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Hartford has sold more than 50,000 machines to all over the world, accumulated more than 37,000 customers, who absolutely affirm Hartford's manufacturing experience and ingenious machine manufacture technology. We insist on providing customers with the best quality machining centers. We will devote more carefully, in order to continuously enhance the technical level of manufacture and applications.

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Hartford

Hartrol · Smartcenter · Robocell

We manufacture intelligent machines only

Hartford innovation

THE NEXT 50 YEARS

PBM Series

Smartcenter

Intelligent Precision Boring & Milling Machining Center

- Hartrol plus controller
- 5-year warranty on guideways
- Maximum cutting torque: 6520N-m
- W-axis supported by two linear guideways
- B-axis repetitive positioning accuracy: ±8"

What is Smartcenter ?

Smartcenter is Smart machine center, an intelligent machine if put it in a simple way.
A Hartford Smartcenter has to include
1.Intelligent operating interface
2.Intelligent machining: Machining accuracy/ surface accuracy/ slef learing / self optimizing
3.Intelligent quality control: Auto compensation for machining accuracy
4.Intelligent maintenance program : Active notification/ Active machine down time schedule also include other intelligent functions, help user reaching the target of Zero Down Time.

The benefits of Hartford smartcenter

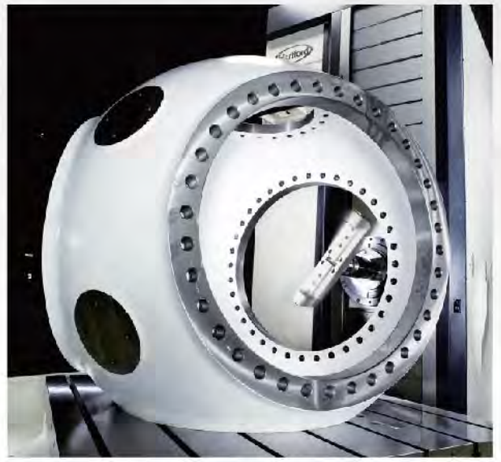
+ Intelligent management : Fully aware of the machining status
+ Fully aware of the status of the machine key components.
+ Improving of the machine efficiency
+ Crash protection – Stop the machine immediately to prevent the further damage when alarm occurred .

Hartford Smartcenter
will help you become an intelligent manager

The main technologies of Hartford smartcenter include intelligent managing system, status monitoring, alarm predicting, machine status diagnosis, crash preventing, 3D program simulation, machining efficiency improving...etc.
All the intelligent functions help you control the machine status and assure the job quality.

Optimized Cutting Efficiency

The optimized cutting efficiency and capability of Hartford Precision Boring is your best partner.



1. Component of wind power generation

2. Vertical machine head

Actual Cutting Test

Model: PBM-135
■ Spindle: 2,500 rpm Gear type, 26kW ■ Cutting material : S45C

Face milling

Tool diameter	Ø160 mm
Feed rate	2,550 mm/min
Cutting depth	2.5 mm
Cutting width	65 mm
Cutting volume	765 cc/mm
Spindle speed	500 rpm/min

Tapping

Tool diameter	M42 x P4.5mm
Feed rate	315 mm/min
Cutting depth	70 rpm/mm

Drilling

Tool diameter	Ø76 mm
Feed rate	120mm/min
Spindle speed	30 mm

All the test results featured in this catalogue were produced under strict testing condition in a special zed testing environment. Under different testing conditions and in less than ideal testing environments. that the test results may vary from those shown in this catalogue.

Tough, rugged and durable for MVP

With the extra rigid structure design, the Hartford PBM series precision boring milling machine features greater durability, stability and accuracy.

The picture shows PBM-135A/B

MEEHANITE®

Full range of box guideway five-year warranty

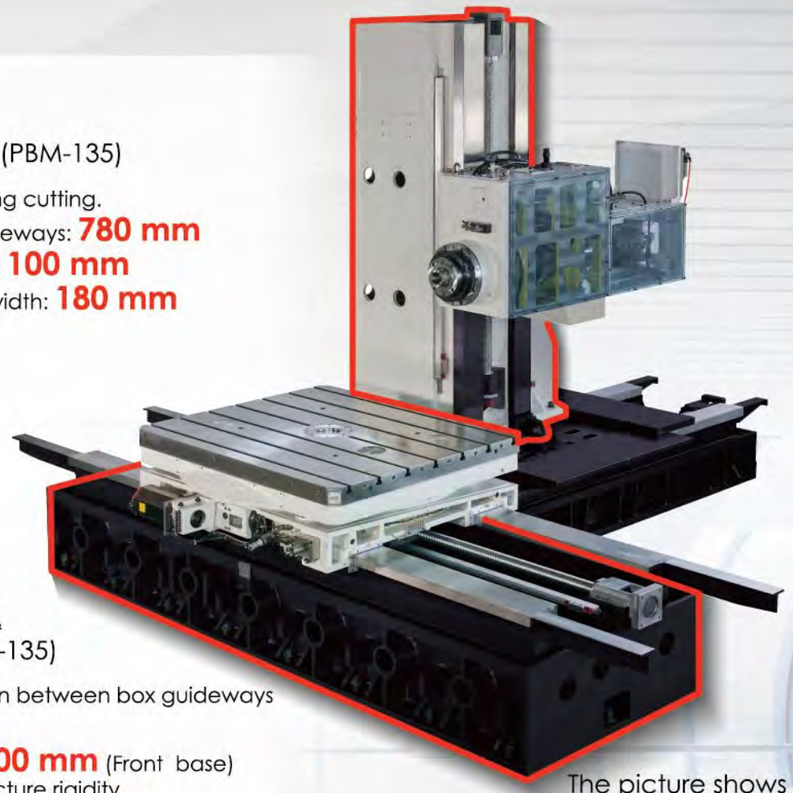
Warranty coverage will not apply under the following conditions,

1.Improper operation (collision)

2.Lack of regular cleaning of accumulated debris causing damaged to the linear rails & carriages.

Oversized column design (PBM-135)

- For greater stability during cutting.
- Span between box guideways: **780 mm**
- Box guideway thickness: **100 mm**
- Box guideway surface width: **180 mm**



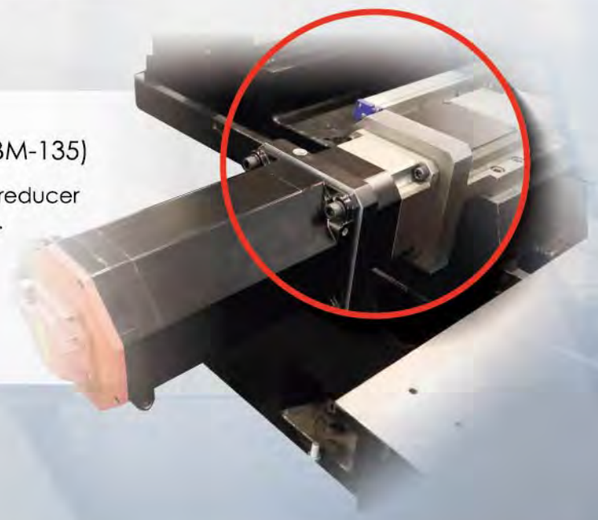
The picture shows PBM-115A/B

Specially design on front & rear base structure (PBM-135)

- Widen base design, span between box guideways **1080 mm**, box guideway width: **200 mm** (Front base)
- Increased machine structure rigidity.
- Span between box guideway: **1140 mm**, box guideway width: **250 mm** (Rear base)

X/Y/Z direct-connected drive system (PBM-135)

- X & Z axis are designed with planetary reducer enhance the overall axial drive torque.
- Y axis is direct-connect drive delivers high speed and less noise.
- Available with PBM-135



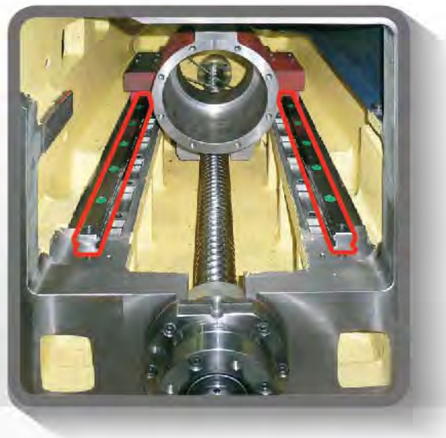
High Rigidity & High Accuracy Spindle

Heavy duty precision spindle

- The spindle supported by D4 class bearings guarantee superior dynamic running accuracy.
- Bearings & gear box are designed with cooling lubrication system so that spindle thermal problem can be reduced and prolong lifespan of parts.
- PBM-115 Spindle diameter: **ϕ 110mm**
  PBM-135 Spindle diameter: **ϕ 130 mm**
- PBM-115 W-axis travel: **500 mm**
- PBM-135 W-axis travel: **700 mm**

W-axis supported by two linear guideways

- Increases the supported rigidity of W-axis.
- Increase the accuracy of W-axis.
- Delivers greater supporting capacity.



Gear-driven spindle

- The spindle is driven by gear box.
- Allowing for 4-step speed change delivers higher torque output and durability.
- Spindle torque is **6527 N-m** (PBM-135)

High rigidity spindle stock

- The spindle stock is a high rigid box type construction.
- Ensures maximum stability during boring cutting.

A Variety of Accessories

Universal head

- Spindle taper: #50
- Max. tool diameter: ϕ200
- Tool clamping: Manual
- Max. power: 55 kW
- Max. speed: 1000 rpm
- Indexing method: Manual

90 degree head

- Spindle taper: #50
- Max. tool diameter: ϕ200
- Tool clamping: Manual
- Max. power: 55 kW
- Max. speed: 1000 rpm
- Indexing method: Manual

90 degree extension

. Spindle taper: #50
. Max. tool diameter: ϕ150
. Tool clamping: Manual
. Max. power: 38 kW
. Max. speed: 1000 rpm
. Indexing method: Manual

Quill support

- Spec.:
  300L (PBM-115)
  310L (PBM-135)
  510L (PBM-135)
- Max. speed: 1500 rpm

U-axis head(UT-360S)

- Travel: 120 mm
- Feedrate: 400 mm
- Max. speed: 500 rpm
- Torque:: 400 N-m
- Weight: 130 kg

Angle plate

- With standard fixtures provide customer a requirement fixtures on machining.

Intelligent Controller- Hartrol Plus

What is Hartrol plus?

- 19" multi-touch screen
- IPC is equipped with the Windows operating system
- Automatic feed system control function(opt.)

By the use of open architecture, we begin to enter a new era of intelligent processing. In addition to basic functions, we have joined hardware and software exclusively developed by Hartford. Software can be added to and updated at any time with new features.

An Intelligent Controller

With three major solutions, Hartrol plus takes your machining to the next level. Highly optimized and intelligent controls bring even more capabilities and productivity to your metal cutting processes.
With ease of use, advanced automation, and smart data collection, Hartrol plus is an essential tool for enhancing performance on your production floor.

The difference between Hartrol plus and others

Function	**Hartrol plus 2**	Others
Screen Size	19" Multi-touch Panel	10.4"(OPT:15")
Hard Drive	32GB CFast	NO
Smoothing Interpolation	SSS-4G	Option
Look Ahead Block	1350	400(1000 Max.)

Cost Down 20%

- Multi-touch screen
- E-book
- Remote control
- Cutting condition calculator
- Stand-by Mode
- Hartford User Connect

Productivity Increased by 18%

- AFC (Automatic feedrate control)
- SSS-4G high speed high accuracy control
- Machining time countdown for single block
- Optimized machining program

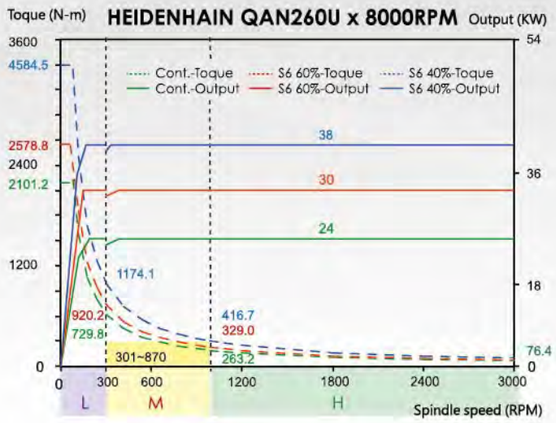
Efficiency Upgraded by 20%

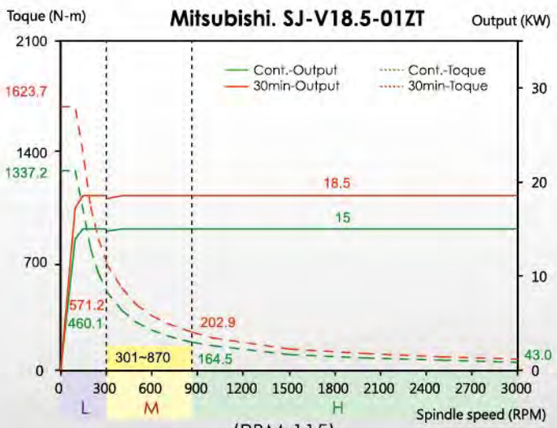
- Machine utilization management
- operators performance management
- 24 hours a day management
- Remote management

Spindle Torques

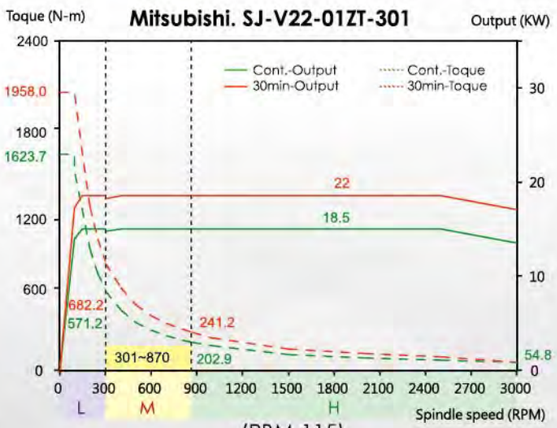
BBT option

- Dual contact between the contact and the flanges.
- Improves the rigidity, accuracy, speed and performance.
- Radial deflection, vibration and deviation are significantly reduced.

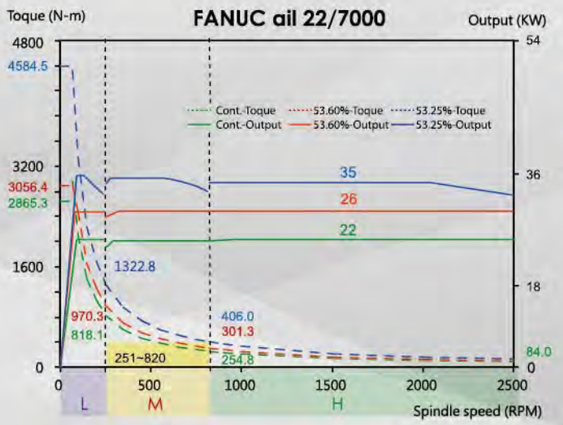


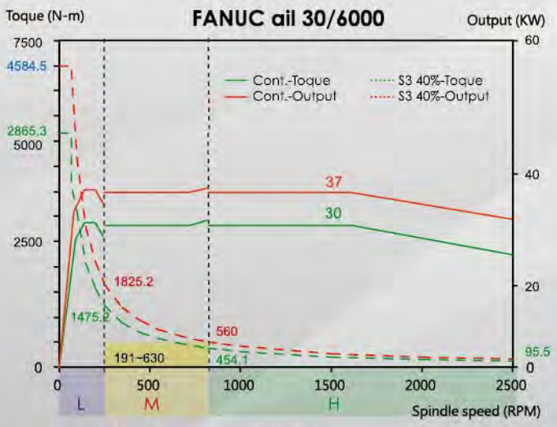


(PBM-115)

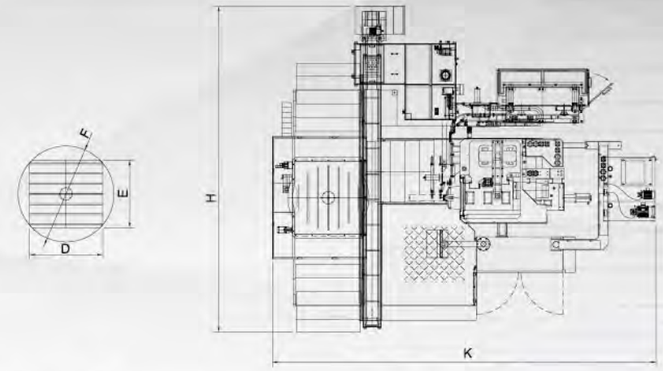


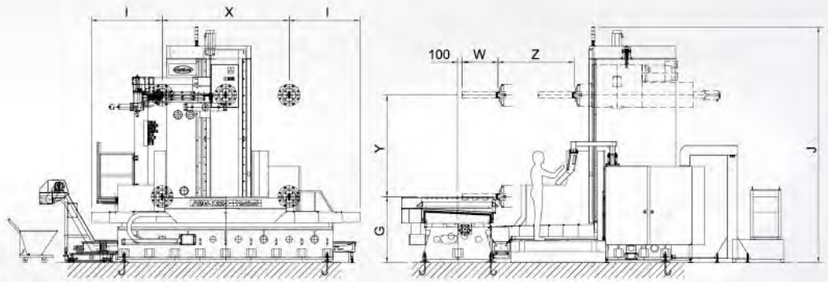
(PBM-115)





Machine Dimension





(Picture shown without guraring)

Unit:mm

Model	X X-axis travel	Y Y-axis travel	Z Z-axis travel	W W-axis travel	D Length of table	E Length of table
PBM-115A	2000	1600	1500	500	1600	1400
PBM-115B	2000	1600	1500	500	1800	1600
PBM-135A, X=2.5M	2500	2000	1500	700	1600	1400
PBM-135B, X=2.5M	2500	2000	1500	700	1800	1600
PBM-135A, X=3M	3000	2000	1500	700	1600	1400
PBM-135B, X=3M	3000	2000	1500	700	1800	1600
PBM-135C, X=3M	3000	2000	1500	700	2000	1800
PBM-135A, X=4M	4000	2000	1500	700	1600	1400
PBM-135B, X=4M	4000	2000	1500	700	1800	1600
PBM-135C, X=4M	4000	2000	1500	700	2000	1800
PBM-135P2	2000	2000	1500	700	2000	1500
PBM-135P3	3000	2000	1500	700	3000	1500

Unit:mm

Model	F Max.table size	G Distance from floor to table	H Width of machine (including frame)	I Distance from spindle to frame	J Height of machine	K Height of machine
PBM-115A	Ø2400 x 1600H	1300	5463	1493	4088	7256
PBM-115B	Ø2400 x 1600H	1300	5463	1493	4088	7256
PBM-135A, X=2.5M	Ø2400 x 2000H	1400	6417	1493	4744	7635
PBM-135B, X=2.5M	Ø2400 x 2000H	1400	6417	1493	4744	7635
PBM-135A, X=3M	Ø3000 x 2000H	1400	7417	1770	4744	7635
PBM-135B, X=3M	Ø3000 x 2000H	1400	7417	1770	4744	7635
PBM-135C, X=3M	Ø3000 x 2000H	1400	7417	1770	4744	7635
PBM-135A, X=4M	Ø3500 x 2000H	1400	8417	1846	4744	7635
PBM-135B, X=4M	Ø3500 x 2000H	1400	8417	1846	4744	7635
PBM-135C, X=4M	Ø3500 x 2000H	1400	8417	1846	4744	7885
PBM-135P2	2000L x 1500W	1150	6417	1743	4644	7615
PBM-135P3	3000L x 1500W	1150	8510	2343	4644	7615

Inspection Results

Straightness of table (X-axis) moves in R&L direction

Inspection item	Hartford PBM
R&L direction (vertical surface)	0.03 / 1000 mm
Forward & backward direction (vertical surface)	0.03 / 1000 mm

Spindle hole runout

Inspection item	HartfordPBM
Fixed side(20mm)	0.015 / 20 mm
At 300mm of testbar	0.025 / 300mm

Positioning & repetitive accuracy of linear movement (PBM-135A)

Inspection item	Positioning accuracy	Repetitive accuracy
X / Y / Z -axis	±0.010/ Full travel	±0.006/ Full travel
W -axis	±0.010/ Full travel	±0.005/ Full travel

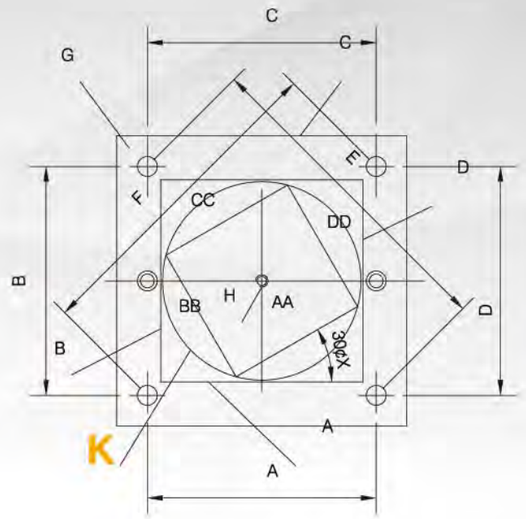
Positioning & repetitive accuracy of linear movement with linear scale (PBM-135A)

Inspection item	Positioning accuracy	Repetitive accuracy
X / Y / Z -axis	±0.007/ Full travel	±0.003/ Full travel
W -axis	±0.010/ Full travel	±0.005/ Full travel

Boring accuracy report: 0 °-180 ° boring (PBM-135A)

Inspection item	JIS standard	Measured value
X -axis deviation	0.06 / 1000 mm	0.03
Z -axis deviation	0.06 / 1000mm	0.03

2D



	Inspection item	Tolerance	Test result	Remarks
Boring positioning accuracy	Positioning accuracy A (300mm)	0.025	0.0078	(⊕)
	Positioning accuracy B (300mm)	0.025	0.0062	(⊕)
	Positioning accuracy C (300mm)	0.025	0.0076	(⊕)
	Positioning accuracy D (300mm)	0.025	0.0056	(⊕)
	Positioning accuracy E (300mm)	0.035	0.0057	(⊕)
	Positioning accuracy F	0.035	0.0134	(⊕)
Circular cutting	Roundness K	0.04	0.0096	(○)
Side milling accuracy	Straightness A	0.015	0.0047	(—)
	Straightness B	0.015	0.0052	(—)
	Straightness C	0.015	0.0055	(—)
	Straightness D	0.015	0.0046	(—)
	Squareness A&B	0.03	0.0140	(⊥)
	Squareness B&C	0.03	0.0146	(⊥)
	Squareness C&D	0.03	0.0148	(⊥)
	Squareness D&A	0.03	0.0141	(⊥)
	Parallelism A&C	0.03	0.0122	(//)
	Parallelism B&D	0.03	0.0112	(//)
Linear interpolation end milling accuracy	Straightness AA	0.02	0.0020	(—)
	Straightness BB	0.02	0.0044	(—)
	Straightness CC	0.02	0.0027	(—)
	Straightness DD	0.02	0.0021	(—)
	Squareness AA & BB	0.04	0.0028	(⊥)
	Squareness BB & CC	0.04	0.0048	(⊥)
	Squareness CC & DD	0.04	0.0056	(⊥)
	Squareness DD & AA	0.04	0.0058	(⊥)
	Parallelism AA & CC	0.04	0.0050	(//)
	Parallelism BB & DD	0.004	0.0060	(//)

Inspection accuracy on each machine may vary with accessories and cutting conditions

Machine Specifications

Model	Unit	PBM-115 A/B	PBM-135 A/B	PBM-135 A/B/C	PBM-135 A/B/C	PBM-135P2	PBM-135P3
Table			(X=2.5M)Standard	(X=3M)	(X=4M)	Plane table type	Plane table type
Working surface	mm	1400x1600(A) / 1600x1800(B)	1400x1600 (A) / 1600x1800 (B)	1400x1600 (A) / 1600x1800 (B) / 1800x2000(C)	1400x1600 (A) / 1600x1800 (B) / 1800x2000(C)	1500x2000	1500x3000
T-slot(Size×Number×Pitch)	mm	22x7x220(A) / 22x7x225(B)	22x7x200 (A) / 22x7x225 (B)	22x7x200 (A) / 22x7x225 (B/C)	22x7x200 (A) / 22x7x225 (B/C)	22x200x7	22x200x7
Max. table load	Kg	8000(A) / 12000(B)	8000(A) / 12000(B)	8000 (A) / 12000 (B) / 15000 (C)	8000 (A) / 12000 (B) / 15000 (C)	10000	12000
Min. indexing degree	deg.	0.001	0.001	0.001	0.001	-	-
Max. rpm	rpm	2	2	2	2	-	-
Max. rotating range	mm	2400	2400	3000	3000	-	-
Travel							
Longitudinal travel (X-axis)	mm	2000	2500	3000	3000	2000	3000
Cross travel (Y-axis)	mm	1600	2000 (2500 opt.)	2000 (2500 opt.)	2000 (2500 opt.)	2000	2000
Vertical travel (Z-axis)	mm	1500	1500	1500	1500	1500	1500
W-axis travel	mm	500	700	700	700	700	700
Spindle							
Spindle diameter	mm	110	130	130	130	130	130
Spindle sleeve	mm	225	245	245	245	245	245
Spindle nose taper		#50	#50	#50	#50	#50	#50
Spindle speed (Gear type)	rpm	3000	2500	2500	2500	2500	2500
Feed							
Cutting feed rate (X、Y、Z axis)	m/min	6/6/6	5/5/5	5/5/5	5/5/5	5/5/5	5/5/5
Rapid traverse (X、Y、Z axis)	m/min	15/12/15	10/10/10	10/10/10	10/10/10	10/10/10	10/10/10
Rapid traverse (W-axis)	m/min	6	6	6	6	6	6
Motor							
Spindle motor(Fanuc)	kw	18.5/25	26/35	26/35	26/35	26/35	26/35
ATC							
Tool storage capacity	Pcs	40 (60 opt.)	40 (60 opt.)	40 (60 opt.)	40 (60 opt.)	40 (60 opt.)	40 (60 opt.)
Max. tool weight	Kg	25	25	25	25	25	25
Max. tool size (diameter×length)	mm	125x400	125x400	125x400	125x400	125x400	125x400
Max. adjacent tool size(dia.x length)	mm	250x400	250x400	250x400	250x400	250x400	250x400
Positioning Accuracy							
3 axes laser positioning accuracy (JIS B6330)							
Positioning accuracy/Full travel	mm	±0.008	±0.008	±0.010	±0.010	±0.008	±0.010
Repetitive positioning accuracy	mm	±0.003	±0.003	±0.003	±0.003	±0.003	±0.003
3 axes laser positioning accuracy (VDI 3441)/Repeated 5 times							
Positioning accuracy	mm	0.015	0.015	0.015	0.015	0.015	0.015
Repetitive positioning accuracy	mm	0.012	0.012	0.013	0.013	0.013	0.013
VDI3441 accuracy available upon order request							
Other							
Coolant Capacity (L)	L	310	310	310	310	310	310
Required Air Pressure	kg/cm2	6.5	6.5	6.5	6.5	6.5	6.5
Electric power consumption	KVA	65	65	65	65	65	65
Machine dimension	mm	6800x8250(CTS:7000x10000)	7370x8650(CTS:8082x10435)	8370x8650	9470x8650	7370x8650	9470x8650
Machine Weight	kg	25000/27000	30000/32000	32000/34000/35000	34000/36000/37000	30000	34000

Standard & Optional Electrical Functions

Standard-Mechanical

- B-axis 0.001°
- Fluorescent lamp x1 (full-enclosed)
- RS-232 interface
- Spindle oil cooler
- Tool ARM Type Tool Magazine_40 pcs
- Automatic Power OFF
- 2500 rpm gear type spindle (PBM-135)
- Work finish lamp
- Air blast through spindle
- MPG
- Lubrication system
- Convection Heat Exchanger In Control Box
- X, Y, Z-axis linear scale system(FAGOR)
- B-axis linear scale system (Heidenhain)
- Mist coolant system
- Table side air blast

Optional-Mechanical

- Full-enclosed splash guard (For CTS)
- Coolant through system
- Full-enclosed splash guard
- Universal milling head
- 90 degree milling head
- 90 degree extension head
- Coolant system
- Shaft Support Block
- Portable chip bucket
- Link type chip conveyor
- Auto. tool probe
- Foot Switch for spindle Clamp/Unclamp
- Air gun
- Wash down hose
- Oil skimmer
- X, Y, Z-axis linear scale system(Heidenhain)

Electrical

Hartrol (Standard)

- Workpiece calibration by MPG directly
- Parameter package
- Tool magazine display(0i&31i only)
- Tool status display
- Utilization rate of machining
- Machining time countdown
- B-axis workpiece calibration (manually)

Hartnet (Optional)

- Management system of utilization
- Machining time countdown
- Convenient file transfer

Electrical (Optional)

- Lifting function against gravity
- Retraction for rigid tapping
- Intelligent MPG

Specifications of the machine are subject to be modified without prior notice, please refer to the shipping document for the precise machine weight.

Remarks: 1. Spindle max. speed is unavailable for long-term usage. 2. B-axis is position machining(Not simultaneous 4th axis)