

OKK

# VG5000

Vertical Machining Center



**Highly Rigid 5-axis Controlled Machining Center!**

# Debut of Highly Rigid 5-axis Controlled Machining Center!

Designed to machine hard-to-process materials such as stainless steel and titanium alloy. A single chucking can complete from roughing to finishing. Responds to all users' needs and achieves highly efficient and accurate processing of aircraft parts and die components through intensive processing.

5-axis Controlled Vertical Machining Center

## VG5000

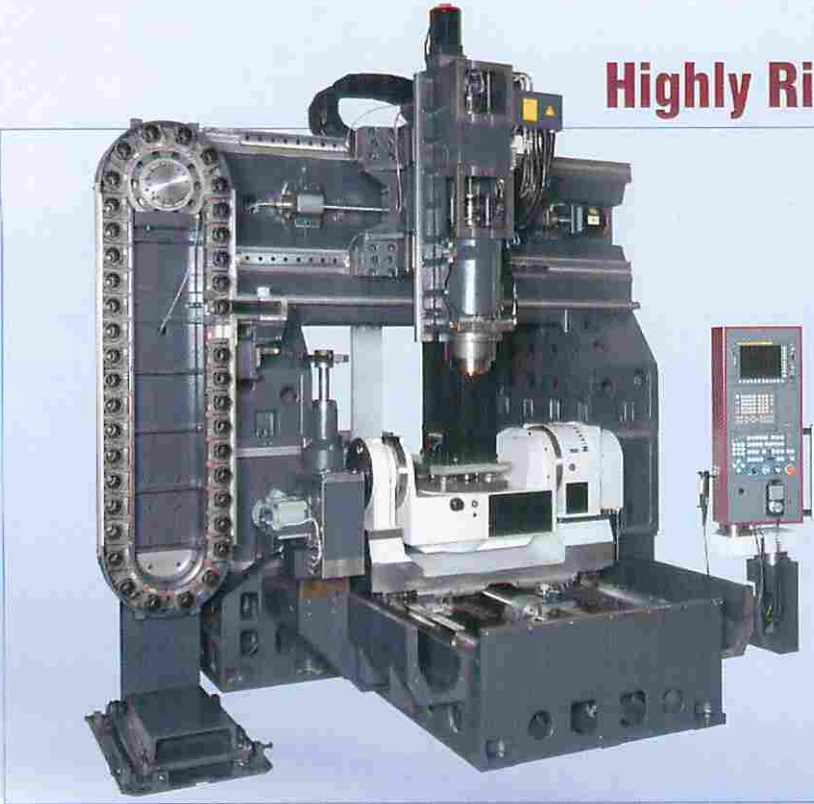


**Delivering a Highly Rigid and Efficient Processing of Dies and Parts that are more Complex and Complicated.**

- ▶ The built-in table tilt and rotary structure enables the multiple face and simultaneous 5-axis controlled processing.
- ▶ The 12,000rpm No.50-taper spindle delivers at the low-speed, heavy-duty cutting and at the high-speed cutting.
- ▶ Drastically improved accessibility and operability relating to workpieces.
- ▶ Vastly improved performance of removing chips from around the table.

## Highly Rigid Main Body Structure

In order to ensure plenty of rigidity and the dampening of vibrations that are generated during processing, the bed and column structure is constructed of triangle ribs arranged to optimize the casting through FEM models.



### High-speed and Highly Rigid Spindle



The 7/24-taper type, No. 50 spindle nose is used in combination with the 100-mm (3.94")-inner-diameter, four-row combination angular bearing.

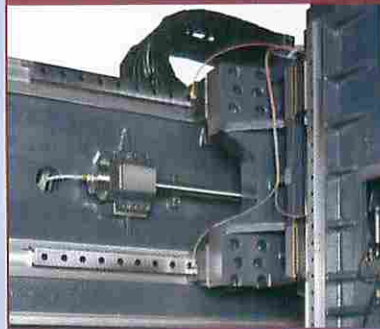
The spindle rotating range is 35 through 12000 rpm. Roughing and heavy-duty cutting of hard-to-process materials are enabled due to the built-in motor that can output maximum 600 N·m (450ft·lbs) (15% ED).

### Feed Guide Face



Use of the highly rigid, large-size linear roller guide improves vibration dampening of the feed system.

### Feed Ball Screw



In order to improve the lost-motion property, the machine uses double-anchored, pretension ball screws with large diameter and small lead. This improves positioning resolutions as well as the feed system's servo rigidity.

### Table

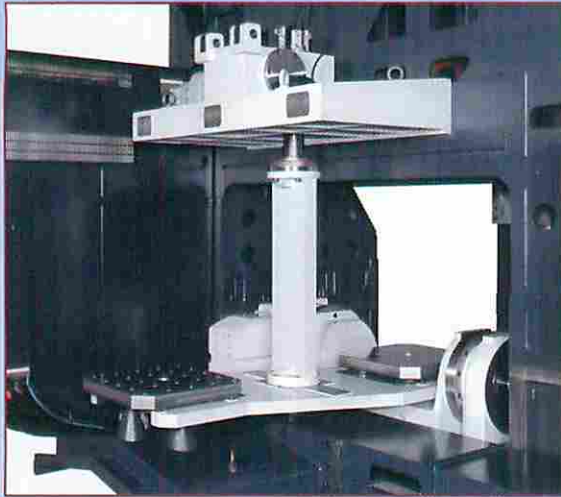


To deliver driving torque, the drive sections of the tilt and rotary axes adopt the mechanism of 1/120-reduction-ratio worm gears. 3870 N·m (2902 ft·lbs) clamping torque in the rotary axis assures rigidity in processing multiple faces indexing. With the brake mechanism on both sides, 5340 N·m (4005 ft·lbs) brake torque is achieved on the tilt axis.

### Thorough Measures for Thermal Displacement

The forcedly core cooled ball screws are included in the standard specification. The standard coolant shelter prevents the main body structure from being exposed directly to chips and coolant. The thermal displacement corrective control function (Soft Scale) adopted as a measure for heat generation of the spindle head ensures constant processing accuracy.

# APC (Automatic Pallet Changer) is included in the Standard Specification!

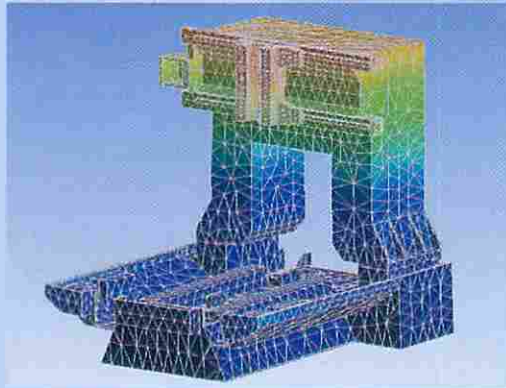


Arranging the APC in the rear of the machine not only ensures operability and accessibility of operators but improves visibility of workpiece processing area. At the same time it realizes compact floor space design (saves about 20% of space compared with our conventional machines).

In addition to the APC included in the standard specification, the conveyor installed inside the machine processes chips completely and thus saves manpower and supports unmanned operation.



## Rigidity Analysis Simulation with FEM (Finite Element Method)



## Titanium Material Processing Sample

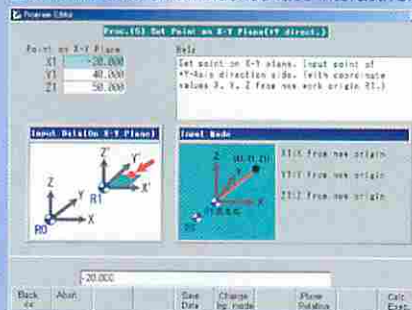
Material: Titanium  
 Coolant: Water-soluble coolant  
 Used tool:  $\phi 10$  ( dia. 0.3937" ) - through  
 $\phi 50$  ( dia. 1.9685" ) - mm end mill  
 Cutting condition: S380 through S6000  
 F120 through F2000  
 Processing time: 3 hours 20 minutes

## 5-axis Processing Software MULTIFACER II

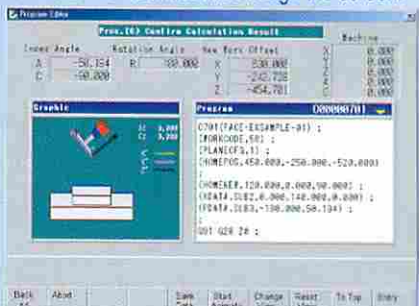
Indexing a processed face on a 5-axis machine it is difficult to set a workpiece's zero point. MULTIFACER II enables easy creation of index programs without requiring calculators and Eliminates the difficulty in setting workpiece's zero points.

- Operators do not need to calculate, they enter the information on an indexed face interactively, the software calculates index angles and new zero points.
- Since data for indexing are registered in the NC memory as subprograms, just executing the programs initiates the index operations and workpiece's zero-point settings.
- The software can be operated in combination with the Program Editor. This helps the use of created index subprograms.

Enters the data on an indexed face interactively



Checks the index results through the screen.



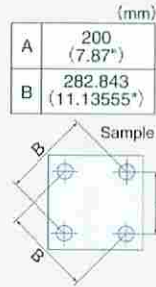
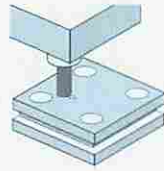
# Accuracy

## Positioning Accuracy (with linear scale) (mm)

Positioning Accuracy for X, Y and Z axes	$\pm 0.0010$ ( $\pm 0.00004''$ ) /full stroke
Repeatability	$\pm 0.0005$ ( $\pm 0.00002''$ ) /full stroke

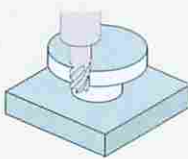
## Positioning Machining Accuracy (mm)

Item	JIS tolerance	OKK tolerance	Result
Axis direction	0.025 (0.00098")	0.015 (0.00059")	0.003 (0.00012")
Diagonal direction	0.035 (0.00138")	0.015 (0.00059")	0.005 (0.00020")
Deviation of hole dia.	0.02 (0.00079")	0.01 (0.00039")	0.005 (0.00020")



## Circular Cutting Accuracy (mm)

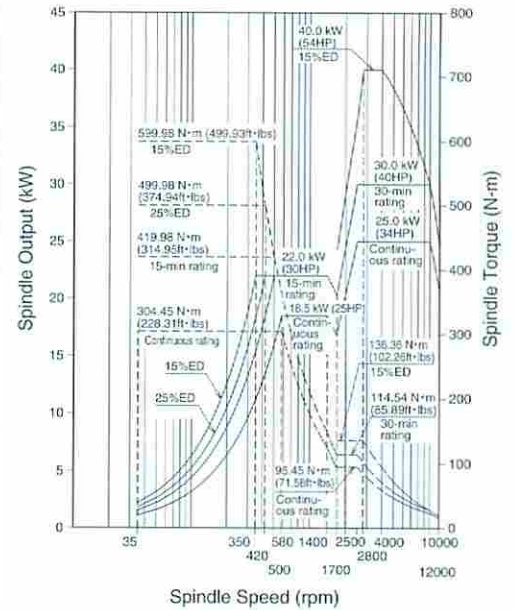
Item	JIS tolerance	OKK tolerance	Result
Roundness	0.04 (0.00157")	0.005 (0.00020")	0.0041 (0.00016")



Note 1: The above sample data show only a short-time processing example. Different results may be caused in the continuous processing.  
 Note 2: The above sample data are obtained under the OKK's in-house cutting test conditions. Different results may be caused according to the cutting tools and mounting jigs.

## FANUC

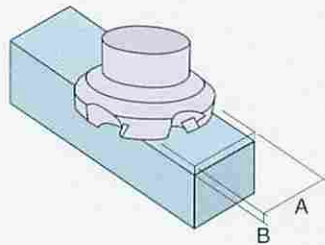
### 12000rpm (Standard)



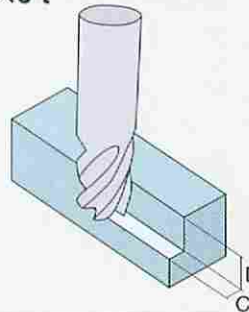
# Processing Capacity

## Sample Processing Data (Cut Material: S45C)

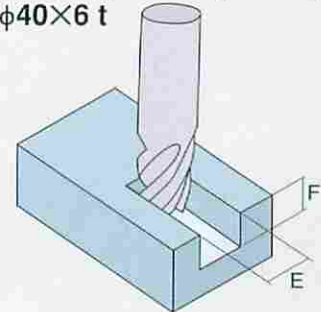
### Face Mill 5"×6 t



### Roughing End Mill (Facing) φ40×6 t



### Roughing End Mill (Grooving) φ40×6 t



	Face Mill 5"×6 t	Roughing End Mill (Facing) φ40×6 t	Roughing End Mill (Grooving) φ40×6 t
Spindle speed	350 rpm	200 rpm	200 rpm
Cutting speed	140m/min (5511.81ipm)	25m/min (984.25ipm)	25m/min (984.25ipm)
Cut width	(A) 100mm (3.94")	(C) 20mm (0.79")	(E) 20mm (0.79")
Cut depth	(B) 7mm (0.28")	(D) 50mm (1.97")	(F) 20mm (0.79")
Feed rate	800mm/min (31.50ipm)	240mm/min (9.45ipm)	300mm/min (11.81ipm)
Feed per tooth	0.381mm/tooth (0.01500inch/tooth)	0.200mm/tooth (0.00787inch/tooth)	0.250mm/tooth (0.00984inch/tooth)
Cutting amount	560cm <sup>3</sup> /min (33.6cu-inch/min)	240cm <sup>3</sup> /min (14.4cu-inch/min)	240cm <sup>3</sup> /min (14.4cu-inch/min)
Spindle motor load	86%	71%	75%

Note 1: The above processing data are obtained at the position of 0-degree table tilting angle.  
 Note 2: The above processing data show a sample actual processing and are for reference only.

## ● Main Specifications

Item	Unit	Specification
Travel on X axis (Saddle: right/left)	mm	760 (29.92")
Travel on Y axis (Table: back/forth)	mm	900 (35.43")
Travel on Z axis (Spindle head: up/down)	mm	610 (24.02")
Travel on A axis (Table tilting)	deg	-120 to 30
Travel on C axis (Table turning)	deg	360
Distance from table top surface to spindle nose	mm	240 (9.45") to 850 (33.46")
Table (Pallet) work surface area (X-axis direction × Y-axis direction)	mm	500 (19.69") and 500 (19.69")
Max. workpiece weight loadable on table (pallet)	kg	600 (for indexing) (1321.6 lbs)
Table (Pallet) work surface configuration (nominal screw-hole size × number of holes):		
		M16×24 holes
Distance to the table work surface from the floor	mm	1250 (49.21")
Pallet exchange time	sec	15
Spindle speed	rpm	35 to 12000
Number of spindle speed change steps		Stepless (electrical 2 steps)
Spindle nose (nominal number)		7/24 taper, No. 50
Spindle bearing bore diameter	mm	φ100 (dia 3.94")
Rapid traverse rate	X, Y and Z axes:	m/min 24 (944.48 ipm)
	A and C axes	rpm 20×30
Cutting feed rate	X, Y and Z axes:	mm/min 1 to 10000 (0.04 to 394 ipm)
	A and C axes	rpm 20×30
<b>Automatic Tool Changer</b>		
Tool shank (nominal number)		JIS B6339 BT50
Pull stud (nominal number)		OKK only 90°
Number of stored tools	tools	40 (※1)
Maximum tool diameter (with adjacent tools)	mm	φ115 (dia 4.53")
Maximum tool diameter (without adjacent tools)	mm	φ230 (dia 9.06")
Maximum tool length (from the gauge line)	mm	400 (15.75")
Maximum tool weight	kg	20 (44.1 lbs)
Tool selection method		Address fixed method
Tool exchange time (tool-to-tool)	sec	4.5
Tool exchange time (cut-to-cut)	sec	10
<b>Motors</b>		
For spindle (15% ED/30-min rating/continuous rating)	kW	40/30/25 (53.6/40.2/33.5 HP)
For feed axes	X, Y and Z axes	kW FANUC: 5.5×5.5×5.5 (7.4×7.4×7.4 HP)
	A and C axes	kW FANUC: 5.5×5.5 (7.4×7.4 HP)
For spindle coolant pump	kW	0.73 (0.98HP) (50Hz) / 1.21 (1.62HP) (60Hz)
For coil-type chip conveyor	kW	0.2×2 (0.3HP×2)
For ATC	kW	0.75 (1HP)
For turning the MG	kW	1.4 (1.88HP)
For hydraulic unit	kW	1.5 (2.01HP)
For APC	kW	0.75 (1HP)
<b>Required Power Supply</b>		
Power supply	kVA	FANUC:70
Supply voltage × supply frequency	V×Hz	AC200±10%×50/60±1
		AC220±10%×60±1(※2)
Compressed air supply pressure	MPa	0.4 to 0.6 (57 to 86 psi)
Compressed air supply flow rate	Lmin <sup>-1</sup> (ANR)	500 (132 gal/min)
Coolant tank capacity	L	380 (100gal)
Spindle head cooling oil tank	L	72 (19gal)
Hydraulic unit tank	L	20 (5.3gal)
Floor space required for operation (width × depth)	mm	3720×4200 (146.46"×165.35")
Floor space including maintenance area (width × depth)	mm	4600×5000 (181.1"×196.85")
Machine weight	kg	24000 (52863 lbs)
Controller type		FANUC 310is-A5
Temperature of operation environment	°C	5 to 40

※1: The number of stored tools refers a total number of tools including the one installed on the spindle i.e. subtract one from the above for the actual number of tools stored in the tool magazine.

※2: When the supply voltage is 220VAC, the supply frequency of 60Hz only is applicable.

## ● Standard Accessories

Item	Qty
Lighting system	1 set
Coolant unit (Separate coolant tank)	1 set
Entire machine cover (Splash guard)	1 set
Slideway protection covers for X and Y axes	1 set
Spindle head and ball screw cooling oil temperature controller	1 set
Feed unit automatic grease lubrication unit	1 set
Hydraulic unit (for clamping the 5-axis table)	1 set
Rear-discharging coil-type chip conveyor (one each for table right and left)	2 sets
Automatic pallet changer (2APC)	1 set
Leveling block	1 set
Foundation parts (Bond for anchoring is optional.)	1 set
Parts for machine transfer (excluding the hoisting jig)	1 set
Automatic power off	1 set
Electrical spare parts (fuses)	1 set
Instruction manual	2 sets
Electrical manuals (operation, maintenance, parts list, hardware diagrams)	1 set

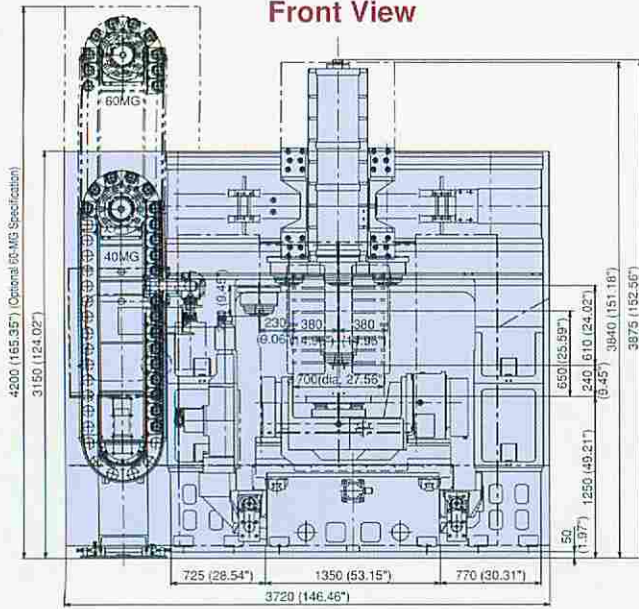
## ● Special Accessories (Options)

Item	Specification
Compatibility with two-face locking tool	
Pull stud	MAS-I or MAS-II
Tool magazine	60-, 80- or 120-tool magazine
Linear scale	For X and Y axes or for X, Y and Z axes
Rotary encoder	For A and C axes
Lift-up type chip conveyor	Scraper type, scraper type with floor magnet, or drum type for aluminum chips
Compatibility with oil-hole holder	BIG or NIKKEN
Compatibility with through-spindle (※3)	2MPa (285.7 Psi) or 7MPa (1000 Psi) coolant, or air
Bond for foundation parts	2 sets for bond anchoring method
Workpiece flushing gun	
Oil-mist air blower	
Air blower	
Signal lamp	2-lamp type or 3-lamp type
Automatic operation of splash guard	Front door
Touch sensor system T0	Workpiece measurement,
	Tool length/diameter measurement
Touch sensor system T1	Workpiece measurement, Tool length
	measurement, Tool break detection
Mist collector	
Coolant cooler	
Touch panel for APC	

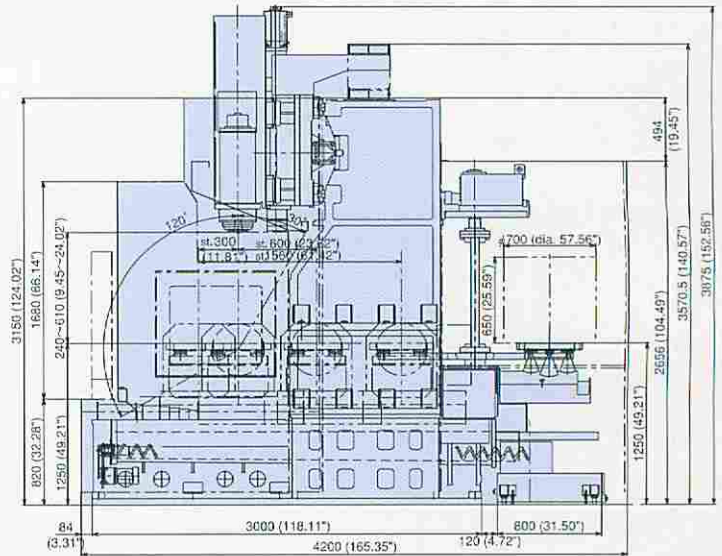
※3: Be sure to use a pull stud with no hole for a tool holder that is not applied to the through-spindle operation.

# ● Main Dimensions

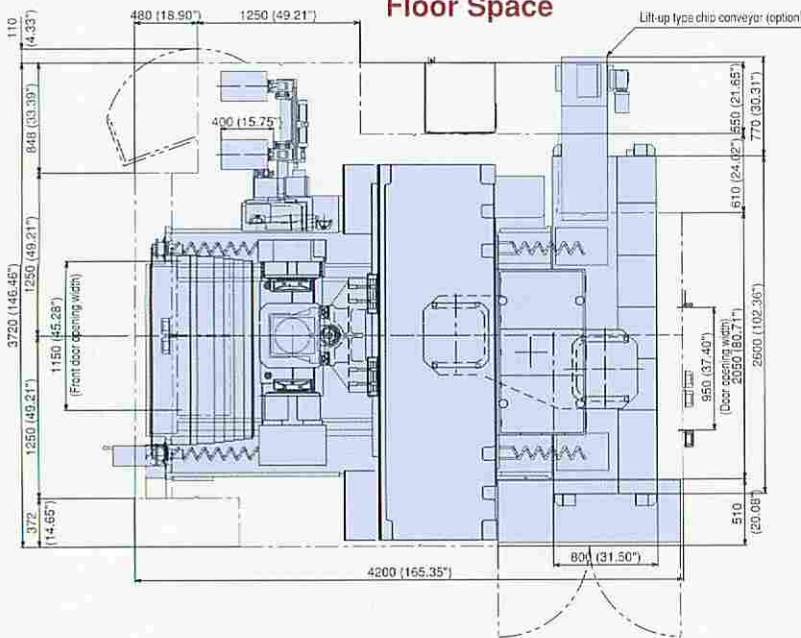
## Front View



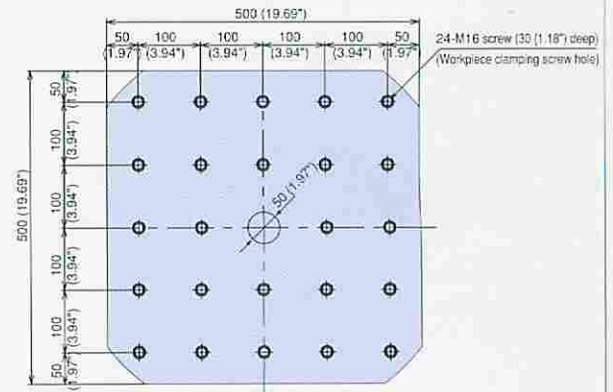
## Side View



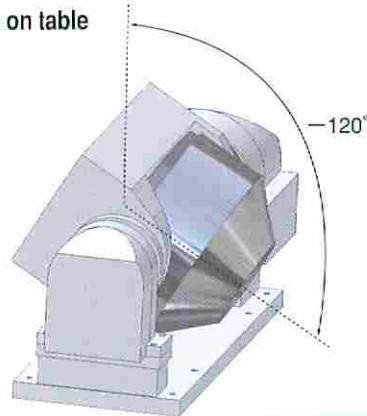
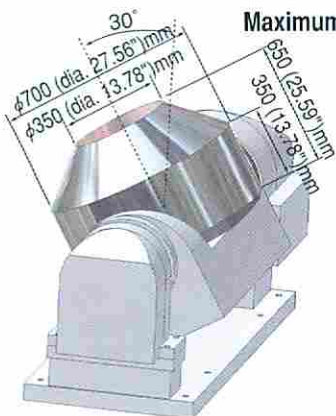
## Floor Space



## Table



## Maximum dimensions loadable on table



# OKK

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