C 400
www.hermle.de

HERMLE
milling at its best

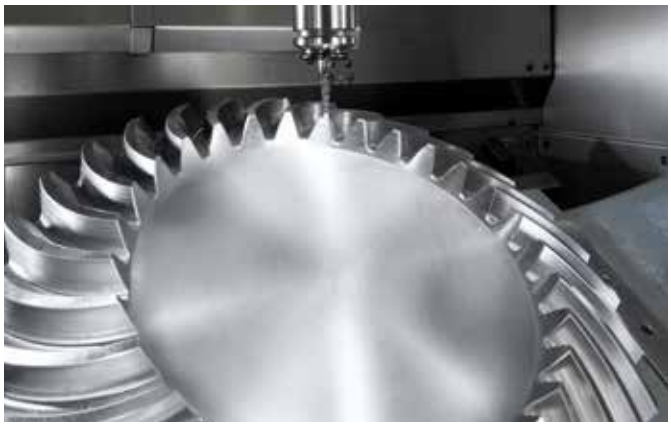
Milling at its best: Hermle machines are often at the forefront when it comes to optimized results.
The proverbial Hermle precision in combination with process consulting and project management has made us an important machine manufacturer in nearly all key sectors: From large complex components to the very smallest components in the high-tech sector. Versatile applications, uncompromising results Hermle – the original.

Contents.

01
Industry sectors

Hermle is at home in all sectors. For us, ensuring the highest precision and reliable machining is always paramount. Our machines are built for daily use.

Machine construction



Precision mechanics

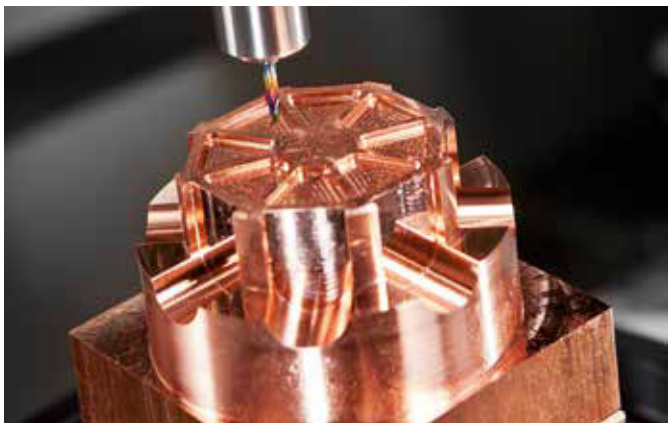
Medical engineering

Energy technology

Aerospace industry

Automotive industry

Tool and mould construction



Subcontractor industry

02
The machine

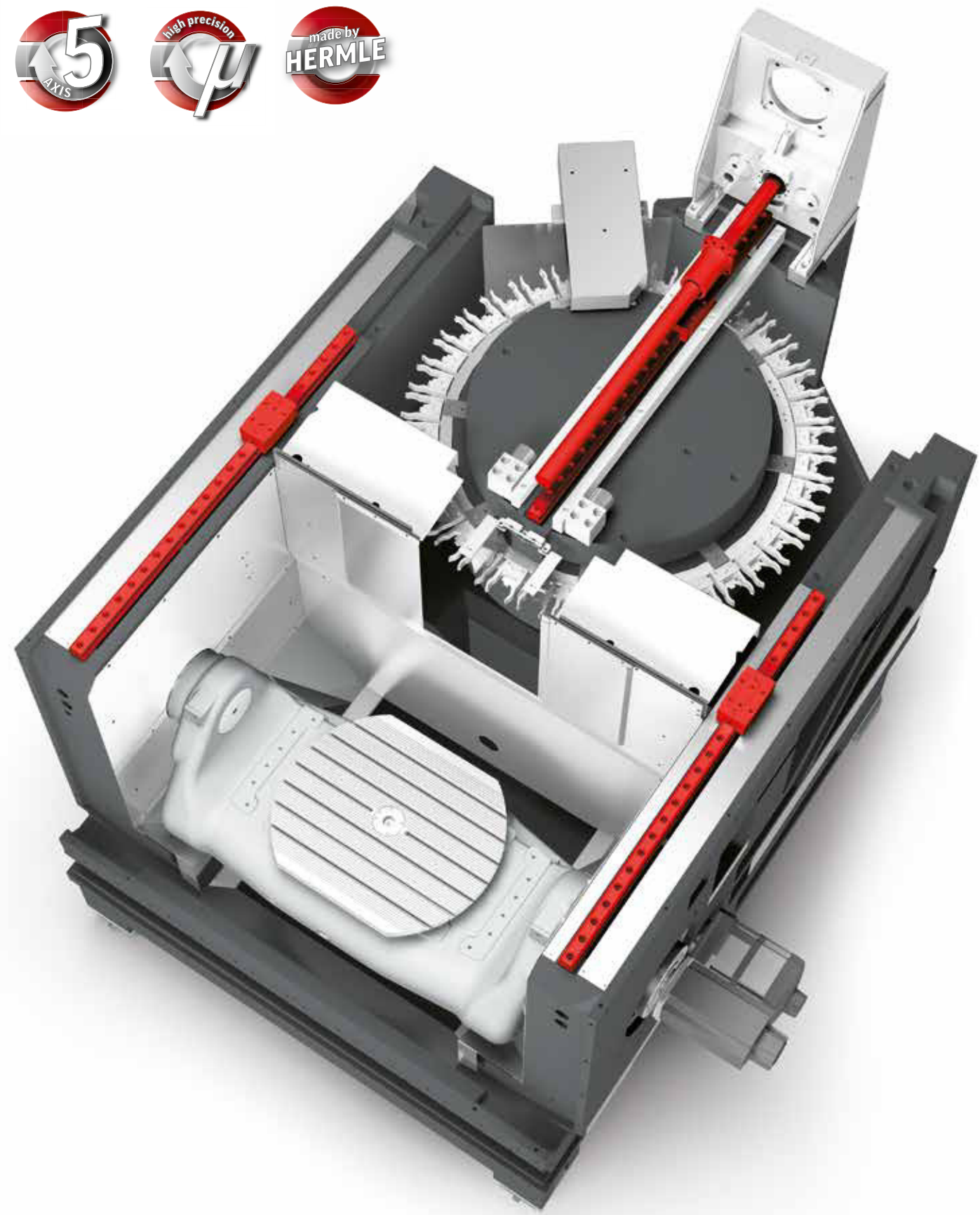
The C 400: a dynamic machining center designed for entry-level 5-axis/5-side machining.
Features galore to ensure high-precision, economical parts production.

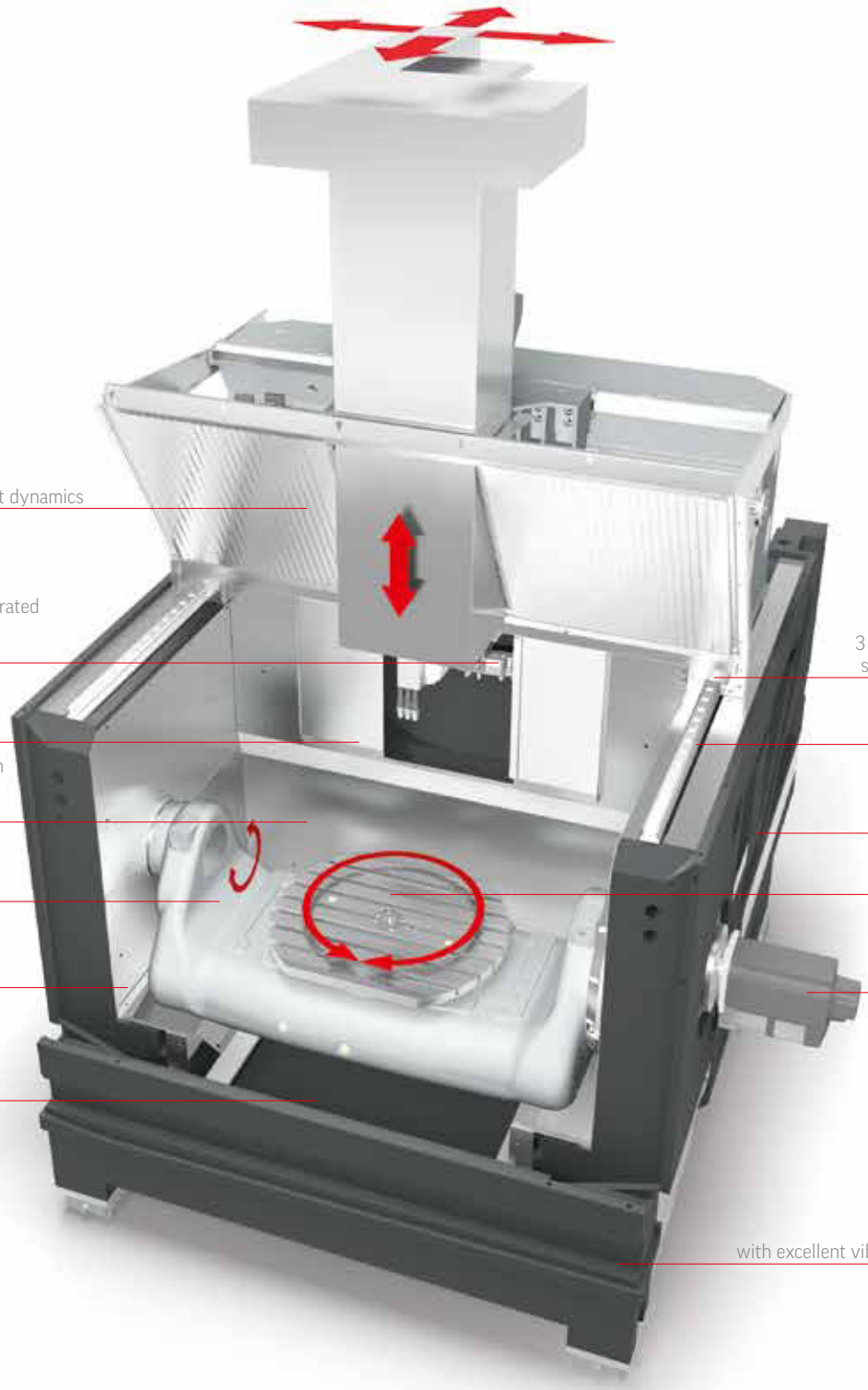
TECHNICAL DATA

Traverse path X-Y-Z:	*850 – 700 – 500 mm*	
Speed:	*15000 / 18000 rpm*	
Rapid linear traverses X-Y-Z:	*35 m/min*	
Linear acceleration X-Y-Z:	*6 m/s²*	
Control unit:	*TNC 640*	
Rigid clamping table:	*1070 x 700 mm*	
Max. table load:	*2000 kg*	
Swivelling rotary tables:		
Machining table with worm:	*Ø 440 mm*	*Ø 650 x 540 mm*
Swivelling range:	*+91° / -139°*	*+91° / -139°*
A-axis speed		
One-sided drive:	*25 rpm*	*25 rpm*
C-axis speed:	*30 rpm*	*30 rpm*
Max. table load:	*450 kg*	*600 kg*


C 400

02.1
New dimensions in dynamics





3 axes in one tool for workpiece-independent dynamics

Pickup magazine integrated into the base body to save space

Stainless steel lining of entire working area

Optimized chip ejection in working area during dry machining

Swivelling range of swivelling rotary table +91° to –139°

Largest working area relative to the support surface

Accessibility, excellent ergonomics

Force characteristics: 3 guideways with one guide shoe for ideal force balance

Linear axes above the working area

Modified gantry design with optimum main axis support

Worm gear (C-axis)

One-sided drive (A-axis) Avoidance of torsion and high accuracy

Mineral casting design with excellent vibration damping properties

02.2
The workpiece

Many important points must be observed in order to guarantee that every workpiece is machined perfectly. For this reason, Hermle has been working on perfecting and optimizing the machining process for many years. This is the reason that the C 400 is now equipped with:
- the largest working area relative to the installation area.
- the largest swivelling range of workpieces in the working area.
- utilization of the entire traverse range.
- a large collision circle between the table flanges.

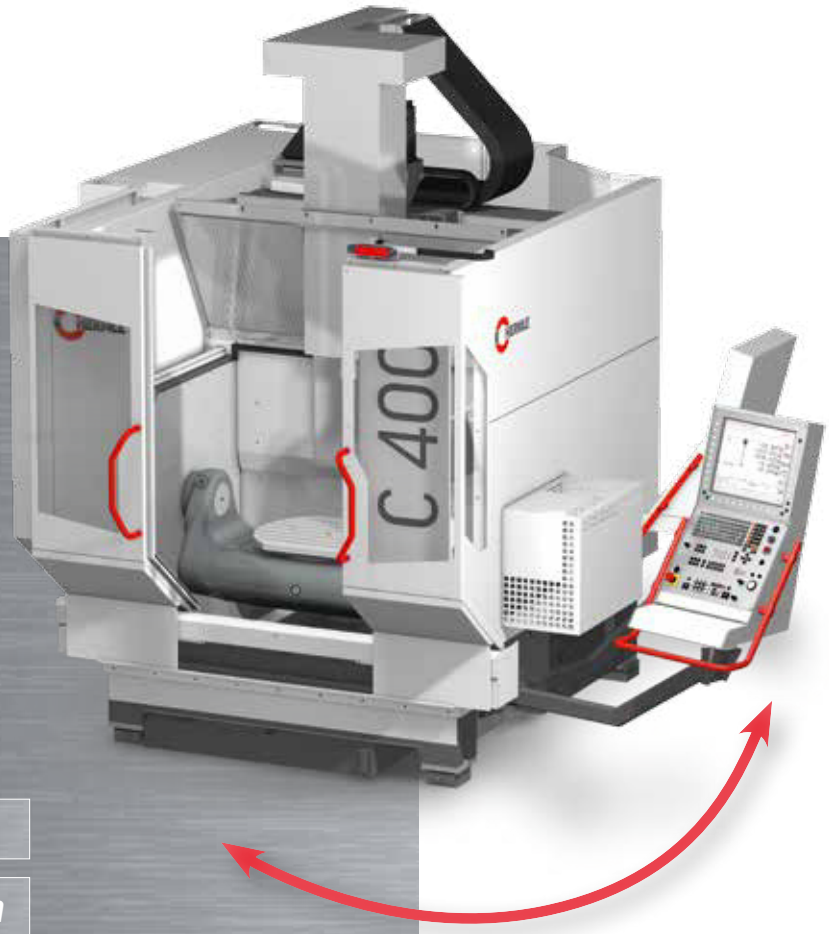
THE WORKPIECE DIMENSION

- *Unlimited crane top loading to above the table center*
- *When loading the crane the tool spindle moves to the tool magazine – this means the working area is completely clear and accessible*

3-axis	5-axis
850 x 700 x 500 mm	Ø 650 x 500 mm
max. 2000 kg	max. 600 kg
	Collision circle: Ø 885 mm

02.3 Ergonomics

Built for daily use: The Hermle C 400 can be ergonomically adapted for every machine operator for optimum ease of use, simple operation and uncomplicated maintenance.



HIGHLIGHTS

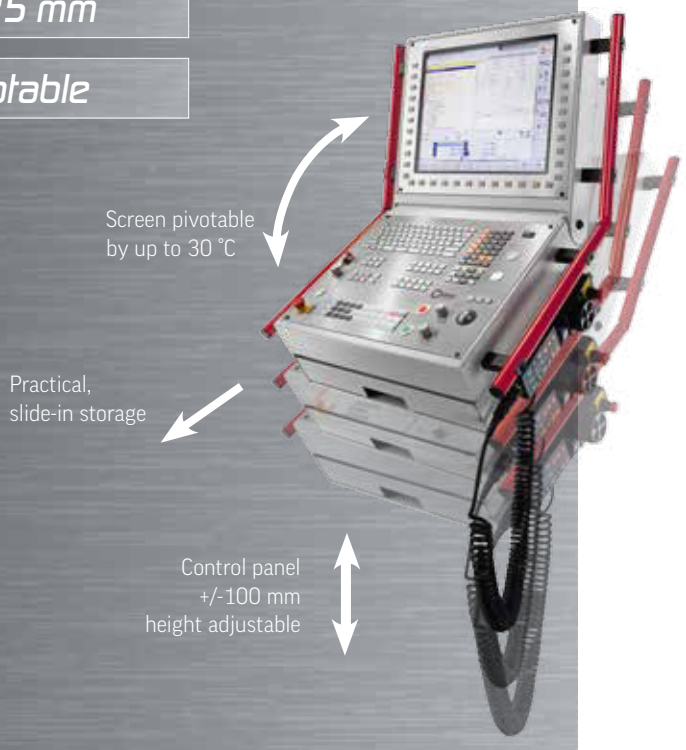
- Ergonomic control panel:
  - Adjustable height +/- 100 mm (Option)
  - Tilting screen 5 - 35° (Option)
  - 19“ screen
  - Control panel pivotable from the tool loading point to the working area
- Optimum loading height
- Crane loading possible
- Minimum interval between machining table and operator
- Large door opening

Door opening 900 mm

Vertical table clearance 625 mm

Loading height 925 mm

Control panel, pivotable



02.4
Table variants

Hermle's swivelling rotary table has revolutionised the concept of 5-axis machining. The C 400 also relies on 5-axis operation, and the swivelling rotary table with worm gear makes full use of its advantages. All machining tables are manufactured exclusively and entirely at our plant in Gosheim.

TECHNICAL DATA

High degree of freedom in working area

- *Very high table loading (up to 2000 kg with the highest accuracy)*
- *No accumulation of chip on the swivelling rotary table (swivel table)*
- *Swivelling axis A and rotary axis C are located within the workpiece (U-shape)*
- *Wide flange spacing results in a very large collision circle in the working area*
- *High swivelling range for undercuts*

Worm table

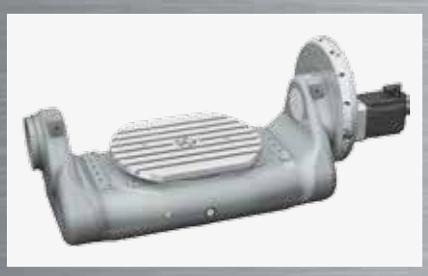
- *Generously dimensioned worm gear*
- *Low torsion attachment*
- *Direct, absolute measuring system*

DRIVE TECHNOLOGY

- *Centrical table load*
- *Drive directly on table housing = low torsion A axis*
- *Direct, absolute measuring system*
- *Good maintenance accessibility*
- *A axis integrated in machine bed*

One-sided drive

- *Mechanical drive on right of table housing*



Uncompromised perfection: this drive design accesses the gearwheel on the table housing directly and so completely eliminates shaft torsion on the swivelling rotary table. This is the only way to achieve the highest precision.

Made in Germany – made in Gosheim: The C 400 table variants stand for the highest quality and optimum material usage from the cast housing to the installed gear motors. At our main plant in Gosheim, these swivelling rotary tables are laying the foundations for the precision, accuracy and quality of the machined surfaces.

Hermle's swivelling rotary tables are equipped with cutting-edge drive technology for high dynamic during 5-axis machining as the slowest axis determines the speed of 5-axis simultaneous milling. High-torque motors and the adapted gear can position loads of up to 600 kg rapidly and, most importantly, with exceptional precision.

Rigid clamping table

Clamping surface: 1070 x 700 mm

Equipped with the rigid clamping table, the machine can deal with clamping weights of up to 2000 kg – ideal for 3-axis machining of large, bulky and heavy workpieces.
T grooves: parallel 10 / 14 H7

Clamping surface:	1070 x 700 mm
T grooves:	parallel 10 / 14 H7
Max. table load:	2000 kg

Swivelling rotary table

Drive type C axis: Worm

The "Worm" swivelling rotary table provides the ideal entry into 5-axis technology.

Secondary clamping plates . 920 x 490 mm

Zero-point clamping systems /
pallet clamping systems

Clamping surface:	Ø 440 mm
T grooves:	parallel 5 / 14 H7
Swivelling range:	+ 91° / - 139°
Drive type - rotary C axis:	worm
Speed rotary axis C:	30 rpm
Speed swivelling axis A:	25 rpm
Max. table load:	450 kg
Secondary clamping plates (optional)	
T grooves:	parallel 7 / 14 H7

Clamping surface:	Ø 650 x 540 mm
T grooves:	parallel 7 / 14 H7
Swivelling range:	+ 91° / - 139°
Drive type rotary axis C:	worm
Speed rotary axis C:	30 rpm
Speed swivelling axis A:	25 rpm
Max. table load:	600 kg

02.5
Tool spindles

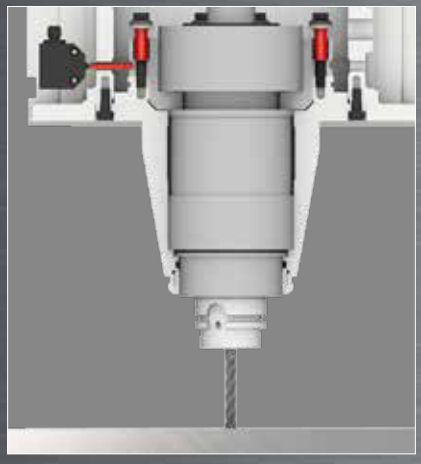
The C 400 is equipped with two-part tool spindles. Both spindle components can be replaced quickly and easily when servicing.
With the different speed ranges and tool holding fixtures the tool spindles are suitable for a wide variety of machining tasks. Like the machining tables, all tool spindles are manufactured exclusively and entirely at our plant in Gosheim.

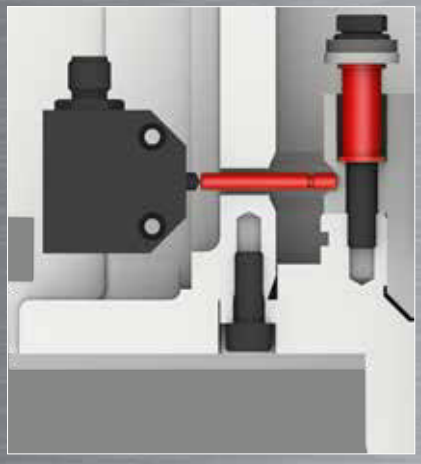
TECHNICAL DATA

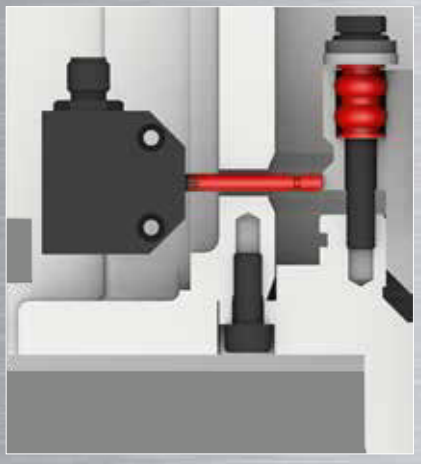
- *High-tech tool spindles for demanding milling processes*
- *Slim-end tool spindle for machining deep cavities*
- *Few projecting edges (prevention of collision)*
- *Two-part tool spindle (faster, easier replacement)*
- *Collision protection (collision sleeves) prevents damage in 50% of collisions*

Collision protection with collision inquiry

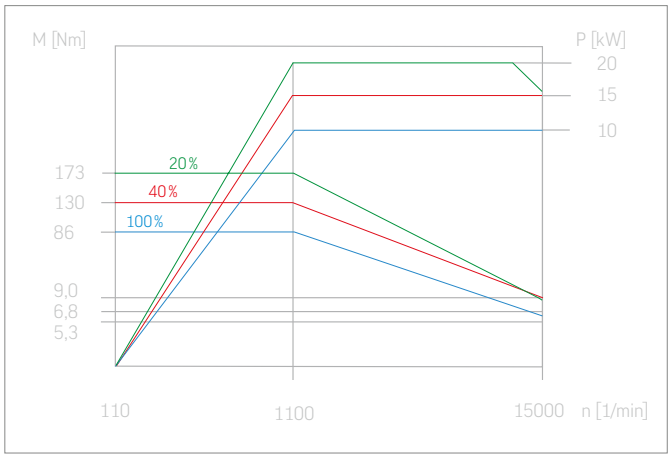
Each tool spindle has several collision sleeves which compensate collision energy in the Z direction.





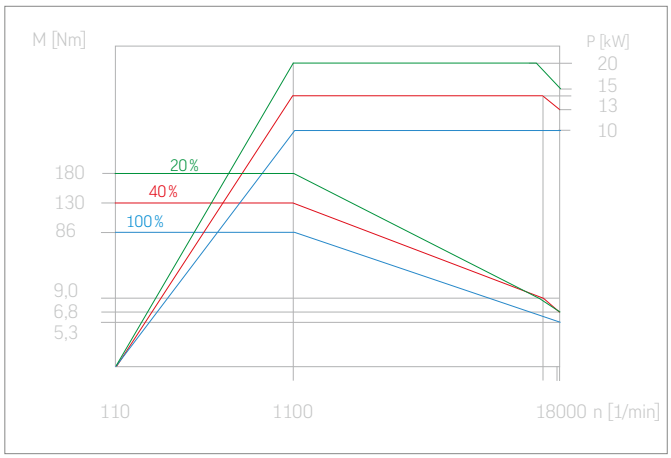


Tool spindle 15000 rpm



Maximum spindle speed:	15000 rpm
Output 20% c.d.f.:	20 kW
Torque 20% c.d.f.:	180 Nm
Tool holding fixture:	SK 40 / HSK A 63
Tool spindle:	two-piece
Collision protection:	collision sleeves

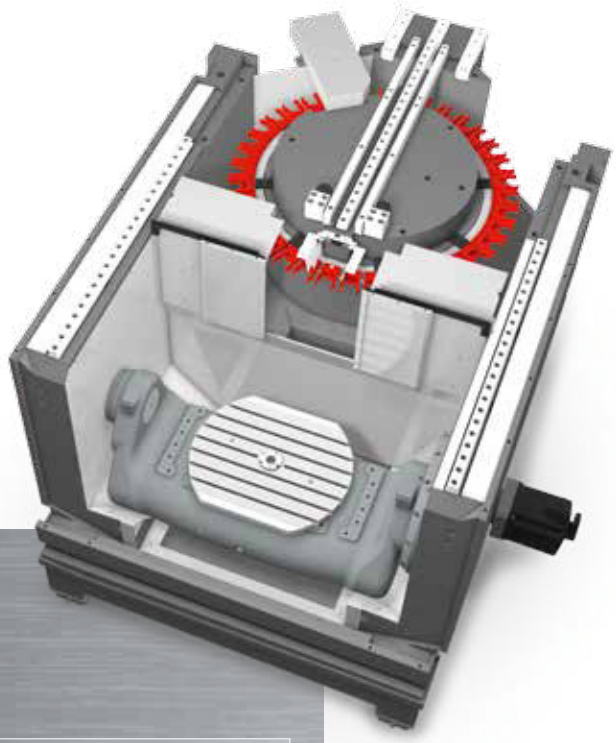
Tool spindle 18000 rpm



Maximum spindle speed:	18000 rpm
Output 20% c.d.f.:	20 kW
Torque 20% c.d.f.:	180 Nm
Tool holding fixture:	HSK A 63
Tool spindle:	two-piece
Collision protection:	collision sleeves

02.6
The tool magazine

The C 400's tool magazine holds up to 38 tools in the standard version and is integrated into the machine bed to save space. It can be filled from the side by swivelling the control panel to the loading point.

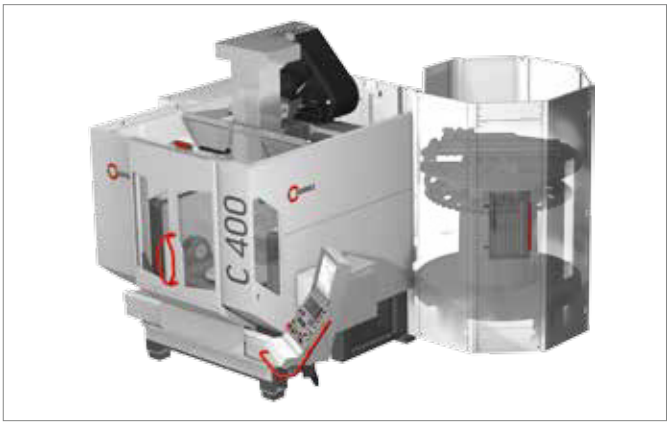


TECHNICAL DATA

- Pick-up magazine
- Integration into the machine bed
- Excellent accessibility
- Control panel pivotable to the loading point
- Tool changer (pick-up)

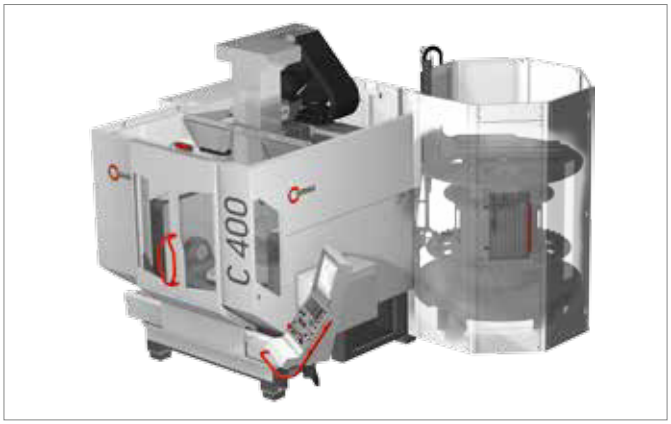
Interface:	SK 40 / HSK A 63
Magazine pockets:	38
Max. tool weight:	8 kg
Max. tool diameter:	Ø 80 with corresponding adjacent pocket allocation Ø 125 mm
Max. tool length:	300 mm
Max. magazine load:	152 kg
Chip-to-chip time:	approx. 6 s

Additional tool magazine ZM 50



Magazine pockets:	50
Max. tool weight:	8 kg
Max. tool diameter:	Ø 80, with corresponding adjacent pocket allocation Ø 125 mm
Max. tool length:	300 mm

Additional tool magazine ZM 88 k



Magazine pockets:	88
Max. tool weight:	8 kg
Max. tool diameter:	Ø 80, with corresponding adjacent pocket allocation Ø 125 mm
Max. tool length:	300 mm

02.7
Control unit

The C 400 is fitted with a Heidenhain TNC 640. The control unit provides diverse program functions. Hermle simplifies programming and operation still further with comprehensive extra features.

Heidenhain

Heidenhain TNC 640

- Dynamic Efficiency (Option) – Active Chatter Control (ACC), Adaptive Feed Control (AFC), trochoidal milling
- Dynamic Precision (Option) – Cross Talk Compensation (CTC), Active Vibration Damping (AVD)
- 19" TFT colour flat screen
- Keyboard unit with full keyboard, integrated trackball, USB and Ethernet interfaces
- Fully digital with HSCI interface and EnDat interface
- Programming in Heidenhain plain text or per DIN/ISO
- Standard drilling and milling cycles
- Touch probe system cycles
- Free contour programming
- Special functions for fast 3D machining
- Automatic calculation of cutting data
- Software option Kinematic Opt (Measurement cycle for improving accuracy of rotational and swivelling operations)

For further advantages and detailed technical data, please see the Heidenhain brochures.

Hermle setups

Standard

Standard

- Standard setting.
- Switches back to the standard setting after a different setup has been used.

Heavy duty machining

Heavy duty machining

- For roughing in conjunction with high milling power.
- Greater machining performance possible thanks to reduced machine vibration (depending on the tool and the selected technology data).

High production

Production

- Used for quicker machining with programs which have many cycle calls or subprograms.

Hermle control tools

Hermle "Tool-Management-Control"

Simple, Hermle tool management system for Heidenhain control units.

Hermle "Wear-Diagnosis-System"

Machine status is continually monitored by the Hermle wear diagnosis system. It facilitates rapid machine diagnostics and status-oriented detection of maintenance tasks.

Hermle „Information-Monitoring-Software“

The "Information-Monitoring-Software" displays the live status of the machines and communicates the events.

3D contour tolerance max.

3D contour tolerance max.

- For 3D roughing with low machining performance.
- Very high machining speed, mainly for free-form surfaces.

3D contour tolerance min.

3D contour tolerance min.

- For very high demands of machining accuracy, mainly for free-form surfaces.
- Can also be used with conventional programs.

3D path smoothing

3D path smoothing

- For very high demands on the surface quality, mainly for free-form surfaces.

02.8
The details

The C 400's details are packed with know-how. All attachments and operating devices of the C 400 have been smartly optimized for users and designed specifically for respective machining tasks.
The machining center can be transported without any disassembly and set up without a foundation. Furthermore, all units are arranged for easy maintenance and servicing.

Space-saving chip conveyor arrangement

Chip drawer

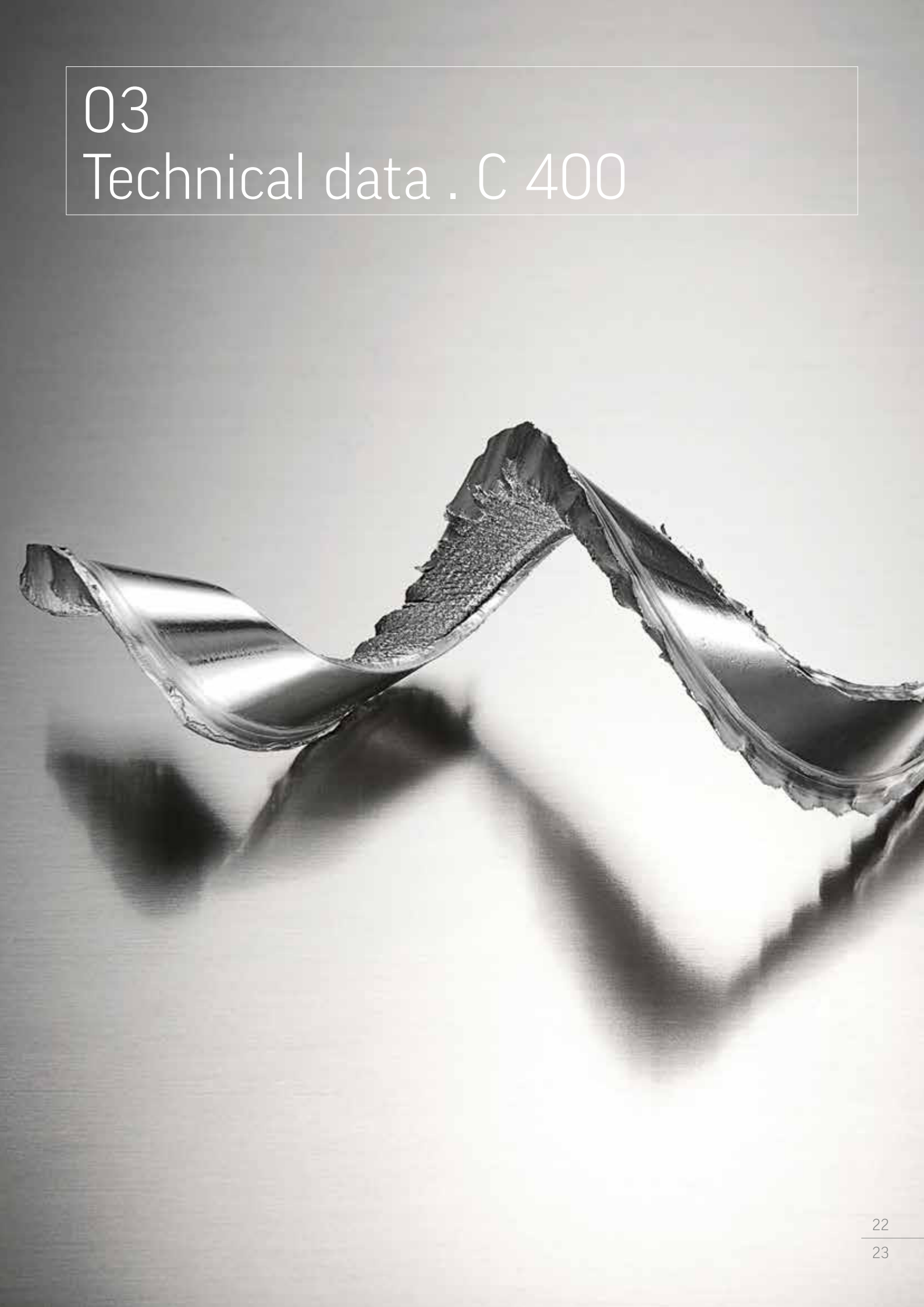
HIGHLIGHTS

- Comprehensive fluid technology
- Optimized chip management
- Diverse cooling lubricant units
- Scraper belt conveyor
- Hinged belt conveyor
- We provide the correct method of chip removal from the working area for all kinds of chip

Chip conveyor

Chip conveyor with internal cooling lubricant supply ICS 80/40

03
Technical data . C 400



03.1
Technical data . C 400

Working area	Traverse	X axis	850 mm	
	Traverse	Y axis	700 mm	
	Traverse	Z axis	500 mm	
	Rapid linear traverses	X-Y-Z	35 - 35 - 35 m/min	
	Linear acceleration	X-Y-Z	6 m/s²	
	Linear feed force	X-Y-Z	7000 N	
	Max. vertical table clearance		625 mm	
	Max. workpiece diameter		Ø 650 mm	
	Max. workpiece height		500 mm	
	Collision circle (A axis) in 0° position		Ø 885 mm	
Main spindle drive	Speed Main power/Torque	15000 rpm 20% c.d.f.	SK 40 / HSK A 63 20 kW / 173 Nm	● ●
	Speed Main power/Torque	18000 rpm 20% c.d.f.	HSK A 63 20 kW / 173 Nm	 ○
Control unit	Heidenhain		TNC 640	●
Tool changer (pick-up)	Magazine pockets		38 items	●
	Chip-to-chip time		approx. 6 s	
	Maximum tool length		300 mm	
	Max. tool diameter with corresponding adjacent pocket allocation		Ø 80 mm Ø 125 mm	
	Max. magazine load		152 kg	
Extension of tool storage capacity	Additional tool magazine ZM 50		additional 50 pockets	○
	Additional tool magazine ZM 88 k		additional 88 pockets	○
	Max. tool diameter with corresponding adjacent pocket allocation in additional tool magazine		Ø 80 mm Ø 125 mm	
	Max. tool weight		8 kg	
Chip drawer	Removable chip drawer			●
Chip conveyor	Scraper belt or hinged belt conveyor Ejection height Chip cart		 at least 940 mm 450 l	○ ○
Internal cooling lubricant supply with paper band filter	Capacity of standard tank		350 l	●
	Capacity of cooling lubricant tank		700 l with 80 bar / 570 l with 40 bar	
	Pressure (manually adjustable up to)		max. 80/40 bar / 17/27 l/min	○

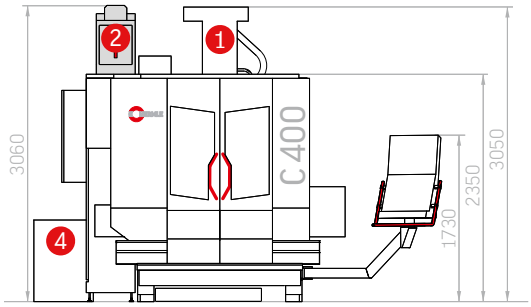
Table variants	Swivelling rotary table	Ø 440	Ø 650	Rigid clamping table
	Clamping surface	Ø 440 mm	Ø 650 x 540 mm	1070 x 700 mm
	Swivelling range	+91° / -139°	+91° / -139°	-
	C axis drive mode	Worm	Worm	-
	Swivelling axis A speed: One-sided drive	 25 rpm	 25 rpm	 -
	Speed rotary axis C:	30 rpm	30 rpm	-
	Max. table load One-sided drive	- 450 kg	- 600 kg	2000 kg -
	T grooves parallel	5 / 14 H7	7 / 14 H7	10 / 14 H7
	Secondary clamping plates T grooves parallel	920 x 490 mm 7 / 14 H7	- -	- -
Positional uncertainty	P in X-Y-Z axes according to VDI/DGQ 3441 (calculated at a constant ambient temperature of 20 °C +/-1 °C. Our products are subject to the German Export Law and require authorization since the attainable precision may be less/greater than 6 µm.)			0.008 mm ●
Hydraulics	Operating pressure			120 bar ●
Central lubrication	Minimum grease lubrication quantity			●
Connected loads (machine)	Mains connection			400 V / 50 Hz
	Power consumption			34 kVA
	Compressed air			6 bar
Weight	(standard version without optional extras, attachments, work-pieces and cooling lubricant)			approx. 9.5 t

● Included in standard delivery
○ Available upon request

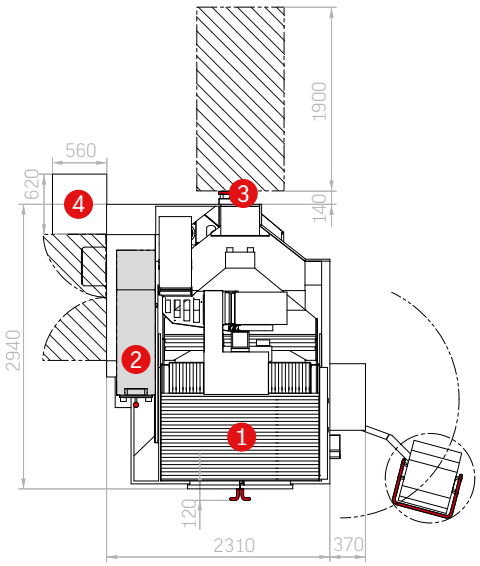
03.2 Options

The C 400 is prepared for anything: numerous optional extras make machining even more efficient and powerful in real applications and enable you to optimize your work with the machining center still further.

C 400 standard machine dimensions



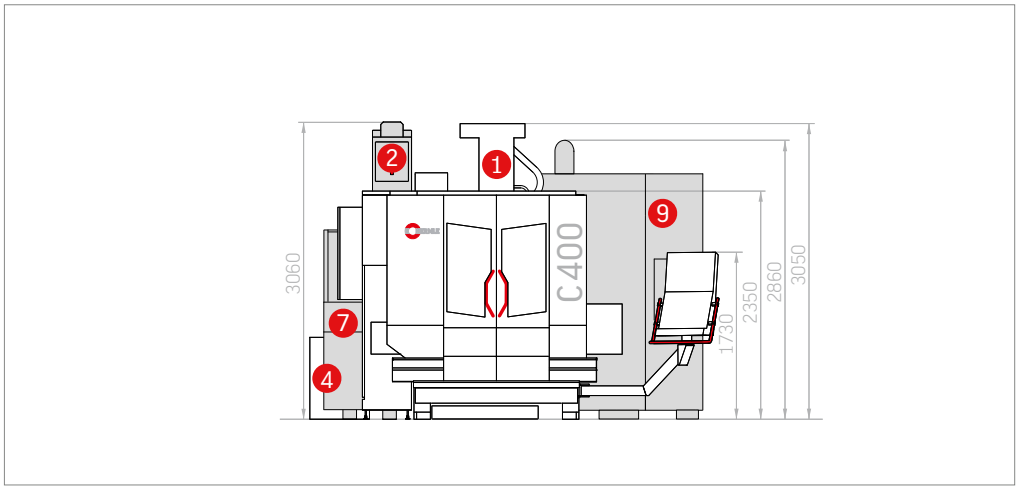
1 Machining center
2 Emulsion mist extractor
3 Chip drawer
4 Cooling unit

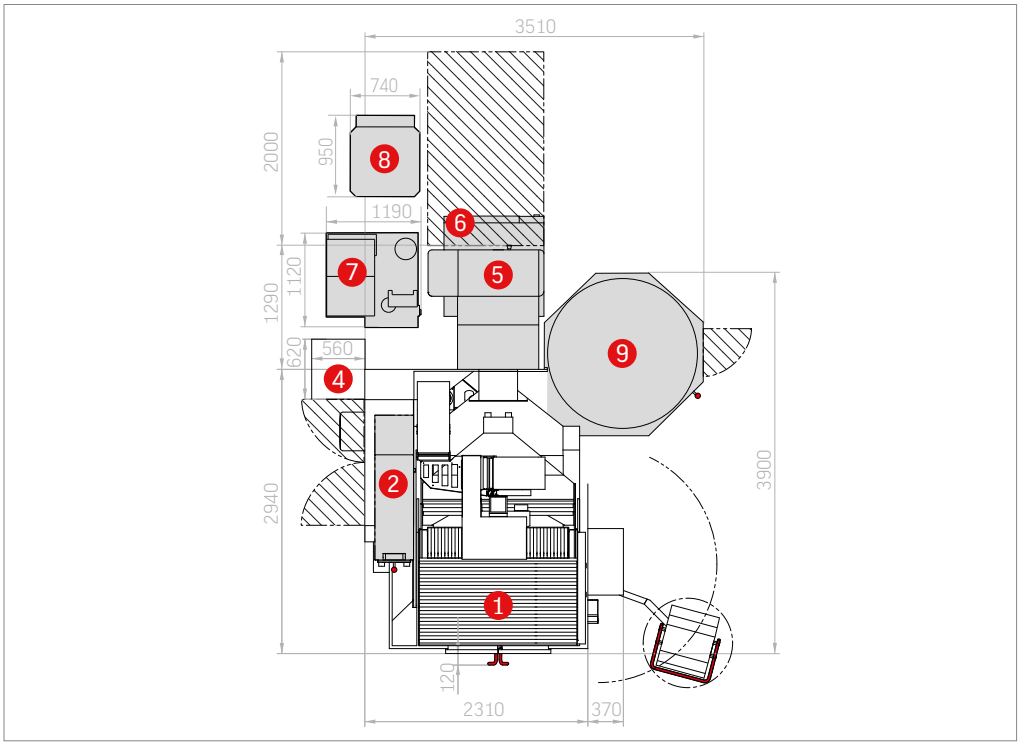


Options

- Automatic cabin door
- Automatic cabin top
- Blow-off unit
- Control panel height adjustable
- BDE signal
- Blow air through spindle centre
- Dynamic Efficiency
- Dynamic Precision
- Elec. manual control module
- Elec. heat compensation
- Emulsion mist extractor
- Internal cooling lubricant supply
- Touch probe with preparation
- Rotating transparent window
- Signal tower
- Chip conveyor
- Coolant nozzle
- Chip cart
- Sealing air for scales
- Laminated safety glass panes
- Button preparation
- Tool breakage monitoring/ measuring
- Additional tool magazine
- 6x rotary feedthrough

C 400 dimensions . Additional tool magazine ZM 50 / ZM 88 k





1 Machining center
2 Emulsion mist extractor
4 Cooling unit
5 Chip conveyor
6 Chip cart
7 Internal cooling lubricant supply
8 Recooling unit for ICS
9 Additional tool magazine ZM 50 / ZM 88 k

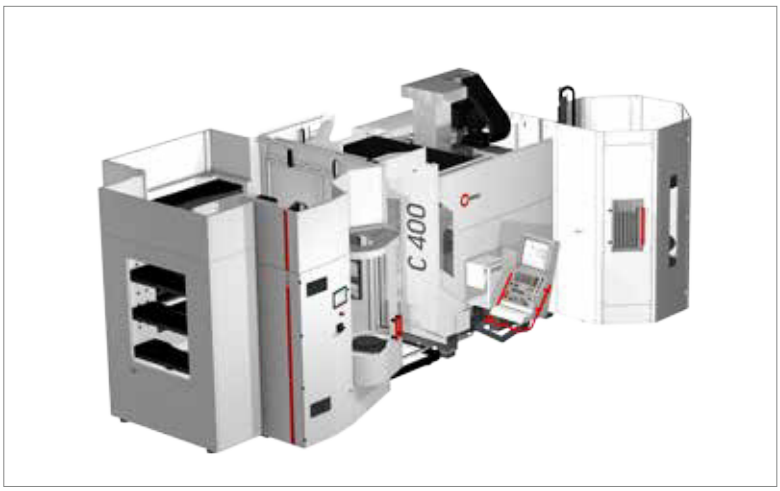
04
Automation


TRIBO
TRIBO

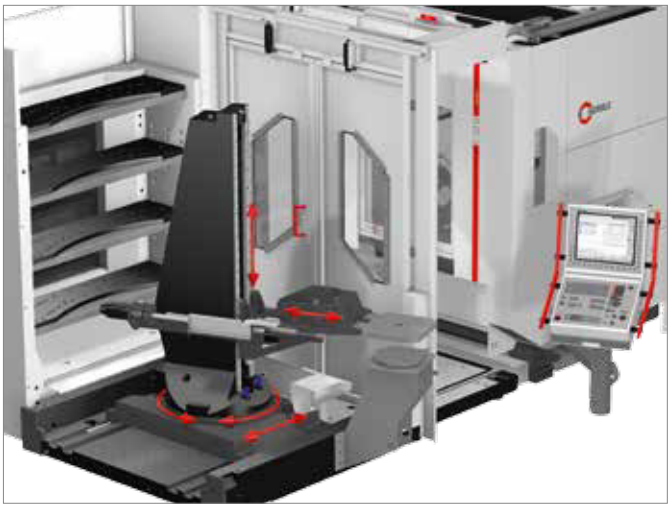
04.1
Automation . C 400

The new HS flex handling system is an automation solution providing cost-effective entry into machining centre automation. The HS flex handling system is an automation solution providing cost-effective entry into machining centre automation. The front-sided adaptation ensures a space-saving layout with direct connection to the machining centre. The large intermediate space provides direct access to the working area for manual operator activities. In automatic mode, a double door blocks operator access; and in setup mode, access to the handling system. The customisable pallet storage modul offers numerous combination options for a large range of parts. A second pallet storage modul can be additionally integrated in the handling system, thus enhancing the storage of parts significantly.

The Hermle Automation-Control-System (HACS), which is operated via an integrated touch panel, provides an ideal platform for intuitive operation and control of the handling system.



HS flex with two pallet storage moduls and setup station, adapted on a machining centre C 400.



Function and movement concept of the handling system. Compact design and space-saving arrangement with optimum access for the machine operator.

YOUR ADVANTAGES

- *Automation solution for enhanced storage of pallets*
- *Optimised, operator-friendly access to the machining centre*
- *Large configurable pallet storage modul*
- *Additional, configurable pallet storage modul*
- *Lateral setup station (optionally rotatable)*
- *Touch pad with integrated operating software HACS*
- *No floor anchorage required*
- *Easy and quick installation and commissioning*

Technical Data. HS flex

Pallet storage modul (storage modul 1 or 2)	12x pallet storage	9x pallet storage	8x pallet storage	6x pallet storage
Storage capacity per modul	12 units	9 units	8 units	6 units
Pallet dimensions (mm)	320 x 320 400 x 400 500 x 400	320 x 320 400 x 400 500 x 400	320 x 320 400 x 400 500 x 400	320 x 320 400 x 400 500 x 400
Max. workpiece height* Interfacial storage level (mm) Sovereign storage level (mm)	 260 625	 485 625	 260 625	 485 625
Max. transport weight** (incl. Pallet) Double taper (kg)	450	450	450	450
Pallet weight min. (kg)	20	20	20	20
Pallet change time (s)	50	50	50	50

* Please note the max workable workpiece height
** Please note the max permitted table load

05 Precision

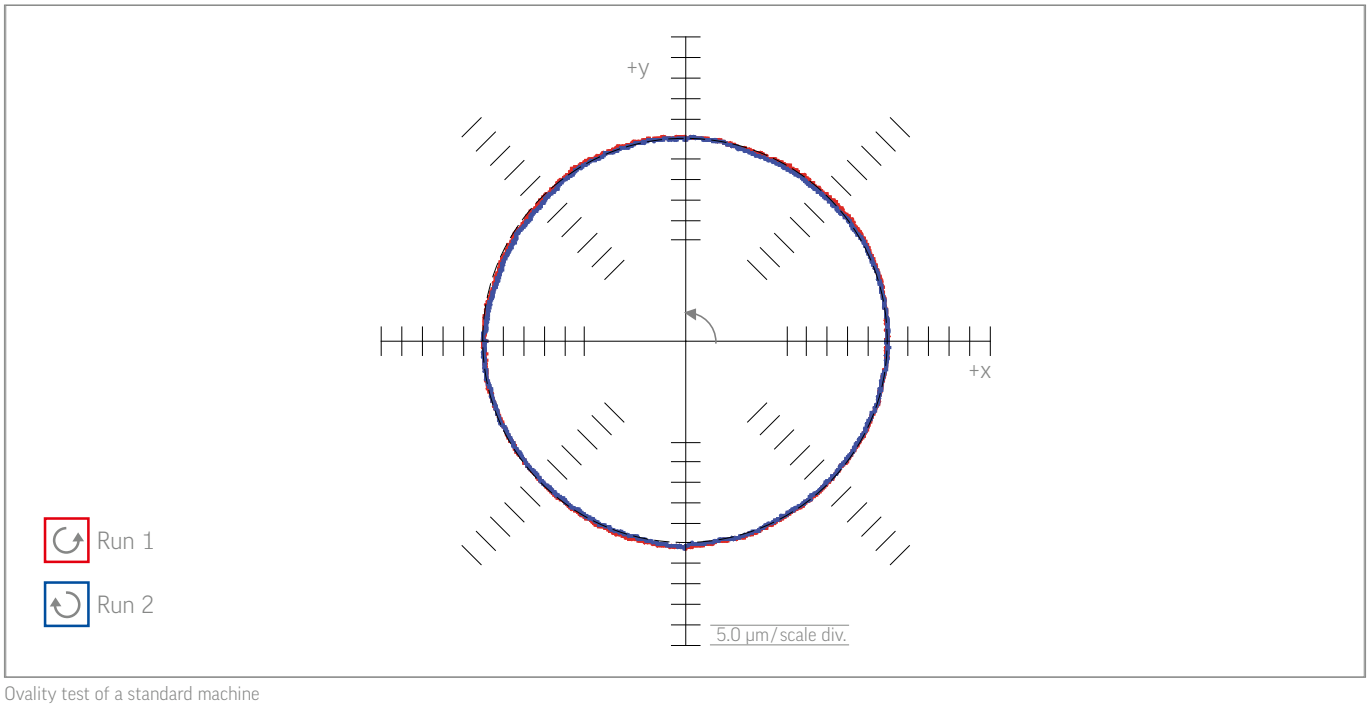
PRECISION IN EVERY DIMENSION: Hermle has a thorough understanding of the requirements for manufacturing high-precision machining centers for processing smaller and larger workpieces of up to 2.5 t in weight. For this reason, "The Original" only uses German machines for production and materials from European suppliers.
Furthermore, the entire machining production department is fully air conditioned and kept clean by a central chip disposal system.
Hermle machining centers have also been thoroughly tested by intensive endurance tests and in manufacture-oriented machining processes in our own machining manufacturing department. Our meticulous manufacturing processes allow Hermle to set new precision standards which undercut those demanded by the DIN/ISO 10791 standard in every way.
At Hermle, we distinguish between positional uncertainty (accuracy with which a certain position within the working area can be pinpointed on one axis) and geometric precision.
The latter is significant for the precision of the entire machine – it encompasses the following factors:
- Positioning of linear and rotary axes.
- Straightness and angular deviation of the linear axes.
- Rectangularity and parallel alignment of all axes to one other.
- Concentricity and axial run-out of the swivelling rotary table.
- Concentricity of the working spindle.

The precision of Hermle machining centers originates during mechanical production and is not produced by subsequent electronic compensation.

PRECISION LEVELS

Hermle standard:

X-Y-Z: Positional uncertainty P ≤ 8 µ
A: Positional uncertainty P ≤ 10"
C: Positional uncertainty P ≤ 8"



Ovality test of a standard machine

06
Energy efficiency

Both manufacturer and customer benefit from efficient production processes. Therefore, Hermle has focused on integrated resource sustainability and energy efficiency for many years. We can rightly claim pioneer status in the "bluecompetence" initiative founded by the VDW (German Machine Tool Builders Association).
From development to low-energy manufacturing (with a high level of in-house production) to the operation of CNC machining centres – Hermle has stood for a principle of sustainable environmental protection combined with economic considerations for many years. Energy recovery is just one of the advantages enjoyed by our customers.

BLUECOMPETENCE
Machine Tools

EFFICIENT MANUFACTURING

We use energy efficient manufacturing methods not because it is the current trend or because it is required of us, but on principle. And we always have.

Low energy component manufacture
- *Mineral casting technology*
- *Lightweight construction*

Virtual machine optimization / machine development

Reduction of transport energy consumption
- *High levels of in-house production*
- *Just one production plant*
- *Locally sourced components and materials*
- *No material tourism*

High-quality, high-efficiency components
- *Ball screws*
- *Guideways*
- *Antifriction bearing etc.*

EFFICIENT OPERATION

Our machining centers are energy efficient both during their manufacture and during operation.

Energy recovery has been standard at Hermle for over 20 years

High quality servo axes

Ideal drive design for the respective application

Demand-based cooling technology both for dimensioning and in application

De-energize system:
Up to 80% less energy consumption in stand-by mode

Very long machine service life

07
Services

The perfection we insist on for the development and production of our machines is also mirrored by our service department. Our service team provides more than just spare parts and rapid response support within hours. At Hermle, we see ourselves as a comprehensive service provider which provides customers with numerous benefits.

Alongside standard services, these include:
- Our superior, cost-effective, practical and flexible training programs carried out by sales representatives directly at the customers' premises.
- Our continual pursuit of optimization and perfection. Our motto – those who stop improving today will not make the grade tomorrow.
- Intensive expert consultation on milling in general, programming and handling of our products.
- Our application technicians who are experts in machining processes and who are quick to assist and advise our customers.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