C 40

The Dynamic

HERMLE

Milling at its best

C 40

Unbeatable in 5-axes / 5-sided machining

The C 40 U –
at home in all fields

Tool and mould making
Highly dynamic simultaneous 5-axes machining up to a component weight of 1,400 kg.

Medical engineering
Difficult to machine material – in record time

Aerospace
Precision in perfection

Mechanical engineering
Fully automatic and flexible manufacturing systems

Motor sport
Highest precision at high availability

Subcontract industry
Dynamic, precise and reliable

C 40

Dynamic in a new dimension

Collision protection
with collision monitor

3 axes in the tool
component independent dynamics

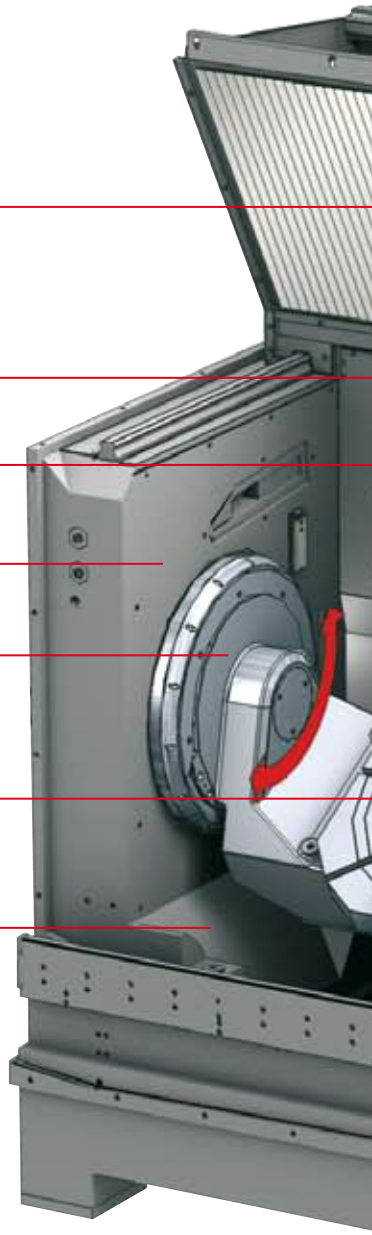
Pick-up magazine
integrated in the base, thereby saving space

Ideal chip clearance
dry machining

Tandem drive
avoidance of torsion and high accuracy

Large working area
relative to the machine footprint

Accessibility
very good ergonomics



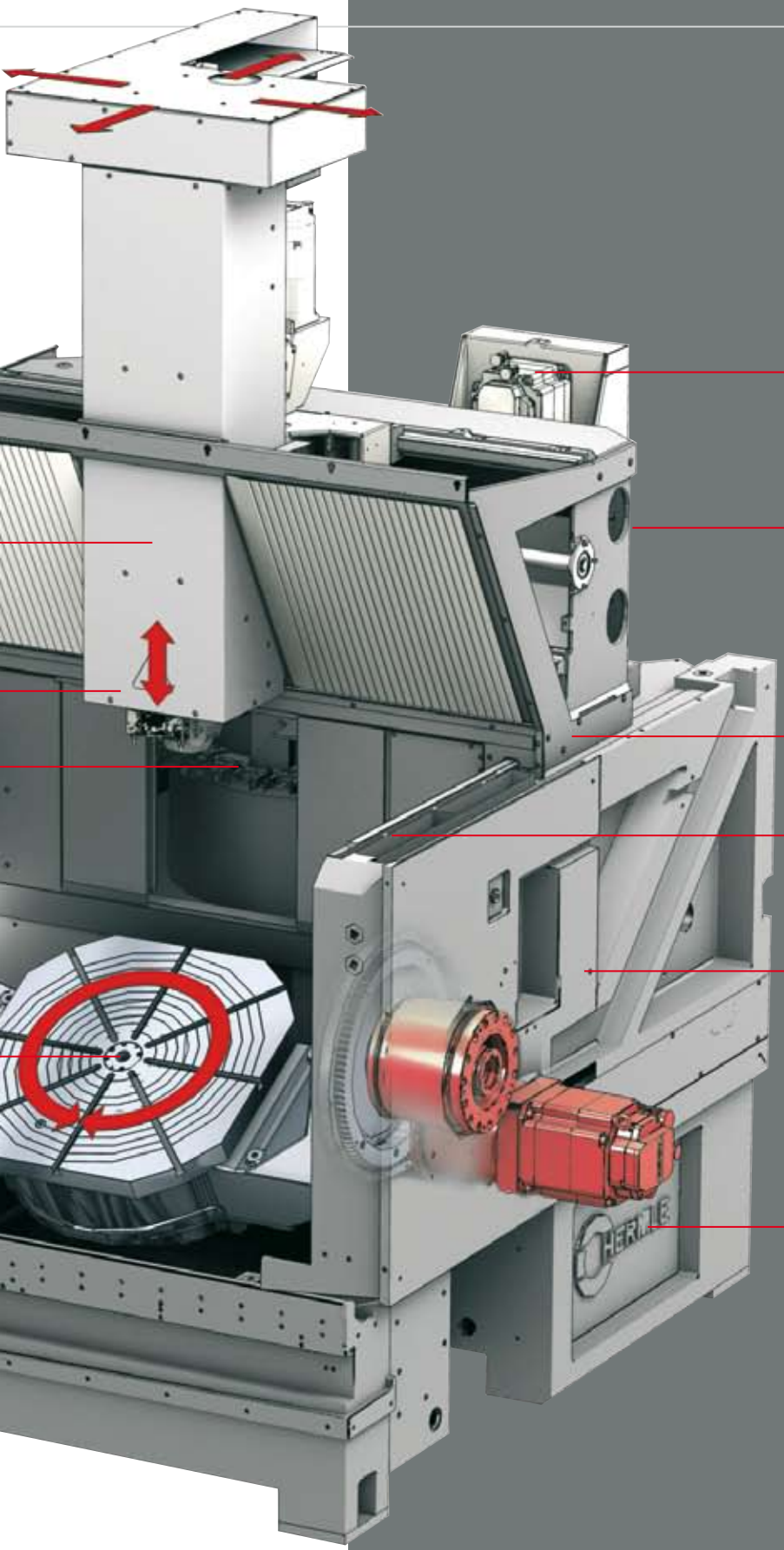
DYNAMICS

ACCURACY

COMPACTNESS

SURFACE QUALITY

AVAILABILITY



Central drive
centrally arranged Y axis main drive

Easy to service
ideal accessibility to the auxiliary units

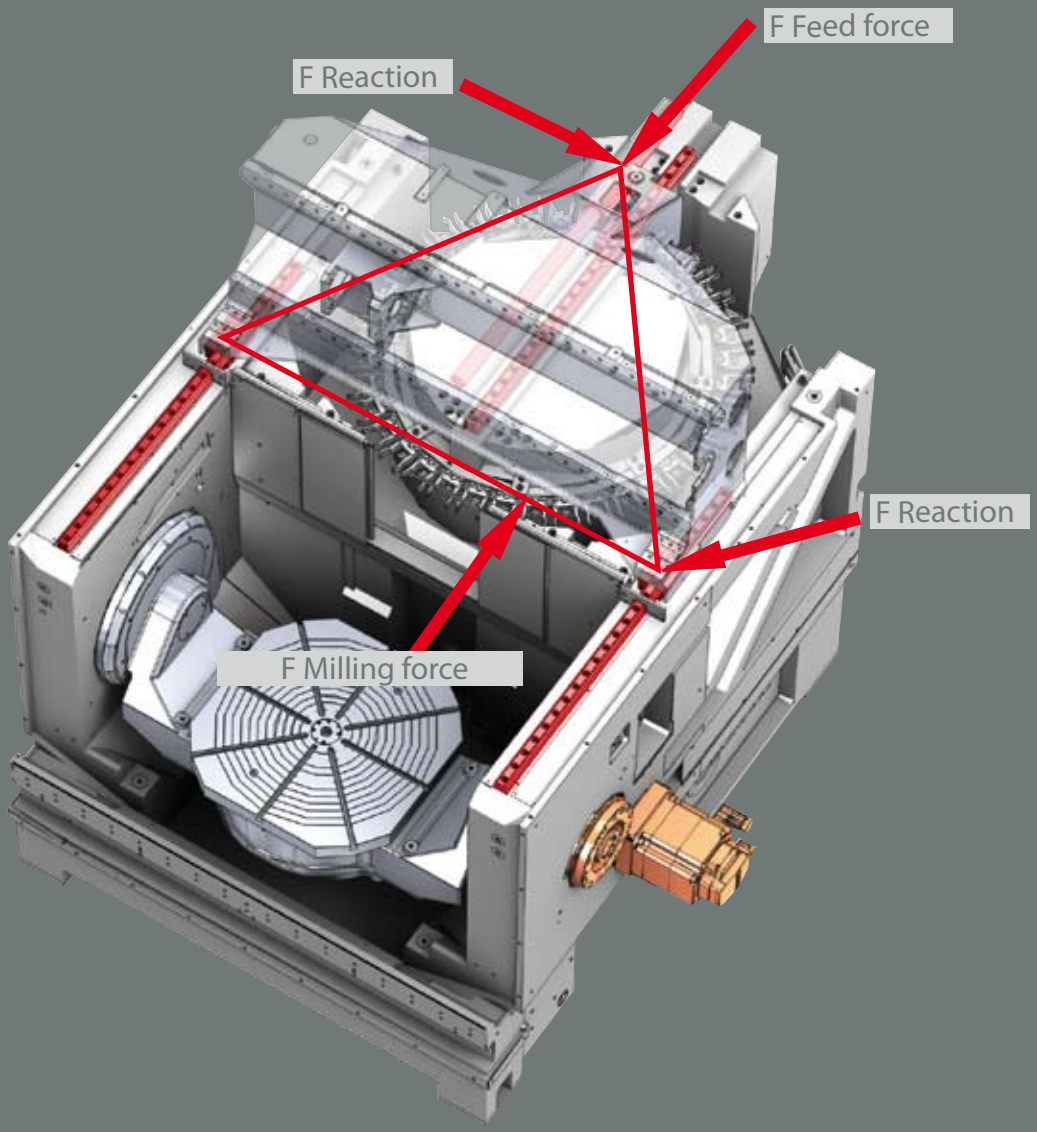
Force characteristics
three guideways with one guideshoe
for ideal force balance

Linear axes
above the working area

Modified gantry design
with ideal main axis support

Mineral casting design
very good vibration dampening properties

Construction



Ideal power transmission through
three staggered guideways with central drive

Development principle

At Hermle, the static, dynamic and thermal properties of the machine are optimized by means of FEM calculations and machine simulations based on the 3-D CAD data and verified on the real machine using experimental studies.

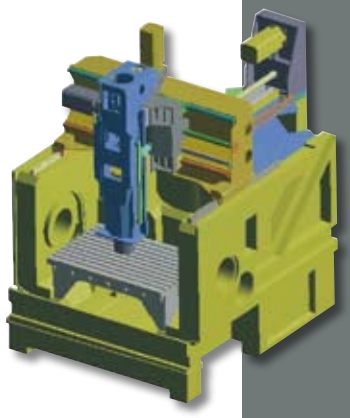
CONSTRUCTION

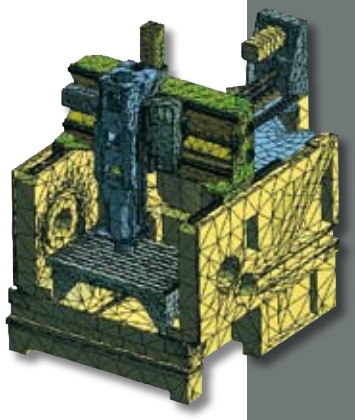
DESIGN

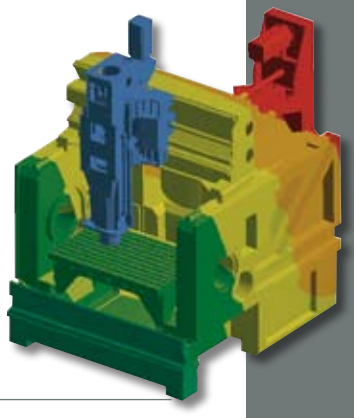
DRIVE

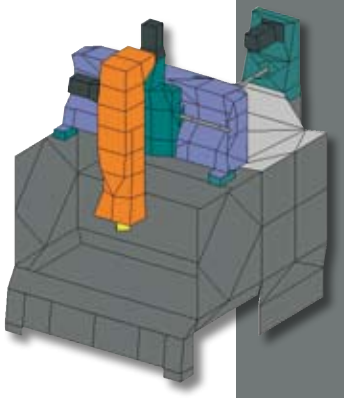
TOOL

ELECTRONICS









Design principle
- Modified gantry design, the disadvantages of the conventional gantry design have been avoided
- Three axes in the tool, thus workpieces independent dynamics, ideal pre-requisite for rapid traverses and feed up to 60 m/min.
- Modular configuration of the table and expansion variants in the multi-functional machine base
- Drives and guideways outside / above the working area
- Z axis with electrical and mechanical quick stop against uncontrolled drop
- Compact design, thus little space required
- Complete transport
- No foundation required (4-point-support)
- Optimised static and dynamic properties
- Maximum utilisation, positioning and long term accuracy
- High dynamics in the machining process
- Short positioning and start times on account of high acceleration of 6 m/s^2 or 10 m/s^2 in dynamic version

Mineral casting version
- Mineral casting has excellent cushioning properties, very low thermal conductivity and will not absorb moisture
- Extremely high form an countour accuracy in all planes
- Optimum surface finish in combination with very narrow tolerances
- Ecological manufacturing and disposal of mineral casting

Drives and guideways
- Y slide as a traverse rests on three carriages with three staggered guideways
- Good guideway ratio of the traverse through three-point rest and central drive
- Ball screw and position measuring system are in direct vicinity of the central linear guideway
- Very rigid dynamic cross slide rest
- Roller recirculating guideways in all linear axes, thus constant dynamic conditions
- Digital AC servo motors with pretensioned ball screws
- Permanent position monitoring system
- Low-maintenance automatic central grease lubrication system

Tool change
- Automatic tool change in cycle
- Ring magazine for 38 tools as SK 40, HSK A 63 or HSK E 40
- Integrated in the machine base unit
- Protected outside of the working area, thus no contamination of the tools

Electronics
- Digital drives
- Absolute measuring systems
- Latest control technologies
- All electronics have been integrated in a central cabinet
- Frequency-based recovery of the braking energy into the mains
- Switch cabinet with air-conditioning unit

Machine

ADVANTAGES OF A UNIQUE MACHINE CONCEPT

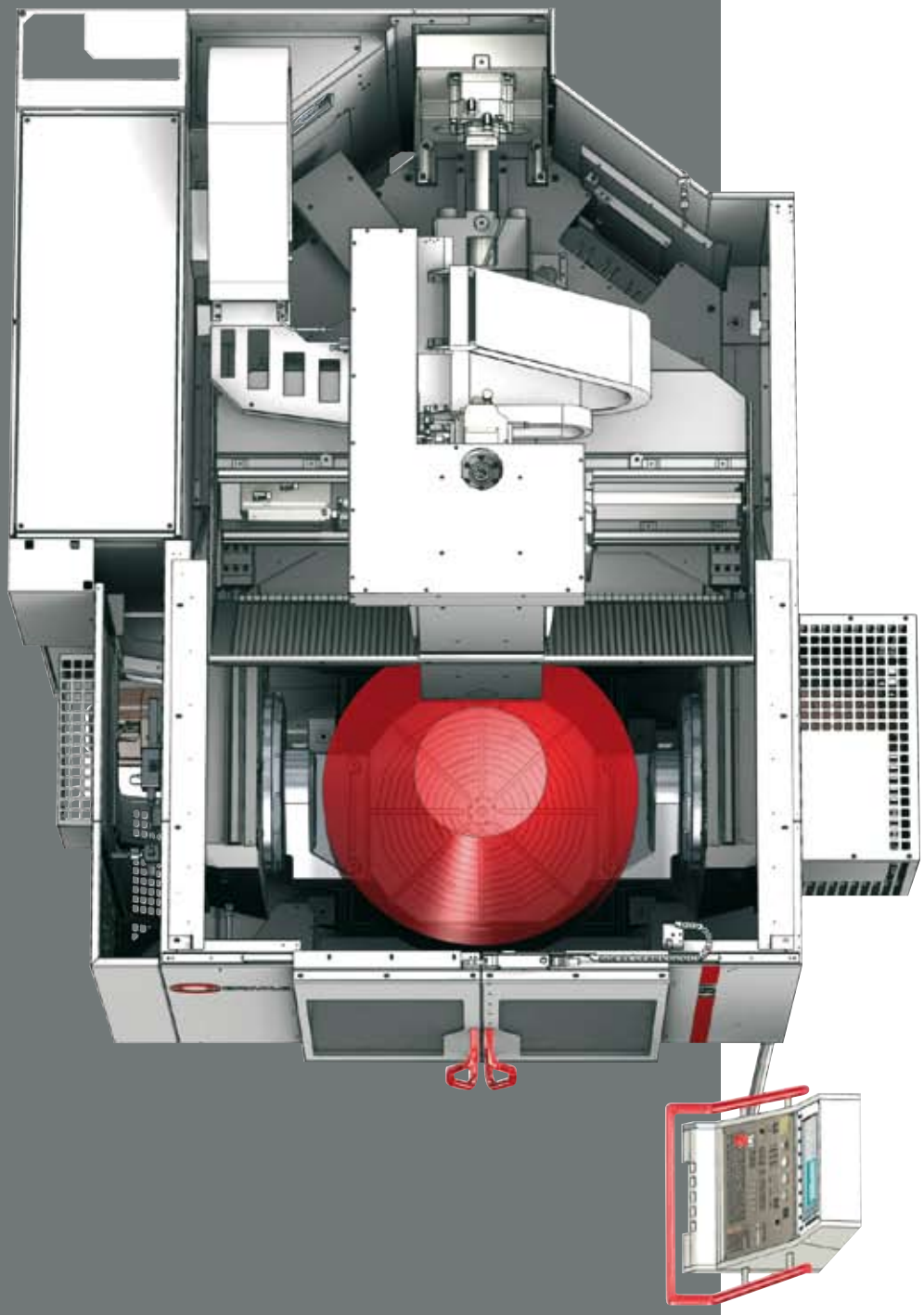
LARGEST WORKING AREA RELATIVE TO THE INSTALLATION SURFACE

UNIQUE AXIS CONCEPT

SHORT CHIP-TO-CHIP TIMES ON ACCOUNT OF INTEGRATED TOOL MAGAZINE

SINGLE LIFT TRANSPORT AND BOLT FREE INSTALLATION

CONSISTENT MODULAR DESIGN FROM THE STANDARD MACHINE
TO THE FLEXIBLE MACHINING CENTRE



Working area	
Traverse X-Y-Z	850-700-500 mm
Rapid linear traverse (dynamic) X-Y-Z	45 (60) m/min
Linear acceleration (dynamic) X-Y-Z	6 (10) m/s²

Main spindle drive	
Speed:	10,000, 18,000, 28,000 or 40,000 rpm
Torque	up to 200 Nm
Main power	up to 32 kW

Tool changer (pick-up)	
Magazine positions	38
Chip-to-chip time*	approx. 5.5 s
Chip-to-chip time* (dynamic)	approx. 4.5 s

Control	
Heidenhain	iTNC530
Siemens	S 840 D

*(chip-to-chip times were determined in accordance with VDI 2852, sheet 1 in a 3-axis design)

Table variants

HIGH DEGREES OF FREEDOM IN THE WORKING AREA

VERY HIGH TABLE LOAD (UP TO 2,000 KG AT HIGHEST PRECISION)

NO CHIP COLLECTION ON THE TABLE (TABLE SWIVELLING)

SWIVELLING AXIS A AND ROTARY AXIS C ARE IN THE WORKPIECE (U SHAPE)

TORSION PREVENTION THROUGH TANDEM DRIVES

HIGH DYNAMICS THROUGH LINEAR TECHNOLOGY
(HIGH-TORQUE MOTORS IN THE ROTARY AXIS)

WIDE TRUNNION SUPPORT DISPLACEMENT RESULTS
IN A LARGE COLLISION FREE CIRCLE

Important table features

- Indexing device to be used as 4th axis
- Zero-point clamping system / pallet clamping system
- Medium supply lines
- SK 50 / HSK A 100 workpiece clamping device
- No hydraulic clamping of the A and C axis required

Rigid clamping table	
Clamping surface:	1,070 x 700 mm
Maximum table load:	2,000 kg
T-grooves:	parallel 10 / 14 H7

NC-controlled swivelling rotary table	
Clamping surface:	Ø 800 mm
Collision circle of the table plate:	700 x 700 mm
Swivel range:	+25° / - 110°
Speed - swivelling axis A:	25 rpm.
Speed - rotary axis C:	65 rpm.
Type of drive:	Torque
Maximum table load:	1,400 kg
T-grooves:	star 8 / 14 H7

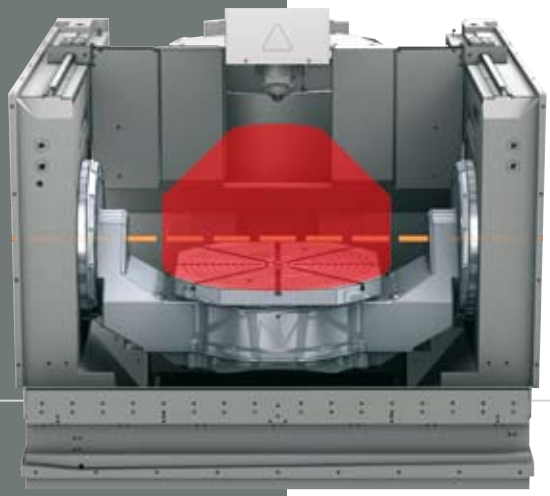
NC-controlled swivelling rotary table		
Clamping surface:		Ø 420 mm
T-grooves:		parallel 5 / 14 H7
Swivel range:		+91° / - 139°
Type of drive:	Worm	Torque
Speed - swivelling axis A:	55 rpm.	55 rpm.
Speed - rotary axis C:	35 rpm.	65 rpm.
Maximum table load:	600 kg	450 kg
Adjacent clamping plate (option)		
T-grooves:		parallel 8 / 14 H7

NC-controlled swivelling rotary table	
Clamping surface:	2 x Ø 280 mm
Swivel range:	+ / - 115°
Speed - swivelling axis A:	55 rpm.
Speed - rotary axis C:	40 rpm.
Type of drive:	2 x worm
Maximum table load:	2 x 300 kg
T-grooves:	star 2 x 4 / 14 H7
Bridging plate (option)	
Clamping surface:	950 x 370 mm
T-grooves:	parallel 5 / 14 H7

Table variants

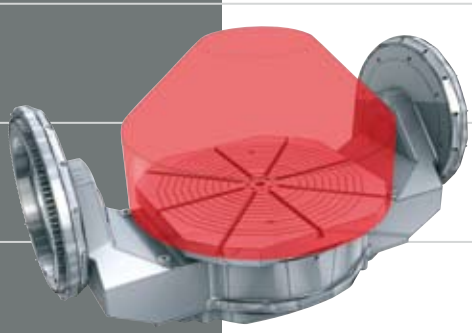
What makes our table concept so special

- High degrees of freedom in the working area
- Wide trunnion support displacement results in a large collision free circle
- Swivelling axis A and rotary axis C are centred in the component (U shape)
- High dynamics through linear technology (high-torque motors in the rotary axis)
- Very high table load (up to 2,000 kg at highest precision)
- No chip collection on the table (table tilting)
- Prevention of torsion by tandem drive



SWIVELLING AXIS A IN THE COMPONENT
Complicated 5-axis machining processes are carried out by comparatively small traverses of the linear axes

VERY LARGE COLLISION CIRCLE
Optimum utilization of the working area



TANDEM DRIVE
Torsion-free highly dynamic positioning of the swivelling axis A

TORQUE DRIVES
Highly dynamic movements in the rotary axis

SEPARATION OF THE ROTARY AND SWIVELLING AXES
User and programmer friendly based on easy follow-up of the table movements

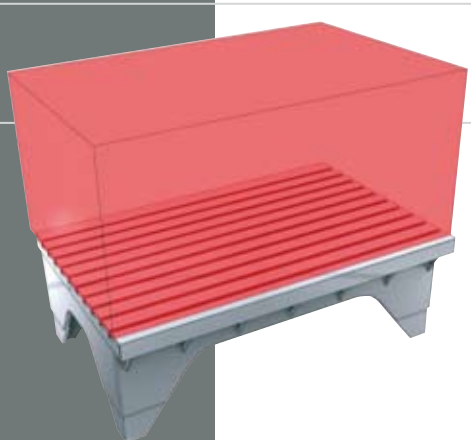
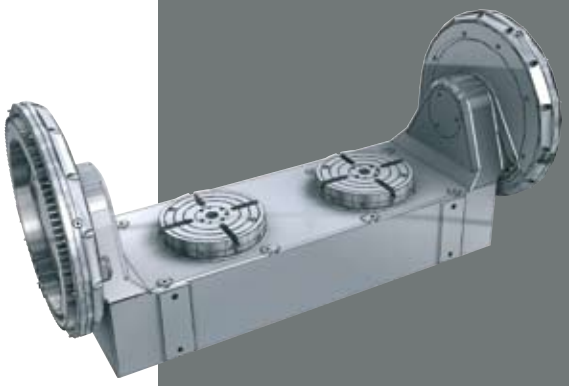
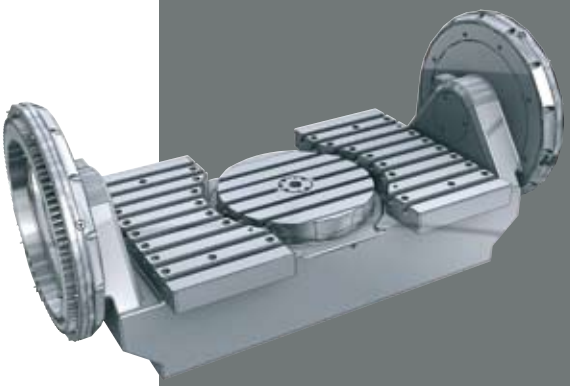


TABLE LOAD
High masses on all table variants



5 AXES IN DOUBLE PACK (OPTION)
2 x 300 kg to be machined in five axes with component dimensions of 2 x Ø 280 x 350 mm



3, 4 OR 5 AXES
Flexibility at very high dynamics

1.4 TONNES – 5 AXES
1.4 t to be machined with up to 65 rpm in five axes

2.0 TONNES AND 400 dm^3
Workpieces with 1,070 x 700 x 500 mm external dimensions to be machined in three axes at higher precision

Spindles

HIGH-TECH SPINDLES FOR DEMANDING MILLING PROCESSES

COLLISION PROTECTION WITH COLLISION MONITORING

SLIM-END SPINDLE FOR MACHINING DEEPER CAVITIES

FEW IRREGULAR EDGES (PREVENTION OF COLLISION)

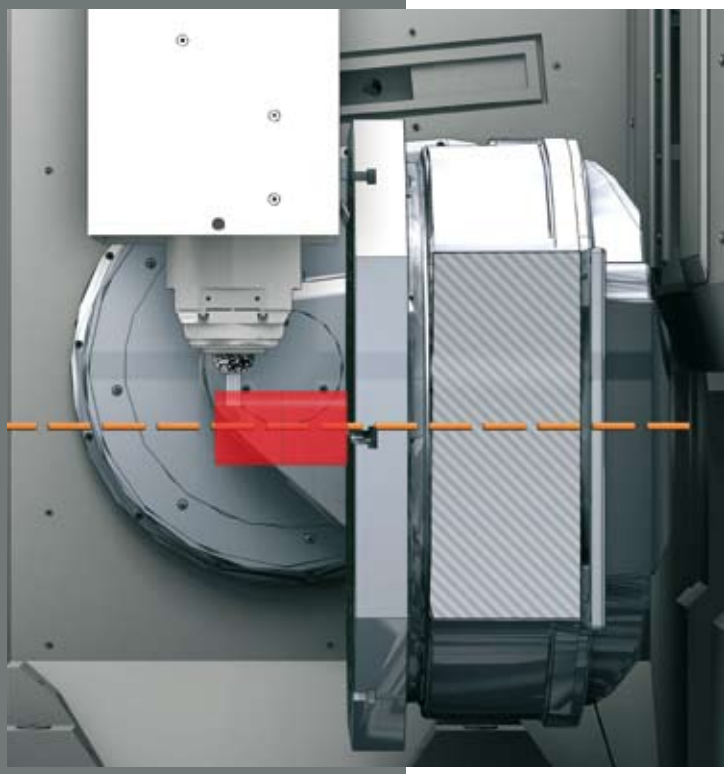
TWO-PART SPINDLE (FASTER REPLACEMENT)

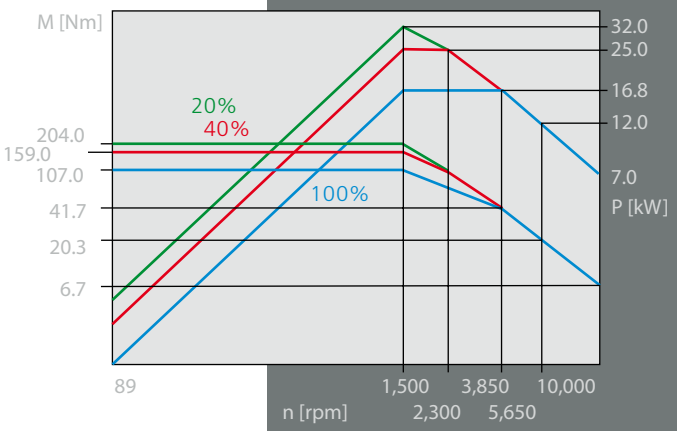
Each spindle has six displacement sleeves to compensate the collision energy.

Prior to a collision

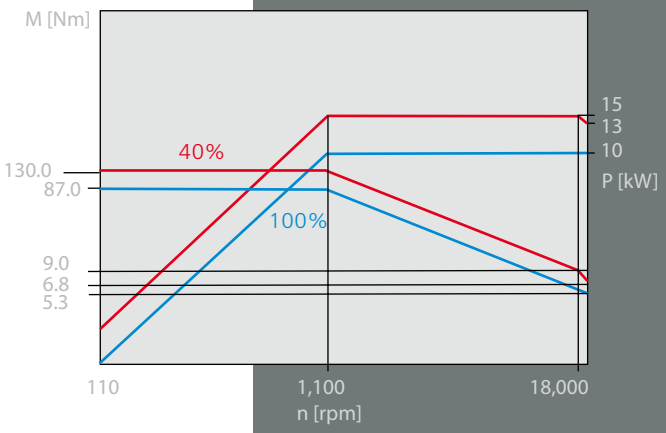
After a collision

Very slender spindle end.

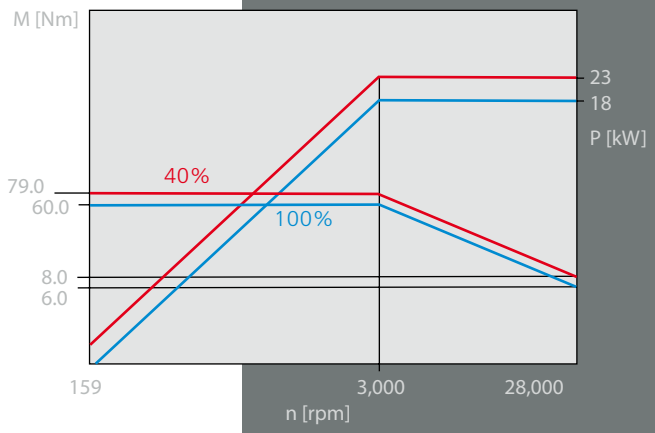




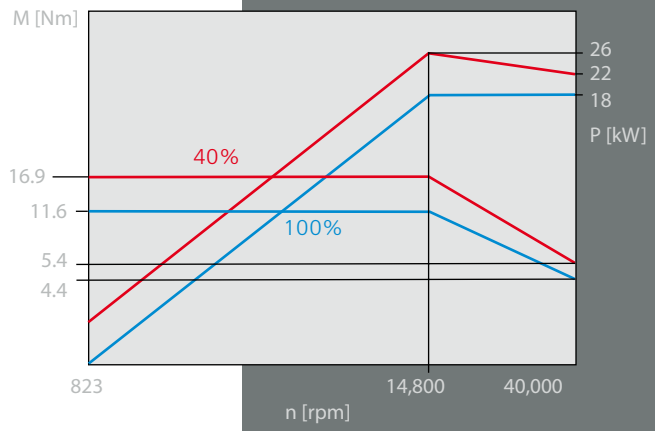
Spindle	
Spindle speed:	10,000 rpm.
Torque:	200 Nm
Main power:	32 kW
Interface:	SK 40 / HSK A 63
Collision protection:	Upsetting sleeves



Spindle	
Spindle speed:	18,000 rpm.
Torque:	130 Nm
Main power:	15 kW
Interface:	SK 40 / HSK A 63
Collision protection:	Upsetting sleeves



Spindle	
Spindle speed:	28,000 rpm.
Torque:	79 Nm
Main power:	23 kW
Interface:	HSK A 63
Collision protection:	-



Spindle	
Spindle speed:	40,000 rpm.
Torque:	17 Nm
Main power:	26 kW
Interface:	HSK E 40
Collision protection:	-

Magazine

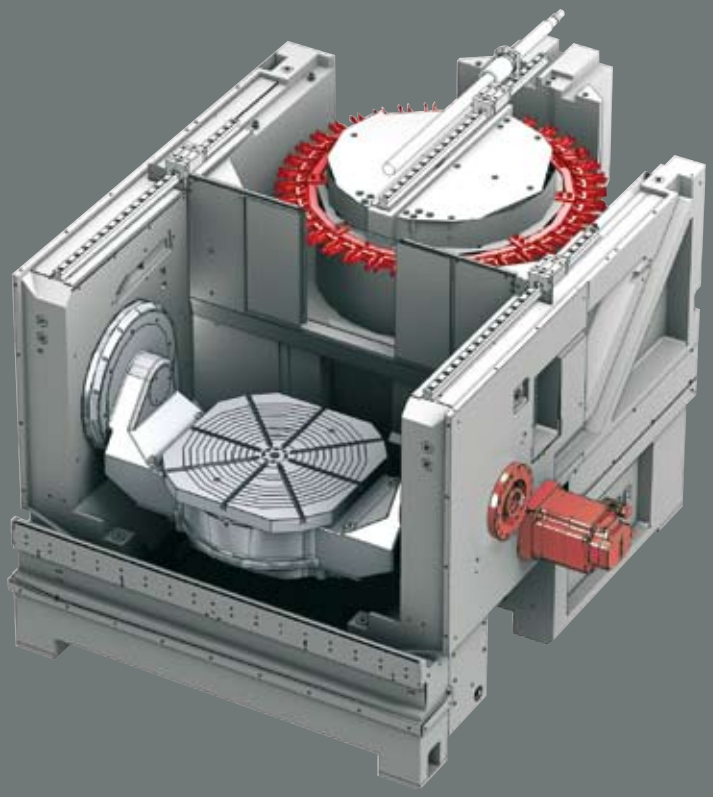
PICK-UP MAGAZINE

INTEGRATION INTO THE MACHINE BASE

VERY GOOD ACCESSIBILITY

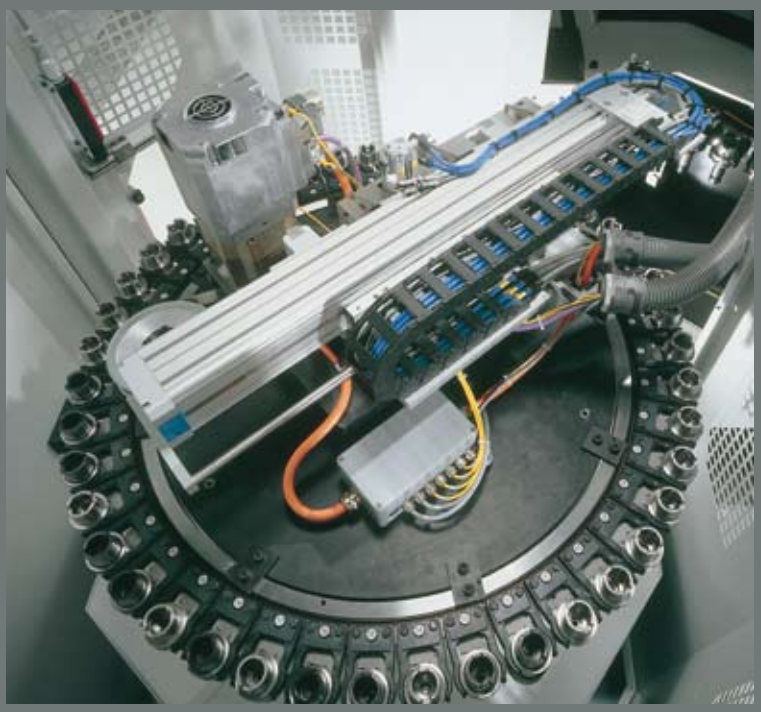
CONTROL PANEL MOVEABLE TO THE LOADING POINT

COVERS FOR THE SPINDLE TAPERS



Tool changer (pick-up)	
Magazine positions:	38
Chip-to-chip time*:	approx. 5.5 s
Chip-to-chip time (dynamic)*:	approx. 4.5 s
Maximum tool length:	300 mm
Maximum tool diameter:	Ø 90 mm
Maximum tool diameter with corresponding adjacent pocket allocation:	Ø 125 mm
Maximum magazine load at 38 units:	152 kg

*(chip-to-chip times were determined in accordance with VDI 2852, sheet 1 in a 3-axis design)



Expansion of the tool storage capacity by:	
Additional magazine:	43 pockets
Additional magazine:	87 pockets
Additional magazine:	157 pockets
Maximum tool length:	300 mm
Maximum tool diameter:	Ø 80 mm
Maximum tool diameter with corresponding adjacent pocket allocation:	Ø 125 mm
Maximum tool weight:	8 kg

Additional magazines
for complex machining processes

- Own tool management software integrated in the control
- Adapted to magazine loading point
- Control panel moveable up to the machining point of the additional magazines
- Up to eight loading points for fast loading of the magazine ZM 157

Options

OPTIONS FOR

INCREASING THE SAFETY FEATURES

THE INDIVIDUAL APPLICATION POSSIBILITIES

THE PROCESS SAFETY

THE ECONOMIC EFFICIENCY

Options in detail

- Through the spindle coolant supply (paper tape filter)
- Chip conveyor (scraper belt or hinged belt conveyor)
- Minimal quantity lubrication internal + external
- Blowing attachment / bed flushing
- Oil mist extractors
- Accuracy packages
- Graphite machining packages
- Tool breakage monitoring system
- Tool measurement
- Automatic front doors / automatic cabin roof
- Laminated safety glass panes

Controls

HEIDENHAIN iTNC 530 OR SIEMENS S 840 D

3D SOFTWARE

15“ TFT-TECHNOLOGY

USER-DEFINED SOFTKEYS

smarTNC

ShopMill

CONTROLS FOR DEMANDING MILLING PROCESSES
Whether for tool and mould making, in production or in high-speed machining, they stand out for their many advantages.

SAFE CONTROLS
Controls with integrated safety technology keeping with category 3 described in European standard EN 954-1.

E-MESSENGER
Increases the availability of the machines and minimises production failures.

TELESERVICE
Teleservice ensures even faster support in case of programming and operating problems.

* For detailed information, please refer to the individual leaflets.

Pallet loading

PALLET CHANGER PW 800

PALLET CHANGER PW 160

PALLET STORAGE SYSTEMS

HERMLE PALLET CLAMPING SYSTEM

TO BE EXTENDED TO A FLEXIBLE MANUFACTURING CELL

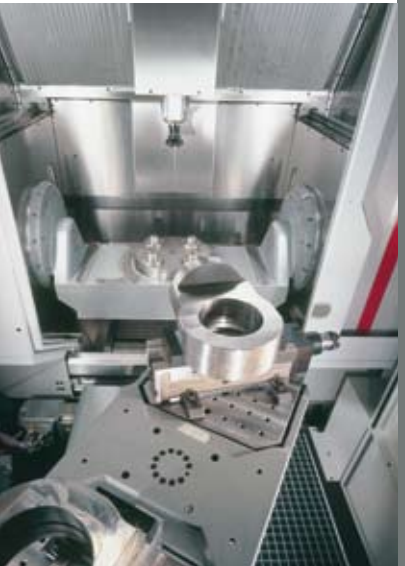
Pallet changer PW 800	
NC-controlled swivelling rotary table:	Ø 800 mm
Swivel range:	+25° / -110°
Pallet dimensions:	630 x 630 / Ø 800 mm 500 x 500 / Ø 630 mm
Number of pallets without storage:	2 pallets
Number of pallets with storage:	15 pallets
Transport weight per side including pallet:	max. 800 kg

Repeating accuracy < 0,01 mm

Flexible manufacturing cell – manufacturing system

The machining centre may be set up for production by means of a pallet storage system for unmanned / minimal manning machine production times or by means of a customised system with various component ranges.

By linking several machining centres, the machining centres can be extended to a complete manufacturing system.



Pallet changer PW 160	
NC-controlled swivelling rotary table:	Ø 420 mm
Swivel range:	+91° / -139°
Pallet dimensions:	400 x 400 / Ø 500 mm
Number of pallets without storage:	3 pallets
Number of pallets with 4-fold storage:	7 pallets
Transport weight per side including pallet:	max. 160 kg

Repeating accuracy < 0,01 mm

Automation

HANDLING SYSTEMS

ROBOT SOLUTIONS

NC CLAMPING YOKES

TURN-KEY SOLUTIONS

From machine supplier to process supplier

The demand of the market for turn-key solutions for machining processes has caused us to further expand our activities in the so-called "turn-key projects".
Not only complicated machining with every increasing demands for automation, handling and equipment, but also intricate manufacturing strategies for part time guarantee, clamping means and tool packages, programming systems and the integration in an existing PPS system are demands which are increasingly voiced.

MACHINE

CLAMPING UNITS

TOOL SELECTION

PROGRAMMING

AUTOMATION

CAD / CAM

Technical data

Working area	Traverse	X axis	850 mm	
	Traverse	Y axis	700 mm	
	Traverse	Z axis	500 mm	
	Linear rapid traverse	X-Y-Z	45 m/min.	■
	Linear acceleration	X-Y-Z	6 m/s²	
	Linear feed force	X-Y-Z	7,000 N	
	Linear rapid traverse (dynamic)	X-Y-Z	60 m/min	●
	Acceleration (dynamic)	X-Y-Z	10 m/s²	
	Feed force (dynamic)	X-Y-Z	8,500 N	
Main spindle drive	Speed Main power / torque	10,000 rpm. 20% c.d.f.	SK 40 / HSK A 63 32 kW / 200 Nm	■
	Speed Main power / torque	18,000 rpm. 40% c.d.f.	SK 40 / HSK A 63 15 kW / 130 Nm	●
	Speed Main power / torque	28,000 rpm. 40% c.d.f.	HSK A 63 23 kW / 79 Nm	●
	Speed Main power / torque	40,000 rpm. 40% c.d.f.	HSK E 40 26 kW / 17 Nm	●
Control unit	Heidenhain		iTNC 530	■
	Siemens		Sinumerik 840 D	■
Tool changer (pick-up)	Magazine pockets		38	■
	Chip-to-chip time*		approx. 5.5 s	
	Chip-to-chip time* (dynamic)		approx. 4.5 s	●
	*(chip-to-chip times were determined in accordance with VDI 2852, sheet 1 in a 3-axis design)			
	Maximum tool length		300 mm	
	Maximum tool diameter		Ø 90 mm	
	Maximum tool diameter with corresponding adjacent pocket allocation		Ø 125 mm	
	Maximum magazine load at 38 units 152 kg			
Extension of tool storage capacity	Additional magazine		43 pockets	●
	Additional magazine		87 pockets	●
	Additional magazine		157 pockets	●
	Maximum tool diameter in additional magazine		Ø 80 mm	
	Maximum tool diameter with corresponding adjacent pocket allocation in additional magazine		Ø 125 mm	
	Maximum tool weight		8 kg	
Connection-values (machine)	Mains connection		400 V / 50 Hz	
	Power consumption		43 kVA	
	Compressed air		6 bar	
Weight	(Standard version)		approx. 9.5 t	
Transport dimensions C 40 (basic machine)	Width		2,350 mm	
	Depth		3,150 mm	
	Height		2,900 mm	

Hermle AG reserves the right to carry out modifications without prior notification, which may lead to deviating technical data.

Table variants	NC-controlled swivelling rotary table	Ø 800	●	Ø 420 ●
	Clamping surface	Ø 800 mm		Ø 420 mm
	Collision circle of the table plate	700 x 700 mm		-
	Swivel range	+25° / - 110°		+91° / - 139°
	Speed - swivelling axis A	25 rpm.		55 rpm.
	Speed - rotary axis C	65 rpm.		65 rpm.
	Maximum table load	1,400 kg		600 kg
	T-grooves radially arranged	8 / 14H7		-
	T-grooves parallel	-		5 / 14H7
	Adjacent clamping plates	-		960 x 553 mm ●
	T-grooves parallel	-		8 / 14 H7

	NC-controlled swivelling rotary table	2 x Ø 280	●	Rigid Clamping table ●
	Clamping surface	2 x Ø 280 mm		1,070 x 700 mm
	Swivel range	+ / - 115°		-
	Speed - swivelling axis A	55 rpm.		-
	Speed - rotary axis C	40 rpm.		-
	Maximum table load	2 x 300 kg		2,000 kg
	T-grooves radially arranged	2 x 4 / 14H7		-
	T-grooves parallel	-		10 / 14H7
	Bridging plate	950 x 370 mm	●	-
	T-grooves parallel	5 / 14 H7		-

In another version the clamping table can be fitted 130 mm lower.

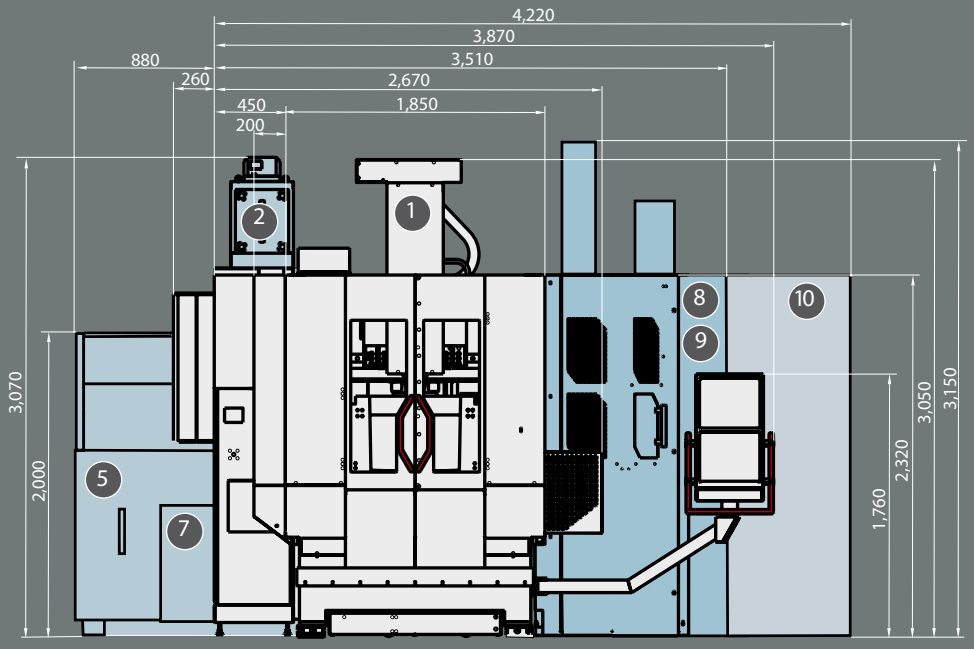
	NC indexing device	Clamping chuck	Ø 200 / Ø 315 mm	●
Position measuring system direct	Resolution		0.0001 mm	■
Position tolerance	Tp in X-Y-Z axis keeping with German standard VDI/DGQ 3441		0.008 mm	■
	(determined at 20° Celsius +/- 1° Celsius constant ambient temperature. Our products are subject to German export laws and exports have to be approved as the achievable accuracy may be smaller / equal than 6 µm.)			
Volume of coolant	Amount of coolant		350 l	■
Through the spindle coolant supply with paper tape filter	Amount of coolant		1,000 l	●
	Pressure (infinitely variable manuel)		max. 80 bar / 20 l/min	
	Mains connection		400 V / 50 Hz	
	Power consumption		17 kVA	
Chip pan	Removable chip pan			●
Chip conveyor	Scraper belt or hinged belt conveyor			●
	Ejection height of swarf conveyor		1,100 mm	
	Chip cart		450 l	●
Hydraulic system	Operating pressure		120 bar	■
Central lubrication system	Minimum quantity lubrication			■

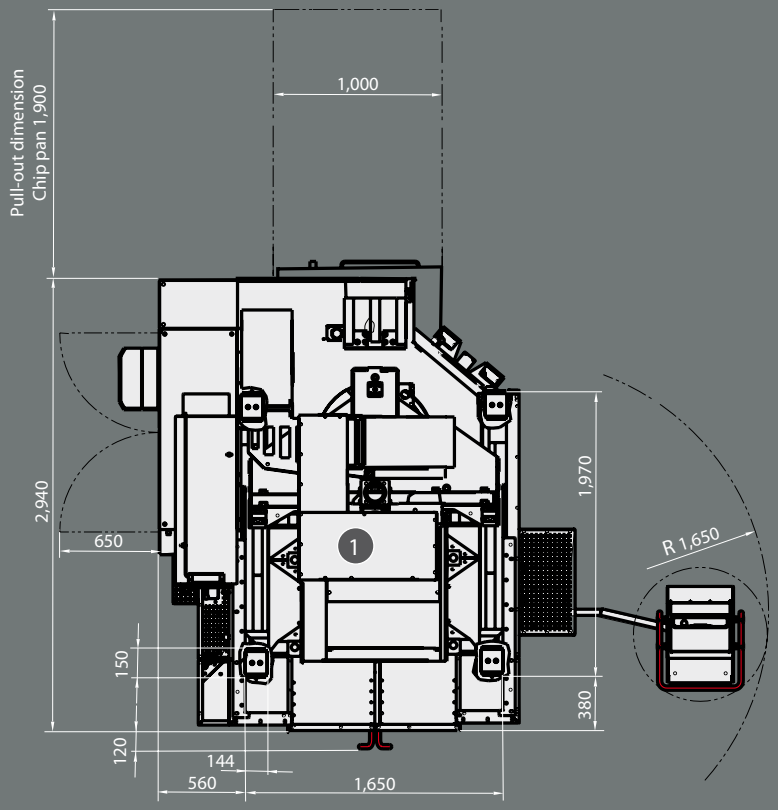
Options	
Automatic cabin door	●
Automatic cabin top	●
Laminated safety glass panes	●
Rotating clear-view window	●
Electrical heat compensation	●
Electrical hand-held control module	●
Touch probe including preparation	●
Preparation for touch probe	●
Tool breakage monitoring / measuring system	●
Coolant nozzle	●
Minimal quantity lubrication internal + external	●
Air blast through the spindle centre	●
Bed flushing	●
BDE signal	●
Oil mist extractor	●
Air purge for linear scales	●
Status lamp	●
Accuracy packages	●
Graphite machining package	●
Pallet changer PW 800	●
Pallet changer PW 160	●
Pallet storage	●
Pallet clamping system	●
Handling System HS 30	●

■ standard equipment

● to order

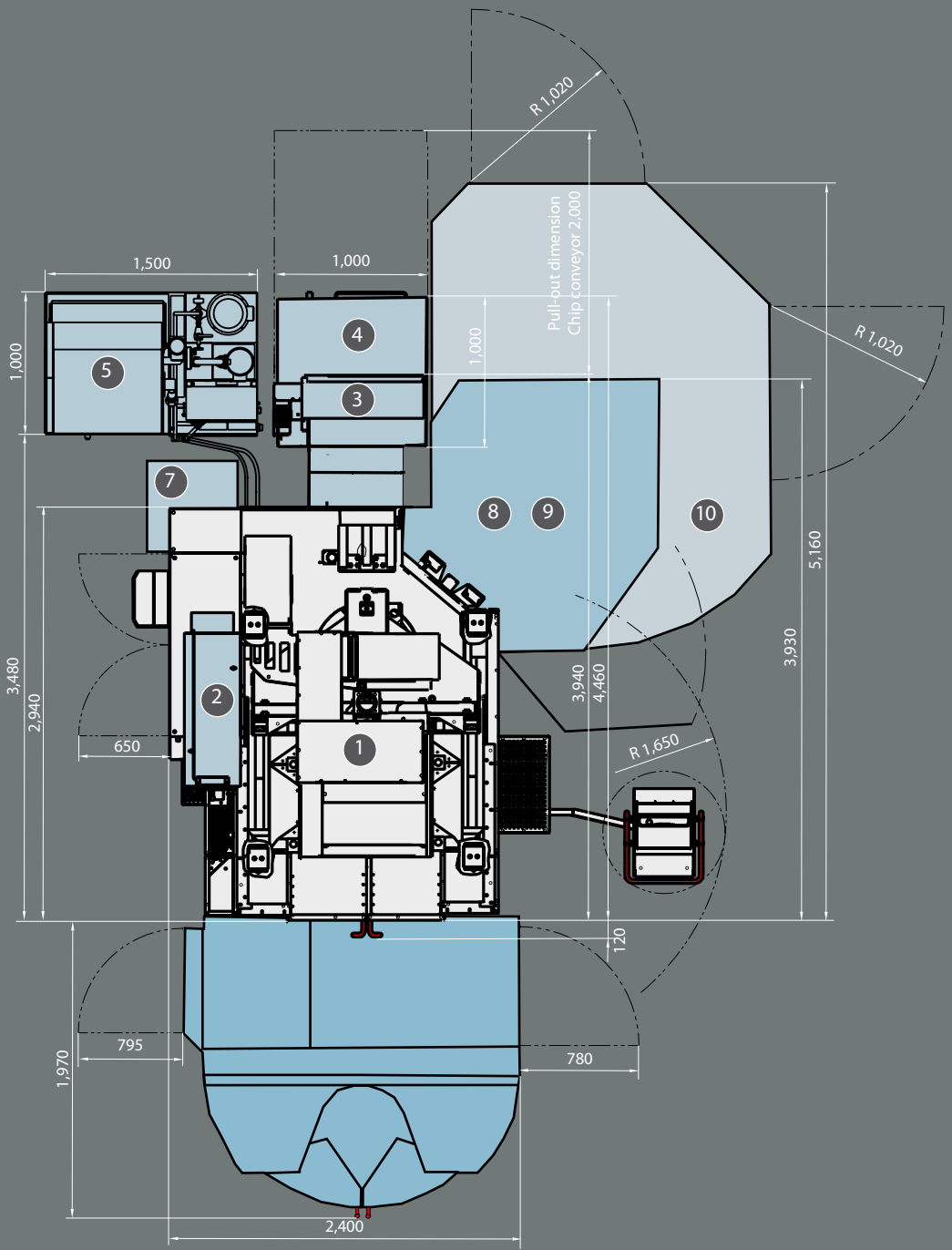
Dimensions

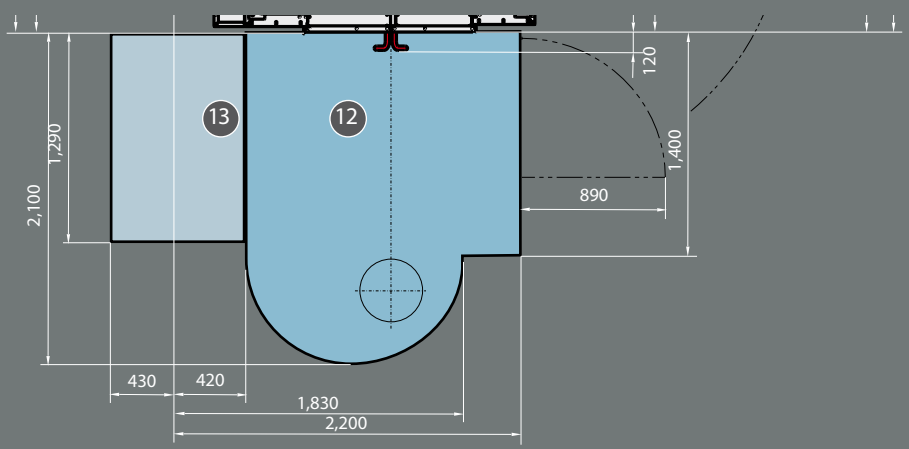

4,220
3,870
3,510
2,670
1,850
880
260
450
200
3,070
2,000
3,050
3,150
2,320
1,760
1
2
5
7
8
9
10


Pull-out dimension
Chip pan 1,900
1,000
2,940
650
1,970
R 1,650
150
380
120
144
560
1,650
1

1	Standard machine
2	Oil mist extractor
3	Chip conveyor
4	Chip cart
5	Through the spindle coolant supply
7	Spindle motor cooling unit
8	Magazine extension ZM 43
9	Magazine extension ZM 87
10	Magazine extension ZM 157
11	Pallet changer PW 800
12	Pallet changer PW 160
13	4-fold pallet storage

(front view shown without pallet changer)





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