

AXILE

V-series

C-type
3-Axis Vertical
Machining Center



National Award
of Outstanding



ISO 9001:2015
FM 538421



ISO 14001:2015
EMS 546518



ISO 50001:2011
ENMS 642457

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.





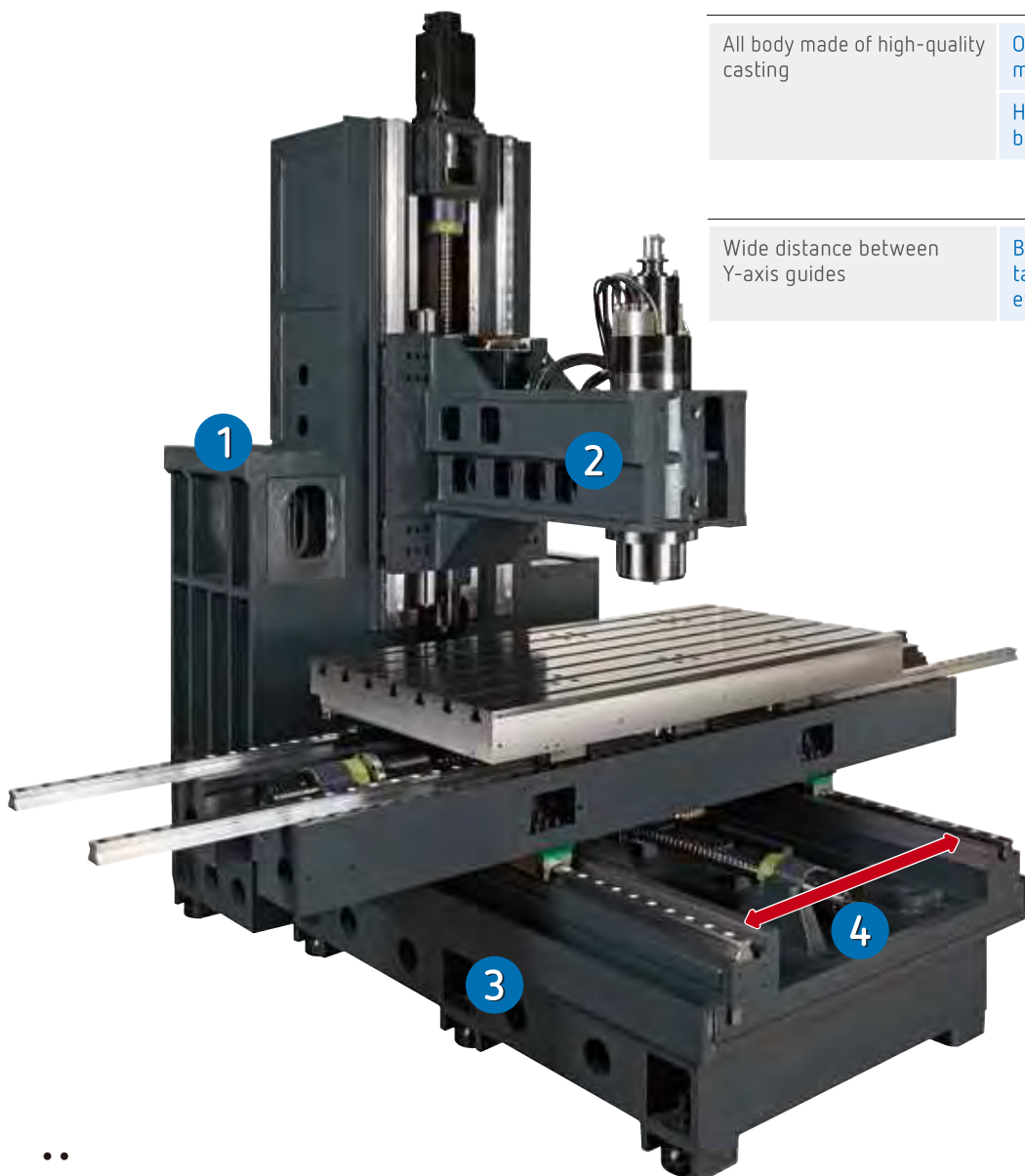
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> Design concept

The structure



1 Flat support for tool magazine directly supported on the floor

No bending of the column and no limitation for bigger, heavier magazines

2 C-type proven design

High rigidity of Z-axis and spindle headstock

Same behavior in full X and Y travel

3 All body made of high-quality casting

Optimal damping of machining vibrations

Homogeneous thermal behaviour

4 Wide distance between Y-axis guides

Best support for saddle and table and stable machining even with heavy loads

Agility

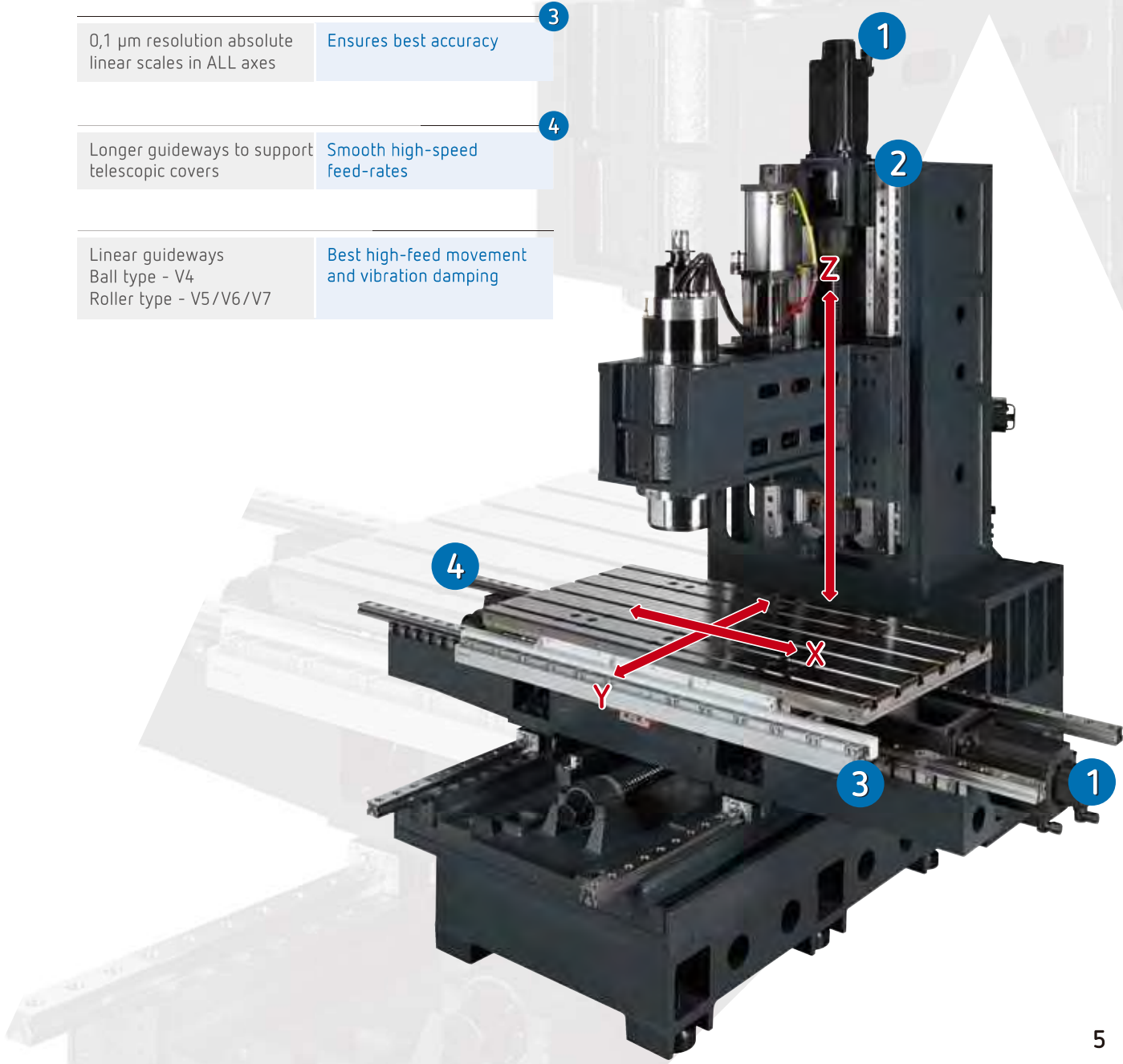
1
Direct driven servomotors (no belts/gears) Best dynamic and minimal elasticity in the driving chain

2
No counterbalance for Z-axis Best dynamics using high-power Z-axis servo motor

3
0,1 μm resolution absolute linear scales in ALL axes Ensures best accuracy

4
Longer guideways to support telescopic covers Smooth high-speed feed-rates

Linear guideways
Ball type - V4
Roller type - V5/V6/V7 Best high-feed movement and vibration damping



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)



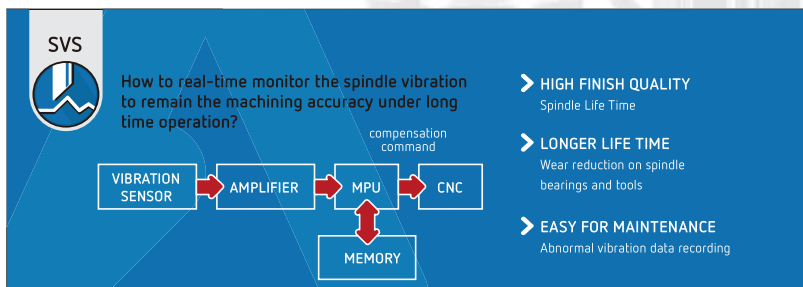
Manufacturing Process (MP)

PATENT PENDING

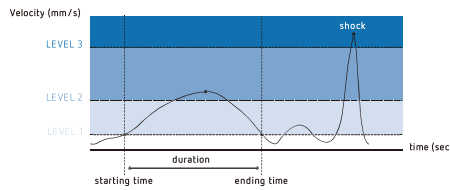
Process & production planning

Reliability

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

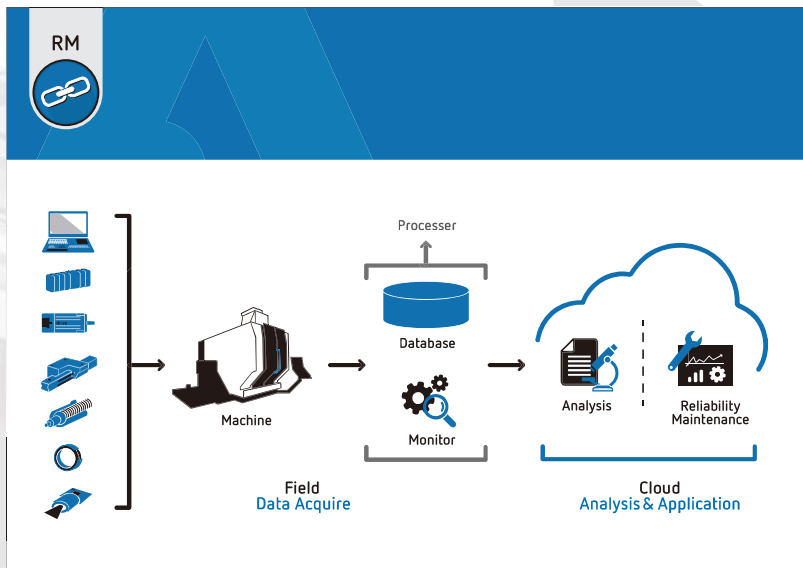


THREE LEVELS FOR SPINDLE VIBRATION MONITORING



- LEVEL 1**
shows the warning message to notify operator
- LEVEL 2**
shows the error message and reduces spindle speed and feed rate
- LEVEL 3**
machine shut down immediately to prevent crash

**Spindle
Vibration
Supervision**



**Reliability
Maintenance**

> Accuracy

Linear axes accuracy

Ballscrew's thermal growth

0.1 μ m resolution absolute linear scales in ALL axes



Spindle thermal growth at high-speed

TPC

TPC

How to prevent the inaccuracy caused by temperature rise of spindle and motor under high speed motion?

- > **HIGH ACCURACY**
Directly measuring expansion
- > **REAL-TIME COMPENSATION**
Electrical type sensor
- > **BETTER SURFACE FINISH**
5~6 times accuracy improved

DISPLACEMENT METER → AMPLIFIER → MPU → CNC

compensation command

DISPLACEMENT DATA

With compensation, the displacement of tool tip is reduced from 65 μ m to 15 μ m

- Without compensation
- With compensation

ACCURACY IMPROVED 5~6 TIMES!



Tool-tip Positioning Control

Angular deformation in machine body causing linear errors

AAC

AAC

How to prevent the inaccuracy caused by temperature rise of machine body under long time operation?

- > **AXIAL THERMO MONITORING**
Integration of temperature sensors and thermal error model
- > **HIGH PRECISION**
Thermal induced positioning error compensation

temperature sensors → MULTIPLEXER / AMPLIFIER → MPU → CNC

calculation with deformation model

THERMAL ERROR BEFORE AND AFTER COMPENSATION

With thermal compensation system the thermal error can be reduced from 20 μ m to 3 μ m

- Error before compensatio
- Error after compensatio



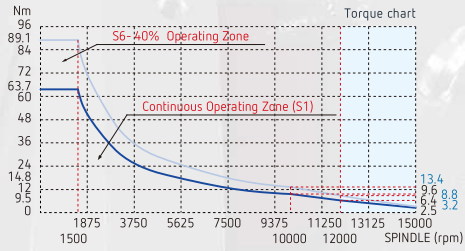
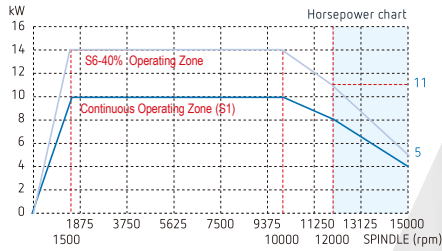
Axial Accuracy Control

Spindle

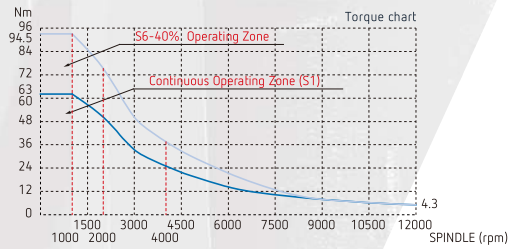
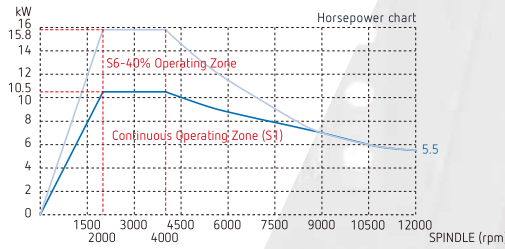
In-line Spindle 12000 rpm

V4/V5

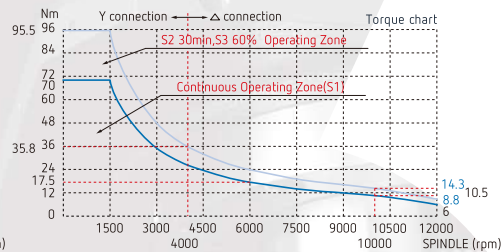
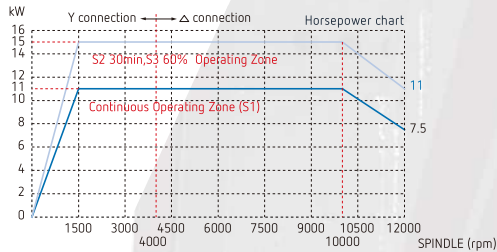
Heidenhain 640/530 controller | Heidenhain QAN200UH 10/14 kW



Siemens 840D controller | Siemens 1PH8107-1SG02-3LA1 10.5/15.8 kW

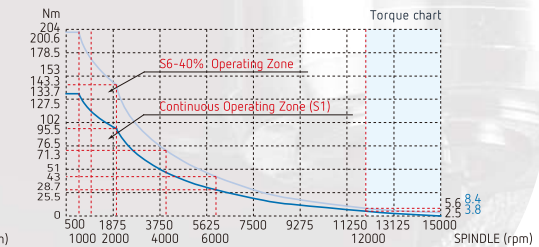
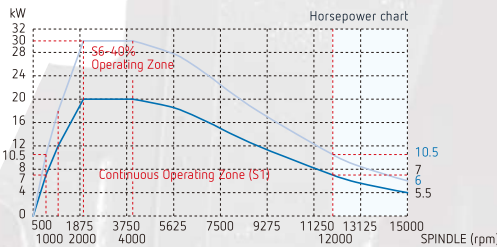


Fanuc 31iB controller | Fanuc AiT12 11/15 kW

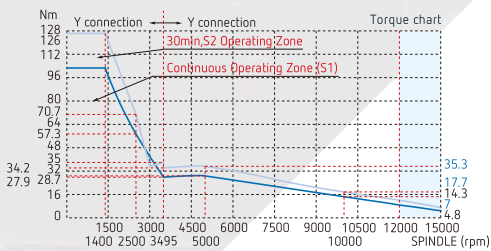
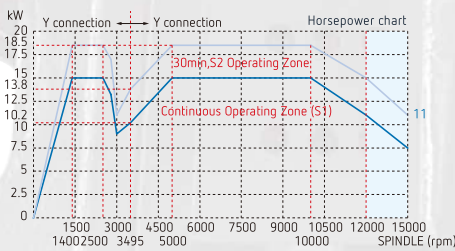


V6/V7

Heidenhain 640/ 530 | Siemens 840D | Siemens 1PH8133-1CG02-3MA1 20/30kW



Fanuc 31iMB | Fanuc alphaT15





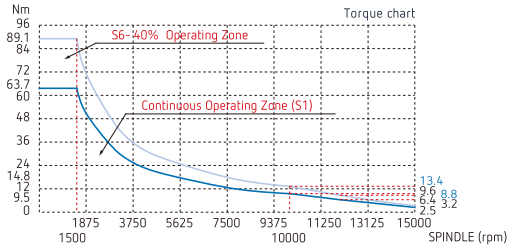
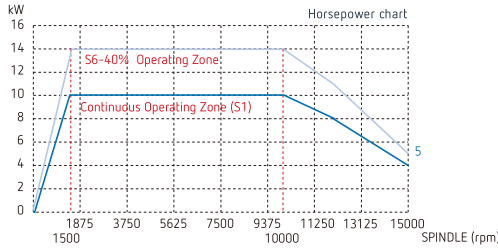
Spindle



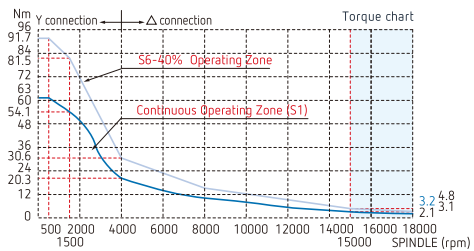
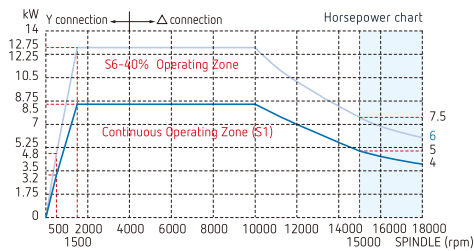
In-line Spindle 15000 rpm

V4/V5

Heidenhain 640/530 controller | Heidenhain QAN200UH 10/14 kW

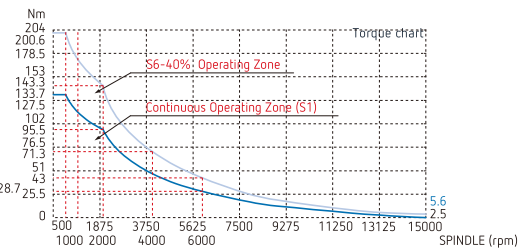
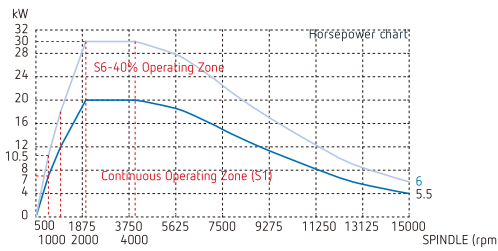


Siemens 840D controller | Siemens 1PH8107-1SS02 8.5/12.8 kW

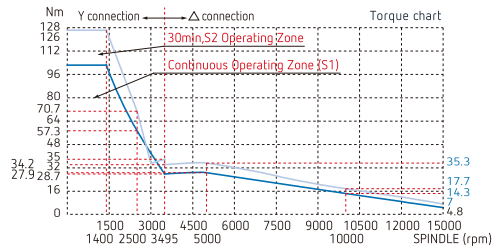
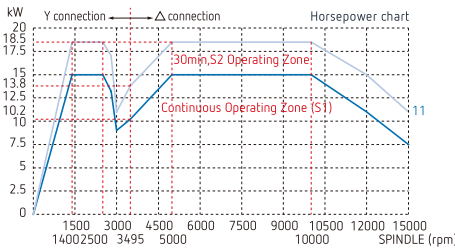


V6/V7

Heidenhain 640/ 530 | Siemens 840D | Siemens 1PH8133 20/30kW



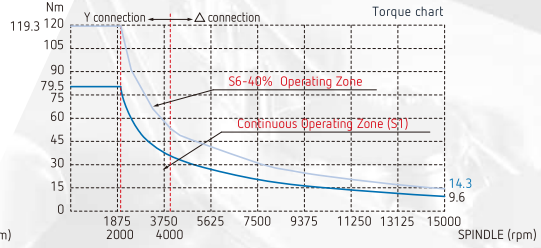
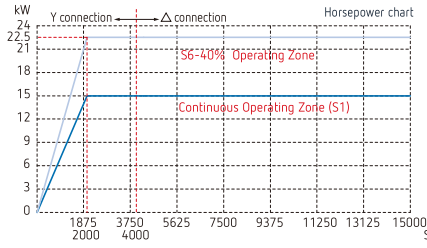
Fanuc 31iB controller | Fanuc AiT15 15/18.5 kW



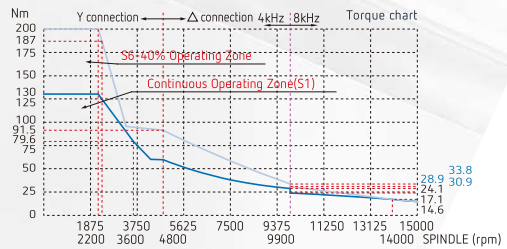
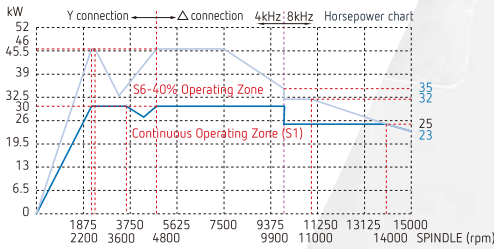


High Speed Built-in Spindle

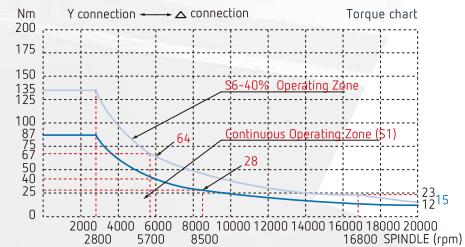
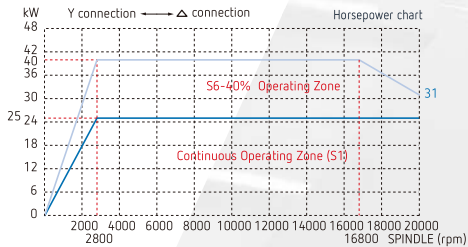
15000 rpm
V5/V6/V7 | >15/22.5 kW



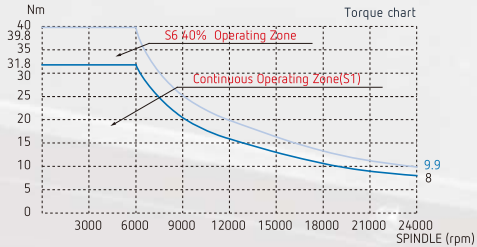
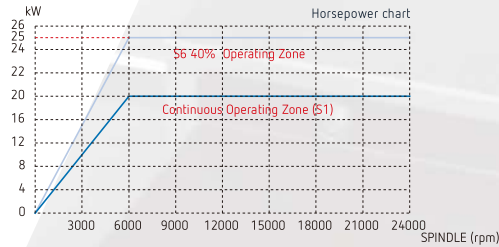
15000 rpm
V6/V7 | >30/46kW



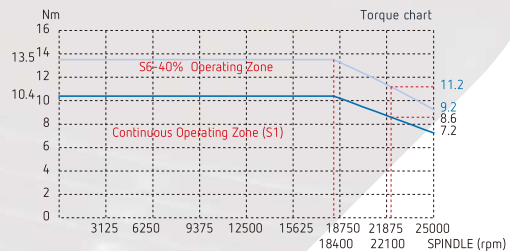
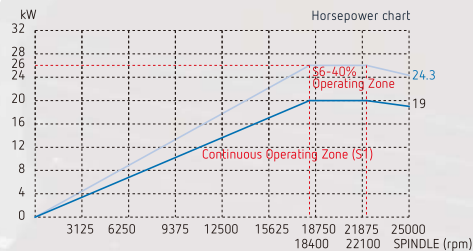
20000 rpm
V6/V7 | >25/40kW



24000 rpm
V4/V5 | >20/25kW



25000 rpm (For Graphite Machining only)
V4/V5 | >20/26kW





Chip and tool management

Flushing chips away



- 1 Chip flushing
- 2 Coolant through spindle
- 3 Coolant at spindle

32 tools



40 tools(opt)



40 tool magazine: tools are accessible by operator

Surveillance and maintenance of tools is possible while machine is in automatic mode.

Control unit

A controller for every user

Heidenhain
iTNC 530 HSCI / TNC 640

Siemens
840D sl

Fanuc
31iB

- High performance path control available
- Automatic smoothing of contour
- Perfect surfaces can be created with any CAM tool
- 3D radius compensation available
- Quick mid program start up on specific NC blocks
- 3D line graphics enables visualization of externally generated NC programs
- Free contour programming

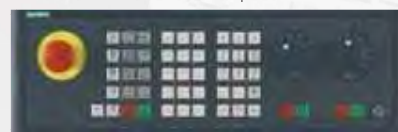
Heidenhain TNC640



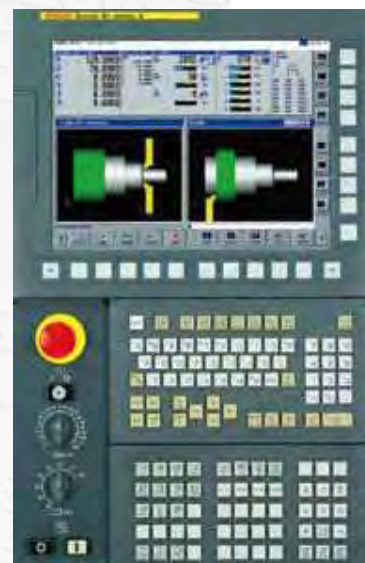
Siemens 840D sl- top part



Siemens 840D sl- bottom part



Fanuc 31iB

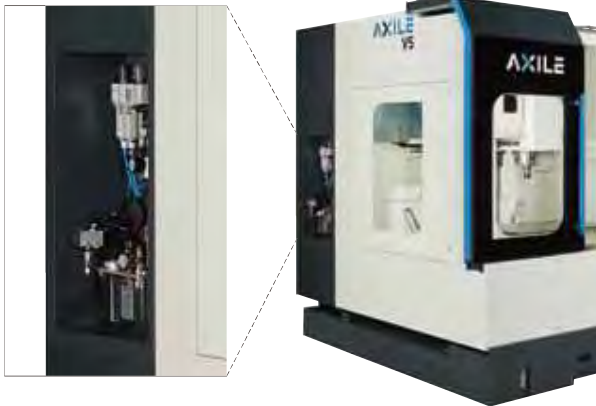


> Ergonomics

Accessibility to work area and focus on the operator

Wide opening of front door. Complete roof integrated in the door. Over-head crane reaches table center

Easy access, loading and unloading of bulky and heavy workpieces



All necessary consumables are located in the back for convenient checking and tank re-filling

Easier maintenance routine for operator

Standard chain type lift conveyor in front of the machine

Chip bucket can easily be reached from the machine front

Swivelling control panel on the right side

Comfortable operator usage and compact design

V7



V6



Standard and optional equipment

Standard details of a premium machine



Electrical cabinet in the right side of machine

Improves the layout as the back of the machine can be place close to wall



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

“ **Customize**
the machine to your needs “

Chain-type chip conveyor and high pressure (20 bar) coolant through spindle

Machine is prepared for every machining operation



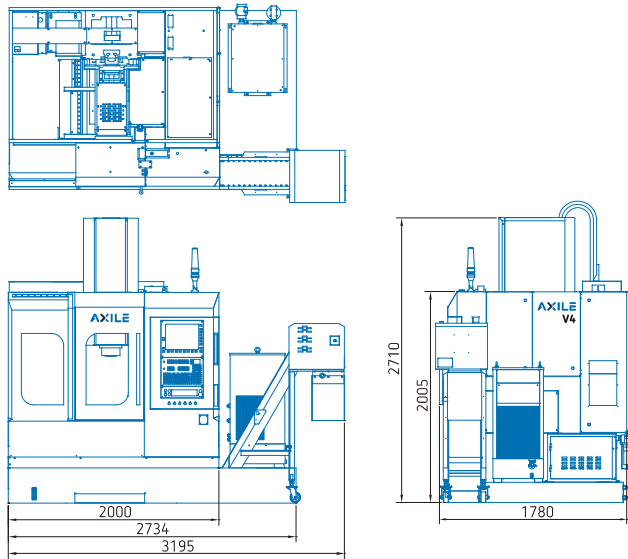
V5



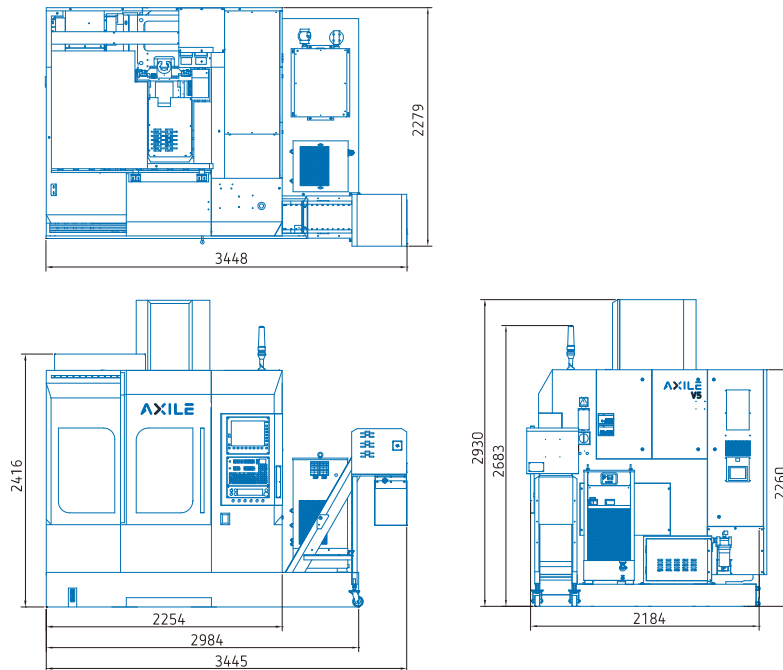
V4

> Layout

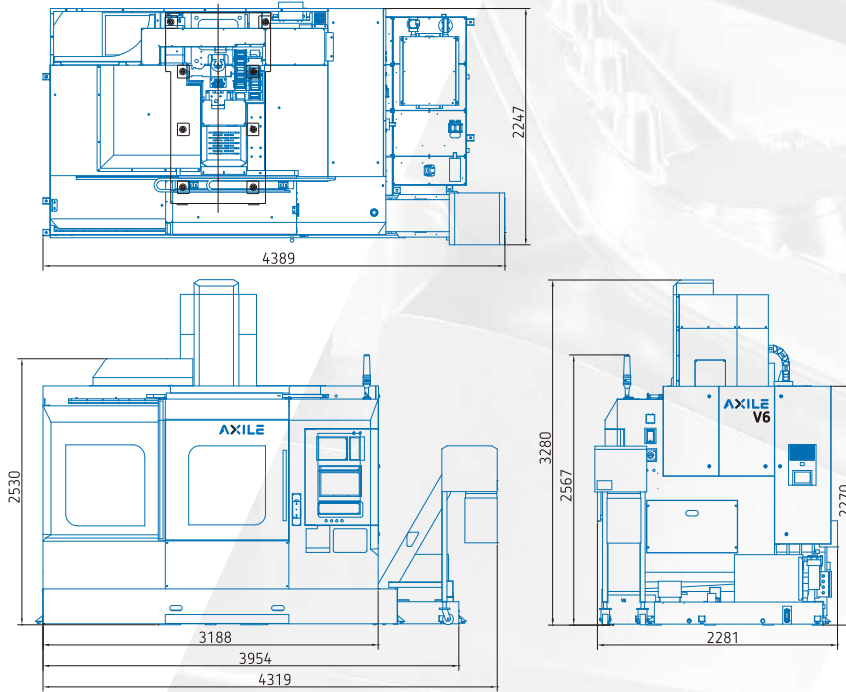
AXILE
V4



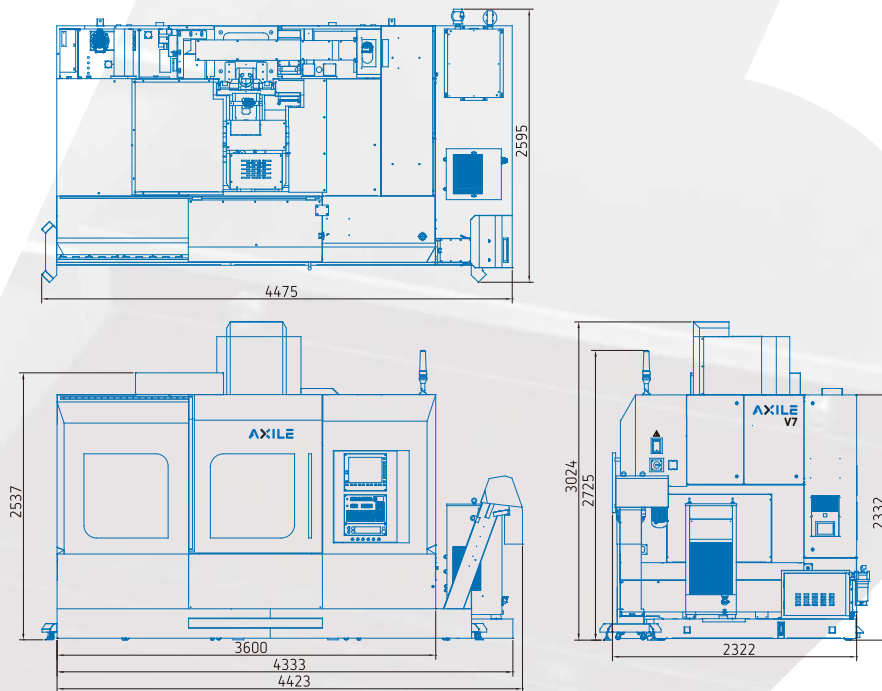
AXILE
V5



AXILE
V6



AXILE
V7





Technical data

Basic parameters

LINEAR AXES		V4	V5	V6	V7
X travel (carriage left and right)	mm	600	800	1050	1200
Y travel (gantry back and forth)	mm	400	500	600	730
Z travel (headstock up and down)	mm	450	500	600	650
Max feedrate X/Y/Z	m/min	36	40	40	40
WORKPIECE AND TABLE					
Table size	mm	770x410	900x520	1200x600	1400x710
Maximum table load	kg	400	600	800	1000
IN-LINE SPINDLE					
Spindle taper		ISO40	ISO40	ISO40	ISO40
Max Speed	rpm	12000(std)/15000(opt)			
Power S1/S6-40%(Heidenhain)	kW	10 / 14	10 / 14	20/30	20/30
Torque S1/S6-40% (Heidenhain)	Nm	63.7 / 89.1	63.7 / 89.1	127.3/191	127.3/191
Power S1/S6-40% (Siemens)	kW	10.5 / 15.8	10.5 / 15.8	20/30	20/30
Torque S1/S6-40% (Siemens)	Nm	50 / 75.4	50 / 75.4	127.3/191	127.3/191
Power S1/S6-40% (Fanuc)	kW	11 / 15	11 / 15	15/18.5	15/18.5
Torque S1/S6-40% (Fanuc)	Nm	70 / 95.5	70 / 95.5	95/117.7	95/117.7
BUILT-IN SPINDLE(OPTION)					
Spindle taper			HSK-A63	HSK-A63	HSK-A63
Spindle specification	mm		202	202	202
Max Speed	rpm		15000	15000	15000
Power S1/S6 (40%)	kW		15/22.5	15/22.5	15/22.5
Torque S1/S6 (40%)	Nm		79.6/119	79.6/119	79.6/119
BUILT-IN SPINDLE(OPTION)					
Spindle taper		HSK-A63	HSK-A63	HSK-A63	HSK-A63
Spindle specification	mm	170	170	210	210
Max Speed	rpm	24000	24000	15000/20000	
Power S1/S6-40%	kW	20 / 25	20 / 25	15K:30/46; 20K:25/40	
Torque S1/S6-40%	Nm	32/40	32/40	15K:130/200; 20K:87/135	
BUILT-IN SPINDLE (OPTION)- for Graphite Machining only					
Spindle taper		HSK-E50	HSK-E50		
Spindle specification	mm	140	140		
Max Speed	rpm	25000	25000		
Power S1/S6(40%)	kW	20/26	20/26		
Toque S1/S6(40%)	Nm	10.4/13.5	10.4/13.5		
TOOL CHANGER					
Magazine positions		Carousel 32 (std)/ Chain 40 (opt)			
Change time T-T (50/60 Hz)	sec	1.55/1.31	1.55/1.31	1.55/1.31	1.55/1.31
Maximum tool length	mm	200	300	300	300
Maximum tool diameter (with adjacent pot empty)	mm	75/125	75/125	75/125	75/125
Maximum tool weight	kg	7	7	7	7
ACCURACY(VDI/DGQ 3441)					
Positioning	mm	0.005	0.005	0.005	0.005
Repeatability	mm	0.005	0.005	0.005	0.005
CONTROL UNIT					
Heidenhain		640/530	640/530	640/530	640/530
Siemens		840D	840D	840D	840D
Fanuc		31iMB	31iMB	31iMB	31iMB

Construction details

WEIGHT		V4	V5	V6	V7
Machine weight including accessories (aprox.)	kg	4350	6250	7000	8850
LINEAR AXES					
Linear guideways type	mm	Ball Type	Roller Type	Roller Type	Roller Type
Linear guideways size X/Y/Z	mm	35	35	45	45
Distance between X/Y/Z axis guides		300/620/400	360/700/400	400/700/400	405/720/365
BALLSCREW					
Ballscrew diameter/pitch	mm	32 x P12	40xP16	40xP16	40xP16
X axis motor power/torque (Heidenhain)	kW/Nm	2.64/8.4	2.64/8.4	5.0/16	5.7/18.1
Y axis motor power/torque (Heidenhain)	kW/Nm	2.64/8.4	2.64/8.4	5.7/18.1	5.7/18.1
Z axis motor power/torque (Heidenhain)	kW/Nm	3.1/9.9	5.4/17.3	5.4/17.3	8.6/27.5
X axis motor power/torque (Siemens)	kW/Nm	1.5/6	2.7/12	3.7/18	3.7/18
Y axis motor power/torque (Siemens)	kW/Nm	2.3/11	2.7/12	3.7/18	4.9/27
Z axis motor power/torque (Siemens)	kW/Nm	2.3/11	4.9/27	4.9/27	5.4/36
X axis motor power/torque (Fanuc)	kW/Nm	2.2/8	2.2/8	4/22	4/22
Y axis motor power/torque (Fanuc)	kW/Nm	2.2/8	2.2/8	4/22	4/22
Z axis motor power/torque (Fanuc)	kW/Nm	3 / 12	4/22	5.5/40	5.5/40
TOOL CHANGER					
Change type		Arm Type	Arm Type	Arm Type	Arm Type
Magazine type			Carousel (std) / Chain (opt)		
MEASURING FEEDBACK					
Linear axes type		Linear scales	Linear scales	Linear scales	Linear scales
Linear axes resolution	µm	0.1	0.1	0.1	0.1
SPINDLE THROUGH COOLANT SUPPLY(STANDARD)					
High pressure pump	bar	20	20	20	20
Filter accuracy	µm	25	25	25	25



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