AXILE
agile smart machining

G8 SERIES

GANTRY 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.

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G8 GANTRY TYPE VMC

The AXILE G8's powerful gantry design perfectly balances rigidity and precision, ideal for the machining of complex workpieces.

With a maximum loading capacity up to 1,300 kg on a swiveling, rotary table, complemented by high-performance built-in spindles, the G8's agility enables production of a wide range of large parts and tools.

The G8 MT option offers both milling and turning in one machine, greatly increasing operational flexibility. By reducing set-up times and potential clamping errors, the G8 MT can efficiently machine a wider variety of parts, including cylindrical components.

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

4

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

5

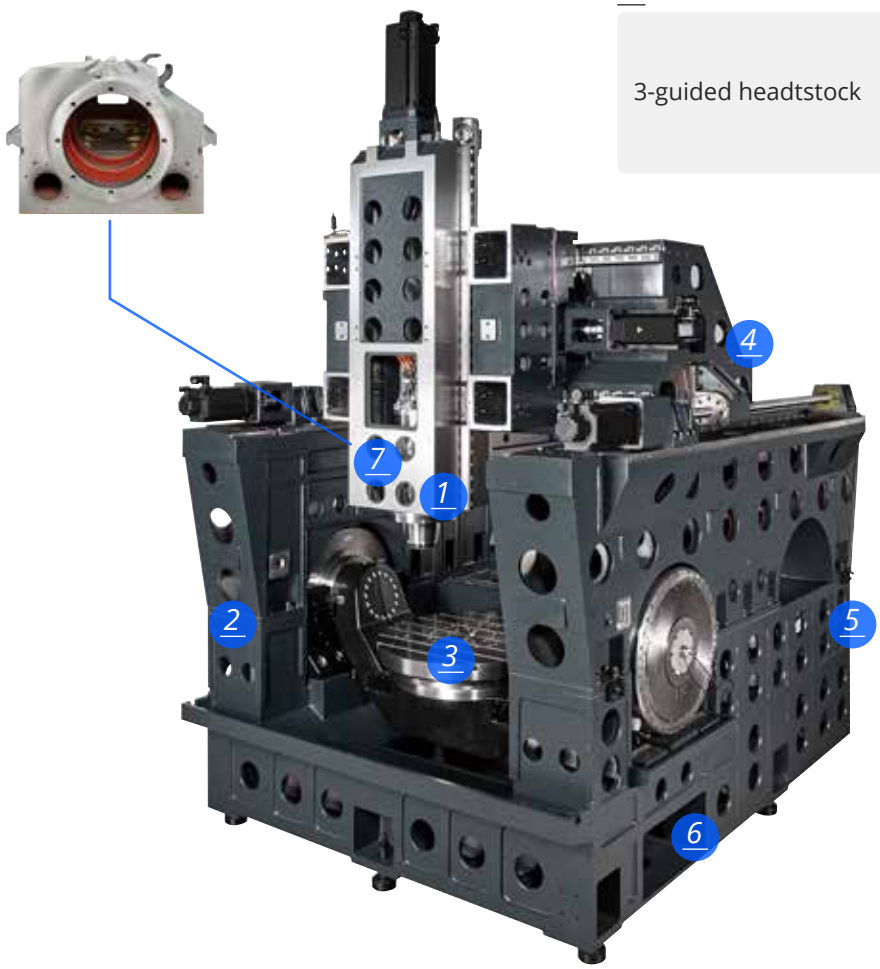
All body made of high-quality casting	Homogeneous thermal behaviour Optimal damping of machining vibrations

6

Integrated chip disposal channel directly under the table	Quick evacuation of chips for high chip volume machining

7

3-guided headtstock	Highest rigidity in roughing processes with high torque in spindle



AGILITY

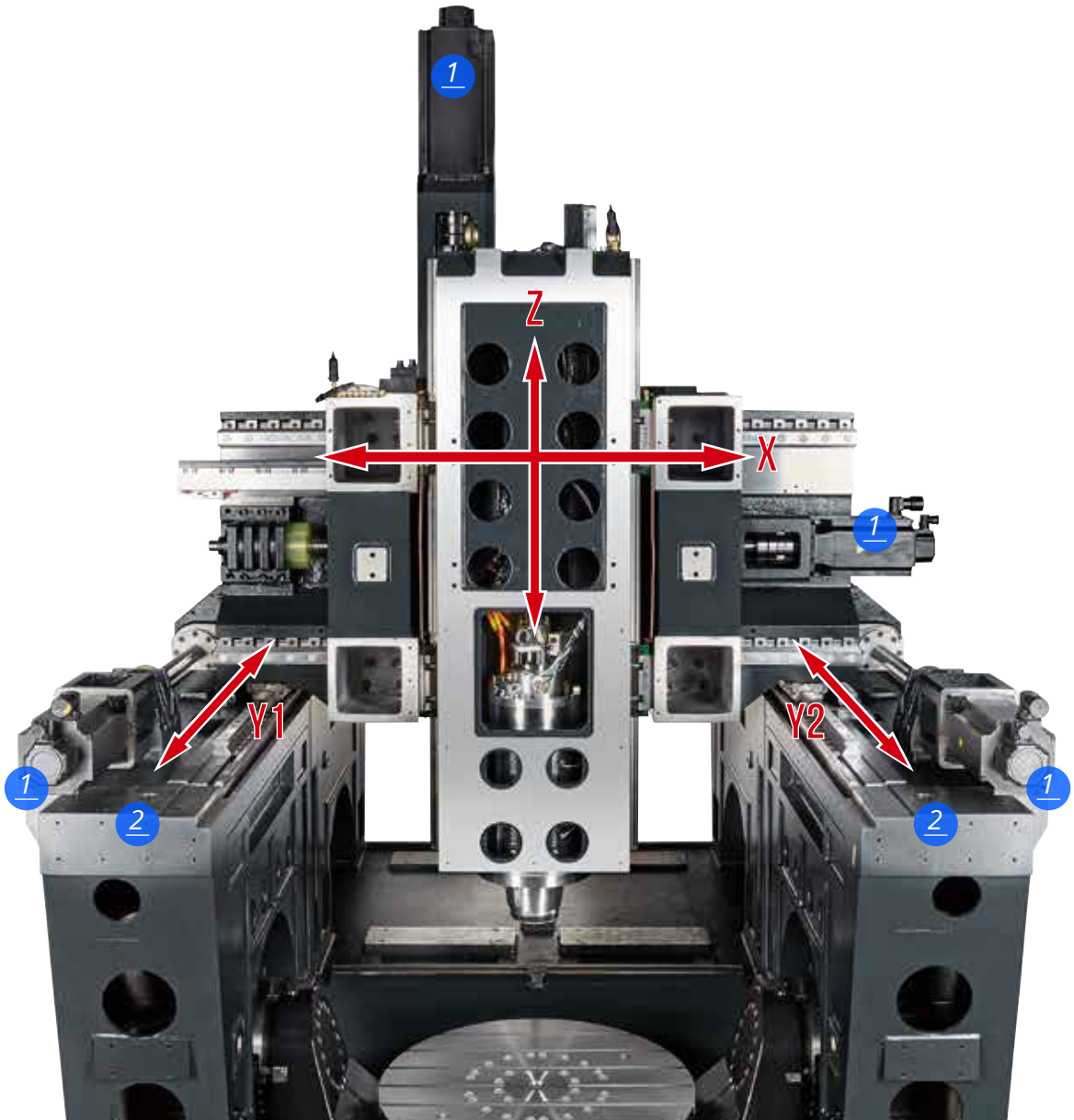
LINEAR AXES

1

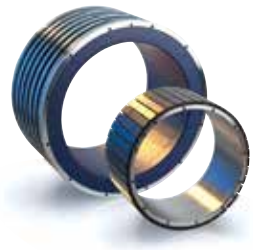
Direct driven servomotors (no belts/gears)	Best dynamic and minimal elasticity in the driving system

2

Double symmetric and synchronized axes (Y1, Y2)	Best dynamic for the gantry no matter the position of the machining force
Linear scales with 0,1 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 backlash allowing high-feed movements



SWIVELLING-ROTARY AXES



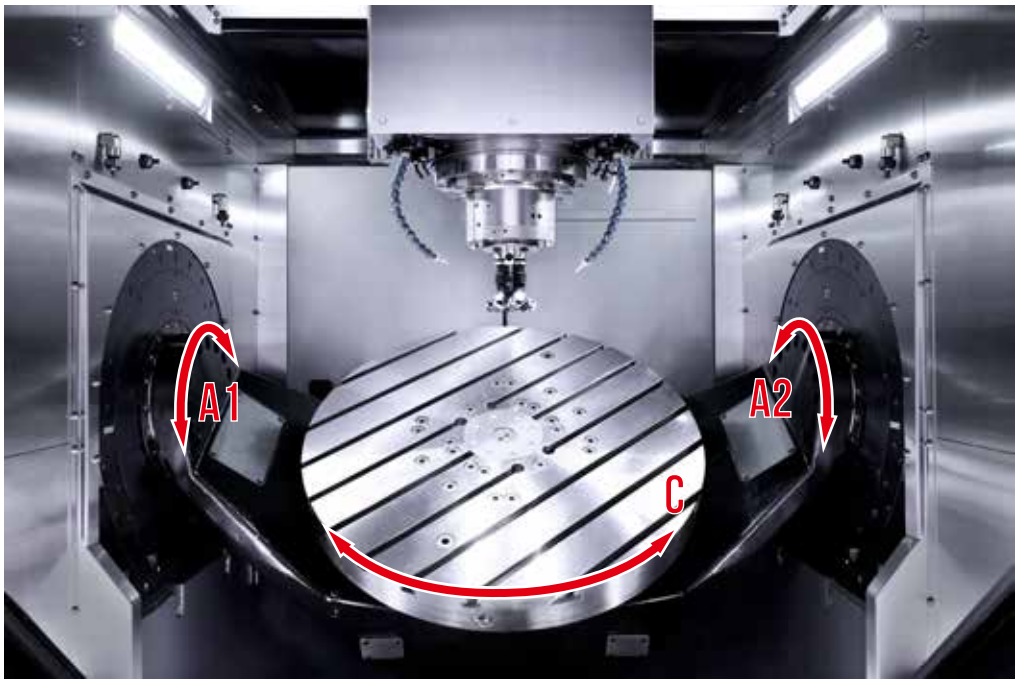
1

Integrated and ready-to-use hydraulic and pneumatic ports	Simplifying parts clamping process

2

Torque motor-driven rotary axis (C)	Highest dynamics
Dual torque motor-driven swivelling axis (A)	Highest accuracy
A axis Torque (Nm) C axis Torque (Nm) A axis Bearing Axial ca (kN/um) A axis Bearing Axial cr (kN/um) C axis Bearing Axial ca (kN/um) C axis Bearing Axial cr (kN/um)	Max. 3700x2 Max. 3700 Max. 3.5x2 Max. 3.5x2 Max. 4.3 Max. 5
Brakes in every shaft	High-repeatibility in 5-axis operation when using the brakes

High-resolution, direct absolute rotary measuring system	Zero-backlash and high accuracy



G8 table

ACCURACY

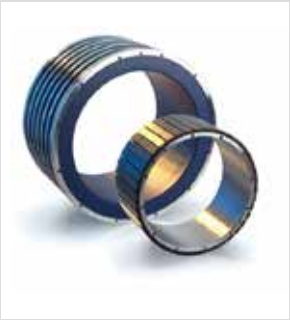
THE CORNERSTONE OF 5-AXIS MACHINING

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

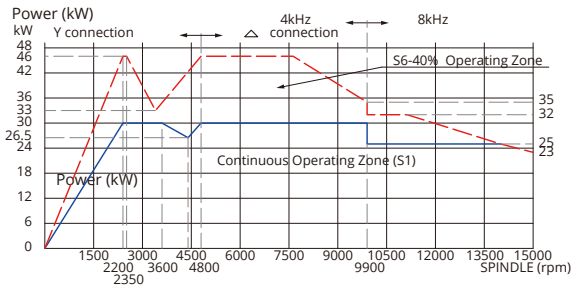
Linear-rotary axes relative positioning

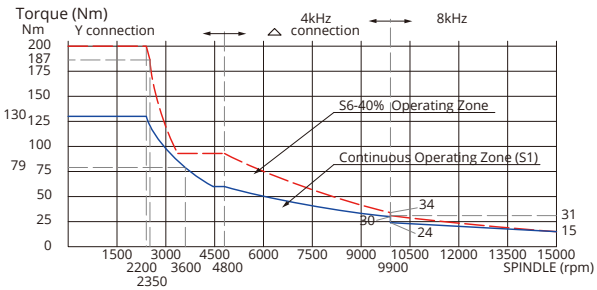
The swivelling-rotary table might shift its relative position to the 3 linear axes by many reasons generating an increasing error in the part	CNC embedded compensating functions like Kinematics (Heidenhain), Kinematic chain (Siemens) and Tilted working plane indexing (Fanuc)

SPINDLE

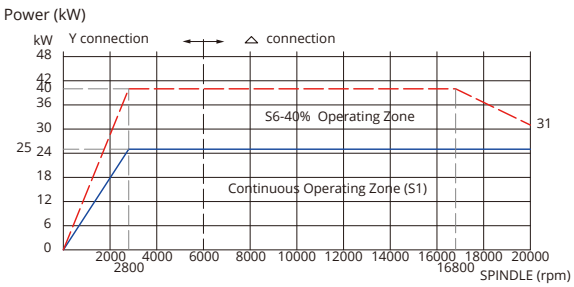
HIGH-PERFORMANCE BUILT-IN SPINDLE SELECTION

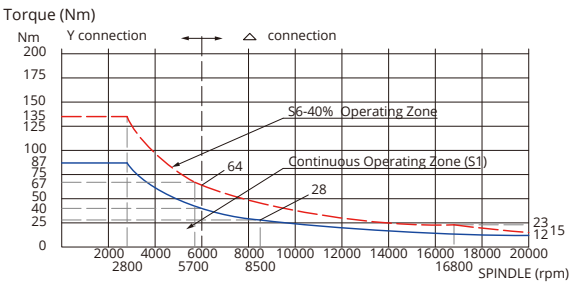
> 15.000 rpm
> HSK A63
> 130/200 Nm S1/S6-40%
> 30/46 kW S1/S6-40%
> Double coil asynchronous motor





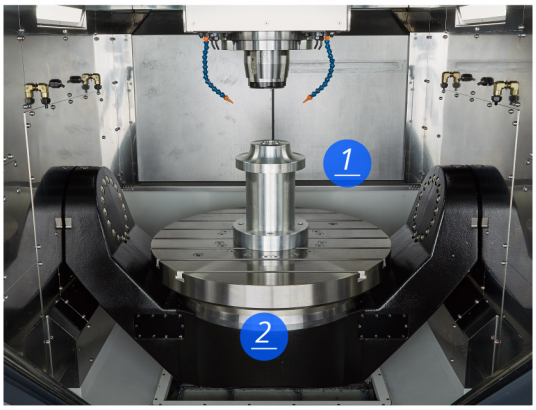
> 20.000 rpm
> HSK A63
> 87/135 Nm S1/S6-40%
> 25/40 kW S1/S6-40%
> Double coil asynchronous motor

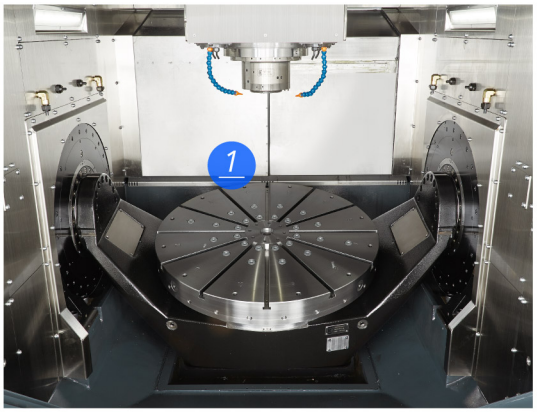




CHIP MANAGEMENT

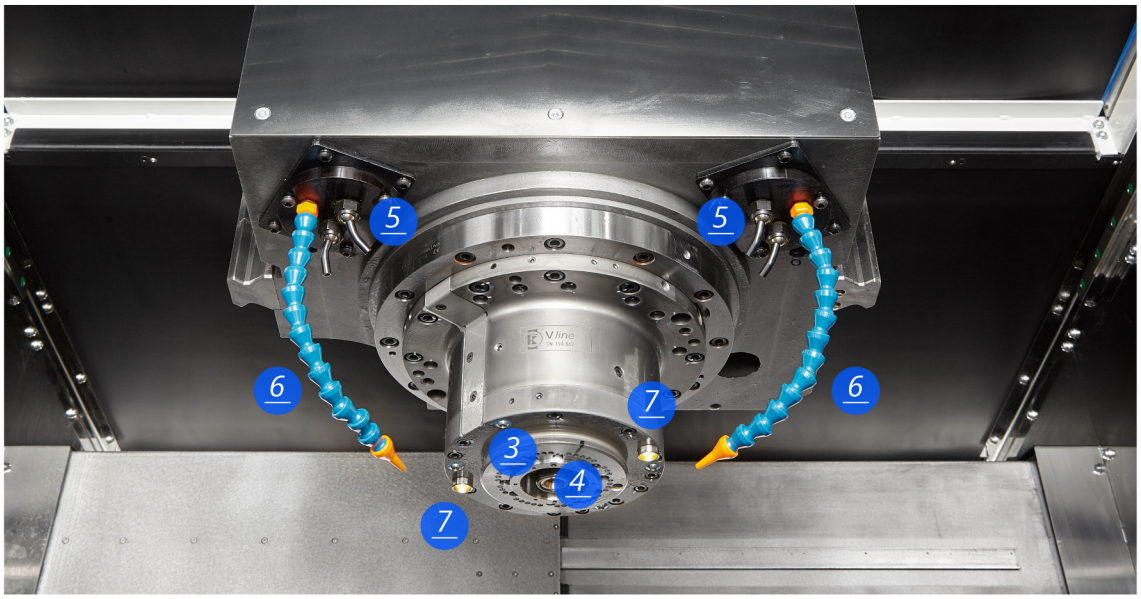
FLUSHING CHIPS AWAY





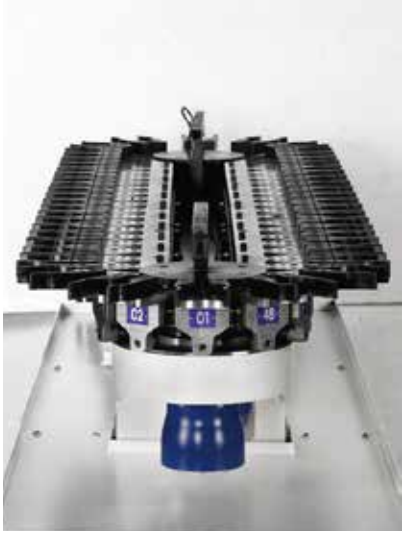
High-quality stainless steel working area	Long-lasting clean operation
Sharp walls and no-corner design	Easier to flush away chips by shower
2 x led lights spindle nose	For optimal illumination of the tool cutting

1 Chip wash down
2 Chip conveyor
3 4x coolant at spindle nose
4 Coolant through spindle
5 Coolant flushing
6 Air flushing
7 2x led lights



TOOL MANAGEMENT

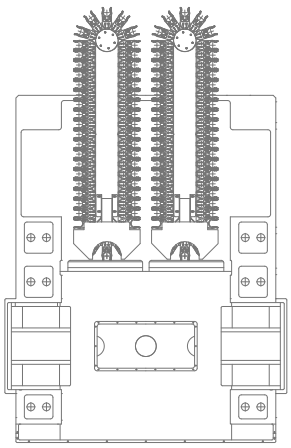
FLEXIBLE CAPACITY FOR EVERY APPLICATION

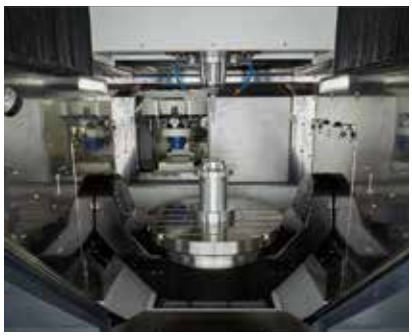


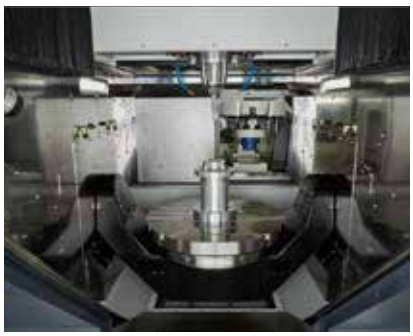
Single or twin carrousels of 32, 48 or 60 tools can be selected and capacity doubled to 64, 96 or 120 tools. Up to 96 tools machine layout is not modified.

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







ERGONOMICS

ACCESSIBILITY TO WORKING 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

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 easily changed during automatic operation
All necessary consumables are located together in the back of the machine	Easier maintenace routine for operator
Smart tool: interface panel is used to select the tool. When finished, the system checks whether all tool 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

CONTROL UNIT

A CONTROLLER FOR EVERY USER

Heidenhain TNC 640

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

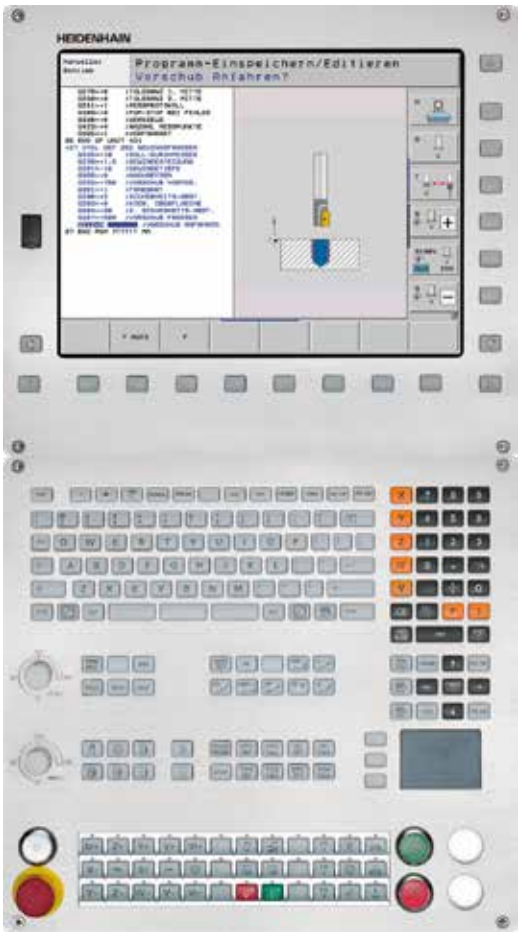
Siemens 840D SL/SINUMERIK ONE

> 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

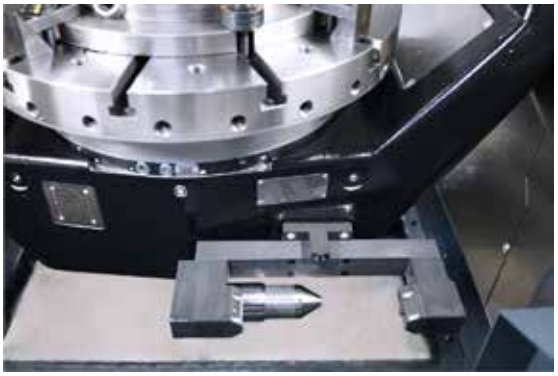
MILL-TURN

Mill-turn for those looking for the maximum integration of metal-cutting processes in a single step, reducing complexity of the process and chance of error in the clamping.

* Rotary-tilting table details may differ depending on the table manufacturer.

C-axis motor is cooled as in the milling version. Additionally the C-axis bearing is cooled in the inner and outer to ensure the long lasting accuracy and life.

Table diameter: 800 mm
Max turning speed: 1000 rpm
Max table load in turning: 850 kg
Max table load in milling: 1200 kg



For accurate tool measurement in length, radius and shape

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

Integrated balancing system that can be monitored from the additional screen located on top of the panel, with the help of a sensor located in the A-axis

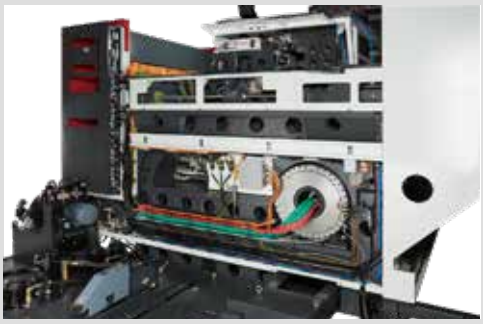
STANDARD & OPTIONAL EQUIPMENT

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 40 bar through spindle coolant pump are standard equipments

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

Standard in G8 / Optional in G8 MT

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.

Optional

- Integrated and ready-to-use 8x hydraulic (80 bar) or pneumatic (6 bar) ports
- 4x vacuum port

Simplifies 5X workpiece clamping.

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.

U-type embedded in the table (for highest accuracy).
Laser tool measurement.

Customize the machine to your needs

Spin window (opt)

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

Separate type CTS unit including (opt):

> Cartridge filter
> Paper filter
> Through spindle 40 & 70 bar centrifugal and screw pumps
> Oil skimmer
> Oil cooler

Recommended for high aluminum or cast iron material

Drum type dual-belt chip conveyor (opt)

Chain type conveyor takes bigger and curly chip away. Scrapper type conveyor takes smaller and lighter chips as well as dusty chips away.

Drum filter takes clean coolant back to tank

TECHNOLOGIES

ART™

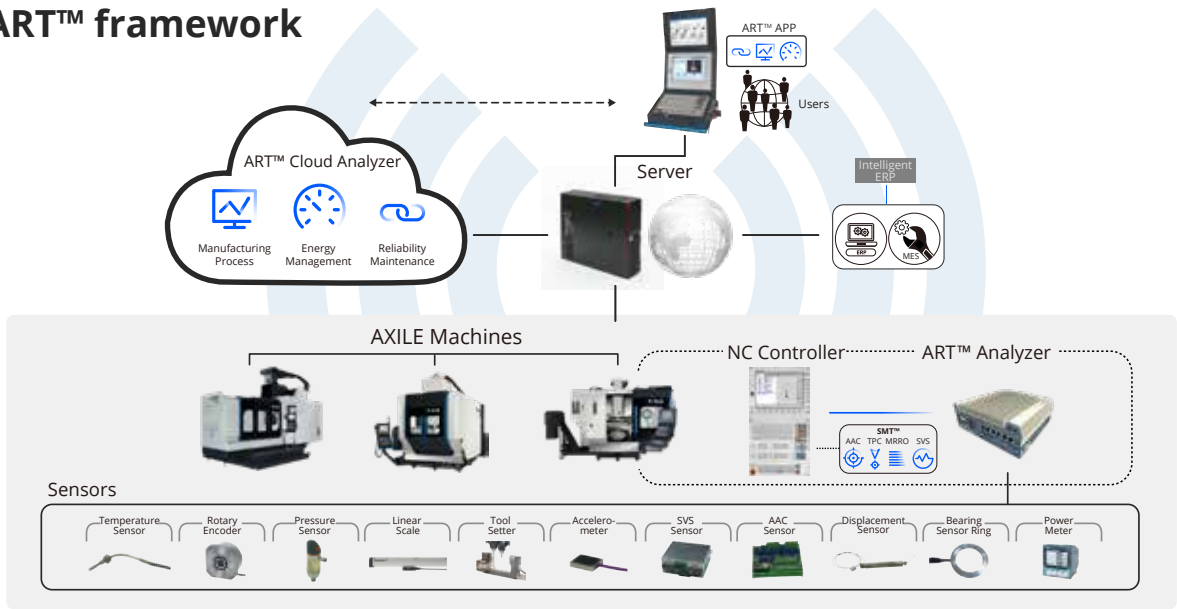
INTELLIGENT MONITORING SYSTEM

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 downtime.

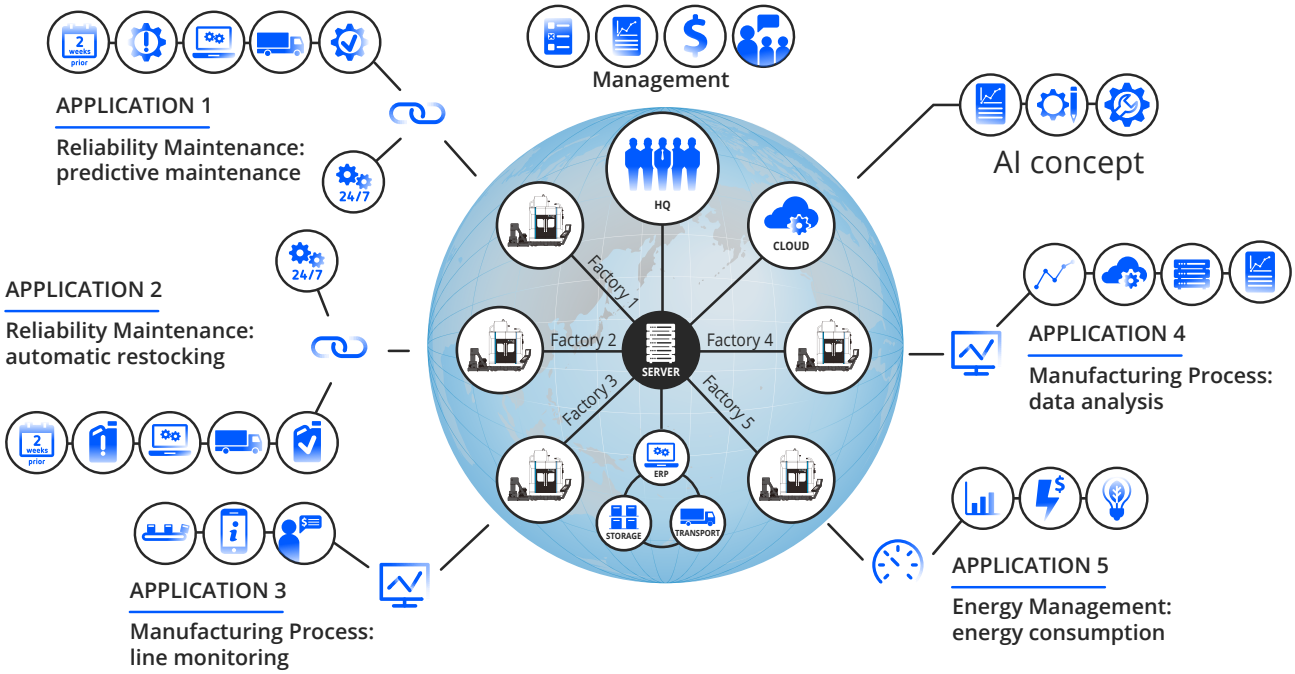
Manufacturing Process (MP)

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

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.

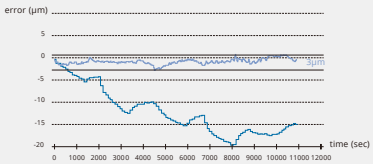
Axial Accuracy Control

TEMPERATURE SENSORS → MULTIPLEXER /AMPLIFIER → MPU → CNC

compensation command

> 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

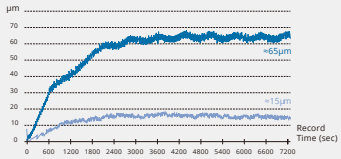
DISPLACEMENT METER → AMPLIFIER → MPU → CNC

compensation command

> 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

compensation command

VIBRATION SENSOR → AMPLIFIER → MPU → CNC

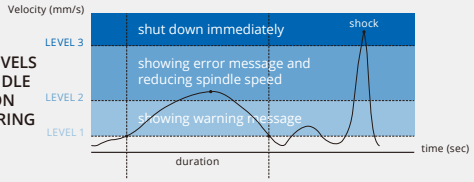
MPU ↔ MEMORY

> 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

THREE LEVELS FOR SPINDLE VIBRATION MONITORING



Metal Removal Rate Optimization

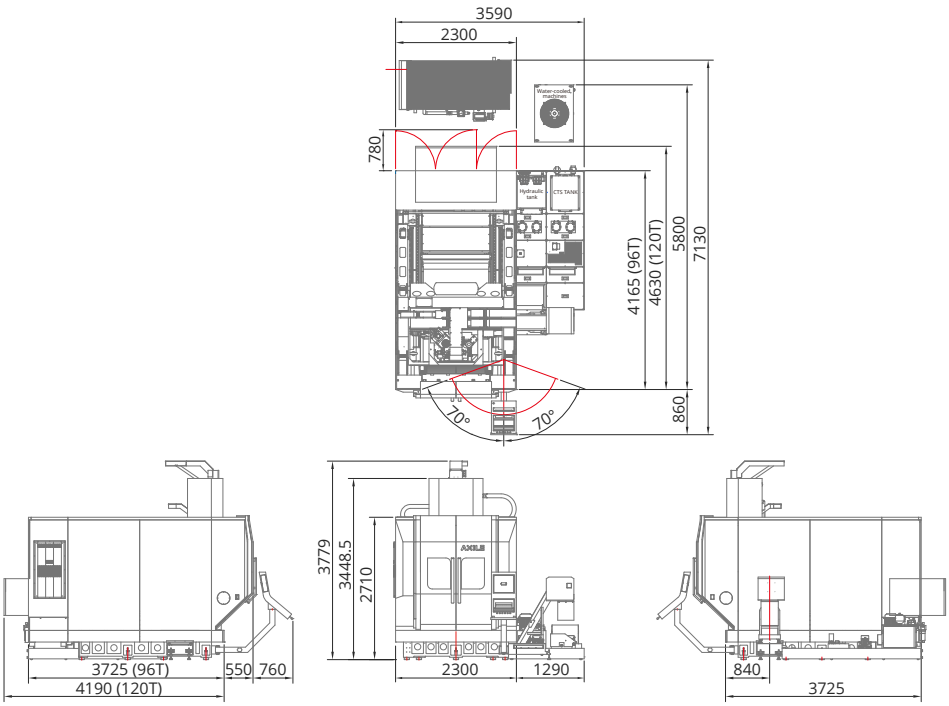
> OPTIMAZATION PRODUCTION
Fully utilize machine capability

> EXTREMELY FAST PROCESSING TIME
Maximization of metal removal rate

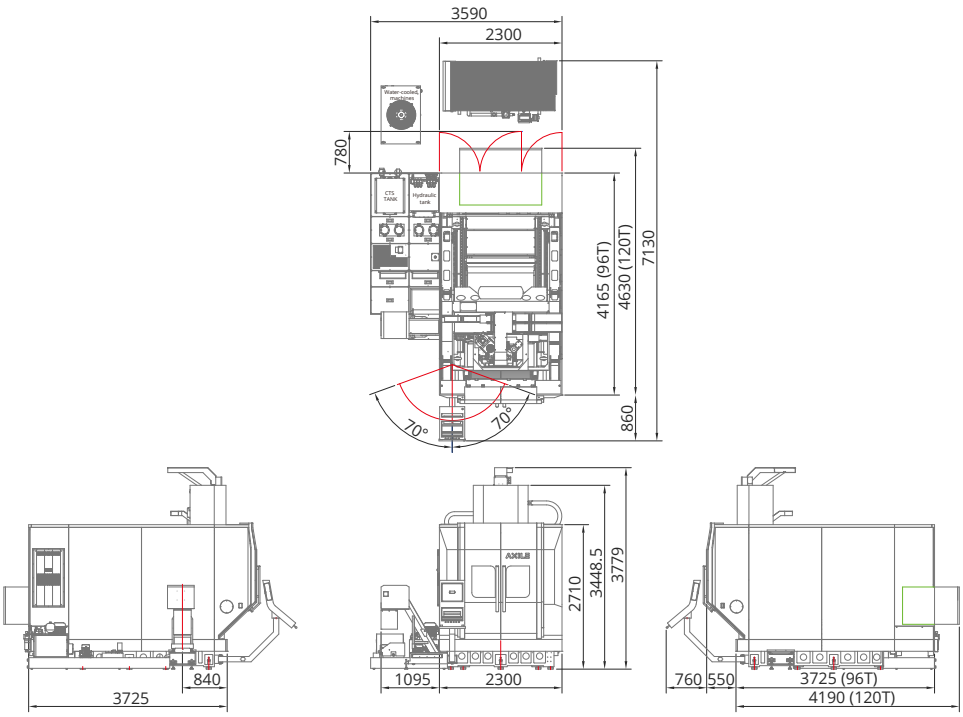
> HIGH TOOL DURABILITY & PERFECT SURFACE ROUGHNESS
Stable cutting force and chatter-free machining
Surface Roughness improved 61.5%
Spindle load decrease 13.6%

LAYOUT AND WORKSPACE

Coolant tank and pending panel at right



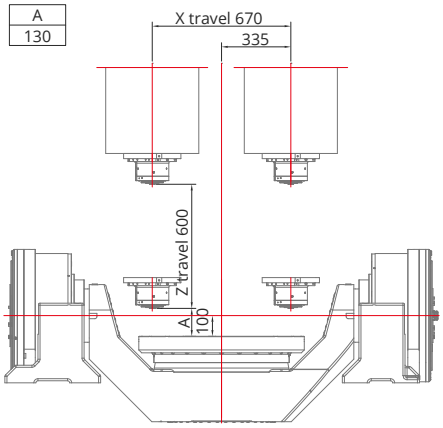
Coolant tank and pending panel at left

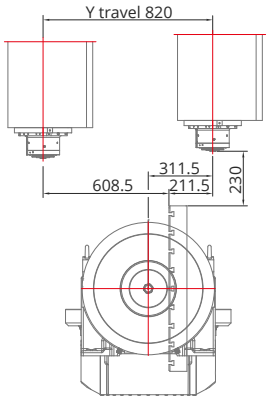


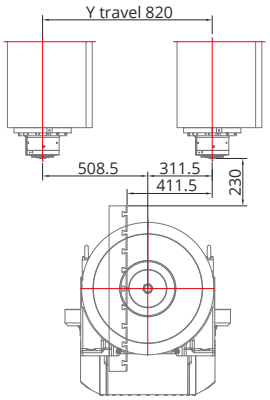
INTERFERENCE

* Rotary-tilting table details may differ depending on the table manufacturer.

G8 / G8 MT

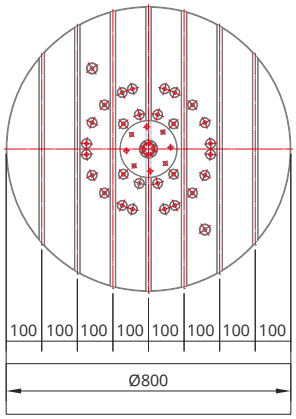






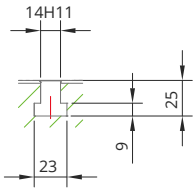
G8

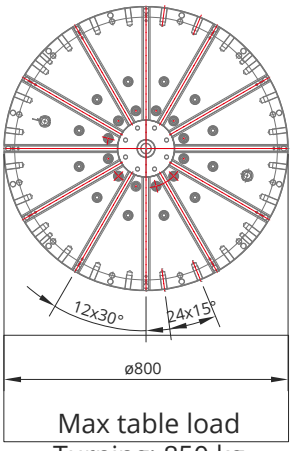
G8 MT

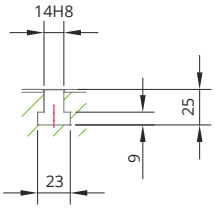


G8 Table(G3)800mm

Max table load 1300kg



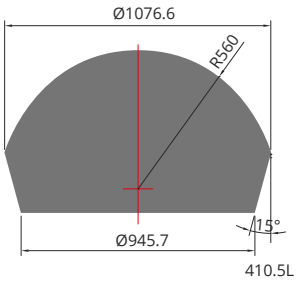




Max table load
Turning: 850 kg
Milling: 1200 kg

Maximum work envelope

G8 & G8 MT*



*Note:
The workpiece size for turning is limited by the weight (850 kg), its maximum height and the cutting force applied. Please request for the limitation diagram or send the drawing of the part to confirm if it can be machined.

TECHNICAL DATA

COMMON DATA FOR G8

TABLE (NOTE 1)		
Table size (diameter)	Ø800 mm	Ø31.5 in
Number and hydraulic ports	3	
Working pressure of hydraulic ports	80 bar	1160.3 psi
Number and pneumatic ports	1	
Working pressure of pneumatic ports	6 bar	87 psi
LINEAR AXES		
X travel (carriage left and right)	670 mm	26.4 in
Y travel (gantry back and forth)	820 mm	32.3 in
Z travel (head stock up and down)	600 mm	23.6 in
Max feedrate X/Y/Z	60 m/min	2362 in/min
Guideways type	Roller	
Guideways size X/Y/Z	55/45/45 mm	2.1/1.7/1.7 in
Distance between X/Y guides	590/1472 mm	23.2/57.9 in
Ballscrew diameter/pitch	45/20 mm	1.7/0.7 in
X/Y/Z axis motor power/torque	X/Y 6/19.2 ; Z 8.9/28.4 kW/Nm	X/Y 8/14.1 ; Z 11.9/20.9 hp/ Ft/lbs
ROTARY AXES (NOTE 1)		
A range (swivelling)	±120 deg	
C range (rotary)	360 deg	
SPINDLE (STANDARD)		
Spindle speed	20000 rpm	
Transmission	Built-in	
Motor type	Asynchronous	
Bearing type (front/rear)	Angular ball	
Bearing cooling and lubrication	Oil/Air	
Power S1/S6-40%	25/40 kW	33/53 hp
Torque S1/S6-40%	87/135 Nm	64.2/99.5 Ft/lbs
SPINDLE (OPTIONAL)		
Spindle speed	15000 rpm	
Transmission	Built-in	
Motor type	Asynchronous	
Bearing type (front/rear)	Angular ball	
Bearing cooling and lubrication	Oil/Air	
Power S1/S6-40%	30/46 kW	40/61 hp
Torque S1/S6-40%	130/200 Nm	95.9/147.5 Ft/lbs
MEASURING FEEDBACK		
Linear axes type	Linear scale	
Linear axes resolution	0.1 µm	
Rotary axes type	Rotary scale	
Rotary axis accuracy	±5"	
TOOL CHANGER		
Change type	Pick-up	
Magazine type	Carrousel (x2)	
Carousel drving system	(x2) Servomotor and gearbox	
Magazine positions	32/64 48/96 60/120	
Tool shank type	HSK-A63	
Maximum tool length	300 mm	11.8 in
Maximum tool diameter (with adjacent pot empty)	Ø75/Ø120 mm	Ø3/Ø4.7 in
Maximum tool weight	7 kg	15.4 lbs
Max. loading weight	160 kg/352.7 lbs (32T); 240 kg/529.1 lbs (48T); 300 kg/661.3 lbs (60T); 320 kg/705.4 lbs (64T); 480 kg/1058.1lbs (96T); 600 kg/1322.7 lbs (120T)	
ACCURACY (VDI/DGQ 3441)		
Positionning	0.005 mm	0.0002 in
Repeatability	±0.0025 mm	±0.00009 in
EXTERNAL COOLANT SUPPLY		
Exteral nozzels coolant supply (number) pressure	(4x) 3 bar	(4x) 43.5 psi
Exteral nozzels air supply (number) pressure	(2x) 6 bar	(2x) 87 psi
Tank capacity	425 L	112.2 US gal

** NOTE 1: Rotary-tilting table details may differ depending on the table manufacturer.*

COMMON DATA FOR G8(CONT.)

SPINDLE THROUGH COOLANT SUPPLY (STANDARD)			
High pressure pump	40 bar	580.1 psi	
Filter type	Catridge		
SPINDLE THROUGH COOLANT SUPPLY WITH SEPARATE TANK(OPTIONAL)			
High pressure pump	40/70 bar	580.1/1015.2 psi	
High pressure pump with stepless programable pressure	0-70 bar stepless	0-1015.2 psi stepless	
Filter type	Catridge and paper band		
Additional accessory	Coolant chiller and oil skimmer		
CONTROL UNIT			
Brand/Model	Heidenhain TNC 640	Siemens 840D sl	Fanuc 31i-B5 plus
SUPPLIES			
Installed power	85 kVA		
DIMEMSION			
Length	3565 mm/140.3 in (32T/64T); 4165 mm/163.9 in (48T/96T); 4630 mm/182.2 in (60T/120T)		
Width	4410 mm	173.6 in	
Height	3779 mm	148.7 in	
Weight	18000 kg	39683 lbs	
Floor Space	3565x4410mm/140.3x173.6 in (32T/64T); 4165x4410 mm/ 163.9x173.6 in(48T/96T); 4630x4410 mm/182.2x173.6 in (60T/120T)		

SPECIFIC DATA FOR G8

WORKPIECE AND TABLE (NOTE 1)		
Maximum table load (note 2)	1300 kg	2866 lbs
T-slot (w/pitch/no)	14x100x7 mm	0.5x3.9x7 in
SPINDLE		
Spindle taper	HSK-A63	
Spindle nose to rotary table clamping surface	130~730 mm	5.1~28.7 in
ROTARY AXES (NOTE 1)		
Maximum sviwelling (A) speed (note 2)	80 rpm	
Maximum rotary (C) speed	100 rpm	
Driving system in swivelling (A) axis	Dual torque motor	
Driving system in rotary (C) axis	Torque motor	
Power & torque of swivelling (A) axis (note 2)	15.7/1870x2 kW/Nm	21/1379.3x1.4 hp/ Ft/lbs
Power & torque of rotary (C) axis (note 2)	15.7/1870 kW/Nm	21/1379.3 hp/ Ft/lbs
Brake type of swivelling (A) axis	Hydraulic clamping	
Braking torque of swivelling (A) axis	3500x2 Nm	2581.6x1.4 Ft/lbs
Brake type of rotary (C) axis	Hydraulic clamping	
Braking torque of rotary (C) axis	2500 Nm	1844 Ft/lbs

SPECIFIC DATA FOR G8 MT

WORKPIECE AND TABLE (NOTE 1)		
Maximum table load	850(Turning) / 1200(Milling) kg	1873(Turning) / 2645(Milling) lbs
T-slot (w/pitch/no)	14 x 30 x 12 mm	0.5x1.2x0.5 in
SPINDLE		
Spindle taper	HSK-A63	
Spindle nose to rotary table clamping surface	130~730 mm	5.1~28.7 in
ROTARY AXES (NOTE 1)		
Maximum sviwelling (A) speed	15(Turning) / 100(Milling) rpm	
Maximum rotary (C) speed	1000(Turning) / 100(Milling) rpm	
Driving system in swivelling (A) axis	Dual torque motor	
Driving system in rotary (C) axis	Torque motor	
Power & torque of swivelling (A) axis	20.4/1948x2 kW/Nm	27.3/1436.8x1.4 hp/ Ft/lbs
Power & torque of rotary (C) axis	55/525 kW/Nm	73.7/387.2 hp/ Ft/lbs
Brake type of swivelling (A) axis	Hydraulic clamping	
Braking torque of swivelling (A) axis	4000x2 Nm	2950.4x1.4 Ft/lbs
Brake type of rotary (C) axis	Hydraulic clamping	
Braking torque of rotary (C) axis	4000 Nm	2950.4 Ft/lbs

** Specifications are subject to change without notice.*
** NOTE1: Rotary-tilting table details may differ depending on the table manufacturer.*
** NOTE2: The tech data may vary according to different brands.*

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