

Valves

3

MODEL A9 DIVERTER VALVE

Maintenance Service

A9 Automatic Diverter Valve

BAUM PNEUMATICS INC.

A9 Diverter Valve

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A9 Diverter Valve

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Model A9, H9, C9, T9 Diverter Valves Introduction

Four Models, one design; A9 Automatic, H9 Hand wheel, C9 Chain wheel, and T9 Toggle Clamp, offers simplicity, flexibility, reliability, and ease of maintenance

A9 The Low 10 - degree angle of impact provides for efficient material flow with minimum pressure drop. The silicone discharge seal stays soft in freezing conditions, port selection is driven thru a positive and accurate rack and pinion arrangement, (2) (3) or (4) discharge ports built into one valve frame with a single gear motor drive. The drive can also be hand wheel, or for elevated locations, chain wheel driven. The valve is also available for side mounting with counter weights or vertical installation.

Chain drive is generally used where an electrical installation is too costly

3A.3 Simplicity / Flexibility

Our base unit, a hand operated toggle clamp version is also available. Most dimensions are the same regardless of model, and a motorization kit can be purchased to upgrade (on site) a base unit, hand wheel or chain wheel valve to a fully motorized valve, without removing the valve from service.



Internal seal ring
the higher the line pressure
the better the seal.

3A.4 Pivot Seal / Maintenance

Mechanical action and sealing are relatively unaffected by mounting distortion, distortion caused by pipeline movement or strain, however should be eliminated with expansion joints, or fixed support structures to protect valve drive assembly. The frame is made from large structural steel tube, mounted on (3) points to a foundation or support tower.

The pivot is sealed thru a ring of internal brass seal plates inside a cylindrical housing, no hump hose, no linkages, or sliding sleeve.

This valve is ideal in cold weather and the rugged sawmill environment. The inlet taper is formed from 3/8" plate and is much longer than other valves. All wear surfaces are a minimum of 3/8" thick. Special wear alloys or stainless steel is also available. All wear parts are replaceable and available from Baum Pneumatics.

3A.5 Reliability / Maintenance

Drive Motor is a 1HP Brake Motor with a Baldor 60:1 right angle gear box. Rack and Pinion drives a cam plate providing linear motion as well as port to port travel, Bearings are simple (4) bolt flange units, Drive coupling is designed to fail if drive is jammed, coupling is easy to change without drive disassembly (element P/N QF15YEL) QM Bearings

The valve is shipped with (corrosion or wear surfaces) coated with dry type graphite lubricant; finish painted and companion flanges, and gaskets attached. The moving portion of this equipment is painted safety orange.

WARNING

The motorized A9 diverter valve can cause physical injury if proper safety procedures are not followed. The approved shut down and lock out safety procedures must be followed before inspecting or servicing this unit.

3A.6 Performance

Controls are either thru inductive proximity switches or by counting time (120 motor revolutions required to make a switch) The motorized A9 valve switches ports in approx. (4) seconds, requiring infeed of material to stop while making the switch (diverter valves should not be switched on the fly!).



FIGURE 3.7 Two 10 ¾" A9 diverter valves 3 way ports.

3B.1 Installation

The Baum A9 valve has three lifting eyes. It is important to lift the valve from these points to eliminate any chance of damage to the drive mechanism or pivot pipe assembly. Avoid heavy shock loads during handling as similar damage to drive components could occur.

As in all pipeline equipment, adequate mounting is recommended, with care taken to eliminate air leakage at all pipe connections, companion flanges, and gaskets are provided with the valve for inlet and outlet connections.

Flanges on the valve discharge ports should have flat head cap screws (provided) located on the pivot pipe side of the port. This eliminates the possibility of hex head bolts damaging the discharge seal when the valve shifts from port to port.

It is important to have proper vertical pipeline supports within 20 feet of the valve, and expansion joints on each side if pipe length exceeds 100 feet, expansion joints eliminate excessive forces caused by (summer) thermal expansion or (winter) thermal contraction.

The port selection on the “9”series valve can be actuated by hand and toggle clamp, hand wheel, chain wheel, or electric gear motor. Operator access and possible field upgrades must be considered when installing the valve. The toggle clamp and hand wheel models require good safe access for operators. In climates where ice build up will occur a shelter over the drive head is necessary. All dimensions for the different models of all sizes are on the Baum Pneumatics catalogue dimension sheets.

For side mounting or vertical installation an additional counter weight assembly is required. Reverse Flow is also available (2 ports into 1 line).

The standard valve is set up for Regular Flow, Horizontal and / or less than 45 degree incline in 2 way, 3way, or 4 way designs.

3B.2 Electrics

Port selection is usually remote either thru inductive proximity sensors or by counting time to switch. Valves are shipped fully assembled, pre wired to a junction box and tested. A local disconnect is supplied by the customer, with the option of a local hand control (on off on) directional selector 3 position control knob

Note

The inductive proximity sensors must be wired and functioning correctly before powering the electric motor, otherwise there is no control of this drive, the drive head will reach the stop bolt at one side of the valve, burn out the motor or shear the soft urethane coupling element (p/n QF-15 YELLOW) . The valve will either no longer function or act erratically, a spare element, found in the junction box, is shipped with each valve,.

Pivot pipe moves axially, as well as radial, keep electrical wiring clear from rubbing this pipe.

3B.3 Delays

Do not switch on the fly, material feed must be held for time required to stop the infeed, purge the line of material (at 100 feet/sec), and then make the switch (4 seconds).

It is best to double the conveying time, to clean out stragglers. The infeed material must be held in a surge bin or infeed hopper, if mill operation is to keep running while making a switch. The surge bin size determines how many minutes of holding capacity is available. Once a switch has been made, the surge bin must be emptied, before allowing another switch, emptying time is 4x holding time.

Example 30 seconds of switching time requires a delay of 2 minutes between switches.

3B.4 Sparks

Sparks that cause an abort gate to trip, also should stop the infeed, empty the line of material (thru the tripped abort gate), then once clean, the switch should be made to another port destination, until the cause of spark(s) has been determined and corrected.

Dumping material to ground is usually done until the surge bin and entire system is emptied and abort gate is reset.

C Operation

3C.1 Start up Procedure

These procedures should be followed after installation, but before start up.

1. Remove all packaging material.
2. Inspect drive mechanism and pivot points to operate freely and for damage.
3. **IMPORTANT** Position pivot pipe in all ports to check for proper alignment. Use the sensors and targets welded on outside of the discharge portion of the pivot frame.
The pivot pipe must be within 1/16" of center of the discharge ports to insure no shoulders in direction of flow.
4. Operate valve by hand and check for proper limit switch and stop bolt (5/8" square head set screw) adjustments. There should be a 1/4" to 1/2" clearance between the drive head and stop set screws when pivot pipe is fully seated on electric actuated valves only.
NOTE: Pivot pipe is fully seated when crank throw is on center closest to discharge port.
On manual hand wheel, and pull chain valves 5/8" stop set screws are used to stop drive head and align pipe to ports.
All side mount units, the lower stop setscrew (even motorized) stops drive head to align pivot pipe to discharge port.
Hand wheel valves should be allowed to travel over center of pivot pipe seated position by approx. 1/2" to insure that valve will not become loose due to vibration and seal pressure.
5. On side and vertical mount valves lower adjustable drive head stabilizer pads are required. Adjust stabilizer pads to hold upper plastic sliding pads against the top flat bar slide; caution too tight will cause excess friction.
6. Motorized valves require a time delay to operate valve only once the line is purged of material. **DO NOT SWITCH ON THE FLY!**
7. Check oil level in gear reducer, and install proper viscosity as temperature requires. See gear reducer's instruction manual, reducers are pre filled at the factory.
8. Check seals and gaskets to be airtight when system is at operating pressure, and valve is in all positions.
9. 120 revolutions of the electric motor will switch the valve from port to port (cam actuates 720 degrees, gear box is 60: 1 reduction.)
10. A **QUICK FLEX** coupling is installed between the gear motor and drive shaft, this coupling has an element that shears when overloaded, this element is designed to shear if limit switches do not shut down valve drive, thus avoiding major damage. Each valve is shipped with a spare QF -15 **YELLOW** element (QM Bearing) Prince George ph 250 563 3604 Vancouver ph 604 520 1191

3C.2 Break In Procedure

These procedures should be followed after start up.

1. Manually switch valve from port to port, confirming with PLC a signal when each port is reached.
2. Inspect coupling element for looseness, or erratic behavior.
3. Initial minor leakage from the inlet pivot seal, will seal up automatically when valve runs material thru it.

3C.3 Starting and Stopping

The A9 (automatic) valve starts from a remote location, therefore it is important operators and maintenance personnel keep clear of the moving portions of this equipment.

Valve cycles for approx. 4 seconds, between ports, stops when a sensor is triggered

3C.4 General Operation & Adjustment

The only adjustment required is periodically adjusting the inductive proximity sensors at the discharge ports, if they get shifted.

3C.5 Restarting from a Power Outage or Emergency stop

1. Power outage: The valve is to be diverted to ground before restarting, since the electro magnets holding the abort gates on silos will have dropped out.
2. All clean outs (in the line to be restarted) should be opened.
3. Blower(s) only to be restarted, which will blow the first section clear.
4. Clean outs nearest feeder (infeed of system) to be closed first, while blower is running, this will cause the second section to blow clear. Continue closing clean outs, until line is completely clear of material. This procedure prevents the building of a "snowball of material" the most common cause of a plugged line.
Opening the clean outs and physically unplugging the line, after the snowball has occurred, is much more time consuming.
5. Reset abort gates
6. Divert valve to a silo, and restart surge bins and feeders.

3C.6 Preventative Maintenance

SCHEDULED Every Four Months: To ensure machines continue to run smoothly and efficiently.

WARNING

The motorized A9 diverter valve can cause physical injury if proper safety procedures are not followed. The approved shut down and lock out safety procedures must be followed before inspecting or servicing this unit.

1. Check oil level in gear motor, see Lube diagram 3D.3
2. Grease the two flange ball bearings on drive head crank.
3. Grease upper & lower pivot nut slide with open gear lubricant.
4. Clean gear rack teeth and top slide plate, coat both with dry graphite lubricant (slip plate)
5. Check inlet pivot seal, discharge silicone seal and pipeline flange connections for leaks, and looseness.
5. Check drive, drive head assembly, stop position to insure discharge seal is being fully compressed.
 6. Check pivot pipe to port alignment, and keep this discharge end clear of build up material. Ice should be kept from building up on the drive portion of the A9 valve.
7. Record faults (damaged or malfunctioning of parts), repair and follow up
8. The pivot pipe can be rotated in 90-degree increments to distribute wear. Welding required. Refer to disassembly and assembly notes.
9. When pipeline develops holes from abrasion they should be patched by cutting out the damaged section and replacing it with a new piece, flush to the inside.

If a shoulder protrudes to the inside in direction of flow the conveying material may stick on the shoulder, slow down or bounce around and cause a line plug or reduce conveying capacity. For the same reason patches should never be added to the outside of a conveying line.
10. Temperature changes causing thermal expansion / contraction from summer to winter conditions will affect a pipeline several inches when ever more than a hundred feet of straight pipeline is installed. If the valve is anchored securely the movement of the pipe causes stress on the valve (restricting it's operation). Therefore expansion joints are always recommended to protect the smooth operation of the A9 valve.

4" expansion for
132 degrees temp change in
400 feet of steel pipe.

3D Maintenance Repair

WARNING

The motorized A9 diverter valve can cause physical injury if proper safety procedures are not followed. The approved shut down and lock out safety procedures must be followed before inspecting or servicing this unit.

3D.5 To Replace Silicone Discharge Seal

- A. Rotate the pinion shaft crank until pivot pipe is in the retracted position. (If electric gear motor driven, rotate motor fan shaft)
- B. Unthread (2) Gear Clamps, remove silicone seal, clean surfaces, and replace seal. Seal is not glued to pipe, but is joined to itself with RTV silicone. Position the seam where visible.

3D.6 To Replace Inlet Pivot Pipe

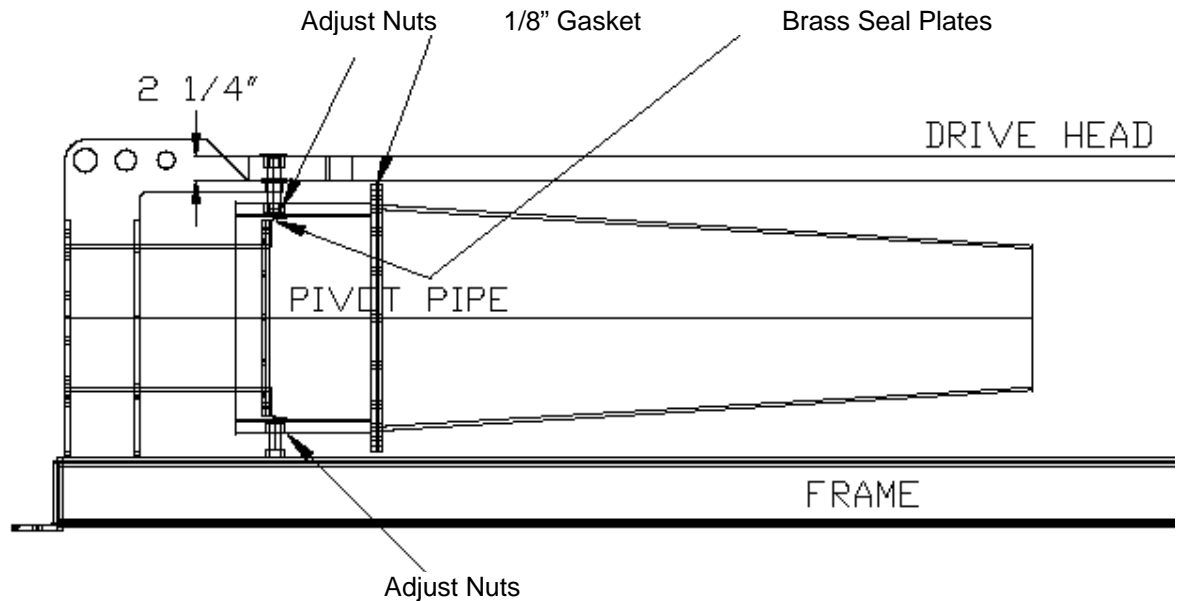
- A. Support discharge pipe. Disconnect angle bracket from flange bearing on discharge end of pivot pipe.
- B. Remove bolts from flange on big end of pivot pipe. Support this flanged end before breaking flange seal connection. Leave pivot inlet section in place.
- C. Remove pivot pipe to the side.

3D.7 To Replace Pivot Section/Seal

- A. Rotate pinion shaft crank until pivot pipe is in a retracted position. (If electric gear motor driven, rotate motor fan shaft)
- B. Remove bolts from flange on big end of pivot pipe. Support this end before breaking flange seal connection. Leave pivot inlet section in place.
- C. Remove pivot pipe to the side. Take care not to twist discharge end lower flange bearing.
- D. Remove pivot inlet section by cocking or prying to one side and sliding it off, mark or measure pivot slide nut height settings.
- E. Remove and replace seal assembly as necessary. Note the direction of bevel on pivot seal assembly plates. Seal plates are designed to compress against inside wall of sliding section under operating air pressure.

Maintenance Repair

3D.8 To Install Pivot Inlet Section Over Pivot Seal



SEAL DETAIL

To center Pivot Pipe over seal

- A. Set upper pivot bolt to 2 ¼" dimension as shown.
- B. While maintaining 2 ¼" dimension, set upper and lower pivot nuts so pivot inlet section is centered over seal plates. Upper nut should have 1/16" vertical clearance inside slide channels.
 Seal assembly is to have a gasket between it and it's mounting flange, the seal assembly should also be caulked with silicone sealer only at the base of each brass seal plate (to assure no leakage of air under these plates)
- C. Slide inlet pivot section over seal assembly with upper and lower hex nuts in their slide channels. Swinging pipe to the side eases assembly. (Seal assembly is oversize and may require extra compression to install.)
- D. Recheck centering of seal, and nut clearance. Lubricate slides with grease. No air spaces between seal and pivot pipe inside diameter.

Maintenance Repair

3D.9 To Install Pivot Pipe:

- A. With pivot inlet section in place, install pivot pipe. Note that the pivot inlet section pilots inside the pivot pipe.
- B. Lift discharge end of pivot pipe into place and connect the angle bracket, which is supported by the pinion shaft crank, and hangar bolt.
- C. Tighten angle bracket bolts after discharge ports have been vertically aligned within 1/16". Check alignment between drive head and valve frame with seal fully compressed. At this point the crankshaft throw will be aligned with the cam roll bracket.

3D.10 To Remove Drive Head Assembly from Valve Frame

- A. On gear motor driven valves, the drive head may be removed complete with electrics by removing the junction box electrical infeed connection.
- B. Support pipe and disconnect angle bracket from discharge end of pivot pipe
- C. Remove only one lifting eye (not changing set screw stop adjustment.). If valve is equipped with a chain wheel actuator, remove the lifting eye that supports chain wheel actuator, remove the lifting eye that supports chain wheel shaft and remove chain wheel assembly from valve.
- D. Bring drive head assembly off end of gear rack towards the side with lifting eye removed. (Mark pinion gear at last tooth just where it disengages from rack.) Marking this gear tooth eases reassembly.
- E. Slide drive head assembly out. Do not lose the two UHMW (plastic) wear pads and backing plates, as they will fall free upon removal of head assembly.

Maintenance Repair

3D.11 To Disassemble Drive Head Components

(Sizes 6 5/8" to 14" dia.)

- A. The Drive head is easily removed But note: DO NOT DRIVE SHAFT OUT THROUGH THE PINION GEAR. THE KEY IN THE SHAFT WILL RUIN THE LOWER BRONZE SLEEVE BUSHING.
Loosen pinion set screw, remove (pull up) pinion from shaft first; remove key, then drive shaft out of drive Head.
- B. The Camrol bearing found behind the rack is pressed in and welded, drill out weld and press out camrol shaft without bending this support plate. Replace camrol with same item, shaft cut short and welded in place.

3D.12 To Disassemble Drive Head Components

(Sizes 16" to 24" dia.)

- A. The Drive head is easily removed But note: When drive pinion shaft is removed through bottom of drive head, care must be taken to keep shaft vertical, or the key may damage the bronze bushing.
- B. The Camrol bearing found behind the rack is pressed in and welded, drill out weld and press out camrol shaft without bending this support plate.
Replace camrol with same item, shaft cut short and welded in place.

On some larger models an eccentric threaded camrol with a nut is used.
The eccentric should be adjusted to eliminate the least clearance at the port positions.

3D.13 To Re assemble Drive Head Components

(Sizes 6 5/8 " to 14" dia.)

- A. Install Camrol bearing.
- B. Install lower plate bronze sleeve bushing in lower plate.
- C. Install pinion shaft with crank (remove burrs and set screw marks). Coat pinion shaft with Anti Seize Compound.
- D. Install pinion key into shaft. Coat key and shaft with Anti seize compound.
- E. Install pinion gear.
- F. Install roller crankshaft assembly. IMPORTANT Flange of bushing to support pinion gear thrust load. (do not forget the key)
- G. Install upper 4 - bolt bearing. Note the holes in the bearing are drilled out to 9/16" and require serrated self locking flange nuts. Grease fitting to be on the most accessible side of drive head. Do not tighten screws or nuts yet.

Maintenance Repair

- H. With 1/32" clearance between crank plate and crank lower 3/4" bearing plate, Loctite and tighten set screws on 4-bolt flange bearing.
- J. Install custom machined (shallow head) and cross drilled hangar bolt into the lower 4- bolt flange bearing. Install castle nut and cotter pin
- K. Install this lower bearing with hangar bolt on to crank plate, grease fitting in a side location when pipe is seated on a port

Note: The upper 4- bolt bearing is not tight; still to be aligned with pinion gear and rack after drive head is installed onto the main frame. After alignment, tighten these bolts.

16" thru to 24" pinion gear is installed before pinion shaft otherwise follow the same procedures as above.

3D.14 To Install Drive Head on to Frame

- A. Install drive head (tail end) over pivot bolt above pivot seal. Check 2 1/4" dimension as shown on section 3D.7.
- B. Install plastic (UHMW) wear pads in to pockets of drive head.
- C. Slide drive head assembly on to gear rack noting timing procedure.
TIMING PROCEDURE
The pinion gear must be engaged with the gear rack, timing marks aligned (between drive head and frame top plate), discharge seal aligned with its port and is under maximum compression

This may take several attempts. If the pinion shaft crank is not compressing the discharge seal when timing marks align, then observe which direction the pinion needs to rotate. Slide the drive head assembly to the side to disengage. Rotate the pinion gear and try again.

- D. Align pinion gear to have proper tooth contact with gear rack. The pinion gear teeth should be parallel to the rack teeth. This assures contact across the full face of the teeth. Tighten the four bolt bearing in position.
- E. Lift discharge end of pivot pipe into place and connect the crank bolt.
- F. Check alignment within 1/16" of discharge ports when seal is fully compressed and crank throw plate aligned.

3D.15 Hand Wheel Drive

- A. Install hand wheel with key
- B. Install both lifting eyes (stop set screws attached)
- C. On valves equipped with latches adjust set screw stops to head assembly 1/2" past point where timing marks align between head assembly and frame. Discharge seal should be fully compressed.

Maintenance Repair

3D.16 Chain Wheel Drive

- A. Chain Wheel may be installed to either the right or left side of valve discharge ports.
- B. Install plastic nut bracket assembly onto drive head top plate.
- C. Install chain wheel lead screw into plastic nut.
- D. Install lifting eye and bearing assembly over chain wheel lead screw. The shaft must extend out beyond bearing $3 \frac{3}{4}$ ". Tighten mounting bolts after aligning lifting eye and bearing assembly to allow lead screw to turn freely in plastic nut.
- E. Check $3 \frac{3}{4}$ " dimension and tighten bearing set screw firmly.
- F. Install chain wheel, chain guide and chain as an assembly onto shaft. Tighten chain wheel set screw firmly.
- G. Install and tighten set collar.
- H. Adjust set screw stops to stop head assembly when timing marks align between head assembly and frame. (Discharge seal fully compressed)

3D.17 Electric Gear Motor Drive

- A. Install Flex coupling halves onto gear motor output shaft and drive head firm shaft. Tighten set screws with coupling firm against flange bearing.
- B. Install gear motor and bracket onto mount, do not tighten yet.
- C. Install coupling element over coupling halves.
- D. Tighten gear motor mounting bolts
- E. Tighten set screws in coupling half at gear motor.
To rotate gear motor remove brake cover and turn fan by hand.
- F. Install and connect electrical controls referring to enclosed electrical control notes.
- G. Install both limit switches and adjust to have drive head assembly stop when timing marks align between head assembly and valve frame. (discharge seal to be fully compressed)
- H. Adjust set screw stops to have $3/8$ " clearance between each set screw and the drive head top plate

Roof protection from weather is suggested for the gear motor operated diverter valve. Call Baum Pneumatics Inc. for maint information of other valve options that available:

Side mounted with counterweight
Vertically mounted
Reverse flow

Maintenance Repair

WARNING

This A9 DIVERTER VALVE can cause death or severe personal injury if all covers are not in place during operation. Do not walk inside frame area during operation. Always Lockout the VALVE before inspecting any part of the unit.

3D.18 Shipping, Handling, and Storage

The Baum Pneumatics A9 Diverter Valve is designed with (3) lifting lugs located at both ends at the top of the frame.



Personal injury or property damage may occur if this diverter valve is lifted by other locations other than the lifting lugs.

Personal injury or property damage may occur if equipment used to lift this A9 Diverter Valve does not have a rated load capability greater than the weight listed on the general arrangement drawings. Check the approximate total weight listed on the assembly drawing. Care should always be taken to insure adequate capacity in any equipment used to lift or move the equipment. Lifting line angles must exceed 45 degrees (from horizontal).

When shipping by truck, the valve should be placed on a wood skids and bound to the flatbed trailer using the lifting holes at the top of the frame. Chains or straps may be

used to tie the valve to the flatbed trailer. Under no circumstances should the valve be lifted or secured by the main pivot pipe or drive head, or drive head tube.

MODEL A9 VALVE – SPARE PARTS

3D.19 Recommended Spare Parts

Manual or chain operated Valves

1	Discharge seal
1	Seal Band clamp (Trident hose clamp)
1	Pivot Seal
1	Upper Flange Bearing
1	Lower Flange bearing
1	Lower Bronze bushing
1	Camrol bearing

Electric Gear motor Valves A9

1	Discharge seal
1	Seal Band clamp (Trident hose clamp)
1	Pivot Seal
1	Upper Flange Bearing
1	Lower Flange bearing
1	Lower Bronze bushing
1	Camrol bearing
1	Motor
1	Limit switch
1	Crank weldment

3D.20 Expansion Joints

Severe changes in weather cause excessive pipe movement and possibly stress and distortion on any diverter valve, expansion joints are recommended to absorb this expansion and contraction of the conveying system pipe.

Overview and General Safety

3.1. Preface

This manual is provided as a guide to personnel involved with the installation, operation, and maintenance of the Baum A9 Diverter Valve. Operators, Inspectors, and Maintenance personnel of Baum supplied equipment should read and become familiar with the general procedures and Information contained within this manual. In addition we recommend that this manual be kept readily available for reference before beginning any operation or work associated with this equipment.

Safety precautions and instructions for awareness and information on potential hazards are found throughout this manual. Due to the complexities of the systems in which this equipment is used and the environments in which it operates, situations may arise which are not directly discussed in detail in this manual. When such a situation arises, past experience, availability of equipment, and common sense play a large part in what steps are to be taken. In addition, a Baum service representative is available to answer your questions, perform inspections and safety reviews, provide operator training, and supervise maintenance crews upon request.

Please feel free to contact a Baum Pneumatics representative at the following office:

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Email Info@baum pneumatics.com

3.2. General Safety

All parts of the equipment and the system into which it's installed must be used in keeping with Sound safety practices. This manual contains safety information designed to be used in two ways: first as a primary reference for operators and plant maintenance personnel, providing them with details and explanations of operational and maintenance safety procedures; and second as a training tool within your plant's safety program.

Safety begins with properly designed and manufactured equipment. To that end, Baum has designed this equipment with safety in mind. However, the use of the equipment is subject to certain hazards that cannot be met by mechanical means alone, but only by the exercise of intelligence, care and common sense. Once the equipment enters service, Baum has no direct control over its inspection, maintenance, or operation. For this reason, safety in the field is the responsibility of the user.

CUSTOMERS ARE CAUTIONED to provide adequate Protection, Warning and Safety Equipment necessary to protect personnel against hazards involved in installation and operation of this equipment in the system or facility.