DHF series

Simultaneous 5 axis Horizontal Machining Center Equipped with a Nodding Head spindle

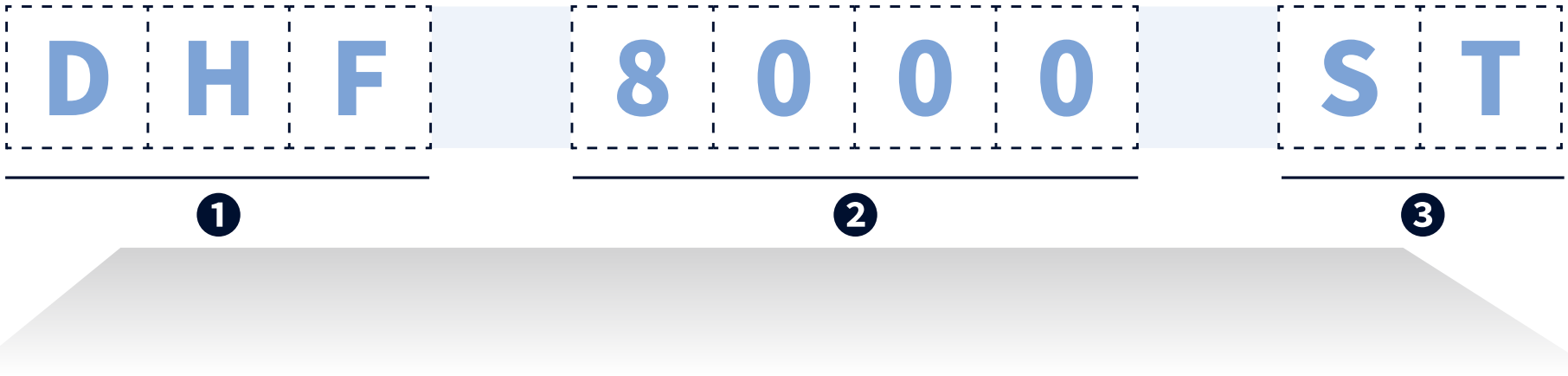
DHF 8000
DHF 8000ST

ver. EN 250808 SU

DN Solutions Marketing & Product Planning Department

MACHINE GREATNESS™

DHF series_Naming rules



❶ Series

- **DHF series**
  - DN Solutions
  - Horizontal
  - Five axes

❷ Pallet size (mm)

= 800

❸ Additional Funtion

- **S : Single pallet**
- **T : Turning**

Internal Use Only

Sales point DHF series SALES POINT

The DHF 8000 with A axis nodding head spindle is a 5 axis simultaneous horizontal machining center with high rigidity structure and dual ballscrews on the X and Y axes.
The DHF 8000 meets the machining requirements of customers ranging from hard materials such as Titanium and Inconel through to high speed machining of Aluminium.

High productivity, single setup with simultaneous 5 axis machining

- **2 Axis Nodding spindle**
  - 6000 r/min Gear box
  - 15000, 30000 r/min built in
- **Travel(X/Y/Z) :** 1450/1200/1500mm (57.1/47.2/59.1 inch)
- **Max Workpiece size :** Ø1400 X h1400mm (55.1 X 55.1 inch)
- **Turning Function :** B-axis 500r/min(DHF 8000ST)

high rigidity & Compact structure

- **Y/Z axes Dual ball screw**
- **Thermal compensation for Spindle & Structure**
- **Cooling system(Bearing, Ball screw shaft)**
- **Linear Scale**

User friendly convenience features

- **Improved rear exit central through chip disposal.**
- **Power Pack, Multi-step TSC**

Internal Use Only

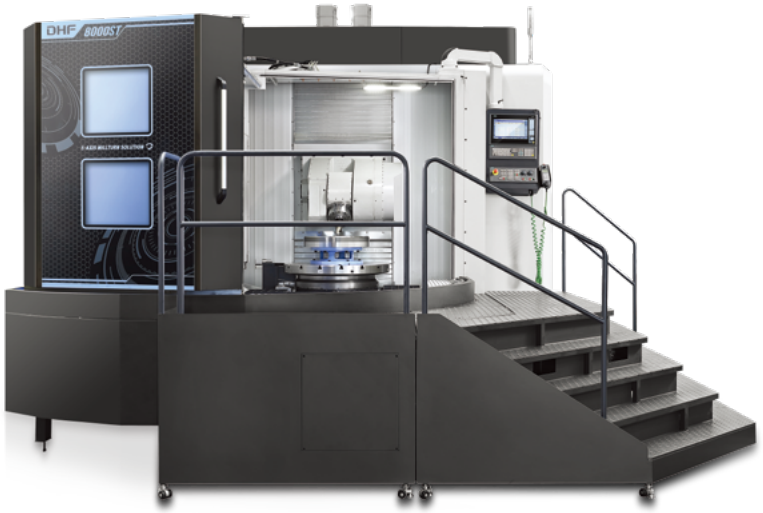
DHF LINE UP

DHF 8000 DHF 8000ST

To handle various complex shapes, we applied the A axis nodding head spindle to achieve simultaneous 5 axis machining.
Dual ballscrews are applied to the X / Y axes for highly stable machining.

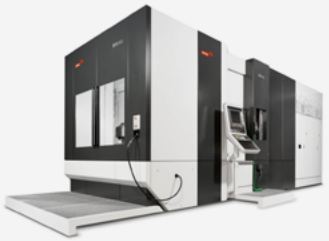
Competitor

- ▶ **Wide stroke**
- ▶ **High Stiffness Spindle**
- ▶ **PALLET SIZE**



Competitors

starrag
STC 800

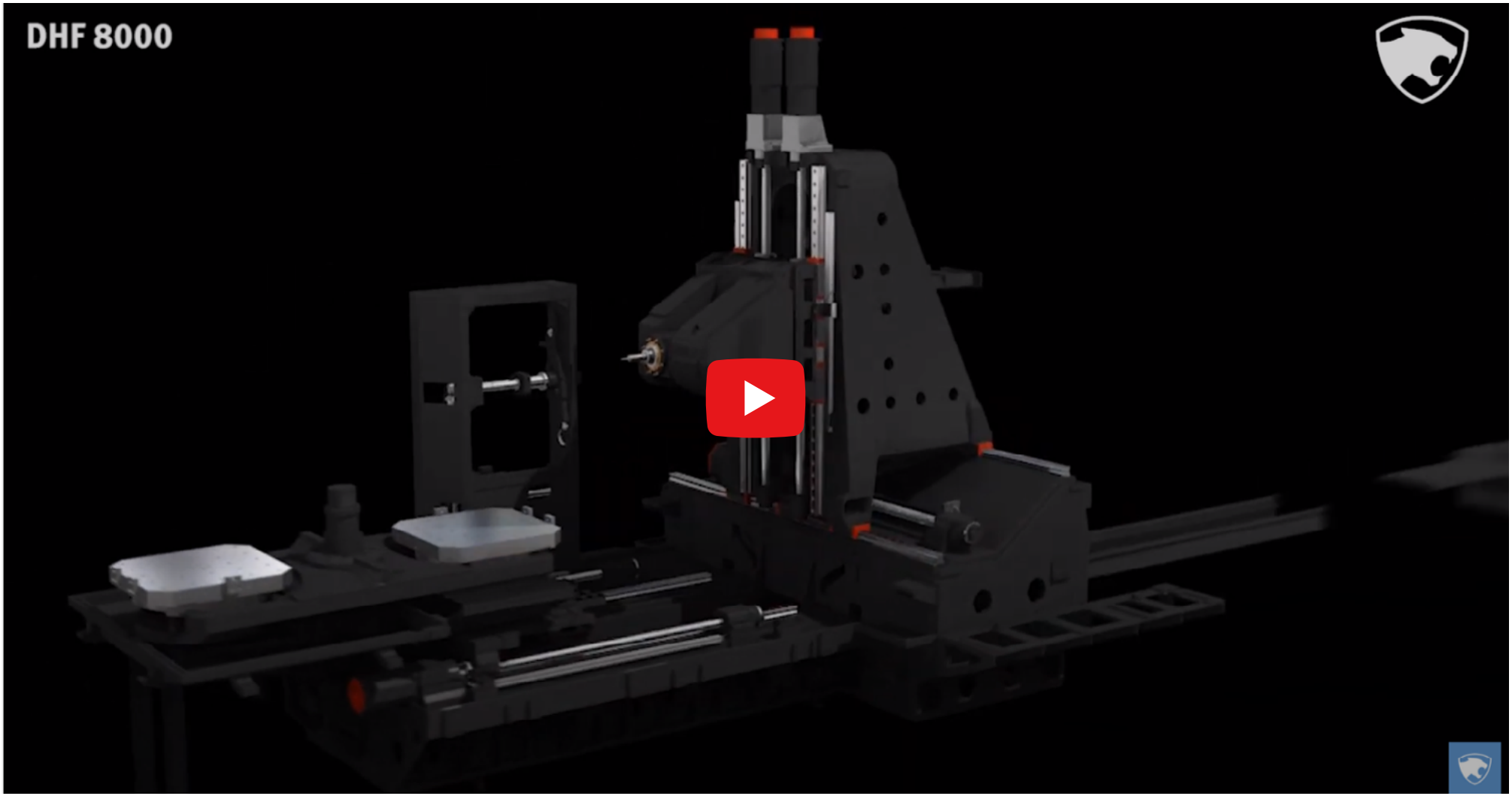


Mazak
INTEGREX i-800V

VORTEX i-800V

Internal Use Only

DHF 8000 Video



Internal Use Only

DHF 8000/ST Sample

Aerospace : 5-axis

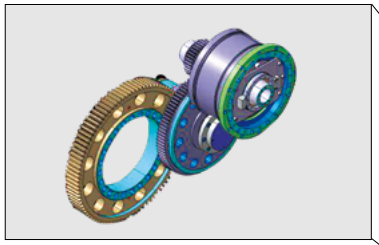
▶ Aerospace component

▶ Titanium Blisk

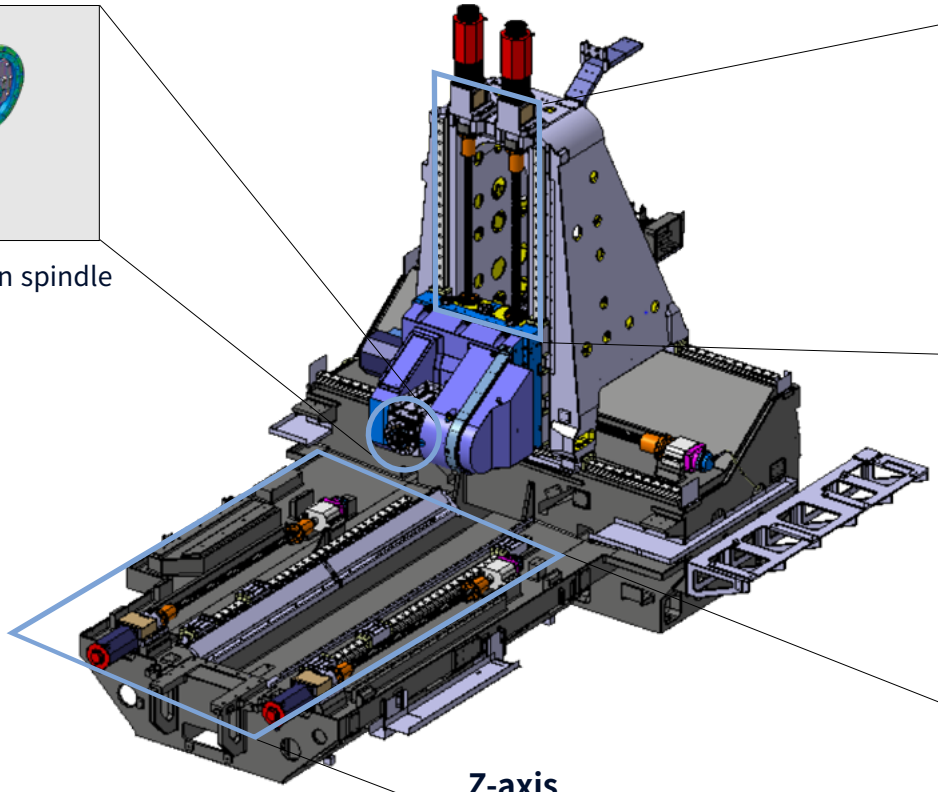
▶ Aero engine case

Internal Use Only

High precision Option



High rigidity gear train spindle head structure



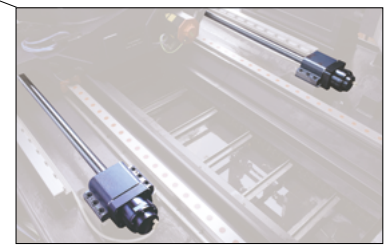
Y-axis > STC 800, Z-axis only

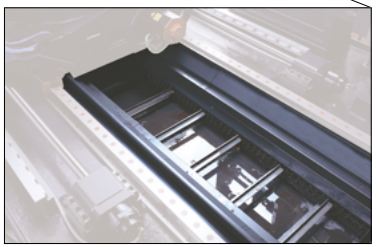
Dual Ball screw benefit

- Stable thermal effect
- Faster speed
- High rigidity & life
- High responsibility

Z-axis

- Ball screw & Bearing cooling
- Linear scale



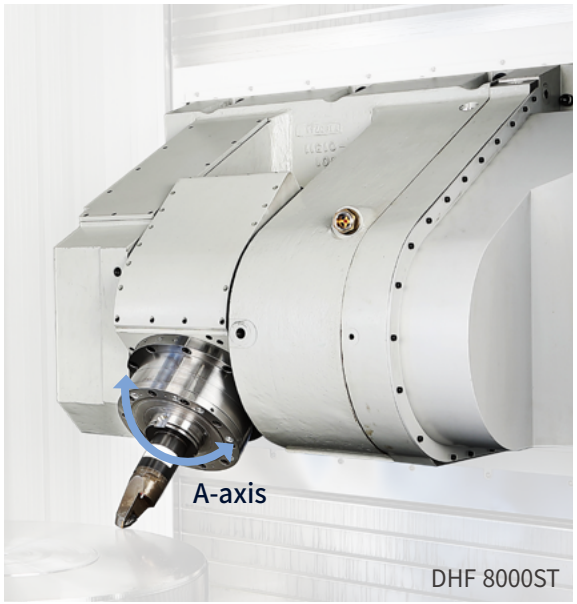


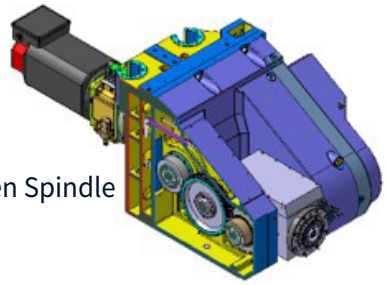
Center through Chip disposal

Internal Use Only

Spindle

Spindle option
6k(Standard)/15k/30k option




Gear driven Spindle

▶ **+60° ~ -100°**

▶ **Gear driven Spindle**

▶ **A axis clamp force : 5000N·m(3690.0 ft-lb)**

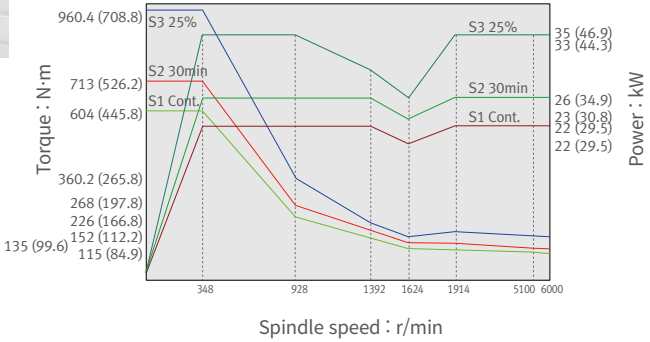
Max. spindle speed
6000 r/min

Max. Torque
960 N·m(708.5 ft-lb)

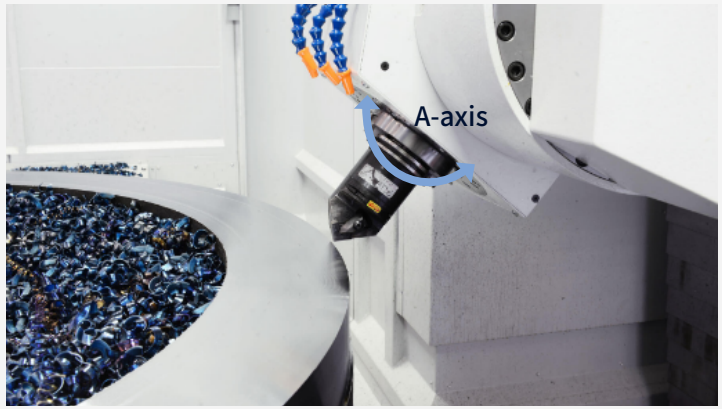
Max. Power
35 kW(46.9 Hp)

A-axis Max. rotating speed
20 r/min

▶ **Compared to Strrag Ouput 94%, Torque 102%**



Competitors
Starrag **STC 800**



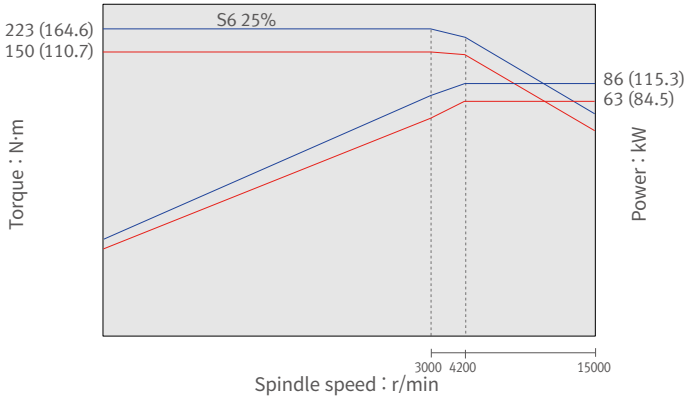
- Max. spindle speed : 8000 r/min
  - Max. Torque : 940 N·m(693.7 ft-lb)
  - Max. Power : 37 kW (49.6 Hp)
  - A-axis Max. rotating speed : 6 r/min
- +60° ~ -100°
- Worm & Worm wheel drive
- A-axis clamp force : 4000N·m (2952.0 ft-lb)

	DN Solutions	Starrag
Max. spindle speed	DHF 8000	STC 800
6000 (Max. Power/Torque)	35/960	37/940
15000(Siemens) (Max. Power/Torque)	86/223	70/230
15000(FANUC) (Max. Power/ Torque)	51/147	X

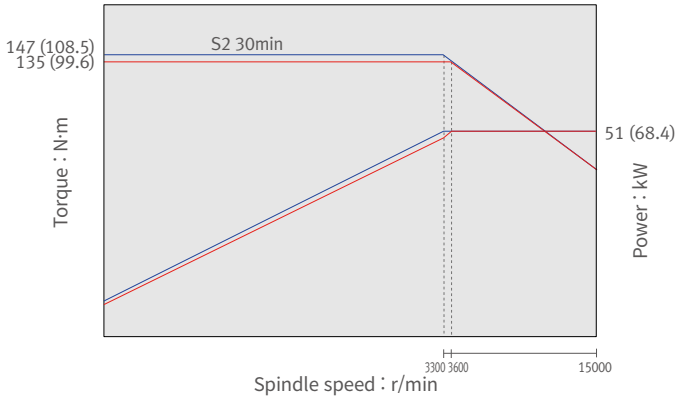
Internal Use Only

Spindle option

▶ 15000r/min



- 15000r/min Siemens (HSK A100)
- 86kW (115.3Hp), 223N·m (164.6 ft-lb)

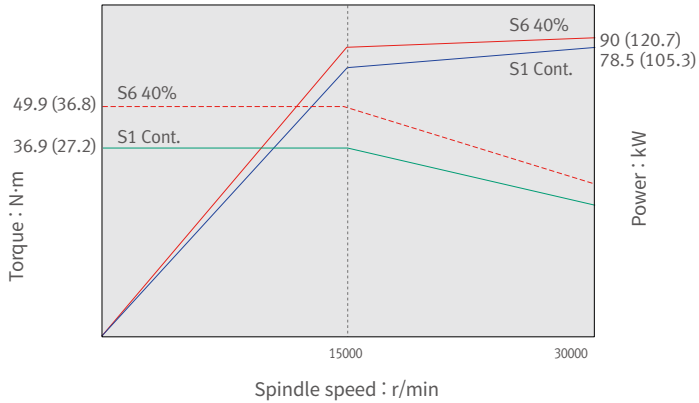


- 15000r/min Fanuc (HSK A100)
- 86kW (115.3Hp), 147N·m (108.5 ft-lb)

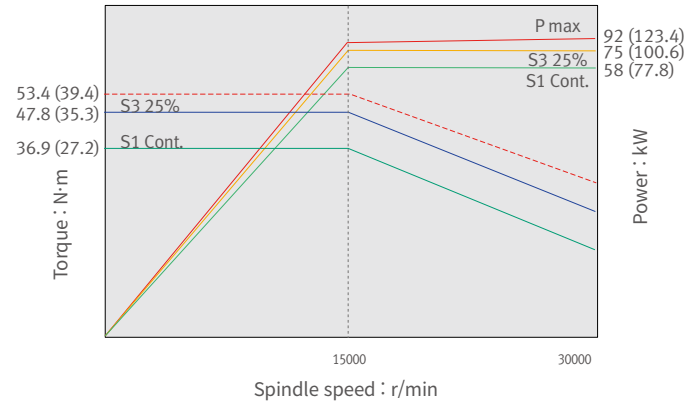
▶ 15k Spindle

- Built-in spindle (HSK100 Only)

▶ 30000r/min



- 30000r/min Siemens (HSK A63)
- 90kW (120.7Hp), 49.9N·m (36.8 ft-lb)



- 30000r/min Fanuc (HSK A63)
- 92kW (123.4Hp), 53.4N·m (39.4 ft-lb)

▶ 30k Spindle

- Built-in spindle (HSK63 Only)

Internal Use Only

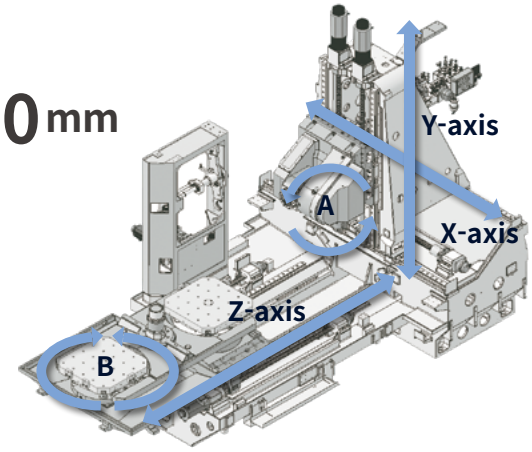
High-rigidity, High-precision Travel

X / Y / Z Travel

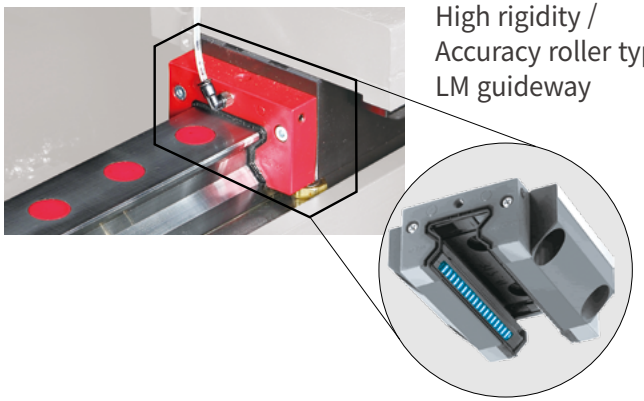
1450/1200/1500 mm
(57.1 / 47.2 / 59.1 inch)

X / Y / Z Rapid

40/40/50 m/min
(1574.8 / 1574.8 / 1968.5 ipm)



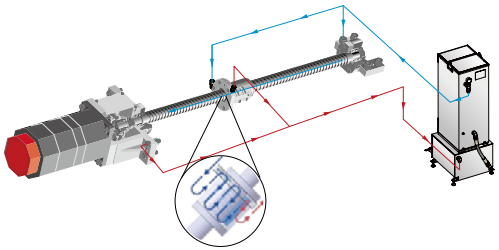
High-rigidity LM



High rigidity / Accuracy roller type LM guideway

Cooling system

- Greatly reduced thermal displacement of ballscrews.



Linear scale

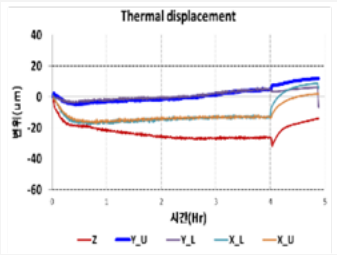
To maintain high precision for long time operation.

Competitors

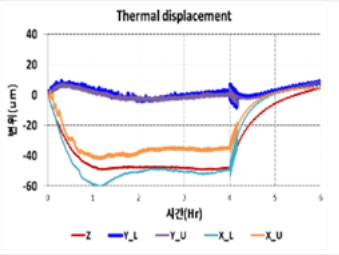
- Thermal displacement

▶ better stability at the same RPM (Before compensation)

DHF 8000

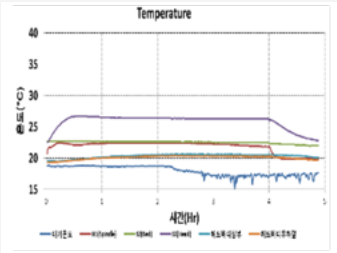


Starrag STC 800

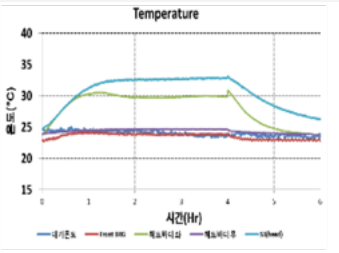


▶ Stable after machine stop

DHF 8000



Starrag STC 800



Internal Use Only

Machining area

Maximizing working area with 800 pallet size

Max. Work size

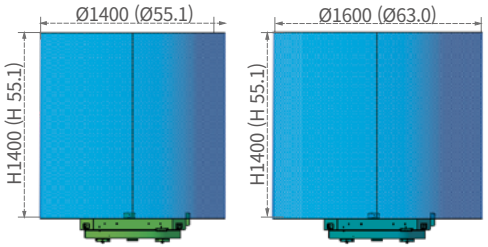
DHF 8000

Ø1400 x H1400mm
(Ø55.1 x H55.1 inch)

DHF 8000ST

Ø1600 x H1400mm
(Ø63.0 x H55.1 inch)

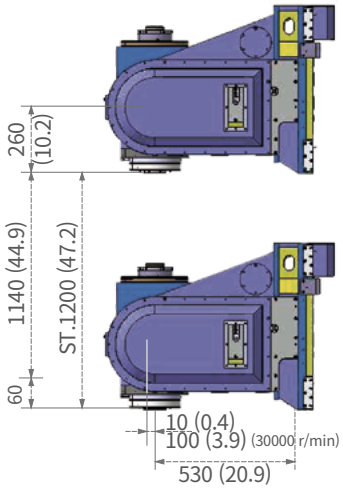
Unit : mm (inch)



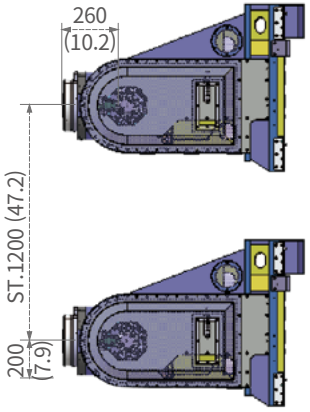
Max. Work weight

2000kg(4409.2 lb)

Vertical



Horizontal

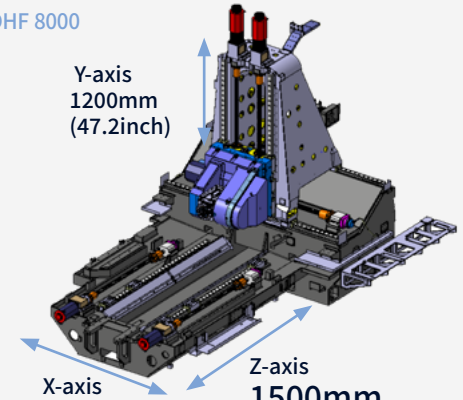


Competitors

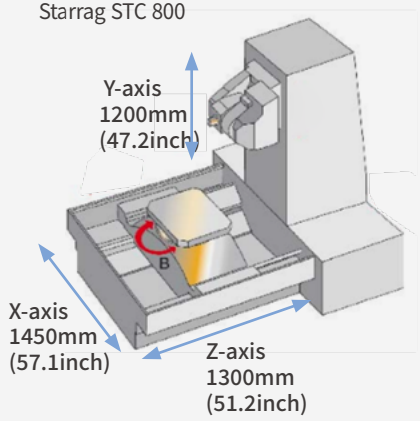
- Stroke

▶ Z axis stroke is 15% wider than competitor

DHF 8000

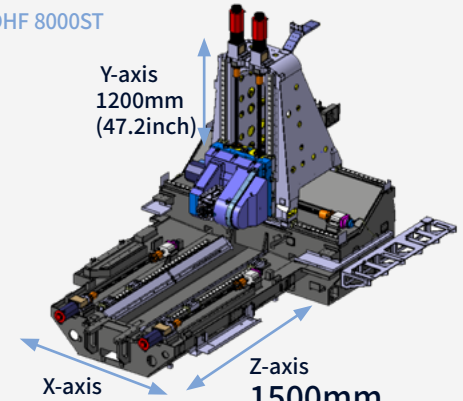


Starrag STC 800

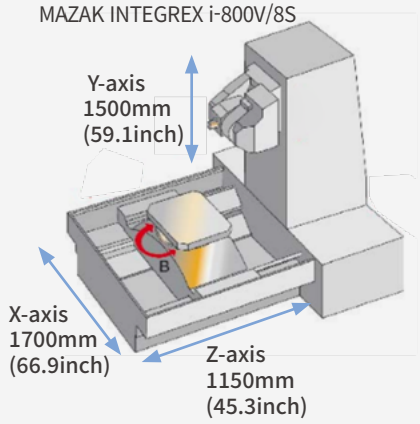


▶ Z axis stroke is 30% wider than competitor

DHF 8000ST



MAZAK INTEGREX i-800V/8S



Internal Use Only

Table

An automatic twin pallet changer is provided as standard. DN Solutions's LPS multi-pallet system is also available.
DHF 8000ST is can process different types of parts.(with turning function)

Pallet size
DHF 8000
800 x 800 mm
(31.5 x 31.5 inch)

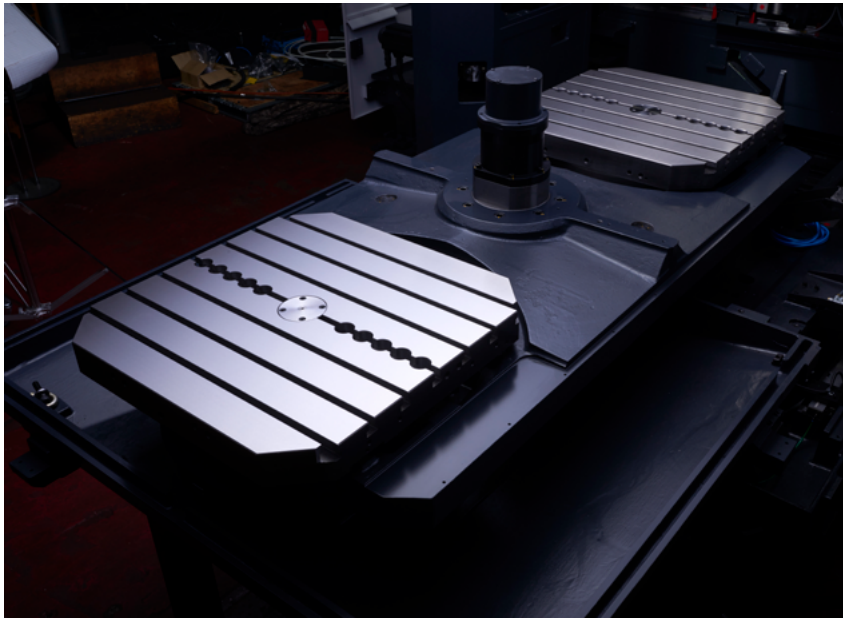
Maximum pallet load
2000 kg
(4409.2 lb)

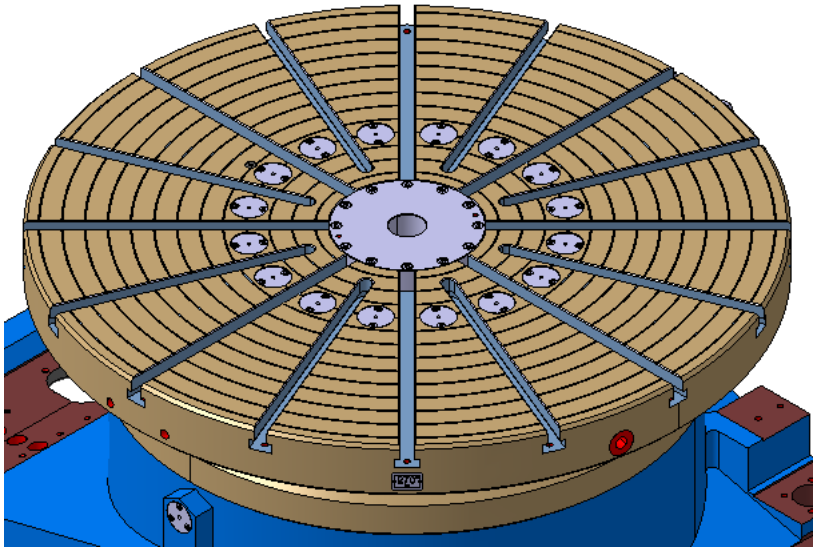
Pallet change time
16 sec

Pallet size
DHF 8000ST
Ø1000 mm
(39.4 inch)

B-Axis rotating speed
500 r/min

• Special option : Ø1000 pallet





Internal Use Only

Magazine

Applied servo type magazine to improve productivity and reliability.

Tool to Tool

3.5 sec

2.4 sec (30000 r/min)

Max tool length

550 mm (21.7 inch)

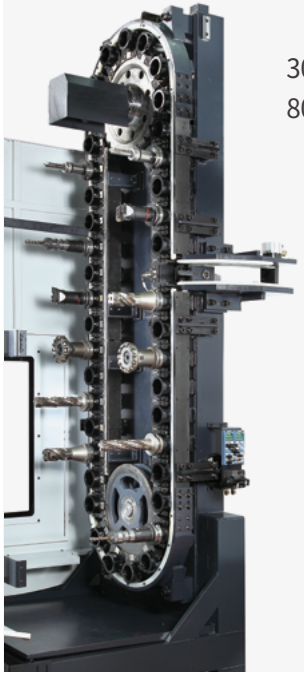
Max tool weight

30 kg (26.5 lb)

12 kg (26.5 lb) (30000 r/min)

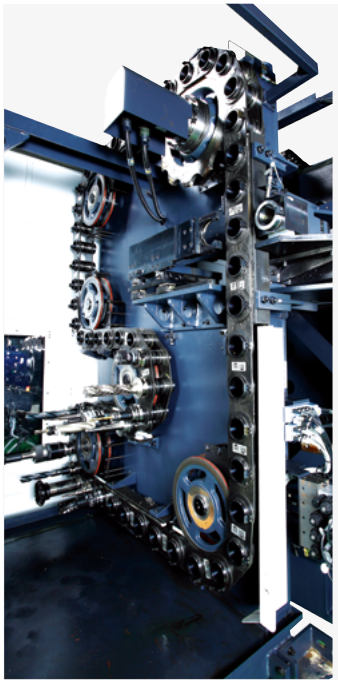
- DHF 8000ST
  Chain type magazine, Matrix type magazine

Port type magazine option



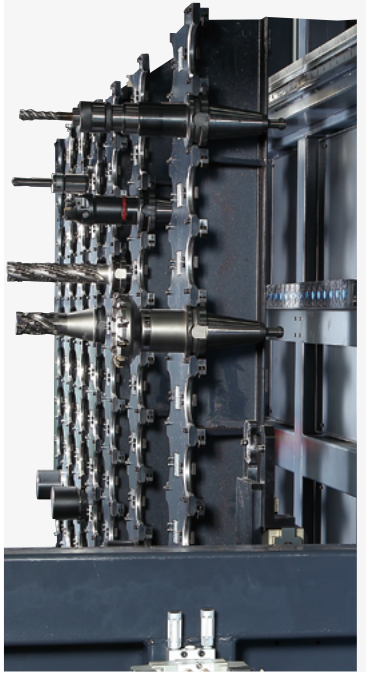
30000 r/min
80 / 120ea

Chain type magazine option



90 / 120 / 150ea

Matrix type magazine option



196 / 256 / 316 / 376ea
30000 r/min
171 / 275ea

Internal Use Only

Survival Test Result

Spindle Survival Test OK

▶ Max rpm 72hours no issue

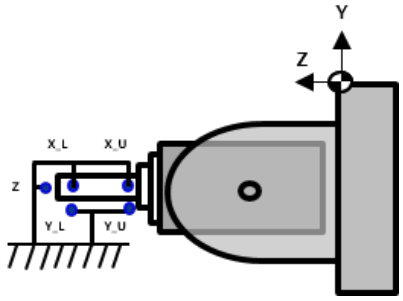


Table Durability OK

▶ **Purpose :** Oil leakage & Durability
▶ **Indexing 15,000Hr**
▶ **Dummy weight :** 2000kg

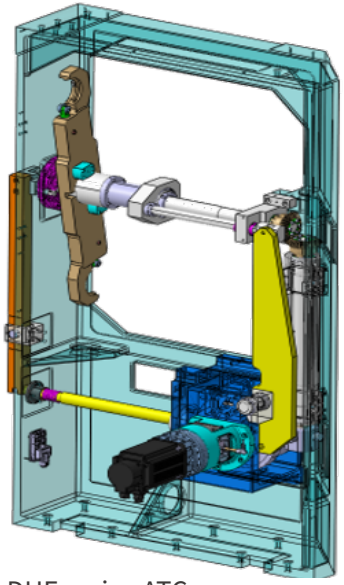
ATC Durability OK

1) CAM
▶ 3,000,000 times

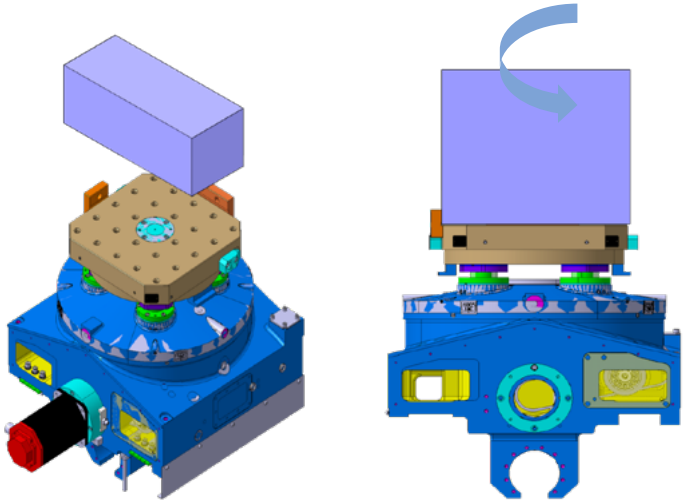
2) Reducer
▶ 1,340,000 times

3) Arm Shaft, Support Housing
▶ After heat treatment 2,130,000 times

4) BAR
▶ 2,760,000 times



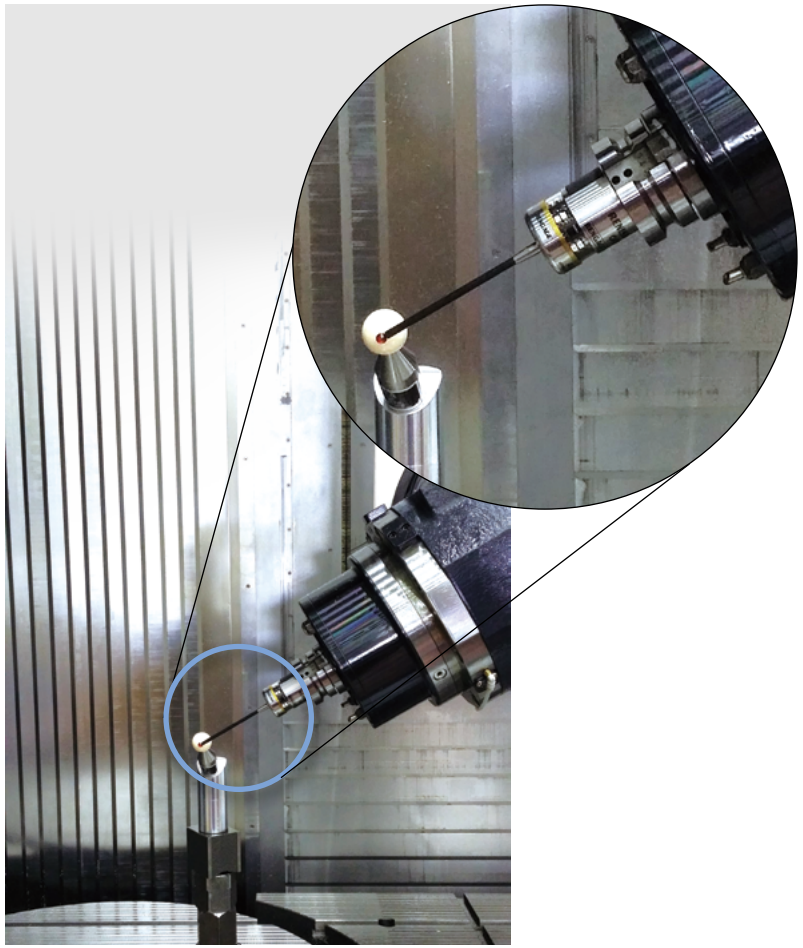
DHF series ATC



Internal Use Only

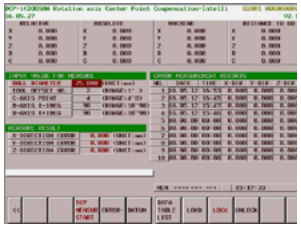
Intelligent Kinematic Compensation for 5-axis option

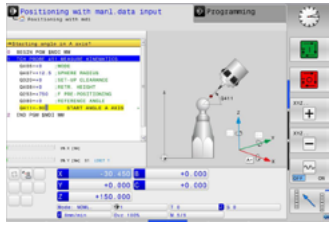
For high accuracy 5-axis machining, Intelligent Kinematic Compensation function is recommended. This function minimizes error in complex 5-axis machining applications by maintaining tip of the tool in correct position in respect to the workpiece. In order to properly utilize this function, the following optional items are required.



Recommended optional items

❶ Software





FANUC NC: DCP-i (Developed by DN Solutions)

CYCLE 996 (SIEMENS NC)

❷ Receiver

❸ Touch Probe

option

❹ Datum ball

option

❺ Master tooll (DHF 8000ST Standard)

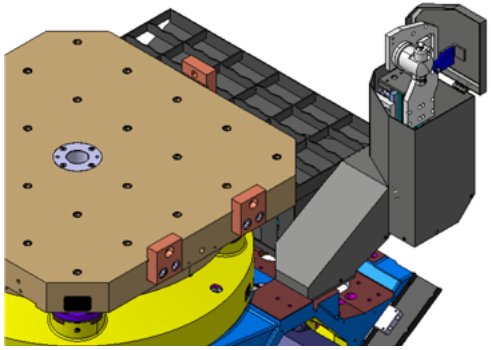
option

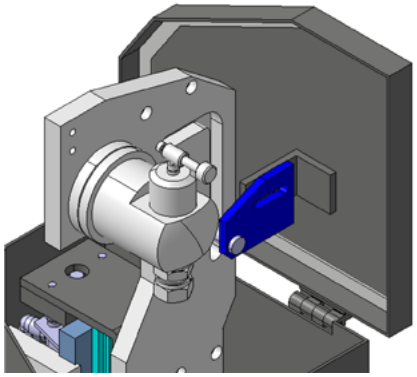
Internal Use Only

Tool Setting System

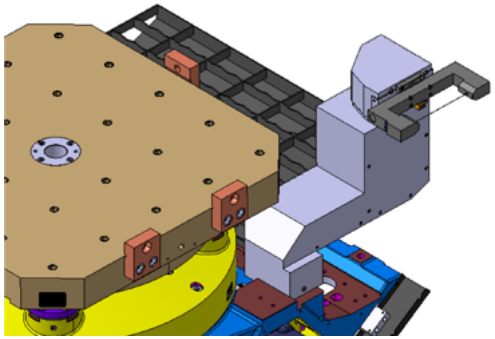
DHF 8000

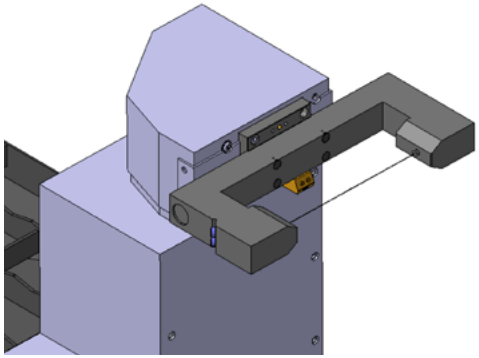
▶Touch type RENISHAW TS27R





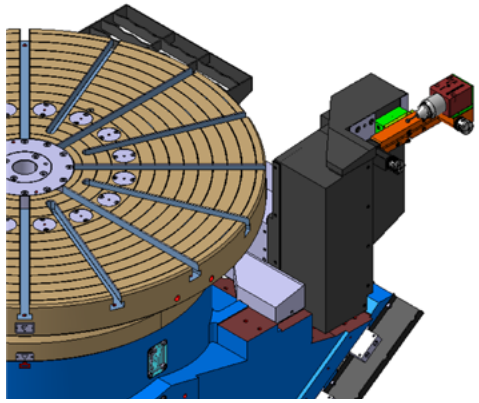
▶ Touchless BLUM LASER MICRO MINI

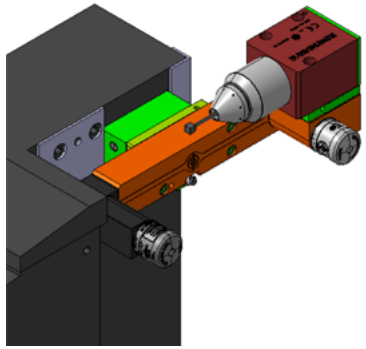




DHF 8000ST

▶ Hybrid type RENISHAW NC4 HYBRID
- Master tool STD.

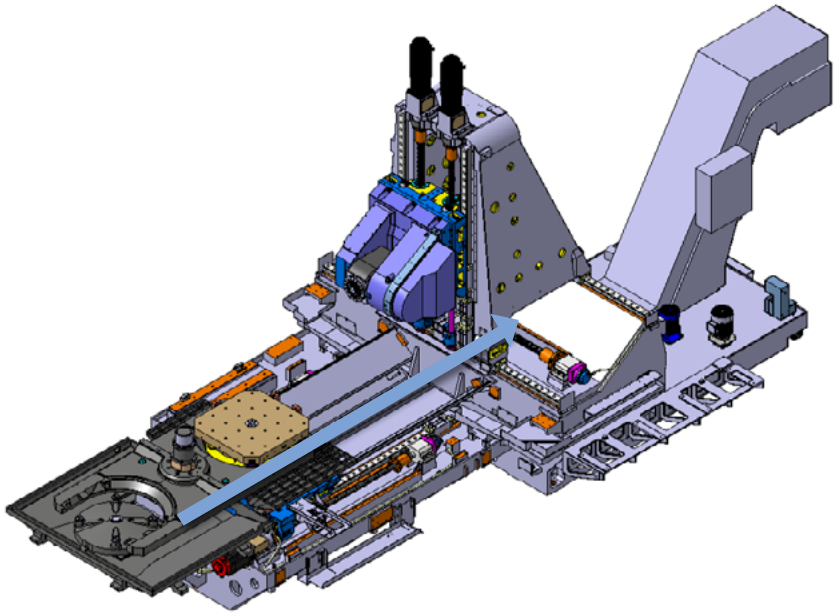


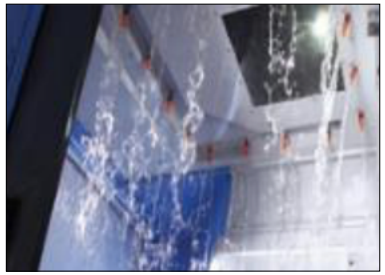


Internal Use Only

Chip Disposal

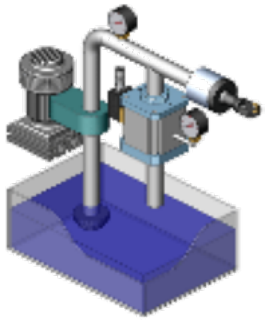
Center through Chip disposal





Top flushing coolant

▶ Improved Chip disposal



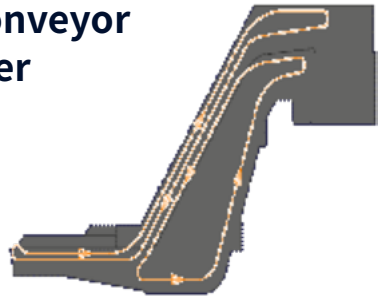
Programmable TSC

▶ Control TSC pressure depends on cutting condition

{10,20,30,40,50,60,70 Bar}

2-step drum Chip conveyor Cyclone & Inline filter

▶ Improved Chip disopsal
▶ Prevent head damage



Internal Use Only

Chip Free Solution(PSC, Programmable Shower Coolant)

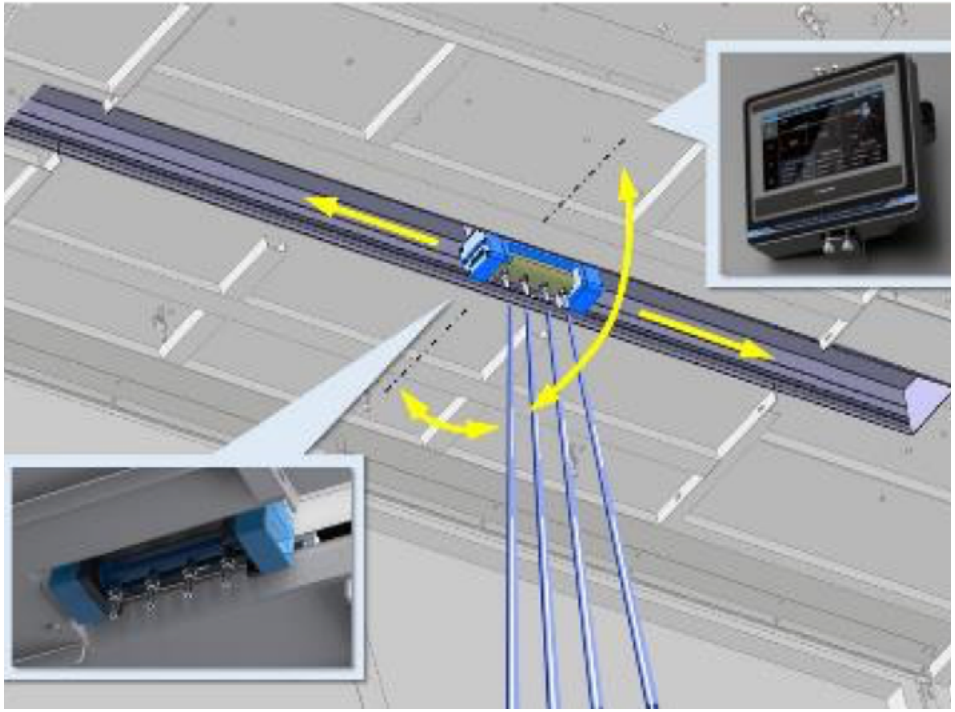
30k

PSC Components

▶Composed of a PSC unit and a separate controller

- Moves to the target point by using the stepping motor and timing belt, and then sprays coolant. Right/left movement Up/downward rotation

▶Pattern program can be created by a separate controller



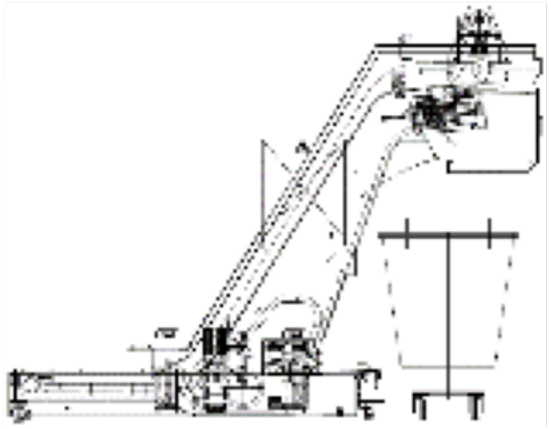
PSC GUI Details

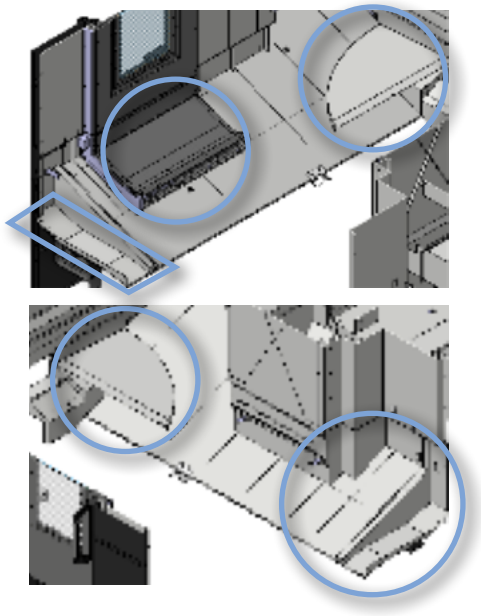
Main structure		Displays the PSC coordinates with the remaining distance, current position, and next position
Manual Operation Pattern Setting		Easy manual operation and pattern creation.
Signal Condition		Displays status of interface signal between machine to allow quick repair, when issue arise
Preferences		Alarm history, language, and parameters can be configured.

Internal Use Only

Chip Disposal Solutions(DHF 8000, 30000 r/min) option

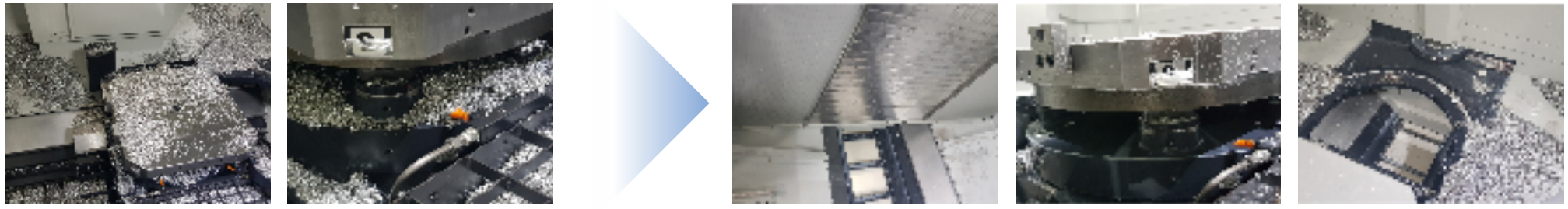
Optimizing for 30k r/min spindle





- ▶ **Coolant flushing : 225 → 370 l/min**
- ▶ **Drum chip conveyor Hinged/Durm type**
  1.4m/min(55.1ipm), 6.8l/min → 1.84m/min(72.4ipm), 10.8l/min
- ▶ **Tank Capacity Max**
  Max. 1050liter, Avr. 830liter → Max. 1570liter, Avr. 1350liter
- ▶ **Splash guard/ Cover / Main door design optimizing for easy chip removal**
- ▶ **Coolant nozzle**
- ▶ **Oil mist collector : 2.2 kW (3.0Hp) → 3.7kW (5.0Hp)**

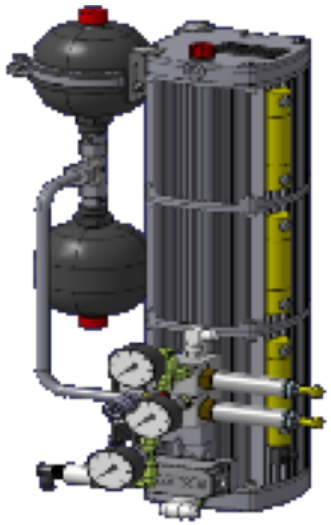
Chip disposal test



Internal Use Only

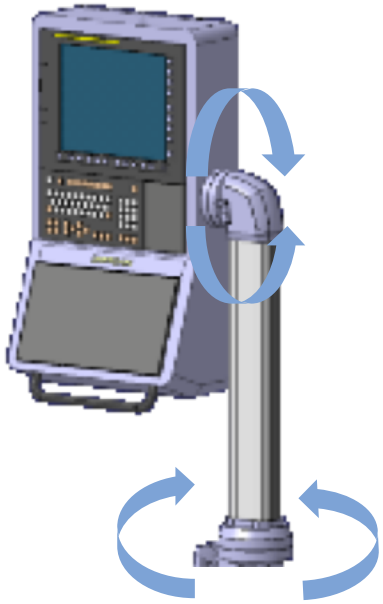
Other Devices

Power pack



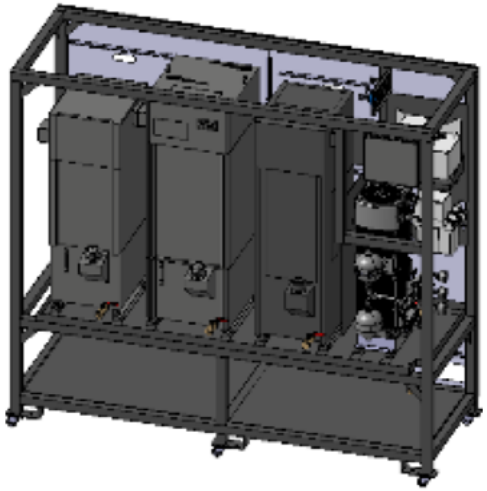
- **Automatic pump off**
  - Energy save & Low noise
- Effective for long time machining

2-axis rotating OP panel



- 2-axis rotating OP panel
- Easy to move units

Movable units



Coolant Chiller

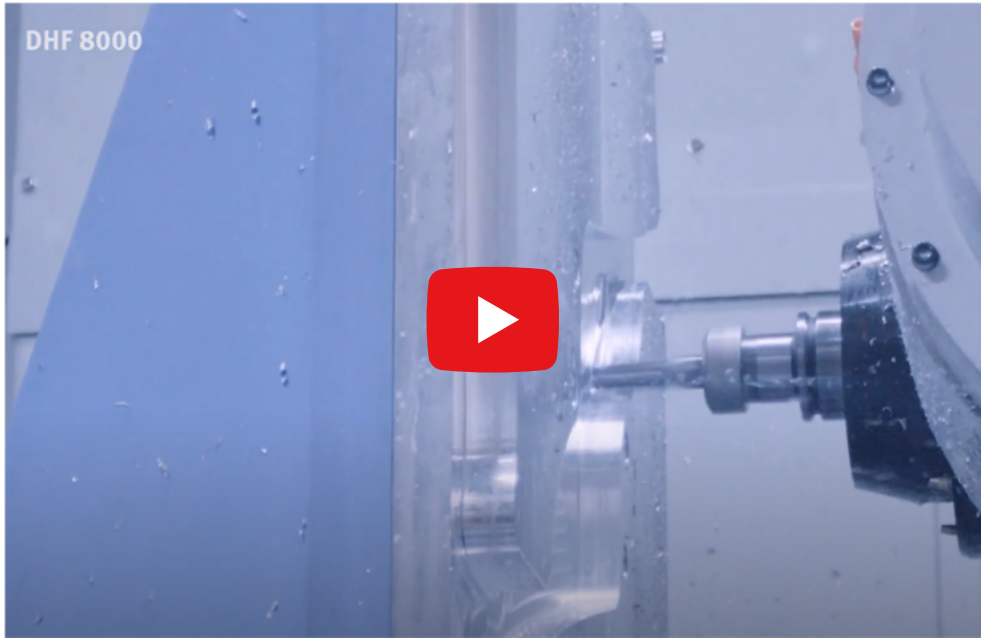
Recommended option

Internal Use Only

DHF 8000ST Video

Internal Use Only

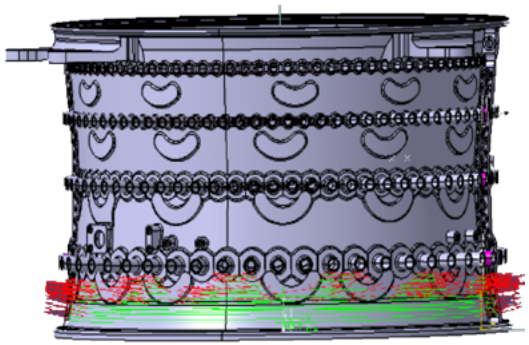
DHF 8000 Video in youtube



Internal Use Only

Real Workpiece

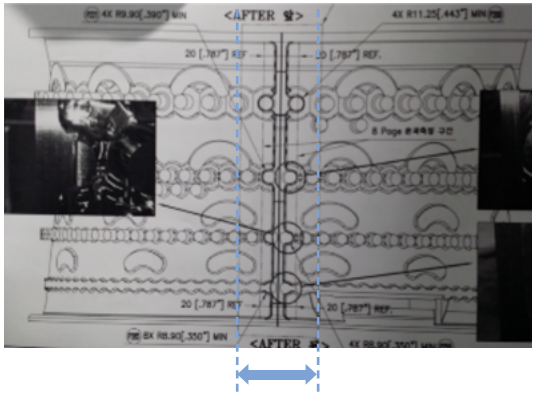
Aircraft Engine Case



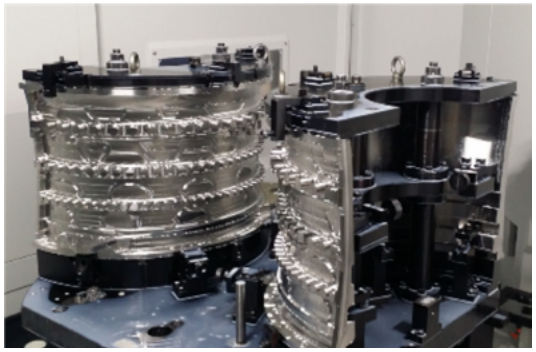
Machining quality at surface in simultaneous 5-Axis Machining

Materials : M152(Stainless affiliation)

- ▶ **Roughing** (Feed : 450mm/min(17.7ipm), 795rpm)
- ▶ **Semi-finishing** (Feed : 500mm/min(19.7ipm), 1910rpm)
  Semi-finishing blade(Feed : 278mm/min(10.9ipm), 1425rpm)
- ▶ **Finishing** (Feed : 70mm/min(2.8ipm), 970rpm)



Machining range



Machining quality at surface in simultaneous 5-Axis Machining

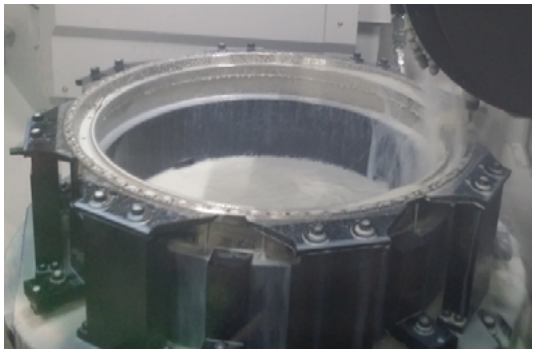
Materials : M152(Stainless affiliation)

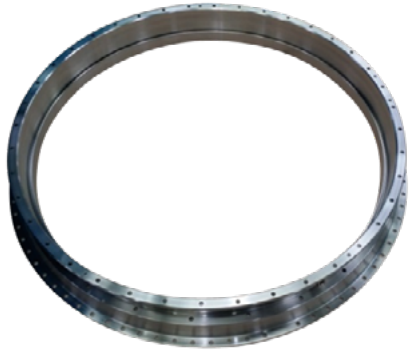
- ▶ **Roughing**
  (Ø16 Insert Mill Feed:120mm/min(4.7ipm), 1500rpm, Dp : 2mm(0.1inch))
- ▶ **Semi-finishing & finishing**
  (Ø16 End mill Feed:200mm/min(7.9ipm), 1200rpm, Dp : 1mm(0.0inch))
- ▶ **Total working time :** 10hr

Internal Use Only

Real Workpiece

Aircraft Engine Case Ring



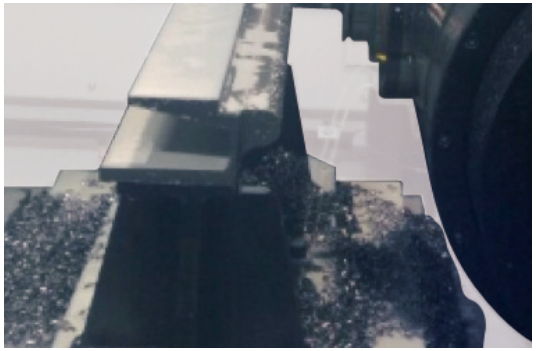


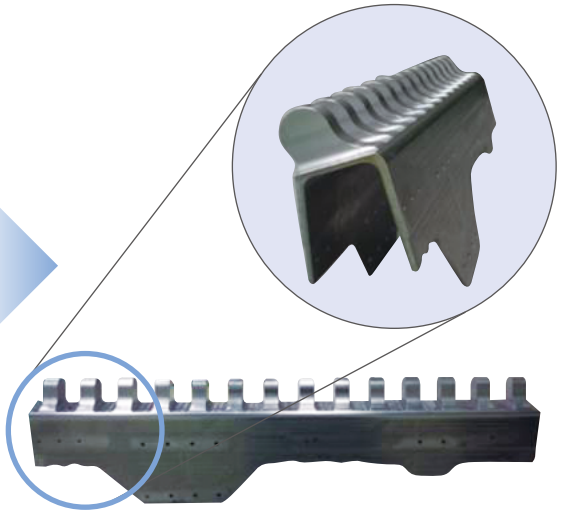
A-90 Top hole, edge boss side shape

Materials : M152(INCONEL affiliation)

▶ **Finishing**

(Ø6.7 drill Feed : 50mm/min(2.0ipm), 700rpm),
(Ø6.95 Ro end mill Feed :
30mm/min(1.2ipm), 200rpm)





Machining quality at surface in simultaneous 5-Axis Machining

Materials : Titanium

▶ **Roughing**

(Ø42.0 Insert Mill Feed:
700mm/min(27.6ipm), 400rpm)

▶ **Semi-finishing**

(Ø20.0 R3.0 End mill Feed:
600mm/min(23.6ipm), 1200rpm)

▶ **Finishing**

(Ø20.0 End mill(45 ° 6) Feed:
150mm/min(5.9ipm), 250rpm)

Internal Use Only

COMPARISON TABLE (DHF 8000)

ITEM		UNIT	DN Solutions	STRARRAG HECKERT	OKUMA	MAZAK		DMG MORI	MAKINO	SNK	Ibarmia
			DHF8000	STC800	MILLAC 800VH	VORTEX i-800/V	VORTEX i-800V/8	DMC 125U	MAGI	CMV 100T	T 16 Extreme
SPINDLE	TOOL HOLDER		BT50 {DIN/CAT 50, HSK-A100}	SK50 {HSK-A100}	BT50	BT50 {DIN/CAT 50, HSK-A100}	BT50	CAT50 / HSK100	HSK-F80	BT50	
	MAX. SPEED	r/min	6000 {15000}	8000 {15000}	10000	10000 {5000, 15000}	10000	6300/9000, 12000/12000/15000	33000	8000 {15000}	7000{10000}
	POWER	kW (Hp)	35 {86,51} (46.9 {115.3, 68.4})	37 {70} (49.6 {93.9})	22/18.5 (29.5/24.8)	30 {30,45} (40.2 {40.2, 60.3})	37 (49.6)	37/54, 44/52/52 (49.6/72.4, 59.0/69.7/69.7)	80 (107.3)	25/22 {35/30} (33.5/29.5 {46.9/40.2})	73/52 (97.9/69.7)
	MAX. TORQUE	N·m (ft-lbs)	960 {223, 147} (708.5 {164.6, 108.5})	940 (693.7)	167 (123.2)	248{525, 118} (183.0 {387.5,) 87.1})	505 (372.7)	1300/700, 288/430/404 (959.4/516.6, (212.5/317.3/298.2)	23.1 (17.0)	600 (442.8)	700{500} (516.6 {369.0})
LINEAR AXIS	STROKE (X/Y/Z)	mm (inch)	1450/1200/1500 (57.1/47.2/59.1)	1450/1200/1300 (57.1/47.2/51.2)	1020/1020/1020 (40.2/40.2/40.2)	1700/1500/1150 (66.9/59.1/45.3)		1250/1250/1000 (49.2/49.2/39.4)	1520/1100/1350 (59.8/43.3/53.1)	1500/1330/1300 (59.1/52.4/51.2)	1600/1300/1200 (63.0/51.2/47.2)
	RAPID (X/Y/Z)	mm (inch)	40/40/50 (1.6/1.6/2.0)	60/60/60 (2.4/2.4/2.4)	30/30/30 (1.2/1.2/1.2)	52/52/52 (2.0/2.0/2.0)		60/60/60 (2.4/2.4/2.4)	50/50/50 (2.0/2.0/2.0)	40/40/40 (1.6/1.6/1.6)	40/37.5/40 (1.6/1.5/1.6)
TABLE	PALLET SIZE	mm (inch)	800 x 800 (31.5 x 31.5)	800 x 800 (31.5 x 31.5)	800 x 800 (31.5 x 31.5)	800 x 800 (31.5 x 31.5)		1000 x 800 (39.4 x 31.5)	800 X 1000 (31.5 x 39.4)	1000 (39.4)	1000 x 1000 (39.4 x 39.4)
	MAX. WORKPIECE SIZE	mm (inch)	Ø1400 x 1400h (Ø55.1 x 55.1h)	Ø1400 x 1400h (Ø55.1 x 55.1h)	Ø1000 x 1170h (Ø39.4 x 46.1h)	Ø1500 x 1500h (Ø59.1 x 59.1h)		Ø1250 x 1600h (Ø49.2 x 63.0h)	Ø1500 x 1500h (Ø59.1 x 59.1h)	Ø1300 (Ø51.2)	Ø1160 x 1450h (Ø45.7 x 57.1h)
	MAX. WORKPIECE WEIGHT	kgf (lbs)	2000 (4409.2)	2000 (4409.2)	1000 (2204.6)	2500 (5511.6)		2000 (4409.2)	13000 (28660.1)	2000 (4409.2)	6000 (13227.7)
ATC	TOOL MAGAZINE CAPACITY	ea	60 {90, 120, 150, 196~376}	60 {80, 180}	80	43 {80, 120, 180, 240, 348}		63 {123/183/ 273/363/453}	120T	40	60 {120/240/360}
	TOOL LENGTH	mm (inch)	550(21.7) (BT)/ 630(24.8) (HSK)	550(21.7) (BT)/ 630(24.8) (HSK)	400 (15.7)	650 (25.6)				500 (19.7)	450 (17.7)
	TOOL WEIGHT	kg (lb)	30 (66.1)	35 (77.2)	20 (44.1)	30 (66.1)				20 (44.1)	20 (44.1)
	TOOL MOMENT	N·m (ft-lbs)	34.3 (25.3)	50 (36.9)	14.7 (10.8)						
	TOOL DIA.	mm (inch)	125/320 (4.9/12.6)	125/325 (4.9/12.8)	125/200 (4.9/7.9)	125/300 (4.9/11.8)		110/200 (4.3/7.9)		110/232 (4.3/9.1)	125/250 (4.9/9.8)

* { } : option

Internal Use Only

COMPARISON TABLE (DHF 8000ST)

ITEM		UNIT	DN Solutions		STRARRAG HECKERT	MAZAK		DMG MORI	
			DHF8000	DHF8000ST	STC800	INTEGREX e-1250V/8(Milling)	INTEGREX e-1250V/8(Turning)	DMC 125U	DMC 125P
SPINDLE	DRIVE TYPE		Two-step gear		Two-step gear	Built-in		Built-in	
	TOOL HOLDER		BT50	HSK-100T	SK50	BT50		BT50	
	MAX. SPEED	r/min	6000 {15000}	6000	8000	10000[5000]		12000	
	POWER	kW(Hp)	22/35 (29.5/46.9)		37(49.6)	30{37}(40.2 {49.6})		25/34 (40% ED)(33.5/45.6)	
	MAX. TORQUE	N·m(ft-lbs)	603 {960} (445.0{708.5})		940(693.7)	505(372.7)			
TILTING AXIS (A-AXIS)	TYPE		Gear		Worm	RGC			
	RAPID	r/min	20		6	30		30	35
	STROKE	deg.	+60 ~ -100		+60 ~ -100	30 ~ -120			
	A-AXIS ~ SPINDLE FRONT	mm(inch)	260(10.2)		220(8.7)				
	SPINDLE NOSE HORIZONTAL TO TABLE CENTER	mm (inch)	-270 ~ 1230 (-10.6 ~ 48.4)		-230 ~ 1070 (-9.1 ~ 42.1)				
	SPINDLE HORIZONTAL CENTER TO PALLET TOP(A 90°)	mm(inch)	200 ~ 1400 {-60 ~ 1140} (7.9 ~ 55.1 {-2.4 ~ 44.9})		150 ~ 1350 (5.9 ~ 53.1) {-70 ~ 1130} ({-2.8 ~ 44.5})				
	CLAMP TORQUE	N·m(ft-lbs)	5000 (3690.0)		4000 (2952.0)				
	DRIVING TORQUE	N·m(ft-lbs)	2000 (1476.0)		4000 (2952.0)				
LINEAR AXIS	STROKE (X/Y/Z)	mm(inch)	1450/1200/1500 (57.1/47.2/59.1)		1450/1200/1300 (57.1/47.2/51.2)	1250/1345/1875 (922.5/992.6/1383.8)		1250/1250/1000 (922.5/922.5/738.0)	
	RAPID (X/Y/Z)	mm(inch)	40/40/50(1.6/1.6/2.0)		60/60/60 (2.4/2.4/2.4)	42/42/42 (31.0/31.0/31.0)			
TABLE	PALLET SIZE	mm(inch)	800 x 800 (31.5 x 31.5)	Ø1000 {800x800}	800 x 800 (31.5 x 31.5)	800 x 800{1000 x 1000} (31.5 x 31.5)	Ø1000 (Ø738.0)		
	B-AXIS ROTATING SPEED	r/min	8	500	60	50	500(300)	35	
	MAX. WORKPIECE SIZE	mm(inch)	Ø1400 x 1400h (Ø55.1 x 55.1h)	Ø1600 x 1400h	Ø1400 x 1400h (Ø55.1 x 55.1h)	Ø1450 x 1400h (Ø57.1 x 55.1h)		Ø1000 x 800h (Ø39.4 x 31.5h)	Ø1250 x 1100h (Ø49.2 x 43.3h)
	MAX. WORKPIECE WEIGHT	kgf (lbs)	2000 (4409.2)		2000 (4409.2)	2200 {1950} (4850.2 {4299.0})	2170 (4784.0)	2000 (4409.2)	2600 (5732.0)
ATC	TOOL MAGAZINE CAPACITY	ea	60 {90, 120, 150, 196~376}		60 {80, 180}			63 {123, 183, 273}	
	TOOL LENGTH	mm(inch)	550(BT)/630(HSK) 550(21.7) (BT)/ 630(24.8) (HSK)	630(24.8) (HSK-100T)	550(21.7) (BT)/ 630(24.8) (HSK)				
	TOOL WEIGHT	kg (lb)	25		35 (77.2)				
	TOOL MOMENT	N·m(ft-lbs)	34.3 (25.3)		50 (36.9)				
	TOOL DIA.	mm(inch)	125/320(4.9/12.6)		125/325(4.9/12.8)				
Floor space	W x L	mm(inch)	5829 x 11630 (229.5 x 457.9)	6060 x 9200 (238.6 x 362.2)	5811 x 9289 (228.8 x 365.7)			4348 x 7002 (171.2x 275.7)	4548 x 6144 (179.1 x 241.9)

* { } : option

Internal Use Only