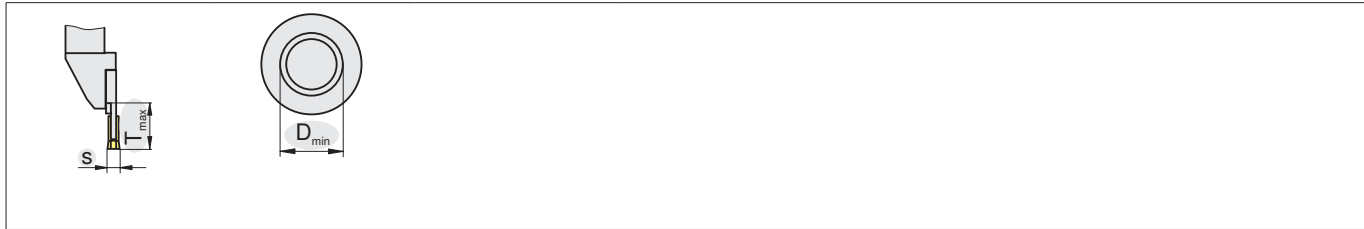
Modular system – external, assembly size 20











Matching products see right-hand side.

		h/d_A [inch]		Type, description
C156		.625	R	MSS-E20R00-10-E
		.750	R	MSS-E20R00-12-E
	0			
C157		.750	L	MSS-E20L90-12-E
	90			

		h/d_A [inch]		Type, description
C156		.625	L	MSS-E20L00-10-E
		.750	L	MSS-E20L00-12-E
	0			
C157		.750	R	MSS-E20R90-12-E
	90			



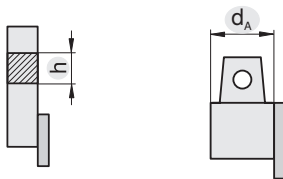
		s/s_{min} [inch]	s_{max} [inch]	D_{min} [inch]	D_{max} [inch]	T_{max} [inch]		Type, description		
C165		.109	.147	1.97	2.76	.551	R	MSS-E20R14-GX24-2 A50-70	GX24-2..	C140
		.109	.147	2.76	3.94	.551	R	MSS-E20R14-GX24-2 A70-100	GX24-2..	C140
		.109	.147	3.94	5.90	.551	R	MSS-E20R14-GX24-2 A100-150	GX24-2..	C140
C167		.118		.39		.197	R	MSS-E20R05-AX05	AX05..	C144
		.118		.79		.394	R	MSS-E20R10-AX10	AX10..	C144
		.118		1.18		.591	R	MSS-E20R15-AX15	AX15..	C144

		s/s_{min} [inch]	s_{max} [inch]	D_{min} [inch]	D_{max} [inch]	T_{max} [inch]		Type, description		
C165		.109	.147	1.97	2.76	.551	L	MSS-E20L14-GX24-2 A50-70	GX24-2..	C140
		.109	.147	2.76	3.94	.551	L	MSS-E20L14-GX24-2 A70-100	GX24-2..	C140
		.109	.147	3.94	5.90	.551	L	MSS-E20L14-GX24-2 A100-150	GX24-2..	C140
C167		.118		.39		.197	L	MSS-E20L05-AX05	AX05..	C144
		.118		.79		.394	L	MSS-E20L10-AX10	AX10..	C144
		.118		1.18		.591	L	MSS-E20L15-AX15	AX15..	C144







Axial grooving

Modular system – external, assembly size 25







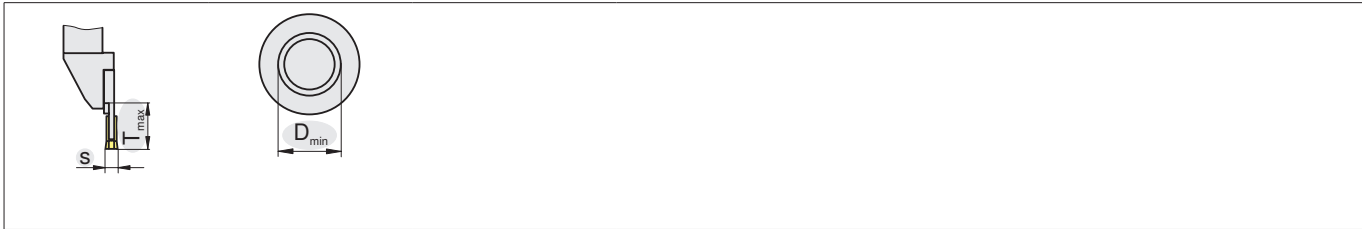
Matching products see right-hand side.





		h/d_A [inch]		Type, description
C156		1.000	R	MSS-E25R00-16-E
	0			
C157		1.000	L	MSS-E25L90-16-E
	90			
C196		2.480	R	HSK-T63-MSS-E25R00
	0			





Application

Tools and inserts for parting and grooving

		h/d_A [inch]		Type, description
C156		1.000	L	MSS-E25L00-16-E
	0			
C157		1.000	R	MSS-E25R90-16-E
	90			
C196		3.937	L	HSK-T100-MSS-E25L00
	0	2.480	L	HSK-T63-MSS-E25L00



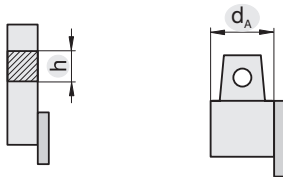
		s/s _{min} [inch]	s _{max} [inch]	D _{min} [inch]	D _{max} [inch]	T _{max} [inch]	LR	Type, description		
C165		.109	.147	1.97	2.76	.590	R	MSS-E25R15-GX24-2 A50-70	GX24-2..	C140
		.109	.147	2.76	3.94	.590	R	MSS-E25R15-GX24-2 A70-100	GX24-2..	C140
		.109	.147	3.94	5.90	.590	R	MSS-E25R15-GX24-2 A100-150	GX24-2..	C140
		.148	.197	1.97	2.76	.590	R	MSS-E25R15-GX24-3 A50-70	GX24-3..	C140
		.148	.197	2.76	3.94	.590	R	MSS-E25R15-GX24-3 A70-100	GX24-3..	C140
		.148	.197	3.94	5.90	.590	R	MSS-E25R15-GX24-3 A100-150	GX24-3..	C140
		.148	.197	5.90	11.81	.590	R	MSS-E25R15-GX24-3 A150-300	GX24-3..	C140
		.198	.256	1.97	2.76	.590	R	MSS-E25R15-GX24-4 A50-70	GX24-4..	C140
		.198	.256	2.76	3.94	.590	R	MSS-E25R15-GX24-4 A70-100	GX24-4..	C140
		.198	.256	3.94	5.90	.590	R	MSS-E25R15-GX24-4 A100-150	GX24-4..	C140
.198	.256	5.90	11.81	.590	R	MSS-E25R15-GX24-4 A150-300	GX24-4..	C140		
C166		.148	.197	1.97	2.75	.827	R	MSS-E25R21-GX24-3 AS50-70	GX24-3..	C140
		.148	.197	2.75	3.94	.827	R	MSS-E25R21-GX24-3 AS70-100	GX24-3..	C140
		.148	.197	3.94	5.90	.827	R	MSS-E25R21-GX24-3 AS100-150	GX24-3..	C140
		.148	.197	5.90	11.81	.827	R	MSS-E25R21-GX24-3 AS150-300	GX24-3..	C140
		.198	.256	1.97	2.75	.984	R	MSS-E25R25-GX24-4 AS50-70	GX24-4..	C140
		.198	.256	2.75	3.94	.984	R	MSS-E25R25-GX24-4 AS70-100	GX24-4..	C140
		.198	.256	3.94	5.90	.984	R	MSS-E25R25-GX24-4 AS100-150	GX24-4..	C140
		.198	.256	5.90	11.81	.984	R	MSS-E25R25-GX24-4 AS150-300	GX24-4..	C140
C167		.118		.39		.197	R	MSS-E25R05-AX05	AX05..	C144
		.118		.79		.394	R	MSS-E25R10-AX10	AX10..	C144
		.118		1.18		.591	R	MSS-E25R15-AX15	AX15..	C144

		s/s _{min} [inch]	s _{max} [inch]	D _{min} [inch]	D _{max} [inch]	T _{max} [inch]	LR	Type, description		
C165		.109	.147	1.97	2.76	.590	L	MSS-E25L15-GX24-2 A50-70	GX24-2..	C140
		.109	.147	2.76	3.94	.590	L	MSS-E25L15-GX24-2 A70-100	GX24-2..	C140
		.109	.147	3.94	5.90	.590	L	MSS-E25L15-GX24-2 A100-150	GX24-2..	C140
		.148	.197	1.97	2.76	.590	L	MSS-E25L15-GX24-3 A50-70	GX24-3..	C140
		.148	.197	2.76	3.94	.590	L	MSS-E25L15-GX24-3 A70-100	GX24-3..	C140
		.148	.197	3.94	5.90	.590	L	MSS-E25L15-GX24-3 A100-150	GX24-3..	C140
		.148	.197	5.90	11.81	.590	L	MSS-E25L15-GX24-3 A150-300	GX24-3..	C140
		.198	.256	1.97	2.76	.590	L	MSS-E25L15-GX24-4 A50-70	GX24-4..	C140
		.198	.256	2.76	3.94	.590	L	MSS-E25L15-GX24-4 A70-100	GX24-4..	C140
		.198	.256	3.94	5.90	.590	L	MSS-E25L15-GX24-4 A100-150	GX24-4..	C140
.198	.256	5.90	11.81	.590	L	MSS-E25L15-GX24-4 A150-300	GX24-4..	C140		
C166		.148	.197	1.97	2.75	.827	L	MSS-E25L21-GX24-3 AS50-70	GX24-3..	C140
		.148	.197	2.75	3.94	.827	L	MSS-E25L21-GX24-3 AS70-100	GX24-3..	C140
		.148	.197	3.94	5.90	.827	L	MSS-E25L21-GX24-3 AS100-150	GX24-3..	C140
		.148	.197	5.90	11.81	.827	L	MSS-E25L21-GX24-3 AS150-300	GX24-3..	C140
		.198	.256	1.97	2.75	.984	L	MSS-E25L25-GX24-4 AS50-70	GX24-4..	C140
		.198	.256	2.75	3.94	.984	L	MSS-E25L25-GX24-4 AS70-100	GX24-4..	C140
		.198	.256	3.94	5.90	.984	L	MSS-E25L25-GX24-4 AS100-150	GX24-4..	C140
		.198	.256	5.90	11.81	.984	L	MSS-E25L25-GX24-4 AS150-300	GX24-4..	C140
C167		.118		.39		.197	L	MSS-E25L05-AX05	AX05..	C144
		.118		.79		.394	L	MSS-E25L10-AX10	AX10..	C144
		.118		1.18		.591	L	MSS-E25L15-AX15	AX15..	C144








Axial grooving






Modular system – external, assembly size 32



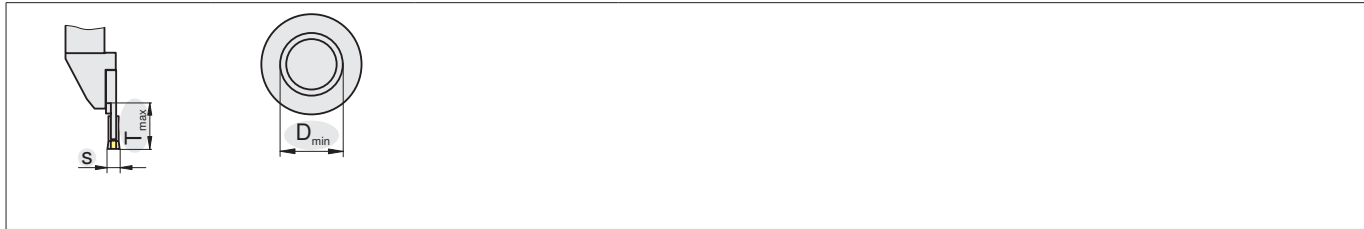
Matching products see right-hand side.

		h/d _A [inch]		Type, description
C156		1.250	R	MSS-E32R00-20-E
		1.250	R	MSS-E32R00-85-E
	0			
C157		1.250	L	MSS-E32L90-20-E
		1.250	L	MSS-E32L90-85-E
	90			
C196		3.937	R	HSK-T100-MSS-E32R00
		2.480	R	HSK-T63-MSS-E32R00
	0			
C197		3.937	L	HSK-T100-MSS-E32L90
		2.480	L	HSK-T63-MSS-E32L90
	90			

Application

		h/d _A [inch]		Type, description
C156		1.250	L	MSS-E32L00-85-E
		1.250	L	MSS-E32L00-20-E
	0			
C157		1.250	R	MSS-E32R90-85-E
		1.250	R	MSS-E32R90-20-E
	90			
C196		2.480	L	HSK-T63-MSS-E32L00
	0			
C197		2.480	R	HSK-T63-MSS-E32R90
		3.937	R	HSK-T100-MSS-E32R90
	90			

Tools and inserts for parting and grooving



		s/s_{min}	s_{max}	D_{min}	D_{max}	T_{max}		Type, description		
		[inch]	[inch]	[inch]	[inch]	[inch]				
C165		.148	.197	2.76	3.94	.590	R	MSS-E32R15-GX24-3 A70-100	GX24-3..	C140
		.148	.197	3.94	5.90	.590	R	MSS-E32R15-GX24-3 A100-150	GX24-3..	C140
		.148	.197	5.90	11.81	.590	R	MSS-E32R15-GX24-3 A150-300	GX24-3..	C140
		.198	.256	11.81	35.43	.590	R	MSS-E32R15-GX24-4 A300-900	GX24-4..	C140
		.198	.256	2.76	3.94	.590	R	MSS-E32R15-GX24-4 A70-100	GX24-4..	C140
		.198	.256	3.94	5.90	.590	R	MSS-E32R15-GX24-4 A100-150	GX24-4..	C140
		.198	.256	5.90	11.81	.590	R	MSS-E32R15-GX24-4 A150-300	GX24-4..	C140

		s/s_{min}	s_{max}	D_{min}	D_{max}	T_{max}		Type, description		
		[inch]	[inch]	[inch]	[inch]	[inch]				
C165		.148	.197	2.76	3.94	.590	L	MSS-E32L15-GX24-3 A70-100	GX24-3..	C140
		.148	.197	3.94	5.90	.590	L	MSS-E32L15-GX24-3 A100-150	GX24-3..	C140
		.148	.197	5.90	11.81	.590	L	MSS-E32L15-GX24-3 A150-300	GX24-3..	C140
		.198	.256	11.81	35.43	.590	L	MSS-E32L15-GX24-4 A300-900	GX24-4..	C140
		.198	.256	2.76	3.94	.590	L	MSS-E32L15-GX24-4 A70-100	GX24-4..	C140
		.198	.256	3.94	5.90	.590	L	MSS-E32L15-GX24-4 A100-150	GX24-4..	C140
		.198	.256	5.90	11.81	.590	L	MSS-E32L15-GX24-4 A150-300	GX24-4..	C140

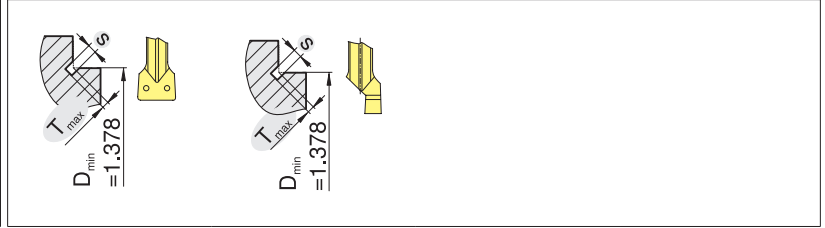



External recessing



Modular system – external, assembly size 20






Matching products see right-hand side.



		h/d _A [inch]	L R	Type, description
C158		.750	R	MSS-E20R45-12-E

		s [inch]	T _{max} [inch]	L R	Type, description	
C164		.039	.045	L	MSS-E20L03-GX16-2	GX16-2..R/L C142
		.047	.053	L	MSS-E20L03-GX16-2	GX16-2..R/L C142
		.055	.060	L	MSS-E20L03-GX16-2	GX16-2..R/L C142
		.067	.072	L	MSS-E20L03-GX16-2	GX16-2..R/L C142
		.077	.081	L	MSS-E20L03-GX16-2	GX16-2..R/L C142
		.089	.093	L	MSS-E20L03-GX16-2	GX16-2..R/L C142
		.118	.118	L	MSS-E20L03-GX16-2	GX16-2.. C142
		.128	.118	L	MSS-E20L03-GX16-2	GX16-2.. C142
		.138	.118	L	MSS-E20L03-GX16-2	GX16-2.. C142
		.157	.118	L	MSS-E20L03-GX16-2	GX16-3.. C142
		.167	.118	L	MSS-E20L03-GX16-2	GX16-3.. C142
		.177	.118	L	MSS-E20L03-GX16-2	GX16-3.. C142
		.197	.118	L	MSS-E20L03-GX16-2	GX16-3.. C142

		h/d _A [inch]	L R	Type, description
C158		.750	L	MSS-E20L45-12-E

		s [inch]	T _{max} [inch]	L R	Type, description	
C164		.039	.045	R	MSS-E20R03-GX16-2	GX16-2..R/L C142
		.047	.053	R	MSS-E20R03-GX16-2	GX16-2..R/L C142
		.055	.060	R	MSS-E20R03-GX16-2	GX16-2..R/L C142
		.067	.072	R	MSS-E20R03-GX16-2	GX16-2..R/L C142
		.077	.081	R	MSS-E20R03-GX16-2	GX16-2..R/L C142
		.089	.093	R	MSS-E20R03-GX16-2	GX16-2..R/L C142
		.118	.118	R	MSS-E20R03-GX16-2	GX16-2.. C142
		.128	.118	R	MSS-E20R03-GX16-2	GX16-2.. C142
		.138	.118	R	MSS-E20R03-GX16-2	GX16-2.. C142
		.157	.118	R	MSS-E20R03-GX16-2	GX16-3.. C142
		.167	.118	R	MSS-E20R03-GX16-2	GX16-3.. C142
		.177	.118	R	MSS-E20R03-GX16-2	GX16-3.. C142
		.197	.118	R	MSS-E20R03-GX16-2	GX16-3.. C142

External recessing

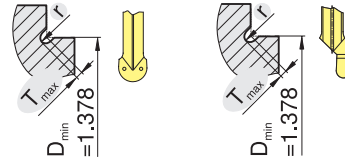
Modular system – external, assembly size 20








C121


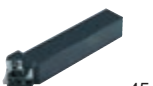





Matching products see right-hand side.



		h/d _A [inch]		Type, description
C158		.750	R	MSS-E20R45-12-E

		r [inch]	T _{max} [inch]		Type, description			
C164		.031	.070	L	MSS-E20L03-GX16-2	GX16-2..R/L	C143	
		.039	.086	L	MSS-E20L03-GX16-2	GX16-2..R/L	C143	
		.047	.102	L	MSS-E20L03-GX16-2	GX16-2..R/L	C143	
		.059	.118	L	MSS-E20L03-GX16-2	GX16-2..	C143	
		.079	.118	L	MSS-E20L03-GX16-2	GX16-3..	C143	
		.098	.118	L	MSS-E20L03-GX16-2	GX16-3..	C143	

		h/d _A [inch]		Type, description
C158		.750	L	MSS-E20L45-12-E

		r [inch]	T _{max} [inch]		Type, description			
C164		.031	.070	R	MSS-E20R03-GX16-2	GX16-2..R/L	C143	
		.039	.086	R	MSS-E20R03-GX16-2	GX16-2..R/L	C143	
		.047	.102	R	MSS-E20R03-GX16-2	GX16-2..R/L	C143	
		.059	.118	R	MSS-E20R03-GX16-2	GX16-2..	C143	
		.079	.118	R	MSS-E20R03-GX16-2	GX16-3..	C143	
		.098	.118	R	MSS-E20R03-GX16-2	GX16-3..	C143	

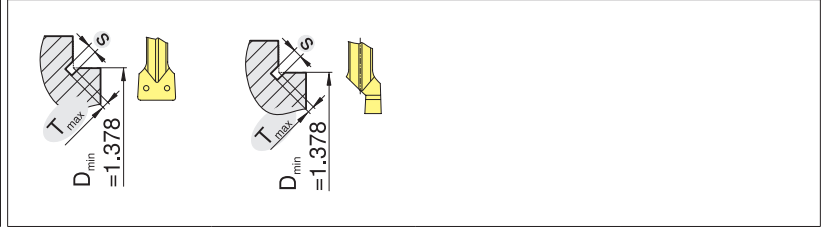
Application


Tools and inserts for parting and grooving






External recessing



Modular system – external, assembly size 25



		h/d _A [inch]	L R	Type, description
C158		1.000	R	MSS-E25R45-16-E

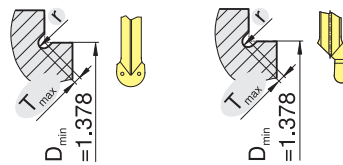
		s [inch]	T _{max} [inch]	L R	Type, description		
C164		.039	.045	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.047	.053	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.055	.060	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.067	.072	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.077	.081	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.089	.093	L	MSS-E25L03-GX16-2	GX16-2..R/L	C142
		.118	.118	L	MSS-E25L03-GX16-2	GX16-2..	C142
		.128	.118	L	MSS-E25L03-GX16-2	GX16-2..	C142
		.138	.118	L	MSS-E25L03-GX16-2	GX16-2..	C142
		.157	.118	L	MSS-E25L03-GX16-2	GX16-3..	C142
		.167	.118	L	MSS-E25L03-GX16-2	GX16-3..	C142
		.177	.118	L	MSS-E25L03-GX16-2	GX16-3..	C142
		.197	.118	L	MSS-E25L03-GX16-2	GX16-3..	C142
		.207	.118	L	MSS-E25L03-GX16-2	GX16-4..	C142
.236	.118	L	MSS-E25L03-GX16-2	GX16-4..	C142		


		h/d _A [inch]	L R	Type, description
C158		1.000	L	MSS-E25L45-16-E



		s [inch]	T _{max} [inch]	L R	Type, description		
C164		.039	.045	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.047	.053	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.055	.060	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.067	.072	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.077	.081	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.089	.093	R	MSS-E25R03-GX16-2	GX16-2..R/L	C142
		.118	.118	R	MSS-E25R03-GX16-2	GX16-2..	C142
		.128	.118	R	MSS-E25R03-GX16-2	GX16-2..	C142
		.138	.118	R	MSS-E25R03-GX16-2	GX16-2..	C142
		.157	.118	R	MSS-E25R03-GX16-2	GX16-3..	C142
		.167	.118	R	MSS-E25R03-GX16-2	GX16-3..	C142
		.177	.118	R	MSS-E25R03-GX16-2	GX16-3..	C142
		.197	.118	R	MSS-E25R03-GX16-2	GX16-3..	C142
		.207	.118	R	MSS-E25R03-GX16-2	GX16-4..	C142
.236	.118	R	MSS-E25R03-GX16-2	GX16-4..	C142		


External recessing



Modular system – external, assembly size 25



		h/d _A [inch]	L R	Type, description
C158		1.000	R	MSS-E25R45-16-E
		45		

		r [inch]	T _{max} [inch]	L R	Type, description		
C164		.031	.070	L	MSS-E25L03-GX16-2	GX16-2..R/L	C143
		.039	.086	L	MSS-E25L03-GX16-2	GX16-2..R/L	C143
		.047	.102	L	MSS-E25L03-GX16-2	GX16-2..R/L	C143
		.059	.118	L	MSS-E25L03-GX16-2	GX16-2..	C143
		.079	.118	L	MSS-E25L03-GX16-2	GX16-3..	C143
		.098	.118	L	MSS-E25L03-GX16-2	GX16-3..	C143
		.118	.118	L	MSS-E25L03-GX16-2	GX16-4..	C143

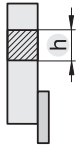
		h/d _A [inch]	L R	Type, description
C158		1.000	L	MSS-E25L45-16-E
		45		

		r [inch]	T _{max} [inch]	L R	Type, description		
C164		.031	.070	R	MSS-E25R03-GX16-2	GX16-2..R/L	C143
		.039	.086	R	MSS-E25R03-GX16-2	GX16-2..R/L	C143
		.047	.102	R	MSS-E25R03-GX16-2	GX16-2..R/L	C143
		.059	.118	R	MSS-E25R03-GX16-2	GX16-2..	C143
		.079	.118	R	MSS-E25R03-GX16-2	GX16-3..	C143
		.098	.118	R	MSS-E25R03-GX16-2	GX16-3..	C143
		.118	.118	R	MSS-E25R03-GX16-2	GX16-4..	C143









Thread turning – external

Modular system – external, assembly size 20



Matching products see right-hand side.

		h/d_A [inch]		Type, description
C156		.625	R	MSS-E20R00-10-E
		.750	R	MSS-E20R00-12-E
	0			
C157		.750	L	MSS-E20L90-12-E
	90			

		h/d_A [inch]		Type, description
C156		.625	L	MSS-E20L00-10-E
		.750	L	MSS-E20L00-12-E
	0			
C157		.750	R	MSS-E20R90-12-E
	90			

Thread turning – external

Modular system – external, assembly size 20



C125



C191		P_{min}	P_{max}	P_{min}	P_{max}	T_{max}		Type, description		
		[mm]	[mm]	[TPI]	[TPI]	[inch]				
		.50	1.50	48	16	.315	R	MSS-E20R-TC16-1	TC16-1..	C150
		1.75	3.00	14	8	.472	N	MSS-E20N-TC16-2	TC16-2..	C150

C191		P_{min}	P_{max}	P_{min}	P_{max}	T_{max}		Type, description		
		[mm]	[mm]	[TPI]	[TPI]	[inch]				
		.50	1.50	48	16	.315	L	MSS-E20L-TC16-1	TC16-1..	C150
		1.75	3.00	14	8	.472	N	MSS-E20N-TC16-2	TC16-2..	C150

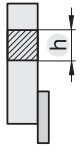
Application

Tools and inserts for parting and grooving







Thread turning – external

Modular system – external, assembly size 25







Matching products see right-hand side.

		h/d_A [inch]		Type, description
C156		1.000	R	MSS-E25R00-16-E
	0			
C157		1.000	L	MSS-E25L90-16-E
	90			
C196		2.480	R	HSK-T63-MSS-E25R00
	0			

Application

Tools and inserts for parting and grooving

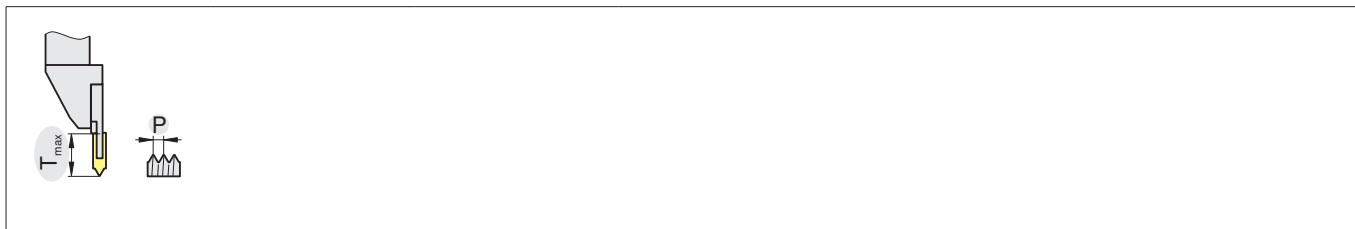
		h/d_A [inch]		Type, description
C156		1.000	L	MSS-E25L00-16-E
	0			
C157		1.000	R	MSS-E25R90-16-E
	90			
C196		3.937	L	HSK-T100-MSS-E25L00
		2.480	L	HSK-T63-MSS-E25L00
	0			

Thread turning – external

Modular system – external, assembly size 25



C127



C191		P_{min}	P_{max}	P_{min}	P_{max}	T_{max}		Type, description		TC16-1..	C150
		[mm]	[mm]	[TPI]	[TPI]	[inch]					
		.50	1.50	48	16	.315	R	MSS-E25R-TC16-1		TC16-1..	C150
		1.75	3.00	14	8	.394	R	MSS-E25R-TC16-2		TC16-2..	C150
		3.50	5.00	7	5	.472	N	MSS-E25N-TC16-3		TC16-3..	C148

C191		P_{min}	P_{max}	P_{min}	P_{max}	T_{max}		Type, description		TC16-1..	C150
		[mm]	[mm]	[TPI]	[TPI]	[inch]					
		.50	1.50	48	16	.315	L	MSS-E25L-TC16-1		TC16-1..	C150
		1.75	3.00	14	8	.394	L	MSS-E25L-TC16-2		TC16-2..	C150
		3.50	5.00	7	5	.472	N	MSS-E25N-TC16-3		TC16-3..	C148

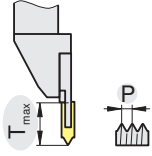
Application




Tools and inserts for parting and grooving

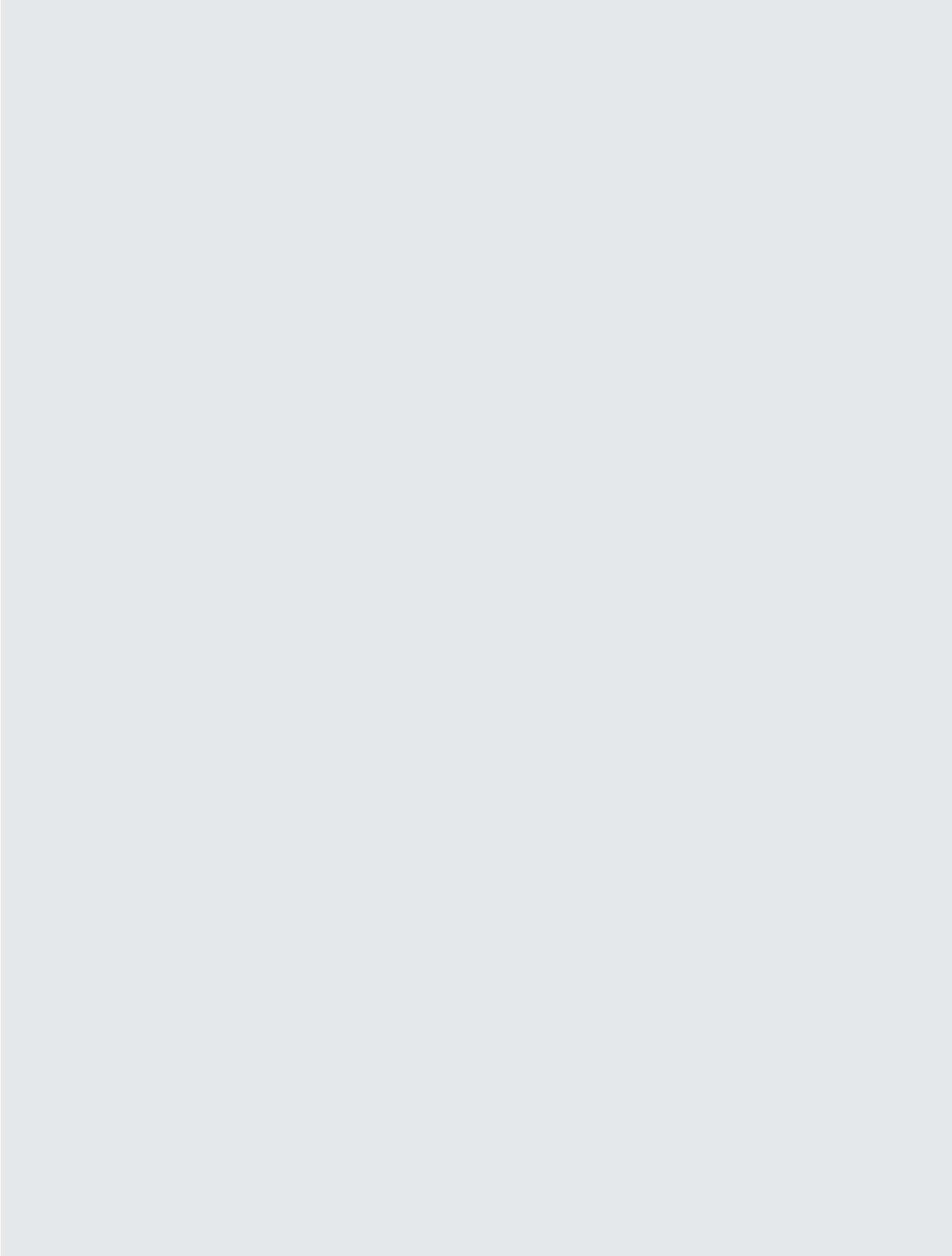


Thread turning – external

Monoblock tools – TC



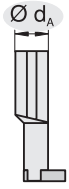
		h	P _{min}	P _{max}	P _{min}	P _{max}	T _{max}		Type, description			
		[inch]	[mm]	[mm]	[TPI]	[TPI]	[inch]					
C192		.500	.50	3.00	48	8	.394	R	E12R00-08-TC16-E	TC16-1/2..	C150	
		.500	.50	3.00	48	8	.394	L	E12L00-08-TC16-E	TC16-1/2..	C150	











Thread turning – internal

Modular system – internal, assembly size 32



Matching products see right-hand side.

		d_A [inch]		Type, description
C183	 1.5D	1.250	R	MSS-I32R90-1.5D-E
C184	 2.5D	1.500	R	MSS-I32R90-2.5D-E

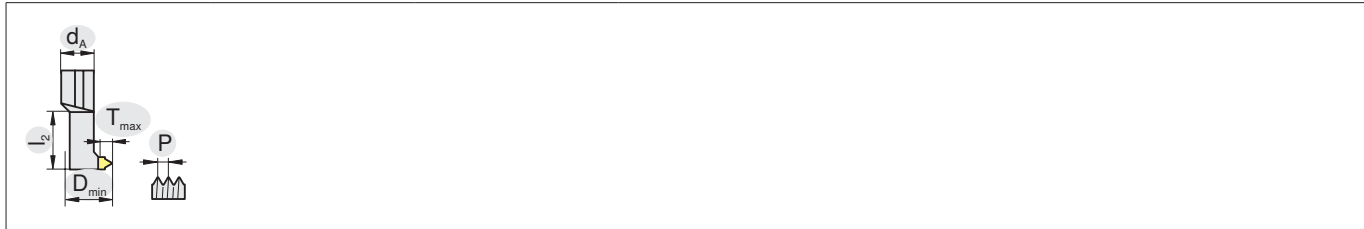
		d_A [inch]		Type, description
C183	 1.5D	1.250	L	MSS-I32L90-1.5D-E
C184	 2.5D	1.500	L	MSS-I32L90-2.5D-E

Thread turning – internal

Modular system – internal, assembly size 32



C131



C193		P_{min}	P_{max}	P_{min}	P_{max}	D_{min}	T_{max}		Type, description		
		[mm]	[mm]	[TPI]	[TPI]	[inch]	[inch]			TC16-1..	C150
		.50	1.50	48	16	1.575	.276	R	MSS-I32R-TC16-1	TC16-1..	C150
		1.75	3.00	14	8	1.575	.276	R	MSS-I32R-TC16-2	TC16-2..	C150
		3.50	5.00	7	5	1.575	.276	N	MSS-I32N-TC16-3	TC16-3..	C148

C193		P_{min}	P_{max}	P_{min}	P_{max}	D_{min}	T_{max}		Type, description		
		[mm]	[mm]	[TPI]	[TPI]	[inch]	[inch]			TC16-1..	C150
		.50	1.50	48	16	1.575	.276	L	MSS-I32L-TC16-1	TC16-1..	C150
		1.75	3.00	14	8	1.575	.276	L	MSS-I32L-TC16-2	TC16-2..	C150
		3.50	5.00	7	5	1.575	.276	N	MSS-I32N-TC16-3	TC16-3..	C148

Application




Tools and inserts for parting and grooving

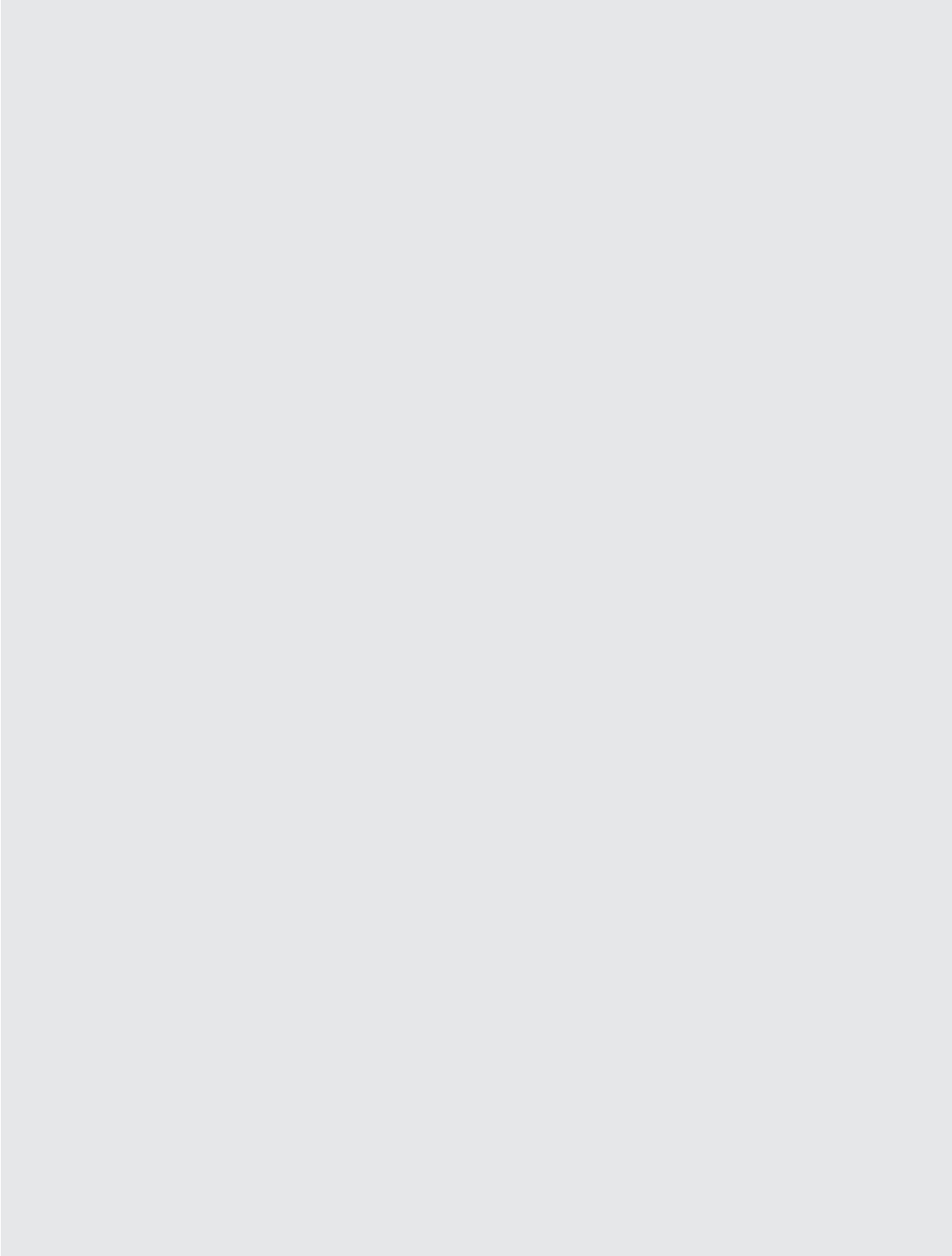


Thread turning – internal

Monoblock boring bars – TC



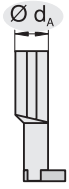
		D_{min}	d_A	l_2	T_{max}	P_{min}	P_{max}	P_{min}	P_{max}		Type, description		
		[inch]	[inch]	[inch]	[inch]	[mm]	[mm]	[TPI]	[TPI]				
C194		.787	.750	1.339	.157	.50	3.00	48	8		I16L90-2D-TC16-E	TC16-1/2..	C150
		.787	.750	1.339	.157	.50	3.00	48	8		I16R90-2D-TC16-E	TC16-1/2..	C150
		.984	1.000	1.654	.197	.50	5.00	48	5		I20R90-2D-TC16-E	TC16-..	C150
		.984	1.000	1.654	.197	.50	5.00	48	5		I20L90-2D-TC16-E	TC16-..	C150
		1.260	1.250	2.047	.236	.50	5.00	48	5		I25R90-2D-TC16-E	TC16-..	C150
		1.260	1.250	2.047	.236	.50	5.00	48	5		I25L90-2D-TC16-E	TC16-..	C150









Thread milling – external

Boring bars – TC









Matching products see right-hand side.

		d_A [inch]	 ^L ^R	Type, description
C183	 1.5D	1.250	R	MSS-I32R90-1.5D-E

		d_A [inch]	 ^L ^R	Type, description
C184	 2.5D	1.500	R	MSS-I32R90-2.5D-E



		D_{min}	P_{min}	P_{max}	P_{min}	P_{max}	T_{max}		Type, description		
		[inch]	[mm]	[mm]	[TPI]	[TPI]	[inch]				
C193		1.732	3.50	5.00	7	5	.276	N	MSS-I32N-TC16-3	TC16-3..	C148
		1.732	1.75	3.00	14	8	.276	R	MSS-I32R-TC16-2	TC16-2..	C150



		D_{min}	P_{min}	P_{max}	P_{min}	P_{max}	T_{max}		Type, description		
		[inch]	[mm]	[mm]	[TPI]	[TPI]	[inch]				
C193		2.323	3.50	5.00	7	5	.276	N	MSS-I32N-TC16-3	TC16-3..	C148
		2.323	1.75	3.00	14	8	.276	R	MSS-I32R-TC16-2	TC16-2..	C150

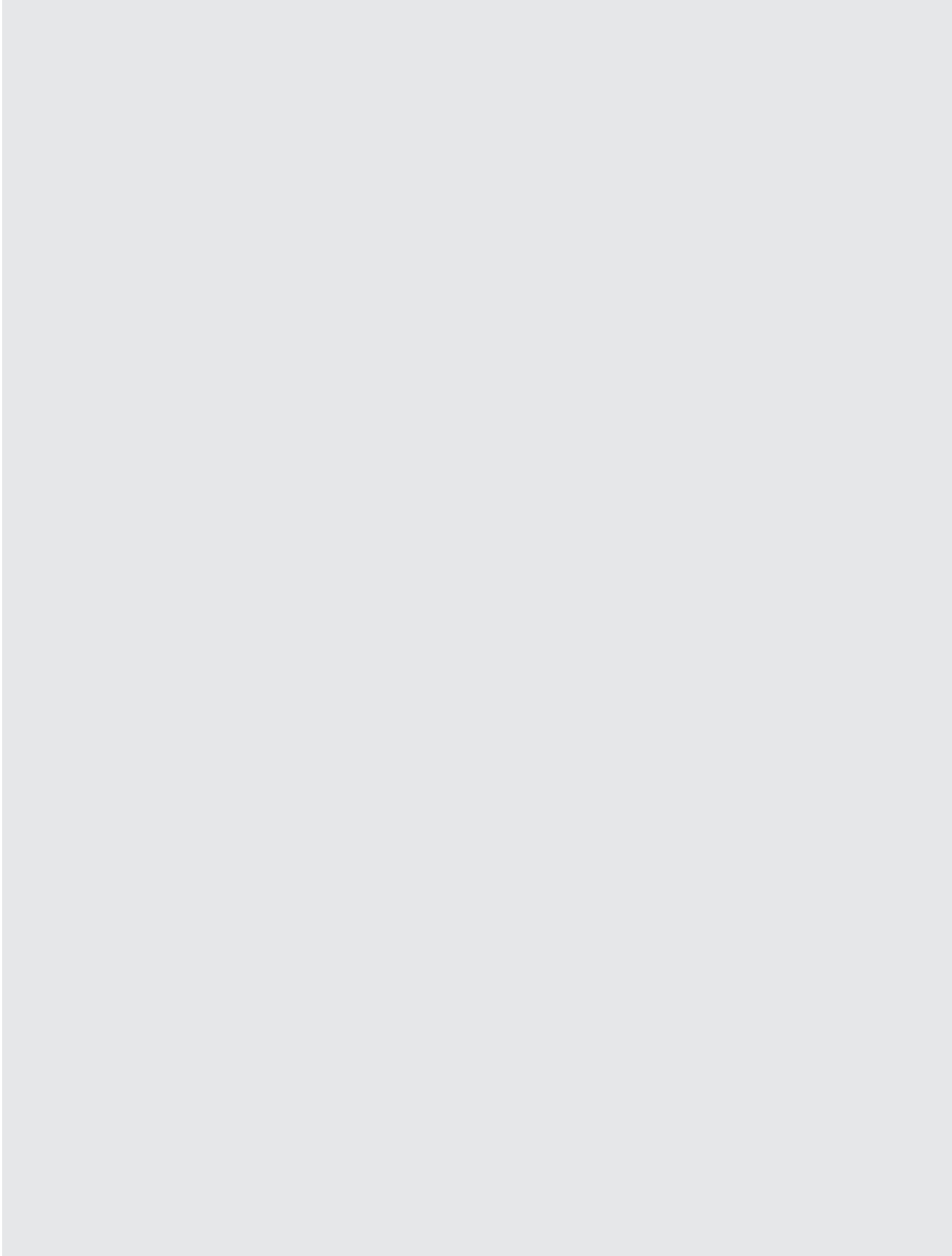


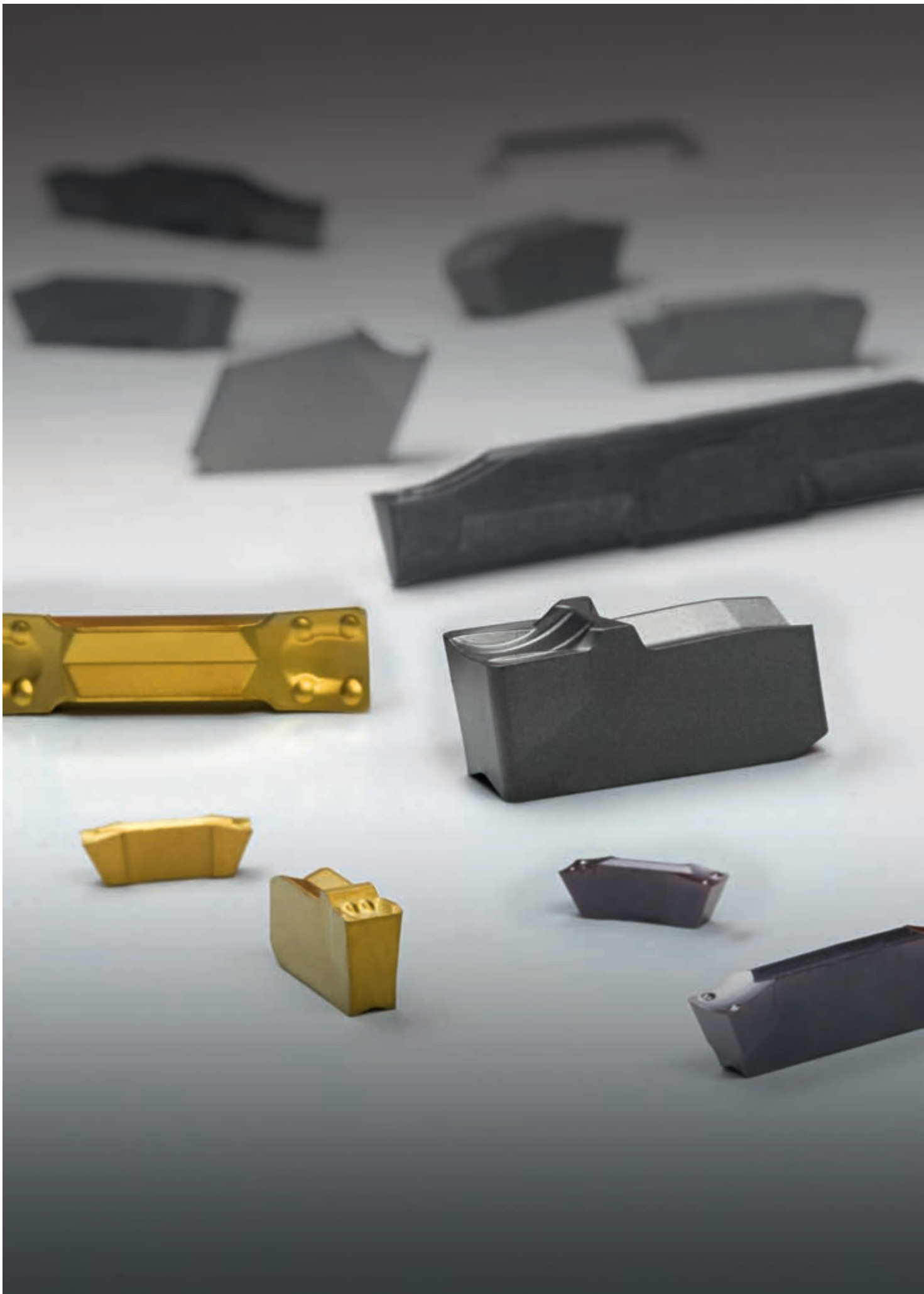
Thread milling – external

Thread milling cutters – TC



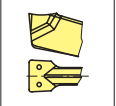


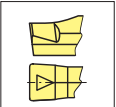
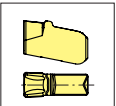
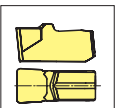
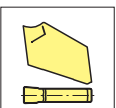
		d _A [inch]	D _N [inch]	l ₂ [inch]	T _{max} [inch]	P _{min} [mm]	P _{max} [mm]	P _{min} [TPI]	P _{max} [TPI]	 L R	Type, description		
C195		1.000	.984	2.13	.118	.50	5.00	28	5	R	I25R90-2D-TC16-W-E	TC16-..	C150
		1.250	1.260	2.68	.138	.50	5.00	28	5	R	I32R90-2D-TC16-W-E	TC16-..	C150









Parting and grooving inserts

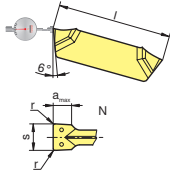
	System GX-E	C140-C141
	System GX-S	C142
	System GX-R	C143
	System AX	C144
	System SX	C145
	System LX	C146
	System FX	C147

Threading inserts

	Partial profile 60° / 55°	C150-C151
	Full profile 60° / 55°	C148-C149



	P	M	K	N	S	H											LNR	s	l	r	a _{max}		
																	[inch]	[inch]	[inch]	[inch]			
							H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110						
-M1																							
-27P																							



Inserts

Tools and inserts for parting and grooving



C49-C63	C66	C216-C219	C202	C160-C162	C165-C166	C172-C173	C175	C185-C187	C190

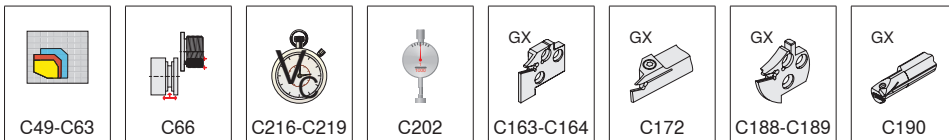
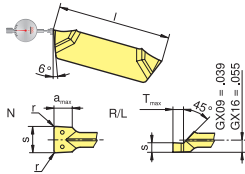


System GX-S

Inserts

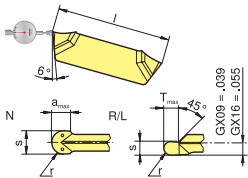
Tools and inserts for parting and grooving

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M		○	○	○	○	○	○	○																																																																													
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S	○	○							○																																																																												
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		H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110																																																																									
		LNR	s	s ₁	s ₂	l	r	T _{max}	a _{max}																																																																												
		[inch]																																																																																			
ER-EL		GX09-1S0.60L	L	.024	.016	.020	.354		.030																																																																												
		GX09-1S0.60R	R	.024	.016	.020	.354		.030																																																																												
		GX09-1S0.80L	L	.031	.024	.028	.354		.037																																																																												
		GX09-1S0.80R	R	.031	.024	.028	.354		.037																																																																												
		GX09-1S0.90L	L	.035	.028	.031	.354		.041																																																																												
		GX09-1S0.90R	R	.035	.028	.031	.354		.041																																																																												
		GX09-1S1.00L	L	.039	.031	.035	.354		.045																																																																												
		GX09-1S1.00R	R	.039	.031	.035	.354		.045																																																																												
		GX09-1S1.20L	L	.047	.039	.043	.354		.053																																																																												
		GX09-1S1.20R	R	.047	.039	.043	.354		.053																																																																												
		GX09-1S1.40L	L	.055	.047	.051	.354		.060																																																																												
		GX09-1S1.40R	R	.055	.047	.051	.354		.060																																																																												
		GX09-1S1.70L	L	.067	.059	.063	.354		.072																																																																												
		GX09-1S1.70R	R	.067	.059	.063	.354		.072																																																																												
		GX16-2S0.60L	L	.024	.016	.020	.630		.030																																																																												
		GX16-2S0.60R	R	.024	.016	.020	.630		.030																																																																												
		GX16-2S0.80L	L	.031	.024	.028	.630		.037																																																																												
		GX16-2S0.80R	R	.031	.024	.028	.630		.037																																																																												
		GX16-2S0.90L	L	.035	.028	.031	.630		.041																																																																												
		GX16-2S0.90R	R	.035	.028	.031	.630		.041																																																																												
GX16-2S1.00L	L	.039	.031	.035	.630		.045																																																																														
GX16-2S1.00R	R	.039	.031	.035	.630		.045																																																																														
GX16-2S1.20L	L	.047	.039	.043	.630		.053																																																																														
GX16-2S1.20R	R	.047	.039	.043	.630		.053																																																																														
GX16-2S1.40L	L	.055	.047	.051	.630		.060																																																																														
GX16-2S1.40R	R	.055	.047	.051	.630		.060																																																																														
GX16-2S1.70L	L	.067	.059	.063	.630		.072																																																																														
GX16-2S1.70R	R	.067	.059	.063	.630		.072																																																																														
GX16-2S1.95L	L	.077	.069	.073	.630		.081																																																																														
GX16-2S1.95R	R	.077	.069	.073	.630		.081																																																																														
GX16-2S2.25L	L	.089	.079	.085	.630		.093																																																																														
GX16-2S2.25R	R	.089	.079	.085	.630		.093																																																																														
EN		GX09-1S1.95N	N	.077	.069	.073	.354	.004	.276	.079																																																																											
		GX09-1S2.25N	N	.089	.079	.085	.354	.004	.276	.079																																																																											
		GX09-2S2.75N	N	.108	.098	.104	.354	.004	.276	.079																																																																											
		GX09-2S3.25N	N	.128	.118	.124	.354	.004	.276	.079																																																																											
		GX16-2S2.75N	N	.108	.098	.104	.630	.004	.472	.118																																																																											
		GX16-2S3.25N	N	.128	.118	.124	.630	.004	.472	.118																																																																											
		GX16-3S4.25N	N	.167	.157	.163	.630	.008	.472	.138																																																																											
		GX16-4S5.25N	N	.207	.197	.203	.630	.008	.472	.157																																																																											
		H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110																																																																									
		LNR	s	s ₁	s ₂	l	r	T _{max}	a _{max}																																																																												
		[inch]																																																																																			





		Material										Geometry												
		P	M	K	N	S	H	H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110	LNR	s	l	r	T _{max}	a _{max}
												[inch]	[inch]	[inch]	[inch]	[inch]	[inch]							
ER-EL		GX09-1R0.80L										●	●						L	.063	.354	.031	.070	
		GX09-1R0.80R										●	●						R	.063	.354	.031	.070	
		GX16-2R0.80L										●	●						L	.063	.630	.031	.070	
		GX16-2R0.80R										●	●						R	.063	.630	.031	.070	
		GX16-2R1.00L										●	●						L	.079	.630	.039	.086	
		GX16-2R1.00R										●	●						R	.079	.630	.039	.086	
		GX16-2R1.20L										●	●						L	.094	.630	.047	.102	
EN		GX09-1R1.00N										●	●					N	.079	.354	.039	.276	.039	
		GX09-1R1.20N										●	●					N	.094	.354	.047	.276	.047	
		GX16-2R1.50N										●	●					N	.118	.630	.059	.472	.059	
		GX16-3R2.00N										●	●					N	.157	.630	.079	.472	.079	
		GX16-3R2.50N										●	●					N	.197	.630	.098	.472	.098	
-M3		GX24-2R1.50N-M3										●	●					N	.118	.961	.059	.827	.059	
		GX24-3R2.00N-M3										●	●					N	.157	.961	.079	.827	.098	
		GX24-3R2.50N-M3										●	●					N	.197	.961	.098	.827	.118	
		GX24-4R3.00N-M3										●	●					N	.236	.961	.118	.827	.157	
-27P		GX16-2R1.50N-27P						●										N	.118	.630	.059	.472	.059	
		GX16-3R2.00N-27P						●										N	.157	.630	.079	.472	.079	
		GX16-3R2.50N-27P						●										N	.197	.630	.098	.472	.098	
		GX24-4R3.00N-27P						●										N	.236	1.015	.118	.827	.157	



Inserts

Tools and inserts for parting and grooving


- C49-C63
- C66
- C216-C219
- C202
- C161-C164
- C165-C166
- C172-C173
- C175
- C186-C189
- C190

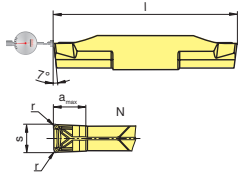


System AX

Inserts

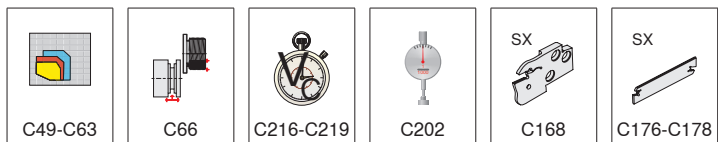
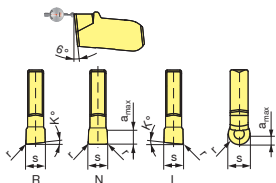
Tools and inserts for parting and grooving

-F50	 AX05-E3.00N0.30-10-F50 AX10-E3.00N0.30-20-F50 AX15-E3.00N0.30-30-F50	Material Compatibility										Dimensions										
		P	M	K	N	S	H	H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110	LNR	s	l	r	a_{max}
												[inch]	[inch]	[inch]	[inch]							
																		N	.118	.945	.012	.197
																		N	.118	1.339	.012	.394
																		N	.118	1.732	.012	.590





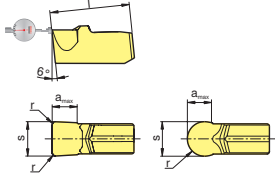








			Material Compatibility											LNR	s [inch]	r [inch]	a _{max} [inch]	K [°]		
			P	M	K	N	S	H												
			H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110							
-F2		SX E2.00N0.20-F2													N	.079	.008	.059		
		SX E3.00N0.30-F2													N	.118	.012	.079		
		SX E4.00N0.40-F2													N	.157	.016	.098		
-M2		SX E2.00N0.20-M2													N	.079	.008	.059		
		SX E3.00N0.30-M2													N	.118	.012	.079		
		SX E4.00N0.40-M2													N	.157	.016	.098		
-M3		SX R1.50N-M3													N	.118	.059	.059		
		SX R2.00N-M3													N	.157	.079	.079		
-M1		SX E2.00L6-M1													L	.079	.008		6	
		SX E2.00N0.20-M1													N	.079	.008			
		SX E2.00R6-M1														R	.079	.008		6
		SX E3.00L6-M1														L	.118	.008		6
		SX E3.00N0.20-M1														N	.118	.008		
		SX E3.00R6-M1														R	.118	.008		6
		SX E4.00L6-M1														L	.157	.012		6
		SX E4.00N0.30-M1														N	.157	.012		
-27P		SX E2.00N0.20-27P													N	.079	.008	.079		
		SX E3.00N0.30-27P													N	.118	.012	.098		
		SX E4.00N0.40-27P													N	.157	.016	.118		





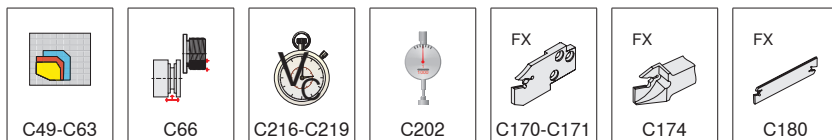
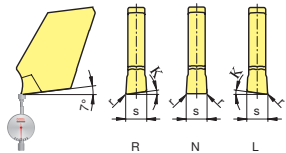
		P																							
		M			O																				
		K																							
		N		O																					
		S			O																				
		H																							
				H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110											
				LNR	s	l	r	a _{max}																	
					[inch]	[inch]	[inch]	[inch]																	
-M2		LX E10.00N0.80-M2																		N	.394	.748	.031	.197	
		LX E8.00N0.80-M2																			N	.315	.748	.031	.197
-M3		LX R4.00N-M3																			N	.315	.748	.157	.197



-  C49-C63
-  C66
-  C216-C219
-  C202
-  LX C169
-  LX C179



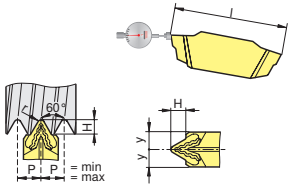
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		H216T	TSM20	CTW7120	S40T	CTC1325	SR127	GM127	CTP1340	CTCP335	CTPP345	CTD4110	LNR	s	r	K																																																																	
													[inch]	[inch]	[°]																																																																		
-F1		FX 2.2L5-F1											L	.087	.006	5																																																																	
		FX 2.2N0.15-F1											N	.087	.006	5																																																																	
		FX 2.2R5-F1											R	.087	.006	5																																																																	
		FX 3.1L5-F1											L	.122	.008	5																																																																	
		FX 3.1L8-F1											L	.122	.008	8																																																																	
		FX 3.1N0.20-F1											N	.122	.008	5																																																																	
		FX 3.1N0.40-F1											N	.122	.016	5																																																																	
		FX 3.1R5-F1											R	.122	.008	5																																																																	
		FX 3.1R8-F1											R	.122	.008	8																																																																	
		FX 4.1N0.20-F1											N	.161	.008	5																																																																	
FX 4.1N0.50-F1											N	.161	.020	5																																																																			
-M1		FX 2.2L4-M1											L	.087	.004	4																																																																	
		FX 2.2N0.10-M1											N	.087	.004	4																																																																	
		FX 2.2R4-M1											R	.087	.004	4																																																																	
		FX 3.1L6-M1											L	.122	.006	6																																																																	
		FX 3.1N0.15-M1											N	.122	.006	6																																																																	
		FX 3.1R6-M1											R	.122	.006	6																																																																	
		FX 4.1L6-M1											L	.161	.008	6																																																																	
		FX 4.1N0.20-M1											N	.161	.008	6																																																																	
		FX 4.1R6-M1											R	.161	.008	6																																																																	
		FX 5.1L6-M1											L	.200	.010	6																																																																	
		FX 5.1N0.25-M1											N	.200	.010	6																																																																	
		FX 5.1R6-M1											R	.200	.010	6																																																																	
		FX 6.5L6-M1											L	.256	.012	6																																																																	
		FX 6.5N0.30-M1											N	.256	.012	6																																																																	
FX 8.2N0.40-M1											N	.323	.016	6																																																																			
FX 9.7N0.40-M1											N	.382	.016	6																																																																			
-R2		FX 3.1N0.40-R2										N	.122	.016	6																																																																		
		FX 4.1N0.50-R2										N	.161	.020	6																																																																		
-27P		FX 2.2N0.10-27P										N	.087	.004	6																																																																		
		FX 3.1N0.15-27P										N	.122	.006	6																																																																		
		FX 4.1N0.15-27P										N	.161	.008	6																																																																		



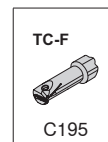
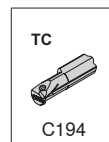
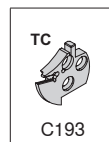
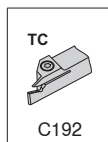
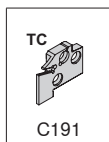
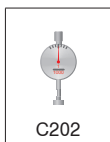
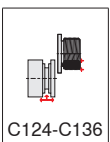


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							P	•	•																																																																																																																													
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		H216T	GM213	GM240	[mm]	[mm]	[TPI]	[TPI]	[inch]	[inch]	[inch]	[inch]																																																																																																																										
-27P		TC16-1 EI-A60-27P	•	•		.50	1.50	16	48	.630	.002	.050	.041																																																																																																																									
		TC16-2 EI-AG60-27P	•	•		.50	3.00	8	48	.630	.002	.101	.085																																																																																																																									
		TC16-2 EI-G60-27P	•	•		1.75	3.00	8	14	.630	.006	.098	.085																																																																																																																									
		TC16-3 EI-N60-27P	•	•		3.50	5.00	5	7	.630	.010	.162	.122																																																																																																																									
EN		TC16-1 EI-A60	•	•		.50	1.50	16	48	.630	.002	.050	.041																																																																																																																									
		TC16-2 EI-AG60	•	•		.50	3.00	8	48	.630	.002	.101	.085																																																																																																																									
		TC16-2 EI-G60	•	•		1.75	3.00	8	14	.630	.006	.098	.085																																																																																																																									
		TC16-3 EI-N60	•	•		3.50	5.00	5	7	.630	.010	.162	.122																																																																																																																									


Inserts

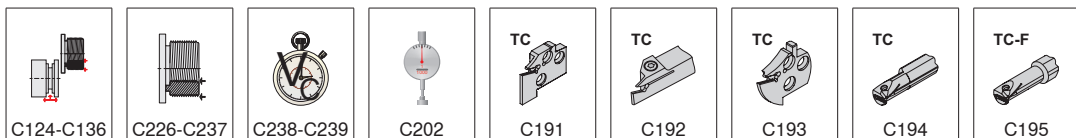
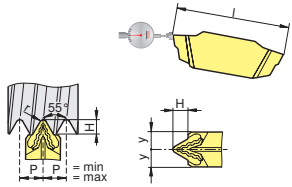


Tools and inserts for parting and grooving





EN		TC16-1 EI-A55	H216T	●	●												P_{min}	P_{max}	P_{min}	P_{max}	l	r	H	y
		TC16-2 EI-AG55	GM213	●	●												[mm]	[mm]	[TPI]	[TPI]	[inch]	[inch]	[inch]	[inch]
		TC16-2 EI-G55	GM240	●	●												.50	1.50	16	48	.630	.005	.055	.041
		TC16-3 EI-N55		●	●												.50	3.00	8	48	.630	.005	.115	.085
				●	●												1.75	3.00	8	14	.630	.009	.109	.085
				●	●										3.50	5.00	5	7	.630	.018	.171	.122		
			H216T													P_{min}	P_{max}	P_{min}	P_{max}	l	r	H	y	
			GM213													[mm]	[mm]	[TPI]	[TPI]	[inch]	[inch]	[inch]	[inch]	
			GM240																					







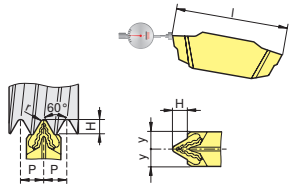
System TC
Full profile 60°

Inserts

Tools and inserts for parting and grooving



P	●	●														
M	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N	●															
S																
H																

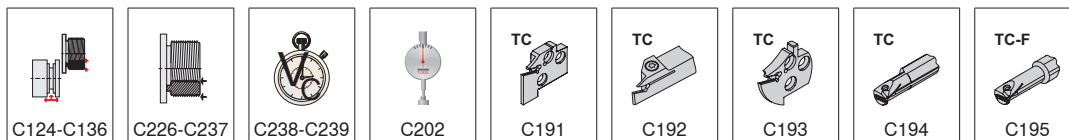
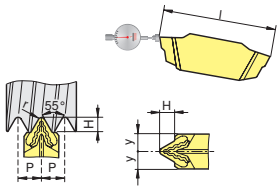
																			P_{min} [mm]	l [inch]	r [inch]	H [inch]	y [inch]
-27P		TC16-1 E 0,5 ISO-27P	●																.50	.630	.002	.013	.041
		TC16-1 E 0,75 ISO-27P	●																.75	.630	.003	.019	.041
		TC16-1 E 1,0 ISO-27P	●																1.00	.630	.005	.025	.041
		TC16-1 E 1,25 ISO-27P	●																1.25	.630	.006	.032	.041
		TC16-1 E 1,5 ISO-27P	●																1.50	.630	.007	.038	.041
		TC16-1 | 1,0 ISO-27P	●																1.00	.630	.002	.024	.041
		TC16-1 | 1,5 ISO-27P	●																1.50	.630	.003	.035	.041
		TC16-2 E 1,75 ISO-27P	●																1.75	.630	.009	.044	.085
		TC16-2 E 2,0 ISO-27P	●																2.00	.630	.010	.050	.085
		TC16-2 E 2,5 ISO-27P	●																2.50	.630	.012	.062	.085
		TC16-2 E 3,0 ISO-27P	●																3.00	.630	.015	.074	.085
		TC16-2 | 2,0 ISO-27P	●																2.00	.630	.005	.046	.085
		TC16-2 | 3,0 ISO-27P	●																3.00	.630	.007	.069	.085
		EN		TC16-1 E 0,5 ISO	●	●															.50	.630	.002	.013	.041
TC16-1 E 0,75 ISO	●			●															.75	.630	.003	.019	.041
TC16-1 E 1,0 ISO	●			●															1.00	.630	.005	.025	.041
TC16-1 E 1,25 ISO	●			●															1.25	.630	.006	.032	.041
TC16-1 E 1,5 ISO	●			●															1.50	.630	.007	.038	.041
TC16-1 | 0,5 ISO	●			●															.50	.630	.001	.012	.041
TC16-1 | 0,75 ISO	●			●															.75	.630	.001	.018	.041
TC16-1 | 1,0 ISO	●			●															1.00	.630	.002	.024	.041
TC16-1 | 1,25 ISO	●			●															1.25	.630	.003	.029	.041
TC16-1 | 1,5 ISO	●			●															1.50	.630	.003	.035	.041
TC16-2 E 1,75 ISO	●			●															1.75	.630	.009	.044	.085
TC16-2 E 2,0 ISO	●			●															2.00	.630	.010	.050	.085
TC16-2 E 2,5 ISO	●			●															2.50	.630	.012	.062	.085
TC16-2 E 3,0 ISO	●			●															3.00	.630	.015	.075	.085
TC16-2 | 1,75 ISO	●			●															1.75	.630	.004	.040	.085
TC16-2 | 2,0 ISO	●			●															2.00	.630	.005	.046	.085
TC16-2 | 2,5 ISO	●			●															2.50	.630	.006	.058	.085
TC16-2 | 3,0 ISO	●			●															3.00	.630	.007	.069	.085
TC16-3 E 3,5 ISO	●			●															3.50	.630	.017	.087	.122
TC16-3 E 4,0 ISO	●			●															4.00	.630	.020	.100	.122
TC16-3 E 4,5 ISO	●			●															4.50	.630	.022	.112	.122
TC16-3 E 5,0 ISO	●			●															5.00	.630	.025	.125	.122
TC16-3 | 3,5 ISO	●			●															3.50	.630	.009	.081	.122
TC16-3 | 4,0 ISO	●			●															4.00	.630	.010	.093	.122
TC16-3 | 4,5 ISO	●	●															4.50	.630	.011	.104	.122		
TC16-3 | 5,0 ISO	●	●															5.00	.630	.012	.116	.122		



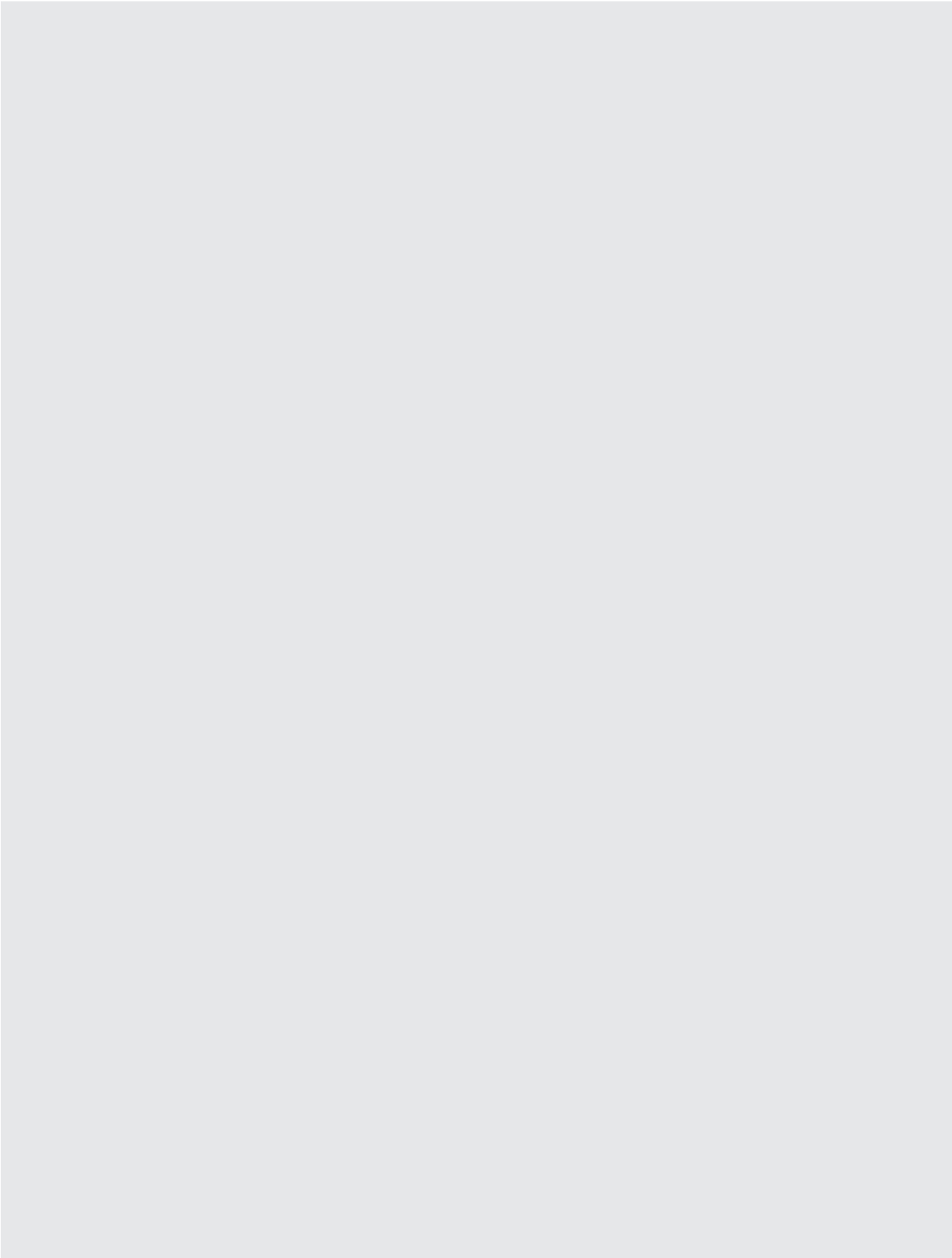
- C124-C136
- C226-C237
- C238-C239
- C202
- TC C191
- TC C192
- TC C193
- TC C194
- TC-F C195



		P	M	K	N	S	H								
		H216T	GM213	GM240						P _{min}	l	r	H	y	
							[TPI]	[inch]	[inch]	[inch]	[inch]				
-27P		TC16-1 EI 19 W-27P	●	●							19	.630	.007	.035	.041
		TC16-2 EI 11 W-27P	●								11	.630	.012	.060	.085
		TC16-2 EI 14 W-27P	●								14	.630	.009	.047	.085
EN		TC16-1 EI 16 W	●	●							16	.630	.008	.042	.041
		TC16-1 EI 18 W	●	●							18	.630	.007	.037	.041
		TC16-1 EI 19 W	●	●							19	.630	.007	.035	.041
		TC16-1 EI 20 W	●	●							20	.630	.006	.033	.041
		TC16-1 EI 24 W	●	●							24	.630	.005	.028	.041
		TC16-1 EI 26 W	●	●							26	.630	.005	.026	.041
		TC16-1 EI 28 W	●	●							28	.630	.005	.024	.041
		TC16-2 EI 10 W	●	●							10	.630	.013	.066	.085
		TC16-2 EI 11 W	●	●							11	.630	.012	.060	.085
		TC16-2 EI 12 W	●	●							12	.630	.011	.055	.085
		TC16-2 EI 14 W	●	●							14	.630	.009	.047	.085
		TC16-2 EI 8 W	●	●							8	.630	.016	.083	.085
		TC16-2 EI 9 W	●	●							9	.630	.014	.074	.085
		TC16-3 EI 5 W	●	●							5	.630	.025	.133	.122
		TC16-3 EI 6 W	●	●							6	.630	.021	.111	.122
TC16-3 EI 7 W	●	●							7	.630	.018	.095	.122		
		H216T	GM213	GM240						P _{min}	l	r	H	y	









Tool holders

	MSS 0°	C156
	MSS 90°	C157
	MSS 45°	C158
	Adapters	C159

Modules - external

	SX	C168
	LX	C169
	FX	C170
	FX long	C171

Modules - external

	GX09	C160
	GX16	C161
	GX24	C162
	GX09	C163
	GX16	C164
	GX24 axial	C165
	GX axial long	C166
	AX	C167

Monoblock tool holders


	GX09	C172
	GX24	C173
	FX	C174

Blades, clamping blocks



	GX24	C175
	SX	C176
	SX reinforced	C177-C178
	LX	C179



Blades, clamping blocks

	FX	C180
	SBN...K	C181
	SBN...KS	C182


Boring bars

	1.5 x D	C183
	2.5 x D	C184

Modules - internal

	GX09	C185
	GX16	C186
	GX24	C187
	GX09	C188
	GX16	C189



Monoblock boring bars

	GX09	C190
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Threading - monoblock tools and modules

	TC16	C191
	TC monoblock	C192
	TC16	C193
	TC monoblock	C194
	TC milling cutters	C195

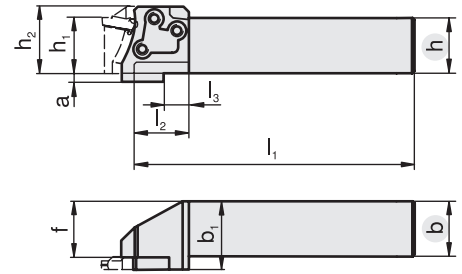
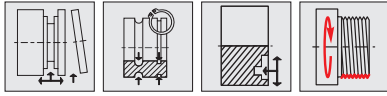
HSK-T tool holders

	HSK-T 0°	C196
	HSK-T 90°	C197



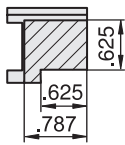
MSS shanks

0°



Picture shows right-hand version

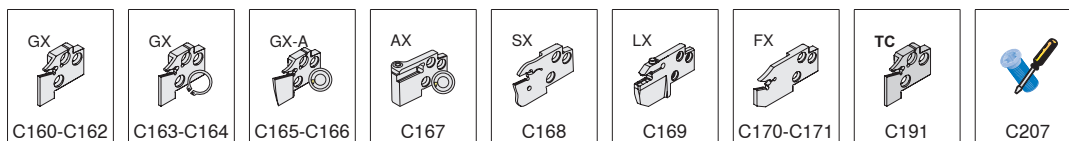
Bgr. [mm]	Type, description	L N R												
			h [inch]	b [inch]	h ₁ [inch]	h ₂ [inch]	b ₁ [inch]	l ₁ [inch]	l ₂ [inch]	l ₃ [inch]	a [inch]	f [inch]		
12	MSS-E12R00-08-E	R	.500	.500	.500	.598	.650	3.0	.472			.512	MSS-E12R..	E01
12	MSS-E12L00-08-E	L	.500	.500	.500	.598	.650	3.0	.472			.512	MSS-E12L..	E01
16	MSS-E16R00-10-E	R	.625	.625	.625	.763	.787	3.5	.630			.650	MSS-E16R..	E02
16	MSS-E16L00-10-E	L	.625	.625	.625	.763	.787	3.5	.630			.650	MSS-E16L..	E02
20	MSS-E20R00-10-E	R	.625	.787	.625	.955	.955	3.5	.787			.793	MSS-E20R..	E03
20	MSS-E20R00-12-E	R	.750	.750	.750	.955	.955	4.5	.787	.394	.077	.793	MSS-E20R..	E03
20	MSS-E20L00-10-E	L	.625	.787	.625	.955	.955	3.5	.787			.793	MSS-E20L..	E03
20	MSS-E20L00-12-E	L	.750	.750	.750	.955	.955	4.5	.787	.394	.077	.793	MSS-E20L..	E03
25	MSS-E25R00-16-E	R	1.000	1.000	1.000	1.236	1.236	5.5	.984			1.020	MSS-E25R..	E04
25	MSS-E25L00-16-E	L	1.000	1.000	1.000	1.236	1.236	5.5	.984			1.020	MSS-E25L..	E04
32	MSS-E32R00-85-E	R	1.250	1.000	1.250	1.236	1.236	6.5	1.260			1.020	MSS-E32R..	E05
32	MSS-E32R00-20-E	R	1.250	1.250	1.250	1.496	1.496	7.0	1.260	.630	.118	1.279	MSS-E32R..	E05
32	MSS-E32L00-85-E	L	1.250	1.000	1.250	1.236	1.236	6.5	1.260			1.020	MSS-E32L..	E05
32	MSS-E32L00-20-E	L	1.250	1.250	1.250	1.496	1.496	7.0	1.260	.630	.118	1.279	MSS-E32L..	E05



valid only for:
MSS-E20R/L00-10-E

Tools and inserts for parting and grooving

E01	228617	56656	
E02	228620		220983
E03	195068		220983
E04	195069		220985
E05	195070		200317



C160-C162

C163-C164

C165-C166

C167

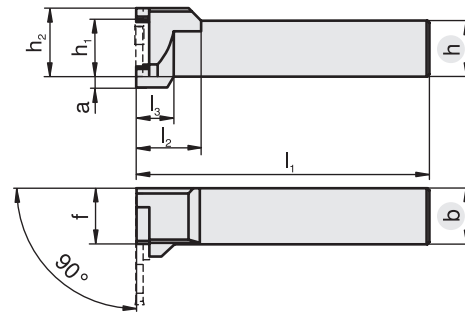
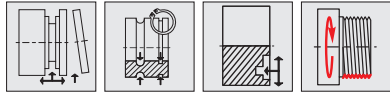
C168

C169



C170-C171




C191

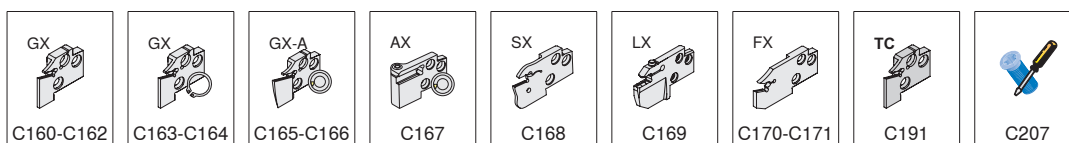
C207



Picture shows right-hand version

Bgr. [mm]	Type, description	L N R	h [inch]	b [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	l ₂ [inch]	l ₃ [inch]	a [inch]	f [inch]		
20	MSS-E20R90-12-E	R	.750	.750	.750	.907	4.5	.783	.287	.077	.787	MSS-E20L..	E01
20	MSS-E20L90-12-E	L	.750	.750	.750	.907	4.5	.783	.287	.077	.787	MSS-E20R..	E01
25	MSS-E25R90-16-E	R	1.000	1.000	1.000	1.197	5.5	1.098			1.000	MSS-E25L..	E02
25	MSS-E25L90-16-E	L	1.000	1.000	1.000	1.197	5.5	1.098			1.000	MSS-E25R..	E02
32	MSS-E32R90-20-E	R	1.250	1.250	1.250	1.528	8.0	1.339	.756	.118	1.260	MSS-E32L..	E03
32	MSS-E32R90-85-E	R	1.250	1.000	1.250	1.486	6.5	1.339			1.260	MSS-E32L..	E03
32	MSS-E32L90-85-E	L	1.250	1.000	1.250	1.486	6.5	1.339			1.260	MSS-E32R..	E03
32	MSS-E32L90-20-E	L	1.250	1.250	1.250	1.528	8.0	1.339	.756	.118	1.260	MSS-E32R..	E03

		
E01	195068	220983
E02	195069	220985
E03	195070	200317



C160-C162

C163-C164

C165-C166

C167

C168

C169

C170-C171

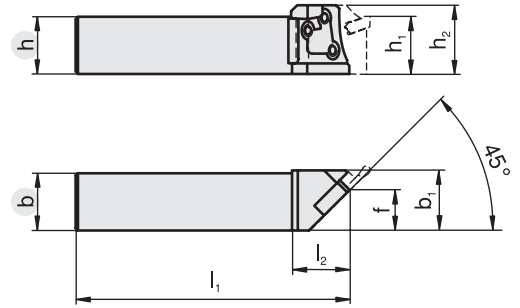
C191

C207





MSS shanks

45°



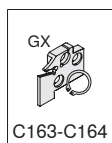
Picture shows left-hand version

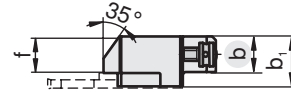
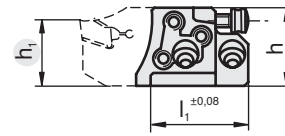
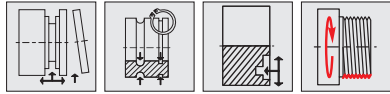
Bgr. [mm]	Type, description	L N R	h [inch]	b [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	l ₂ [inch]	l ₃ [inch]	a [inch]	f [inch]		
20	MSS-E20R45-12-E	R	.750	.750	.750	.984	4.5	.787	.771	.077	.571	MSS-E20L..	E01
20	MSS-E20L45-12-E	L	.750	.750	.750	.984	4.5	.787	.771	.077	.571	MSS-E20R..	E01
25	MSS-E25R45-16-E	R	1.000	1.000	1.000	1.197	5.5	.984			.709	MSS-E25L..	E02
25	MSS-E25L45-16-E	L	1.000	1.000	1.000	1.197	5.5	.984			.709	MSS-E25R..	E02

Tools



Tools and inserts for parting and grooving





			
E01	219981	195068	220983
E02	219982	195069	220985

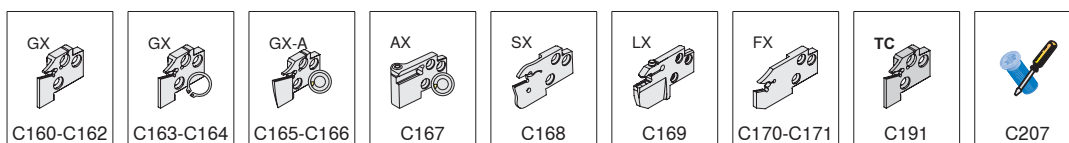




Picture shows right-hand version

Bgr. [mm]	Type, description	L N R								
			h_1 [inch]	b [inch]	h [inch]	b_1 [inch]	l_1 [inch]	f [inch]		
20	MSS-E20R00-AD	R	.787	.421	.945	.602	1.181	.441	MSS-E20R..	E01
20	MSS-E20L00-AD	L	.787	.421	.945	.602	1.181	.441	MSS-E20L..	E01
25	MSS-E25R00-AD	R	.984	.496	1.181	.732	1.457	.516	MSS-E25R..	E02
25	MSS-E25L00-AD	L	.984	.496	1.181	.732	1.457	.516	MSS-E25L..	E02
32	MSS-E32R00-AD	R	1.260	.575	1.496	.811	1.811	.594	MSS-E32R..	E03
32	MSS-E32L00-AD	L	1.260	.575	1.496	.811	1.811	.594	MSS-E32L..	E03

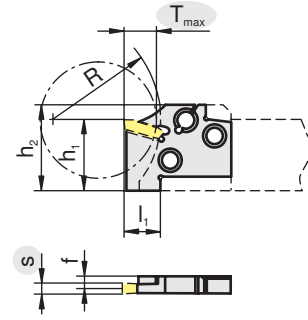
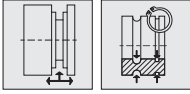
			
E01	195068	229131	220983
E02	195069	284518	220985
E03	195070	229126	200317





MSS modules – external

Grooving and turning – GX09

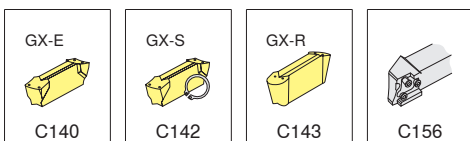


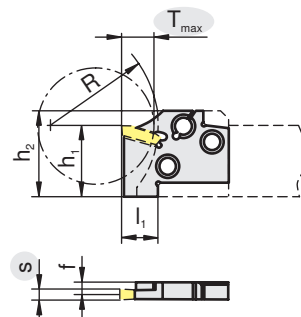
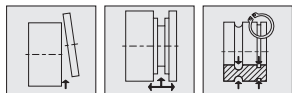
Picture shows right-hand version

Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]	
12	MSS-E12R07-GX09-1	R	.079	.108	.276	.472	.571	.315	.124	.709	GX09-1..
12	MSS-E12R07-GX09-2	R	.109	.148	.276	.472	.571	.315	.124	.709	GX09-2..
12	MSS-E12L07-GX09-1	L	.079	.108	.276	.472	.571	.315	.124	.709	GX09-1..
12	MSS-E12L07-GX09-2	L	.109	.148	.276	.472	.571	.315	.124	.709	GX09-2..
16	MSS-E16R07-GX09-1	R	.079	.108	.276	.630	.768	.315	.124	.945	GX09-1..
16	MSS-E16R07-GX09-2	R	.109	.148	.276	.630	.768	.315	.124	.945	GX09-2..
16	MSS-E16L07-GX09-1	L	.079	.108	.276	.630	.768	.315	.124	.945	GX09-1..
16	MSS-E16L07-GX09-2	L	.109	.148	.276	.630	.768	.315	.124	.945	GX09-2..

Tools

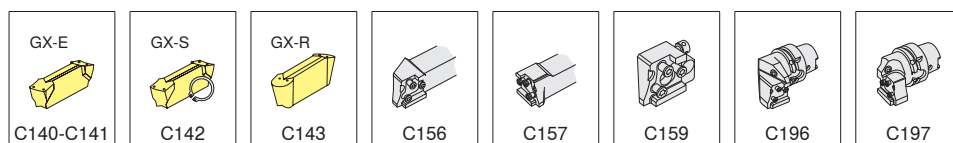
Tools and inserts for parting and grooving





Picture shows right-hand version

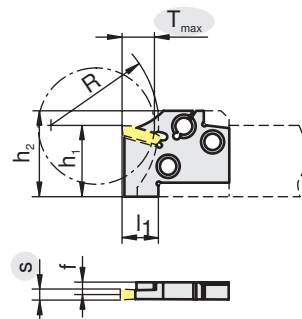
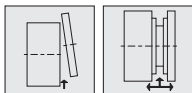
Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]	
20	MSS-E20R12-GX16-1	R	.079	.108	.472	.787	.945	.512	.148	1.181	GX16-1..
20	MSS-E20R12-GX16-2	R	.109	.147	.472	.787	.945	.512	.134	1.181	GX16-2..
20	MSS-E20R12-GX16-3	R	.148	.197	.472	.787	.945	.512	.115	1.181	GX16-3..
20	MSS-E20L12-GX16-1	L	.079	.108	.472	.787	.945	.512	.148	1.181	GX16-1..
20	MSS-E20L12-GX16-2	L	.109	.147	.472	.787	.945	.512	.134	1.181	GX16-2..
20	MSS-E20L12-GX16-3	L	.148	.197	.472	.787	.945	.512	.115	1.181	GX16-3..
25	MSS-E25R12-GX16-1	R	.079	.108	.472	.984	1.181	.512	.207	1.476	GX16-1..
25	MSS-E25R12-GX16-2	R	.109	.147	.472	.984	1.181	.512	.193	1.476	GX16-2..
25	MSS-E25R12-GX16-3	R	.148	.197	.472	.984	1.181	.512	.174	1.476	GX16-3..
25	MSS-E25R12-GX16-4	R	.198	.256	.472	.984	1.181	.512	.150	1.476	GX16-4..
25	MSS-E25L12-GX16-1	L	.079	.108	.472	.984	1.181	.512	.207	1.476	GX16-1..
25	MSS-E25L12-GX16-2	L	.109	.147	.472	.984	1.181	.512	.193	1.476	GX16-2..
25	MSS-E25L12-GX16-3	L	.148	.197	.472	.984	1.181	.512	.174	1.476	GX16-3..
25	MSS-E25L12-GX16-4	L	.198	.256	.472	.984	1.181	.512	.150	1.476	GX16-4..
32	MSS-E32R12-GX16-2	R	.109	.147	.472	1.260	1.496	.512	.193	1.890	GX16-2..
32	MSS-E32R12-GX16-3	R	.148	.197	.472	1.260	1.496	.512	.174	1.890	GX16-3..
32	MSS-E32R12-GX16-4	R	.198	.256	.472	1.260	1.496	.512	.150	1.890	GX16-4..
32	MSS-E32L12-GX16-2	L	.109	.147	.472	1.260	1.496	.512	.193	1.890	GX16-2..
32	MSS-E32L12-GX16-3	L	.148	.197	.472	1.260	1.496	.512	.174	1.890	GX16-3..
32	MSS-E32L12-GX16-4	L	.198	.256	.472	1.260	1.496	.512	.150	1.890	GX16-4..





MSS modules – external

Grooving and turning – GX24

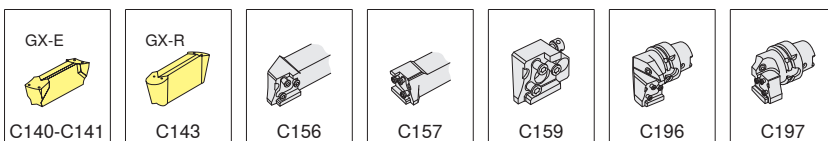


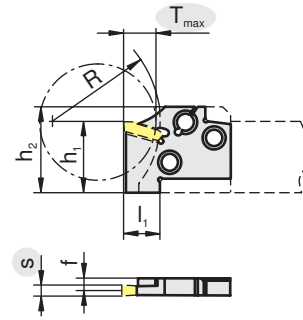
Picture shows right-hand version

Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]	
20	MSS-E20R21-GX24-1	R	.079	.108	.827	.787	.945	.866	.152	1.181	GX24-1..
20	MSS-E20R21-GX24-2	R	.109	.147	.827	.787	.945	.866	.134	1.181	GX24-2..
20	MSS-E20R21-GX24-3	R	.148	.197	.827	.787	.945	.866	.118	1.181	GX24-3..
20	MSS-E20L21-GX24-1	L	.079	.108	.827	.787	.945	.866	.152	1.181	GX24-1..
20	MSS-E20L21-GX24-2	L	.109	.147	.827	.787	.945	.866	.134	1.181	GX24-2..
20	MSS-E20L21-GX24-3	L	.148	.197	.827	.787	.945	.866	.118	1.181	GX24-3..
25	MSS-E25R21-GX24-1	R	.079	.108	.827	.984	1.181	.866	.211	1.476	GX24-1..
25	MSS-E25R21-GX24-2	R	.109	.147	.827	.984	1.181	.866	.193	1.476	GX24-2..
25	MSS-E25R21-GX24-3	R	.148	.197	.827	.984	1.181	.866	.175	1.476	GX24-3..
25	MSS-E25R21-GX24-4	R	.198	.256	.827	.984	1.181	.866	.150	1.476	GX24-4..
25	MSS-E25L21-GX24-1	L	.079	.108	.827	.984	1.181	.866	.211	1.476	GX24-1..
25	MSS-E25L21-GX24-2	L	.109	.147	.827	.984	1.181	.866	.193	1.476	GX24-2..
25	MSS-E25L21-GX24-3	L	.148	.197	.827	.984	1.181	.866	.175	1.476	GX24-3..
25	MSS-E25L21-GX24-4	L	.198	.256	.827	.984	1.181	.866	.150	1.476	GX24-4..
32	MSS-E32R21-GX24-2	R	.109	.147	.827	1.260	1.496	.866	.195	1.890	GX24-2..
32	MSS-E32R21-GX24-3	R	.148	.197	.827	1.260	1.496	.866	.174	1.890	GX24-3..
32	MSS-E32R21-GX24-4	R	.198	.256	.827	1.260	1.496	.866	.150	1.890	GX24-4..
32	MSS-E32L21-GX24-2	L	.109	.147	.827	1.260	1.496	.866	.195	1.890	GX24-2..
32	MSS-E32L21-GX24-3	L	.148	.197	.827	1.260	1.496	.866	.174	1.890	GX24-3..
32	MSS-E32L21-GX24-4	L	.198	.256	.827	1.260	1.496	.866	.150	1.890	GX24-4..

Tools

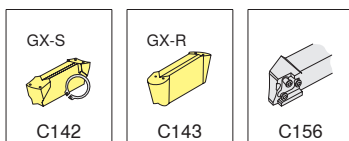
Tools and inserts for parting and grooving





Picture shows right-hand version

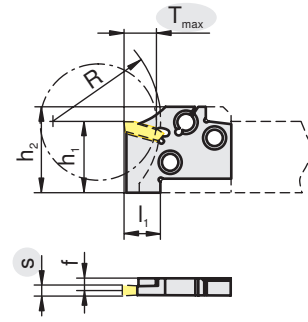
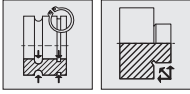
Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]	
12	MSS-E12R02-GX09-1	R	.024	.077	.079	.472	.571	.315	.124	.709	GX09-1..R/L
12	MSS-E12L02-GX09-1	L	.024	.077	.079	.472	.571	.315	.124	.709	GX09-1..R/L
16	MSS-E16R02-GX09-1	R	.024	.077	.079	.630	.768	.315	.124	.945	GX09-1..R/L
16	MSS-E16L02-GX09-1	L	.024	.077	.079	.630	.768	.315	.124	.945	GX09-1..R/L





MSS modules – external

Circlip and radius grooves – GX16

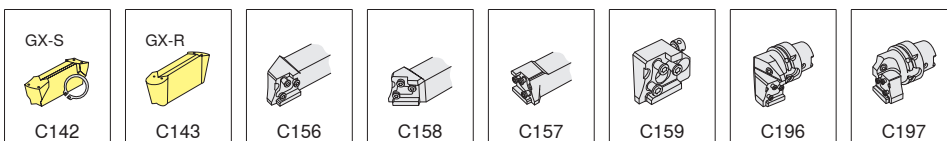


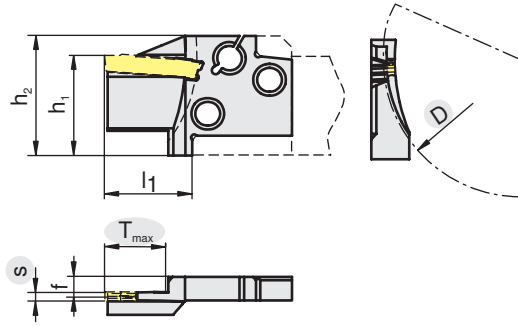
Picture shows right-hand version

Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]	
20	MSS-E20R03-GX16-2	R	.024	.108	.118	.787	.945	.512	.134	1.181	GX16-2..R/L
20	MSS-E20L03-GX16-2	L	.024	.108	.118	.787	.945	.512	.134	1.181	GX16-2..R/L
25	MSS-E25R03-GX16-2	R	.024	.108	.118	.984	1.181	.512	.193	1.476	GX16-2..R/L
25	MSS-E25L03-GX16-2	L	.024	.108	.118	.984	1.181	.512	.193	1.476	GX16-2..R/L
32	MSS-E32R03-GX16-2	R	.024	.108	.118	1.260	1.497	.512	.193	1.890	GX16-2..R/L
32	MSS-E32L03-GX16-2	L	.024	.108	.118	1.260	1.497	.512	.193	1.890	GX16-2..R/L

Tools

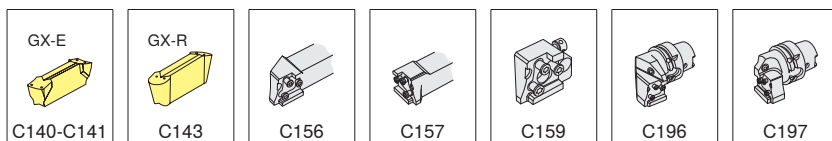
Tools and inserts for parting and grooving





Picture shows right-hand version

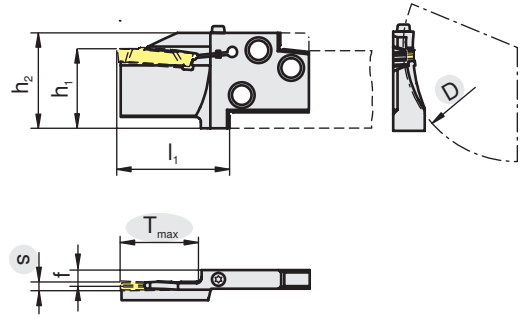
Bgr. [mm]	Type, description	LNR 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	D _{min} [inch]	D _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	
20	MSS-E20R14-GX24-2 A50-70	R	.109	.147	.551	1.97	2.76	.787	.945	.866	.134	GX24-2..
20	MSS-E20R14-GX24-2 A70-100	R	.109	.147	.551	2.76	3.94	.787	.945	.866	.134	GX24-2..
20	MSS-E20R14-GX24-2 A100-150	R	.109	.147	.551	3.94	5.90	.787	.945	.866	.134	GX24-2..
20	MSS-E20L14-GX24-2 A50-70	L	.109	.147	.551	1.97	2.76	.787	.945	.866	.134	GX24-2..
20	MSS-E20L14-GX24-2 A70-100	L	.109	.147	.551	2.76	3.94	.787	.945	.866	.134	GX24-2..
20	MSS-E20L14-GX24-2 A100-150	L	.109	.147	.551	3.94	5.90	.787	.945	.866	.134	GX24-2..
25	MSS-E25R15-GX24-2 A50-70	R	.109	.147	.590	1.97	2.76	.984	1.181	.866	.192	GX24-2..
25	MSS-E25R15-GX24-2 A100-150	R	.109	.147	.590	3.94	5.90	.984	1.181	.866	.192	GX24-2..
25	MSS-E25R15-GX24-2 A70-100	R	.109	.147	.590	2.76	3.94	.984	1.181	.866	.192	GX24-2..
25	MSS-E25R15-GX24-3 A100-150	R	.148	.197	.590	3.94	5.90	.984	1.181	.866	.174	GX24-3..
25	MSS-E25R15-GX24-3 A70-100	R	.148	.197	.590	2.76	3.94	.984	1.181	.866	.174	GX24-3..
25	MSS-E25R15-GX24-3 A150-300	R	.148	.197	.590	5.90	11.81	.984	1.181	.866	.174	GX24-3..
25	MSS-E25R15-GX24-3 A50-70	R	.148	.197	.590	1.97	2.76	.984	1.181	.866	.174	GX24-3..
25	MSS-E25R15-GX24-4 A50-70	R	.198	.256	.590	1.97	2.76	.984	1.181	.866	.150	GX24-4..
25	MSS-E25R15-GX24-4 A150-300	R	.198	.256	.590	5.90	11.81	.984	1.181	.866	.150	GX24-4..
25	MSS-E25R15-GX24-4 A70-100	R	.198	.256	.590	2.76	3.94	.984	1.181	.866	.150	GX24-4..
25	MSS-E25L15-GX24-2 A50-70	L	.109	.147	.590	1.97	2.76	.984	1.181	.866	.193	GX24-2..
25	MSS-E25L15-GX24-2 A100-150	L	.109	.147	.590	3.94	5.90	.984	1.181	.866	.193	GX24-2..
25	MSS-E25L15-GX24-2 A70-100	L	.109	.147	.590	2.76	3.94	.984	1.181	.866	.193	GX24-2..
25	MSS-E25L15-GX24-3 A100-150	L	.148	.197	.590	3.94	5.90	.984	1.181	.866	.174	GX24-3..
25	MSS-E25L15-GX24-3 A70-100	L	.148	.197	.590	2.76	3.94	.984	1.181	.866	.174	GX24-3..
25	MSS-E25L15-GX24-3 A150-300	L	.148	.197	.590	5.90	11.81	.984	1.181	.866	.174	GX24-3..
25	MSS-E25L15-GX24-3 A50-70	L	.148	.197	.590	1.97	2.76	.984	1.181	.866	.174	GX24-3..
25	MSS-E25L15-GX24-4 A100-150	L	.198	.256	.590	3.94	5.90	.984	1.181	.866	.150	GX24-4..
25	MSS-E25L15-GX24-4 A70-100	L	.198	.256	.590	2.76	3.94	.984	1.181	.866	.150	GX24-4..
25	MSS-E25L15-GX24-4 A150-300	L	.198	.256	.590	5.90	11.81	.984	1.181	.866	.150	GX24-4..
32	MSS-E32R15-GX24-3 A70-100	R	.148	.197	.590	2.76	3.94	1.260	1.496	.866	.174	GX24-3..
32	MSS-E32R15-GX24-3 A150-300	R	.148	.197	.590	5.90	11.81	1.260	1.496	.866	.174	GX24-3..
32	MSS-E32R15-GX24-3 A100-150	R	.148	.197	.590	3.94	5.90	1.260	1.496	.866	.174	GX24-3..
32	MSS-E32R15-GX24-4 A70-100	R	.198	.256	.590	2.76	3.94	1.260	1.496	.866	.150	GX24-4..
32	MSS-E32R15-GX24-4 A150-300	R	.198	.256	.590	5.90	11.81	1.260	1.496	.866	.150	GX24-4..
32	MSS-E32R15-GX24-4 A100-150	R	.198	.256	.590	3.94	5.90	1.260	1.496	.866	.174	GX24-4..
32	MSS-E32R15-GX24-4 A300-900	R	.198	.256	.590	11.81	35.43	1.260	1.496	.866	.150	GX24-4..
32	MSS-E32L15-GX24-3 A150-300	L	.148	.197	.590	5.90	11.81	1.260	1.496	.866	.174	GX24-3..
32	MSS-E32L15-GX24-3 A70-100	L	.148	.197	.590	2.76	3.94	1.260	1.496	.866	.174	GX24-3..
32	MSS-E32L15-GX24-3 A100-150	L	.148	.197	.590	3.94	5.90	1.260	1.496	.866	.174	GX24-3..
32	MSS-E32L15-GX24-4 A70-100	L	.198	.256	.590	2.76	3.94	1.260	1.496	.866	.150	GX24-4..
32	MSS-E32L15-GX24-4 A300-900	L	.198	.256	.590	11.81	35.43	1.260	1.496	.866	.150	GX24-4..
32	MSS-E32L15-GX24-4 A100-150	L	.198	.256	.590	3.94	5.90	1.260	1.496	.866	.150	GX24-4..
32	MSS-E32L15-GX24-4 A150-300	L	.198	.256	.590	5.90	11.81	1.260	1.496	.866	.150	GX24-4..





MSS modules – external

Axial grooves – GX24



Picture shows right-hand version

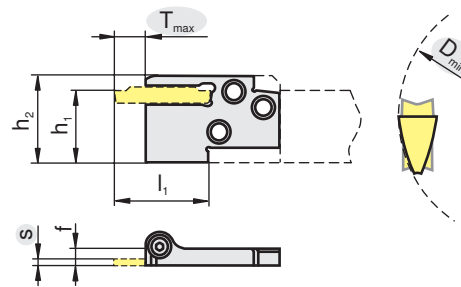
Bgr. [mm]	Type, description	L N R	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	D _{min} [inch]	D _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]		
25	MSS-E25R21-GX24-3 AS100-150	R	.148	.197	.827	3.94	5.90	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25R21-GX24-3 AS70-100	R	.148	.197	.827	2.75	3.94	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25R21-GX24-3 AS50-70	R	.148	.197	.827	1.97	2.75	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25R21-GX24-3 AS150-300	R	.148	.197	.827	5.90	11.81	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25R25-GX24-4 AS100-150	R	.198	.256	.984	3.94	5.90	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25R25-GX24-4 AS70-100	R	.198	.256	.984	2.75	3.94	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25R25-GX24-4 AS50-70	R	.198	.256	.984	1.97	2.75	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25R25-GX24-4 AS150-300	R	.198	.256	.984	5.90	11.81	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25L21-GX24-3 AS50-70	L	.148	.197	.827	1.97	2.75	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25L21-GX24-3 AS70-100	L	.148	.197	.827	2.75	3.94	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25L21-GX24-3 AS100-150	L	.148	.197	.827	3.94	5.90	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25L21-GX24-3 AS150-300	L	.148	.197	.827	5.90	11.81	.984	1.181	1.378	.174	GX24-3..	E01
25	MSS-E25L25-GX24-4 AS50-70	L	.198	.256	.984	1.97	2.75	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25L25-GX24-4 AS70-100	L	.198	.256	.984	2.75	3.94	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25L25-GX24-4 AS100-150	L	.198	.256	.984	3.94	5.90	.984	1.181	1.378	.150	GX24-4..	E01
25	MSS-E25L25-GX24-4 AS150-300	L	.198	.256	.984	5.90	11.81	.984	1.181	1.378	.150	GX24-4..	E01

Tools

Tools and inserts for parting and grooving

E01	11081190	11149570	220983

 C140-C141	 C143	 C156	 C157	 C207	 C159	 C196	 C197
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Picture shows right-hand version

Bgr. [mm]	Type, description	L N R 	s [inch]	D _{min} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]		
										AX05..	E01
16	MSS-E16R05-AX05	R	.118	.39	.197	.630	.807	.945	.098	AX05..	E01
16	MSS-E16L05-AX05	L	.118	.39	.197	.630	.807	.945	.098	AX05..	E01
20	MSS-E20R10-AX10	R	.118	.79	.394	.787	.984	1.299	.122	AX10..	E02
20	MSS-E20R15-AX15	R	.118	1.18	.591	.787	.984	1.732	.122	AX15..	E02
20	MSS-E20R05-AX05	R	.118	.39	.197	.787	.984	1.102	.122	AX05..	E02
20	MSS-E20L15-AX15	L	.118	1.18	.591	.787	.984	1.732	.122	AX15..	E02
20	MSS-E20L10-AX10	L	.118	.79	.394	.787	.984	1.299	.122	AX10..	E02
20	MSS-E20L05-AX05	L	.118	.39	.197	.787	.984	1.102	.122	AX05..	E02
25	MSS-E25R10-AX10	R	.118	.79	.394	.984	1.181	1.280	.181	AX10..	E03
25	MSS-E25R05-AX05	R	.118	.39	.197	.984	1.181	1.083	.181	AX05..	E03
25	MSS-E25R15-AX15	R	.118	1.18	.591	.984	1.181	1.713	.181	AX15..	E03
25	MSS-E25L15-AX15	L	.118	1.18	.591	.984	1.181	1.713	.181	AX15..	E03
25	MSS-E25L10-AX10	L	.118	.79	.394	.984	1.181	1.280	.181	AX10..	E03
25	MSS-E25L05-AX05	L	.118	.39	.197	.984	1.181	1.083	.181	AX05..	E03

Tools

Tools and inserts for parting and grooving

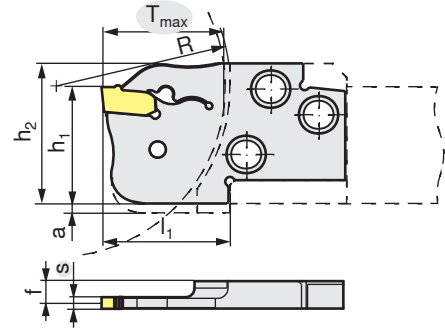
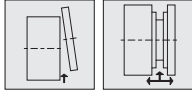
E01	228620	220983
E02	195068	220983
E03	195069	220985





MSS modules – external

Grooving and turning – SX



Picture shows right-hand version

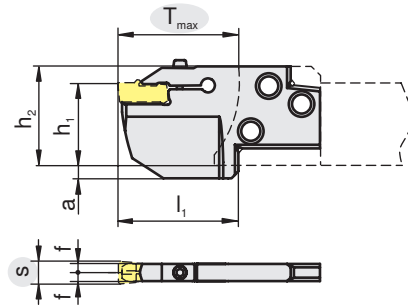
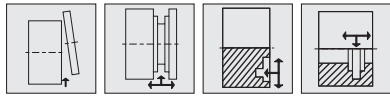
Bgr. [mm]	Type, description	L N R	s [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	a [inch]	R [inch]		
20	MSS-E20R20-SX2	R	.079	.787	.787	.945	.866	.141	.118	1.181	SX..2	E01
20	MSS-E20R20-SX3	R	.118	.787	.787	.945	.866	.126	.118	1.181	SX..3	E01
20	MSS-E20L20-SX2	L	.079	.787	.787	.945	.866	.141	.118	1.181	SX..2	E01
20	MSS-E20L20-SX3	L	.118	.787	.787	.945	.866	.126	.118	1.181	SX..3	E01
25	MSS-E25R20-SX2	R	.079	.787	.984	1.181	.866	.200		1.476	SX..2	E01
25	MSS-E25R35-SX3	R	.118	1.378	.984	1.181	1.457	.185		1.476	SX..3	E01
25	MSS-E25R25-SX3	R	.118	.984	.984	1.181	1.063	.185		1.476	SX..3	E01
25	MSS-E25R35-SX4	R	.157	1.378	.984	1.181	1.457	.169		1.476	SX..4	E02
25	MSS-E25R25-SX4	R	.157	.984	.984	1.181	1.063	.169		1.476	SX..4	E02
25	MSS-E25L20-SX2	L	.079	.787	.984	1.181	.866	.200		1.476	SX..2	E01
25	MSS-E25L35-SX3	L	.118	1.378	.984	1.181	1.457	.185		1.476	SX..3	E01
25	MSS-E25L25-SX3	L	.118	.984	.984	1.181	1.063	.185		1.476	SX..3	E01
25	MSS-E25L35-SX4	L	.157	1.378	.984	1.181	1.457	.169		1.476	SX..4	E02
25	MSS-E25L25-SX4	L	.157	.984	.984	1.181	1.063	.169		1.476	SX..4	E02
32	MSS-E32R35-SX3	R	.118	1.378	1.378	1.496	1.457	.185		1.890	SX..3	E01
32	MSS-E32R35-SX4	R	.157	1.378	1.378	1.496	1.457	.169		1.890	SX..4	E02
32	MSS-E32L35-SX3	L	.118	1.378	1.378	1.496	1.457	.185		1.890	SX..3	E01
32	MSS-E32L35-SX4	L	.157	1.378	1.378	1.496	1.457	.169		1.890	SX..4	E02

Tools



Tools and inserts for parting and grooving





E01	11366865
E02	11366866









 C145	 C145	 C156	 C157	 C159	 C207	 C196	 C197
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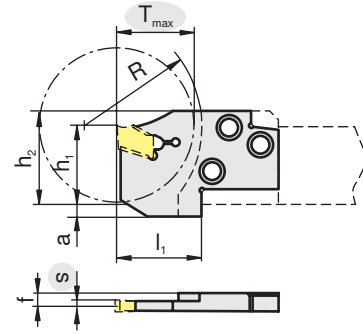


Picture shows right-hand version

Bgr. [mm]	Type, description	L N R	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	a [inch]		
32	MSS-E32N25-LX	N	.315	.394	.984	1.260	1.526	1.063	.134	.207	LX..	E01
32	MSS-E32N32-LX	N	.315	.394	1.260	1.260	1.526	1.339	.134	.207	LX..	E01
32	MSS-E32N45-LX	N	.315	.394	1.772	1.260	1.526	1.850	.134	.207	LX..	E01

			
E01	11007006	11149571	220985

							
C146	C146	C156	C157	C159	C207	C196	C197



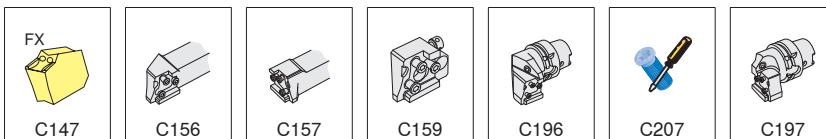
Picture shows right-hand version

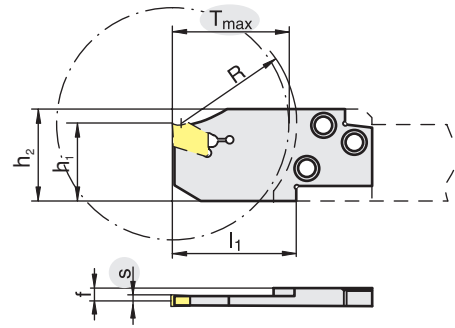
Tools

Tools and inserts for parting and grooving

Bgr. [mm]	Type, description	L N R	s [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	a [inch]	R [inch]	FX	E
20	MSS-E20R20-FX2.2	R	.087	.787	.787	.945	.866	.141	.118	1.181	FX 2.2..	E01
20	MSS-E20R20-FX3.1	R	.122	.787	.787	.945	.866	.126	.118	1.181	FX 3.1..	E02
20	MSS-E20R20-FX4.1	R	.161	.787	.787	.945	.866	.110	.118	1.181	FX 4.1..	E02
20	MSS-E20L20-FX2.2	L	.087	.787	.787	.945	.866	.141	.118	1.181	FX 2.2..	E01
20	MSS-E20L20-FX3.1	L	.122	.787	.787	.945	.866	.126	.118	1.181	FX 3.1..	E02
20	MSS-E20L20-FX4.1	L	.161	.787	.787	.945	.866	.110	.118	1.181	FX 4.1..	E02
25	MSS-E25R20-FX2.2	R	.087	.787	.984	1.181	.866	.200		1.476	FX 2.2..	E01
25	MSS-E25R25-FX3.1	R	.122	.984	.984	1.181	1.063	.185		1.476	FX 3.1..	E02
25	MSS-E25R25-FX4.1	R	.161	.984	.984	1.181	1.063	.169		1.476	FX 4.1..	E02
25	MSS-E25R25-FX5.1	R	.201	.984	.984	1.181	1.063	.154		1.476	FX 5.1..	E02
25	MSS-E25R25-FX6.5	R	.256	.984	.984	1.181	1.063	.130		1.476	FX 6.5..	E02
25	MSS-E25L20-FX2.2	L	.087	.787	.984	1.181	.866	.200		1.476	FX 2.2..	E01
25	MSS-E25L25-FX3.1	L	.122	.984	.984	1.181	1.063	.185		1.476	FX 3.1..	E02
25	MSS-E25L25-FX4.1	L	.161	.984	.984	1.181	1.063	.169		1.476	FX 4.1..	E02
25	MSS-E25L25-FX5.1	L	.201	.984	.984	1.181	1.063	.154		1.476	FX 5.1..	E02
25	MSS-E25L25-FX6.5	L	.256	.984	.984	1.181	1.063	.130		1.476	FX 6.5..	E02
32	MSS-E32R32-FX3.1	R	.122	1.260	1.260	1.496	1.339	.185		1.890	FX 3.1..	E02
32	MSS-E32R32-FX4.1	R	.161	1.260	1.260	1.496	1.339	.169		1.890	FX 4.1..	E02
32	MSS-E32R32-FX5.1	R	.201	1.260	1.260	1.496	1.339	.154		1.890	FX 5.1..	E02
32	MSS-E32R32-FX6.5	R	.256	1.260	1.260	1.496	1.339	.130		1.890	FX 6.5..	E02
32	MSS-E32L32-FX3.1	L	.122	1.260	1.260	1.496	1.339	.185		1.890	FX 3.1..	E02
32	MSS-E32L32-FX4.1	L	.161	1.260	1.260	1.496	1.339	.169		1.890	FX 4.1..	E02
32	MSS-E32L32-FX5.1	L	.201	1.260	1.260	1.496	1.339	.154		1.890	FX 5.1..	E02
32	MSS-E32L32-FX6.5	L	.256	1.260	1.260	1.496	1.339	.130		1.890	FX 6.5..	E02

E01	154461
E02	154463





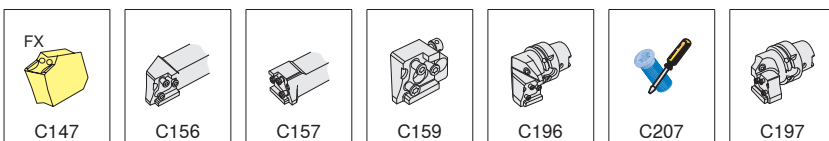
Picture shows right-hand version

Bgr. [mm]	Type, description	L N R	s [inch]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]		
25	MSS-E25R35-FX3.1	R	.122	1.378	.984	1.181	1.457	.185	1.476	FX 3.1..	E01
25	MSS-E25R35-FX4.1	R	.161	1.378	.984	1.181	1.457	.169	1.476	FX 4.1..	E01
25	MSS-E25R35-FX5.1	R	.201	1.378	.984	1.181	1.457	.154	1.476	FX 5.1..	E01
25	MSS-E25R35-FX6.5	R	.256	1.378	.984	1.181	1.457	.130	1.476	FX 6.5..	E01
25	MSS-E25L35-FX3.1	L	.122	1.378	.984	1.181	1.457	.185	1.476	FX 3.1..	E01
25	MSS-E25L35-FX4.1	L	.161	1.378	.984	1.181	1.457	.169	1.476	FX 4.1..	E01
25	MSS-E25L35-FX5.1	L	.201	1.378	.984	1.181	1.457	.154	1.476	FX 5.1..	E01
25	MSS-E25L35-FX6.5	L	.256	1.378	.984	1.181	1.457	.130	1.476	FX 6.5..	E01
32	MSS-E32R45-FX3.1	R	.122	1.772	1.260	1.496	1.850	.185	1.890	FX 3.1..	E01
32	MSS-E32R45-FX4.1	R	.161	1.772	1.260	1.496	1.850	.169	1.890	FX 4.1..	E01
32	MSS-E32R45-FX5.1	R	.201	1.772	1.260	1.496	1.850	.154	1.890	FX 5.1..	E01
32	MSS-E32R45-FX6.5	R	.256	1.772	1.260	1.496	1.850	.130	1.890	FX 6.5..	E01
32	MSS-E32L45-FX3.1	L	.122	1.772	1.260	1.496	1.850	.185	1.890	FX 3.1..	E01
32	MSS-E32L45-FX4.1	L	.161	1.772	1.260	1.496	1.850	.169	1.890	FX 4.1..	E01
32	MSS-E32L45-FX5.1	L	.201	1.772	1.260	1.496	1.850	.154	1.890	FX 5.1..	E01
32	MSS-E32L45-FX6.5	L	.256	1.772	1.260	1.496	1.850	.130	1.890	FX 6.5..	E01

Tools

Tools and inserts for parting and grooving

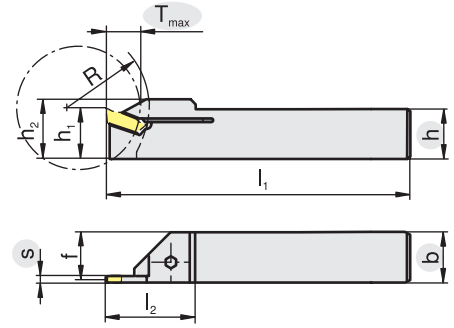
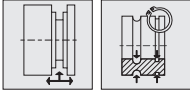
	154463
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Monoblock tool holders

GX09



Picture shows right-hand version

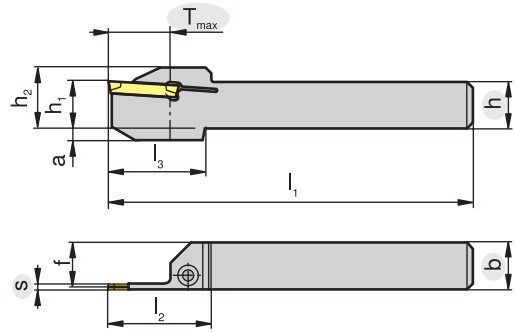
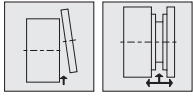
h [inch]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₂ [inch]	b [inch]	h ₁ [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	R [inch]		
													GX09..	E01
.375	E10R00-06-GX09-E	R	.024	.147	.276	.472	.375	.375	6.0	.709	.349	.591	GX09..	E01
.375	E10L00-06-GX09-E	L	.024	.147	.276	.472	.375	.375	6.0	.709	.349	.591	GX09..	E01

Tools

Tools and inserts for parting and grooving

E01	219981	220983

C207	GX-E C140	GX-S C142	GX-R C143

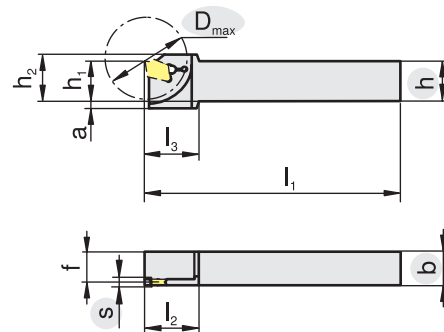


Picture shows right-hand version

h [inch]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₂ [inch]	b [inch]	l ₁ [inch]	l ₂ [inch]	l ₃ [inch]	f [inch]	a [inch]		
.625	E16R0021-10C-GX24-2-E	R	.109	.147	.827	.822	.625	5.0	1.378	1.260	.586	.162	GX24-2..	E01
.625	E16L0021-10C-GX24-2-E	L	.109	.147	.827	.822	.625	5.0	1.378	1.260	.586	.162	GX24-2..	E01
.750	E20R0021-12C-GX24-2-E	R	.109	.147	.827	.947	.750	5.0	1.378		.711		GX24-2..	E01
.750	E20R0021-12C-GX24-3-E	R	.148	.197	.827	.947	.750	5.0	1.378		.692		GX24-3..	E01
.750	E20L0021-12C-GX24-2-E	L	.109	.147	.827	.947	.750	5.0	1.378		.711		GX24-2..	E01
.750	E20L0021-12C-GX24-3-E	L	.148	.197	.827	.947	.750	5.0	1.378		.692		GX24-3..	E01
1.000	E25R0021-16D-GX24-2-E	R	.109	.147	.827	1.197	1.000	6.0	1.378		.961		GX24-2..	E01
1.000	E25R0021-16D-GX24-3-E	R	.148	.197	.827	1.197	1.000	6.0	1.378		.942		GX24-3..	E01
1.000	E25R0021-16D-GX24-4-E	R	.198	.256	.827	1.197	1.000	6.0	1.378		.917		GX24-4..	E01
1.000	E25L0021-16D-GX24-2-E	L	.109	.147	.827	1.197	1.000	6.0	1.378		.961		GX24-2..	E01
1.000	E25L0021-16D-GX24-3-E	L	.148	.197	.827	1.197	1.000	6.0	1.378		.942		GX24-3..	E01
1.000	E25L0021-16D-GX24-4-E	L	.198	.256	.827	1.197	1.000	6.0	1.378		.917		GX24-4..	E01
1.250	E32R0021-85D-GX24-2-E	R	.109	.147	.827	1.447	1.000	6.0	1.378		.961		GX24-2..	E01
1.250	E32R0021-85D-GX24-3-E	R	.148	.197	.827	1.447	1.000	6.0	1.378		.942		GX24-3..	E01
1.250	E32R0021-85D-GX24-4-E	R	.198	.256	.827	1.447	1.000	6.0	1.378		.917		GX24-4..	E01
1.250	E32L0021-85D-GX24-2-E	L	.109	.147	.827	1.447	1.000	6.0	1.378		.961		GX24-2..	E01
1.250	E32L0021-85D-GX24-3-E	L	.148	.197	.827	1.447	1.000	6.0	1.378		.942		GX24-3..	E01
1.250	E32L0021-85D-GX24-4-E	L	.198	.256	.827	1.447	1.000	6.0	1.378		.917		GX24-4..	E01

E01	11007006	220985

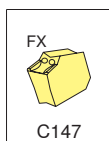
 C140-C141	 C143	 C207
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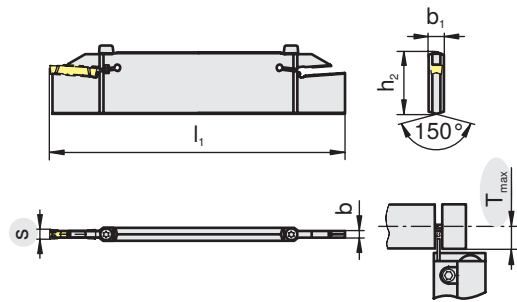
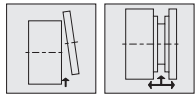


Picture shows right-hand version

h [inch]	Type, description	L N R 	s [inch]	D _{max} [inch]	b [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	l ₂ [inch]	l ₃ [inch]	f [inch]	a [inch]		
.375	XLCE06 M22 FX-E	R	.087	1.181	.375	.375	.498	6.0	.709	.709	.343	.270	FX 2.2..	E01
.375	XLCEL06 M22 FX-E	L	.087	1.181	.375	.375	.498	6.0	.709	.709	.343	.270	FX 2.2..	E01
.500	XLCE08 F22 FX-E	R	.087	1.181	.500	.500	.623	3.0	.709	.709	.497	.145	FX 2.2..	E01
.500	XLCE08 M22 FX-E	R	.087	1.181	.500	.500	.623	6.0	.709	.709	.497	.145	FX 2.2..	E01
.500	XLCEL08 F22 FX-E	L	.087	1.181	.500	.500	.623	3.0	.709	.709	.497	.145	FX 2.2..	E01
.500	XLCEL08 M22 FX-E	L	.087	1.181	.500	.500	.623	6.0	.709	.709	.497	.145	FX 2.2..	E01
.563	XLCE09 M22 FX-E	R	.087	1.181	.563	.563	.686	6.0	.709	.709	.530	.082	FX 2.2..	E01
.563	XLCEL09 M22 FX-E	L	.087	1.181	.563	.563	.686	6.0	.709	.709	.530	.082	FX 2.2..	E01
.625	XLCEFR10 H31 FX-E	R	.122	1.380	.625	.625	.748	4.0	.827	.827	.578	.138	FX 3.1..	E02
.625	XLCEFR10 H22 FX-E	R	.087	1.181	.625	.625	.748	4.0	.709	.709	.593	.020	FX 2.2..	E01
.625	XLCEL10 H22 FX-E	L	.087	1.181	.625	.625	.748	4.0	.709	.709	.593	.020	FX 2.2..	E01
.625	XLCEFR10 H31 FX-E	L	.122	1.380	.625	.625	.748	4.0	.827	.827	.578	.138	FX 3.1..	E02
.750	XLCEFR12 K31 FX-E	R	.122	1.575	.750	.750	.906	5.0	.984	.984	.703	.118	FX 3.1..	E02
.750	XLCEFR12 K41 FX-E	R	.161	1.575	.750	.750	.906	5.0	.984	.984	.687	.118	FX 4.1..	E02
.750	XLCEFR12 K31 FX-E	L	.122	1.575	.750	.750	.906	5.0	.984	.984	.703	.118	FX 3.1..	E02
.750	XLCEFR12 K41 FX-E	L	.161	1.575	.750	.750	.906	5.0	.984	.984	.687	.118	FX 4.1..	E02
1.000	XLCEFR64 M31 FX-E	R	.122	1.969	.750	1.000	1.118	6.0	1.220	1.220	.703	.138	FX 3.1..	E02
1.000	XLCEFR64 M41 FX-E	R	.161	1.969	.750	1.000	1.118	6.0	1.220	1.220	.687	.138	FX 4.1..	E02
1.000	XLCEFR64 M31 FX-E	L	.122	1.969	.750	1.000	1.118	6.0	1.220	1.220	.703	.138	FX 3.1..	E02
1.000	XLCEFR64 M41 FX-E	L	.161	1.969	.750	1.000	1.118	6.0	1.220	1.220	.687	.138	FX 4.1..	E02

E01		154461
E02		154463



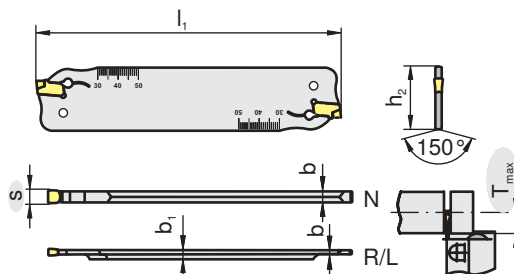
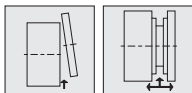


Picture shows right-hand version

h_2 [inch]	Type, description	L N R 	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	b [inch]	b_1 [inch]	l_1 [inch]		
1.260	XLCFN 3202-GX24-1S	N	.079	.108	.827	.063	.244	7.087	GX24-1..	E01
1.260	XLCFN 3203 GX24-2S	N	.109	.147	.827	.083	.244	7.087	GX24-2..	E01
1.260	XLCFN 3204 GX24-3S	N	.148	.197	.827	.120	.244	7.087	GX24-3..	E01
1.260	XLCFN 3206 GX24-4S	N	.198	.256	.827	.165	.244	7.087	GX24-4..	E01

E01	11081190	11149570	220983

 C140-C141	 C143	 C181-C182	 C207
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Picture shows right-hand version

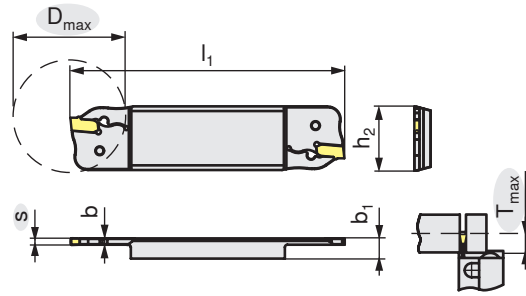
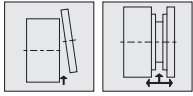
h_2 [inch]	Type, description	L N R 	s [inch]	T_{max} [inch]	b [inch]	b_1 [inch]	l_1 [inch]		
1.024	XLCFR 2602-SX2	R	.079	.984	.060	.094	4.330	SX..2	E01
1.024	XLCFL 2602-SX2	L	.079	.984	.060	.094	4.330	SX..2	E01
1.024	XLCFN 2603-SX3	N	.118	1.378	.094		4.330	SX..3	E01
1.024	XLCFN 2604-SX4	N	.157	1.575	.126		4.330	SX..4	E02
1.260	XLCFR 3202-SX2	R	.079	.984	.060	.094	5.910	SX..2	E01
1.260	XLCFL 3202-SX2	L	.079	.984	.060	.094	5.910	SX..2	E01
1.260	XLCFN 3203-SX3	N	.118	1.969	.094		5.910	SX..3	E01
1.260	XLCFN 3204-SX4	N	.157	1.969	.126		5.910	SX..4	E02
1.260	XLCFN 3205-SX5	N	.197	2.165	.165		5.910	SX..5	E02
1.260	XLCFN 3206-SX6	N	.236	2.362	.205		5.910	SX..6	E02

Tools



Tools and inserts for parting and grooving



E01	11366865
E02	11366866





 C145	 C145	 C181-C182	 C207
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Picture shows right-hand version

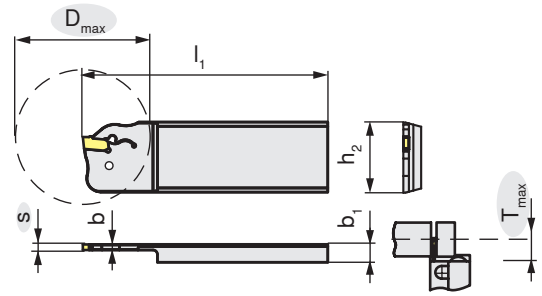
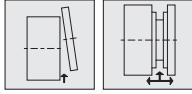
h_2 [inch]	Type, description	L N R	s [inch]	T_{max} [inch]	D_{max} [inch]	b [inch]	b_1 [inch]	l_1 [inch]		
1.024	XLCFR 2608-SX2	R	.079	.866	1.732	.060	.315	4.330	SX..2	E01
1.024	XLCFL 2608-SX2	L	.079	.866	1.732	.060	.315	4.330	SX..2	E01
1.024	XLCFR 2608-SX3	R	.118	.866	1.732	.098	.315	4.330	SX..3	E01
1.024	XLCFL 2608-SX3	L	.118	.866	1.732	.098	.315	4.330	SX..3	E01

	
E01	11366865

 C145	 C145	 C181-C182	 C207
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Blades
SX, reinforced blades



Picture shows right-hand version

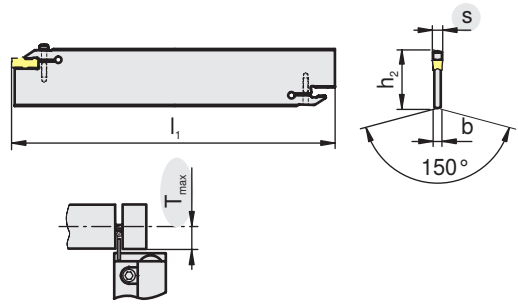
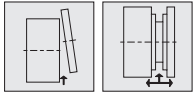
h ₂ [inch]	Type, description	L N R 	s [inch]	T _{max} [inch]	D _{max} [inch]	b [inch]	b ₁ [inch]	l ₁ [inch]		
									SX..3	E01
1.260	XLCFR 3208-SX3	R	.118	1.300	2.600	.098	.315	4.330	SX..3	E01
1.260	XLCFL 3208-SX3	L	.118	1.300	2.600	.098	.315	4.330	SX..3	E01
1.260	XLCFR 3208-SX4	R	.157	1.300	2.600	.134	.315	4.330	SX..4	E02
1.260	XLCFL 3208-SX4	L	.157	1.300	2.600	.134	.315	4.330	SX..4	E02

Tools



Tools and inserts for parting and grooving

E01	11366865
E02	11366866





 C145	 C145	 C181-C182	 C207
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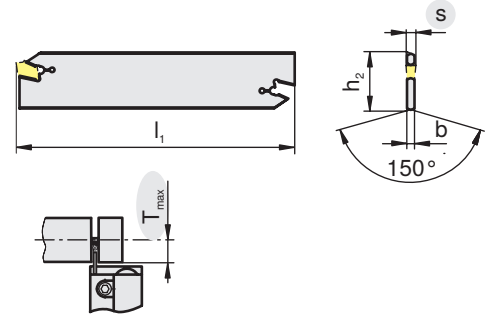


Picture shows right-hand version

h_2 [inch]	Type, description	L N R	s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	b [inch]	l_1 [inch]		
1.811	XLCEN 4608 LX	N	.315	.394	3.150	.268	9.840	LX..	E01

			
E01	11007006	11149571	220985

 LX-E C146	 LX-R C146	 C181	 C207
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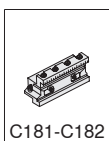
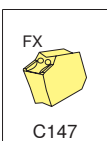
Picture shows right-hand version

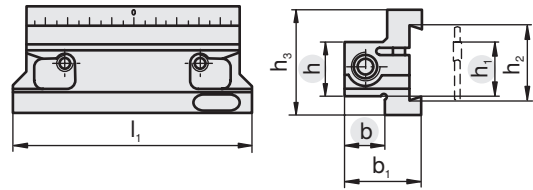
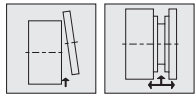
h_2 [inch]	Type, description	L N R 	s [inch]	T_{max} [inch]	b [inch]	l_1 [inch]		
1.024	XLCEN 2602 J22 FX	N	.087	.984	.065	4.330	FX 2.2..	E01
1.024	XLCFN 2603 J31 FX	N	.122	1.378	.094	4.330	FX 3.1..	E02
1.024	XLCFN 2604 J41 FX	N	.161	1.575	.126	4.330	FX 4.1..	E02
1.260	XLCEN 3202 M22 FX	N	.087	1.181	.065	5.910	FX 2.2..	E01
1.260	XLCFN 3203 M31 FX	N	.122	1.969	.094	5.910	FX 3.1..	E02
1.260	XLCFN 3204 M41 FX	N	.161	1.969	.126	5.910	FX 4.1..	E02
1.260	XLCFN 3205 M51 FX	N	.201	2.165	.157	5.910	FX 5.1..	E02
1.260	XLCFN 3206 M65 FX	N	.256	2.165	.205	5.910	FX 6.5..	E02
1.811	XLCEN 4608 S82 FX	N	.323	3.150	.268	9.840	FX 8.2..	E03
1.811	XLCEN 4609 S97 FX	N	.382	3.150	.315	9.840	FX 9.7..	E03

Tools

Tools and inserts for parting and grooving

E01		154461
E02		154463
E03		154464





Picture shows right-hand version

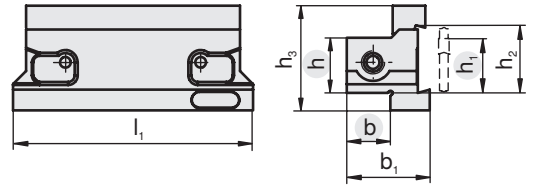
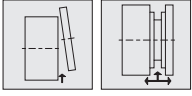
h ₂ [inch]	Type, description	L N R 	h [inch]	h ₁ [inch]	h ₃ [inch]	l ₁ [inch]	b [inch]	b ₁ [inch]		
1.024	SBN 12-26K-E	N	.750	1.024	1.535	3.540	.700	1.369	XLC.. 26..	E01
1.260	SBN 16-32K-E	N	1.000	1.260	1.890	4.330	.950	1.647	XLC.. 32..	E01
1.260	SBN 20-32K-E	N	1.250	1.260	1.890	4.720	1.200	1.909	XLC.. 32..	E01
1.811	SBN 20-46K-E	N	1.250	1.811	2.756	5.910	1.200	2.106	XLC.. 46..	E02
1.811	SBN 24-46K-E	N	1.500	1.811	2.756	5.910	1.450	2.362	XLC.. 46..	E02

E01	22485	4496	82952
E02	81158	4497	82954

GX C175	SX C176-C178	 C207	LX C179	FX C180
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Split clamping blocks

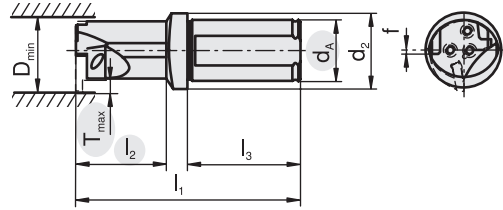
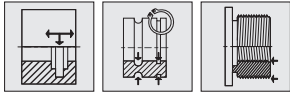


Picture shows right-hand version

h ₂ [inch]	Type, description	L N R 	h [inch]	h ₁ [inch]	h ₃ [inch]	l ₁ [inch]	b [inch]	b ₁ [inch]		
1.024	SBN 12-26KS-E	N	.750	1.024	1.688	3.540	.700	1.369	XLC.. 26..	E01
1.260	SBN 16-32KS-E	N	1.000	1.260	1.929	4.330	.950	1.647	XLC.. 32..	E01
1.260	SBN 20-32KS-E	N	1.250	1.260	2.044	4.720	1.200	1.909	XLC.. 32..	E01

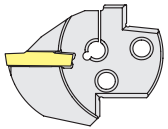
E01	22485	4496	82952

GX C175	SX C176-C178	LX C179	FX C180	 C207
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Picture shows right-hand version

Bgr. [mm]	Type, description	L N R	T _{max} [inch]	D _{min} [inch]	d _A [inch]	d ₂ [inch]	l ₁ [inch]	l ₂ [inch]	l ₃ [inch]	f [inch]		
16	MSS-I16R90-1.5D-E	R	.160	.787	.750	1.000	3.250	.945	2.00	.039	MSS-I16R..	E01
16	MSS-I16L90-1.5D-E	L	.160	.787	.750	1.000	3.250	.945	2.00	.039	MSS-I16L..	E01
20	MSS-I20R90-1.5D-E	R	.197	.984	.750	1.000	3.450	1.181	2.00	.039	MSS-I20R..	E02
20	MSS-I20L90-1.5D-E	L	.197	.984	.750	1.000	3.450	1.181	2.00	.039	MSS-I20L..	E02
25	MSS-I25R90-1.5D-E	R	.236	1.260	1.000	1.260	4.050	1.496	2.25	.059	MSS-I25R..	E03
25	MSS-I25L90-1.5D-E	L	.236	1.260	1.000	1.260	4.050	1.496	2.25	.059	MSS-I25L..	E03
32	MSS-I32R90-1.5D-E	R	.354	1.575	1.250	1.575	4.810	1.890	2.50	.079	MSS-I32R..	E04
32	MSS-I32L90-1.5D-E	L	.354	1.575	1.250	1.575	4.810	1.890	2.50	.079	MSS-I32L..	E04
40	MSS-I40R90-1.5D-E	R	.394	1.969	1.500	1.969	5.820	2.362	3.00	.098	MSS-I40R..	E05
40	MSS-I40L90-1.5D-E	L	.394	1.969	1.500	1.969	5.820	2.362	3.00	.098	MSS-I40L..	E05



When using module **MSS-I40N19-GX24..** :

T_{max} + .354 inch / D_{min} + .394 inch

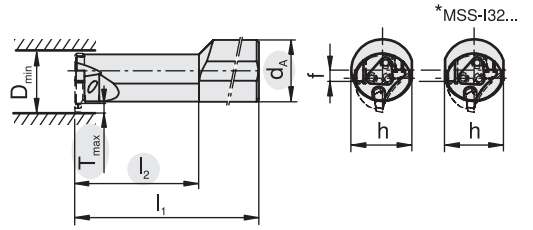
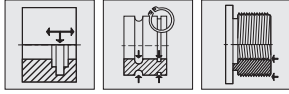
E01	228617	56656	
E02	228619	291576	
E03	228620		220983
E04	228621		220985
E05	195069		220985

 C185-C162	 C188-C189	 C193	 C207
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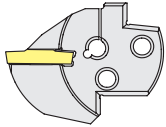
MSS boring bars

2.5 D



Picture shows right-hand version

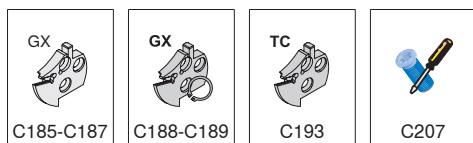
Bgr. [mm]	Type, description	L N R	T _{max} [inch]	D _{min} [inch]	d _A [inch]	l ₁ [inch]	l ₂ [inch]	h [inch]	f [inch]		
16	MSS-I16R90-2.5D-E	R	.160	.787	.750	7.0	1.575	.728	.177	MSS-I16R..	E01
16	MSS-I16L90-2.5D-E	L	.160	.787	.750	7.0	1.575	.728	.177	MSS-I16L..	E01
20	MSS-I20R90-2.5D-E	R	.197	.984	1.000	8.0	1.969	.953	.236	MSS-I20R..	E02
20	MSS-I20L90-2.5D-E	L	.197	.984	1.000	8.0	1.969	.953	.236	MSS-I20L..	E02
25	MSS-I25R90-2.5D-E	R	.236	1.260	1.250	10.0	2.480	1.216	.276	MSS-I25R..	E03
25	MSS-I25L90-2.5D-E	L	.236	1.260	1.250	10.0	2.480	1.216	.276	MSS-I25L..	E03
32	MSS-I32R90-2.5D-E	R	.354	1.575	1.500	12.0	3.150	1.425	.374	MSS-I32R..	E04
32	MSS-I32L90-2.5D-E	L	.354	1.575	1.500	12.0	3.150	1.425	.374	MSS-I32L..	E04
40	MSS-I40R90-2.5D-E	R	.394	1.969	2.000	14.0	3.937	1.941	.433	MSS-I40R..	E05
40	MSS-I40L90-2.5D-E	L	.394	1.969	2.000	14.0	3.937	1.941	.433	MSS-I40L..	E05

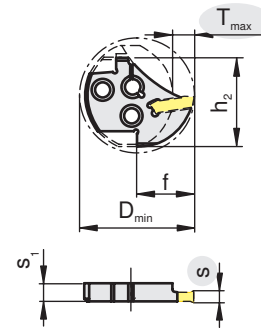
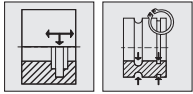


When using module **MSS-I40N19-GX24..** :
 T_{max} + .354 inch / D_{min} + .394 inch

Tools and inserts for parting and grooving

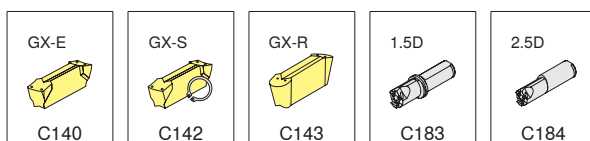
E01	228617	56656	
E02	228619	291576	
E03	228620		220983
E04	228621		220985
E05	195069		220985





Picture shows right-hand version

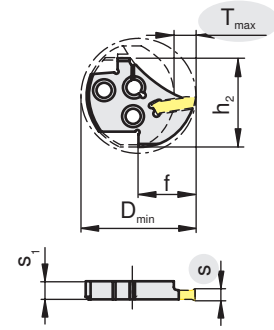
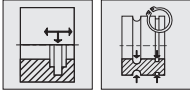
Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₂ [inch]	D _{min} [inch]	s ₁ [inch]	f [inch]	
16	MSS-I16R04-GX09-1	R	.079	.108	.157	.646	.787	.150	.394	GX09-1..
16	MSS-I16R04-GX09-2	R	.109	.147	.157	.646	.787	.150	.394	GX09-2..
16	MSS-I16L04-GX09-1	L	.079	.108	.157	.646	.787	.150	.394	GX09-1..
16	MSS-I16L04-GX09-2	L	.109	.147	.157	.646	.787	.150	.394	GX09-2..
20	MSS-I20R05-GX09-1	R	.079	.108	.197	.799	.984	.150	.472	GX09-1..
20	MSS-I20R05-GX09-2	R	.109	.147	.197	.799	.984	.150	.472	GX09-2..
20	MSS-I20L05-GX09-1	L	.079	.108	.197	.799	.984	.150	.472	GX09-1..
20	MSS-I20L05-GX09-2	L	.109	.147	.197	.799	.984	.150	.472	GX09-2..
25	MSS-I25R06-GX09-1	R	.079	.108	.236	.980	1.260	.150	.610	GX09-1..
25	MSS-I25R06-GX09-2	R	.109	.147	.236	.980	1.260	.150	.610	GX09-2..
25	MSS-I25L06-GX09-1	L	.079	.108	.236	.980	1.260	.150	.610	GX09-1..
25	MSS-I25L06-GX09-2	L	.109	.147	.236	.980	1.260	.150	.610	GX09-2..





MSS modules – internal

Grooving and turning – GX16/24

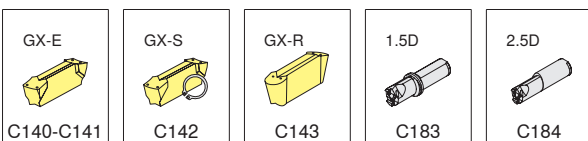


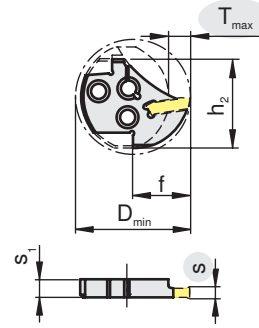
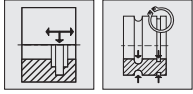
Picture shows right-hand version

Bgr. [mm]	Type, description	L N R 									
			s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	h_2 [inch]	D_{min} [inch]	s_1 [inch]	f [inch]		
32	MSS-I32R09-GX16-1	R	.079	.108	.354	1.268	1.575	.232	.787	GX16-1..	
32	MSS-I32R09-GX16-2	R	.109	.147	.354	1.268	1.575	.232	.787	GX16-2..	
32	MSS-I32R09-GX16-3	R	.148	.197	.354	1.268	1.575	.232	.787	GX16-3..	
32	MSS-I32R09-GX16-4	R	.198	.256	.354	1.268	1.575	.232	.787	GX16-4..	
32	MSS-I32L09-GX16-1	L	.079	.108	.354	1.268	1.575	.232	.787	GX16-1..	
32	MSS-I32L09-GX16-2	L	.109	.147	.354	1.268	1.575	.232	.787	GX16-2..	
32	MSS-I32L09-GX16-3	L	.148	.197	.354	1.268	1.575	.232	.787	GX16-3..	
32	MSS-I32L09-GX16-4	L	.198	.256	.354	1.268	1.575	.232	.787	GX16-4..	
40	MSS-I40R10-GX16-1	R	.079	.108	.394	1.559	1.969	.232	.965	GX16-1..	
40	MSS-I40R10-GX16-2	R	.109	.147	.394	1.559	1.969	.232	.965	GX16-2..	
40	MSS-I40R10-GX16-3	R	.148	.197	.394	1.559	1.969	.232	.965	GX16-3..	
40	MSS-I40R10-GX16-4	R	.198	.256	.394	1.559	1.969	.232	.965	GX16-4..	
40	MSS-I40L10-GX16-1	L	.079	.108	.394	1.559	1.969	.232	.965	GX16-1..	
40	MSS-I40L10-GX16-2	L	.109	.147	.394	1.559	1.969	.232	.965	GX16-2..	
40	MSS-I40L10-GX16-3	L	.148	.197	.394	1.559	1.969	.232	.965	GX16-3..	
40	MSS-I40L10-GX16-4	L	.198	.256	.394	1.559	1.969	.232	.965	GX16-4..	

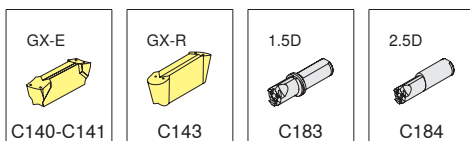
Tools

Tools and inserts for parting and grooving





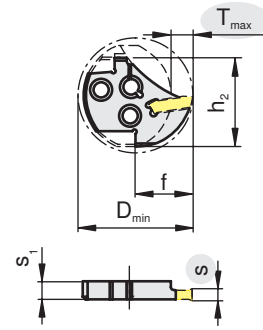
Bgr. [mm]	Type, description	L N R 								
			s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	h_2 [inch]	D_{min} [inch]	s_1 [inch]	f [inch]	
40	MSS-I40N19-GX24-2	N	.109	.147	.748	1.602	2.362	.244	1.319	GX24-2..
40	MSS-I40N19-GX24-3	N	.148	.197	.748	1.602	2.362	.244	1.319	GX24-3..
40	MSS-I40N19-GX24-4	N	.198	.256	.748	1.602	2.362	.244	1.319	GX24-4..





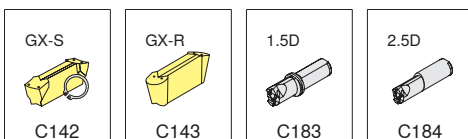
MSS modules – internal

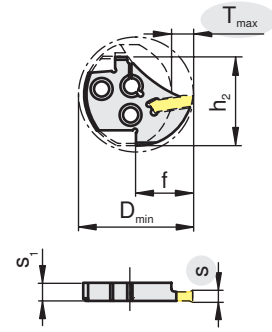
Circlip and radius grooves – GX09



Picture shows right-hand version

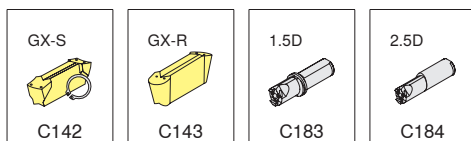
Bgr. [mm]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h ₂ [inch]	D _{min} [inch]	s ₁ [inch]	f [inch]	
16	MSS-I16R02-GX09-1	R	.024	.077	.079	.648	.787	.150	.394	GX09-1..R/L
16	MSS-I16L02-GX09-1	L	.024	.077	.079	.648	.787	.150	.394	GX09-1..R/L
20	MSS-I20R02-GX09-1	R	.024	.077	.079	.799	.984	.150	.472	GX09-1..R/L
20	MSS-I20L02-GX09-1	L	.024	.077	.079	.799	.984	.150	.472	GX09-1..R/L
25	MSS-I25R02-GX09-1	R	.024	.077	.079	.980	1.260	.150	.610	GX09-1..R/L
25	MSS-I25L02-GX09-1	L	.024	.077	.079	.980	1.260	.150	.610	GX09-1..R/L





Picture shows right-hand version

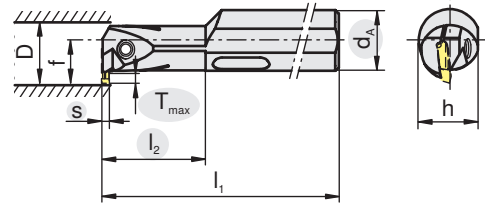
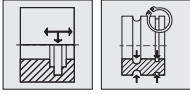
Bgr. [mm]	Type, description	L N R									
			s_{min} [inch]	s_{max} [inch]	T_{max} [inch]	h_2 [inch]	D_{min} [inch]	s_1 [inch]	f [inch]		
32	MSS-I32R03-GX16-2	R	.024	.108	.118	1.268	1.575	.232	.787	GX16-2..R/L	
32	MSS-I32L03-GX16-2	L	.024	.108	.118	1.268	1.575	.232	.787	GX16-2..R/L	
40	MSS-I40R03-GX16-2	R	.024	.108	.118	1.559	1.969	.232	.965	GX16-2..R/L	
40	MSS-I40L03-GX16-2	L	.024	.108	.118	1.559	1.969	.232	.965	GX16-2..R/L	





MSS modules – internal

Circlip and radius grooves – GX09



Picture shows right-hand version

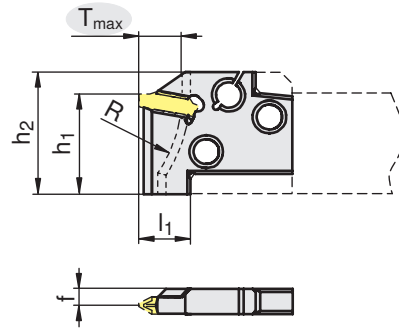
d _A [inch]	Type, description	L N R 	s _{min} [inch]	s _{max} [inch]	T _{max} [inch]	h [inch]	l ₂ [inch]	l ₁ [inch]	D _{min} [inch]	f [inch]	 	
											GX09..	E01
.625	I12R90-2.5D-GX09-E	R	.024	.148	.118	.600	1.181	6.0	.63	.433	GX09..	E01
.625	I12L90-2.5D-GX09-E	L	.024	.148	.118	.600	1.181	6.0	.63	.433	GX09..	E01

Tools

Tools and inserts for parting and grooving

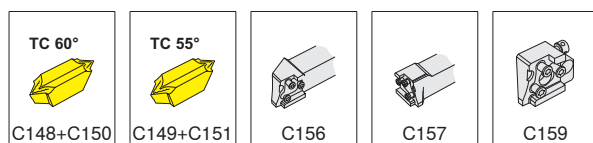
E01	228620	220983

C140	C142	C143	C207



Picture shows right-hand version

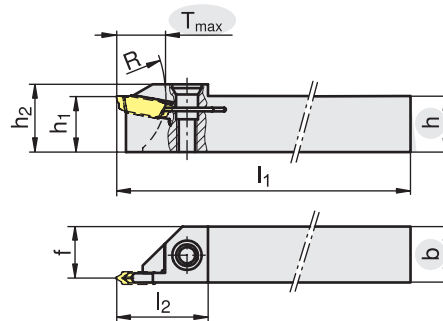
Bgr. [mm]	Type, description	L N R 	P _{min} [mm]	P _{max} [mm]	P _{min} [TPI]	P _{max} [TPI]	T _{max} [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	f [inch]	R [inch]	
20	MSS-E20R-TC16-1	R	.50	1.50	48	16	.315	.787	.945	.787	.136	1.181	TC16-1..
20	MSS-E20N-TC16-2	N	1.75	3.00	14	8	.472	.787	.945	.787	.087		TC16-2..
20	MSS-E20L-TC16-1	L	.50	1.50	48	16	.315	.787	.945	.787	.136	1.181	TC16-1..
25	MSS-E25R-TC16-1	R	.50	1.50	48	16	.315	.984	1.181	.984	.205	1.476	TC16-1..
25	MSS-E25R-TC16-2	R	1.75	3.00	14	8	.394	.984	1.181	.984	.161	1.476	TC16-2..
25	MSS-E25N-TC16-3	N	3.50	5.00	7	5	.472	.984	1.181	.984	.122		TC16-3..
25	MSS-E25L-TC16-1	L	.50	1.50	48	16	.315	.984	1.181	.984	.205	1.476	TC16-1..
25	MSS-E25L-TC16-2	L	1.75	3.00	14	8	.394	.984	1.181	.984	.161	1.476	TC16-2..





Monoblock tool holders

TC threading



Picture shows right-hand version

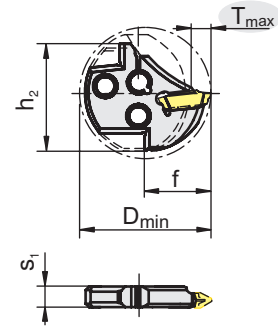
h [inch]	Type, description	L N R 	P _{min} [mm]	P _{max} [mm]	P _{min} [TPI]	P _{max} [TPI]	T _{max} [inch]	h ₂ [inch]	b [inch]	h ₁ [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]	R [inch]		
.500	E12R00-08-TC16-E	R	.50	3.00	48	8	.394	.598	.500	.500	6.0	.768	.461	.591	TC16-1/2..	E01
.500	E12L00-08-TC16-E	L	.50	3.00	48	8	.394	.598	.500	.500	6.0	.768	.461	.591	TC16-1/2..	E01

Tools


Tools and inserts for parting and grooving

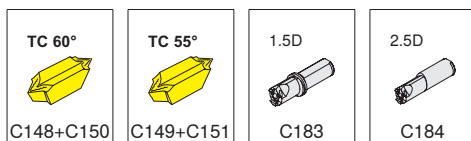
E01	219981	220983

 TC 60° C148+C150	 TC 55° C149+C151	 C207
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Picture shows right-hand version

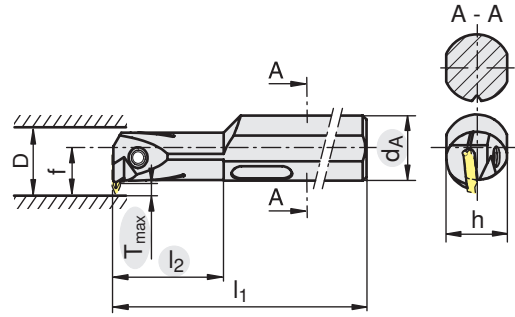
Bgr. [mm]	Type, description	L N R					T _{max} [inch]	D _{min} [inch]	h ₂ [inch]	s ₁ [inch]	f [inch]	
			P _{min} [mm]	P _{max} [mm]	P _{min} [TPI]	P _{max} [TPI]						
32	MSS-I32R-TC16-1	R	.50	1.50	48	16	.276	1.575	1.268	.244	.787	TC16-1..
32	MSS-I32R-TC16-2	R	1.75	3.00	14	8	.276	1.575	1.268	.244	.787	TC16-2..
32	MSS-I32N-TC16-3	N	3.50	5.00	7	5	.276	1.575	1.268	.244	.787	TC16-3..
32	MSS-I32L-TC16-1	L	.50	1.50	48	16	.276	1.575	1.268	.244	.787	TC16-1..
32	MSS-I32L-TC16-2	L	1.75	3.00	14	8	.276	1.575	1.268	.244	.787	TC16-2..





Monoblock boring bars

TC



Picture shows right-hand version

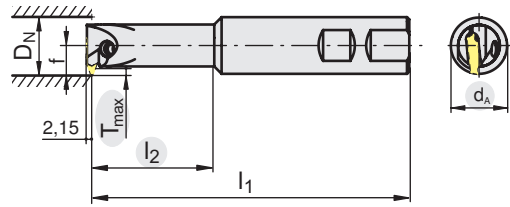
d _A [inch]	Type, description	L N R 	P _{min} [mm]	P _{max} [mm]	P _{min} [TPI]	P _{max} [TPI]	T _{max} [inch]	D _{min} [inch]	h [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
.750	I16R90-2D-TC16-E	R	.50	3.00	48	8	.157	.787	.669	7.0	1.339	.551	TC16-1/2..	E01
.750	I16L90-2D-TC16-E	L	.50	3.00	48	8	.157	.787	.669	7.0	1.339	.551	TC16-1/2..	E01
1.000	I20R90-2D-TC16-E	R	.50	5.00	48	5	.197	.984	.906	8.0	1.654	.689	TC16-..	E02
1.000	I20L90-2D-TC16-E	L	.50	5.00	48	5	.197	.984	.906	8.0	1.654	.689	TC16-..	E02
1.250	I25R90-2D-TC16-E	R	.50	5.00	48	5	.236	1.260	1.181	10.0	2.047	.866	TC16-..	E03
1.250	I25L90-2D-TC16-E	L	.50	5.00	48	5	.236	1.260	1.181	10.0	2.047	.866	TC16-..	E03

Tools

Tools and inserts for parting and grooving

E01	195068	220983
E02	195069	220985
E03	195070	200317

 TC 60° C148+C150	 TC 55° C149+C151	 C207
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d_A [inch]	Type, description	L N R 	l_1 [inch]	l_2 [inch]	T_{max} [inch]	D_N [inch]	f [inch]		
1.000	I25R90-2D-TC16-W-E	R	5.50	2.13	.118	.984	.492	TC16-..	E01
1.250	I32R90-2D-TC16-W-E	R	6.50	2.68	.138	1.260	.630	TC16-..	E02

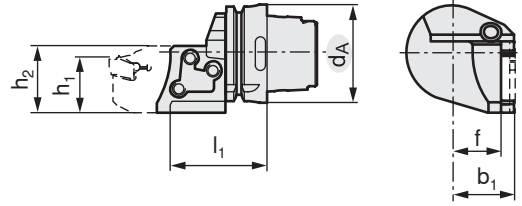
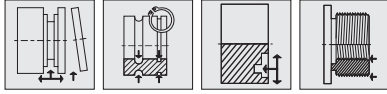
E01	228621	220985
E02	195070	200317

 TC 55° C148+C150	 TC 60° C149+C151	 C207
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Modular system (MSS)

HSK-T 0°



Picture shows right-hand version

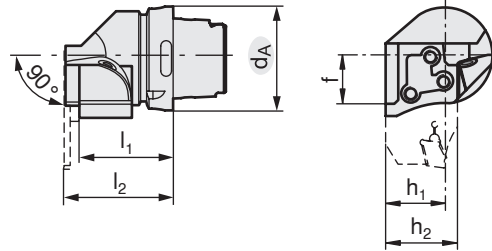
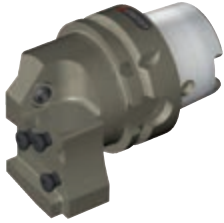
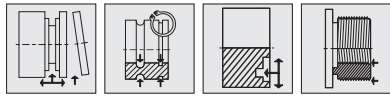
Bgr. [mm]	Type, description	L N R 	d _A [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	b ₁ [inch]	f [inch]		
25	HSK-T63-MSS-E25R00	R	2.480	.984	1.232	2.638	1.740	1.524	MSS-E25R..	E01
25	HSK-T100-MSS-E25R00	R	3.937	1.228	1.929	3.937	2.146	1.929	MSS-E25R..	E02
25	HSK-T63-MSS-E25L00	L	2.480	.984	1.232	2.638	1.740	1.524	MSS-E25L..	E01
25	HSK-T100-MSS-E25L00	L	3.937	1.228	1.929	3.937	2.146	1.929	MSS-E25L..	E01
32	HSK-T63-MSS-E32R00	R	2.480	1.378	1.614	2.913	1.740	1.524	MSS-E32R..	E03
32	HSK-T100-MSS-E32R00	R	3.937	1.724	1.961	3.031	2.134	1.917	MSS-E32R..	E03
32	HSK-T63-MSS-E32L00	L	2.480	1.378	1.614	2.913	1.740	1.524	MSS-E32L..	E03
32	HSK-T100-MSS-E32L00	L	3.937	1.724	1.961	3.031	2.134	1.917	MSS-E32L..	E04

Tools

Tools and inserts for parting and grooving

E01	195069	231176	220985
E02	195069	11848510	220985
E03	195070	231176	200317
E04	195070	11848510	200317

C160-C162	C163-C164	C165-C166	C167	C168	C169	C170-C171	C191	C207



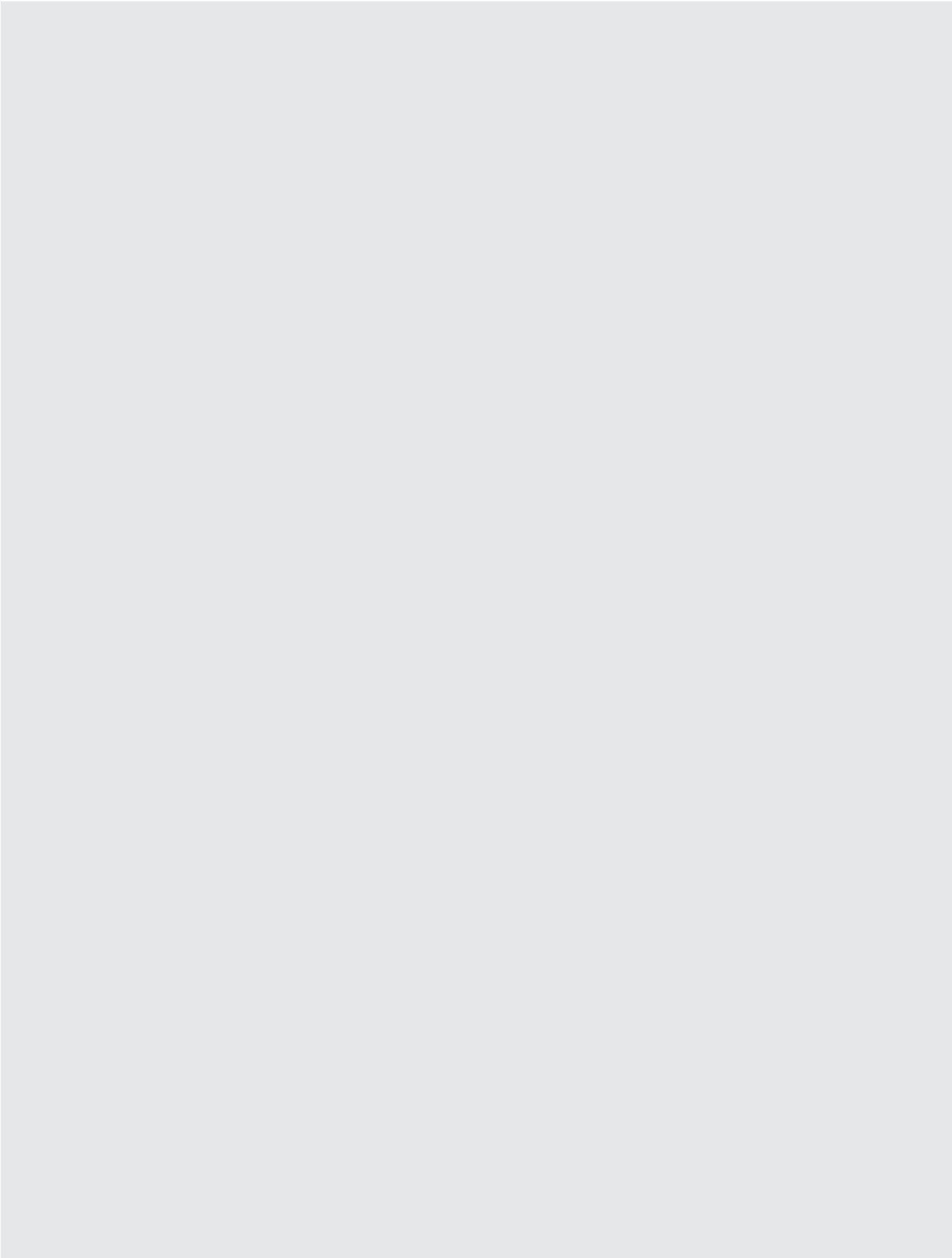
Picture shows right-hand version

Bgr. [mm]	Type, description	L N R								
			d _A [inch]	h ₁ [inch]	h ₂ [inch]	l ₁ [inch]	l ₂ [inch]	f [inch]		
32	HSK-T63-MSS-E32R90	R	2.480	1.370	1.610	2.508	2.724	1.240	MSS-E32L...	E01
32	HSK-T100-MSS-E32R90	R	3.937	1.724	1.961	2.902	3.118	1.969	MSS-E32L...	E01
32	HSK-T63-MSS-E32L90	L	2.480	1.370	1.610	2.508	2.724	1.240	MSS-E32R...	E01
32	HSK-T100-MSS-E32L90	L	3.937	1.724	1.961	2.902	3.118	1.969	MSS-E32R...	E01

E01	195070	231176	200317

C160-C162	C163-C164	C165-C166	C167	C168	C169	C170-C171	C191	C207

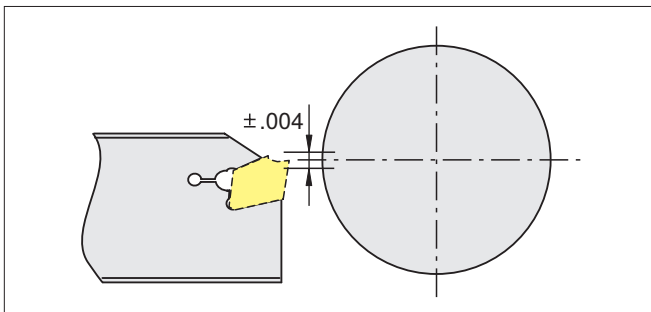






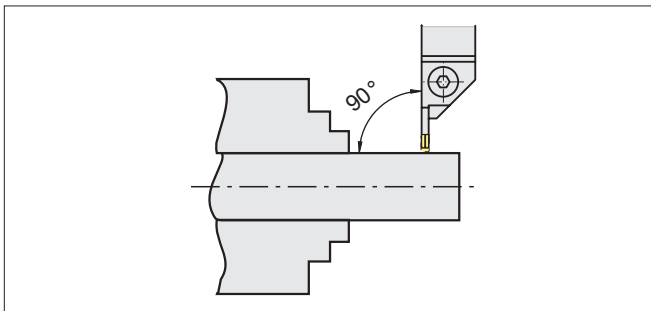
Tool - setting

Application recommendations



Center height

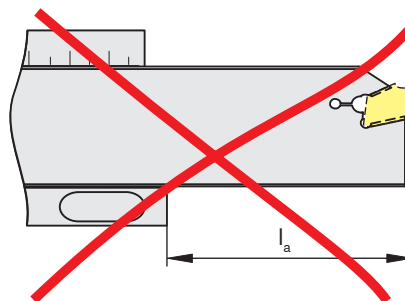
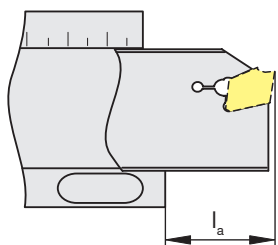
The center height should be set within a tolerance of $\pm .004$ inch to the work piece axis. This is especially important when parting into center.



Tool setting

The parting and grooving tool must be mounted with a 90° angle to the axis of the work piece.

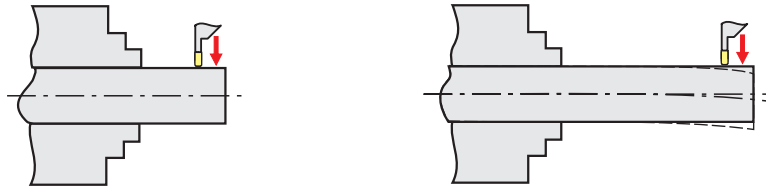
Tool overhang



For optimum stability the tool overhang has to be kept as short as possible. The following rule can be applied: overhang l_a should not be larger than $8 \times s$ (cutting width).

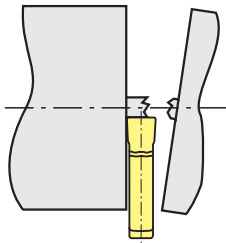


Tool overhang



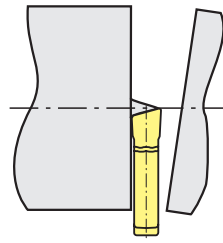
In order to avoid vibration the work piece should be clamped with the minimum overhang possible.

Advice for part-off operations



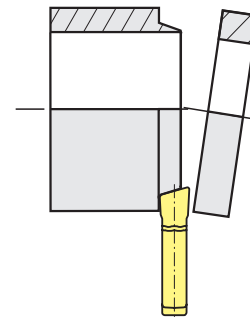
From dia. .197 mm on, reduce feed rate 'f' by approx. 50%.

No part-off across center (risk of breakage).



For parting pip-free, use R or L inserts.

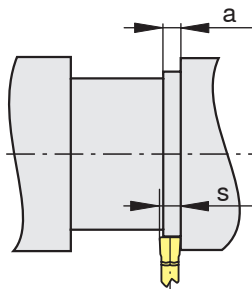
Reduce feed rate 'f' by approx. 20% - 50% to minimize lateral deflection.



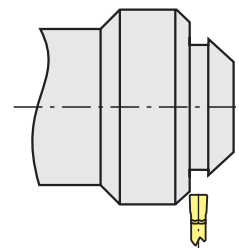
In order to prevent ring formation, use R or L inserts.

Reduce feed rate 'f' by approx. 20% - 50% to minimize lateral deflection.

Advice for grooving operations



When grooving with an axial displacement the width 'a' should be at least 70% of the cutting width 's'.



When grooving inclined surfaces the feed should be reduced by approx. 20% - 50% at the beginning.



GX09-S / GX 16-S			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
R/L	±.0008	±.0008	–
N			±.0008

GX09-R			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
–	±.0008	±.0008	±.0020

GX09-E			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-F2 / –	±.0008	±.0008	±.0020
-M40	±.0039	±.0020	

GX 24-R			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P	±.0008	±.0008	±.0020
-M3	±.0059	±.0020	±.0020

AX			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-F50	±.0008	±.0008	±.0020

PX			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-F3	±.0008	±.0008	±.0020

FX				
Chip groove	Width	Tolerances (inch)		
		<i>x</i>	<i>s</i>	<i>r</i>
-27P	.0866 - .1614	±.0020	±.0020	±.0020
-F1	.0866 - .1614	±.0051	±.0020	±.0020
-M1	.0866 - .1614	±.0051	-.0039	±.0020
	.2008 - .2559		-.0059	
	.3228 - .3819	±.0059	-.0008	±.0004
-R2	.1220 - .1614	±.0051	±.0020	±.0004

SX			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P / -F2	±.0008	±.0008	±.0020
-M1 / -M2 / -M3	±.0039	±.0020	±.0020

GX 24-R			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P	±.0008	±.0008	±.0020
-M3	±.0059	±.0020	±.0020

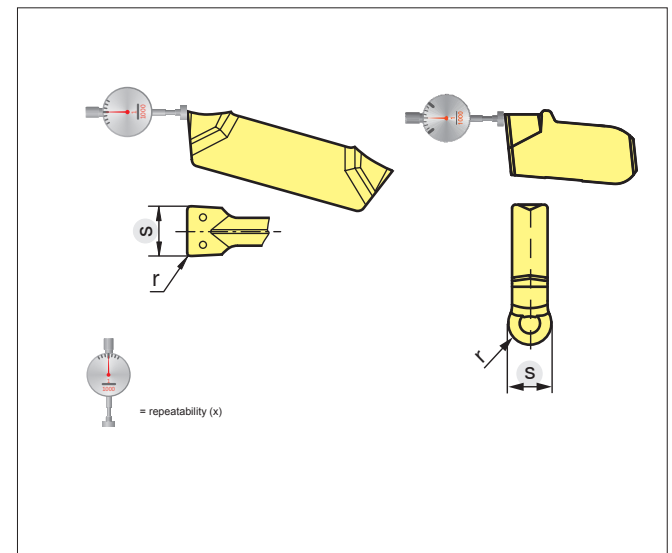
GX 16-R			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P / –	±.0008	±.0008	±.0020

GX16-E			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P / -F2 / –	±.0008	±.0008	±.0020
-M40 / -M1	±.0059	±.0020	

GX24-E			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P / -F2 / –	±.0008	±.0008	±.0020
-M40 / -M1	±.0059	±.0020	

LX			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-M2 / -M3	±.0059	±.0031	±.0031

MaxiClick			
Chip groove	Tolerances (inch)		
	<i>x</i>	<i>s</i>	<i>r</i>
-27P / -F2 / -F3	±.0098	±.0012	–





Reduced parting and grooving depth

The MSS parting and grooving modules are selected by size to suit a certain work piece diameter (D_{max}). If the diameter of the work piece is bigger than D_{max} of the module, then the achievable parting and grooving depth is reduced by dimension 'a'. The extent of the reduction is established by reference to the following table.

T_{max} = maximum grooving depth
 D_{max} = maximum work piece diameter with full grooving depth T_{max} ($a = 0$)
 a = reduction of grooving depth

$$T_{red.} = T_{max} - a$$

Assembly size	Work piece diameter (inch)																	
	1.38	1.58	1.77	2.36	2.95	4.53	>9.84											
E12	1.38	1.58	1.77	2.36	2.95	4.53	>9.84											
E16	1.97	2.17	2.36	2.76	3.15	3.94	5.12	7.88	>16.5									
E20	2.36	2.56	2.76	2.95	3.35	3.75	4.33	5.12	6.50	8.66	12.99							
E25	2.95	3.15	3.35	3.54	3.94	4.33	4.92	5.51	6.30	7.48	9.45	12.60	>19.7					
E32	3.74	3.94	4.13	4.33	4.72	4.92	5.32	5.71	6.30	7.09	7.87	8.86	10.63	12.60	15.75	20.87	20.87	
		.02	.04	.06	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	

Reduction of the maximum grooving depth a (inch)

Maximum work piece diameter (D_{max})
in case of full parting and grooving depth (T_{max}) in
inch

Calculation example: module

MSS-E25R21-GX24-3

E25 assembly size 25

21 $T_{max} = .827, \text{Ø } 2.953$ inch

$D = \text{Ø } 3.9$ inch

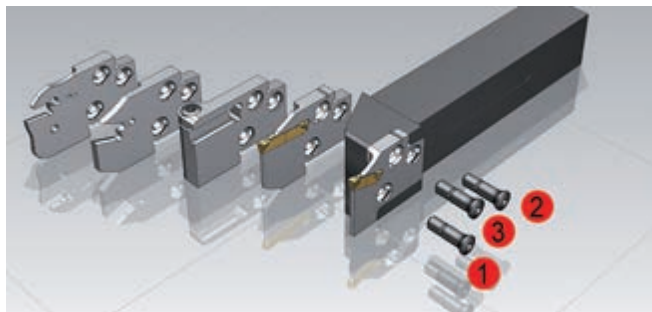
$$\Rightarrow T_{max} - a = T_{red.}$$

$$.827 - .079 = .748$$



Torque moments

MSS module clamping screws



MSS tool shanks

Note the order in which screws must be clamped!



C10

MSS tool shanks	Screw	Torx	Torque moments	
			Nm	in.lbs
MSS-E12...	7897200/M2,5x10/T08	T08	1.2	10.6
MSS-E16...	7897202/M3,5x12,5/T15	T15	3.2	28.3
MSS-E20...	7897203/M4x14/T15	T15	4	35.4
MSS-E25...	7897205/M5x18/T20	T20	5	44.3
MSS-E32...	7897206/M6x20/T25	T25	6	53.1



MSS tool shanks

Note the order in which screws must be clamped!



C10

MSS boring bars	Screw	Torx	Torque moments	
			Nm	in.lbs
MSS-E12...	7897200/M2,5x10/T08	T08	1.2	10.6
MSS-E16...	7897202/M3,5x12,5/T15	T15	3.2	28.3
MSS-E20...	7897203/M4x14/T15	T15	4	35.4
MSS-E25...	7897205/M5x18/T20	T20	5	44.3
MSS-E32...	7897206/M6x20/T25	T25	6	53.1

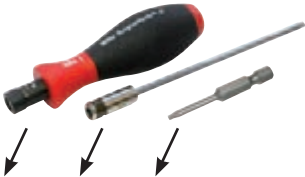
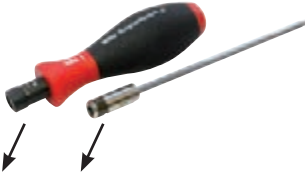



Recommended torque moments

Tool	Screw	Torx	Torque moments	
			Nm	in.lbs
SX 	7897218/M4,0X18/T20	T20	4.0	35.4
PX 	7897218/M4,0X18/T20	T20	4.0	35.4
AX 	7897202/M3,5X12,5/T15 7897203/M4,0X14/T15 7897205/M5,0X18/T20	T15 T15 T20	3.2 4.0 5.0	28.3

Technical information


Torque key (inserts/bits)







 1 + 1 + 5 pcs. (incl. in delivery)	DMSD 1,2Nm/SORT T08 DMSD 2,0Nm/SORT T10 DMSD 3,2Nm/SORT T15 DMSD 4,0Nm/SORT T15 DMSD 4,0Nm/SORT T20 DMSD 5,0Nm/SORT T20 DMSD 6,0Nm/SORT T25	Torque moment set to: 1.2 - 6.0 Nm
 1 + 1 piece (incl. in delivery)	DMSD 1-5Nm/SORT	Torque moment can be adjusted flexibly: 1.0-5.0 Nm
	DMSD 2-8Nm/SORT	Torque moment can be adjusted flexibly: 2.0-8.0 Nm
	DMSD-B T08-50MM DMSD-B T10-50MM DMSD-B T15-50MM DMSD-B T20-50MM DMSD-B T25-50MM	


Tools and inserts for parting and grooving







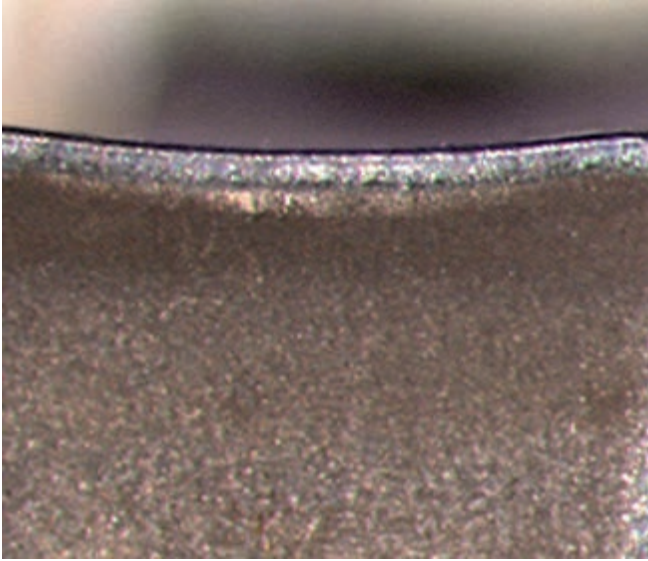


	Material	Type, description	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11149570	DMSD 3,2Nm/SORT T15	T15	3,2	28,3
	11149571	DMSD 4,0Nm/SORT T20	T20	4,0	35,4

	Material	Type, description	Key size
	154461	7802180/A 2,2	A2,2
	154463	7802181/A 3,1	A3,1
	154464	7802182/A 8,2	A8,2
	11366865	10005884/S12-3	S12-3
	11366866	10001365/S15-4	S15-4
	11206195	10002494/TORX 08IP F	T08IP
	11488748	10007404/TORX 07IP F	T07IP
	11843205	10014921/TORX 06IP F	T06IP
	11843208	10014922/TORX 09IP F	T09IP
	4496	7812301/SW 5	SW5
	4497	7812302/SW 6	SW6
	11450858	10006919/TORX 15IP	T15IP
	11816974	10013909/TORX 20IP	T20IP
	291576	7883306/TORX T10	T10
	56656	7724106/TORX T08	T08
	200317	7883304/TORX T25 T	T25
	220983	7897208/TORX T15 T	T15
	220985	7897207/TORX T20 T	T20

	Material	Type, description	Length	Thread size	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11227305	M3,0x7,0-09IP/10003007	7.0	M3,0	T09IP	2,2	19,5
	11610311	M3,5x8,6-15IP/10008749	8.6	M3,5	T15IP	3,2	28,3
	11684214	M2,2x5,0-07IP/10009244	5.0	M2,2	T07IP	1,0	8,9
	11684216	M2,5x6,0-08IP/10009243	6.0	M2,5	T08IP	1,2	10,6
	11801441	M4,5x10,5-20IP/10013040	10.5	M4,5	T20IP	5,0	44,3
	11807480	M2,0x4,3-06IP/10013332	4.3	M2,0	T06IP	0,7	6,2
	11807484	M1,8x3,6-06IP/10013338	3.6	M1,8	T06IP	0,4	3,6

	Material	Type, description	Length	Thread size	Key size
	310720	7897990/M8X1X8 DIN913	8.0	M8	SW4
	219981	7897209/M4,0X11/T15	11	M4	T15
	219982	7897210/M5,0X13,5/T20	13.5	M5	T20
	195068	7897203/M4,0X14/T15	14	M4	T15
	195069	7897205/M5,0X18/T20	18	M5	T20
	195070	7897206/M6,0X20/T25	20	M6	T25
	228617	7897200/M2,5X10/T08	10	M2,5	T08
	228619	7897201/M3,0X11/T10	11	M3	T15
	228620	7897202/M3,5X12,5/T15	12.5	M3,5	T15
	228621	7897204/M4,5X17/T20	17	M4,5	T20
	11007006	7897218/M4,0X18/T20	18	M4	T20
	11081190	7897221/M3,5X14,0/T15	16.5	M3,5	T15
	22485	7802115/M6X25 DIN 912	25	M6	SW5
	229126	7897213/M6X20 12.9 DIN 912	20	M6	SW5
	229131	7897211/M4X12 DIN 912 - 12.9	12	M4	SW3
	284518	7818319/M5,0X16,0/DIN912-12.9	16	M5	SW4
81158	7802133/M8X35 DIN 912	35	M8	SW6	



Flank wear

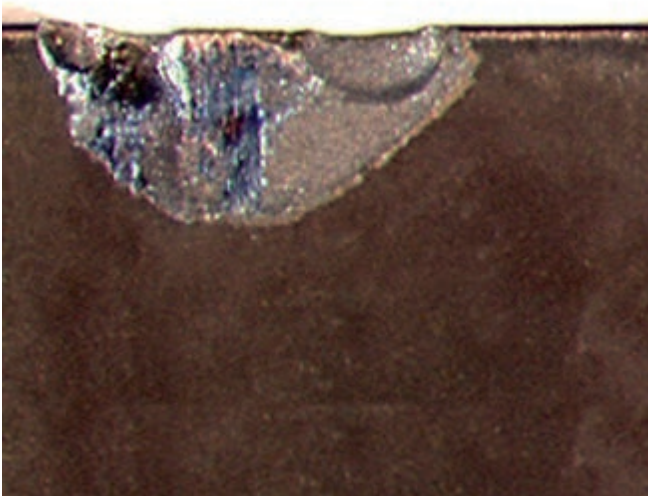
Reasons

- Cutting speed too high
- Carbide grade with insufficient wear resistance
- Insufficient amount of cooling lubricant

Remedies

- Reduce cutting speed
- Select more wear-resistant carbide grade
- Improve coolant supply

Abrasion on the flank, normal wear after a certain machining time.



Edge chipping

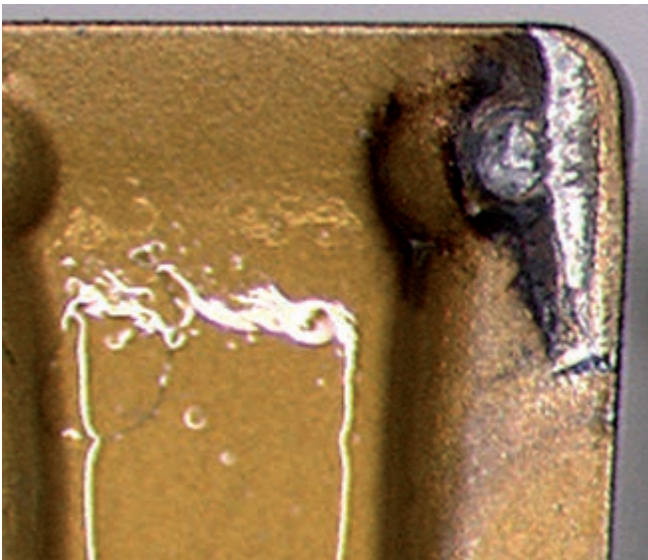
Reasons

- Grade with too high wear resistance
- Vibration
- Feed rate too high or excessive depth of cut
- Swarf damage

Remedies

- Use tougher grade
- Use negative cutting edge geometry with chip groove
- Reduce overhang; check center height
- Increase stability of cutting edge

Through excessive mechanical stress at the cutting edge fracture and chipping may occur.



Cratering

Reasons

- Cutting speed and / or feed rate too high
- Rake angle too shallow
- Grade with insufficient wear resistance
- Incorrect coolant supply

Remedies

- Reduce cutting speed and / or feed rate
- Increase coolant quantity and / or pressure, optimize coolant supply
- Use grade which is more resistant to cratering

The hot chip which is being evacuated causes cratering at the rake face of the cutting edge.



Plastic deformation

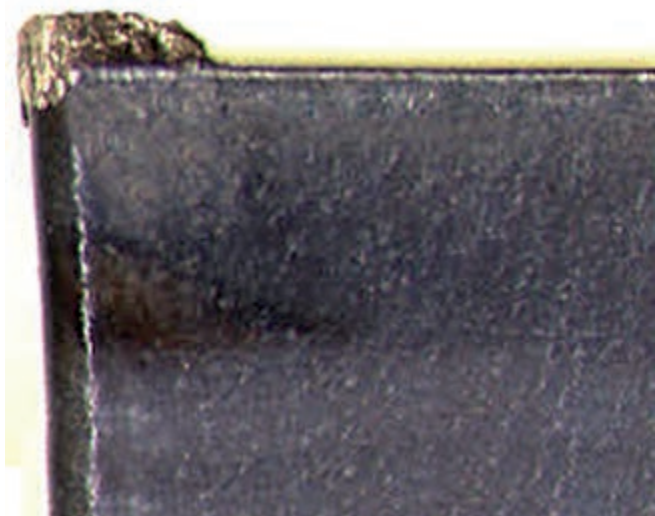
Reasons

- Too high machining temperature resulting in softening of substrate
- Wear / heat resistance of carbide grade too low
- Insufficient coolant supply

Remedies

- Reduce cutting speed
- Choose carbide grade with higher wear resistance
- Provide cooling

High machining temperature and simultaneous mechanical stress may lead to plastic deformation.



Built-up edge

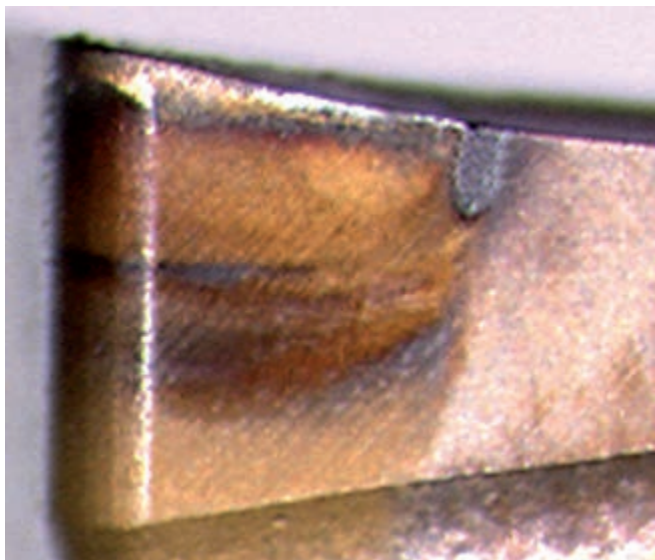
Reasons

- Cutting speed too low
- Rake angle too small
- Wrong cutting material
- Lack of cooling / lubrication

Remedies

- Increase cutting speed
- Enlarge rake angle
- Apply TiN-coating
- Use emulsion with higher concentration

Built-up edge occurs when the chip is not evacuated properly due to insufficient cutting temperature.



Notching

Reasons

- Oxidation of the cutting edge
- Excessive heat on the cutting edge

Remedies

- Use various depths of cut
- Reduce cutting speed
- Improve coolant supply

Notch at the maximum depth of cut



Type of problem										Corrective measures		
Type of wear				Work piece problems				Chip control				
Edge chipping	Built-up edge	Flank wear	Plastic deformation	Vibration	Formation of pips and burrs	Chattered surface	Surface quality	Chip too long (tangled swarf)	Chip too short (fragmented chip)			
	↑	↓	↓	↓			↑	↓		Cutting speed	Cutting values	
↓		≈	↓	↑		↓	↓	↑	↓	Feed rate		
↓		↓	↓		↓	↓	↓			Feed - center area		
↑	↑		≈	≈	↓	↓	↓	↓	↑	Chip groove	↓ -R -M -F ↑	Selection of inserts
					○					R / L - right-hand / left-hand version		
↑		↑	↑	↓	↓	↓	↑			Corner radius	larger ↓ ↑ smaller	
↓		↑	↑							Cutting material	wear resistance ↓ ↑ toughness	
				↓		↑	↑			Cutting width		
≈				≈		≈	≈			Clamping of tool		
≈				≈		≈	≈			Clamping of work piece		
≈				≈			↓			Overhang		
≈		≈		≈	≈		≈			Tip height		
	○	○	○		○		○	○		Cooling lubricant		

↑ raise, increase, large influence

↓ avoid, reduce large influence

≈ check, optimize

↑ raise, increase low influence

↓ avoid, reduce low influence

○ use



Tensile strength N/mm ²	Vickers HV	Brinell HB	Rockwell HRC	Shore C
575	180	171		
595	185	176		
610	190	181		
625	195	185		
640	200	190	12	
660	205	195	13	
675	210	199	14	
690	215	204	15	
705	220	209	15	28
720	225	214	16	
740	230	219	17	29
755	235	223	18	
770	240	228	20.3	30
785	245	233	21.3	
800	250	238	22.2	31
820	255	242	23.1	32
835	260	247	24	33
850	265	252	24.8	
865	270	257	25.6	
880	275	261	26.4	34
900	280	268	27.1	
915	285	271	27.8	35
930	290	276	28.5	
950	295	280	29.2	36
965	300	285	29.8	37
995	310	295	31	38
1030	320	304	32.2	39
1060	330	314	33.3	40
1095	340	323	34.3	41
1125	350	333	35.5	42
1155	360	342	36.6	43
1190	370	352	37.7	44
1220	380	361	38.8	45
1255	390	371	39.8	46
1290	400	380	40.8	47
1320	410	390	41.8	48
1350	420	399	42.7	
1385	430	409	43.6	49
1420	440	418	44.5	
1455	450	428	45.3	51
1485	460	437	46.1	52
1520	470	447	46.9	53
1555	480	465	47.7	54
1595	490	466	48.4	
1630	500	475	49.1	57
1665	510	485	49.8	58
1700	520	494	50.5	59
1740	530	504	51.1	60
1775	540	513	51.7	61
1810	550	523	52.3	62

Tensile strength N/mm ²	Vickers HV	Brinell HB	Rockwell HRC	Shore C
1845	560	532	53	63
1880	570	542	53.6	64
1920	580	551	54.1	65
1955	590	561	54.7	66
1995	600	570	55.2	67
2030	610	580	55.7	68
2070	620	589	56.3	69
2105	630	599	56.8	70
2145	640	608	57.3	71
2180	650	618	57.8	72
2210	660	628	58.3	73
2240	665	633	58.8	74
2280	670	638	59.3	
2310	675	643	59.8	75
2350	680	648	60.3	76
2380	685	653	61.1	77
2410	690	658	61.3	78
2450	695	663	61.7	79
2480	710	668	62.2	80
2520	720	678	62.6	81
2550	730	683	63.1	82
2590	740	693	63.5	
2630	750	703	63.9	83
2660	760	708	64.3	84
2700	770	718	64.7	85
2730	780	723	65.1	
2770	790	733	65.5	86
2800	800	738	65.9	
2840	810	748	66.3	87
2870	820	753	66.7	88
2910	830	763	67	
2940	840	768	67.4	89
2980	850		67.7	
3010	860		68.1	90
3050	870		68.4	
3080	880		68.7	91
3120	890		69	
3150	900		69.3	92
3190	910		69.6	
3220	920		69.9	
3260	930		70.1	

The figures given are approximate according to DIN EN ISO18265 (02-2004)



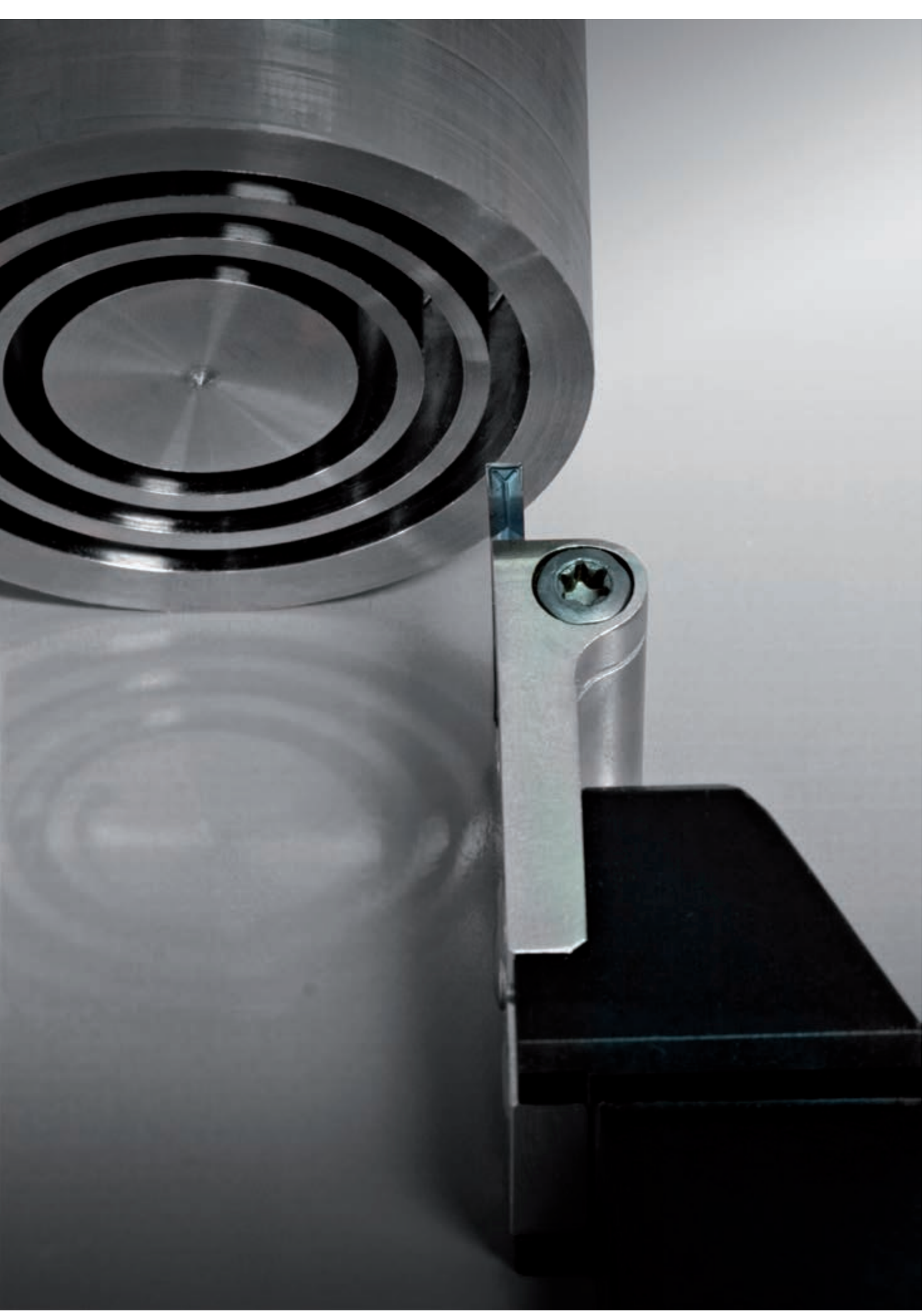
Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
10 SPb 20	1.0722		10 PbF 2		11 L 08		1350	.20	1
100 Cr 6	1.2067	BL 3	Y 100 C 6		L 3	SUJ2	1775	.24	6/9
105 WCr 6	1.2419		105 WC 13			SKS31	1775	.24	6/9
12 CrMo 9 10	1.7380	1501-622 Gr. 31; 45	10 CD 9.10	2218	A 182-F22	SPVA,SCMV4	1675	.24	6/7
12 Ni 19	1.5680		Z 18 N 5		2515		2450	.23	10/11
13 CrMo 4 4	1.7335	1501-620 Gr. 27	15 CD 3.5	2216	A 182-F11; F12	SPVAF12	1675	.24	6/7
14 MoV 6 3	1.7715	1503-660-440					1675	.24	6/7
14 Ni 6	1.5622		16 N 6		A 350-LF 5		1675	.24	6/7
14 NiCr 10	1.5732		14 NC 11		3415	SNC415(H)	1675	.24	6/7
14 NiCr 14	1.5752	655 M 13	12 NC 15		3310; 9314	SNC815(H)	1675	.24	6/7
14 NiCrMo 13 4	1.6657						1675	.24	6/7
15 Cr 3	1.7015	523 M 15	12 C 3		5015		1675	.24	6/7
15 CrMo 5	1.7262		12 CD 4			SCM415(H)	1675	.24	6/7
15 Mo 3	1.5415	1501-240	15 D 3	2912	A 204 Gr. A		1675	.24	6/7
16 MnCr 5	1.7131	527 M 17	16 MC 5	2511	5115	SCR415	1675	.24	6/7
16 Mo 5	1.5423	1503-245-420			4520	SB450M	1675	.24	6/7
17 CrNiMo 6	1.6587	820 A 16	18 NCD 6				1675	.24	6/7
21 NiCrMo 2	1.6523	805 M 20	20 NCD 2	2506	8620	SNCM220(H)	1725	.24	6/8
25 CrMo 4	1.7218	1717 CDS 110	25 CD 4 S	2225	4130	SM420;SCM430	1725	.24	6/8
28 Mn 6	1.1170	150 M 28	20 M 5		1330		1500	.22	2
32 CrMo 12	1.7361	722 M 24	30 CD 12	2240			1775	.24	6/9
34 Cr 4	1.7033	530 A 32	32 C 4		5132	SCR430(H)	1725	.24	6/8
34 CrMo 4	1.7220	708 A 37	35 CD 4	2234	4135; 4137	SCM432;SCCRM3	1775	.24	6/9
34 CrNiMo 6	1.6582	817 M 40	35 NCD 6	2541	4340	SNCM447	1775	.24	6/9
35 S 20	1.0726	212 M 36	35 MF 4	1957	1140		1525	.22	2/3
36 CrNiMo 4	1.6511	816 M 40	40 NCD 3		9840	SNCM447	1775	.24	6/9
36 Mn 5	1.1167						1525	.22	2/3
36 NiCr 6	1.5710	640 A 35	35 NC 6		3135	SNC236	1800	.24	3/9
38 MnSi 4	1.5120						1800	.24	3/9
39 CrMoV 13 9	1.8523	897 M 39					1775	.24	6/9
40 Mn 4	1.1157	150 M 36	35 M 5		1039		1525	.22	2/3
40 NiCrMo 2 2	1.6546	311-Type 7	40 NCD 2		8740	SNCM240	1775	.24	6/9
41 Cr 4	1.7035	530 M 40	42 C 4		5140	SCR440(H)	1775	.24	6/9
41 CrAlMo 7	1.8509	905 M 39	40 CAD 6.12	2940	A 355 Cl. A	SACM645	1775	.24	6/9
41 CrMo 4	1.7223	708 M 40	42 CD 4 TS	2244	4142; 4140	SCM440	1775	.24	6/9
42 Cr 4	1.7045	530 A 40	42 C 4 TS	2245	5140	SCR440	1775	.24	6/9
42 CrMo 4	1.7225	708 M 40	42 CD 4	2244	4142; 4140	SCM440(H)	1775	.24	6/9
45 WCrV 7	1.2542	BS 1		2710	S 1		1775	.24	6/9
50 CrV 4	1.8159	735 A 50	50 CV 4	2230	6150	SUP10	1775	.24	6/9
55 Cr 3	1.7176	527 A 60	55 C 3	2253	5155	SUP9(A)	1775	.24	6/9
55 NiCrMoV 6	1.2713		55 NCDV 7		L 6	SKH1;SKT4	1775	.24	6/9
55 Si 7	1.0904	250 A 53	55 S 7	2085; 2090	9255		1775	.24	6/9
58 CrV 4	1.8161						1775	.24	6/9
60 SiCr 7	1.0961		60 SC 7		9262		1775	.24	6/9
9 SMn 28	1.0715	230 M 07	S 250	1912	1213	SUM22	1350	.21	1
9 SMn 36	1.0736	240 M 07	S 300		1215		1350	.21	1
9 SMnPb 28	1.0718		S 250 Pb	1914	12 L 13	SUM22L	1350	.21	1
9 SMnPb 36	1.0737		S 300 Pb	1926	12 L 14		1350	.21	1
Al99	3.0205						700	.25	21
AlCuMg1	3.1325						700	.25	22
AlMg1	3.3315						700	.25	21



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
AlMgSi1	3.2315						700	.25	22
C 105 W1	1.1545		Y1 105	1880	W 110	SK3	1675	.24	3
C 125 W	1.1663		Y2 120		W 112		1675	.24	3
C 15	1.0401	080 M 15	AF3 7 C 12; XC 18	1350	1015	S15C	1350	.21	1
C 22	1.0402	050 A 20	AF 42 C 20	1450	1020	S20C, S22C	1350	.21	1
C 35	1.0501	060 A 35	AF 55 C 35	1550	1035	S35C	1525	.22	2/3
C 45	1.0503	080 M 46	AF 65 C 45	1650	1045	S45C	1525	.22	2/3
C 55	1.0535	070 M 55		1655	1055	S55C	1675	.24	3
C 60	1.0601	080 A 62	CC 55		1060	S60C	1675	.24	3
Cf 35	1.1183					S35C	1525	.22	2/3
Cf 53	1.1213					S50C	1525	.22	2/3
Ck 101	1.1274	060 A 96		1870	1095		1675	.24	3
Ck 15	1.1141	080 M 15	XC 15; XC 18	1370	1015	S15C	1350	.21	1
Ck 55	1.1203	070 M 55	XC 55		1055	S55C	1675	.24	3
Ck 60	1.1221	080 A 62	XC 60	1665; 1678	1060	S58C	1675	.24	3
CoCr20W15Ni	2.4764						3300	.24	35
CuZn15	2.0240						700	.27	27
CuZn36Pb3	2.0375						700	.27	26
E-Cu57	2.0060						700	.27	28
G-AlSi10Mg	3.2381						700	.25	24
G-AlSi12	3.2581						700	.25	23
G-AlSi9Cu3	3.2163						700	.25	23
G-CuSn5ZnPb	2.1096						700	.27	26
G-CuZn40Fe	2.0590						700	.27	28
G-X 120 Mn 12	1.3401	Z 120 M 12	Z 120 M 12		A 128 (A)		3300	.24	35
G-X 20 Cr 14	1.4027	420 C 29	Z 20 C 13 M			SCS2	1875	.21	12/13
G-X 40 NiCrSi 38 18	1.4865	330 C 40					2600	.24	31
G-X 45 CrSi 9 3	1.4718	401 S 45	Z 45 CS 9		HNV 3		2450	.23	10/11
G-X 5 CrNi 13 4	1.4313	425 C 11	Z 5 CN 13.4	2385	CA 6-NM		1875	.21	12/13
G-X 5 CrNiMoNb 18 10	1.4581	318 C 17	Z 4 CNDNb 18.12 M				2150	.2	14
G-X 6 CrNi 18 9	1.4308	304 C 15	Z 6 CN 18.10 M	2333	CF-8		2150	.2	14
G-X 6 CrNiMo 18 10	1.4408						2150	.2	14
G-X 7 Cr 13	1.4001						1875	.21	12/13
GG-10	.6010		Ft 10 D	01 10-00	A48-20 B	FC100	1150	.2	15
GG-15	.6015	Grade 150	Ft 15 D	01 15-00	A48-25 B	FC150	1150	.2	15
GG-20	.6020	Grade 220	Ft 20 D	01 20-00	A48-30 B	FC200	1150	.2	15
GG-25	.6025	Grade 260	Ft 25 D	01 25-00	A48-40 B	FC250	1250	.24	15/16
GG-30	.6030	Grade 300	Ft 30 D	01 30-00	A48-45 B	FC300	1350	.28	16
GG-35	.6035	Grade 350	Ft 35 D	01 35-00	A48-50 B	FC350	1350	.28	16
GG-40	.6040	Grade 400	Ft 40 D	01 40-00	A48-60 B	FC400	1350	.28	16
GGG-35.3	.7033					FCD350	1225	.25	17
GGG-40	.7040	SNG 420/12	FGS 400-12	0717-02	60-40-18	FCD400	1225	.25	17
GGG-40.3	.7043	SNG 370/17	FGS 370-17	0717-15		FCD400	1225	.25	17
GGG-50	.7050	SNG 500/7	FGS 500-7	0727-02	65-45-12	FCD500	1350	.28	18
GGG-60	.7060	SNG 600/3	FGS 600-3	0732-03	80-55-06	FCD600	1350	.28	18
GGG-70	.7070	SNG 700/2	FGS 700-2	0737-01	100-70-03	FCD700	1350	.28	18
GGG-NiCr 20 2	.7660	S-NiCr 20 2	S-NC 20 2		A 439 Type D-2		1350	.28	18
GGG-NiMn 13 7	.7652	S-NiMn 13 7	S-NM 13 7				1350	.28	18
GS-Ck 45	1.1191	080 M 46	XC 42	1672	1045	S45C	1525	.22	2/3
GTS-35-10	.8135	B 340/12	MN 35-10				1225	.25	19
GTS-45-06	.8145	P 440/7					1420	.3	20



Germany DIN	Mat. no.	United Kingdom BS	France AFNOR	Sweden SS	USA AISI	Japan JIS	Kc1.1 N/mm ²	mc	VDI 3323 group
GTS-55-04	.8155	P 510/4	MP 50-5				1420	.3	20
GTS-65-02	.8165	P 570/3	MP 60-3				1420	.3	20
GTS-70-02	.8170	P 690/2	IP 70-2				1420	.3	20
NiCr20TiAl	2.4631	HR 401; 601	Nimonic 80 A				3300	.24	33
NiCr22Mo9Nb	2.4856		Inconel 625				3300	.24	33
NiCu30Al	2.4375		Monel K 500				3300	.24	34
NiFe25Cr20NbTi	2.4955						3300	.24	34
S 18-0-1	1.3355	BT 1	Z 80 WCV 18-04-01		T 1		2450	.23	10/11
S 18-1-2-5	1.3255	BT 4	Z 80 WKCV 18-05-04-0		T 4		2450	.23	10/11
S 2-9-2	1.3348		Z 100 DCWV 09-04-02-	2782	M 7		2450	.23	10/11
S 6-5-2	1.3343	BM 2	Z 85 WDCV 06-05-04-0	2722	M 2	SKH9; SKH51	2450	.23	10/11
S 6-5-2-5	1.3243		Z 85 WDKCV 06-05-05-	2723		SKH55	2450	.23	10/11
TiAl6V4	3.7165	TA 10 bis TA 13	T-A 6 V				2110	.22	37
X 10 Cr 13	1.4006	410 S 21	Z 12 C 13	2302	410; CA-15	SUS410	1875	.21	12/13
X 10 CrNiMoNb 18 12	1.4583				318		2150	.2	14
X 10 CrNiS 18 9	1.4305	303 S 21	Z 10 CNF 18.09	2346	303		2150	.2	14
X 100 CrMoV 5 1	1.2363	BA 2	Z 100 CDV 5	2260	A 2		2450	.23	10/11
X 12 CrMoS 17	1.4104		Z 10 CF 17	2383	430 F	SUS430F	1875	.21	12/13
X 12 CrNi 17 7	1.4310	301 S 21	Z 12 CN 17.07		301		2150	.2	14
X 12 CrNi 22 12	1.4829					SUS301	1350	.28	16
X 12 CrNi 25 21	1.4845	310 S24	Z 12 CN 25.20	2361	310 S	SUH310; SUS310S	2150	.2	14
X 12 CrNiTi 18 9	1.4878	321 S 20	Z 6 CNT 18.12 (B)	2337	321		2150	.2	14
X 12 NiCrSi 36 16	1.4864	NA 17	Z 12 NCS 37.18		330	SUH330	2600	.24	31
X 15 CrNiSi 20 12	1.4828	309 S 24	Z 15 CNS 20.12		309	SUH309	1350	.28	16
X 165 CrMoV 12	1.2601			2310			2450	.23	10/11
X 2 CrNiMo 18 13	1.4440						2150	.2	14
X 2 CrNiMoN 17 13 3	1.4429	316 S 62	Z 2 CND 17.13 Az	2375	316 LN	SUS316LN	2150	.2	14
X 2 CrNiN 18 10	1.4311	304 S 62	Z 2 CN 18 .10	2371	304 LN	SUS304LN	2150	.2	14
X 20 CrNi 17 2	1.4057	431 S 29	Z 15 CN 16.02	2321	431	SUS431	1875	.21	12/13
X 210 Cr 12	1.2080	BD 3	Z 200 C 12		D 3		2450	.23	10/11
X 210 CrW 12	1.2436			2312			2450	.23	10/11
X 30 WCrV 9 3	1.2581	BH 21	Z 30 WCV 9		H 21	SKD5	2450	.23	10/11
X 40 CrMoV 5 1	1.2344	BH 13	Z 40 CDV 5	2242	H 13	SKD61	2450	.23	10/11
X 46 Cr 13	1.4034	420 S 45	Z 40 C 14				1875	.21	12/13
X 5 CrNi 18 9	1.4301	304 S 15	Z 6 CN 18.09	2332; 2333	304; 304 H	SUS304	2150	.2	14
X 5 CrNiMo 17 13 3	1.4436	316 S 16	Z 6 CND 17.12	2343	316	SUS316	2150	.2	14
X 5 CrNiMo 18 10	1.4401	316 S 16	Z 6 CND 17.11	2347	316	SUS316	2150	.2	14
X 53 CrMnNiN 21 9	1.4871	349 S 54	Z 52 CMN 21.09		EV 8		1875	.21	12/13
X 6 Cr 13	1.4000	403 S 17	Z 6 C 13	2301	403	SUS403	1875	.21	12/13
X 6 Cr 17	1.4016	430 S 15	Z 8 C 17	2320	430	SUS430	1875	.21	12/13
X 6 CrMo 17	1.4113	434 S 17	Z 8 CD 17.01	2325	434	SUS434	1875	.21	12/13
X 6 CrNiMoTi 17 12 2	1.4571	320 S 31	Z 6 CNT 17.12	2350	316 Ti		2150	.2	14
X 6 CrNiNb 18 10	1.4550	347 S 17	Z 6 CNNb 18.10	2338	347		2150	.2	14
X 6 CrNiTi 18 10	1.4541	321 S 12	Z 6 CNT 18.10	2337	321		2150	.2	14
X2 CrNi 18-8	1.4317						2150	.2	14





	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Uncoated carbide		
H216T v_c [sfpm]	CTW7120 v_c [sfpm]	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
–	–	
394 - 525	–	
295 - 460	–	
427 - 558	–	
295 - 427	–	
460 - 657	–	
394 - 525	–	
985 - 8208	328 - 1642	
657 - 6506	328 - 985	
1313 - 4925	328 - 1642	
1313 - 4925	328 - 985	
657 - 2626	328 - 985	
821 - 1970	328 - 1642	
657 - 1970	328 - 1642	
492 - 1313	328 - 985	
492 - 985	328 - 985	
263 - 591	263 - 591	
197 - 492	197 - 492	
328 - 821	328 - 821	
98 - 148	–	
66 - 115	–	
66 - 115	–	
59 - 98	–	
49 - 82	–	
197 - 394	164 - 394	
98 - 263	98 - 164	
–	–	
–	–	
–	–	
–	–	



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

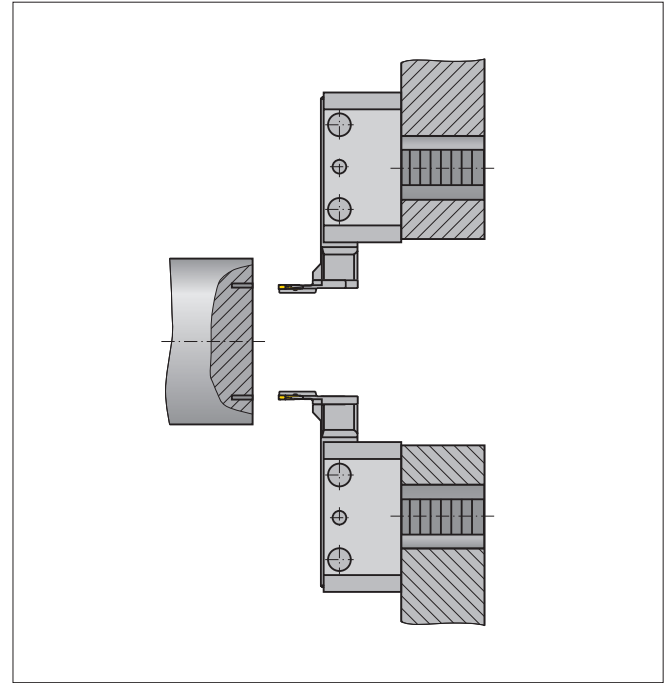
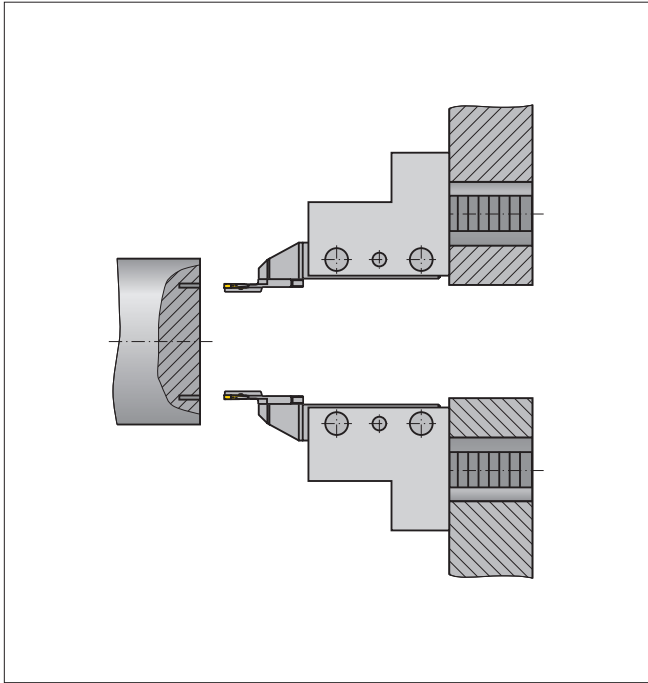
* R_m = ultimate tensile strength, measured in MPa



Coated carbide					
CTC1325 v_c [sfpm]	SR127 v_c [sfpm]	GM127 v_c [sfpm]	CTP1340 v_c [sfpm]	CTCP335 v_c [sfpm]	CTPP345 v_c [sfpm]
492 - 919	492 - 919	492 - 919	394 - 821	427 - 821	361 - 624
427 - 788	427 - 788	427 - 788	263 - 591	361 - 624	263 - 492
328 - 657	328 - 657	328 - 657	197 - 492	230 - 558	230 - 460
460 - 722	460 - 722	460 - 722	263 - 591	394 - 657	230 - 460
427 - 591	427 - 591	427 - 591	197 - 492	361 - 591	230 - 394
328 - 525	328 - 525	328 - 525	197 - 394	230 - 492	197 - 394
394 - 558	394 - 558	394 - 558	263 - 525	295 - 558	197 - 328
328 - 492	328 - 492	328 - 492	164 - 394	230 - 525	197 - 328
492 - 821	492 - 821	492 - 821	164 - 657	394 - 657	295 - 525
197 - 328	197 - 328	197 - 328	164 - 492	197 - 328	197 - 328
460 - 722	460 - 722	460 - 722	164 - 657	394 - 657	328 - 591
394 - 657	394 - 657	394 - 657	164 - 591	328 - 558	263 - 492
263 - 427	263 - 427	263 - 427	164 - 328	230 - 361	230 - 361
197 - 328	197 - 328	197 - 328	164 - 263	197 - 295	197 - 295
394 - 722	394 - 722	–	328 - 657	295 - 591	–
328 - 657	328 - 657	–	295 - 525	263 - 492	–
427 - 624	427 - 624	–	328 - 591	328 - 525	–
328 - 624	328 - 624	–	263 - 525	230 - 460	–
460 - 919	460 - 919	–	361 - 755	328 - 657	–
295 - 624	295 - 624	–	263 - 525	263 - 492	–
–	–	–	328 - 1642	–	–
–	–	–	328 - 985	–	–
–	–	–	328 - 1642	–	–
–	–	–	328 - 985	–	–
–	–	–	328 - 657	–	–
–	–	–	328 - 1642	–	–
–	–	–	328 - 1642	–	–
–	–	–	328 - 985	–	–
–	–	–	328 - 985	–	–
–	–	–	263 - 591	–	–
–	–	–	197 - 492	–	–
–	–	–	328 - 821	–	–
82 - 148	82 - 148	82 - 148	66 - 164	–	–
66 - 131	66 - 131	66 - 131	66 - 131	–	66 - 131
49 - 82	49 - 82	49 - 82	49 - 82	–	66 - 98
33 - 66	33 - 66	33 - 66	33 - 66	–	–
33 - 66	33 - 66	33 - 66	33 - 66	–	–
–	–	–	164 - 394	–	–
–	–	–	98 - 164	–	–
33 - 66	33 - 66	–	–	–	–
–	–	–	–	–	–
33 - 66	33 - 66	–	–	–	–
33 - 66	33 - 66	–	–	–	–



Tool configuration



Technical information

MSS tools 0°

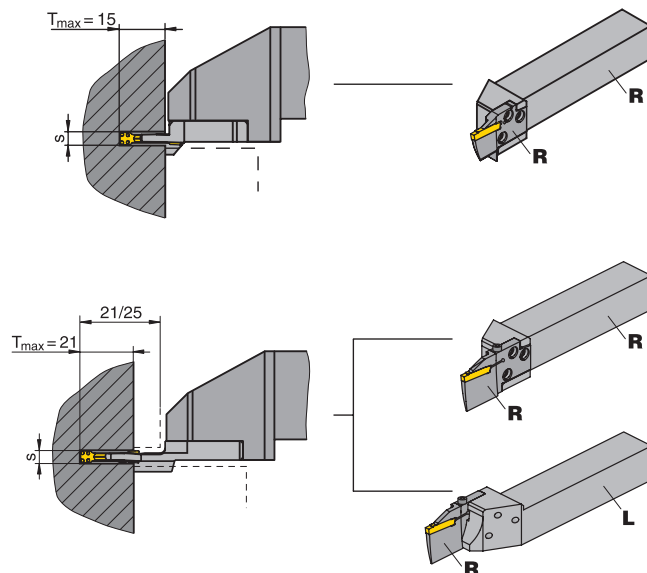
- Large overhang
- Danger of collision
- Special VDI adapter necessary

MSS tools 90°

- Short overhang
- Increased stability
- Normal clamping in VDI shank possible

Tools and inserts for parting and grooving

Parting and grooving depth



Short axial module

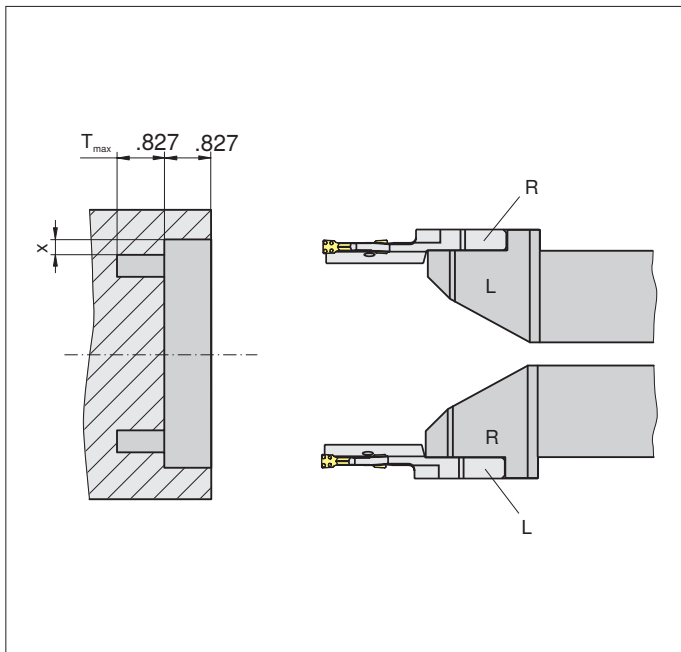
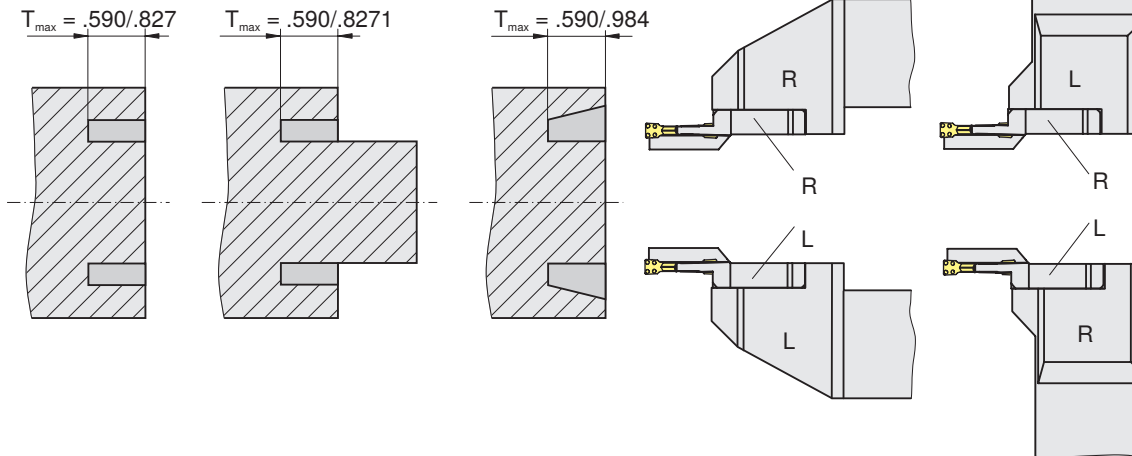
- Can be clamped on one side only
- Parting and grooving depth max. .591 inch

Long axial module

- Can be clamped from either side
- Parting and grooving depth max. .827 inch

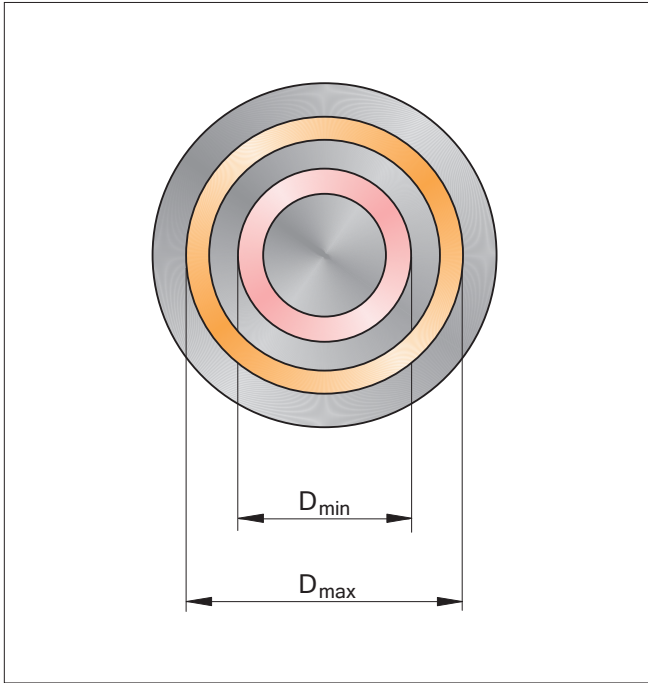


Machining possibilities with short/long axial module



Machining possibilities with long axial module only

Depending on the diameter range or width class an axial displacement (dimension 'x') might be necessary when producing the second groove. The dimension 'x' depends on the groove diameter and shank height.



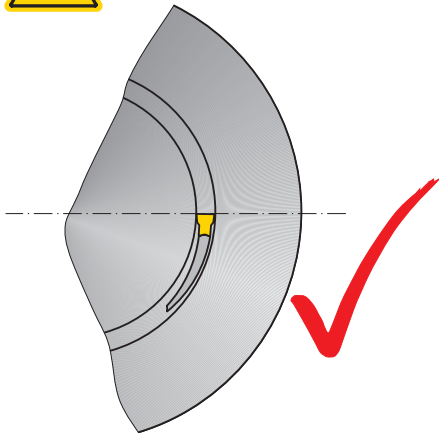
Diameter range ($D_{min} - D_{max}$)
1.97 - 2.76 inch
2.76 - 3.94 inch
3.94 - 5.91 inch
3.91 - 11.81 inch
11.81 - 35.43 inch

Important: the indicated diameter refers to the outside diameter of the groove.

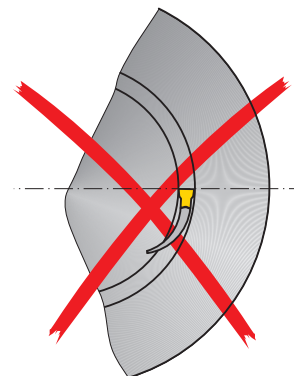
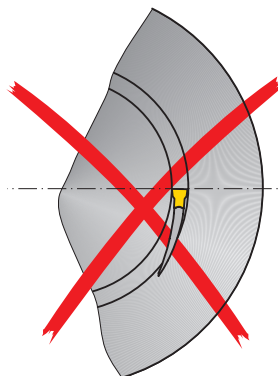
Diameter range	MSS assembly size								
	20	25				32			
	Cutting width	Cutting width						Cutting width	
		Short module			Long module				
	.109 - .147	.109 - .147	.148 - .197	.198 - .256	.148 - .197	.198 - .256	.148 - .197	.198 - .256	
1.97 - 2.76	●	●	●	●					
2.76 - 3.94	●	●	●	●	●	●	●	●	
3.94 - 5.91	●	●	●	●	●	●	●	●	
5.91 - 11.81			●	●	●	●	●	●	
11.81 - 35.43								●	
max. grooving depth	.551	.591			.827		.591		



Please note: the diameter of face grooves must lie within the diameter range indicated on the module. Otherwise the tool may be damaged or destroyed.



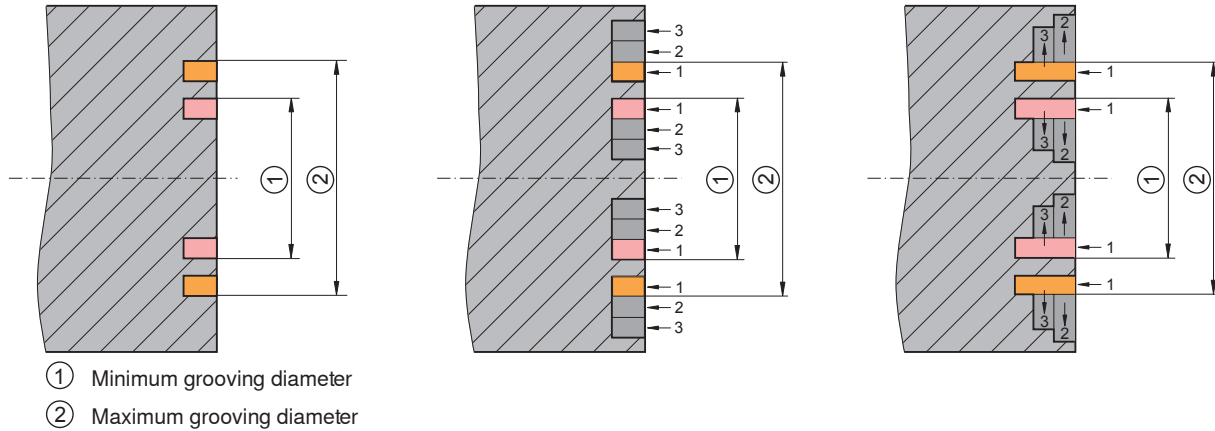
Correct axial grooving module



Incorrect axial grooving module



Application advice for axial grooving and face turning



Axial grooving

is only possible within the diameter range for that module (e.g. 1.969 - 2.756 inch).

Please note: the indicated diameter range refers to the outside diameter of the groove.

Axial grooving - groove widening

Groove widening is possible above and below the diameter range indicated on the module.

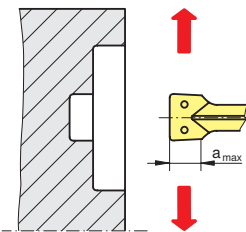
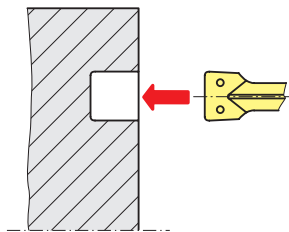
Please note: only the first groove must lie within the diameter range of the module. The depth of the widening groove must not be larger than the depth of the original groove.

Axial grooving and face turning

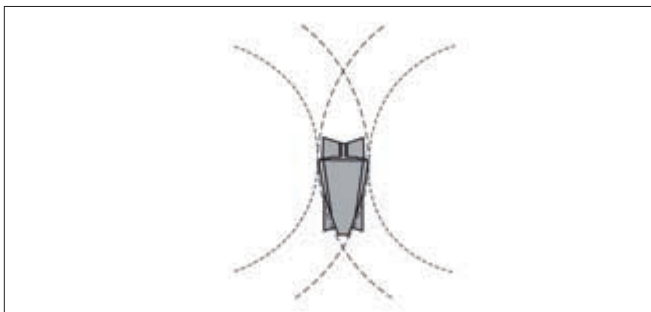
When face turning it is possible to widen the groove above and below the diameter range indicated on the module.

Please note: only the first groove must lie within the diameter range of the module.

Axial grooving and face turning



Designation	f [Inch/rev]	a _{max} [inch]	f [Inch/rev]
GX24-2E3.00N0.30	.002 - .006	.098	.002 - .008
GX24-3E4.00N0.40	.002 - .006	.118	.002 - .010
GX24-3E5.00N0.40	.002 - .006	.118	.004 - .010
GX24-4E6.00N0.50	.002 - .008	.138	.004 - .012
GX24-2E3.00N0.30-F2	.001 - .005	.098	.002 - .006
GX24-2E3.50N0.30-F2	.001 - .005	.098	.002 - .006
GX24-3E4.00N0.40-F2	.002 - .006	.118	.004 - .008
GX24-3E4.50N0.40-F2	.002 - .006	.118	.004 - .008
GX24-3E5.00N0.40-F2	.003 - .008	.138	.004 - .008
GX24-4E6.00N0.50-F2	.002 - .006	.157	.004 - .010



Neutral insert

- May be applied in left-hand and right-hand tools
- Application is independent on the groove diameter (tool position is possible in x+ or x-)
- Only limited by D_{\min} for first grooving operation



Geometry -F50

- Universal application, suitable for all materials
- Suitable for grooving and turning



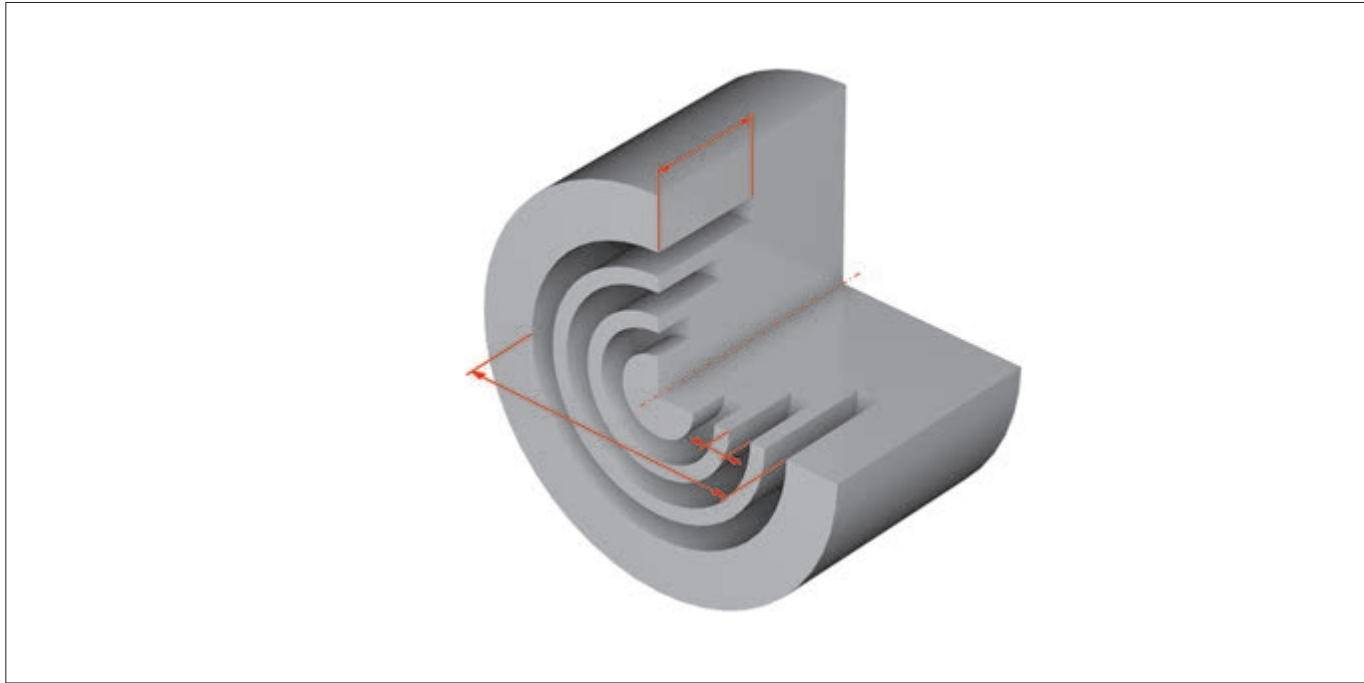
Tools provided with 'hard & tough' coating

- Maximum wear protection
- Maximum corrosion resistance



Monoblock and modular tools

- High flexibility
- Cost-optimized solution for every application



System GX



T_{max}		
$D_{min} - D_{max}$	.591 [inch]	.827 [inch]
1.97 - 2.76	x	x
2.76 - 3.94	x	x
3.94 - 5.91	x	x
5.91 - 11.81	x	x
11.81 - 35.43	x	
S [inch]	.109 - .256	.148 - .256

System AX



T_{max}			
$D_{min} - D_{max}$	AX05	AX10	AX15
$D_{min} - D_{max}$	.394 - ∞	.790 - ∞	1.180 - ∞
T_{max}	.200	.390	.590
S [inch]	.118	.118	.118

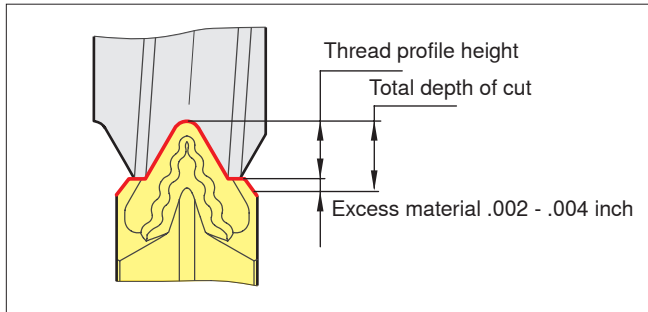
System LX



T_{max}			
$D_{min} - D_{max}$	E32N25	E32N32	E32N45
$D_{min} - D_{max}$	19.685 - ∞	19.685 - ∞	19.685 - ∞
T_{max}	.748	1.020	1.540
S [inch]	.310 - .390	.310 - .390	.310 - .390

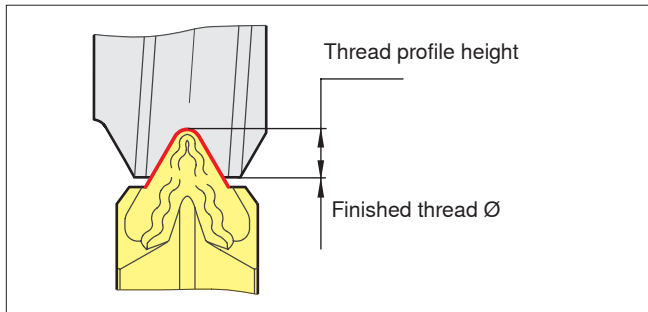


Differences between full and partial profile inserts



Full profile insert

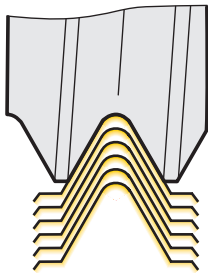
- + The entire thread profile including the external dia. is machined (excess material .002 - .004 inch over finished diameter) + high profile precision
- + Increased tool life thanks to larger point radii
- + Burr-free thread
- One insert per pitch



Partial profile insert

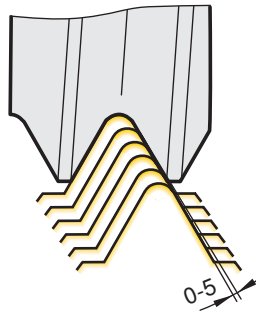
- + One insert for several pitches
- Therefore the thread profile does not exactly meet the standard
- The external dia. (or the core dia. in case of internal threads) is not machined

Approach selection



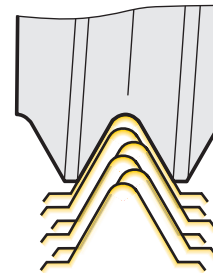
Radial approach

- + Conventional lathes
- + With pitches < .079 inch
- + With short chipping materials
- Reduced chip control



Flank approach

- + Preferred approach on CNC-machines
- + With pitches from .079 to .157 inch
- + Long chipping materials
- + Good chip control



Alternating approach

- + With pitches > .157 inch
- + Long chipping materials
- + Uniform insert wear
- + Long tool life
- + Good chip control
- More complex NC programming



Type of problem											Corrective measures	
Type of wear				Work piece problems				Chip control				
Flank wear	Edge chipping	Plastic deformation	Built-up edge	Burr formation at external thread Ø	Profile precision	Surface quality	Chatter marks, vibration	Chip cross section too large	Chip cross section too small	Chip shape (tangled swarf)		
↓		↓	↑			↑	↓				Cutting speed	Cutting values
a,b	a,b		a,b	a,b		a,b	a,b	a,b		a,b	Feed motion a) via the flanks b) alternating via the flanks	
↑	↓	↓		↓	↓	↓	↓	↓	↑	≈	Approach (depth of cut)	Selection of inserts
↓	↑	↑		≈	≈	↑	≈	↑	↓	↓	Number of passes	
				○	○	○					Finish cut (idle cut)	
			○			○	○			○	Chip groove	
↑	↓	↑									Cutting material ↓ wear resistance toughness ↑	General criteria
				○	○	○					Full profile	
											Partial profile	
	≈					≈	≈				Stability tool - insert	
	≈					≈	≈				Stability - work piece	
	↓					↓	↓				Overhang	
≈	≈	≈			≈	≈	≈				Tip height	
○	○	○	○	○		○					Cooling lubricant	

↑ raise, increase, large influence

↓ avoid, reduce large influence

≈ check, optimize

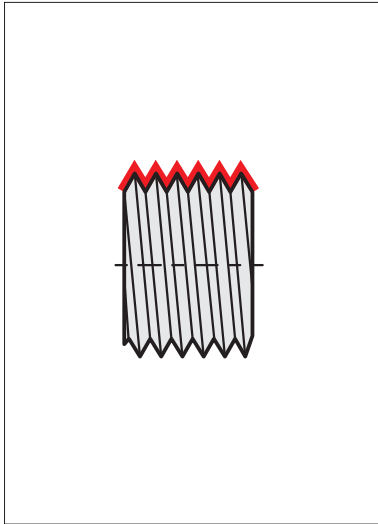
↑ raise, increase low influence

↓ avoid, reduce low influence

○ use



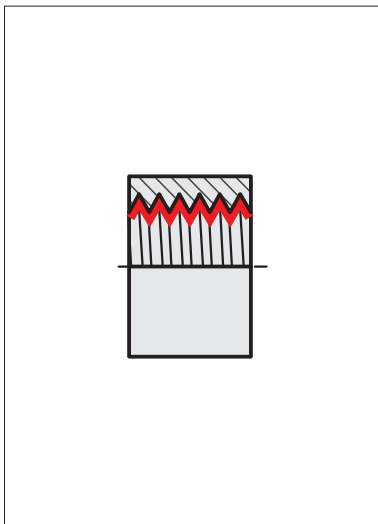
Full profile



Metric ISO 60° external threads

Pitch [mm]	0,5	0,75	1,0	1,25	1,5	1,75	2,0	2,5	3,0	3,5	4,0	4,5	5,0
Number of cuts	4	4	5	5	6	7	8	9	10	10	12	12	12
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	6	7	8	9	10	11	12	14	18	18	20	20	20
Thread profile height	0,32	0,48	0,64	0,80	0,95	1,10	1,26	1,58	1,89	2,21	2,53	2,84	3,16

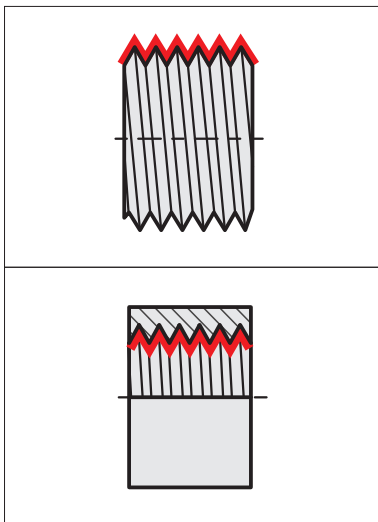
These are recommended values for steel machining



Metric ISO 60° internal threads

Pitch [mm]	0,5	0,75	1,0	1,25	1,5	1,75	2,0	2,5	3,0	3,5	4,0	4,5	5,0
Number of cuts	4	4	5	5	6	7	8	9	10	10	12	12	12
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	6	7	8	9	10	11	12	14	18	18	20	20	20
Thread profile height	0,30	0,45	0,59	0,74	0,89	1,02	1,17	1,46	1,76	2,02	2,35	2,64	2,93

These are recommended values for steel machining



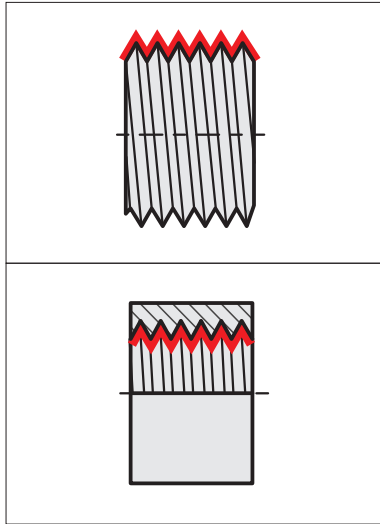
Whitworth 55° external and internal threads

Pitch [passes/inch]	28	26	24	20	19	18	16	14	12	11	10	9	8	7	6	5
Number of cuts	5	5	5	5	6	6	7	8	9	9	10	10	10	12	12	12
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	8	8	9	9	10	10	11	12	14	14	17	18	18	20	20	20
Thread profile height	.024	.026	.028	.033	.035	.037	.041	.047	.055	.060	.066	.074	.083	.095	.111	.133

These are recommended values for steel machining



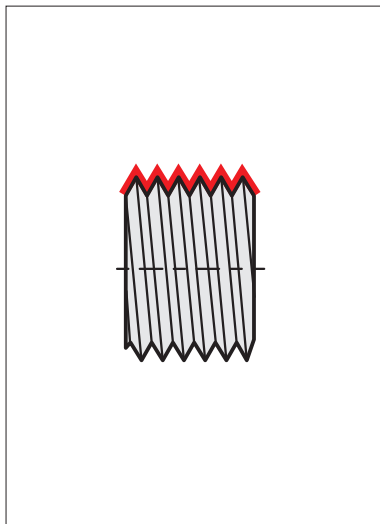
Partial profile



60° external and internal threads

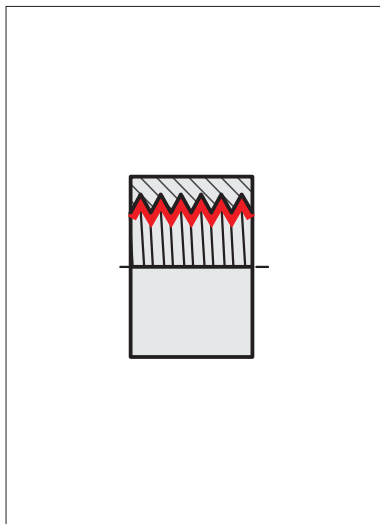
Threading insert	TC16-2EI-AG60																
	TC16-1EI-A60								TC16-2EI-G60				TC16-3EI-N60				
Pitch [mm]	0,5	0,75	1,0	1,25	1,5	1,75	2,0	2,5	3,0	1,75	2,0	2,5	3,0	3,5	4,0	4,5	5,0
Number of cuts	4	4	5	6	7	8	9	10	12	8	9	10	12	12	13	14	14
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Thread profile height external	0,33	0,52	0,71	0,90	1,09	1,28	1,47	1,84	2,22	1,23	1,42	1,79	2,17	2,45	2,83	3,21	3,59
Thread profile height internal	0,27	0,44	0,60	0,76	0,92	1,09	1,25	1,57	1,90	1,04	1,20	1,52	1,85	2,07	2,4	2,72	3,05

These are recommended values for steel machining



55° external threads

	TC16-2EI-AG55												
	TC16-1EI-A55												
Pitch [passes/inch]	28	26	24	20	19	18	16	14	12	11	10	9	8
Number of cuts	5	5	6	6	7	7	8	9	10	10	11	12	12
	↓	↓	-	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Thread profile height	.026	.028	.031	.037	.040	.042	.048	.055	.064	.070	.078	.087	.098



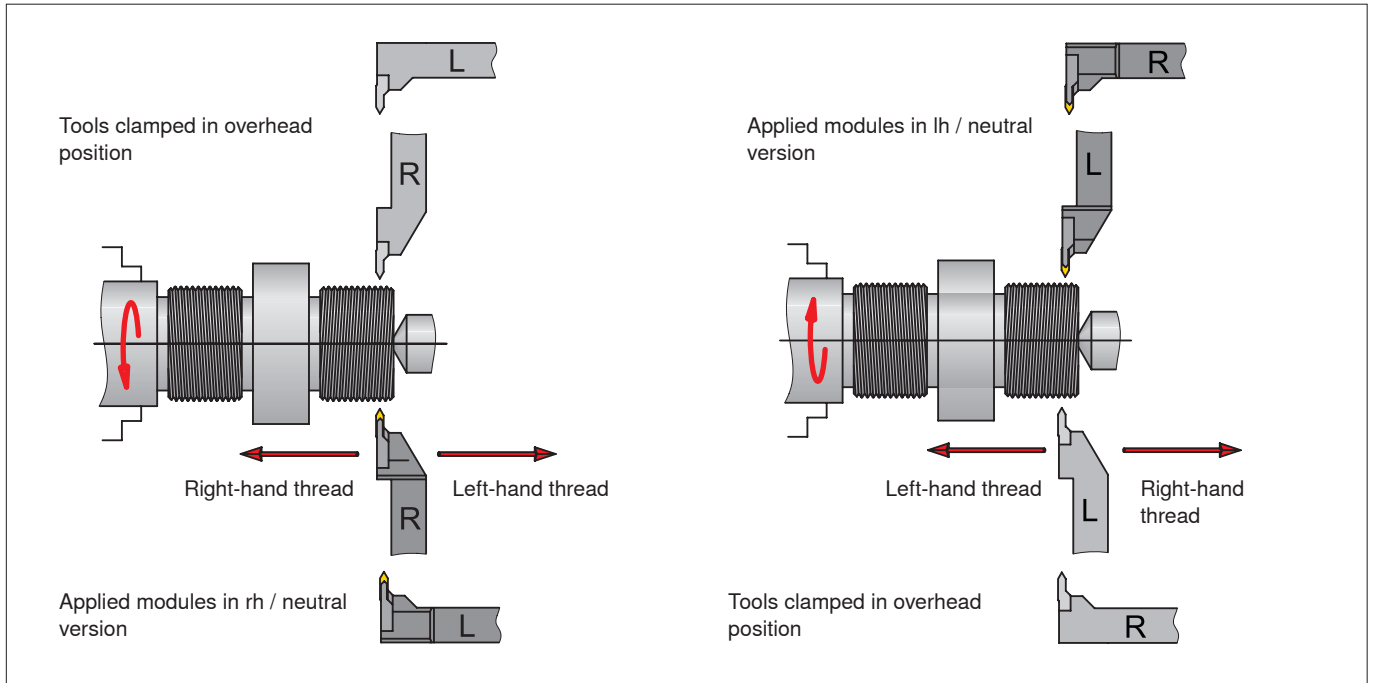
55° internal threads

Threading insert	TC16-2EI-G55						TC16-3EI-N55		
	Pitch [passes/inch]	14	12	11	10	9	8	7	6	5
Number of cuts	8	9	10	11	12	12	12	12	14
	↓	↓	↓	↓	↓	↓	↓	↓	↓
Thread profile height	.048	.057	.061	.071	.080	.091	.094	.114	.140

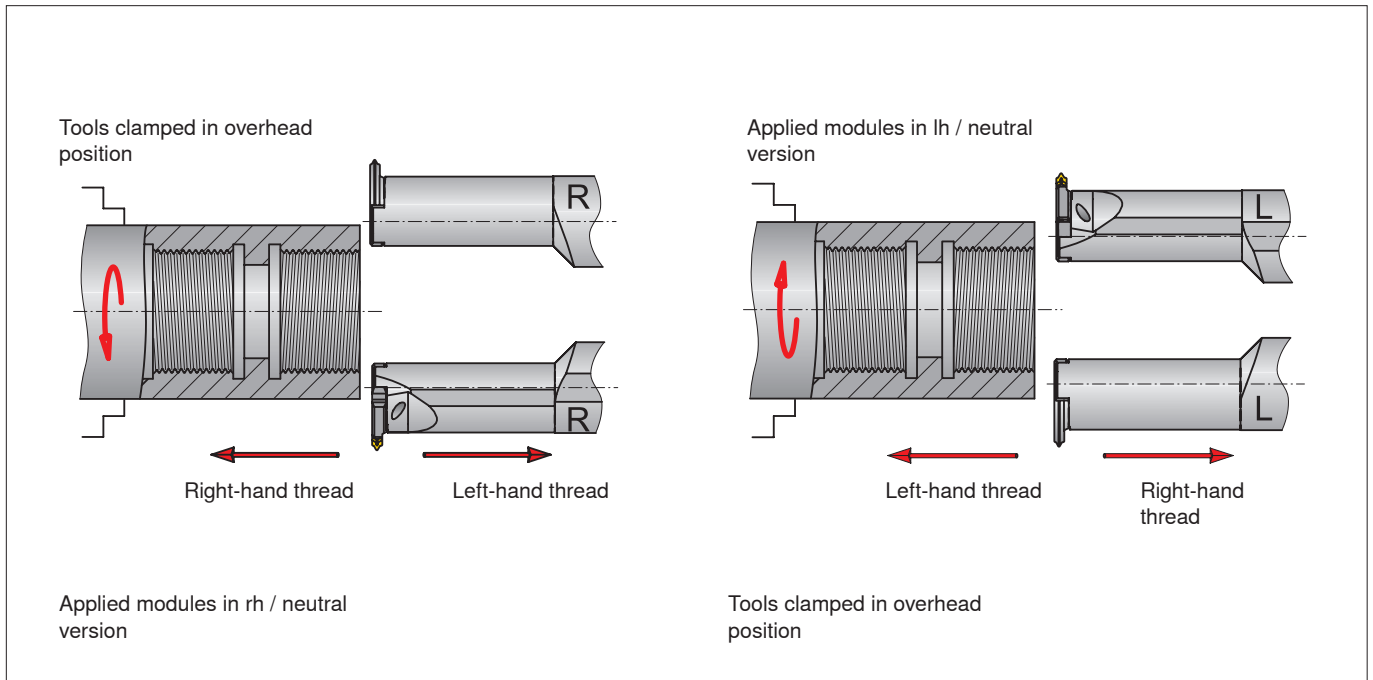
These are recommended values for steel machining



Application methods for external machining



Application methods for internal machining





External thread

	Conventional milling	Climb milling
Right-hand thread		
Left-hand thread		

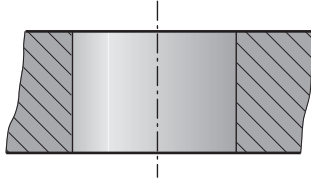
Internal thread

	Conventional milling	Climb milling
Right-hand thread		
Left-hand thread		

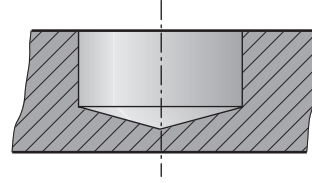




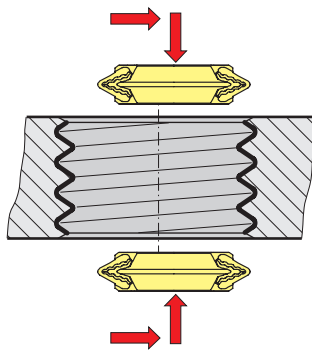
Drilling - through-hole thread



Drilling - bottom hole thread

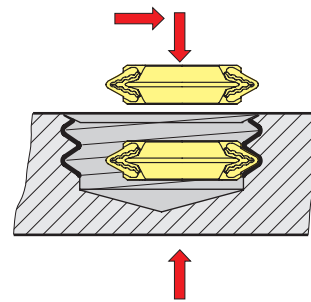


Through-hole thread



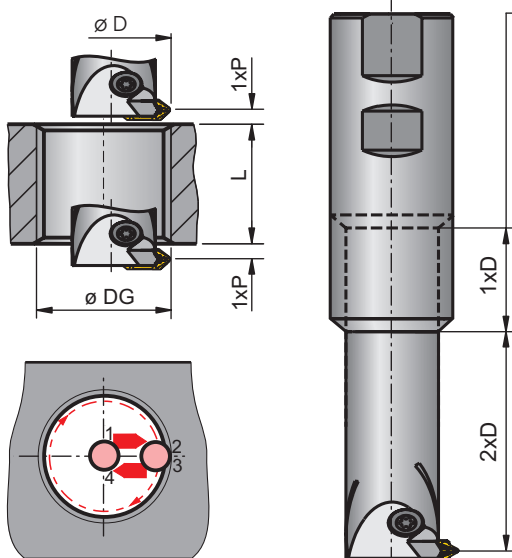
No radial plunging necessary, radial approach above or below work piece + spiral movement

Bottom hole thread



Radial approach until total profile depth + spiral movement
Radial plunging + spiral movement



Advantages compared to multi-tooth threading inserts

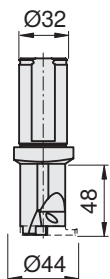
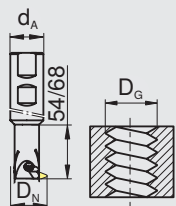


Readjustment possible when necessary

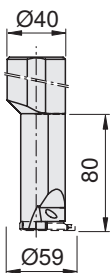
- Same insert for thread turning and milling
- Considerably lower cost of TC inserts
- Thread is cut in a single feed from outside inwards or vice versa, so no step in the thread
- Low cutting forces possible through single-tooth thread milling
- Stable conditions
- Standard reach is $2 \times D$. Tools may be modified up to $3 \times D$.
- Higher cutting values ($v_c + f$) in this manner machining times are similar to multi-tooth insert machining
- Easy programming



Bgr.	Type, description	Full profile metric ISO 60°			Full profile Whitworth 55°	
		D _G [mm]	 MSS-I32R-TC16-2		 MSS-I32N-TC16-3	
			TC16-2 | 2,0 ISO	TC16-2 | 3,0 ISO	MSS-I32R-TC16-2 TC16-2 EI 11W	
32	1.5D MSS-I32R90-1.5D	M82	x	x	R 2 ³ / ₄	x
		M85	x	x		
		M90	x	x	R3	x
		M95	x	x	R3 ¹ / ₄	x
		M100	x	x	R3 ¹ / ₂	x
		M105	x	x	R3 ³ / ₄	x
		M110	x	x	R4	x
		M115	x	x		
		M120	x	x		
		M125	x	x	R4 ¹ / ₂	x
		M130	x	x		
		M135	x	x		
		M140	x	x	R5	x
		M145	x	x		
		M150	x	x	R5 ¹ / ₂	x
		M155		x		
	M160		x			
	M165		x			
	M170		x			
	M175		x			
	M180		x			
	M185		x			
	M190		x			
	M195		x			
	M200		x			
	M205		x			
	M210		x			
	M215		x			
	M220		x			
	M225		x			
	M230		x			
	M235		x			
M240		x				
M245		x				
M250		x				
		↓	↓			
		M300	x	x		



2.5D
MSS-I32R90-2.5D

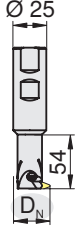
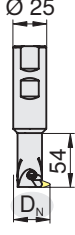


Bgr. = assembly size



Thread milling – external

Milling tool system MSS-TC

D_N	Type, description	D_G [mm]	Full profile metric ISO 60°										
			TC threading inserts										
			TC16-1 | 0,5 ISO	TC16-1 | 0,75 ISO	TC16-1 | 1,0 ISO	TC16-1 | 1,5 ISO	TC16-1 | 2,0 ISO	TC16-1 | 2,5 ISO	TC16-1 | 3,0 ISO	TC16-1 | 3,5 ISO	TC16-1 | 4,0 ISO	TC16-1 | 4,5 ISO	TC16-1 | 5,0 ISO
25	I25R90-2D-TC16-W	↓ M16											
		↓											
32	I32R90-2D-TC16-W	↓											
		↓											
		M80											

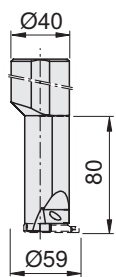
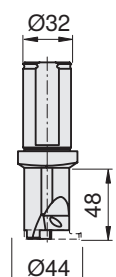
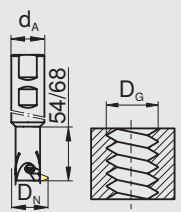
External threads in the range between M16 and M80 can be milled with both tools, I25... or I32... Choose the adequate threading inserts with the required pitch.

D_G [inch]	Full profile Whitworth 55°								
	TC threading inserts								
	TC16-2 EI 14W	TC16-2 EI 12W	TC16-2 EI 11W	TC16-2 EI 10W	TC16-2 EI 9W	TC16-2 EI 8W	TC16-3 EI 7W	TC16-3 EI 6W	TC16-3 EI 5W
↓									
5/8		x							
3/4			x						
7/8				x					
1					x				
1 1/8						x			
1 3/8							x		
1 1/2								x	
1 5/8									x
1 3/4									x

D_N = nominal milling Ø



Bgr.	Type, description	Full profile metric ISO 60°			
		D _a [mm]	MSS-I32R-TC16-2		MSS-I32N-TC16-3
			TC16-2 I 2,0 ISO	TC16-2 I 3,0 ISO	TC16-3 I 4,0 ISO
32	1.5D MSS-I32R90-1.5D	M82	x	x	x
		M85	x	x	x
		M90	x	x	x
		M95	x	x	x
		M100	x	x	x
		M105	x	x	x
		M110	x	x	x
		M115	x	x	x
		M120	x	x	x
		M125	x	x	x
		M130	x	x	x
		M135	x	x	x
		M140	x	x	x
		M145	x	x	x
		M150	x	x	x
		2.5D MSS-I32R90-2.5D	M155		x	x
	M160			x	x
	M165			x	x
	M170			x	x
	M175			x	x
	M180			x	x
	M185			x	x
	M190			x	x
	M195			x	x
	M200			x	x
	M205			x	x
	M210			x	x
	M215			x	x
	M220			x	x
	M225			x	x
	M230			x	x
	M235		x	x	
M240		x	x		
M245		x	x		
M250		x	x		
↓			↓	↓	
M300			x	x	



Bgr. = assembly size

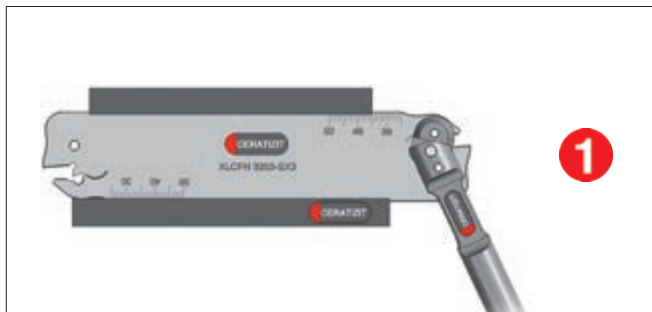


	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
		alpha + beta alloys	37	R _m 1050*	
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

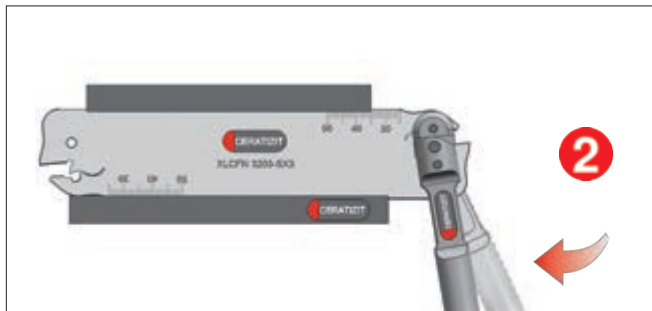
* R_m = ultimate tensile strength, measured in MPa



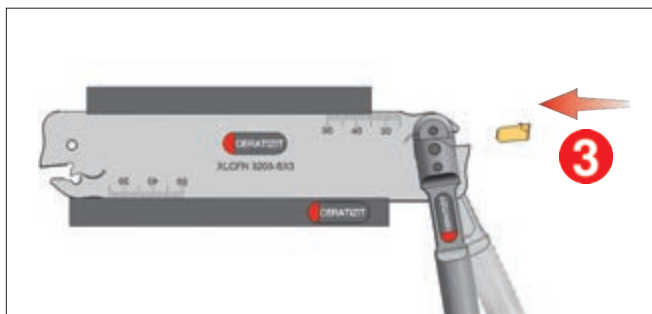
Coated carbide			Uncoated carbide		
GM213 v_c [sfpm]	GM240 v_c [sfpm]		H216T v_c [sfpm]		
492 - 821	657 - 886		–		
361 - 591	591 - 755		–		
295 - 525	460 - 624		–		
328 - 558	591 - 624		–		
263 - 492	394 - 624		–		
230 - 394	394 - 525		–		
295 - 427	460 - 657		–		
230 - 361	328 - 525		–		
361 - 558	558 - 755		–		
295 - 460	427 - 624		–		
361 - 591	492 - 657		–		
263 - 460	–		–		
230 - 328	–		–		
230 - 394	–		–		
394 - 525	427 - 657		–		
328 - 427	394 - 591		–		
525 - 657	394 - 558		–		
295 - 460	394 - 624		–		
394 - 460	492 - 755		–		
295 - 427	394 - 558		–		
–	–		328 - 2626		
–	–		328 - 2626		
–	–		328 - 1642		
–	–		328 - 1642		
–	–		328 - 1149		
–	–		263 - 1642		
–	–		263 - 1642		
–	–		263 - 1642		
–	–		263 - 1642		
–	–		263 - 1642		
–	–		263 - 1642		
–	–		263 - 1642		
98 - 164	66 - 131		–		
82 - 115	66 - 98		–		
82 - 115	33 - 66		–		
33 - 66	33 - 66		–		
33 - 82	33 - 66		–		
328 - 492	230 - 328		–		
131 - 197	82 - 148		–		
115 - 148	–		98 - 131		
–	–		–		
33 - 66	–		16 - 49		
115 - 148	–		98 - 131		



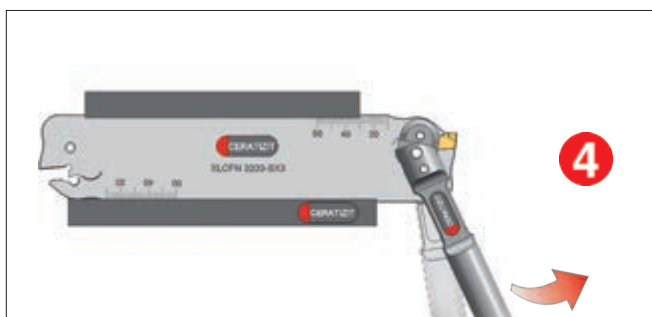
Insert mounting key with handle towards the front into the 2 tool location points.



When moving the mounting key in the direction of the arrows the insert seat is opened.



Position the insert pressing it against the location face.

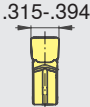
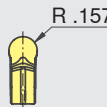
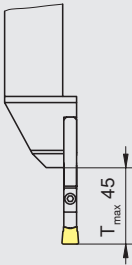
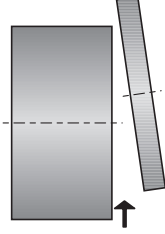
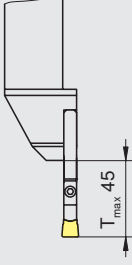
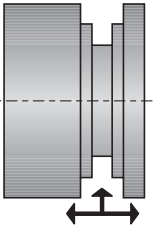
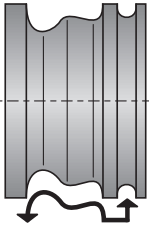
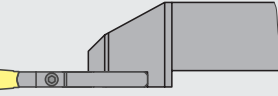
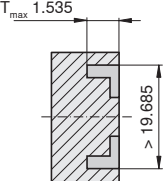
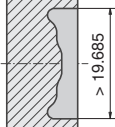
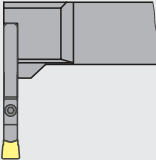
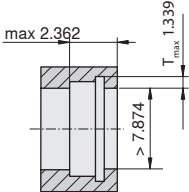
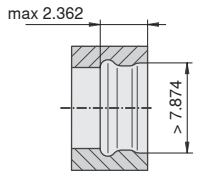


Moving the mounting key forward the insert seat locks and the insert is clamped securely.



The clamping system is designed in such a way that the mounting key can be inserted into the blade from either side.



<p style="text-align: right;">Insert</p> <p>Application</p>	 <p style="text-align: center;">.315-.394</p>	 <p style="text-align: center;">R.157</p>
<p style="text-align: center;">Part-off</p> 		
<p style="text-align: center;">Grooving and turning</p> 		
<p style="text-align: center;">Axial grooving</p> 		
<p style="text-align: center;">Internal grooving and turning</p> 		



Special tools

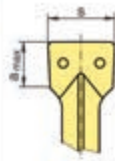
Kunde: Kunden-Nr.:
 Ansprechpartner: Datum:
 E-Mail: Tel.:

Stückzahl: Werkzeug / Modul:
 Werkstoff: Festigkeit: [N/mm²]

GX-Stechwendplatten sind auf Wunsch auch in verschiedenen Sonderformen lieferbar. In der folgenden Übersicht sind die Wichtigsten angeführt. Die eingetragenen Maße zeigen welche Mindestangaben zur Definition der Sonderformen erforderlich sind.
Wichtig: Maße und Toleranzen des Werkstückes anführen!

Zzeichnung auf Seite 3 verfügbar

Rohlingstypen für Sonderformen			
Breitenklasse	WSP-Größe	s	Rmax
1	09	2,00 - 2,75	1,5
2	09	2,76 - 3,75	2,0
1	16	2,00 - 2,75	2,5
2	16	2,76 - 3,75	3,0
3	16	3,76 - 5,00	3,5
4	16	5,01 - 6,50	4,0
1	24	2,00 - 2,75	2,5
2	24	2,76 - 3,75	2,5
3	24	3,76 - 5,00	3,5
4	24	5,01 - 6,50	4,0



Wendepfattendimensionen: 09 16 24

Breitenklasse:

Maße:

Maß	Toleranz	
s		[mm]
T		[mm]
R ₁		[mm]
R ₂		[mm]
C ₁		[mm]
C ₂		[mm]
ø ₁		[°]
ø ₂		[°]

Innenbearbeitung - Bohrung Ø [mm]

Ihre Anmerkungen:

Technical information

Tools and inserts for parting and grooving

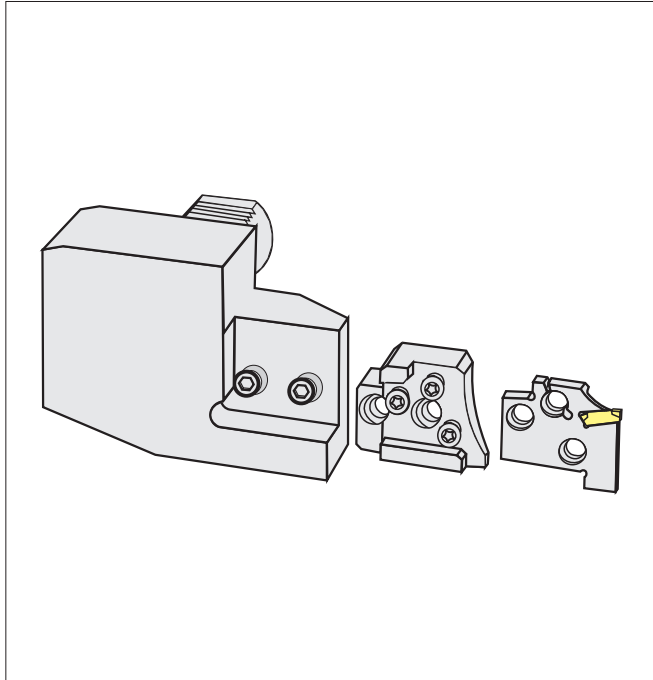


You can download the form below at our website www.ceratitis.com ->Download ->Forms or using the QR code.



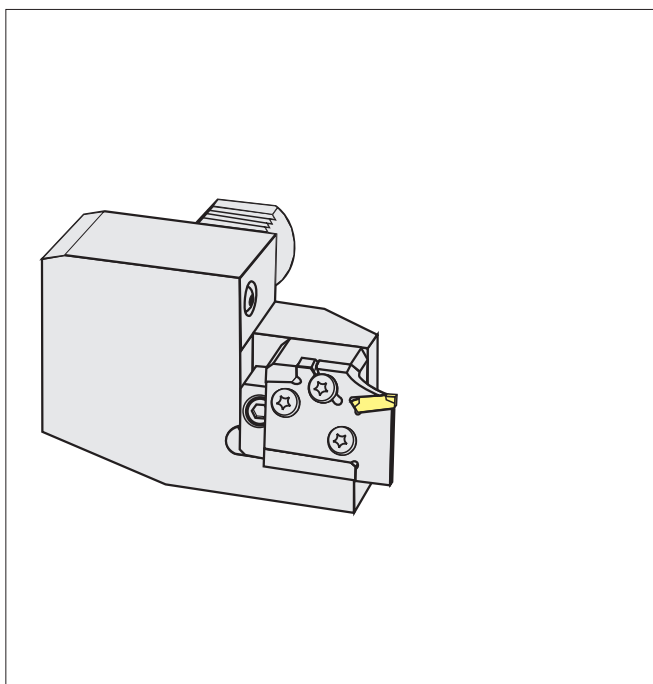
Application possibilities for MSS adapters

MSS adapters offer the possibility to apply the modular parting and grooving system where conventional tool shanks or Maxiflex UTS tool heads cannot be used.



Examples

- Special solutions of all kinds
- Special tools and shanks
- Rotating tools for circular milling
- Special machines
- Limited space



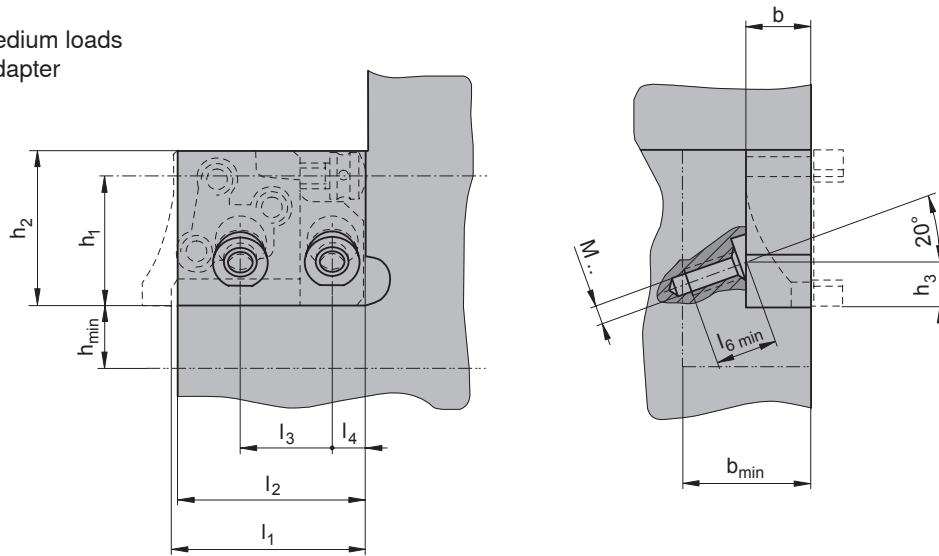
Assembly example

Adapters in combination with VDI shank



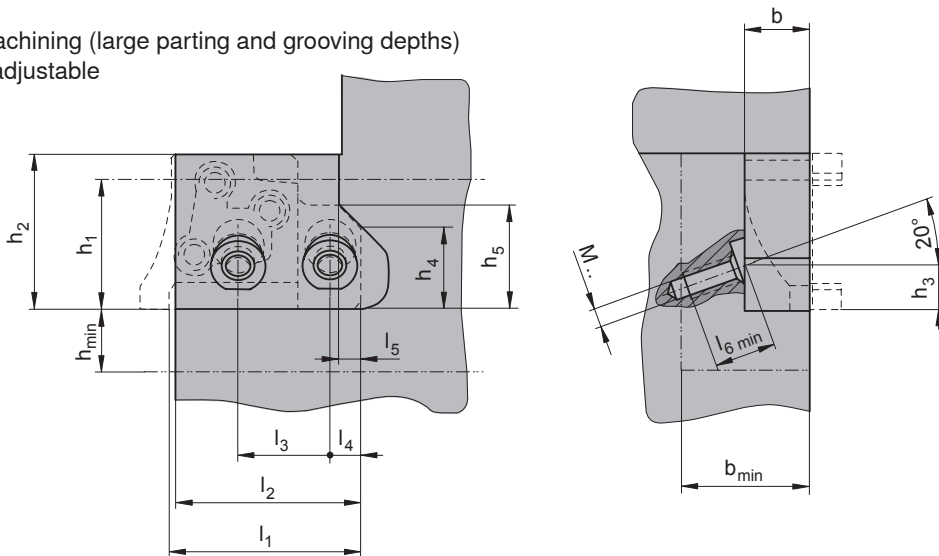
Assembly type A

- For low or medium loads
- Adjustable adapter

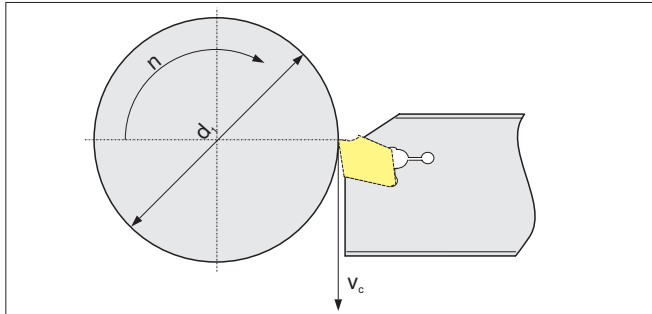


Assembly type B

- For heavy machining (large parting and grooving depths)
- Adapter not adjustable



Adapters for:	Dimensions in mm														
	h_1	h_2	$h_3^{+0,1}$	h_4	h_5	$h_{min.}$	b	$b_{min.}$	l_1	l_2	l_3	l_4	l_5	$l_{6 min.}$	$M..$
MSS-E20R00-AD MSS-E20L00-AD	.787	.945	.236	.512	.630	.394	.421	.748	1.181	1.142	.561	.197	.118	.315	M4
MSS-E25R00-AD MSS-E25L00-AD	.984	1.181	.335	.630	.787	.472	.496	.984	1.457	1.417	.709	.256	.157	.472	M5
MSS-E32R00-AD MSS-E32L00-AD	1.260	1.496	.531	.866	1.024	.630	.575	1.181	1.811	1.752	.925	.295	.157	.591	M6

**Cutting speed (v_c)**

$$v_c = \frac{d_1 \cdot \pi \cdot n}{12} \text{ [sfpm]}$$

Revolutions per minute (n)

$$n = \frac{v_c \cdot 12}{d_1 \cdot \pi} \text{ [rev./min]}$$



Feed rate (v_f)

$$v_f = f \cdot n \text{ [inch/min]}$$






Introduction

	System characteristics	D3
	Application	D4-D5


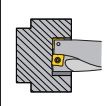


Inserts

	SONT...	D7
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Tools

	System C900 2xD	D8-D9
	System C900 3xD	D10-D11
	System C900 4xD	D12-D13
	System C900 5xD	D14

Technical information

	Cutting data	D16-D23
	Off-center drilling	D24
	Coolant pressure	D25
	Formula collection	D26



Chip grooves

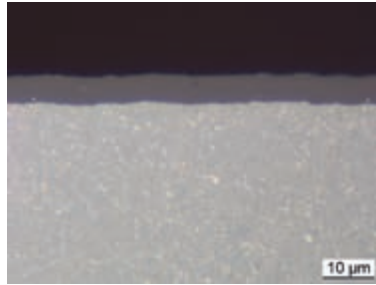
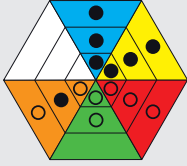
MaxiDrill 900

Introduction

Tools and inserts for drilling

CTPP430

HC-P30
HC-M25
HC-S25

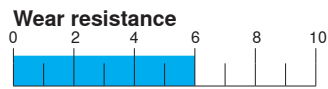
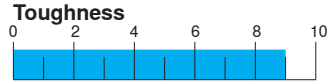


Composition:
Co 9.0%; other .75%; WC balance

Grain size:
.85 μm

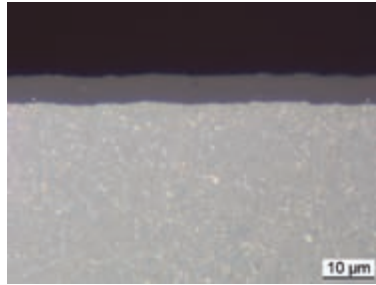
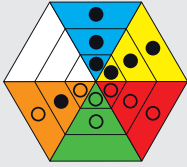
Hardness:
HV 1590

Coating specification:
PVD
TiAlN; 7 μm



CTPP430

HC-P30
HC-M25
HC-S25

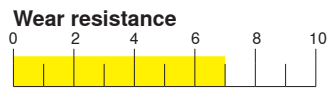
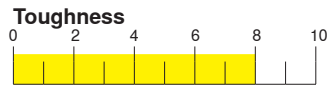


Composition:
Co 9.0%; other .75%; WC balance

Grain size:
.85 μm

Hardness:
HV 1590

Coating specification:
PVD
TiAlN; 7 μm



Chip groove	Material	Machining situation and stability				Machining type F / M / R
		○	○	◐	◑	
<p>$\gamma = 10^\circ$</p> <p>-M30</p>		X	X			<p>M</p>

- MasterGuide:**
- Steel
 - Stainless
 - Cast iron
 - Non-ferrous metals
 - Heat-resistant
 - Heat-resistant materials
 - Hard materials

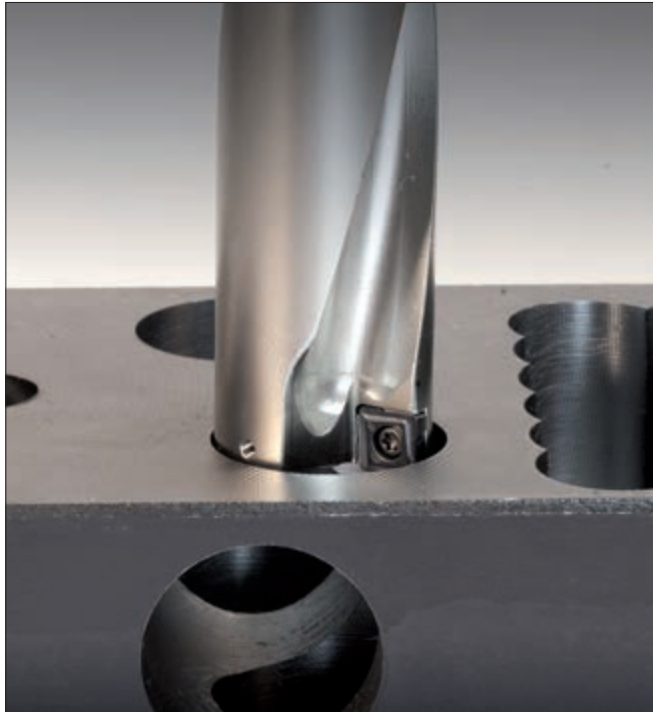
- Main application
- Extended application

Machining situation and stability:

- excellent
- good
- acceptable
- difficult

Machining type:

- F** Fine machining
- M** Medium machining
- R** Rough machining



Since its introduction two years ago MaxiDrill 900 has established itself as a high-performance solid carbide drilling tool. It sets new standards in high-feed machining with lengths up to 5xD and demonstrates its performance capacity on steel, cast iron, non-ferrous metals and difficult to machine materials.

CERATIZIT has extended the program, which means that MaxiDrill 900 is now one of the most comprehensive drilling programs on the market.

Program

The new SONT inserts of the program are available in eleven insert sizes.

With these new insert sizes, we can now drill diameters from 14mm to 63mm.



Success factors

- Process security and precision: dimensional accuracy even under demanding conditions
- Excellent productivity: high feed rates are possible
- Reduced friction for smooth operations: optimal chip evacuation through asymmetric chip flute design



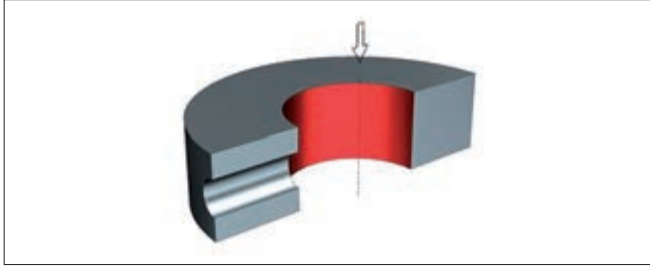
Application

MaxiDrill 900

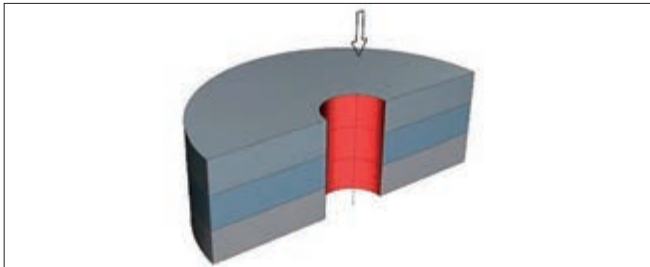
This solid carbide tool shows its high performance capacity in a wide application range and most difficult situations.

Note: feed rate reduction between 30 and 60 % is necessary

in the depicted cutting situations! The machining possibilities are reduced in case of long-chipping tough materials.



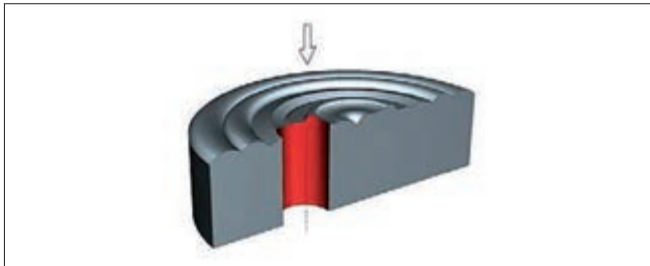
Producing a transverse through hole



Stack drilling



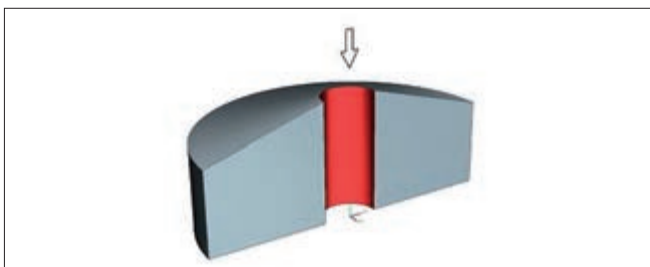
Attention: minimum gap required in stack.



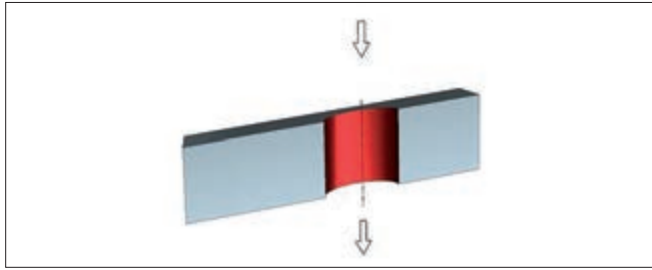
Drilling on an uneven surface



Drilling on a stepped surface



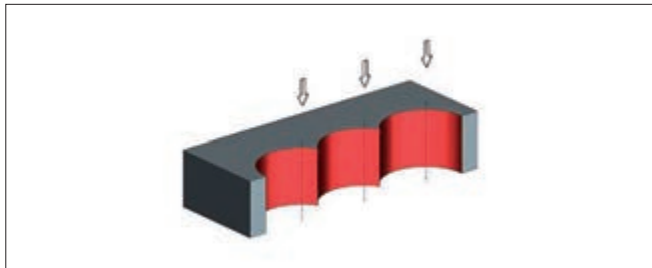
Drilling of a convex surface



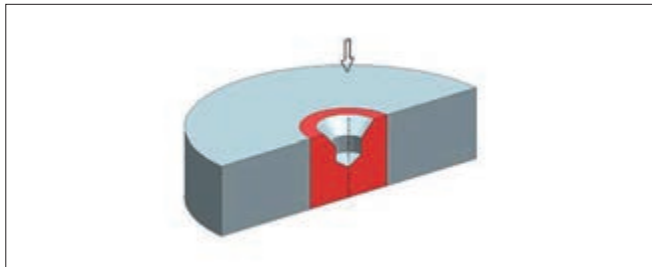
Drilling on inclined surfaces: the drill exits at an angle



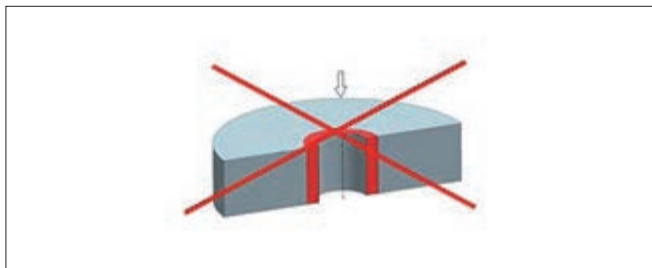
Drilling on a ridge



Chain drilling is possible depending on the material



Spot drilling in a central hole or bead



Reboring not possible!



When the drill exits the material, in the case of through-holes, a sharp-edged disk is produced.


When the tool is stationary, this sharp-edged disk may be thrown out of the clamping chuck at high speed and can cause damage and personal injury.

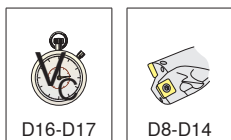
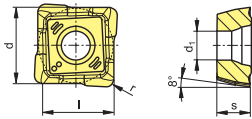
In order to prevent this happening, safety precautions must be taken.







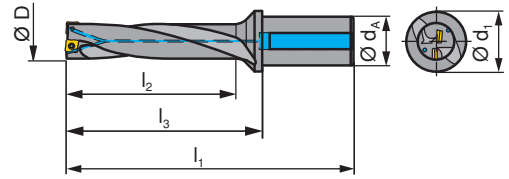
		Material Groups											Dimensions															
		P	M	K	N	S	H	CTPP430	d	l	s	r	d ₁	[mm]	[mm]	[mm]	[mm]	[mm]										
-M30		SONT 042105ER-M30	●																			4.60	4.20	2.10	.50	2.25		
		SONT 052306ER-M30	●																				5.30	4.80	2.30	.60	2.25	
		SONT 062506ER-M30	●																				5.90	5.50	2.50	.60	2.50	
		SONT 072907ER-M30	●																				6.50	6.10	2.90	.70	2.50	
		SONT 083308ER-M30	●																				7.70	7.30	3.30	.80	2.90	
		SONT 093808ER-M30	●																					8.90	8.50	3.80	.80	3.50
		SONT 104408ER-M30	●																					10.10	9.60	4.40	.80	4.10
		SONT 124810ER-M30	●																					11.60	11.00	4.80	1.00	4.10
		SONT 135012ER-M30	●																					13.00	12.20	5.00	1.20	5.30
		SONT 155312ER-M30	●																					15.20	14.40	5.30	1.20	5.30
		SONT 175612ER-M30	●																					17.50	16.70	5.60	1.20	5.30
		CTPP430																				d	l	s	r	d ₁		





MaxiDrill 900

2xD / Ø 14 - 36 mm



Tools

Tools and inserts for drilling

D [mm]	Type, description	L N R 							
			d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
14.0	C900.2D.140.R.04	R	20	30	96	28	46	SONT 04..	E01
14.5	C900.2D.145.R.04	R	20	30	97	29	47	SONT 04..	E01
15.0	C900.2D.150.R.04	R	20	30	98	30	48	SONT 04..	E01
15.5	C900.2D.155.R.04	R	20	30	99	31	49	SONT 04..	E01
16.0	C900.2D.160.R.05	R	20	30	100	32	50	SONT 05..	E01
16.5	C900.2D.165.R.05	R	20	30	101	33	51	SONT 05..	E01
17.0	C900.2D.170.R.05	R	20	30	102	34	52	SONT 05..	E01
17.5	C900.2D.175.R.05	R	20	30	103	35	53	SONT 05..	E01
18.0	C900.2D.180.R.06	R	25	32	111	36	55	SONT 06..	E02
18.5	C900.2D.185.R.06	R	25	32	112	37	56	SONT 06..	E02
19.0	C900.2D.190.R.06	R	25	32	113	38	57	SONT 06..	E02
19.5	C900.2D.195.R.06	R	25	32	114	39	58	SONT 06..	E02
20.0	C900.2D.200.R.06	R	25	32	115	40	59	SONT 06..	E02
20.5	C900.2D.205.R.06	R	25	32	116	41	60	SONT 06..	E02
21.0	C900.2D.210.R.07	R	25	32	118	42	62	SONT 07..	E02
22.0	C900.2D.220.R.07	R	25	32	120	44	64	SONT 07..	E02
23.0	C900.2D.230.R.07	R	25	32	122	46	66	SONT 07..	E02
24.0	C900.2D.240.R.08	R	32	40	132	48	72	SONT 08..	E03
25.0	C900.2D.250.R.08	R	32	40	134	50	74	SONT 08..	E03
26.0	C900.2D.260.R.08	R	32	40	136	52	76	SONT 08..	E03
27.0	C900.2D.270.R.08	R	32	40	138	54	78	SONT 08..	E03
28.0	C900.2D.280.R.09	R	32	40	140	56	80	SONT 09..	E04
29.0	C900.2D.290.R.09	R	32	40	142	58	82	SONT 09..	E04
30.0	C900.2D.300.R.09	R	32	40	144	60	84	SONT 09..	E04
31.0	C900.2D.310.R.09	R	32	40	146	62	86	SONT 09..	E04
32.0	C900.2D.320.R.09	R	32	40	148	64	88	SONT 09..	E04
33.0	C900.2D.330.R.10	R	40	50	163	66	93	SONT 10..	E05
34.0	C900.2D.340.R.10	R	40	50	165	68	95	SONT 10..	E05
35.0	C900.2D.350.R.10	R	40	50	167	70	97	SONT 10..	E05
36.0	C900.2D.360.R.10	R	40	50	169	72	99	SONT 10..	E05

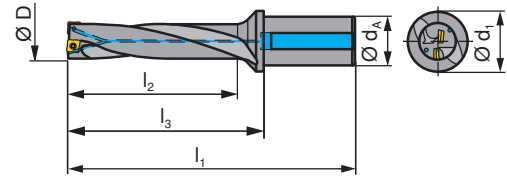
E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
E05	11610311	11450867	11450858



D18-D19

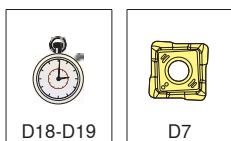


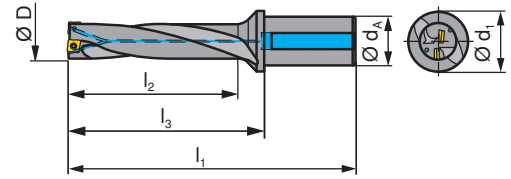
D7



D [mm]	Type, description	LNR 							
			d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
37.0	C900.2D.370.R.12	R	40	56	174	74	104	SONT 12..	E01
38.0	C900.2D.380.R.12	R	40	56	176	76	106	SONT 12..	E01
39.0	C900.2D.390.R.12	R	40	56	178	78	108	SONT 12..	E01
40.0	C900.2D.400.R.12	R	40	56	180	80	110	SONT 12..	E01
41.0	C900.2D.410.R.12	R	40	56	182	82	112	SONT 12..	E01
42.0	C900.2D.420.R.13	R	40	60	187	84	117	SONT 13..	E02
43.0	C900.2D.430.R.13	R	40	60	189	86	119	SONT 13..	E02
44.0	C900.2D.440.R.13	R	40	60	191	88	121	SONT 13..	E02
45.0	C900.2D.450.R.13	R	40	60	193	90	123	SONT 13..	E02
46.0	C900.2D.460.R.13	R	40	60	195	92	125	SONT 13..	E02
47.0	C900.2D.470.R.15	R	40	60	198	94	128	SONT 15..	E02
48.0	C900.2D.480.R.15	R	40	60	200	96	130	SONT 15..	E02
49.0	C900.2D.490.R.15	R	40	60	202	98	132	SONT 15..	E02
50.0	C900.2D.500.R.15	R	40	60	204	100	134	SONT 15..	E02
51.0	C900.2D.510.R.15	R	40	60	206	102	136	SONT 15..	E02
52.0	C900.2D.520.R.15	R	40	60	208	104	138	SONT 15..	E02
53.0	C900.2D.530.R.15	R	40	60	210	106	140	SONT 15..	E02
54.0	C900.2D.540.R.15	R	40	60	212	108	142	SONT 15..	E02
55.0	C900.2D.550.R.17	R	40	60	215	110	145	SONT 17..	E02
56.0	C900.2D.560.R.17	R	40	60	217	112	147	SONT 17..	E02
57.0	C900.2D.570.R.17	R	40	60	219	114	149	SONT 17..	E02
58.0	C900.2D.580.R.17	R	40	60	221	116	151	SONT 17..	E02
59.0	C900.2D.590.R.17	R	40	60	223	118	153	SONT 17..	E02
60.0	C900.2D.600.R.17	R	40	62	225	120	155	SONT 17..	E02
61.0	C900.2D.610.R.17	R	40	62	227	122	157	SONT 17..	E02
62.0	C900.2D.620.R.17	R	40	64	229	124	159	SONT 17..	E02
63.0	C900.2D.630.R.17	R	40	64	231	126	161	SONT 17..	E02

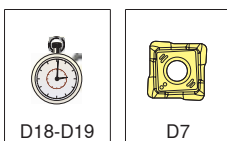
E01	11610311	11450867	11450858
E02	11801441	11816987	11816974





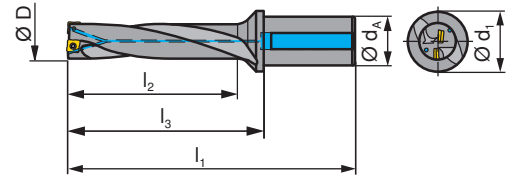
D [mm]	Type, description	LNR 							
			d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
14.0	C900.3D.140.R.04	R	20	30	109	42	59	SONT 04..	E01
14.5	C900.3D.145.R.04	R	20	30	111	44	61	SONT 04..	E01
15.0	C900.3D.150.R.04	R	20	30	112	45	62	SONT 04..	E01
15.5	C900.3D.155.R.04	R	20	30	114	47	64	SONT 04..	E01
16.0	C900.3D.160.R.05	R	20	30	115	48	65	SONT 05..	E01
16.5	C900.3D.165.R.05	R	20	30	117	50	67	SONT 05..	E01
17.0	C900.3D.170.R.05	R	20	30	118	51	68	SONT 05..	E01
17.5	C900.3D.175.R.05	R	20	30	120	53	70	SONT 05..	E01
18.0	C900.3D.180.R.06	R	25	32	128	54	72	SONT 06..	E02
18.5	C900.3D.185.R.06	R	25	32	130	56	74	SONT 06..	E02
19.0	C900.3D.190.R.06	R	25	32	131	57	75	SONT 06..	E02
19.5	C900.3D.195.R.06	R	25	32	133	59	77	SONT 06..	E02
20.0	C900.3D.200.R.06	R	25	32	134	60	78	SONT 06..	E02
20.5	C900.3D.205.R.06	R	25	32	136	62	80	SONT 06..	E02
21.0	C900.3D.210.R.07	R	25	32	138	63	82	SONT 07..	E02
21.5	C900.3D.215.R.07	R	25	32	140	65	84	SONT 07..	E02
22.0	C900.3D.220.R.07	R	25	32	141	66	85	SONT 07..	E02
22.5	C900.3D.225.R.07	R	25	32	143	68	87	SONT 07..	E02
23.0	C900.3D.230.R.07	R	25	32	144	69	88	SONT 07..	E02
23.5	C900.3D.235.R.07	R	25	32	146	71	90	SONT 07..	E02
24.0	C900.3D.240.R.08	R	32	40	155	72	95	SONT 08..	E03
24.5	C900.3D.245.R.08	R	32	40	157	74	97	SONT 08..	E03
25.0	C900.3D.250.R.08	R	32	40	158	75	98	SONT 08..	E03
25.5	C900.3D.255.R.08	R	32	40	160	77	100	SONT 08..	E03
26.0	C900.3D.260.R.08	R	32	40	161	78	101	SONT 08..	E03
26.5	C900.3D.265.R.08	R	32	40	163	80	103	SONT 08..	E03
27.0	C900.3D.270.R.08	R	32	40	164	81	104	SONT 08..	E03
27.5	C900.3D.275.R.08	R	32	40	166	83	106	SONT 08..	E03
28.0	C900.3D.280.R.09	R	32	40	167	84	107	SONT 09..	E04
28.5	C900.3D.285.R.09	R	32	40	169	86	109	SONT 09..	E04
29.0	C900.3D.290.R.09	R	32	40	170	87	110	SONT 09..	E04
29.5	C900.3D.295.R.09	R	32	40	172	89	112	SONT 09..	E04
30.0	C900.3D.300.R.09	R	32	40	173	90	113	SONT 09..	E04
30.5	C900.3D.305.R.09	R	32	40	175	92	115	SONT 09..	E04
31.0	C900.3D.310.R.09	R	32	40	176	93	116	SONT 09..	E04
31.5	C900.3D.315.R.09	R	32	40	178	95	118	SONT 09..	E04
32.0	C900.3D.320.R.09	R	32	40	179	96	119	SONT 09..	E04

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140



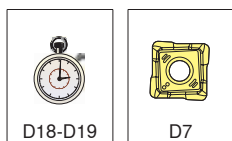
D18-D19

D7



D [mm]	Type, description	LNR 	d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
32.5	C900.3D.325.R.10	R	40	50	192	98	124	SONT 10..	E01
33.0	C900.3D.330.R.10	R	40	50	193	99	125	SONT 10..	E01
33.5	C900.3D.335.R.10	R	40	50	195	101	127	SONT 10..	E01
34.0	C900.3D.340.R.10	R	40	50	196	102	128	SONT 10..	E01
34.5	C900.3D.345.R.10	R	40	50	198	104	130	SONT 10..	E01
35.0	C900.3D.350.R.10	R	40	50	199	105	131	SONT 10..	E01
35.5	C900.3D.355.R.10	R	40	50	201	107	133	SONT 10..	E01
36.0	C900.3D.360.R.10	R	40	50	202	108	134	SONT 10..	E01
36.5	C900.3D.365.R.10	R	40	50	204	110	136	SONT 10..	E01
37.0	C900.3D.370.R.12	R	40	56	211	111	141	SONT 12..	E01
38.0	C900.3D.380.R.12	R	40	56	214	114	144	SONT 12..	E01
39.0	C900.3D.390.R.12	R	40	56	217	117	147	SONT 12..	E01
40.0	C900.3D.400.R.12	R	40	56	220	120	150	SONT 12..	E01
41.0	C900.3D.410.R.12	R	40	56	223	123	153	SONT 12..	E01
42.0	C900.3D.420.R.13	R	40	60	229	126	159	SONT 13..	E02
43.0	C900.3D.430.R.13	R	40	60	232	129	162	SONT 13..	E02
44.0	C900.3D.440.R.13	R	40	60	235	132	165	SONT 13..	E02
45.0	C900.3D.450.R.13	R	40	60	238	135	168	SONT 13..	E02
46.0	C900.3D.460.R.13	R	40	60	241	138	171	SONT 13..	E02
47.0	C900.3D.470.R.15	R	40	60	245	141	175	SONT 15..	E02
48.0	C900.3D.480.R.15	R	40	60	248	144	178	SONT 15..	E02
49.0	C900.3D.490.R.15	R	40	60	251	147	181	SONT 15..	E02
50.0	C900.3D.500.R.15	R	40	60	254	150	184	SONT 15..	E02
51.0	C900.3D.510.R.15	R	40	60	257	153	187	SONT 15..	E02
52.0	C900.3D.520.R.15	R	40	60	260	156	190	SONT 15..	E02
53.0	C900.3D.530.R.15	R	40	60	263	159	193	SONT 15..	E02
54.0	C900.3D.540.R.15	R	40	60	266	162	196	SONT 15..	E02
55.0	C900.3D.550.R.17	R	40	60	270	165	200	SONT 17..	E02
56.0	C900.3D.560.R.17	R	40	60	273	168	203	SONT 17..	E02
57.0	C900.3D.570.R.17	R	40	60	276	171	206	SONT 17..	E02
58.0	C900.3D.580.R.17	R	40	60	279	174	209	SONT 17..	E02
59.0	C900.3D.590.R.17	R	40	60	282	177	212	SONT 17..	E02
60.0	C900.3D.600.R.17	R	40	62	285	180	215	SONT 17..	E02
61.0	C900.3D.610.R.17	R	40	62	288	183	218	SONT 17..	E02
62.0	C900.3D.620.R.17	R	40	64	291	186	221	SONT 17..	E02
63.0	C900.3D.630.R.17	R	40	64	294	189	224	SONT 17..	E02

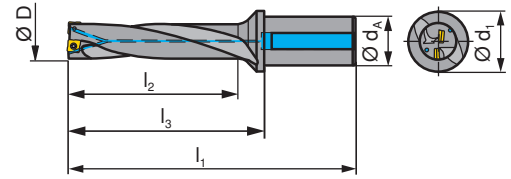
E01	11610311	11450867	11450858
E02	11801441	11816987	11816974





MaxiDrill 900

4xD / Ø 14 - 41 mm

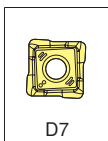
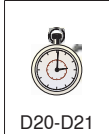


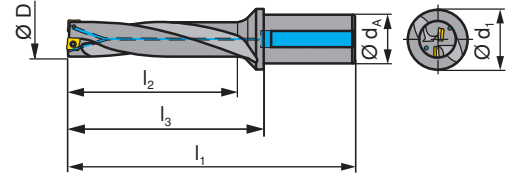
Tools

Tools and inserts for drilling

D [mm]	Type, description	L N R 							
			d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
14.0	C900.4D.140.R.04	R	20	30	123	56	73	SONT 04..	E01
15.0	C900.4D.150.R.04	R	20	30	127	60	77	SONT 04..	E01
16.0	C900.4D.160.R.05	R	20	30	131	64	81	SONT 05..	E01
17.0	C900.4D.170.R.05	R	20	30	135	68	85	SONT 05..	E01
18.0	C900.4D.180.R.06	R	25	32	146	72	90	SONT 06..	E02
19.0	C900.4D.190.R.06	R	25	32	150	76	94	SONT 06..	E02
20.0	C900.4D.200.R.06	R	25	32	154	80	98	SONT 06..	E02
21.0	C900.4D.210.R.07	R	25	40	159	84	103	SONT 07..	E02
22.0	C900.4D.220.R.07	R	25	40	163	88	107	SONT 07..	E02
23.0	C900.4D.230.R.07	R	25	40	167	92	111	SONT 07..	E02
24.0	C900.4D.240.R.08	R	32	40	179	96	119	SONT 08..	E03
25.0	C900.4D.250.R.08	R	32	40	183	100	123	SONT 08..	E03
26.0	C900.4D.260.R.08	R	32	40	187	104	127	SONT 08..	E03
27.0	C900.4D.270.R.08	R	32	40	191	108	131	SONT 08..	E03
28.0	C900.4D.280.R.09	R	32	40	195	112	135	SONT 09..	E04
29.0	C900.4D.290.R.09	R	32	40	199	116	139	SONT 09..	E04
30.0	C900.4D.300.R.09	R	32	40	203	120	143	SONT 09..	E04
31.0	C900.4D.310.R.09	R	32	40	207	124	147	SONT 09..	E04
32.0	C900.4D.320.R.09	R	32	40	211	128	151	SONT 09..	E04
33.0	C900.4D.330.R.10	R	40	50	226	132	159	SONT 10..	E05
34.0	C900.4D.340.R.10	R	40	50	230	136	162	SONT 10..	E05
35.0	C900.4D.350.R.10	R	40	50	234	140	166	SONT 10..	E05
36.0	C900.4D.360.R.10	R	40	50	238	144	170	SONT 10..	E05
37.0	C900.4D.370.R.12	R	40	56	248	148	178	SONT 12..	E05
38.0	C900.4D.380.R.12	R	40	56	252	152	182	SONT 12..	E05
39.0	C900.4D.390.R.12	R	40	56	256	156	186	SONT 12..	E05
40.0	C900.4D.400.R.12	R	40	56	260	160	190	SONT 12..	E05
41.0	C900.4D.410.R.12	R	40	56	264	164	194	SONT 12..	E05

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
E05	11610311	11450867	11450858





D [mm]	Type, description	LNR 	d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
42.0	C900.4D.420.R.13	R	40	60	271	168	201	SONT 13..	E01
43.0	C900.4D.430.R.13	R	40	60	275	172	205	SONT 13..	E01
44.0	C900.4D.440.R.13	R	40	60	279	176	209	SONT 13..	E01
45.0	C900.4D.450.R.13	R	40	60	283	180	213	SONT 13..	E01
46.0	C900.4D.460.R.13	R	40	60	287	184	217	SONT 13..	E01
47.0	C900.4D.470.R.15	R	40	60	292	188	222	SONT 15..	E01
48.0	C900.4D.480.R.15	R	40	60	296	192	226	SONT 15..	E01
49.0	C900.4D.490.R.15	R	40	60	300	196	230	SONT 15..	E01
50.0	C900.4D.500.R.15	R	40	60	304	200	234	SONT 15..	E01
51.0	C900.4D.510.R.15	R	40	60	308	204	238	SONT 15..	E01
52.0	C900.4D.520.R.15	R	40	60	312	208	242	SONT 15..	E01
53.0	C900.4D.530.R.15	R	40	60	316	212	246	SONT 15..	E01
54.0	C900.4D.540.R.15	R	40	60	320	216	250	SONT 15..	E01

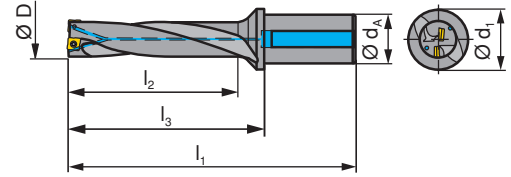
E01	11801441	11816987	11816974

D20-D21	D7



MaxiDrill 900

5xD / Ø 14 - 41 mm

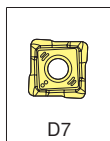


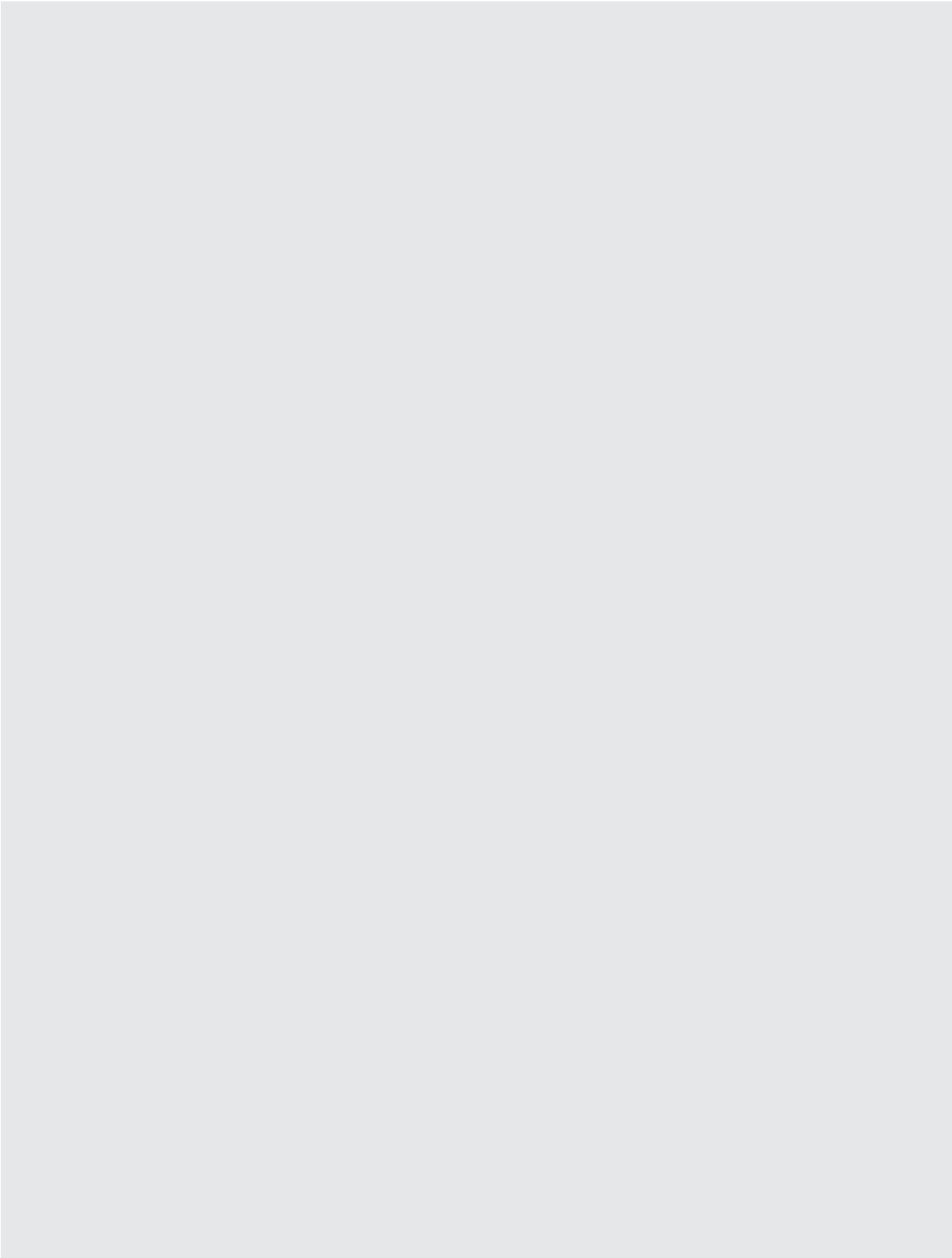
Tools

Tools and inserts for drilling

D [mm]	Type, description	L N R 							
			d _A [mm]	d ₁ [mm]	l ₁ [mm]	l ₂ [mm]	l ₃ [mm]		
14.0	C900.5D.140.R.04	R	20	30	137	70	87	SONT 04..	E01
15.0	C900.5D.150.R.04	R	20	30	142	75	92	SONT 04..	E01
16.0	C900.5D.160.R.05	R	20	30	147	80	97	SONT 05..	E01
17.0	C900.5D.170.R.05	R	20	30	152	85	102	SONT 05..	E01
18.0	C900.5D.180.R.06	R	25	32	164	90	108	SONT 06..	E02
19.0	C900.5D.190.R.06	R	25	32	169	95	113	SONT 06..	E02
20.0	C900.5D.200.R.06	R	25	32	174	100	118	SONT 06..	E02
21.0	C900.5D.210.R.07	R	25	32	180	105	124	SONT 07..	E02
22.0	C900.5D.220.R.07	R	25	32	184	110	128	SONT 07..	E02
23.0	C900.5D.230.R.07	R	25	32	189	115	133	SONT 07..	E02
24.0	C900.5D.240.R.08	R	32	40	203	120	143	SONT 08..	E03
25.0	C900.5D.250.R.08	R	32	40	208	125	148	SONT 08..	E03
26.0	C900.5D.260.R.08	R	32	40	212	130	152	SONT 08..	E03
27.0	C900.5D.270.R.08	R	32	40	217	135	157	SONT 08..	E03
28.0	C900.5D.280.R.09	R	32	40	221	140	161	SONT 09..	E04
29.0	C900.5D.290.R.09	R	32	40	226	145	166	SONT 09..	E04
30.0	C900.5D.300.R.09	R	32	40	230	150	170	SONT 09..	E04
31.0	C900.5D.310.R.09	R	32	40	235	155	175	SONT 09..	E04
32.0	C900.5D.320.R.09	R	32	40	239	160	179	SONT 09..	E04
33.0	C900.5D.330.R.10	R	40	50	259	165	191	SONT 10..	E05
34.0	C900.5D.340.R.10	R	40	50	264	170	196	SONT 10..	E05
35.0	C900.5D.350.R.10	R	40	50	269	175	201	SONT 10..	E05
36.0	C900.5D.360.R.10	R	40	50	274	180	206	SONT 10..	E05
37.0	C900.5D.370.R.12	R	40	56	285	185	215	SONT 12..	E05
38.0	C900.5D.380.R.12	R	40	56	290	190	220	SONT 12..	E05
39.0	C900.5D.390.R.12	R	40	56	295	195	225	SONT 12..	E05
40.0	C900.5D.400.R.12	R	40	56	300	200	230	SONT 12..	E05
41.0	C900.5D.410.R.12	R	40	56	305	205	235	SONT 12..	E05

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
E05	11610311	11450867	11450858







	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



Coated carbide
CTPP430
V_c (m/min)
180-300
140-250
140-250
160-280
130-220
100-200
110-200
100-160
120-250
80-150
100-160
100-180
80-140
80-140
120-200
100-180
120-200
100-180
80-160
70-150
150-500
150-450
150-350
150-300
150-250
150-350
150-350
150-350
150-350
200-400
50-150
50-140
80-200
20-80
20-80
20-80
20-80
20-80
20-80
40-100
40-100
–
–
–
–



Cutting data

MaxiDrill 900 2xD/3xD

Technical information

Tools and inserts for drilling

	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



SONT 04 Ø14-15.5 f [mm/rev]	SONT05 Ø16-17.5 f [mm/rev]	SONT 06 Ø19-20.5 f [mm/rev]	SONT 07 Ø21-23.5 f [mm/rev]	SONT 08 Ø24-27.5 f [mm/rev]	SONT 09 Ø28-32 f [mm/rev]	SONT 10 Ø32.5-36.5 f [mm/rev]	SONT 12 Ø37-41 f [mm/rev]	SONT 13 Ø41.5-46 f [mm/rev]	SONT 15 Ø46.5-54 f [mm/rev]	SONT 17 Ø54.5-63.0 f [mm/rev]
.04-.13	.04-.14	.05-.15	.07-.15	.08-.17	.08-.18	.09-.19	.09-.19	.09-.20	.10-.22	.10-.22
.04-.15	.04-.15	.05-.16	.07-.17	.08-.19	.08-.20	.09-.21	.09-.22	.09-.24	.10-.26	.10-.26
.04-.16	.05-.17	.05-.18	.08-.20	.09-.22	.09-.23	.10-.24	.10-.25	.10-.27	.10-.30	.10-.30
.04-.17	.05-.18	.05-.20	.08-.22	.09-.23	.09-.24	.10-.25	.10-.27	.10-.30	.10-.32	.10-.32
.04-.16	.04-.17	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.28	.10-.30	.10-.30
.04-.16	.04-.17	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.27	.10-.29	.10-.29
.04-.15	.05-.16	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.27	.10-.29	.10-.29
.04-.15	.05-.16	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.27	.10-.29	.10-.29
.04-.13	.05-.14	.05-.15	.08-.15	.08-.17	.08-.18	.09-.19	.10-.21	.10-.23	.10-.23	.10-.23
.04-.13	.05-.14	.05-.15	.08-.15	.08-.17	.08-.18	.09-.19	.10-.21	.10-.23	.10-.23	.10-.23
.04-.12	.04-.13	.05-.14	.05-.16	.05-.18	.07-.18	.08-.21	.10-.23	.10-.23	.10-.23	.10-.23
.04-.11	.04-.12	.05-.13	.05-.15	.06-.16	.07-.16	.08-.20	.10-.22	.10-.22	.10-.22	.10-.22
.04-.10	.04-.11	.05-.13	.05-.15	.06-.15	.07-.16	.08-.20	.08-.20	.08-.20	.08-.20	.08-.20
.04-.10	.04-.11	.05-.12	.05-.14	.05-.15	.06-.15	.07-.19	.08-.20	.08-.20	.08-.20	.08-.20
.07-.20	.07-.22	.08-.24	.10-.25	.1-.28	.1-.28	.1-.30	.1-.32	.1-.32	.1-.34	.1-.34
.07-.19	.07-.20	.08-.22	.10-.24	.1-.26	.1-.26	.1-.28	.1-.30	.1-.30	.1-.32	.1-.32
.07-.20	.07-.20	.08-.22	.10-.25	.1-.28	.1-.28	.1-.28	.1-.30	.1-.30	.1-.32	.1-.32
.07-.18	.07-.18	.08-.20	.10-.23	.1-.25	.1-.25	.1-.25	.1-.27	.1-.27	.1-.29	.1-.29
.07-.19	.07-.20	.08-.21	.10-.25	.1-.28	.1-.28	.1-.30	.1-.32	.1-.32	.1-.34	.1-.34
.07-.19	.07-.20	.08-.21	.10-.25	.1-.28	.1-.28	.1-.30	.1-.32	.1-.32	.1-.34	.1-.34
.06-.12	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.18	.10-.18	.10-.18	.10-.18	.10-.18
.06-.13	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.19	.10-.20	.10-.20	.10-.20	.10-.20
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.19	.10-.20	.10-.20	.10-.20	.10-.20
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.06-.12	.07-.14	.08-.15	.13-.20	.13-.20	.13-.22	.13-.25	.13-.25	.13-.25	.13-.25	.13-.25
.06-.13	.07-.14	.08-.15	.10-.16	.10-.16	.10-.17	.10-.18	.10-.19	.10-.19	.10-.19	.10-.19
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.06-.14	.07-.15	.08-.16	.10-.16	.10-.16	.10-.17	.10-.19	.10-.20	.10-.20	.10-.20	.10-.20
.04-.09	.04-.10	.05-.10	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12
.06-.14	.07-.14	.08-.15	.10-.16	.10-.16	.10-.16	.10-.16	.10-.18	.10-.18	.10-.18	.10-.18
.05-.10	.05-.10	.06-.12	.08-.14	.08-.14	.08-.14	.08-.14	.10-.15	.10-.15	.10-.15	.10-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.04-.10	.04-.10	.05-.10	.05-.12	.06-.12	.07-.15	.07-.15	.08-.16	.08-.16	.08-.18	.08-.18
.04-.10	.04-.10	.05-.10	.05-.12	.06-.12	.07-.15	.07-.15	.08-.16	.08-.16	.08-.18	.08-.18
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



SONT 04 Ø14-15.5 f [mm/rev]	SONT 05 Ø16-17.5 f [mm/rev]	SONT 06 Ø19-20 f [mm/rev]	SONT 07 Ø21-23 f [mm/rev]	SONT 08 Ø24-27 f [mm/rev]	SONT 09 Ø28-32 f [mm/rev]	SONT 10 Ø33-36 f [mm/rev]	SONT 12 Ø37-41 f [mm/rev]	SONT 13 Ø41.5-46 f [mm/rev]	SONT15 Ø46.5-54 f [mm/rev]
.04-.11	.04-.12	.05-.12	.05-.13	.06-.15	.06-.17	.06-.17	.06-.17	.07-.17	.07-.19
.04-.13	.04-.14	.05-.14	.05-.15	.06-.17	.06-.19	.06-.19	.06-.20	.07-.22	.07-.24
.04-.14	.04-.15	.05-.16	.06-.18	.07-.20	.07-.22	.07-.22	.07-.23	.08-.25	.08-.27
.04-.17	.04-.18	.05-.18	.06-.20	.07-.20	.07-.23	.07-.23	.07-.24	.08-.26	.08-.28
.04-.14	.04-.15	.05-.15	.06-.17	.07-.20	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.14	.04-.15	.05-.15	.06-.18	.07-.21	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.14	.04-.15	.05-.15	.06-.18	.07-.20	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.14	.04-.15	.05-.15	.06-.18	.07-.20	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.11	.04-.12	.05-.12	.06-.12	.06-.15	.06-.17	.08-.20	.08-.22	.08-.22	.08-.22
.04-.11	.04-.12	.05-.12	.06-.12	.06-.15	.06-.17	.08-.20	.08-.22	.08-.22	.08-.22
.04-.12	.04-.12	.05-.13	.05-.15	.05-.16	.07-.16	.08-.20	.08-.22	.08-.22	.08-.22
.04-.10	.04-.10	.05-.11	.05-.13	.06-.14	.07-.15	.08-.18	.08-.20	.08-.20	.08-.20
.04-.10	.04-.10	.05-.11	.05-.12	.06-.12	.07-.14	.08-.16	.08-.17	.08-.17	.08-.17
.04-.10	.04-.10	.05-.10	.05-.11	.05-.12	.06-.13	.07-.14	.07-.16	.07-.16	.07-.16
.07-.18	.07-.20	.08-.22	.10-.24	.10-.25	.10-.25	.10-.28	.10-.30	.10-.30	.10-.32
.07-.17	.07-.18	.08-.20	.10-.22	.10-.25	.10-.25	.10-.27	.10-.29	.10-.29	.10-.30
.07-.18	.07-.18	.08-.20	.10-.24	.10-.26	.10-.26	.10-.26	.10-.28	.10-.28	.10-.30
.07-.17	.07-.18	.08-.18	.10-.22	.10-.22	.10-.22	.10-.23	.10-.25	.10-.25	.10-.27
.07-.17	.07-.18	.08-.18	.10-.22	.10-.25	.10-.25	.10-.28	.10-.30	.10-.30	.10-.32
.07-.17	.07-.18	.08-.18	.10-.22	.01-.25	.10-.25	.10-.28	.10-.30	.01-.30	.10-.32
.06-.12	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.17	.10-.17	.10-.17	.10-.17
.06-.13	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.17	.10-.18	.10-.18	.10-.18
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.19	.10-.20	.10-.20	.10-.20
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.19	.10-.21	.10-.21	.10-.21
.06-.12	.07-.14	.08-.15	.13-.20	.13-.20	.13-.22	.13-.22	.13-.22	.13-.22	.13-.22
.06-.13	.07-.14	.08-.15	.10-.16	.10-.16	.10-.17	.10-.17	.10-.18	.10-.18	.10-.18
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.20	.10-.22	.10-.22	.10-.22
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.20	.10-.22	.10-.22	.10-.22
.06-.14	.07-.15	.08-.16	.10-.16	.10-.16	.10-.17	.10-.17	.10-.18	.10-.18	.10-.18
.04-.09	.04-.10	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12
.06-.14	.07-.14	.08-.14	.10-.15	.10-.16	.10-.16	.10-.16	.10-.18	.10-.18	.10-.18
.05-.10	.05-.10	.06-.10	.08-.12	.08-.14	.08-.14	.08-.14	.08-.15	.08-.15	.08-.15
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.04-.10	.04-.10	.05-.10	.05-.12	.05-.12	.06-.15	.07-.15	.07-.15	.07-.15	.07-.16
.04-.10	.04-.10	.05-.10	.05-.12	.05-.12	.06-.15	.07-.15	.07-.15	.07-.15	.07-.16
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-



	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
		pearlitic	20	230	
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
		fiber-reinforced plastics	29	–	
		hard rubber	30	–	
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

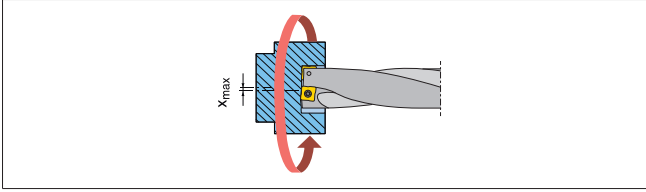
* R_m = ultimate tensile strength, measured in MPa



SONT 04 Ø14-15.5 f [mm/rev]	SONT 05 Ø16-17.5 f [mm/rev]	SONT 06 Ø19-20 f [mm/rev]	SONT 07 Ø21-23 f [mm/rev]	SONT 08 Ø24-27 f [mm/rev]	SONT 09 Ø28-32 f [mm/rev]	SONT 10 Ø33-36 f [mm/rev]	SONT 12 Ø37-41 f [mm/rev]
.04-.09	.04-.09	.04-.09	.04-.10	.06-.12	.06-.13	.08-.17	.08-.18
.04-.10	.04-.11	.05-.11	.05-.12	.06-.14	.06-.15	.08-.19	.08-.20
.04-.12	.04-.13	.05-.13	.05-.15	.07-.17	.08-.18	.10-.22	.10-.25
.04-.15	.04-.16	.05-.16	.05-.17	.07-.18	.08-.19	.10-.23	.10-.25
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.09	.04-.09	.04-.09	.04-.10	.06-.12	.07-.14	.09-.18	.09-.20
.04-.09	.04-.09	.04-.09	.04-.10	.06-.12	.07-.14	.09-.18	.09-.20
.04-.11	.04-.11	.05-.12	.05-.13	.05-.14	.06-.15	.08-.18	.08-.20
.04-.09	.04-.09	.05-.09	.05-.11	.05-.12	.06-.13	.08-.17	.08-.18
.04-.08	.04-.08	.05-.08	.05-.09	.05-.10	.06-.11	.07-.14	.08-.15
.04-.08	.04-.08	.05-.08	.05-.09	.05-.10	.06-.11	.07-.14	.08-.15
.07-.18	.07-.20	.08-.22	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.07-.17	.07-.18	.08-.18	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.07-.18	.07-.18	.08-.18	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.07-.17	.07-.18	.08-.16	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.07-.17	.07-.18	.08-.16	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.07-.17	.07-.18	.08-.16	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.06-.12	.07-.14	.08-.14	.10-.15	.10-.15	.10-.17	.10-.17	.10-.17
.06-.13	.07-.14	.08-.14	.10-.15	.10-.15	.10-.17	.10-.17	.10-.17
.06-.12	.07-.14	.08-.14	.10-.18	.10-.18	.10-.19	.10-.19	.10-.19
.06-.12	.07-.14	.08-.14	.10-.18	.10-.18	.10-.19	.10-.19	.10-.19
.06-.12	.07-.14	.10-.15	.13-.20	.13-.20	.13-.22	.13-.22	.13-.22
.06-.13	.07-.14	.08-.15	.10-.16	.10-.16	.10-.17	.10-.17	.10-.17
.06-.15	.07-.16	.08-.16	.10-.18	.10-.18	.10-.20	.10-.20	.10-.20
.06-.15	.07-.16	.08-.16	.10-.18	.10-.18	.10-.20	.10-.20	.10-.20
.06-.14	.07-.15	.08-.14	.10-.16	.10-.16	.10-.17	.10-.17	.10-.17
.04-.09	.04-.10	.04-.08	.05-.10	.05-.10	.05-.10	.05-.10	.05-.10
.06-.14	.07-.14	.08-.14	.10-.15	.10-.15	.10-.15	.10-.15	.10-.15
.05-.10	.05-.10	.06-.10	.08-.12	.08-.12	.08-.12	.08-.12	.08-.12
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.04-.08	.04-.08	.04-.08	.05-.11	.05-.11	.06-.12	.07-.12	.07-.12
.04-.08	.04-.08	.04-.08	.05-.11	.05-.11	.06-.12	.07-.12	.07-.12
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-



In order to guarantee that four cutting edges of the insert are utilized, the following offset dimensions X must be observed:



With the maximum offset X_{max} the hole becomes:

$$D_{max} = D + 2X_{max}$$

e.g. $D = 20 \text{ mm}$, $X_{max} = .20 \text{ mm}$

$$D_{max} = D + .4 = 20.4 \text{ mm}$$

Type, description	Ø [mm]	max. offset	
		x_{max} [mm]	D_{max} [mm]
SONT 042105ER	14.0	.35	14.7
	14.5	.25	15.0
	15.0	.20	15.4
	15.5	.15	15.8
SONT 052306ER	16.0	.40	16.8
	16.5	.35	17.2
	17.0	0.30	17.6
	17.5	.25	18.0
SONT 062506ER	18.0	.50	19.0
	18.5	.40	19.3
	19.0	.35	19.7
	19.5	.25	20.0
	20.0	.20	20.4
	20.5	.15	20.8
SONT 072907ER	21.0	.35	21.7
	21.5	.30	22.1
	22.0	.25	22.5
	22.5	.15	22.8
	23.0	.15	23.3
	23.5	.10	23.7
SONT 083308ER	24.0	.65	25.3
	24.5	.55	25.6
	25.0	.55	26.1
	25.5	.40	26.3
	26.0	.35	26.7
	26.5	.30	27.1
	27.0	.25	27.5
	27.5	.15	27.8
SONT 093808ER	28.0	.90	29.8
	28.5	.80	30.1
	29.0	.75	30.5
	29.5	.70	30.9
	30.0	.60	31.2
	30.5	.55	31.6
	31.0	.45	31.9
	31.5	.40	32.3
	32.0	.30	32.6

Type, description	Ø [mm]	max. offset	
		x_{max} [mm]	D_{max} [mm]
SONT 104408ER	32.5	.80	34.1
	33.0	.80	34.6
	33.5	.65	34.8
	34.0	.60	35.2
	34.5	.50	35.5
	35.0	.45	35.9
	35.5	.35	36.2
	36.0	.35	36.7
	36.5	.20	36.9
SONT 124810ER	37.0	1.00	39.0
	38.0	.85	39.7
	39.0	.70	40.4
	40.0	.50	41.0
	41.0	.35	41.7
SONT 135012ER	42.0	.95	43.9
	43.0	.80	44.6
	44.0	.60	45.2
	45.0	.45	45.9
	46.0	.30	46.6
SONT 155312ER	47.0	1.80	50.6
	48.0	1.65	51.3
	49.0	1.50	52.0
	50.0	1.35	52.7
	51.0	1.15	53.3
	52.0	.95	53.9
	53.0	.80	54.6
	54.0	.60	55.2
SONT 175612ER	55.0	2.10	59.2
	56.0	1.90	59.8
	57.0	1.75	60.5
	58.0	1.55	61.1
	59.0	1.35	61.7
	60.0	1.15	62.3
	61.0	1.00	63.0
	62.0	.85	63.7
	63.0	.65	64.3

The maximum radial offset dimension X influences the force compensation of the drill, therefore a low feed rate is recommended.

Hole tolerances

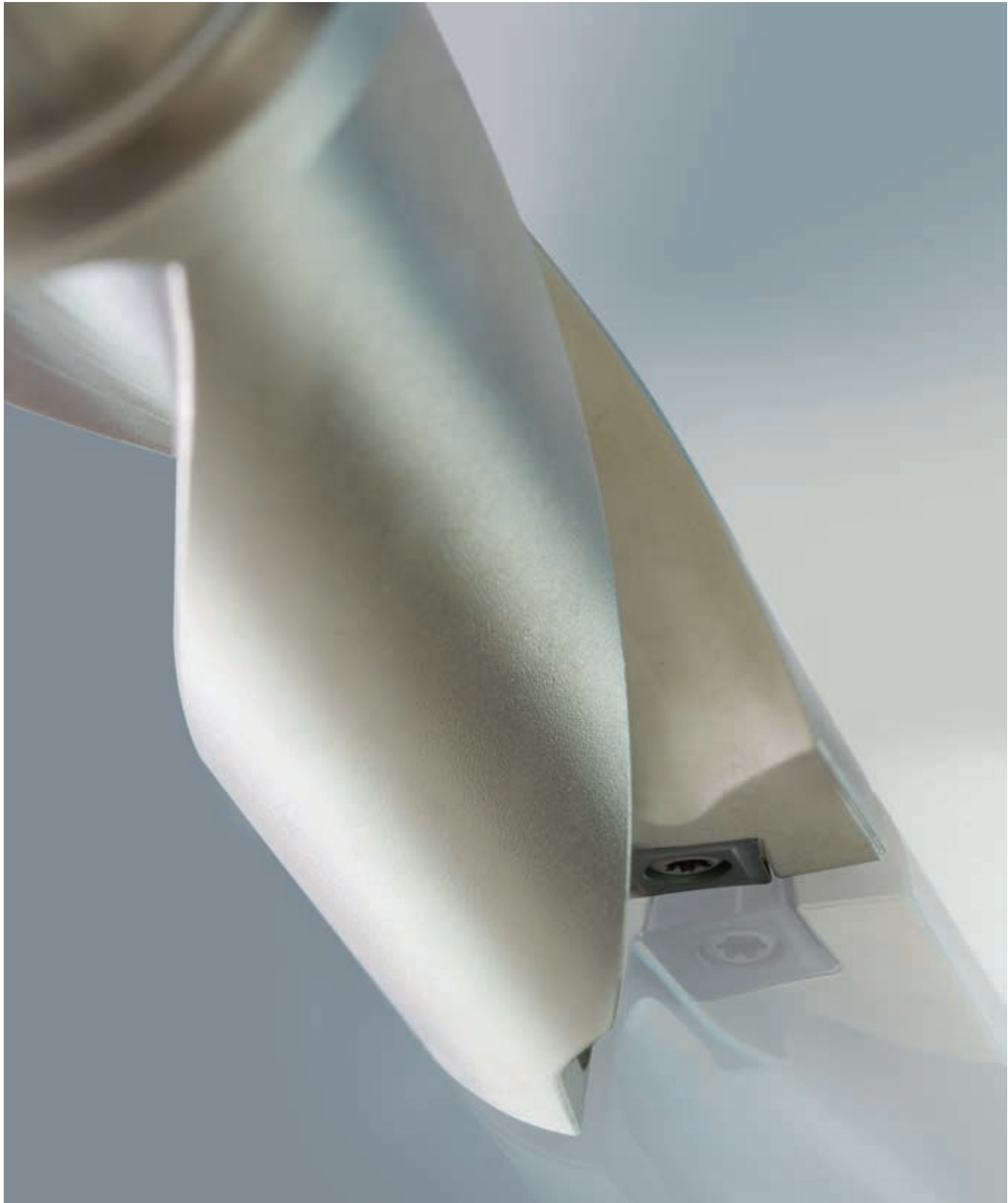
	2xD	3xD	4xD	5xD
Drilling diameter [mm]	14-63	14-63	14-54	14-41
Drilling tolerance [mm]	0/+ .3	0/+ .3	0/+ .35	0/+ .4



Recommended coolant pressure and coolant flow



In order to guarantee efficient chip evacuation from the hole, a minimum coolant pressure of 5 bar is required. The optimal coolant pressure is >15 bar.





Formula collection


Formulas, material designation & dimensions



Revolution number	$n = \frac{vc \cdot 1000}{\pi \cdot D}$	[min ⁻¹]
Cutting speed	$v_c = \frac{\pi \cdot D \cdot n}{1000}$	[m/min]
Feed rate	f	[mm/rev.]
Feed rate	$v_f = f \cdot n$	[m/min]
Machining cross section	$A_T = \frac{\pi \cdot D^2}{4}$	[mm ²]
Metal removal rate	$Q = \frac{vf \cdot AT}{1000}$	[cm ³ /min]
Specific cutting force	$k_c =$ see table	[N/mm ²]
Power requirements	$P_c = \frac{Q}{60 \cdot 1000 \cdot \eta} \cdot k_c$	[kW]
Torque moment	$M_c = \frac{f \cdot kc}{1000} \cdot \frac{D^2}{8}$	[Nm]
Feed force (approx.)	$F_f \approx 0,7 \frac{D}{2} \cdot f \cdot k_c$	[N]
Drilling time	$T_c = \frac{L + h}{vf}$	[min]
Clearance	h	[mm]
Drilling depth	L	[mm]


Material	Specific cutting force k_c (N/mm ²)
St 37.11; St 42.11	1740
St 50.11	1950
St 60.11	2070
St 70.11	2220
C 35, C 45, Ck 45	2060/2175
C 60, Ck 60	2090
16 Mn Cr 5	2060
18 Cr Ni 6	2220
34 Cr Mo 4	2190
50 Cr V 4	2175
tempered 100 Cr 6	2335
Mn, Cr Ni alloyed steel	2335
Cr Mo alloyed steel	2570
Corrosion resistant steel	2530
Hot working steel	2570
Nitriding steel	2570
GS 45	1570
GS 52	1765
GG 22, GG 25	1140
GGG 42	1370
Aluminum cast alloys	640


Please note! The k_c -values depend on the feed. Therefore the table contains their upper limit values. The calculated power is possibly higher than the power actually needed (~ 10 - 20%).



	Material	Type, description	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11450867	DMSD 3,2Nm/SORT 15IP	IP15	3,2	28,3
	11450898	DMSD 1,0Nm/SORT 07IP	IP07	1,0	8,9
	11690144	DMSD 1,2NM/SORT 08IP	08IP	1,2	10,6
	11690146	DMSD 2,2NM/SORT 09IP	09IP	2,2	19,5
	11816987	DMSD 5,0Nm/SORT 20IP	20IP	5,0	44,3
	11817562	DMSD 0,7Nm/SORT 06IP	06IP	0,7	6,2

	Material	Type, description	Key size
	11206195	10002494/TORX 08IP F	T08IP
	11488748	10007404/TORX 07IP F	T07IP
	11843205	10014921/TORX 06IP F	T06IP
	11843208	10014922/TORX 09IP F	T09IP
	11114698	10000276/TORX 08IP	08IP
	11450849	10006918/TORX 07IP	IP07
	11450858	10006919/TORX 15IP	T15IP
	11690140	10009333/TORX 09IP	09IP
	11816974	10013909/TORX 20IP	T20IP
	11817560	10013959/TORX 06IP	06IP





	Material	Type, description	Length	Thread size	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11227305	M3,0x7,0-09IP/10003007	7.0	M3,0	T09IP	2,2	19,5
	11610311	M3,5X8,6-15IP/10008749	8.6	M3,5	T15IP	3,2	28,3
	11684214	M2,2x5,0-07IP/10009244	5.0	M2,2	T07IP	1,0	8,9
	11684216	M2,5x6,0-08IP/10009243	6.0	M2,5	T08IP	1,2	10,6
	11801441	M4,5X10,5-20IP/10013040	10.5	M4,5	T20IP	5,0	44,3
	11807480	M2,0x4,3-06IP/10013332	4.3	M2,0	T06IP	0,7	6,2
	11807484	M1,8x3,6-06IP/10013338	3.6	M1,8	T06IP	0,4	3,6

	Material	Type, description	Length	Thread size	Key size
	310720	7897990/M8X1X8 DIN913	8.0	M8	SW4

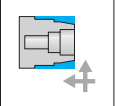


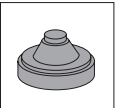





Introduction

	The original	E2-E3
	Productivity	E4-E5
	MasterGuide	E6
	Designation system	E7-E14

Technical information

	Depth of cut / feed rate	E29-E35
	Application	E36-E40
	Spare parts	E41
	Machining example	E42



Inserts

	XC..	E15-E16
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Tools

	EcoCut Mini	E19
	EcoCut Mini adapters	E20
	EcoCut Classic	E21-E23

Technical information

	Cutting data	E24-E25
	Surface quality	E26-E28



EcoCut – the original multi-function tool

EcoCut unites the capabilities of tools for the machining of internal and external profiles as well as for drilling. The reduced number of tools frees up additional turret positions on the machine. Simultaneously, the setting and programming time is minimized.

The EcoCut program consists of the 'Classic' tools with index-

able inserts, and the solid carbide tools, 'Mini'. This allows drilling diameters between 4 and 32 mm.

In perfect timing for the 20 year anniversary, the EcoCut program presents itself with a new look.

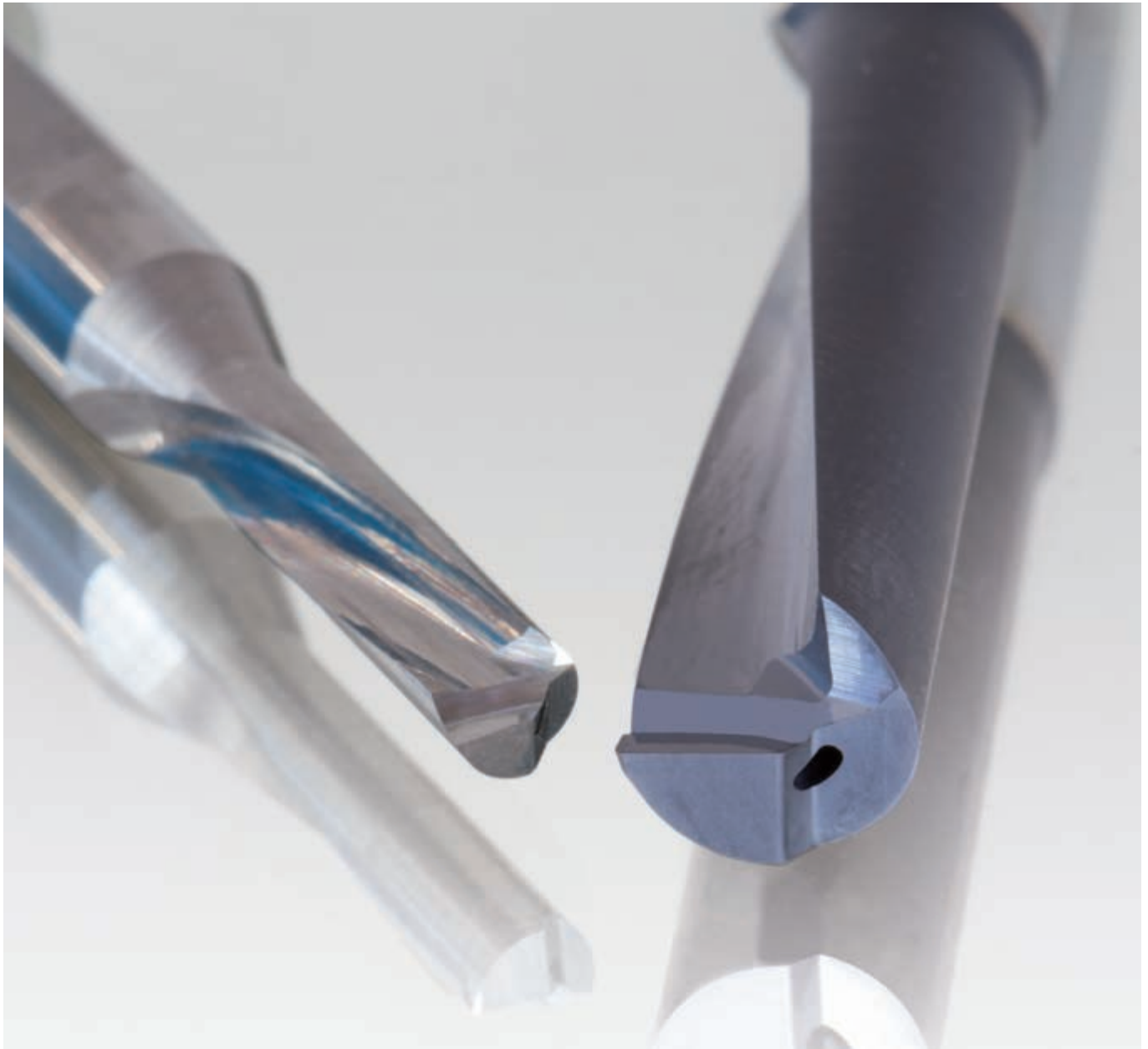
EcoCut Mini

The solid carbide tool EcoCut Mini is available in diameters from 4 to 8 mm.

During the optimization process of the system, CERATIZIT developed two additional carbide grades: CTWN425 – uncoated and sharp-edged, for aluminum and non-ferrous metals; CTPP435 – coated and wear-resistant for all other materials.

NEW

- Improved toughness
- Increased heat resistance
- Increased transverse rupture strength
- Optimized resistance to edge chipping





EcoCut Classic

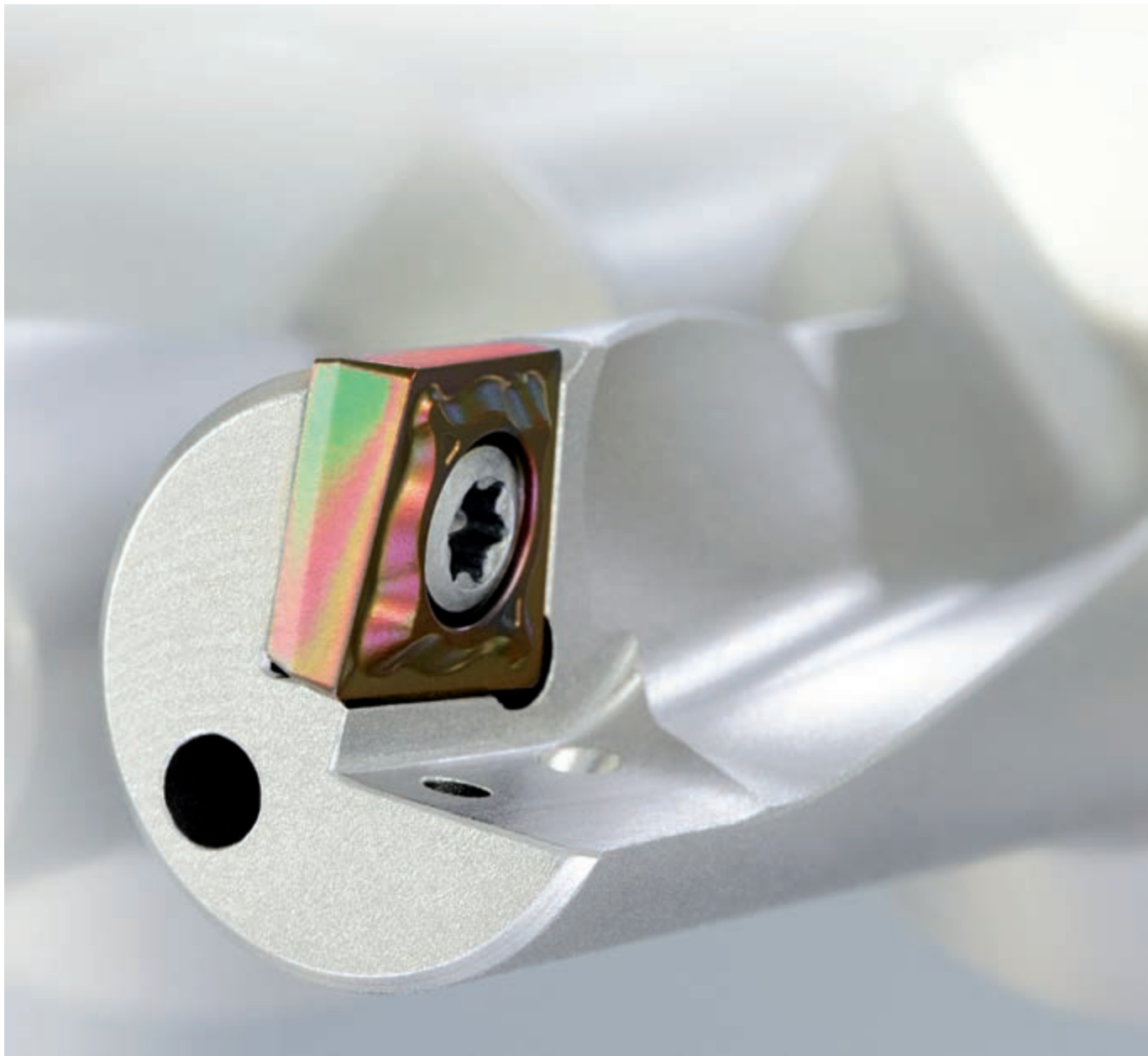
The redesigned EcoCut Classic program consists of three new coated high-performance grades, with wide application ranges to cover all materials of the ISO material groups P, M, K and S. The grades CTCP425 and CTCP435 feature Colourful Coat to ensure stable cutting edges and heat resistance. CTPP430 is the grade for universal application.

The tool holders have been redesigned for better stability. The new Torx Plus screws are used for better insert clamping as well as easier and more reliable handling.

The smooth surface of the 'hard & tough' tool holders ensures that the swarf is evacuated easily. Thanks to the hard surface abrasion is reduced.

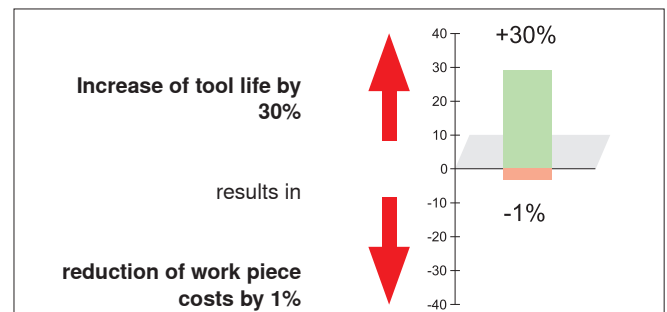
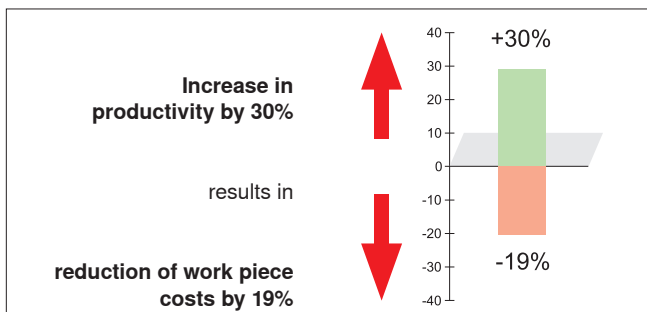
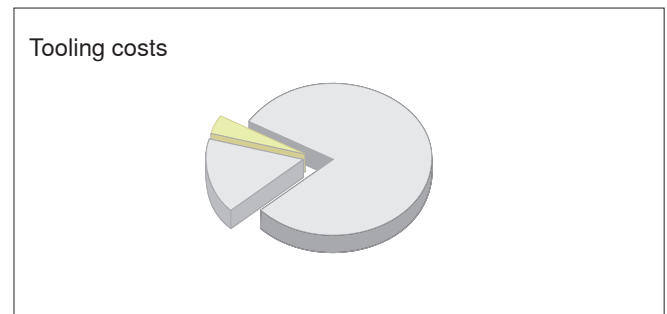
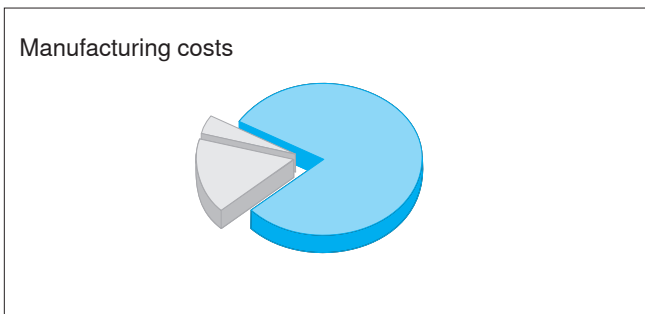
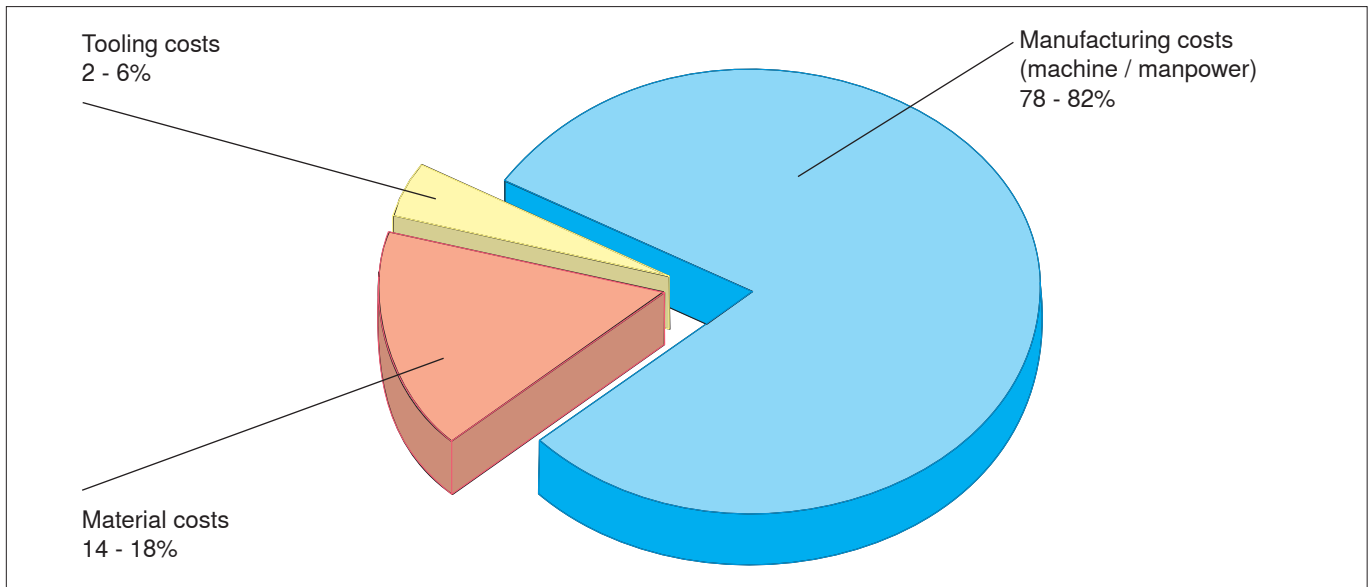
NEW

- New coated high-performance grades, combining with wide application ranges
- Optimized stability of the tools
- New Torx Plus screws
- 'Hard & tough' surfaces





Turn the cost screw together with CERATIZIT



Increase in productivity (parts produced per time unit)

Improved utilization of the available machine capacity leads to considerable cost reduction per work piece. In this context CERATIZIT EcoCut makes a decisive contribution through:

- o fewer tool changes
- o increase of v_c
- o increase of f
- o increase of a_p

As the average tool costs amount to only 2 - 6% of the work piece costs, prolonging tool life typically can only reduce total costs minimally.



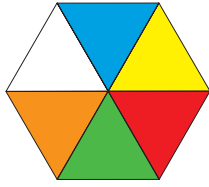
Four machining operations with only one tool

- Drilling into solid material with flat bottom holes
- Boring applications
- Turning of face profiles
- External turning applications



Advantages of EcoCut

- Problem solver for insufficient tool storage
- Less programming effort
- Produces a flat bottom hole
- Reduced tool and insert inventory costs. Considerable tool acquisition cost savings
- Shorter set-up times. Reduced pre-setting time



Material

Based on VDI 3323 CERATIZIT's MasterGuide divides materials into six main groups (P, M, K, N, S, H). Each is given a color, according to the system partly adopted in ISO 513.



Steel



Stainless steel



Cast iron



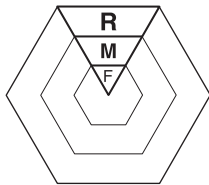
Non-ferrous metals and non-metals



Heat-resistant alloys, titanium



Hard materials



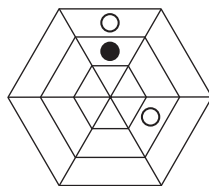
Machining application type

Each colored segment is divided into three sections, and each section indicates the relevant machining application type:

R = rough machining

M = medium machining

F = fine machining



Application

The ideal application area for the insert is indicated by a black circle. Extended applications are indicated by an open circle. The CERATIZIT MasterGuide provides you with an easily understandable structure for choosing a product and enables you to reduce grade and geometry stocks.

- Main application
- Extended application



Grade designation	Standard designation	Cutting material	Application range							P	M	K	N	S	H						
										Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials						
			01	05	10	15	20	25	30	35	40	45	50								
H210T	HW-M10	W																			
	HW-K10	W																			
H216T	HW-K15	W																			
CTWN425	HW-N25	W																			
CTCP425	HC-P25	C																			
	HC-M20	C																			
	HC-K30	C																			
CTPP430	HC-P30	P																			
	HC-M25	P																			
	HC-S25	P																			
CTCP435	HC-P35	C																			
	HC-M30	C																			
	HC-K40	C																			
CTPP435	HC-P35	P																			
	HC-M30	P																			
	HC-S30	P																			
			01	05	10	15	20	25	30	35	40	45	50	● Main application ○ Extended application							

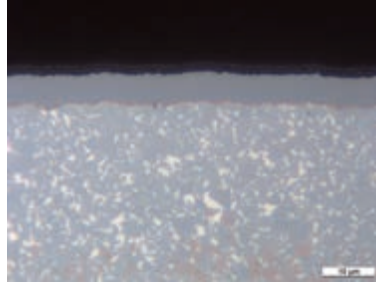
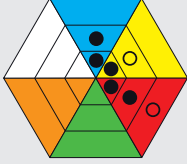


Grade description

Steel

CTCP425

HC-P25
HC-M20
HC-K30



Composition:

Co 7%; mixed carbides 8.1%; WC balance

Grain size:

1 - 2 μm

Hardness:

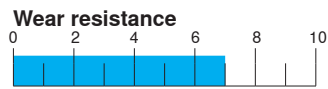
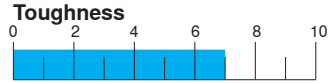
HV 1450

Coating specification:

CVD

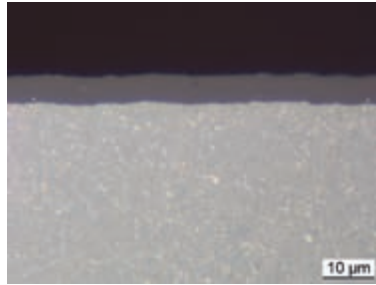
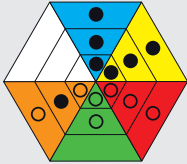
Ti (C,N) + Al_2O_3

7.5 μm



CTPP430

HC-P30
HC-M25
HC-S25



Composition:

Co 9.0%; other .75%; WC balance

Grain size:

.85 μm

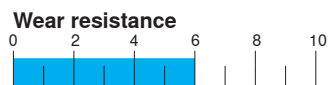
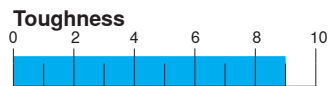
Hardness:

HV 1590

Coating specification:

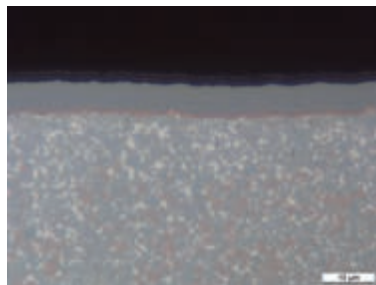
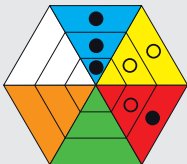
PVD

TiAlN; 7 μm



CTCP435

HC-P35
HC-M30
HC-K40



Composition:

Co 9.6%; mixed carbides 7.8%; other .4%; WC balance

Grain size:

1 - 2 μm

Hardness:

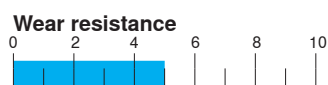
HV 1400

Coating specification:

CVD

Ti (C,N) + Al_2O_3

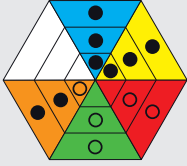
7.5 μm



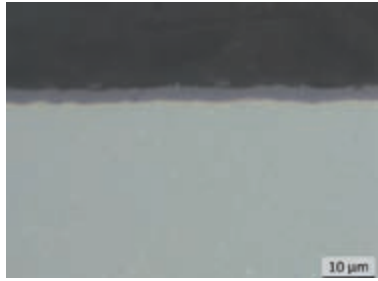


CTPP435

HC-P35
HC-M30
HC-S30



EcoCut Mini



Composition:

Co 10.3%; other 1.2%; WC balance

Grain size:

.7 µm

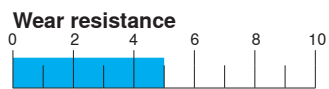
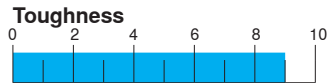
Hardness:

HV₃₀ 1600

Coating specification:

PVD

TiN / TiAlN; 3 µm





Grade description

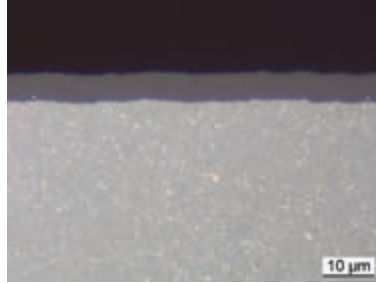
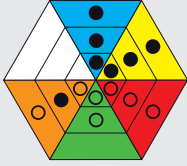
Stainless steel / cast iron

Introduction

Multi-function tools

CTPP430

HC-P30
HC-M25
HC-S25

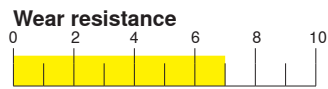
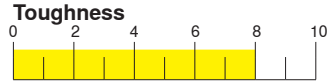


Composition:
Co 9.0%; other .75%; WC balance

Grain size:
.85 µm

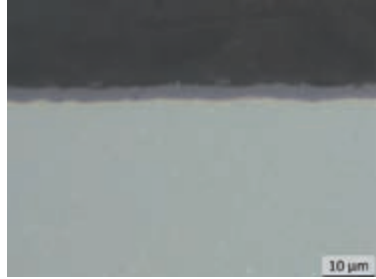
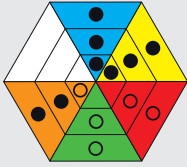
Hardness:
HV 1590

Coating specification:
PVD
TiAlN; 7 µm



CTPP435

HC-P35
HC-M30
HC-S30

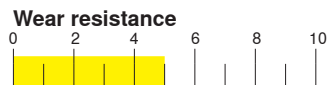
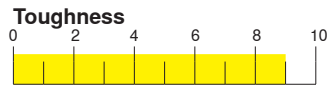


Composition:
Co 10.3%; other 1.2%; WC balance

Grain size:
.7 µm

Hardness:
HV₃₀ 1600

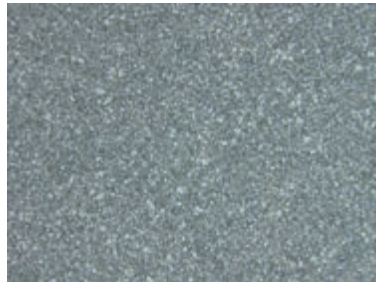
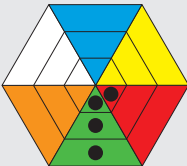
Coating specification:
PVD
TiN / TiAlN; 3 µm



EcoCut Mini

H216T

HW-K15



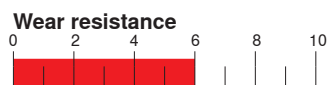
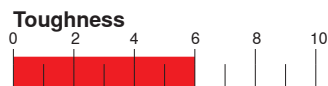
Composition:
Co 6.0%; WC balance

Grain size:
1 µm

Hardness:
HV₃₀ 1630

Properties, application:

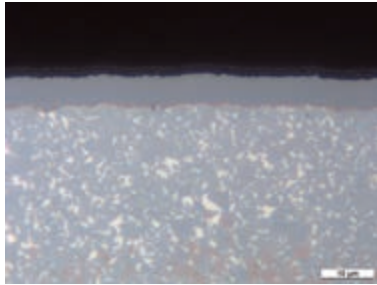
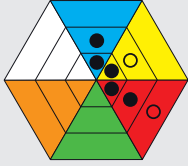
- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion





CTCP425

HC-P25
HC-M20
HC-K30



Composition:

Co 7%; mixed carbides 8.1%; WC balance

Grain size:

1 - 2 μm

Hardness:

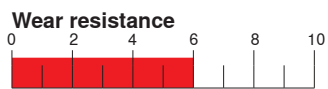
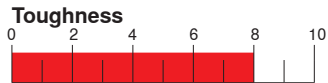
HV 1450

Coating specification:

CVD

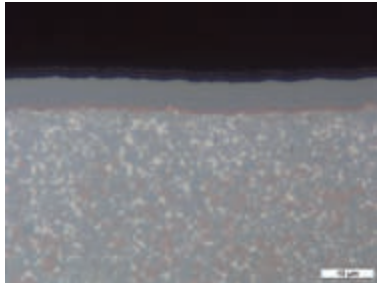
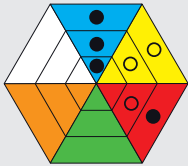
Ti (C,N) + Al_2O_3

7.5 μm



CTCP435

HC-P35
HC-M30
HC-K40



Composition:

Co 9.6%; mixed carbides 7.8%; other .4%; WC balance

Grain size:

1 - 2 μm

Hardness:

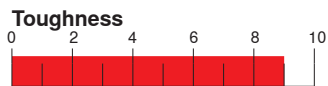
HV 1400

Coating specification:

CVD

Ti (C,N) + Al_2O_3

7.5 μm





Grade description

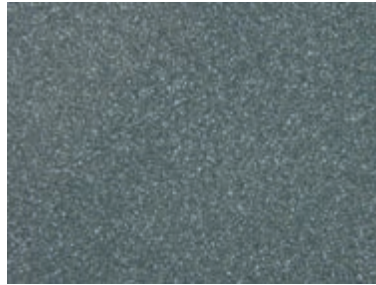
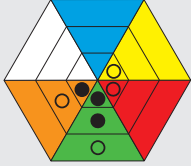
Non-ferrous metals and non metals / heat-resistant alloys / titanium

Introduction

Multi-function tools

H210T

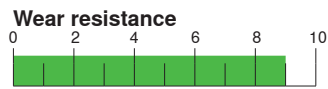
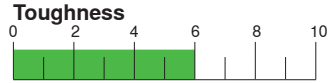
HW-M10
HW-K10



Composition:
Co 6.0%; WC balance

Grain size:
.8 μm (submicron grade)

Hardness:
HV 1850

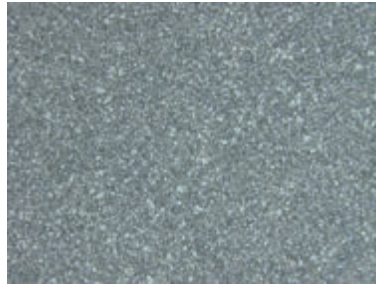
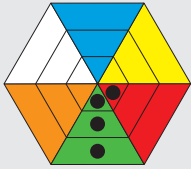


Properties, application:

- Ideal for heat-resistant alloys, titanium, refractory metals (W, Mo), aluminum and glass & carbon fiber reinforced plastics
- Low tendency for adhesion

H216T

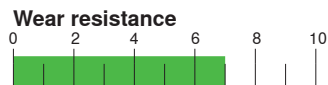
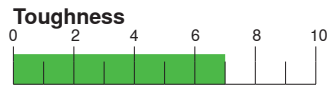
HW-K15



Composition:
Co 6.0%; WC balance

Grain size:
1 μm

Hardness:
HV₃₀ 1630

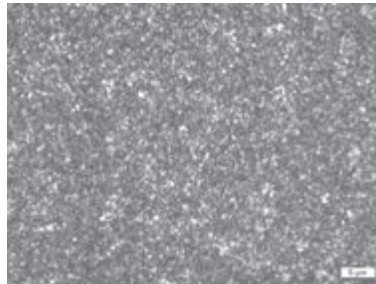
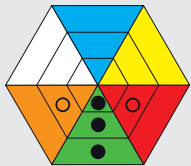


Properties, application:

- Ideal for aluminum
- High wear resistance
- High heat resistance
- Low tendency for adhesion

CTWN425

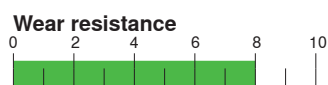
HW-N25



Composition:
Co 10.3%; other 1.2%; WC balance

Grain size:
.7 μm (submicron grade)

Hardness:
HV₃₀ 1600

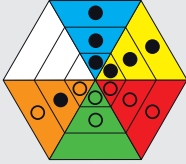


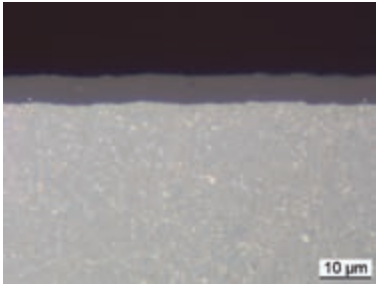
For EcoCut Mini



CTPP430

HC-P30
HC-M25
HC-S25





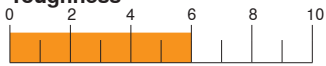
Composition:
Co 9.0%; other .75%; WC balance

Grain size:
.85 µm

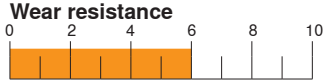
Hardness:
HV 1590

Coating specification:
PVD
TiAlN; 7 µm

Toughness

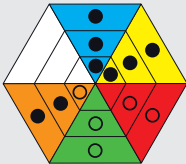


Wear resistance

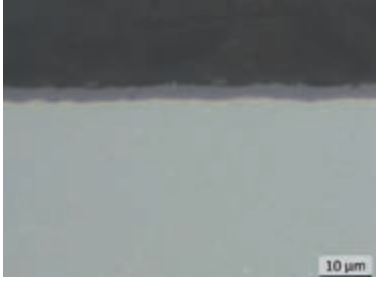


CTPP435

HC-P35
HC-M30
HC-S30



EcoCut Mini



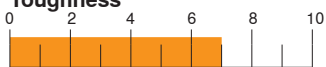
Composition:
Co 10.3%; other 1.2%; WC balance

Grain size:
.7 µm


Hardness:
HV₃₀ 1600

Coating specification:
PVD
TiN / TiAlN; 3 µm

Toughness

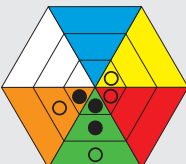


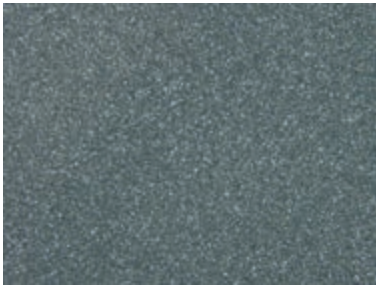
Wear resistance



H210T

HW-M10
HW-K10



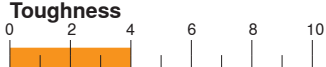


Composition:
Co 6.0%; WC balance

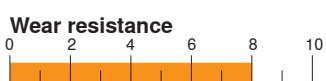
Grain size:
.8 µm (submicron grade)

Hardness:
HV 1850

Toughness



Wear resistance

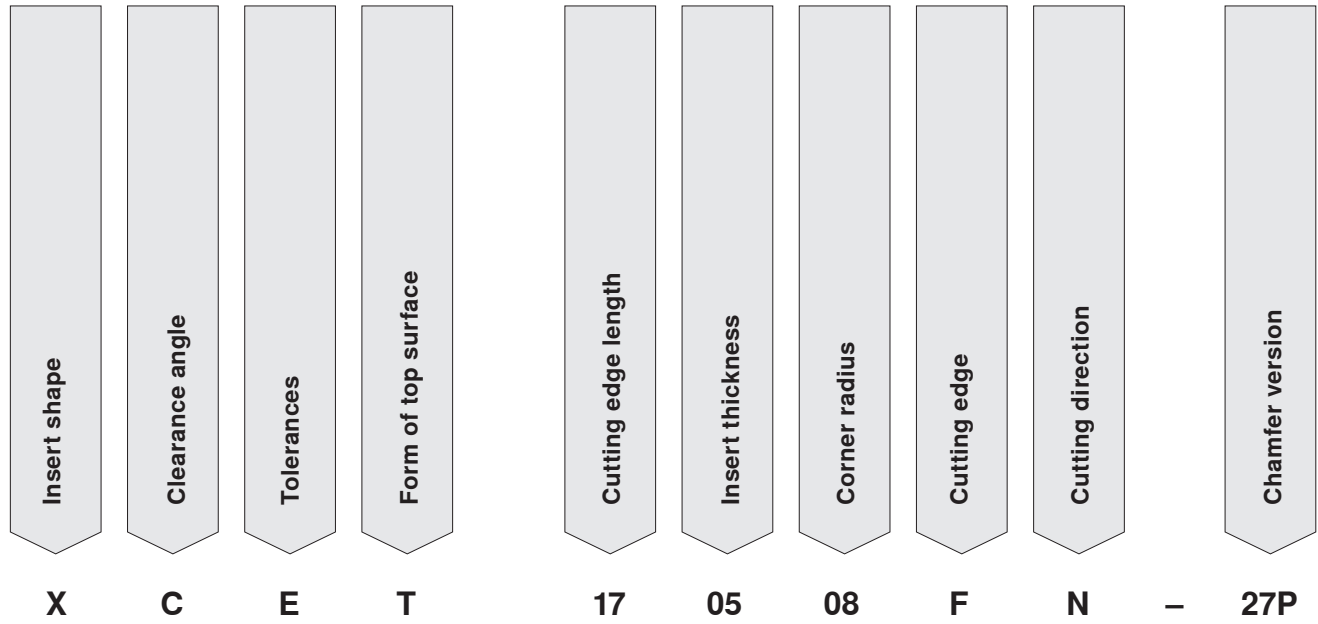


Properties, application:

- Ideal for heat-resistant alloys, titanium, refractory metals (W, Mo), aluminum and glass & carbon fiber reinforced plastics
- Low tendency for adhesion

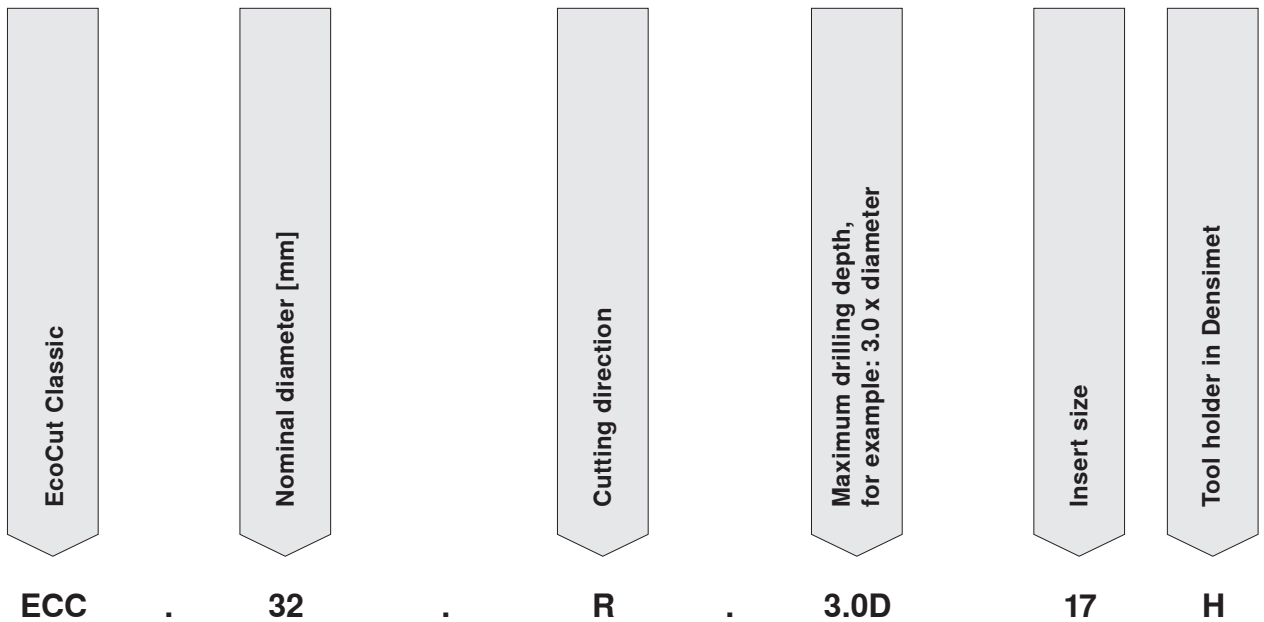


Inserts



Introduction

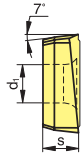
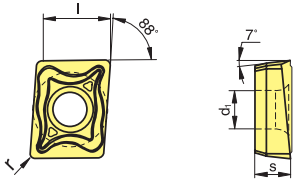
Tools



Multi-function tools

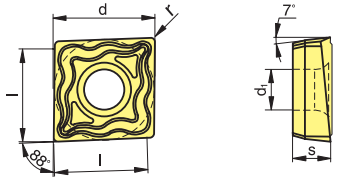


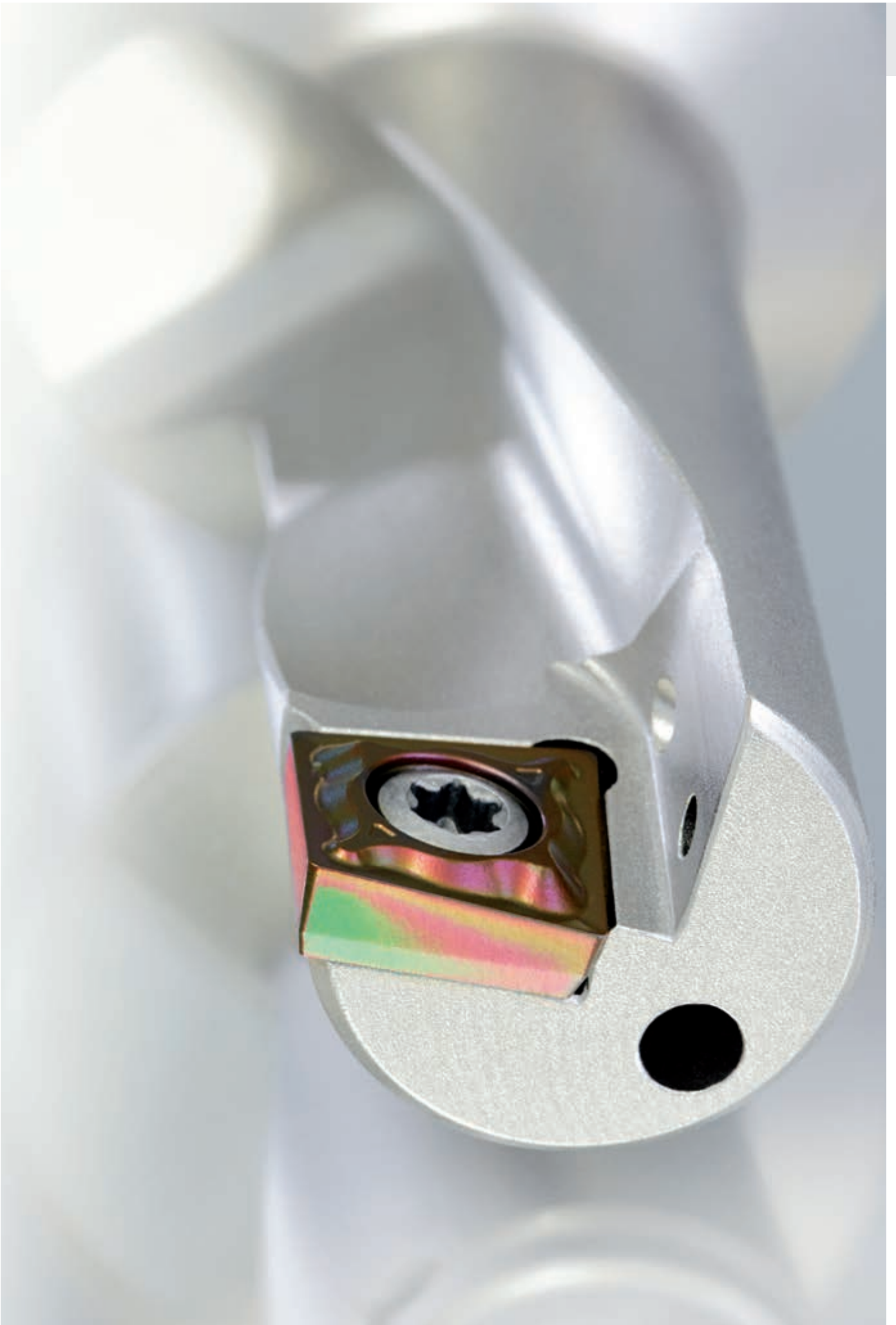
		P	M	K	N	S	H													d	l	s	r	d ₁		
		●	○	●	●	●														[inch]	[inch]	[inch]	[inch]	[inch]		
								H210T	H216T	CTCP425	CTPP430	CTCP435														
-27P								●													.177	.157	.071	.008	.083	
									●												.177	.157	.071	.008	.083	
								●													.177	.157	.071	.016	.083	
								●													.177	.157	.071	.016	.083	
-27Q								●													.177	.157	.071	.008	.083	
								●													.177	.157	.071	.008	.083	
								●													.177	.157	.071	.016	.083	
								●													.177	.157	.071	.016	.083	
ER-EL										●	●	●									.177	.157	.071	.008	.083	
										●	●	●									.177	.157	.071	.008	.083	
										●	●	●									.177	.157	.071	.016	.083	
										●	●	●									.177	.157	.071	.016	.083	
-M50Q										●											.177	.157	.071	.016	.083	
										●											.177	.157	.071	.016	.083	





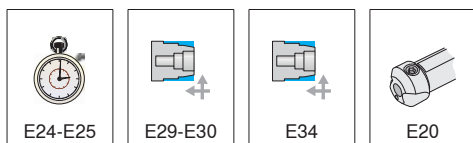
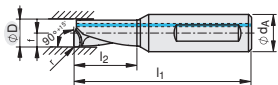
														d [inch]	l [inch]	s [inch]	r [inch]	d ₁ [inch]					
		P	M	K	N	S	H	H210T	H216T	CTCP425	CTPP430	CTCP435											
-M50Q		XCNT 050204EN-M50Q	●	○	●	●	●											.228	.197	.083	.016	.089	
		XCNT 060204EN-M50Q	●	○	●	●	●												.256	.236	.094	.016	.098
		XCNT 070304EN-M50Q	●	○	●	●	●												.299	.276	.125	.016	.110
		XCNT 080304EN-M50Q	●	○	●	●	●												.335	.315	.125	.016	.134
		XCNT 09T304EN-M50Q	●	○	●	●	●												.378	.354	.156	.016	.134
		XCNT 10T304EN-M50Q	●	○	●	●	●												.417	.394	.156	.016	.173
		XCNT 10T308EN-M50Q	●	○	●	●	●												.417	.394	.156	.031	.173
		XCNT 130404EN-M50Q	●	○	●	●	●												.531	.492	.187	.016	.209
		XCNT 130408EN-M50Q	●	○	●	●	●												.531	.492	.187	.031	.209
		XCNT 170508EN-M50Q	●	○	●	●	●												.689	.630	.219	.031	.209
		H210T	H216T	CTCP425	CTPP430	CTCP435											d	l	s	r	d ₁		

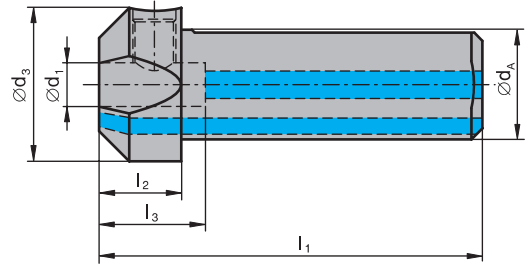








		P	M	K	N	S	H	CTWN425	CTPP435	RL	D	d _A	l ₁	l ₂	r	f
											[inch]	[inch]	[inch]	[inch]	[inch]	[inch]
-27		ECM 04L-2.25D-27	●							L	.157	.236	1.378	.354	.008	.079
		ECM 04L-4.00D-27	●							L	.157	.236	1.614	.630	.008	.079
		ECM 04R-2.25D-27	●							R	.157	.236	1.378	.354	.008	.079
		ECM 04R-4.00D-27	●							R	.157	.236	1.614	.630	.008	.079
		ECM 05L-2.25D-27	●							L	.197	.236	1.457	.443	.008	.098
		ECM 05L-4.00D-27	●							L	.197	.236	1.772	.787	.008	.098
		ECM 05R-2.25D-27	●							R	.197	.236	1.457	.443	.008	.098
		ECM 05R-4.00D-27	●							R	.197	.236	1.772	.787	.008	.098
		ECM 06L-2.25D-27	●							L	.236	.315	1.496	.531	.008	.118
		ECM 06L-4.00D-27	●							L	.236	.315	1.929	.945	.008	.118
		ECM 06R-2.25D-27	●							R	.236	.315	1.496	.531	.008	.118
		ECM 06R-4.00D-27	●							R	.236	.315	1.929	.945	.008	.118
		ECM 07L-2.25D-27	●							L	.276	.315	1.654	.620	.008	.138
		ECM 07L-4.00D-27	●							L	.276	.315	2.087	1.102	.008	.138
		ECM 07R-2.25D-27	●							R	.276	.315	1.654	.620	.008	.138
		ECM 07R-4.00D-27	●							R	.276	.315	2.087	1.102	.008	.138
		ECM 08L-2.25D-27	●							L	.315	.315	1.772	.709	.008	.157
		ECM 08L-4.00D-27	●							L	.315	.315	2.244	1.260	.008	.157
ECM 08R-2.25D-27	●							R	.315	.315	1.772	.709	.008	.157		
ECM 08R-4.00D-27	●							R	.315	.315	2.244	1.260	.008	.157		
EN		ECM 04L-2.25D	●							L	.157	.236	1.378	.354	.008	.079
		ECM 04L-4.00D	●							L	.157	.236	1.614	.630	.008	.079
		ECM 04R-2.25D	●							R	.157	.236	1.378	.354	.008	.079
		ECM 04R-4.00D	●							R	.157	.236	1.614	.630	.008	.079
		ECM 05L-2.25D	●							L	.197	.236	1.457	.443	.008	.098
		ECM 05L-4.00D	●							L	.197	.236	1.772	.787	.008	.098
		ECM 05R-2.25D	●							R	.197	.236	1.457	.443	.008	.098
		ECM 05R-4.00D	●							R	.197	.236	1.772	.787	.008	.098
		ECM 06L-2.25D	●							L	.236	.315	1.496	.531	.008	.118
		ECM 06L-4.00D	●							L	.236	.315	1.929	.945	.008	.118
		ECM 06R-2.25D	●							R	.236	.315	1.496	.531	.008	.118
		ECM 06R-4.00D	●							R	.236	.315	1.929	.945	.008	.118
		ECM 07L-2.25D	●							L	.276	.315	1.654	.620	.008	.138
		ECM 07L-4.00D	●							L	.276	.315	2.087	1.102	.008	.138
		ECM 07R-2.25D	●							R	.276	.315	1.654	.620	.008	.138
		ECM 07R-4.00D	●							R	.276	.315	2.087	1.102	.008	.138
		ECM 08L-2.25D	●							L	.315	.315	1.772	.709	.008	.157
		ECM 08L-4.00D	●							L	.315	.315	2.244	1.260	.008	.157
ECM 08R-2.25D	●							R	.315	.315	1.772	.709	.008	.157		
ECM 08R-4.00D	●							R	.315	.315	2.244	1.260	.008	.157		



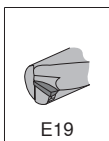
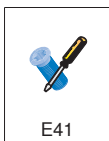


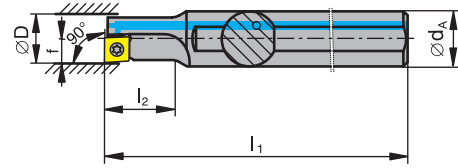
[inch]	Type, description	L N R	d_A [inch]	d_3 [inch]	l_1 [inch]	l_2 [inch]	[mm]		
.236	EC-ADX12-06-E	N	.750	.984	2.500	.550		ECM..	E01
.315	EC-ADX12-08-E	N	.750	.984	2.500	.550		ECM..	E01

Tools

Multi-function tools

	
E01	310720

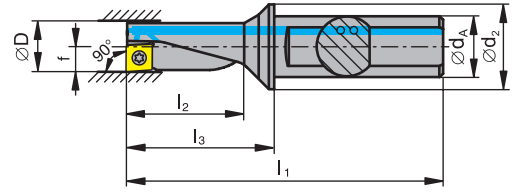




D_{min} [inch]	Type, description	LNR 						
			d_A [inch]	l_1 [inch]	l_2 [inch]	f [inch]		
.315	ECC 08R-1.5D 04-E	R	.500	3.1	.470	.157	XC.. 0401..	E01
.315	ECC 08L-1.5D 04-E	L	.500	3.1	.470	.157	XC.. 0401..	E01
.394	ECC 10R-1.5D 05-E	R	.500	3.5	.590	.197	XC.. 0502..	E02
.394	ECC 10L-1.5D 05-E	L	.500	3.5	.590	.197	XC.. 0502..	E02
.472	ECC 12R-1.5D 06-E	R	.625	3.9	.710	.236	XC.. 0602..	E03
.472	ECC 12L-1.5D 06-E	L	.625	3.9	.710	.236	XC.. 0602..	E03
.551	ECC 14R-1.5D 07-E	R	.625	4.3	.830	.276	XC.. 0703..	E04
.551	ECC 14L-1.5D 07-E	L	.625	4.3	.830	.276	XC.. 0703..	E04
.630	ECC 16R-1.5D 08-E	R	.750	4.9	.940	.315	XC.. 0803..	E05
.630	ECC 16L-1.5D 08-E	L	.750	4.9	.940	.315	XC.. 0803..	E05
.709	ECC 18R-1.5D 09-E	R	1.000	5.3	1.060	.354	XC.. 09T3..	E05
.709	ECC 18L-1.5D 09-E	L	1.000	5.3	1.060	.354	XC.. 09T3..	E05
.787	ECC 20R-1.5D 10-E	R	1.000	5.9	1.180	.394	XC.. 10T3..	E06
.787	ECC 20L-1.5D 10-E	L	1.000	5.9	1.180	.394	XC.. 10T3..	E06
.984	ECC 25R-1.5D 13-E	R	1.250	7.0	1.480	.492	XC.. 1304..	E07
.984	ECC 25L-1.5D 13-E	L	1.250	7.0	1.480	.492	XC.. 1304..	E07
1.260	ECC 32R-1.5D 17-E	R	1.500	7.8	1.890	.630	XC.. 1705..	E07
1.260	ECC 32L-1.5D 17-E	L	1.500	7.8	1.890	.630	XC.. 1705..	E07

E01	11807484		11843205
E02	11807480		11843205
E03	11684214		11488748
E04	11684216		11206195
E05	11227305		11843208
E06	11610311	11450858	
E07	11801441	11816974	

 E24-E25	 E31+E35	 E41	 E15-E17
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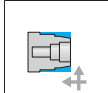


D_{\min} [inch]	Type, description	LNR 	d_A [inch]	d_2 [inch]	l_1 [inch]	l_2 [inch]	l_3 [inch]	f [inch]		
.315	ECC 08R-2.25D 04-E	R	.375	.590	2.3	.710	.870	.157	XC.. 0401..	E01
.315	ECC 08L-2.25D 04-E	L	.375	.590	2.3	.710	.870	.157	XC.. 0401..	E01
.394	ECC 10R-2.25D 05-E	R	.500	.708	2.7	.890	1.085	.197	XC.. 0502..	E02
.394	ECC 10L-2.25D 05-E	L	.500	.708	2.7	.890	1.085	.197	XC.. 0502..	E02
.472	ECC 12R-2.25D 06-E	R	.625	.866	3.0	1.060	1.300	.236	XC.. 0602..	E03
.472	ECC 12L-2.25D 06-E	L	.625	.866	3.0	1.060	1.300	.236	XC.. 0602..	E03
.551	ECC 14R-2.25D 07-E	R	.625	.906	3.2	1.240	1.520	.276	XC.. 0703..	E04
.551	ECC 14L-2.25D 07-E	L	.625	.906	3.2	1.240	1.520	.276	XC.. 0703..	E04
.630	ECC 16R-2.25D 08-E	R	.750	1.102	3.7	1.420	1.730	.315	XC.. 0803..	E05
.630	ECC 16L-2.25D 08-E	L	.750	1.102	3.7	1.420	1.730	.315	XC.. 0803..	E05
.709	ECC 18R-2.25D 09-E	R	1.000	1.417	4.3	1.590	2.110	.354	XC.. 09T3..	E05
.709	ECC 18L-2.25D 09-E	L	1.000	1.417	4.3	1.590	2.110	.354	XC.. 09T3..	E05
.787	ECC 20R-2.25D 10-E	R	1.000	1.378	4.4	1.770	2.170	.394	XC.. 10T3..	E06
.787	ECC 20L-2.25D 10-E	L	1.000	1.378	4.4	1.770	2.170	.394	XC.. 10T3..	E06
.984	ECC 25R-2.25D 13-E	R	1.250	1.732	5.0	2.210	2.715	.492	XC.. 1304..	E07
.984	ECC 25L-2.25D 13-E	L	1.250	1.732	5.0	2.210	2.715	.492	XC.. 1304..	E07
1.260	ECC 32R-2.25D 17-E	R	1.500	2.126	6.2	2.830	3.460	.630	XC.. 1705..	E07
1.260	ECC 32L-2.25D 17-E	L	1.500	2.126	6.2	2.830	3.460	.630	XC.. 1705..	E07

E01	11807484		11843205
E02	11807480		11843205
E03	11684214		11488748
E04	11684216		11206195
E05	11227305		11843208
E06	11610311	11450858	
E07	11801441	11816974	



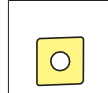
E24-E25



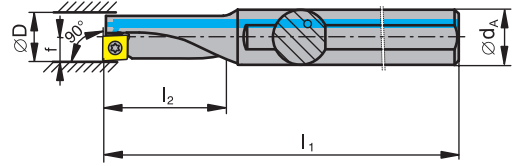
E32+E35



E41



E15-E17



D_{min} [inch]	Type, description	LNR 	d_A [inch]	l_1 [inch]	l_2 [inch]	f [inch]		
.315	ECC 08R-3.0D 04 H-E	R	.500	3.1	.940	.157	XC.. 0401..	E01
.315	ECC 08L-3.0D 04 H-E	L	.500	3.1	.940	.157	XC.. 0401..	E01
.394	ECC 10R-3.0D 05 H-E	R	.500	3.3	1.180	.197	XC.. 0502..	E02
.394	ECC 10L-3.0D 05 H-E	L	.500	3.3	1.180	.197	XC.. 0502..	E02
.472	ECC 12R-3.0D 06 H-E	R	.625	3.7	1.420	.236	XC.. 0602..	E03
.472	ECC 12L-3.0D 06 H-E	L	.625	3.7	1.420	.236	XC.. 0602..	E03
.551	ECC 14R-3.0D 07 H-E	R	.625	3.9	1.650	.276	XC.. 0703..	E04
.551	ECC 14L-3.0D 07 H-E	L	.625	3.9	1.650	.276	XC.. 0703..	E04
.630	ECC 16R-3.0D 08 H-E	R	.750	4.3	1.890	.315	XC.. 0803..	E05
.630	ECC 16L-3.0D 08 H-E	L	.750	4.3	1.890	.315	XC.. 0803..	E05
.709	ECC 18R-3.0D 09 H-E	R	1.000	5.0	2.120	.354	XC.. 09T3..	E05
.709	ECC 18L-3.0D 09 H-E	L	1.000	5.0	2.120	.354	XC.. 09T3..	E05
.787	ECC 20R-3.0D 10 H-E	R	1.000	5.1	2.360	.394	XC.. 10T3..	E06
.787	ECC 20L-3.0D 10 H-E	L	1.000	5.1	2.360	.394	XC.. 10T3..	E06
.984	ECC 25R-3.0D 13 H-E	R	1.250	5.9	2.950	.492	XC.. 1304..	E07
.984	ECC 25L-3.0D 13 H-E	L	1.250	5.9	2.950	.492	XC.. 1304..	E07
1.260	ECC 32R-3.0D 17 H-E	R	1.500	7.2	3.780	.630	XC.. 1705..	E07
1.260	ECC 32L-3.0D 17 H-E	L	1.500	7.2	3.780	.630	XC.. 1705..	E07

E01	11807484		11843205
E02	11807480		11843205
E03	11684214		11488748
E04	11684216		11206195
E05	11227305		11843208
E06	11610311	11450858	
E07	11801441	11816974	

 E24-E25	 E33+E35	 E40	 E41	 E15-E17
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	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Gray cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm ²	35	–
	Titanium alloys		pure titanium	36	R _m 440*
			alpha + beta alloys	37	R _m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa



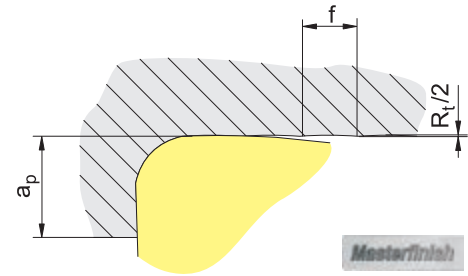
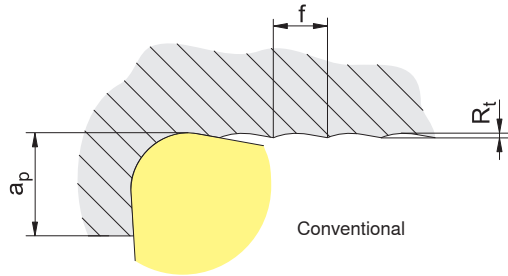
Uncoated carbide			Coated carbide			
H210T	H216T	CTWN425*	CTCP425	CTPP430	CTCP435	CTPP435*
v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]	v_c [sfpm]
–	–	–	492 - 985	394 - 821	460 - 919	197 - 755
–	–	–	394 - 722	263 - 591	328 - 657	197 - 525
–	–	–	328 - 657	197 - 525	263 - 591	164 - 427
–	–	–	394 - 722	263 - 591	328 - 657	197 - 525
–	–	–	328 - 591	197 - 492	263 - 525	164 - 427
–	–	–	263 - 492	197 - 427	230 - 460	164 - 328
–	–	–	361 - 624	263 - 558	328 - 591	197 - 460
–	–	–	230 - 492	164 - 427	197 - 460	131 - 328
–	–	–	361 - 722	164 - 657	328 - 657	131 - 657
–	–	–	328 - 591	164 - 492	263 - 492	131 - 492
–	–	–	394 - 722	164 - 525	328 - 657	131 - 657
–	–	–	328 - 657	164 - 591	328 - 591	131 - 591
–	–	–	–	164 - 427	–	131 - 328
–	–	–	–	164 - 394	–	131 - 263
455 - 656	394 - 525	263 - 460	427 - 919	394 - 657	394 - 821	328 - 591
328 - 525	294 - 458	197 - 394	427 - 919	328 - 591	394 - 821	263 - 525
522 - 656	425 - 558	295 - 492	394 - 919	394 - 657	361 - 821	328 - 591
361 - 492	294 - 425	197 - 361	394 - 919	328 - 591	361 - 821	263 - 525
525 - 722	458 - 656	197 - 591	361 - 919	295 - 525	328 - 821	328 - 657
458 - 589	394 - 525	328 - 460	361 - 919	230 - 492	328 - 821	295 - 525
984 - 9840	984 - 11480	263 - 6566	–	263 - 6566	263 - 6566	263 - 6566
656 - 8200	656 - 6560	263 - 4925	–	263 - 4925	263 - 4925	263 - 4925
1312 - 6560	1312 - 4920	263 - 4925	–	263 - 4925	263 - 4925	263 - 4925
1312 - 5904	1312 - 4920	263 - 4268	–	263 - 4268	263 - 4268	263 - 4268
656 - 3280	656 - 2624	263 - 1970	–	263 - 1970	263 - 1970	263 - 1970
820 - 2624	820 - 1968	263 - 1313	–	263 - 1313	263 - 1313	263 - 1313
656 - 2624	656 - 1968	263 - 1313	–	263 - 1313	263 - 1313	263 - 1313
492 - 1968	492 - 1312	263 - 985	–	263 - 985	263 - 985	263 - 985
492 - 1312	492 - 984	263 - 657	–	263 - 657	263 - 657	263 - 657
328 - 7216	261 - 589	66 - 525	–	197 - 525	197 - 525	197 - 525
263 - 656	197 - 492	197 - 460	–	164 - 460	164 - 460	164 - 460
328 - 656	328 - 820	164 - 657	–	263 - 657	263 - 657	263 - 657
115 - 164	–	263 - 131	–	66 - 295	66 - 164	66 - 164
82 - 130	–	82 - 98	–	66 - 295	66 - 131	66 - 131
82 - 130	–	66 - 98	–	66 - 295	49 - 66	49 - 66
66 - 97	–	66 - 82	–	66 - 295	33 - 66	33 - 66
48 - 82	–	49 - 82	–	66 - 295	33 - 66	33 - 66
261 - 458	–	49 - 328	–	131 - 328	164 - 394	164 - 394
130 - 328	–	98 - 197	–	98 - 295	98 - 164	98 - 164
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–

* EcoCut Mini



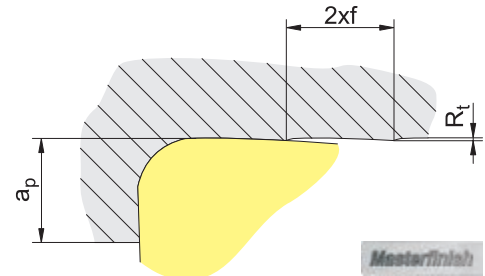
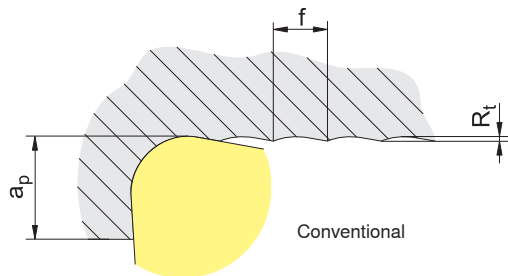
Improved surface finish

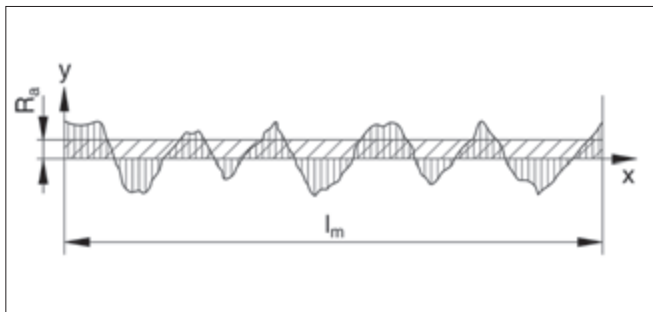
With the same feed rate an insert with 'Masterfinish' cutting edge reaches a roughness value R_a which is many times higher than the one of a conventional insert.



Reduced machining time

If you want to reach the same R_a value as with a standard insert, a twice as high feed rate can be applied for the insert with 'Masterfinish' cutting edge (= shorter production time per component!).



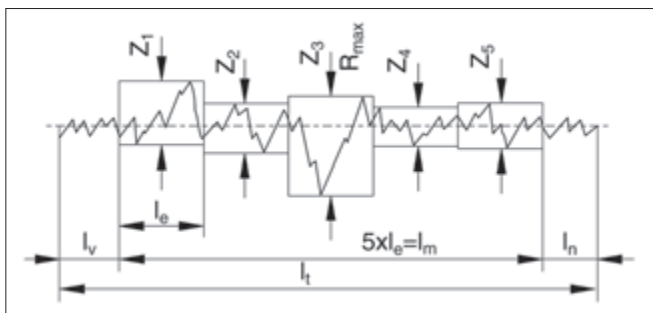


Average roughness value R_a DIN (4768)

This is defined as the arithmetical mean of the absolute sums of the roughness profile R within the entire measured length l_m .

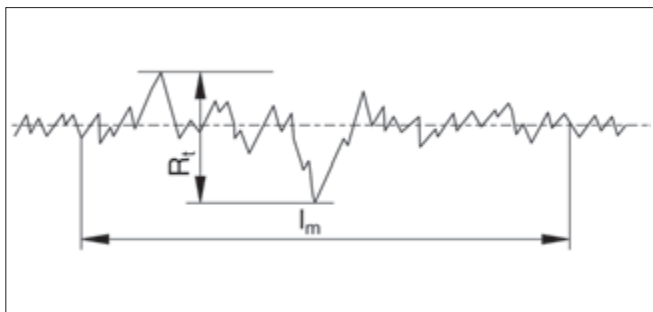
Average roughness depth R_z (DIN 4768)

This is defined as the average value resulting from the single roughness depths of five successive single measured lengths l_e .



Single surface roughness depth $Z_1 \dots Z_5$

This is the vertical distance between the highest and the lowest point of the roughness profile R within a single measured length l_e .



Maximum surface roughness depth R_1 (DIN 4768/1)

This is the distance between the elevation and depression of the line within the measured length (reference distance) of profile filtered according to DIN 4768 sheet 1.

Surface quality according to manufacturing method

Surface symbol according to ISO 1302	new	.025	.05	.1	.2	.4	.8	1.6	3.2	6.3	12.5	25	50
Surface symbol according to ISO 3141	until now	▽▽▽▽					▽▽▽			▽▽		▽	
Roughness index		N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8	N 9	N 10	N 11	N 12
Arithmetic mean value	R_a [μm]	.025	.05	.1	.2	.4	.8	1.6	3.2	6.3	12.5	25	50
Surface roughness depth	R_z [μm]	.25	.63	1	1.6	2.5	4-6.3	10	16-25	40	63	100	160
Longitudinal turning Face turning													
Longitudinal turning Face turning													
Longitudinal grinding Surface grinding													

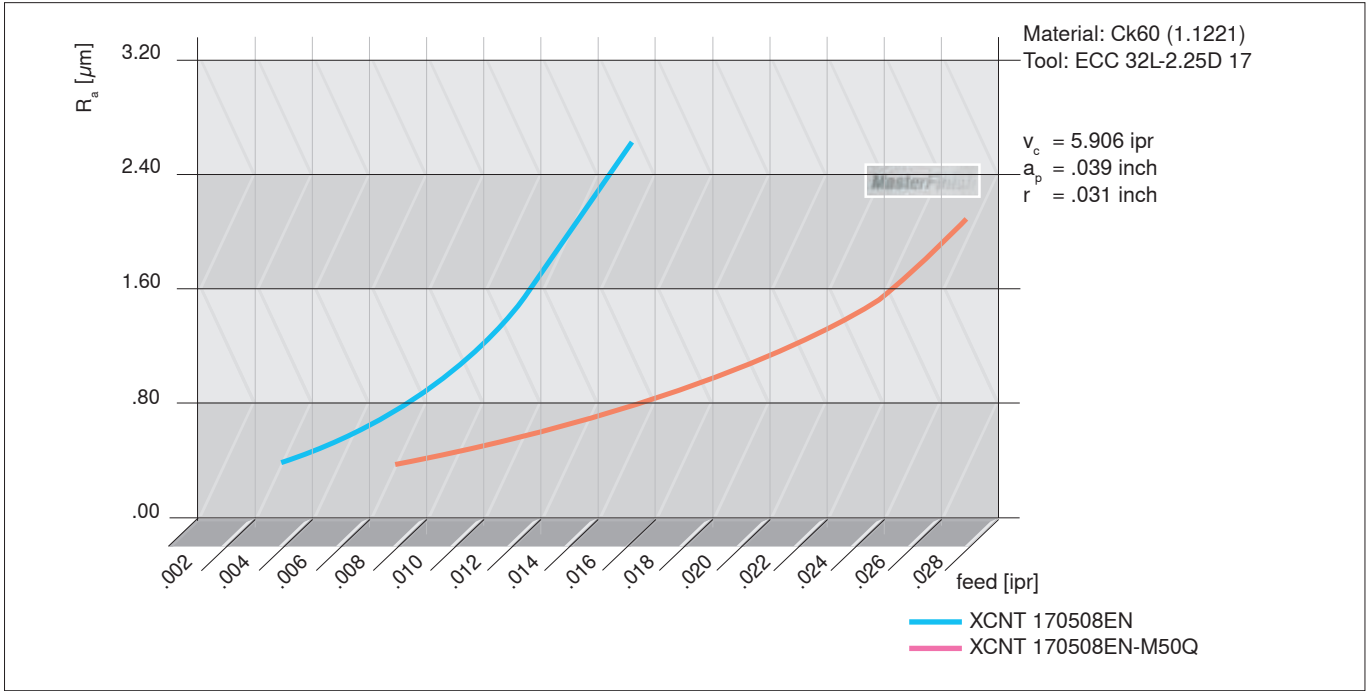
☐ $\hat{=}$ Surface roughness (produced through special methods)

☐ $\hat{=}$ Surface roughness (produced through normal workshop methods)

☐ $\hat{=}$ Surface roughness (produced through rough machining methods)



Surface quality / feed rate

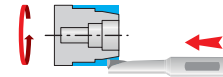


Technical information

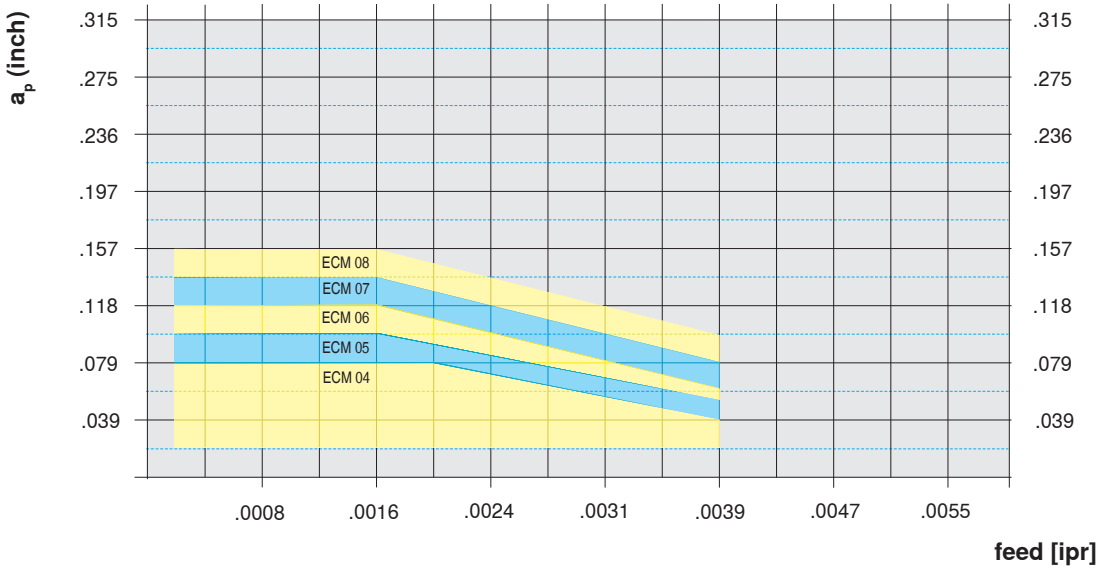
Multi-function tools



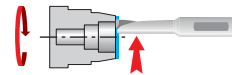
Longitudinal turning



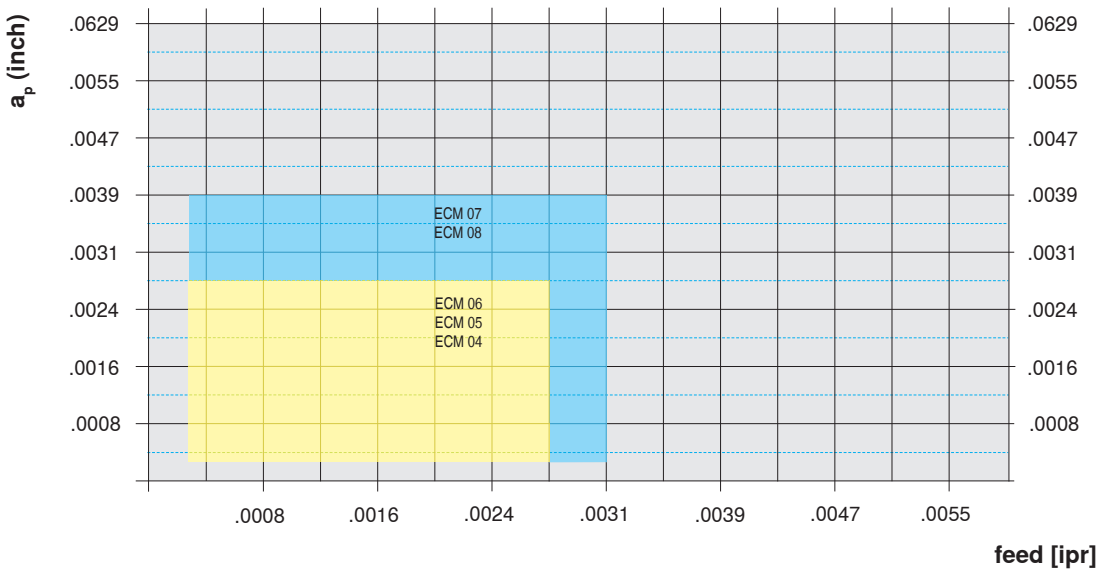
2.25D



Face turning

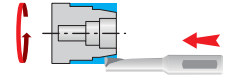


2.25D

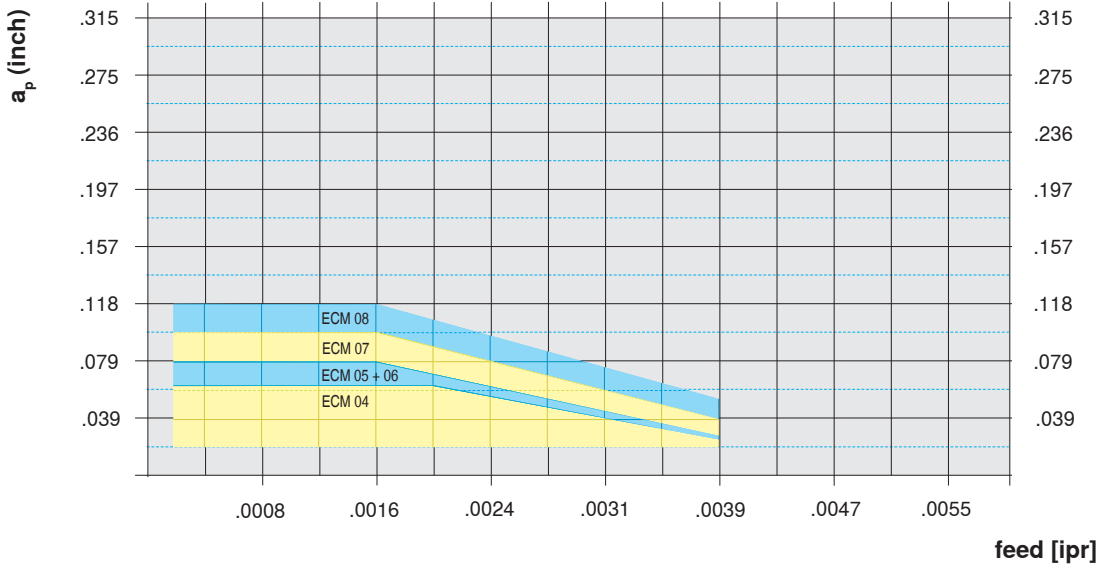




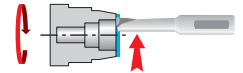
Longitudinal turning



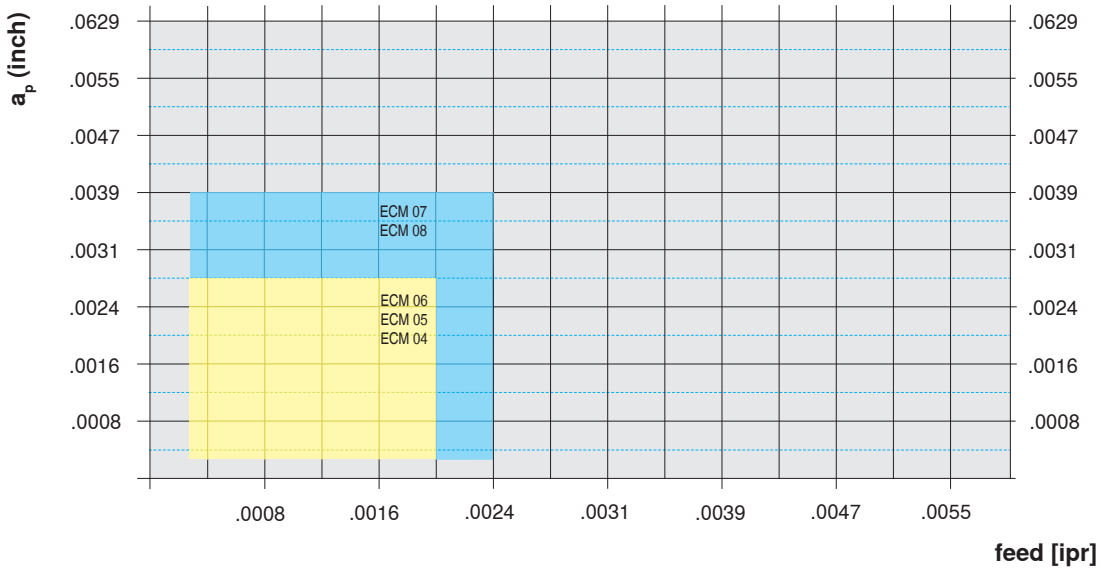
4.0D



Face turning



4.0D

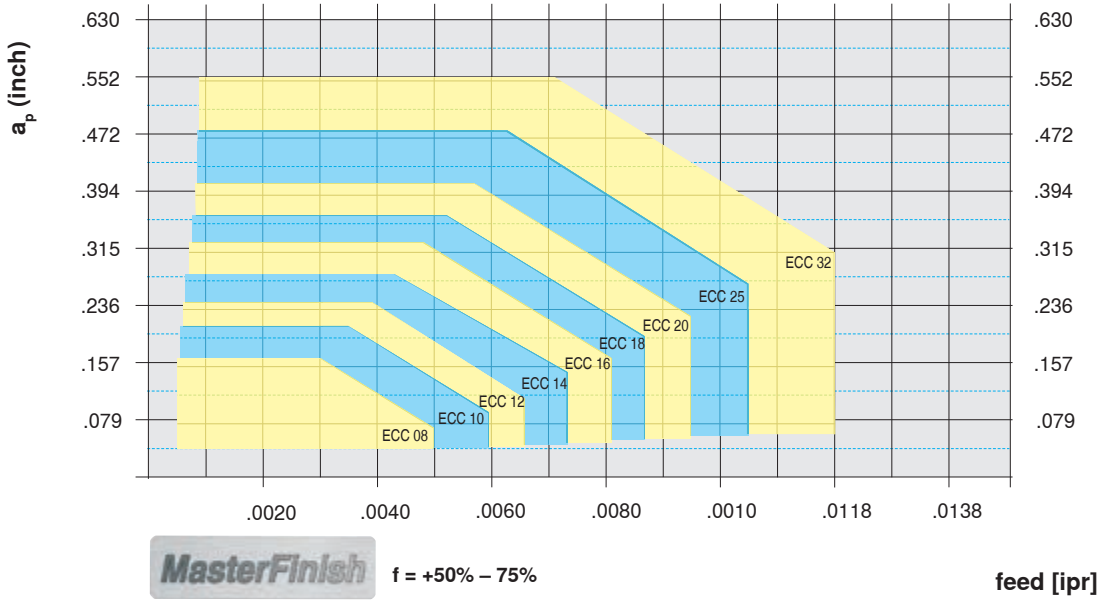




Longitudinal turning



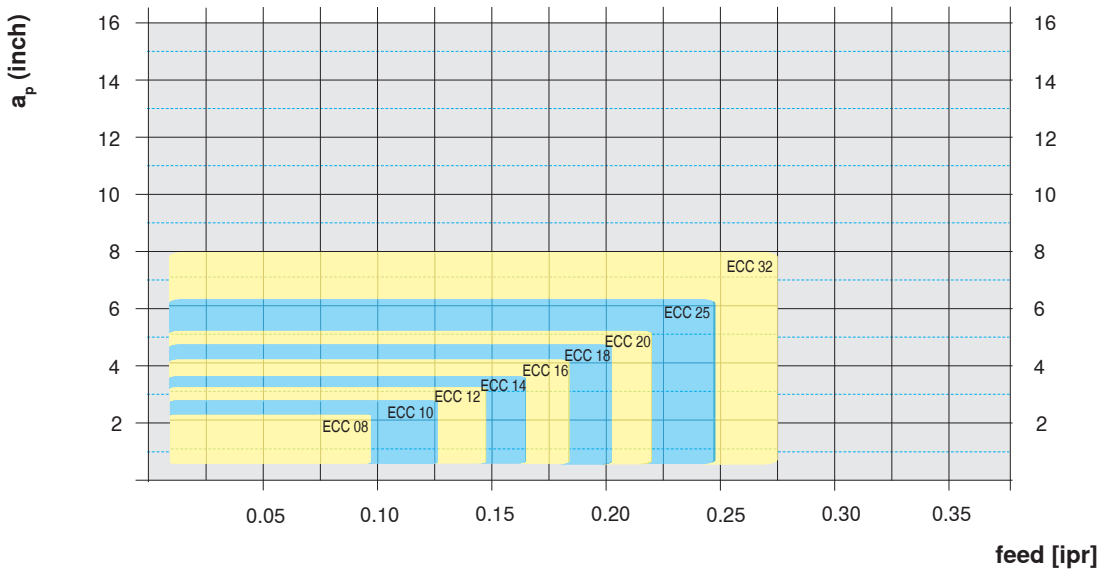
1.5D



Face turning



1.5D

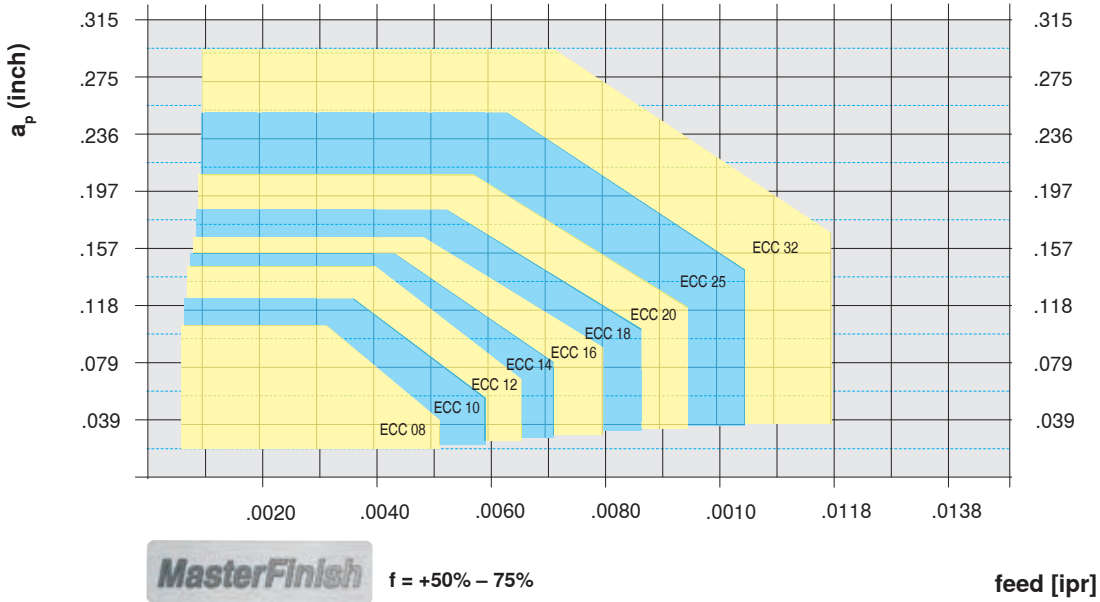




Longitudinal turning



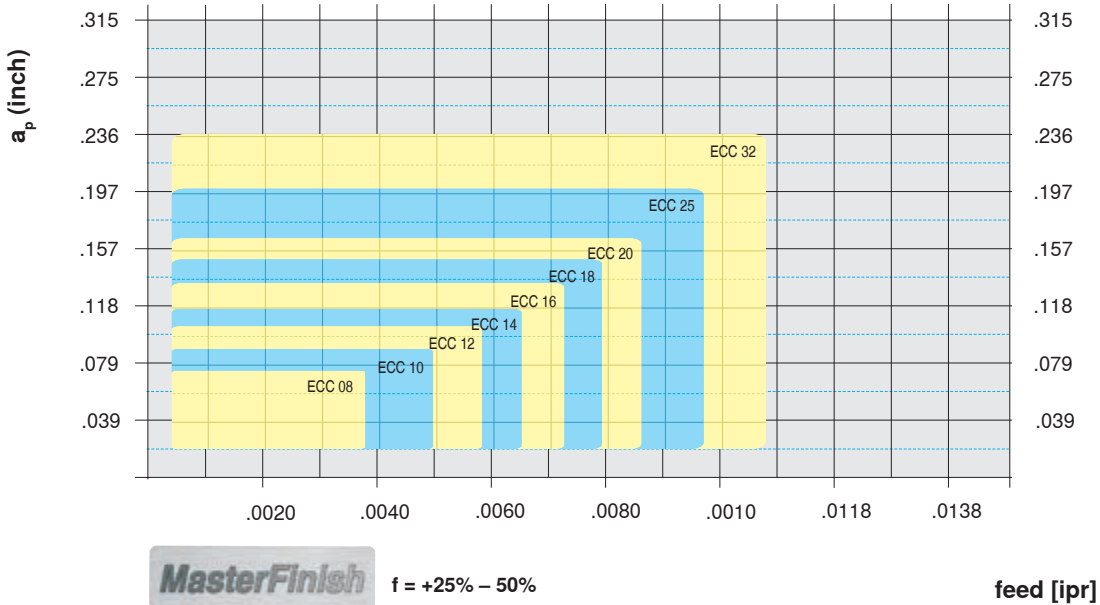
2.25D



Face turning



2.25D

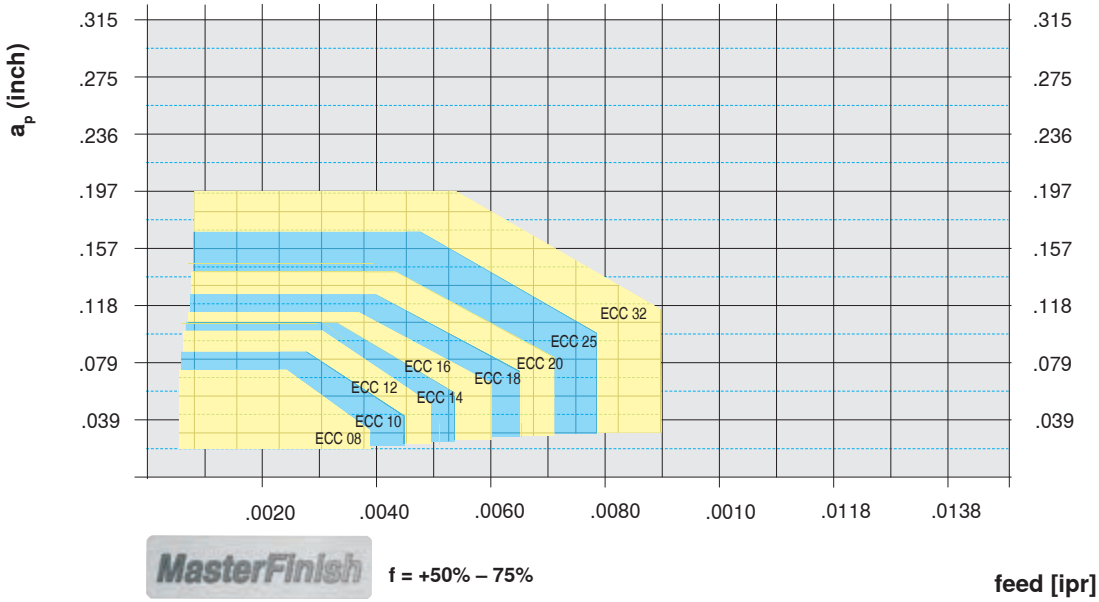




Longitudinal turning



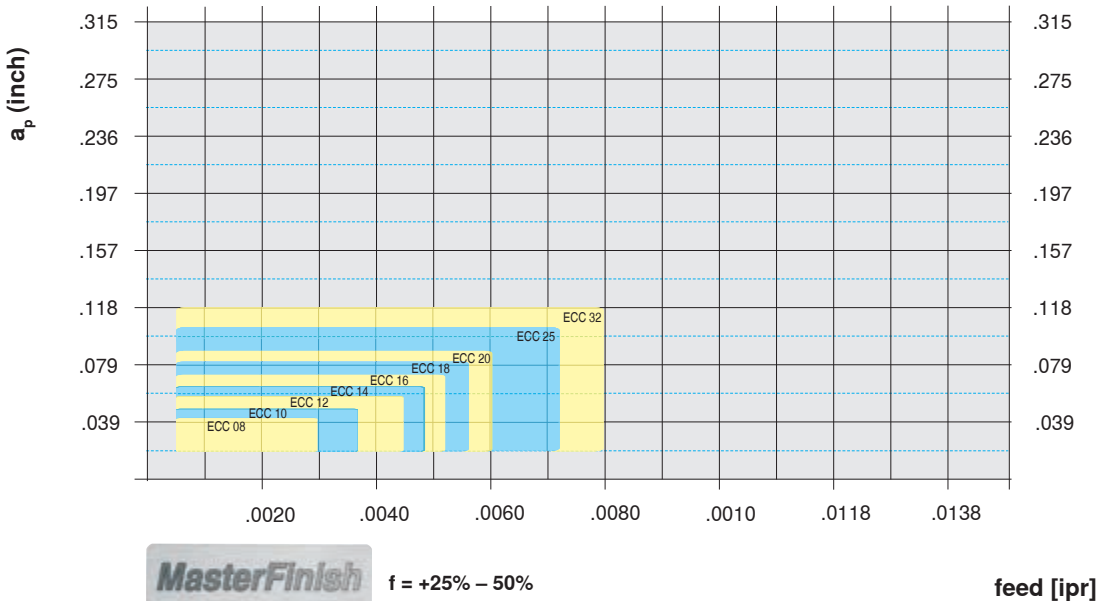
3.0D



Face turning

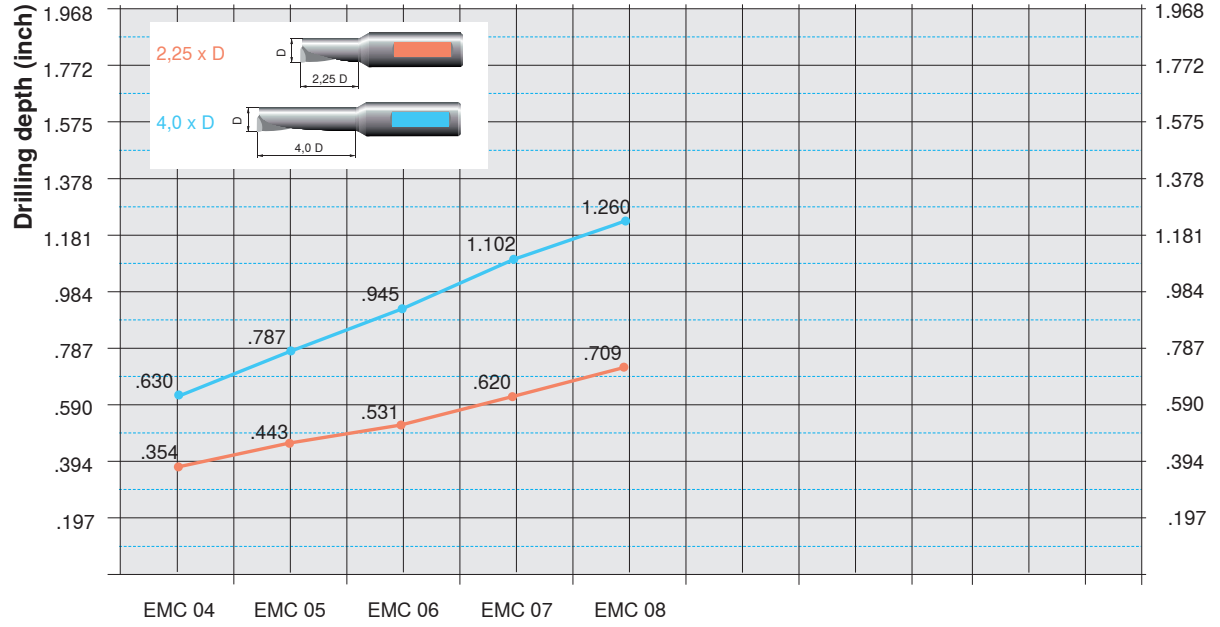


3.0D

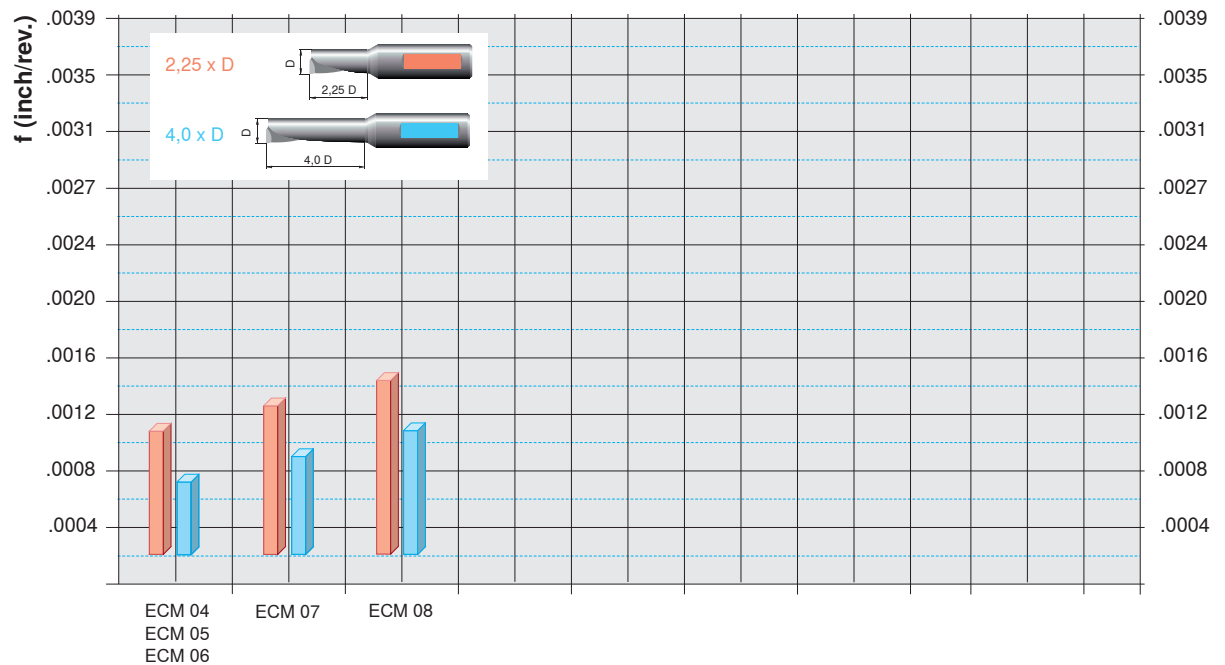




Drilling depth

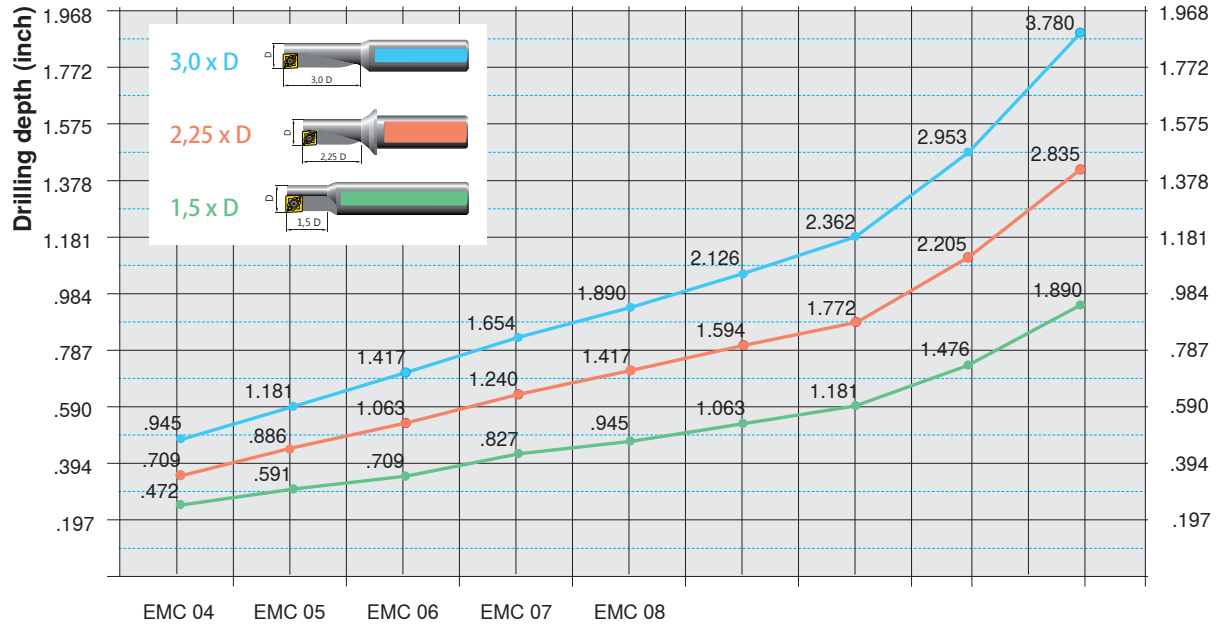


Drilling feed rate

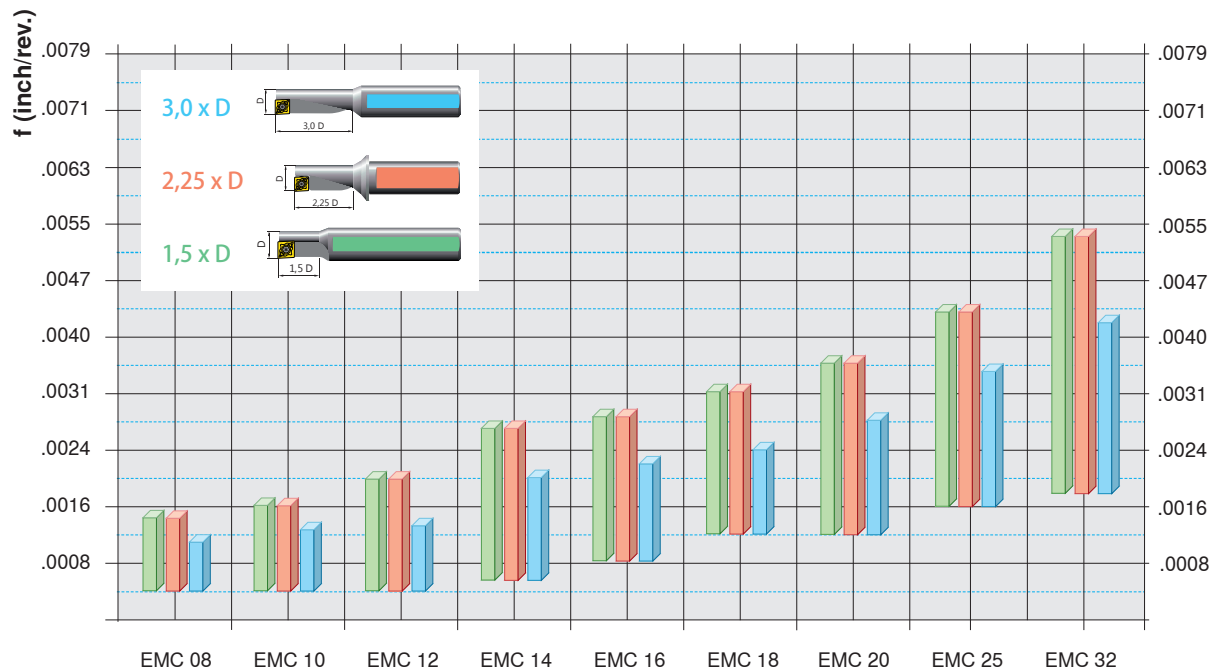




Drilling depth



Drilling feed rate





Mounting of the insert

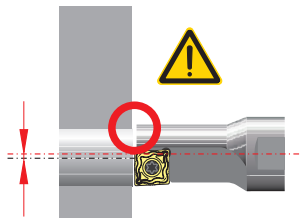
For tools \varnothing 8 mm right-hand or left-hand inserts are required.
From \varnothing 10-32 mm neutral inserts are applied.



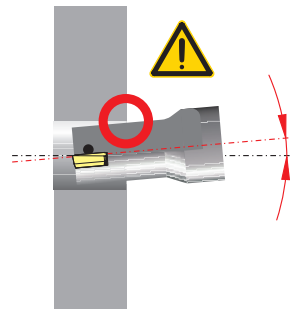
Through hole

With through holes a **sharp-edged disk** is created as tool break-out occurs. Safety measures are necessary.

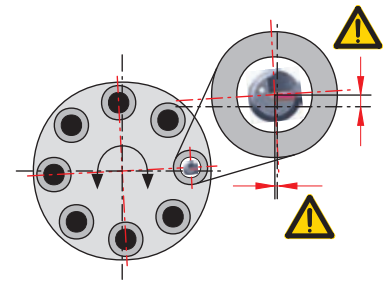
Axial displacement of the machine



Displacement in
x-direction



Angular error

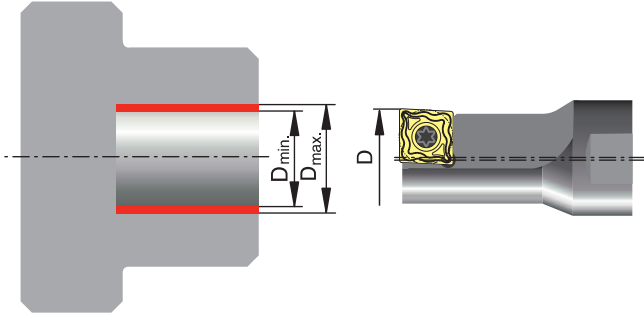


Turret position error



Off-center drilling

Thanks to the special construction of EcoCut tools and inserts off-center drilling is possible. Thus desired deviations from the tool's nominal diameter can be obtained (see table below).



Type of tool Solid carbide	Nominal tool D [inch]	Work piece bore diameter	
		D _{min} [inch]	D _{max} [inch]
ECM 04 L/R - 2.25D	.157	.154	.165
ECM 05 L/R - 2.25D	.197	.193	.205
ECM 06 L/R - 2.25D	.236	.232	.244
ECM 07 L/R - 2.25D	.276	.272	.283
ECM 08 L/R - 2.25D	.315	.311	.323

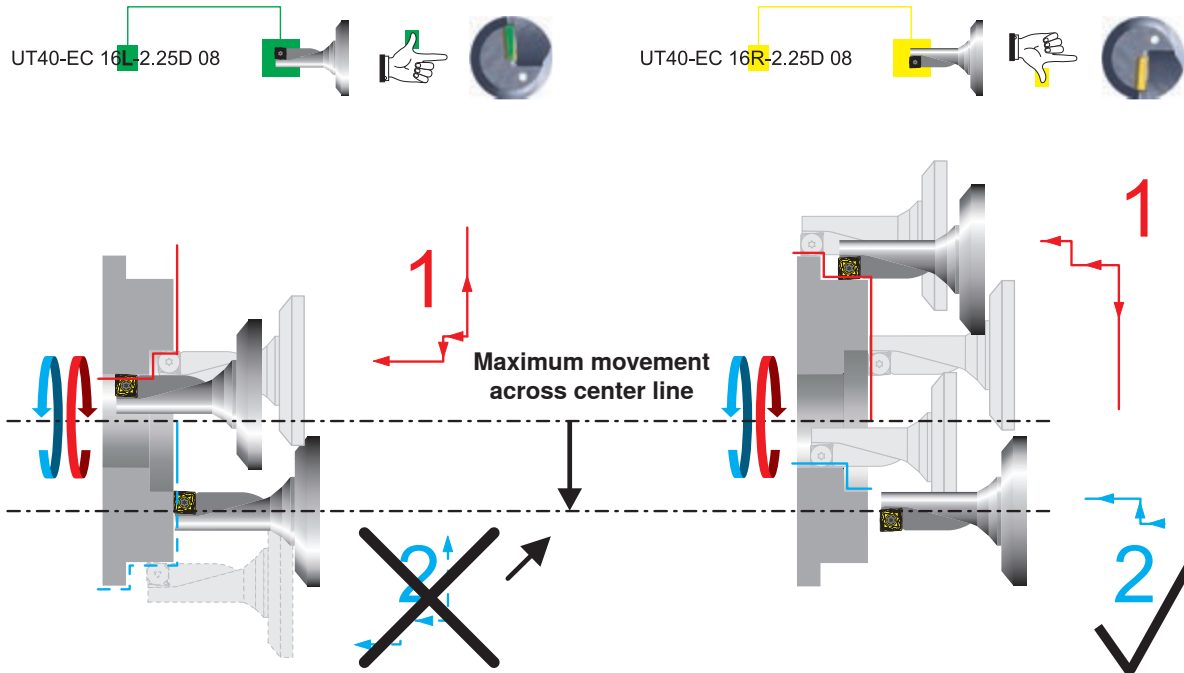
Type of tool	Nominal tool D [inch]	Work piece bore diameter	
		D _{min} [inch]	D _{max} [inch]
ECC 08 L/R - ... 04	.315	.309	.327
ECC 10 L/R - ... 05	.394	.388	.413
ECC 12 L/R - ... 06	.472	.467	.492
ECC 14 L/R - ... 07	.551	.542	.571
ECC 16 L/R - ... 08	.63	.624	.65
ECC 18 L/R - ... 09	.709	.703	.728
ECC 20 L/R - ... 10	.787	.78	.807
ECC 25 L/R - ... 13	.984	.976	1.016
ECC 32 L/R - ... 17	1.26	1.252	1.299



Application

Machining across center line

Machining across center line



Situation:

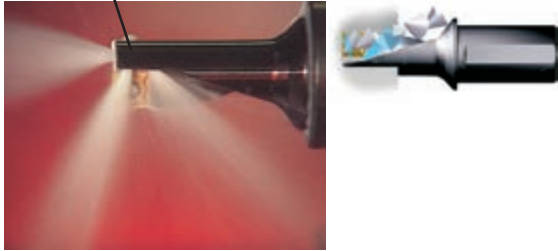
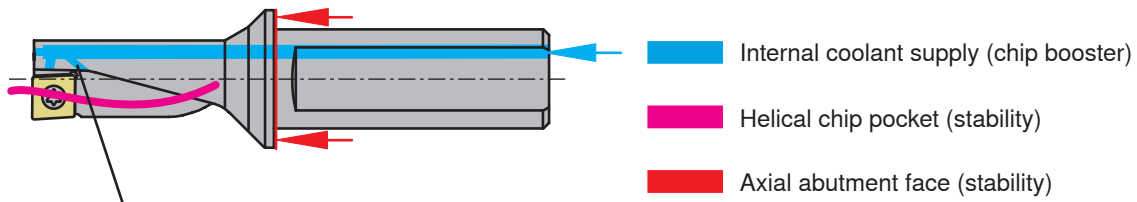
In case of insufficient movement of the machine across the center line the external diameter can not be machined with the same tool.

Solution

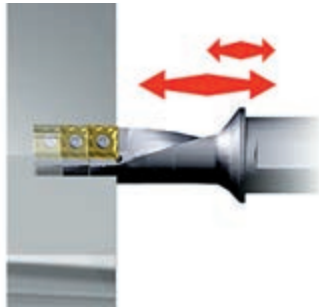
Use a right-hand EcoCut tool.



Chip booster/coolant pressure



EcoCut offers an innovative detail solution for **range 2.25D**, namely additional bidirectional coolant supply for better chip evacuation. An additional **backwards directed coolant stream** improves chip transportation from the flute area. Minimum coolant pressure required 22 - 44 psi.



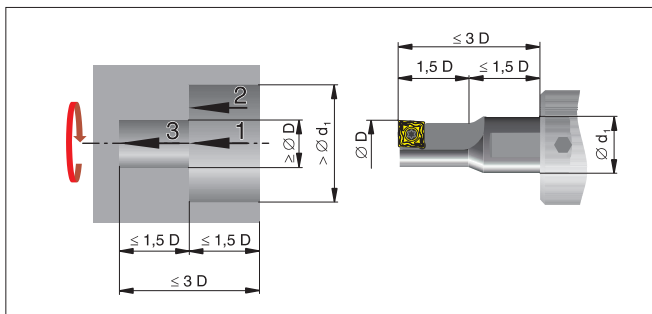
If the necessary coolant pressure is not available, it can be advantageous to interrupt the cutting action in order to clear the bore.

Technical information

Multi-function tools

Deep bores up to 3xD

With a stepped bore approach EcoCut tools EC..1.5D can be machined with holes of up to three times the nominal diameter (see picture). Operation sequences 1, 2 and 3 respectively should be followed.



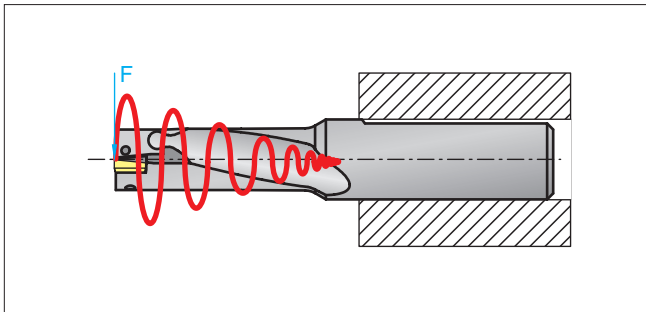


The advantages of DENSIMET compared to steel

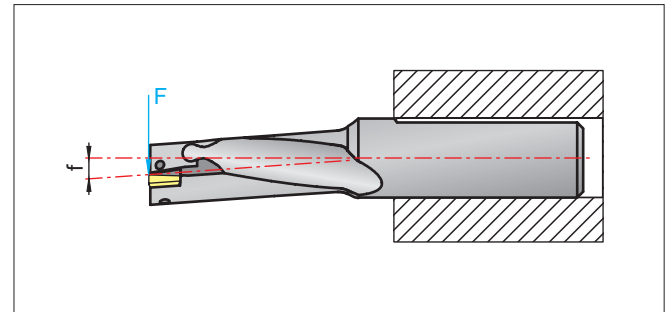
The new generation of our EcoCut 3.0D series with the new designation offers maximized performance. The tools are classified with the new designation **ECC .. R/L-3.0D .. H** and have particularly been developed for bigger drilling depths and maximum precision requirements. The material used here is

DENSIMET, a PLANSEE tungsten heavy metal alloy. The high modulus of elasticity as well as its density give this alloy very good vibration-damping properties. The result is highest precision, excellent surface quality and improved tool life.

Material	Nominal tool \varnothing	
	Modulus of elasticity (N/mm ²)	Density (g/mm ³)
Steel	210 000	7,85
DENSIMET	360 000	17,50

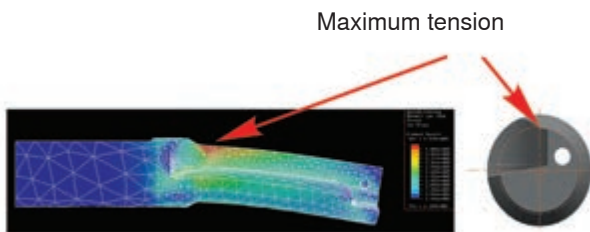


Vibration-damping



40% lower deflection than steel

The new chip flute design





Version with straight chip flute





Version with helical chip flute

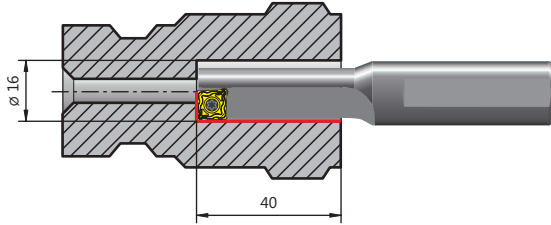
Up to 50% reduced tensions in the tool through Finite Element Modelling (FEM), optimized chip pocket design.



	Material	Type, description	Key size
	11206195	10002494/TORX 08IP F	T08IP
	11488748	10007404/TORX 07IP F	T07IP
	11843205	10014921/TORX 06IP F	T06IP
	11843208	10014922/TORX 09IP F	T09IP
	11450858	10006919/TORX 15IP	T15IP
	11816974	10013909/TORX 20IP	T20IP

	Material	Type, description	Length	Thread size	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11227305	M3,0x7,0-09IP/10003007	7.0	M3,0	T09IP	2,2	19,5
	11610311	M3,5X8,6-15IP/10008749	8.6	M3,5	T15IP	3,2	28,3
	11684214	M2,2x5,0-07IP/10009244	5.0	M2,2	T07IP	1,0	8,9
	11684216	M2,5x6,0-08IP/10009243	6.0	M2,5	T08IP	1,2	10,6
	11801441	M4,5X10,5-20IP/10013040	10.5	M4,5	T20IP	5,0	44,3
	11807480	M2,0x4,3-06IP/10013332	4.3	M2,0	T06IP	0,7	6,2
	11807484	M1,8x3,6-06IP/10013338	3.6	M1,8	T06IP	0,4	3,6

	Material	Type, description	Length	Thread size	Key size
	310720	7897990/M8X1X8 DIN913	8.0	M8	SW4



Technical data

Work piece	bush
Material	C45 ANSI 1045
Tensile strength	730 - 900 N/mm ²
Tool	ECC 16L-3.0D 08 H
Insert	XCNT 080304EN CTCP435
Competitor	2 tools

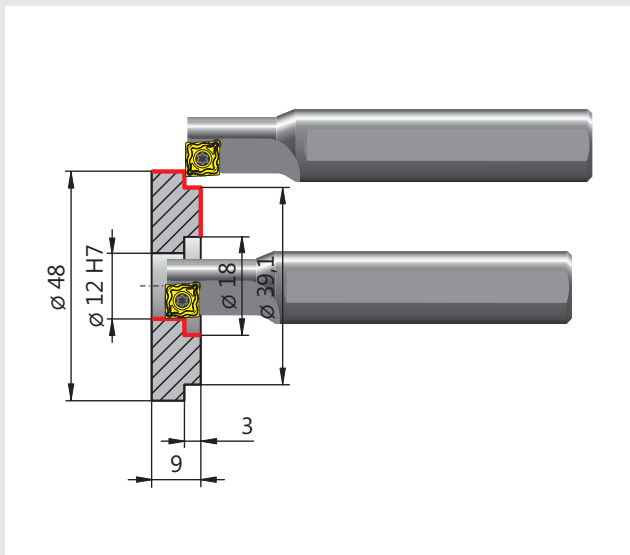
		Drilling	
V_c	[inch/min]	6.929	
f	[inch]	.002	
a_p	[\varnothing inch]	.63	

Criteria

- o Deep hole with 90° shoulder applying only one tool

Result

- o Machining time reduced by 50% compared to original machining method



Technical data

Work piece	flange
Material	16 MnCr5 / 1.7131 ANSI 5115
Tensile strength	800 - 900 N/mm ²
Tool	ECC 12L-1.5D 06
Insert	XCNT 060204EN CTCP435
Competitor	3 tools

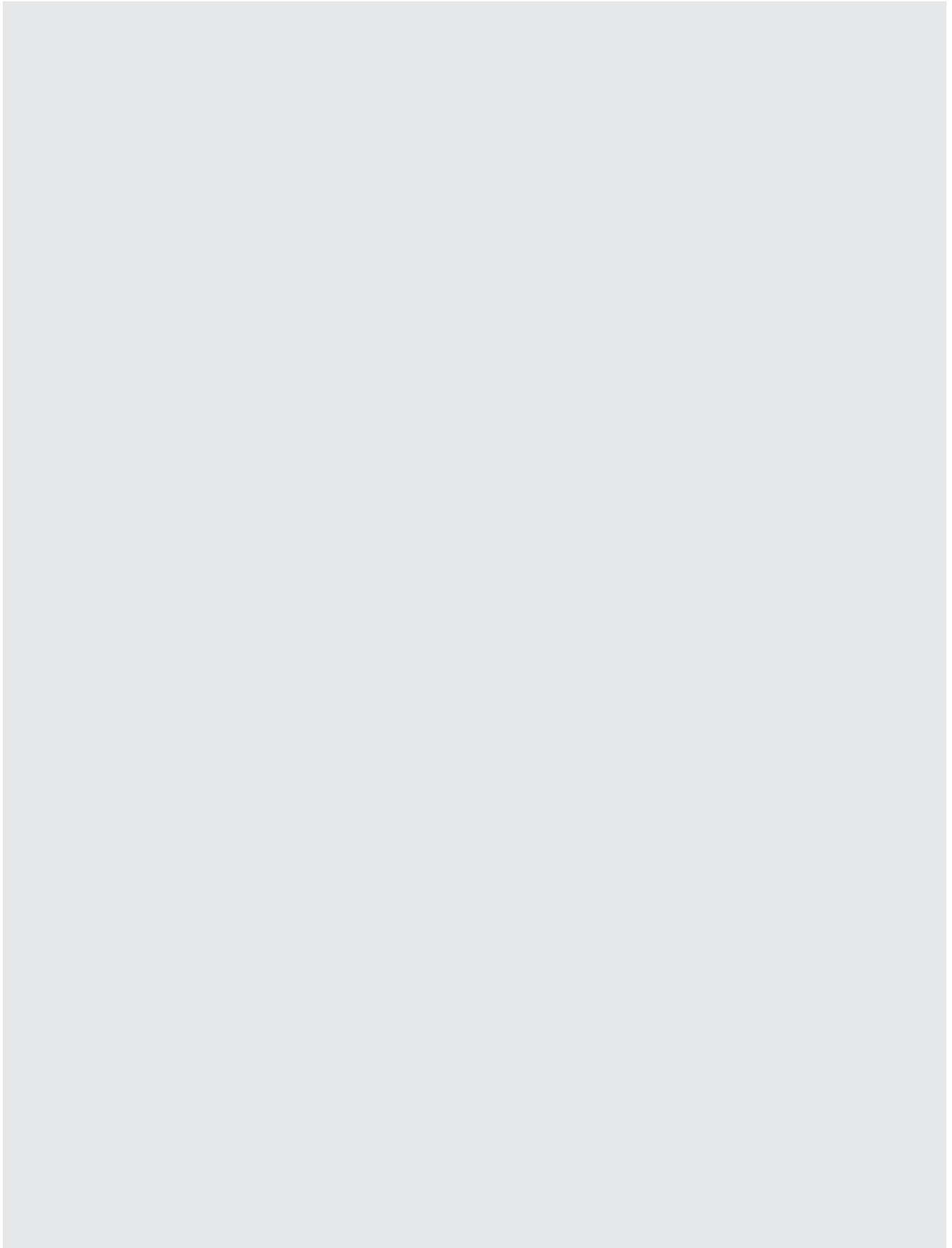
		Drilling	Boring	Face turning	External turning
V _c	[inch/min]	5.906	5.906	7.874	5.906
f	[inch]	.001	.004	.004	.004

Criteria

- Increase in productivity
- Fewer tools in the turret
- Reduction of tooling costs

Result

- 1 tool instead of 3
- Machining time reduced by 45%
- 2 additional tools in the turret





A	
A.. MCLN..	A155
A.. MDUN..	A157
A.. MTFN..	A160
A.. MVUN..	A163
A.. MWLN..	A165
A.. SCLC..	A167
A.. SDUC..	A169
A.. STFC..	A173
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CNGA	A80
CNGM	A64, A65, A66, A67
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CNGP	A64, A65, A66, A67
CNGX	A80
CNMA	A67, A80
CNMG	A64, A65, A66, A67
CNMM	A66, A67
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S.. MSKN..	A159
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S.. SSKC..	A172
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S.. SVUC..	A176
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SRSC	A144
SSDC	A145
STDC	A146
STFC	A147
STGC	A148
STTC	A149
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SVVC	A152
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TCMW	A89
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VCMW	A91
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AHSC..	B89
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MSS-E20..AX..		C167
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MSS-E20..GX16..		C161, C164
MSS-E20..GX24..		C162
MSS-E20..GX24..A..		C165
MSS-E20..SX..		C168
MSS-E20..TC16..		C191
MSS-E25..AX..		C167
MSS-E25..FX..		C170, C171
MSS-E25..GX16..		C161, C164
MSS-E25..GX24..		C162
MSS-E25..GX24..A..		C165, C166
MSS-E25..SX..		C168
MSS-E25..TC16..		C191
MSS-E32..FX..		C170, C171
MSS-E32..GX16..		C161, C164
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XLC..41 FX		C180
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XLC..65 FX		C180
XLC..82 FX		C180
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XLC..SX..		C176, C177, C178



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C900.. 3D..	D10, D11
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C900.. 4D..	D12, D13
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C900.. 5D..	D14
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S

SONT	D7
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ECC	E20, E21, E22
X	
XCET	E14, E15, E16
XCNT	E14, E15, E16



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