

CNC · HORIZONTAL MACHINING CENTER

PRECISION

# BORING MILLING

- ▶ 29,000 lbs. table load on B-axis
- ▶ 4,814 ft-lb spindle torque
- ▶ 27-inch W-axis quill stroke
- ▶ 4-Step gear transmission



# VIPER



*Precision  
Boring  
Milling  
Machine*

PBM-Series

115A

115B

135A

135B

# PBM-SERIES

## PRECISION BORING MILLING

- **Powerful 4-step spindle transmission**
- **Tremendous spindle torque**
- **Fast W-axis travel**
- **Extra long spindle travel**

- Rigid large headstock size: 37.6" x 33.6"
- Oil mist lubrication promotes longer bearing life
- Spindle designed for optimum accuracy and high speed (2500 rpm)
- Direct drive servomotor on Y-axis for fast movement and low noise
- Oversized column has guide width of 30.7" and a guide thickness of 3.9"
- Large base, two-guide width 42.5", single-guide width 7.9"
- Maximum table load: 15,432 lbs. (Opt. 29,000 lbs.)
- Table working surface: 55" x 63" (Opt. 63" x 71")
- Wide range of tool storage options: 60 / 90 / 160 tools
- Unique chip disposal system design
- Extra large cooling system for all spindle cartridges, gearbox and hydraulic devices

*PBM-115A to 135B  
CTS Full Splash  
Guarding (optional)*



*PBM-135A  
with  
Front Table Guarding*





### UNIQUE W-AXIS DESIGN

Two linear guideways on W-travel provide fast and rigid movement.

W-axis  
Travel

**27.5**  
inches

Wide Spindle  
Diameter

**5.12**  
inches

### 4-STEP TRANSMISSION

True gearbox driven spindle provides high torque by using a ratio of 1:2 on the X/Z-axes.

Spindle torque maximum:

**4,814**    **(50)**  
ft-lb        hp

*Way Cover metal is galvanized for longer service life.*

## GREATER MACHINING RIGIDITY.

### MORE DAMPENING, GREATER STABILITY WITH NEW PBM STRUCTURE DESIGN

With an extra rigid structure design, the Alex-Tech **PBM-Series** precision boring milling machine features greater durability, stability and accuracy. Its newly designed base construction combined with scientific rib reinforcement offers unmatched structural rigidity and dampening capability. Complete oil and fluid separation throughout the machine, extends the service life of fluids, and saves on production costs. Also, meets environmental protection requirements not found on competitors' models.

#### Oversized Column (Y-Axis)

The column has an oversized design that yields greater stability during cutting

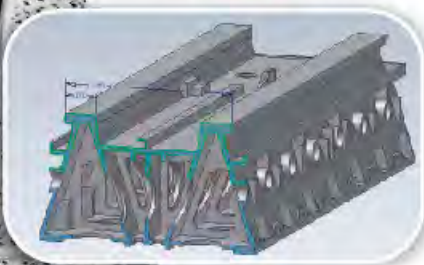
- Span between box ways is **30.7"**
- Box way thickness is **4.0"**
- Box way surface width is **7.0"**

#### Rigid Table Travel / Table Load

Table employs single axis travel for better rigidity. Table movement is dedicated to X-travel only, ensuring tighter cutting accuracy. Competitors table and saddle design uses two axis motion that can yield more vibration, and reduced accuracy.

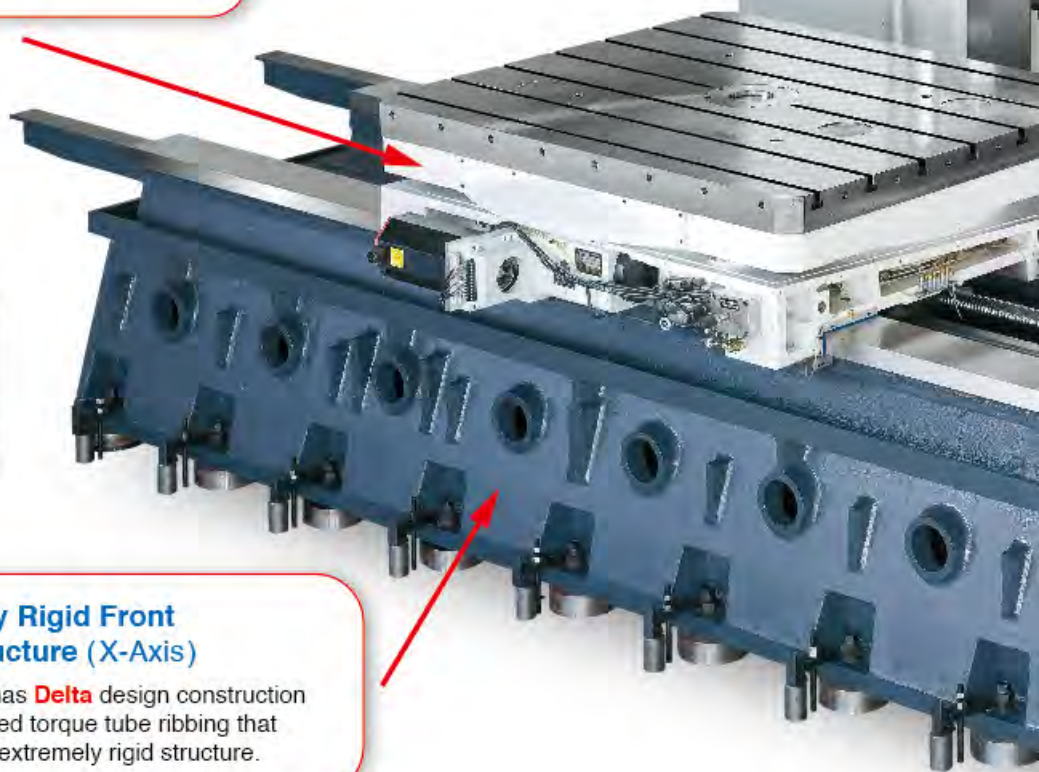
*Forced circulation cooling is applied to spindle, bearings and gearbox.*

#### FRONT X-AXIS BASE **DELTA** DESIGN

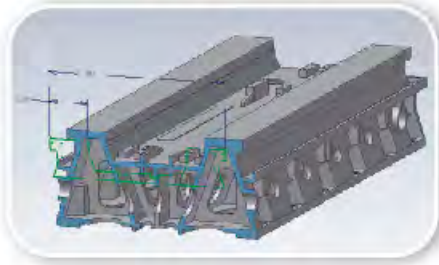


#### Extremely Rigid Front Base Structure (X-Axis)

Front base has **Delta** design construction with integrated torque tube ribbing that provides an extremely rigid structure.



**REAR Z-AXIS BASE  
DELTA DESIGN**



**Extra Wide Rear  
Base Structure  
Design (Z-Axis)**

Extra wide column base couples **Delta** design construction with torque tube ribbing for heavy-duty machine stability.

- Span between box ways is **44.8"**
- Width of single box ways is **9.8"**



**Powerful XYZ-Axes  
Transmission System**

- Gearbox driven transmission on X and Z-axes with a 1:2 gear ratio
- Direct-drive on Y-axis

**Solid and Rigid  
Structural Design**

To assure the best possible machine rigidity, stability, dampening capacity and dynamic performance, Mighty USA engineers apply advanced **Finite Element Analysis** software to thoroughly analyze the structural members and feed systems. FEA aided design yields increased machining efficiency and minimized vibration while ensuring a fine surface cut.

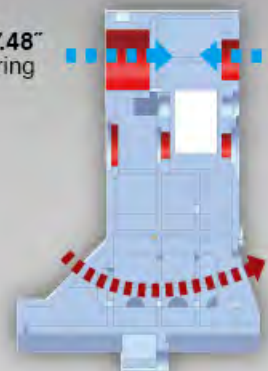
*Exceptional counter boring accuracy.*



**Boring Accuracy**

Ø7.48" Boring

Ø4.72" Boring



Boring center accuracy: **0.00079"**

Positioning accuracy: within **0.00039"**

Inner hole surface roughness: **3.2µm**

Table rotation position accuracy: **15 Arc Seconds**  
Repeatability accuracy: **±8 Arc Seconds**

# HEAVY BORING EXTRA HIGH TORQUE OUTPUT.

## VARIABLE 4-STEP SPEED

The variable speed spindle settings are high, middle, low and neutral position. The gear-driven spindle provides extra high torque output, making the machine ideal for heavy boring.

## PRECISION SPINDLE

The spindle, supported by P4 class precision bearings, is precision ground and carefully assembled to guarantee superior dynamic running accuracy.

## HIGH TORQUE

Powerful gearbox driven spindle provides up to **4,814 ft-lb** of torque output at 50 hp. (maximum output)

## QUALITY MATERIAL

The spindle, gears, and spindle shaft are all made of high grade alloy steel, heat treated and precision ground.



W-Axis Linear Guideways

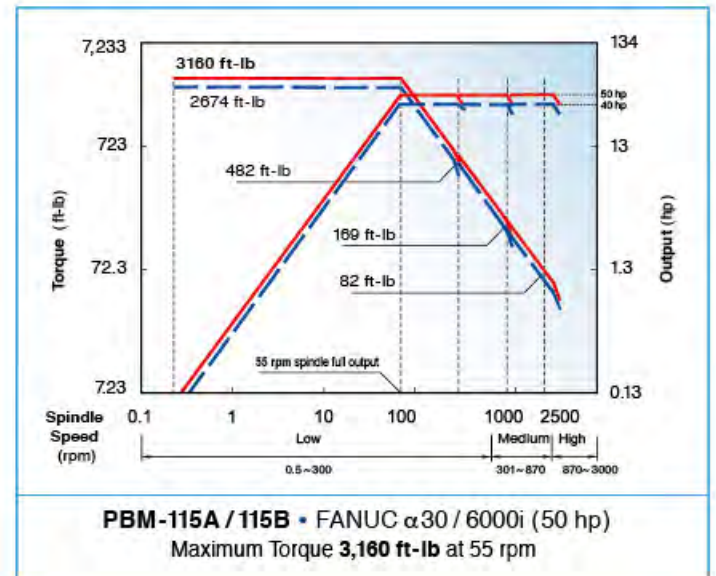
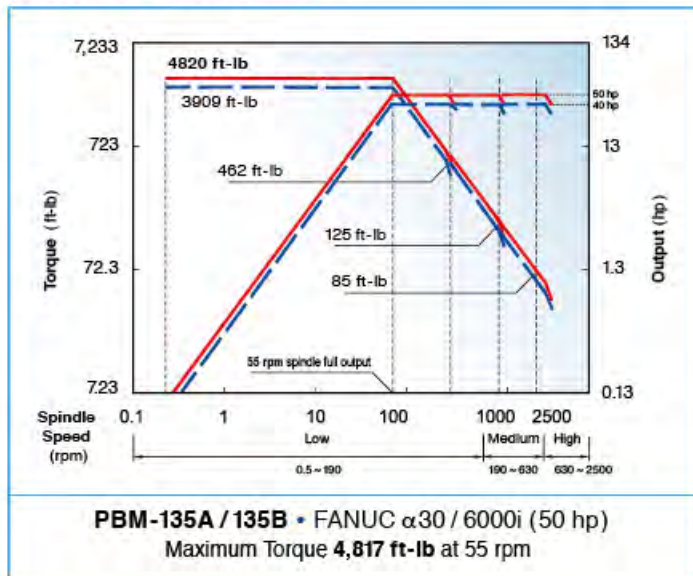
## Greater W-Axis Rigidity

W-Axis utilizes two linear guideways for increased horizontal stability.

- Heavier support capacity
- Fast horizontal movement
- Greater torque output



## TORQUE DIAGRAM



# RIGID CONSTRUCTION YIELDS MAXIMUM STABILITY

## SPINDLE STOCK CONSTRUCTION

The PBM spindle stock has a rigid box type construction that yields maximum stability during boring operation.

## AUTOMATIC COOLING AND LUBRICATION SYSTEM

Automated forced circulation cooling and lubrication system is applied to spindle, bearings and gearbox to reduce thermal strain on the spindle and extend the service life.



**PBM-115**

**Ø4.33"**

Spindle Diameter

**19.68"**

W-Axis Travel



**PBM-135**

**Ø5.12"**

Spindle Diameter

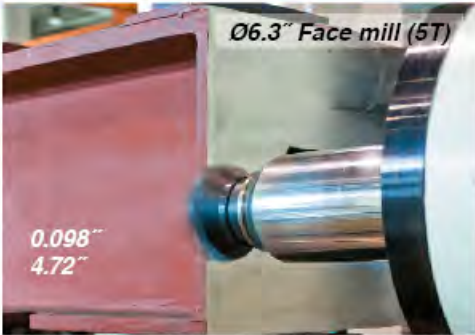


**27.5"**

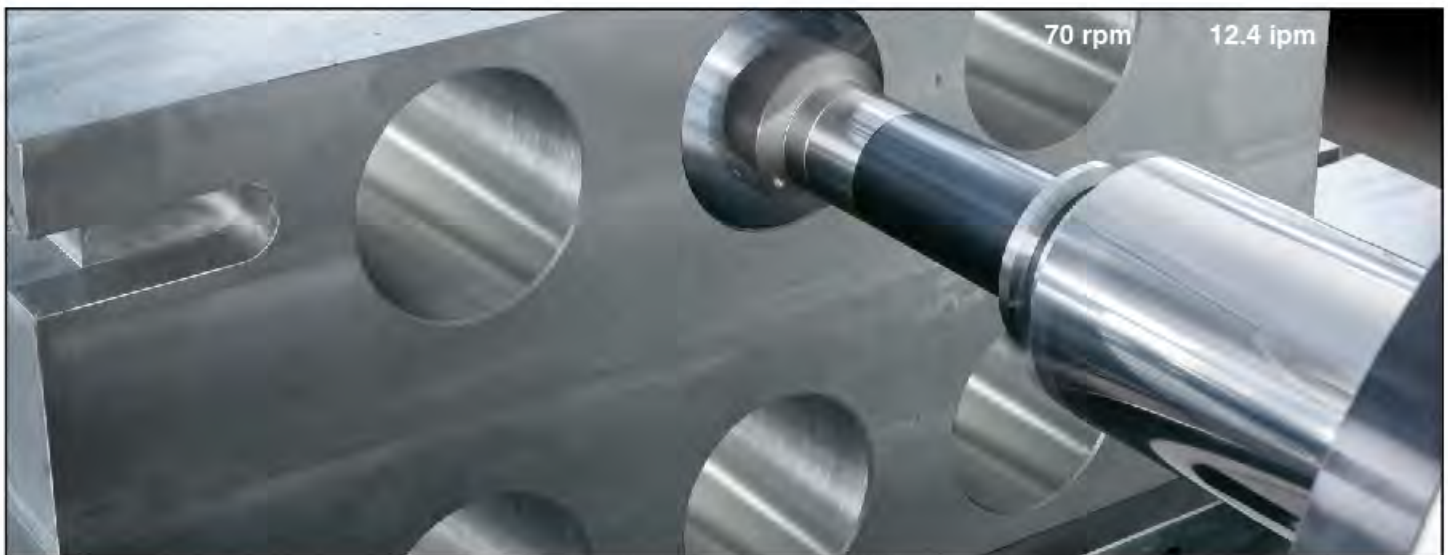
W-Axis Travel

# OUTSTANDING W-AXIS

*Opens the Way to Greater Boring Capacity.*

# CUTTING EDGE PRECISION AND POWER

FACE MILL • Cast Iron (FC30)		DRILL • Cast Iron (FC30)		TAP • Cast Iron (FC30)	
 <p>0.098" 4.72"</p>		 <p>2.99"</p>		 <p>Ø1.48" Drill (2T)</p>	
<b>MACHINING RATE</b>		<b>FEEDRATE</b>		<b>TOOL</b>	
<b>46.6 in<sup>3</sup>/min</b>		<b>4.7 ipm</b>		<b>M42 x P4.5</b>	
Spindle Speed 500 rpm	Feedrate 100 ipm	Spindle Speed 300 rpm	Feedrate 4.7 ipm	Spindle Speed 70 rpm	Feedrate 12.4 ipm



## Machine Accuracy

Comparison with competitive model

Straightness of Table (X-axis) • Moves in right and left direction.			
Inspection Items	Mighty Viper PBM	Competitive Model	Difference
Right and Left Direction (vertical surface)	0.001181" / 39.37"	0.04 / 39.37"	<b>33% better</b>
Forward and Backward Direction (vertical surface)	0.001181" / 39.37"	0.08 / 39.37"	<b>167.7% better</b>
Spindle Hole Run-out			
Inspection Items	Mighty Viper PBM	Competitive Model	Difference
At fixed end of test bar (0-inches)	0.000039" / 0"	0.00059"	<b>50% better</b>
At 11.81" of test bar	0.00078" / 11.81"	0.00197"	<b>50% better</b>



Positioning and Repeatability Accuracy of Linear Movement			
Inspection Items	Mighty Viper PBM	Competitive Model	Difference
X-axis / Y-axis	0.00039" / 0.00039"	0.00078" / 0.00078"	100% / 100% better
Z-axis / W-axis	0.00039" / 0.00039"	0.00078" / ±0.00047"	100% / 20% better

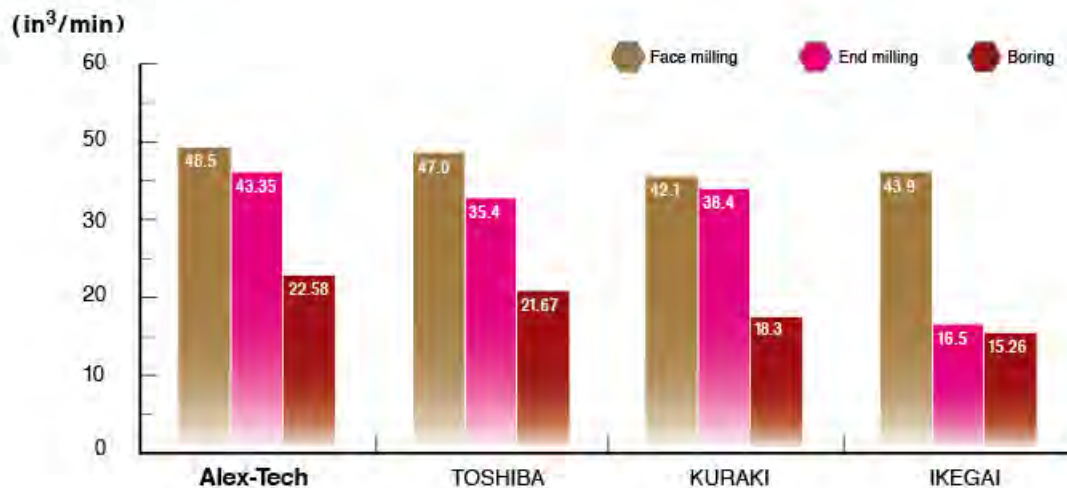
<b>Outstanding Cutting Capabilities</b>	<b>Face Milling:</b> 46.6 in <sup>3</sup> /min	<b>End Milling:</b> 47 in <sup>3</sup> /min
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Machining Type	Face Milling (FC30 Cast Iron)	End Milling (FC30 Cast Iron)
Tool diameter (inch)	6.2	2.0
Cutting speed (ipm)	9.8	7.7
Running speed (ipm)	19.6	39.3
Feedrate (ipm)	100	51
Cutting width (inch)	4.7	0.78
Cutting depth (inch)	0.098	1.18
Material removal rate (in <sup>3</sup> /min)	46.6	47.5

Boring Accuracy Report 0°~180° Boring		
Inspection Items	JIS Standard	Measured Value
X-axis deviation	0.0023"/39.3"	0.00059"
Z-axis deviation	0.0023"/39.3"	0.00114"

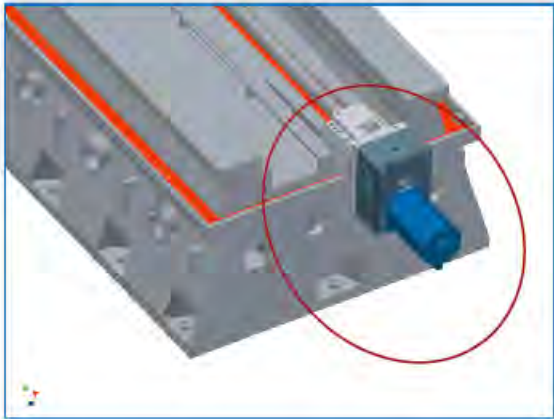


## Unmatched MACHINING CAPACITY



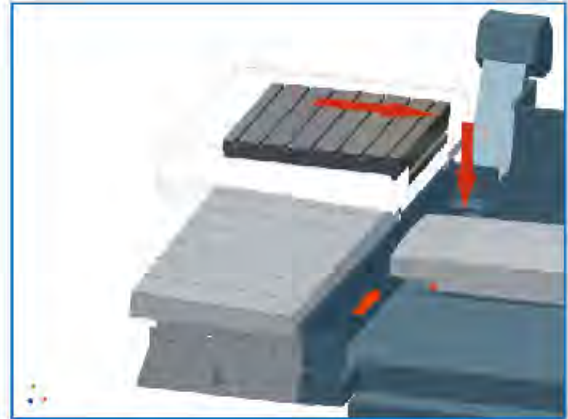
# NEW DESIGN FEATURES THAT BOOST-UP PERFORMANCE

The Alex-Tech precision boring milling machine offers the leading edge in technology for high precision / high productivity boring. The enhanced capability of the PBM machine is a result of several special design features: unique 4-step gear transmission, zero back-lash worm-drive, and strategically positioned chip removal system.



### XYZ-AXES TRANSMISSION SYSTEM

- The X and Z-axes are driven with **Gearbox Transmission** (1:2 gear ratio), providing powerful axial thrusting force.
- The Y-axis is **Direct-Drive** powered, featuring fast transmission with low noise, for smooth up and down spindle travel



### SPECIAL CHIP EXHAUST DESIGN

Conveyor is positioned right between front X-axis base structure and rear Z-axis base structure, chips land directly on the **conveyor bed** for removal to outside container. Table is keep clear of metal chip build-up. Cutting area is keep cleaner, yielding efficient machine operation.

## ZERO BACK-LASH TABLE ROTATION

Duplex gear transmission provides exact and even rotary movement.

Duplex gearing employs two involute teeth flanks with different pitches that facilitate a stepless compensation of the tooth flank backlash (present in even pitched teeth flanks) or wear by means of the simple axial re-adjustment of the worm shaft. The worm drive can be adjusted to correct table travel backlash.



**±10 Arc Seconds**

*Positioning and repeatability accuracy of rotary table.*

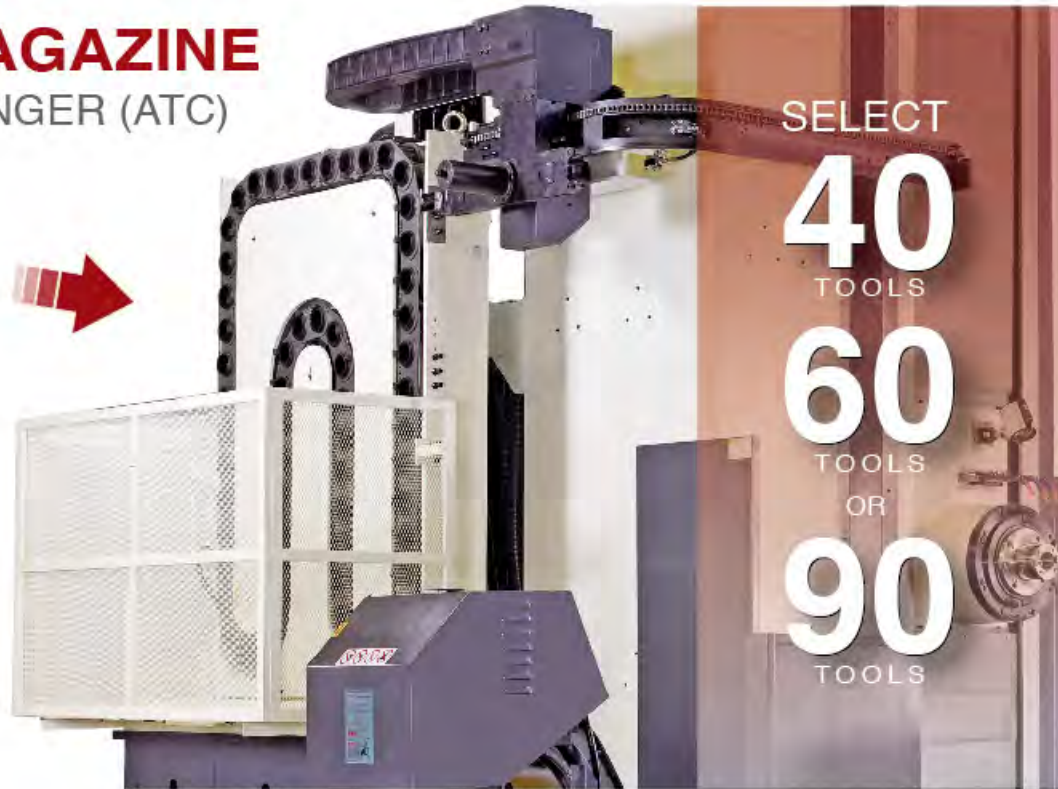
### Positioning and Repeatability Accuracy of Rotary Table

Inspection Items	Alex-Tech PBM	Competitive Model	Difference
Positioning and repeatability accuracy of rotary table	±10 arc seconds	±15 arc seconds	<b>50% better</b>
Positioning and repeatability accuracy of W-axis	0.00078"	0.00087" / 11.81"	<b>10% better</b>

STAND ALONE  
**CHAIN-TYPE MAGAZINE**  
 AUTOMATIC TOOL CHANGER (ATC)

Fast tool-to-tool exchange — tool magazine is independently mounted to prevent tool interfering with cutting operation, ensures cutting accuracy of PBM machine.

- BT-50 tool shank
- 40-tool magazine (standard)
- 60-tool magazine (optional)



**SPINDLE HEADS** A VARIETY OF OPTIONS TO CHOOSE

**Universal Head**

Spindle taper: #50  
 Max. tool diameter: Ø7.87"  
 Tool picking: manual  
 Max. power: 73 hp  
 Max. speed: 1000 rpm  
 Indexing method: manual



**90-Degree Head**

Spindle taper: #50  
 Max. tool diameter: Ø7.87"  
 Tool picking: manual  
 Max. power: 73 hp  
 Max. speed: 1000 rpm  
 Indexing method: manual



**90-Degree Extension Head**

Spindle taper: #50  
 Max. Tool diameter: Ø5.9"  
 Tool picking: manual  
 Max. power: 50 hp  
 Max. speed: 1000 rpm  
 Indexing method: manual



**Quill Support**

Specification: 12" / 20"  
 Max. Speed: 1500 rpm



# ENHANCED MACHINE FUNCTIONS

## OPERATIONALLY CONVENIENT MULTI-FUNCTION HANDWHEEL (Optional)

Conventional analytic handwheels have no coordinate display function. If the operator needs to know the current coordinate, turn the coordinate display on the controller. The coordinate display function of the handwheel allows coordinate value to be displayed on the handwheel display for increasing convenience of operation.

(1) CURRENT COORDINATE DISPLAY



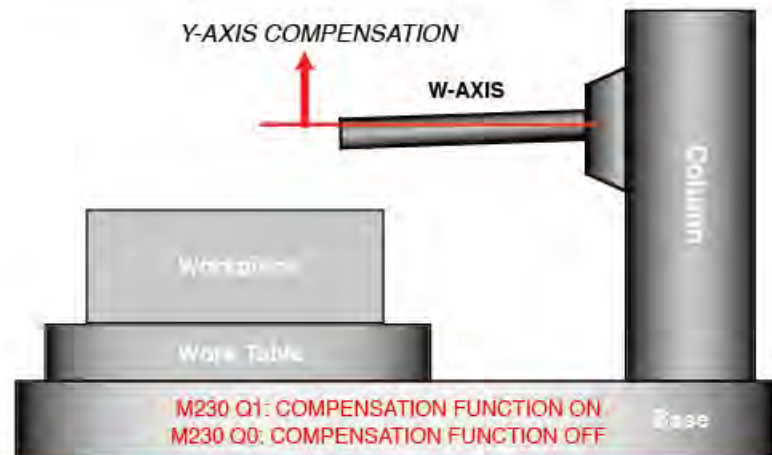
(2) MANUAL START / STOP SPINDLE ROTATION

(3) JOG MOVEMENT CONTROL



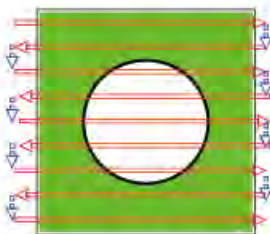
## MACHINING ACCURACY UPGRADED W-AXIS DEFLECTION COMPENSATION FUNCTION (Optional)

Due to the gravity factor, when the W-axis protrudes too much or tool weight is heavier, this may result in a slight deflection on the W-axis. This deflection compensation function may be applied to ensure high machining accuracy.



## INCREASE MACHINING EFFICIENCY BY USING HARTROL SPECIAL CYCLES (Optional)

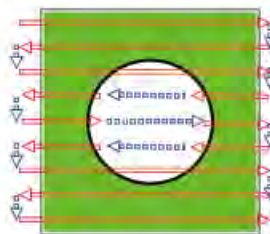
EX. 1: COMPLEX FACE MILLING



GENERAL FACE MILLING

**TEST CONDITIONS**

- GIF 39.37 ipm
- GOF 275.59 ipm
- Square sizes: 3.94" x 3.94"
- Circle diameter: 2.36"
- Cutting width: 0.39"
- Relief value: 0.19"



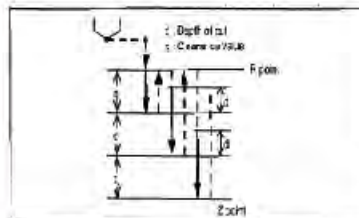
COMPLEX FACE MILLING

**EFFICIENCY ANALYSIS**

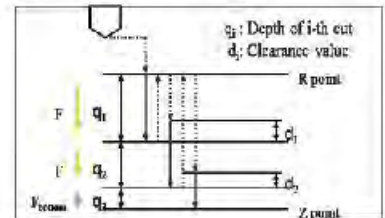
- 83 seconds when applying conventional face milling.
- 77 seconds when applying the complex face milling.
- 7% increased efficiency.

□□□□ G00 → G01

EX. 2: SPECIAL PECK DRILLING CYCLE (Available with FANUC OiMD / 32iMA / 31iMA)

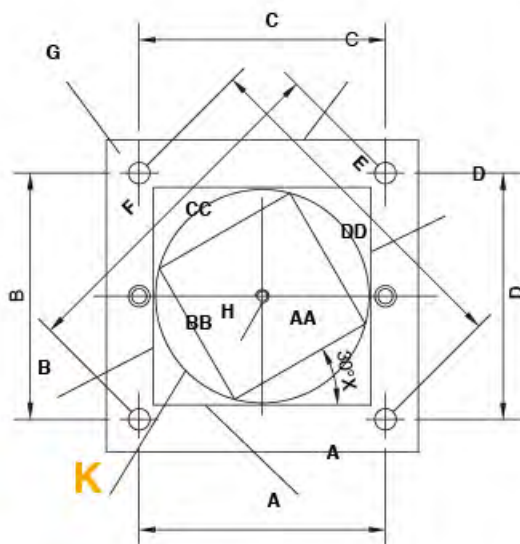
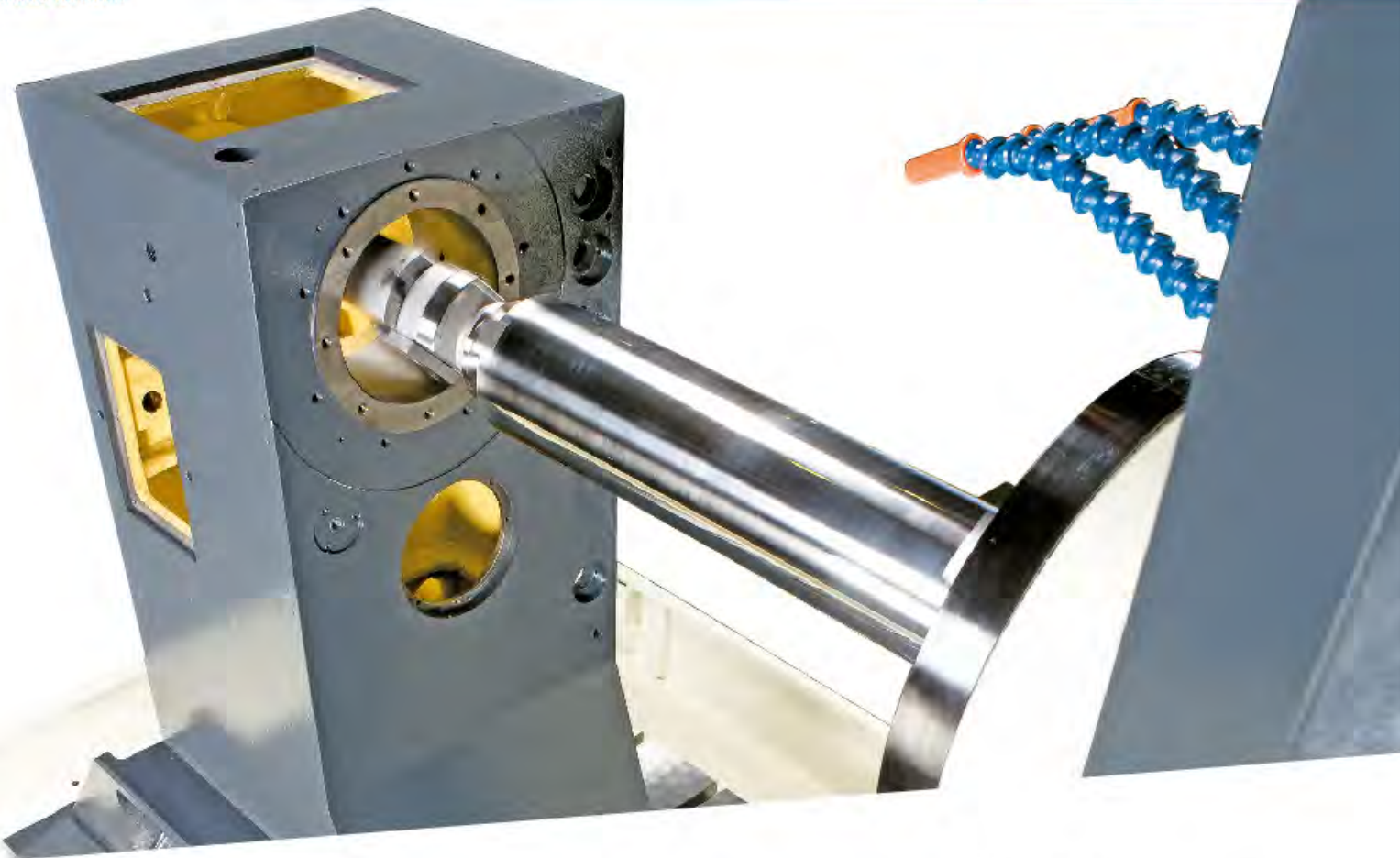


CONSTANT PECK DRILL



SPECIAL PECK DRILL

The special peck drilling function provides an increase of drilling efficiency. The drilling conditions for each step may be set individually. This drilling mode allows bigger tolerances and drilling depths at initial steps, and returns to standard tolerance setting at the last step. The variable depth peck drilling provides higher efficiency than constant (standard) peck drilling by 20%.



	Inspection Items	Allowable Tolerance	Insp. Results	Remarks
<b>Boring Positioning Accuracy</b>	Positioning accuracy A (11.8")	0.00098"	0.0003"	(⊕)
	Positioning accuracy B (11.8")	0.00098"	0.0002"	(⊕)
	Positioning accuracy C (11.8")	0.00098"	0.0003"	(⊕)
	Positioning accuracy D (11.8")	0.00098"	0.0002"	(⊕)
	Positioning accuracy E (11.8")	0.0013"	0.0002"	(⊕)
	Positioning accuracy F	0.0013"	0.0005"	(⊕)
<b>Circular Cutting Side Milling Accuracy</b>	Roundness K	0.0015"	0.0004"	(○)
	Straightness A	0.00059"	0.0002"	(-)
	Straightness B	0.00059"	0.0002"	(-)
	Straightness C	0.00059"	0.0002"	(-)
	Straightness D	0.00059"	0.0002"	(-)
	Squareness A&B	0.0011"	0.0006"	(⊥)
	Squareness B&C	0.0011"	0.0006"	(⊥)
	Squareness C&D	0.0011"	0.0006"	(⊥)
	Squareness D&A	0.0011"	0.0006"	(⊥)
	Parallelism A&C	0.0011"	0.0005"	(//)
Parallelism B&D	0.0011"	0.0004"	(//)	
<b>Linear Interpolation End Milling Accuracy</b>	Straightness AA	0.00078"	0.0001"	(-)
	Straightness BB	0.00078"	0.0002"	(-)
	Straightness CC	0.00078"	0.0001"	(-)
	Straightness DD	0.00078"	0.0001"	(-)
	Squareness AA & BB	0.0015"	0.0001"	(⊥)
	Squareness BB & CC	0.0015"	0.0002"	(⊥)
	Squareness CC & DD	0.0015"	0.0002"	(⊥)
	Squareness DD & AA	0.0015"	0.0002"	(⊥)
Parallelism AA & CC	0.0015"	0.0002"	(//)	
Parallelism BB & DD	0.0015"	0.0002"	(//)	

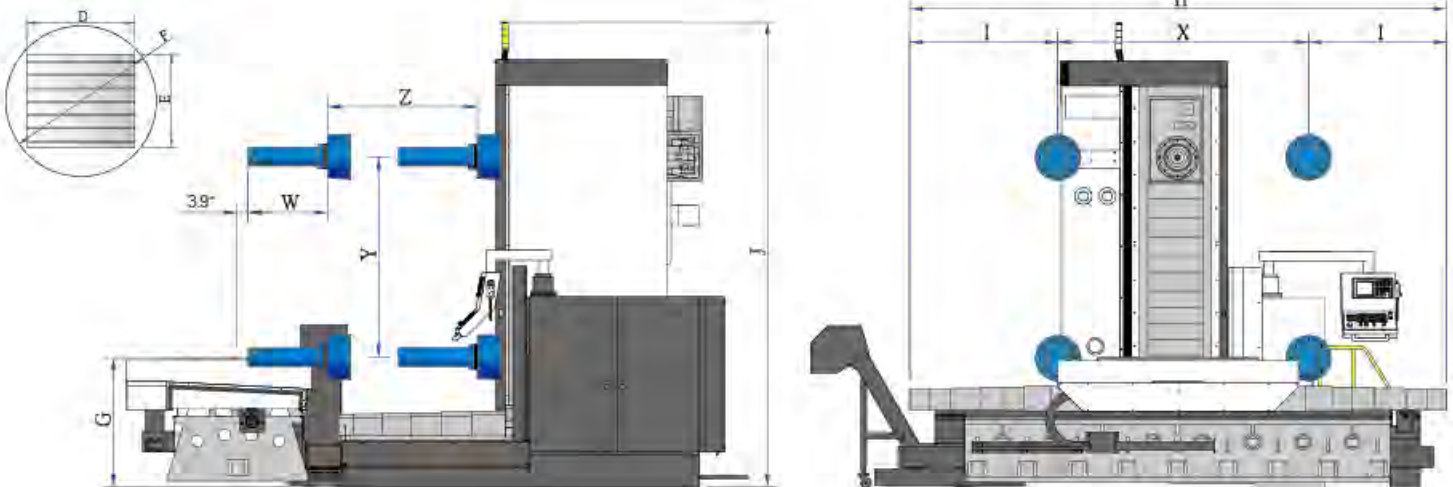
• Inspection accuracy on each machine may vary with accessories and working conditions.

## MACHINE Specifications

MODEL	UNIT	PBM-115A	PBM-115B
<b>Table</b>			
Surface Size	mm	1400 × 1600	1600 × 1800
T-slots (size × no. × pitch) (opt.)	mm	22 × 7 × 200	22 × 7 × 225
Max. loading	Kg	7000	12000
<b>Travel</b>			
X-axis travel	mm	2000	2000
Y-axis travel	mm	1600	1500
Z-axis travel	mm	1500	1500
W-axis travel	mm	500	500
<b>Spindle</b>			
Spindle diameter	mm	110	110
Spindle sleeve	mm	225	225
Spindle taper		#50	#50
Spindle speed (gear)	rpm	3000	3000
Spindle (option)	rpm	4000	4000
<b>Feed Rate</b>			
X / Y / Z-axis cutting federate	mm/min	6000	6000
X / Y / Z-axis rapid traverse	m/min	15/12/15	15/12/15
W-axis rapid traverse	m/min	6	6
B-axis rapid traverse	rpm	1.7	1.7
<b>ATC</b>			
No. of tools	pcs	40/60*	40/60*
Max tools weight	kg	25	25
Max. tool size (dia. × length)	mm	125D × 400	125D × 400
Max. adjacent tools size (dia. × length)	mm	249 × 400	249 × 400
Tool shank	-	CAT-50	CAT-50
Tool stud bolt	-	P50T-1	P50T-1
<b>Spindle Motor</b>			
Motor – FANUC (30 min.)	hp	20/30*/35*	20/30*/35*
Air source	bar	7	7
Max. torque	Nm	2306 (35 hp)	2306 (35 hp)
Electric power consumption	kVA	65	65

Design and specifications are subject to change without prior notice.

## MACHINE Dimensions





MODEL	UNIT	PBM-135A	PBM-135B
<b>Table</b>			
Surface Size	mm	1400 × 1600	1600 × 1800
T-slots (size × no. × pitch) (opt.)	mm	22 × 7 × 200	22 × 7 × 225
Max. loading	Kg	7000	12000
<b>Travel</b>			
X-axis travel	mm	2500	2500
Y-axis travel	mm	2000	1900
Z-axis travel	mm	1500	1500
W-axis travel	mm	700	700
<b>Spindle</b>			
Spindle diameter	mm	130	130
Spindle sleeve	mm	245	245
Spindle taper		#50	#50
Spindle speed (gear)	rpm	2500	2500
Spindle (option)	rpm		
<b>Feed Rate</b>			
X / Y / Z-axis cutting federate	mm/min	5000	5000
X / Y / Z-axis rapid traverse	m/min	10/10/10	10/10/10
W-axis rapid traverse	m/min	6	6
B-axis rapid traverse	rpm	1.7	1.7
<b>ATC</b>			
No. of tools	pcs	40/60*	40/60*
Max tools weight	kg	25	25
Max. tool size (dia. × length)	mm	125D × 400	125D × 400
Max. adjacent tools size (dia. × length)	mm	249 × 400	249 × 400
Tool shank	-	CAT-50	CAT-50
Tool stud bolt	-	P50T-1	P50T-1
<b>Spindle Motor</b>			
Motor – FANUC (30 min.)	hp	30/50*	35/50*
Air source	bar	7	7
Max. torque	Nm	6060 (50 hp)	6060 (50 hp)
Electric power consumption	kVA	65	65

Design and specifications are subject to change without prior notice.

**STANDARD FEATURES**

- B-axis 0.001°
- NC rotary table
- Fluorescent light
- RS-232 interface
- Spindle oil cooler
- Oil fluid separator
- Arm type ATC (40T)
- Automatic power-off
- Gear head 2,500 rpm
- Operation finish lamp
- Air blast through spindle
- Remote manual pulse generator
- Centralized automatic lubrication system
- Convection heat exchanger in control box
- Link type chip conveyor

**Optional Accessories**

- Universal milling head
- 90° head
- 90° extension head
- Quill support: 12" and 20"
- Cooling system
- Coolant through spindle
- CTS full splash guard
- Full splash guard
- Portable chip bucket
- Oil mist collector system
- Table side air blast (1-tube)
- Auto tool length measurement
- Foot switch for spindle clamp / unclamp
- Closed loop linear scale positioning system
- Air gun

**Machine Dimensions**

Unit = inch

Model	X X-Axis Travel	Y Y-Axis Travel	Z Z-Axis Travel	W W-Axis Travel	D E		F Max. Workpiece
					Table	Length	
PBM-135A	98	78	59	27	63	55	Ø94 x 78H
PBM-135B	98	74	59	27	70	63	Ø94 x 74H
PBM-115A	79	63	59	20	63	55	Ø94 x 78H
PBM-115B	79	59	59	20	70	63	Ø94 x 74H

Model	G Distance from Floor to Table	H Width of Machine (including Frame)	I Distance from Spindle Center to Frame	J Machine Height
PBM-135A	51	215	58	182
PBM-135B	55	215	58	182
PBM-115A	47	196	58	161
PBM-115B	51	196	58	161

## **ALEX-TECH**

**Alex-Tech Machinery Industrial Co., Ltd.** is spearheading the industry with specialized R&D for CNC lathes and machining centers that are widely known among world class engineers for precision. Our entirely computerized production facility occupies a space of over 3,300 square meters and employs a staff of over one hundred employees. Extremely rigid quality control procedures throughout operations ensure our world-wide acclaim for reliability. Leadership within the company combines a neoteric passion for innovation with unshakable experience. ALEX-TECH is a highly motivated company, committed to empowering manufacturers with quality, precision and reliability.

**伍將機械工業股份有限公司**

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