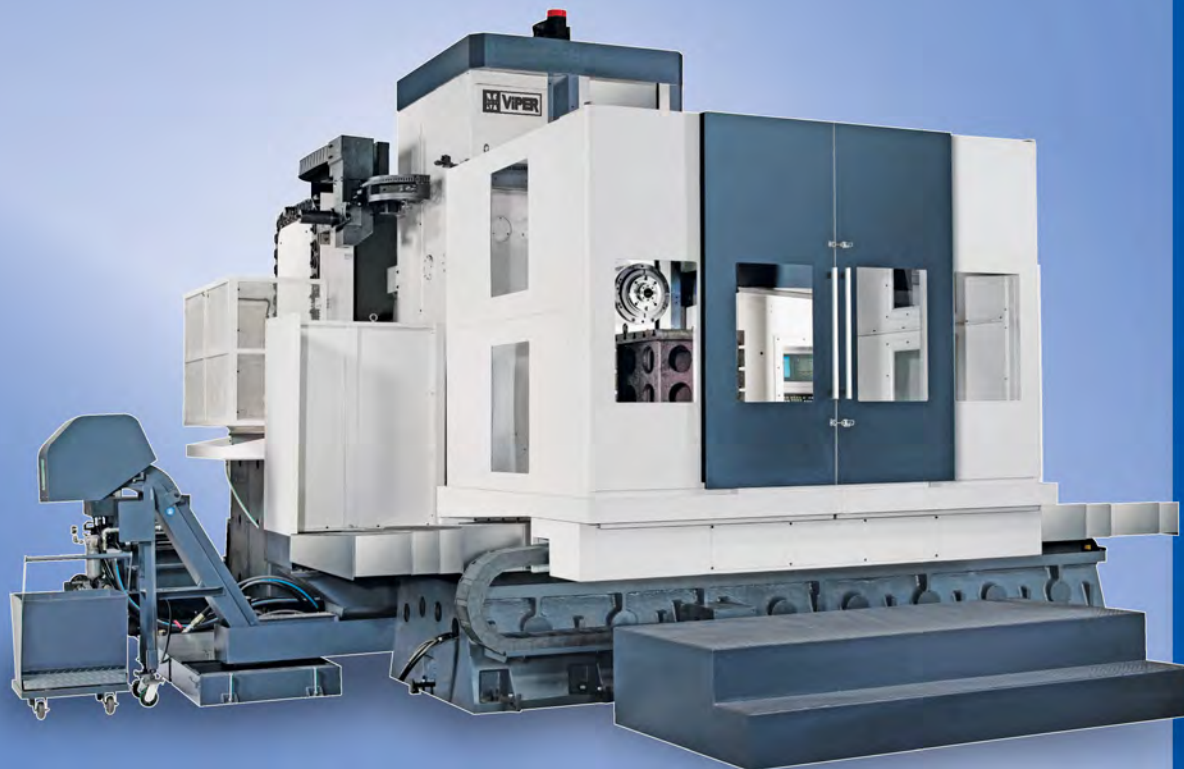


CNC · HORIZONTAL MACHINING CENTER

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 Mighty Viper **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

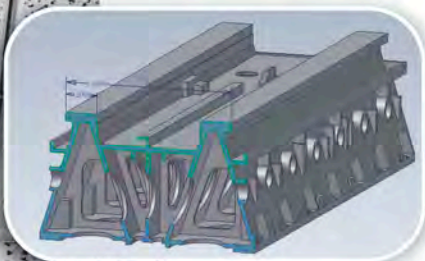
- Span between box ways is 30.7"
- Box way thickness is 4.0"
- Box way surface width is 7.0"

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.

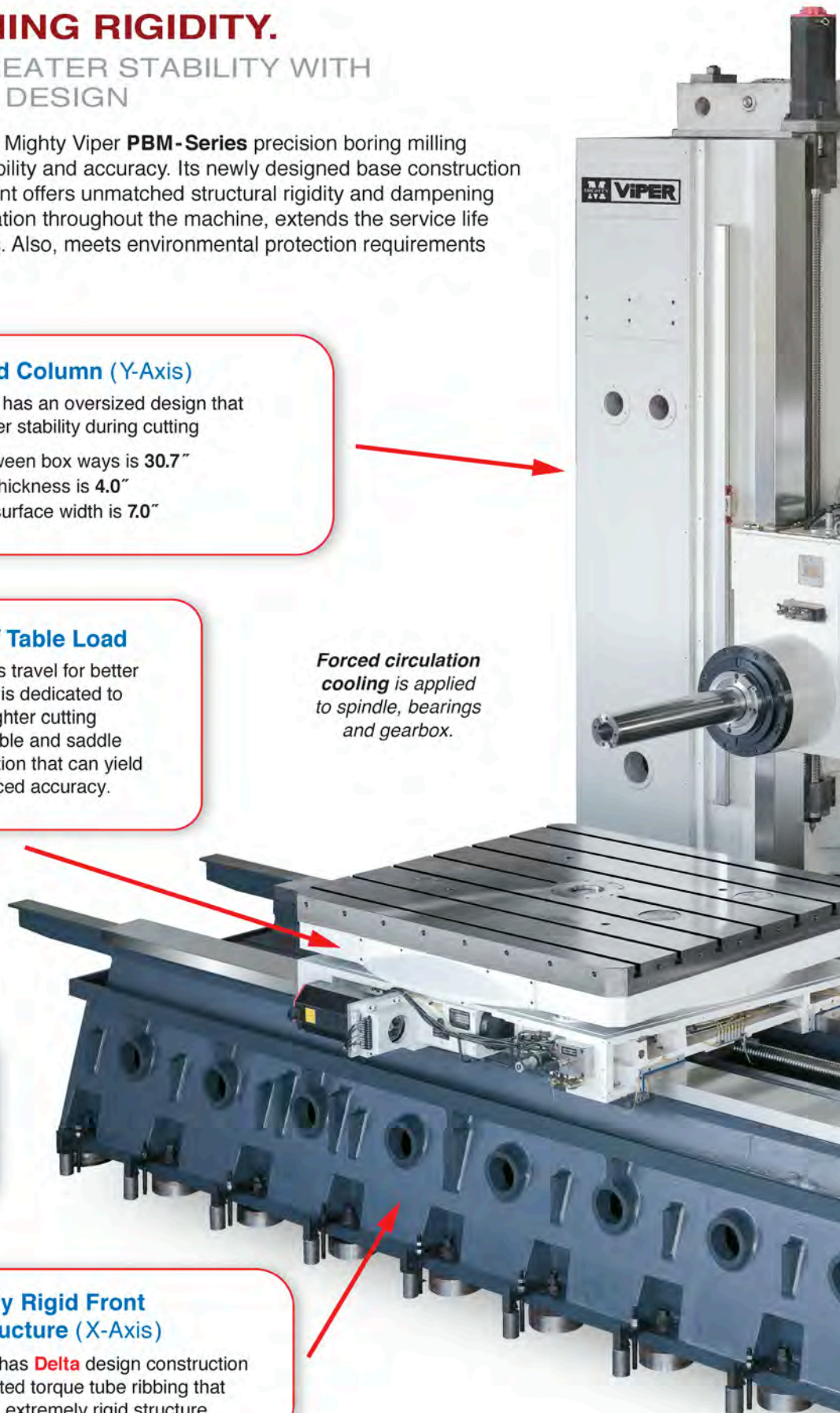
Forced circulation cooling is applied to spindle, bearings and gearbox.

FRONT X-AXIS BASE **DELTA** DESIGN

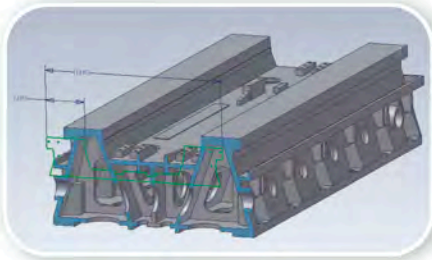


Extremely Rigid Front Base Structure (X-Axis)

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.

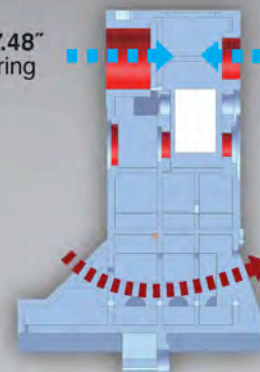
Exceptional counter boring accuracy.



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.

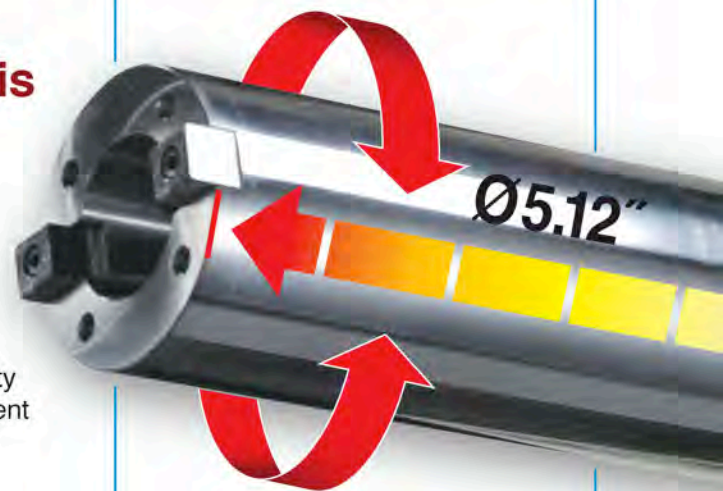


W-Axis Linear Guideways

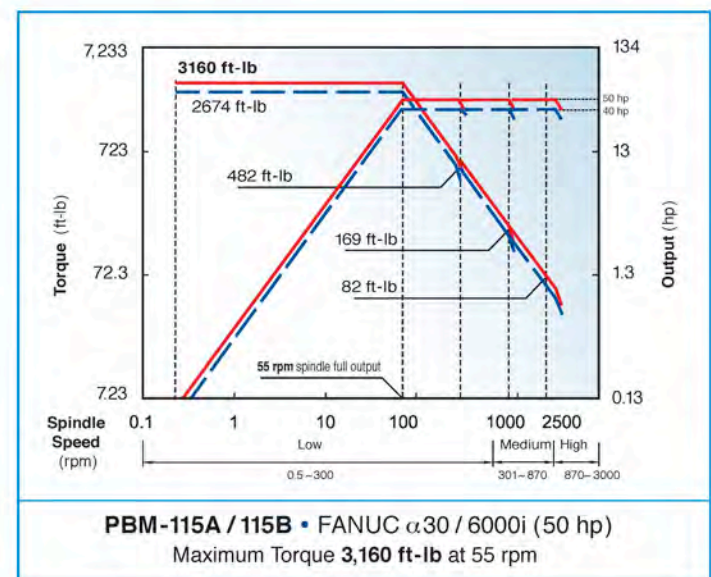
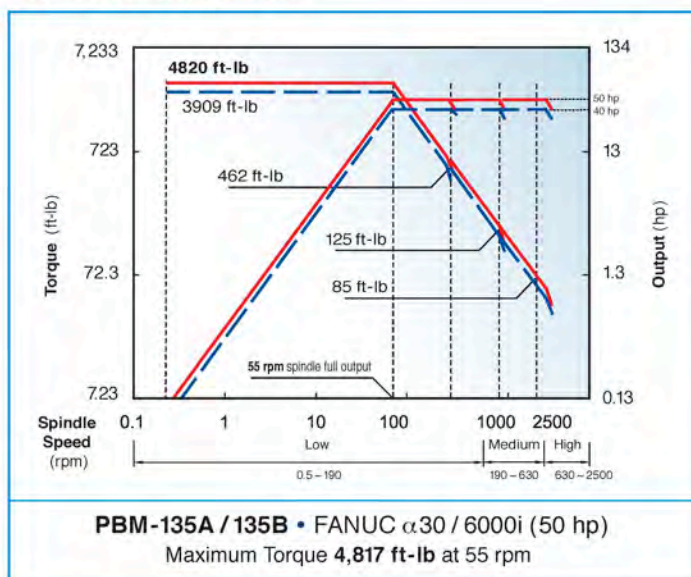
Greater W-Axis Rigidity

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

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



TORQUE DIAGRAM



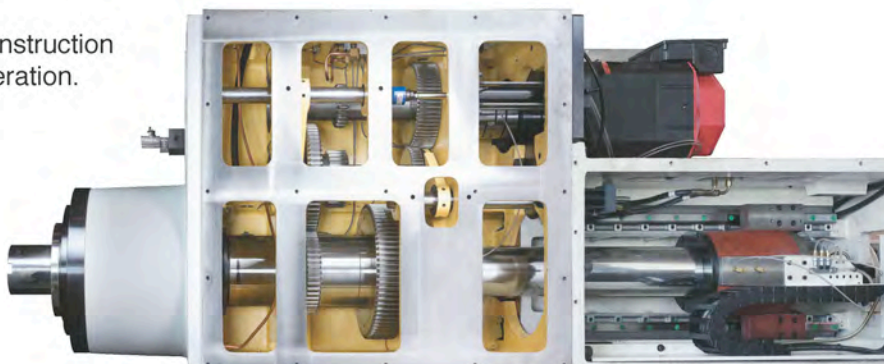
RIGID CONSTRUCTION YIELDS MAXIMUM STABILITY

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

Travel 27.5"

PBM-135

Ø5.12"

Spindle Diameter

27.5"

W-Axis Travel

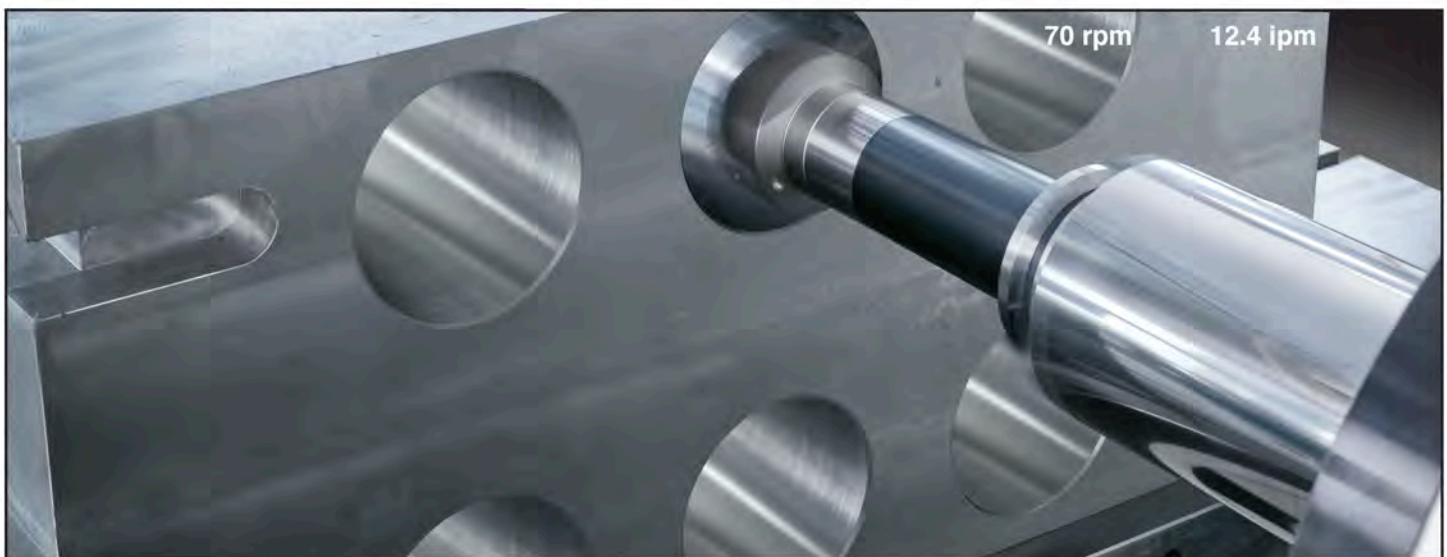
OUTSTANDING W-AXIS

Opens the Way to Greater Boring Capacity.

CUTTING EDGE PRECISION AND POWER



MACHINING RATE		FEEDRATE		TOOL	
46.6 in³/min		4.7 ipm		M42 x P4.5	
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 Right and Left Direction (vertical surface) Forward and Backward Direction (vertical surface)	Mighty Viper PBM 0.001181" / 39.37" 0.001181" / 39.37"	Competitive Model 0.04 / 39.37" 0.08 / 39.37"	Difference 33% better 167.7% better
Spindle Hole Run-out			
Inspection Items At fixed end of test bar (0-inches) At 11.81" of test bar	Mighty Viper PBM 0.000039" / 0" 0.00078" / 11.81"	Competitive Model 0.00059" 0.00197"	Difference 50% better 50% better

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

Outstanding Cutting Capabilities

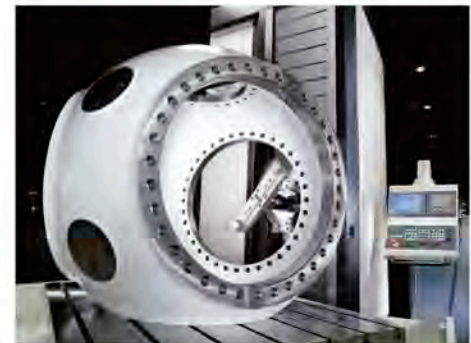
Face Milling: 46.6 in³/min

End Milling: 47 in³/min

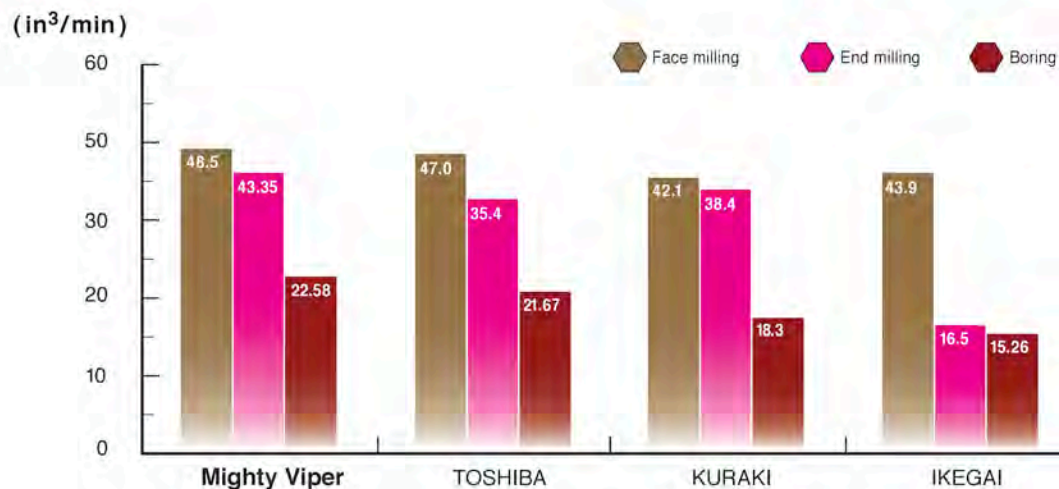
Machining Type	Face Milling (FC30 Cast Iron)	End Milling (FC30 Cast Iron)
Tool diameter (inch)	6.2	2.0
Cutting speed (ipm)	9.8	7.7
Running speed (ipm)	19.6	39.3
Feedrate (ipm)	100	51
Cutting width (inch)	4.7	0.78
Cutting depth (inch)	0.098	1.18
Material removal rate (in ³ /min)	46.6	47.5

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"

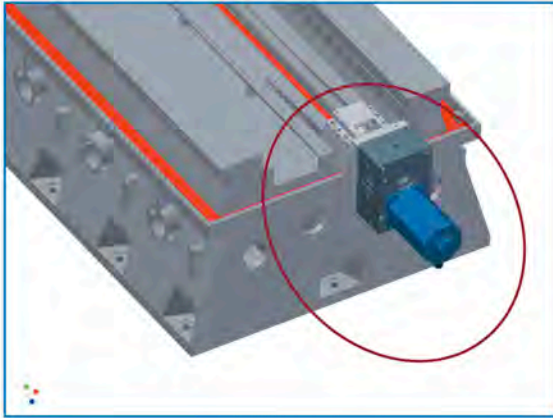


Unmatched MACHINING CAPACITY



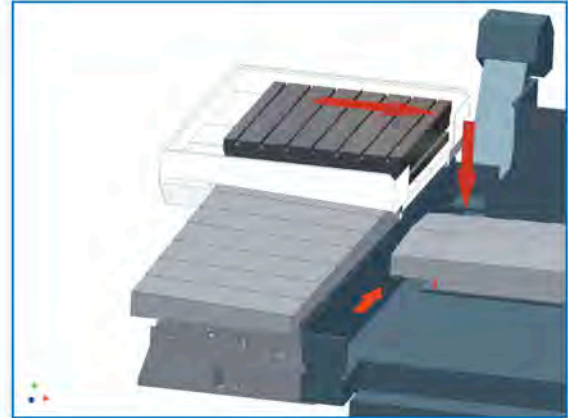
NEW DESIGN FEATURES THAT **BOOST-UP PERFORMANCE**

The Mighty Viper 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 kept clear of metal chip build-up. Cutting area is kept 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	Mighty Viper PBM	Competitive Model	Difference
Positioning and repeatability accuracy of rotary table	±10 arc seconds	±15 arc seconds	50% better
Positioning and repeatability accuracy of W-axis	0.00078"	0.00087" / 11.81"	10% better

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



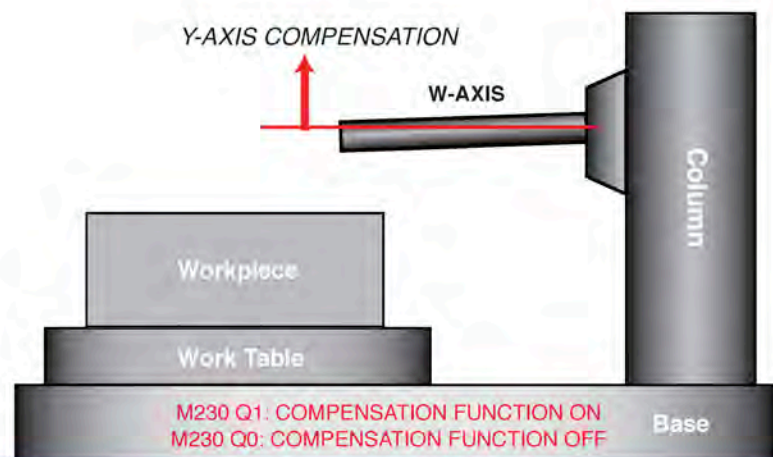
(2) MANUAL START / STOP
SPINDLE ROTATION

(3) JOG MOVEMENT CONTROL



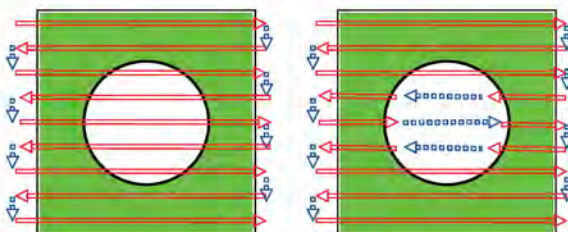
MACHINING ACCURACY UPGRADED W-AXIS DEFLECTION COMPENSATION FUNCTION (Optional)

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

COMPLEX 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"

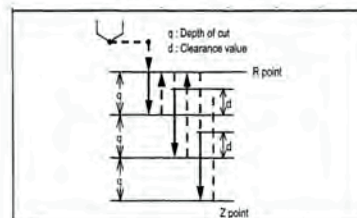
EFFICIENCY ANALYSIS

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

◀ G00 → G01

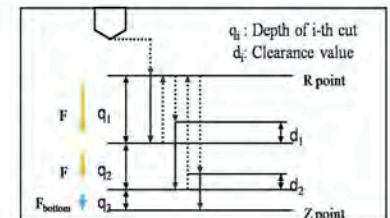
EX. 2: SPECIAL PECK DRILLING CYCLE

(Available with FANUC OiMD / 32iMA / 31iMA)

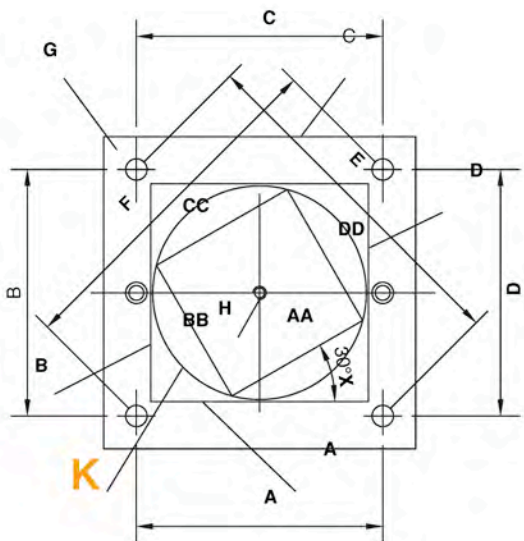
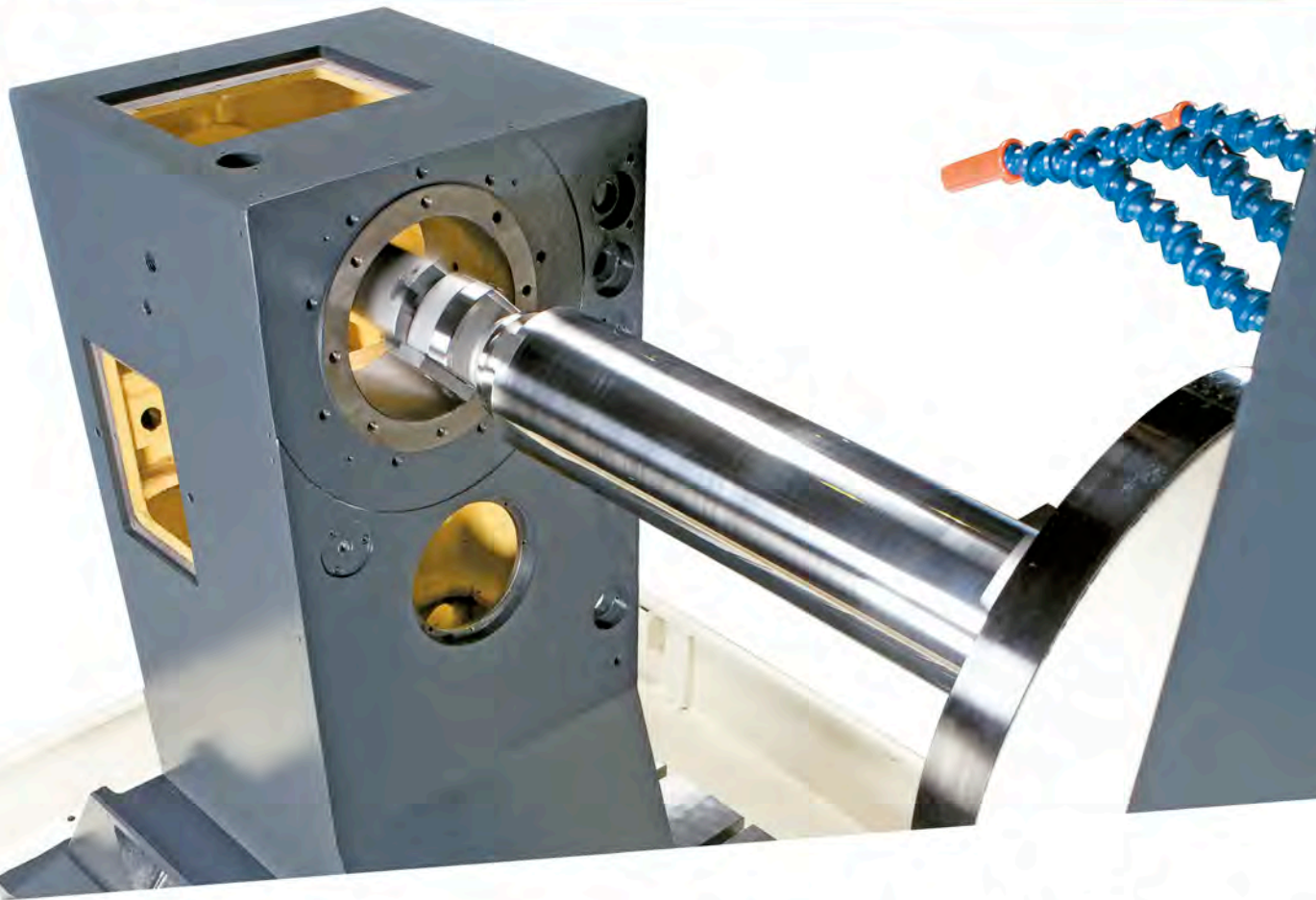


CONSTANT PECK DRILL

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%.



SPECIAL PECK DRILL



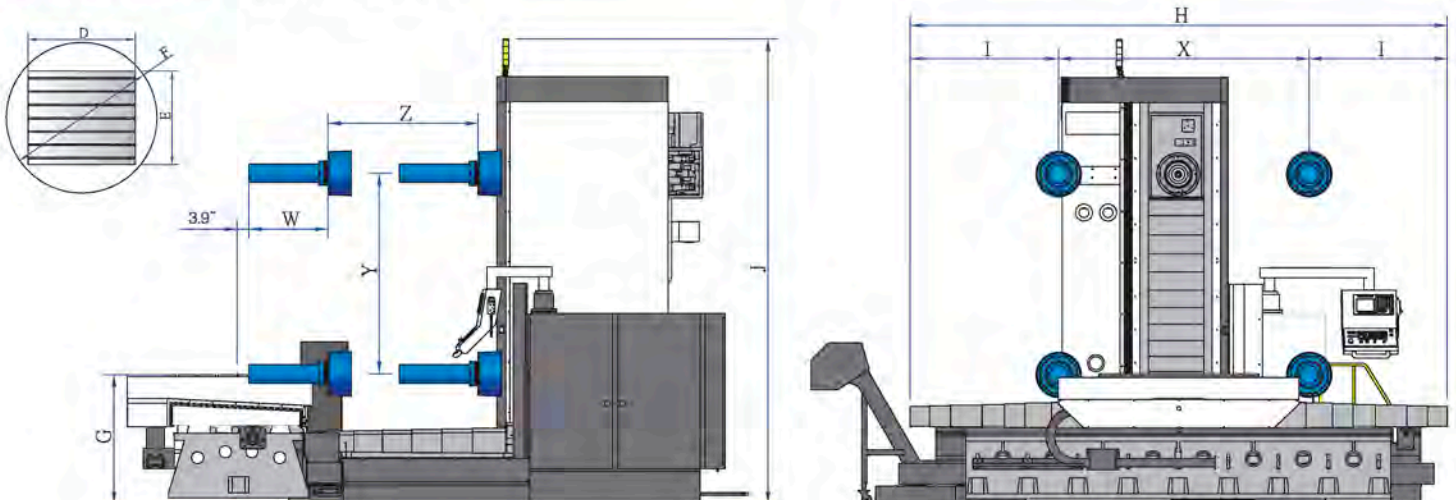
	Inspection Items	Allowable Tolerance	Insp. Results	Remarks
Boring Positioning Accuracy	Positioning accuracy A (11.8")	0.00098"	0.0003"	(+)
	Positioning accuracy B (11.8")	0.00098"	0.0002"	(+)
	Positioning accuracy C (11.8")	0.00098"	0.0003"	(+)
	Positioning accuracy D (11.8")	0.00098"	0.0002"	(+)
	Positioning accuracy E (11.8")	0.0013"	0.0002"	(+)
	Positioning accuracy F	0.0013"	0.0005"	(+)
Circular Cutting Side Milling Accuracy	Roundness K	0.0015"	0.0004"	(O)
	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"	(//)
Linear Interpolation End Milling Accuracy	Parallelism B&D	0.0011"	0.0004"	(//)
	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	PBM-135A	PBM-135B
Table					
Surface Size	inch	55 x 63	63 x 71	55 x 63	63 x 71
T-slots (size x no. x pitch) (opt.)	inch	0.87 x 7 x 7.87	0.87 x 7 x 8.86	0.87 x 7 x 7.87	0.87 x 7 x 8.86
Max. loading	lbs	15,432	26,455	15,432	26,455
Travel					
X-axis travel	inch	79	79	98	98
Y-axis travel	inch	63	59	79	74.5
Z-axis travel	inch	59	59	59	59
W-axis travel	inch	20	20	27.5	27.5
Spindle					
Spindle diameter	inch	4.3	4.3	5	5
Spindle sleeve	inch	9.7	9.7	9.7	9.7
Spindle taper		#50	#50	#50	#50
Spindle speed (gear)	rpm	3000	3000	2500	2500
Feed Rate					
X / Y / Z-axis cutting feedrate	ipm	1~236	1~236	1~197	1~197
X / Y / Z-axis rapid traverse	ipm	590	590	394	394
W-axis rapid traverse	ipm	590	590	236	236
B-axis rapid traverse	rpm	2	2	2	2
ATC					
No. of tools	pcs	40 / 60*	40 / 60*	40 / 60*	40 / 60*
Max tools weight	lbs	55	55	55	55
Max. tool size (dia. x length)	inch	4.9 x 16	4.9 x 16	4.9 x 16	4.9 x 16
Max. adjacent tools size (dia. x length)	inch	9.8 x 16	9.8 x 16	9.8 x 16	9.8 x 16
Tool shank	—	BT-50	BT-50	BT-50	BT-50
Tool stud bolt	—	P50T-1	P50T-1	P50T-1	P50T-1
Spindle Motor					
Motor - FANUC (30 min.)	hp	25 / 35*	25 / 35*	35 / 50*	35 / 50*
Air source	psi	92	92	92	92
Max. torque	lb-ft	4814 (50 hp)	4814 (50 hp)	4814 (50 hp)	4814 (50 hp)
Electric power consumption	kVA	60	60	60	60

MACHINE Dimensions



Machine Specifications

PBM-135A/BX3	PBM-135A/BX4	PBM-135P2	PBM-135P3	PBM-135P4
55 x 63	55 x 63	59 x 79	59 x 118	59 x 158
63 x 71	63 x 71			
0.87 x 7 x 7.87	0.87 x 7 x 7.87	0.87 x 8 x 7.87	0.87 x 8 x 7.87	0.87 x 8 x 7.87
0.87 x 7 x 8.86	0.87 x 7 x 8.86			
15,432 (A)	15,432 (A)	22,046	30,000	40,000
26,455 (B)	26,455 (B)			
118	157	79	118	157
79 (A)	79 (A)	79	79	79
75 (B)	75 (B)			
59	59	59	59	59
27.5	27.5	27.5	27.5	27.5
5	5	5	5	5
9.7	9.7	9.7	9.7	9.7
#50	#50	#50	#50	#50
2500	2500	2500	2500	2500
1~197	1~197	1~197	1~197	1~197
394	394	394	394	394
236	236	236	236	236
2	2	2	2	2
40 / 60*	40 / 60*	40 / 60*	40 / 60*	40 / 60*
55	55	55	55	55
4.9 x 16	4.9 x 16	4.9 x 16	4.9 x 16	4.9 x 16
9.8 x 16	9.8 x 16	9.8 x 16	9.8 x 16	9.8 x 16
BT-50	BT-50	BT-50	BT-50	BT-50
P50T-1	P50T-1	P50T-1	P50T-1	P50T-1
35	35	35	35	50
92	92	92	92	92
4814 (50 hp)	4814 (50 hp)	4814 (50 hp)	4814 (50 hp)	4814 (50 hp)
60	60	60	60	60

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	