

## Accessories

ITEM	MODLE	SW-x16	SW-x20	SW-x23	SW-x26
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 Conveyer		●		●	●
11.Oil Fluid Separator		●		●	●
12.Cooling System(With Coolant Tank)		★		★	★
13.Tools package		●		●	●
14.Hartford Manual x1		●		●	●
15.Automatic 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.Mutiangular Milling Head (HF-MU360L)		★		★	★
39.Extend Head (Hartford)		★		★	★
40.Semi-Automatic Angular Head ((HF-S90L)		★		★	★
41.Semi-Automatic Multangular 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		★		★	★

Standard : ●  
Optional : ★



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# Hartford

Hartrol · Smartcenter · Robocell

We manufacture intelligent machines only

**Hartford**  
EXCLUSIVE  
HartrolPlus APP

# Intelligent Machining Center

**SW Series**  
Smartcenter

**Hartrol Premium®**

From tradition to intelligent



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

Imagine what future machines ought to be outlined.

## AiSmartControl

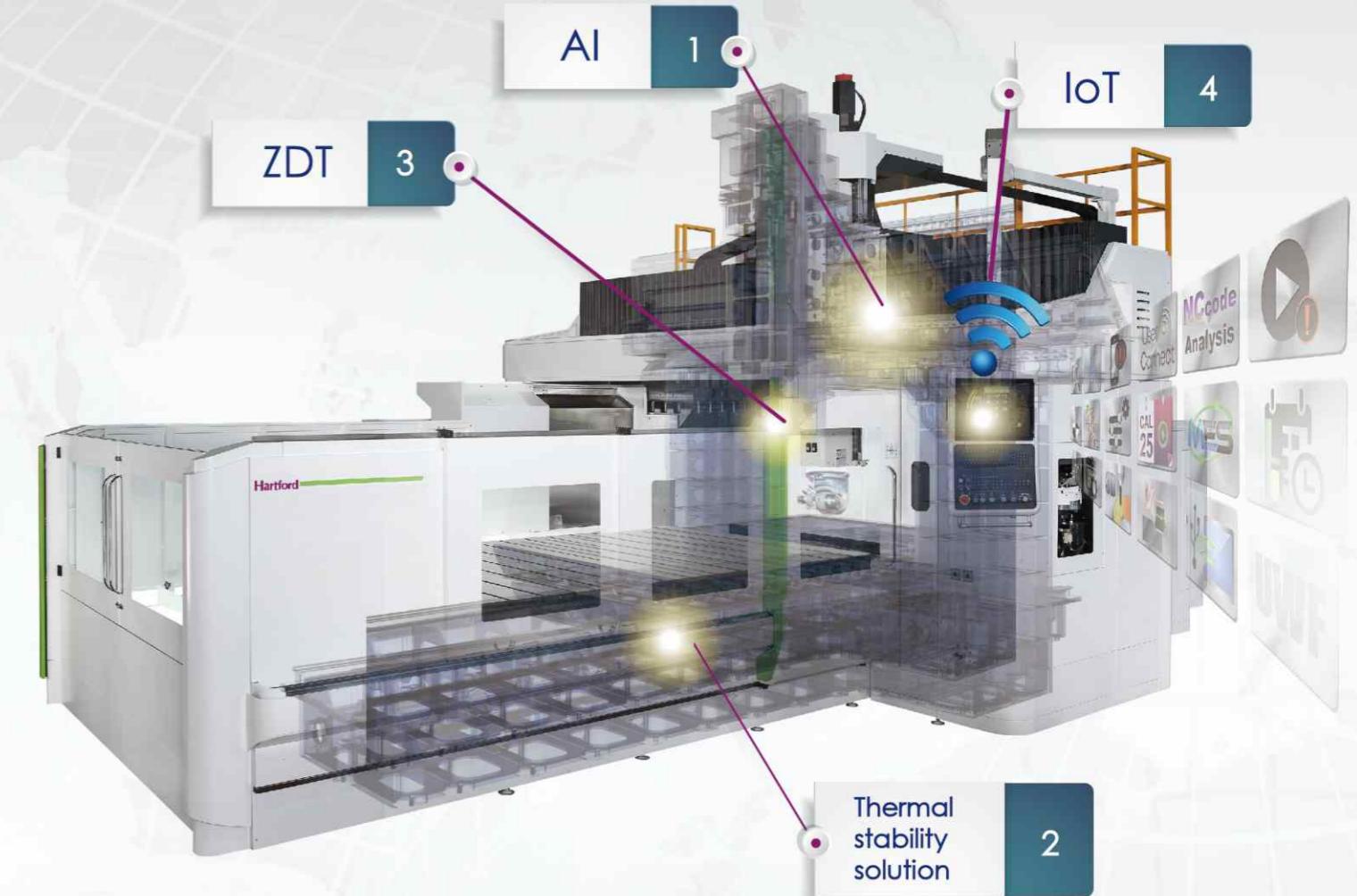


Major functions of Hartford AI controller



## Hartford

redefine the future



**IoT**  
+ Hartrol Plus Sync & Update  
+ User Connect



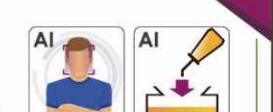
**Thermal stability solution**  
+ Spindle Thermal Compensation  
+ Casting Thermal Compensation  
+ Thermal Symmetry / Thermal Balancing



**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

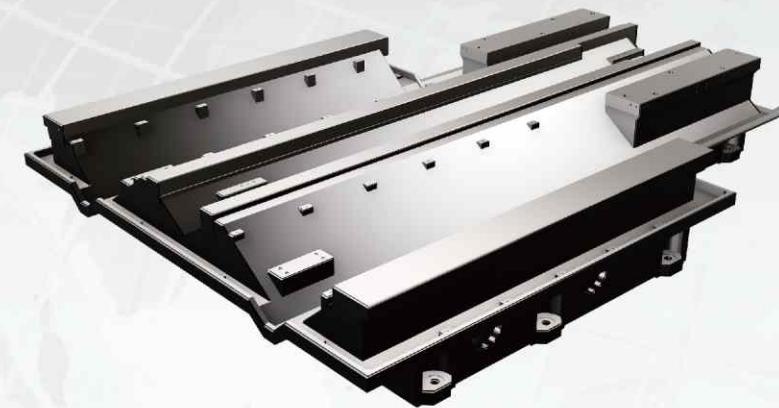
- High-volume chip-removal system comprising dual side augers

## 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-320

■ Spindle: 6,000 rpm Gear type, 18.5kW ■ Cutting material : S45C



#### Face milling

Tool diameter Ø125 mm  
Feed rate 1,300 mm/min  
Cutting depth 4 mm  
Cutting volume 100mm  
Cutting volume 520cc



#### End milling

Tool diameter Ø63 mm  
Feed rate 900mm/min  
Cutting depth 40 mm  
Cutting width 10 mm  
Cutting volume 440cc



#### Tapping

Tool diameter M36 x P4 mm  
Feed rate 480 mm/min  
Cutting depth 40 mm  
Spindle speed 120 rpm



#### Drilling

Tool diameter Ø76 mm  
Feed rate 96 mm/min  
Cutting depth 50 mm  
Spindle speed 400 rpm

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.

## Hartford APP Store

### What is Hartrol Premium?

Hartrol premium 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 Premium 	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

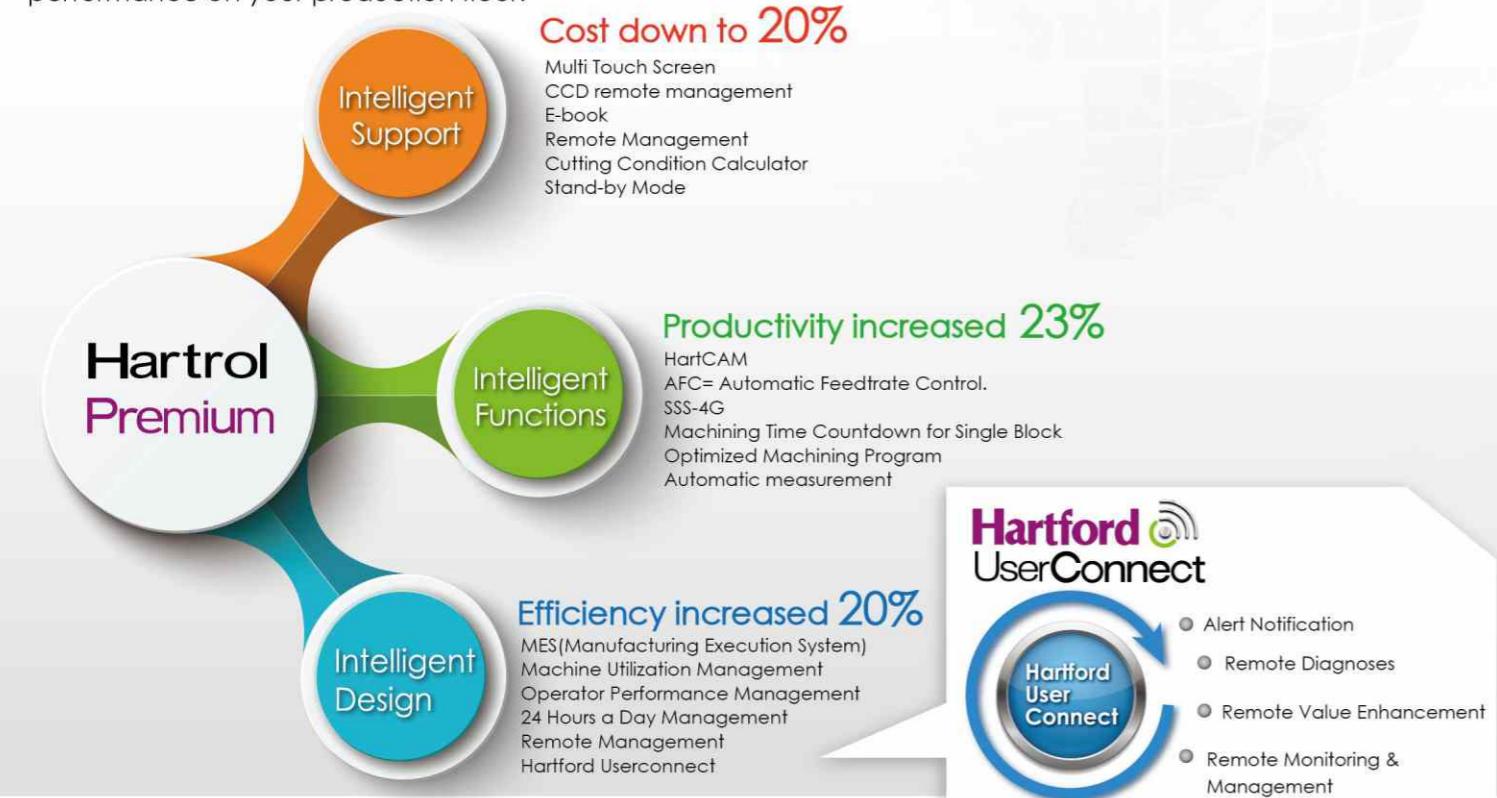


### The Intelligent Controller You Should Have

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.



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.



**EXCLUSIVE**  
**HartrolPlus APP**

### 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

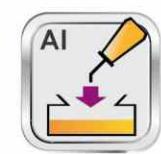
- Intelligent auger automatically proceeds cleaning iron chips based on electrical current of spindle.
- Intelligent auger automatically performing reversal mode in case amount of iron chips outnumbers, preventing from machine stop. Auger is overly shielded



## 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 Hartford 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



## 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.Instant notification to your machine and your portable device

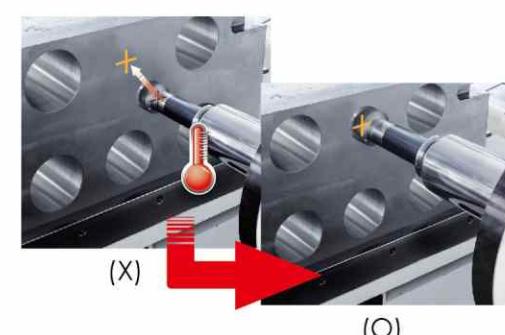


## AFC(opt.)

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

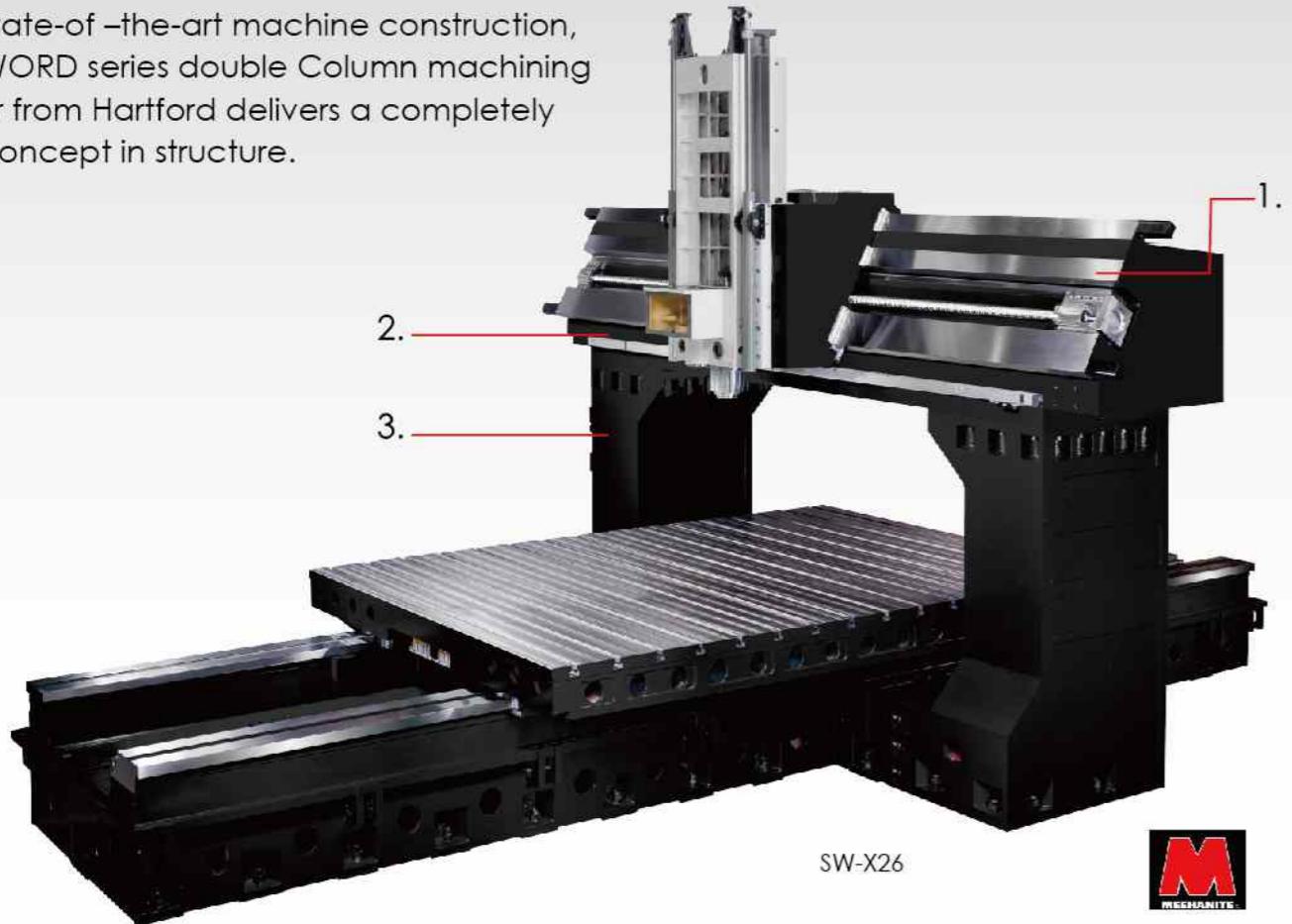
Spindle thermal extension is around 0.10mm

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.



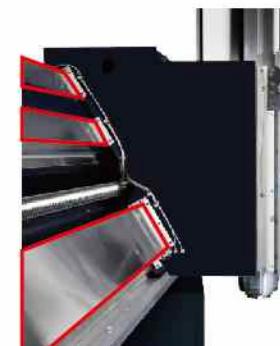
### Full range of box guideway five-year warranty

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.



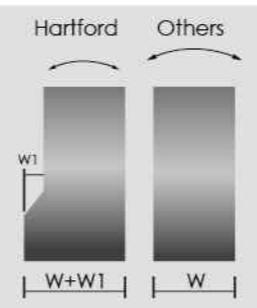
### 2.Slant beam structure

- 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



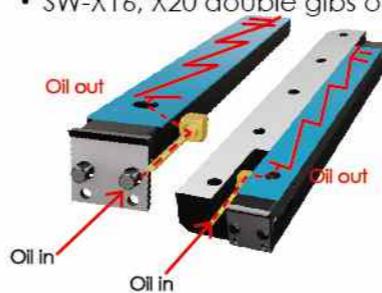
SW-X16



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 gib on Y & Z axis, increases accuracy.
- SW-X16, X20 double gib 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

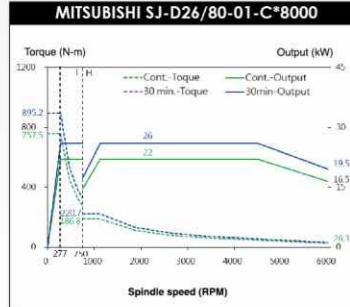
Available with gear-drive or direct-drive spindle head for efficient and powerful machining capability.  
#50 Gear type: 6000/8000 rpm

## BBT for optional

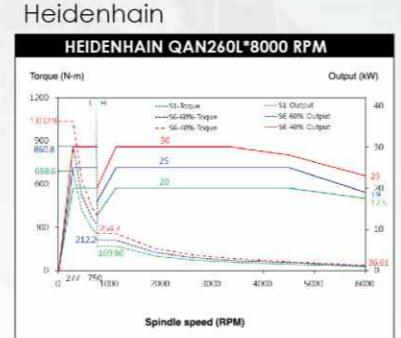
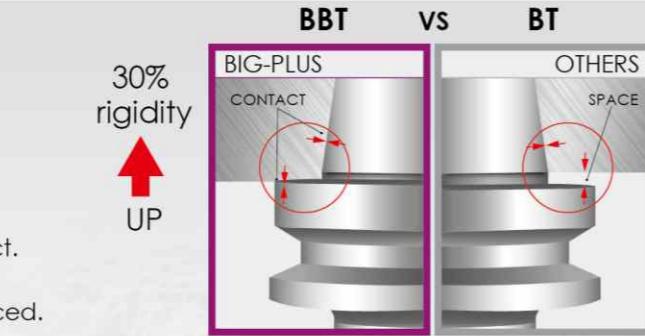
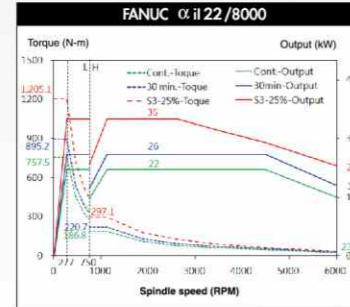
With simultaneously fit of taper and flange to spindle face contact. Improve the rigidity, accuracy, speed and performance. The radial deflection, vibration, deviation all are significantly reduced.

## Spindle torque

Mitsubishi



FANUC



Efficient angular heads increase your cutting productivity

Manual position head applicable to general model SWPRD

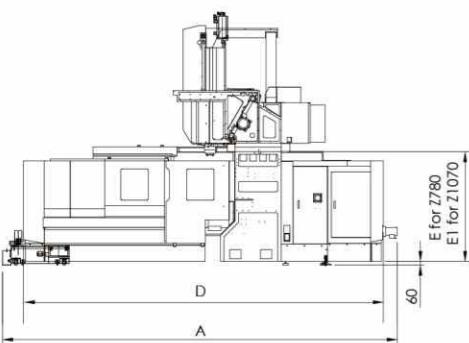


Universal head (manual / semi-automatic)		Manual universal head	Semi-automatic universal head
A-axis : ±110° C-axis : ±180° Maximum speed : 2,500rpm Maximum power:18.5kw The maximum torque to withstand: 650N·m	Binding mechanism	Manual	Manual
	Clamp/unclamping mechanism	Manual	Manual(Hydraulic clamp/unclamp)
	C-axis rotation	Manual	Manual
90° Side milling head (manual / semi-automatic)  Manual 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 90° head	Semiautomatic 90° Head
	Clamp/unclamping mechanism	Manual	Manual
	C-axis rotation	Manual	Manual

Extension head (350/500mm)

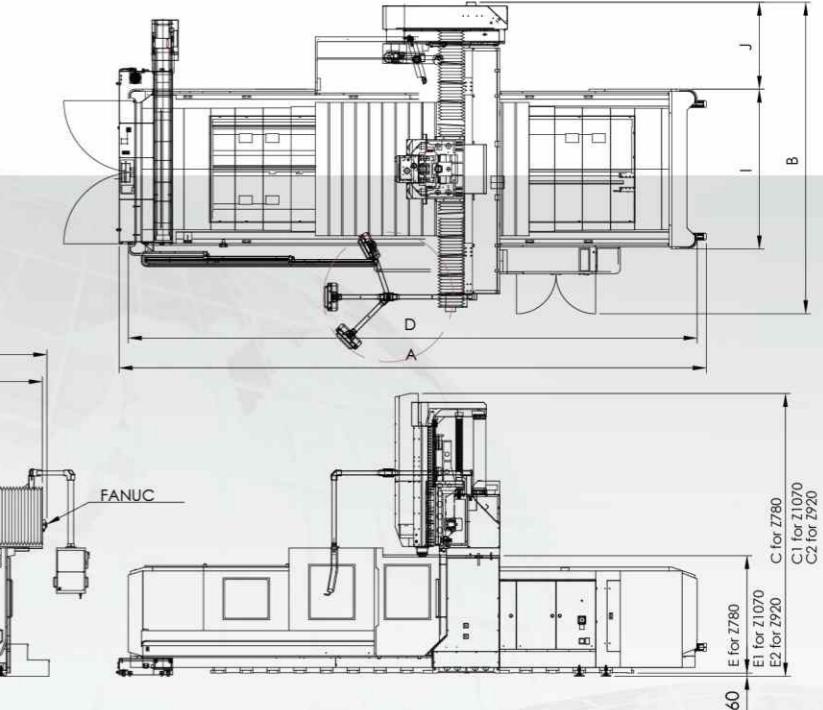
Maximum speed : 4,000rpm  
Maximum power:18.5kw  
The maximum torque to withstand : 650N·m

## 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-316	9400	4893	4363	5313	8800	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-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	15076	5624	4343	5283	-	14896	1900	2200	-	2311	2361	4939	2882	1610
SW-435	11076	5624	4343	5283	-	10796	1900	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	Pitch	A(300mm)	0.025 mm	(⊕)
2		B(300mm)	0.025 mm	(⊕)
3		C(300mm)	0.025 mm	(⊕)
4		D(300mm)	0.025 mm	(⊕)
5		E	0.035 mm	0.0012 (⊕)
6		F	0.035 mm	0.0017 (⊕)
7	Cutting	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	End Milling Accuracy	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	Geometric Accuracy	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	Linear Interpolation Accuracy	DD&AA	0.04 mm	0.0095 (⊖)
26		AA&CC	0.04 mm	0.0055 (⊖)
27		BB&DD	0.04 mm	0.0022 (⊖)

# Specification

ITEM	MODEL	UNIT	SW-216/316	SW-320	SW-323/423/523/623	SW-326/426/526/626	SW-435
Table	Working surface	mm	2000 / 3000 x 1450	3000 x 1830	3000 / 4000 / 5000 / 6000 x 2200	3000 / 4000 / 5000 / 6000 x 2500	4000 x 3000
	T-slot Width X pitch(number)	mm	22x180 (6 / 17)	22 x 250 (12)	28x250(12 / 16 / 20 / 24)	28 x 250(12 / 16 / 20 / 24)	28 x 250 ( 16 )
	Max. load (Average)	kg	7000 / 7500 / 8000	10000	10000 / 12000 / 14000 / 16000	12000/13500/15000 /16500	16000
Travel	X -axis travel	mm	2100 / 2600 / 3100	3100	3000 / 4000 / 5000 / 6000	3000 / 4000 / 5000 / 6000	4000
	Y -axis travel	mm	1600	2000	2300	2600	3500
	Z -axis travel	mm	780 opt. 1070	920 opt. 780 / 1070	780 opt. 1070	780 opt. 1070	780 opt. 1070
Distance from spindle center to column	mm	430	430	430	430	430	430
Distance between two columns	mm	1600	2100	2300	2700	3500	
Distance from Spindle End to Table #50	mm	Z780 : 220~1000 Z1070 : 230~1300	Z780:200~980 Z920:150~1070 Z1070:200~1270	Z780 : 200~980 Z1070 : 200~1270	Z780 : 160~940 Z1070 : 160~1230	Z780 : 300~1080 Z1070 : 200~1270	
Spindle	Spindle nose taper		#50	#50	#50	#50	#50
	Spindle speed(DDS)	rpm	—	—	10000/12000	10000/12000	10000/12000
	Spindle speed(Gear)	rpm	6000	6000	6000	6000	6000
Feed	Cutting feedrate(X/Y/Z)	m/min	7 / 7 / 7	7 / 7 / 7	7 / 7 / 7(323/423) 5/7/7(523/623)	5/5/5	5/5/5
	Rapid traverse rate(X/Y/Z)	m/min	12 / 12 / 15	12 / 12 / 12	12 / 12 / 12(323/423) 8/12/12(523) 6/12/12(623)	10/10/12(326/426) 8/10/12(526) 6/10/12(626)	8 / 10 / 12
ATC	Capacity	pcs	S:20 A: 32/40	S:20 A: 32/40	S:20 A: 32(40)	S:20 A: 32(40)	S:20 A: 32(40)
	Max. tool weight	kg	15	S:15 A:20	S:15 A:20	S:15 A:20	S:15 A:20
	Tool shank		BT50(BBT/CAT/DIN)	BT50(BBT/CAT/DIN)	BT-50(BBT-50/CAT-50/DIN69871A)	BT-50(BBT-50/CAT-50/DIN69871A)	BT-50(BBT-50/CAT-50/DIN69871A)
	Pull stub bolt		P50T-1	P50T-1	MAS-P50T-1/DIN69872A(PD50TA)	MAS-P50T-1/DIN69872A(PD50TA)	MAS-P50T-1/DIN69872A(PD50TA)
	Max. tool size(dia.X length)#50	mm	Ø125 x 350L	S:Ø125x350L A:Ø125x400L	S:Ø125x400Lx15kg A:Ø125x400Lx20kg	S:Ø125x350Lx15kg A:Ø125x400Lx20kg	S: Ø125x350Lx15kg A : Ø125x400Lx20kg
Motor	Spindle drive motor (cont./30 min)	kw	18.5 opt.22/26	18.5 opt.22/26	18.5 / 22 (18.55 / 22 DDS)	18.5 / 22 (18.5 / 22 DDS)	18.5 / 22 (18.5 / 22 DDS)
	3-axis laser positioning accuracy(JIS B6330), without linear scale						
	Positioning accuracy	mm	±0.014	±0.014	±0.014/±0.015/±0.015/±0.015	±0.014/±0.015/±0.015/±0.015	±0.015
	Repeatability	mm	±0.003	±0.003	±0.003	±0.003	±0.003
Positioning Accuracy	3-axis laser positioning accuracy(JIS B6330), with linear scale						
	Positioning accuracy	mm	±0.012	±0.012	±0.012/0.013/0.013/0.013	±0.012/±0.013	±0.013
	Repeatability	mm	±0.003	±0.003	±0.003	±0.003	±0.003
	3-axis laser positioning accuracy(VDI13441)repeat 5 time						
	Positioning accuracy	mm	0.020 / 0.026	0.026	0.026 / 0.028/0.028/0.030	0.026/0.028/0.028/0.030	0.028 / 0.030
	Repeatability	mm	0.016 / 0.022	0.022	0.022 / 0.024 / 0.024 / 0.026	0.022/0.024/0.024/0.026	0.024/0.026
	Required air pressure	kg/cm <sup>2</sup>	6.5	6.5	6.5	6.5	6.5
	Electric power requirement	kVA	35 - 55	40 - 60	45 - 70(323) / 40-70 (423/523) 45-70(623)	40-65(326/426) 40-70(526)45-70(626)	40-65
Other	Machine weight	kg	19000 / 22000	27500	Z780 : 26500/30500/35000/40000 Z1070 : 29000/33000/37500/45000	Z780 : 30900/34900/38900/42900 Z1070 : 34000/38000/42000/46000	Z780 : 46000 Z1070 : 48000
	Floor space	mm	8385 / 10965 x 6055	11073 x 6800	11218 / 13218/15218/17342 x 7000	11500/13500 / 15500 / 17500x 7250	13100 x 7250
	Machine dimension(LxWxH)	mm	Z780 : 6820 / 9400 x 4893 x 4363 Z1070 : 6820 / 9400 x 4893 x 5313	Z780 : 9236 x 5168 x 4303 (Z920 : H4743 / Z1070 : H5243)	Z780 : 9081/11081/13081/15205 x5351x4303	Z780 : 9076 / 11076/13076/15076 x 5624 x 4343	Z780 : 11276 x 6624 x 4638

## Standard & Optional Electrical Functions

### Hartrol / Standard

- Workpiece calibration by mpg directly
- Tool magazine display
- Pop-up calculator (in hartrol screen)
- Parameter package
- Threading cutting (only for Oi and 31i)
- Monitoring of tool status (only for Oi and 31i)
- Character carving macro

### Electrical Function /Optional

- Compensation of temperature displacement
- Lifting Function Against Gravity
- Retraction for Rigid tapping
- Intelligent MPG
- HMI for tool magazine

### Hartnet / Optional

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