WARRANTY

We warrant that the equipment built by us will be free from defects of material or workmanship and, if properly used, will do the work for which it is designed.

Any Part or parts which, upon our examination, are found to be defective will be replaced or repaired, at our option. Said part or parts must be returned, freight prepaid, to the home plant. The repaired part or parts will he shipped F.O.B. Minneapolis, Minnesota.

This is an unqualified warranty to the original purchaser of the equipment and shall apply for the period of one year from the date of shipment of the equipment from our plant.

INDEX

LOOK FOR THIS SYMBOL TO POINT OUT IMPORTANT SAFETY PRECAUTIONS. IT MEANS – ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.

Precautions for the Installation and Operation of Pneumatic Die Cushions

In order to get efficient and trouble free performance on any pneumatic die cushion installation, it is very important that the pin pressure pad or wear plate of the die cushion unit be parallel with the top of the press had and adjusted to its correct height relative to the top of the press bed. The maximum amount that the pin pressure pad can be out of parallel with the top of the press bed and still work satisfactorily is 1/64". For this reason it is important that the mounting rods on both the bolster plate mounting and the press bad mounting be checked periodically to make sure all the nuts are tight and that the adjustment at all four corners is uniform. If this adjustment is not maintained, the cylinder will not travel parallel to the piston and as a result cause breakdown of the cushion cylinder.

When a piece of work jams in a drawing or forming die, do not remove the jammed part by using the die cushion with the air pressure on. The air pressure should be turned off and system air drained before attempting to remove jammed part from the die. When a part is removed with the air pressure on, a severe shock is caused against the stop and adjusting nut on the Model D and MD or on the stop rods on the Model C, HC or HD cushion, which may cause a breakdown of the cushion unit. In addition to this it is very dangerous from the operator's standpoint, as the part sometimes comes loose with much force it may cause personal injury.

It should be remembered that once a pneumatic die cushion has been inflated to the required pressure, it theoretically uses no more air. The combination reducing regulating valve merely maintains the required pressure, by compensating for any air leaks through the pipe connections, packings or fittings.

If an air leak develops in the cushion unit, it is generally assumed that the packings are worn out and must be replaced. However, if the cushion has not been used for a period of two or three weeks it is advisable to inject two or three shots of grease into each grease fitting to soften the packing. Also, under severe vibration conditions the metal tubing may fracture near the connections and cause an air leak, which may be mistaken for a leaking cap packing. Before disassembling C and D cushions it is advisable to check these fittings as explained on page 53.

Note: Pneumatic Die Cushions should always be loaded evenly. When die requires pins to be unbalanced, use **compensating pins** to balance load, Dayton Die Cushions manufactures cushions specifically designed to customers' requirements for jobs where off-center loading is necessary.

CAUTION! Failure to lubricate as instructed may result in permanent mechanical damage to internal working parts of die cushion or counterbalance cylinder. This may result in seizure of unit and **possibility of injury** to operating personnel.

Types of Mountings

Dayton Pneumatic Die Cushions are designed and constructed primarily for deep drawing die operations; however, they can be used to an advantage for pressure pad control on forming dies as well as for stripper pad control on compound blanking and piercing dies. To meet these requirements several different die cushion models were developed which could be suspended from the **bolster plate** of the press or directly from the **press bed**.

BOLSTER PLATE MOUNTING

This type of mounting, as shown in Fig. 1, is recommended for single units in either the Model C, D, MC, MD, HC or Model HD cushions, however, it is occasionally used for mounting multiple installations when the press bed is so designed that no other type of mounting can he used. The installation procedure is very simple, as it requires only the drilling and tapping of four holes in the bolster plate of the press. The mounting rods are provided with shoulders that automatically take care of the alignment of the cushion with reference to the bed of the press. When drilling and tapping bolster, extra care should be taken to measure that the holes are perpendicular to the bolster plate. As a general rule, those rods should not be out of parallel with the center line of the cushion by more than **.001 for each two inches of rod length** in order to reduce side stresses in the rods.

PRESS BED MOUNTING

This type of mounting, as shown in Fig. 2, is used on single unit installations as well as on the larger, multiple installations. It is more desirable in most installations; because the bolster plate of the press can he removed at any time without disturbing the cushion unit. This feature is very desirable on presses where a variety of different types of tools are being used. The installation of a press bed mounting, however, requires greater care, because the mounting plate, as well as the pin pressure pad, must be aligned with the top of the press bed to avoid a tilting action on the cushion unit when in operation. **When the bed is tapped the same precautions as to out-of-parallel conditions should be applied as for bolster mounting.**

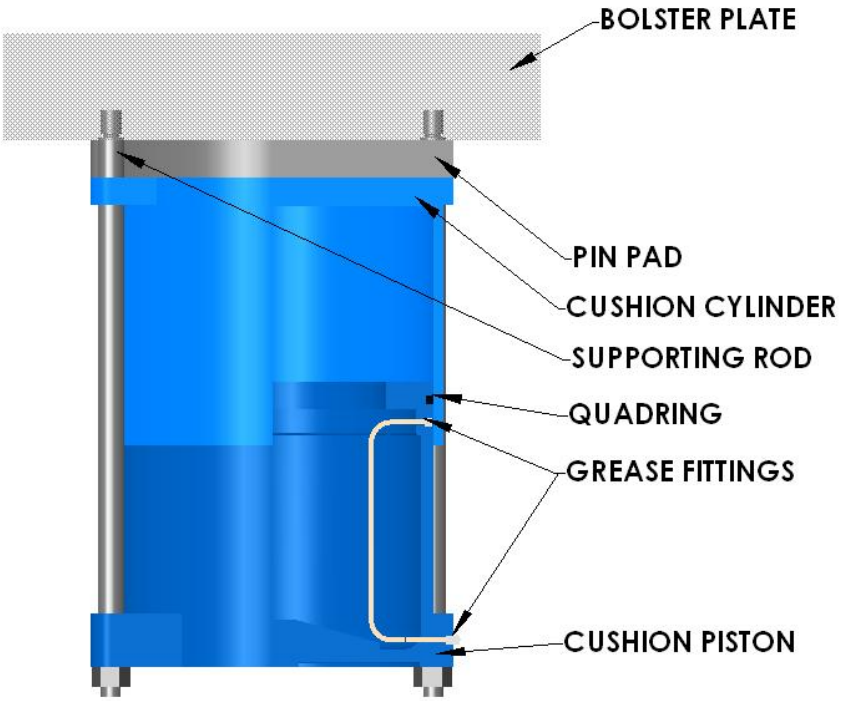


Fig. 1 Bolster Mounting

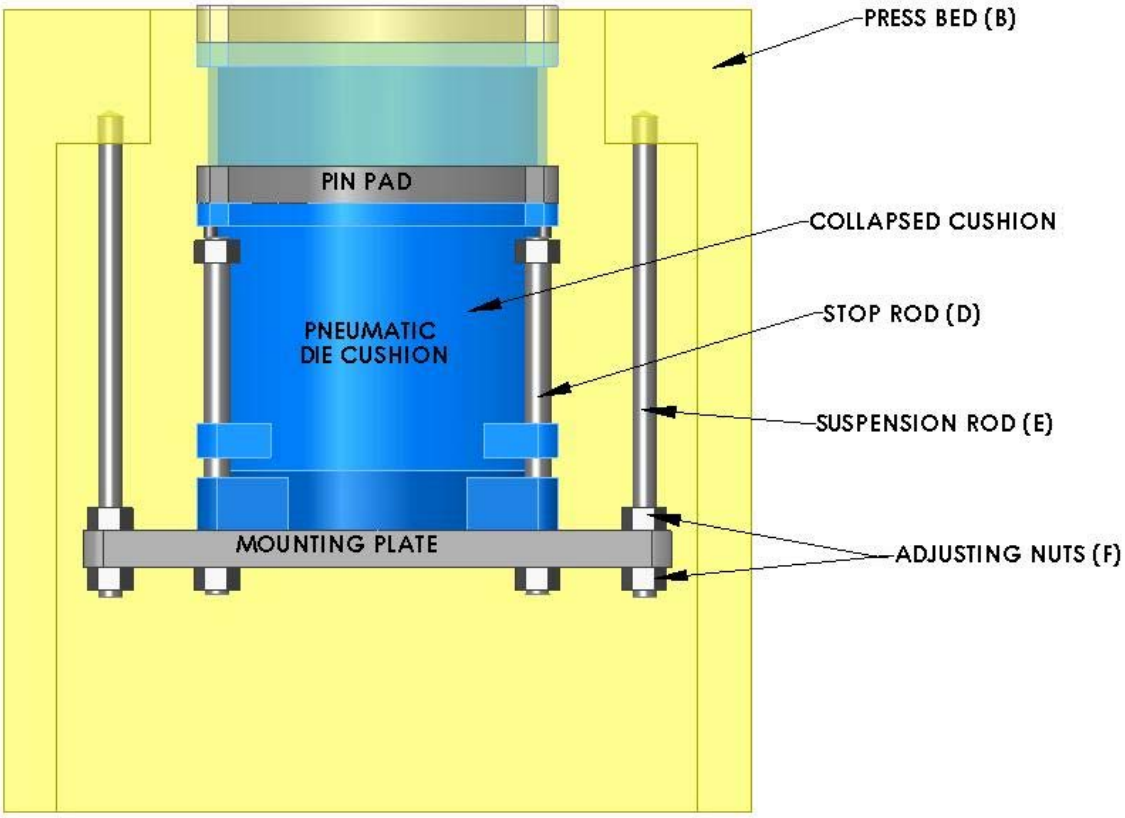


Fig. 2 Press Bed Mounting

Installation Instructions

Model D Bolster Plate Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a single unit Model D to the bolster plate of a press:

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed (See Fig. 4). To accomplish this it is advisable to scribe the press bed opening on the underside of the bolster plats before removing it from the press. This outline will locate the relative position for attaching the die cushion,

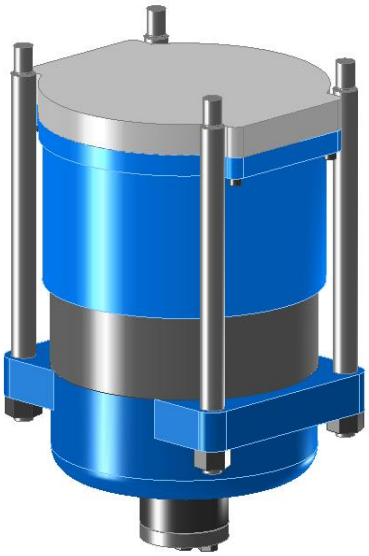


Fig. 3 Model D Die Cushion 100 psi Max. Pressure

(2) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and then replace, the bolster plate on the press and again scribe the opening on the underside of it.

(3) Layout hole centers on the underside of the bolster plate according to dimensions "A" and "B" shown on page 7. The tolerances on these holes must be held to a maximum of plus or minus 1/64", otherwise the mounting rods will not line up with the holes in the bottom flange of the die cushion unit. Drill and tap holes according to dimensions "I" and "J", making sure that the holes are square with the surface of the bolster plate (See page 3). If blind holes are used, be sure a minimum length of full thread is tapped in the bolster plate.

(4) Bolt the bolster plate onto the press bed in its normal position.

(5) Screw the ends of the four mounting rods with the short length of thread into the bolster plate. Make sure that the shoulders of these rods are securely screwed up to the plate.

(6) Place cushion under the press in its correct relative position, making sure the side with the name plate is toward the front of the press. Raise the die cushion into position so that the mounting rods pass through the holes in the bottom Range of the cushion and arrange some temporary blocking device to hold the cushion unit in place. Run on the four nuts and lock washers, making sure they are pulled up tight so that the shoulders of the rods are secured against the bottom flange of cushion. Install 3/8” set screws into the nuts (one screw in each nut in the most accessible location). Shallow pilot holes should be made into the threads on the rods with a 5/16” drill through existing hole in the nut. Please remember to use blue Locktite on the set screws’ threads.

(7) Install combination reducing and regulating valve and pressure gauge, as well as the high pressure hoses, according to detailed instructions on page 49.

(8) If surge tank is to be used with the cushion installation, refer to page 51 for detailed instructions on installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the pop safety valve provided for this purpose.

(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after every 8 hours of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Catalog Number	Standard Draw (Without Surge Tank)	Maximum Draw (Surge Tank Required)	Draw Ring Pressure (At 100 psi)
D-5	1 1/4"	2 11/16"	0.9 Tons
D-6	1 3/4"	3 1/4"	1.4 Tons
D-8	2"	3 3/4"	2.5 Tons
D-10	2"	3 3/4"	3.9 Tons
D-12	2"	3 3/4"	5.7 Tons
D-14	2 1/2"	4 3/4"	7.7 Tons
D-16	2 1/2"	5 3/4"	10.0 Tons

Cushion Size	A	B	C	D	E	F	G
D-5	5 3/4"	3 7/8"	5 3/4"	6 5/8"	4 1/2"	4 3/4"	6 3/8"
D-6	7 1/4"	4"	7"	8 1/2"	4 3/4"	5 1/4"	8"
D-8	8 19/32"	5 19/32"	9"	10"	6 15/32"	7"	9 15/32"
D-10	10 7/8"	6 3/8"	11"	12 3/8"	7 3/8"	7 7/8"	11 7/8"
D-12	12"	8 7/16"	13 1/8"	13 3/4"	9 9/16"	10 3/16"	13 1/8"
D-14	14 1/4"	10 1/4"	15 1/4"	16 1/4"	11 1/2"	12 1/4"	15 1/2"
D-16	16 1/2"	11"	17 1/4"	19"	12 3/8"	13 1/2"	17 7/8"

Cushion Size	H	I	J	K	L	M	N
D-5	3"	3/8-16	3/4"	15 7/16"	12 15/16"	2 11/16"	5/8"
D-6	3 1/8"	1/2-13	3/4"	19 15/16"	17 1/16"	3 1/14"	5/8"
D-8	4 1/2"	5/8-11	1"	21 13/16"	18 7/16"	3 3/4"	5/8"
D-10	5 1/8"	3/4-10	1"	22 3/8"	19"	3 3/4"	5/8"
D-12	7 1/16"	7/8-9	1 1/4"	24 7/16"	21 1/16"	3 3/4"	1/2"
D-14	8 3/4"	1-8	1 3/8"	28 5/16"	23 15/16"	4 3/4"	1/2"
D-16	9"	1 1/4-7	1 7/16"	28 13/16"	23 7/16"	5 3/4"	1"

INSTRUCTIONS FOR OPERATING ADJUSTMENT NUT

1. Loosen lock bolts* on bottom of nut.
2. Rotate nut up or down by hand or with wrench if cushion is pressurized.
3. Tighten lock bolts.

* **Never loosen center bolt** unless nut is to be removed.

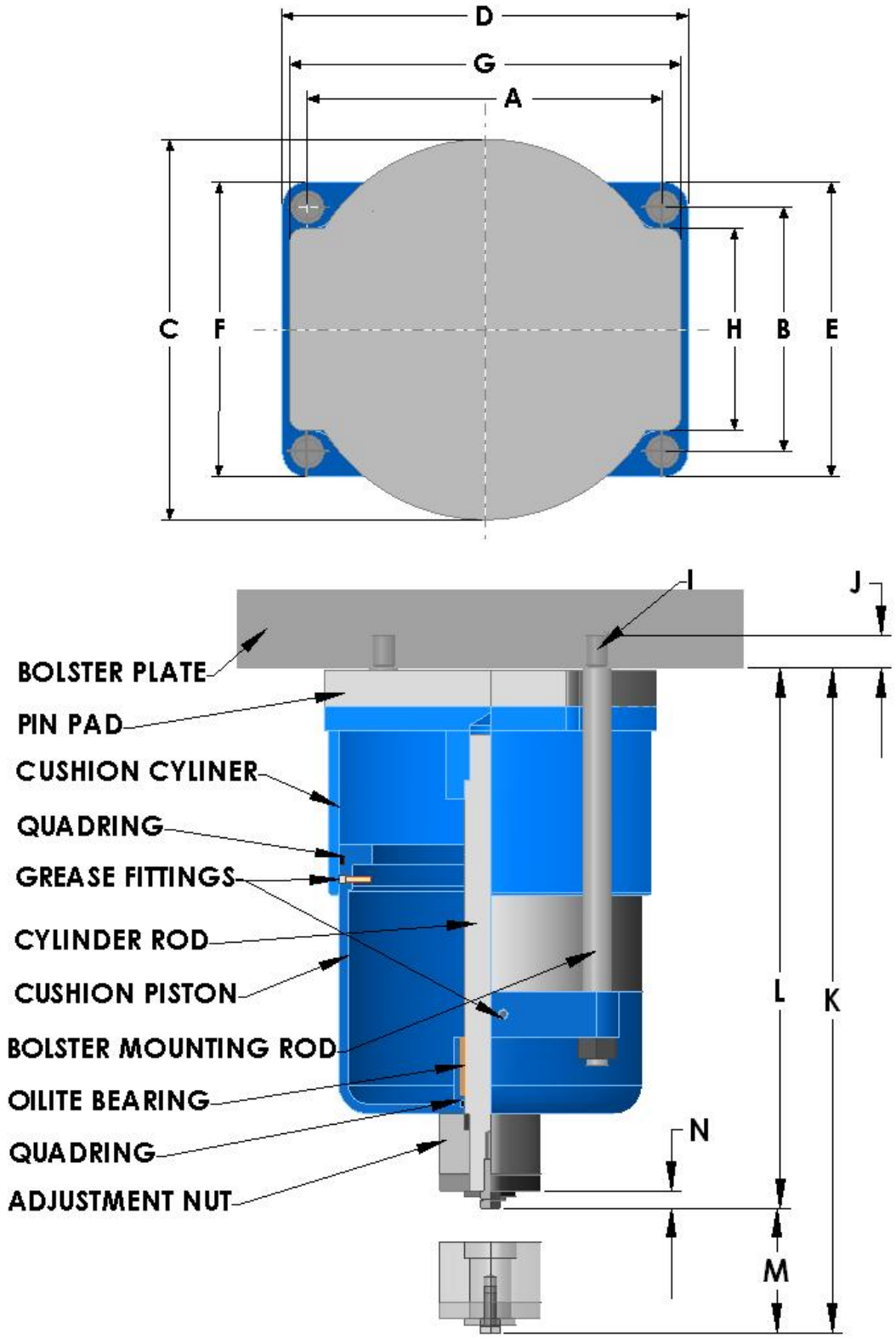


Fig. 4 Bolster plate mounted Model D cushion.

Installation Instructions

Model D Press Bed Mounting (With Supporting Structure)

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a die cushion to the press bed of a press:

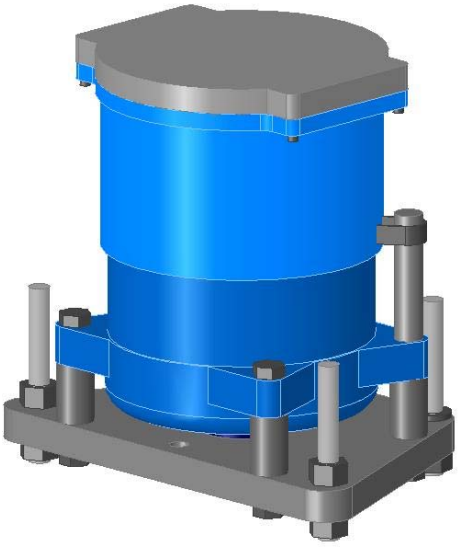


Fig. 5 Model D Die Cushion 100 psi Max. Pressure

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed and not parallel, have them machined so that the pin pressure pad of the cushion will have an accurate surface to stop against.

(2) Screw the ends of the suspension rods, "D", (See Fig. 6) with the short length of thread into the chilled and tapped holes in the press bed, which have been provided for mounting the die cushion. Make sure these rods are pulled up as for as they will go into the tapped holes. If the cushion is to be suspended from mounting bosses that are not tapped, the mounting rods are provided with nuts on both top and bottom of the bosses.

(3) With the use of skids or timbers, slide the cushion unit into the approximate location relative to the press bed opening. (**NOTE:** If the distance between the mounting rods at the front of the press bed is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.)

(4) Run on the upper adjusting nuts, "F", as far as they will go. Raise the cushion unit so that the rods pass through the holes in the mounting plate or mounting channels and run on the lower adjusting nuts, “F”.

(5) Prepare a measuring rod, "C” from 3/16" round steel for adjusting the height and alignment of the cushion unit. The over-all length of this rod should be equal to the dimension “H”, plus the thickness of the pin pad minus 1/8". **The 1/8” is allowed to make sure that the pin pressure pad comes to rest against the bottom of the bolster plate.**

(6) With a large parallel, "A", laid on top of the press bed, (See Fig. 6) line up the supporting structure at the four points marked, "X", by using the measuring rod, "C". The adjustment and alignment of the mounting plate at these four points must be held to a maximum tolerance of 1/64” avoid a tilting action. After this adjustment is obtained, lock the upper adjusting nuts on the mounting plate, which will secure the cushion unit in correct parallel alignment and relative height in connection with the top of the press. Install 3/8” set screws into all the nuts (one screw in each nut in the most accessible location). Shallow pilot holes should be made into the threads on the rods with a 5/16” drill through existing hole in the nut. Please remember to use blue Locktite on the set screws’ threads.

PRECAUTION: It should be remembered that the adjustment of the nuts on the suspension rods should allow the pin pressure pool to extend 1/8" above the press bed when the cushion cylinder is fully expanded and the bolster plate removed. The Model “D” cushion is fully expanded when the adjusting nut is run to the bottom of its adjustment.

(7) Install combination reducing and regulating valve and pressure gauge, as well as high pressure hoses, according to detailed instructions on page 49.

(8) If surge tank is to be used with the cushion installation, turn to page 51 for detailed instructions on the installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the **pop safety valve** provided for this purpose.

(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

DIMENSIONS FOR DETERMINING LENGTH OF THE MEASURING ROD, “C”

EXAMPLE: On a Model D-6, the “H” dimension is 10 1/4”, and assuming the thickness of the pin pad is 1” it would make a total height of 11 1/4”. By subtracting 1/8” from this figure as described in Paragraph (5), the length of measuring rod, “C” would be 11 1/8”.

Cushion Size	H	K	M	Draw Ring Pressure (At 100 psi)
D-5	9 1/8”	12 3/16”	2 11/16”	0.9 Tons
D-6	11 1/16”	16”	3 1/14”	1.4 Tons
D-8	12 5/16”	17 4/7”	3 3/4”	2.5 Tons
D-10	12 3/16”	18”	3 3/4”	3.9 Tons
D-12	12 7/8”	19 1/2"	3 3/4"	5.7 Tons
D-14	15 3/4”	22 3/8”	4 3/4"	7.7 Tons
D-16	18 5/8”	21 5/16”	5 3/4"	10.0 Tons

NOTE: Dimension “M” equals the maximum draw **only** when adjustment nut is fully extended.

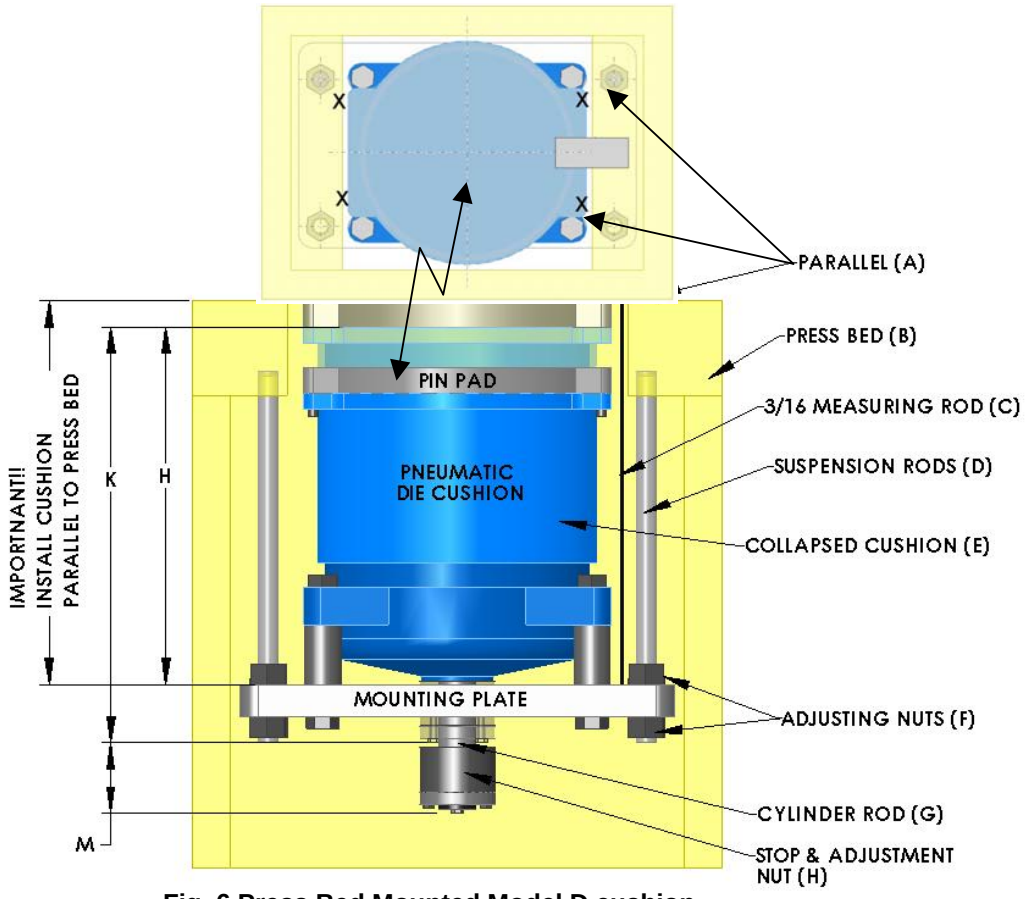


Fig. 6 Press Bed Mounted Model D cushion.

INSTRUCTIONS FOR OPERATING ADJUSTMENT NUT

4. Loosen lock bolts* on bottom of nut.
5. Rotate nut up or down by hand or with wrench if cushion is pressurized.
6. Tighten lock bolts.

* **Never loosen center bolt** unless nut is to be removed.

Installation Instructions

Model C Bolster Plate Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

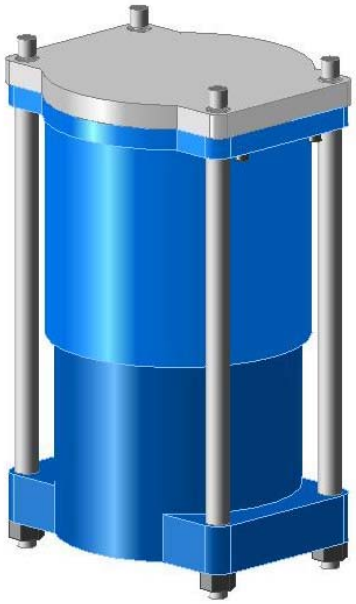


Fig. 7 Model C Die Cushion 100 psi Max. Pressure

The following is the recommended procedure for mounting a single unit Model "C" to the bolster plate of a press:

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed (See Fig. 8). To accomplish this it is advisable to scribe the press bed opening on the underside of the bolster plats before removing it from the press. This outline will locate the relative position for attaching the die cushion,

(2) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and then replace the bolster plate on the press and again scribe the opening on the underside of it.

(3) Layout hole centers on the underside of the bolster plate according to dimensions "A" and "B" shown on page 14. The tolerances on these holes must be held to a maximum of plus or minus 1/64", otherwise the mounting rods will not line up with the holes in the bottom flange of the die cushion unit. Drill and tap holes according to dimensions "I" and "J", making sure that the holes are square with the surface of the bolster plate (See page 3). If blind holes are used, be sure a minimum length of full thread is tapped in the bolster plate.

(4) Bolt the bolster plate onto the press bed in its normal position.

(5) Screw the ends of the four mounting rods with the short length of thread into the bolster plate. Make sure that the shoulders of these rods are securely screwed up to the plate.

(6) Place cushion under the press in its correct relative position, making sure the side with the name plate is toward the front of the press. Raise the die cushion into position so that the mounting rods pass through the holes in the bottom flange of the cushion and arrange some temporary blocking device to hold the cushion unit in place. Run on the four nuts and lock washers, making sure they are pulled up tight so that the shoulders of the rods are secured against the bottom flange of cushion.

(7) Install combination reducing and regulating valve and pressure gauge, as well as the high pressure hoses, according to detailed instructions on page 49.

(8) If surge tank is to be used with the cushion installation, refer to page 51 for detailed instructions on installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the pop safety valve provided for this purpose.

(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after every 8 hours of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Catalog Number	*Overall Height (H) If Cushions Having A Maximum Draw Of						Ring Holding Pressure @ 100 psi
	2”	3”	4”	5”	6”	8”	
C-6	10 1/4	11 1/4					1.4 Tons
C-8	11 1/4	12 1/4	13 1/4				2.5 Tons
C-10		15 1/4	16 1/4	17 1/4	18 1/4		3.9 Tons
C-12		15 1/4	16 1/4	17 1/4	18 1/4		5.7 Tons
C-14		15 1/4	16 1/4	17 1/4	18 1/4		7.7 Tons
C-16		16 1/4	17 5/8	18 5/8	19 5/8		10.0 Tons
C-18		18 13/16	19 13/16	20 13/16	21 13/16		12.7 Tons
C-20			19 13/16	20 13/16	21 13/16		15.7 Tons
C-22			22 7/16	23 7/16	24 7/16		19.0 Tons
C-24			24 7/16	25 7/16	26 7/16	28 7/16	22.6 Tons

* These dimensions do not include pin pad, or lower nut on mounting rods.

** These dimensions include piston reinforcing plate.

Cushion Size	A	B	C	D	E	I	J
C-6	7 1/4	4	7	8 1/2	5 1/4	1/2-13	3/4
C-8	8 19/32	5 19/32	9	10	7	5/8-11	1
C-10	10 7/8	6 3/8	11	12 3/8	7 7/8	3/4-10	1
C-12	12	8 7/16	13 1/8	13 1/2	10	3/4-10	1
C-14	14 1/4	10 1/4	15 1/4	16 1/4	12 1/4	1-8	1 3/8
C-16	16 1/2	11	17 1/4	19	13 1/2	1 1/4-7	1 1/2
C-18	17 3/4	12 3/4	19 1/4	20 1/4	15 1/4	1 1/4-7	1 1/2
C-20	20 1/2	14 1/4	21 1/4	23 3/8	17 1/8	1 1/4-7	1 3/4
C-22	22 1/4	15 1/2	23 3/8	25 1/4	18 1/2	1 3/8-6	2
C-24	24	16 3/4	25 3/8	27 1/4	20	1 3/8-6	2

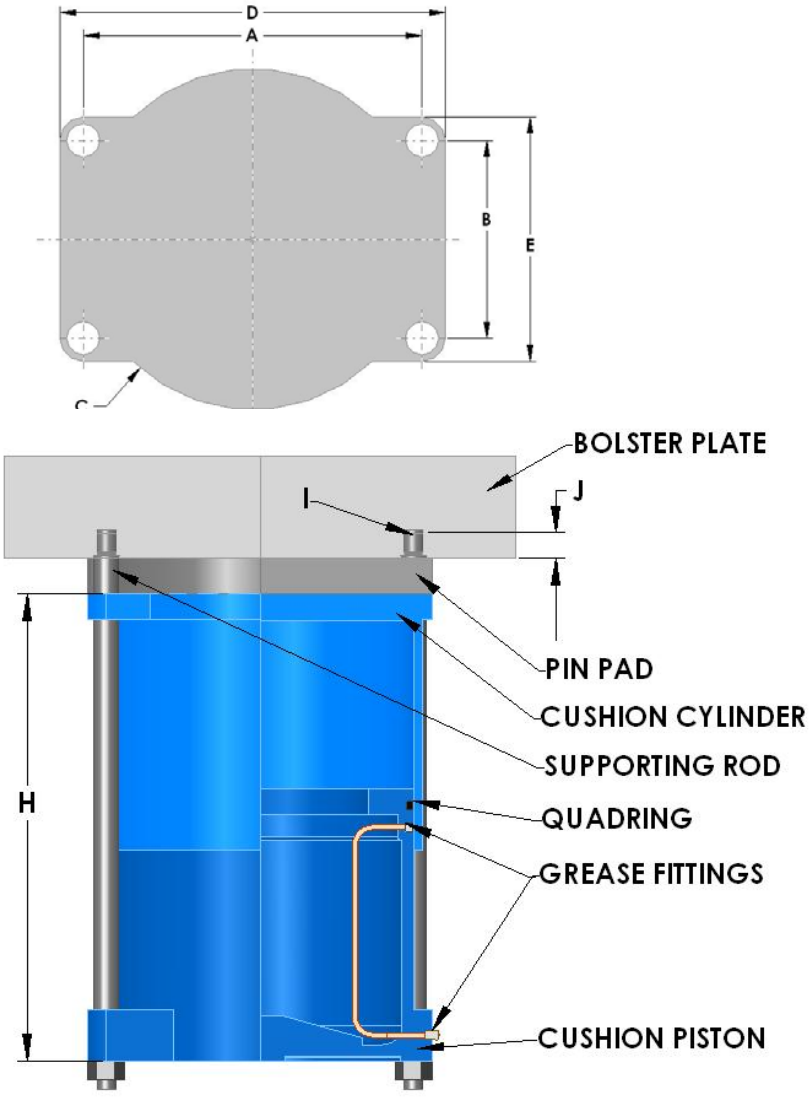


Fig. 8 Bolster plate mounted Model C cushion.

Installation Instructions

Model C Press Bed Mounting (With Supporting Structure)

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a die cushion to the press bed of a press:

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed and not parallel, have them machined so that the pin pressure pad of the cushion will have an accurate surface to stop against.

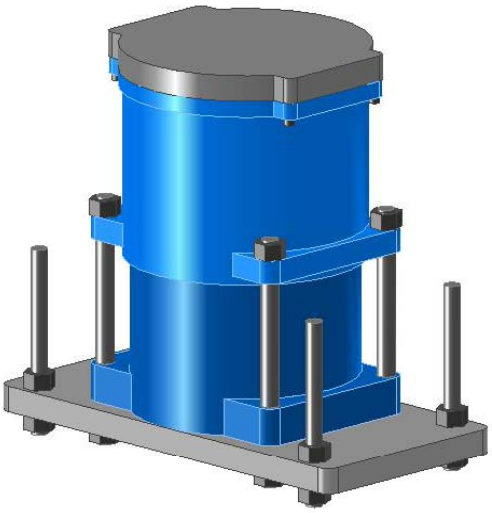


Fig. 9 Model C Die Cushion 100 psi Max. Pressure

(2) Screw the ends of the suspension rods, "E", (See Fig. 10) with the short length of thread into the drilled and tapped holes in the press bed, which have been provided for mounting the die cushion. Make sure these rods are pulled up as for as they will go into the tapped holes. If the cushion is to be suspended from mounting bosses that are not tapped, the mounting rods are provided with nuts on both top and bottom of the bosses.

(3) With the use of skids or timbers, slide the cushion unit into the approximate location relative to the press bed opening. (**NOTE:** If the distance between the mounting rods at the front of the press bed is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.)

(4) Run on the upper adjusting nuts, "H"', as far as they will go. Raise the cushion unit so that the rods pass through the holes in the mounting plate or mounting channels and run on the lower adjusting nuts, “H”.

(5) Prepare a measuring rod, "C" from 3/16" round steel for adjusting the height and alignment of the cushion unit. The over-all length of this rod should be equal to the overall height of the cushion when expanded, plus the thickness of the pin pad minus 1/8". **The 1/8" is allowed to make sure that the pin pressure pad comes to rest against the bottom of the bolster plate.**

(6) With a large parallel, "A", laid on top of the press bed, (See Fig. 10) line up the supporting structure at the four points marked, "X", by using the measuring rod, "C". The adjustment and alignment of the mounting plate at these four points must be held to a maximum tolerance of 1/64" avoid a tilting action. After this adjustment is obtained, lock the upper adjusting nuts on the mounting plate, which will secure the cushion unit in correct parallel alignment and relative height in connection with the top of the press.

PRECAUTION: It should be remembered that the adjustment of the nuts on the suspension rods should allow the pin pressure pool to extend 1/8" above the press bed when the cushion cylinder is fully expanded and the bolster plate removed. The Model "C" cushion is fully expanded when the stop rods, "D", are up against the bottom of the mounting plate.

(7) Install combination reducing and regulating valve and pressure gauge, as well as high pressure hoses, according to detailed instructions on page 49.

(8) If surge tank is to be used with the cushion installation, turn to page 51 for detailed instructions on the installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the **pop safety valve** provided for this purpose.

(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

DIMENSIONS FOR DETERMINING LENGTH OF THE MEASURING ROD, "C"

EXAMPLE: On a Model C-6 with a 2" draw, the overall height is 10 1/4", and assuming the thickness of the pin pas is 1", it would make a total height of 11 1/4". By subtracting 1/8" from this figure as described in Paragraph (5), the length of measuring rod, "C" would be 11 1/8".

Catalog Number	Overall Height (H) If Cushions Having A Maximum Draw Of					
	2”	3”	4”	5”	6”	8”
C-6	10 1/4	11 1/4				
C-8	11 1/4	12 1/4	13 1/4			
C-10		15 1/4	16 1/4	17 1/4	18 1/4	
C-12		15 1/4	16 1/4	17 1/4	18 1/4	
C-14		15 1/4	16 1/4	17 1/4	18 1/4	
C-16		16 5/8	17 5/8	18 5/8	19 5/8	
C-18		17 7/8	18 7/8	19 7/8	20 7/8	
C-20		17 7/8	18 7/8	19 7/8	20 7/8	
C-22		20	21	22	23	
C-24		22	23	24	25	27

NOTE: Dimension “M” equals the maximum draw **only** when adjustment nut is fully extended.

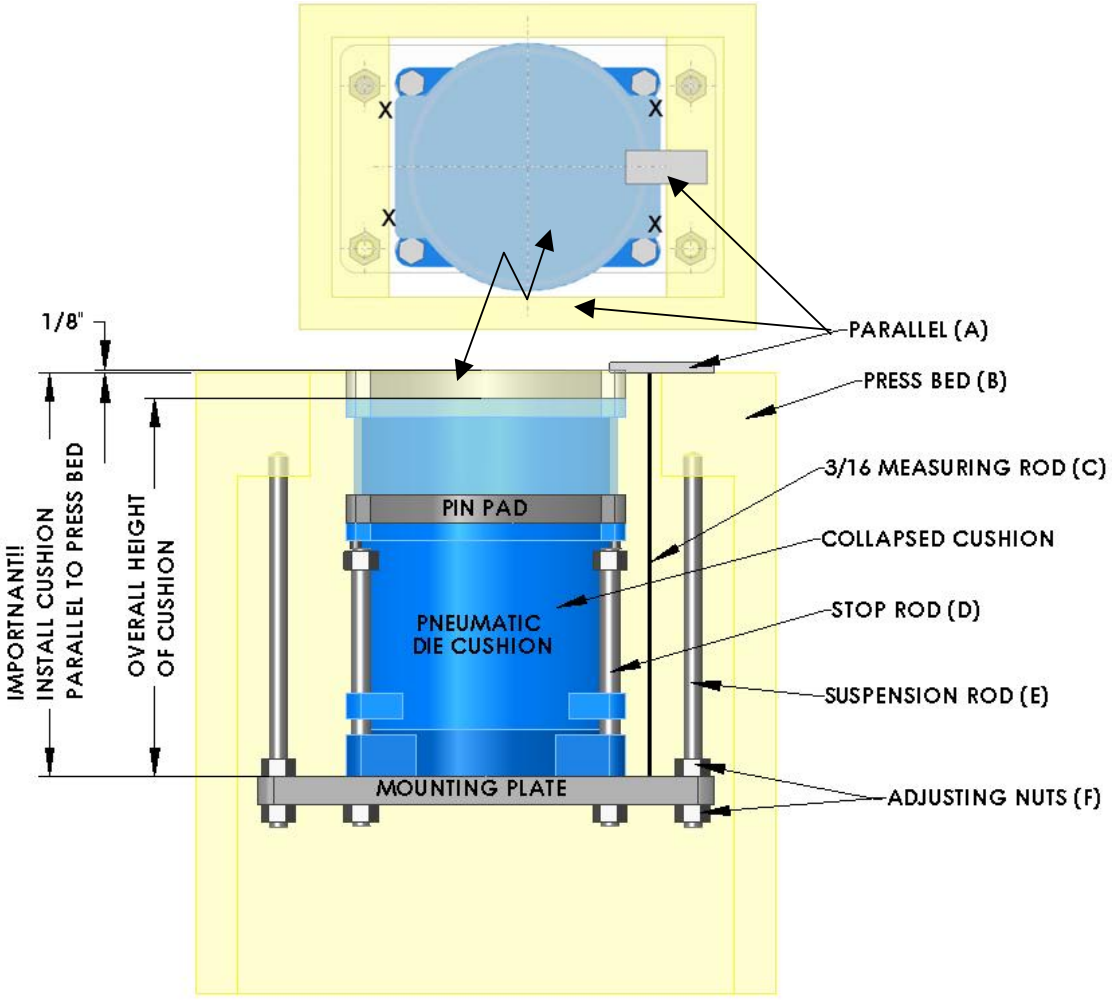


Fig. 10 Press bed Mounted Model C cushion.

Installation Instructions

Model MC Bolster Plate Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting the bolster plate of a press:

Fig. 11 Model MC Die Cushion 100 psi Max. Pressure

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed Scribe the press bed opening on the underside of the bolster plate, remove and check both surfaces to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe the opening on the underside of it.

(2) Lay out holes according to dimensions "F" and "G" shown on page 8. The tolerances on these holes must be held to ± 1/64" for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure that the holes are square with the surface of the bolster plate (See page 3).

(3) Bolt the bolster plate onto the press bed in its normal position and screw the ends of the four mounting rods with the short length of thread into the bolster plate. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods and raise so that rods pass through holes in base flange of cushion. Use temporary blocking of necessary to hold the cushion until lock washers and nuts can be run on and tightened. (On Mc-12 through MC-16 cushions, nuts should be pinned after assembled by drilling shallow pilot holes into the threads on the rods with a 5/16” drill through existing hole in the nut and inserting set screw.)

(5) Install combination reducing and regulating valve and pressure gauge, the high pressure hoses, as well as the surge tank per instructions on pages 49 and 51. **Note! Piping for surge and air line is the same as shown on page 34.**

(6) Lubricate unit until grease emerges between piston and cylinder walls before initial operation. Note that the grease fitting located per chart below feeds the upper piston. Since this is buried within the cylinder no grease will ever be seen externally. Therefore, when lubricating insert the same volume in this fitting as is put in the total of all others (i.e. If MC-14 uses 2 shots of grease in each of the 3 lower piston fittings, put 6 shots in the upper piston fitting). The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Catalog Number	Quantity of Lubrication Fittings	Upper Piston Fitting Number	
		If On Round Area	If On Flat Area
MC-8	2	# 2	# 2
MC-10	3	# 3	# 3
MC-12	3	# 3	# 3
MC-14	4	# 4	# 3
MC-16	4	# 4	# 3
MC-18	5	# 5	# 4
MC-20	5	# 3	# 3
MC-22	5	# 3	# 3
MC-24	5	# 3	# 3

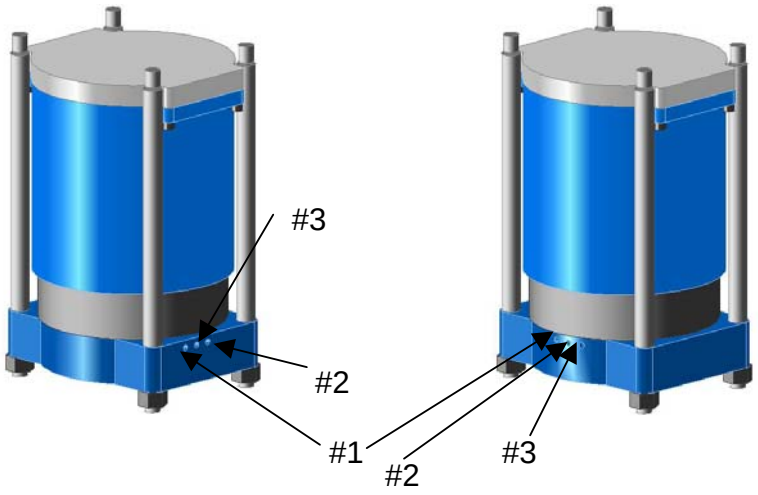


Fig. 12 Grease Fitting Numbers

Cushion Size	Dimensions							Ring-holding Pressure @ 100 psi
	E	D	F	G	M	K*	I*	
MC-8	7 1/4”	10 1/4”	8 19/32”	5 19/32”	9”	1”	7/8-9	5.0 Tons
MC-10	8 1/8”	12 5/8”	10 7/8”	6 3/8”	11”	1 1/4”	1-8	7.8 Tons
MC-12	10 3/16”	13 3/4”	12”	8 7/16”	13”	1 1/2”	1-8	11.4 Tons
MC-14	12 1/4”	16 1/4”	14 1/4”	10 1/4”	15”	1 5/8”	1 1/4-7	15.4 Tons
MC-16	13 1/2”	19”	16 1/2”	11”	17 1/4”	1 3/4”	1 3/8-6	20.0 Tons
MC-18	16 1/4”	20 1/4”	17 3/4”	12 3/4”	19 1/4”	1 7/8”	1 1/2-6	25.4 Tons
MC-20	18 3/4”	24 3/4”	21 1/4”	15 1/4”	21 1/4”	2”	1 3/4-5	31.4 Tons
MC-22	20 1/4”	26 1/4”	22 3/4”	16 3/4”	23 3/8”	2”	1 3/4-5	38.0 Tons
MC-24	22 1/8”	28 7/8”	24 7/8”	18 1/8”	25 3/8”	2 1/4”	2-4 1/2	45.2 Tons

* Recommended side – all mounting rods are made to customer requirements.

Cushion Size	Cushion Height – “L” For Stroke of					
	2”	3”	4”	5”	6”	8”
MC-8	19”	20”	27”	28”	29”	
MC-10	19 1/2”	20 1/2”	27 1/2”	28 1/2”	29 1/2”	
MC-12	20 1/8”	21 1/8”	28 1/8”	29 1/8”	30 1/8”	
MC-14	23”	24”	25”	30”	31”	
MC-16	22 3/4”	23 3/4”	28 3/4”	29 3/4”		
MC-18	26 3/4”	27 3/4”	32 3/4”	33 3/4”		
MC-20	33 5/8”	34 5/8”	35 5/8”	38 5/8”	39 5/8”	
MC-22	33 5/8”	34 5/8”	35 5/8”	38 5/8”	39 5/8”	
MC-24	37 1/8”	38 1/8”	39 1/8”	40 1/8”	45 1/8”	46 1/8”

Note: Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. **Never plug these vents** as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is lik ely that the cushion packing need replacing.

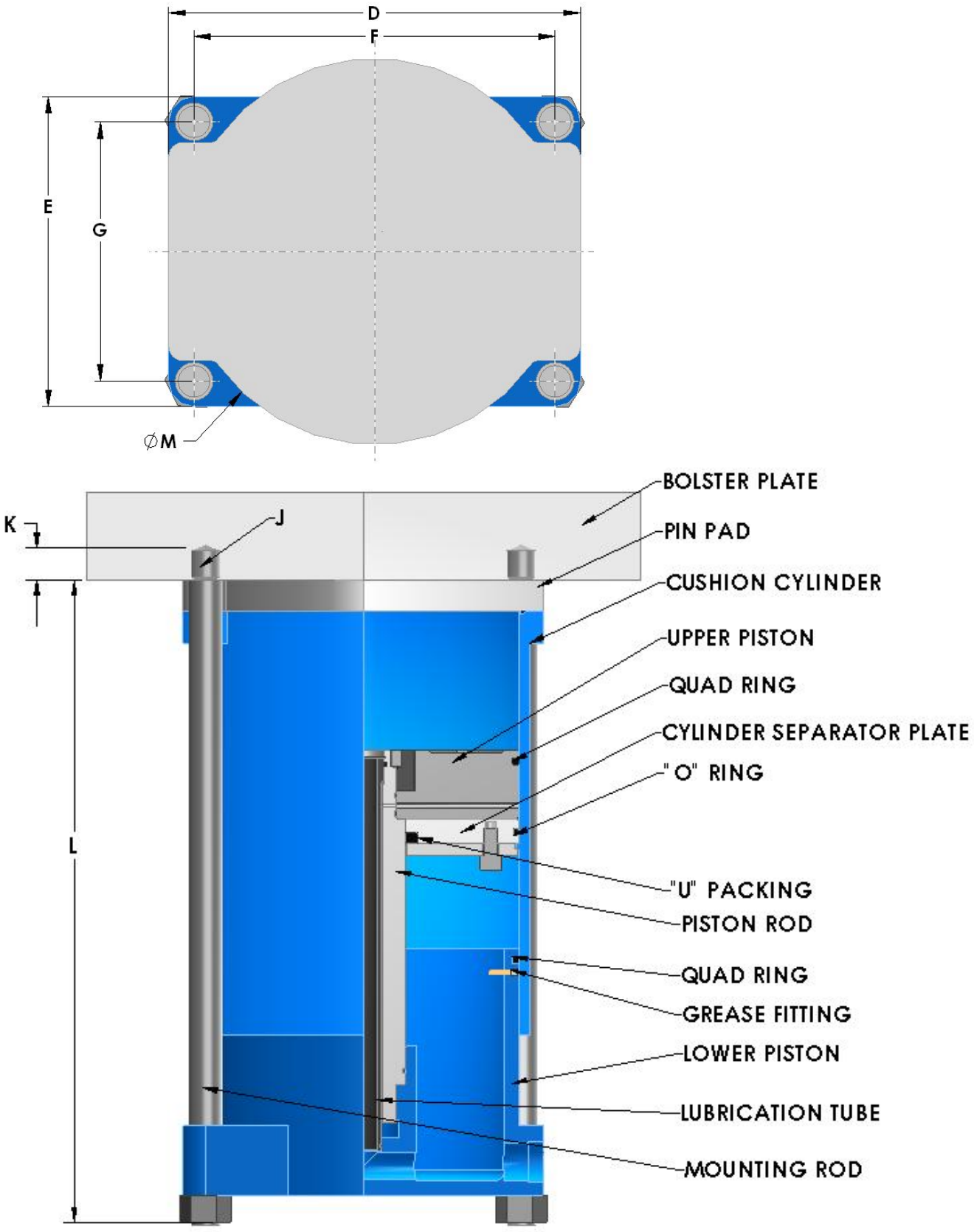


Fig. 13 Bolster plate mounted Model MC Cushion.

Installation Instructions

Model MC Press Bed Mounting (With Supporting Structure)

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a die cushion to the press bed of a press:

Fig. 14 Model MC Die Cushion 100 psi Max. Pressure

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread (See Fig. 15) into the drilled and tapped holes in the press bed, which have been provided for mounting the die cushion. If the cushion is to be suspended from mounting bosses that are not tapped, the mounting rods are provided with nuts on both top and bottom of the bosses.

(3) With the use of skids or timbers, slide the cushion unit into the approximate location relative to the press bed opening. (**NOTE:** If the distance between the mounting rods at the front of the press bed is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.)

(4) Install combination reducing and regulating valve and pressure gauge, high pressure hoses as well as surge tank according to detailed instructions on pages 49 and 51.

(5) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. Note that the grease fitting located per chart on page 6 feeds the upper piston. Since this is buried within the cylinder, no grease will ever be seen externally. Therefore, when lubricating insert the same volume in this fitting as is put in the total of all others (i.e. If MC-14 uses 2 shots of grease in each of the 3 lower piston fittings, put 6 shots in the upper piston fitting). The same

procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

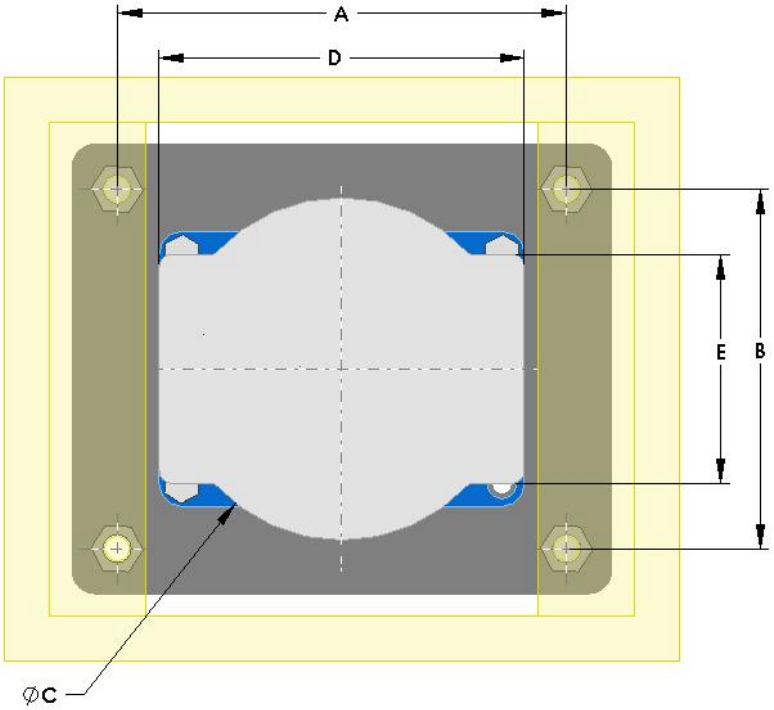
Cushion Size	Dimensions					Ring-holding Pressure @ 100 psi
	D	E	C	I*	J*	
MC-8	10 1/4"	7 1/4"	9”	7/8-9	1 1/4"	5.0 Tons
MC-10	12 5/8”	8 1/8”	11”	1-8	1 1/2"	7.8 Tons
MC-12	13 3/4"	10 3/16”	13 1/8”	1-8	1 1/2"	11.4 Tons
MC-14	16 1/4"	12 1/4"	15 1/4"	1 1/4-7	1 3/4"	15.4 Tons
MC-16	19”	13 1/2"	17 1/4"	1 3/8-6	2”	20.0 Tons
MC-18	20 1/4"	16 1/4"	19 1/4"	1 1/2-6	2 1/4"	25.4 Tons
MC-20	24 3/4"	18 3/4"	21 1/4"	1 3/4-5	2 3/4"	31.4 Tons
MC-22	26 1/4"	20 1/4"	23 3/8”	1 3/4-5	2 3/4"	38.0 Tons
MC-24	28 7/8”	22 1/8”	25 3/8”	2-4 1/2	3 1/4"	45.2 Tons

* Recommended side – all mounting rods are made to customer requirements.

Cushion Size	Cushion Height – “H” For Stroke of					
	2”	3”	4”	5”	6”	8”
MC-8	18 1/8”	19 1/8”	26 1/8”	27 1/8”	28 1/8”	
MC-10	18 1/2”	19 1/2”	26 1/2"	27 1/2"	28 1/2"	
MC-12	19”	20”	27”	28”	29”	
MC-14	21 1/4"	22 3/4”	23 3/4”	28 3/4”	29 3/4"	
MC-16	21 3/8”	22 3/8”	27 3/8”	28 3/8”		
MC-18	24 5/8”	25 5/8”	30 5/8”	31 5/8”		
MC-20	30 3/4”	31 3/4"	32 3/4"	35 3/4"	36 3/4"	
MC-22	30 3/4"	31 3/4"	32 3/4"	35 3/4"	36 3/4"	
MC-24	33 3/4"	34 3/4"	35 3/4"	36 3/4"	41 3/4"	42 3/4”

Note: Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. **Never plug these vents** as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is likely that the cushion packing need replacing.



Dimensions A and B
To be specified by customer

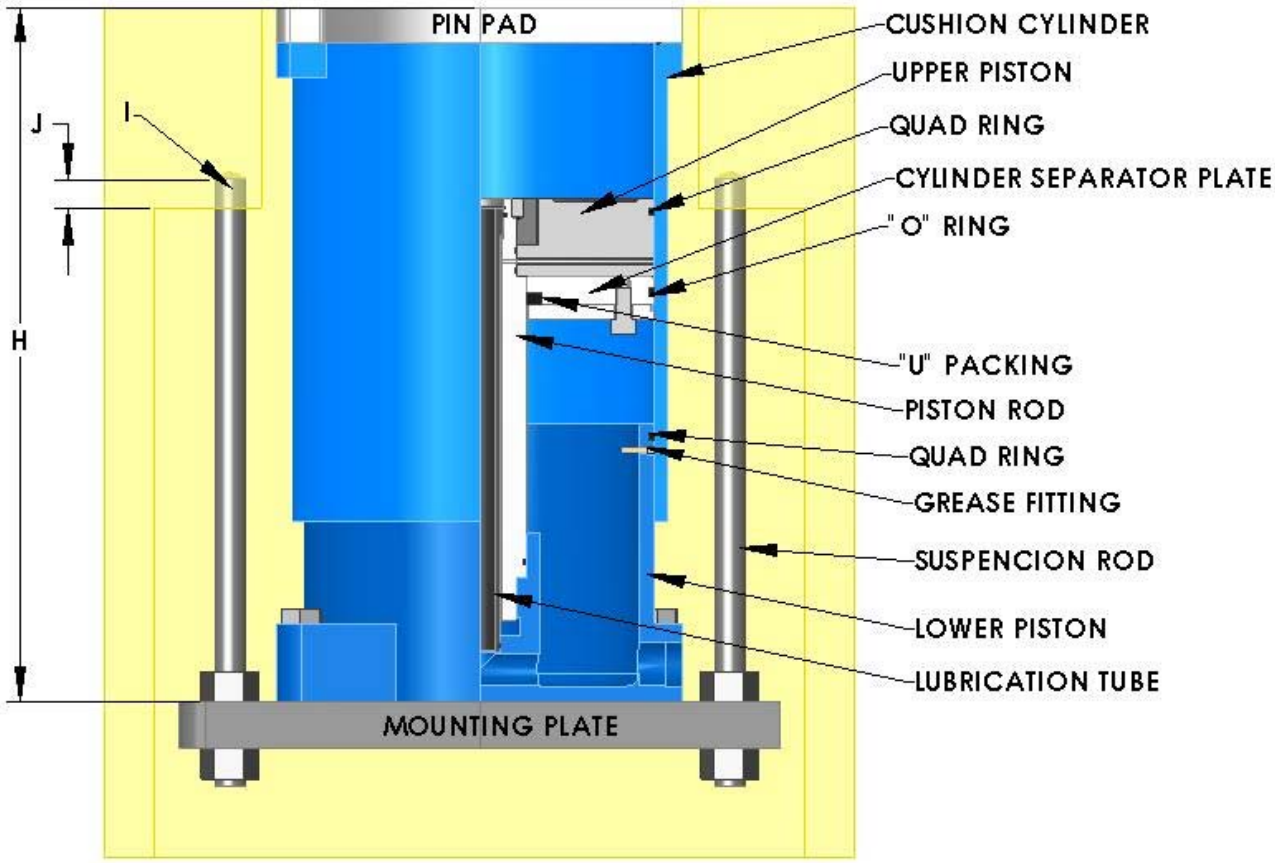


Fig. 15 Press bed Mounted Model MC cushion.

Installation Instructions

Model MD Bolster Plate Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting the bolster plate of a press:

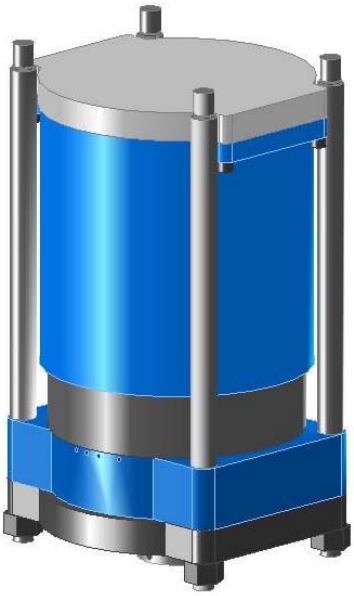


Fig. 16 Model MD Die Cushion 100 psi Max. Pressure

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed Scribe the press bed opening on the underside of the bolster plate, remove and check both surfaces to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe the opening on the underside of it.

(2) Lay out holes according to dimensions "F" and "G" shown on page 28. The tolerances on these holes must be held to ± 1/64" for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure that the holes are square with the surface of the bolster plate (See page 3).

(3) Bolt the bolster plate onto the press bed in its normal position and screw the ends of the four mounting rods with the short length of thread into the bolster plate. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods and raise so that rods pass through holes in base flange of cushion. Use temporary blocking of necessary to hold the cushion until lock washers and nuts can be run on and tightened. (On MD-12 through MD-16 cushions, nuts should be pinned after assembled by drilling shallow pilot holes into the threads on the rods with a 5/16” drill through existing hole in the nut and inserting set screw.)

(5) Install combination reducing and regulating valve and pressure gauge, the high pressure hoses, as well as the surge tank per instructions on pages 49 and 51. **Note! Piping for surge and air line is the same as shown on page 88.**

(6) Lubricate unit until grease emerges between piston and cylinder walls before initial operation. Note that the grease fitting located per chart below feeds the upper piston. Since this is buried within the cylinder no grease will ever be seen externally. Therefore, when lubricating insert the same volume in this fitting as is put in the total of all others (i.e. If MD-14 uses 2 shots of grease in each of the 3 lower piston fittings, put 6 shots in the upper piston fitting). The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Catalog Number	Quantity of Lubrication Fittings	Upper Piston Fitting Number	
		If On Round Area	If On Flat Area
MD-8	2	# 2	# 2
MD-10	3	# 4	# 4
MD-12	3	# 4	# 4
MD-14	4	# 5	# 4
MD-16	4	# 5	# 4

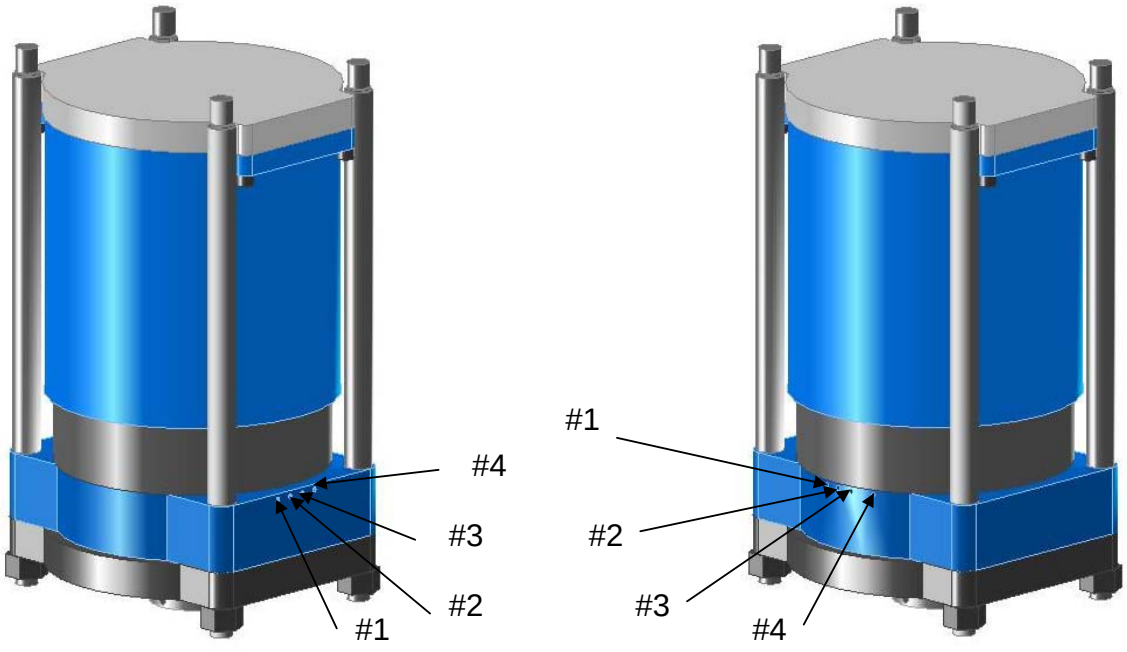


Fig. 17 Grease Fitting Numbers

Cushion Size	Dimensions							Ring-holding Pressure @ 100 psi
	E	D	F	G	C	K*	I*	
MD-8	7 1/4”	10 1/4”	8 19/32”	5 19/32”	9”	1”	7/8-9	5.0 Tons
MD-10	8 1/8”	12 5/8”	10 7/8”	6 3/8”	11”	1 1/4”	1-8	7.8 Tons
MD-12	10 3/16”	13 3/4”	12”	8 7/16”	13 1/8”	1 1/2”	1-8	11.4 Tons
MD-14	12 1/4”	16 1/4”	14 1/4”	10 1/4”	15 1/4”	1 5/8”	1 1/4-7	15.4 Tons
MD-16	13 1/2”	19”	16 1/2”	11”	17 1/4”	1 3/4”	1 3/8-6	20.0 Tons

* Recommended size – all mounting rods are made to customer requirements.

Cushion Size	Dimensions					
	N	Max Adj.	Cushion Height – “L” For Stroke of			
			3”	4”	5”	6”
MD-8	3 7/8”	5/8”	20 5/16”	27 5/16”	28 5/16”	29 5/16”
MD-10	3 7/8”	5/8”	20 5/16”	27 11/16”	28 11/16”	29 11/16”
MD-12	3 7/8”	5/8”	21 11/16”	28 11/16”	29 11/16”	30 11/16”
MD-14	3 11/16”	5/8”	24 11/16”	25 11/16”	30 11/16”	31 11/16”
MD-16	3 11/16”	5/8”	24 9/16”	29 9/16”	30 9/16”	

Note: Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. **Never plug these vents** as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is likely that the cushion packing need replacing.

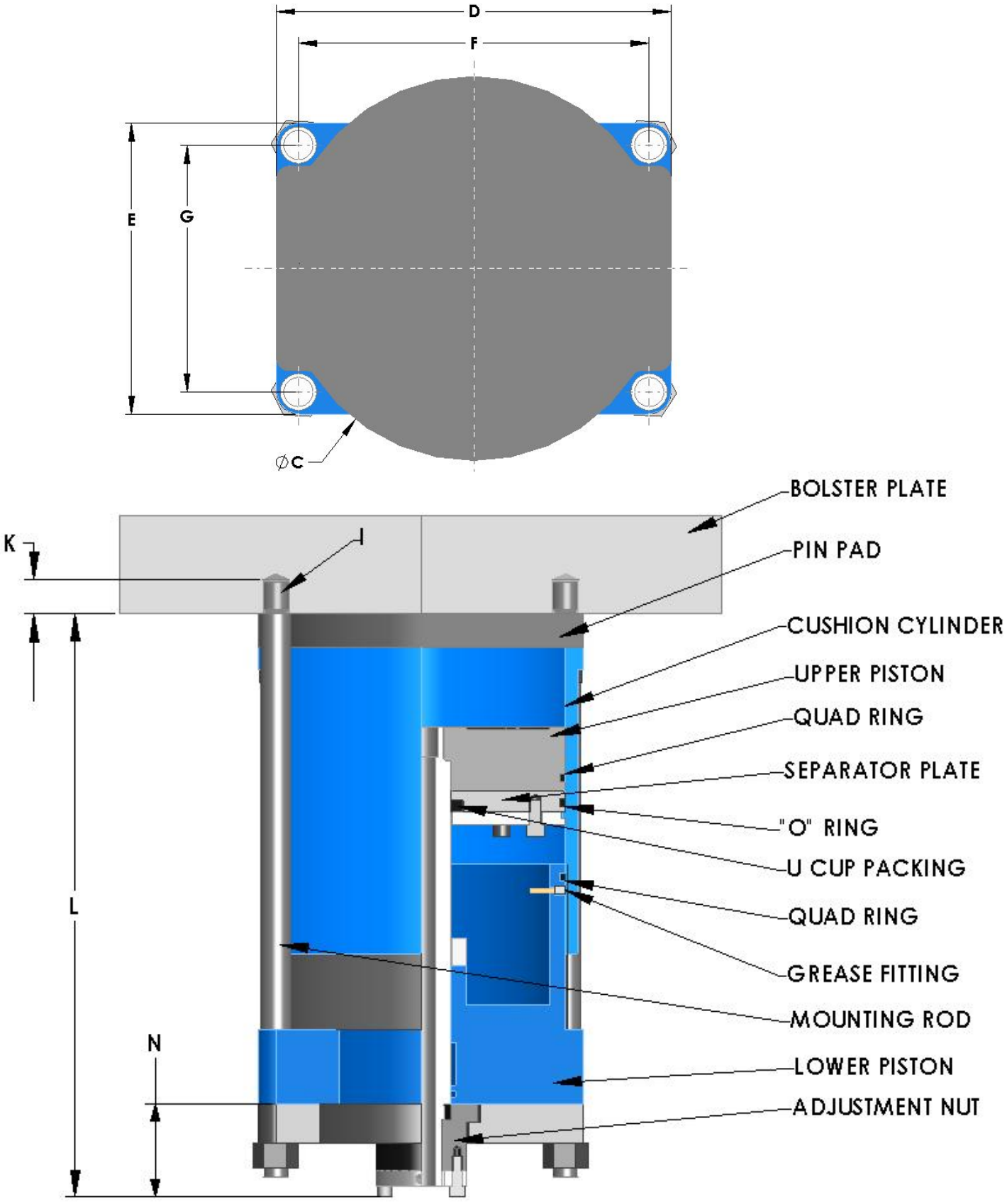


Fig. 18 Bolster plate mounted Model MD Cushion.

Installation Instructions

Model MD Press Bed Mounting (With Supporting Structure)

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a die cushion to the press bed of a press:

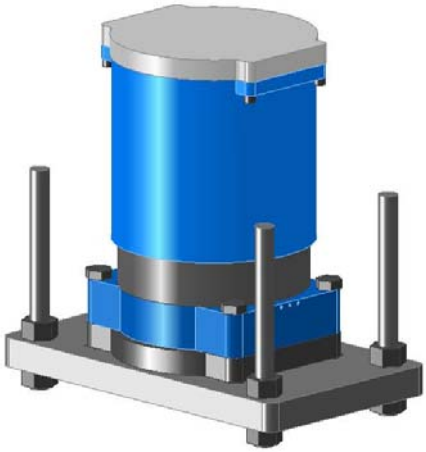


Fig. 19 Model MD Die Cushion 100 psi Max. Pressure

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread (See Fig. 20) into the drilled and tapped holes in the press bed, which have been provided for mounting the die cushion. If the cushion is to be suspended from mounting bosses that are not tapped, the mounting rods are provided with nuts on both top and bottom of the bosses.

(3) With the use of skids or timbers, slide the cushion unit into the approximate location relative to the press bed opening. (**NOTE:** If the distance between the mounting rods at the front of the press bed is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.)

(4) Install combination reducing and regulating valve and pressure gauge, high pressure hoses as well as surge tank according to detailed instructions on pages 49 and 51.

(5) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. Note that the grease fitting located per chart on page 6 feeds the upper piston. Since this is buried within the cylinder, no grease will ever be seen externally. Therefore, when lubricating insert the same volume in this fitting as is put in the total of all others (i.e. If MD-14 uses 2 shots of grease in

each of the 3 lower piston fittings, put 6 shots in the upper piston fitting). The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the Dayton Die Cushions has developed a specially compounded lubricant for die cushions (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Cushion Size	Dimensions				Ring-holding Pressure @ 100 psi
	M	O	J*	Max Adj.	
MD-8	9"	1 3/16”	1 1/4"	5/8”	5.0 Tons
MD-10	11"	1 3/16”	1 1/2"	5/8”	7.8 Tons
MD-12	13"	1 11/16”	1 1/2"	5/8”	11.4 Tons
MD-14	15"	1 11/16”	1 3/4"	5/8”	15.4 Tons
MD-16	17 1/4"	2 3/16”	2”	5/8”	20.0 Tons

* Recommended side – all mounting rods are made to customer requirements.

Cushion Size	Cushion Height – “H” For Stroke of			
	3”	4”	5”	6”
MD-8	20 5/16”	27 5/16”	28 5/16”	29 5/16”
MD-10	20 5/16”	27 11/16”	28 11/16”	29 11/16”
MD-12	21 11/16”	28 11/16”	29 11/16”	30 11/16”
MD-14	24 11/16”	25 11/16”	30 11/16”	31 11/16”
MD-16	24 11/16”	29 9/16”	30 9/16”	

Note: Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. **Never plug these vents** as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is likely that the cushion packing need replacing.

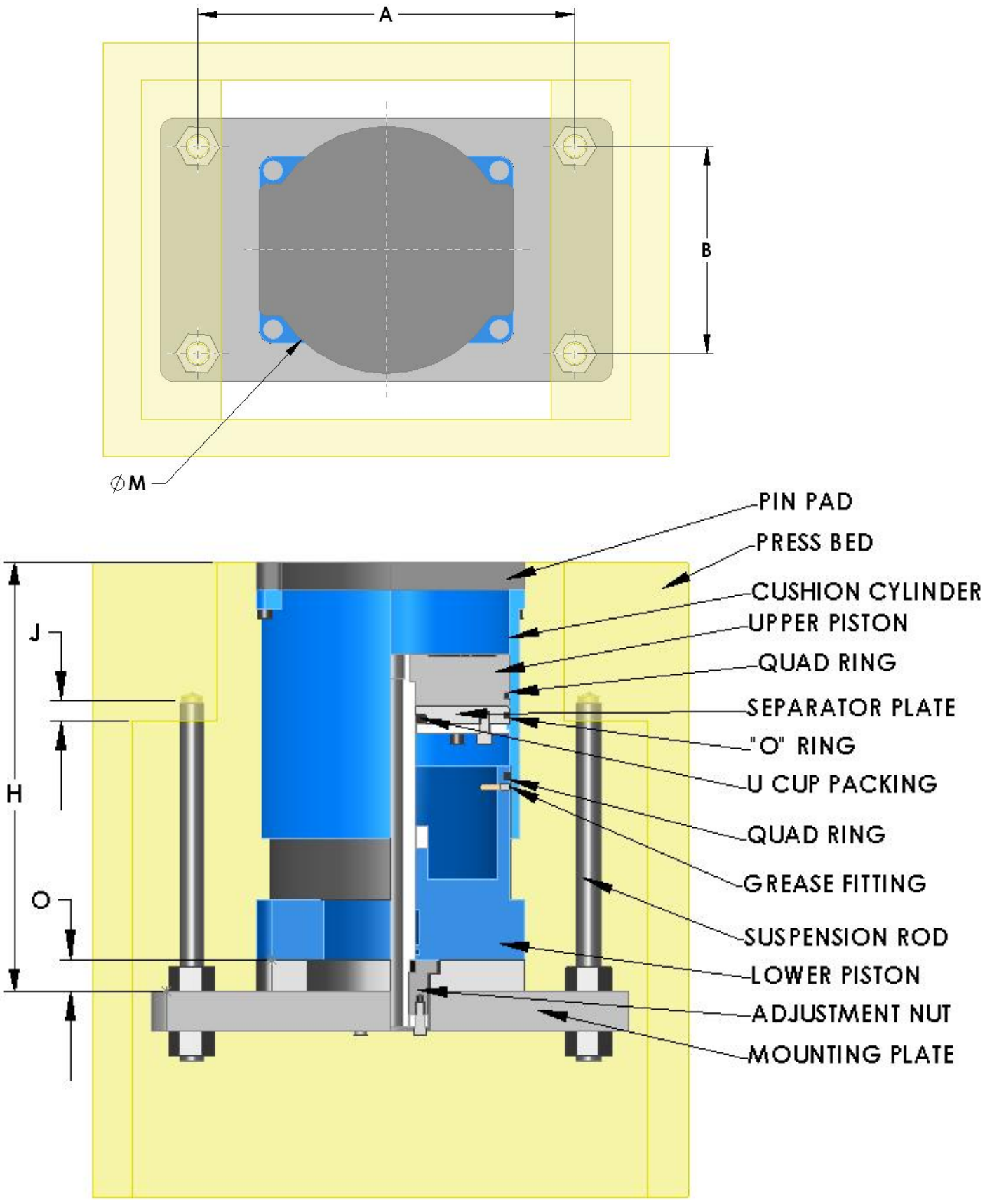


Fig. 20 Press bed mounted Model MD cushion.

Installation Instructions

Model HC Bolster Plate Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a single unit Model "HC" to the bolster plate of a press:

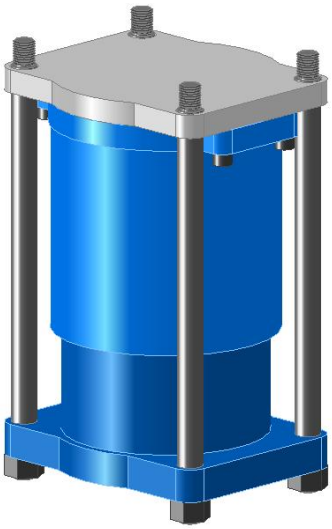


Fig. 21 Model HC Die Cushion 200 psi Max. Pressure

(1) The die cushion should he mounted to the bolster plate so that it is centrally located with reference to the press bed opening. Scribe press bed opening on the under side of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to “F" and "G", Fig. 22. The tolerance on these holes must be held to ± 1/64" for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate (See page 3).

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On HC-12 through HC-24 cushions, nuts should be pinned after assembled by cross-drilling, tapping, and inserting set screw).

(5) Install surge tank and booster pump per instructions on pages 51 and 65, respectively. Combination regulator and gauge (Page 49) can be substituted for booster pump if shop air pressure is adequate.

(6) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. Note that the grease fitting located per chart below feeds the upper piston. The same procedure should be followed after **EVERY 8 HOURS** of operation. Use Dayton Die Cushions specially compounded lubricant (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Cushion Size	Dimensions						
	C	D	E	F	G	I	K
HC-8	9 3/4	11 5/8	8 1/2	9 7/8	6 3/4	7/8-9	1
HC-10	11 3/4	13 11/16	10 1/4	11 11/16	8 1/4	18	1 1/4
HC-12	13 1/2	15 5/8	11 3/4	13 3/8	9 1/2	1 1/4-7	1 1/2
HC-14	16	17 5/8	13 3/8	15 1/8	10 7/8	1 1/4-7	1 5/8
HC-16	18	19 3/4	15	17	12 1/4	1 3/8-6	1 3/4
HC-18	20	22	16 3/4	19	13 3/4	1 1/2-6	1 7/8
HC-20	22 1/4	24 3/4	18 3/4	21 1/4	15 1/4	1 3/4-5	2
HC-22	24 1/4	26 1/2	20 1/4	22 3/4	16 3/4	1 3/4-5	2
HC-24	26 1/4	28 7/8	22 1/8	24 7/8	18 1/8	2-4 1/2	2 1/4

Cushion Size	Draw Length						Ring Holding Pressure @ 200 psi
	2	4	6	8	10	12	
	L	L	L	L	L	L	
HC-8	17 1/4	19 1/4	21 1/4				5.0
HC-10	19 1/2	21 1/2	23 1/2				7.8
HC-12		22	24				11.4
HC-14		23 3/4	25 3/4	29 3/4	33 3/4		15.4
HC-16		24 3/8	26 3/8	30 3/8	34 3/8		20.0
HC-18		26	28	32	36	40	25.4
HC-20		26 1/4	28 1/4	32 1/4	36 1/4	40 1/4	31.4
HC-22		28	30	34	38	42	38.0
HC-24		31 1/2	33 1/2	35 1/2	39 1/2	43 1/2	45.2

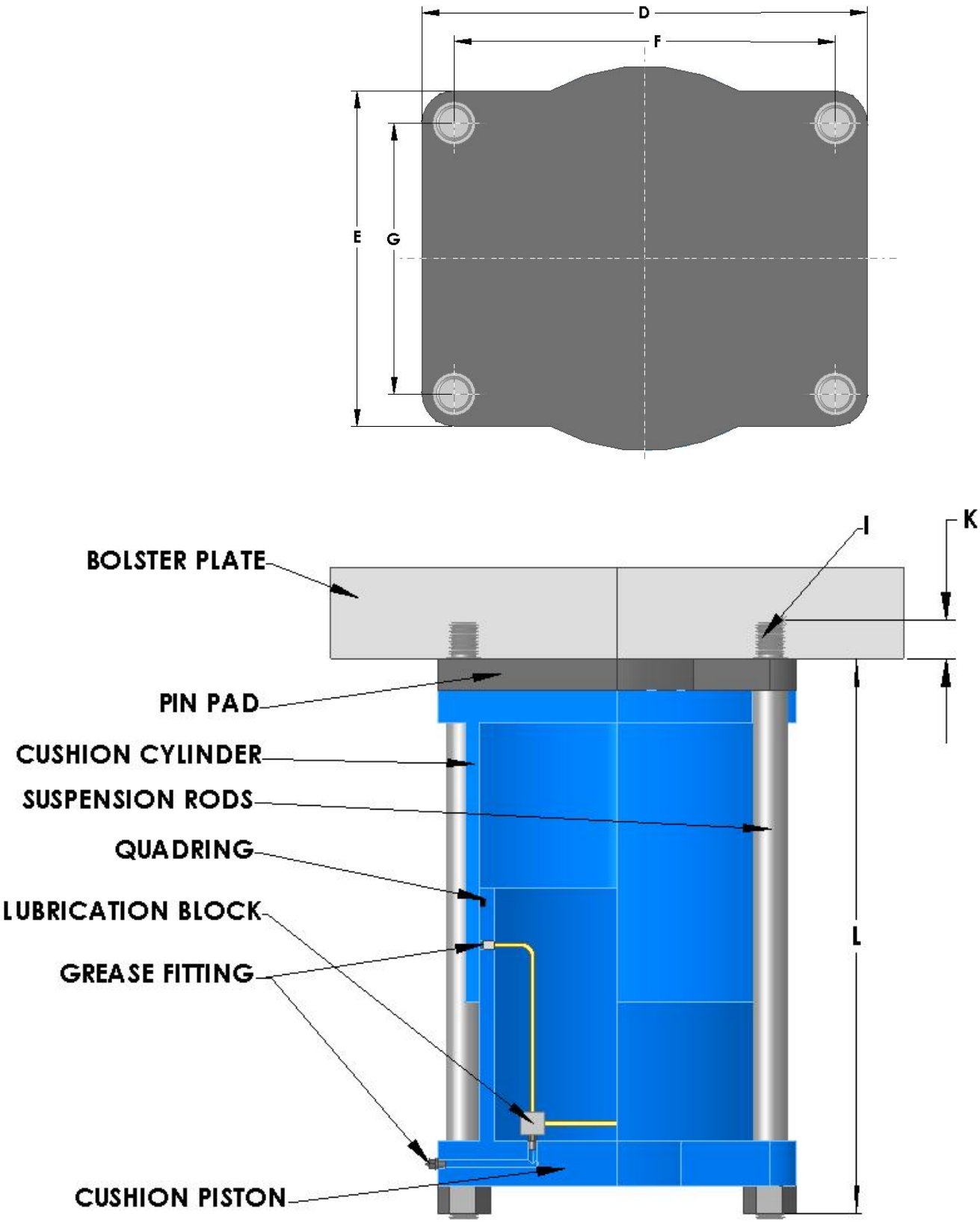


Fig. 22 Model HC Die Cushion – section and top view

Installation Instructions

Model HC Press Bed Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a single unit Model "HC" to the press bed:

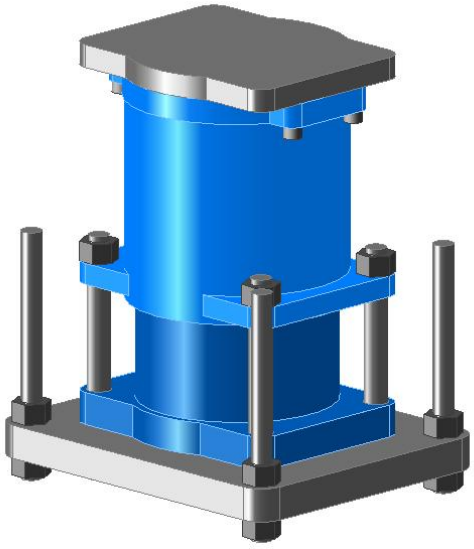


Fig. 23 Model HC Die Cushion 200 psi Max. Pressure

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. (See Page 3) If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.

(5) Model "HC" cushion can either he mounted so they stop against the bolster plate or against their own stop rod, according to customer's preference. If bolster stopping is desired, subtract 1/8" from dimension "H" and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by cross-drilling, tapping, and inserting set screw.

(6) Follow steps 32 and 33, from pages 5 and 6, to hook-up installation for operation.

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Cushion Size	I	J	Draw Length						Ring Holding Pressure @ 200 psi
			2”	4”	6”	8”	10”	12”	
			H	H	H	H	H	H	
HC-8	7/8-9	1 1/4	17 1/4	19 1/4	21 1/4				5.0
HC-10	18	1 1/2	19 1/2	21 1/2	23 1/2				7.8
HC-12	1 1/4-7	1 1/2		22	24				11.4
HC-14	1 1/4-7	1 3/4		23 3/4	25 3/4	29 3/4	33 3/4		15.4
HC-16	1 3/8-6	2		24 3/8	26 3/8	30 3/8	34 3/8		20.0
HC-18	1 1/2-6	2		26	28	32	36	40	25.4
HC-20	1 3/4-5	2 3/4		26 1/4	28 1/4	32 1/4	36 1/4	40 1/4	31.4
HC-22	1 3/4-5	2 3/4		28	30	34	38	42	38.0
HC-24	2-4 1/2	3 1/4		31 1/2	33 1/2	35 1/2	39 1/2	43 1/2	45.2

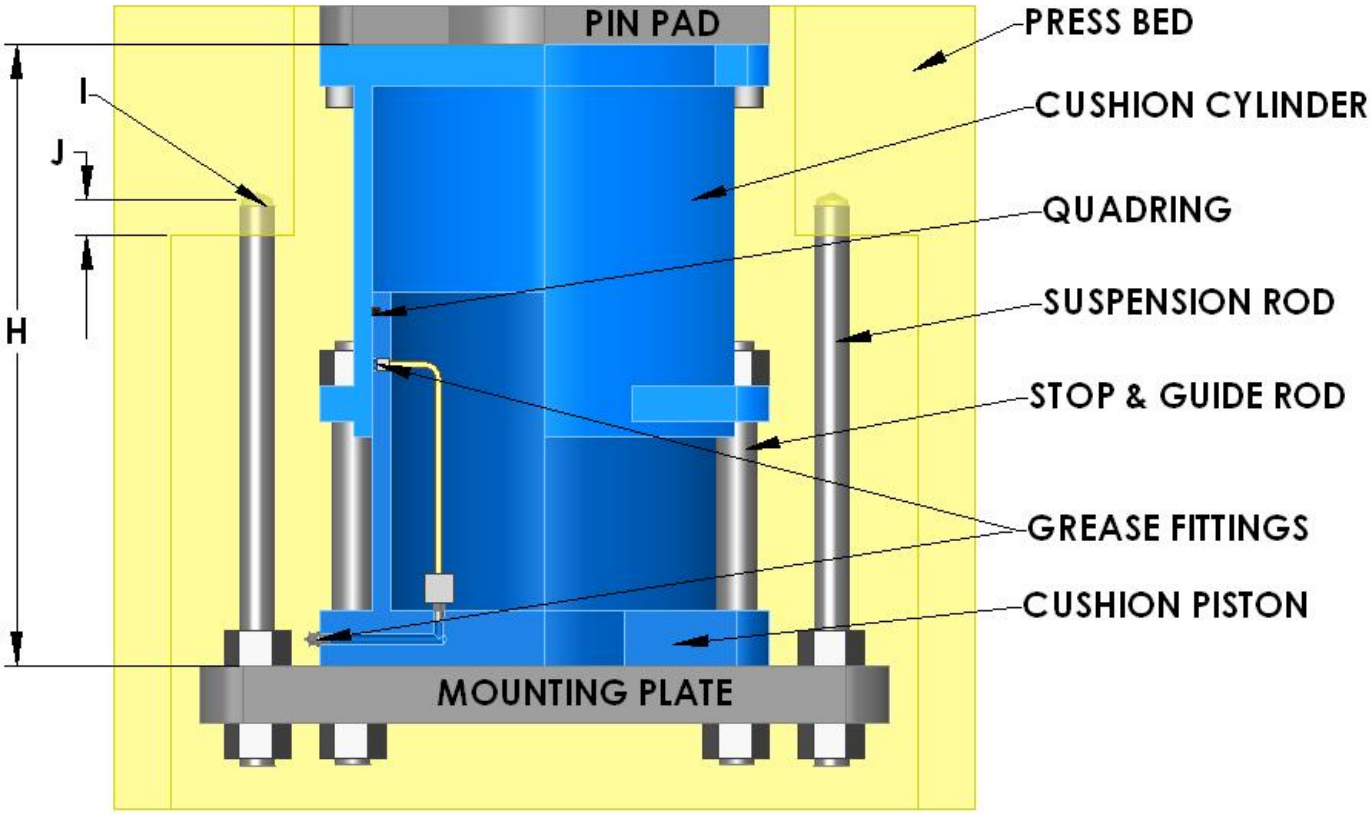


Fig. 24 Model HC Die Cushion – cross section view

Installation Instructions

Model HD Bolster Plate Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a single unit Model "HD" to the bolster plate of a press:

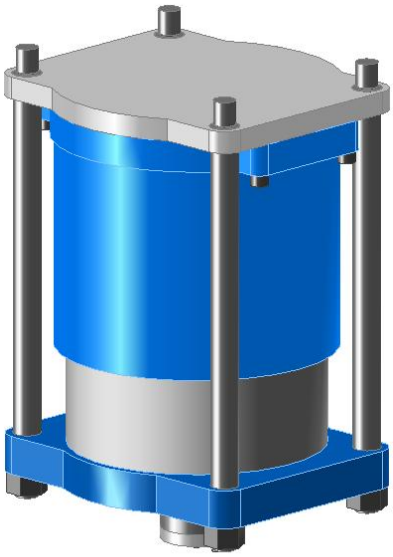


Fig. 25 Model HD Die Cushion 200 psi Max. Pressure

(1) The die cushion should he mounted to the bolster plate so that it is centrally located with reference to the press bed opening. Scribe press bed opening on the underside of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to “F" and "G", Fig. 26. The tolerance on these holes must be held to ± 1/64" for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate (See page 3).

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On HD-12 through HD-16 cushions, nuts should be pinned after assembled by cross-drilling, tapping, and inserting set screw).

(5) Install surge tank and booster pump per instructions on pages 51 and 65, respectively. Combination regulator and gauge (page 49) can be substituted for booster pump if shop air pressure is adequate.

(6) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. The same procedure should be followed after **EVERY 8 HOURS** of operation. Use Dayton Die Cushions specially compounded lubricant (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Cushion Size	Dimensions						
	C	D	E	F	G	I [a]	K [a]
HD-8	9 3/4	11 5/8	8 1/2	9 7/8	6 3/4	19 1/2	1
HD-10	11 3/4	13 11/16	10 1/4	11 11/16	8 1/4	21 5/8	1 1/4
HD-12	13 1/2	15 5/8	11 3/4	13 3/8	9 1/2	21 5/8	1 1/2
HD-14	16	17 5/8	13 3/8	15 1/8	10 7/8	23 1/8	1 5/8
HD-16	18	19 3/4	15	17	12 1/4	23 5/8	1 3/4

Cushion Size	Dimensions				Ring Holding Pressure @ 200 psi	Draw Without Surge Tank
	L [d]	M [b]	N [c]	P [d]		
HD-8	23 5/16	6	2	29 5/16	5.0	2
HD-10	25 7/16	6	2	31 7/16	7.8	2
HD-12	26 1/8	6	2	32 1/8	11.4	2
HD-14	27 5/8	6	2	33 5/8	15.4	2
HD-16	28 1/8	6	2	34 1/8	20.0	2

(a) Recommended size – all mounting rods are made to customer requirements.
(b) Dimensions “M” equal the maximum draw **only** when adjustment nut is **fully extended**.
(c) N – Adjustment
(d) Dimension for 6” draw – may be less by reduction of draw.

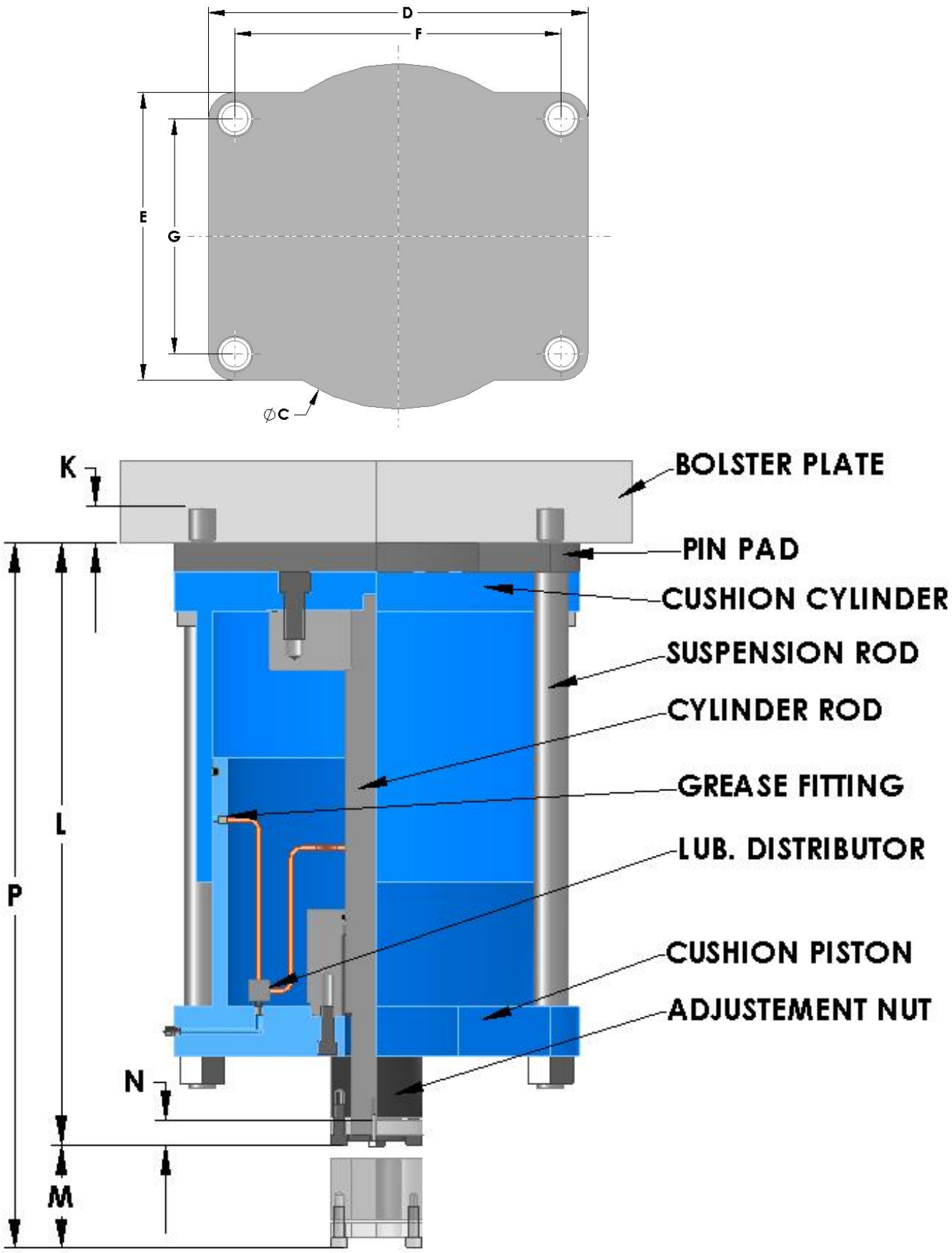


Fig. 26 BPM Model HD Die Cushion

Installation Instructions

Model HD Press Bed Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a single unit Model "HD" to the press bed:

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

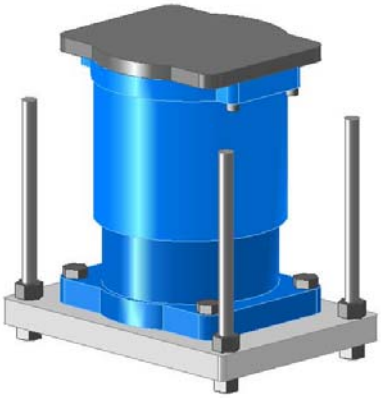


Fig. 27 Model HD Die Cushion 200 psi Max. Pressure

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed (See page 3). If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. Be sure to **protect** the **adjustment nut** while cushion is being installed. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.

(5) Model "HD" cushion can either he mounted so they stop against the bolster plate or against their own stop nut, according to customer's preference. If bolster stopping is desired, measure pin pad thickness, add dimension "H", subtract 1/8” and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by cross-drilling, tapping, and inserting set screw.

(6) Install surge tank and booster pump per instructions on pages 51 and 65, respectively. Combination regulator and gauge (page 49) can be substituted for booster pump if shop air pressure is adequate.

(7) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. The same procedure should be followed after **EVERY 8 HOURS** of operation. Use Dayton Die Cushions specially compounded lubricant (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Cushion Size	Dimensions					Ring Holding Pressure @ 200 psi	Draw Without Surge Tank
	D	E	I [(a)]	J [(a)]	H [(b)]		
HD-8	11 5/8	8 1/2	7/8-9	1 1/4	19 1/2	5.0	2
HD-10	13 11/16	10 1/4	1-8	1 1/2	21 5/8	7.8	2
HD-12	15 5/8	11 3/4	1 1/4-7	1 1/2	21 5/8	11.4	2
HD-14	17 5/8	13 3/8	1 1/4-7	1 3/4	23 1/8	15.4	2
HD-16	19 3/4	15	1 3/8-6	2	23 5/8	20.0	2

(a) Recommended size – all mounting rods are made to customer requirements.
(b) Dimension for 6” draw – may be less by reduction of draw.

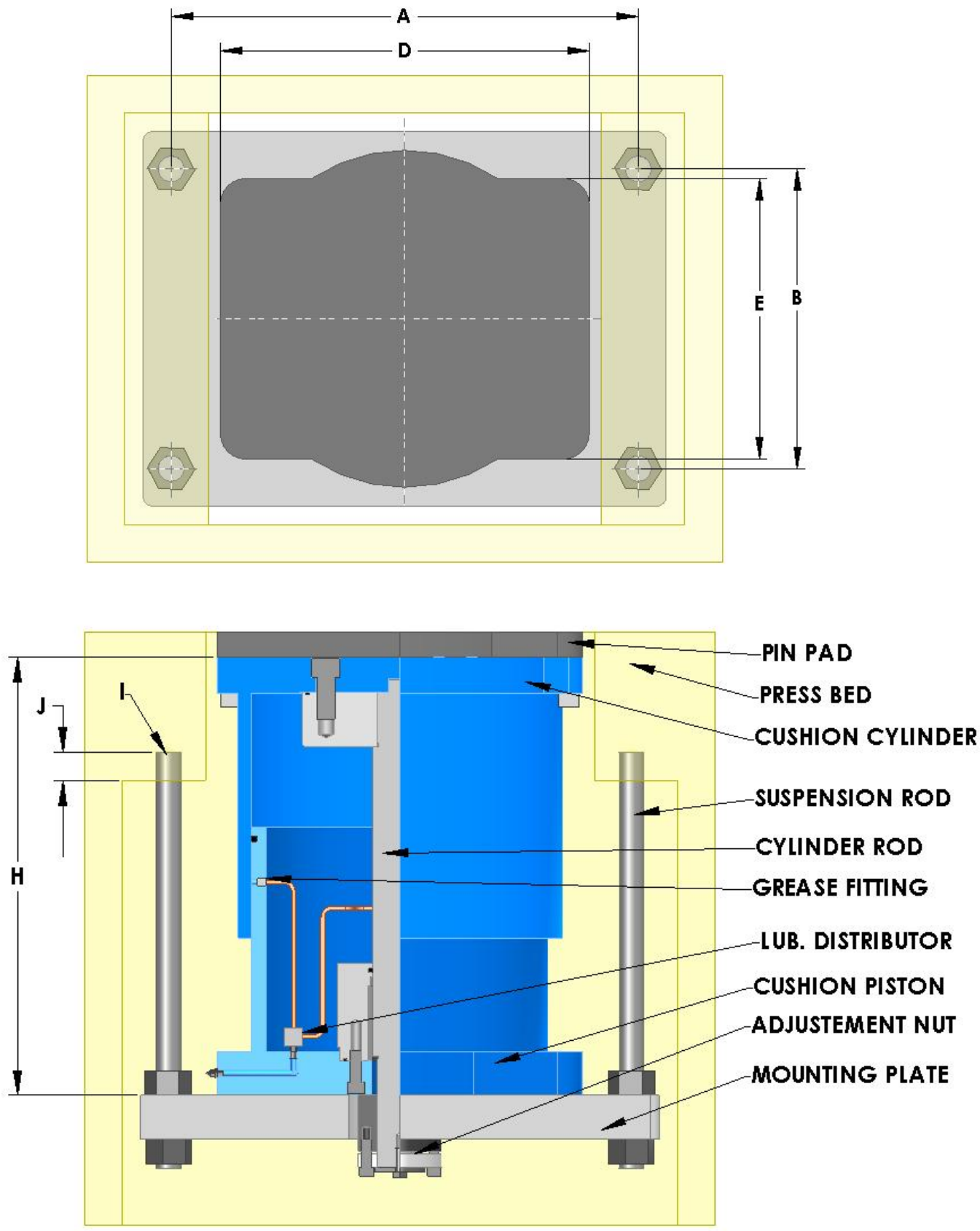


Fig. 28 Press bed mounted cushion. Dimensions A and B to be specified by the customer.

Installation Instructions

Model HMC Press Bed Mounting

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

The following is the recommended procedure for mounting a single unit Model "HMC" to the press bed:

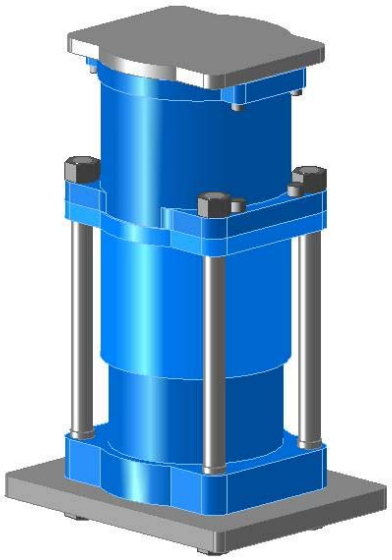


Fig. 29 Model HMC Die Cushion 200 psi Max. Pressure

(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed (See page 3). If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.

(5) Model "HMC" cushion can either he mounted so they stop against the bolster plate or against their own stop nut, according to customer's preference. If bolster stopping is desired, measure pin pad thickness, add dimension "H", subtract 1/8” and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by cross-drilling, tapping, and inserting set screw.

(6) Install surge tank and booster pump per instructions on pages 51 and 65, respectively. Combination regulator and gauge (page 49) can be substituted for booster pump if shop air pressure is adequate.

(7) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. The same procedure should be followed after **EVERY 8 HOURS** of operation. Use Dayton Die Cushions specially compounded lubricant (See page 87).

IMPORTANT! READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE 2.

Cushion Size	Dimensions						
	Min. Dim. A	Min. Dim. B	C	D	E	I	J
HMC-8	9 7/8”	6 3/4"	9 3/4"	12”	4 5/8”	1-8	1 1/2"
HMC-10	11 11/16”	8 1/4"	11 3/4"	14 1/2"	6”	1 1/4-7	1 1/2"
HMC-12	13 3/8”	9 1/2"	13 1/2"	16 1/4"	6 1/2”	1 1/2-6	1 3/4"
HMC-14	15 1/8”	10 7/8”	16”	17 5/8”	8”	1 1/2-6	2”
HMC-16	17”	12 1/4"	18”	20 1/4"	9”	1 3/4-5	2”
HMC-18	18”	16”	20”	22 1/2"	11 1/2"	2 1/4-4 1/2	2 1/2"
HMC-20	20”	17 1/2"	22 1/4"	24 3/4"	12 1/4"	2 1/2-4	3”
HMC-22	22”	19”	24 1/4"	27”	13”	2 1/2-4	3”
HMC-24	24”	20 1/2"	26 1/4"	28 7/8”	13 3/4"	2 1/2-4	3”

Cushion Size	Overall Height “H” for Maximum Draw of				Ring Holding Pressure @ 200 psi
	3”	4”	5”	6”	
HMC-8	20 1/2"	27 1/2"	28 1/2"	29 1/2"	10.0 Ton
HMC-10	20 1/2"	27 1/2"	28 1/2"	29 1/2"	15.6 Ton
HMC-12	20 1/2"	27 1/2"	28 1/2"	29 1/2"	22.8 Ton
HMC-14	27 1/4"	28 1/4"	33 1/4"	34 1/4"	30.8 Ton
HMC-16	27 1/4"	28 1/4"	33 1/4"	34 1/4"	40.0 Ton
HMC-18	31 5/8”	32 5/8”	33 5/8”	36 5/8”	50.8 Ton
HMC-20	31 5/8”	32 5/8”	33 5/8”	36 5/8”	62.8 Ton
HMC-22	32”	33”	38”	39”	76.0 Ton
HMC-24	37 1/4"	38 1/4"	39 1/4"	40 1/4"	90.4 Ton

Model HMC cushions can be mounted to the bolster plate if no provisions are available for mounting to the pres bed. The mounting procedure 1-7 should be followed. The customer must drill and tap the bottom side of the bolster in accordance with dimensions A, B, J and I.

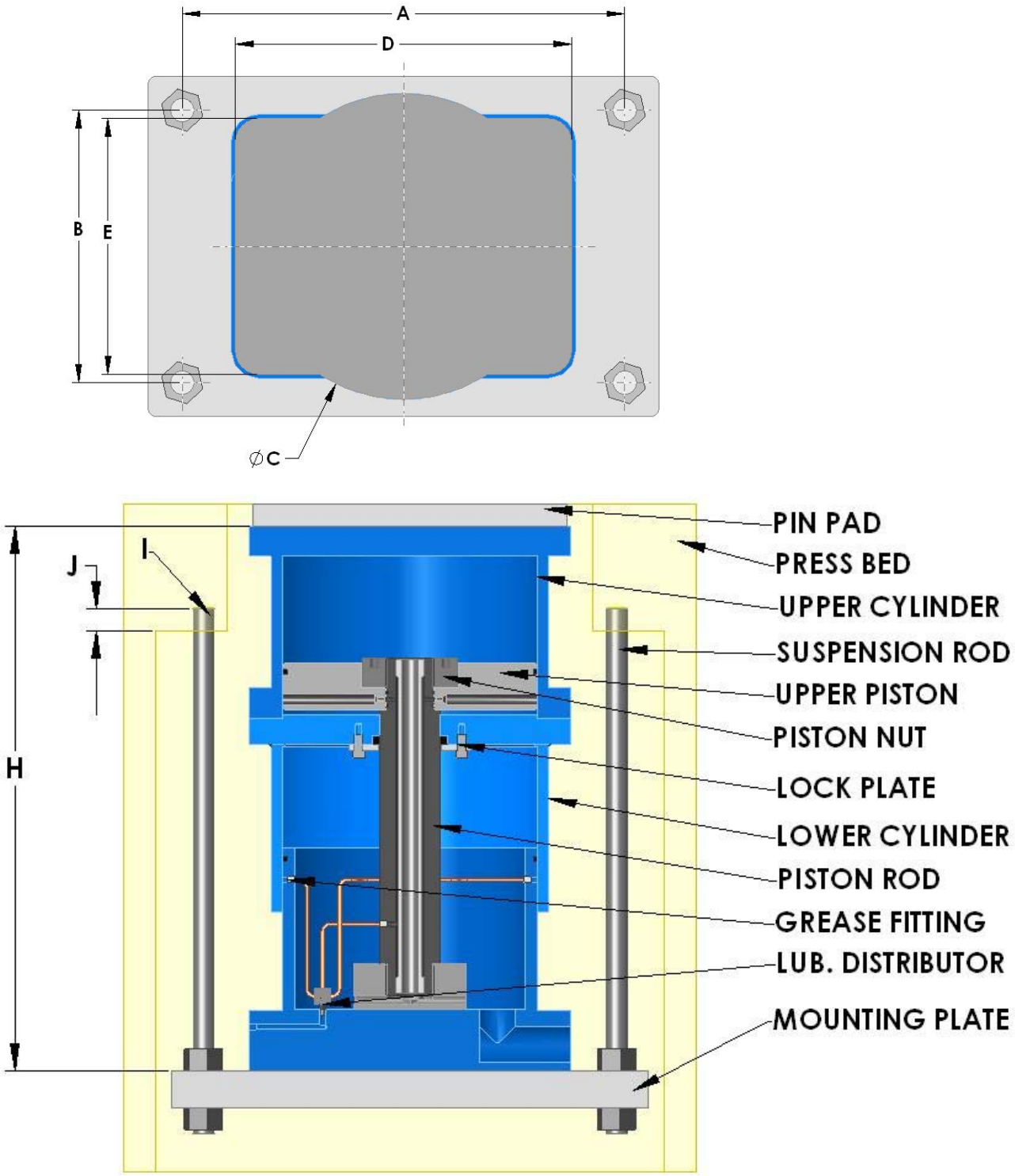


Fig. 30 Press bed mounted cushion. Dimensions A and B to be specified by the customer.

NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. Never plug these vents, as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed, it is likely that the cushion packings need replacing.

Instructions for Installing Multiple Cushions Installations (Models 2C, 3C, 2MC, etc.)

As a general rule, each multiple cushion installation requires special consideration in the design of the mounting structure. Consequently, it is usually necessary to create the installation drawings showing all the details as applied to each installation. These drawings are sent to the customer to be used when installing the cushion installation.

When installing a multiple cushion, it is very important that the bolster plate or any other surface against which the pin pad is to stop be flat and parallel. If the bolster or other surfaces are not flat and parallel, they should be machined so that the pin pad will have an accurate surface for a positive stop.

It is also important that the mounting plate or structure be aligned so that it is parallel with the top of the press bed and adjusted to the correct height. Since practically all multiple installations are mounted on a supporting structure, the instructions for press bed mounting on page 8 must be followed. The method for determining the height from the top of the press bed to the mounting plate or structure must be altered on some designs as follows:

MODELS 2C, 3C, 2HC, 2MC, ETC.

When installing a 2C, 3C, etc., installation as shown in Fig. 31, the height from the top of the press bed to the mounting channels is determined by taking the overall height of the cushion plus the thickness of the pin pressure pad, minus 1/8". However, since spacers have been added between the bottom of the cushion unit and the top of the mounting channels, it is necessary to add the height of these spacers.

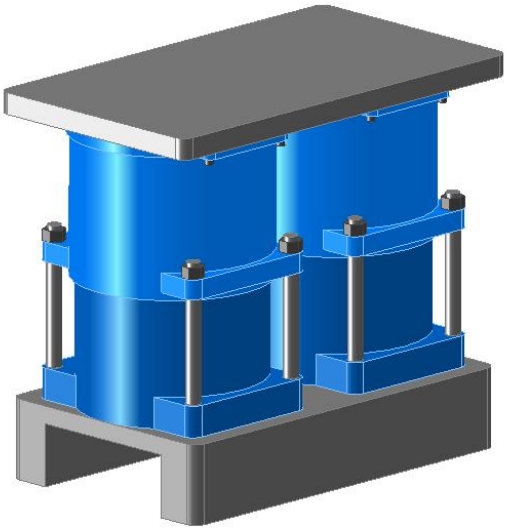


Fig. 31 2C12 PBM Die Cushions

Refer to page 51 for detailed instructions for installation of surge tank or tanks. It is important to note that surge piping for multiple installations with common pin pads must provide common interconnection between all cushions and surge tank or tanks. Regulating valve can be connected to any cushion in system (page 49) and air inlets in the remaining cushions can be plugged.

PARTS LIST AND ACCESSORIES

FOR

PNEUMATIC DIE CUSHIONS

Should it be necessary to order repair parts, always give the **Cushion Model, Serial Number and Key Number** of the part. The serial number is stamped at the front of the lower left-hand flange of each cushion unit. The cushion model and maximum drawing depth is stamped on the same plate of each cushion unit. This information is very important, as it enables us to give prompt service, which we cannot do unless we know the exact cushion on which the new parts are to be used. It is seldom advisable to make your own repair parts, since the manufacturer has an accurate record of all parts for your pneumatic die cushion equipment and can furnish them directly from stock at a nominal charge.

In conclusion, remember there is no finer or better cushion built than the Dayton Die Cushions models. Remember, too, that no machine equipment, regardless of how well it is designed and built, will stand up for a long period under abuse, neglect or indifferent treatment. A careful study of the instructions in this book will insure you years of uninterrupted service.

Cushion Surge Size

Pipe Size Required from Cushion Unit to Surge Tank

Cushion Size (Model C, D & H)	Number of Cushion Units					
	1	2	3	4	5	6
6”	1/2" NPT	3/4 “ NPT	1 1/4" NPT	1 1/4" NPT	1 1/4" NPT	1 1/2" NPT
8”	1/2" NPT	3/4" NPT	1 1/4" NPT	1 1/4" NPT	1 1/4" NPT	1 1/2" NPT
10”	3/4 “ NPT	1 1/4" NPT	1 1/2" NPT	2” NPT	2” NPT	2” NPT
12”	3/4" NPT	1 1/4" NPT	1 1/2" NPT	2” NPT	2” NPT	2” NPT
14”	1" NPT	1 1/2" NPT	2” NPT	2 1/2” NPT	2 1/2” NPT	3” NPT
16”	1 1/4" NPT	2” NPT	2 1/2” NPT	3” NPT	3” NPT	
18”	1 1/4" NPT	2” NPT	2 1/2” NPT	3” NPT	3” NPT	
20”	1 1/4" NPT	2” NPT	2 1/2” NPT	3” NPT	3” NPT	
22”	1 1/2" NPT	2 1/2” NPT	3” NPT			
24”	1 1/2 NPT	2 1/2” NPT	3” NPT			

Cushion Size (Model MC & MD)	Number of Cushion Units	
	1	2
8”	3/4" NPT	1 1/4" NPT
10”	1 1/4" NPT	2" NPT
12”	1 1/4“ NPT	2" NPT
14”	1 1/2" NPT	2 1/2" NPT
16”	2" NPT	2 1/2" NPT
18”	2" NPT	3” NPT
20”	2" NPT	3” NPT
22”	2 1/2" NPT	4” NPT
24”	2 1/2" NPT	4” NPT

Installation Instructions and Parts List

Combination Reducing Regulating Valve and Pressure Gauge

When installing a Dayton Die Cushions Combination Regulator and Pressure Gauge on a pneumatic die cushion installation, high pressure hoses should be used from the regulator to the cushion unit. A brass or steel pipe may be used; however, a high pressure hose is long-lived, and does absorb the shock of the press on the working equipment of the regulator as well as the pressure gauge.

The Combination Regulator and Gauge, which is furnished with a bracket, should be installed on the left-hand side of the press bed frame. It should be mounted approximately five or six feet from the floor within easy reach and view of the operator.

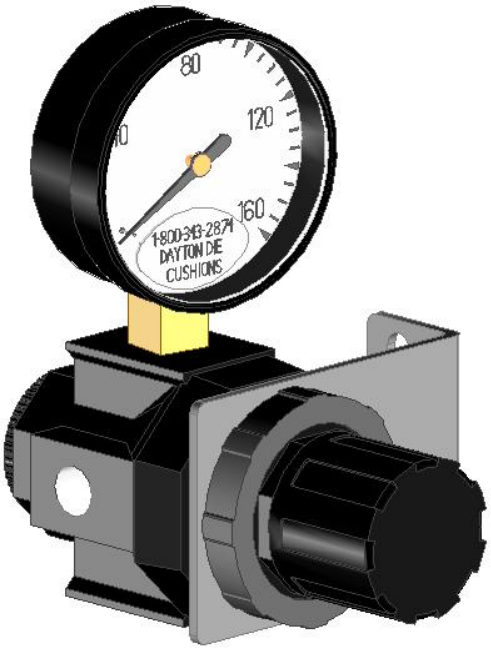


Fig. 32 Regulator and Gauge Assembly

It is very important that the vibration dampener be used when mounting the regulator in order to remove as much of the press shock from the regulator and gauge as possible. After the shop air line has been piped to within 2 or 2 1/2 feet of the pressure regulator, it is advisable to provide a globe shut-off valve on the end of the pipe so that the air pressure can be turned off when the cushion is not in use.

PRECAUTION

After the globe shut-off valve has been attached to the shop air line, be sure to blow out the shop air line to remove any foreign matter or dirt before connecting the short length of hose from the globe shut-off valve to the inlet side of the pressure regulator. If this precaution is not taken, there is a possibility a small piece of dirt will get under the seat of the regulator valve and it will not function properly. Also, note that the regulator openings are marked with an arrow to indicate direction of flow so that the air hoses can be connected to correct side for proper operation.

The 6-foot high pressure hose connects the outlet side of the regulator and the model C, D, MC and MD cushion through the cross, as shown in Fig. 18.

For high pressure cushions, model HC, HD and HMC, regulator and gauge are mounted directly to the booster pump. The booster pump is connected to the cushion by means of the high pressure hose through the cross as shown in Fig. 49.

By recording the pressure required for a given job when it is first set up, it is an easy matter to reset the same die equipment at a later date by merely setting the pressure on the pressure gauge according to this reading.

The 1/4” size regulator and gauge assembly, part number 1502 (see Fig. No. 46) is furnished as standard equipment with all C, D, MC and MD cushion installations.

Pressure Gauge

The gauges supplied by Dayton Die Cushions have safety backs and 1/4-inch pipe thread on the inlet. Pressure gauge is part of reducing regulating valve assembly used for models C, D, MC and MD. For high pressure models HC, HD and HMC, gauge is mounted directly to the booster pump. Also, each surge tank is supplied with the appropriate pressure gauge: low pressure gauge (Part # 284) for models C, D, MC and MD and high pressure gauge (Part #6114) for models HC, HD and HMC.

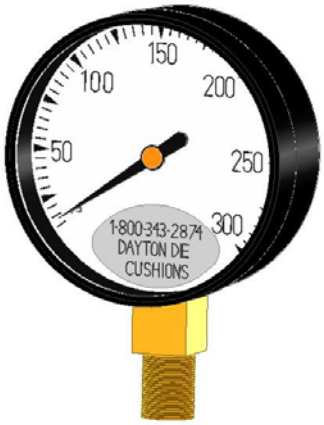


Fig. 33 Pressure Gauge

Part Number	Dial Reading	Graduation Intervals	Diameter
284	160 lbs.	2 lbs.	2 1/2 “
6114	300 lbs.	5 lbs.	2 1/2 “

Surge Tanks

On deep-drawing operations where the pin pressure pad is deflected to the maximum drawing capacity of the pneumatic die cushion, a surge tank reservoir is used so that the air compressed in the cushion cylinder will not build up to prohibitive pressure at the bottom of the work cycle of the press. The larger the surge tank used, the more constant the ring holding or pad pressure will be throughout the work cycle. Too small a surge tank or one connected with too small a pipe will cause a noticeable increased pressure during the work cycle of the pneumatic die cushion unit.

The size of the surge tank required depends on the combined piston area and the depth of the draw. **The volume of the tank plus the volume of the cushion when inflated should be six times the displacement of the cushion at maximum draw**. The pipe connection from the cushion to the surge tank should be sufficiently large to permit a free flow of air from the cushion to the surge tank. The pipe sizes given in the table below are the recommended sizes for cushion installations consisting of one to six cushion units.

Fig. 34 Surge Tank

All cushion units are drilled and tapped for the correct size surge line to handle the flow of air required. On multiple units a reducing bushing for the correct size is furnished to give the proper air flow for the entire installation. Each cushion installation should have its own surge tank, as the pressure in the cushion unit and the surge tank is practically the same at all times. This would make it impossible to use one surge tank for two cushion installations, particularly if they were being run under different air pressures.

It is advisable to install the surge tank as close to the cushion unit as possible to minimize the flow of air through surge lines. The surge tank itself may be installed in either a horizontal or vertical position. Each surge tank is provided with the required number of outlets for making either of the above installations.

All surge tanks furnished with pneumatic die cushions include pop safety valve, pressure gauge and drain cock. Tanks furnished with C, D, MC and MD installations have pop safety valve set to relieve at 125 psi, while high pressure cushion installations model HC, HD and

HMC have it set to 250psi. All tanks are built to ASME and National Board of Registration Standards and are furnished with certified code tag.

REPAIR PARTS FOR SURGE TANK AND ACCESSORIES

If it becomes necessary to order replacements parts for a surge tank and its accessories, order by part number according to the part list below.

Tank Number	Size	Volume	Outlet Port Size	Shipping Weight
6301	12 x 33	12 gal.	2” NPT	76 lbs.
6302	12 x 45	18 gal.	2” NPT	100 lbs.
6303	16 x 47	33 gal.	2 1/2” NPT	157 lbs.
6304	18 x 55	51 gal.	3” NPT	250 lbs.

Surge Tank Assembly		
Description	Part Number	
	Low Pressure Cushions	High Pressure Cushions
Surge Tank	See table above	See table above
Pop Safety Valve	285	6308
Pressure Gauge	284	6114
Surge Drain Cock	443	443

Please contact Dayton Die Cushions for bigger surge tank sizes.

Lubrication

Instructions and Parts List

All Dayton Pneumatic Die Cushions are thoroughly lubricated at the factory prior to shipment. It is advisable, however, to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. If the cushion is permitted to stand idle for a period of two or three weeks, the grease may dry out and as a result the packing will become hard and will possibly cause an air lack until it has softened up sufficiently. It may be necessary in some cases to inject grease into the lubrication system to soften up these packings so that they will retain their resiliency. A standard automotive pressure grease gun can be used an all lubricating fittings on Dayton pneumatic die cushions.

DO NOT USE AN ORDINARY CUP GREASE, AS IT WILL NOT DISTRIBUTE ITSELF PROPERLY OVER INTERIOR SURFACES OF THE CYLINDER AND PISTON WALLS LUBRICANT ESPECIALLY COMPOUNDED FOR DIE CUSHIONS IS AVAILABLE FROM DAYTON DIE CUSHION IN 35-LB. PAILS. SEE PAGES 73 AND 74 FOR DETAILS.

CAUTION!! Failure to lubricate as instructed may result in permanent mechanical damage to interval working parts of die cushion. This may result in seizure of unit and the possibility of Injury to operating personnel.

Pressure fittings are located either at the front or on the side of each individual model C, D, MC and MC the cushion piston.

In low pressure cushion models, under severe vibrating conditions the 3/16" copper tubing, “D” (see Fig. 35), may have a tendency to fracture just behind compression sleeve "C". In the event an air leak develops, this can be very readily checked by removing compression fitting "F", and inspecting the compression sleeve to make sure the seat in tight against the cushion piston and that no fractures are visible in the tubing.

Models HC and HD Pneumatic Die Cushions (see Fig. 36) are lubricated through one fitting located on the piston base (either at the front or on the side). Lubricant is distributed automatically and evenly to all points of wear by means of lubrication distributor "F". If necessary, hose “C” can be removed by unscrewing grease fitting, “A”.

Instructions for Grease Fittings Installation

To install grease fittings located in the top part of the low pressure cushion piston, please follow the steps.

1. Put the copper tube from the inside of the cushion through the drilled hole. Place the compression sleeve (part no. 867) onto copper tube from the outside of the cushion and slip it inside the drilled hole.
2. Use compression fitting (no. 870) to compress the sleeve on the copper tubing against the walls of the hole drilled in the piston flange while tightening it.
3. Press the grease fitting (no 625) into the compression fitting. Make sure that copper tubing is deep enough inside the compression fitting so that the grease fitting fits inside the compression fitting (as shown in Fig. 11).
4. Retighten the compression fitting.

To install grease fittings located in the lower flange of the low pressure cushion piston, please follow the steps.

1. Take the copper tube from the inside of the cushion and run it through the drilled hole. Place the compression sleeve (part no. 867) onto the copper tube and slip it inside the drilled hole.
2. Use the compression fitting (no. 870) to compress the sleeve onto the copper tubing.
3. Remove the compression fitting and take out the copper tubing with the compression sleeve on it.
4. Smear the sleeve's surface with Permatex.
5. Put the sleeve back into the hole and tighten the grease screw (#868).

Low Pressure Standard Lubrication Layout

	DESCRIPTION	PART NUMBER
A	Cushion Cylinder	-
B	Grease Screw	868
C	Compression Sleeve	867
D	Copper Tubing	629
E	Compression Sleeve	867
F	Compression Fitting	870
G	Grease Fitting	625
H	Cushion Piston	-

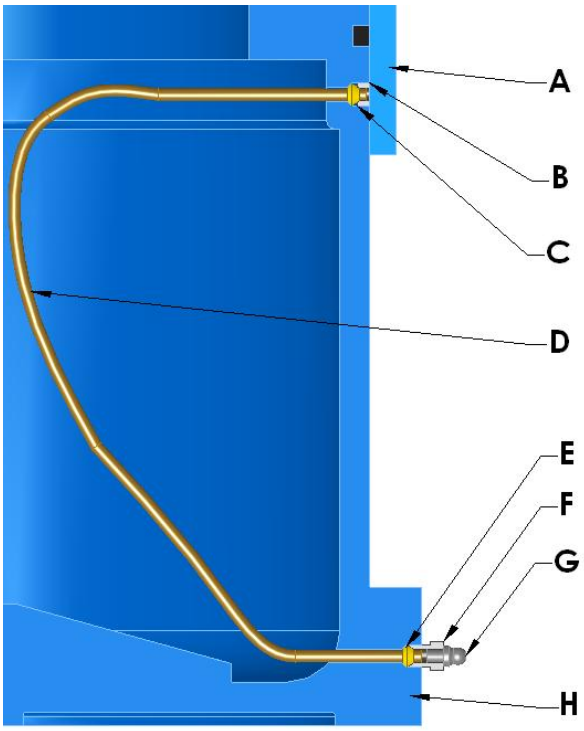


Fig. 35 Model C, D, MC and MD Lubrication

High Pressure Standard Lubrication Layout

	DESCRIPTION	PART NUMBER
A	Grease Fitting	15392
B	Cushion Cylinder	-
C	Nylon Tubing	15302
D	Cushion Piston	-
E	Grease Fitting	15392
F	Lub. Distributor	6620
G	Hex Nipple	14498
H	Lub. Fitting	210

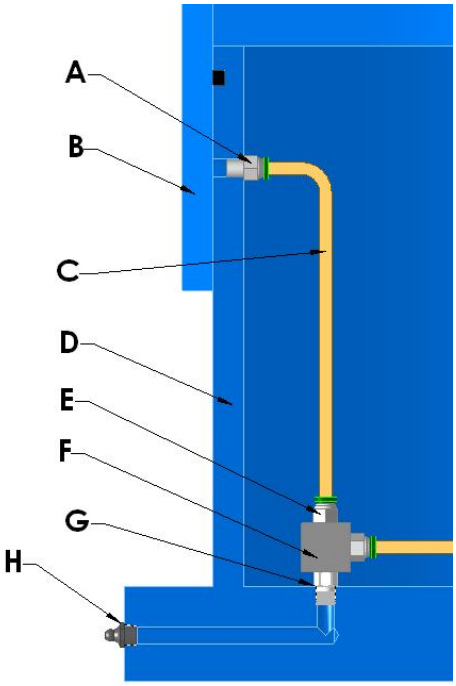


Fig. 36 Model HC, HD Lubrication

Centralized Lubrication

On some installations, particularly in the larger sizes, the press bed is so constructed that the grease fittings are not accessible. The lubrication of the cushion unit on installations of this type can be easily provided for by centralized lubrication. The centralized lubrication system consists of a header block (see Fig. 37) and 3/16" copper tubing that connects this header block directly to the die cushion unit. The header block is provided with as many grease fittings as there are in the complete cushion installation. These header blocks can be placed in any convenient location on the press and will permit easy and positive lubrication of all the necessary points on the cushion units. In addition to the copper tubing, all other fittings required for making the complete installation are furnished. This principle can be applied equally to both low and high pressure installations.

After centralized lubrication system has been installed, fill the lines with grease until it emerges from between the piston and cylinder walls. Check again after 8 hours operation to see how many shots are necessary to again cause grease to emerge. Thereafter lubricate this amount every 8 hours of operation.

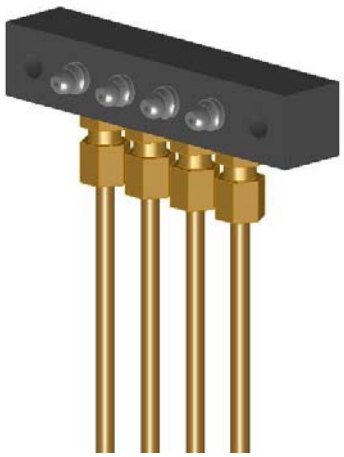


Fig. 37 Header Block with Grease Lines Connected to it.

Header Block Part List

	DESCRIPTION	PART NUMBER
A	Header Block	Refer to table below
B	Grease Fitting	625
C	Male Connector	2853
D	Compression Sleeve	867
E	Nut	6407
F	Copper Tubing	629

Number of Header Block Stages	Part Number
2 Stages	6985
4 Stages	703
8 Stages	637

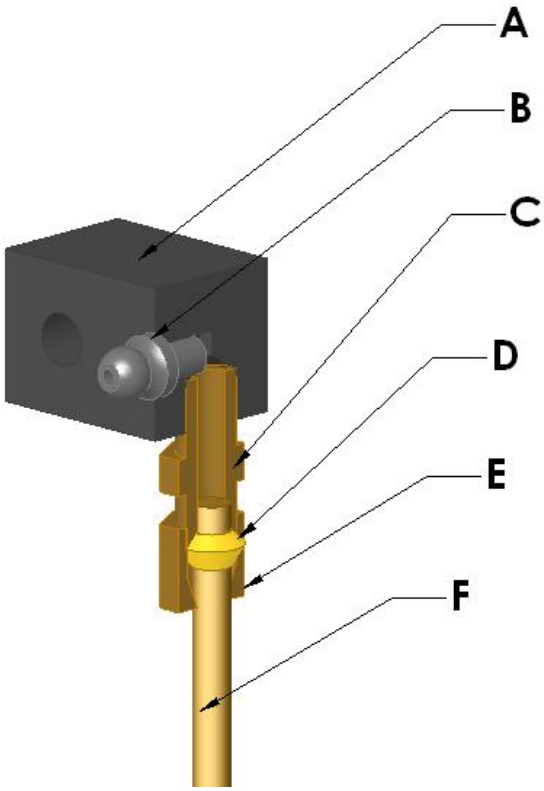


Fig. 38 Section view through the header

Grease Fittings Part List for Low Pressure Cushions

	DESCRIPTION	PART NUMBER
A	Compression Sleeve	867
B	Compression Union	869
C	Nut	6407
D	Compression Sleeve	867
E	Copper Tubing	629

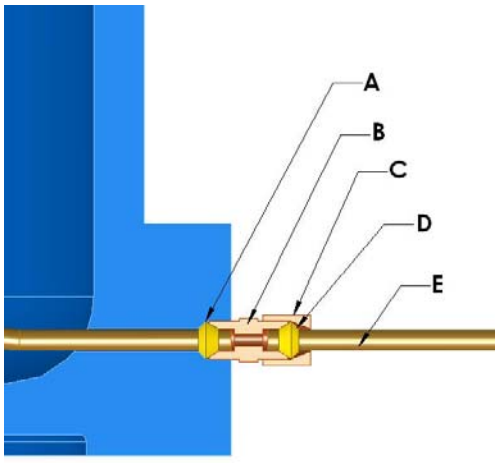


Fig. 39 Centralized lubrication fittings on the low pressure die cushion.

Grease Fittings Part List for High Pressure Cushions

	DESCRIPTION	PART NUMBER
A	Copper Tubing	629
B	Nut	6407
C	Compression Sleeve	867
D	Male Connector	2853

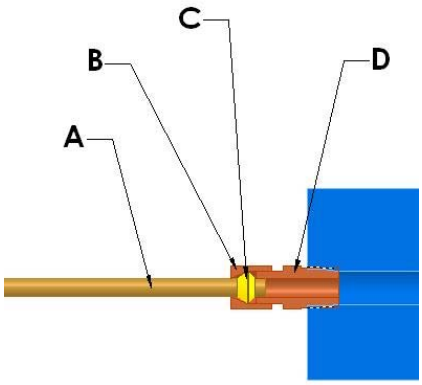


Fig. 40 Centralized lubrication fittings on the high pressure die cushion.

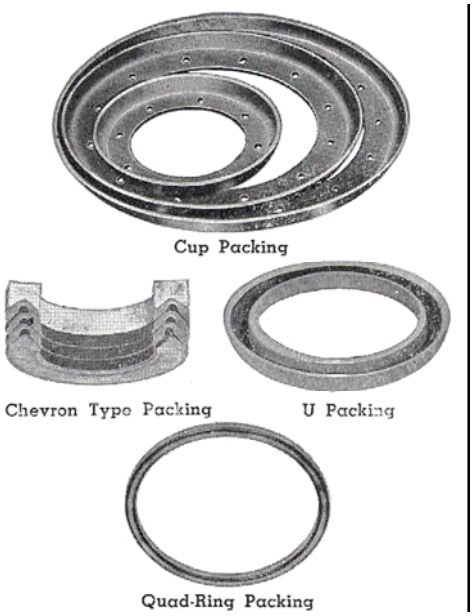
Repair Parts

If it becomes necessary to order repair parts for the lubrication system on a pneumatic die cushion, please specify the quantity of items required, and the part number as shown in the part list tables above.

Pneumatic Packings

Dayton Die Cushions Packings are of first quality material, thus assuring long wear and dependability under strenuous conditions. When ordering packings, please give model, size and serial number of cushion as well as part number of the packing.

There has been a **change in the type of packing** used on several models. Serial number higher than the one listed below for particular cushion model use quad packing instead of cup packing. Please refer to the tables below to check what type of packing your cushion uses.



Model C Piston Packings				
	Piston Diameter	**Cup Packing Part Number**	**Quad Ring Part Number**	**Cushion Serial Number ***
C-6	6”	495	8312	19762
C-8	8”	169	8335	19603
C-10	10”	490	8700	19570
C-12	12”	492	10109	19238
C-14	14”	179	9878	19187
C-16	16”	168	10110	19230
C-18	18”	650	10687	19646
C-20	20”	970	10688	19609
C-22	22”	1104	15393	19642
C-24	24”	798	15394	19384

* Quad Ring Packings used after this Serial Number.

Model D Piston Packings				
	Piston Diameter	**Cup Packing Part Number**	**Quad Ring Part Number**	**Cushion Serial Number ***
D-5	5”	646	10013	19035
D-6	6”	495	8312	18985
D-8	8”	169	8335	19105
D-10	10”	490	8700	19185
D-12	12”	492	10109	19532
D-14	14”	179	9878	20264
D-16	16”	168	10110	19232

* Quad Ring Packings used after this Serial Number.

Model D Rod Packings				
	Rod Diameter	**Chevron Type Packing Part Number**	**Quad Ring Part Number**	**Cushion Serial Number ***
D-5	1 ¼” Quad, 1 ½ “ Chevron	702	10013	19035
D-6	1 ¼”	811	8312	18985
D-8	1 ½”	702	8335	19105
D-10	1 ½”	702	8700	19185
D-12	2”	684	10109	19532
D-14	2”	684	9878	20264
D-16	2”	684	10110	19232

* Quad Ring Packings used after this Serial Number.

Model HC Piston Packings				
	Piston Diameter	**Cup Packing Part Number**	**Quad Ring Part Number**	**Cushion Serial Number ***
HC-8	8”	169	8335	24997
HC-10	10”	490	8700	19626
HC-12	12”	492	10109	20115
HC-14	14”	179	9878	19343
HC-16	16”	168	10110	19253
HC-18	18”	650	10687	20056
HC-20	20”	970	10688	20009
HC-22	22”	1104	10689	19639
HC-24	24”	798	10690	19743
HC-30	30”	8650	10761	19974
HC-40	40”		10699	19600

* Quad Ring Packings used after this Serial Number.

Model HD Piston Packings				
	Piston Diameter	Cup Packing Part Number	Quad Ring Part Number	Cushion Serial Number *
HD-8	8”	169	8335	22375
HD-10	10”	490	8700	20000
HD-12	12”	492	10109	
HD-14	14”	179	9878	18873
HD-16	16”	168	10110	19799

* Quad Ring Packings used after this Serial Number.

Model HD Rod Packings				
	Rod Diameter	Chevron Type Packing Part Number	Quad Ring Part Number	Cushion Serial Number *
HD-8	2”	684	8311	22375
HD-10	2”	684	8311	20000
HD-12	3”	6510	9893	
HD-14	3”	6510	9893	18873
HD-16	3” Quad 3 1/2" Chev.	7310	9893	19799

* Quad Ring Packings used after this Serial Number.

Model L Piston Packings				
	Piston Diameter	Cup Packing Part Number	Quad Ring Part Number	Cushion Serial Number *
L-5	5”	646	-	-
L-6	6”	495	-	-
L-8	8”	169	-	-
L-10	10”	490	8700	19476
L-12	12”	492	10109	21615

* Quad Ring Packings used after this Serial Number.

Model L Rod Packings				
	Rod Diameter	U-Packing Part Number	Quad Ring Part Number	Cushion Serial Number *
L-5	1 ½”	6187	9324	19680
L-6	1 ½”	6187	9324	19506
L-8	1 ½”	6187	9324	19400
L-10	1 ½”	6187	9324	19476
L-12	2”	6746	8311	21615

* Quad Ring Packings used after this Serial Number.

Model L Rod Packings				
	Piston Diameter	**U-Packing Part Number**	**Quad Ring Part Number**	**Cushion Serial Number ***
R-3	3”	5987	9653	18586
R-4	4”	5975	7955	18877
R-5	5”	5985	10013	18747
R-6	6”	495	8312	18798

* Quad Ring Packings used after this Serial Number.

Model L Rod Packings				
	Rod Diameter	**U-Packing Part Number**	**Quad Ring Part Number**	**Cushion Serial Number ***
R-3	1”	6121	9141	18586
R-4	1 ¼”	6122	7954	18877
R-5	1 ½”	6123	9324	18747
R-6	2”	6759	8311	18798

* Quad Ring Packings used after this Serial Number.

Installation Instructions

Cup Packings

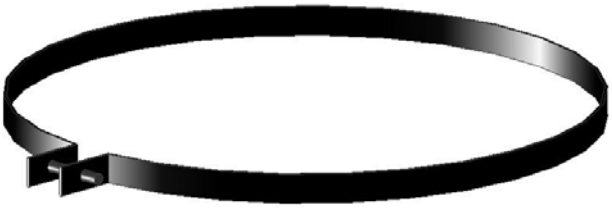


Fig. 41 Clamping band

PRECAUTION: When installing a cup packing, be careful not to damage or turn back the lip. This can be avoided by making a clamping band as shown in Fig. 41 from 16-gauge band iron, 1/2" to 1/8" wide. The ends of this band iron with two holes pierced to receive an ordinary stove bolt should be bent so that the circumference is a little less from bend to bend than the circumference of the piston of the pneumatic die cushion unit on which it is to be use.

	Description
A	Cushion Cylinder
B	Cup Packing
C	Clamping Band
D	1/4" Lockwasher (Part No. 438)
E	Cup Packing Ring
F	1/4"-20 x 3/4" Allen Cap Screw (Part No. 441)
G	Cushion Piston

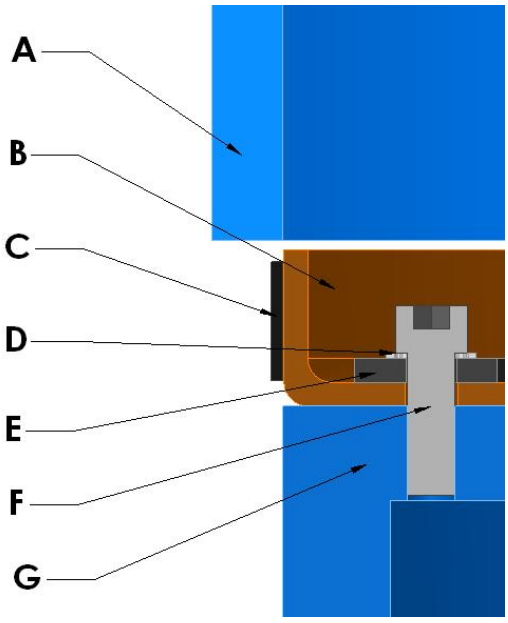


Fig. 42 Cup Packing Installation

Installation Instructions

Quad Packings

When installing quad packings it is advisable to grease the packing and groove thoroughly before cylinder is installed. Cylinder should be eased over packing to prevent shearing or gouging during installation.

CAUTION: It is advisable to check the 3/16" metal greasing tubes while the cushion unit is disassembled, because severe vibration may cause them to fracture at times. The lubrication instructions given on Page 53 will explain the procedure to follow in checking the lubrication system.

	Description
A	Cushion Cylinder
B	Quad Packing
C	Lubrication Tubing
D	Cushion Piston

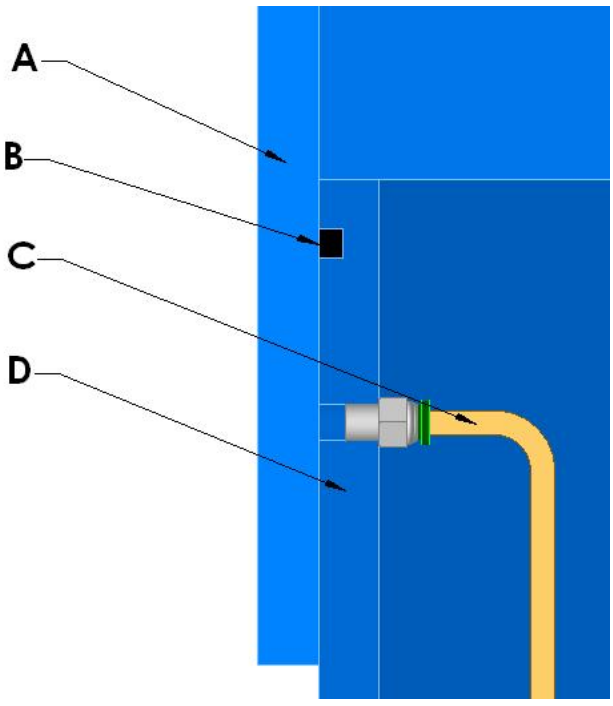


Fig. 43 Quad Ring Installation

Installation Instructions

Pneumatic Booster Pump

The booster pump is used with Dayton high pressure die cushions (models HC, HD and HMC). A piston rod is incorporated in the driving end. Two limit valves are mounted on the driving end head and a piston rod guide and limit valve actuators are attached to the piston rod. The limit valves control a 3 way control valve which in turn controls the booster. When the system is “powered up” the booster strokes, raising the fluid pressure in the output end. When it fully strokes, a limit valve is actuated, reversing the booster, resetting it. When it is fully reset, the other limit valve is actuated shifting the control valve for another power stroke. This cycle continues until the output pressure reaches the desired level. The booster then stalls out and holds that pressure until some of the air is used. The booster then resumes cycling until output air again reaches the desired pressure and the booster stalls out. This cycling will continue as long as the system is “powered up.”

During the stall mode there is no energy used, making the air powered booster an extremely efficient and quiet method of maintaining that high pressure. A hydraulic power unit, for instance, requires continuous energy input.

The input pressure is defined by the regulator mounted on the booster pump. The booster pump has 2.8 power factor. This means that if the input pressure is 70 psi, the maximum output pressure will be 200 psi (2.8 multiplied by 70 psi). However, the more effective way to achieve 200 psi system pressure is to use full input pressure (100 psi). After the desired system pressure (for example 200 psi) is achieved, the input pressure has to be backed off to the value that allows maintaining the required system pressure (in above mentioned example – 70 psi, which is equal to 200 psi divided by 2.8). This way shortens pump up time. In the table below, the input pressure values and corresponding average system pressures are presented.

CAUTION! The maximum system pressure for models HC, HD and HMC die cushions is 200 psi! Do not exceed this value. There is the risk of accident, damage or death!

Input pressure (regulator reading)	Resulting maximum system pressure
10 psi	30 psi
20 psi	55 psi
30 psi	85 psi
40 psi	110 psi
50 psi	140 psi
60 psi	170 psi
70 psi	200 psi

The pump can be mounted horizontally or vertically to the press frame or any other convenient place by bolting through four holes provided in the mounting structure. Select space large enough to accommodate pump as dimensioned in Fig. 44. If the pump is mounted on an uneven or curved surface, care should be taken not to bend pump. Booster pump should be connected to shop air line with standard pipe fittings (1/4” NPT) and to the cushion using high pressure hoses through the cross as shown in Fig. 49.

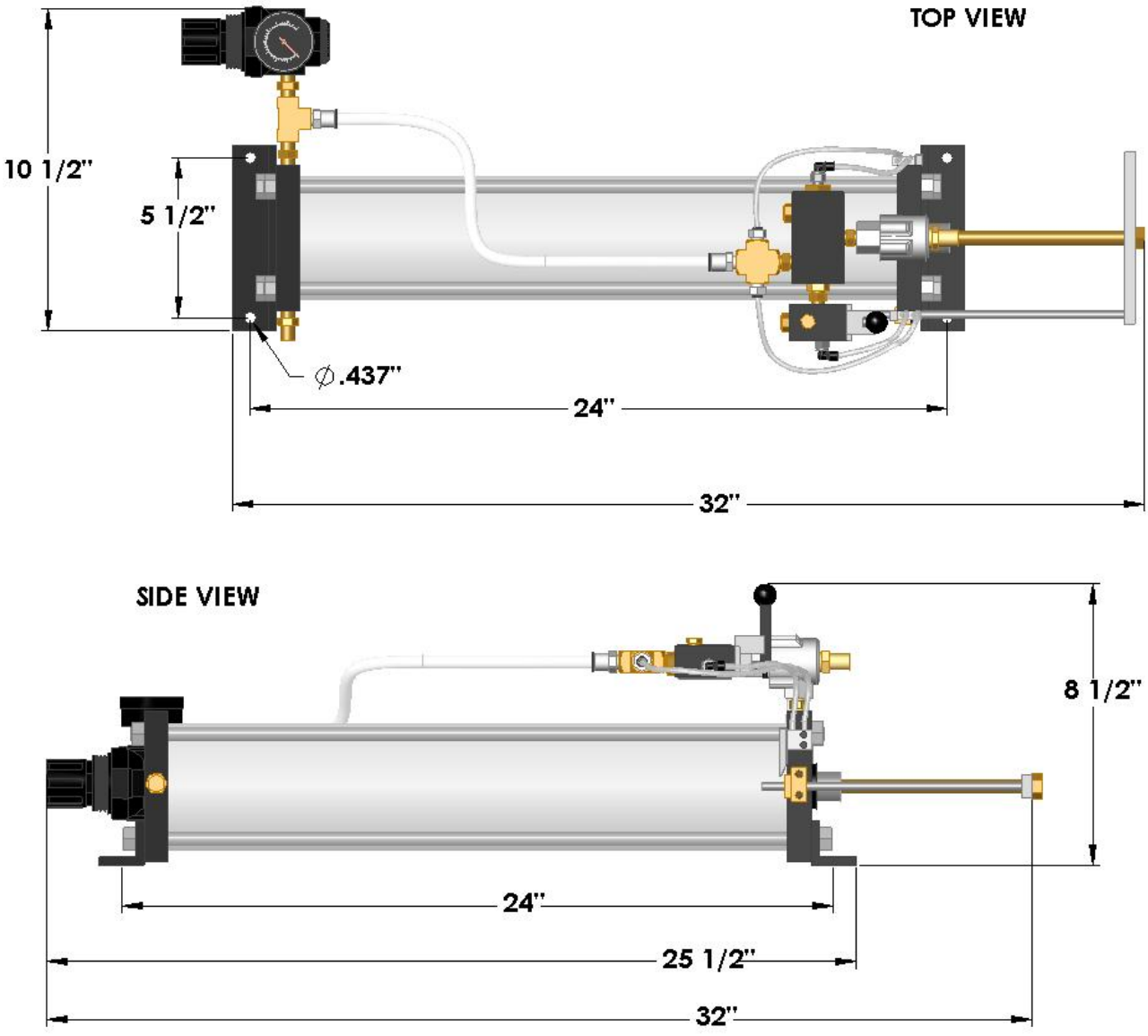


Fig. 44 Booster pump dimensions

Booster Pump Parts List

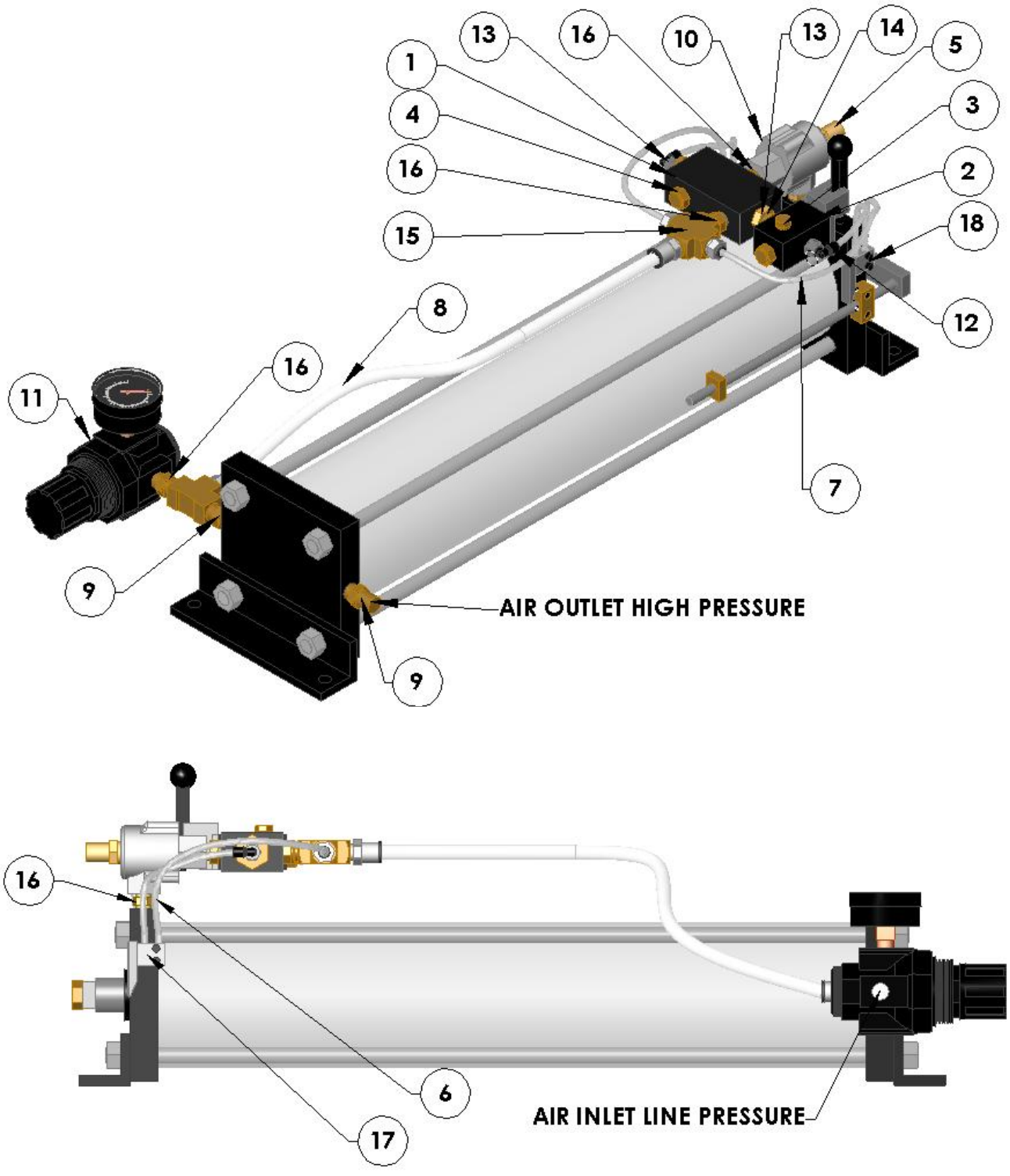
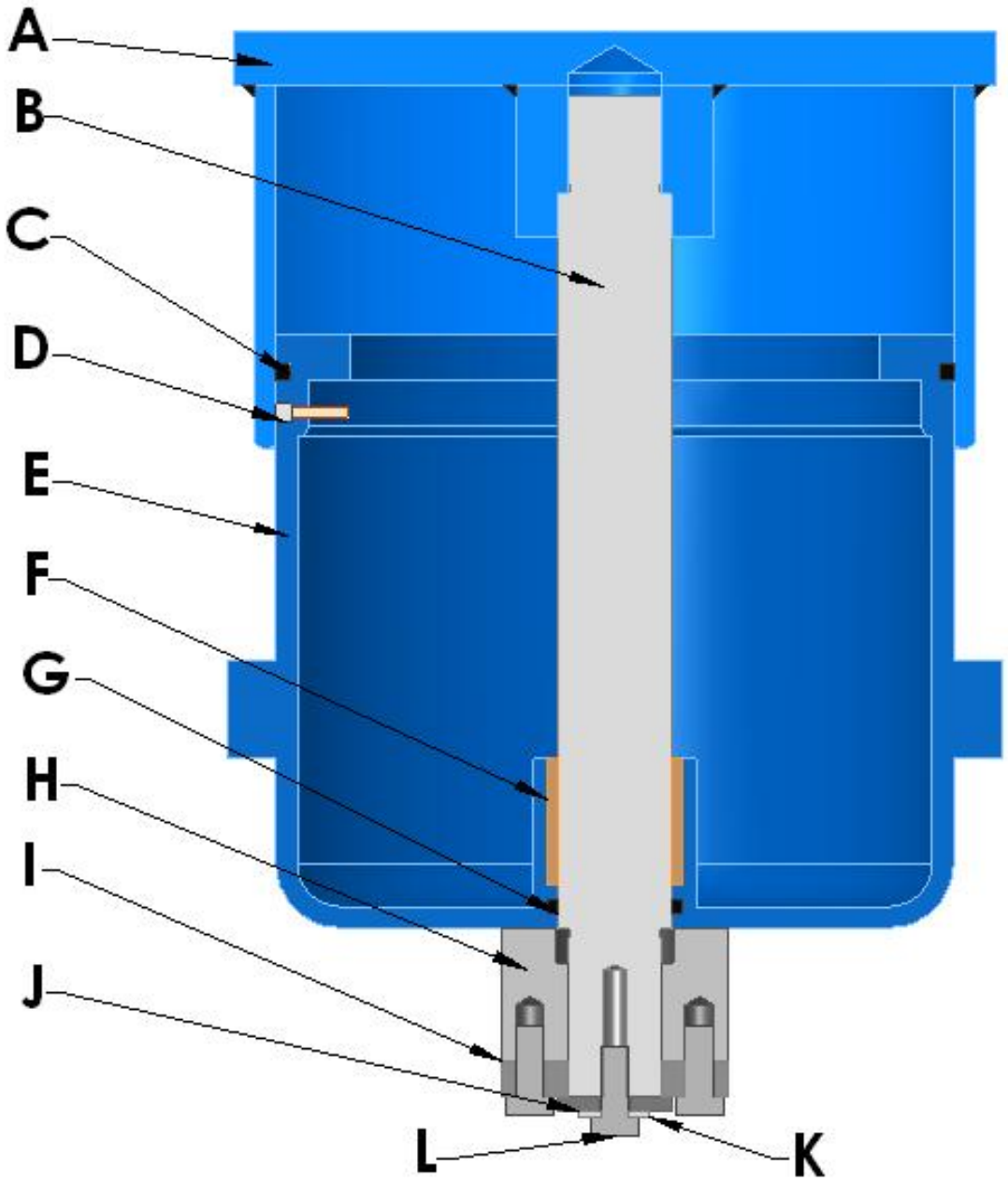


Fig. 45 Booster Pump (14799) part list

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	14DP-3	Fabco Valve
2	1	18HL-3	Valve
3	1	20311-1	Breather Vent F18
4	1	20311-2	Breather Vent F28
5	1	20311-3	Muffler P38
6	2	3109-04-11	Tube 5/32 X 1/8 NPT
7	2	3175-04-14	Tube 5/32 X 1/4 NPT
8	2	3175-60-14	Tube 3/8 X 1/4 NPT
9	2	CMMQ20B	Check Valve
10	1	EV250	Exhaust Valve
11	1	R27221-600	Regulator
12	4	1016	Fitting
13	2	106-0024	Brass Fitting
14	1	106-0051	Brass Fitting
15	1	106-0186	Brass Fitting
16	4	106-0189	Brass Fitting
17	1	MSV-2	Directional Control Valve
18	1	MSV-2	Directional Control Valve
19	1	BA/BP4-4SK	Packing Kit

Model D Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



Model D Parts List

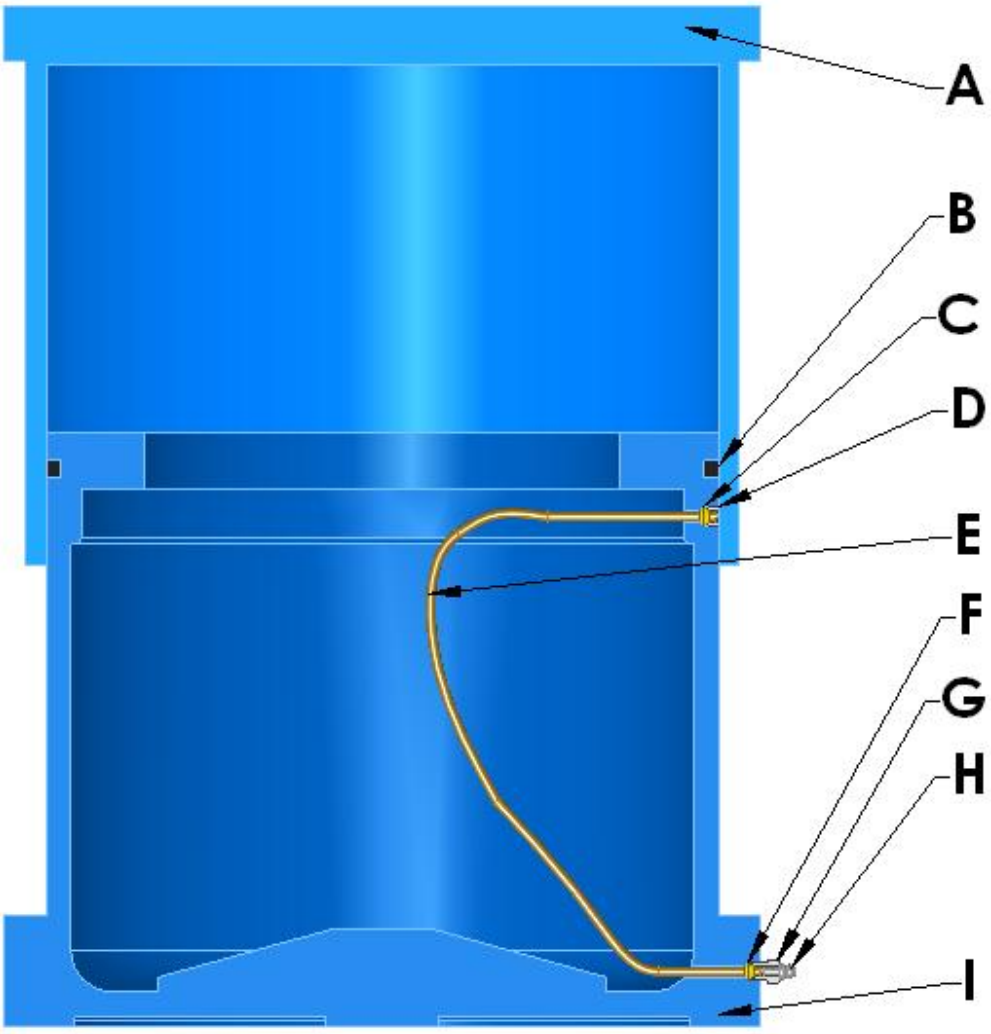
Description		Cushion Diameter and Part Number						
		5”	6”	8”	10”	12”	14”	16”
Cushion Cylinder [a]	A	10114	10148	10150	10136	10152	10166	10169
Cylinder Rod	B	10113	12153	10151	10137	10153	10167	10170
Quad Ring	C	10013	8312	8335	8700	10109	9878	10110
Lubrication Set [b]	D	1134	1134	1134	1134	1134	1134	1134
Piston [a]	E	10112	12146	694	707	5288	756	892
Bearing	F	813	813	698	698	668	668	668
Quad Ring	G	7954	7954	9324	9324	8311	8311	8311
Adjustment Nut	H	6404	6404	6405	6405	7006	7006	7006
Lock Plate	I	7217	7217	7218	7218	7008	7008	7008
Limit Plate	J	6400	6400	7534	7534	6402	6402	6402
Lockwasher	K	7234	7234	7234	7234	7235	7235	7235
Hex. Hd. Cap Screw	L	3584	3584	3584	3584	6394	6394	6394

(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

(b) See detailed sketch on Page. 21.

Model C Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



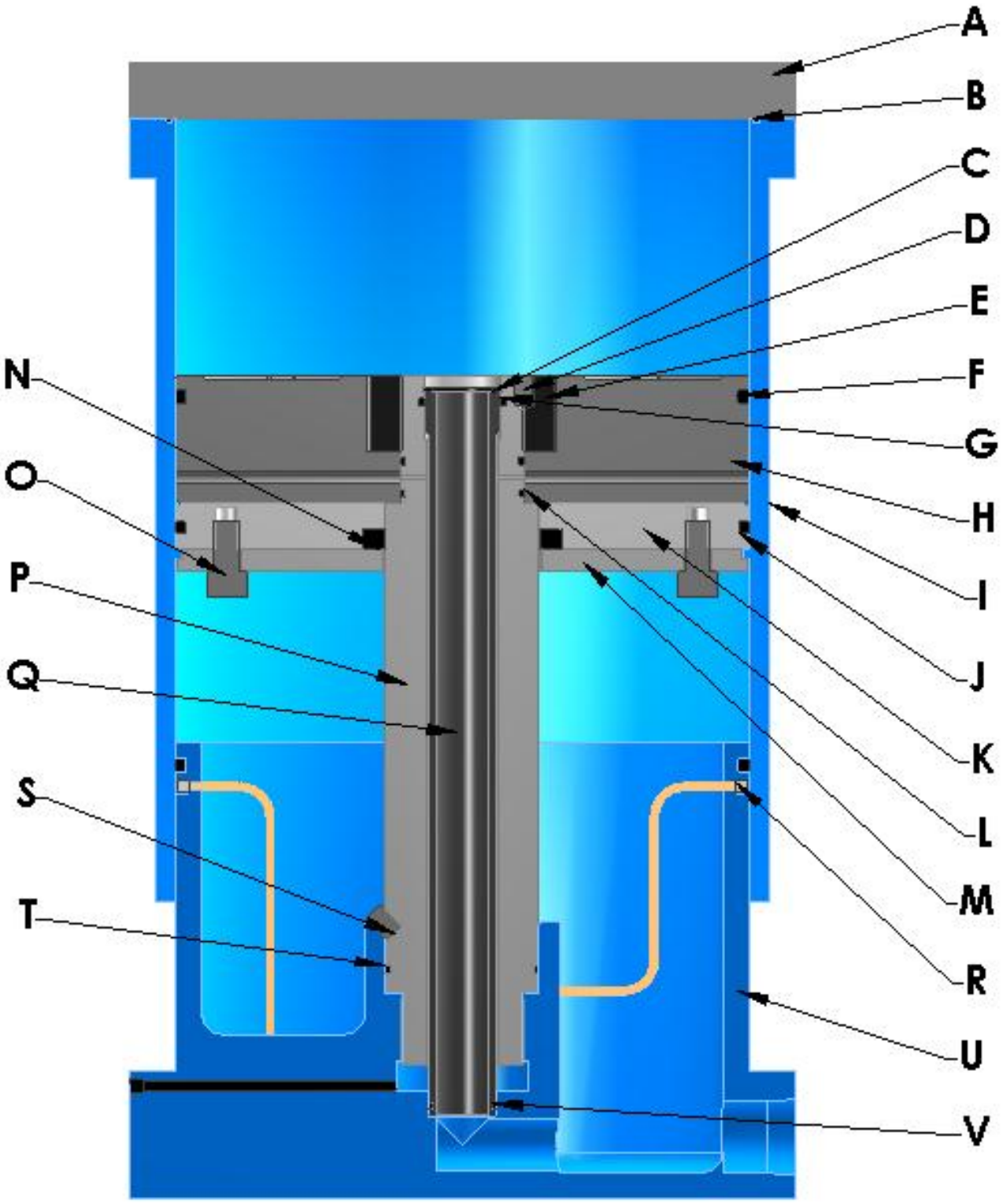
Model C Parts List

Description		Cushion Diameter and Part Number				
		6”	8”	10”	12”	14”
Cushion Cylinder [(a)]	A	7429	4231	4170	4141	4142
Quad Ring	B	8312	8335	8700	10109	9878
Compression Sleeve	C	867	867	867	867	867
Grease Screw	D	868	868	868	868	868
Copper Tubing	E	629	629	629	629	629
Compression Sleeve	F	867	867	867	867	867
Compression Fitting	G	870	870	870	870	870
Grease Fitting	H	625	625	625	625	625
Cushion Piston [(a)]	I	222	318	306	311	309
Description		**Cushion Diameter and Part Number**				
		16”	**18”**	**20”**	**22”**	**24”**
Cushion Cylinder [(a)]	A	4143	5681	5682	4146	5683
Quad Ring	B	10110	10687	10688	15393	15394
Compression Sleeve	C	867	867	867	867	867
Grease Screw	D	868	868	868	868	868
Copper Tubing	E	629	629	629	629	629
Compression Sleeve	F	867	867	867	867	867
Compression Fitting	G	870	870	870	870	870
Grease Fitting	H	625	625	625	625	625
Cushion Piston [(a)]	I	556	649	969	1103	797

(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

Model MC Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



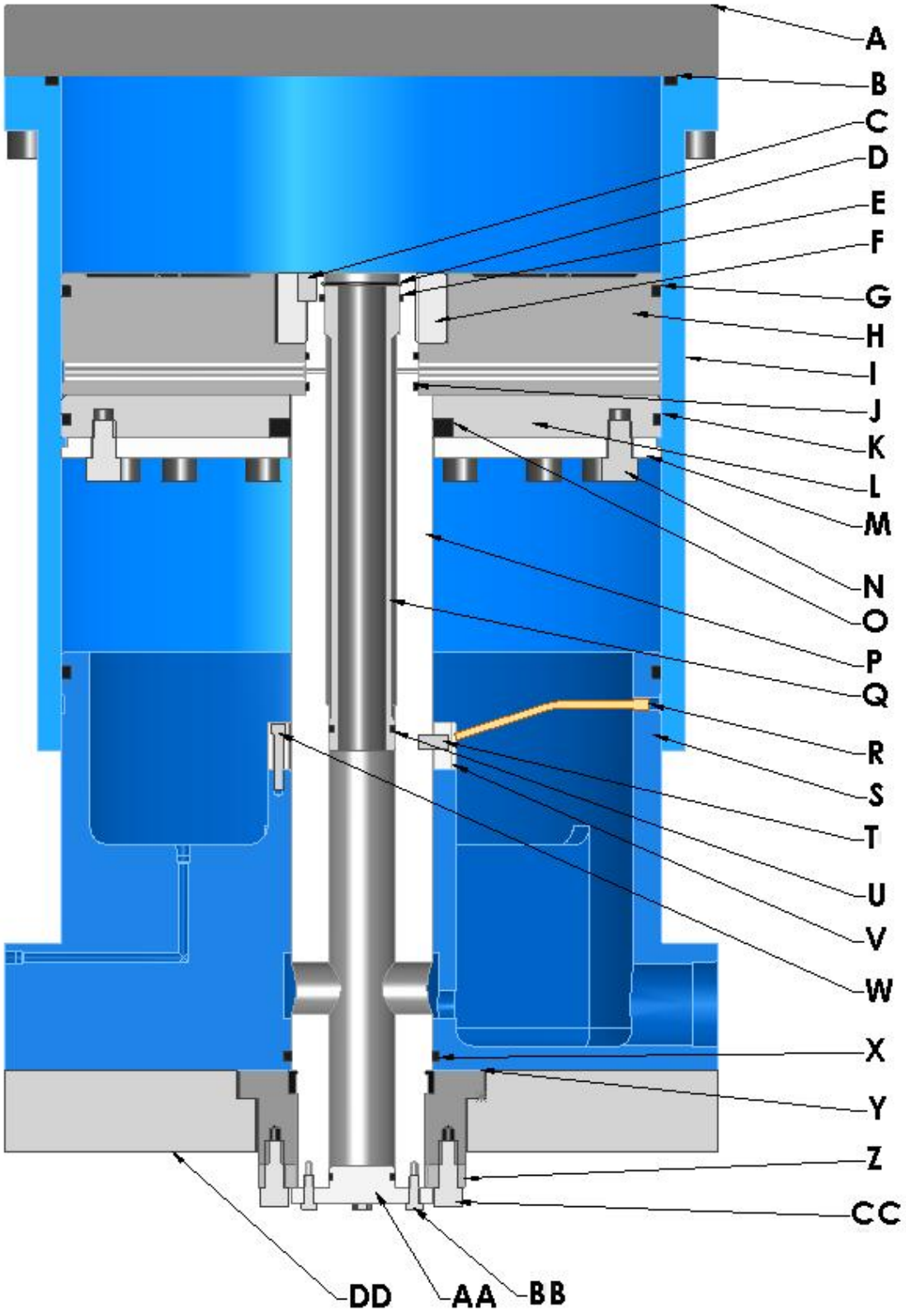
Model MC Parts List

Description		Cylinder Diameter and Part Number								
		8”	10”	12”	14”	16”	18”	20”	22”	24”
PBM Pin Pad	A	418	418	418	418	418				
BPM Pin Pad		8982	7550	8788	8797	8969				
"O" Ring	B	8987	10737	7884	8972	10110				
Retaining Ring	C	6074	6074	6074	10873	10873	10873			
Soc. Hd. Set Screw	D	6223	6223	6223	3018	3018	3018	3018	3018	3018
Piston Nut	E				10785	10785	10785	11734	11734	11734
Quad Ring	F	8335	8700	10109	9878	10110	10687	10688	10689	10690
"O" Ring	G	10412	10412	10412	6490	6490	6490			
Upper Piston	H	8983	7685	8789	8793	8970	11617	11739	11723	11754
Cylinder Weldment	I	8981	7549	7687	8798	8968				
"O" Ring	J	6153	6157	6158	10086	6159				
Cylinder Seperator Plate	K	8984	7748	8790	8795	8971				
"O" Ring	L	6161	6161	6161	6162	6162	6162	6068	6068	6068
Lock Plate	M	8985	7686	8791	8796	8974	11618	11735	11735	11735
"U" Packing	N	7882	7882	7882	8973	8973	8973	11737	11737	11737
Soc. Hd. Cap Screw	O	7879	11455	11455	11456	11456	11455	11455	6394	6394
Piston Rod	P	7511	7511	7511	8794	8978	11620	11728	11728	11728
Lubrication Tube	Q	7677	7677	7677	8799	8799	11619			
Lubrication Set	R	1134	1134	1134	1134	1134	1134	1134	1134	1134
Soc. Hd. Set Screw	S	2002	2002	2002	6223	6223	7498			
"O" Ring	T	6161	6161	6161	7419	7419	7419	3639	3639	3639
Lower Piston	U	8986	7304	7693	8792	8977	11611	11738	11729	11750
"O" Ring	V	8892	8892	8892	9345	9345	9345			

(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

Model MD Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



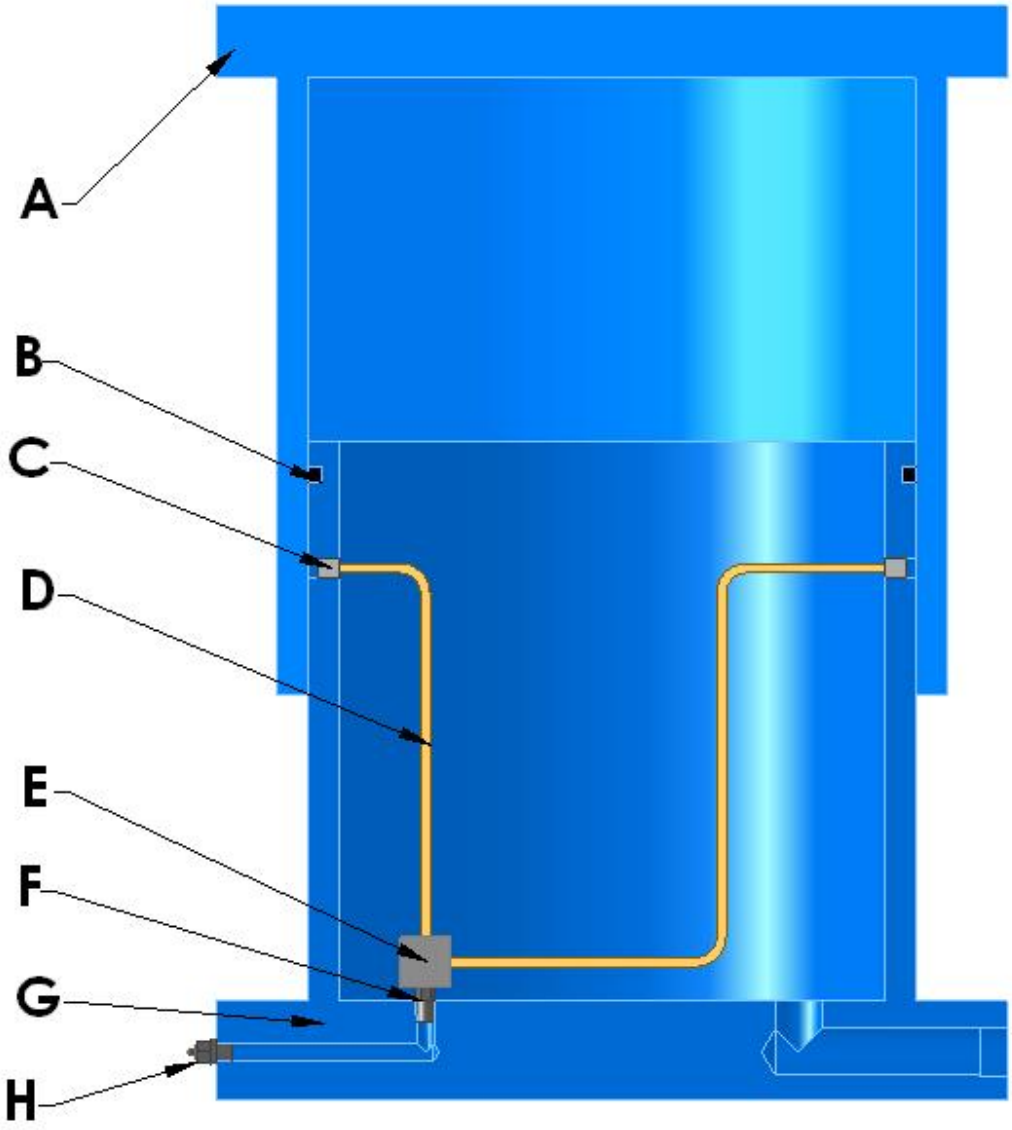
Model MD Parts List

Description		Cylinder Diameter and Part Number				
		8”	10”	12”	14”	16”
PBM Pin Pad	A	418	418	418	418	418
BPM Pin Pad		8982	7550	8788	8797	8969
"O" Ring	B	8987	10737	7884	8972	10110
Soc. Hd. Set Screw	C	3889	2889	2889	3018	3018
Retaining Ring	D	3473	3473	3473	10873	10873
"O" Ring	E	10412	10412	10412	6490	6490
Piston Nut	F	-	-	-	10875	10785
Quad Ring	G	8335	8700	10109	9878	10110
Upper Piston [(a)]	H	8983	7685	8789	8793	8970
Cylinder Weldment [(a)]	I	8981	7549	7687	8798	8968
"O" Ring	J	6161	6161	6161	6162	6162
"O" Ring	K	6156	6157	6158	10086	6159
Cylinder Separator Plate	L	8984	7748	8790	8795	8971
Lock Plate	M	8985	7686	8791	8796	8974
Soc. Hd. Cap Screw	N	7879	11455	11455	11456	11456
"U" Packing	O	7882	7882	7882	8973	8973
Piston Rod	P	12427	12357	12357	12415	12446
Lubrication Tube	Q	12366	12366	12416	12416	12445
Lubrication Set	R	1134	1134	1134	1134	1134
Lower Piston [(a)]	S	12405	12384	12361	12414	12448
Dowel, Ant. Rotation	T	12576	12576	12576	12576	12576
"O" Ring	U	2723	2723	2723	6146	6146
Anti-Rotation Collar	V	12912	12362	12362	12417	12417
Soc. Hd. Cap Screw	W	3058	3058	3058	3058	3058
Quad Ring	X	8698	8698	8698	12027	12027
Adjustment Nut	Y	12365	12365	12365	12418	12418
Lock Plate	Z	12364	12364	12364	12419	12419
Plug	AA	12911	12911	12911	12911	12911
Soc. Hd. Cap Screw	BB	3391	3391	3391	3391	3391
Soc. Hd. Cap Screw	CC	1291	1291	1291	1291	1291
Support Plate	DD	12473	12386	12367	12420	12447

(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

Model HC Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



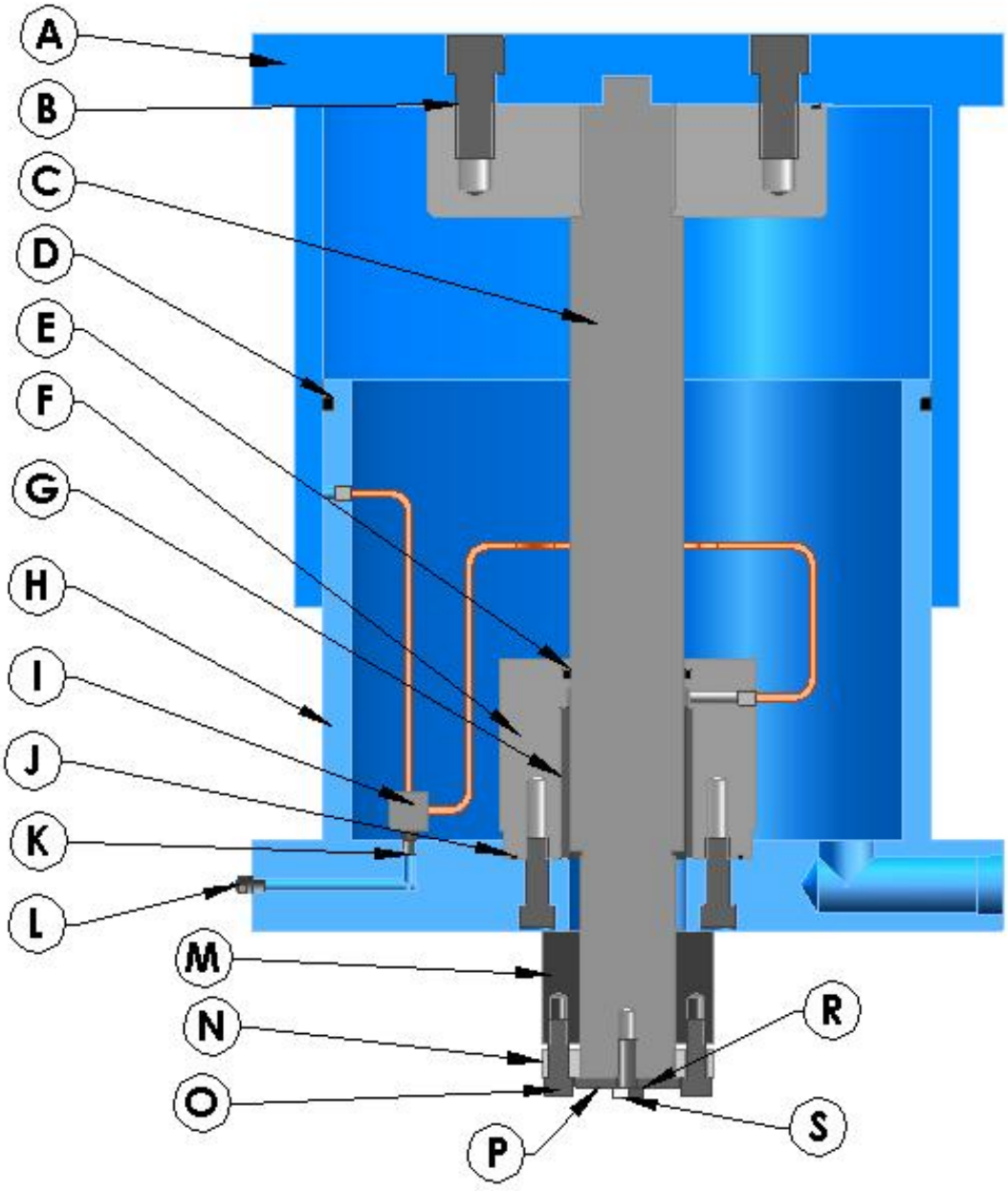
Model HC Parts List

Description		Cushion Diameter and Part Number								
		8”	10”	12”	14”	16”	18”	20”	22”	24”
Cushion Cylinder [a]	A	6629	6671	6622	6595	6323	6281	6509	6506	6289
Quad Ring	B	8335	8700	10109	9878	10110	10687	10688	10689	10690
Grease Fitting	C	15392	15392	15392	15392	15392	15392	15392	15392	15392
Flex. Hose	D	10140	10140	10140	10140	10140	10140	10140	10140	10140
Pipe Tee	-	10965	10965	10965	-	-	-	-	-	-
Lub. Distributor	E	-	-	-	6620	6620	6620	6620	6620	6620
Hex Nipple	F	14498	14498	14498	14498	14498	14498	14498	14498	14498
Cushion Piston [a]	G	6630	6672	6623	6596	6324	6282	6581	6507	6290
Lubrication Fitting	H	210	210	210	210	210	210	210	210	210

(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

Model HD Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

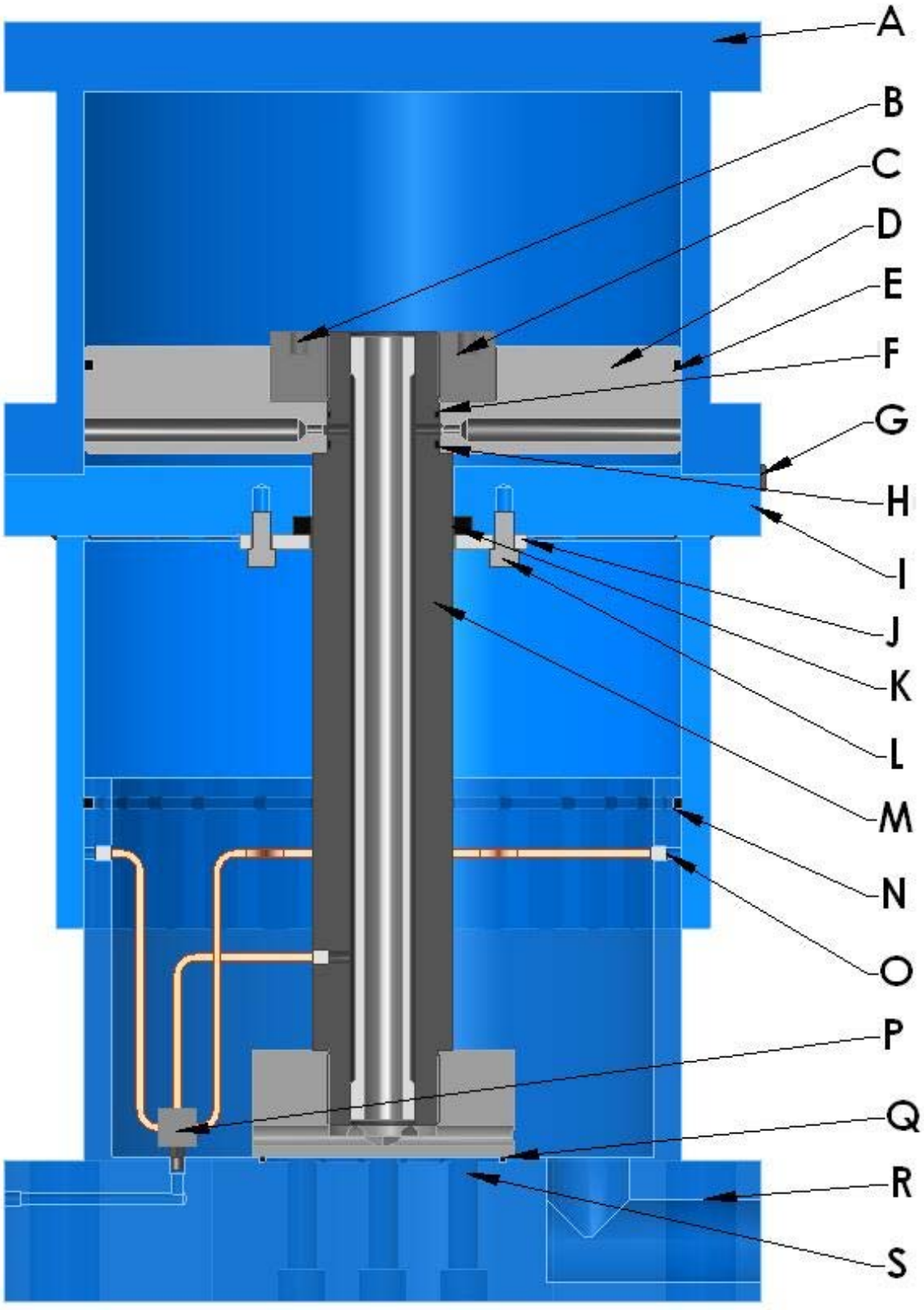


Model HD Parts List

Description		Cushion Diameter and Part Number				
		8”	10”	12”	14”	16”
Cylinder [a]	A	8542	8598	8619	8442	8625
Soc. Hd. Cap Screw	B	7932	2615	3324	1489	1463
Cylinder Rod	C	7146	7206	6895	6895	7164
Quad Ring	D	8335	8700	10109	9878	10110
Quad Ring	E	8311	8311	9893	9893	9893
Bearing Block	F	8602	8602	8446	8446	8446
Bushing	G	946	946	6955	6955	6955
Piston [a]	H	8545	8601	8622	8445	8628
Lubrication Distributor	I	6620	6620	6620	6620	6620
"O" Ring	J	6068	6068	3640	3640	3640
Hex Nipple	K	14498	14498	14498	14498	14498
Lubrication Fitting	L	210	210	210	210	210
Adj. Nut	M	7007	7007	6897	6897	6897
Lock Plate	N	7008	7008	6898	6898	6898
Soc. Hd. Cap Screw	O	774	774	7349	7349	7349
Limit Plate	P	6402	6402	6953	6953	6953
Lock washer	R	7235	7235	7235	7235	7235
Hex. Hd. Cap Screw	S	6394	6394	6394	6394	6394

(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

Model HMC Parts List



Model HMC Parts List

Description		Cylinder Diameter and Part Number								
		8”	10”	12”	14”	16”	18”	20”	22”	24”
Upper Cylinder	A	12802	12428	12487	12516	12399	12886	12890	12894	12898
Soc. Hd. Set Screw	B	1307	1307	1307	1463	1463	1463	1463	1463	1463
Piston Nut	C	-	-	-	12388	12388	13066	13066	13070	13070
Upper Piston	D	12801	12429	12489	12521	13060	11737	12890	13069	13075
Quadring	E	8335	8700	10109	9878	10110	10687	10688	10689	10690
“O” Ring	F	6161	6161	6161	6162	6162	6068	6068	11256	11256
Vent Cover	G	10384	10384	10384	10384	10384	10384	10384	10384	10384
“O” Ring	H	6161	6161	6161	6162	6162	6068	6068	11256	11256
Cylinder Weldment	I	12803	12430	12488	12518	12397	12887	12891	12895	12899
Lock Plate	J	13052	13052	13052	12401	12401	11735	11735	13071	13071
Soc. Hd. Cap Screw	K	7879	7879	7879	10951	10951	7886	7886	7886	7886
“U” Packing	L	7882	7882	7882	8973	8973	11737	11737	13068	13068
Piston Rod Assy.	M	12805	12805	12805	12387	12387	13064	13064	13073	13073
Quadring	N	8335	8700	10109	9878	10110	10687	10688	10689	10690
Grease Hose	O	10140	10140	10140	10140	10140	10140	10140	10140	10140
Lubr. Distr. Block	P	-	-	-	6620	6620	6620	6620	6620	6620
“O” Ring	Q	6068	6068	6068	12016	12016	11676	11676	13546	13546
Lower Piston	R	12804	12433	12485	12514	12389	12888	12892	12896	12990
Soc. Hd. Cap Screw	S	6656	6656	6656	8607	8607	1276	1276	8204	8204

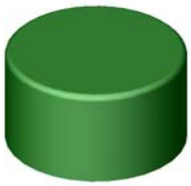
(a) When ordering cylinders and cushion pistons, order according to cushion model and serial number (Serial Number is located at the front, lower flange of the cushion unit)

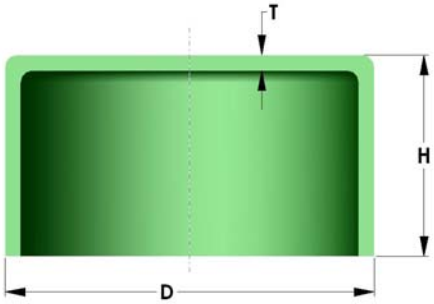
Tonnage and Ring Holding Force Necessary for Drawing Shells*

A. Tonnage for Drawing Shells

In general, the tonnage necessary to draw a shell of round or rectangular shape is a function of the area of metal in the wall (i.e. = mean perimeter and metal thickness). This is true because at any given time, the force necessary to deform the metal equals the area of metal being deformed multiplied by the yield strength of the material. (In calculating these forces tensile strength is used, since this will either draw the part, push out the bottom or tear the walls). This is generally true for parts having odd shapes, although there are other factors involved which complicate the operation.

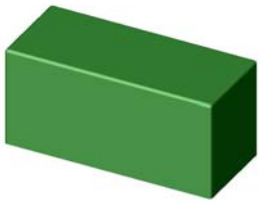
1. ROUND SHELLS

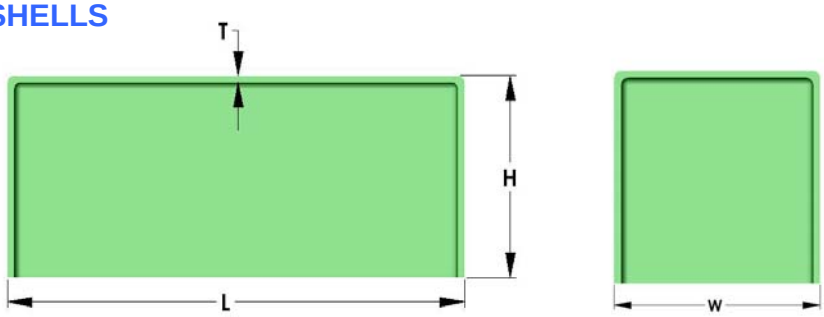




$$TONNAGE = \frac{\pi \cdot D \cdot T \cdot TENSILE\ STRENGTH}{2000}$$

2. RECTANGULAR SHELLS





$$TONNAGE = \frac{2(L+W) \cdot T \cdot TENSILE\ STRENGTH}{2000}$$

*This information is general and should be treated as such. Specific forces must be determined for each job.

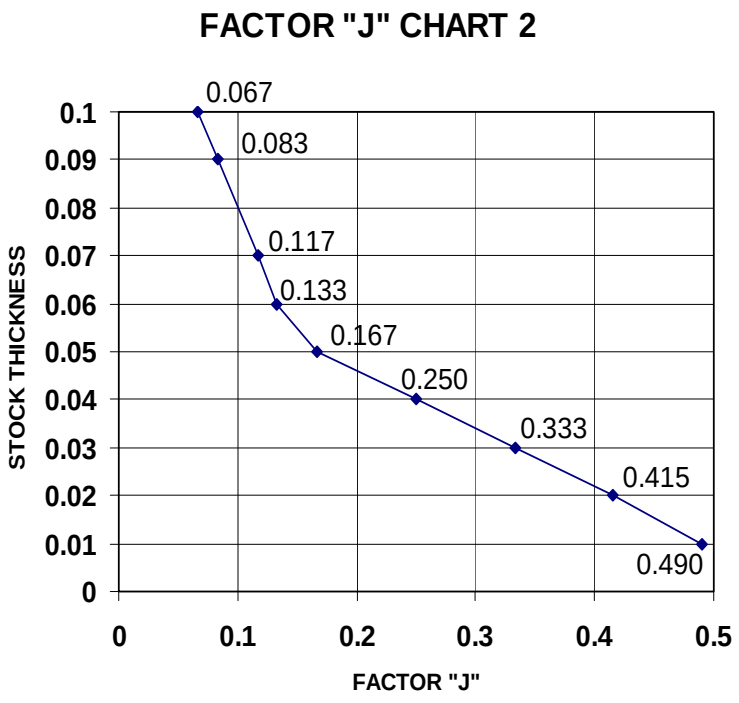
Mechanical punch presses are designed to deliver their maximum tonnage near the bottom of the stroke. Since drawing work actually starts before bottom, the full tonnage will not be available. The above results, therefore, should be multiplied by .G. factor (Chart 1) when this type press is used.

H	"G"	H	"G"	H	"G"	H	"G"
1/2	1	3	1.75	10	3	18	4.0
1	1	4	2	12	3.25	20	4.25
1 1/2	1.5	6	2.5	14	3.5	22	4.5
2	1.5	8	2.75	16	3.75	24	4.75

FACTOR "G" CHART 1

B. Ring Holding Pressure or Force

The primary function of the draw ring is to hold the blank while it is being formed to prevent wrinkles. Since the resistance to wrinkling becomes greater as the metal thickness increases, the necessary R.H.F. decreases. Experience indicates that a close approximation to the R.H.P. can be obtained by multiplying the tonnage required to draw the shell by "J" factor (Chart 2). **Note: Disregard "G" factor for this calculation.**



C. Press Tonnage

Size of press necessary to draw shell in question is as follows:

MINIMUM PRESS TONNAGE = SHELL TONNAGE PLUS CUSHION TONNAGE (R.H.P.)

D. Example

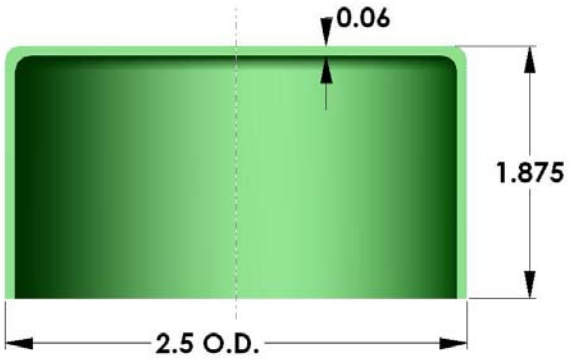
Determine the size of mechanical press required to draw the shell pictured.

$$\textit{DRAW TONNAGE} = \frac{\pi \cdot (2.50 - 0.06) \cdot 0.06 \cdot 55{,}000}{2000} = 12.7\ T \cdot 1.5\ (\text{"}G\text{"}) = 19.0\ T$$

$$\textit{CUSHION TONNAGE} = 12.7\ T \cdot 0.133\ (\text{"}J\text{"}) = 1.7\ T$$

$$\textit{MINIMUM MECHANICAL PRESS TONNAGE} = 19.0\ T + 1.7\ T = 20.7\ T$$

$$\textit{MINIMUM HYDRAULIC PRESS TONNAGE} = 12.7\ T + 1.7\ T = 14.4\ T$$



Tonnage Capacities on Presses

Capacity of Crankshafts at the Bottom of the Stroke					
Crank Shaft Dia. (inches)	Tons		Crank Shaft Dia. (inches)	Tons	
	Single Crank Press	Double Crank Press		Single Crank Press	Double Crank Press
1 3/8	6	…	6 1/2	150	150
1 1/2	7.5	…	7	180	180
1 5/8	9	…	7 1/2	215	215
1 3/4	10.5	…	8	255	255
1 7/8	12	…	9	345	345
2	14	…	10	440	450
2 1/8	16	…	11	545	650
2 1/4	18	…	12	665	900
2 1/2	22	22	13	790	1150
2 3/4	26.5	26.5	14	920	1400
3	31.5	31.5	15	1060	1700
3 1/4	37	37	16	…	2000
3 1/2	43	43	16 1/2	1300	…
4	56	56	17	…	2300
4 1/2	71	71	18	1560	2700
5	88	88	20	1950	…
5 1/2	106	106	22	2380	…
6	126	126	24	2860	…
The tonnage figures do not apply to end wheel type of presses with overhanging crank-pin.					

It is customary to equip the average punch press with a pneumatic die cushion that will develop a drawing holding pressure equal to one-sixth the total press tonnage. However, present practice indicates a trend toward cushion ratios approaching one fifth of the press tonnage. On the average inclinable press, it is usually desirable to use an HC or MC type installation because the press bed opening is not large enough to permit installation of a C or D cushion that will develop enough ring holding pressure.

To figure the draw-ring holding pressure produced by a pneumatic die cushion, multiply the area of the piston or pistons in square inches by the air pressure applied. For example, if an 8" diameter cushion is used which has a piston area of 50 square inches and the working pressure supplied from the shop air line is 50 pounds per square inch, the ring holding pressure developed would be 50 times 50 or 2,500 pounds pressure. In other words, the maximum ring holding pressure developed by an 8" diameter cushion on a 50-pound maximum shop air line would be 1 1/4 tons.

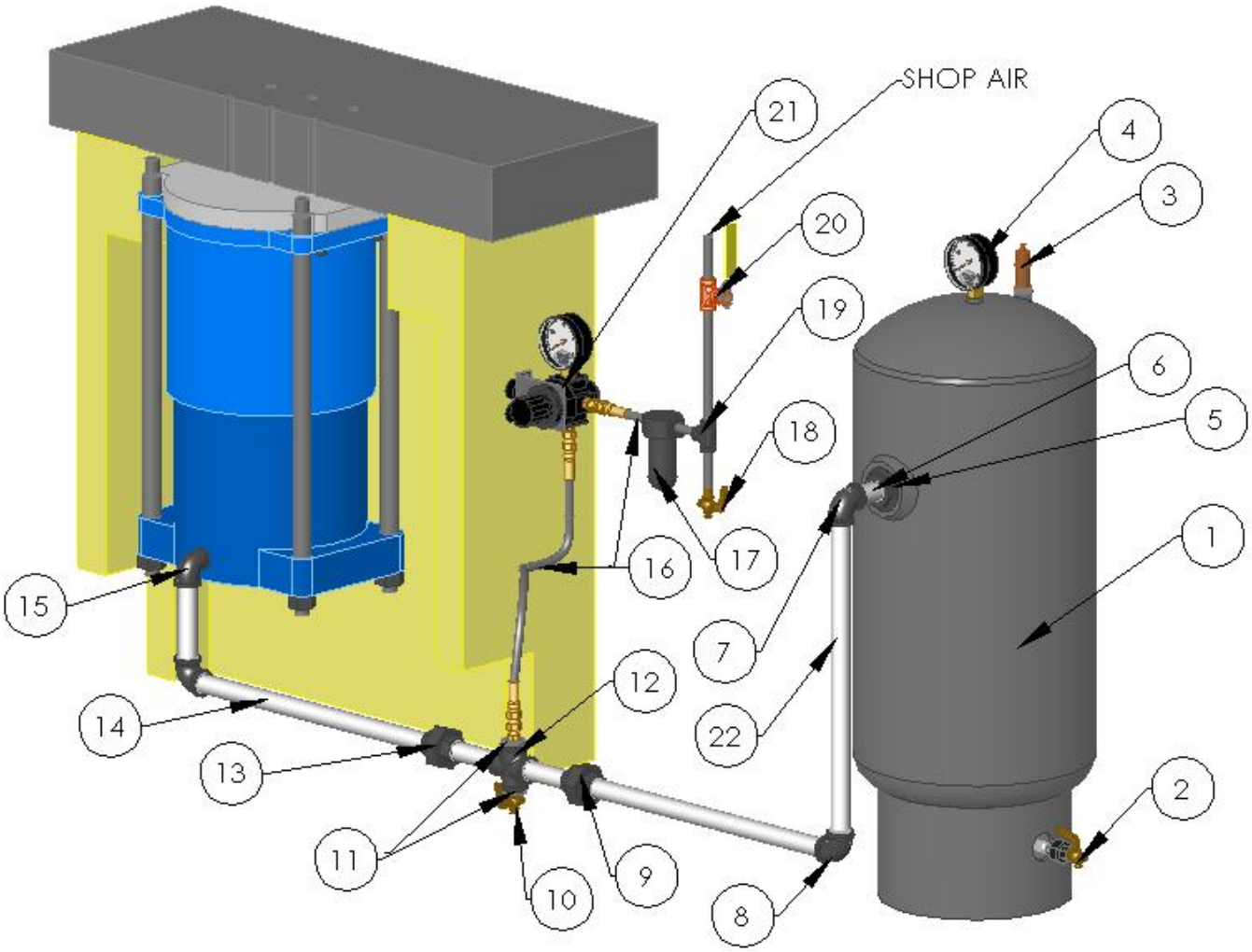
Die Cushion Lubricant for All Pneumatic Die Cushions

As a result of careful tests and experimental research work, this die cushion lubricant is especially compounded for all pneumatic the cushions. It assures maximum packing life and also provides proper lubricant between the cylinder and piston surfaces of the die cushion units and all other working parts.

It is available from stock in 35-pound pails direct from the Dayton Die Cushions.

LOW PRESSURE CUSHION PIPING LAYOUT (FIG. 46)

No.	Description
1	Surge Tank
2	Drain Cock
3	Pop Safety Valve
4	Gauge
5	Red. Bushing
6	Pipe Nipple *
7	Elbow *
8	Elbow *
9	Union *
10	Drain Cock
11	Red. Bushing
12	Cross
13	Union *
14	Pipe *
15	Elbow *
16	Hose
17	Air Filter *
18	Water Trap & Drain *
19	Tee *
20	Shut-Off Valve *
21	Regulator Assembly
22	Pipe *

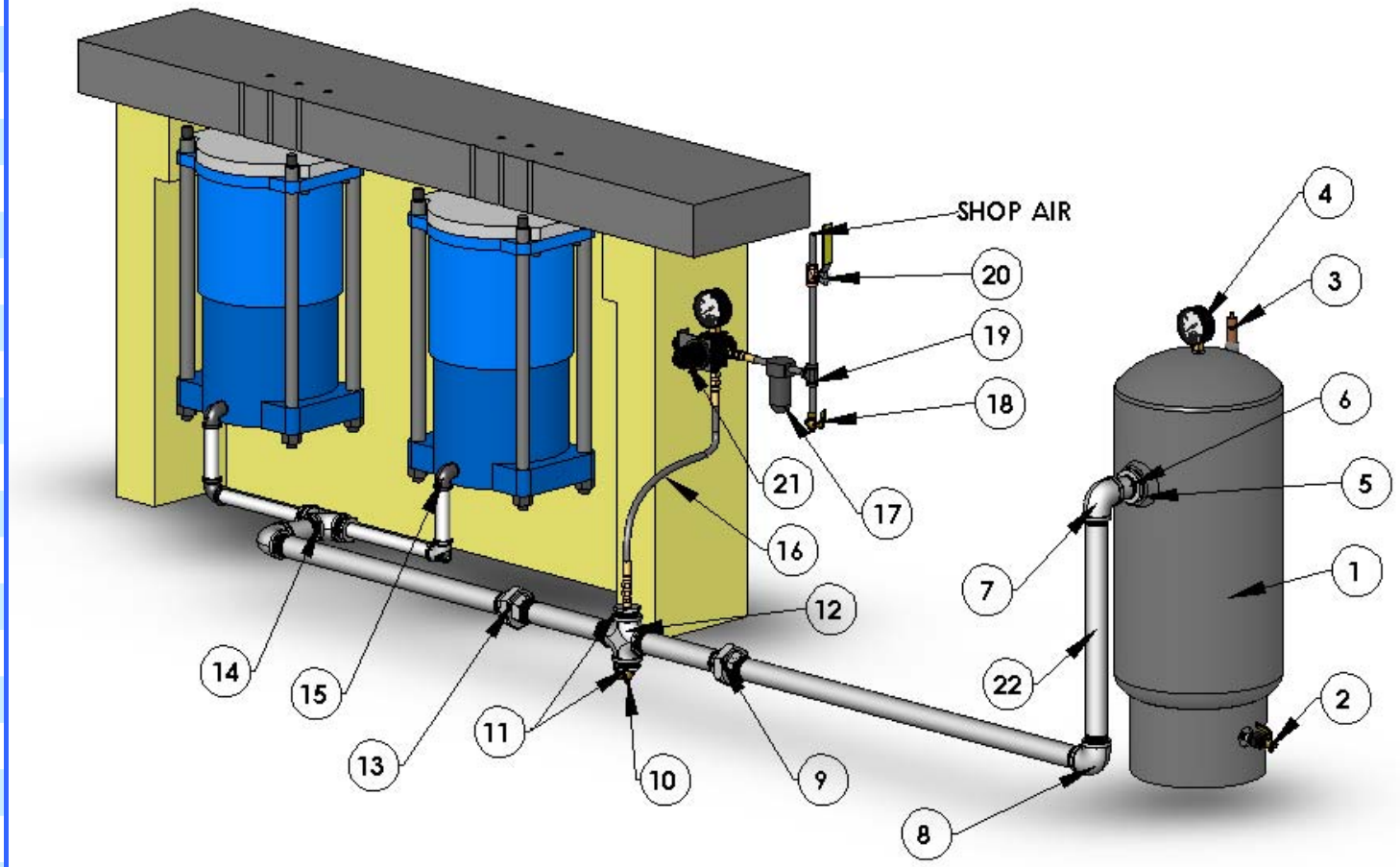


* Indicates furnished by customer

Note: Drain Cock at lowest point in system

MULTIPLE LOW PRESSURE CUSHIONS PIPING LAYOUT (FIG. 47)

No.	Description
1	Surge Tank
2	Drain Cock
3	Pop Safety Valve
4	Gauge
5	Red. Bushing
6	Pipe Nipple *
7	Elbow *
8	Elbow *
9	Union *
10	Drain Cock
11	Red. Bushing
12	Cross
13	Union *
14	Tee
15	Elbow *
16	Hose
17	Air Filter *
18	Water Trap & Drain *
19	Tee *
20	Shut-Off Valve *
21	Regulator Assembly
22	Pipe *



* Indicates furnished by customer

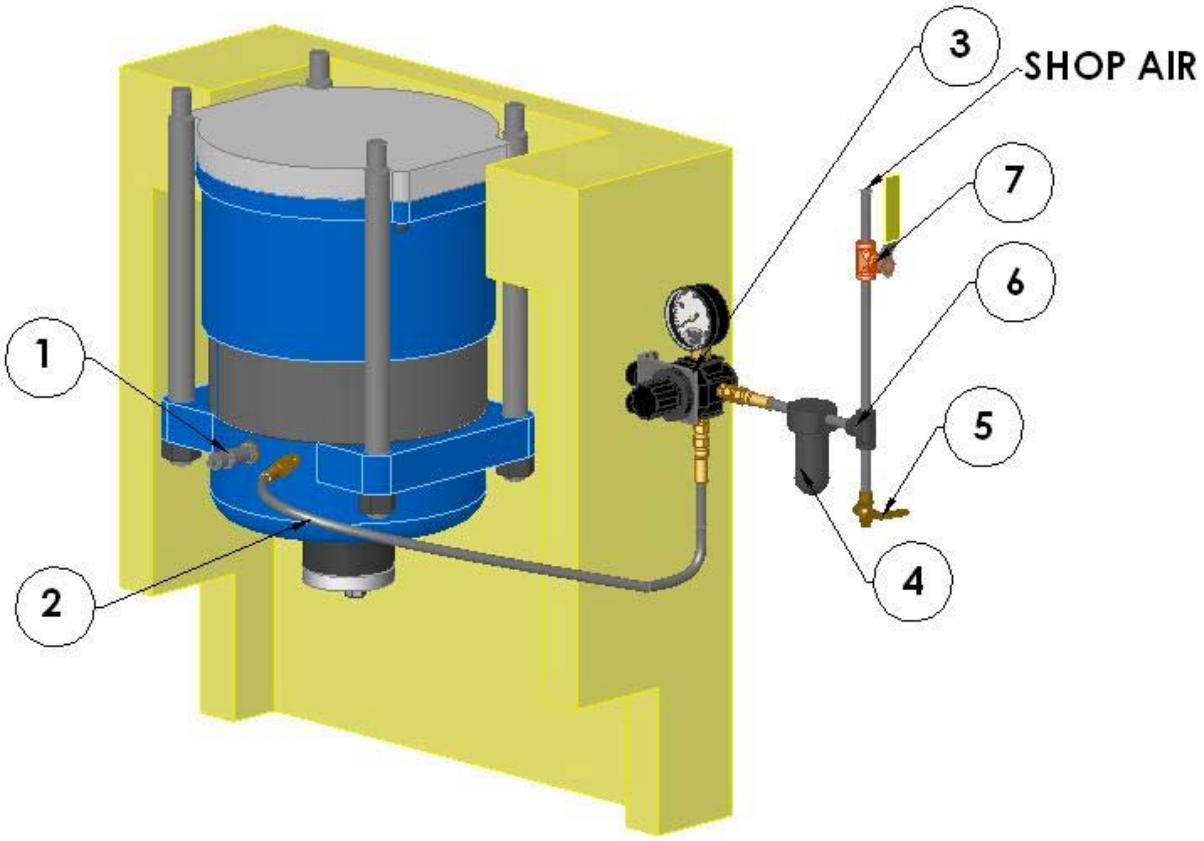
Note: Drain Cock at lowest point in system. See page 44 for correct surge line size. Surge line becomes larger once it is common between cushions. Plumbing needs to be symmetric for each of the cushions.

LOW PRESSURE CUSHION WITHOUT SURGE TANK PIPING LAYOUT (FIG. 48)

No.	Description
1	Pop Safety Valve
2	Hose
3	Regulator Assembly
4	Air Filter *
5	Water Trap & Drain *
6	Tee *
7	Shut-Off Valve *

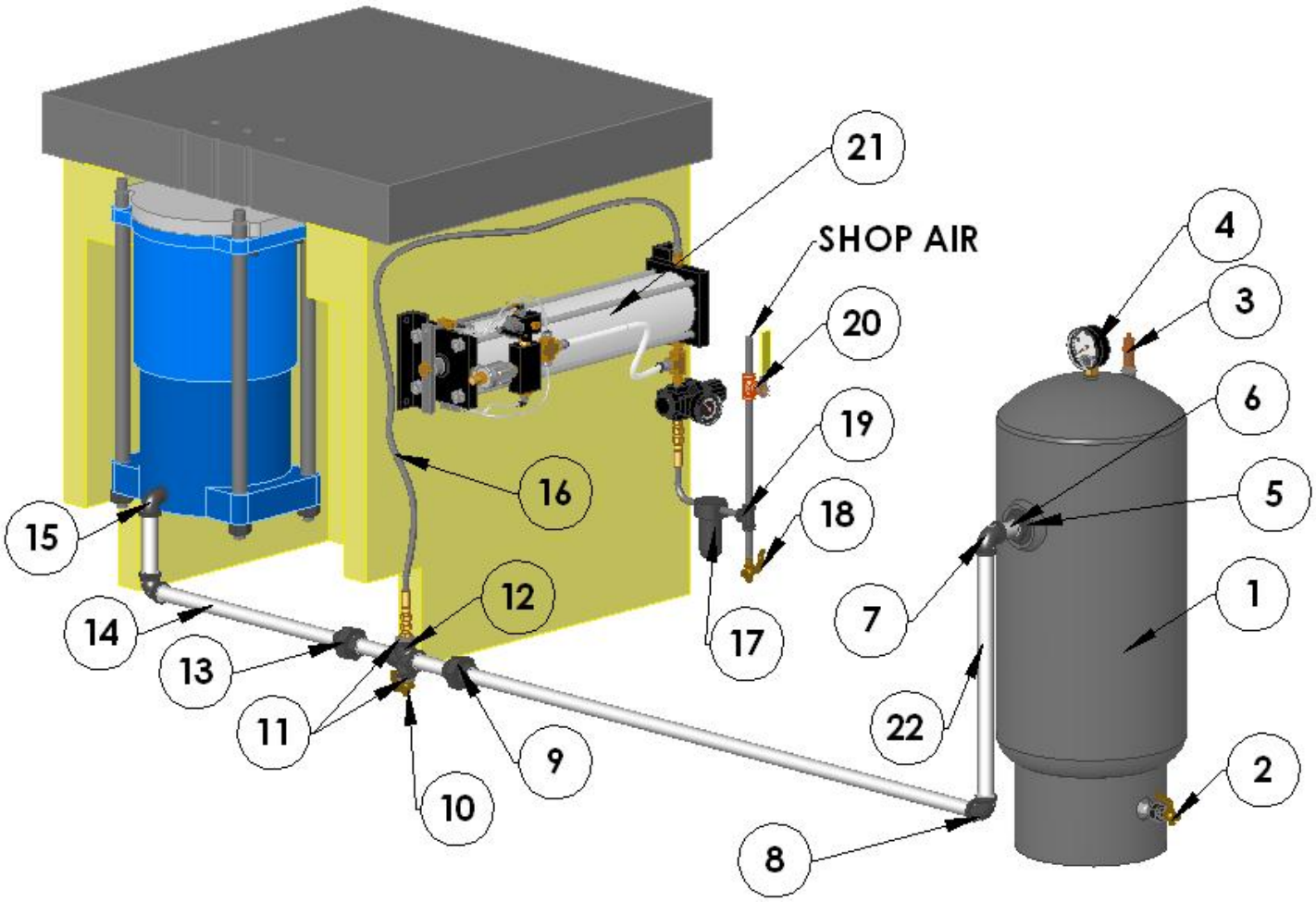
* Indicates furnished by customer

Note: Drain Cock at lowest point in system



HIGH PRESSURE CUSHION PIPING LAYOUT (FIG. 49)

No.	Description
1	Surge Tank
2	Drain Cock
3	Pop Safety Valve
4	Gauge
5	Red. Bushing
6	Pipe Nipple *
7	Elbow *
8	Elbow *
9	Union *
10	Drain Cock
11	Red. Bushing
12	Cross
13	Union *
14	Pipe *
15	Elbow *
16	Hose
17	Air Filter *
18	Water Trap & Drain *
19	Tee *
20	Shut-Off Valve *
21	Booster Pump
22	Pipe *

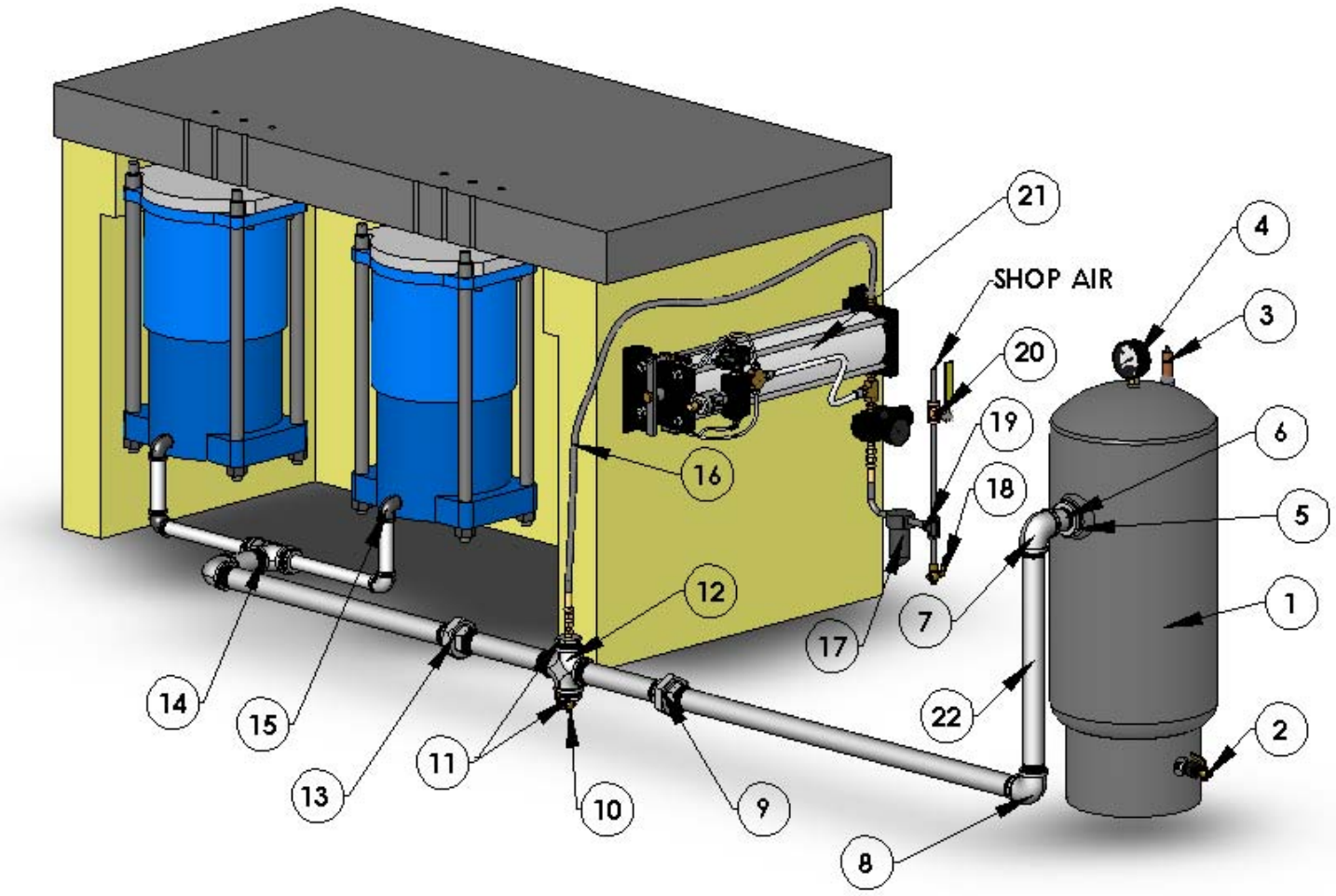


* Indicates furnished by customer

Note: Drain Cock at lowest point in system

MULTIPLE HIGH PRESSURE CUSHIONS PIPING LAYOUT (FIG. 50)

No.	Description
1	Surge Tank
2	Drain Cock
3	Pop Safety Valve
4	Gauge
5	Red. Bushing
6	Pipe Nipple *
7	Elbow *
8	Elbow *
9	Union *
10	Drain Cock
11	Red. Bushing
12	Cross
13	Union *
14	Tee
15	Elbow *
16	Hose
17	Air Filter *
18	Water Trap & Drain *
19	Tee *
20	Shut-Off Valve *
21	Booster Pump
22	Pipe *



* Indicates furnished by customer

Note: Drain Cock at lowest point in system. See page 44 for correct surge line size. Surge line becomes larger once it is common between cushions. Plumbing needs to be symmetric for each of the cushions.