AXILE
agile smart machining

V5X

C-TYPE 5-AXIS VERTICAL MACHINING CENTER

www.axilemachine.com

WE ARE AXILE

AXILE designs and builds agile smart 5-axis VMCs with leading automation solutions for manufacturers of complex parts and components.

“ We believe manufacturers shouldn’t have to choose between high-speed and high-performance 5-axis machines. ”

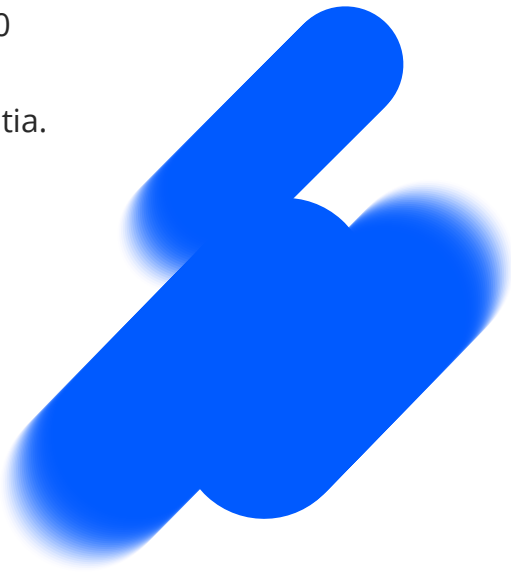
By combining sheer agility, digitalized intelligent automation, and a new standard of 5-axis machining, we’ve created an all-new approach:

Agile Smart Machining.

In short, our dedicated team of industry experts brings together ultra-high removal rates, pinpoint precision, and 24/7 automation and reliability within each and every AXILE 5-axis machine.

Our breakthrough design concepts and advanced proprietary technologies serve highly sophisticated manufacturers of complex parts and components for applications in aerospace, die and mold, medical, and general job shop, among others.

The AXILE service and support network spans nearly 50 countries, with more than 70 distributors across Asia, Europe, and the Americas, and a service center in Croatia.



CONTENTS

V5X C-TYPE VMC

The compact V5X comes in dry or wet cut for small graphite or metal workpieces, respectively. The V5X Graphite features a built-in dust collector vacuum, while the V5X Metal offers efficient chip management.

V5X Graphite machining type

V5X Metal machining type

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

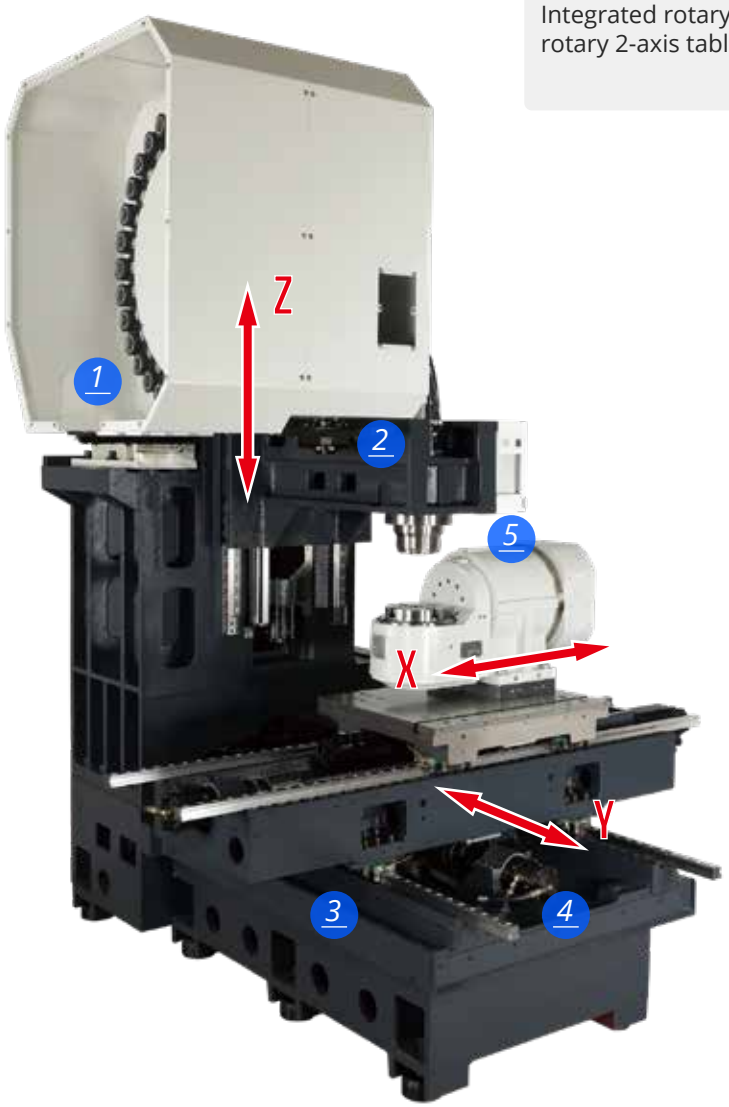
All body made of high-quality casting	Homogeneous thermal behaviour Optimal damping of machining vibrations

4

Wide distance between Y-axis guides	Best support for saddle and table and stable machining even with heavy loads

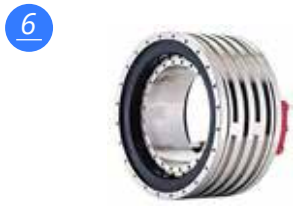
5

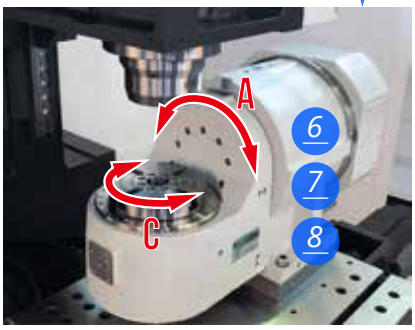
Integrated rotary-on-rotary 2-axis table	Easy and comprehensive 5X machining kinematic

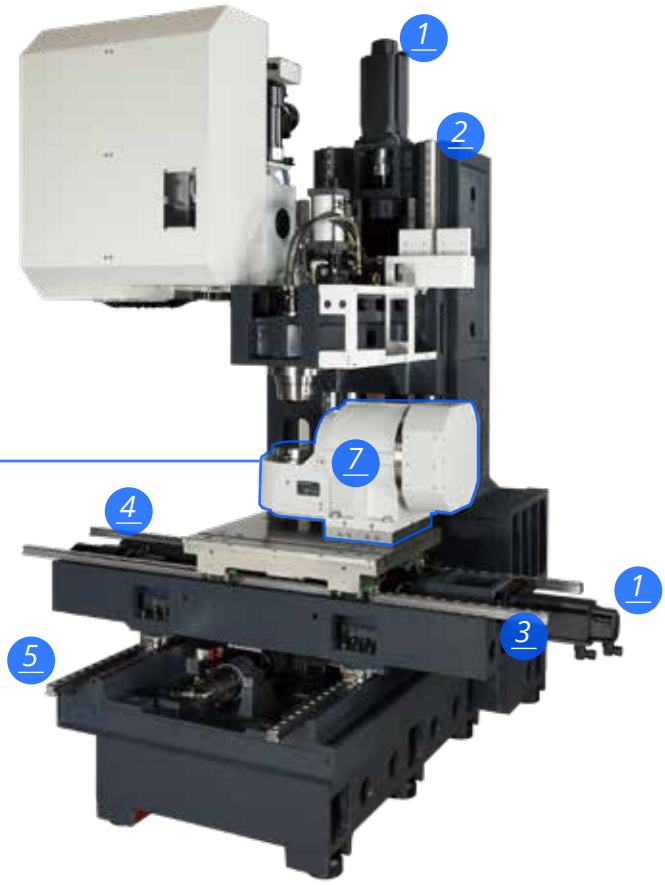


AGILITY

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	
5	Roller type liner guideways	Best high-feed movement and vibration damping	
6	Torque motor-driven rotary axes (A and C)	Highest dynamics and accuracy	
7	Pneumatic brakes in rotary axes (A and C)	High-repetibility in 5-axis operation	
8	High-resolution direct absolute rotary measuring system	Zero backlash and high accuracy	







ACCURACY

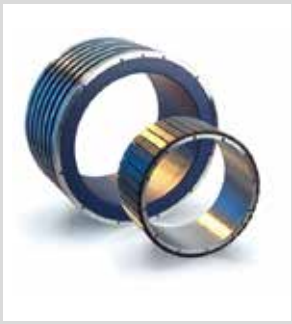
THE CORNERSTONE OF 5-AXIS MACHINING

Linear axes accuracy

Ballscrew´s thermal growth	0.1µm resolution absolute linear scales in ALL axes

Rotary axes accuracy

Elasticity and backlash of driving system	Direct-driven torque motors with no backlash
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

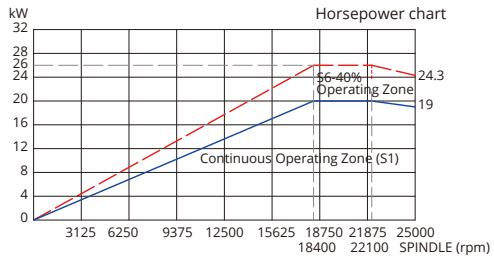
Linear-rotary axes relative positioning

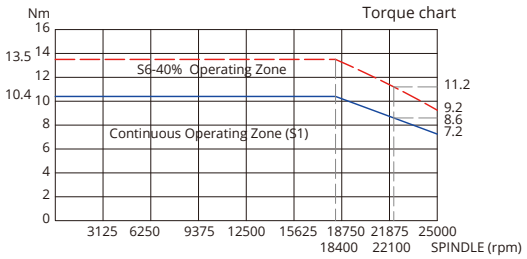
The swivelling-rotary table might shift its relative position to the 3 linear axes by many reasons generating an increasing error in the part	CNC embedded compensating functions like Kinematics (Heidenhain), Kinematic chain (Siemens) and Tilted working plane indexing (Fanuc)

SPINDLE

GRAPHITE MACHINING

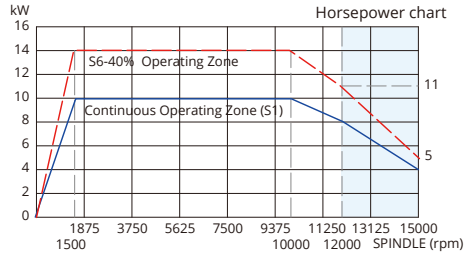
> 25.000 rpm > 20/26 kW

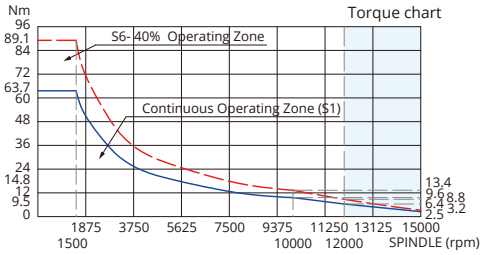




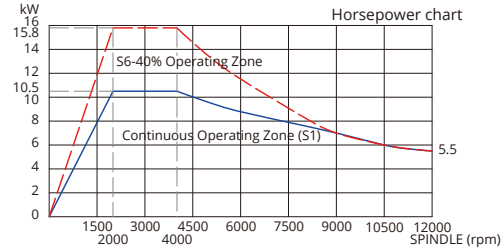
METAL MACHINING / IN-LINE SPINDLE

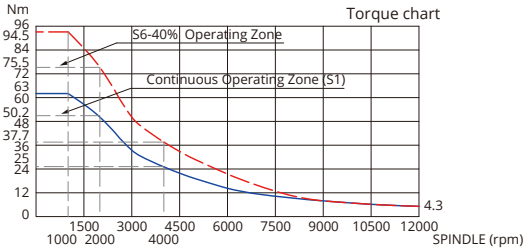
> 12.000 rpm > Heidenhain 640 controller | Heidenhain QAN200UH 10/14 kW



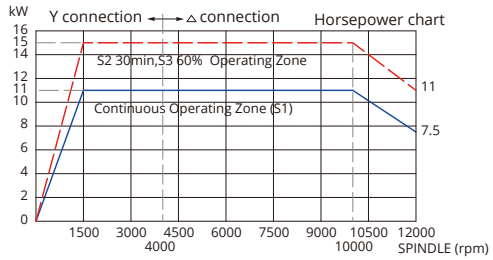


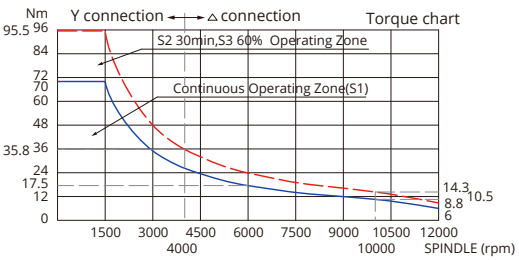
> 12.000 rpm > Siemens 840D controller | Siemens 1PH8107-1SG02-3LA1 10.5/15.8 kW



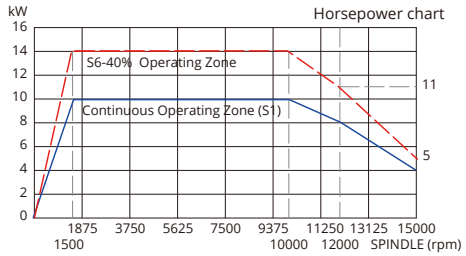


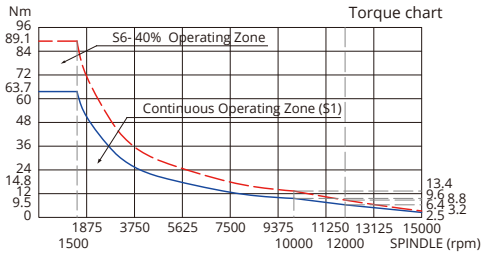
> 12.000 rpm > Fanuc 31iB controller | Fanuc AilT12 11/15 kW



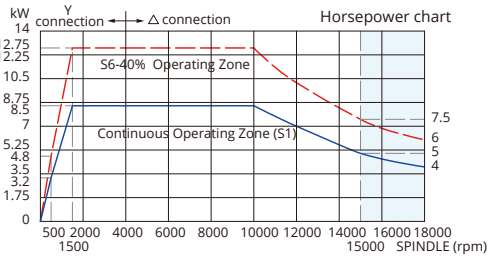


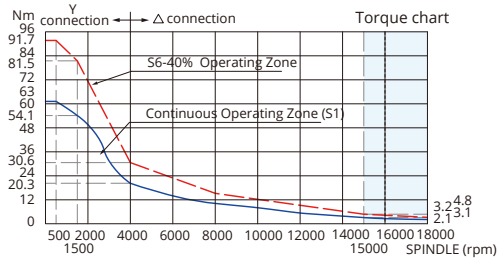
> 15.000 rpm > Heidenhain 640 controller | Heidenhain QAN200UH 10/14 kW



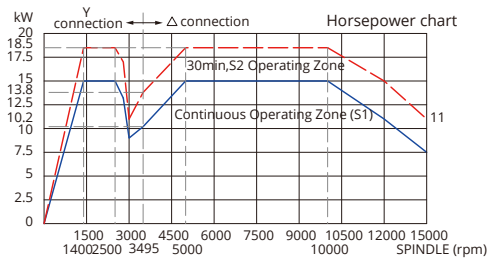


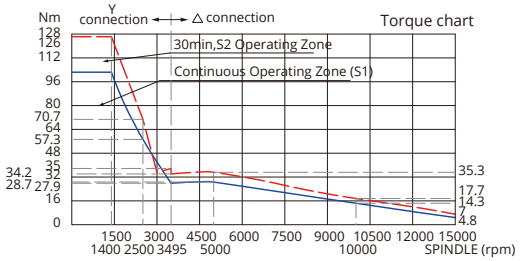
> 15.000 rpm > Siemens 840D controller | Siemens 1PH8107-1SS02 8.5/12.8 kW





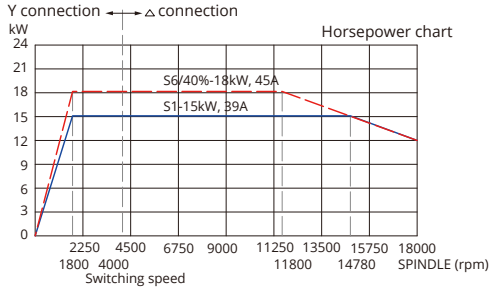
> 15.000 rpm > Fanuc 31iB controller | Fanuc AiIT15 15/18.5 kW

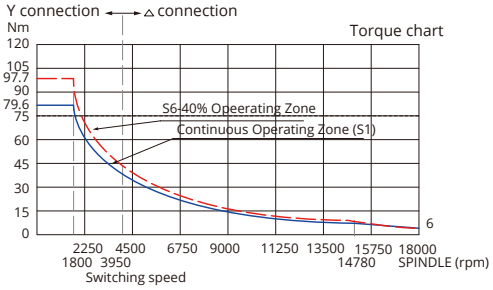




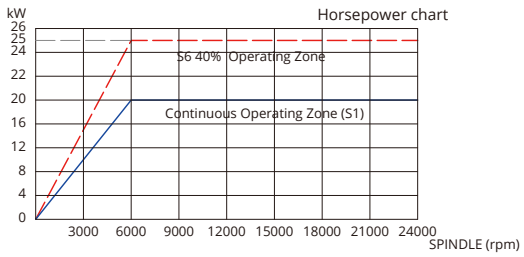
METAL MACHINING / HIGH SPEED BUILT-IN SPINDLE

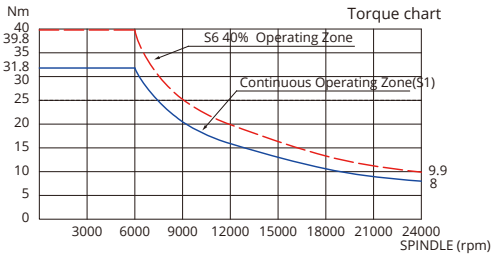
> 14.000 rpm (Grease) | 18.000 rpm (Air/Oil) > 15/18 kW



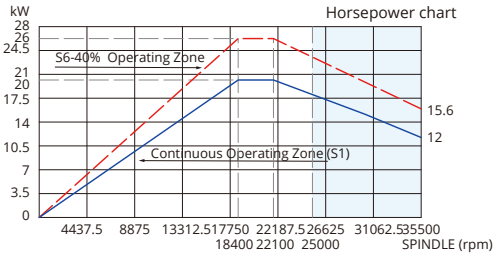


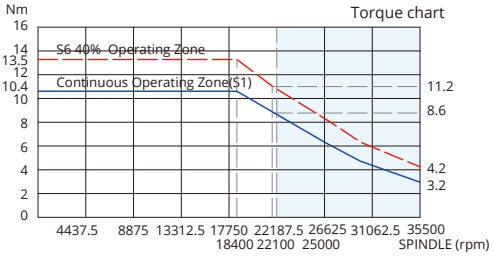
> 24.000 rpm > 20/25 kW





> 36.000 rpm > 20/26 kW

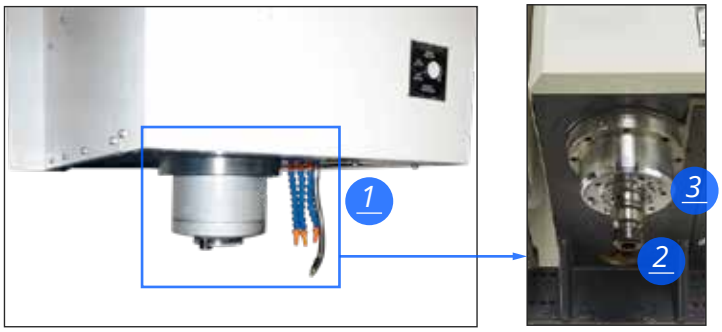




CHIP & TOOL MANAGEMENT

FLUSHING CHIPS AWAY

Metal

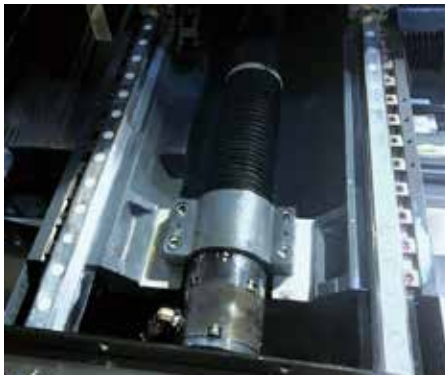


1 Chip flushing
2 Coolant through spindle
3 Coolant at spindle

Graphite

Dust suction hose
Airflow Capacity: Max 4000 m³/h
Dust Collector Capacity: 205 L

Dust suction hose and graphite telescopic covers



Ballscrew and quideways below telescopic cover

TOOL MAGAZINE SELECTION FOR EVERY APPLICATION

1

32 tools

2

40 tools

1

Cam mechanism and electric motor drive	Fast Tool Change Time of 1.55 (50Hz) and 1.31 (60Hz) sec

2

Tools are easily accessible by operator	Surveillance and maintenance of tools is possible while machine is in automatic mode

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

Standard scraper-type lift conveyor in front of the Metal type V5X machine body	Chip bucket can easily be reached from the machine front
Swivelling control panel on the right side	Comfortable operator usage and compact design
All necessary consumables are located in the back for convenient checking and tank re-filling	Easier maintenance routine for operator
Large dust collection bins in the front of Graphite type V5X machine body	Easy to pull out and empty the falling dust

AUTOMATION

Loader

> Max Workpiece Capacity: 84 places for workpieces
Dimension: 100x100x100 mm

> Option: 16 places for workpieces
Dimension: Ø200x250 mm + 42 places for workpieces
Dimension: 100x100x100 mm

> Max Workpiece Loading: 8 kg

Loader loading accessibility

CONTROL UNIT

A CONTROLLER FOR EVERY USER

Heidenhain TNC 640

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

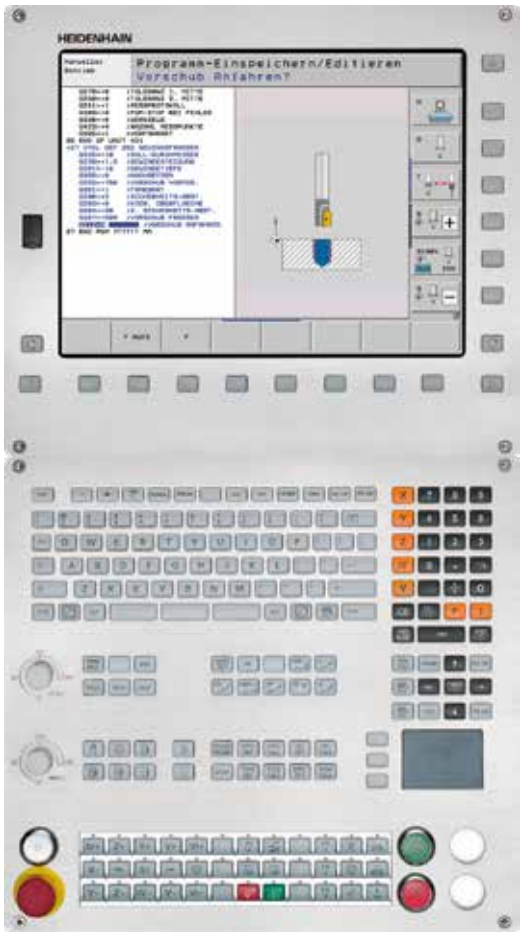
Siemens 840D SL/SINUMERIK ONE

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

Fanuc 31i-B5 plus

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

Heidenhain TNC 640



Siemens 840D SL

Fanuc 31i-B5 plus

STANDARD & 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

Cooling units options for Metal Machining:
> CTS 40 bar built-in type
> CTS 70 bar Separate type (Option)
> CTS 40 bar Separate type with Ppaper filter + Coolant chiller (Option)
> CTS 70 bar Separate type with Paper filter + Coolant chiller (Option)
> CTS 70 bar programmacble Separate type with Paper filter + Coolant chiller (Option)

Recommended for high aluminum or cast iron material cutting

Customize the machine to your needs

Chain-type chip conveyor and high pressure (70 bar) coolant through spindle

Machine is prepared for every machining operation

TECHNOLOGIES

SMT™

SMART MACHINING TECHNOLOGY

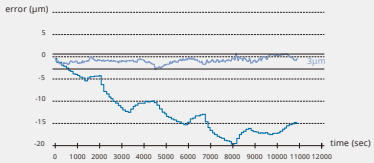
As pioneers of advanced mechatronic systems with decades of R&D expertise, AXILE has taken 5-axis CNC machining to the next level. Our patented SMT™ (Smart Machining Technology) delivers groundbreaking compensation and calibration functionality for unrivaled cutting speeds and industry-leading accuracy, and more importantly, resolves the aforementioned issues created by thermal expansion.

With AXILE's SMT™ manufacturers can have it all. There's no longer the need to choose between speed and precision, meaning manufacturers can produce superior parts rapidly, while also securing total process reliability and long-term machining performance.

Axial Accuracy Control

> AXIAL THERMO MONITORING
Integration of temperature sensors and thermal error model

> HIGH PRECISION
Thermal induced positioning error compensation



THERMAL ERROR BEFORE AND AFTER COMPENSATION

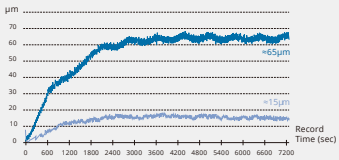
With thermal compensation system, the thermal error van be reduced from 20μm to 3μm.

Tool-tip Positioning Control

> HIGH ACCURACY
Directly measuring expansion

> BETTER SURFACE FINISH
5~6 times accuracy improved

> REAL-TIME COMPENSATION
Electrical type sensor



With compensation, the displacement of tool tip is reduced from 65μm to 15μm.

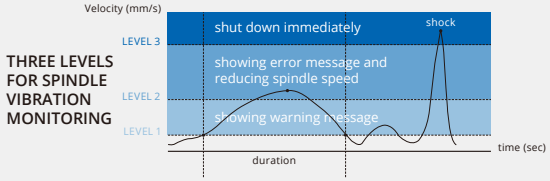
ACCURACY IMPROVED **5~6 TIMES!**

Spindle Vibration Supervision

> HIGH FINISH QUALITY
Spindle Life Time

> LONGER LIFE TIME
Wear reduction on spindle bearings and tools

> EASY FOR MAINTENANCE
Up to 12000 abnormal vibration data recording



Metal Removal Rate Optimization

> OPTIMAZATION PRODUCTION
Fully utilize machine capability

> EXTREMELY FAST PROCESSING TIME
Maximization of metal removal rate

> HIGH TOOL DURABILITY & PERFECT SURFACE ROUGHNESS
Stable cutting force and chatter-free machining
Surface Roughness improved 61.5%
Spindle load decrease 13.6%

ART™

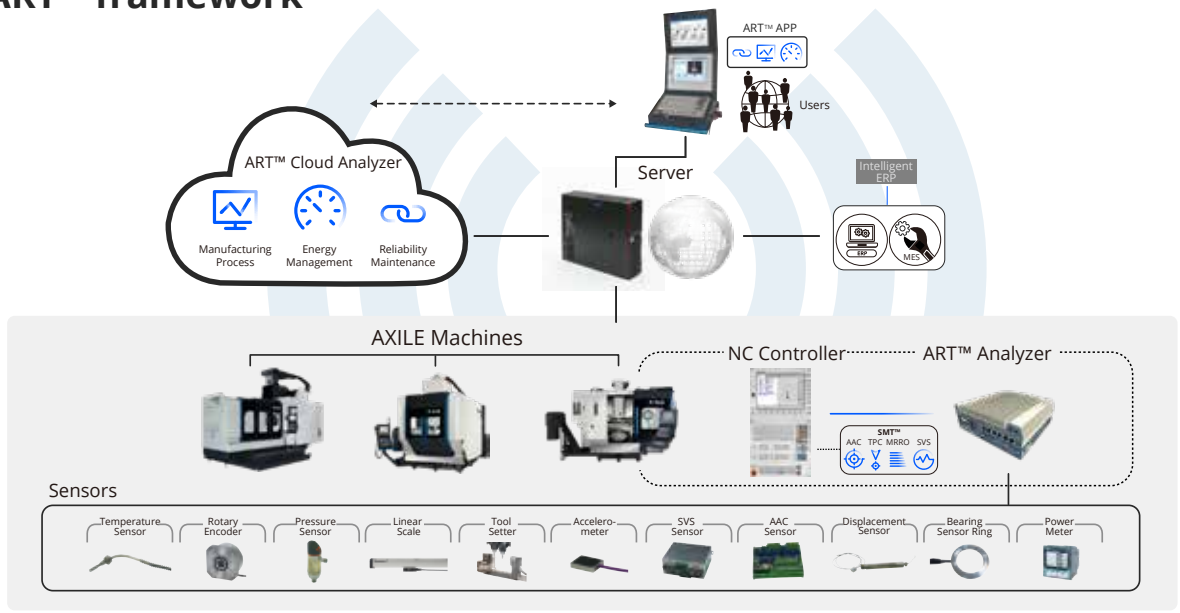
INTELLIGENT MONITORING SYSTEM

The future of manufacturing depends on optimized, intelligent production. To gain an edge on the competition, embracing smart manufacturing is the best way to stay ahead of the curve.

To deliver agile smart machining, and that all-important competitive edge, we have created ART™, an intelligent monitoring system that enables 24/7 operations and eliminates unexpected downtime. ART™ monitors all wearing components, energy consumption, and fluids such as lubricant and coolant, to supply real-time status updates on the machine and its components, and to pre-empt future issues.

Utilizing ART™ in daily operations immediately improves production efficiency by empowering machinists to make informed decisions. Moreover, ART™ gives manufacturers the reassurance required to embrace automation solutions, by delivering vital oversight through total operational transparency.

ART™ framework



3 Core Functions to Boost Productivity & Profitability

Reliability Maintenance (RM)

Unexpected downtime is the enemy of profitability. ART™ delivers machine components diagnosis, machine lifetime estimation, and consumable supplies monitoring to pre-empt machine failure and eliminate unplanned down-time.

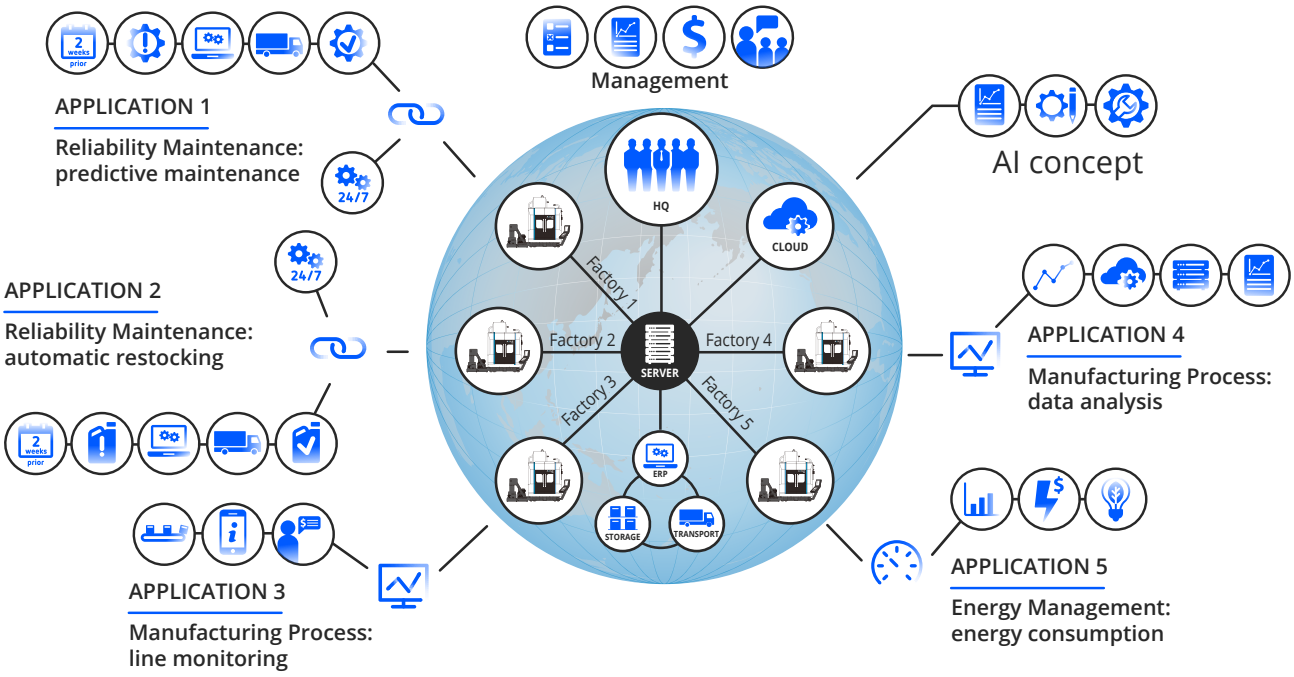
Manufacturing Process (MP)

Knowledge is power. ART™ achieves superior data collection and analytics on machine status and utilization rates, to deliver real-time information for optimized production strategies.

Energy Management (EM)

Every penny counts. ART™ enables manufacturers to monitor their power consumption, to identify ways to maximize energy efficiency and reduce expenditure.

Industry 4.0 Solutions to Intelligent Machine



How ART™ Brings Production Benefits

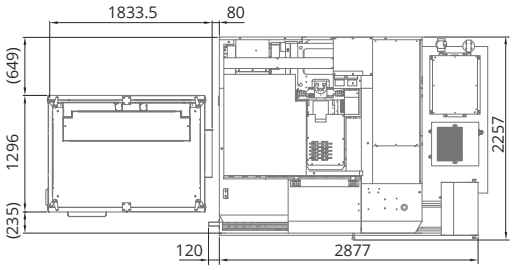
> Clearly displays machine status, for quick decision-making
> Maximizes machine accessibility and utilization, for optimized production
> Provides real-time notification of abnormal conditions, for swift intervention
> Gives machinists the information required to optimize removal rates and machine lifetime

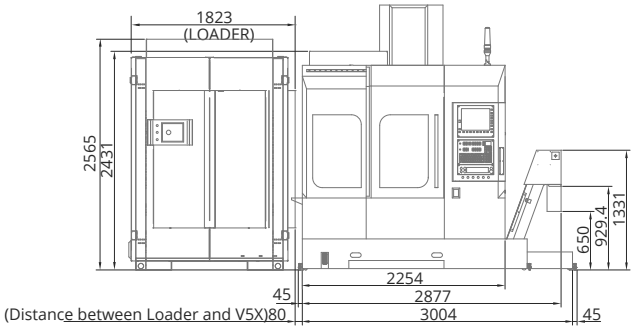
How ART™ Brings Maintenance & Service Benefits

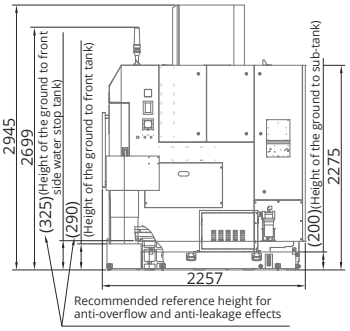
> Delivers pre-emptive error messages prior to breakdown, to eliminate unexpected downtime
> Decreases service expenses, by precisely identifying the issue
> Enhances service efficiency, by recommending appropriate action
> Reduces spare parts inventory, by highlighting exactly what is needed and when
> Automatically orders new parts, by linking to online purchasing system
> Allows machines and equipment to remain on stand-by, always ready to work

LAYOUT AND WORKSPACE

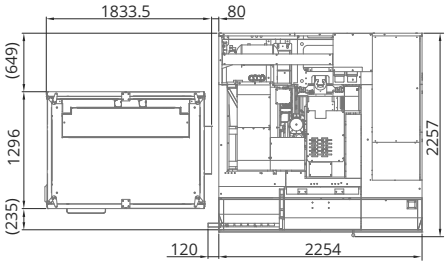
Metal+Robot(option)

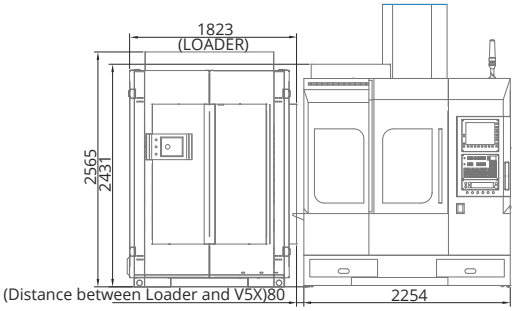


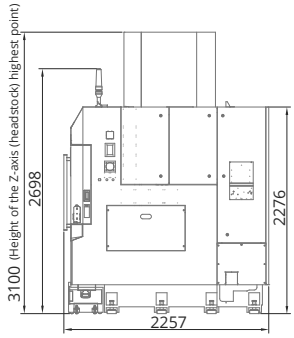




Graphite+Robot(option)







TECHNICAL DATA

BASIC PARAMETERS

ROTARY AND TILTING TABLE				
Table size	Ø1700 mm		Ø6.7 in	
T-solt (w/pitch/no)	14H8			
Maximun table load	30 kg		66 lbs	
LINEAR AXES				
X travel (carriage left and right)	600 mm		23.6 in	
Y travel (gantry back and forth)	500 mm		19.7 in	
Z travel (headstock up and down)	435 mm		17.1 in	
Max feedrate X/Y/Z	40 m/min		1575 in/min	
ROTARY & SWIVELLING AXES				
Swiveling axis A	±120 deg			
Rotary axis C	360 deg			
Max speed axis A	100 rpm			
Max speed axis C	200 rpm			
IN-LINE SPINDLE (METAL MACHINING)				
Spindle taper	ISO40			
Maximum speed	12000(std) ; 15000 rpm (opt)			
Power S1/S6-40% (Heidenhain)	10/14 kW		13.5/19 hp	
Torque S1/S6-40% (Heidenhain)	63.7/89.1 Nm		47/65.7 Ft/lbs	
Power S1/S6-40% (Siemens)	10.5/15.8 kW (12K) 8.5/12.8 kW (15K)		14/21.1 hp (12K) 11.3/17.1 hp (15K)	
Torque S1/S6-40% (Siemens)	63/94.5 Nm (12K) 63/91.7 Nm (15K)		46.4/69.7 Ft/lbs (12K) 46.4/67.6 Ft/lbs (15K)	
Power S1/S6-40% (Fanuc)	11/15 kW (12K) 15/18.5 kW (15K)		14.7/20.1 hp (12K) 20.1/24.8 hp (15K)	
Torque S1/S6-40% (Fanuc)	70/95.5 Nm (12K) 102.7/126 Nm (15K)		51.6/70.4 Ft/lbs (12K) 75.7/92.9 Ft/lbs (15K)	
Spindle nose to rotary & swivelling table	100-535 mm		3.93-21.1 in	
BUILT-IN SPINDLE (METAL MACHINING)				
Spindle taper	HSK E50/A63			
Maximum speed	14000 rpm (Grease) ; 18000 rpm (Air/Oil) ; 24000 rpm ; 36000 rpm			
Power S1/S6-40%	15/18 kW 20.1/24.1 hp	15/18 kW 20.1/24.1 hp	20/25 kW 26.8/33.5 hp	20/26 kW 26.8/34.8 hp
Torque S1/S6-40%	79.6/97.7 Nm 58.7/72 Ft/lbs	79.6/97.7 Nm 58.7/72 Ft/lbs	31.8/39.8 Nm 23.4/29.3 Ft/lbs	10.6/13.5 Nm 7.8/9.9 Ft/lbs
Spindle nose to rotary & swivelling table	100-535 mm		3.93-21.1 in	
BUILT-IN SPINDLE (GRAPHITE MACHINING)				
Spindle taper	HSK E50			
Maximum speed	25000 rpm			
Power S1/S6-40%	20/26 kW		26/35 hp	
Torque S1/S6-40%	10.4/13.5 Nm		7.67/9.96 Ft/lbs	
Spindle nose to rotary & swivelling table	100-535 mm		3.93-21.1 in	
TOOL CHANGER				
Magazine positions	32/40			
Change time T-T (50/60 Hz)	1.55/1.31 sec			
Maximum tool length	300 mm		11.8 in	
Maximum tool diameter (with adjacent pot empty)	Ø75/Ø125 mm		Ø2.95/Ø4.92 in	
Maximum tool weight	7 kg		15.4 lbs	
Maximum loading weight	160 kg(32T) ; 200 kg (40T)		1575 in/min	
ROTARY ACCURACY				
A axis Positioning	±5 arc-sec			
C axis Positioning	±2 arc-sec			
CONTROL UNIT				
Heidenhain	TNC 640			
Siemens	840D SL			
Fanuc	31i-B5 Plus			

** Specifications are subject to change without notice.*

CONSTRUCTION DETAILS

LINEAR AXES		
Linear guideways type	Roller type	
Linear guideways size X/Y/Z	35 mm	1.4 in
Distance between X/Y/Z axis guides	360/700/400 mm	14.2/27.6/15.7 in
BALLSCREW		
Ballscrew diameter/pitch	40 x P16 mm	1.6 x P0.6 in
X axis motor power/torque (Heidenhain)	2.64 kW ; 8.4 Nm	3.5 hp ; 6.1 Ft/lbs
Y axis motor power/torque (Heidenhain)	2.64 kW ; 8.4 Nm	3.5 hp ; 6.1 Ft/lbs
Z axis motor power/torque (Heidenhain)	5.4 kW ; 17.3 Nm	7.2 hp ; 12.7 Ft/lbs
X axis motor power/torque (Siemens)	2.7 kW ; 12 Nm	3.6 hp ; 8.8 Ft/lbs
Y axis motor power/torque (Siemens)	2.7 kW ; 12 Nm	3.6 hp ; 8.8 Ft/lbs
Z axis motor power/torque (Siemens)	4.9 kW ; 27 Nm	6.5 hp ; 19.9 Ft/lbs
X axis motor power/torque (Fanuc)	2.2 kW ; 8 Nm	2.9 hp ; 5.9 Ft/lbs
Y axis motor power/torque (Fanuc)	2.2 kW ; 8 Nm	2.9 hp ; 5.9 Ft/lbs
Z axis motor power/torque (Fanuc)	4 kW ; 22 Nm	5.3 hp ; 16.2 Ft/lbs
TOOL CHANGER		
Change type	Arm type	
MEASURING FEEDBACK		
Linear axes type	Linear scales	
Linear axes resolution	0.1 µm	
Rotary axes type	Angle Encoder	
Indexing accuracy	±5 arc-sec	
DIMENSION		
Length (without chip conveyor)	2300 mm	7.54 ft
Width	2300 mm	7.54 ft
Height	3070 mm	10.07 ft
Weight	6560 kg	14462 lbs
Floor space	2300 x 2300 mm	7.54 x 7.54 ft

** Specifications are subject to change without notice.*

AXILE MACHINE

E info@axilemachine.com

W www.axilemachine.com