HELLER

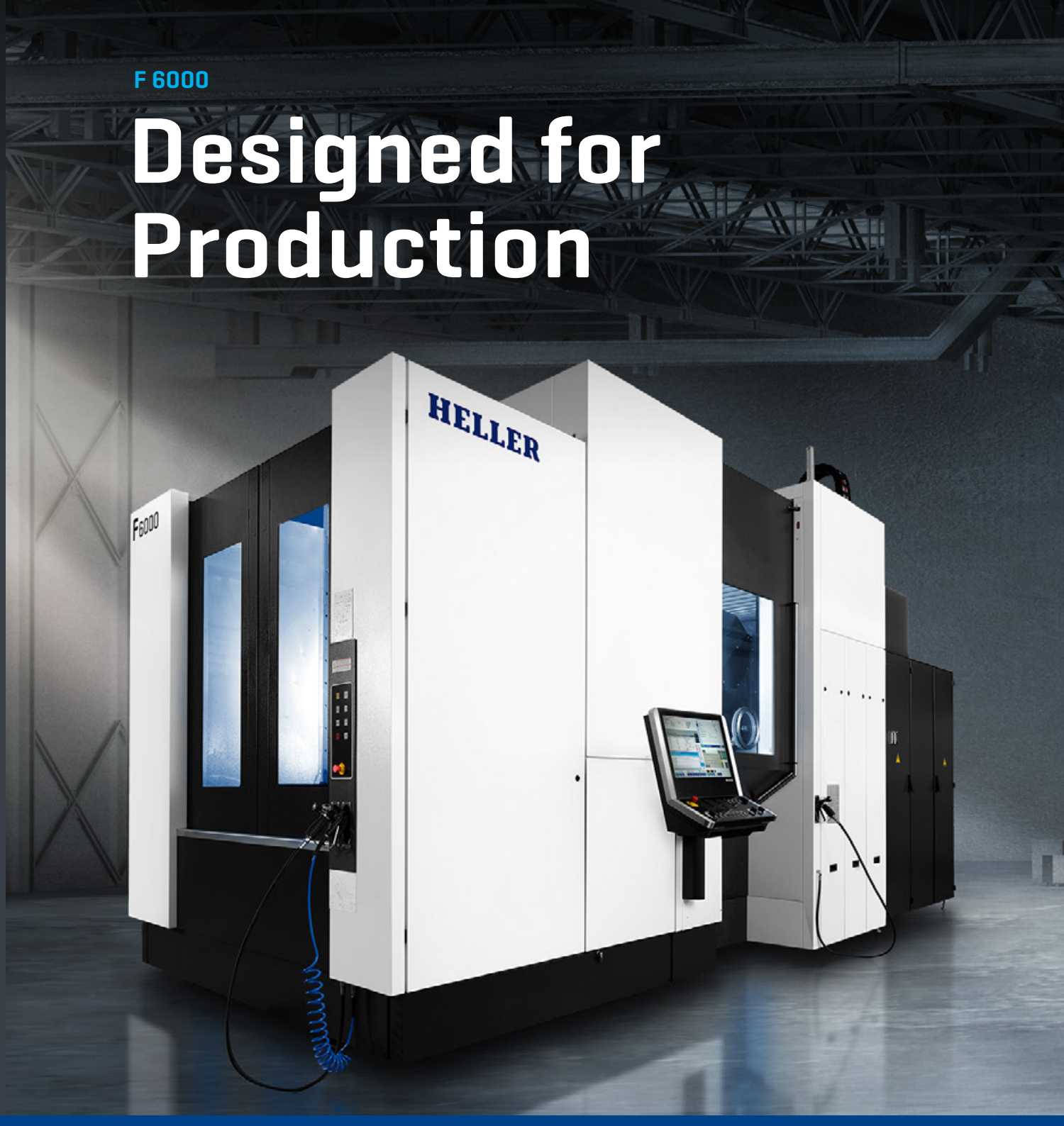
5-axis machining centre

F 6000

Contents

F 6000

Designed for Production



The F 6000 is the first of the new generation of F series 5-axis machining centres. With its head kinematics, the machine is designed from the ground up for flexible series production. Like all HELLER machines, it sets a benchmark for cutting performance and precision. Other highlights include free chip fall, short idle times, optimum automation capability and compatibility with the H and FP series for a wide range of workpieces. The F 6000 also scores with first-class equipment and expandability with technologies such as Mill-Turn, interpolation turning or power skiving.

Key facts

_HSK-A 100 class universal 5-axis machining centre with the 5th axis provided by the tool and pallet changer

_suitable for powerful and flexible high-volume production

_best-in-class cutting performance due to high-torque spindles and robust traversing column concept

_upgradable with technologies such as Mill-Turn as an option for effective complete machining

_PRO equipment package as standard for high dynamics, low positional tolerances and simultaneous 5-axis machining

_key components 'made by HELLER' for maximum cutting performance and long-term reliability

_fast chip removal due to free chip fall and wide central chip conveyor

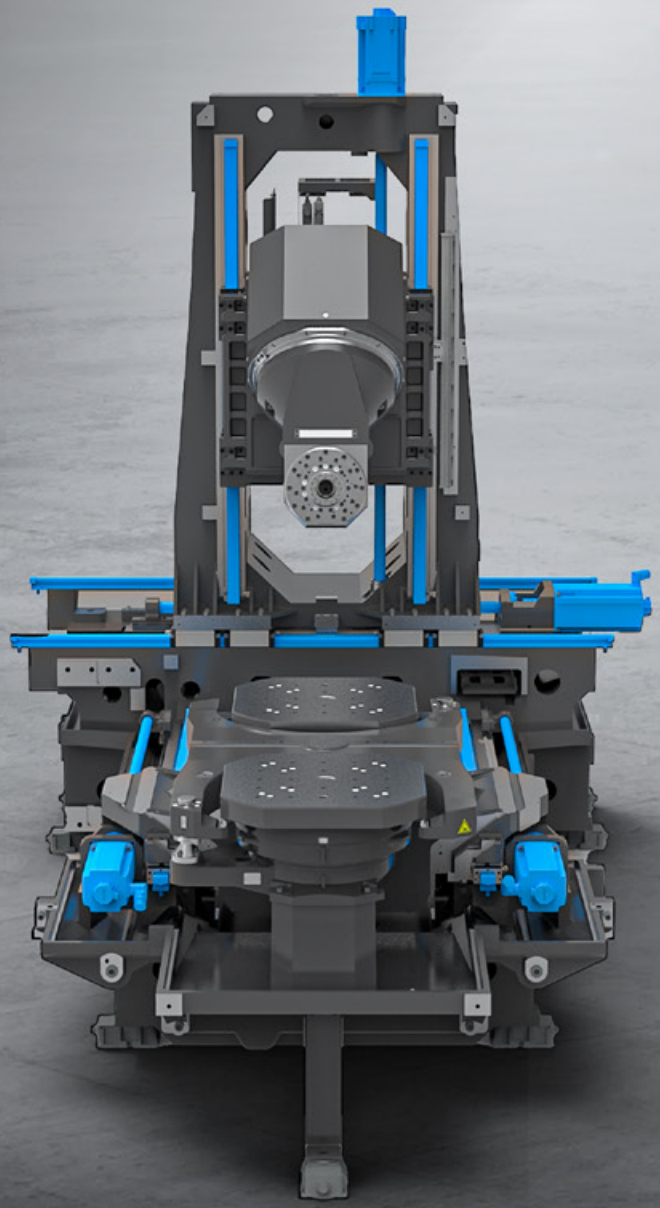
_the AUTOMATION-READY option makes it easy to add automation at a later date at low cost and without major modifications

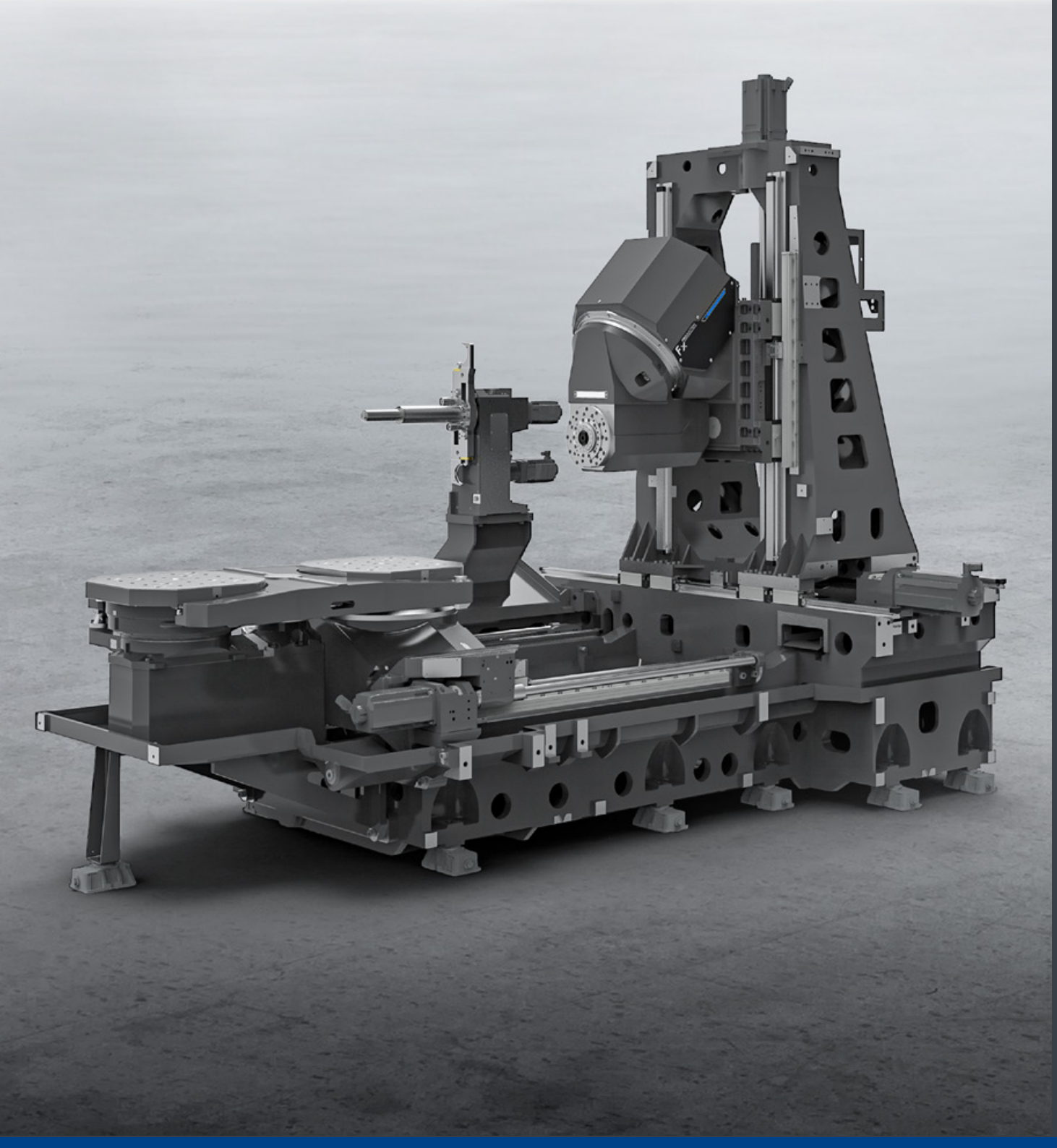
More information at:
www.heller.biz/en/f6000

Machine concept

Maximum performance with lasting precision

Only the perfect combination of rigidity and light-weight construction results in a machine design that ensures optimum surface finish and a long tool life. As with all HELLER machines, the main components of our F 6000 machining centre have been designed using FEA. The result is a machine bed optimised for rigidity and a mass-reduced column that ensures reliable productivity and high dynamics combined with perfect precision.





Basic structure

_5-axis machining centre in horizontal orientation

_machine bed in cross-bed design for maximum rigidity even with high payloads

_traversing column in gantry-design for fast positioning and short idle times

_cast iron structural components with topology optimised design for maximum stability and damping in the force flow

_pallet changer with lift-swivel principle, designed as a fork-type changer for high payload and short pallet change time

_chain-type tool magazines combined with fast NC tool changer for shortest tool provisioning times

Kinematics

_robust 5-axis kinematics with 5th axis provided by the tool

_machine bed supporting the X and Z axes in cross bed design

_machine column moves in X-direction and supports the machining unit

_machining unit moves in Y-direction compact and robustly integrated into the machine column

_rotary table (B-axis) moves in Z-direction and rotates the workpiece continuously in B (360,000 x 0.001°)

_5th axis designed as swivel head (C-axis) for continuous movement (350,000 x 0.001°)

Drive concept

_maximum performance with lasting precision

_linear axes with wide roller guides driven by precision ball screws with cooled drives or drive flanges

_Z-axis with drive on both sides for fast feed motions and free chip fall under the spindle

_direct absolute measuring systems for highest precision and low positional tolerance

_rotary axes with large YRT bearing and automatic clamping for maximum stability and high tangential moments

_rotary table with duplex worm gear and a direct driven high-speed rotary table for mill-turn applications (option)

Equipment

PRO for flexible series production

Even in the standard version, the new F 6000 offers all the benefits of PRO equipment: maximum performance, optimum conditions for simultaneous 5-axis machining and class-leading specifications in every respect. The new generation of F series 5-axis machines has been designed from the ground up for powerful and flexible series production.

			F 6000
Rapid traverse speed	X/Y/Z	m/min	65 / 65 / 65
Acceleration	X/Y/Z	m/s^2	5 / 7[1] / 7
Chip-to-chip time	HSK-A 100	s	4.0
Positioning Tolerance Tp	X/Y/Z	µm	5 / 5 / 5
Positioning Tolerance Tp	B/C	arcsec	7 / 7
Feed forces	X/Y/Z	kN	15 / 30[2] / 20[3]
Clamping load		kg	1,500 (2,000)

( ) = Optional values **1)** In Y- **2)** DCU/SCU **3)** S3 20% 6 min

Maximum performance

_two ball screws in the Z-axis

_increased feed force in the Z-axis

_reduced positional tolerances in all axes

Simultaneous 5-axis machining

_milling technology package (ONE Dynamics) for optimum path guidance and perfect surface finish

_highest dynamics in the linear axes

_fast, backlash-free swivel drive in the 5-axis head

Class-leading specifications

_optimum set-up of all components

_AutoSet function for optimum drive parameters to suit the current payload

_AutoCal function for optimum accuracy of the axes

Mill-Turn

Complete machining on a single machine

The optional mill-turn functionality available for the F 6000 enables combined milling and turning on a single machine – for even greater flexibility in production. Machining in a single set-up provides maximum component accuracy, while the use of a high-torque rotary table ensures maximum productivity.

			F 6000
Speed	S3 40%	min^{-1}	700
Torque		Nm	2,600
Workpiece diameter		mm	Ø 1,300 / Ø 1,000 Full circle

Mill-Turn features

_NC rotary table in DDT (Direct Drive Turning) design

_spindle locking for secure hold of the turning tools

_balancing technology cycle for balancing of the workpieces and fixture in the machine

_Siemens NC turning cycles for easy programming of turning operations

_HSK-T tool holder for optimum turning accuracy

NC rotary table with rotary function

_direct drive rotary table for high speeds in turning operation and high milling dynamics

_permanent cooling with separate cooling unit

_automatic imbalance detection during machining

_HELLER balancing cycle for easy balancing of the clamped workpiece and imbalance checking

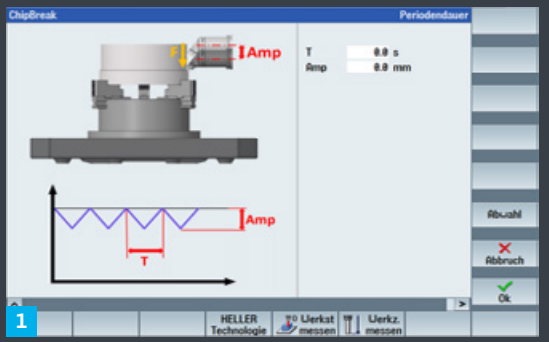
Options

_media interface with multi-line clamping technology for mill-turn operations with 80 bar

_tool measurement with precision laser and probe for turning tools

_oscillating speed to avoid vibrations during critical processes

_ChipBreak for avoidance of long chips through variation of the feed rate 1



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Machining units

High cutting performance

Optimum process stability in 5-axis machining is also a question of having the right spindle. With our F 6000 you can choose from a range of swivel head designs. Whether it is heavy-duty cutting of cast iron or steel, high-volume machining of light metals or vertical, horizontal and tilted turning with the optional Mill-Turn functionality – we have the right solution to suit your requirements.

			PCUe 100 G	DCU 100 M	SCU 100 M
Tool shank SK/BT available as an option on selected units | Mill-Turn: HSK-T		Size	HSK-A 100		
Speed		min^{-1}	8,000	12,000	15,000
Power	S6 40%	kW	60	52	45
Torque	S6 40%	Nm	1,146	380	282

Standard: SCU 100 M

Powerful machining units

_machining units with 5th axis provided by the tool with robust swivel head kinematics

_choice of 2 machining units with motor spindle and 1 machining unit with gear spindle

_HSK-A 100 tool shank as standard, gear unit can be combined with SK/BT 50 as an option

_thermal stability and precision thanks to permanent cooling: precision cooling unit and thermal growth compensation of the spindle

_automatic clamping of the 5th axis, optional hydraulic clamping for ultra-heavy-duty machining operations with tilted rotary axes

_sturdy cast iron guide slide with high dynamic rigidity and damping

_Mill-Turn (option): HSK-T tool shank for maximum turning precision and integrated automatic spindle locking for maximum stability during turning operations

HELLER zero spindle system*

_easy replacement without time-consuming fine adjustment due to spindle set to zero dimension

_short repair times ensure maximum machine availability

_cost-effective solution for low TCO (Total Cost of Ownership)

Options

HELLER attachment head support (MSK) 1

_for the use of attachment heads, e.g. angular heads

_enlarged support basis with three-point rest

_integrated torque input and media transfer

SETUP-Assist 2

_remaining path display with additional functions always at your fingertips

Swivel head kinematics

_compact design and high rigidity

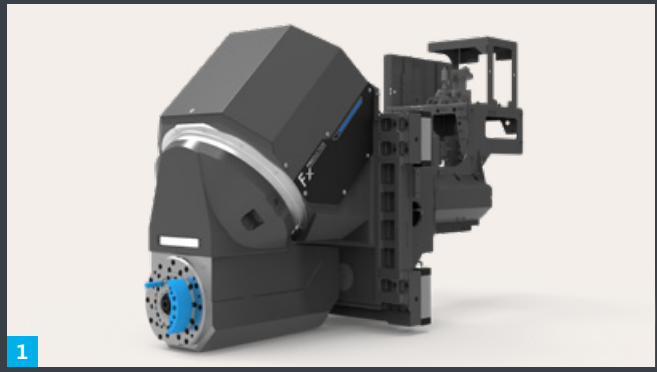
_robust 45° swivel head kinematics and short distance between bearing and tool shank

_dynamic, backlash-free swivel drive with two electrically pre-loaded motors

_large swivelling range of C 350° for high flexibility with 5-sided machining

_high projection length in vertical position for precise machining behind the rotary centre of the rotary table

_integrated LED light (WorkLIGHT) and remaining path display (part of the optional function SETUP-Assist)



1

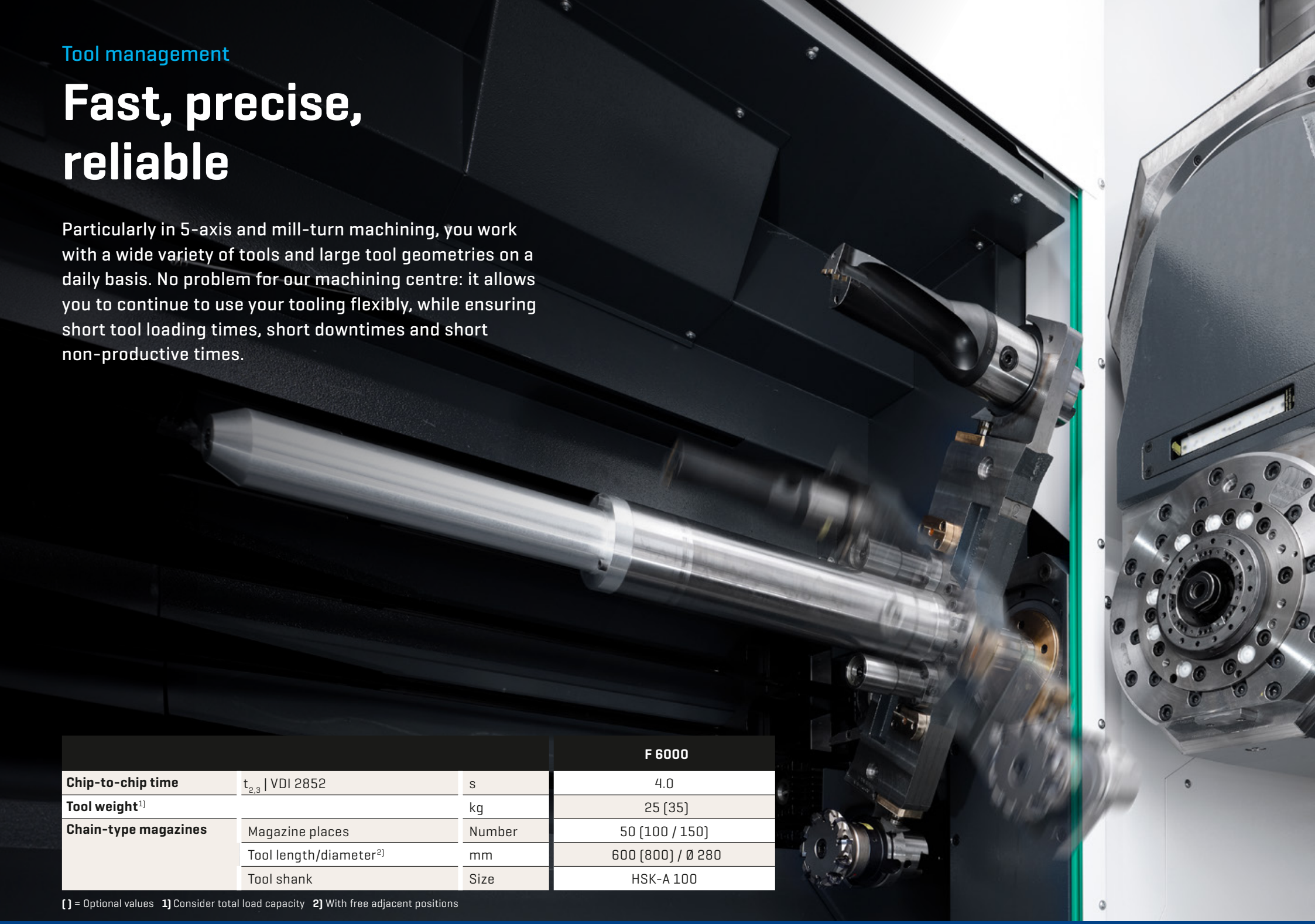
2

* available for the machining unit with gear spindle

Tool management

Fast, precise, reliable

Particularly in 5-axis and mill-turn machining, you work with a wide variety of tools and large tool geometries on a daily basis. No problem for our machining centre: it allows you to continue to use your tooling flexibly, while ensuring short tool loading times, short downtimes and short non-productive times.



			F 6000
Chip-to-chip time	$t_{2,3}$ | VDI 2852	s	4.0
Tool weight[1]		kg	25 (35)
Chain-type magazines	Magazine places	Number	50 (100 / 150)
	Tool length/diameter[2]	mm	600 (800) / Ø 280
	Tool shank	Size	HSK-A 100

( ) = Optional values **1)** Consider total load capacity **2)** With free adjacent positions

1

Chain-type magazines

_choice of 3 chain-type magazines with up to 150 positions

_double chain with high traversing dynamics and sturdy tool holders mounted on both sides

_workpiece loading station with optimum accessibility for ergonomic and rapid loading of tools 1

_integrated tool provisioning place for provision of the next tool during machining and short tool-to-tool times

_tool shank in enclosed holders: protection against contamination and optimum hold during positioning

_tool provisioning during machining for short tool-to-tool times

Tool changer

_rapid tool change for short chip-to-chip times

_two NC axes with lift/swivel principle for high dynamics and long-term precision

_sturdy double gripper for a secure hold with heavy tool weights and moments of weight

Options

_tool loading during machining without affecting the ongoing machining process

_cleaning of tool shanks and pockets at the tool provisioning position of the chain-type magazines

_tool coding for automatic storage and transfer of tool data in the tool

_precision laser measurement and monitoring of the tools in the spindle

Workpiece management

Automated from the ground up

The F 6000 5-axis machining centre is currently available with a pallet changer, making it ideal for flexible and reliable series production. Of course, integration of other automation solutions is also possible.

			F 6000
Type			Pallet changer
Clamping surface	Nominal size	mm	630 x 630 (800 x 800)
Workpiece dimension	Diameter W / Full circle D Depth T x Width W	mm	Ø 1,300 / Ø 1,000 Full circle 1,000 x 1,300
	Height H	mm	1,300
Clamping load		kg	1,500 (2,000)
Load pallet changer	Total / load difference	kg	2,000 (3,000) / 1,500
Pallet change time		s	14

( ) = Optional values

Pallet changer

_automatic pallet changer with lift/swivel principle

_high maximum load with robust, hydraulic drive

_optimum application of force to machine pallets due to the fork shape of the lift-and-swivel bridge

_consistently high tool change accuracy due to robust alignment elements and extensive blow-off of functional surfaces

_hydraulic pallet clamping for secure hold, even under high process forces

_machine pallets with DIN hole pattern and standardised alignment elements for rapid mounting of clamping fixtures

Rotary table 1

_NC rotary tables (DDT) with direct drive (Torque)

_HELLER construction ensures optimal, compact design of the rotary table for high tilting moments

_rotary table clamping with oil-hydraulic diaphragm brake

_rotary feed table positioning by direct path measurement with absolute rotary encoders

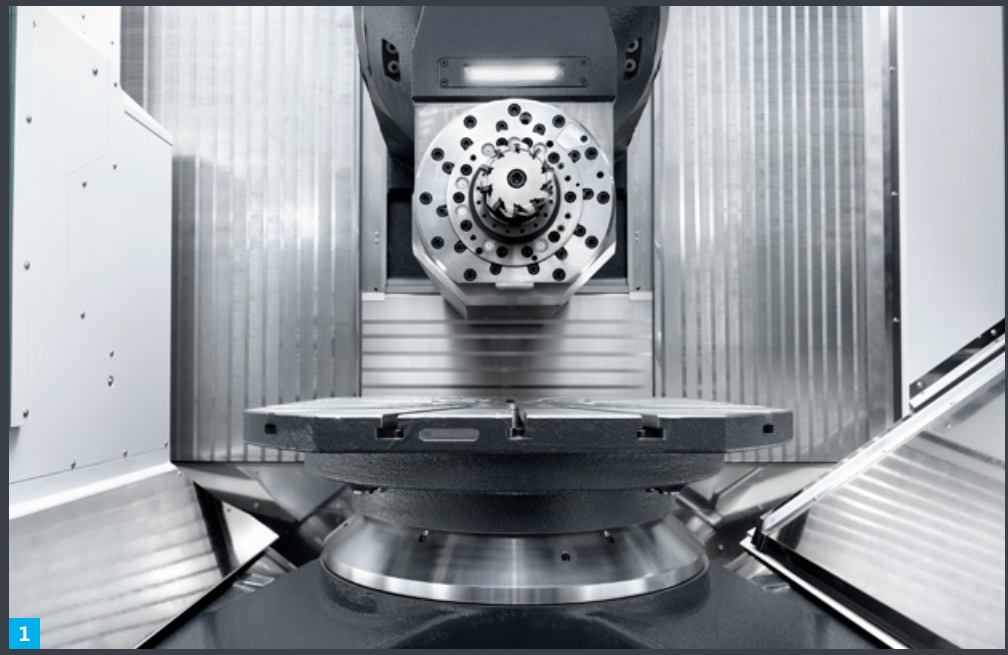
_pallet alignment by means of diamond-type dowel pin and indexing pin for consistent clamping and alignment

Options

_available in three versions: hole pattern, parallel T-slot and radial T-slot

_existing manual clamping fixtures can be reused on H/F/C machines

_pallet interchangeable with H/F/C series



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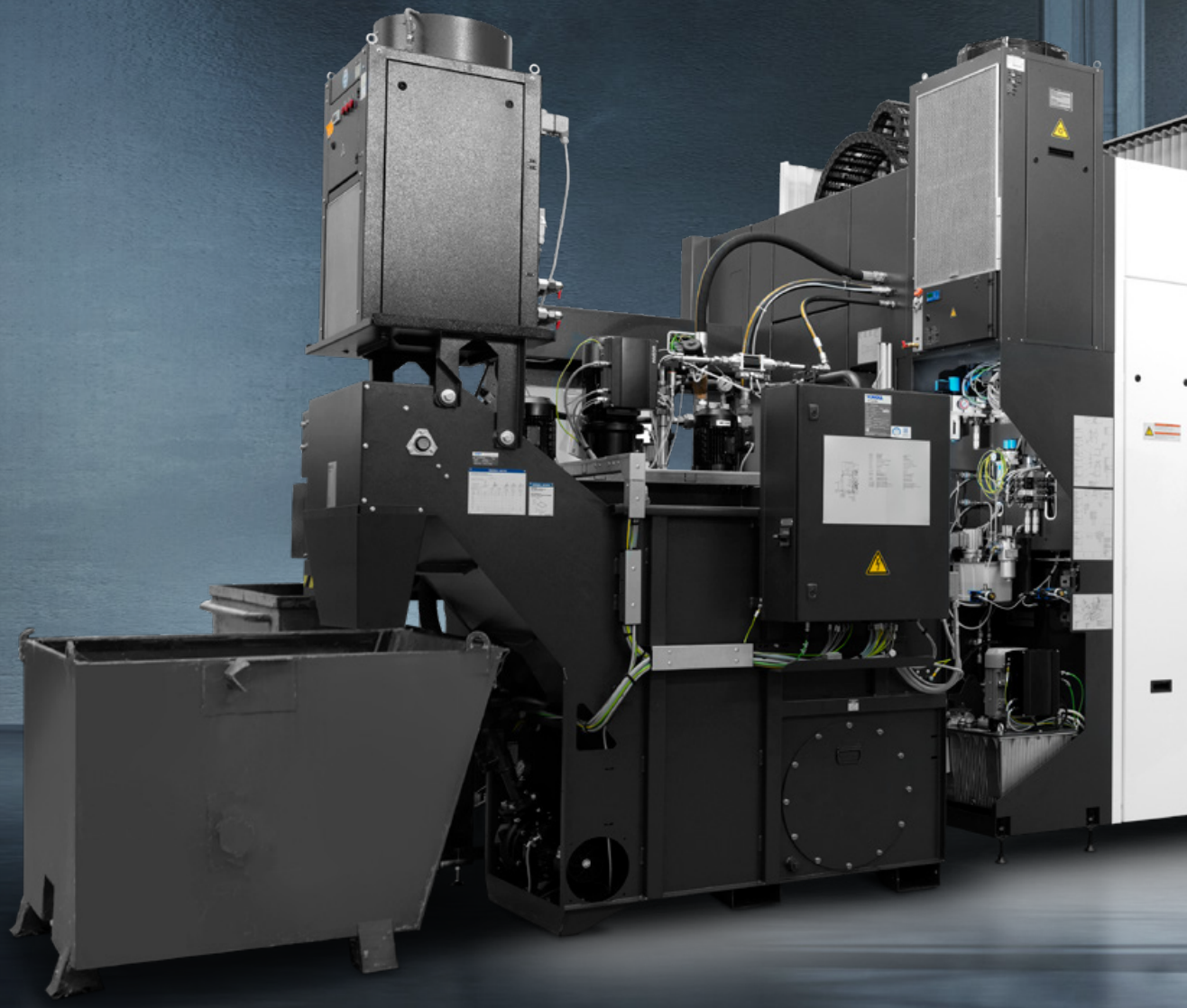
Supply and disposal

For maximum chip removal rates

Fast and effective chip removal is a top priority with our machining centres. The design of the work area prevents the accumulation of chips and ensures that they are quickly removed from the machine. You can select the most suitable conveyor design and coolant unit for your individual work processes. Precision and process are assured!



Cooling lubricant supply

_coolant units: paper band filter or vacuum rotation filter with high tank volumes available as options

_internal coolant supply (IKZ) through the tool with high pressure 50 bar (option: 70 bar)

_internal coolant supply with up to 7 pressure steps freely programmable via NC program

_external tool cooling with integrated spindle flushing nozzles

_integrated work area shower with adjustable nozzles for optimum flushing of the work area and cooling of the workpiece

Options

_coolant cooler for high thermal stability and precision

_coolant temperature control unit

_automatic filling of the coolant unit

_oil skimmer for separation of foreign oil from the cooling lubricant tank

_automatic setting station flushing

Chip disposal

_chip disposal using spiral conveyors and a cross-conveyor

_chip conveyor either as scraper belt or hinged conveyor, depending on the application (option)

_steep side panels and concertina covers with self-cleaning effect to prevent chip deposits **1**

_work area flushing and shower to support rapid chip removal in machines with coolant units

_option: extraction unit for the removal of coolant mist from the work area

Media supply

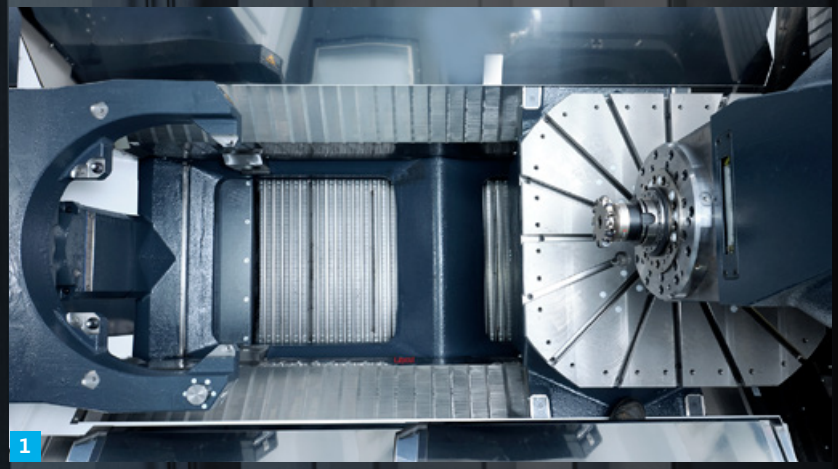
_easy maintenance with optimum accessibility, all supply units at a glance

_compressed air and water guns integrated into the machine housing at the workpiece loading station the workpiece loading and operating station **2**

_central oil-air lubrication for key components

_sealing air and selective blow-off of interfaces for continuous, smooth machine operation

_media interface for hydraulic workpiece clamping with 60 bar or 200 bar (option)



1

2

2

Control technology

Perfect performance for complete machining

In everyday working life, speed is of the essence.
The modern, high-performance Siemens SINUMERIK ONE control with HELLER Operation Interface makes things easy for you and provides perfect support for your tasks: with intuitive operation, easy programming, cycle support and key information always at your fingertips.

Machine control

_high-performance control Siemens SINUMERIK ONE to meet the highest standards of performance and machining precision

_ergonomic operating panels around the machine: 1 main operating unit HELLER Operation Interface as standard, HT2/HT10 handheld operating unit as option

_digital drive technology and modern system architecture

_SINUMERIK Operate user interface for efficient machine operation

_HELLER Operation Interface for enhanced ease of operation

_optimally integrated and tailored to the requirements of HELLER machining centres with MDynamics 5-Axis technology package

HELLER Operation Interface

_main operating unit in panel design for optimum ease of operation

_24” screen and multi-touch function, ideal for displaying documents and drawings

_HELLER Operation Interface with 4 function areas for extra information at a glance

_practice-oriented Xtends: HELLER extensions with additional functions

_machine control panel with pushbuttons and 3 overrides for optimum control in all operating situations

Options

_HT2/HT10 handheld operating unit

_convenient operating panel at the tool loading station 2

_HELLER Remote Diagnostic Services RDS

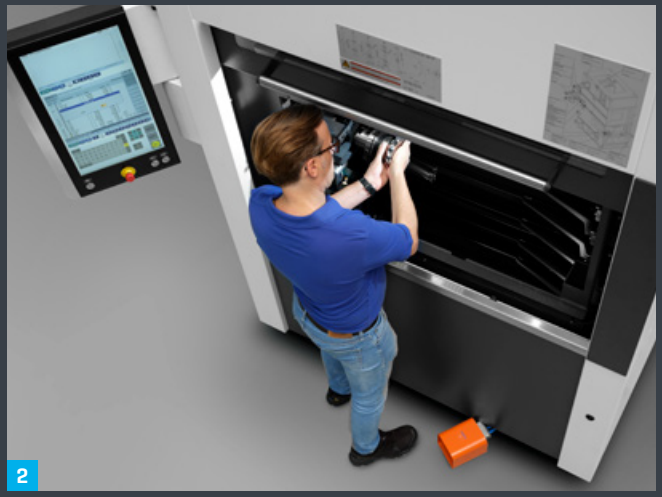
_pallet management system for multiple setups

_alternative strategy

_job management

_automatic loading and unloading sequence

1

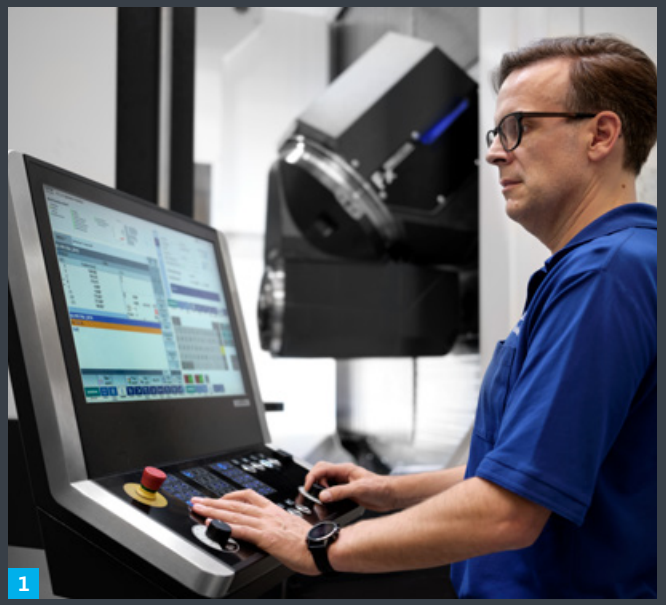


2

Operation and maintenance

Optimal access to all work areas

Working with HELLER machines, you can feel every day how much engineering experience has gone into these machining centres. Whether at the workpiece setting station, during tool loading, programming or maintenance – your comfort, safety and, above all, the productivity of your manufacturing operations are always in the foreground.



1

Operating station 1

_ergonomically arranged operating elements and control screens

_swivelling main operating unit with clamping function integrated into the machine enclosure to save space

_good view into the work area thanks to large safety window

_smooth-running, linear-guided work area door opens the work area roof in the operating area

_operating modes 2 and 3 included in the standard scope of supply

Options

_HT2/HT10 handheld operating unit

_screen blow-off device for a clear view when machining with coolant

2

Workpiece setting station 2

_large smooth-running doors for optimum access during loading and set-up using a crane or other handling equipment

_workpiece setting station lockable in 90° indexing positions

_easy-to-reach operating elements and media guns

Options

_automatically operated setting station door

_automatically rotating NC setting station

_software options: automatic loading and unloading sequence

Tool setting station

_ergonomically arranged operating elements

_optimum-height insertion position with integrated unclamping function for easy handling

_tool loading at the magazine while the spindle is running

Options

_convenient operating panel at the tool loading station

_tool loading during machining

_tool coding with RFID chip

_HELLER TRP (Tool Requirement Planning) for automatic generation of loading and unloading lists

3

Maintenance 3

_all supply units at a glance with easy access

_smooth-running doors and easy-to-remove sheet metal panels

_easy and direct access to the control cabinet

_quick-response HELLER spare part service

Options

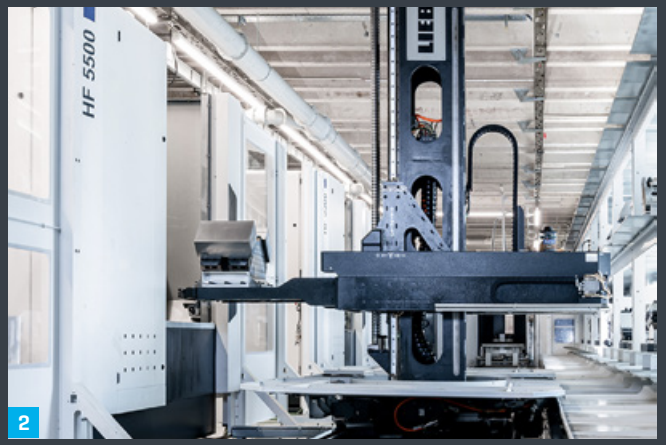
_maintenance manager for maintenance planning and operator support at the machine

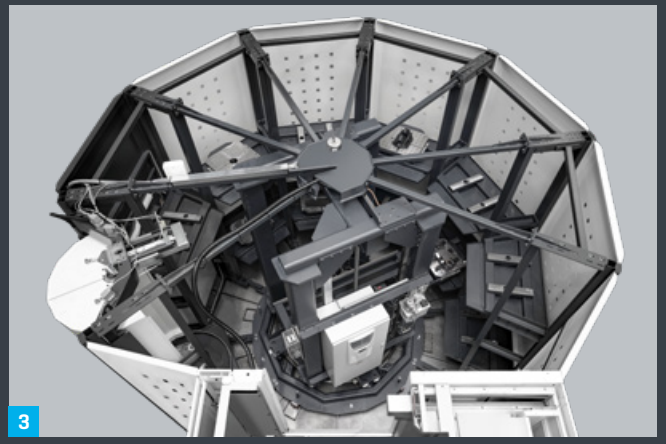
_HELLER TPS (Total Productive Services): service agreements for inspection, maintenance and servicing

Automation solutions

Open to standards – flexible for customised solutions

The main objective of automated manufacturing and production centres is to reduce downtime and optimise system availability. For this purpose, HELLER has developed its own automation solutions that work perfectly with HELLER's highly productive machining centres. To meet the diverse needs of the market, this portfolio is complemented by a range of specialised solutions that HELLER is able to offer through best-in-class partnerships.





Pallet automation

Pallet changer 1

First automation level, integrated into the machine.
Perfect for serial production with medium and large lot sizes.

Linear pallet storage 2

Automatic handling of pallets for optimised flexibility.
Perfect for serial production with medium and large lot sizes.

Rotary pallet storage 3

Automatic handling of pallets for optimised flexibility with low space requirement. Perfect for serial production with medium and large lot sizes.

Optimally equipped with AUTOMATION-READY

This new option for the F 6000 allows the standardised linear and rotary storage solutions to be retrofitted at low cost and without major modifications.

Workpiece automation

Robot 4

Automatic loading and unloading of workpieces, fixtures and pallets as well as automation of additional handling jobs.
Perfect for serial production with medium and large lot sizes.

Linear gantry loader 5

Linking of plant components in production lines with maximum output. Perfect for serial production with short durations and highest production volume.

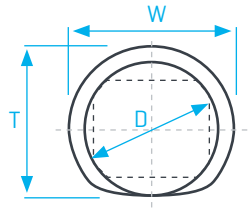
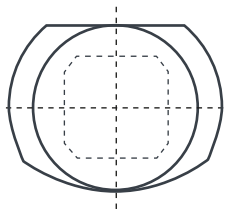
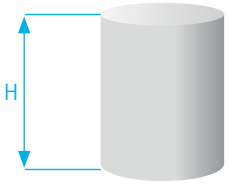
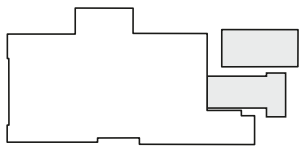
Tool automation

Background tool magazine 6

Central tool provision for several machines.
Perfect for production systems with maximum of flexibility and automation.

Technical data			F 6000
LINEAR AXES			
Positioning range	X/Y/Z	mm	1,000 / 1,000 / 1,400
Rapid traverse speed	X/Y/Z	m/min	65
Acceleration	X/Y/Z	m/s^2	5 / 7[1] / 7
Feed forces	X/Y/Z | S3 40%	kN	15 / 30[2] / 20[3]
Positioning tolerance Tp / At[4]	X/Y/Z | VDI/DGQ 3441 / ISO 230	mm	0.005
ROTARY AXES			
NC rotary feed table	B | Speed / Torque S3 40%	min^{-1}/Nm	25 / 2,900
NC rotary feed table: Mill-Turn	B | Speed S3 40% / Torque	min^{-1}/Nm	700 / 2,600
Positioning tolerance Tp / At[4]	B | VDI/DGQ 3441 / ISO 230	arcsec	7
5th axis		Type	Swivel head
MACHINING UNITS			
Tool shank	SK/BT for selected units available as alternative | Mill-Turn: HSK-T	Size	HSK-A 100
Variants	Type: Speed / Power S6 40% / Torque S6 40%	min^{-1}/ kW/Nm	(PCUe: 8,000 / 60 / 1,146)
			(DCU: 12,000 / 52 / 380)
			SCU: 15,000 / 45 / 282
TOOL MANAGEMENT			
Chip-to-chip time	$t_{2,3}$ | VDI 2852	s	4.0
Tool weight[5]		kg	25 (35)
Chain-type magazines	Magazine places	Number	50 (100 / 150)
	Tool length/diameter[6]	mm	600 (800) / Ø 280
	Tool shank	Size	HSK-A 100

( ) = Optional values **1)** In Y- **2)** DCU/SCU **3)** S3 20% 6 min **4)** Position uncertainty **5)** Consider total load capacity **6)** With free adjacent places

Technical data			F 6000
WORKPIECE MANAGEMENT			
Type			Pallet changer
Clamping surface	Nominal size	mm	630 x 630 (800 x 800)
Workpiece dimension			
	Diameter W / Full circle D Depth T x Width W	mm	Ø 1,300 / Ø 1,000 Full circle 1,000 x 1,300
			
	Height H	mm	1,300
Clamping load		kg	1,500 (2,000)
Load pallet changer	Total / load difference	kg	2,000 (3,000) / 1,500
Pallet change time		s	14
MACHINE			
Dimensions	approx. L x W x H | Basic machine with standard chain-type magazine, coolant unit with paper band filter and platforms, if required.	mm	7,500 x 4,100 x 3,900
	approx. L x W x H | Basic machine with standard chain-type magazine, coolant unit with backflush filter and platforms, if required.	mm	7,900 x 3,700 x 3,900
			
Weight	approx. | Basic machine with standard chain-type magazine, without coolant unit	t	22
CONTROL TECHNOLOGY			
Machine control			Siemens SINUMERIK ONE

Machines

Productivity over the full spectrum

4-axis machining centres

H

Tailor-made off the peg:
Flexibly configurable 4-axis machining centres with unbeatable productivity and unparalleled resilience

5-axis machining centres

HF

Productivity in 5 axes:
5-axis machining centres with the 5th axis in the workpiece for dynamic and productive machining

5-axis machining centres

F

The benchmark in 5 axes:
5-axis machining centres with the 5th axis in the tool for high-performance 5-sided and simultaneous 5-axis machining

5-axis milling/turning machining centres

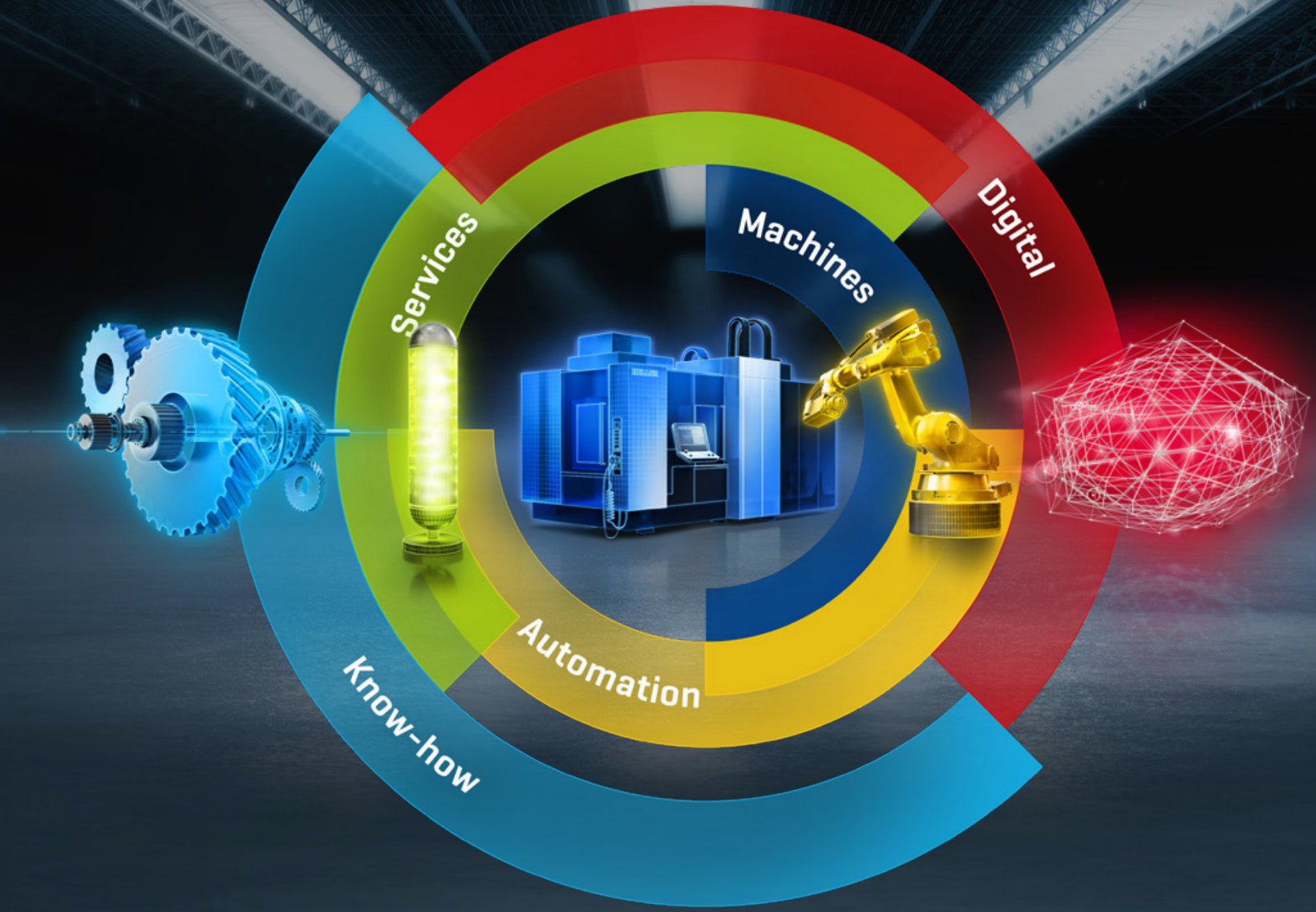
C

Powerful complete machining:
5-axis milling/turning machining centres for combined milling and turning on one machine

Flexible manufacturing systems

Highly-productive series production of light duty to heavy duty automotive components

360° solutions for tomorrow's manufacturing



Machines
Full spectrum of productivity

Get the most out of your production – with tailored solutions from stand-alone machine to production system. Made by HELLER – made to work.

Automation
Flexible, value-adding, competitive

Reduce idle times and optimise system availability – with customised concepts for pallet, workpiece and tool automation.

Services
Lifetime Partnership

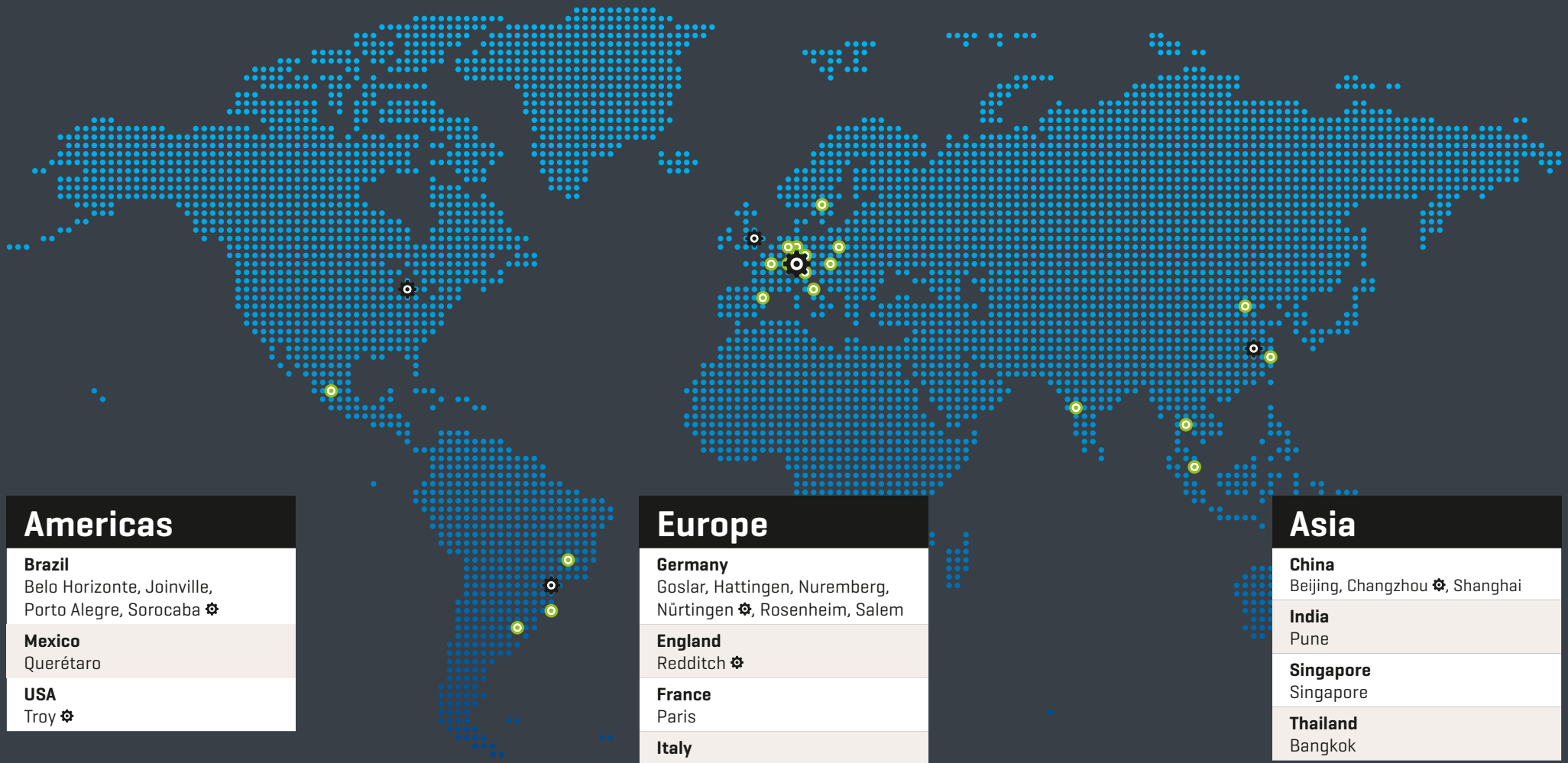
Experience genuine support throughout the entire life cycle of your machine – from project planning through to reuse. Fast, flexible, customer-oriented.

Digital
Equipped for the factory of the future

Increase the productivity of your machines through digitisation – with user-oriented, future-proof operating systems, interfaces and applications.

Know-how
Experience meets the spirit of innovation

Benefit from our knowledge from over 125 years experience – with sound application assessment, technological innovations and hands-on training.



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