

Power Drawbar Precision Matthews PM-25MV and PM-30MV Installation and Operations Guide



Required Air Compressor Fittings Supplied by the User

The Power Drawbar system requires a compressed air supply of 90-120psi. Fittings on air compressors vary. Many air compressors have female Industrial Quick-Disconnect Hose Couplings. The fittings listed below are usually compatible with this type of fitting. The user is required to supply the following fittings.

1. Air valve such as McMaster <https://www.mcmaster.com/4912k42> (\$7.57).
2. Industrial Quick-Disconnect Hose Coupling for Air (if you air compressor has a compatible socket) such as McMaster <https://www.mcmaster.com/6534k46> (\$1.18).
3. Push-to-Connect Tube Fitting for Air such as McMaster <https://www.mcmaster.com/5779k109> (\$3.16).



Installation of the Power Drawbar requires the chip guard and its switch enclosure be removed from the mill. The chip guard circuit wires are used by the Power Drawbar system to disable power to the mill when the Power Drawbar is activated.



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Unbox all items and verify contents with the attached packing list.

Installation Overview

1. Prepare mill for installation of the Power Drawbar.
2. Install support plate.
3. Assemble fittings in MAC valve.
4. Install drawbar, Belleville stack, R8 collet and load Belleville stack.
5. Assemble fittings in cylinder.
6. Attach socket cap screws to cylinder plate.
7. Attach cylinder to cylinder plate.
8. Attach cylinder assembly to support plate.
9. Install limit switch and connect chip guard circuit wires to wiring harness.
10. Assemble actuator plate.
11. Connect the Power Drawbar to your air compressor.
12. Test the Power Drawbar.

Tools Required

1. Metric hex key wrenches: 2.5, 4, 10mm
2. Inch hex key wrenches: 1/8, 5/32"
3. Phillips screwdriver, #1
4. Inch wrenches: 7/16, 1/2, 9/16, 5/8"
5. Spindle wrench (supplied with mill)
6. 6" rule
7. White China Marker pencil



Prepare Mill for Installation of the Power Drawbar

1. Unplug the mill.
2. Lower the headstock to a convenient position to install the Power Drawbar on top of the headstock.
3. Remove the following items from the mill (refer to the Owner's Manual):
 - a. Tooling and collet from the spindle
 - b. Spindle cover
 - c. Motor cover
 - d. Drawbar
 - e. Spindle cap



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Install support plate

Attach the support plate to the mill's motor bracket using the 2 supplied M5 x 12mm socket cap screws.



Assemble Fittings in Pneumatic Valve

1. Place the supplied pneumatic valve (which is connected to the wiring harness) printed-side up on a flat work surface.
2. Install the following push-to-connect fittings in the valve:
 - a. Extended elbow to lower left port
 - b. Elbow to upper left port
 - c. Muffler to upper right port
 - d. Straight fitting to lower right port
3. The valve and installed fittings should look as shown in the picture.



Attach the switch enclosure to the support plate using the 2 supplied #10-24 x 1/2" socket cap screws.

Mount the valve on the right side of the support plate using the supplied #4 x 1.125" machine screws and washers.

Install drawbar, Belleville stack, R8 collet and load Belleville stack

1. This part gets a little messy. Place a bead of supplied anti-seize under the head of the supplied drawbar.
2. Slide one of the supplied Belleville spring washers up the drawbar shaft with the convex face up against the underside of the drawbar head.
3. Place a bead of anti-seize around and under the edge of the washer (concave side).
4. Slide another Belleville washer onto the drawbar shaft with the convex side toward the convex side of the first washer.
5. Place a bead of anti-seize around the washer hole and the drawbar shaft.
6. Repeat the previous 3 steps until all the Belleville washers are mounted onto the drawbar shaft.
7. Apply a bead of anti-seize on the broad flat surface of the drawbar flange. Slide the flange onto the drawbar up to the last spring washer. Apply anti-seize around the end of the flange collar and drawbar shaft.
8. When completed, the side view of the drawbar assembly should look like this
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9. Place a light coating of anti-seize on the taper (outside) only of the supplied 3/4" R8 collet. Take great care in not getting any anti-seize on the face, inside or spring cuts of the collet. If any anti-seize gets into the inside of the collet, the tool will slip and it will not work.
10. Slide the supplied 3" washer over the 3/4" stud and insert into the supplied R8 collet.
11. Holding the face of the collet with a paper towel, insert the collet assembly up into the spindle and thread the drawbar into the collet. Finger tighten as much as possible.
12. Lay the face of the spindle wrench on the 3" washer and engage the spindle wrench with the flats of the spindle. Use the supplied binder clip to hold the spindle wrench to the washer. (For the PM-30 mill only, slide the supplied spindle wrench extender (9" plastic tube) over the handle of the wrench.) Rotate the spindle clockwise (as viewed from the top) until the spindle wrench handle touches the side of the mill column. This keeps the spindle from turning when tightening the drawbar and loading the Belleville washers.
13. With the spindle "locked", the rotation of the drawbar compresses the Belleville washers which applies holding torque to the tool in the R8 collet. The amount of rotation determines the final holding torque. The table below shows approximate holding torque per 1/6th revolution of the drawbar. Typical tool holding torque on manual drawbars is 15 to 20psi. This can be tested using a torque wrench prior to installation of the Power Drawbar.



	Hex	(90 psi)	(120 psi)
Full	Turns	Torque	Torque
Revs	1/6 Rev	(ft lbs)	(ft lbs)
1	6	10.0	
	7	15.0	
	8	17.0	
	9	21.0	
	10	25.0	
	11	n/a	27.0
2	12		32.0
	13		34.0
	14		n/a

At 90psi, the Power Drawbar can release a maximum of approximately 25 foot pounds of holding torque or 10, 1/6th turns of the drawbar. Since most shop compressors operate in the range of 90-120psi, it is recommended not to exceed 10, 1/6th turns in loading the drawbar.

14. Make a mark on the drawbar head with a grease pen to know how many revolutions have been made.
15. Tighten the drawbar one full revolution to test the system. The drawbar can be loaded further to achieve a higher holding torque at a later time.
16. Remove the spindle wrench and binder clip from the washer. The washer and hex cap screw will be removed later when the Power Drawbar is activated.

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Using Push-To-Connect Air Fittings

Align the tube with the fitting and gently insert the tube. Once the tube is started into the fitting, press the tube firmly into the fitting until the tube bottoms-out. Gently tug on the tube to make sure it is fully inserted into the fitting.

Assemble Fittings in Cylinder

1. Position the cylinder with the air ports facing up and the ram to the right.
2. Remove the protective covers from the ports.
3. Install the following fittings into the cylinder's air ports from right (ram-end) to left. Tighten firmly, but not to the point of stripping the thread.
 - a. Flow control (with the knurled knob)
 - b. Elbow
 - c. Muffler
 - d. Tee
4. Cut 5.25" from the supplied 1/4" air supply tubing and connect one end of the Tee fitting with the elbow.
5. Cut a 7" length of the 1/4" Push-To-Connect tubing from the supplied roll. Connect one end to the flow-control elbow (bottom port) on the air cylinder.
6. Cut a 9" length of 1/4" Push-To-Connect tubing from the supplied roll. Connect one end to the tee fitting (top port) on the air cylinder.



Attach Socket Cap Screws to Cylinder Plate

1. Thread the long socket cap screws with the protective caps into the underside of the cylinder plate.
2. The socket cap screws (including the head and protective cap) should extend the length of the black spacer (approximately 1 3/4") + 1/2" (for the support plate), approximately 2 1/4" from the bottom of the plate.

Attach Cylinder to Cylinder Plate

1. Place the cylinder with the ram up on a flat surface.
2. Position the cylinder spacers over the four mounting holes of the cylinder.
3. Gently place the cylinder plate onto the spacers with the dove-tail slot facing down and the linear bearing that is press-fit into the cylinder plate on the same end as the air ports of the cylinder.
4. Thread the four supplied M12 socket cap screws down through the cylinder plate and spacers, into the cylinder mounting holes. Use a 10mm hex key wrench to thread the socket cap screws into the body of the cylinder. Before final tightening, make sure that the





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spacers are centered on the cylinder mounting holes and slightly away from the outer edges of the cylinder walls. Tighten each cap screw evenly with the other screws in a “crisscross” pattern to make sure the cylinder is mounted flush with the spacers. Then perform a final tightening to secure the cylinder and spacers to the plate.

5. Rotate the cylinder and cylinder plate so that the cylinder is up and the plate down.
6. Refer to the Support Plate Legend Attachment and locate the mounting holes for this mill. Place the black spacers over the 10-24 mounting holes for this mill. Gently place the cylinder and plate assembly on top of the headstock and support plate and align the bearing in the cylinder plate with the receiving hole in the base plate. Insert the supplied shoulder screw down through the bearing and thread into the base plate. Make fine adjustments to the position of the cylinder plate so the shoulder screw threads easily, without binding, into the base plate. Tighten the shoulder screw.
7. Feed the other shoulder screw down through the hole in the right front corner of the cylinder plate, through the spacer, and thread into the support plate.

Wiring Harness Connections

1. Install the limit switch on the cylinder plate with the switch lever facing forward using the supplied 4-40 thumb screws.
2. Remove the headstock front panel. Rout the 2 wires used for the chip guard back into the headstock and down below the headstock. Connect the chip guard wires to the 2 insulated male connectors of the wiring harness. This connection is used to disable power to the mill when the Power Drawbar is engaged.
3. Two pieces of raceway and magnetic tape are included for wire management. The raceway and magnetic strips have an adhesive backing. There are two options for attaching the raceway to the headstock. The first and preferred method is peel the tape backing on both the raceway and magnetic strip and secure the magnetic strip to the back of the raceway. Use patience and care to align the magnetic strip to the back of the raceway before pressing together to bond. This option allows for adjustments to the position of the raceway if necessary.

The second option is to simply remove the adhesive backing of the raceway and attach it to the headstock. This bond is somewhat permanent. Once applied, the position of the raceway cannot be changed, and removing the raceway, if necessary, will be difficult and may damage the paint on the headstock.

Attach one of the raceways to the headstock base casting just below the headstock to secure the chip guard switch wires. Attach the other raceway to the side of the headstock to secure the wires from the Power Drawbar switch enclosure.

Connect the air tube from the cylinder tee (upper) fitting to the long elbow fitting of the MAC valve and the air tube from the cylinder flow control (lower) fitting to the “short” elbow of the MAC valve.



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Assemble actuator plate

1. Thread 10-24x1/4 socket cap screw into designated hole.
2. Thread 3/8-16 hex nut onto spring plunger.
3. Thread spring plunger onto actuator plate making sure that, when retracted, the nose is slightly recessed from the bottom of the actuator plate.
4. Tighten the 3/8-16 hex nut to secure the spring plunger to the actuator plate.
5. Slide the actuator plate into the Dovetail slot of the cylinder plate.

Operating the Power Drawbar System

1. The Power Drawbar is intended for use in light to moderate cutting operations. The Power Drawbar cylinder assembly may be removed for heavy cutting operations where high holding torque on the cutting tool is required, then re-installed for normal cutting operations.
2. Slide the actuator plate (with the beveled edges) into the dovetail channel on the cylinder plate.
3. Release the spring plunger on the actuator plate so that it indexes into the front hole in the dovetail channel in the cylinder plate.
4. When ready to change a tool, lift the spring plunger knob on the actuator plate and slide the actuator plate forward a bit and release the knob of the spring plunger so that the tip of the plunger is out of the first hole and resting on the bottom of the cylinder plate dovetail channel. Do not rotate and lock the spring plunger open.
5. Slide the actuator plate forward until the spring plunger engages with the second (back) hole in the dovetail channel. With the actuator plate forward and engaged and the limit switch pressed: (1) power is enabled to the Power Drawbar system, and (2) power is disabled to the mill.
6. Place one hand on the tool in the collet and flip the green toggle switch up. The cylinder ram comes down and compresses the spring assembly and the tool is released from the collet.
7. Remove the tool from the collet and replace it with the next tool. **Keep your fingers away from where the side of the tool meets the bottom surface of the collet as this is a severe pinching hazard.**
8. Flip the green toggle switch down and the cylinder ram retracts into the cylinder and the drawbar spring assembly grips the tool in the collet.
9. Lift the knob on the actuator plate spring plunger and pull the actuator plate toward the front of the cylinder plate so the tip of the spring plunger clears the back (second) indexing hole in the cylinder plate. Continue to slide the actuator plate toward the front of the cylinder plate with the spring plunger released until the spring plunger engages with the front (first) hole in the dovetail channel of the cylinder plate.
10. The operating cycle of the Power Drawbar system is now complete.
11. Cycle the Power Drawbar several times to break-in the system.

Drawbar Tension Adjustments

The compression force of the Belleville spring washers and resulting tool holding torque may be adjusted. Lock the spindle from rotating using the "loading Belleville stack" procedure described above. The maximum recommended load on the Belleville washers is 10, 1/6th turns of the drawbar from a starting point of finger tight. If the load is increased beyond the capacity of the air cylinder to compress the spring washers, then the tool being held in the collet will not release. The load must then be reduced to the point where the force of the air cylinder can release the tool from the collet. If the collet does not release the tool at this loading, then reverse the loading on the Belleville stack releasing all tension and repeat the loading procedure.

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Maintenance

The drawbar, spring washers, and R8 collet used in the power Drawbar system are regular wear items and should be replaced periodically depending on frequency of use. These items should be dis-assembled, cleaned, inspected, and a fresh application of anti-seize applied as described above periodically.



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