AXILE G6

Gantry type 5-Axis Vertical Machining Center

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National Award of Outstanding

ISO 9001:2015 FM 538421
ISO 14001:2015 EMS 546518
ISO 50001:2011 ENMS 642457

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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

Table moved by swivelling-rotary axes	Best accuracy with fixed relative position between 2 rotary axes.

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

4

Massive gantry sliding on 2 symmetric synchronized axes	Best servo response to any milling forces

5

All body made of high-quality casting	Optimal damping of machining vibrations
	Homogeneous thermal behaviour

6

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

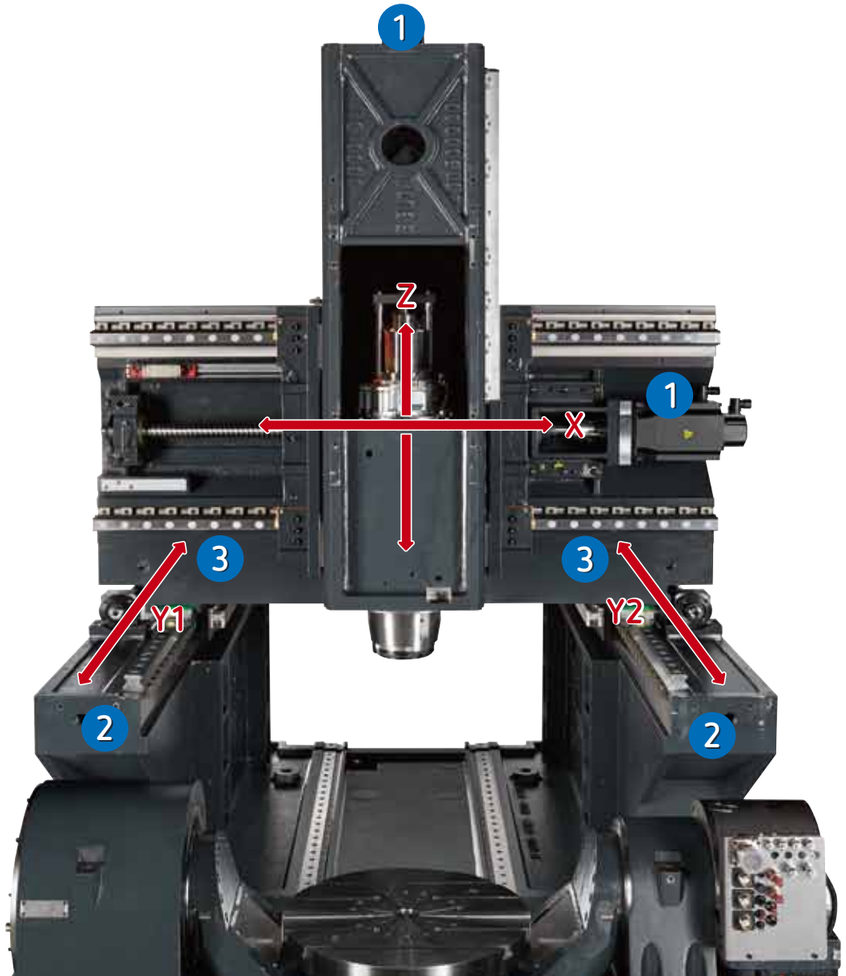
1

Double symmetric and synchronized axes (Y1, Y2)	Best dynamic for the gantry no matter the position of the machining force

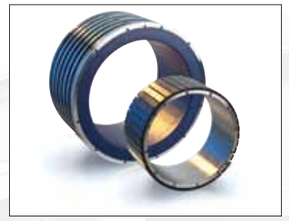
2

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

3



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**
Torque motor-driven swivelling axis (A)	Highest **accuracy**

2

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 Accurancy 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.

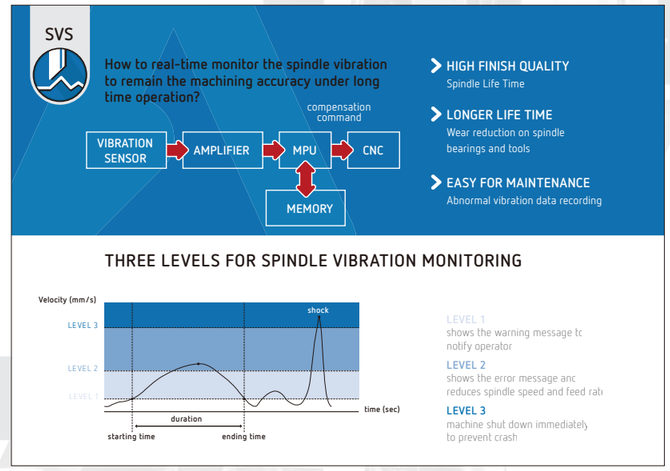
Reliability Maintenance (RM) PATENT PENDING
Predictive maintenance

Energy Management (EM) PATENT PENDING
ISO14955 (Eco-friendly)

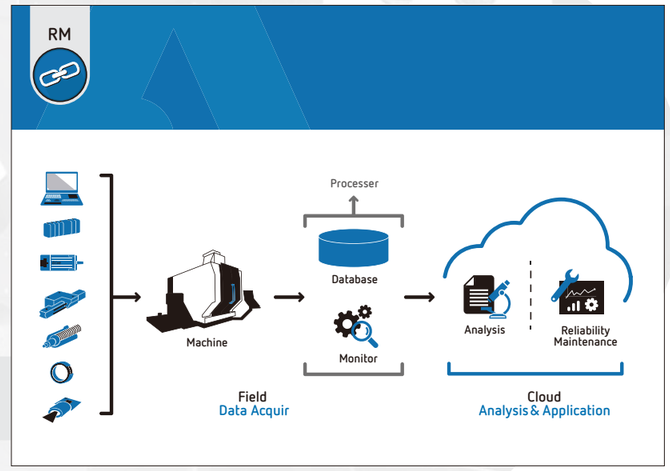
Manufacturing Process (MP) PATENT PENDING
Process & production planning

Reliability

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



Spindle Vibration Supervision



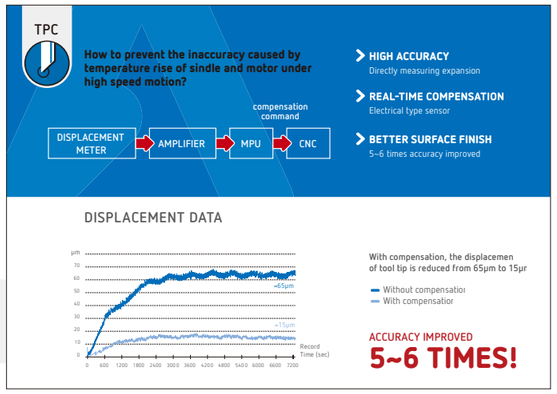
Reliability Maintenance

Accuracy

Linear axes accuracy

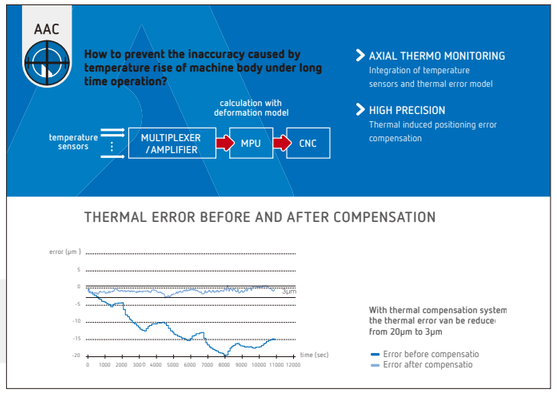
Ballscrew´s thermal growth	0.001µm resolution absolute linear scales in ALL axes

Spindle thermal growth at high-speed	TPC



Tool-tip
Positioning
Control

Angular deformation in machine body causing linear errors	AAC



Axial
Accurancy
Control

"The **Cornerstone** of 5-Axis machining"

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

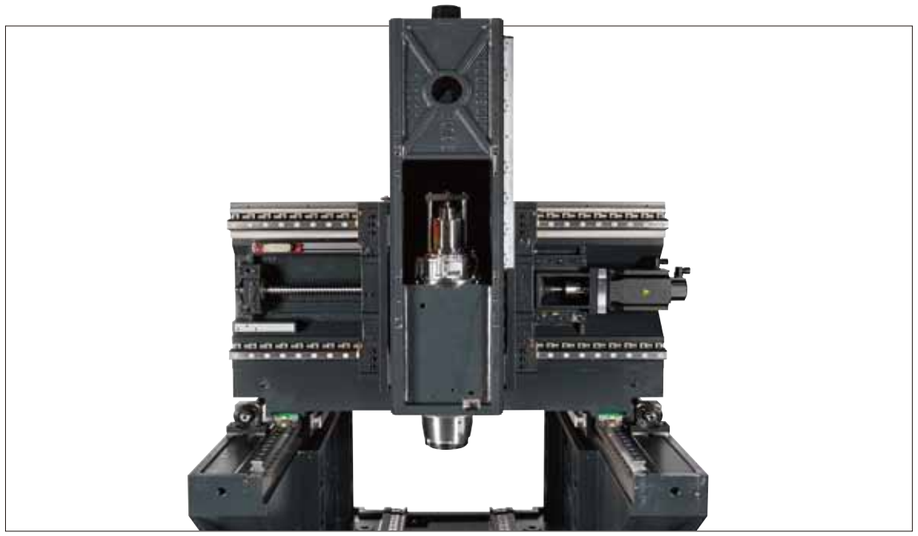
Heat generated by spindle and torque motors	Spindle and torque motors are cooled with a water chiller close-circuit and a cooling unit

Linear-rotary axes relative positioning

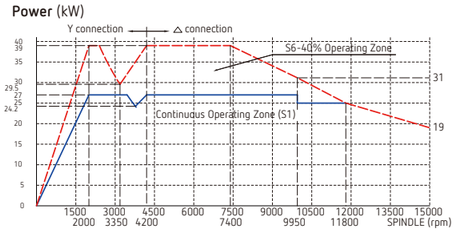
The swivelling-rotary table might shift its relative position to the 3 linear axes by many reasons generating an increasing error in the part	CNC embedded compensating functions like Kinematics (Heidenhain), Kinematic chain (Siemens) and Tilted working plane indexing (Fanuc)

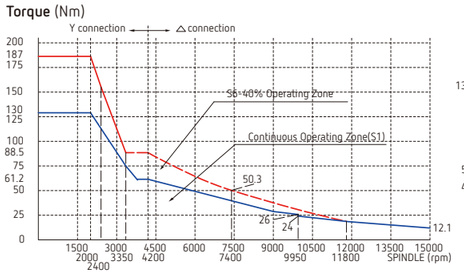
Spindle

High-performance built-in spindle selection

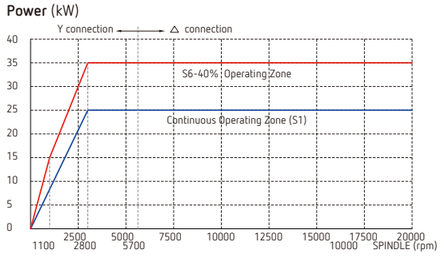


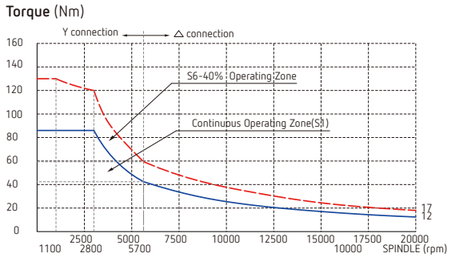
- 15.000 rpm
- Double coil synchronous motor
- 130/187 Nm S1/S6-40%
- 27/39 kW S1/S6-40%
- HSK A63





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



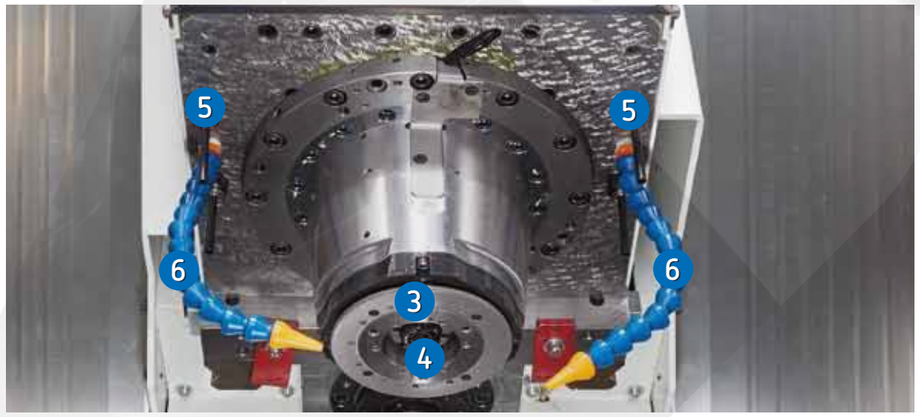


Chip management

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. Air flushing
6. Coolant flushing



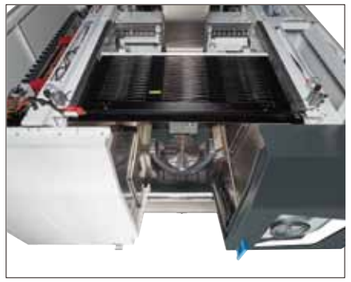
Ergonomics

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 unloding 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

Tool management

Easier tooling management and maintenance

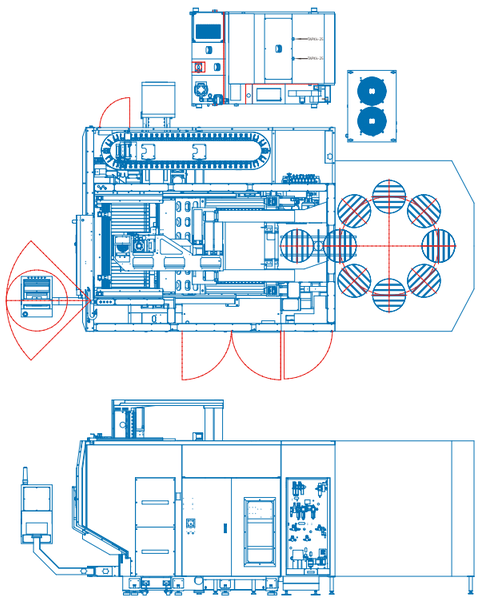
"Travel arm type magazine with **60 or 120 tools** capacity"

1 level (60 tools) or 2 level (120 tools) magazine are selectable within the same machine layout	Unmanned operation with automation, sister tools and complex parts can be machined with no worries on tool magazine capacity
Vertical tool magazine and arm-type automatic tool change	Next tool preparation is executed during automatic machining operation for time saving. Tool change is fast and non-cutting time is reduced
Tools are accessible from the front-left side of the machine and stored in vertically	Tools can be easily changed during automatic operation in the same area for machining supervision, CNC panel and workpiece loading and unloading.
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

Automation

Prepared for 24/7 unmanned operation

Flexible automation from back side of machine



Automation through the back-side of the working area	Front area is always free for the operator for supervision and manual loading-unloading

Control unit

A controller for every user

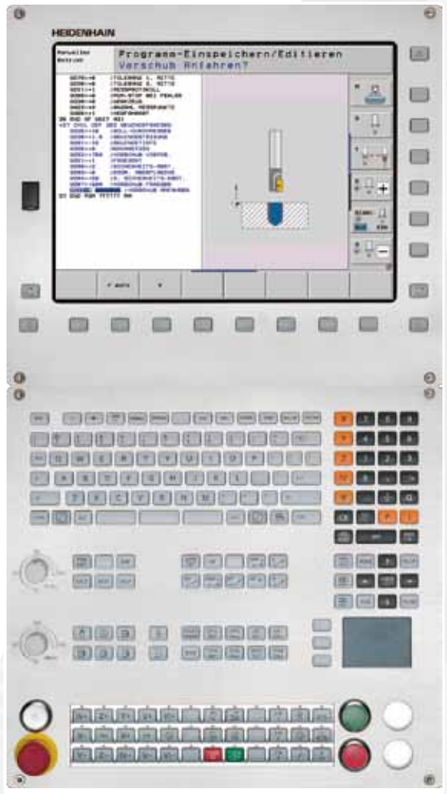
Heidenhain iTNC530 HSCI
- Kinematics
- Dynamic Collision Monitoring
- Tool Center Point Management
- Tilted the Working Plane

Heidenhain TNC640
- 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

Fanuc 31iMB5
- 3D Interference Check
- High Speed Smooth TCP
- Tilted Working Plane indexing

Heidenhain TNC640



Fanuc 31iMB5

Siemens 840D sl

Standard & optional equipment

Standard details of a premium machine

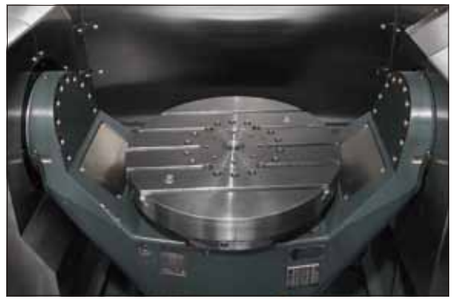
Optional design and organization of electrical connectors and cables

Easier maintenance

High-speed and twisting stress cycles

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

Easier maintenance routine for operator



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 8 hydraulic or pneumatic ports. 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)

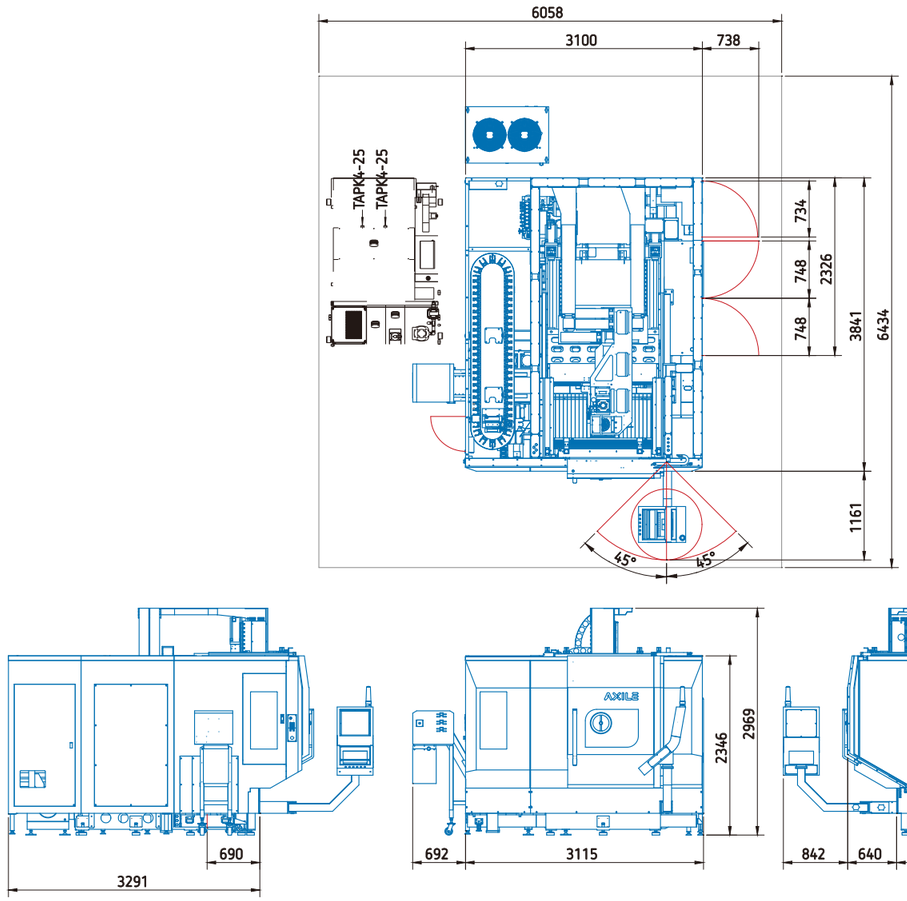
Separate type cooling unit including:
- Cartridge filter
- Paper filter
- Through spindle 20 bar centrifugal pump or ...
- Through spindle 70 bar screw type pump with stepless programmable pressure
- Oil skimmer
- Coolant chiller

Recommended for high aluminum or cast iron material cutting

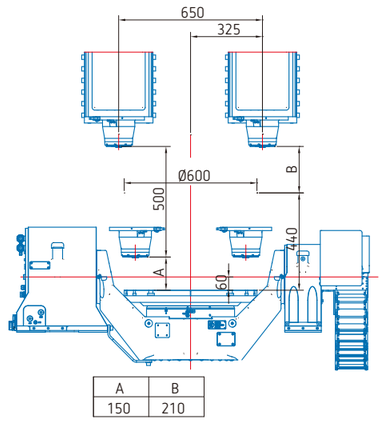
Spin window

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

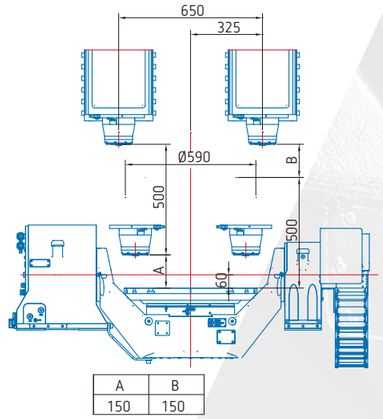
Layout and workspace



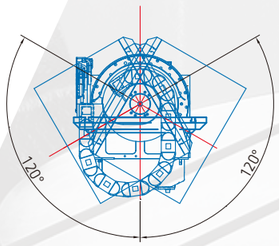
Interference

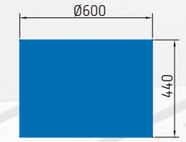


A	B
150	210

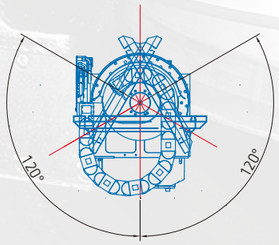


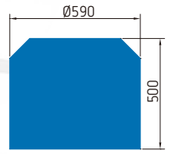
A	B
150	150



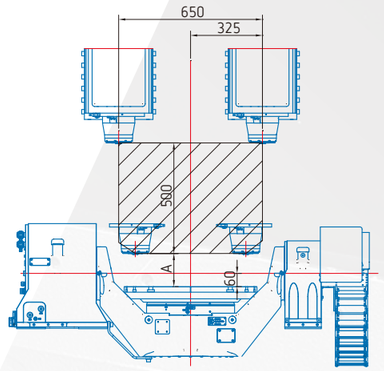


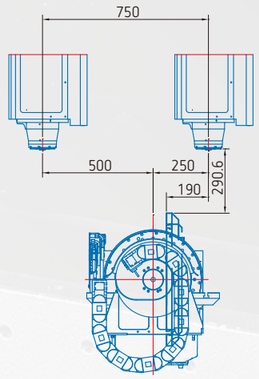
Maximum workpiece

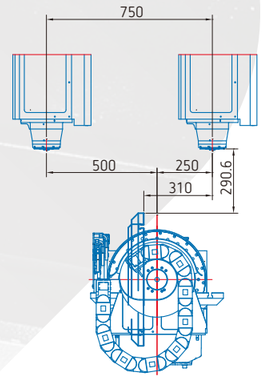




Maximum workpiece







Technical data

Basic parameters

LINEAR AXES		
X travel (carriage left and right)	mm	650
Y travel (gantry back and forth)	mm	750
Z travel (headstock up and down)	mm	500
Max feedrate X/Y/Z	m/min	36
WORKPIECE AND TABLE		
Max workpiece dia/height	mm	600/500
Table size (diameter)	mm	600
Maxium table load	kg	500
ROTARY AXES		
A range (swivelling)	deg	+/- 120
C (rotary)	deg	360 (unlimited)
Maximum sviwelling (A) speed	rpm	80
Maximum rotary (C) speed	rpm	200
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		60/96/120
Maximum lenght	mm	300
Maximum tool diameter (with adjacent pot empty)	mm	75 (125)
Maximum tool weight	kg	8
ACCURACY (VDI/DGQ 3441)		
Positionning	mm	0,005
Repeatability	mm	0,005
CONTROL UNIT		
Heidenhain		iTNC 530 HSCI / TNC 640
Siemens		840D sl
Fanuc		31iMB5
SUPPLIES		
Installed power	kVA	80
Voltage without transformer	V	400
Frequency	Hz	50/60
WEIGHT		
Machine weight including accesories (aprox.)	kg	12.000

Construction details

LINEAR AXES		
Linear guideways type		Roller type
Linear guideways size X/Y/Z	mm	45/45/45
Distance between X/Y axis guides	mm	500/1110
Ballscrew type		Ball
Ballscrew diameter/pitch	mm	40/12
X axis motor power/torque	kW/Nm	5/17.7
Y axis motor power/torque (x2)	kW/Nm	5/21.6 (x2)
Z axis motor power/torque	kW/Nm	6/26.1
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		Torque motor
Driving system in swivelling (C) axis		Torque motor
Power and torque of swivelling (A) axis	kW/Nm	9.8/1040
Power and torque of rotary (C) axis	kW/Nm	8.4/401
Brake type of swivelling (A) axis		Hydraulic
Braking torque of swivelling (A) axis	Nm	3200
Brake type of rotary (C) axis		Hydraulic
Braking torque of rotary (C) axis	Nm	2000
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		Arm
Magazine type		DVCA
Carrousel driving system		Servomotor
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	1500
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	70
High pressure pump with stepless programable pressure	○ bar	0 - 70 stepless
Filter type		Cartdrige and paper band
Additional		Coolant chiller and oil skimmer