

Accessories

Standard : ● Optional : ★

Description	Model	5BC-X26	5BC-X29	5BC-X34	5BC-X38	5BC-X42
1.Air blast through spindle_M53		●	●	●	●	●
2.Air conditioning for electrical cabinet habor HA-750AF		●	●	●	●	●
3.ARM Type ATC 32P		●	●	●	●	●
4Automatic Power off		●	●	●	●	●
5.Built-in Spindle 15000RPM/HSK-A63		●	●	●	●	●
6.Calibration spheres (KKH 250)		●	●	●	●	●
7.Coolant system_Coolant Pump Motor,Stand		●	●	●	●	●
8.Centralized Automatic Lubrication System		●	●	●	●	●
9.X, Y, Z-axis linear scale system_HEIDENHAIN		●	●	●	●	●
10.Dynamic Collision Monitoring(#40)		●	●	●	●	●
11.Full-enclosed splash guard_multi-piece door		●	●	●	●	●
12.Fluorescent lamp x 1		●	●	●	●	●
13.Foundation bolt		●	●	●	●	●
14.Hydraulic Hose Coolant gun		●	●	●	●	●
15.Individual machine manual x 1		●	●	●	●	●
16.kinematicOpt(#48 CYCLE 451)		●	●	●	●	●
17.Link Type Chip Conveyor and Portable chip bucket		●	●	●	●	●
18.Maintenance safety guard(Including maintenance ladder)		●	●	●	●	●
19.WORKPIECE MEASURE PROBE(HEIDENHAIN TS-460)		●	●	●	●	●
20.Pedal Ladder_L1500*W800*H490mm [L59.06**W31.50**H19.29"]		★	★	★	★	★
21.RS232 Interface		●	●	●	●	●
22.Remote manual pulse generator/HR510		●	●	●	●	●
23.Spindle Water Cooler		●	●	●	●	●
24.Spray around spindle		●	●	●	●	●
25.Spindle Air Curtain		●	●	●	●	●
26.Screw Type Chip Conveyor		●	●	●	●	●
27.Tool package		●	●	●	●	●
28.Y-axis ball screw support device		★	●	●	●	●
29.Z Axis Nitrogen Counter Balance		●	●	●	●	●
30.Air gun		★	★	★	★	★
31.ARM Type ATC 40P		★	★	★	★	★
32.Built-in Spindle 12000RPM/HSK-A100(CYTEC)		★	★	★	★	★
33.Built-in Spindle 24000RPM/HSK-A63		★	★	★	★	★
34.Coolant Through Spindle_20BAR [290.07PSI] With Water Cart		★	★	★	★	★
35.Coolant Through Spindle_25BAR [362.58PSI] With Water Cart		★	★	★	★	★
36.CTS full splash guard with top cover		★	★	★	★	★
37.Hoist Seat		★	★	★	★	★
38.TOUCH PROBE		★	★	★	★	★
39.X-axis ball screw support device		★	★	★	★	★
40. Software Option 1_Cylinder surface interpolation,Tilting plane,Circle in 3 axes (#8)		●	●	●	●	●
41.Software Option 2 Spline interpolation /TCPM (#9)		●	●	●	●	●
42.Kinematic coordinate conversion		●	●	●	●	●
43.TNCRemot Software		★	★	★	★	★

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Hartford

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We manufacture intelligent machines only

Hartford
 EXCLUSIV
 HartrolPlus APP

Intelligent Machining Center

5BC Series Smartcenter

- 5-Year warranty on guideways
- 5-axis head made by Hartford
- 4 linear guideways on Z-axis
- One-piece wider column design
- Slant beam design on cross beam



Website



Facebook



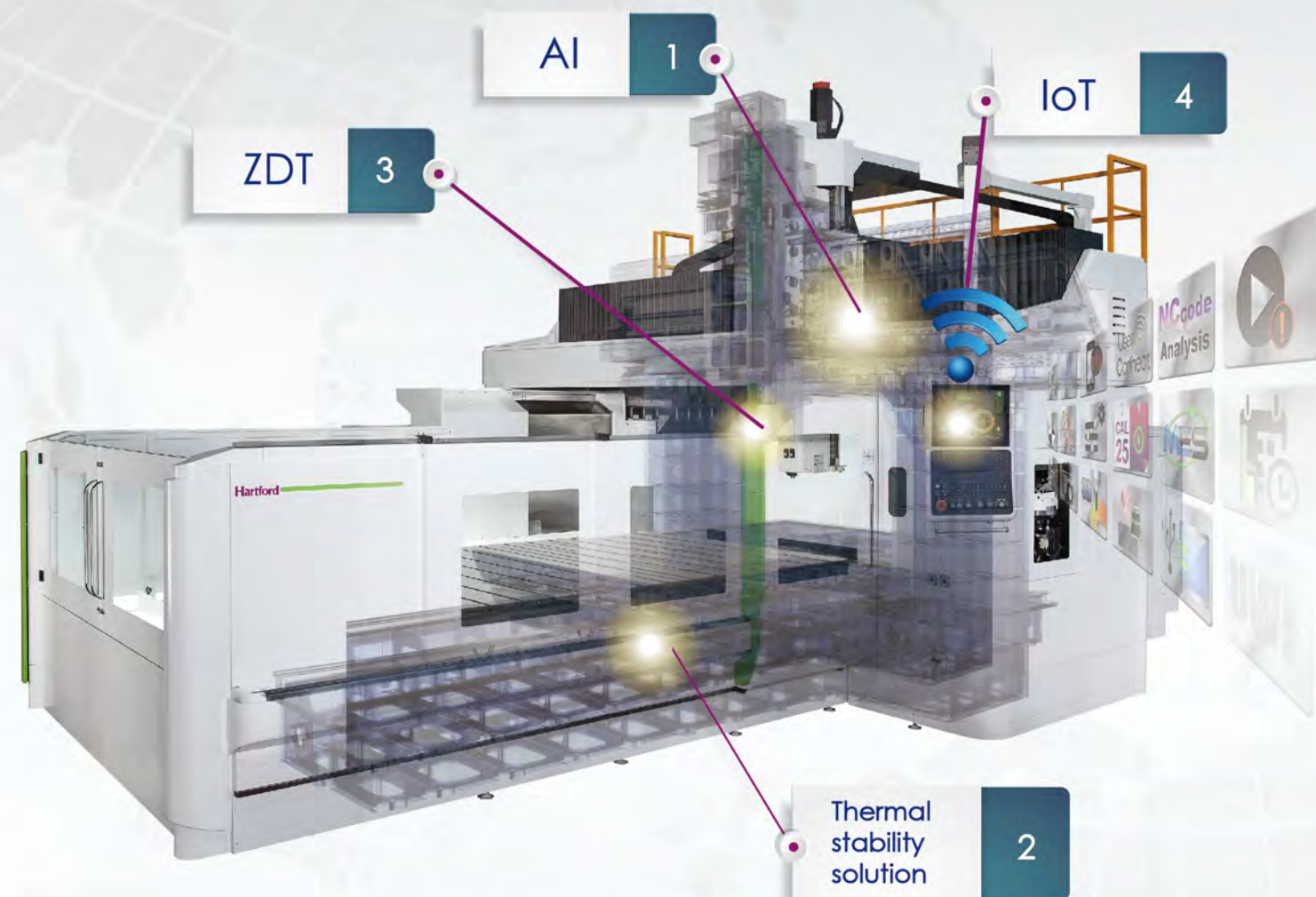
A.I. Applications inside, Hartrol Plus is the control which provides machining status with advanced features.

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

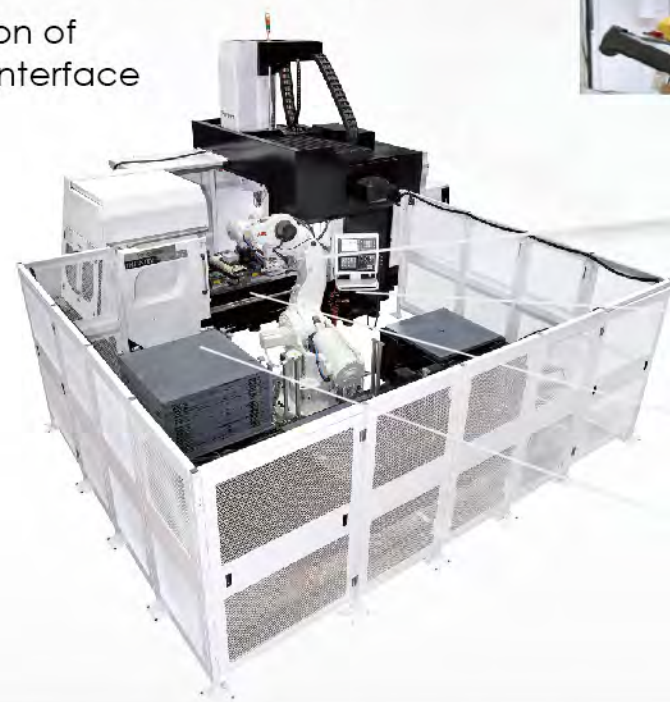
Quality control monitoring

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

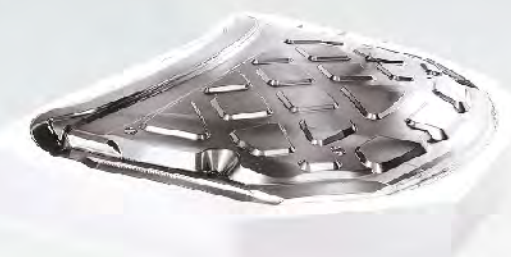
High Efficiency Solutions for Aerospace Components

A perfect demonstration for machining accuracy and ability.

Hartford 5-axis double column machining center suits for complex multi axis components whilst maintaining high precision and excellent material removal efficiency



1. Aerospace component



2. Hood

NCG-2005 5-axis Accuracy Testing

■ Workpiece name	NCG2005	■ Workpiece material	Necuron 1007	■ Workpiece size	75x105x50 mm
■ Workpiece fixed angle	0° & 30°	■ Cycle time	12 min	■ Tool	Ø6 mm end mill

Dimensional accuracy



Marginal lines(1 mm) in X, Y-axis are consistent.

N/C Thermal elongation check



Connection wall thickness down to 10 μm is not broken.

Angle accuracy deviation of rotating axes



High angle accuracy of B/C axes is easily recognized by surface finish and spacing symmetry.

Workpiece surface check



Accurate right angle between X & Y plane.

Axis accuracy check



In hole cutting, tool feeds in right and left direction are symmetrical.

Contour accuracy check



By the high accuracy of contour.

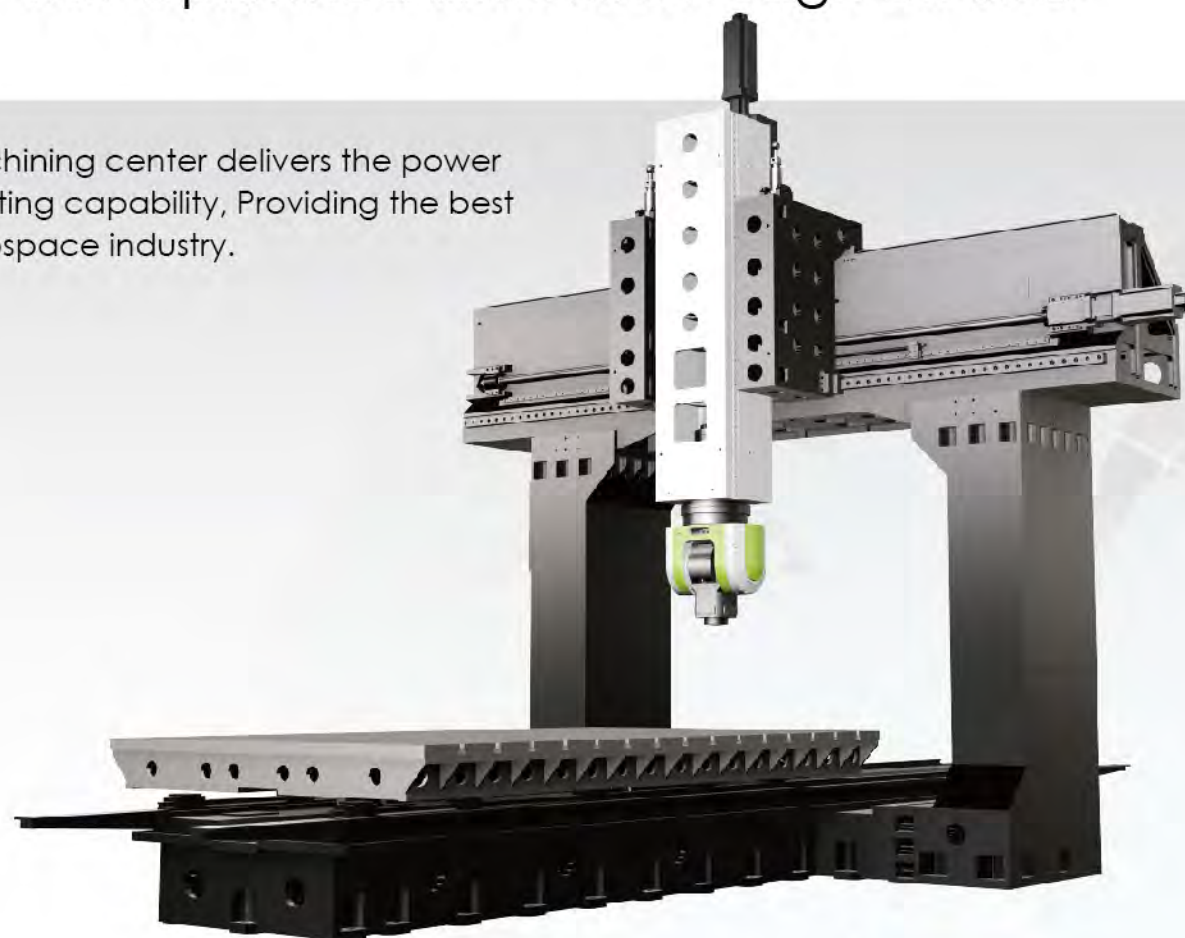
Tool center point check



Tool center point in 5-axis (X,Y,Z,B,C) positions accurately.

The Optimized Structure Design on 5BC

Hartford 5BC machining center delivers the power and versatility cutting capability, Providing the best resolution for aerospace industry.



Full range of linear guideway five-year warranty:

Warranty coverage will not apply under following conditions
1.Improper operation (collision)
2.Lack of regular cleaning of accumulated debris causing damage to the linear rails & carriages.



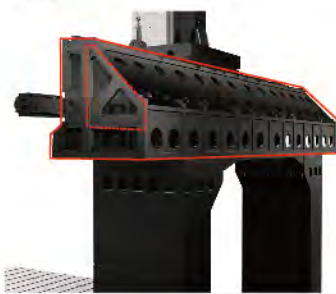
Four linear guideways on Z-axis

- Supported by high rigidity roller type linear guideways.
- Bilateral supported delivers higher rigidity.
- Provides higher stability and accuracy.
- Patent (1264343 : Four linear guideways on Z-axis.)



Slant beam design on cross beam

- 45 ° Force flow design reducing vibration through efficient force flow transfer.
- Increased machine stability.
- Increased machine cutting accuracy.
- Patent (M435318: Slant beam design on double column cross beam)



One-piece wider column design

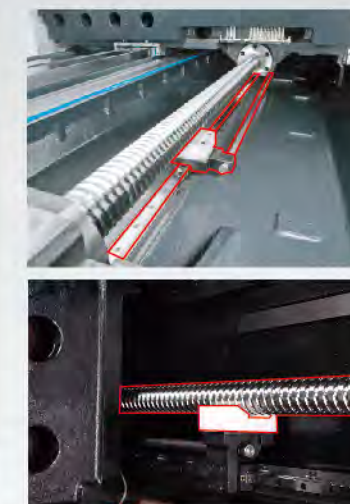
- Increased contact area the column and the machine base to **1250mm**.
- This provides a more efficient delivery of cutting force to the machine base.
- Multi-layer box-in-box ribs structure design.
- Reduce vibration to improve your accuracy.
- Patent(M437316:The section of box type structure features excellent torsion-resistance.)



Hartford-Made High Rigidity Head & Structure

X,Y-axis ballscrew supported

- ballscrews downcast problem can be improved.
- Enhance machining accuracy.
- Y-axis: x29/x34/x38/x42 are standard,x26 are optional.
- X-axis : Machines above 5 meter are standard, machines under 5 meter are optional.



Hartford-made high rigidity 5-axis head

- The 5-axis head is made in Taiwan.
- High rigidity **FORK** structure design.
- High accuracy & high rigidity 5-axis head



High rigidity & strength machine head stock

- The size of machine head section is **540x521 mm**
- Chamfer design inside the stock
- Machine head rigidity and strength can be boosted.



Measurement Equipment

The advanced measurement technique

- Dynamic collision monitoring (DCM) function increases machine running safety.
- CYCLE 451 measurement can be operated easily so that machine accuracy is always maintained.
- Heidenhain TS460+KKH250 are standard.



Dynamic collision monitoring(DCM)

- Automatically monitors the working space of machine.
- Prevents collision with components.
- Increases the level of safety for both the operator and machine.

Kinematic Comp(opt.)

- This technology takes volumetric compensation to a new level.
- Enhances precision machining of large workpiece.

Kinematic Opt 48

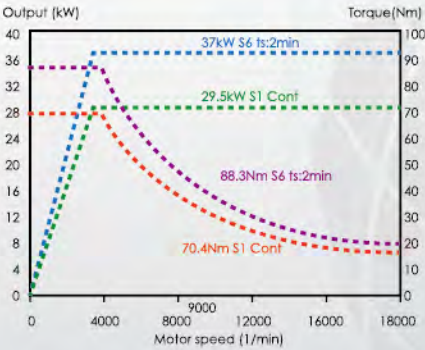
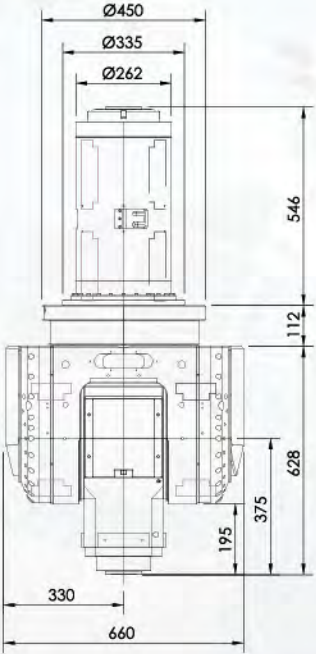
- It's a 3-D touch probe cycle that automatically measures all rotary axes.
- This makes recalibration a fast and efficient process.
- Machine accuracy can be controlled even over long period.

Powerful spindle torque

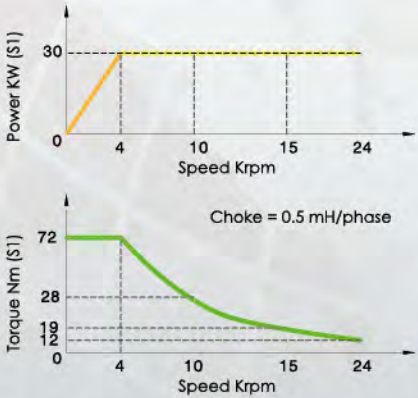
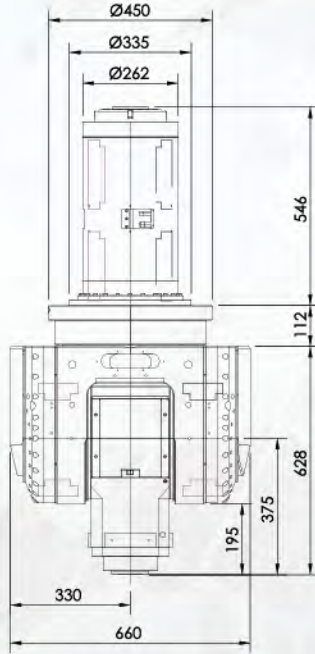
	Model	ITRI-5A63				CYTEC_M21		
		HSK-A63(Spindle)	B	C		HSK-A100(Spindle)	B	C
Rotation range	degree	-	-	±105°	±240°	-	±110°	±360°
Positioning accuracy	sec	-	-	±5"	±5"	-	±5"	±2"
Rotation speed	rpm	15000	24000	60	60	12000	60	60
Rotation torque(Con.)	Nm	70.4	72	648	638	170	700	700
	ft-lbs	51.92	53.1	477.94	470.56	125.39	516.29	516.29
Rotation torque(Max.)	Nm	88.3	88	1200	1000	220	1000	1000
	ft-lbs	65.13	64.91	885.07	737.56	162.26	737.56	737.56
Holding torque	Nm	-	-	4000	4000	-	4000	4000
	ft-lbs	-	-	2950.25	2950.25	-	2950.25	2950.25

Spindle diagram

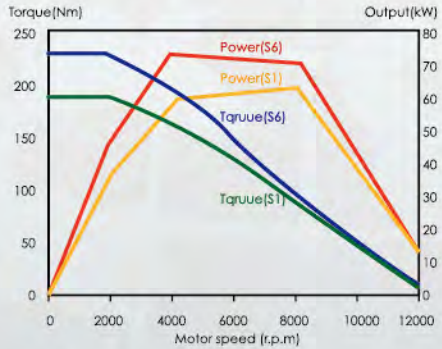
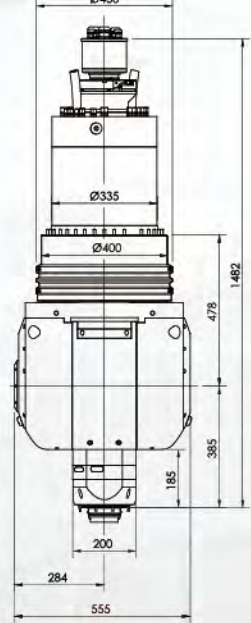
HSK-A63
15,000 rpm



HSK-A63
24,000 rpm



HSK-A100
12,000 rpm



5BC Pyramid RMP600 Precision measuring

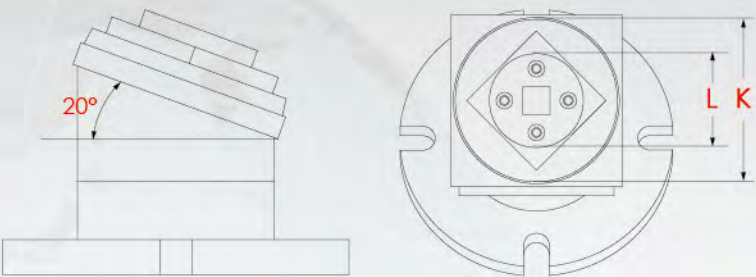
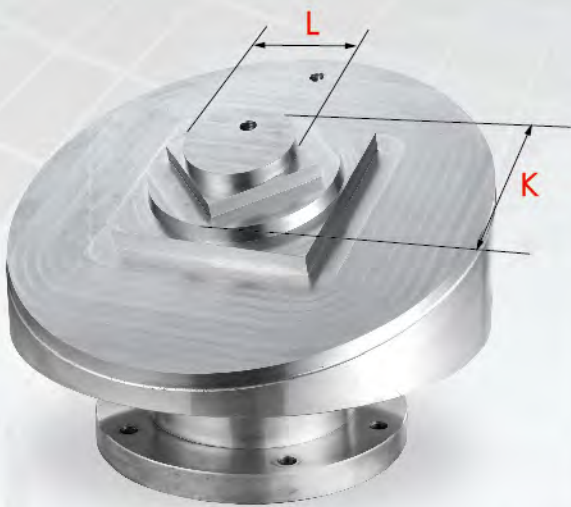


- 1 3-axis < 0.01mm
5-Axis Head Bo, Co, 3 Axis Machining accuracy
- 2 5-axis < 0.02mm
Precision when 5 Axis head at C/Axis
- 3 3-axis< 0.01mm
5-Axis Head Bo, Co, Repetitive Accuracy
- 4 5-axis < 0.02mm
Precision when 5 Axis head at C Axis

		Actual length		Std. length		Error margin	
NO.	Machining Accuracy	X-axis	Y-axis	X-axis	Y-axis	X-axis	Y-axis
1	3-axis >0.01mm	34.6061	41.6073	34.6	41.6	-0.0061	-0.0073
2	5-axis >0.02mm	71.4207	80.4093	71.4	80.4	-0.0207	-0.0093
3	3-axis >0.01mm	112.6049	121.6025	112.6	121.6	-0.0049	-0.0025
4	5-axis >0.02mm	151.2162	160.2055	151.2	160.2	-0.0162	-0.0055

Unit : mm

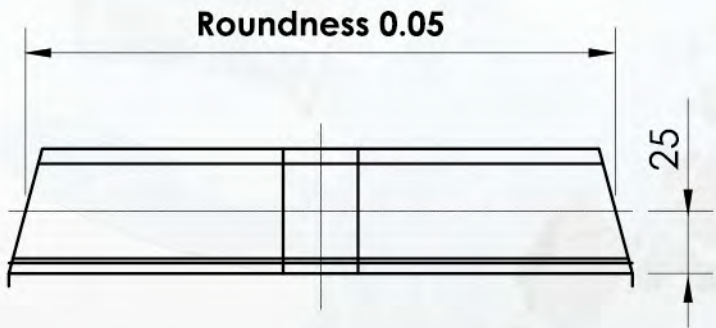
5-axis accuracy test: NAS-975



Unit:mm

Item	Test Item	Tolerance	Test Results
1	Roundness	L	0.0037
2	Roundness	K	0.0069
3	Inclination Ansgle	20° ±1' 20"	19° 58' 48"

NAS-979 Inspection Cutting report



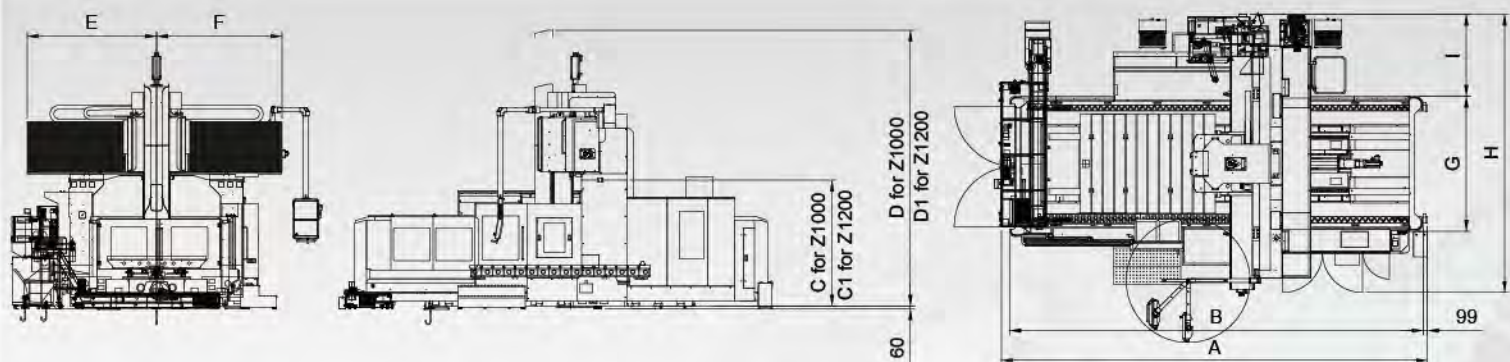
	Tolerance	Test results
Inclination angle	∠15°(±1°/20")	15.0007°
Roundness	0.05	0.0148

Unit: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 less than ideal testing environments. That the test results may vary from those shown in this catalogue.

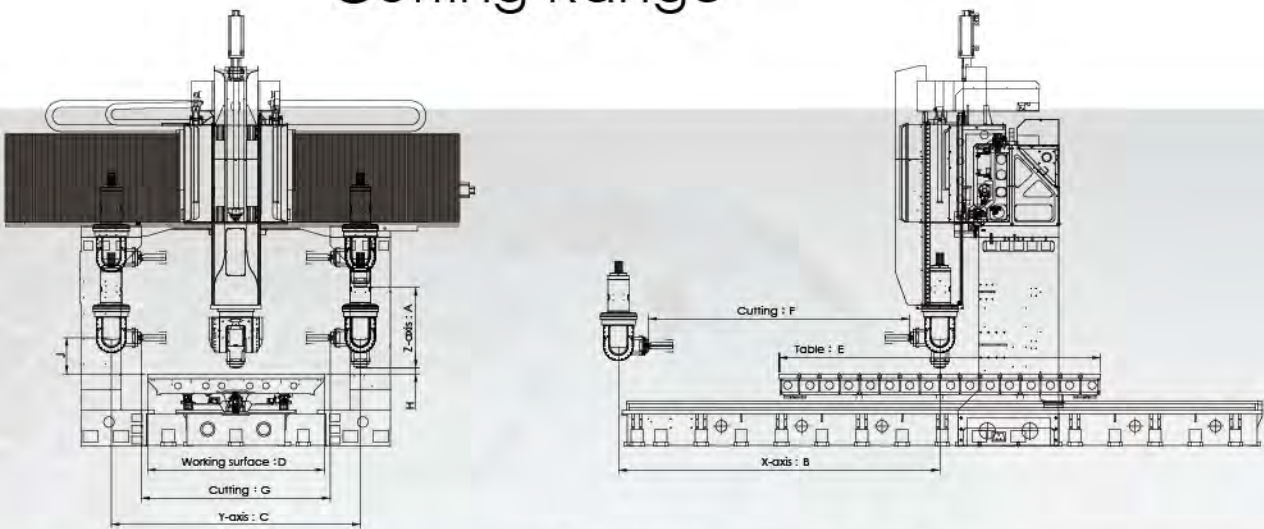
Machine Dimension



Model	A	B	C	C1	D	D1	E	F	G	H	I	
5BC-226	9068	8255	2600	2800	5930	6130	2379	2279	2194	5387	1830	HSK-A63
			2800	3000	6130	6330				5487	1930	HSK-A100(CYTEC)
5BC-326	9468	9188	2600	2800	5930	6130				5387	1830	HSK-A63
			2800	3000	6130	6330				5487	1930	HSK-A100(CYTEC)
5BC-426	11076	10796	2600	2800	5930	6130	2624	2533	2494	5387	1830	HSK-A63
			2800	3000	6130	6330				5487	1930	HSK-A100(CYTEC)
5BC-329	9468	9188	2600	2800	5930	6130				5687	1830	HSK-A63
			2800	3000	6130	6330				5787	1930	HSK-A100(CYTEC)
5BC-429	11076	10796	2600	2800	5930	6130				5687	1830	HSK-A63
			2800	3000	6130	6330				5787	1930	HSK-A100(CYTEC)
5BC-529	13076	12796	2600	2800	5930	6130				5687	1830	HSK-A63
			2800	3000	6130	6330				5787	1930	HSK-A100(CYTEC)
5BC-629	15076	14796	2600	2800	5930	6130	2873	2784	2994	5687	1830	HSK-A63
			2800	3000	6130	6330				5787	1930	HSK-A100(CYTEC)
5BC-334	9468	9188	2600	2800	5930	6130				6187	1830	HSK-A63
			2800	3000	6130	6330				6287	1930	HSK-A100(CYTEC)
5BC-434	11076	10796	2600	2800	5930	6130				6187	1830	HSK-A63
			2800	3000	6130	6330				6287	1930	HSK-A100(CYTEC)
5BC-534	13076	12796	2600	2800	5930	6130				6187	1830	HSK-A63
			2800	3000	6130	6330				6287	1930	HSK-A100(CYTEC)
5BC-634	15076	14796	2600	2800	5930	6130	3073	2984	3394	6187	1830	HSK-A63
			2800	3000	6130	6330				6287	1930	HSK-A100(CYTEC)
5BC-438	11076	10796	2600	2800	5930	6130				6587	1830	HSK-A63
			2800	3000	6130	6330				6687	1930	HSK-A100(CYTEC)
5BC-538	13076	12796	2600	2800	5930	6130				6587	1830	HSK-A63
			2800	3000	6130	6330				6687	1930	HSK-A100(CYTEC)
5BC-638	15076	14796	2600	2800	5930	6130				6587	1830	HSK-A63
			2800	3000	6130	6330				6687	1930	HSK-A100(CYTEC)
5BC-738	17076	16796	2600	2800	5930	6130	3273	3184	3794	6587	1830	HSK-A63
			2800	3000	6130	6330				6687	1930	HSK-A100(CYTEC)
5BC-838	19076	18796	2600	2800	5930	6130				6587	1830	HSK-A63
			2800	3000	6130	6330				6687	1930	HSK-A100(CYTEC)
5BC-442	11076	10796	2600	2800	5930	6130				6987	1830	HSK-A63
			2800	3000	6130	6330				7087	1930	HSK-A100(CYTEC)
5BC-542	13076	12796	2600	2800	5930	6130				6987	1830	HSK-A63
			2800	3000	6130	6330				7087	1930	HSK-A100(CYTEC)
5BC-642	15076	14796	2600	2800	5930	6130	3273	3184	3794	6987	1830	HSK-A63
			2800	3000	6130	6330				7087	1930	HSK-A100(CYTEC)
5BC-742	17076	16796	2600	2800	5930	6130				6987	1830	HSK-A63
			2800	3000	6130	6330				7087	1930	HSK-A100(CYTEC)
5BC-842	19076	18796	2600	2800	5930	6130				6987	1830	HSK-A63
			2800	3000	6130	6330				7087	1930	HSK-A100(CYTEC)

Unit: mm

Cutting Range



						ITIR-5A65 HSK-A63				CYTEC-M21 HSK-A100				
Model	A	B	C	D	E	F	G	H	J	F	G	H	J	
5BC-226	1000/ 1200	2000	2600	1800	2000	1250	1850	75	450	1230	1830	190	575	
5BC-326		3000			3000	2250				2230				
5BC-426		4000			4000	3250				3230				
5BC-329		3000	2900	2200	3000	2250	2150			2230	2130			
5BC-429		4000			4000	3250				3230				
5BC-529		5000			5000	4250				4230				
5BC-629		6000	3400	2200	6000	5250	2650			5230	2630			
5BC-334		3000			3000	2250				2230				
5BC-434		4000			4000	3250				3230				
5BC-534		5000	3800	2500	5000	4250	3050			4230	3030			
5BC-634		6000			6000	5250				5230				
5BC-438		4000			4000	3250				3230				
5BC-538		5000	4200	3000	5000	4250	3450			4230	3430			
5BC-638		6000			6000	5250				5230				
5BC-738		7000			7000	6250				6230				
5BC-838		8000	4200	3000	8000	7250	35			410	7230	150		535
5BC-442		4000			4000	3250					3230			
5BC-542		5000			5000	4250					4230			
5BC-642		6000			6000	5250					5230			
5BC-742		7000	7000		6250	6230								
5BC-842		8000	8000		7250	7230								

Unit: mm

Model		Unit	5BC-226/326/426	5BC-329/429/529/629
Table				
Working surface	mm		2000/3000/4000x1800	3000/4000/5000/6000x2200
T-slot(Size x Number x Pitch)	mm		22x7/11/15 x250	28x11/15/19/23 x250
Max. table load	kg		8000/10000/12000	10000/12000/15000/18000
Travel				
Longitudinal travel(X-axis)	mm		2000/3000/4000	3000/4000/5000/6000
Cross travel (Y-axis)	mm		2600	2900
Vertical travel (Z-axis)	mm		1000/1200	1000/1200
Distance from spindle end to table	mm		Z1000 : 75~1075(ITRI-5A63) Z1000 : 190~1190(CYTEC_HSK-A100) Z1200 : 75~1275(ITRI-5A63) Z1200 : 190~1390(CYTEC_HSK-A100)	Z1000 : 75~1075(ITRI-5A63) Z1000 : 190~1190(CYTEC_HSK-A100) Z1200 : 75~1275(ITRI-5A63) Z1200 : 190~1390(CYTEC_HSK-A100)
Distance from spindle center to column	mm		480	480
Width between column	mm		2000	2300
Spindle				
Spindle drive motor	Kw (SI/S6)		29.5/37(ITRI-5A63,SETCO_HSK-A63_15000rpm) 30/37(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 34/43(CYTEC,CS-34-180-S_HSK-A100_12000rpm)	29.5/37(ITRI-5A63,SETCO_HSK-A63_15000rpm) 30/37(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 34/43(CYTEC,CS-34-180-S_HSK-A100_12000rpm)
Spindle Rated Torque	Nm(SI/S6)		70.4/88.3(ITRI-5A63,SETCO_HSK-A63_15000rpm) 72/88(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 170/220(CYTEC,CS-34-180-S_HSK-A100_12000rpm)	70.4/88.3(ITRI-5A63,SETCO_HSK-A63_15000rpm) 72/88(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 170/220(CYTEC,CS-34-180-S_HSK-A100_12000rpm)
Spindle speed	rpm		15000/24000(HSK-A63) 12000(HSK-A100)	15000/24000(HSK-A63) 12000(HSK-A100)
Spindle nose tape			HSK-A63/HSK-A100	HSK-A63/HSK-A100
B-axis				
RPM of B-axis	rpm		60	60
Roted Torque(max)	Nm		1200(ITRI-5A63) 1000(CYTEC-M21)	1200(ITRI-5A63) 1000(CYTEC-M21)
Braking Torque	Nm		4000(ITRI-5A63) 4000(CYTEC-M21)	4000(ITRI-5A63) 4000(CYTEC-M21)
B-axis travel	degree		±105°(ITRI-5A63)±110°(CYTEC-M21)	±105°(ITRI-5A63)±110°(CYTEC-M21)
Precision of Positioning			±5"	±5"
C-axis				
RPM of B-axis	rpm		60	60
Roted Torque(max)	Nm		1000(ITRI-5A63) 1000(CYTEC-M21)	1000(ITRI-5A63) 1000(CYTEC-M21)
Braking Torque	Nm		4000(ITRI-5A63) 4000(CYTEC-M21)	4000(ITRI-5A63) 4000(CYTEC-M21)
C-axis travel	degree		±240°(ITRI-5A63) ±360°(CYTEC-M21)	±240°(ITRI-5A63) ±360°(CYTEC-M21)
Precision of Positioning			±5"(ITRI-5A63) ±2"(CYTEC-M21)	±5"(ITRI-5A63) ±2"(CYTEC-M21)
Feed				
Cutting feedrate(X/Y/Z axis)	m/min		X/Y/Z : 12	X: 12/10/8/8 Y/Z : 12
Rapid Traverse feedrate(X/Y/Z axis)	m/min		X: 24/20/20 Y:18 Z:16	X: 20/20/14/12 Y : 18 Z : 16
ATC				
Tool storage capacity	Pcs		32/40、60(A-Type)	32/40、60(A-Type)
Max. tool weight	Kg		7(HSK-A63) 20(HSK-A100)	7(HSK-A63) 20(HSK-A100)
Max. tool size(diameter x length)	mm		ø75x300(HSK-A63) ø125x400(HSK-A100)	ø75x300(HSK-A63) ø125x400(HSK-A100)
Positioning Accuracy				
3- axes laser positioning accuracy(JIS B6330)				
Positioning accuracy / Full travel	mm		±0.010	±0.010 /±0.010
Repetitive positioning accuracy	mm		±0.003	±0.003
3-axes laser positioning accuracy (VDI 3441)/repeated 5 times				
Positioning accuracy	mm		0.015/0.016/0.018	0.016/0.018
Repetitive positioning accuracy	mm		0.014/0.014/0.015	0.014/0.015
Other				
Coolant Capacity(L)	L		640	700
Required Air Pressure	kg/cm²		6.5	6.5
Distance From Table Surface To Foolr	mm		960	960
Machine Height	mm		6020(HSK-A63) 6220(HSK-A100)	6020(HSK-A63) 6220(HSK-A100)
Floor space (Full Guarding)	mm		11617/11417/13007x6940	11567/13157/15157/17157 x7240
Machine Weight	kg		29000/33000/37000	35000/39000/42000/46000

VDI 3441 accuracy available upon order request.

5BC-334/434/534/634		5BC-438/538/638/738/838	5BC-442/542/642/742/842
3000/4000/5000/6000x2200 28x11/15/19/23 x250 10000/12000/15000/18000		3000/4000/5000/6000/7000/8000x2500 28x15/19/23/27/31 x250 18000/20000/23000/25000/27000	4000/5000/6000/7000/8000x3000 28x15/19/23/27/31 x250 18000/21000/24000/27000/30000
3000/4000/5000/6000 3400 1000/1200 Z1000 : 75~1075(ITRI-5A63) Z1000 : 190~1190(CYTEC_HSK-A100) Z1200 : 75~1275(ITRI-5A63) Z1200 : 190~1390(CYTEC_HSK-A100)		4000/5000/6000/7000/8000 3800 1000/1200 Z1000 : 35~1035(ITRI-5A63) Z1000 : 150~1150(CYTEC_HSK-A100) Z1200 : 35~1235(ITRI-5A63) Z1200 : 150~1350(CYTEC_HSK-A100)	4000/5000/6000/7000/8000 4200 1000/1200 Z1000 : 35~1035(ITRI-5A63) Z1000 : 150~1150(CYTEC_HSK-A100) Z1200 : 35~1235(ITRI-5A63) Z1200 : 150~1350(CYTEC_HSK-A100)
29.5/37(ITRI-5A63,SETCO_HSK-A63_15000rpm) 30/37(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 34/43(CYTEC,CS-34-180-S_HSK-A100_12000rpm) 70.4/88.3(ITRI-5A63,SETCO_HSK-A63_15000rpm) 72/88(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 170/220(CYTEC,CS-34-180-S_HSK-A100_12000rpm) 15000/24000(HSK-A63) 12000(HSK-A100) HSK-A63/HSK-A100		29.5/37(ITRI-5A63,SETCO_HSK-A63_15000rpm) 30/37(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 34/43(CYTEC,CS-34-180-S_HSK-A100_12000rpm) 70.4/88.3(ITRI-5A63,SETCO_HSK-A63_15000rpm) 72/88(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 170/220(CYTEC,CS-34-180-S_HSK-A100_12000rpm) 15000/24000(HSK-A63) 12000(HSK-A100) HSK-A63/HSK-A100	29.5/37(ITRI-5A63,SETCO_HSK-A63_15000rpm) 30/37(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 34/43(CYTEC,CS-34-180-S_HSK-A100_12000rpm) 70.4/88.3(ITRI-5A63,SETCO_HSK-A63_15000rpm) 72/88(ITRI-5A63,PERON SPEED_HSK-A63_24000rpm) 170/220(CYTEC,CS-34-180-S_HSK-A100_12000rpm) 15000/24000(HSK-A63) 12000(HSK-A100) HSK-A63/HSK-A100
60 1200(ITRI-5A63) 1000(CYTEC-M21) 4000(ITRI-5A63) 4000(CYTEC-M21) ±105°(ITRI-5A63)±110°(CYTEC-M21) ±5"		60 1200(ITRI-5A63) 1000(CYTEC-M21) 4000(ITRI-5A63) 4000(CYTEC-M21) ±105°(ITRI-5A63)±110°(CYTEC-M21) ±5"	60 1200(ITRI-5A63) 1000(CYTEC-M21) 4000(ITRI-5A63) 4000(CYTEC-M21) ±105°(ITRI-5A63)±110°(CYTEC-M21) ±5"
60 1000(ITRI-5A63) 1000(CYTEC-M21) 4000(ITRI-5A63) 4000(CYTEC-M21) ±240°(ITRI-5A63) ±360°(CYTEC-M21) ±5"(ITRI-5A63) ±2"(CYTEC-M21)		60 1000(ITRI-5A63) 1000(CYTEC-M21) 4000(ITRI-5A63) 4000(CYTEC-M21) ±240°(ITRI-5A63) ±360°(CYTEC-M21) ±5"(ITRI-5A63) ±2"(CYTEC-M21)	60 1000(ITRI-5A63) 1000(CYTEC-M21) 4000(ITRI-5A63) 4000(CYTEC-M21) ±240°(ITRI-5A63) ±360°(CYTEC-M21) ±5"(ITRI-5A63) ±2"(CYTEC-M21)
X: 12/10/8/8 Y/Z : 12 X: 20/20/14/12 Y : 18 Z : 16		X: 10/8/8/8/6 Y/Z : 12 X: 16/12/10/10/8 Y : 18 Z : 16	X: 10/8/8/8/6 Y/Z : 10 X: 16/14/12/10/8 Y : 16 Z : 16
32/40、60(A-Type) 7(HSK-A63) 20(HSK-A100) ø75x300(HSK-A63) ø125x400(HSK-A100)		32/40、60(A-Type) 7(HSK-A63) 20(HSK-A100) ø75x300(HSK-A63) ø125x400(HSK-A100)	32/40、60(A-Type) 7(HSK-A63) 20(HSK-A100) ø75x300(HSK-A63) ø125x400(HSK-A100)
±0.010 /±0.010 ±0.003		±0.010 /±0.010/0.012/0.012 ±0.003	±0.012 ±0.003
0.016/0.018 0.014/0.015		0.016/0.018/0.026/0.028 0.014/0.015/0.021/0.024	0.018/0.026/0.028/0.028/0.030 0.015/0.021/0.024/0.024/0.026
800 6.5 960 6020(HSK-A63) 6220(HSK-A100) 11817/13425/15425/17425 x7740 39000/45000/50000/55000		920 6.5 1000 6020(HSK-A63) 6220(HSK-A100) 13625/15625/17625/19625/21625 x8140 48000/55000/62000/69000/76000	1020 6.5 1000 6020(HSK-A63) 6220(HSK-A100) 13825/15825/17825/19825/21825x8540 54000/62000/70000/78000/87000