

## SW Series Smartcenter

**Intelligent** Double column machining center

- Hartrol plus controller
- 5-year warranty on guideway
- Spindle run-out: 5 micro
- Gear type 8,000rpm spindle
- Column oversized design

**Hartrol Plus<sup>®</sup>**  
From tradition to intelligent



Website



Facebook



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

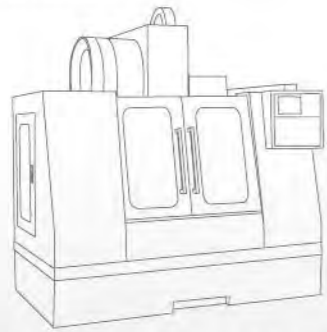
We manufacture intelligent machines only

# What is Smartcenter?

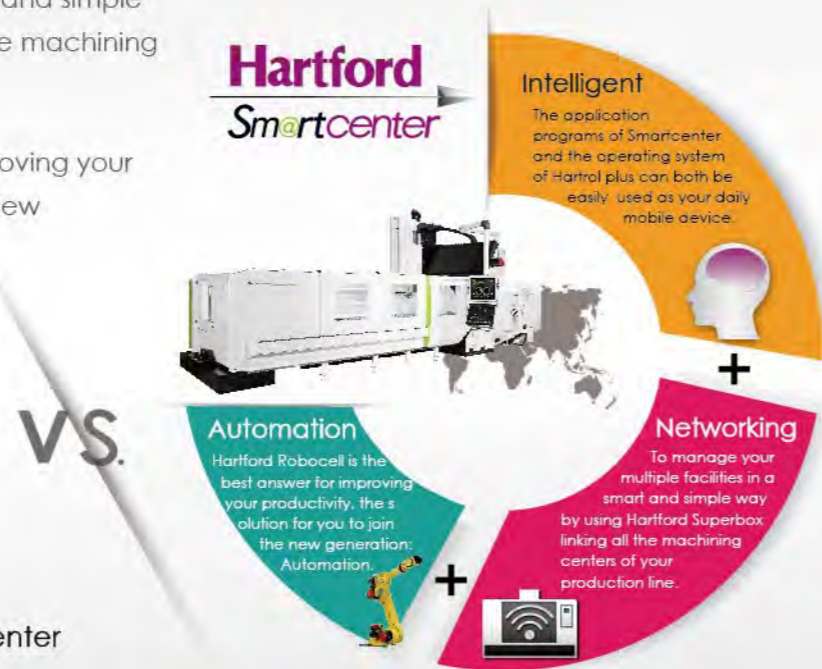
Smartcenter is Smart machining center. To put it simply, an intelligent machining center.

HartfordSmartcenter has three major advantages:

- Intelligent :
  1. Intelligent operating interface / 2. Intelligent machining / 3. Intelligent quality control /
  4. Intelligent maintenance system, to help our customer reach the ultimate goal: Zero Down Time.
- Networking :  
To manage your multiple facilities in a smart and simple way by using Hartford Superbox linking all the machining centers of your production line.
- Automation :  
Hartford Robocell is the best answer for improving your productivity, the solution for you to join the new generation: Automation.

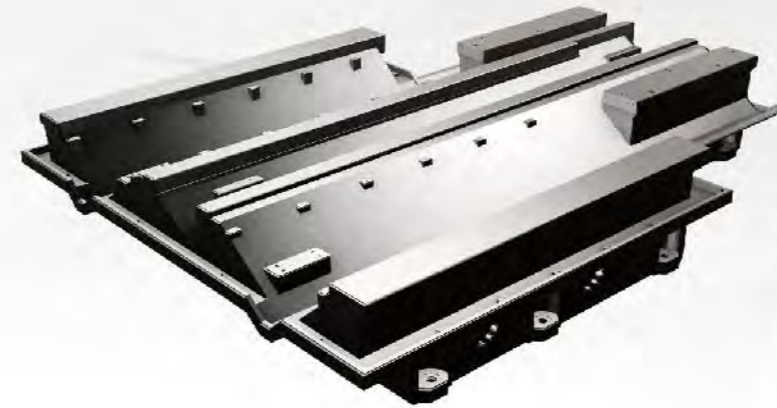


The regular standard machining center



## Powerful Cutting Performance

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

## 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.

Hartford smartcenter APP

set and inspect	ZDT	NCcode Analysis	Machining Time Estimation	Path	Utilization Status	Machining Condition Computing	User connect
Spindle Loading Monitor	AFC	Message Board	Tool Magazine	Calculator	Online E-books	File Transfer	Account Management
Spindle Bearing Diagnosis	HartCAM	CCD	Automatic Door	Broken Tool Detection System	Integrated Information Monitor Screen	Z-direction Thermal Compensation	
Spindle Collision Protection G Sensor	CTS Leakage Detect	i-Factory	Idling Stop	Remote Desk Connection			

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

## 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.

# 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-X16



SW-X23



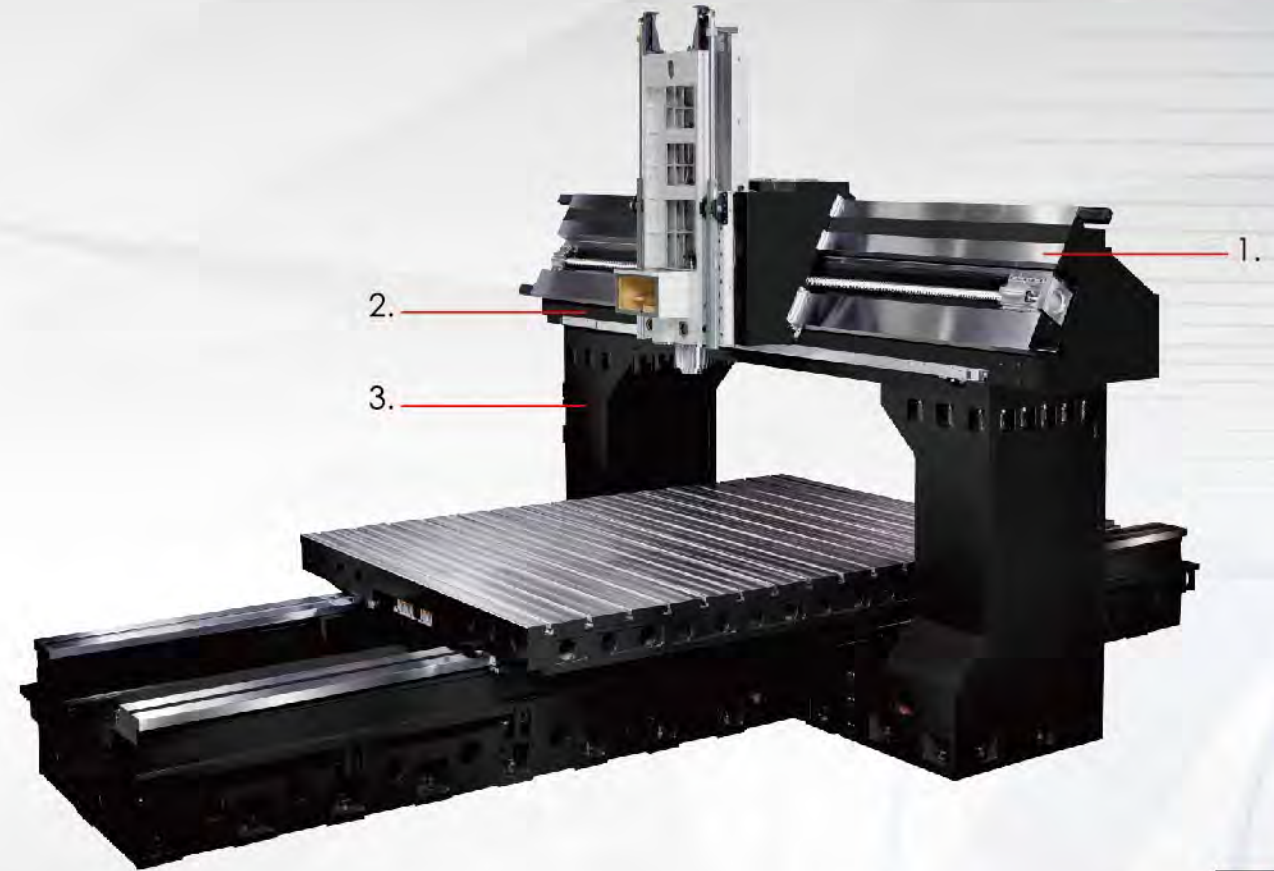
SW-X26



## 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.



The picture show sw-x26

### 1. 3 box guideways on column

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



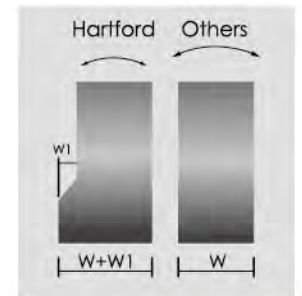
### 2. Slant beam structure

- 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

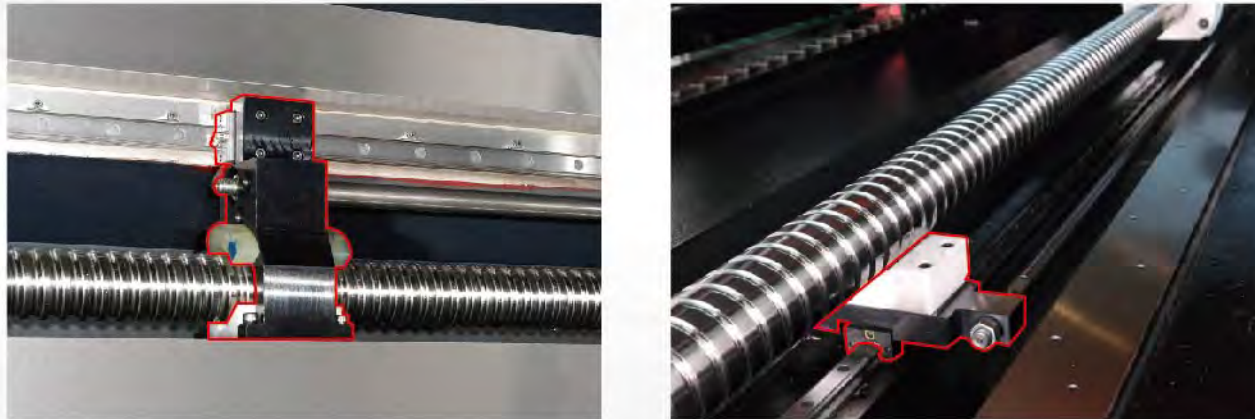
- Provide larger contact surface between column and base.
- Sustaining more cutting force from the spindle.
- Width of contact surface: 1,250mm  
SW-X16: 1,050 mm



# Massive Construction with Optimized Structural

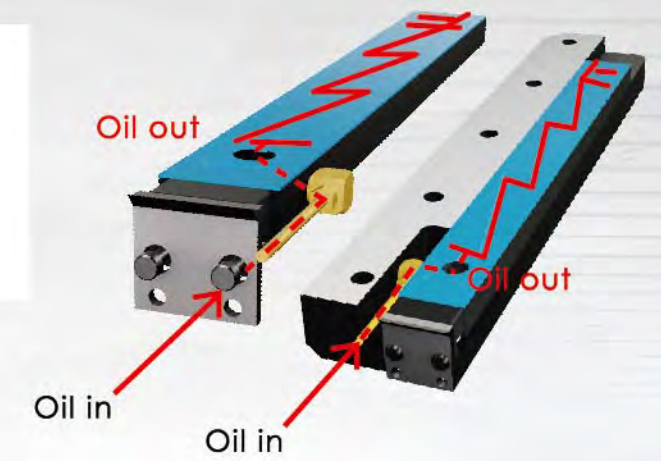
## Ballscrew support mechanism maintains excellent positioning accuracy

- 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 3meters.)
- Y-axis: Optional.



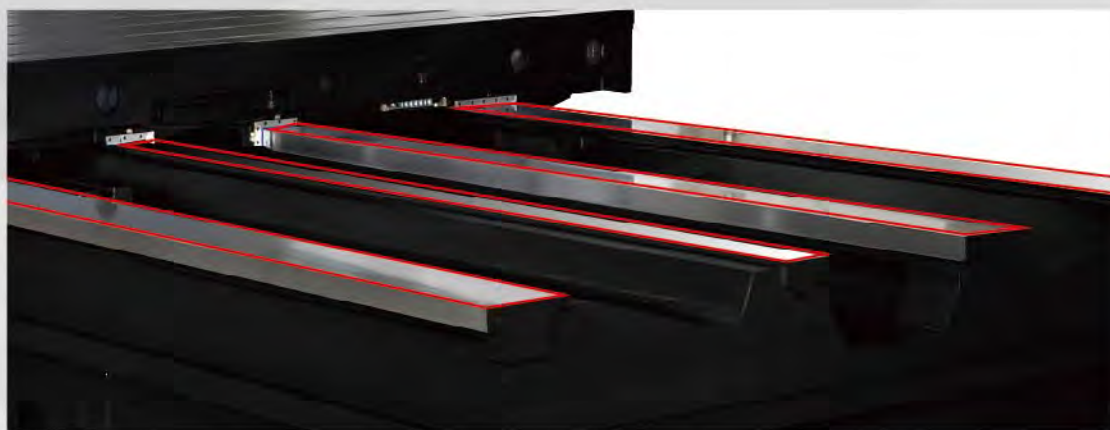
## Taper gib lubrication

- 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



## 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, X23: Two box guideways.



## 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



# Intelligent Controller- **Hartrol Plus**

## 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.

### Cost down to 20%

- Multi Touch Screen
- CCD remote management
- E-book
- Remote Management
- Cutting Condition Calculator
- Stand-by Mode

Intelligent Support

**Hartrol Plus**

Intelligent Functions

### Productivity increased 23%

- HartCAM
- AFC= Automatic Feedrate Control.
- SSS-4G
- Machining Time Countdown for Single Block
- Optimized Machining Program
- Automatic measurement

Intelligent Design

### Efficiency increased 20%

- MES(Manufacturing Execution System)
- Machine Utilization Management
- Operator Performance Management
- 24 Hours a Day Management
- Remote Management
- Hartford Userconnect

**Hartford**   
**UserConnect**



- Alert Notification
- Remote Diagnoses
- Remote Value Enhancement
- Remote Monitoring & Management

## Hartrol Plus 5 Major intelligent Functions

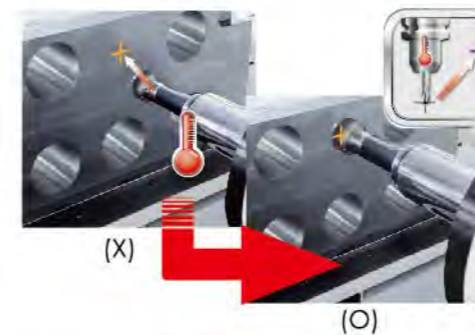
The integrated intelligent functions of Hartrol plus could achieve your machining requirements. For more Hartrol Plus functions, please contact our sales person.



### Hartrol plus Multi-information monitor

Integrated multi-information screen makes your machining much more convenient.

- 1 3 axes Feed rate
- 2 Spindle speed / Tool number / Spindle speed override
- 3 Feed rate Feed rate Override
- 4 Job Machining remaining time / Batch Machining remaining 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



### 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



### Set & Inspect(opt.)

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.Instand notification to your machine and your protable device

## Variety of Hartford Made Spindle Have Quality Assurance

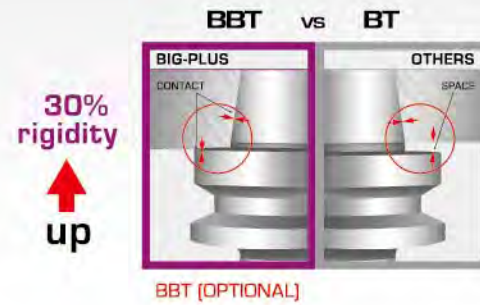
### Spindle type

Available with gear-drive or direct-drive spindle head for efficient and powerful machining capability.

- #50 Gear type: 4000/6000/8000 rpm
- #50 DDS type: 10000/12000 rpm

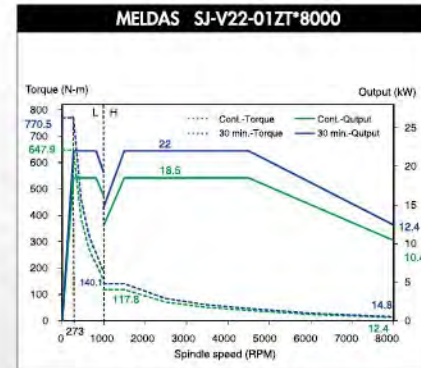
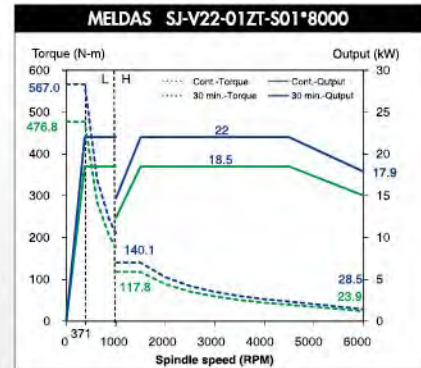
### BBT for optional

- 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.

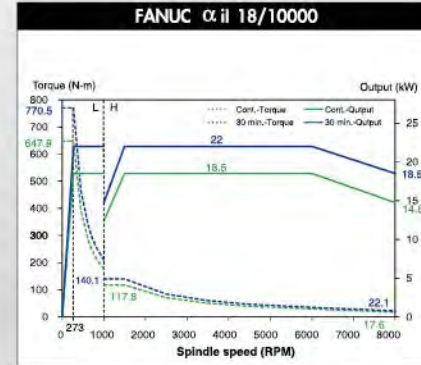
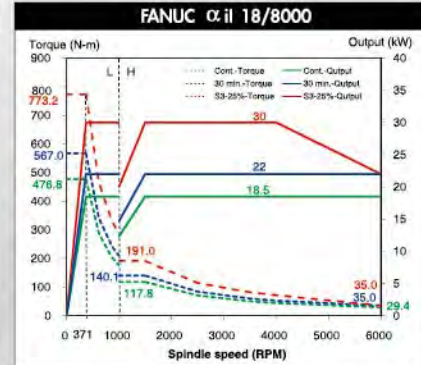


### Spindle torque

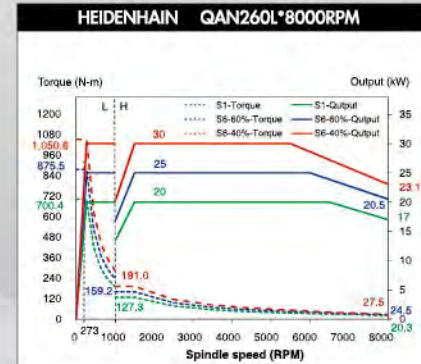
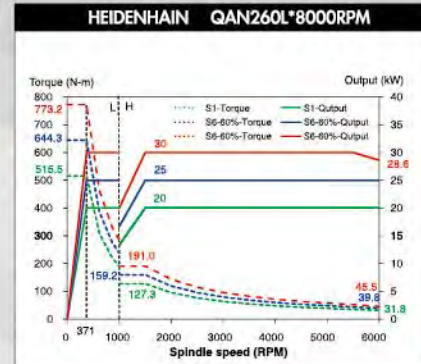
Mitsubishi



Fanuc



Heidenhain



## Efficient angular heads increase your cutting productivity

Manual position head applicable to general model SWORD



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

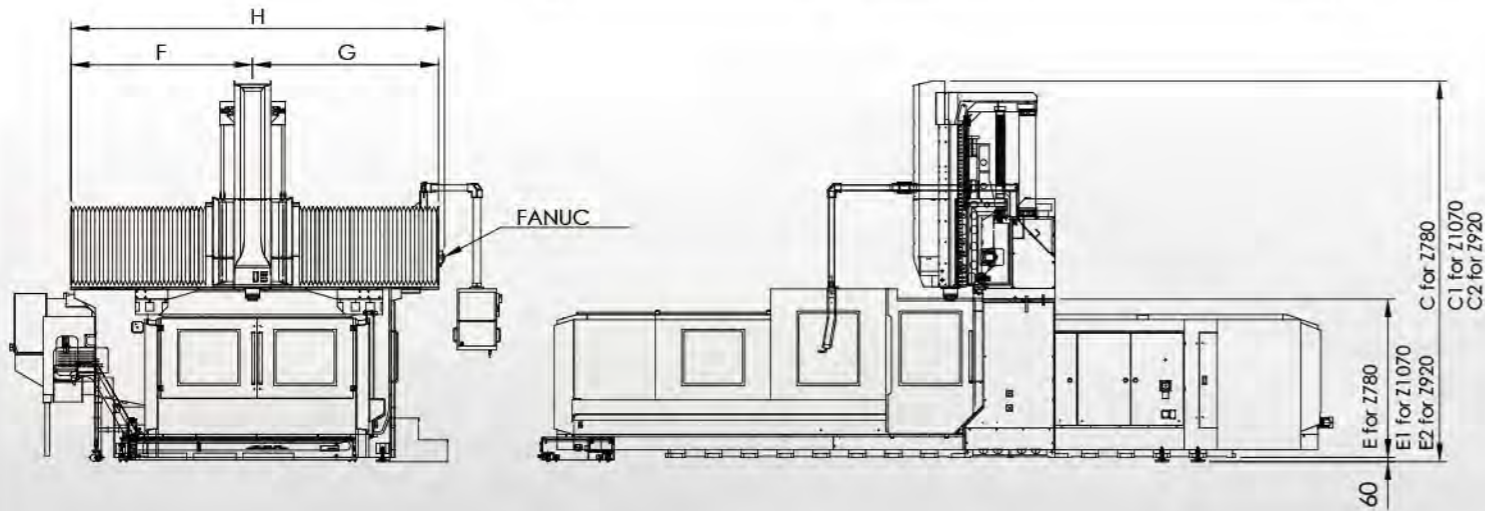
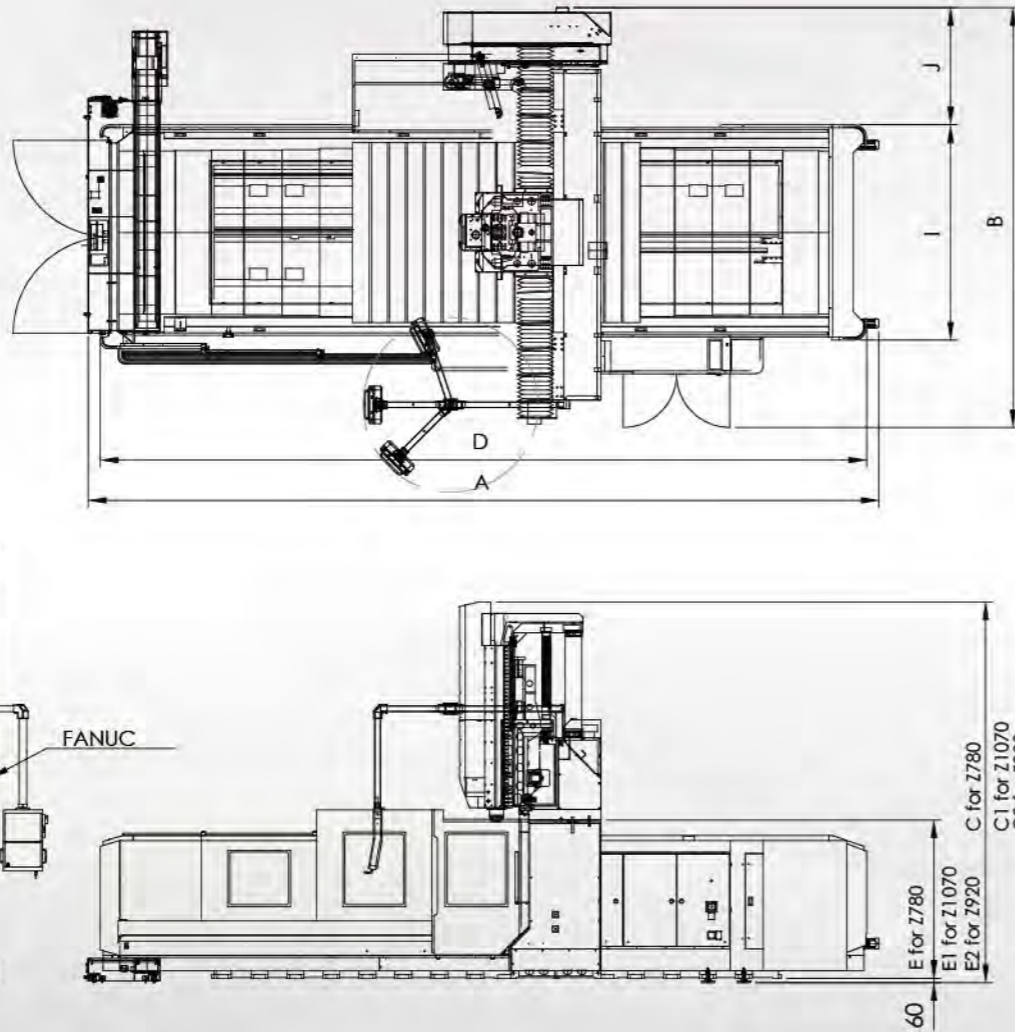


90° side milling head (manual / semi-automatic)		Manual 90° head	Semiautomatic 90° head
Manual tool change (manual / hydraulic lock release tool.) Maximum speed: 2,000rpm Maximum power: 18.5 kW The maximum torque to withstand: 650 N-m	Binding mechanism	Manual	Manual
	clamp/unclamping mechanism	Manual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



Extension head (350 / 500 mm)
Maximum speed: 4,000 rpm Maximum power: 18.5 kW The maximum torque to withstand: 650 N-m

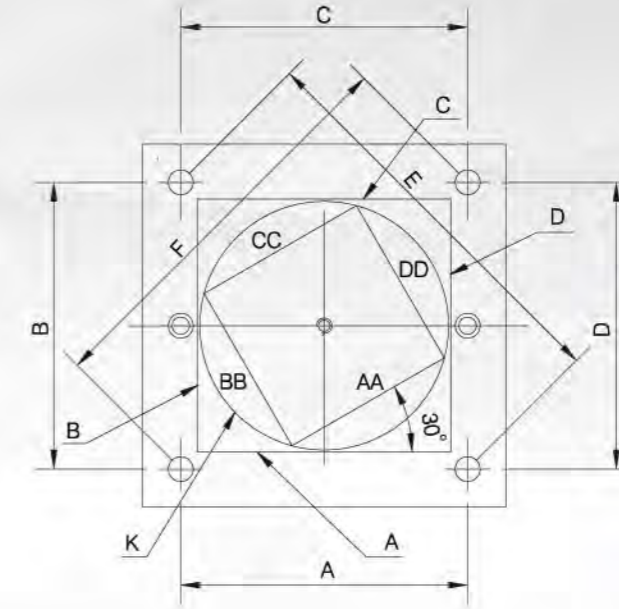
## Machine Dimensions



Unit : mm

MODEL	A	B	C	C1	C2	D	E	E1	E2	F	G	H	I	J
SW-320	9237	5068	4303	5243	4713	8865	1900	2200	2000	2001	2269	4270	2282	1610
SW-420	11237	5068	4303	5243	4713	10865	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	15071	5624	4303	5243	-	14796	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	-	14796	1900	2200	-	2311	2361	4939	2882	1610

## 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	Cutting	K	0.04 mm	(○)	
8	End Milling Accuracy	A	0.015 mm	(—)	
9		B	0.015 mm	(—)	
10		C	0.015 mm	(—)	
11		D	0.015 mm	(—)	
12	Geometric Accuracy	A&B	0.03 mm	(⊥)	
13		B&C	0.03 mm	(⊥)	
14		C&D	0.03 mm	(⊥)	
15		D&A	0.03 mm	(⊥)	
16	A&C	0.03 mm	0.0037	(//)	
17	B&D	0.03 mm	0.0086	(//)	
18	Linear Interpolation Accuracy	AA	0.02 mm	(—)	
19		BB	0.02 mm	(—)	
20		CC	0.02 mm	(—)	
21		DD	0.02 mm	(—)	
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	(//)

# Machine Specifications

MODEL	UNIT	SW-216/316	SW-320/420	SW-323/423/523/623	SW-326/426/526/626
<b>TABLE</b>					
Working surface	mm	2000/3000 x1450	3000/4000x1830	3000/4000/5000/6000x2200	3000/4000/5000/6000x2500
T-slot(size x number x pitch)	mm	22x11/17 x180	22x12/16x250	28x12/16/20/24x250	28x12/16/20/24x250
Max.table load	kg	7000 /8000	10000/12000	10000/12000/14000/16000	12000/13500/15000/16500
<b>TRAVEL</b>					
Longitudinal travel(X-axis)	mm	2100/3100	3100/4100	3000/4000/5000/6000	3000/4000/5000/6000
Cross travel(Y-axis)	mm	1600	2000	2300	2600
Vertical travel(Z-axis)	mm	780(1070 opt.)	920(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 opt.)(200~1270 opt.)	200~980(200~1270 opt.)	160~940(160~1230 opt.)
Distance from spindle center to column	mm	430	430	430	430
Width between column	mm	1600	2100	2300	2700
<b>SPINDLE</b>					
Spindle speed (Gear)	rpm	6000	6000	6000(4000)	6000(4000)
Spindle nose taper		ISO50	ISO50	ISO50	ISO50
<b>ATC</b>					
Tool storage capability	pcs	20(S type)/OPT.32,40,60(A type)	20(S type)/OPT.32,40(A type)	20(S type)/OPT.32,40,60(A type)	20(S type)/OPT.32,40,60(A type)
Max tool weight	kg	15	15	S:15 A:20	S:15 A:20
Max tool size(Diameter x length)	mm	∅125x350L	∅125x350L	S:∅125x350L A:∅125x400L(Opt.)	S:∅125x350L A:∅125x400L(Opt.)
Tool shank		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
<b>FEED</b>					
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
Rapid Traverse(X,Y,Z-axis)	m/min.	12/12/15	12/12/12	X=12,Y=12,Z=12	X=10,Y=10,Z=12
<b>MOTOR</b>					
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.)
X-axis drive motor(Fanuc)	Nm	α iF22(22Nm)/ α iF22(22Nm)/ α iF30(30Nm)/ α iF30(30Nm)	α iF22(22Nm)/ α iF30(30Nm)/ α iF30(30Nm)	SW-323/423: α iF30(30Nm), SW-523: α iF40+F(53Nm),SW-623: α iS60+F(95Nm)	SW-326/426: α iF30(30Nm), SW-526: α iF40+F(53Nm),SW-626: α iF60+F(95Nm)
Y-axis drive motor(Fanuc)	Nm	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)
<b>POSITIONING ACCURACY</b>					
3-axis laser positioning accuracy(JIS B6338)					
Positioning accuracy/full travel	mm	±0.014	±0.014	±0.014/±0.015/±0.015/±0.015	±0.014/±0.015/±0.015/±0.015
Repetitive positioning accuracy	mm	±0.003	±0.003	±0.003	±0.003
3-axis laser positioning accuracy(VDI 3441)/repeated 5 times					
Positioning accuracy	mm	0.020/0.026	0.026/0.028	0.026/0.028/0.028/0.030	0.026/0.028/0.028/0.030
Repetitive positioning accuracy	mm	0.016 /0.022	0.022/0.024	0.022/0.024/0.024/0.026	0.022/0.024/0.024/0.026
VDI 3441 accuracy available upon order request					
<b>OTHERS</b>					
Required air pressure	kg/cm <sup>2</sup>	6.5	6.5	6.5	6.5
Electric power consumption	KVA	50	55	55/55/55/60	60/60/60/60
Machine weight	kg	19500 /22500	27500/31500	26500/30500/35000/40000	30900/34900/38900/42900
Floor space-full guarding	mm	8370/10950x5755	11140/13140x6600	11161/13161/15161/17161x6920	11500/13500/15500/17500 x 7800

## Standard&Optional Electrical Functions

Hartrol/Standard	Hartnet/Optional
<ul style="list-style-type: none"> <li>Workpiece calibration by mpg directly</li> <li>Tool magazine display</li> <li>Pop-up calculator (in hartrol screen)</li> <li>Parameter package</li> <li>Threading cutting (only for 0i and 31i)</li> <li>Tool type display on (only for 0i and 31i)</li> <li>Monitoring of tool status (only for 0i and 31i)</li> <li>Character carving macro</li> </ul>	<ul style="list-style-type: none"> <li>Management system of utilization</li> <li>Machining time countdown</li> <li>Convenient file transfer</li> <li>Production management</li> </ul>
	Electrical Function/Optional
	<ul style="list-style-type: none"> <li>Compensation of temperature displacement</li> <li>Lifting Function Against Gravity</li> <li>Retraction for Rigid tapping</li> <li>Intelligent MPG</li> <li>HMI for tool magazine</li> </ul>

## Standard&Optional Mechanical Accessories

Standard	Optional
<ul style="list-style-type: none"> <li>Full-enclosed splash guard</li> <li>Spindle oil cooler</li> <li>Centralized automatic lubrication system</li> <li>Oil fluid separator</li> <li>Fluorescent lamp</li> <li>Rs-232 interface</li> <li>Air blast through spindle</li> </ul>	<ul style="list-style-type: none"> <li>Leveling bolts and blocks</li> <li>Remote manual pulse generator</li> <li>Convection heat exchanger in control</li> <li>Auto power off</li> <li>Operation finish lamp</li> <li>Stand operator box (SW-X16)</li> <li>Operation manual &amp; electric drawing equipment</li> </ul>
	<ul style="list-style-type: none"> <li>90 Angle head(tool type)</li> <li>Closed loop linear scale positioning system</li> <li>Auto tool length measurement</li> <li>Auto tool length and diameter measurement</li> <li>Auto workpiece measurement</li> <li>Water gun</li> <li>Air gun</li> <li>#50 4000rpm gear spindle</li> </ul>
	<ul style="list-style-type: none"> <li>#50 10000rpm direct spindle</li> <li>#50 12000rpm direct spindle</li> </ul>

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