

Perfect mastery  
of surfaces



# HIGH-DYNAMIC PRECISION MILLING

PIONEERING TECHNOLOGY SOLUTIONS

Maximum Focus on Precision

# Customers Trust in our expert knowledge

OPS Ingersoll is a customer-focused company with a clear passion; to support and drive technology for manufacturing of precision tools and components using the best construction and the latest technologies. You can rely on our many years of experience and benefit from our unique EAGLE technologies, proven expertise, and automation solutions. Our 170+ employees guarantee the highest level of process competence and product quality.

Our common goal: continuous improvement, flexibility and efficiency.

Trust in the intelligent and highly profitable machine concepts from OPS-INGERSOLL and join us at the forefront of innovation!



## **EAGLE Tec inside**

Our customers around the world have relied on the strong innovative capacity of the experts at OPS-INGERSOLL for over two decades. The permanent and continuous research and development of unique performance components with state-of-the-art technology provides our customers with highly-profitable trend setting and thus long-lasting return on investment.

“EAGLE Tec inside” is a commitment and a pioneering promise that every machine that leaves our factory meets the maximum level of excellence for our customers and our employees. We want to inspire everyone.



# DEVELOPMENT RESEARCH INNOVATION TREND SCOUTING

## **Our Company**

Since 1996, we have been developing and building high-speed milling machines, making us one of the drivers and trendsetters in HSC-technology.

Thanks to consistent research and development, OPS Ingersoll machines achieve a wide range of applications. The HIGH SPEED EAGLE series offers highly dynamic machines that ensure success in achieving the highest precision and surface quality.

All our machines can be easily automated, ensuring optimum productivity.

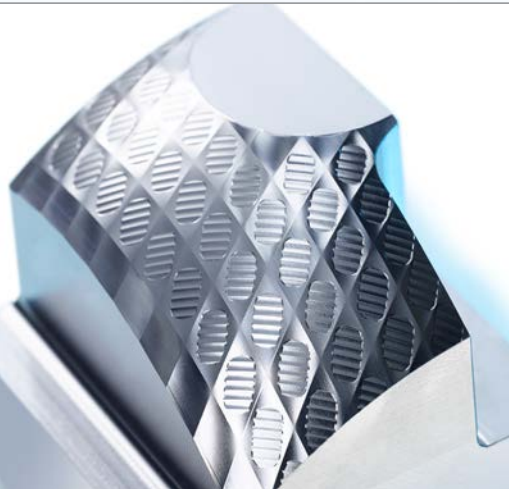
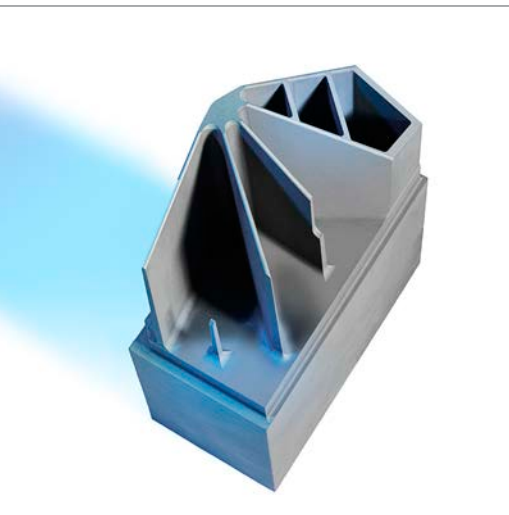
MADE IN GERMANY - We build our machines to the highest levels of quality.

We are a reliable Worldwide partner for our customers and offer excellent service and application support.



Big Points

# Diversity of business sectors





Tool and mold construction

Pressing and metal forming

Aerospace technology

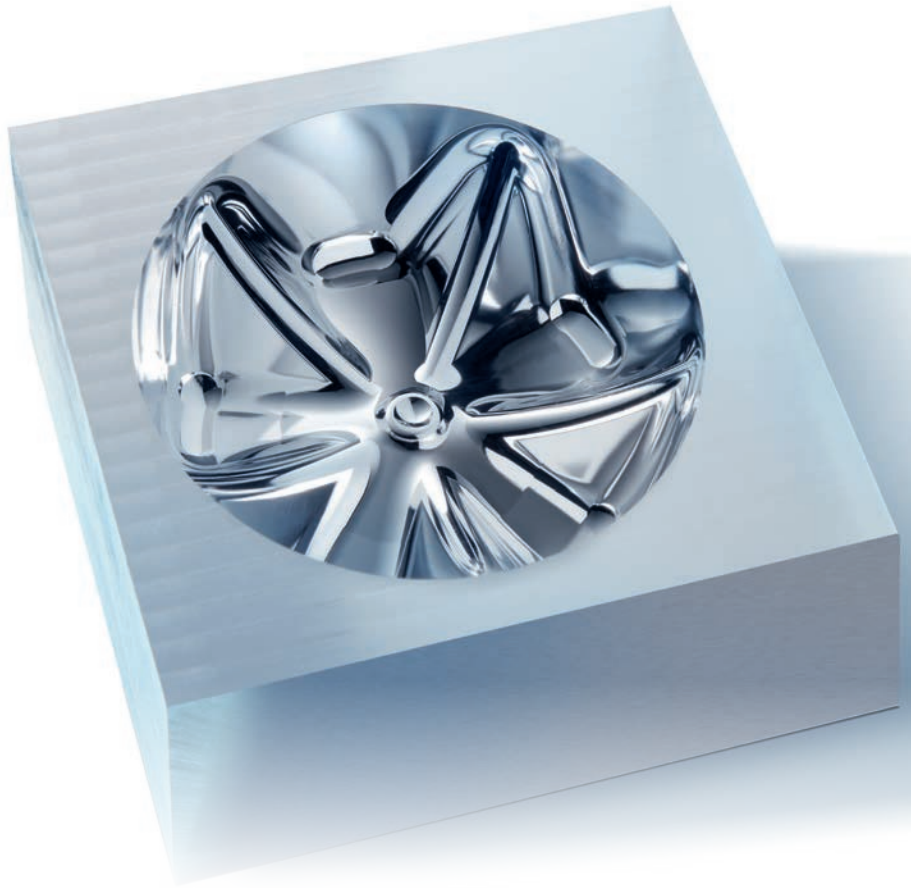
Dental and medical technology

Molds for  
optical components

Micro-scale processing

Precision part machining

OPS-INGERSOLL offers  
efficient solutions to  
increase productivity.



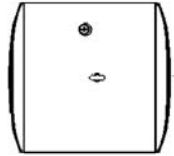
Precision, power, perfection – EagleTec inside!

# V5 – The highly dynamic precision marvel

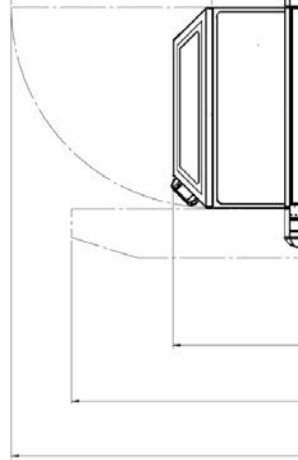
**HIGH SPEED  
EAGLE V5**

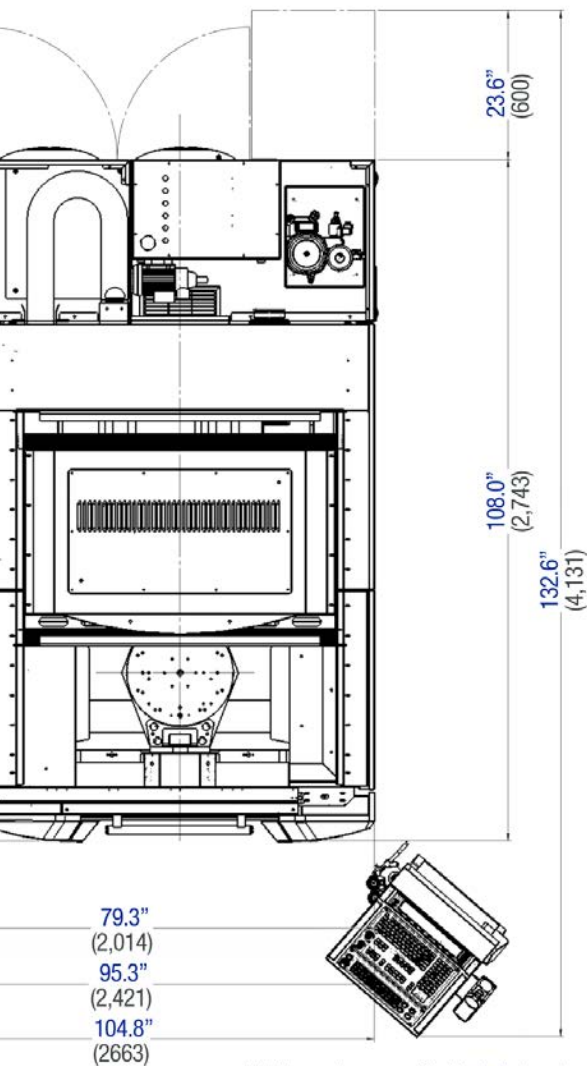


Machine Height:  
96.5"  
(2,450)



31.7"  
(805)





All dimensions specified in inch (mm)

## 5-AXIS



Ø 15.7" : 400 mm / H 15.0" : 380 mm  
max. 550 lb. : 250 kg

## Setup – Technical data

|  |  |
|--|--|
| Travel distances                           | X 21.6" x Y 15.7" x Z 15.7"<br>X 550 mm x Y 400 mm x Z 400 mm  |
| Travel speed                               | max. 1,181"/min. : 30 m/min  |
| Acceleration                               | max. 590.5"/s <sup>2</sup> : 15 m/s <sup>2</sup>   |
| Spindle nose to table distance min. / max. | 4.75" / 20.4"<br>120.6 / 518.2 mm  |
| Workpiece size 5-Axis                      | Ø 15.7" ; H 15.0" (max. 550 lb)<br>Ø 400 mm; H 380 mm (max. 250 kg)  |
| Connected load                             | 32 kVA   |
| High-frequency spindle selection           | HSK E40: 1 - 42.000 rpm<br>HSK E50: 1 - 36.000 rpm   |
| Spindle power                              | 20 HP : 15 kW  |
| Tool changer selection                     | 32/100 positions (HSK E40)<br>24/32 position (HSK E50)<br>Optional: MultiTool 100 / 150  |
| Minimum lubrication                        | Included   |
| CNC control unit                           | Heidenhain TNC 640   |
| Dimensions                                 | W 79.5" x D 110.2" x H 96.5"<br>W 2,020 mm x D 2,800 x H 2,450 mm  |
| Total weight                               | 15,873 lb. : 7.200 kg  |
| 5-Axis rotary table                        | B-axis -120 degrees / +60 degrees<br>C-axis 100 rpm<br>Workpiece weight: 550 lb. : 250 kg  |
| Options                                    | <ul style="list-style-type: none"> <li>• Laser system for tool measurement</li> <li>• Automatic cutter cleaning station</li> <li>• Infrared measuring sensor</li> <li>• PowerInspect - 3D-measuring</li> <li>• Graphite exhaust system</li> <li>• Oil mist suction unit • Wet machining</li> <li>• ATS - Aerosol dry lubrication</li> <li>• Chip conveyor • SMS Alarm • EcoTec</li> <li>• Ready-for-Automation</li> <li>• Software options HEIDENHAIN</li> </ul> |



Multiple possibilities

# Multi-axis machining



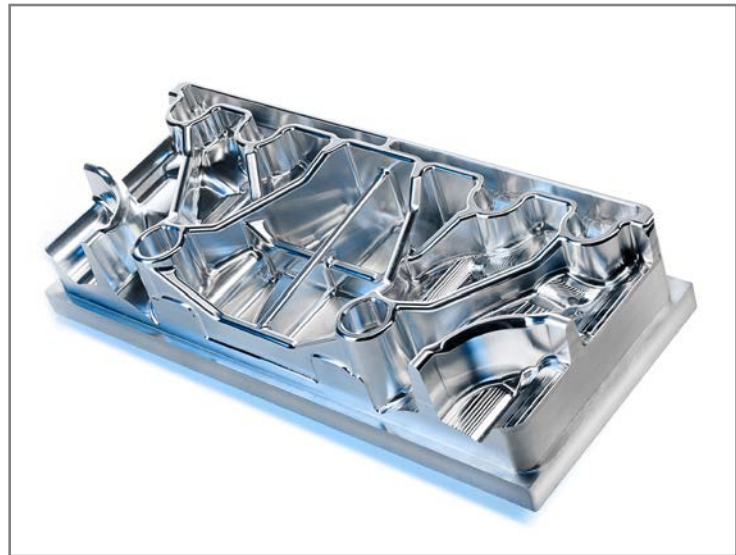
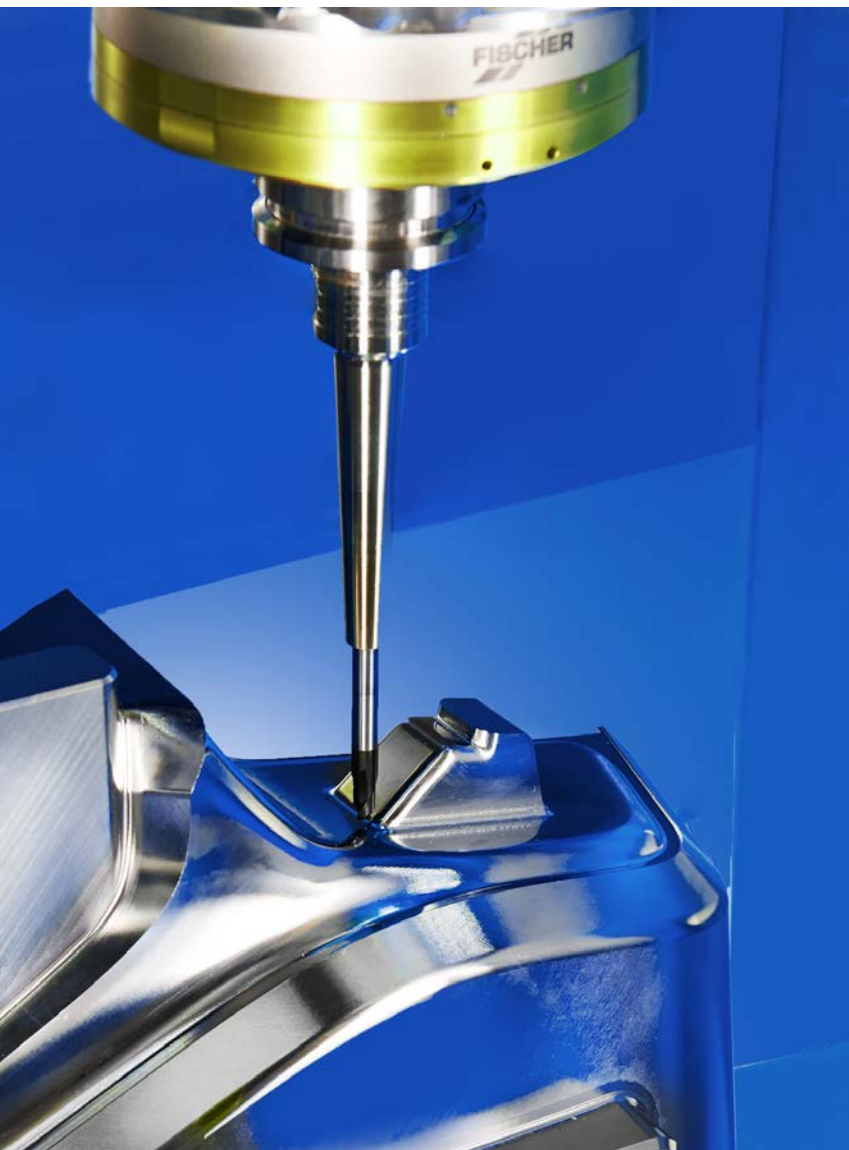
The HIGH SPEED EAGLE V5 offers numerous variants of multi-axis machining to produce complex contours and geometries in a single setup.

## 4-axis machining

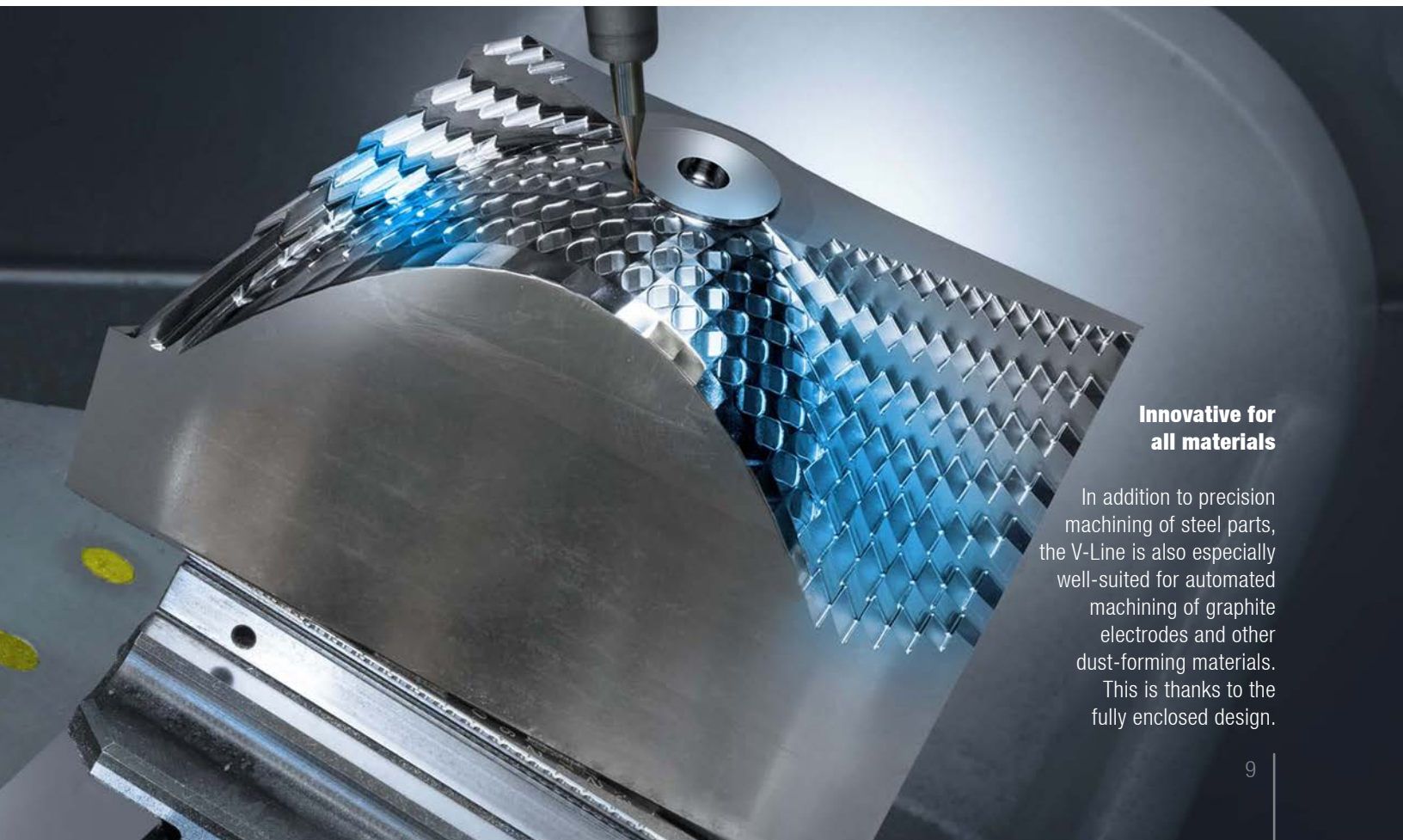
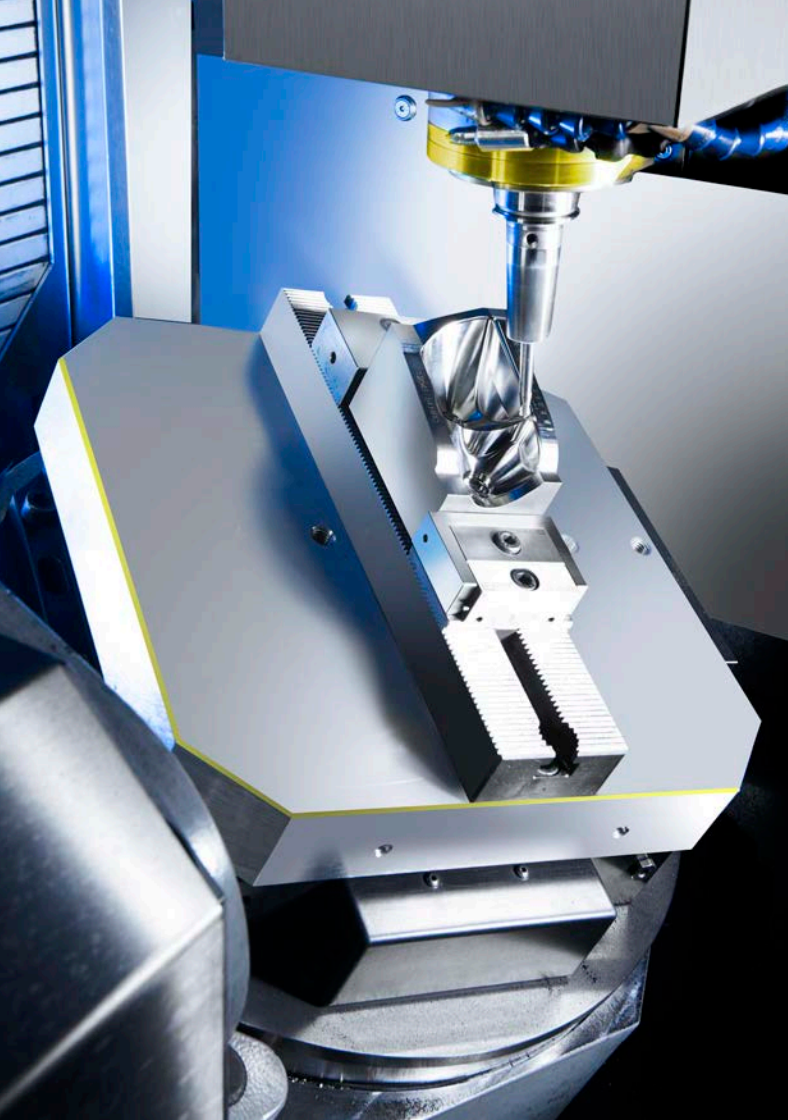
## 5-axis machining

Simultaneous machining with five axes – also fully automated with the best accessibility – increases cost-effectiveness without limiting flexibility.

Widely used in the market, the HIGH SPEED EAGLE V5 promises maximum precision with high dynamics and is perfectly matched to your applications with task-optimised options.







**Innovative for  
all materials**

In addition to precision machining of steel parts, the V-Line is also especially well-suited for automated machining of graphite electrodes and other dust-forming materials. This is thanks to the fully enclosed design.

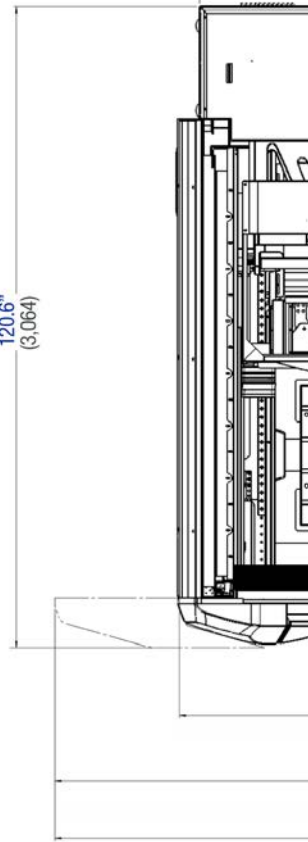
Precision, power, perfection – *EAGLE* Tec inside!

# V9 – Dynamics and precision

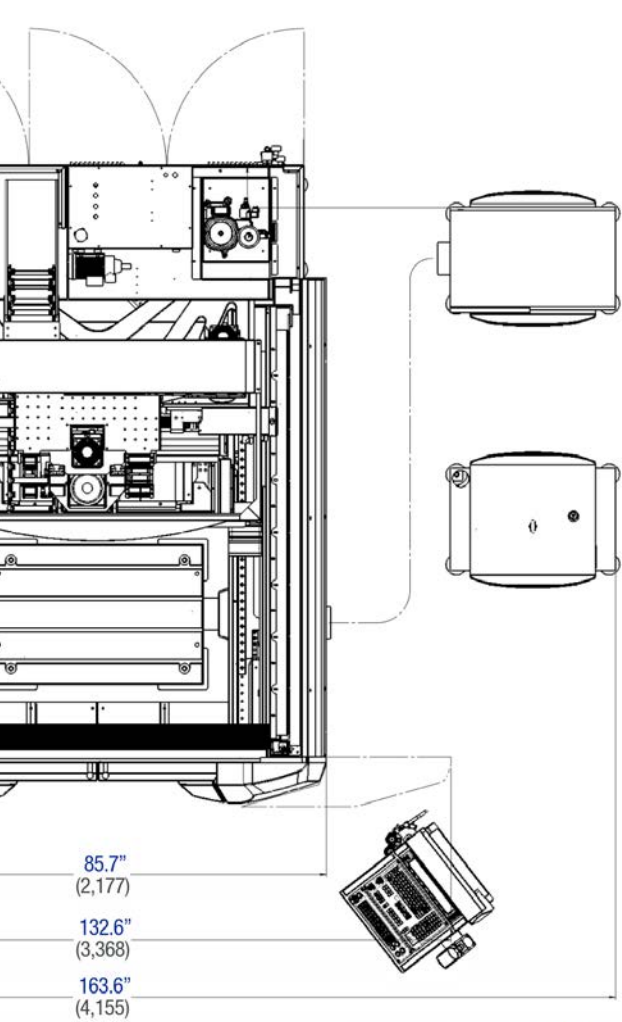
HIGH SPEED  
**EAGLE V9**

Machine Height:  
112.2"  
(2,850)

120.6"  
(3,064)

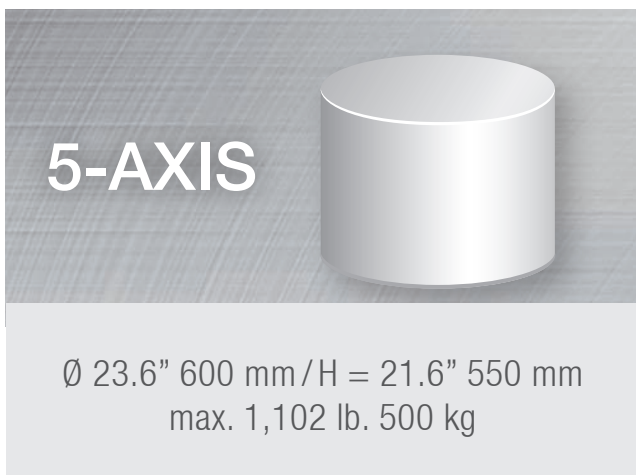






All dimensions specified in inch (mm)

### Workpiece dimensions



## Setup – Technical data

|  |  |
|--|--|
| Travel distances   | X 31.5" x Y 23.6" x Z 19.7"<br>X 800 mm x Y 600 mm x Z 500 mm  |
| Travel speed   | max. 1,181"/min. : 30 m/min  |
| Acceleration   | max. 590.5"/s <sup>2</sup> : 15 m/s <sup>2</sup>   |
| Spindle nose to table distance min. / max.               | 2.7" / 22.4" : 70 / 570 mm   |
| Workpiece size 5-axis                                    | Ø 23.6" H 21.6" (max. 1,102 lb.)<br>Ø 600 mm; H 550 mm (max. 500 kg)   |
| Connected load   | 32 kVA   |
| High-frequency spindle selection<br>* standard equipment | HSK E40: 1 - 42.000 rpm - 20 HP (15kW)<br>HSK E50: 1 - 36.000 rpm - 23 HP (17kW)*<br>HSK A63: 1 - 18.000 rpm - 34 HP (25kW)<br>HSK A63: 1 - 24.000 rpm - 34 HP (25kW)  |
| Tool changer selection                                   | 88 positions (HSK E40)<br>72 positions (HSK E50)<br>48 positions (HSK A63)<br>Optional MultiTool 150<br>Optional: external tool changer as production changer<br>30 position internal and 181 position external  |
| Minimum lubrication                                      | Included   |
| CNC control unit   | HEIDENHAIN TNC 640   |
| Dimensions   | W 85.7" x D 120.6" x H 112.2"<br>W 2,177 mm x D 3,064 mm x H 2,850 mm  |
| Total weight   | 25,353 lb. : 11.500 kg   |
| 5-Axis Rotary Table                                      | B-axis +140 degrees / - 60 degrees<br>Torque-C-axis 100 rpm<br>Workpiece weight: 1,102 lb. 550 kg  |
| Options  | <ul style="list-style-type: none"> <li>• Laser system for tool measurement</li> <li>• Automatic cutter cleaning station</li> <li>• Infrared measuring sensor</li> <li>• PowerInspect - 3D-measuring</li> <li>• Graphite exhaust system</li> <li>• Oil mist suction unit • Chip conveyor</li> <li>• Wet machining • SMS Alarm • EcoTec</li> <li>• ATS - Aerosol dry lubrication</li> <li>• Ready-for-Automation</li> <li>• Software options HEIDENHAIN</li> </ul> |

'Dimensional' precision guarantee!

# Unique Gantry machine concept

## Excellent machine design

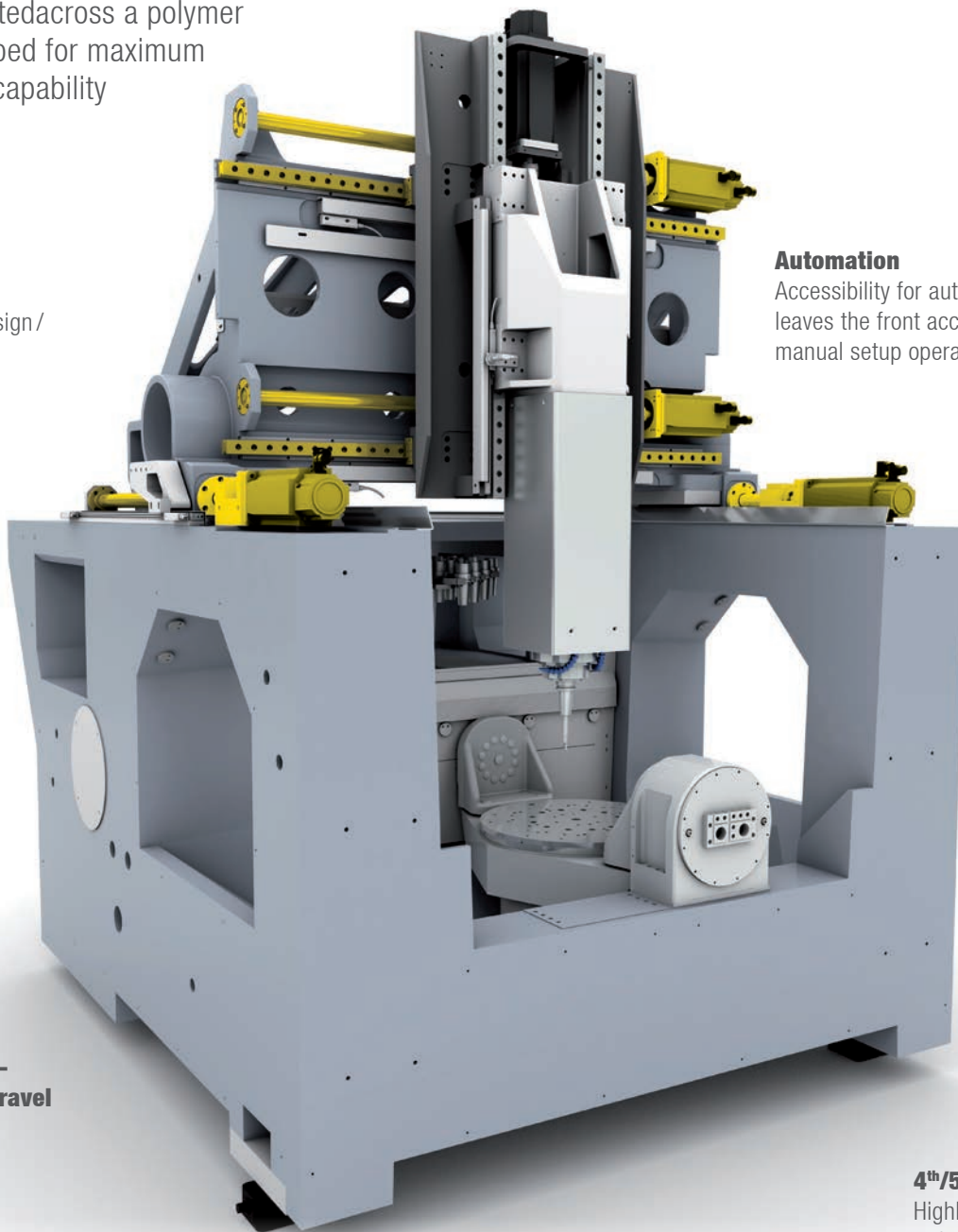
Dimensional precision guaranteed!  
The highest dynamic rigidity that is distributed across a polymer concrete bed for maximum damping capability

**Thermo-symmetric design**  
Temperature compensation / stability



**Gantry** design /  
dual drive

**Automation**  
Accessibility for auto side loading  
leaves the front accessible for  
manual setup operations



Minimum  
**footprint** –  
maximum **travel**

**4<sup>th</sup>/5<sup>th</sup> axis**  
Highly dynamic rotating  
swivel axis with robust  
weight capacity

Precise and versatile

# Precision milling spindles

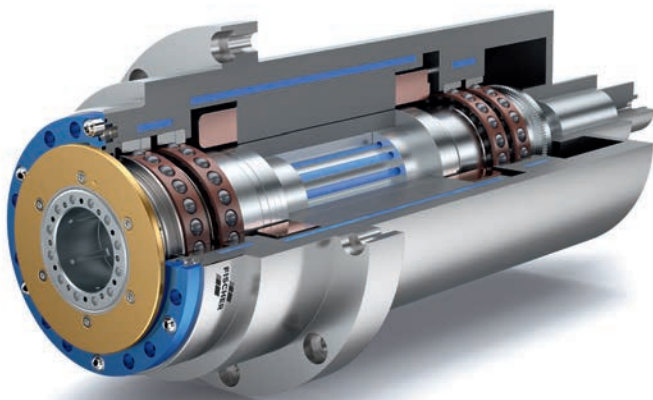
From high-speed spindles for the finest details and high-end finishing to high-torque powerspindles (up to 120 Nm) for steel and drilling operations.

All milling spindles are optionally available with internal coolant supply for all common media (air, aerosol, water).

In addition, the Precision-series machines can be equipped with shaft-cooled milling spindles for optimum thermal characteristics, maximum precision and maximum repeatability.



Work image: Step-Tec

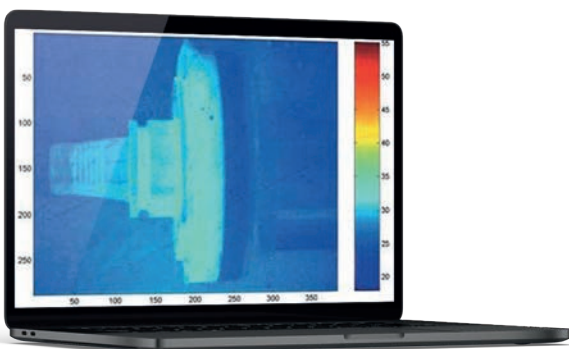


Work images: Fischer AG

## High precision CSC spindle with shaft cooling

Highest precision thanks to thermally stable process conditions due to cooled spindle shaft

- Low axial expansion
- High repeatability
- No temperature load into the tool or measuring probe
- Shortened saturation times after tool and speed changes



Cool HSK interface and tools



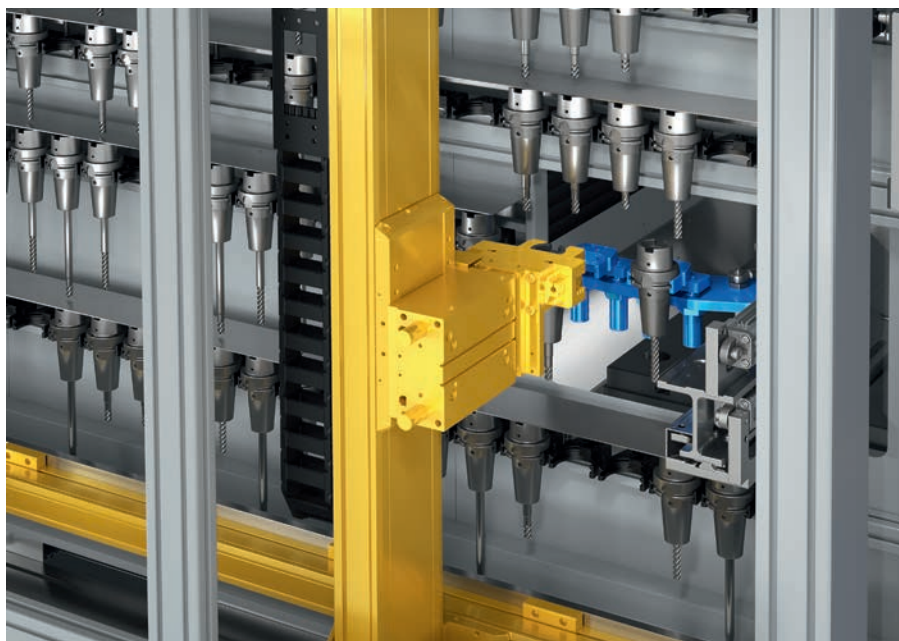
High number of tools for increased productivity  
Faster changeover times

# MultiTool 100 / 150

NEW



The larger tool magazine offers more solutions for machining different materials.  
Perfect for automation and complex applications with a wide range of tools.



- 100 / 150 tools\*
- For HSK 40, 50 and 63 Tool
- identification
- Control-supported magazine assignment
- Double gripper for short changeover times

\* MultiTool 100 and 150 available for HIGH SPEED EAGLE V5 | MultiTool 150 available for HIGH SPEED EAGLE V9

Efficiency bearer -  
Versatile technology in smallest space

# MultiChange plusTools

A further development of our successful  
MultiChange series



With the MultiChange plusTools, workpiece pallets, electrode holders and milling tools can be handled with just one handling system. The robot-cell can operate both HSC and EDM technology, as well as both in combination.



- Modular configuration
- Customisation according to the requirements
- Double gripper for fast changeover times
- Prepared tool change
- Identification via RFID chips
- Job manager
- Tool management

4<sup>th</sup>/5<sup>th</sup> axis – energy efficient force transmission

# Optional gear or torque drive



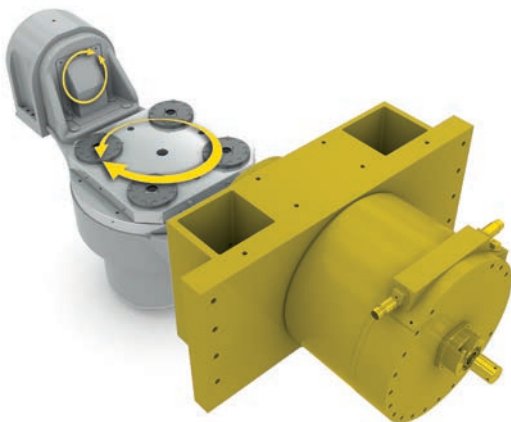
## V9 - Graphite Configuration

- Rotary / Swiveling Table for High-Precision Machining
- Table Load Capacity: 1,100 lbs.
- C-axis with Direct Drive / 100 RPM
- M-Code Programmable Brake for Heavy Milling
- Preparation for Clamping Systems up to MTS 498x498 (Also for Automation)
- HEIDENHAIN LAC Option Included: Automatic Dynamic Drive Optimization for Various Part Weights



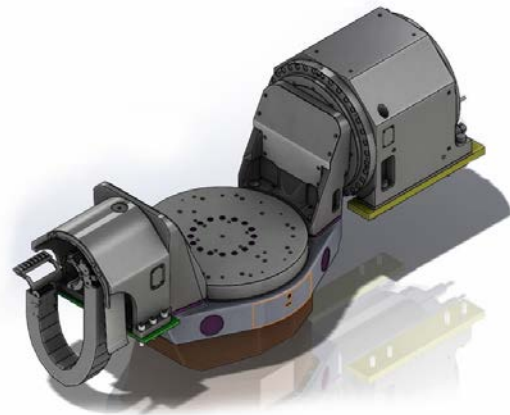
## V5 - Graphite Configuration

- High Dynamic Turn/Tilting-Axis
- Maximum Weight Capacity 1100 lb
- B-Axis Uses a Zero Backlash Gear Drive System Handles the Torque of the Load with 25 rpm Capability
- C-Axis with Direct Drive (Torque Motor) 100 RPM
- Preparation for Clamping Systems
- HEIDENHAIN LAC Option Included: Automatic Dynamic Drive Optimization for Various Part Weights



## V9 Coolant Machine Configuration

- High-Dynamic Rotary / Swiveling Table
- Direct Drives in B- and C-Axis
- High Feedrate Capability for Simultaneous 5X Machining
- HEIDENHAIN LAC Option Included: Automatic Dynamic Drive Optimization for Various Part Weights
- M-Code Programmable Brake for Heavy Milling
- Preparation for Clamping Systems up to MTS 498x498 (Also for Automation)



## V5 Coolant - Direct Drive Configuration

- Table load 400 lbs
- Workpiece size (L x B x H) Ø 400 mm
- Pivoting angle B-axis -120° /+ 60°
- Rotation angle C-axis 360°
- Rotation 100 U/min
- Table Ø 430 mm
- Prepared for Clamping Systems or T-slot Plate



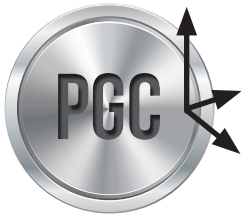


**Intelligent  
load movement**

The 4<sup>th</sup>/5<sup>th</sup> axis is designed to accommodate loads of up to 1100 lb. (500 kg). The available work space is utilized ideally with the central arrangement and low position of the swivel axis. The swivel angle of up to 140° enables optimal machining conditions from all sides.

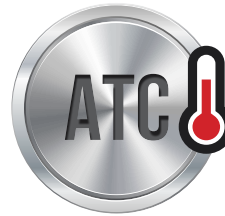
Guaranteed accuracy

# Precision features



## PGC - Position- & geometric-compensation

- Precision assembly followed by geometric error compensation of the linear axes using calibrated measuring standards
- Compensation of the positioning accuracy of the linear axes by laser interferometer
- Automated measurement procedures for continuous testing of the results obtained



## ATC - Automatic temperature-drift-control

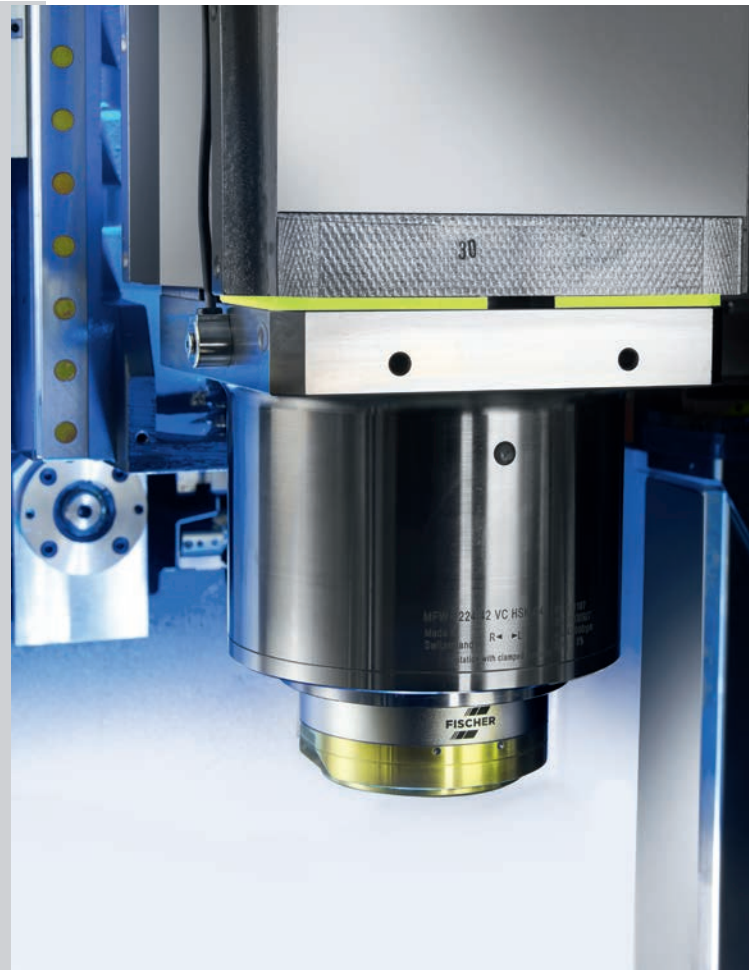
Room temperature compensation to reduce thermal displacements

- Permanent monitoring of various component temperatures
- Full enclosure of the machine cabin



## PSC - Precision spindle compensation

Various options for cooling of the geometry- and temperature-compensation for the machine and milling spindle, ensure maximum machining accuracy over the entire movement range of all 5 axes.







## **IPR - Increase precision and repeatability**

Space compensation using the most advanced laser measuring equipment over the entire movement range

Our precision features increase the application precision and repeatability of the machine. These are further enhanced by geometric and thermal fine-tuning in the subsequent working environment of the machine. IPR – a guarantor for highest precision over the entire travel distances.

# Precision cycles



## **OPS-INGERSOLL Tool Centre Cycle Cycle 320**

- Standardized calibration of the machine with its components (laser, infrared measuring probe, 5-axis TCP)
- Maximum ease of use and simple handling
- Documentation of all measured values with the evaluation for fast analysis function
- Quick-check of the TCP in progress



## **OPS-INGERSOLL Advanced Motion Control Cycle 332**

- Whether fast or precise, motion control optimized for the respective machining task
- Highest contour accuracy for HSC machining
- Optimum speed for roughing



More possibilities...

# The high performer for flexible use

**HIGH SPEED  
EAGLE**  
PRECISION

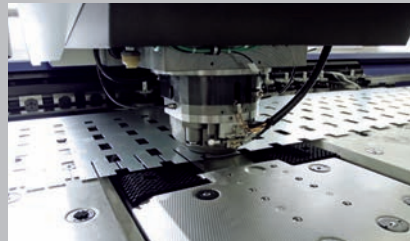
Benefit from our experience. Our **Competition-Line** machines perform with their flexible equipment possibilities.

Due to its concept and flexibility, the **Competition-Line** allows highly dynamic milling of graphite, steel or non-ferrous metals, both in dry and wet machining.

**The Competition-Line machines offer excellent all around solutions for applications such as:**



Tool and mold construction



Pressing and metal forming



Production



Aerospace technology



Medical technology

## HIGH SPEED EAGLE Competition- and Precision-Line

These high-quality options are included in the standard scope of both, HIGH SPEED EAGLE Competition-Line and Precision-Line machines:

- BLUM Laser LC50-DIGILOG
- Infrared measuring probe RENISHAW OMP 400
- EcoTec energy saving function
- Handwheel HEIDENHAIN HR510
- Prepared for automation
- HEIDENHAIN TNC 640 control incl. 19" Touch-Screen
- Vibration damped polymer concrete bed
- Sealed, absolute HEIDENHAIN linear encoders
- Full enclosure with dust- and liquid-proof guides and drive elements
- LED workroom light

... and more precise work!

# Specialists in top precision







**5-axis simultaneous machining** with a precision of **less than 10 µm** during active temperature control of all drive components

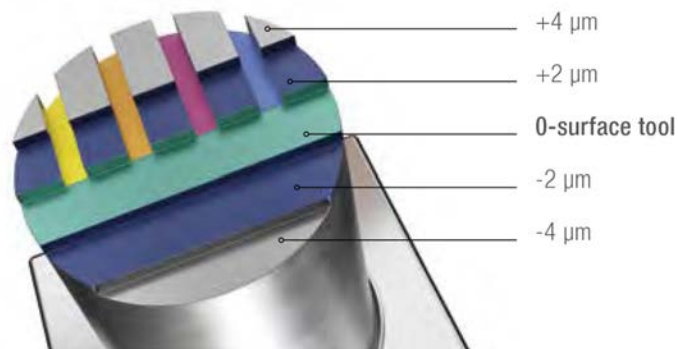
The new **ACTC** (Active-Component-Temperature-Control) regulates the temperature of additional machine components, for absolute thermal stability to increase machining precision and surface quality on the workpiece.

With the **HEIDENHAIN CTC** option, acceleration-dependent errors are compensated in order to further increase the surface quality and accuracy of the workpiece. Special setup cycles support the operator in setting up the kinematics and document the behaviour of the machine and the environment.

## Precision applications

Economical and reliable milling with absolute precision, with the best surfaces and the highest repeatability; this is what you can achieve with our newly developed Precision-Line milling machines for machining precision parts in tool and mold making and in production.

-  Tool B, 10.500 rpm + 1 µm
-  Tool B, 21.000 rpm + 1 µm
-  Tool B, 31.500 rpm + 1 µm
-  Tool B, 42.000 rpm + 1 µm



3-axis precision application



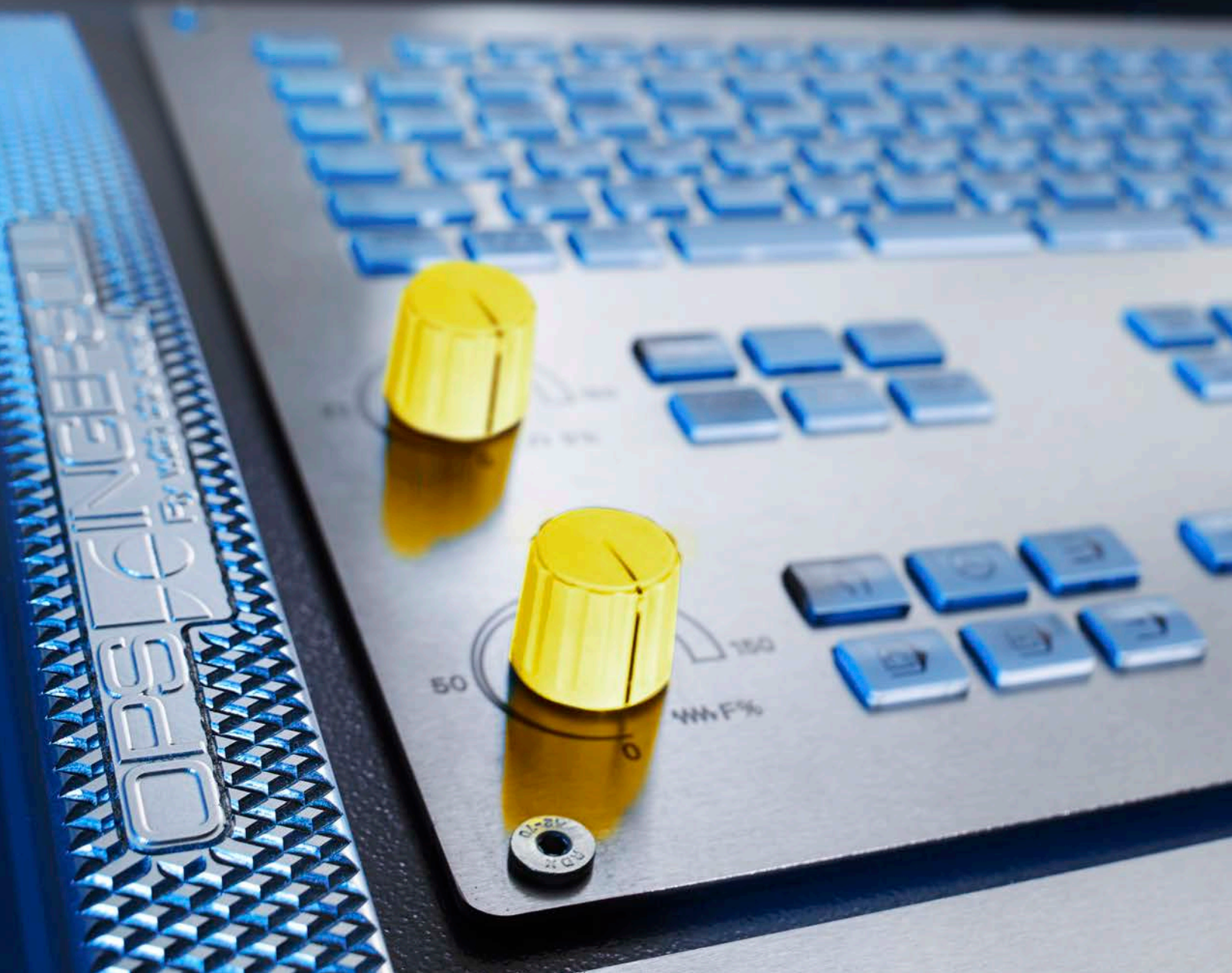
### OPS-INGERSOLL High Precision Cycle Cycle 330

Automatic stabilisation of thermally induced spindle displacement in the selected tolerance band.



High speed symbiosis

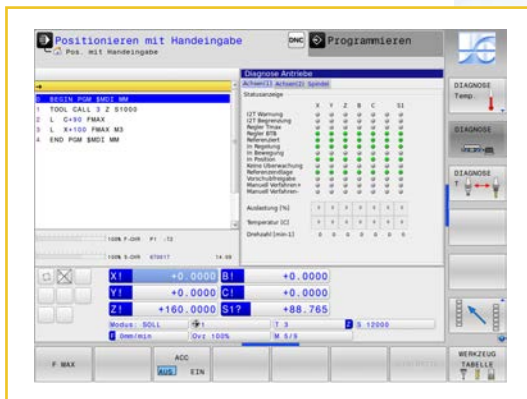
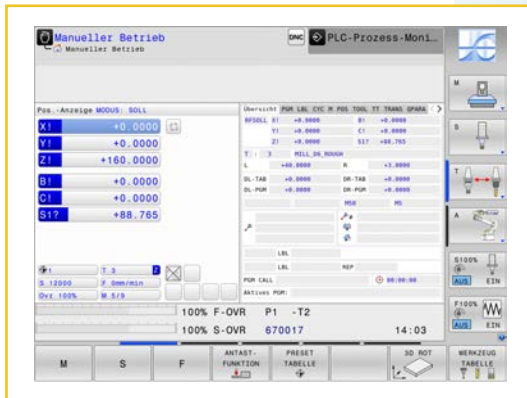
# Perfectly matched for each other **HEIDENHAIN**





## TNC 640 - Control unit of the latest generation

With strategies especially optimized for HSC and 5-axis machining, top results are achieved even with workpieces having different sizes. The specific concept of the V-Line in combination with the new features of the control unit, enables outstanding surfaces and precision with simultaneous optimization of the machining time.





Individual for every application

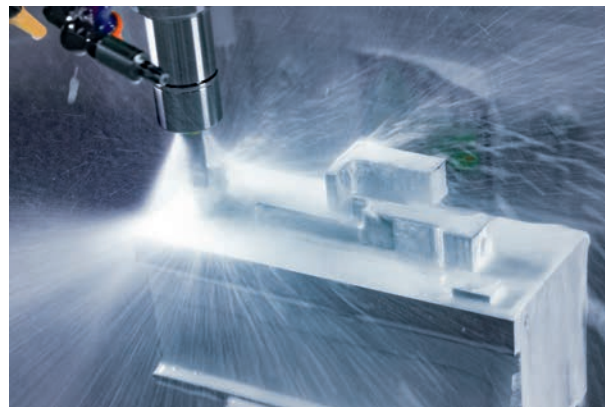
# Cooling lubricant concepts and chip disposal



- Knoll coolant management
- Internal coolant supply and workspace flushing
- Scrape chain conveyor
- Belt filter
- Additional maintenance system for wet machining of graphite
- Heating and cooling systems
- Optimal design for your machining tasks



**Wet machining of graphite**



**Variable and compact coolant management system in various expansion stages**

New technologies for optimal results

# Innovative cooling lubricant options

## Aerosol Master®

**The formula for ATS:  
Reduce heat instead of combating it.**

An extremely fine aerosol is created with smallest quantities of lubricant. This is constantly regulated and supplied to the tool tip without any loss. Optimal lubricating particle application effectively reduces the creation of friction heat.



### Chip removal

Chips are immediately and permanently blown away from any position by a precisely directed strong air jet. The free machining area generates optimum conditions for the tool edge and workpiece.

### Cooling

At the same time, the compressed air ensures uniform and permanent cooling of all cutting edges. Friction pressure is greatly reduced, thereby protecting tools and significantly extending their service life. In complete dry processing!

### Lubrication

Depending on the requirements and material, the air can be enriched with an aerosol-quality lubricant. Each particle of the targeted lubrication arrives at the interface without segregation. Components come out of the machine dry and can be further processed immediately without cleaning and reworking.



## Process safety MHT medium distributor

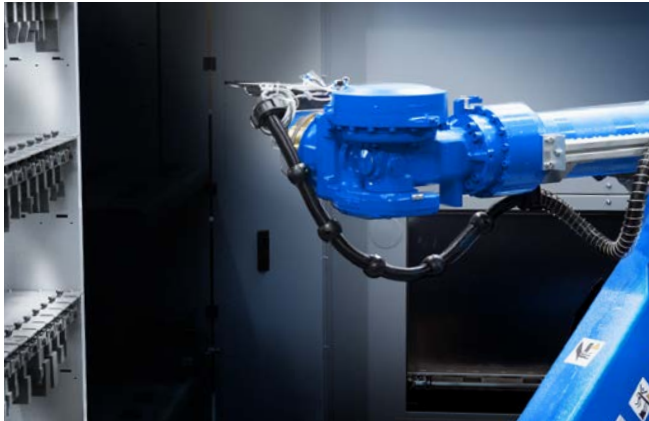
**The alternative for cooling lubricants, minimum quantity lubrication and internal coolant supply**

Compressed air is used to generate an air jacket along the cutting edges to the machining point, which cools, can be mixed with an aerosol-quality lubricant and removes chips from the machining point.

Work image: MHT

Completely from one source

# Flexible automation solutions

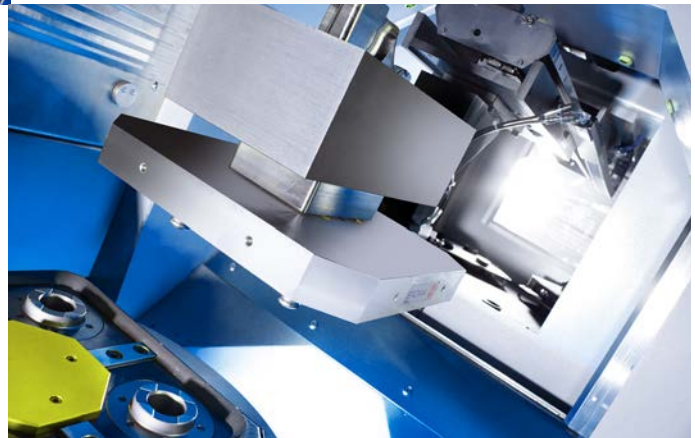


## Connection of handling systems

All of our machines are prepared for automation, whether as a single machine, as a cell, or line automation.

## Optimal accessibility

The possibility of loading with tools and workpieces from multiple sides offers ideal conditions for compact automation solutions without limiting the operator's accessibility to the work space.



## Fully equipped production plant:

- HIGH SPEED EAGLE V9
- HSK A63, 24.000 rpm
- 4th/5th axis with direct drives for highly dynamic simultaneous machining operations
- Workpiece changer
- Identification via RFID chips
- Tool changer, 30 positions internal, 181 positions external
- Full coolant management 1.200 litres (317 Gal.)



Industry 4.0

# Be prepared for tomorrow, today



With Industry 4.0 and the IoT, standardised interfaces are becoming increasingly important, e.g. when implementing requirements from the areas of process automation and condition monitoring.

With the HEIDENHAIN OPC UA NC Server, the TNC 640 offers a standardized interface for accessing data and functions of the control. OPC UA is a platform-independent communication standard according to IEC 62541 that meets many Industry 4.0 requirements:

- High data security
- Platform independence
- Scalability in horizontal and vertical communication

**Reduce basic energy consumption, conserve resources, save money.**

EcoTec thinks and regulates for you and is designed to ensure that energy is only consumed when it is actually needed. It monitors and regulates optionally selectable warm-up programs, programmable wake-up functions, idle states after program end, and much more. Intelligently designed to reduce energy consumption to an absolute minimum!



# Service management

North American service is provided by:

**MC MACHINERY  
SYSTEMS, INC.**

a subsidiary of  Mitsubishi Corporation



## Spare parts

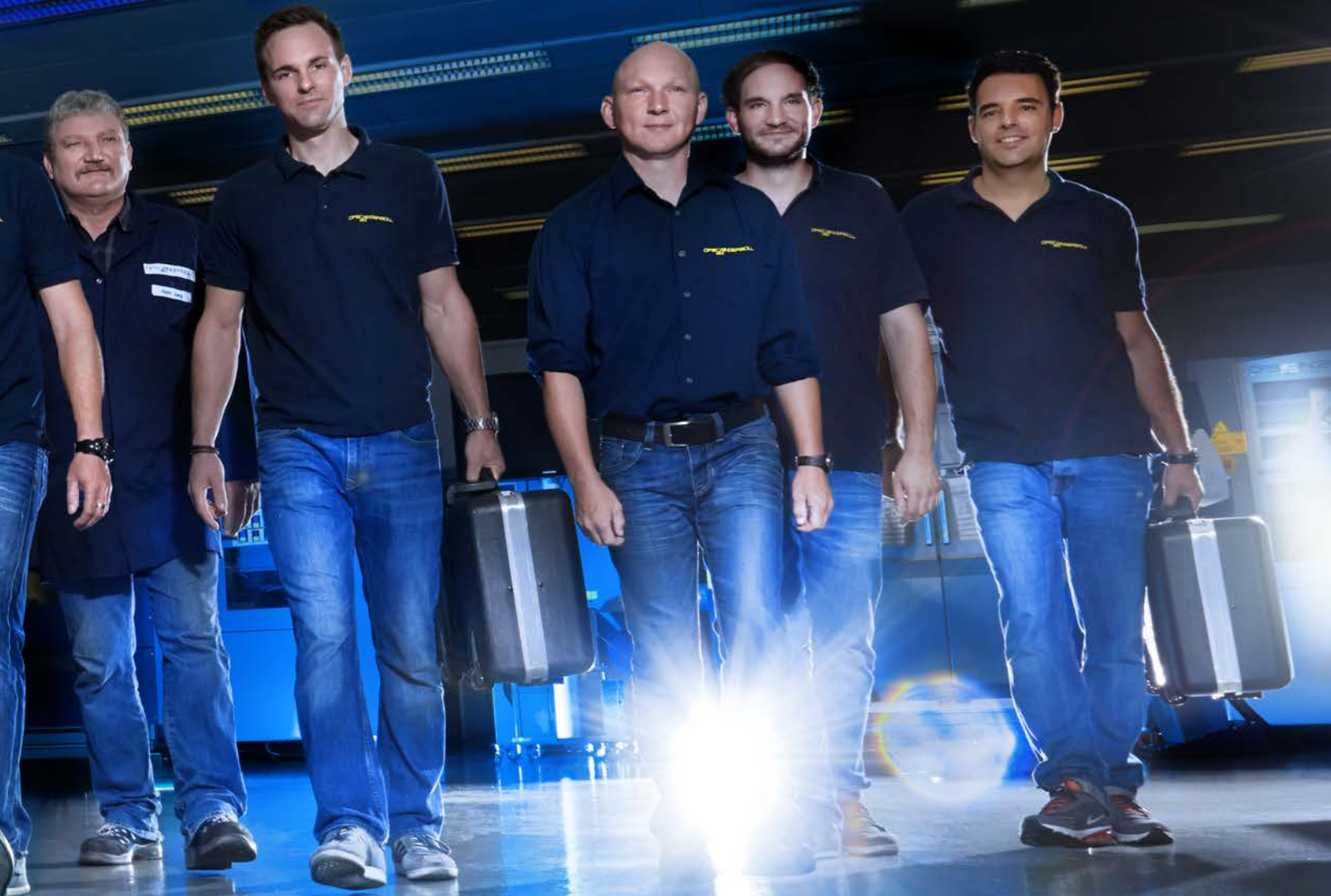
As a guarantee of the availability of your machines, a rapid and flexible supply of spare parts is of essential importance to your economic success. Thanks to our comprehensive stock of spare parts, we can react to your requirements on short notice.

## Application support

An important part of the OPS-INGERSOLL / MC Machinery Systems service spectrum is the know-how transfer of our application technology. Our team of experts consists of experienced tool and mold makers, who advise and support you in the implementation of your technical requirement.



# FAST DIRECT FLEXIBLE PERFECT



## **Maintenance**

Regular maintenance intervals reduce downtime and increase reliability and thus the service life of your machines.

## **Training**

All North American training is done on site so we can provide you with practical training on your work to refine your expertise and operator skills. Benefit from the know-how of our experts!



## The Success Factory

Outstanding customer solutions are created here. This is where passionate and experienced mechanical engineering experts live. This is our home!

## Quality finale

Well thought-out, highly efficient production processes assure the high quality of all machines from the design to the delivery. This assures enthusiastic customers!











# The **EXPERT** Principle

Complete process  
performance

The 4 success factors for profitable  
process organisation:

- 1 EAGLE technologies
- 2 Automation solutions
- 3 Process experts
- 4 Application know-how



OPS  **INGERSOLL**  
Fly with the eagle!

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