TOOLOX®

ENGINEERING & TOOL STEEL

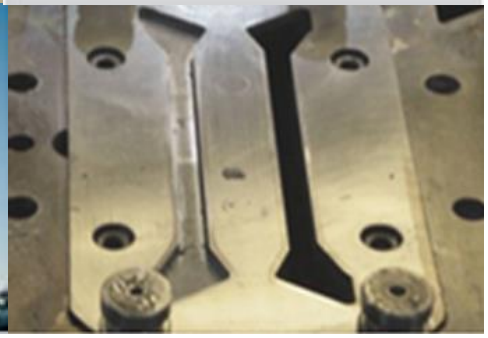
Toolox for plastic moulds

SSAB

DOMEX®
HIGH STRENGTH STEEL

HARDOX®
WEAR PLATE

DOCOL®
HIGH STRENGTH STEEL



WELDOX®
HIGH STRENGTH STEEL

PRELAQ®
COLORFUL BUILDING

ARMOX®
PROTECTION PLATE

TOOLOX®
PREHARDENED TOOL STEEL

SSAB


KASSETT
FILTER


SMS

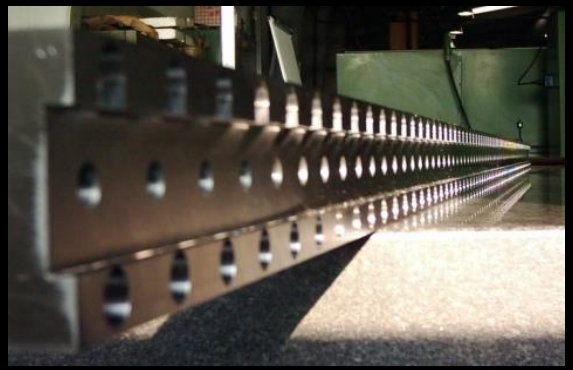
TOOLOX

Plastic moulds

Cold forming

Hot forming

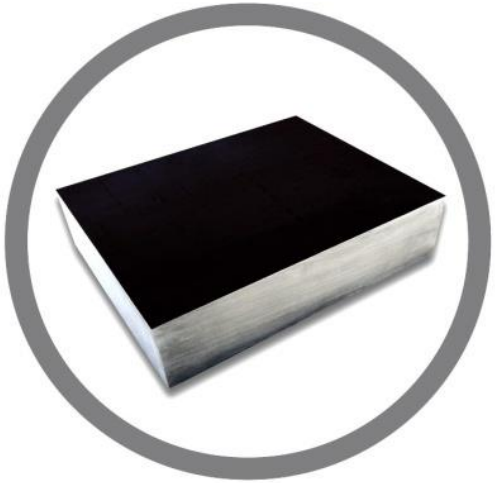
High friction
(Clamping/Holding)

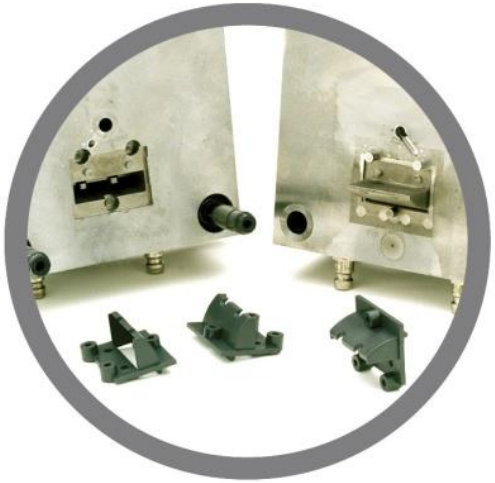


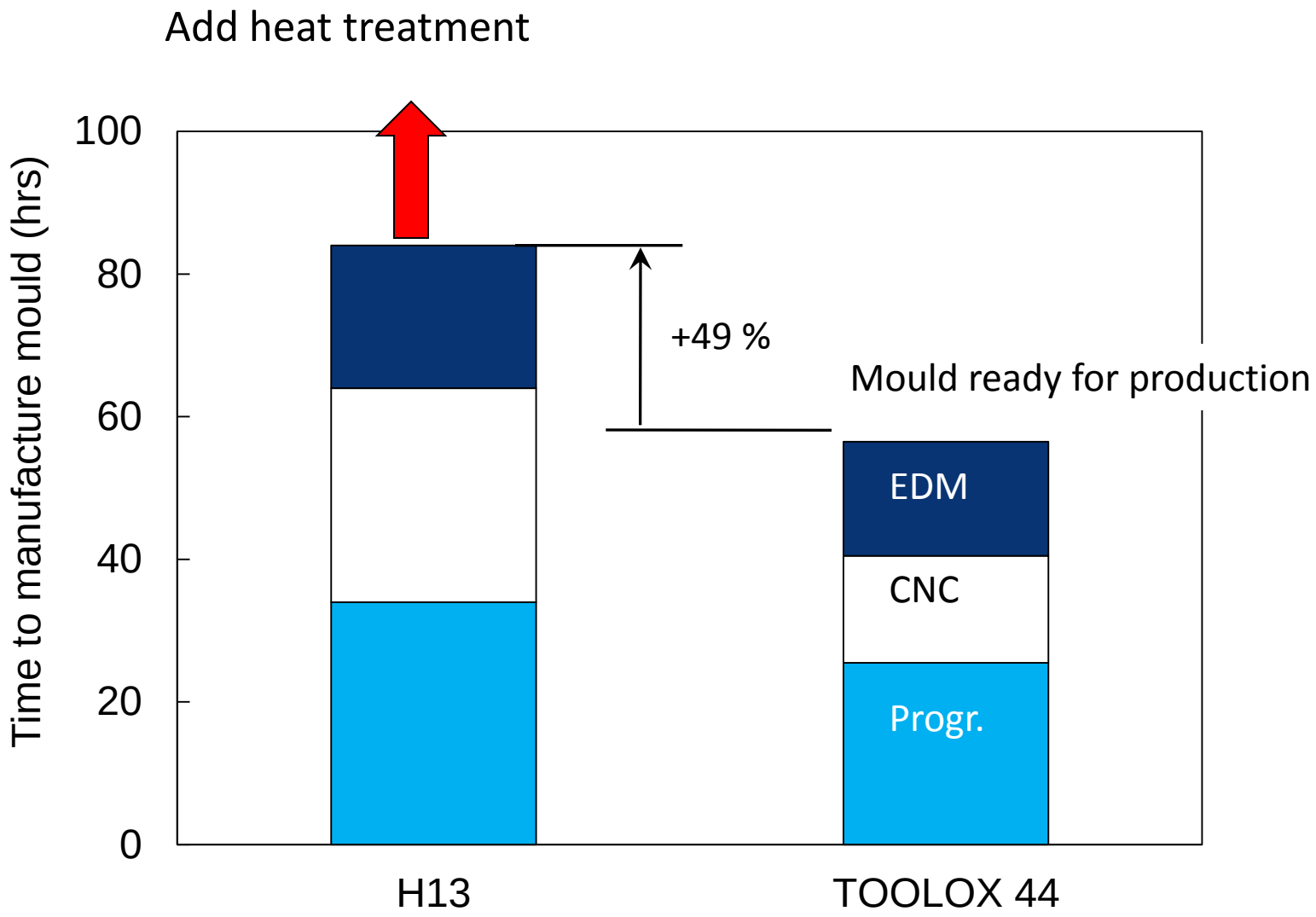
Low friction
(Sliding/Guiding)

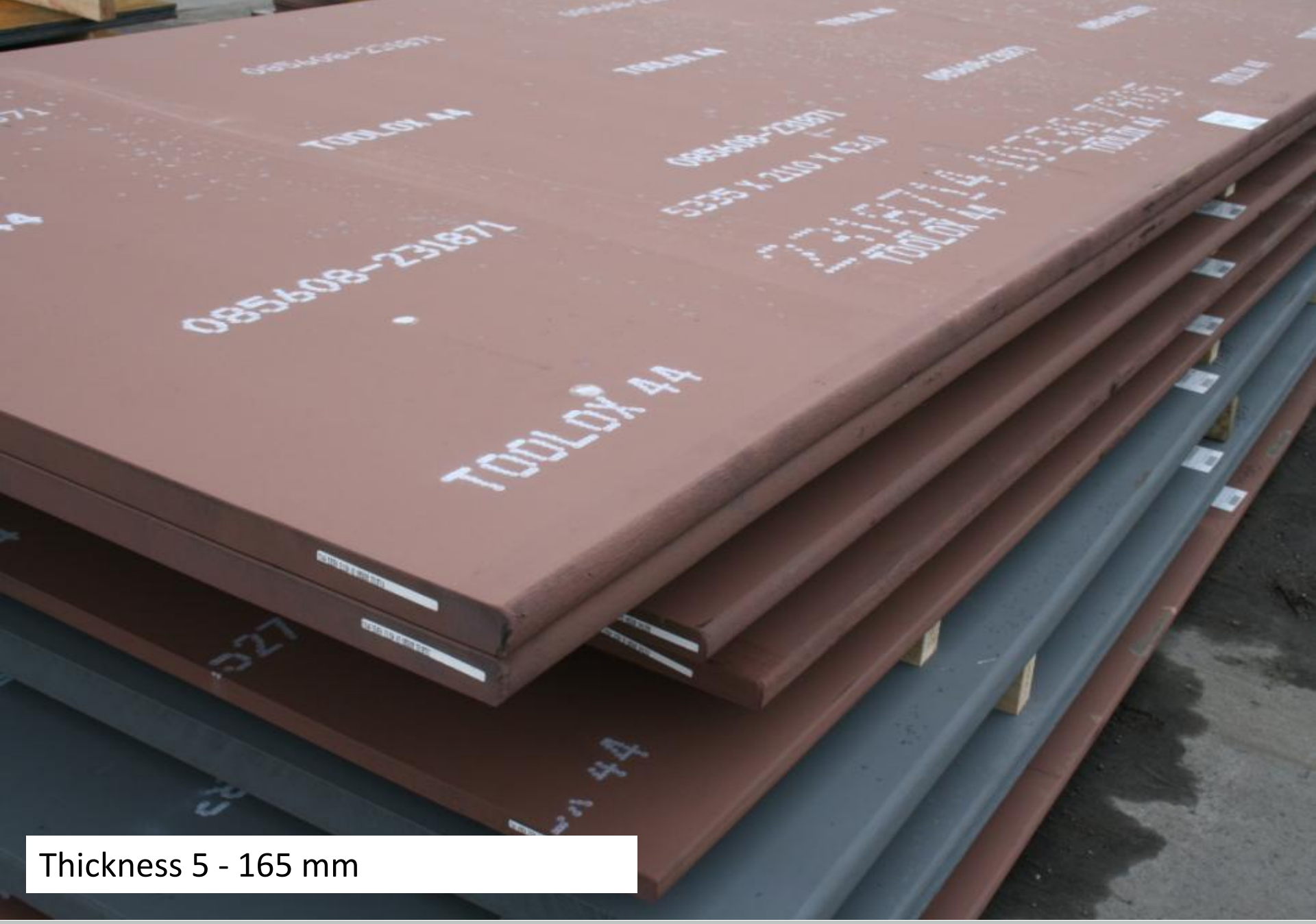
Structures
(Mechanical properties,
High temp.)

	TOOLOX 33	W.Nr 1.2738 (P20+Ni)	TOOLOX 44	W.Nr 1.2344 (H13)
Hardness	280-330 HBW	280-325 HBW	410-475 HBW	None
Toughness	Min 27 J @ RT	None	Min 18 J @ RT	None
ESR-prop.	Yes	No	Yes	Optional
C	0.21-0.26	0.35-0.45	0.30-0.34	0.37-0.43
Si	1.0-1.2	0.20-0.40	1.0-1.2	0.90-1.20
Mn	0.7-0.9	1.30-1.60	0.7-0.9	0.30-0.50
P	Max 0.010	Max 0.035	Max 0.010	Max 0.030
S	Max 0.003	Max 0.035	Max 0.003	Max 0.030
Cr	1.0-1.3	1.80-2.10	1.3-1.4	4.80-5.50
Ni	-	0.90-1.20	-	-
Mo	0.15-0.40	0.15-0.25	0.75-0.85	1.20-1.50
V	0.09-0.12	-	0.13-0.15	0.90-1.10
CE_{IIW}	0.61-0.73	1.01-1.27	0.90-0.94	1.80-2.13






Add heat treatment
Time to manufacture mould (hrs)
100
80
60
40
20
0
+49 %
Mould ready for production
EDM
CNC
Progr.
H13
TOOLOX 44



Thickness 5 - 165 mm

Toolox 33	300 HB
Toolox 40	40 HRc
Toolox 44	45 HRc

+ Nitriding, PVD etc

SSAB OXELÖSUND

Inspection certificate A02	Issuing department A05	Purchaser order no A07	Our order no A08	Certificate no and date A03
EN 10 204 - 3.1	Quality Inspection	November/December	10071412	12611344 2009-02-20

Consignee A06	Product B01	Marking (Stamping) B06	Standard/rules OX B02
SSAB Oxelösund AB Antwerp Stock C/o Bvba Thor Shipping & Transport 2030 Antwerpen Belgien Belgium	Tool steel	Trade mark, PLATE ID NO	Steel grade TOOLOX 33

Dimensions [mm] B10-B12	Weight [kg] B13	PLATE ID NO B07	Deliv. Cond. B04	Internal code B16
T 53 W 2080 L 5240	4648	090259-768709	Q	21059

Purchaser A11	Customer marks B15
SSAB Oxelösund AB C/O Bvba Thor Shipping & Transport Quay	

Chemical composition C71-C92

Heat no	C	Si	Mn	P	S	Cr	Ni	Mo	V	Ti	Cu	Al	Nb	B	N
090259	.25	1.05	.80	.010	.001	1.20	.06	.345	.112	.011	.01	.011	.017	.002	.003

Carbon equivalent etc C93-C99

C04 Testtype	C00 Millcode	C01 Specimen position	C02 Direc-tion	B05 Treat-ment	C10 Specimen type	C03 Temp [degr C]	Test results			
Tensile Test	207542	Top end	Transvers	Delivery condition	Round		C11 Rp0.2 [MPa] 854	C12 Rm [MPa] 963	C13 A5 [%] 19	
Impact test	207542	Top end	Transvers	Delivery condition	Charpy-V 10x10	20	C42 E [J] 142	C42 E [J] 144	C42 E [J] 149	C43 Ave [J] 145
Hardness test (HBW)	207542	Top end		Delivery condition			C32 Ave 307			

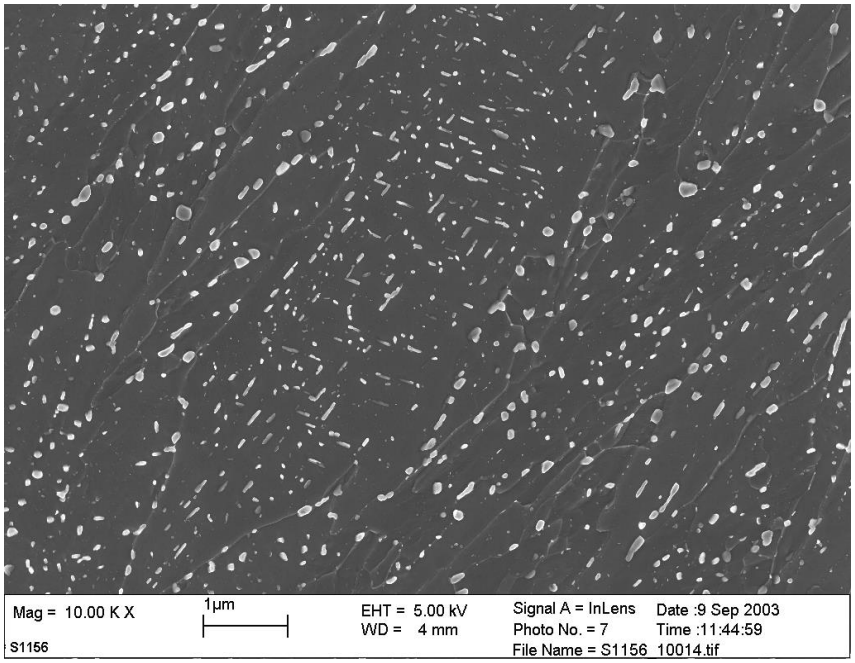
Ultrasonic testing: Satisfactory results according to:

TOOLSTEEL

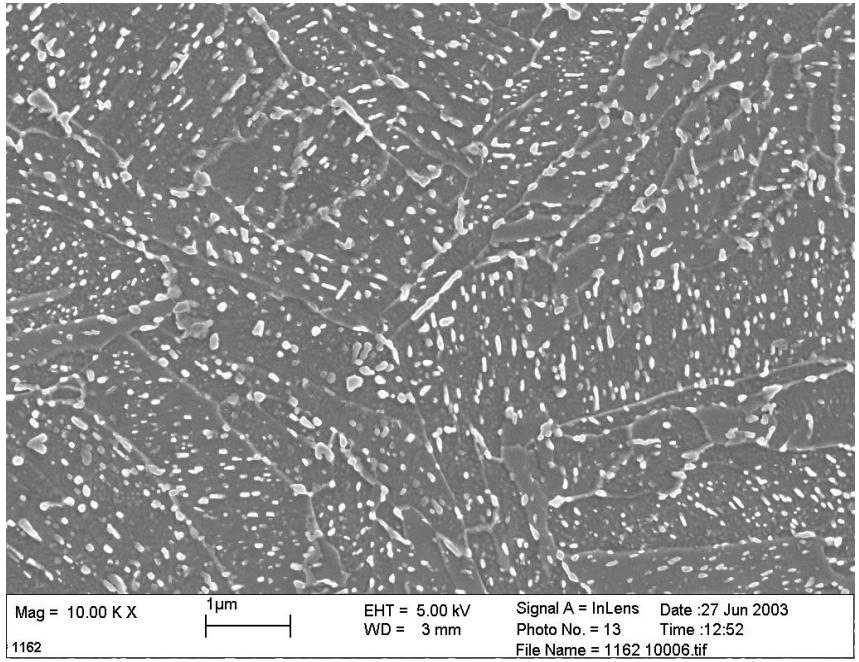
Z02		Z01	A04
It is hereby certified that the material described above complies with the requirements of the order.		This certificate is produced with EDP and valid without signature Quality Inspection Department/ I Ivarsson / R Persson	TOOLOX 33

SSAB

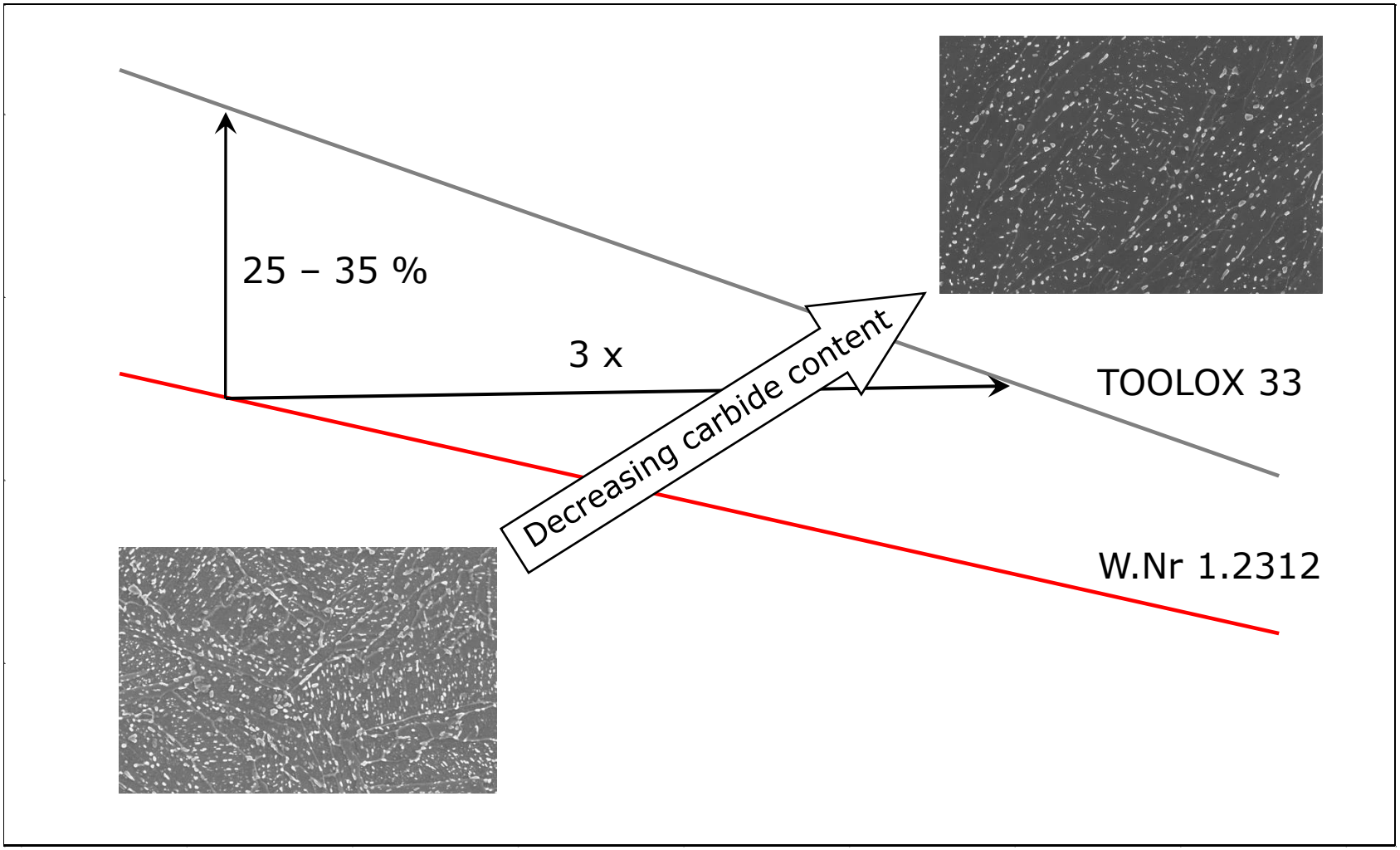
Differences in carbide morphology



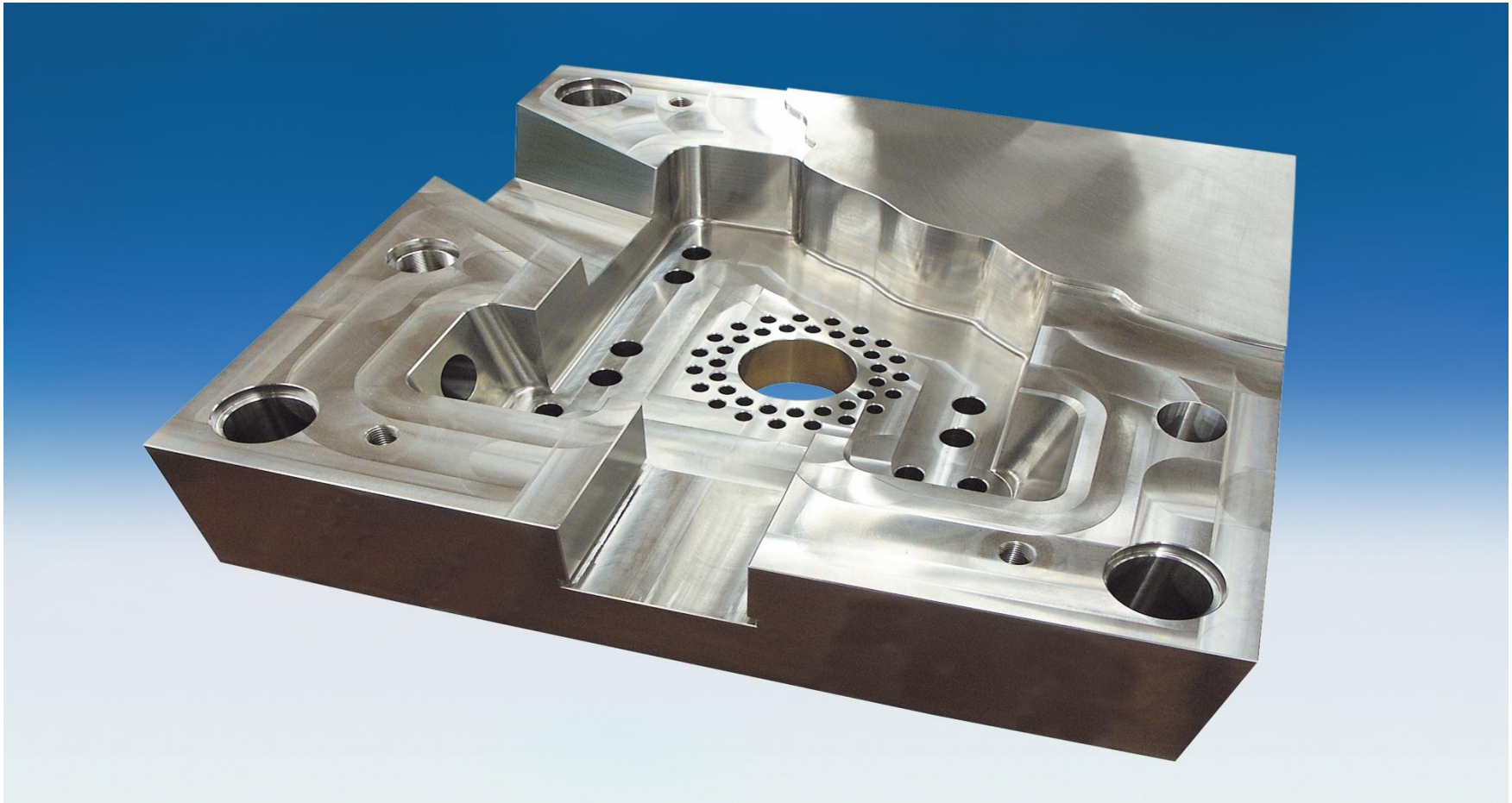
- **Area fraction of carbides 6.4 %**



- **Area fraction of carbides 10.0%**

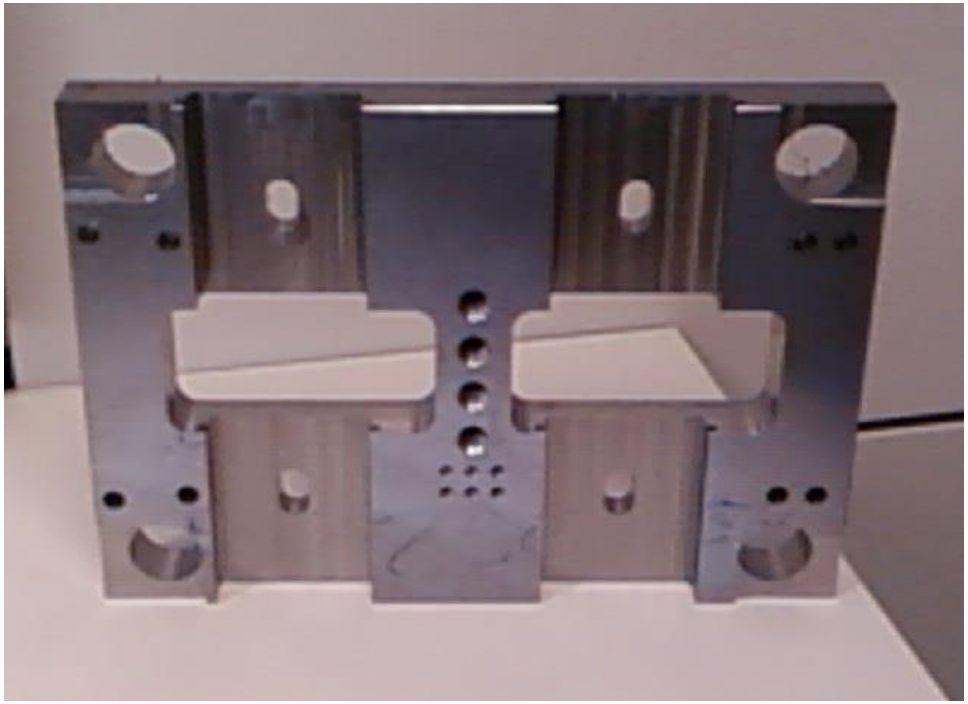

25 – 35 %
3 x
Decreasing carbide content
TOOLOX 33
W.Nr 1.2312
Milling speed
Insert life length

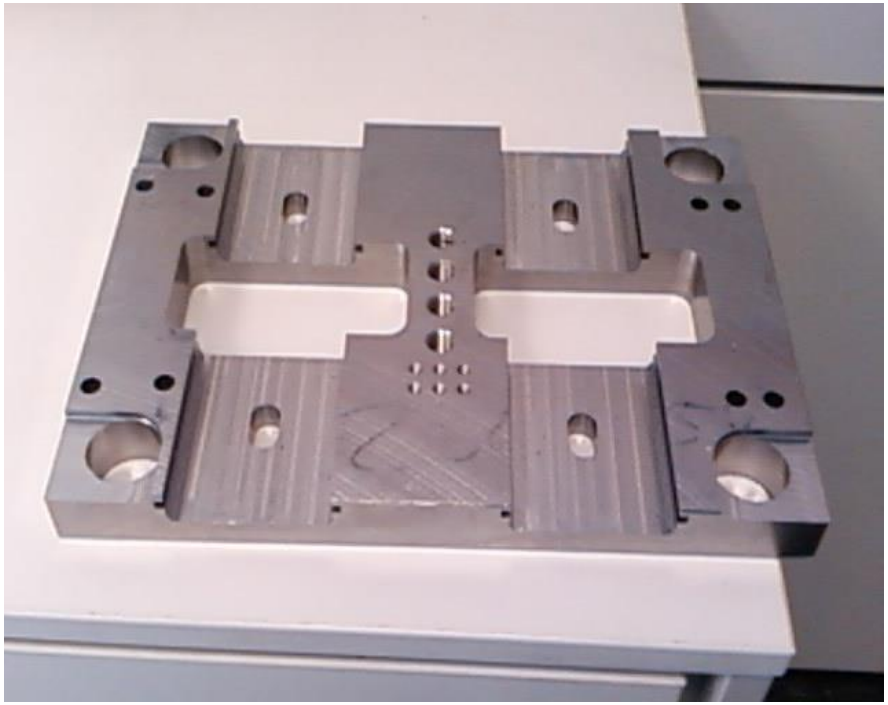
HASCO – test piece TOOLOX 33



	1.2312	Toolox 33
Material Cost	671	976
Machining	4,960	3930
Stress Reliving	191	0
Griding	260	70
Total Cost after 70 Hr.	6,062	4,976

HASCO – test piece
TOOLOX 44





HASCO – results machining TOOLOX 44

- Milling with average speeds for hard milling possible
- Very good behavior when drilling and thread milling with very low tool wear
- Long hole drilling with 30 x D possible
- Optimal surface quality after finishing
- Safe behavior when achieving close tolerances
- The test piece was absolutely stress free
- Thanks to this production using clamping is possible
- Usage of tools for hard milling necessary

NYBRO STÅLPRODUKTER AB — Kontrollavdelningen

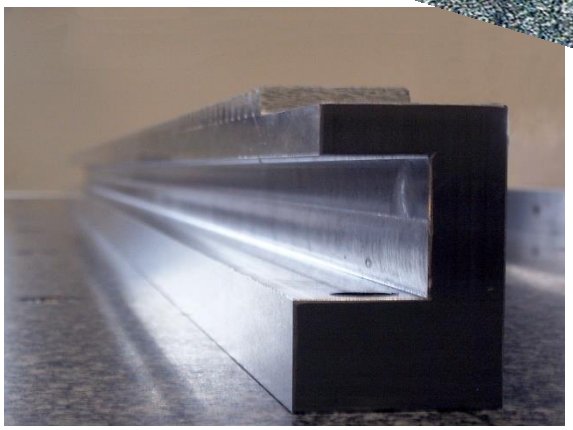
Kund: — Artikel: KUGGSTÅNG

Ritn.nr: 2-621 308 0 — Order.nr: 161323

Date: 03.02.25 — Time: 09:43:25

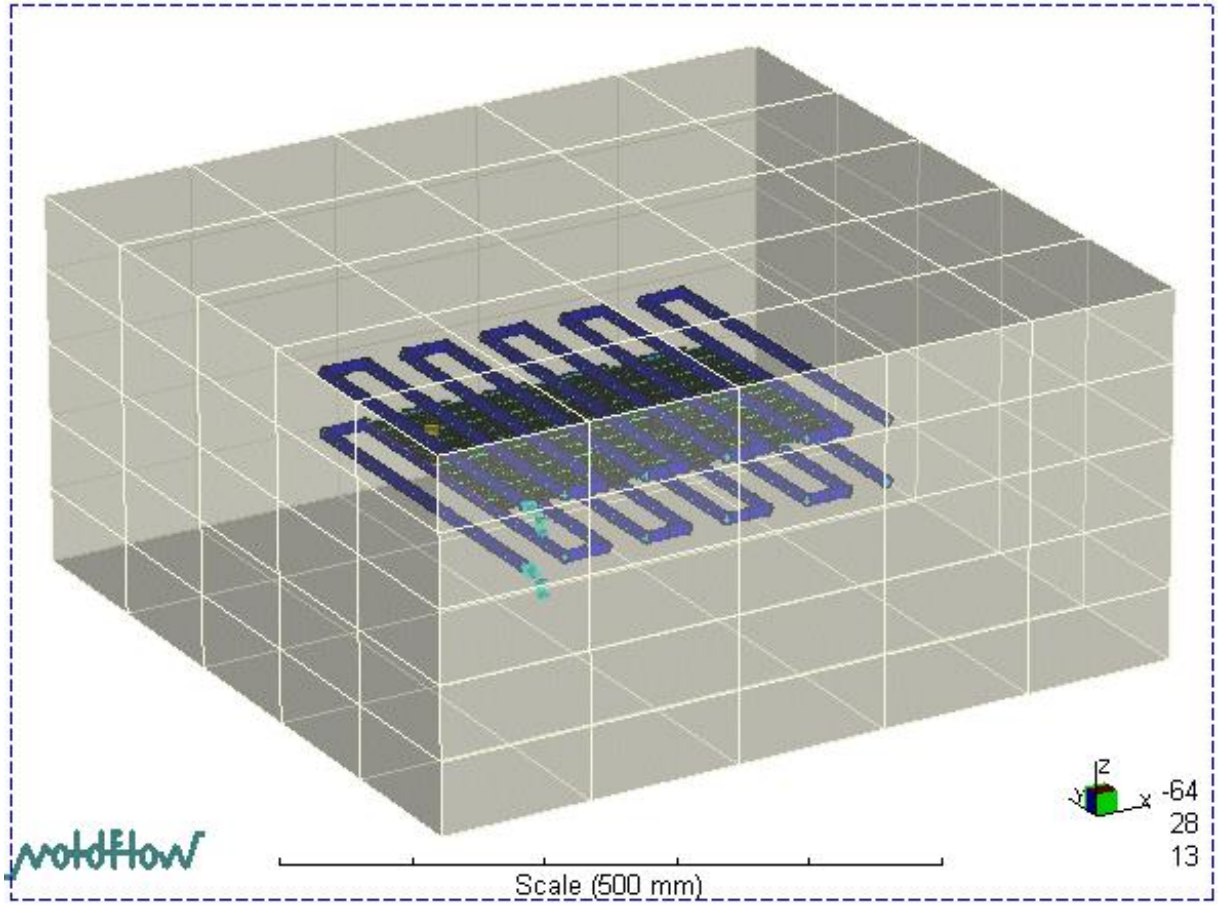
Uppmätta mått enligt ritning.

# 3 PLAN	Ref.sys 1						
Planhet	ÄR 0.136						
# 4 LINJE	Ref.sys 1						
Rakhet	ÄR 0.004						
# 5 PUNKT	Ref.sys 1						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
Z	-39.982	-40.000	-0.018	0.000	-0.100		
# 6 PUNKT	Ref.sys 1						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
X	1830.034	1830.000	0.034	1.200	-1.200		
# 8 PUNKT	Ref.sys 2						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
X	11.988	12.000	-0.012	0.021	-0.021		
# 10 LINJE	Ref.sys 2						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
X	-0.052	0.000	-0.052	0.100	-0.100		
# 11 CIRKEL	Ref.sys 2						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
	-904.998	-905.000	-0.002	0.800	-0.800		
	24.934	25.000	-0.066	0.200	-0.200		
	12.003	12.000	0.003	0.018	0.000		



Tommy Petterson, Stena Stål. ”To start with flat instead of round material saved a lot of production time. The gear-racks were absolutely straight; 0.004 mm sidewise deflection and 0.136 mm longitudinal deflection on 1.8 m measuring length!”

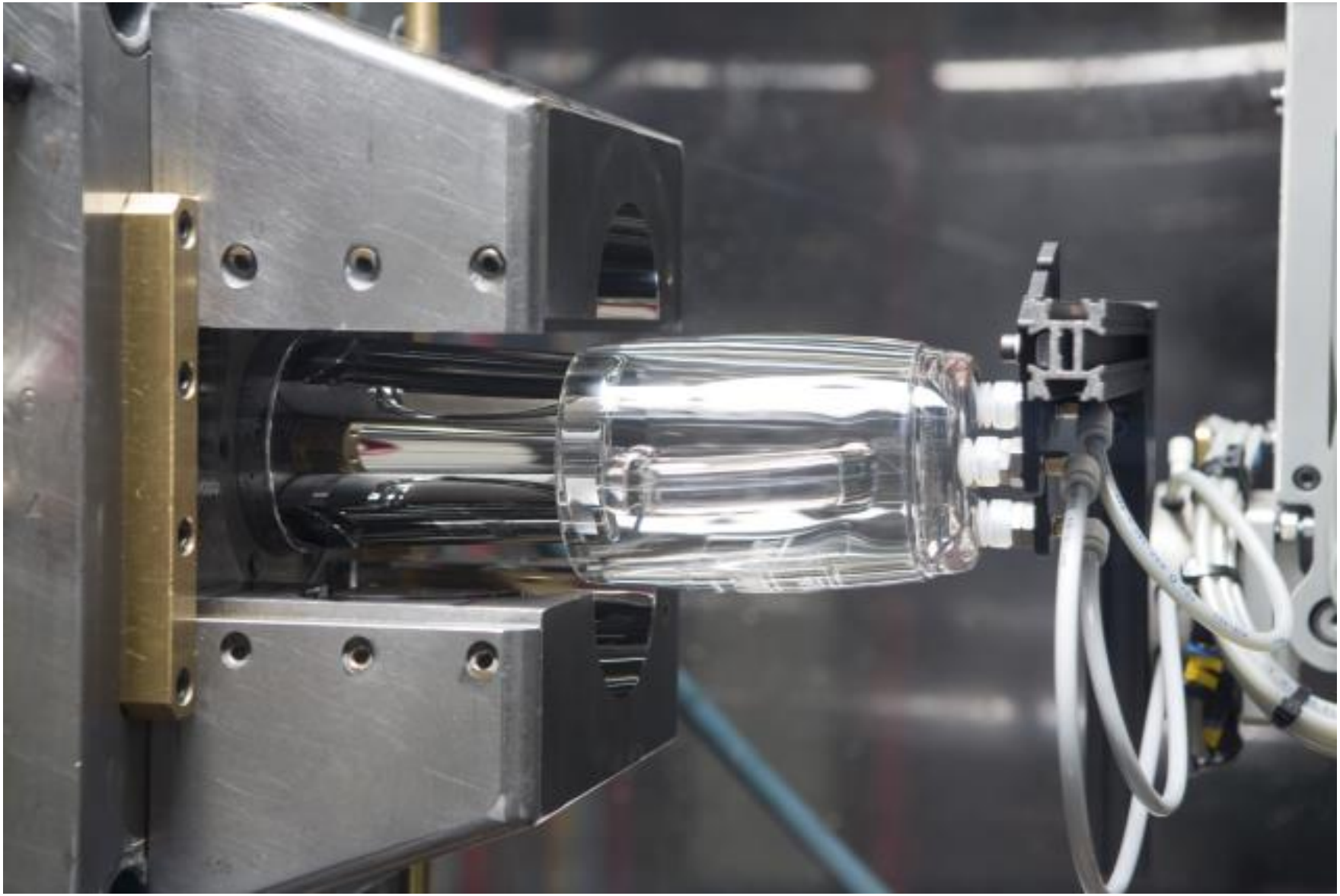
Thermal conductivity…

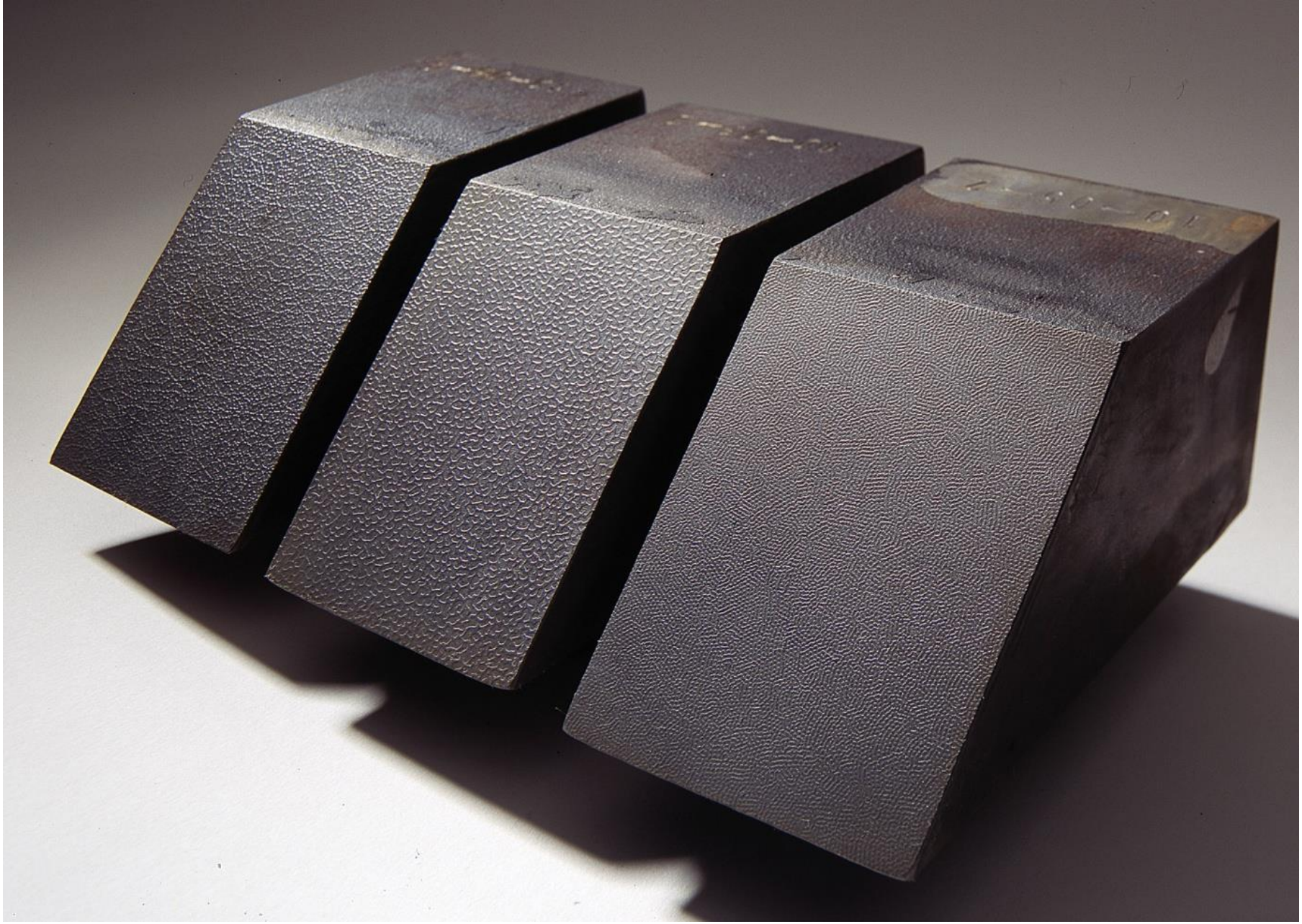


Thermal conductivity…

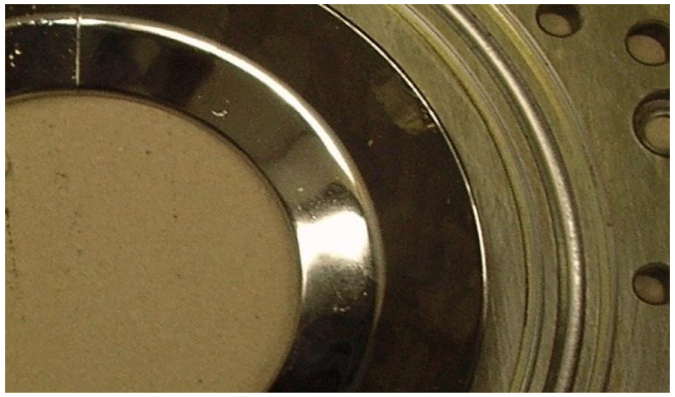
- Higher mould thermal conductivity will shorten the cooling time.
- The analysis shows that a reduction in cycle time due to the increased thermal conductivity of TOOLOX 44 gives 3-5 % shorter cooling time when compared to W.Nr 1.2344 (Q&T to 45 HRC)


ZANOLA
WWW.LUCIDATURASTAMPI

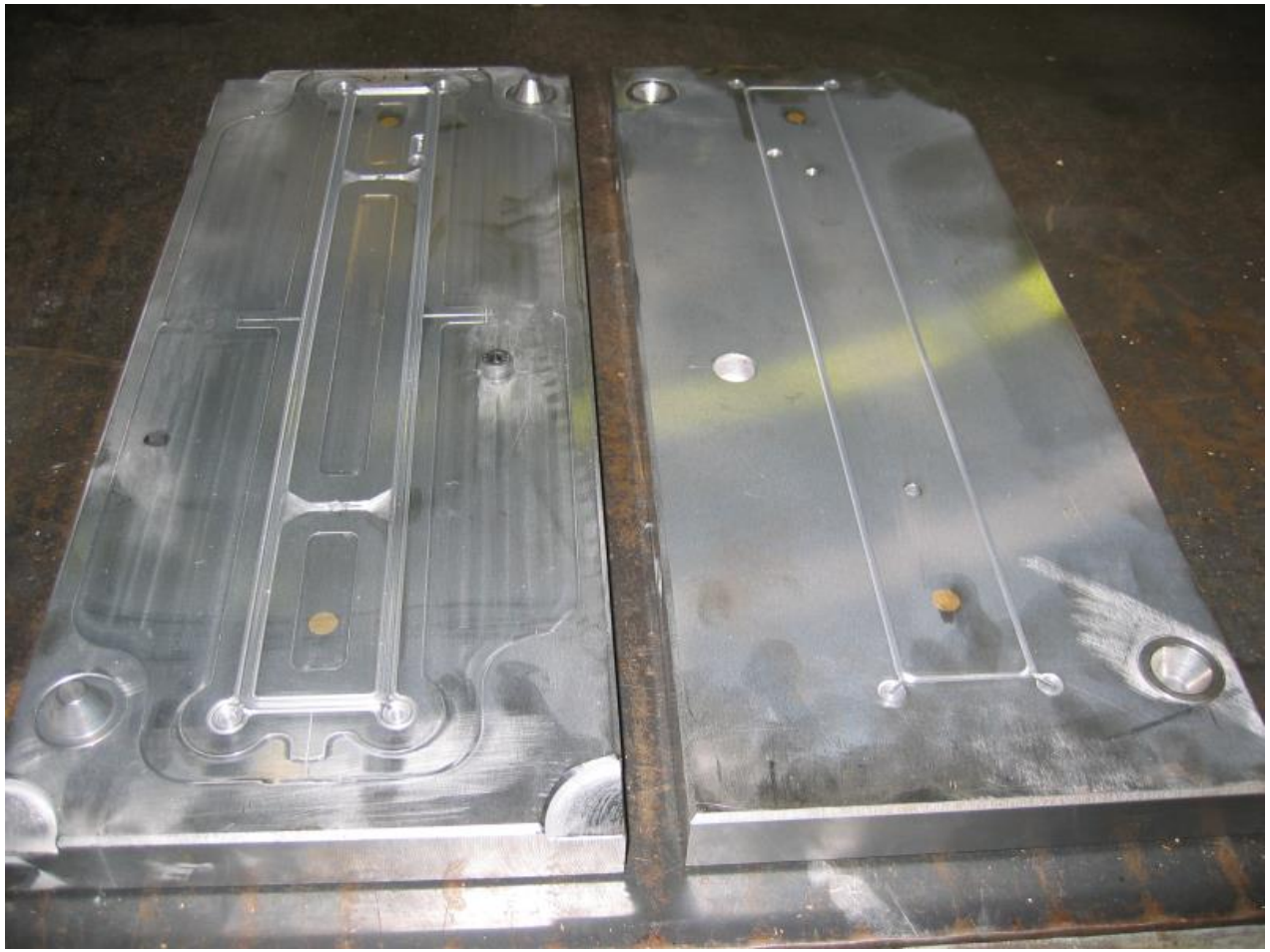




Polycarbonate plastic cover for a head light glass



Toolox 33 for car motor sealing



Front grill for Ford car
Toolox 44

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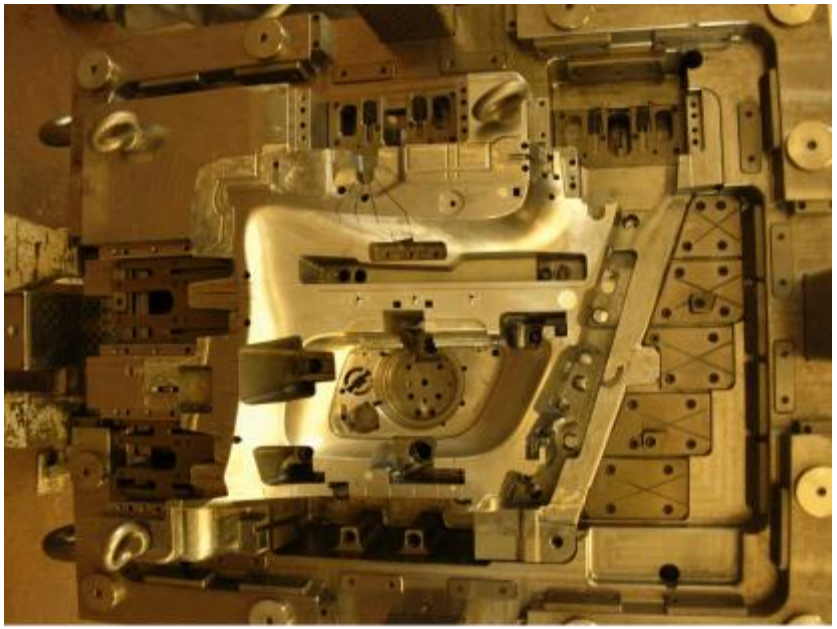
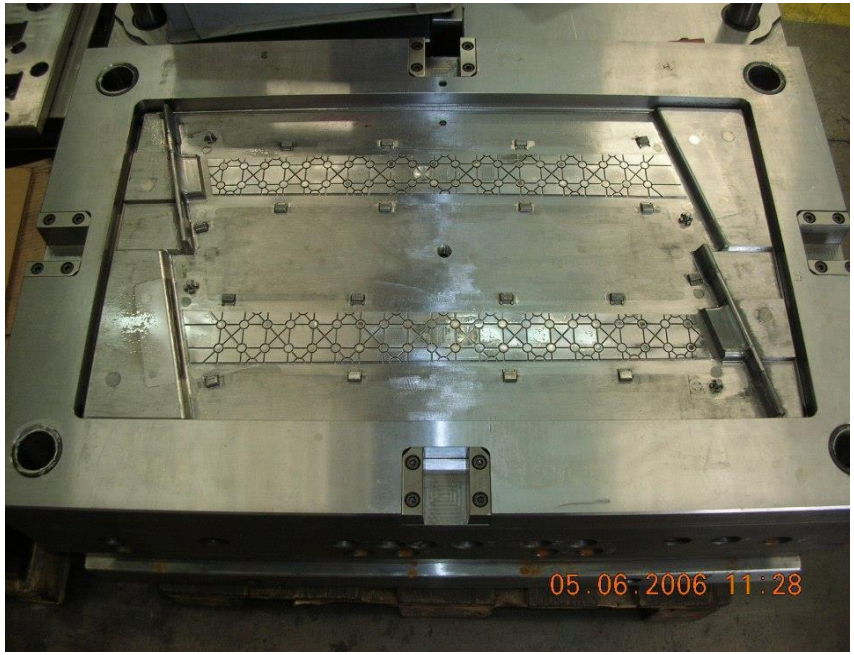
TOOLOX 44 in a mould for Audi TT



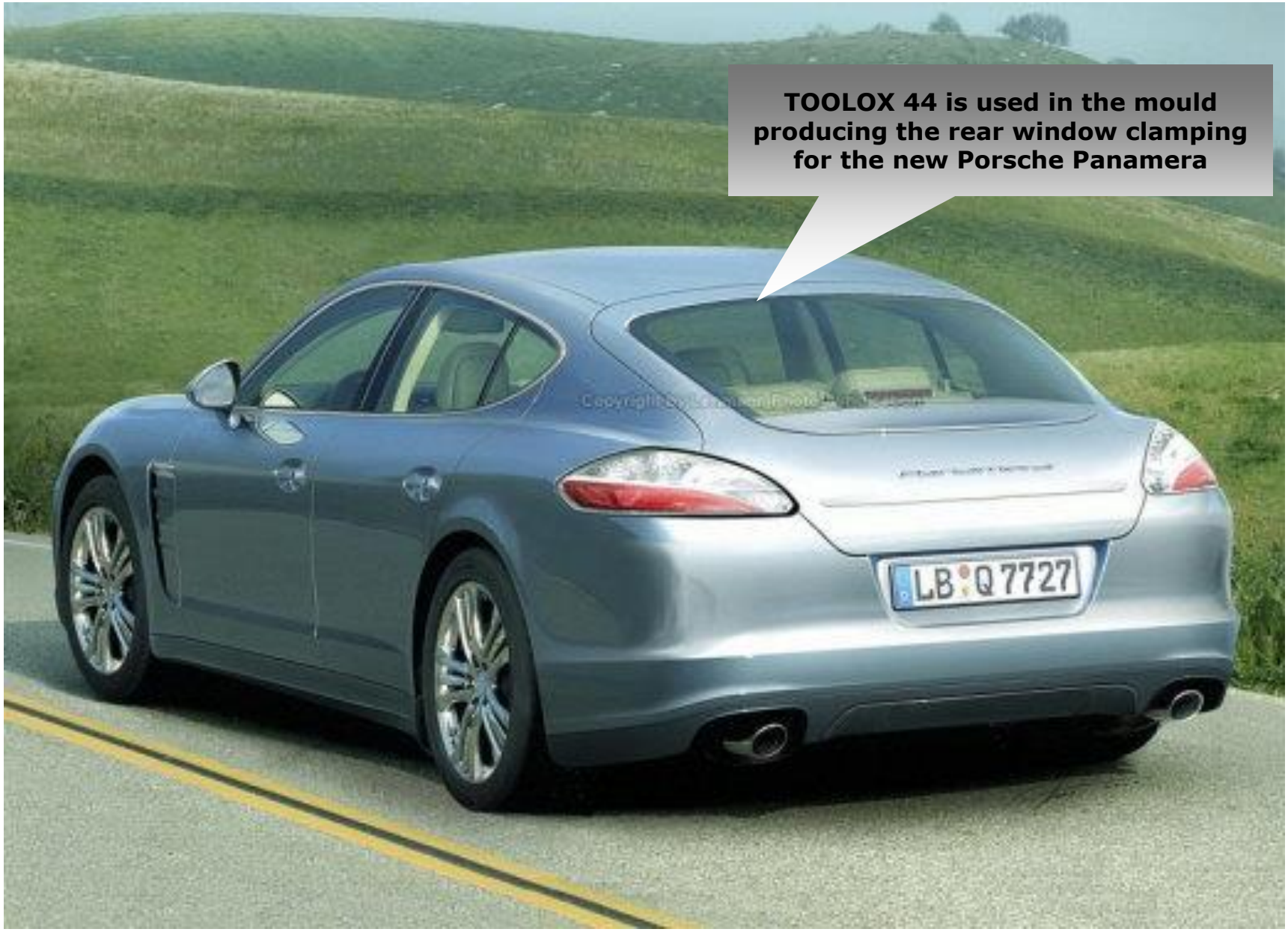
All inserts are made in TOOLOX 44

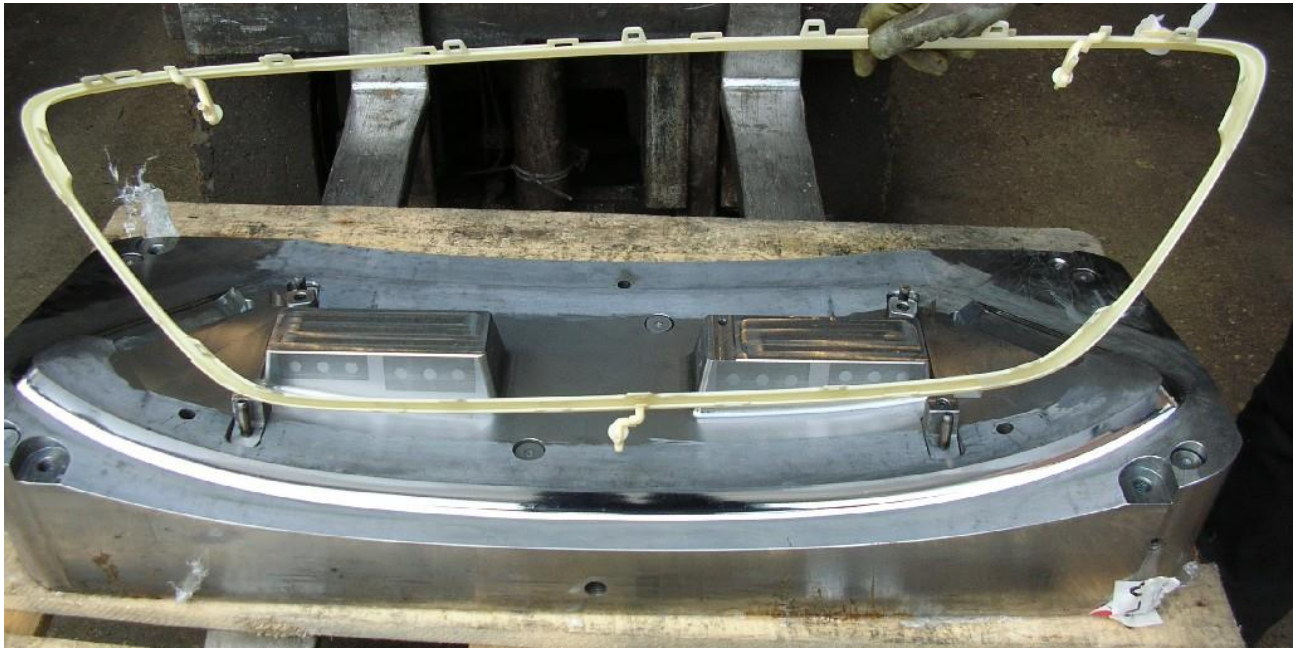
W.Nr 1.2738 HH due to the large thickness (400 mm)

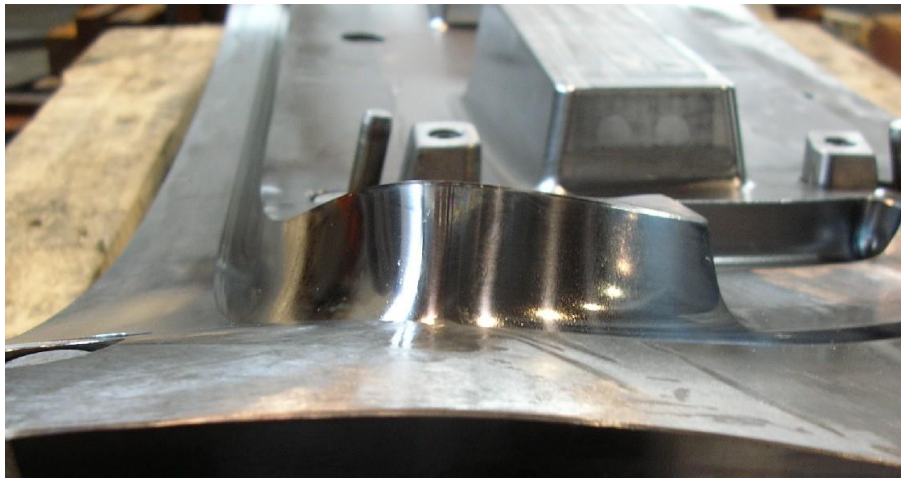


Mould for injection moulding of an automotive security belt guide. The temperature of the molten plastic during injection is estimated to 220°C. This gives an estimated mould surface temperature of 80°C.
A 600x400x110 mm TOOLOX 44 blank was used. Due to elimination of heat treatment in mould production, manufacturing time was reduced by 25-30 %. The total mould cost was decreased with around 2.5 €/kg

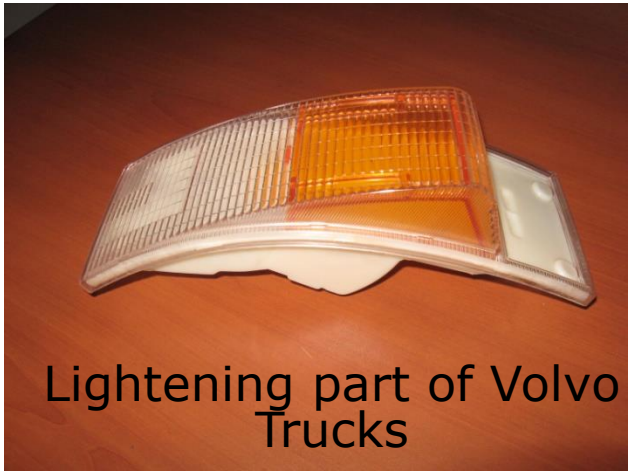
The mould maker experienced slightly more difficulties during machining as compared to the previously material used. Electro-erosion was made with good result and very small deformations. No surface hardening was carried out.


TOOLOX 44 is used in the mould producing the rear window clamping for the new Porsche Panamera
LB Q 7727

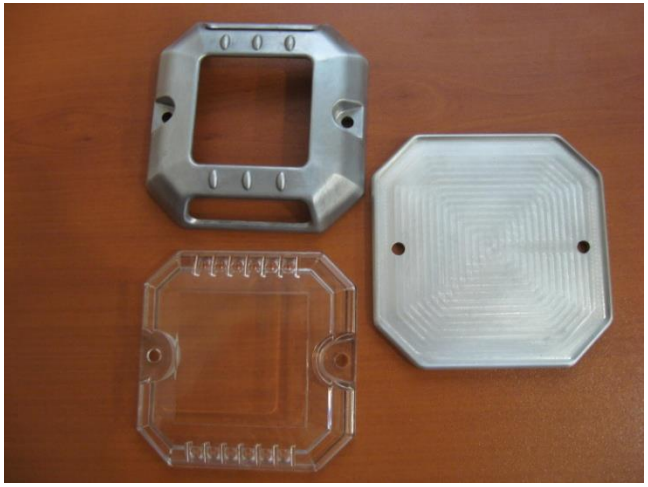




Mold producer: Bay Plastik/Turkey
Raw Material:Acrylic
Much better machinability
than 1.2738
Higher polishabilty than 1.2738



Lightening part of Volvo Trucks



Cover for motorcycle lamp
1 week shorter manufacture time
Much lower cost
Full series made with excellent result

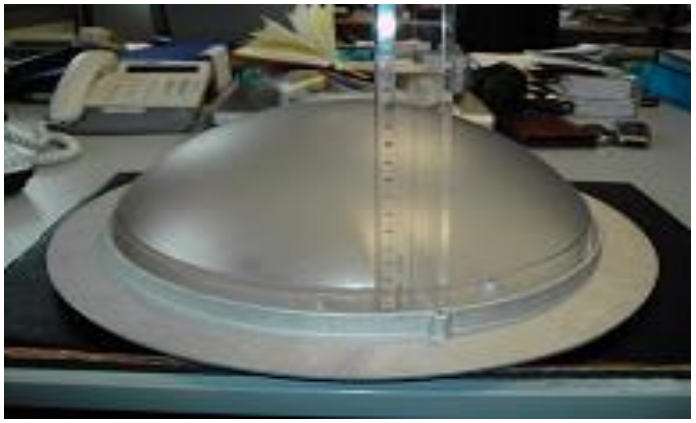
TOOLOX 44 in a mould for door handle to Fiat

W.Nr 1.2343 Q&T was the earlier choice.

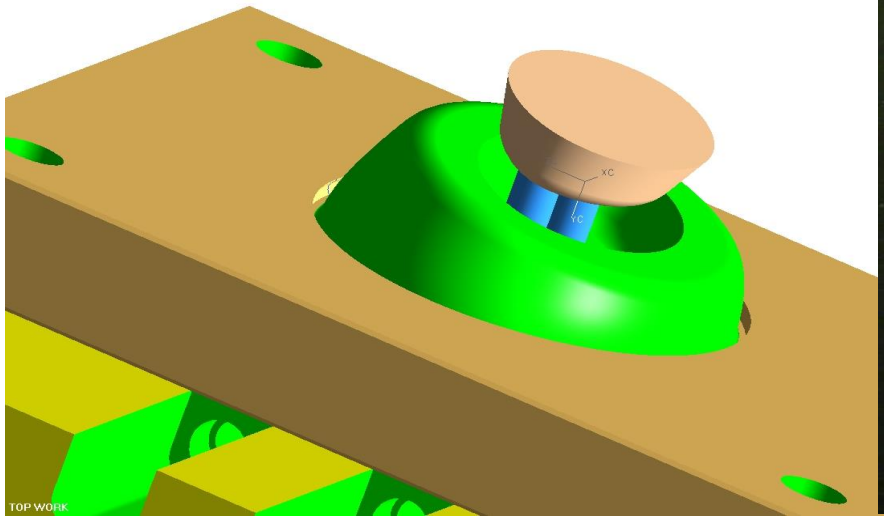
TOOLOX 44 is now the choise to shorten mould manufacturing time.


The mould producing the central tunnel for the Mercedes E class is made in TOOLOX 44
CLASSE E
EVO

Nitrided TOOLOX 44 was used in a mould producing glass-fibre reinforced nylon components.
The demand of mould service life was production of 50,000 components.



Polycarbonate plastic
1.2343 ESR > Toolox 44
Machining from 130 mm > 20 mm



Conventionally 1.2344 would normally have been used. By using Toolox 44 at least 5 days were saved in the manufacture of this core. Two to three days in heat treatment and two days extra wire erosion and machining.

Plastic mould. Tap of spice grinder. Nitriding will be made.
Polishing better than 1.2738

Company : World 4th Largest LCD TV Manufacturers (China)

Product : 46’’ LCD TV Frame

Work Material : ABS+~45%GF

Moulding Temp. : ~100°C

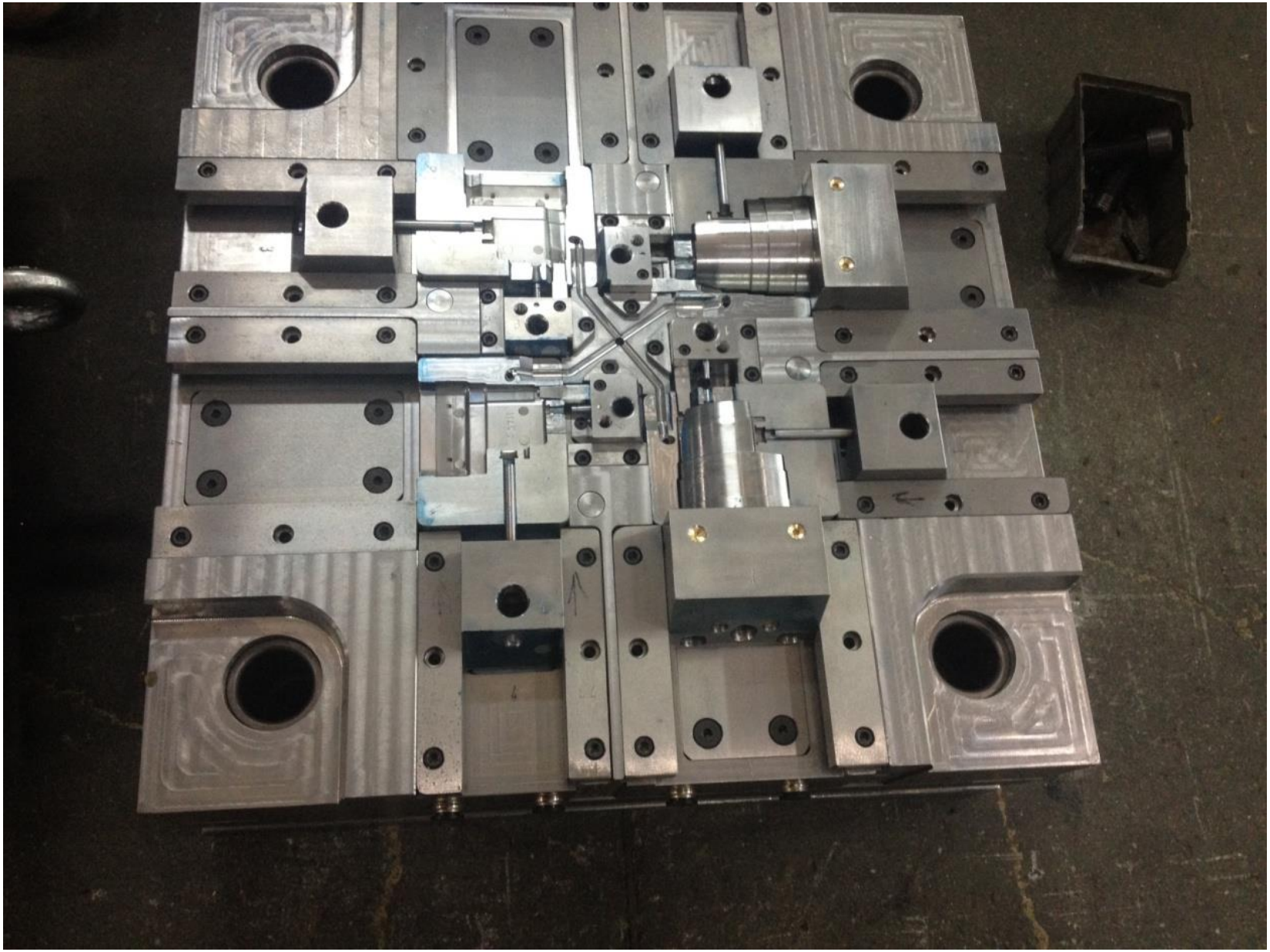
Mould Style : One Cavity Injection Mould

Tooling Type : Mold Cavity

Tooling Size(mm): 98mm x 550mm x 580mm

Tool Steel	S STAR (Japan)	Toolox44
Heat Treatment	Yes	No
Hardness	48 - 52HRC	~45HRC
Surface Treatment	None	
Cycle Time (sec)	45-60 sec	
Expected Tool Life	300,000 shots	
Problems Encountered	1. Warpage/Distortion after Q & T 2. Cracks during production runs	Still Running
Comments on Toolox44	1. Satisfied with polishing result 2. Fine texture finish is easily achievable 3. No heat treatment risks 4. Apply surface treatment if necessary	

Toolox 40 + Cr plating
ABS plastic. Designed for 500000 pieces



Test at plastic mould maker
2 pcs 80x960x1155

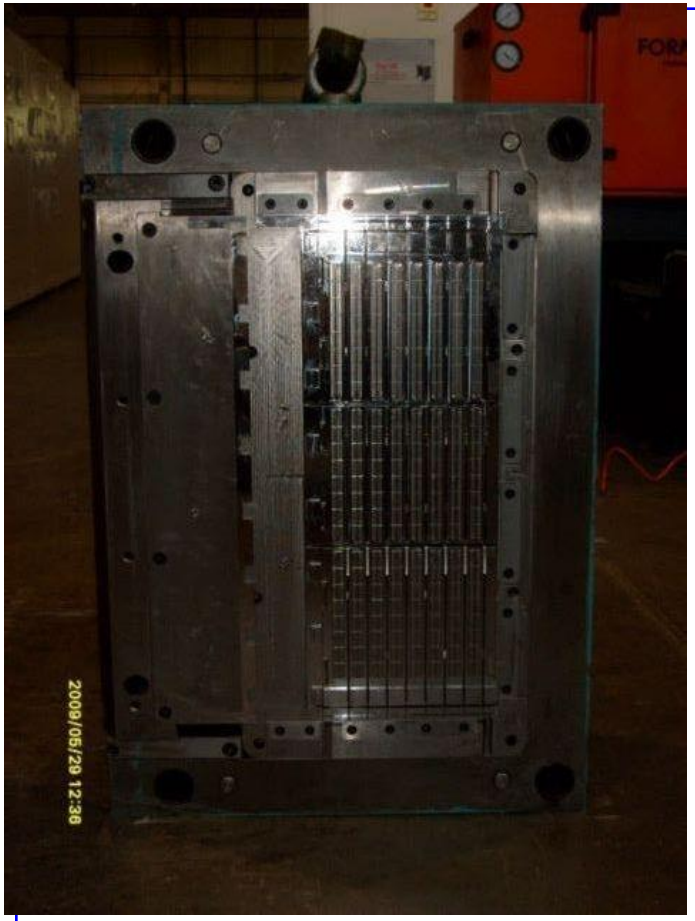
High speed rough milling with MECOF AGILE 500 machine.

Hitachi ASRB-3052RM-7-22 tool with diam 52 mm and 7 inserts.
EPNW-08T3TN-R10 inserts with JP4020 insert grade

Vc = rpm. Fz = 1.587 mm/tooth
Ap = 0.659 mm

Insert lifetime 180 min
Chip volume removed 161 cm2/min
(28980 cm2 removed chip volume)
Cooling with mist
Very small deformations
(<0.1 mm on flatness) despite a lot of machining
Good surface quality (enough to avoid polishing)

Traditional milling
Vc = 130-150 m/min
Air cooling
Inserts;
Round shape diam 12 mm
Walter WKP35S
DIJES JC8015
0.4 mm deformation on flatness during rough milling



TOOLOX 44

Plastic Part:

Part Name: GLASS SHELF

Raw Material: PS (ŞEFFAF)

Weight of the part:427 GR

Closing Force of the Injection Press: 300 TON

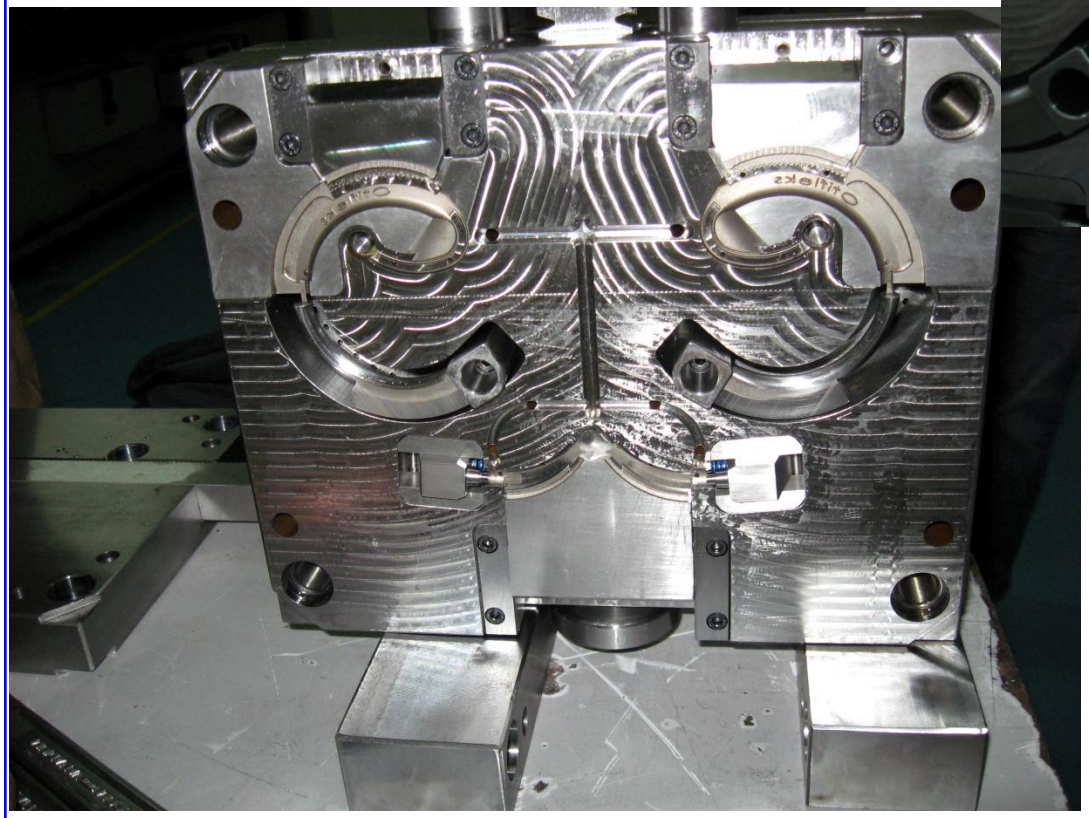
Total part: 5.000-10.000 / Year

Mould and Part Producer : BALKAN PLASTİK

End User : BSH

Mold Producer: Elit Kalıp

End User: Otifleks



TOOLOX 44

TOOLOX33 is used in core and cavity side

Which grade to choose in moulding?

Plastic	Choose
PP	TOOLOX 33
PA6 (nylon)	TOOLOX 44
PA66	TOOLOX 44
PC	TOOLOX 44
ABS	TOOLOX 44
PMMA (Styrene)	TOOLOX 33 alt. TOOLOX 44
PCPBT	TOOLOX 44
With filler (glass-fibre)	TOOLOX 44 + Nitriding

Raw Material		Feature	Mould Life&Metarial Recc.			
			<100.000	<500.000	< 1 million	> 1 million
Thermo Plastic	General	Machinability	Toolox 33 Superplast 2738 mod 1.2738	Toolox 33 Superplast 2738mod Superplast 2738mod HH	Toolox 40 Toolox 44 Superplast 2738mod HH SP 400	Toolox 40 + Nit Toolox 44 + Nit SP 400 + Nit
	Engineering Plastics	Wear Resistance	Toolox 33 Superplast 2738 mod 1.2738	Toolox 33 + Nit Superplast 2738mod + Nit Superplast mod HH +Nit	Toolox 40 + Nit Toolox 44 + Nit SP 400 + Nit	DAC MAGIC + Kap ISOTROP + Kap
	Reinforces Plastics	High Wear Resistance	Toolox 40 Toolox44 Superplast 2738mod HH SP 400	Toolox 40 + Nit Toolox 44 + Nit SP 400 + Nit	DAC MAGIC ISOTROP	SLD MAGIC + Kap
	Polisher Additive	Corosion Resistance	Superplast Stainless 1.2316	1.2083 1.2316	1.2083	1.2083 + Kap
	Transparent	Mirror Polished	Toolox 40 Toolox44 Superplast 2738mod HH SP 400	1.2083 ESR	1.2083 ESR	1.2083 ESR + Kap
Thermoset Plastics	General	Wear Resistance	Toolox 40 Toolox44 Superplast 2738mod HH SP 400	Toolox 40 + Kap Toolox 44 + Kap SP 400 + Kap	DAC MAGIC ISOTROP	DAC MAGIC + Nit ISOTROP + Nit
	Reainforced	High Wear Resistance	Toolox 40 + Nit Toolox44 + Nit Superplast 2738mod HH + Nit SP 400 + Nit	DAC MAGIC ISOTROP	DAC MAGIC	CPM 3V + Kap