

Accessories

Standard : ● Optional : ★

ITEM	MODLE	SW-x16	SW-x20	SW-x23	SW-x26	SW-x35
1.Full-enclosed guard		●	●	●	●	●
2.Spindle Air Curtain		●	●	●	●	●
3.Air Blast Through Spindle		●	●	●	●	●
4.Table Side Air Blast (1 tube)		●	●	●	●	●
5.Lubrication System		●	●	●	●	●
6.Fluorescent Lampx1		●	●	●	●	●
7.Spindle Cooler		●	●	●	●	●
8.Foundation bolt, concrete		●	●	●	●	●
9.Link Type Chip Conveyor & Portable Chip Bucket(1 EA)(Without Coolant Tank)		★	●	★	★	★
10.Screw Type Chip Conveyor		●	●	●	●	●
11.Oil Fluid Separator		●	●	●	●	●
12.Cooling System(With Coolant Tank)		★	★	★	★	★
13.Tools package		●	●	●	●	●
14.Hartford Manual x1		●	●	●	●	●
15Automatic Power off		●	●	●	●	●
16.Operation Finish Lamp		●	●	●	●	●
17.Foot Switch For Spindle Clamp/Unclamp		●	●	●	●	●
18.Remote Manual Pulse Generator		●	●	●	●	●
19.RS-232 Interface		●	●	●	●	●
20.Convection Heat Exchanger in Control Box		●	●	●	●	●
21.Armless Type Tool Magazine		●	●	●	●	●
22.#50 6000rpm gear spindle		●	●	●	●	●
23.Z-axis accumulator		★	★	★	★	★
24.CTS Full splash guard with top cover		★	★	★	★	★
25.Fluorescent Lampx2		★	★	★	★	★
26.Oil skimmer		★	★	★	★	★
27.Coolant Through Spindle, prepare, without water cart		★	★	★	★	★
28.Coolant Through Spindle, 20BAR, with water cart		★	★	★	★	★
29.Coolant Through Spindle, 25BAR, with water cart		★	★	★	★	★
30.Hydraulic Hose Coolant gun		★	★	★	★	★
31.Air Gun		★	★	★	★	★
32.Hartford Manual x2		★	★	★	★	★
33.Hartford Manual x3		★	★	★	★	★
34.X/Y/Z-axis linear scale system_HEIDENHAIN		★	★	★	★	★
35.Without Tool Magazine		★	★	★	★	★
36.Tool ARM Type Tool Magazine		★	★	★	★	★
37.Angular Head (HF-M90L)		★	★	★	★	★
38. Multifangular Milling Head (HF-MU360L)		★	★	★	★	★
39.Extend Head (Hartford)		★	★	★	★	★
40.Semi-Automatic Angular Head ((HF-S90L)		★	★	★	★	★
41.Semi-Automatic Multifangular Milling Head		★	★	★	★	★
42.Automatic Angular Head(G.Y)		★	★	★	★	★
43.Rotary ARM Seat of Angular Head		★	★	★	★	★
44.Auto Tool Length Measurement		★	★	★	★	★
45.Imitative Mold Cutting System		★	★	★	★	★
46.DNC Software		★	★	★	★	★

Facebook



Website



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Hartford

Hartrol · Smartcenter · Robocell

We manufacture intelligent machines only

Hartford
EXCLUSIV
Hartrol Plus APP

Intelligent Machining Center

SW Series

- Hartrol plus controller
- 5-year warranty on guideways
- Spindle run-out : 5 micro
- Gear type 6,000rpm Spindle
- Column oversized design

Hartrol Plus®
From tradition to intelligent



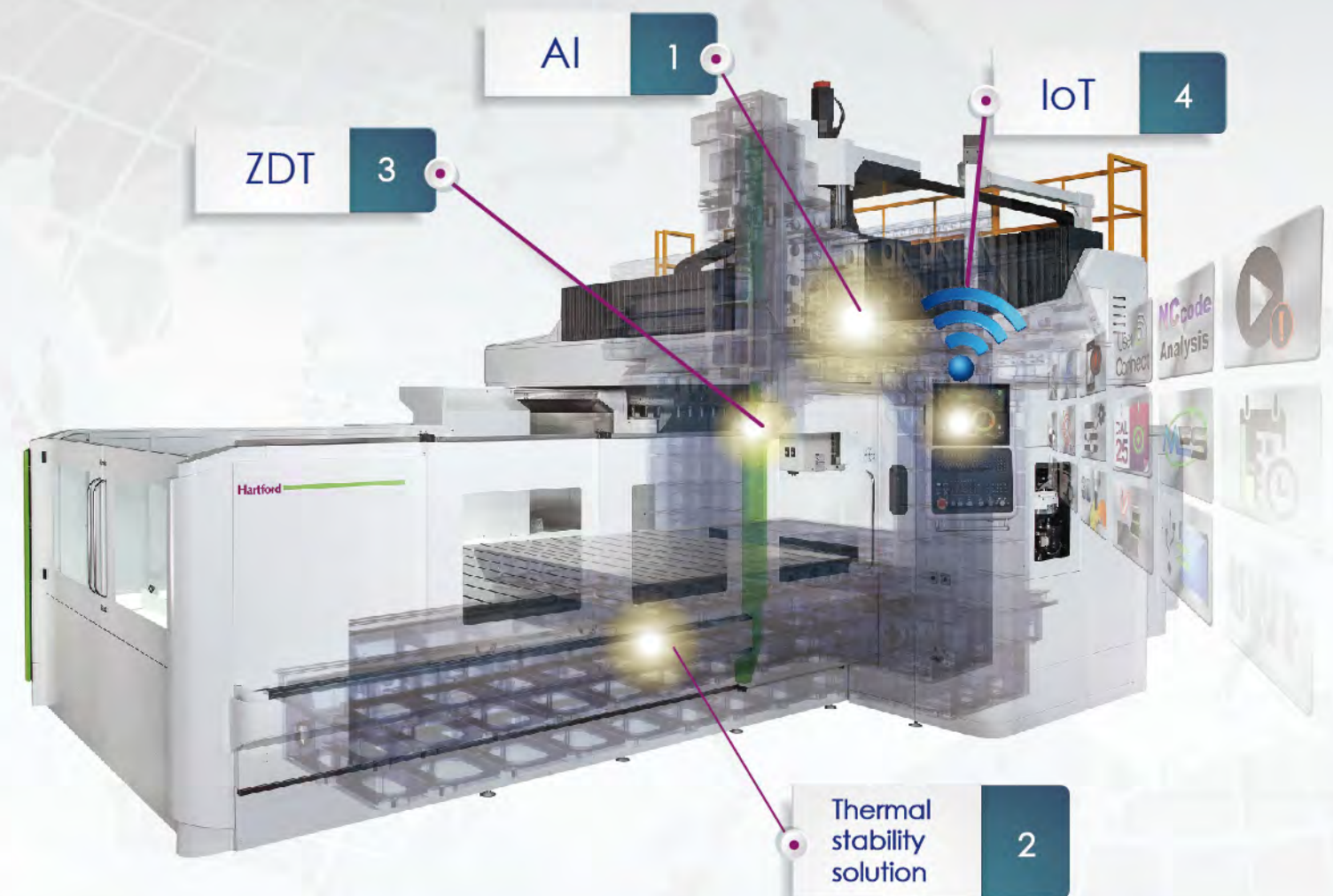
A.I. Applications inside, Hartrol Plus is the control which provides machining status with advanced features.

Imagine what future machines ought to be outlined.

AiSmartControl



Hartford
redefine the future



Major functions
of Hartford AI
controller



Facial
Recognition
system-Face ID



AI Environment
Thermal
Displacement
Compensation



AI Efficient
Lubrication
Management



Broken Tool
Detection
System



Highlight on
Intelligent
Auger



AI Navi

IoT

- + Remote Warm-up & Turn-on
- + Hartrol Plus Sync & Update
- + User Connect



Thermal stability solution

- + Spindle Thermal Compensation
- + Casting Thermal Compensation
- + Thermal Symmetry / Thermal Balancing



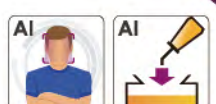
ZDT

- + Diagnosis Report on Spindle Operation
- + Alarm Report System



AI

- + Facial Recognition System
- + AI Efficient Lubrication Management
- + Smart Efficient Chip Collection



How to quickly implement automation?

Hartford Robot Production Cell

Easy to get started

Hartford Robocell provides you a professional robot training and rich automation experience, to let you quickly learn and easily operate your automation systems

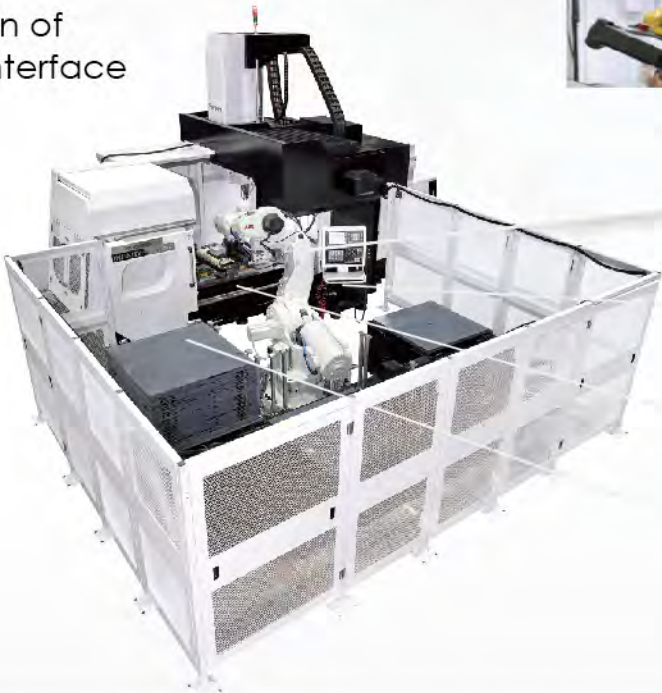
Quality control monitoring

Automation systems have to pass all the strict Quality Control tests at every stage like design, assembly, testing, final inspection and shipment, complete quality control processes for all the products.

Professional analysis

Robocell Machining optimization service, to let you be on the top by using professional machining methods

What definition of Automation interface only :



- 1. Automatic Door
- 2. Automatic Interface
- 3. Pneumatic/ Hydraulic Interface
- 4. Other options

1. Automatic Door

- Pneumatic/Automatic Door System_Operating Door
- Pneumatic/ Servo Automatic Door System_Right Side Door

2. Automatic Interface

- I/O Preparation
- Profibus Link Preparation
- CC-Link Preparation
- EtherNet/IP Link Preparation

3. Pneumatic/ Hydraulic Interface

- 1/2/3 Cell Automatic Pneumatic/ Hydraulic Interface in the machine

4. Other options

- High Pressure Spray Nozzle with Automatic Preparation
- HStainless Base
- High-volume chip-removal system comprising dual side augers

Power Cutting Performance

A perfect demonstration for machining accuracy and ability.

The SWORD drastically reduces your cycle time and increase your working range with our expended working area.

The new structural design delivers exceptional cutting performance.



1. Heavy cutting for large component



2. Casting iron component

Actual Cutting Test

Model: SW-426

■ Spindle: 6,000 rpm Gear type, 22kW ■ Cutting material : S45C



Face milling

Tool diameter Ø125 mm
Feed rate 1,800 mm/min
Cutting depth 3 mm
Cutting volume 540mm



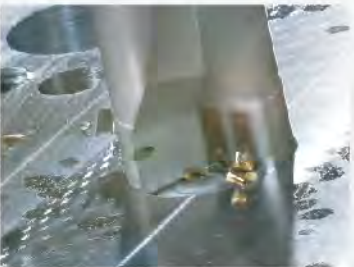
End milling

Tool diameter Ø63 mm
Feed rate 700mm/min
Cutting depth 40 mm
Cutting width 10 mm
Cutting volume 280cc



Tapping

Tool diameter Ø30 mm
Feed rate 350 mm/min
Cutting depth 35 mm



Drilling

Tool diameter Ø76 mm
Feed rate 96 mm/min
Cutting depth 50 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.

The very first step for fully intelligent machining.

What is Hartrol Plus?

Hartrol plus is a brand new intelligent controller Hartrol , Hartnet and Hartford electrical function together which developed and made by Hartford.

HMI and operation is user friendly, it can achieve :

1. Internet connection, collect and analyze data, monitoring by portable device
2. Intelligent control: Auto revise human error and operating basis
3. Real time update new APPs

The difference between Hartrol plus and others

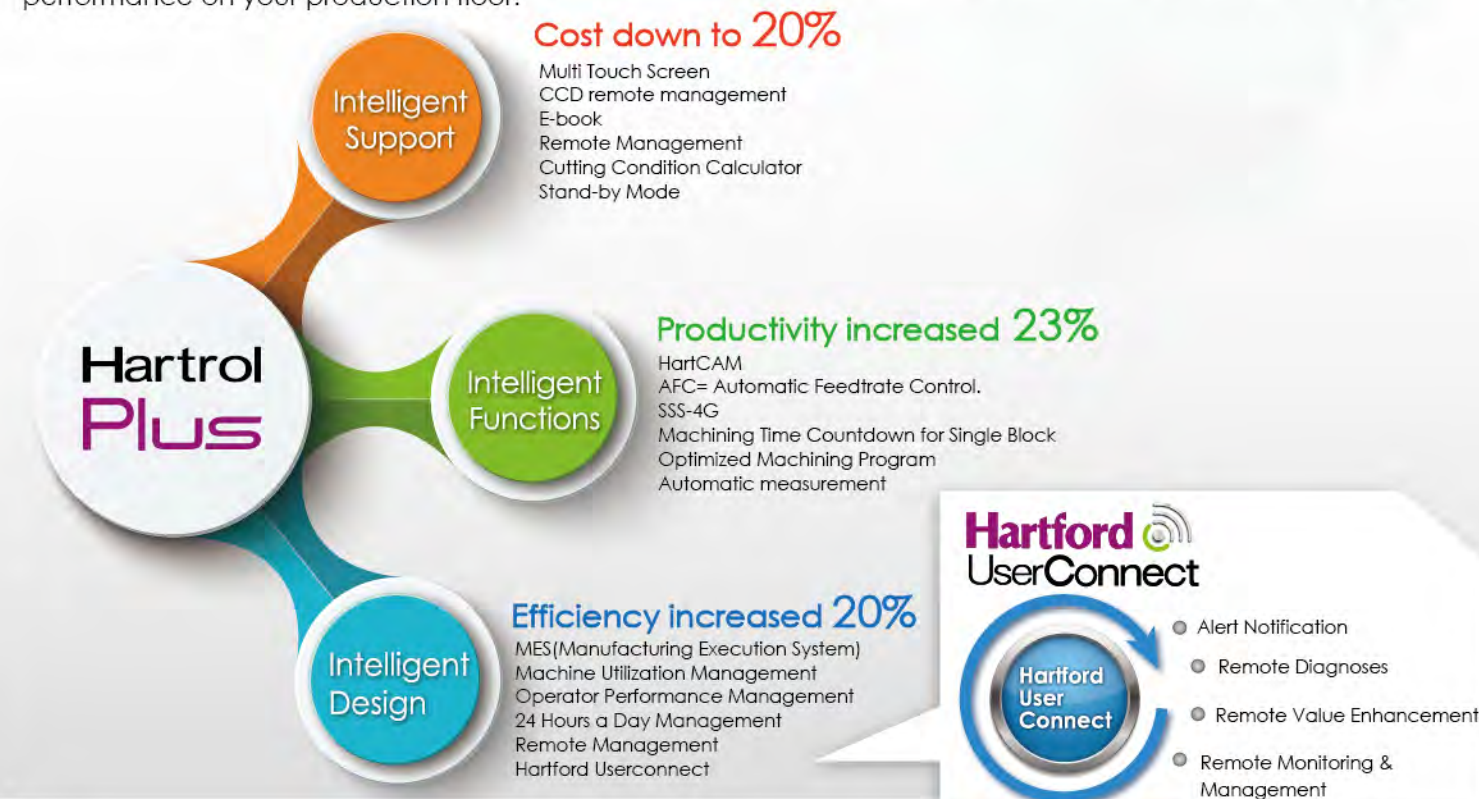
Function	Hartrol Plus P1	Others
Screen Size	19"Multi-touch Panel	10.4" (OPT:15")
Look Ahead Block	2700(G5P20000)	400(1000 Max.)
Hard Drive	32GB SSD	NO
Smoothing Interpolation	SSS 4G	Option
Industry 4.0	Hartford UserConnect	NO

The Intelligent Controller You Should Have

With three major solutions, Hartrol Plus takes you machining to the next level.

Highly optimized and intelligent controls bring even more capabilities and productivity to your metal cutting processes.

With ease use, advanced automation, and smart data collection, Hartrol plus is essential tool for enhancing performance on your production floor.

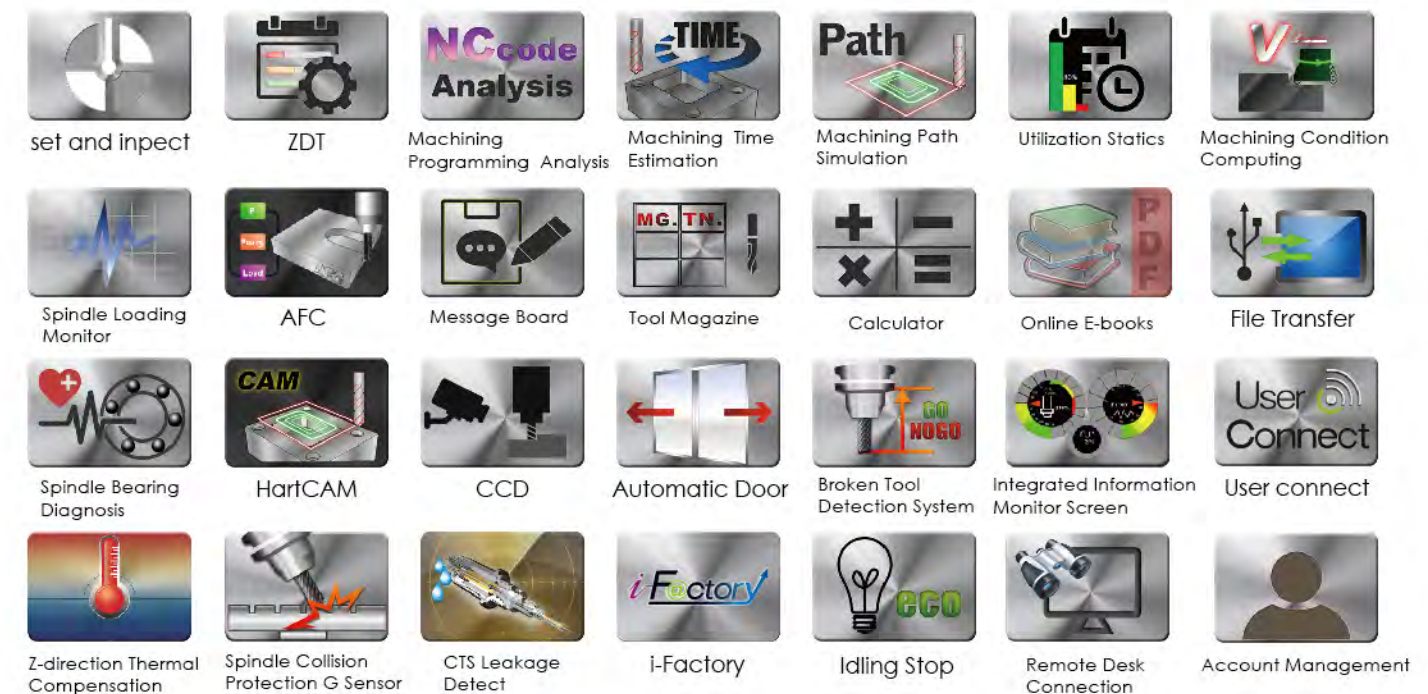


Hartford APP Store

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.



Hartford smartcenter APP



The fuctions mentioned above will need to option the Hartrol plus controller or Dual screen with Fanuc controller.

What Hartford APP can do for you?

The integrated intelligent functions of Hartrol plus could achieve your machining requirements.
For more Hartrol Plus functions, please contact our sales person.

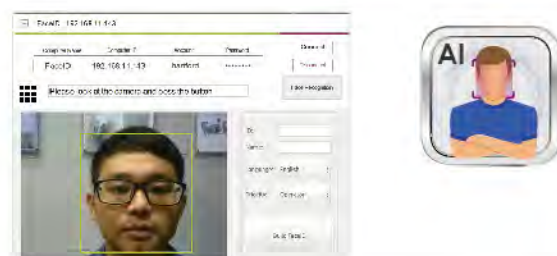
AI Environment Thermal Displacement Compensation(opt.)

Vertical machining center : **0.03mm**
Thermal displacement problem is improved up to **60%**
It can achieve good accuracy as in constant temperature room.



AI Facial recognition system(opt.)

Face ID log-in authority
Recognition time: **2 seconds**
Recognition accuracy: **100%**



Highlight on Intelligent Auger(opt.)

50% efficacy increases
■ Intelligent auger automatically proceeds cleaning iron chips based on electrical current of spindle.
■ Intelligent auger automatically performing reversal mode in case amount of iron chips outnumbers, preventing from machine stop.
■ Auger is overly shielded



AI Efficient Lubrication Management(opt.)

50% lubrication saved.
■ Auto-adjustment oil supply base on machining condition.
■ 50% oil consumption saved



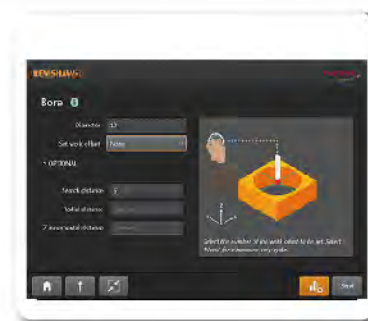
On line update

With online updating system similar to smart phone will make sure your operating system stays the latest version with Hartford.

- 24hr ➡ Live updating , no boundary no time zone difference.
- NEW ➡ Synchronize with Hartford for the latest information and functions.
- Easy ➡ One key updating, easy and fast !



The Hartrol plus NC version must be A6 or above



Graphical user interfaces for part setting, inspection, tool setting

- Ease of use
- Increasing usability
- Eliminating manual set-up tasks
- Increasing efficiency



CIS Integral Design page



Hartford ZDT

Eliminate machine down time and increase efficiency. ZDT —

- 1.Ease of use
- 2.Check parts status clearly
- 3.Eliminating unexpected down time
- 4.Instand notification to your machine and your portable device



Spindle Vibration Intelligent Monitoring System (B-Safe) is ensuring spindle stability at times(opt.)

Highlights

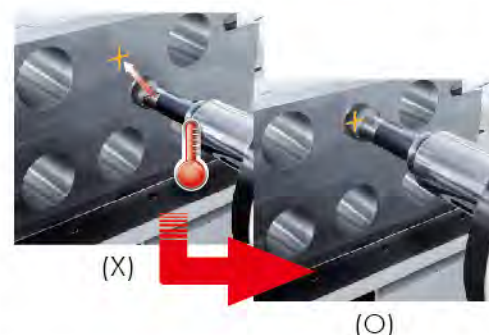
1. APP Vibration function is handy to set up manually.
2. Alert status on crash protection.
3. Responsive graphic is available for diagnosis by user, and analytic information is just-in-time served.



AFC(opt.)

Machining efficiency is increased by **21%**↑
Controls the feed rate depending on the machining situation

- Adjusting feed rate automatically
- Lengthen your tool life
- Reduce machining time



Thermal compensation on spindle(opt.)

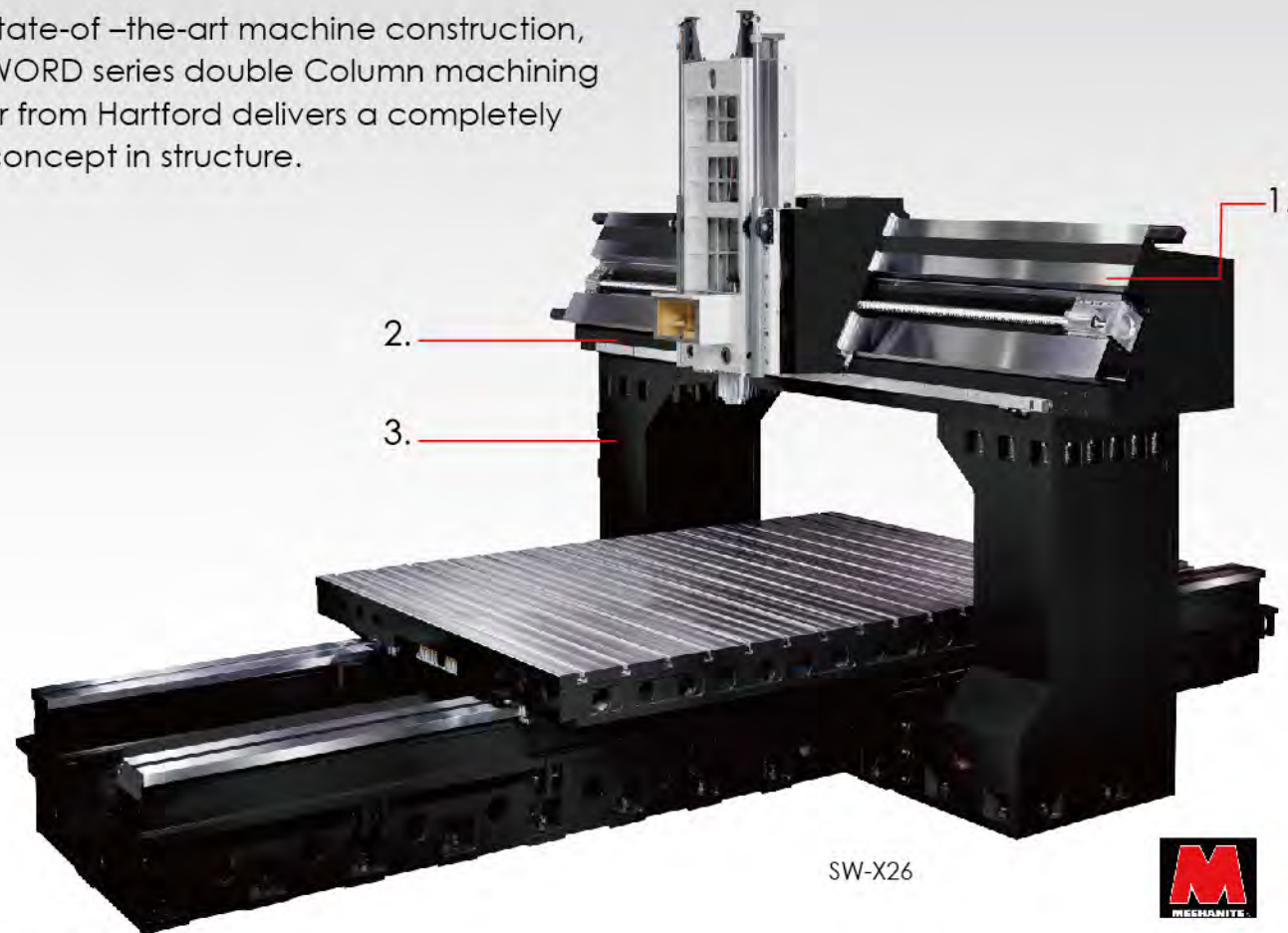
No worries about HEAT!!

- Machine with compensation
#40 spindle thermal extension is within 0.03mm
#50 spindle thermal extension is within 0.02mm
 - Machine without compensation
Spindle thermal extension is around 0.10mm
- Notes: Above test is under room temperature



Extra Rigid & Stable

With state-of-the-art machine construction, the SWORD series double Column machining center from Hartford delivers a completely new concept in structure.



SW-X26



Full range of box guideway five-year warranty

The following situation is not covered under warranty

1. Improper operation (collision)
2. No regular cleaning of accumulated debris causes damaged to the track.

1.3 box guideways on column

- Rigidity increased by **30%**.
- Three box guideways on the beam with extra wide way surface.
- Higher movement accuracy.



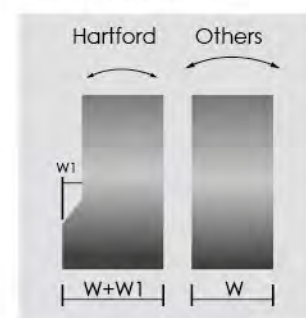
2. Slant beam structure

- Makes the machine excellent for heavy cutting.
- The gravity of Y-axis close to the column.
- Increased way width, ensure outstanding stability.
- Shortest force flow, max. rigidity.
- Max. dampening capability.



3. Oversized column design

- Provide larger contact surface between column and base.
- Sustaining more cutting force from the spindle.
- Width of contact surface: 1,250mm
SW-X16 : 1,050mm



Massive Construction with Optimized Structural



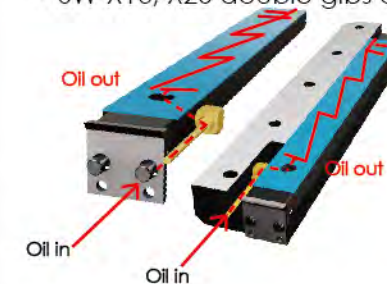
SW-X16



SW-X23

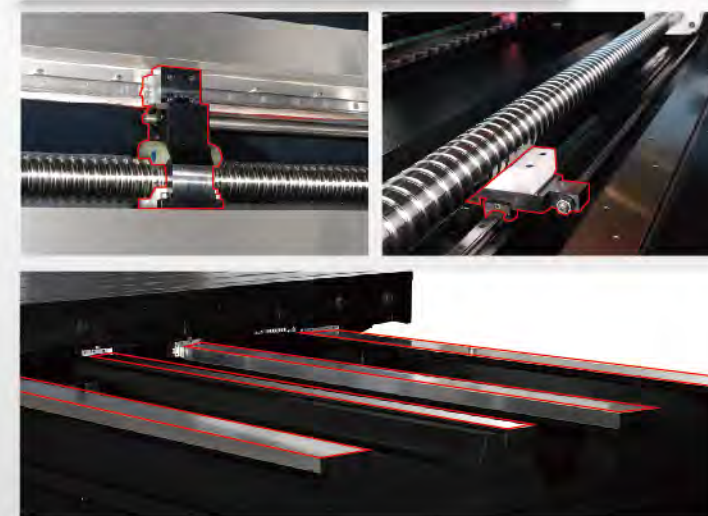
Taper gib lubrication

- Prevent against Lubrication oil leaks from the contact surface between casting and gib.
- Avoid lubrication failure on the Turcite-B.
- Double gibs on Y & Z axis, increases accuracy.
- SW-X16, X20 double gibs on X & Y axis.



Self-made gear driven spindle head

- Two-step speed for transmit.
- Low speed with great force output.
- Perfect for heavy cutting
- High speed for die & mold industry.



Ballscrew support mechanism maintains excellent positioning accuracy

- Improve the overhang problem at the center of ballscrew.
- Increased positioning accuracy.
- X-axis: Models above 5 meters is standard; below 4 meters is optional. (This feature is unavailable for machine below 3 meters.)
- Y-axis : Optional.

Four box guideways design

- The base is designed with four box ways so that the machine stability can be enhanced effectively.
- SW-X26: Four box guideways.
- SW-X16, X20, X23: Two box guideways.

Variety of Hartford Made Spindle Have Quality Assurance

Spindle type

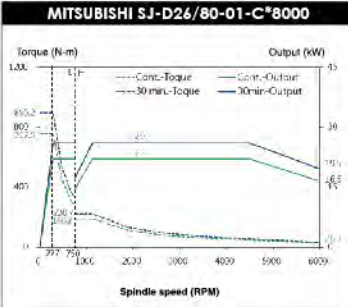
Available with gear-drive or direct-drive spindle head for efficient and powerful machining capability.
#50 Gear type:4000/6000/8000 rpm

BBT for optional

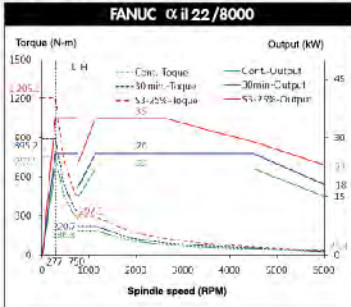
With simultaneously fit of taper and flange to spindle face contact.
Improve the rigidity, accuracy, speed and performance.
The radial deflection, vibration, deviation all are significantly reduced.

Spindle torque

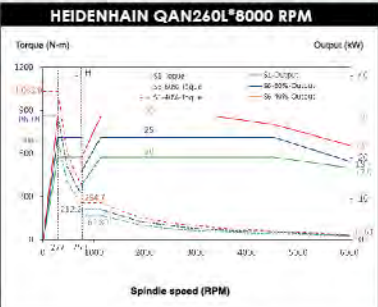
Mitsubishi



Fanuc



Heidenhain



Efficient angular heads increase your cutting productivity

Manual position head applicable to general model SWPRD



Universal head (manual / semi-automatic)		Manual universal head	Semi-automatic universal head
A-axis : ±110° C-axis : ±180° Maximum speed :2,500rpm Maximum power:18.5kw The maximum torque to withstand : 650N-m	Binding mechanism	Manual	Manual
	Clamp/unclamping mechanism	Manual	Manual(Hydraulic clamp/unclamp)
	C-axis rotation	Manual	Manual



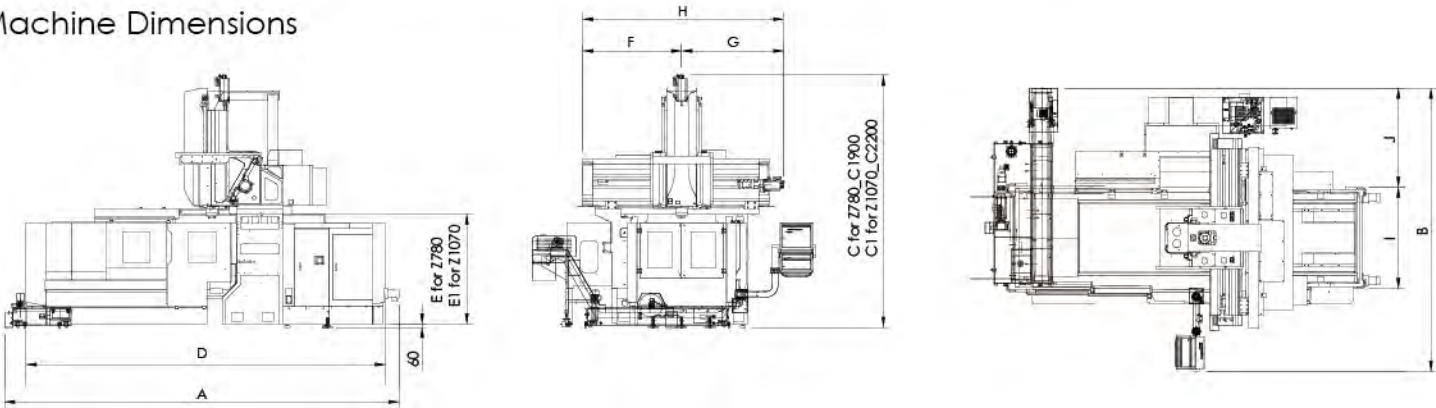
90° Side milling head (manual / semi-automatic)		Manual 90° head	Semiautomatic 90° Head
Manual tool change(manual/hydraulic lock release tool.) Maximum speed : 2,000rpm Maximum power:18.5kw The maximum torque to withstand : 650N-m	Binding mechanism	Manual	Manual
	Clamp/unclamping mechanism	Manual	Automatic
	C-axis rotation	Manual	Manual



Extension head (350/500mm)

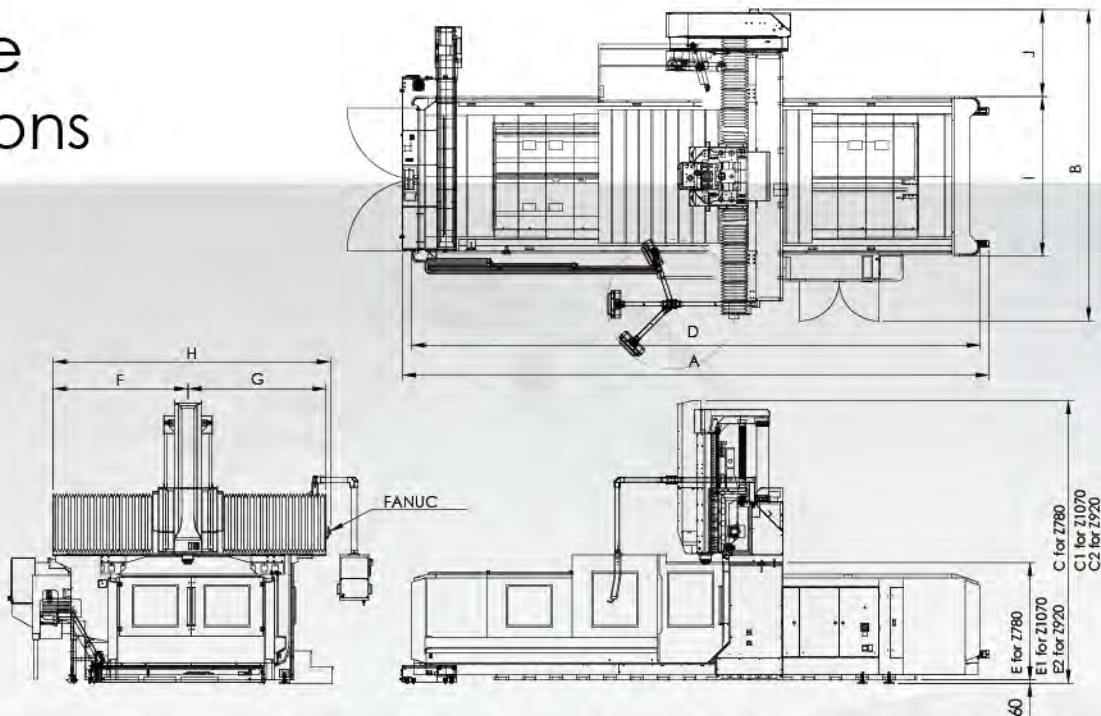
Maximum speed : 4,000rpm
Maximum power:18.5kw
The maximum torque to withstand : 650N-m

Machine Dimensions



MODEL	A	B	C	C1	D	E	E1	F	G	H	I	J
SW-216	6820	4893	4363	5313	6220	1900	2200	1711	1511	3401	1750	1711
SW-2616	8110	4893	4363	5313	7510	1900	2200	1711	1511	3401	1750	1711
SW-316	9400	4893	4363	5313	8800	1900	2200	1711	1511	3401	1750	1711
SW-416	11980	4893	4363	5313	11380	1900	2200	1711	1511	3401	1750	1711

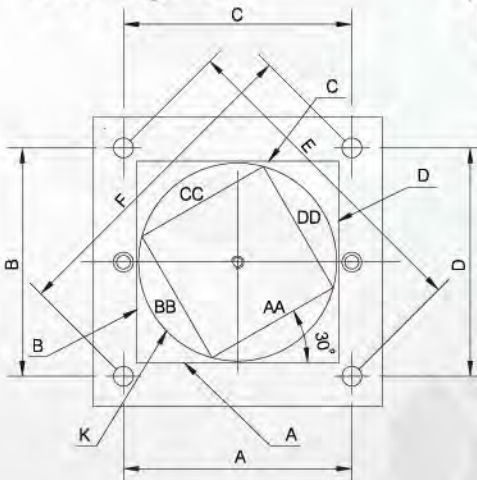
Machine Dimensions



MODEL	A	B	C	C1	C2	D	E	E1	E2	F	G	H	I	J
SW-320	9237	5095	4303	5243	4713	8796	1900	2200	2000	2001	2269	4270	2282	1610
SW-420	11237	5095	4303	5243	4713	10796	1900	2200	2000	2001	2269	4270	2282	1610
SW-323	9081	5224	4303	5243	-	8796	1900	2200	-	2101	2161	4470	2482	1610
SW-423	11081	5224	4303	5243	-	10796	1900	2200	-	2101	2161	4470	2482	1610
SW-523	13081	5224	4303	5243	-	12796	1900	2200	-	2101	2161	4470	2482	1610
SW-623	15205	5624	4303	5243	-	14920	1900	2200	-	2101	2161	4470	2482	1610
SW-326	9076	5624	4343	5283	-	8796	1900	2200	-	2311	2361	4939	2882	1610
SW-426	11076	5624	4343	5283	-	10796	1900	2200	-	2311	2361	4939	2882	1610
SW-526	13076	5624	4343	5283	-	12796	1900	2200	-	2311	2361	4939	2882	1610
SW-626	15176	5624	4343	5283	-	14896	1900	2200	-	2311	2361	4939	2882	1610
SW-435	11076	6600	4638	5323	-	10796	2000	2200	-	2862	2922	6100	3684	1676
SW-535	13276	6600	4638	5323	-	12996	2000	2200	-	2862	2922	6100	3684	1676
SW-635	15276	6600	4638	5323	-	14996	2000	2200	-	2862	2922	6100	3684	1676

Unit : mm

Cutting Test



SW-426A CUTTING TEST

WITH-2D-NASA STANDARD TESTING PART(LINEAR SCALE OFF)

No.	Insp.Item	Deviation	Test result	Note
1	A(300mm)	0.025 mm	0.0057	(⊕)
2	B(300mm)	0.025 mm	0.0068	(⊕)
3	C(300mm)	0.025 mm	0.0055	(⊕)
4	D(300mm)	0.025 mm	0.0049	(⊕)
5	E	0.035 mm	0.0012	(⊕)
6	F	0.035 mm	0.0017	(⊕)
7	K	0.04 mm	0.0017	(○)
8	A	0.015 mm	0.0058	(—)
9	B	0.015 mm	0.0037	(—)
10	C	0.015 mm	0.0011	(—)
11	D	0.015 mm	0.0016	(—)
12	A&B	0.03 mm	0.0093	(⊥)
13	B&C	0.03 mm	0.013	(⊥)
14	C&D	0.03 mm	0.0043	(⊥)
15	D&A	0.03 mm	0.0056	(⊥)
16	A&C	0.03 mm	0.0037	(//)
17	B&D	0.03 mm	0.0086	(//)
18	AA	0.02 mm	0.0054	(—)
19	BB	0.02 mm	0.0026	(—)
20	CC	0.02 mm	0.0025	(—)
21	DD	0.02 mm	0.0024	(—)
22	AA&BB	0.04 mm	0.0073	(⊥)
23	BB&CC	0.04 mm	0.0018	(⊥)
24	CC&DD	0.04 mm	0.0040	(⊥)
25	DD&AA	0.04 mm	0.0095	(⊥)
26	AA&CC	0.04 mm	0.0055	(//)
27	BB&DD	0.04 mm	0.0022	(//)

Specification

Model	UNIT	SW-216/2616/316	SW-320/420	SW-323/423/523/623	SW-326/426/526/626	SW-435/535/635
Table						
Working surface	mm	2000/2500/3000x1450	3000/4000x1830	3000/4000/5000/6000x2200	3000/4000/5000/6000x2500	4000/5000/6000x3000
T-slot(size x number x pitch)	mm	22x11/13/17x180	22x12/16x250	28x12/16/20/24x250	28x12/16/20/24x250	28x16/20/24x250
Max. table load	kg	7000/7500/8000	10000/12000	10000/12000/14000/16000	12000/13500/15000/16500	16000/18000/20000
Travel						
Longitudinal travel (X-axis)	mm	2100/2600/3100	3100/4100	3000/4000/5000/6000	3000/4000/5000/6000	4000/5000/6000
Cross travel (Y- axis)	mm	1600	2000	2300	2600	3500
Vertical travel (Z-axis)	mm	780(1070 opt.)	920(780/1070 opt.)	780(1070 opt.)	780(1070 opt.)	780(1070 opt.)
Distance from spindle end to table	mm	220~1000(230~1300 opt.)	150~1070(200~980/200~1270 opt.)	200~980(200~1270 opt.)	160~940(160~1230 opt.)	300~1080(200~1270 opt.)
Distance from spindle center to column	mm	430	430	430	430	430
Width between column	mm	1600	2100	2300	2700	3500
Spindle						
Spindle speed(Gear)	rpm	6000	6000	6000(4000)	6000(4000)	6000(4000)
Spindle nose taper		ISO50	ISO50	ISO50	ISO50	ISO50
ATC						
Tool storage capability	pcs	20(S type)/opt.32,40(A type)	20(S type)/opt.32,40(A type)	20(S type)/opt.32,40(A type)	20(S type)/opt.32,40(A type)	20(S type)/opt.32,40(A type)
Max tool weight	kg	15	S:15 A:20	S:15 A:20	S:15 A:20	S:15 A:20
Max tool size (Diameter x length)	mm	Ø125x350L	S:Ø125x350L A:Ø125x400L(opt.)	S:Ø125x350L A:Ø125x400L(opt.)	S:Ø125x350L A:Ø125x400L(opt.)	S:Ø125x350L A:Ø125x400L(opt.)
Tool shank		BT50(BBT/CAT/DIN)	BT50(BBT/CAT/DIN)	BT50(BBT/CAT/DIN)	BT50(BBT/CAT/DIN)	BT50(BBT/CAT/DIN)
Pull stud bolt		P50T-1	P50T-1	P50T-1	P50T-1	P50T-1
Feed						
Cutting feedrate (X/Y/Z-axis)	mm/min	1~7000	1~7000	SW-323/423:X/Y/Z:1~7000 SW-523/623:X:1~5000 Y,Z:1~7000	X,Y,Z:1~5000	X,Y,Z:1~5000
Rapid Traverse feedrate(X/Y/Z-axis)	m/min	12/12/15	12/12/12	X:12/12/8/6, Y:12, Z:12	X:10/10/8/6, Y:10, Z:12	X:8/8/6, Y:10, Z:12
Motor						
Spindle drive motor-Fanuc 30 min	kw	18.5(22/26 opt.)	18.5(22/26 opt.)	22(26/37 opt.)	22(26/37 opt.)	22(26/37 opt.)
X-axis drive motor(Fanuc)	Nm	α iF22(22Nm)/ α iF22(22Nm) α iF30(30Nm)	α iF30(30Nm)	SW-323/423: α iF30(30Nm) SW-523: α iF40+F(53Nm),SW-623: α iS40+F(53Nm)	SW-326/426: α iF30(30Nm) SW-526: α iF40+F(53Nm),SW-626: α iF40+F(53Nm)	SW-35: α iF40(53Nm) SW-535: α iS60+F(95Nm),SW-635: α iS200(180Nm)
Y-axis drive motor(Fanuc)	Nm	α iF22(22Nm)	α iF22(22Nm)	α iF22(22Nm)	α iF22(22Nm)	α iF22(22Nm)
Z-axis drive motor(Fanuc)	Nm	α iF30+B(30Nm)	α iF30+B(30Nm)	α iF30+B(30Nm)	α iF30+B(30Nm)	α iF30+B(30Nm)
Positioning accuracy						
3-axis laser positioning accuracy (JIS B6338)						
Positioning accuracy /full travel	mm	±0.014	±0.014/±0.015	±0.014/±0.015/±0.015/±0.015	±0.014/±0.015/±0.015/±0.015	±0.015/±0.015/±0.015
Repetitive positioning accuracy	mm	±0.003	±0.003	±0.003	±0.003	±0.003
3-axis laser positioning accuracy (VDI3441)/Repeated 5 times						
Positioning accuracy	mm	0.020/0.023/0.026	0.026/0.028	0.026/0.028/0.028/0.030	0.026/0.028/0.028/0.030	0.028/0.028/0.030
Repetitive positioning accuracy	mm	0.016/0.019/0.022	0.022/0.024	0.022/0.024/0.024/0.026	0.022/0.024/0.024/0.026	0.024/0.024/0.026
Others						
Required air pressure	kg/cm	6.5	6.5	6.5	6.5	6.5
Electric power consumption	KVA	50~75	40~60	40~70(323/423) 40~75(523) 45~70(623)	40~65(326/426)40~70(526)45~70(626)	40~65(435) 45~70(535/635)
Machine weight	kg	19500/21000/22500	27500/31500	26500/30500/35000/40000	30900/34900/38900/42900	46000/50000/54000
Floor space-full guarding	mm	8583/9675/10965 x7490 x 4363	11073/13073x6800x4713(Z920)	8796/10796/12796/14896 x5624 x 4303(Z780)	8796/10796/12796/14896 x 5624 x 4343(Z780)	10796/12996/14996 x 6196 x 4451(Z780)

VDI 3441 accuracy available upon order request.

Standard & Optional Electrical Functions

Hartrol / Standard	Electrical Function /Optional	Hartnet / Optional
• Workpiece calibration by mpg directly • Tool magazine display • Pop-up calculator (in hartrol screen) • Parameter package • Threading cutting (only for 0i and 31i) • Monitoring of tool status (only for 0i and 31i) • Character carving macro	• Compensation of temperature displacement • Lifting Function Against Gravity • Retraction for Rigid tapping • Intelligent MPG • HMI for tool magazine	• Management system of utilization • Machining time countdown • Convenient file transfer • Production management