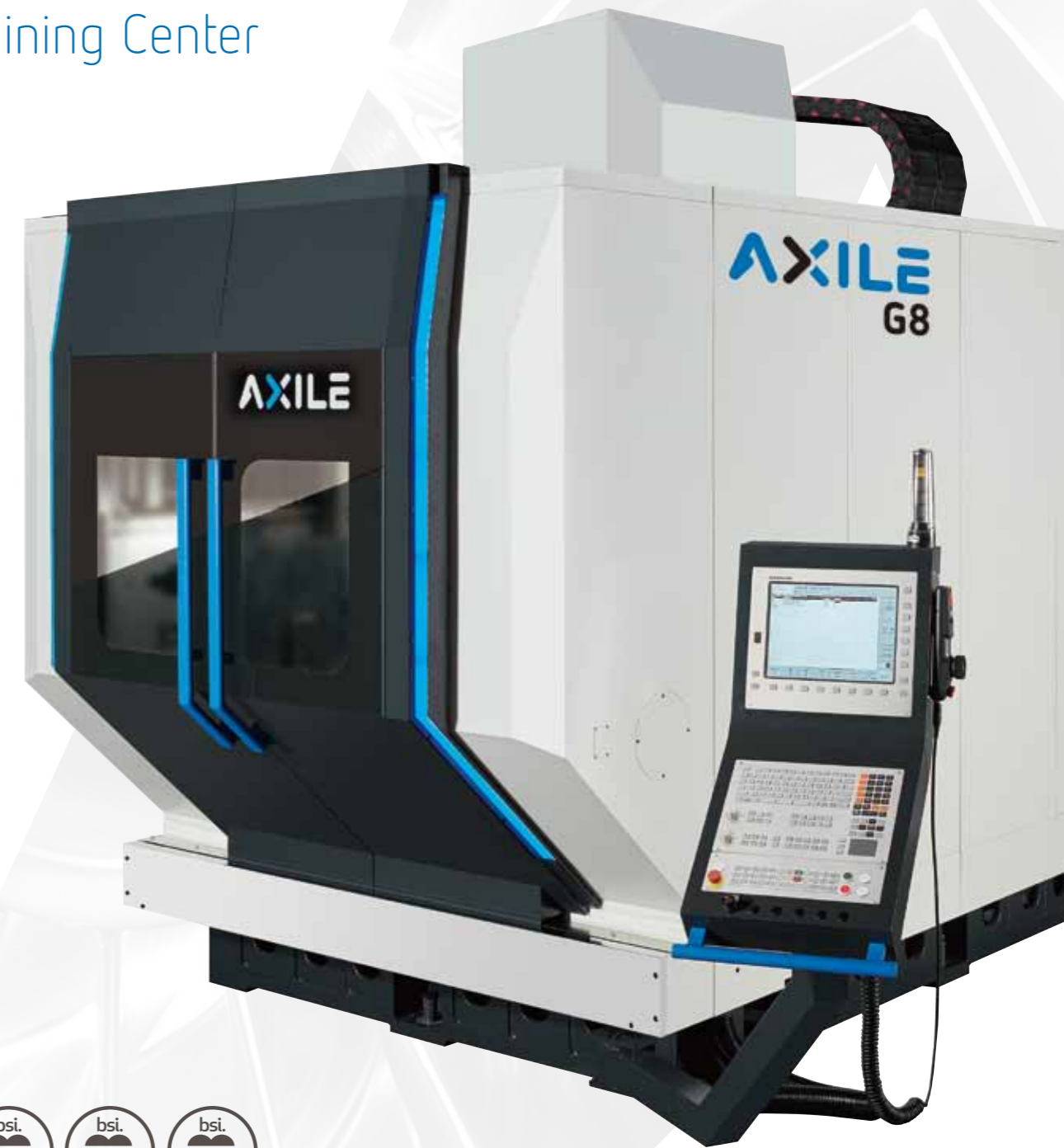


AXILE G8

Gantry type
5-Axis Vertical
Machining Center



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www.axilemachine.com

> AXILE /'æksail/, stands for "agile"

Agility is the best word to define the identity of **AXILE**. Motor agility is the ability to move quickly and precisely, which is the essence of **high-speed machining**. Mental agility is the ability to think and understand quickly, to be **smart** in other words.

AXILE provides agile smart machining.

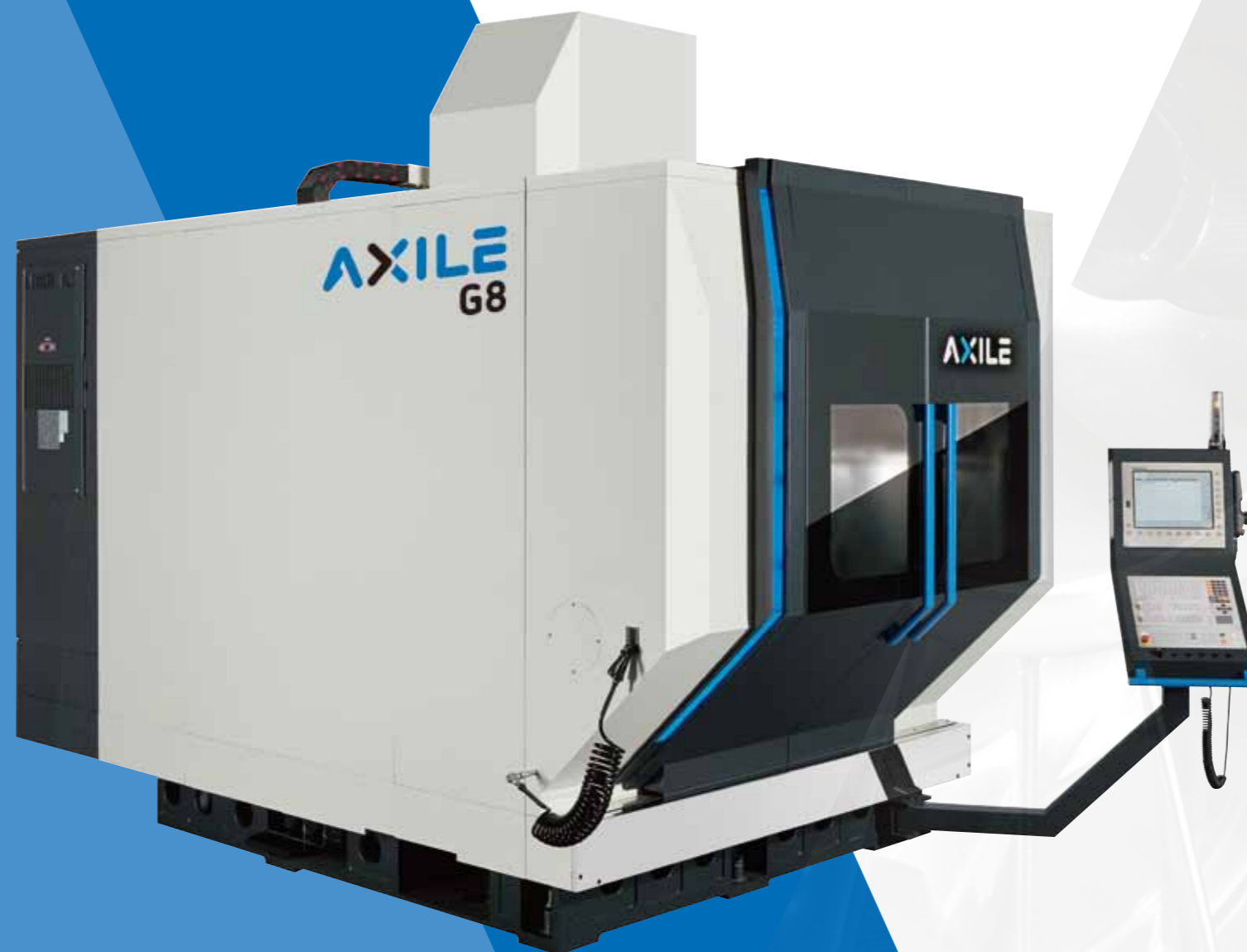
Highly sophisticated part manufacturers face the same problems everywhere: lower selling prices every day, higher costs and a shortage of specialized labour. AXILE propose highly productive machines based on **high-speed and 5-axis technologies at very competitive prices**.

The new AXILE line is built with **standard high-tech design and components** from world-class suppliers to **ensure the best quality and reliability**. AXILE patented **SMT technology** attains reaching high levels of accuracy and embraces **Industrie 4.0 technologies**, **reliability** is upgraded, maintenance costs minimized and downtime avoided.

AXILE products are proudly designed and manufactured at Buffalo's facilities, one of the leading technology manufacturers in **Taichung (Taiwan)**. Taichung is the world's biggest **cluster of machine tool builders**, thanks to abundant specialized workforce and a component supply chain far more efficient than in any other country. The rationalized range of 3X and 5X high-speed VMC's covers only the most requested sizes to reach economies of scale to maintain reasonable market prices.

AXILE is conceived to conquer the premium market of 3X and 5X high-speed vertical machining centers. Such markets will grow and AXILE will be the real Asian big player amongst its European competitors.

AXILE, motor and mental agility at a competitive price.



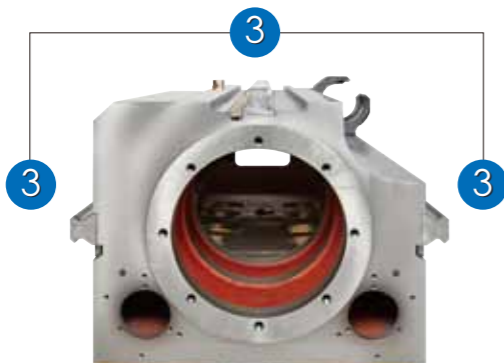
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Design concept

The structure

- 1 Spindle moved by 3 linear axes
No rotary axis between the tool and the machine body, for better machining rigidity.
- 2 Perfect U-shape closed-gantry design
Same stability in all travels of X and Y axes
Excellent accessibility to working area
- 3 3-guided headstock
Highest rigidity in roughing processes with high torque in spindle



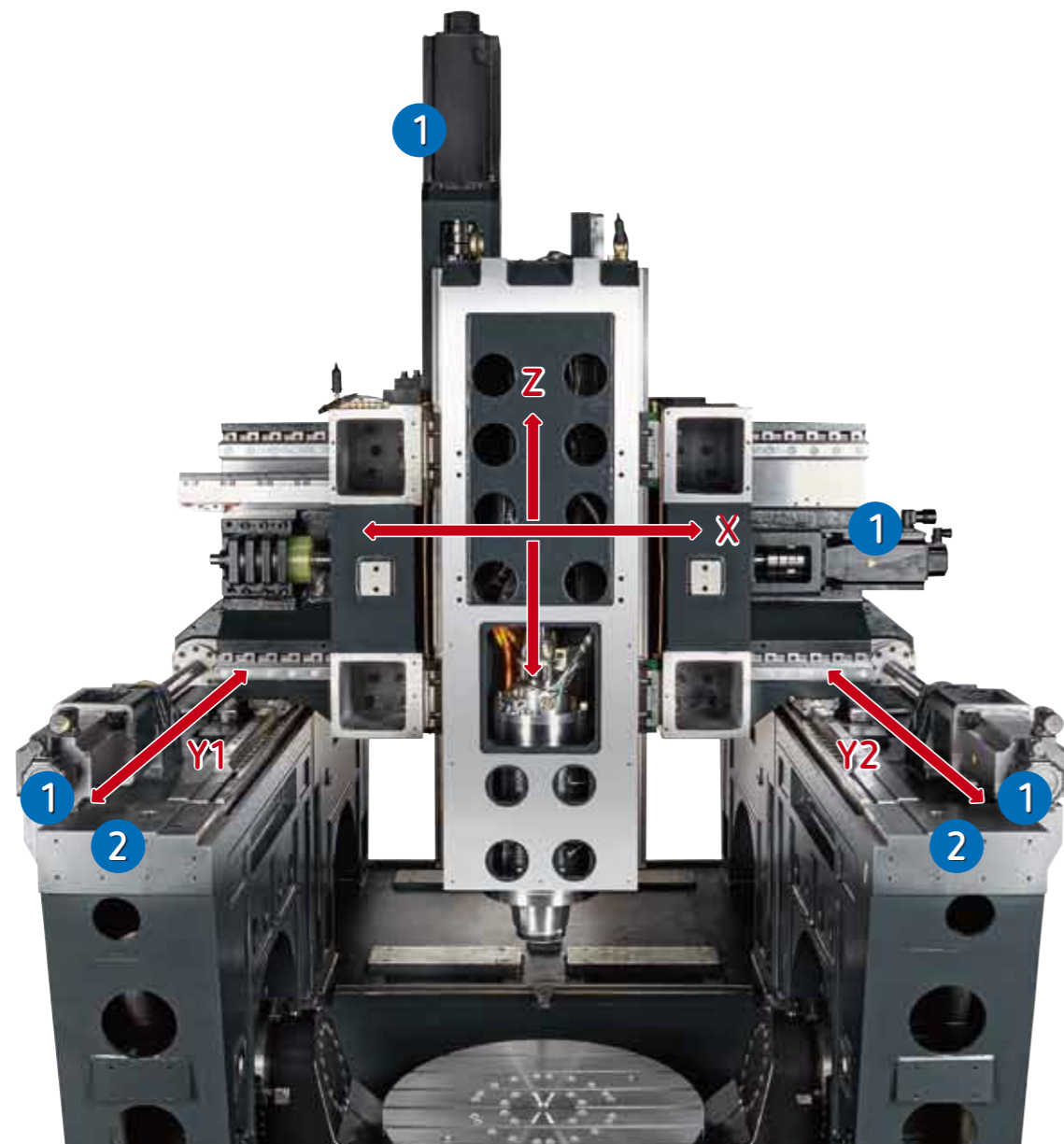
Gantry:
best dynamics, accuracy and ergonomics for 5X machines

- 4 Table moved by swivelling-rotary axes
Best accuracy with fixed relative position between 2 rotary axes.
- 5 Massive gantry sliding on 2 symmetric synchronized axes
Best servo response to any milling forces
- 6 All body made of high-quality casting
Optimal damping of machining vibrations
Homogeneous thermal behaviour
- 7 Integrated chip disposal channel directly under the table
Quick evacuation of chips for high chip volume machining

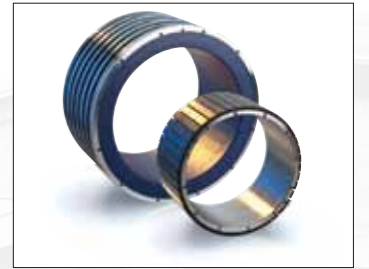
Agility

Linear axes

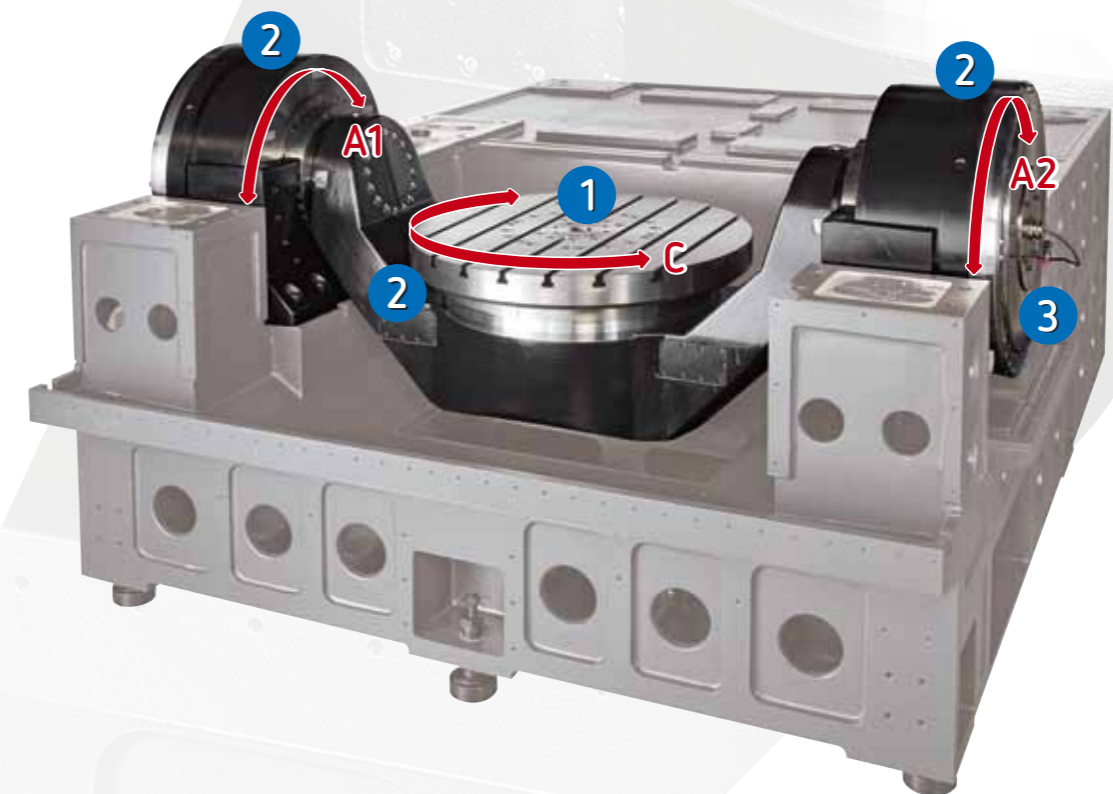
Direct driven servomotors (no belts/gears)	Best dynamic and minimal elasticity in the driving system 1
Double symmetric and synchronized axes (Y1, Y2)	Best dynamic for the gantry no matter the position of the machining force 2
Linear scales with 0,001 μm resolution in X, Y1, Y2 and Z axes	Ensures optimal synchronization in Y1 and Y2 axes, and best accuracy for ALL axes
Double roller type linear guideways	Best high-feed movement and vibration damping
Double pre-loaded double-nut ballscrews	Minimized back-lash allowing high-feed movements



Swivelling-rotary axes




Integrated and ready-to-use hydraulic and pneumatic ports	Simplifying parts clamping process 1
Torque motor-driven rotary axis (C)	Highest dynamics 2
Dual torque motor-driven swivelling axis (A)	Highest accuracy
Brakes in every shaft	High-repetibility in 4+1x operation when using the brakes
High-resolution, direct absolute rotary measuring system	Zero-backlash and high accuracy 3



Smart Technology




Smart Machining Technology (SMT)

High-speed and 5-axis technologies pursue lower manufacturing costs for complex products, but they also represent some serious challenges for accuracy and reliability. This is why Buffalo dedicated almost a decade to research the necessary knowledge to dominate such technologies. We call them SMT.

- 
Tool-tip Positioning Control (TPC) PATENTED
 Direct displacement measure and real-time monitoring and compensation technology
- 
Metal Removal Rate Optimization (MRRO) PATENTED
 Maximal metal removal rate, cutting force and chatter-free machining
- 
Axial Accuracy Control (AAC) PATENTED
 A machine thermo monitoring and compensation technology
- 
Spindle Vibration Supervision (SVS) PATENTED
 Spindle vibration monitoring and real-time control technology


Axile Reliability Technology (ART)

Axile also embraces Industrie 4.0 and is developing its own patented technologies called ART. The main components of the machine will be equipped with sensors that collect relevant data like vibration, acceleration or temperature, to monitor working conditions in real-time.

- 
Reliability Maintenance (RM) PATENT PENDING
 Predictive maintenance
- 
Energy Management (EM) PATENT PENDING
 ISO14955 (Eco-friendly)
- 
Manufacturing Process (MP) PATENT PENDING
 Process & production planning

Reliability

SMT and ART technologies are applied to predict Mean Time Between Failure (MTBF)



Spindle Vibration Supervision

SVS

How to real-time monitor the spindle vibration to remain the machining accuracy under long time operation?

VIBRATION SENSOR

→

AMPLIFIER

→

MPU

→

CNC

compensation command


MEMORY

↕

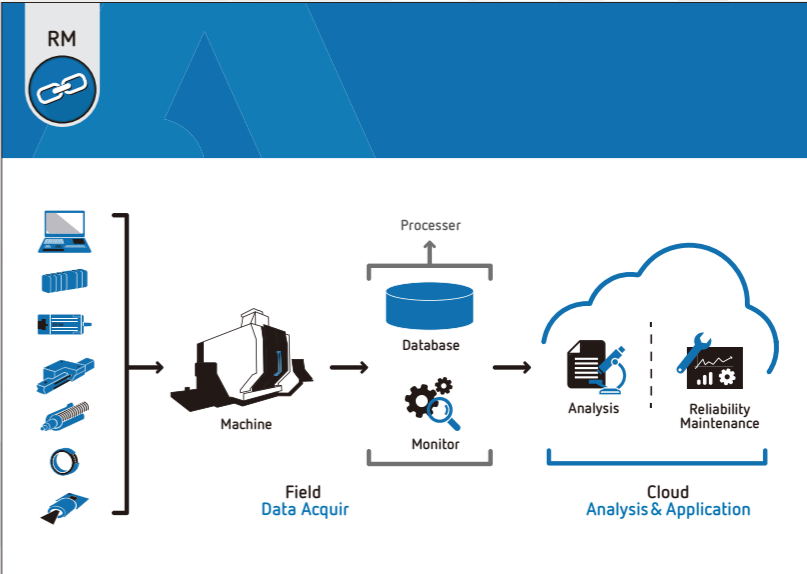
MPU

- **HIGH FINISH QUALITY**
Spindle Life Time
- **LONGER LIFE TIME**
Wear reduction on spindle bearings and tools
- **EASY FOR MAINTENANCE**
Abnormal vibration data recording

RM



Reliability Maintenance



“The Cornerstone of 5-Axis machining”

Accuracy

Linear axes accuracy

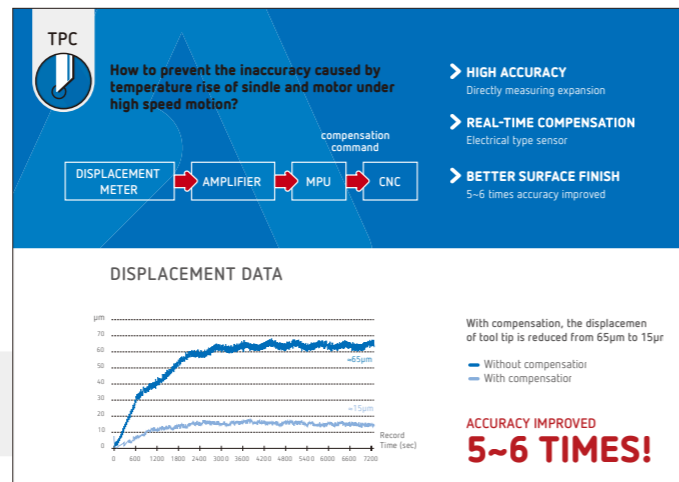
Ballscrew's thermal growth

0.001 μ m resolution absolute linear scales in ALL axes



Spindle thermal growth at high-speed

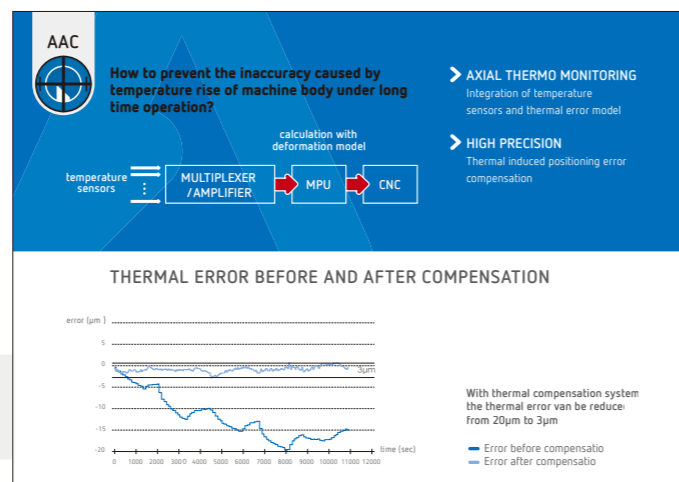
TPC



Tool-tip Positioning Control

Angular deformation in machine body causing linear errors

AAC



Axial Accuracy Control

Rotary axes accuracy

Elasticity and backlash of driving system

Direct-driven torque motors with no back-lash

Angular error is multiplied by the distance from rotary axis to machining point

+/- 5" accuracy absolute rotary scale feedback



Thermal control

Heat generated by spindle and torque motors

Spindle and torque motors are cooled with a water chiller close-circuit and a cooling unit



Linear-rotary axes relative positioning

The swivelling-rotary table might shift its relative position to the 3 linear axes by many reasons generating an increasing error in the part

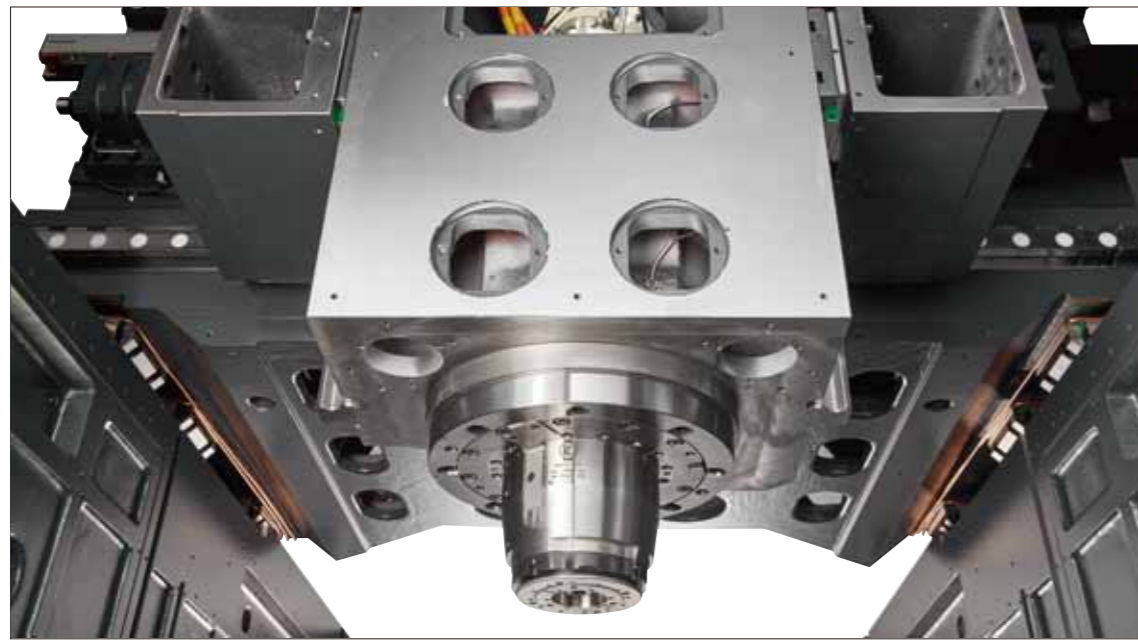
CNC embedded compensating functions like Kinematics (Heidenhain), Kinematic chain (Siemens) and Tilted working plane indexing (Fanuc)



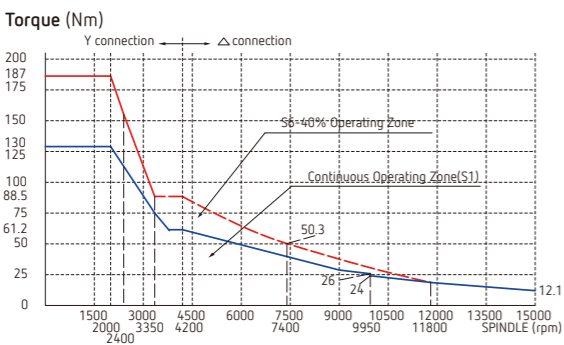
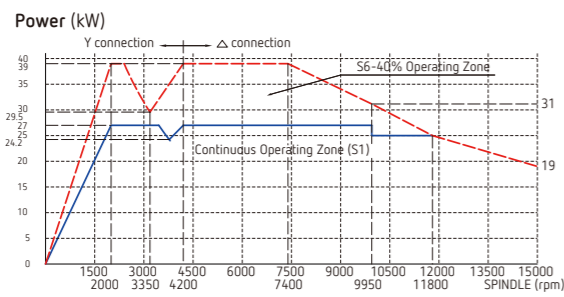
Spindle



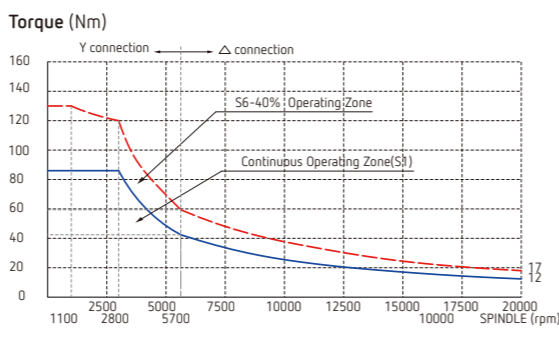
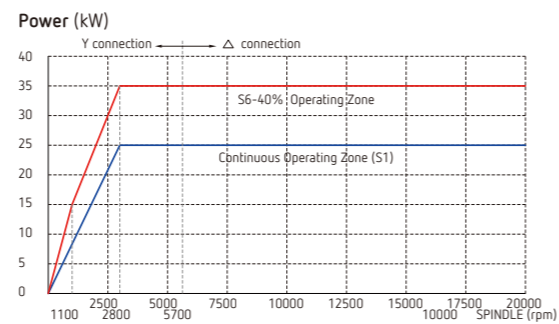
High-performance built-in spindle selection



- > 15.000 rpm
- > Double coil synchronous motor
- > 130/187 Nm S1/S6-40%
- > 27/39 kW S1/S6-40%
- > HSK A63

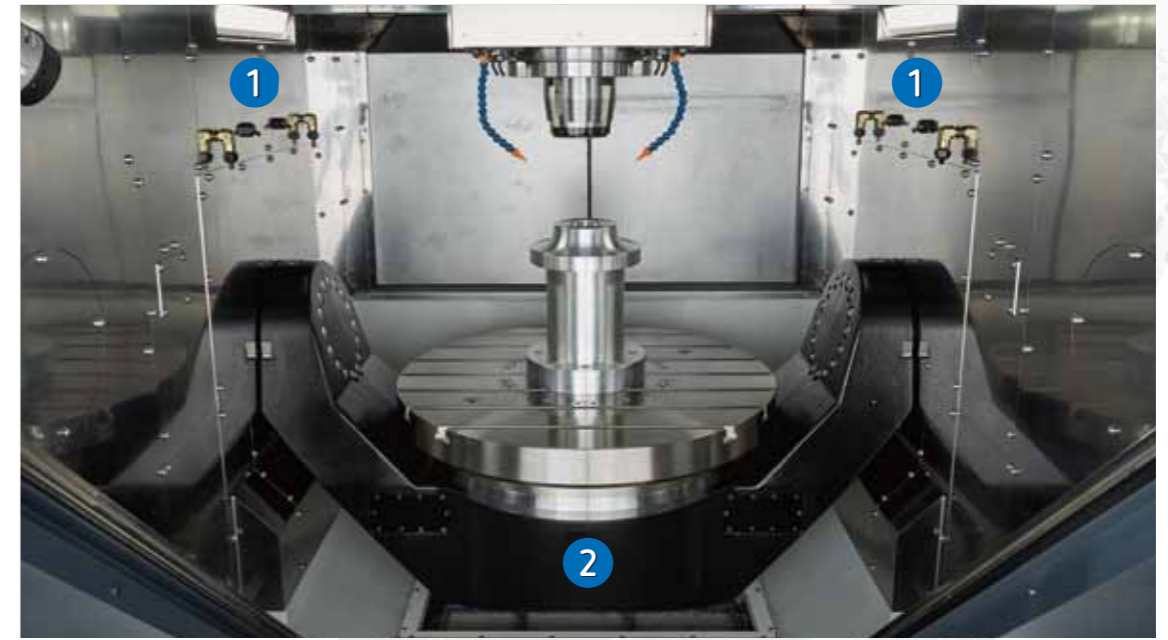


- > 20.000 rpm
- > Double coil synchronous motor
- > 86/130 Nm S1/S6-40%
- > 25/35 kW S1/S6-40%
- > HSK A63



Chip management

Flushing chips away



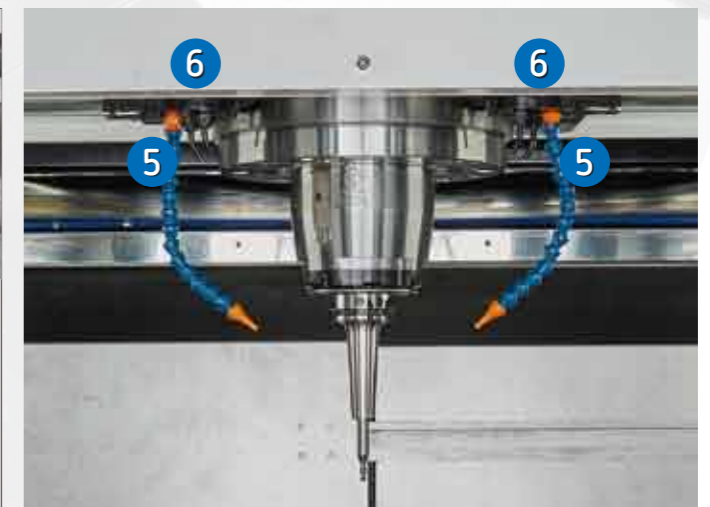
High-quality stainless steel work area

Long-lasting clean operation

Sharp walls and no-corner design

Easier to flush away chips by shower

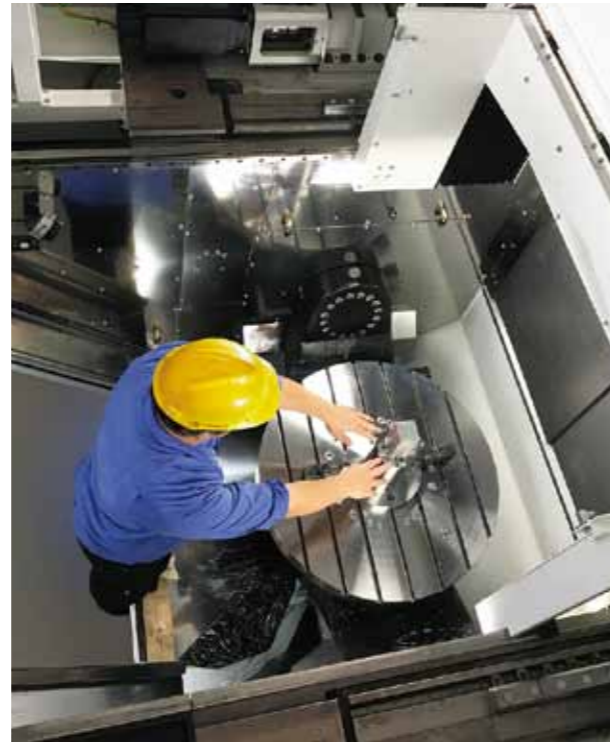
- 1 Chip wash down
- 2 Chip conveyor
- 3 4x coolant at spindle nose
- 4 Coolant through spindle
- 5 2x air flushing
- 6 2+2 coolant flushing



➤ Ergonomics

Accessibility to work area

Large front door opening	Comfortable access to work area for workpiece preparation and supervision
Short distance from operator to table	Ergonomic loading and unloading of small parts
Automatic roof to open ceiling working area	Easy loading and unloading of heavy and bulky workpieces by over-head crane



Automatic roof for overhead crane loading and unloading

Roof closed



Automatic sliding of roof



Fold-up the roof



Easy access to table center



Easier tooling management and maintenance



Tools are accessible from back of the machine and stored vertically

Tools can be changed into the magazine while automatic operation of machine.

All necessary consumables are located together in the back of the machine

Easier maintenance routine for operator

Smart tool interface panel is used to select the tool. When finished, the system checks whether all tool HSK A-63 holders are in the right position

Avoid human failures when automatically change tool to spindle, protecting spindle and reducing down-time

Comfortable pending panel can be selected in either sides of machine

Layout is optimized and operator ergonomics customized



➤ Tool management

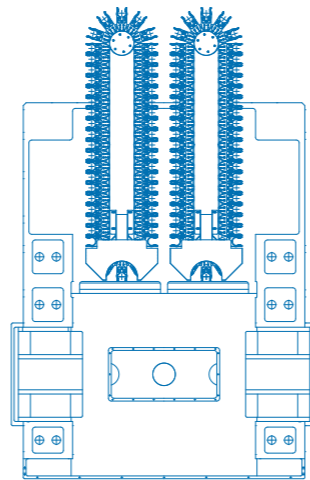
Flexible capacity for every application



Single or twin carrousel of 32, 48 or 60 tools can be selected and capacity doubled to 64, 96 or 120 tools. Up to 96 tools machine layout is not modified.

Sister tools, complex parts and unmanned operation can be executed with no worries on the tool magazine capacity.

“Carrousel-type magazine with **32 to 120 tools** capacity”



➤ Control unit

A controller for every user

Heidenhain iTNC530 HSCI

- Kinematics
- Dynamic Collision Monitoring
- Tool Center Point Management
- Tilted the Working Plane

Siemens 840D sl

- Kinematic chain
- Collision Avoidance
- 5-axis transformation with tool orientation
- Swivel the Coordinate System

Heidenhain TNC640

- Kinematics
- Dynamic Collision Monitoring
- Tool Center Point Management
- Tilted the Working Plane

Fanuc 31iMB5

- 3D Interference Check
- High Speed Smooth TCP
- Tilted Working Plane indexing

Heidenhain TNC640



Siemens 840D sl



Standard & optional equipment

Standard details of a premium machine



Optional design and organization of electrical connectors and cables

Easier maintenance

High-speed and twisting stress cycles

Major heat generating electrical components like transformer and line filters are kept in a separate cabinet for easier temperature control

Electrical cabinet is maintained at stable temperature using an air conditioner.



Chain-type chip conveyor with chip bucket, oil skimmer and built-in 20 bar through spindle coolant pump are standard equipments.

They can be positioned either side of the machine for layout customization.

Integrated and ready-to-use 3 hydraulic and 1 pneumatic port. Clamping and unclamping functions by softkeys in the control panel and/or by M-function.

Simplifies 5X workpiece clamping.



Customize the machine to your needs



Automatic workpiece measurement (with probe, receiver and reference ball)

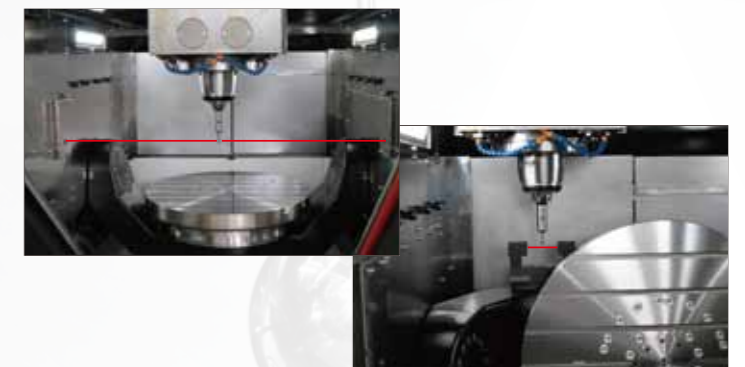
Automatic compensation of the linear-rotary axis relative positioning: Kinematics (Heidenhain), Kinematic chain (Siemens) and Tilted working plane indexing (Fanuc)

For accurate workpiece positioning or in-process measuring of some machining features.

2 versions: U-type embedded in the table (for highest accuracy) or wall-to-wall type with protection gate (for best protection). Laser tool measurement. This option is used for:

For accurate tool measurement in length, radius and shape

For in-process tool measurement at working conditions (spindle running at thermal stable conditions)



Separate type cooling unit including:

- > Cartridge filter
- > Paper filter
- > Through spindle 20 bar centrifugal pump or ...
- > Through spindle 70 bar screw type pump with stepless programmable pressure
- > Oil skimmer
- > Coolant chiller

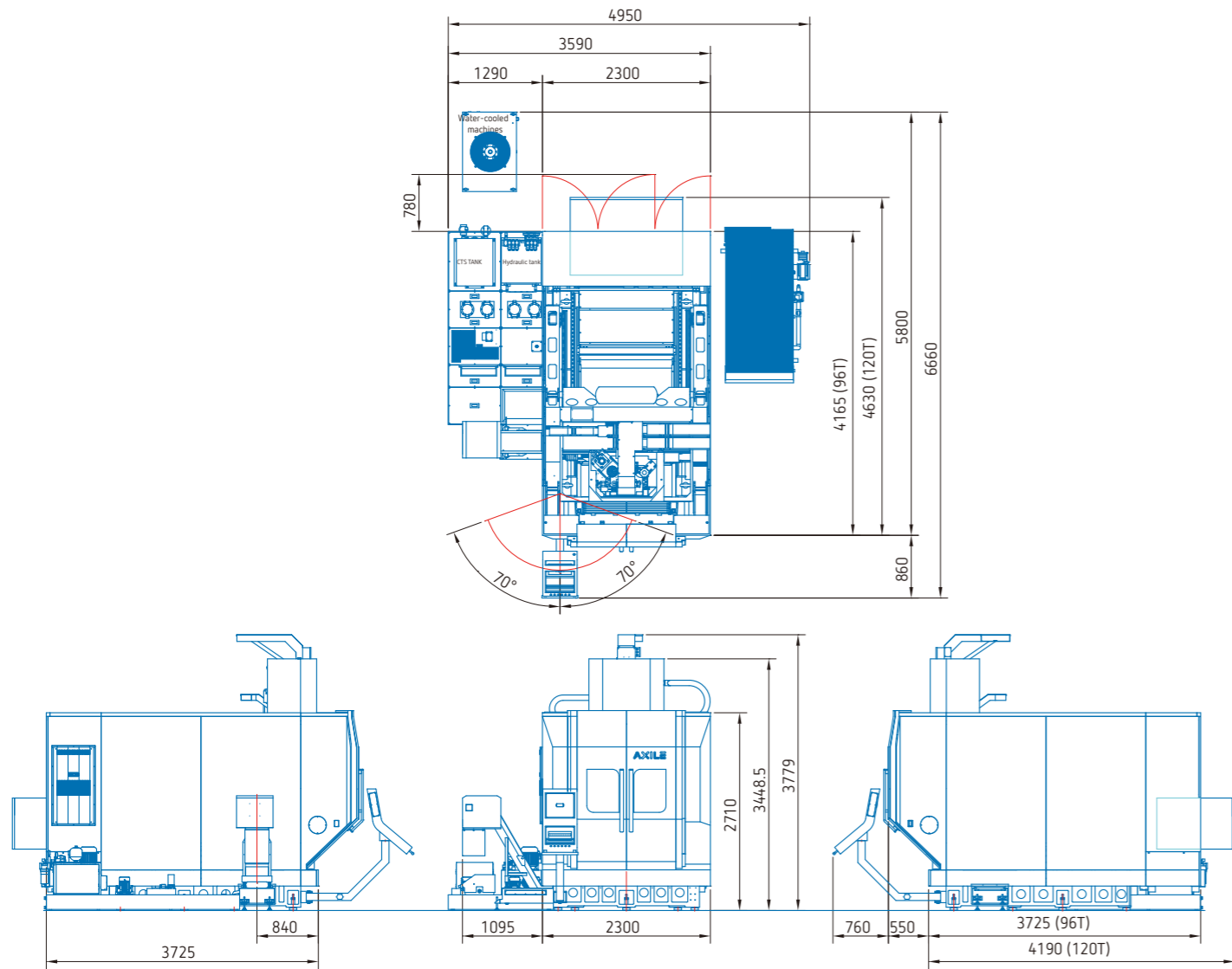
Recommended for high aluminum or cast iron material cutting

Spin window

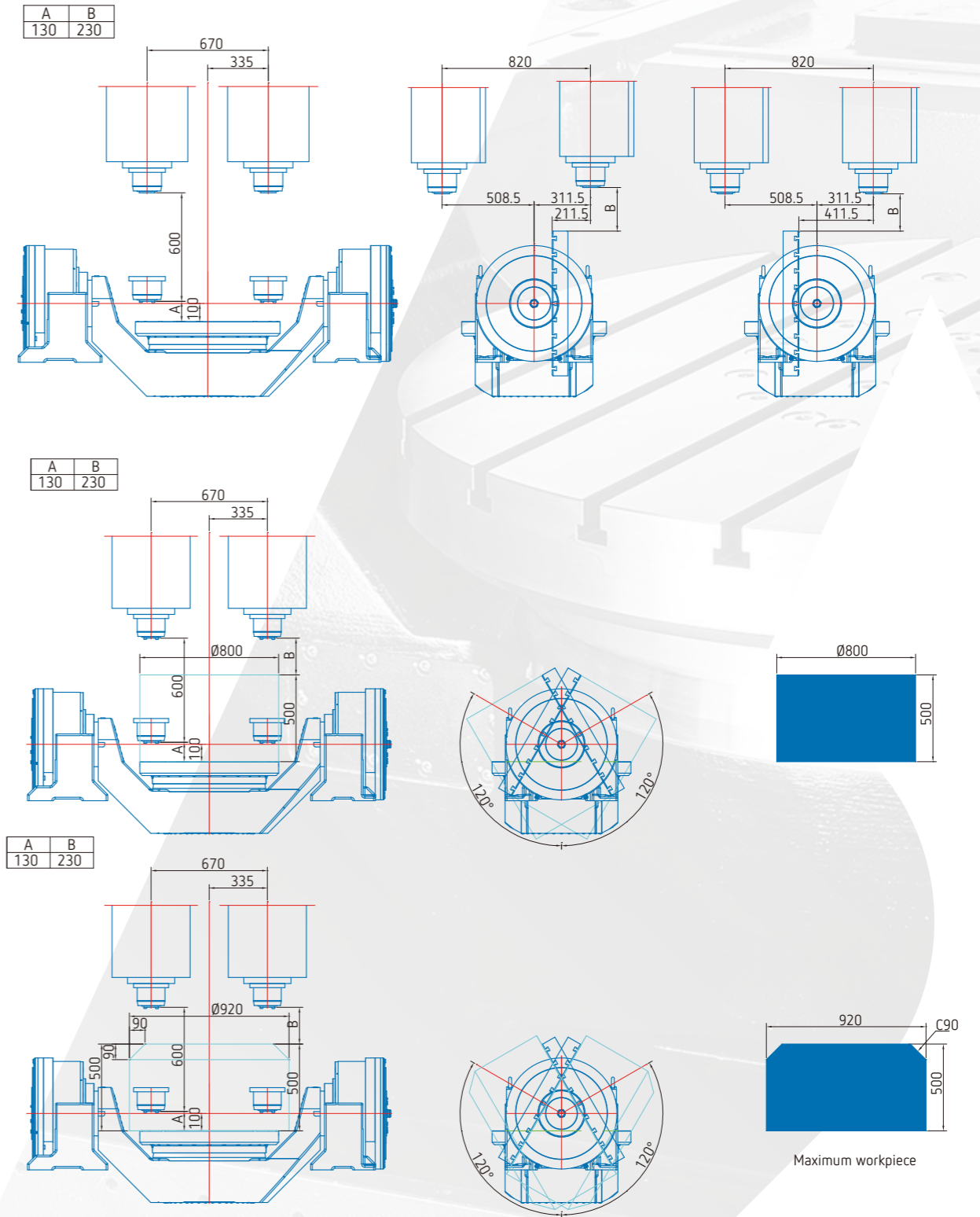
For easier view of working area when huge amount of coolant and chips are produced



Layout and workspace



Interference



Technical data

Basic parameters

LINEAR AXES		
X travel (carriage left and right)	mm	670
Y travel (gantry back and forth)	mm	820
Z travel (headstock up and down)	mm	600
Max feedrate X/Y/Z	m/min	60
WORKPIECE AND TABLE		
Max workpiece dia/height	mm	920/500
Table size (diameter)	mm	800
Maximum table load	kg	1300
ROTARY AXES		
A range (swivelling)	deg	+/- 120
C (rotary)	deg	360 (unlimited)
Maximum swivelling (A) speed	rpm	80
Maximum rotary (C) speed	rpm	100
SPINDLE 15.000rpm		
Spindle taper		HSK A63
Max Speed	rpm	15000
Power S1/S6-40%	kW	27/39
Torque S1/S6-40%	Nm	130/187
SPINDLE 20.000rpm		
Spindle taper		HSK A63
Max Speed	rpm	20000
Power S1/S6-40%	kW	25/35
Torque S1/S6-40%	Nm	86/130
TOOL CHANGER		
Magazine positions		32/64 48/96 60/120
Maximum length	mm	300
Maximum tool diameter (with adjacent pot empty)	mm	75 (120)
Maximum tool weight	kg	7
ACCURACY (VDI/DGQ 3441)		
Positioning	mm	0,008
Repeatability	mm	0,004
CONTROL UNIT		
Heidenhain		iTNC530 HSCI/TNC640
Siemens		840D sl
Fanuc		31iMB5
SUPPLIES		
Installed power	kVA	85
Voltage without transformer	V	400
Frequency	Hz	50/60
WEIGHT		
Machine weight including accessories (aprox.)	kg	18.000

Construction details

LINEAR AXES		
Linear guideways type		Roller type
Linear guideways size X/Y/Z	mm	55/45/45
Distance between X/Y axis guides	mm	590/1472
Ballscrew type		Double nut
Ballscrew diameter/pitch	mm	45/20
X axis motor power/torque	kW/Nm	6/19.2
Y axis motor power/torque (x2)	kW/Nm	6/19.2 (x2)
Z axis motor power/torque	kW/Nm	9.9/31.5
WORKPIECE AND TABLE		
Number of hydraulic ports		3
Working pressure of hydraulic ports	bar	80
Number of pneumatic ports		1
Working pressure of pneumatic port	bar	6
ROTARY AXES		
Driving system in swivelling (A) axis		Dual torque motor
Driving system in swivelling (C) axis		Torque motor
Power and torque of swivelling (A) axis	kW/Nm	15.7/1870 x2
Power and torque of rotary (C) axis	kW/Nm	15.7/1870
Brake type of swivelling (A) axis		Dual hydraulic
Braking torque of swivelling (A) axis	Nm	3500 x2
Brake type of rotary (C) axis	kW	Hydraulic
Braking torque of rotary (C) axis	Nm	2500
SPINDLE 15.000rpm		
Motor type		Synchronous
Bearing type front/rear		Angular ball
Bearing cooling and lubrication		Oil/Air
SPINDLE 20.000rpm		
Motor type		Synchronous
Bearing type front/rear		Angular ball
Bearing cooling and lubrication		Oil/Air
TOOL CHANGER		
Change type		Pick-up
Magazine type		Carrousel (x2)
Carrousel driving system		(2x) Servomotor and gearbox
MEASURING FEEDBACK		
Linear axes type		Linear scales
Linear axes resolution	µm	0.001
Rotary axes type		Rotary scale
Rotary axes accuracy		+/- 5"
EXTERNAL COOLANT SUPPLY		
External nozzles coolant supply (number) pressure	bar	(4x) 3
External nozzles air supply (number) pressure	bar	(2x) 6
Tank capacity	l	425
SPINDLE THROUGH COOLANT SUPPLY (STANDARD)		
High pressure pump	●	bar 20
Filter type		cartdrige
SPINDLE THROUGH COOLANT SUPPLY WITH SEPARATE TANK (OPTIONAL)		
High pressure pump	○	bar 20
High pressure pump	○	bar 70
High pressure pump with stepless programable pressure	○	bar 0 - 70 stepless
Filter type		Cartdrige and paper band
Additional		Coolant chiller and oil skimmer
Additional tank capacity	l	700