INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Figures 7100-D, 7100-DM, 7100-DL, 7100-DML
2½" to 16" Normally Open Solenoid Valves

Figures 7100-DC, 7100-DCM, 7100-DCL, 7100-DCML
2½" to 16" Normally Open Solenoid Valves with Stop-Check Piston

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Manual Number IOM-7100-062822R1

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Section 1

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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INSTALLATION, OPERATION and MAINTENANCE

2½" – 16" Normally Open Solenoid Valves

INTRODUCTION
This manual provides information to install, operate and maintain GA Industries pilot-operated pressure reducing valves to ensure a long service life. The valve is ruggedly constructed to provide many decades of dependable service with minimal maintenance.

CAUTION
The valve is NOT recommended for use with toxic, corrosive, or flammable fluids.

The Shop Order (SO) Number, Figure Number, size, and pressure rating are stamped on a nameplate attached to the valve. Please refer to the SO number when ordering parts.

DESCRIPTION OF OPERATION
The Figure 7100-D solenoid valve opens fully when the solenoid is de-energized and closes tight when it is energized.

The Figure 7100-D consists of a differential piston main valve and a pilot system, pre-piped and factory installed on the main valve. The main valve consists of just one moving part – the piston – with the top of the piston being larger than the bottom. System pressure applied to the bottom of the piston provides an opening force. When system pressure is simultaneously applied to the larger area on top of the piston, a greater closing force produced. Thus, applying system pressure to the top of the piston closes the valve while exhausting it from the top allows system pressure to lift the piston and open the valve.

The pilot system consists of a solenoid pilot, opening and closing speed control valves, wye strainer and pilot isolating valves. When energized, the solenoid pilot applies inlet pressure to the top of the piston to close the main valve and when de-energized exhausts pressure from the top of the piston to open the main valve.

The speed control valves determine how fast the main valve opens and closes.

The Figure 7100-DC is supplied with optional "Stop-Check Piston" feature. The valve will "check" to prevent reverse flow should inlet pressure fall below outlet pressure.

Figure 7100-DM includes an optional manual operator on the solenoid pilot so that the main valve can be opened and closed without electrical power.

Figure 7100-DL includes an optional limit switch to electrically indicate the is valve closed or not closed.

These options can be combined (e.g., Figure 7100-DCML).

RECEIVING AND STORAGE
Inspect the valve upon receipt for damage during shipment. Carefully unload all valves to the ground without dropping.

Valves should remain in a clean, dry, and weather protected area until installed. After completion of shop testing the valve is drained of the test water but a small residual amount could remain so the valve should be protected from freezing during storage.

INSTALLATION
Figure Numbers suffixed with "D" indicate the valve has ANSI Class 125 flanged connections. Figure Numbers suffixed with "U" indicate the valve has ANSI Class 250 flanged connections.

GA Industries differential piston solenoid valves are typically supplied with a globe body main valve where the inlet and outlet connections in line. They can be supplied with an angle body main valve that have the inlet and outlet connections 90 degrees apart. Angle body solenoid valves are designated with an "A" (e.g., 7100-DA. 7100-DAML).

Install the valve in the proper flow direction noting the "INLET" tag on the valve. The INLET is the high-pressure side of the valve.

The valve is configured to be installed in the orientation specified by the engineer. Consult the drawings of record to verify the valve is installed in the proper orientation.

GA Industries valves with Stop-Check Piston should be installed with the bolted cover parallel to the floor/ground to ensure proper operation of the check feature.

Prior to installation ensure all debris, packing material or other foreign material has been removed from both ports.

If installed outdoors, below ground in a vault or in an unheated area, adequate freeze protection must be provided.

Adequate isolating valves should be installed upstream and downstream of the valve to facilitate maintenance.

It is beneficial to install pressure gauges on the inlet and outlet sides of the valve.

The valve should be installed with sufficient clearance to permit maintenance and removal of internal components.

The valve is not designed to support adjacent equipment, piping loads should not be imposed on the valve and large valves should be properly supported. Ensure mating flanges are square and parallel to the valve flanges before tightening flange bolts.

Flat-faced flanged valves should be mated with flat-faced flanges and full-face gaskets. If ring gaskets are used the bolt material shall be ASTM A307 Grade B (or equivalent). Higher strength bolting should only be used with full-face gaskets.

Lower heavy valves using slings or chains around the valve body and/or the lifting eyes. DO NOT LIFT BY THE EXTERNAL PILOT PIPING. Lubricate the bolts or studs and insert around flange. Lightly tighten bolts until gaps are eliminated. Torque bolts in an alternating pattern in graduated steps. If leakage occurs wait 24 hours and re-torque the bolts but do not compress the gasket more than 50% or exceed bolt maximum torque rating.

START-UP

The valve generally does not require any calibration or adjustment prior to start-up.

Refer to Page 4 for the location of components.

The opening speed control valves (B) should be initially set at ½ turn open while the closing speed control valve (C) should be initially opened ¼ turn. Loosen the lock nut, close the valves completely by turning the adjusting knob clockwise then ¼ to ½ turn counterclockwise and tighten the locknut.

Stop valve (A) must be fully open.

NOTE: If the valve is being installed in an orientation that the main valve's bolted cover is not parallel to the floor/ground, it's recommended the main valve's piston be filled with water before installation. This can be done by removing an unused pipe plug from the valve's cover and filling the valve through a funnel. Replace the pipe plug before installing the valve.

After the valve has been installed, slowly open the inlet isolating valve to introduce pressure to the valve. If the solenoid is de-energized the main valve will open and air will be bled through the solenoid. supplied with manual operator. Energize the solenoid and the main valve will close.

Open the downstream isolating valve to allow flow through the solenoid valve.

Energize and de-energize the solenoid (or use the manual operator) and observe the inlet and outlet pressures as the main valve opens and closes. Adjust the speed control valves as needed so the main valve's opening and closing speed does not produce an excessive rise in pressure. Turn the applicable speed control valve's adjusting knob clockwise to slow the speed or counterclockwise to increase the speed.

A slight and/or intermittent discharge of water from the main valve side vent tube is normal and has no effect on the valve's operation.

Each time the valve opens it will discharge a volume of water through the solenoid pilot. If installed indoors this can be piped to waste. If in a vault, adequate drainage must be provided.

Discharge Volume

SIZE	VOLUME
2½" – 3"	0.08 Gallons
4"	0.16 Gallons
6"	0.50 Gallons
8"	1.12 Gallons
10"	2.08 Gallons
12"	3.73 Gallons
14"	6.29 Gallons
16"	10.56 Gallons

PREVENTIVE MAINTENANCE

No routine lubrication or adjustments are needed. The valve should be visually inspected once a month for the first 3 to 6 months after initial start-up to check for leaks and the wye-strainer should be flushed of collected debris.

Flushing the wye-strainer can be facilitated by installing a small ball or gate valve in place of the pipe plug in the bottom of the wye-strainer. Opening the valve while there is pressure in the system will "blow off" collected debris.

After the initial period, once every three (3) months the strainer should be flushed of collected debris as described above. The time between strainer flushing can be extended if no debris is found.

Visually inspect for leaks around the indicator rod, side vent tube or pilot vent hole. If leakage is detected, see **TROUBLESHOOTING** to resolve.

WARNING
Personal injury may occur if the valve is disassembled while pressurized. Before attempting disassembly, follow appropriate lockout/tag out procedures to prevent accidental pressurization.

Once a year the valve should be isolated, depressurized and the wye-strainer screen removed and cleaned. At the same time the speed control valves should be inspected. First, note the number of turns required to close it fully. Remove the needle valve bonnet and needle and inspect the needle for wear. Replace if needed. Clear needle valve seat of collected debris and reinstall the bonnet and needle. Open to the noted position.

TROUBLESHOOTING

SYMPTOM or PROBLEM	SOLUTION
Main valve will not open	
• Water cannot exhaust from top of piston through solenoid pilot	Verify solenoid is de-energized Verify manual operator is disengaged (if supplied) Verify minimum 15 PSI line pressure
• Opening speed control valve (B) closed or plugged	Verify opening speed control valve is not closed Disassemble and clear debris from speed control valve
• Vent tube blocked	Ensure vent tube is open to atmosphere
• Indicator rod packing too tight	Turn indicator gland counterclockwise in quarter turn increments
Main valve will not close	
• Inlet pressure cannot be applied to top of piston	Verify solenoid is energized Solenoid coil faulty/burned out - replace Verify manual operator is disengaged (if supplied) Verify minimum 15 PSI line pressure
• Wye-strainer clogged	Flush strainer or remove screen to clear debris
• Isolating valve (A) closed	Open fully
• Closing speed needle valve (C) closed	Turn handwheel counterclockwise ¼ turn
• Debris in main valve	Isolate the valve, remove pilot piping and valve cover, clear debris and inspect internal components for damage. Replace as needed
Leakage through main valve when closed	
• Debris in valve	Remove debris, inspect for damage
• Worn or damaged main valve seat ring	Inspect, replace (See Main Valve Repair Instructions)
Leakage through solenoid pilot exhaust port when main valve is closed	
• Worn or damaged solenoid pilot seat	Inspect, repair (See Solenoid Repair Instructions)
• Closing speed needle valve (C) worm	Replace
Excessive leakage through vent tube (slight and/or intermittent leakage is normal)	
• Worn piston and/or liner seals	Replace (See Main Valve Repair Instructions)
• Vent tube loose or its threaded connection to liner not sealed	Tighten and/or apply thread sealant. (See Main Valve Repair Instructions)
Excessive leakage past indicator rod (slight and/or intermittent leakage is normal)	
• Indicator packing worn or not sufficiently compressed	Turn indicator gland clockwise one quarter to one half turn. DO NOT OVERTIGHTEN. If leakage does not stop, replace indicator packing.

REPAIR INSTRUCTIONS
Instructions for the inspection, troubleshooting and repair of the main valves utilized in the GA Industries 2½" to 10" Figure 7100-D normally open solenoid valves are provided in IOM-DPMV2.5-10 (Latest Rev)

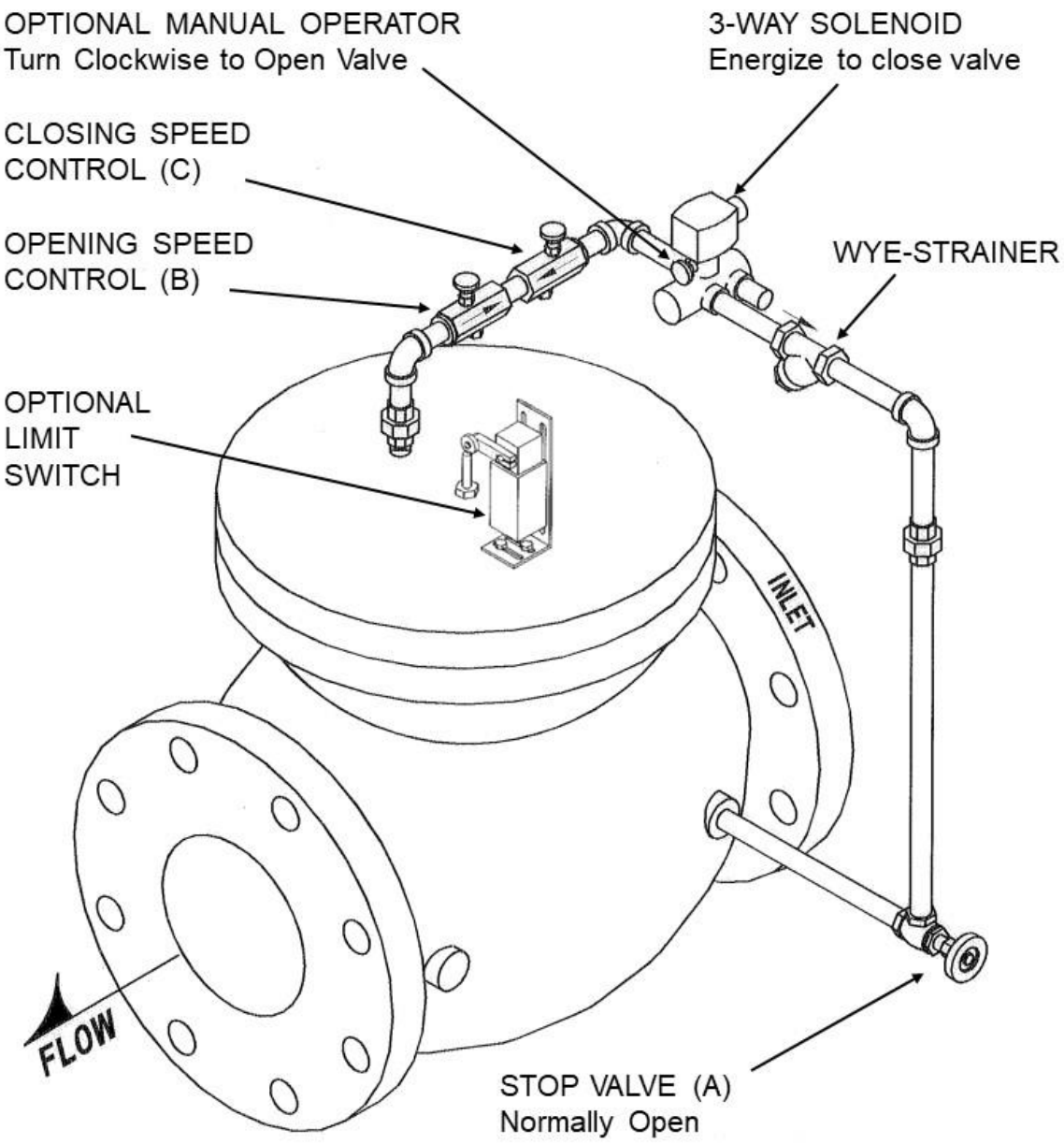
Instructions for the inspection, troubleshooting and repair of the main valves utilized in the GA Industries 12" to 16" Figure 7100-D normally open solenoid valves are provided in IOM-DPMV12-20 (Latest Rev)

Instructions for the inspection, troubleshooting and repair of the ASCO 8316G24 Solenoid Valve are provided in ASCO Form V6928.

REPLACEMENT PARTS
Genuine replacement parts are available from your local GA Industries representative or from the factory:

VAG USA, LLC
234 Clay Avenue
Mars, PA 16046 USA
Telephone: 724-776-1020
Fax: 724-776-1254
E-mail: quotes-ga@vag-group.com

Please have the nameplate data available when ordering parts.


OPTIONAL MANUAL OPERATOR
Turn Clockwise to Open Valve
3-WAY SOLENOID
Energize to close valve
CLOSING SPEED
CONTROL (C)
OPENING SPEED
CONTROL (B)
WYE-STRAINER
OPTIONAL
LIMIT
SWITCH
INLET
FLOW
STOP VALVE (A)
Normally Open

Section 2

OPERATION AND MAINTENANCE MANUAL

2½” to 10” Differential Piston Main Valves

Drawings G-1035, G-1036, G-1037, G-1041, G-1047, G-1051, D-1028 and D-1161

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Manual Number IOM-DPMV-2.5-10inch 041621

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INSTALLATION, OPERATION and MAINTENANCE

2½" to 10" Differential Piston Main Valve

INTRODUCTION

This manual provides information about the operation and proper maintenance of standard GA Industries differential piston main valves. The main valve is an integral part of all GA Industries differential piston pilot-operated control valve. The valve is ruggedly constructed to provide many decades of dependable service with minimal maintenance.

CAUTION
The valve is NOT recommended for use with toxic, corrosive, or flammable fluids.

The Shop Order (SO) Number, Figure Number, size and pressure rating are stamped on a nameplate attached to the valve. Please refer to the SO number when ordering parts.

DESCRIPTION OF OPERATION

The operation of the main valve is controlled by the pilot system which automatically closes, opens or throttles the main valve. The main valve consists on one moving part, the piston. Applying inlet pressure to the underside of the piston creates an opening force but simultaneously applying it to the larger area on top of the piston creates a greater closing force. Thus, applying inlet pressure to the top of the piston closes the main valve (Figure 1) while exhausting it from the top opens the main valve (Figure 2).

A regulating pilot controls the pressure applied to the top of the piston so that the opening and closing forces are balanced and the main valve is in a partially open, "throttled" position to control pressure level or flow (Figure 3).

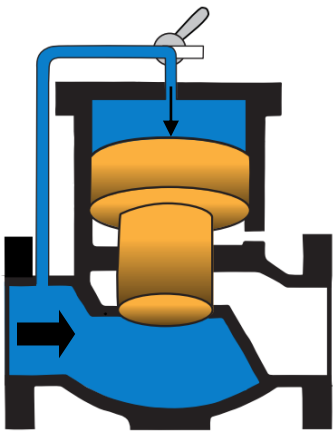

Figure 1. Valve Closed

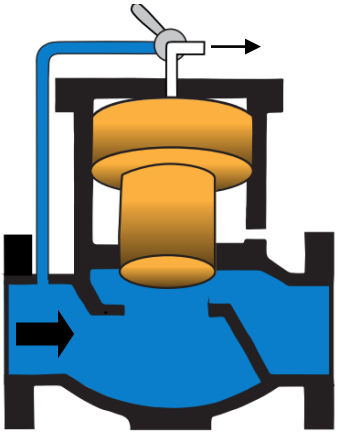

Figure 2. Valve Open

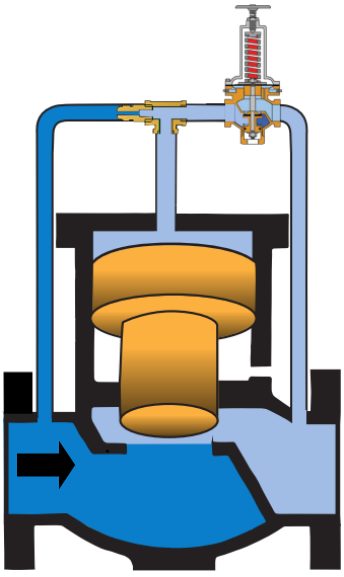

Figure 3. Valve Throttling

TYPES OF DIFFERENTIAL PISTON MAIN VALVES

There are two basic types of differential piston main valves: Water Service and Reducing Service. While there are exceptions, water service main valves are typically used in GA Industries pilot-operated control valves that perform an "open/close" (non-throttling) function (e.g., pump control, altitude, surge relief, solenoid) and reducing service main valves are typically used in GA Industries pilot-operated control valves that regulate or throttle (e.g., pressure reducing, pressure sustaining, flow control). The parts for water service main valves are different than for reducing service so it's important to know the type of main valve. To aid in identifying, Table 1 lists the diameter of the top of the piston or the factory can identify which type by the valve's serial (SO) number
.

Table 1 Top of Piston Diameter

SIZE	Water Service	Reducing Service
2½"	4.25"	3.50"
3"	4.25"	3.50"
4"	5.63"	4.63"
6"	8.00"	6.75"
8"	10.50"	8.75"
10"	13.00"	10.75"

Most GA Industries differential piston main valves incorporate a 1-piece piston. Some main valves are supplied with optional 2-piece "stop-check" piston (Figure 4). If the valve is open and there is a pressure reversal, the bottom part of the piston (the "baffle") drops and checks to prevent back flow through the valve.

The "stop-check" piston can be supplied in both water service and reducing service main valves.

Repair procedures and parts (except for the piston, baffle, and indicator rod) are the same whether a 1-piece or 2-piece piston.

Figure 4

RECEIVING AND STORAGE

Inspect the valve upon receipt for damage during shipment. Carefully unload all valves to the ground without dropping.

Valves should remain in a clean, dry and weather protected area until installed. After completion of shop testing the valve is drained of the test water but a small residual amount could remain so the valve should be protected from freezing during storage.

INSTALLATION

Figure Numbers suffixed with "D" indicate the valve has ANSI Class 125 flanged connections, Figure Numbers suffixed with "U" indicate the valve has ANSI Class 250 flanged connections.

GA Industries differential piston globe body main valves have the inlet and outlet connections in line while angle body main valves have the inlet and outlet connections 90 degrees apart.

Install the valve in the proper flow direction noting the "INLET" tag on the valve.

The valve is configured to be installed in the orientation specified by the engineer. Consult the drawings of record to verify the valve is installed in the proper orientation.

Prior to installation ensure all debris, packing material or other foreign material has been removed from both ports.

If installed outdoors, below ground in a vault or in an unheated area, adequate freeze protection must be provided.

Adequate isolating valves should be installed between the valve and the pipeline or system to facilitate maintenance.

The valve should be installed with sufficient clearance to permit maintenance and removal of internal components.

The valve is not designed to support adjacent equipment, piping loads should not be imposed on the valve and large valves should be properly supported. Ensure mating flanges are square and parallel to the valve flanges before tightening flange bolts.

Flat-faced flanged valves should be mated with flat-faced flanges and full-face gaskets. If ring gaskets are used the bolt material shall be ASTM A307 Grade B (or equivalent). Higher strength bolting should only be used with full-face gaskets.

Lower heavy valves using slings or chains around the valve body and/or the lifting eyes. DO NOT LIFT BY THE EXTERNAL PILOT PIPING. Lubricate the bolts or studs and insert around flange. Lightly tighten bolts until gaps are eliminated. Torque bolts in an alternating pattern in graduated steps. If leakage occurs wait 24 hours and re-torque the bolts but do not compress the gasket more than 50% or exceed bolt maximum torque rating.

MAIN VALVE CONSTRUCTION

The standard valve has a flanged cast iron body with a bolted cover. The piston and liner are made from bronze. The piston has a replaceable rubber seat, held in place by a brass or stainless steel follower ring and stainless steel screws. A brass or stainless steel visual position indicator is attached to the piston and extends through the valve cover through a packing gland. A brass or stainless steel vent tube protrudes from the side of the main valve.

Refer to Pages 5 to 7 for parts identification and location for each type of main valve.

START-UP

Refer to the Installation, Operation and Maintenance Manual for the start-up procedure applicable to the pilot-operated control valve being installed.

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PREVENTATIVE MAINTENANCE

Thew differential piston main valve does not require routine lubrication or adjustments. After the initial start-up, periodic visual inspection is recommended.

Perform any additional preventative maintenance procedures as recommended in the Installation, Operation and Maintenance Manual for the pilot-operated control valve being installed.

TROUBLESHOOTING

SYMPTOM or PROBLEM	SOLUTION
Main valve will not open	
• Water cannot exhaust from top of piston	Check status of manual valves and electrical connection to solenoids (if any) in external pilot piping
• Insufficient inlet pressure	Ensure inlet isolating valve is open and there is at least 5 to 10 PSI inlet pressure present. Small sizes require 10 PSI, minimum decreases with size.
• Vent tube blocked	Ensure vent tube (22) is open to atmosphere
• Indicator rod packing too tight	Turn indicator gland (17) counterclockwise in quarter turn increments
Main valve will not close	
• Inlet pressure cannot be applied to top of piston	Check status of manual valves and electrical connection to solenoids (if any) in external pilot piping
• Wye-strainer clogged	Clean strainer
Leakage through main valve when closed	
• Debris in valve	Remove debris, inspect for damage
• Worn or damaged seat ring (10)	Inspect, replace
Excessive leakage through vent tube (slight or intermittent leakage is normal)	
• Worn piston cup (4) and/or liner cup (7)	Replace
• Vent tube (22) loose or its threaded connection to liner (3) not sealed	Connection into liner (3) must be leak tight. Tighten and/or apply thread sealant.
Excessive leakage past indicator rod (slight or intermittent leakage is normal)	
• Indicator packing (18) worn or not sufficiently compressed	Turn indicator gland (17) clockwise one quarter to one half turn. DO NOT OVERTIGHTEN. If leakage does not stop, replace indicator packing.

REPAIR PROCEDURES

GA Industries differential piston main valves are fully serviceable and repairable while the body remains bolted in the line. No special tools are required for normal repair. Due to the weight of the internal components, servicing large valves requires overhead lifting equipment.

Special care must be utilized when servicing differential piston main valves when installed such that the piston is in a horizontal position. Service can be more easily performed if large valves installed in this manner are first removed from the line.

Repair kits are available (see REPAIR KITS) and should be on hand before starting any repairs.

The valve should be disassembled only to the point necessary to perform the repair.

These repair procedures apply only to the main valve. External pilot piping should be removed prior to undertaking disassembly of the main valve. Adequate unions are provided in the control piping to facilitate removal.

CAUTION

Repairs should be conducted by skilled technicians who have read all instructions and are familiar with the equipment and associated drawings. Follow all safety procedures.

WARNING

Before starting repairs, ensure valve is isolated from the system and properly locked out and tagged to prevent accidental pressurization. Completely de-pressurize the valve before commencing work.

INSTALLING A 2½" to 10" REPAIR KIT

1. Remove indicator gland (17) and indicator packing (18)
2. Scribe or mark an alignment line on the OD of the cover and the top flange of the valve body to ensure cover is properly aligned during assembly
3. Remove cover bolts/nuts (14)
4. Remove cover (13) lifting straight up to avoid damaging or bending the indicator rod (16)
5. Remove cover O-ring (32)
6. Loosen indicator rod lock nut (20) and remove indicator rod 16).
7. Remove piston (2). DO NOT use indicator rod to pull out the piston. If necessary, remove indicator rod bushing (19) and install 5/8-11 eyebolt to lift piston out of the valve.
8. Remove the piston U-cup (4A)
9. Remove the seat ring (10) by removing the follower screws (12) and follower (12).
10. Reach inside the liner and remove the liner U-cup (7A)
11. Using very fine wet or dry emery cloth, sand the large ID of the liner and the small OD of the piston to shiny metal. Inspect for deep scoring or gouges on those surfaces that cannot be polished out. Consult factory for evaluation if unsure.

12. Install new liner U-cup ensuring the lips are pointing into the valve. Apply a very light coating of lightweight lubricant such as petroleum jelly.
13. Replace seat ring (10), follower ring (11) and screws (12) and tighten. Do not over-tighten to the point where the seat ring or the follower ring deforms.
    a. Reducing service pistons: trim any rubber that extrudes beyond the small OD of the piston with a sharp utility type razor knife.
14. Install the new piston U-cup (4A) ensuring the lips are pointed toward the large diameter end of the piston. Apply a very light coating of lightweight lubricant such as petroleum jelly.
15. Apply a thin coating of lubricant to the large ID of the liner and the small OD of the piston.
16. Install the piston being careful not to damage the cups.
17. Install the indicator rod bushing (19). Clean and polish the indicator rod (16) with very fine emery cloth and install with indicator rod lock nut (20). Tighten lock nut.
18. Install cover new O-ring (32).
19. Align cover (13) and lower over indicator rod (16) *being careful not to bend the rod. Install cover* bolt/nuts (14) and tighten in alternating pattern.
20. Install new indicator packing (18) by wrapping it around the indicator rod and tamping until 2 or 3 threads are exposed. Cut off excess.
21. Install indicator gland (17) and tighten to compress packing only until resistance is felt. DO NOT OVERTIGHTEN. Packing compression can be adjusted once pressure has been introduced.
22. If desired, remove vent tube gland (23) and vent tube packing (24). DO NOT LOOSEN OR REMOVE vent tube (22). Replace packing as in step 20 above. Install vent tube gland (23) and tighten to compress packing.
23. Replace pilot piping, slowly introduce pressure to the valve and check for leaks. Tighten indicator rod gland only as much as needed to stop leakage.

LINER REMOVAL & INSTALLATION

1. Mark a line across top of liner and the top of the valve body to ensure the liner is properly aligned when installed.
2. Remove the vent tube gland (23), packing (24) and unscrew the vent tube (22). DO NOT DAMAGE THE VENT TUBE SEALING SURFACE.
3. Reach inside the liner (3) through the V-ports and pull up while slightly rotating. In the unlikely event the liner cannot be extracted from the valve body in this manner, follow steps 3a through 3h. Otherwise, proceed to step 4.
    a. Refer to Figure 5.
    b. The “lower bar” is a steel bar approximately 1” x ½” x long enough to be inserted through opposite V-ports and engage the liner. It should be drilled and tapped 5/8”-11 at its center.
    c. The “upper bar” is a steel bar the same size as the lower bar but with a length equal to the OD of the valve’s top flange. It should be drilled through 11/32” at its center.
    d. Support the upper bar on wooden blocks positioned just outside the OD of the liner.
    e. Insert a piece of 5/8”-11 all-thread through the upper bar and thread into the lower bar. It should be long enough to extend 1 to 2 inches beyond the upper bar.
    f. Install two 5/8”-11 hex nuts on the all thread and turn both nuts clockwise until resistance is felt.
    g. Continue to slowly turn the nuts to “jack” the liner outward. After a few turns the liner should “pop” at which time it can be removed.
    h. Note the liner in some 8” and 10” valves is in two pieces, a liner (3) and seat crown (21). Both pieces will be extracted using this method.

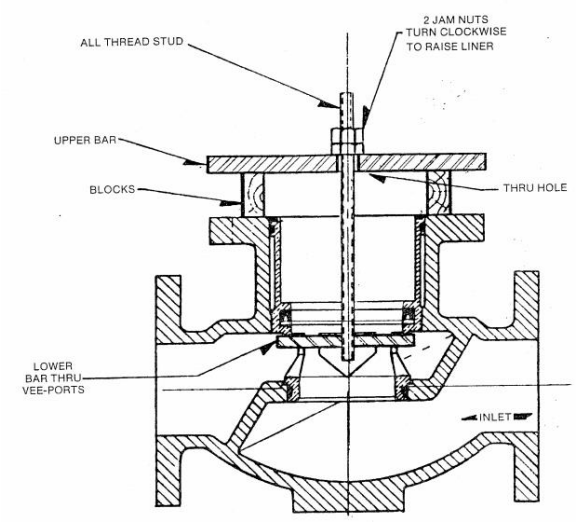

Figure 5

4. Once liner is extracted, remove top (33) and lower (35) liner O-rings.
5. Using very fine wet or dry emery cloth, sand the liner ID to shiny metal. Inspect for deep scoring or gouges that cannot be polished out. Consult factory for evaluation if unsure. Should a new liner be required, see **INSTALLING A NEW LINER**
6. Before installing the liner (and seat crown), lubricate the O-ring grooves and the top (33) and lower (35) O-rings and install in the appropriate grooves.
7. Clean and lubricate the areas of the valve body where the O-rings will seal.
8. Install the liner (3) so that it aligns with the mark, being careful not to damage the O-rings. If 2-piece liner, first install seat crown (21) then the liner (3).
9. The top of the liner should be flush with the top of the valve body. A mallet or wooden block can be used to bump the liner into position.
10. Apply pipe sealant or tape to the threads on one end of the vent tube (22) and thread into the liner. Tighten to a leak tight joint.

11. Install vent tube packing (24) and gland (23) and tighten to compress packing.

INSTALLING A NEW LINER

New liners are not drilled and tapped to accept the vent tube. Follow these instructions to ensure the liner is properly aligned before drilling/tapping.

1-Piece Liner

1. Locate the raised boss on the OD of the liner, compare to old liner
2. Install liner (3) without any O-rings in the valve body ensuring it is flush with the top of the valve body. Center the liner's boss on the vent tube hole in the side of the valve body.
3. Loosely install the vent tube gland (23) and slide in the vent tube (22). Insert a center punch through the vent tube and punch a mark in the liner.
4. Make an alignment mark across the liner and the top flange of the valve body
5. Remove the vent tube (22), gland (23) and liner (3).
6. Tap drill the liner 11/32" centered on the punch mark and tap 1/8" NPT.
7. Install liner in body and loosely screw in the vent tube and gland. If everything fits, remove gland, vent tube and liner and proceed with reassembly.

2-Piece Liner

1. There is no raised boss on the 2-piece liner
2. Install seat crown (21) and liner (3) without any O-rings in the valve body ensuring the liner is flush with the top of the valve body.
3. Loosely install the vent tube gland (23) and slide in the vent tube (22). Insert a center punch through the vent tube and punch a mark in the liner.
4. Make an alignment mark across the liner and the top flange of the valve body
5. Remove the vent tube (22), gland (23) and liner (3).
6. Tap drill the liner 11/32" centered on the punch mark and tap 1/8" NPT.
7. Install liner in body and loosely screw in the vent tube and gland. If everything fits, remove gland, vent tube and liner and proceed with reassembly.

REPLACEMENT PARTS

Genuine replacement parts are available from your local GA Industries representative or from the factory:

VAG USA, LLC
234 Clay Avenue
Mars, PA 16046 USA
Telephone: 724-776-1020
Fax: 724-776-1254
E-mail: quotes-ga@vag-group.com

Please have the nameplate data available when ordering parts.

REPAIR KITS

The below Soft Goods Repair Kits are applicable to 2½" to 10" GA Industries differential piston main valves with a serial number 800000 or higher. The kits contain part numbers 4A, 7A, 10, 18, 24, 32, 33 and 35.

Reducing Service Kits

Size	Kit Number	Part Number
2½"	GA3R	2-80-23000-007
3"	GA3R	2-80-23000-007
4"	GA4R	2-80-23000-009
6"	GA6R	2-80-23000-012
8"	GA8R	2-80-23000-015
10"	GA10R	2-80-23000-004

Water Service Kits

Size	Kit Number	Part Number
2½"	GA3W	2-80-23000-008
3"	GA3W	2-80-23000-008
4"	GA4W	2-80-23000-010
6"	GA6W	2-80-23000-014
8"	GA8W	2-80-23000-016
10"	GA10W	2-80-23000-005

All other parts are ordered separately.

Consult factory for valves with lower serial numbers.

PARTS LIST

Refer to Figures 6, 7, 8 and 9 for parts location.

Item	Part Name
1	Body
2	Piston
2a	Baffle
3	Liner
4a	Piston U-Cup
7a	Liner U-Cup
10	Seat Ring
12	Sear Ring Follower Screws
14	Cover Bolts/Nuts
16	Indicator Rod
17	Indicator Gland
18	Indicator Packing
19	Indicator Bushing
20	Indicator Lock Nut
22	Vent Tube
23	Vent Tube Gland
24	Vent Packing
32	Cover O-Ring
33	Top Liner O-Ring
35	Lower Liner O-Ring

WARRANTY:

The Warranty for GA Industries valves is included in our Terms and Conditions which can be found here: https://gaindustries.com/terms

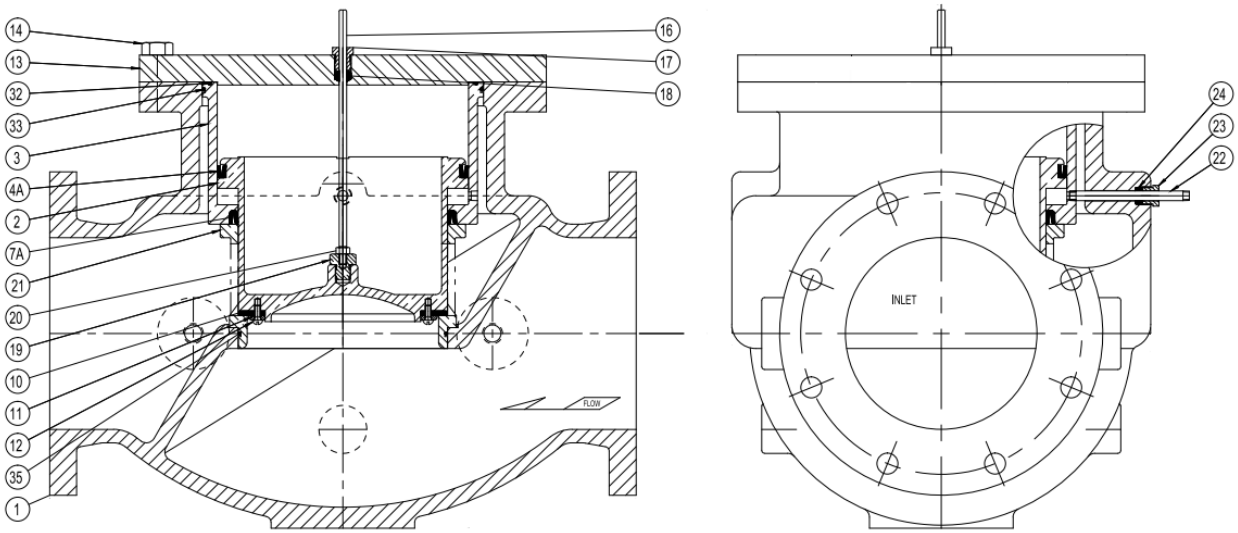

Figure 6 Globe Body

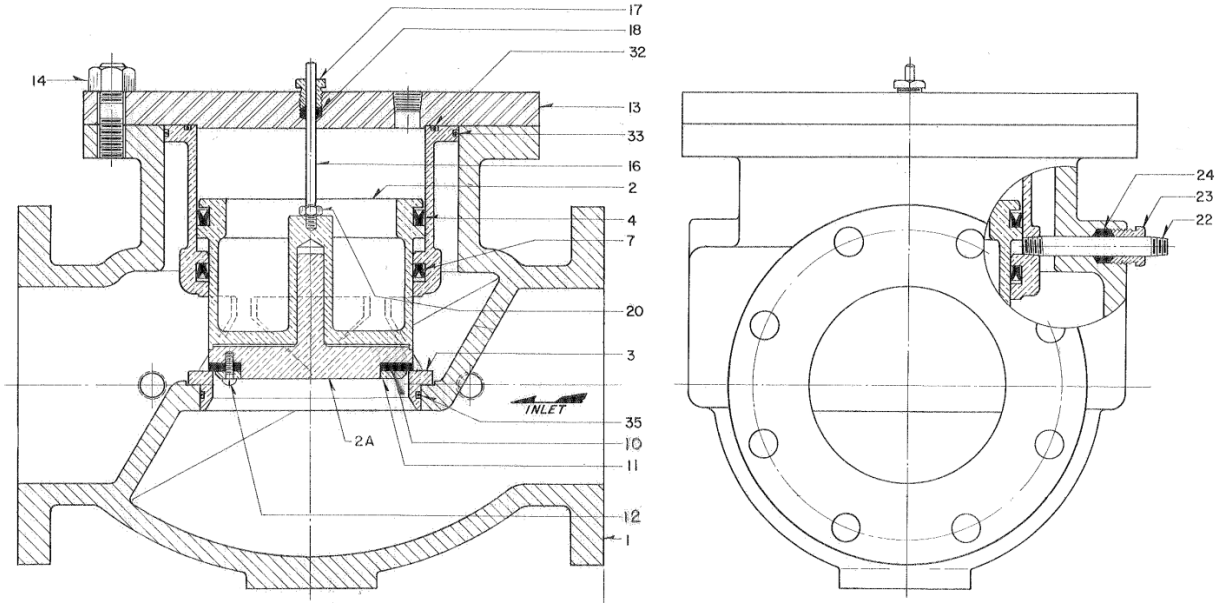

Figure 7 Globe Body, Stop Check

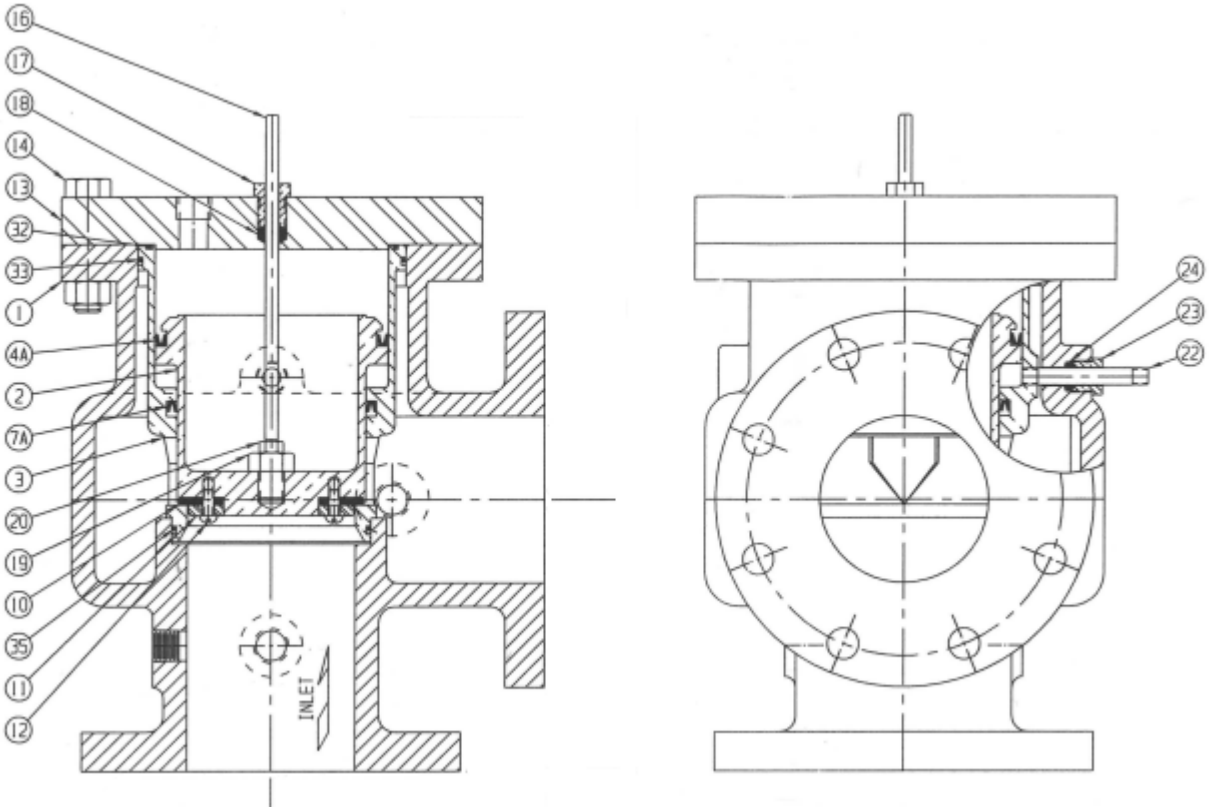

Figure 8 Angle Body

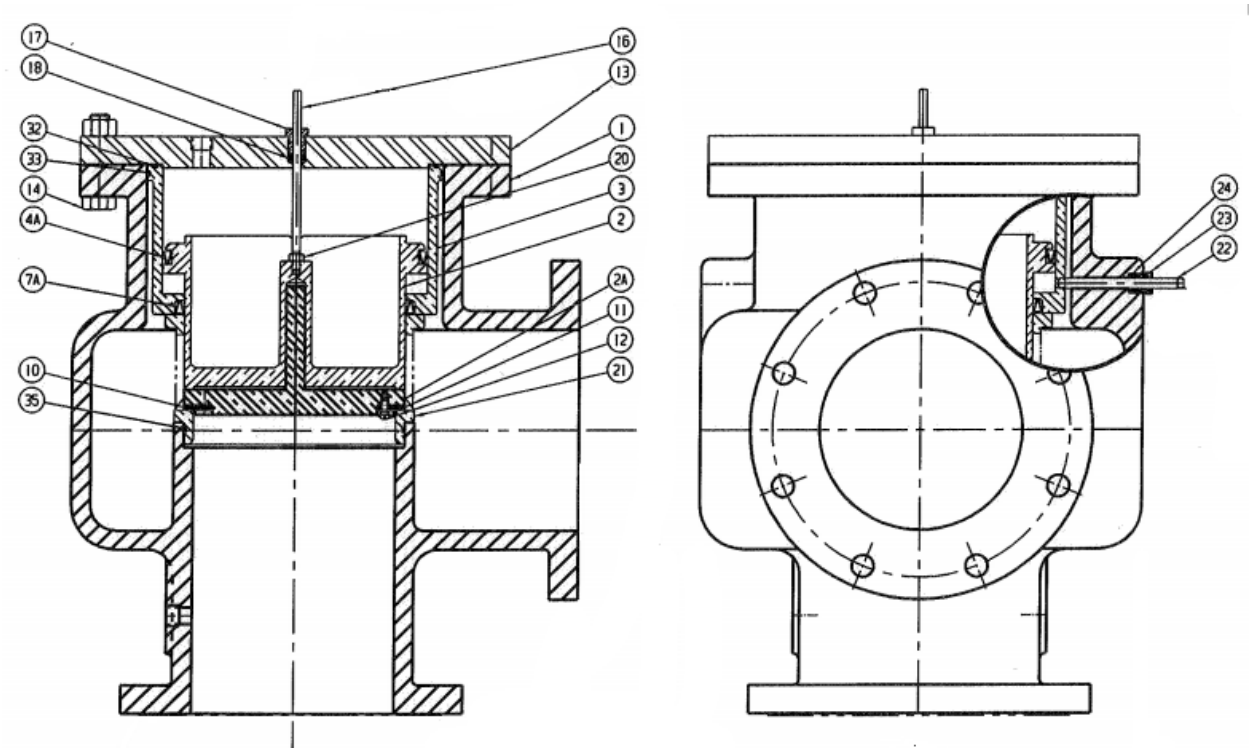

Figure 9 Angle Body, Stop Check

Section 3

OPERATION AND MAINTENANCE MANUAL

12” to 20” Differential Piston Main Valves

Drawings D-1027, D-1036, G-1031, G-1052, G-1054, G-1064

TABLE OF CONTENTS

GA INDUSTRIES
A VAG-Group Brand

234 Clay Avenue • Mars, PA 16046 USA
Telephone (724) 776-1020 • Fax (724) 776-1254
E-mail: info-ga@vag-group.com

Manual Number IOM-DPMV-12-20inch 073121 (Rev 1)

WARNING: Cancer and Reproductive Harm – www.Prop65Warnings.ca.gov

INSTALLATION, OPERATION and MAINTENANCE

12” to 20” Differential Piston Main Valve

INTRODUCTION

This manual provides information about the operation and proper maintenance of standard GA Industries differential piston main valves. The main valve is an integral part of all GA Industries differential piston pilot-operated control valve. The valve is ruggedly constructed to provide many decades of dependable service with minimal maintenance.

CAUTION

The valve is NOT recommended for use with toxic, corrosive, or flammable fluids.

The Shop Order (SO) Number, Figure Number, size and pressure rating are stamped on a nameplate attached to the valve. Please refer to the SO number when ordering parts.

DESCRIPTION OF OPERATION

The operation of the main valve is controlled by the pilot system which automatically closes, opens or throttles the main valve. The main valve consists on one moving part, the piston. Applying inlet pressure to the underside of the piston creates an opening force but simultaneously applying it to the larger area on top of the piston creates a greater closing force. Thus, applying inlet pressure to the top of the piston closes the main valve (Figure 1) while exhausting it from the top opens the main valve (Figure 2).

A regulating pilot controls the pressure applied to the top of the piston so that the opening and closing forces are balanced and the main valve is in a partially open, “throttled” position to control pressure level or flow (Figure 3).

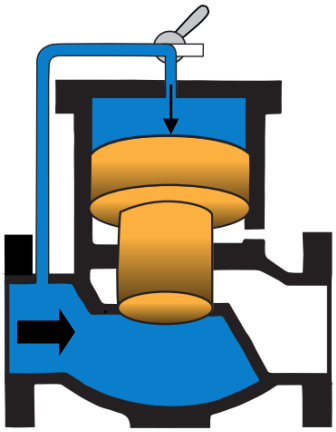

Figure 1. Valve Closed

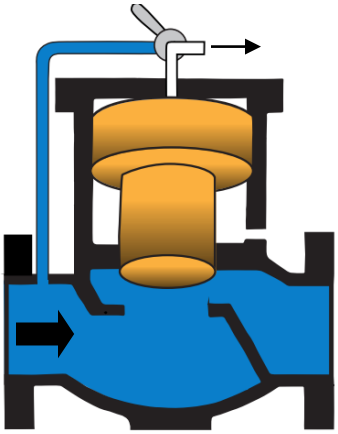

Figure 2. Valve Open

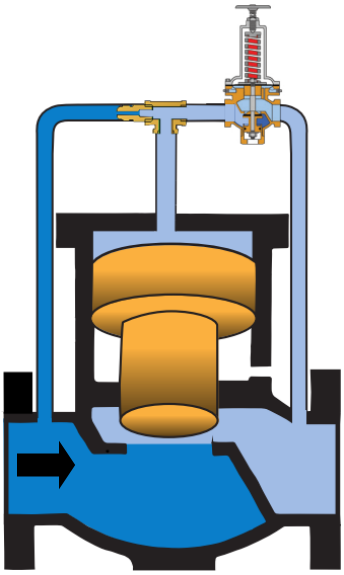

Figure 3. Valve Throttling

TYPES OF DIFFERENTIAL PISTON MAIN VALVES

There are two basic types of differential piston main valves: Water Service and Reducing Service. While there are exceptions, water service main valves are typically used in GA Industries pilot-operated control valves that perform an “open/close” (non-throttling) function (e.g., pump control, altitude, surge relief, solenoid) and reducing service main valves are typically used in GA Industries pilot-operated control valves that regulate or throttle (e.g., pressure reducing, pressure sustaining, flow control). The parts for water service main valves are different than for reducing service so it’s important to know the type of main valve.

To aid in identifying, Table 1 lists the diameter of the top of the piston or the factory can identify which type by the valve’s serial (SO) number

Table 1 Top of Piston Diameter

SIZE	Water Service	Reducing Service
12”	15”	12.75”
14”	19”	15”
16”	21.75”	17”
18”	24.75”	21.25”
20”	24.75”	21.25”

Most GA Industries differential piston main valves incorporate a 1-piece piston. Some main valves are supplied with optional 2-piece “stop-check” piston (Figure 4). If the valve is open and there is a pressure reversal, the bottom part of the piston (the “baffle”) drops and checks to prevent back flow through the valve.

The “stop-check” piston can be supplied in both water service and reducing service main valves.

Repair procedures and parts (except for the piston, baffle, and indicator rod) are the same whether a 1-piece or 2-piece piston.

Figure 4

RECEIVING AND STORAGE

Inspect the valve upon receipt for damage during shipment. Carefully unload all valves to the ground without dropping.

Valves should remain in a clean, dry, and weather protected area until installed. After completion of shop testing the valve is drained of the test water but a small residual amount could remain so the valve should be protected from freezing during storage.

INSTALLATION

Figure Numbers suffixed with “D” indicate the valve has ANSI Class 125 flanged connections, Figure Numbers suffixed with “U” indicate the valve has ANSI Class 250 flanged connections.

GA Industries differential piston globe body main valves have the inlet and outlet connections in line while angle body main valves have the inlet and outlet connections 90 degrees apart.

Install the valve in the proper flow direction noting the “INLET” tag on the valve.

The valve is configured to be installed in the orientation specified by the engineer. Consult the drawings of record to verify the valve is installed in the proper orientation.

Prior to installation ensure all debris, packing material or other foreign material has been removed from both ports.

If installed outdoors, below ground in a vault or in an unheated area, adequate freeze protection must be provided.

Adequate isolating valves should be installed between the valve and the pipeline or system to facilitate maintenance.

The valve should be installed with sufficient clearance to permit maintenance and removal of internal components.

The valve is not designed to support adjacent equipment, piping loads should not be imposed on the valve and large valves should be properly supported. Ensure mating flanges are square and parallel to the valve flanges before tightening flange bolts.

Flat-faced flanged valves should be mated with flat-faced flanges and full-face gaskets. If ring gaskets are used the bolt material shall be ASTM A307 Grade B (or equivalent). Higher strength bolting should only be used with full-face gaskets.

Lower heavy valves using slings or chains around the valve body and/or the lifting eyes. DO NOT LIFT BY THE EXTERNAL PILOT PIPING. Lubricate the bolts or studs and insert around flange. Lightly tighten bolts until gaps are eliminated. Torque bolts in an alternating pattern in graduated steps. If leakage occurs wait 24 hours and re-torque the bolts but do not compress the gasket more than 50% or exceed bolt maximum torque rating.

MAIN VALVE CONSTRUCTION

The standard valve has a flanged cast iron body with a bolted cover. The piston and liner are made from bronze. The piston has a replaceable rubber seat, held in place by a brass or stainless steel follower ring and stainless steel screws. A brass or stainless steel visual position indicator is attached to the piston and extends through the valve cover through a packing gland. A brass or stainless steel vent tube protrudes from the side of the main valve.

Refer to Pages 5 to 7 for parts identification and location for each type of main valve.

START-UP

Refer to the Installation, Operation and Maintenance Manual for the start-up procedure applicable to the pilot-operated control valve being installed.

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PREVENTATIVE MAINTENANCE

Thew differential piston main valve does not require routine lubrication or adjustments. After the initial start-up, periodic visual inspection is recommended.

Perform any additional preventative maintenance procedures as recommended in the Installation, Operation and Maintenance Manual for the pilot-operated control valve being installed.

TROUBLESHOOTING

SYMPTOM or PROBLEM	SOLUTION
Main valve will not open	
• Water cannot exhaust from top of piston	Check status of manual valves and electrical connection to solenoids (if any) in external pilot piping
• Insufficient inlet pressure	Ensure inlet isolating valve is open and there is at least 5 to 10 PSI inlet pressure present. Small sizes require 10 PSI, minimum decreases with size.
• Vent tube blocked	Ensure vent tube (22) is open to atmosphere
• Indicator rod packing too tight	Turn indicator gland (17) counterclockwise in quarter turn increments
Main valve will not close	
• Inlet pressure cannot be applied to top of piston	Check status of manual valves and electrical connection to solenoids (if any) in external pilot piping
• Wye-strainer clogged	Clean strainer
Leakage through main valve when closed	
• Debris in valve	Remove debris, inspect for damage
• Worn or damaged seat ring (10)	Inspect, replace
Excessive leakage through vent tube (slight or intermittent leakage is normal)	
• Worn piston cup (4) and/or liner cup (7)	Replace
• Vent tube (22) loose or its threaded connection to liner (3) not sealed	Connection into liner (3) must be leak tight. Tighten and/or apply thread sealant.
Excessive leakage past indicator rod (slight or intermittent leakage is normal)	
• Indicator packing (18) worn or not sufficiently compressed	Turn indicator gland (17) clockwise one quarter to one half turn. DO NOT OVERTIGHTEN. If leakage does not stop, replace indicator packing.

REPAIR PROCEDURES

GA Industries differential piston main valves are fully serviceable and repairable while the body remains bolted in the line. No special tools are required for normal repair. Due to the weight of the internal components, servicing large valves requires overhead lifting equipment.

Special care must be utilized when servicing differential piston main valves when installed such that the piston is in a horizontal position. Service can be more easily performed if large valves installed in this manner are first removed from the line.

Repair kits are available (see REPAIR KITS) and should be on hand before starting any repairs.

The valve should be disassembled only to the point necessary to perform the repair.

These repair procedures apply only to the main valve. External pilot piping should be removed prior to undertaking disassembly of the main valve. Adequate unions are provided in the control piping to facilitate removal.

CAUTION

Repairs should be conducted by skilled technicians who have read all instructions and are familiar with the equipment and associated drawings. Follow all safety procedures.

WARNING

Before starting repairs, ensure valve is isolated from the system and properly locked out and tagged to prevent accidental pressurization. Completely de-pressurize the valve before commencing work.

INSTALLING A 12” to 20” REPAIR KIT

1. Remove indicator gland (17) and indicator packing (18)
2. Scribe or mark an alignment line on the OD of the cover and the top flange of the valve body to ensure cover is properly aligned during assembly
3. Remove cover bolts/nuts (14)
4. Remove cover (13) lifting straight up to avoid damaging or bending the indicator rod (16)
5. Remove cover gasket (15)
6. Loosen indicator rod lock nut (20) and remove indicator rod (16).
7. Make a mark across the top of the liner and body to permit alignment when the liner is replaced.
8. Remove the vent tube gland (23), vent tube packing (24) and unscrew the vent tube (22)
9. Remove piston (2). DO NOT use indicator rod to pull out the piston. If necessary, remove indicator rod bushing (19) and install 5/8-11 eyebolt to lift piston out of the valve (18” & 20” is 1”-14).
10. Remove the piston cup follower screws (6), piston cup follower (5) and piston cup (4).
11. Remove the seat ring (10) by removing the follower screws (12) and follower (11).
12. Remove the liner (3), liner cup follower screws (9), liner cup follower (9) and liner cup (7).
13. Using very fine wet or dry emery cloth, sand the large ID of the liner and the small OD of the piston

to shiny metal. Inspect for deep scoring or gouges on those surfaces that cannot be polished out. Consult factory for evaluation if unsure. See next section if new liner is needed.

14. Clean the top of the body (1) and liner (3) and the mating surfaces of the cover (13) of any gasket residue.
15. Install new liner cup (7) ensuring the lips are pointing into the valve. Install the liner cup follower (8) and screws (7) and tighten uniformly in an alternating pattern. Do not tighten so much as to deform the follower. Apply a very light coating of lightweight lubricant such as petroleum jelly.
16. Install assembled liner in valve body and align marks. Apply thread sealant to one end of the vent tube (23), install in threaded hole in liner and tighten. Install vent tube packing (24) by wrapping it around the vent tube and tamping it into the cavity until 2 or 3 internal threads are exposed. Cut off the excess. Install vent tube gland (23) and lightly tighten.
17. Install a new seat ring (10), follower ring (11) and screws (12) and tighten. Do not over-tighten to the point where the seat ring or the follower ring deforms.
    a. Reducing service pistons: trim any rubber that extrudes beyond the small OD of the piston with a sharp utility type razor knife.
18. Install the new piston cup (4) ensuring the lips are pointed toward the large diameter end of the piston. Install the follower ring (5) and screws (6) and tighten uniformly in an alternating pattern. Do not tighten so much as to deform the follower. Apply a very light coating of lightweight lubricant such as petroleum jelly.
19. Apply a thin coating of lubricant to the large ID of the liner and the small OD of the piston.
20. Run a finger under the liner cup to flare its lip inward to facilitate an initial seal. Install the piston being careful not to damage the cups.
21. Install the indicator rod bushing (19). Clean and polish the indicator rod (16) with very fine emery cloth and install with indicator rod lock nut (20). Tighten lock nut.
22. Place new cover gasket (15) on top of valve aligning bolt holes.
23. Align cover (13) and lower over indicator rod (16) *being careful not to bend the rod.* Install cover bolt/nuts (14) and tighten in alternating pattern.
24. Install new indicator packing (18) by wrapping it around the indicator rod and tamping until 2 or 3 threads are exposed. Cut off excess.
25. Install indicator gland (17) and tighten to compress packing only until resistance is felt. DO NOT OVERTIGHTEN. Packing compression can be adjusted once pressure has been introduced.
26. Replace pilot piping, slowly introduce pressure to the valve and check for leaks. Tighten indicator rod gland (17) and vent tube gland (23) only as much as needed to stop leakage.

INSTALLING A NEW LINER

New liners are not drilled and tapped to accept the vent tube. Follow these instructions to ensure the liner is properly aligned before drilling/tapping.

1. Make a mark on the top flange of the new liner centered on the location of one of the two bosses on the side of the liner.
2. Make a mark on the top flange of the body centered on the location of the vent tube
3. Install liner in the valve body ensuring the liner is flush with the top of the valve body and the two marks are aligned.
4. Loosely install the vent tube gland (23) and slide in the vent tube (22). Insert a center punch through the vent tube and punch a mark in the liner.
5. Remove the vent tube (22), gland (23) and liner (3).
6. Tap drill the liner to accept the vent tube:
   a. 12" and 14" – tap drill 37/64" and tap ⅜" NPT
   b. 16" to 20" – tap drill 23/32" and tap ½" NPT
7. Install liner in body and loosely screw in the vent tube and gland. If everything fits, remove gland, vent tube and liner and proceed with reassembly Step 15 in previous section.

REMOVING & INSTALLING A NEW SEAT CROWN

Note: The seat crown (21) in reducing service valves (see Table 1) is threaded in and bonded and is not easily removed. If damaged, it may have to be "cut out."

Removing a water service seat crown:

1. After the piston and liner have been removed, reach inside the seat crown (21) through the V-ports and pull up while slightly rotating. In the unlikely event the liner cannot be extracted from the valve body in this manner, refer to Figure 5 and follow these steps.
   a. The "lower bar" is a steel bar approximately 1" x ½" x long enough to be inserted through opposite V-ports and engage the liner. It should be drilled and tapped 5/8"-11 at its center.
   b. The "upper bar" is a steel bar the same size as the lower bar but with a length equal to the OD of the valve's top flange. It should be drilled through 11/32" at its center.
   c. Support the upper bar on wooden blocks positioned just outside the OD of the liner.
   d. Insert a piece of 5/8"-11 all-thread through the upper bar and thread into the lower bar. It should be long enough to extend 1 to 2 inches beyond the upper bar.
   e. Install two 5/8"-11 hex nuts on the all thread and turn both nuts clockwise until resistance is felt.
   f. Continue to slowly turn the nuts to "jack" the liner outward. After a few turns the liner should "pop" at which time it can be removed.

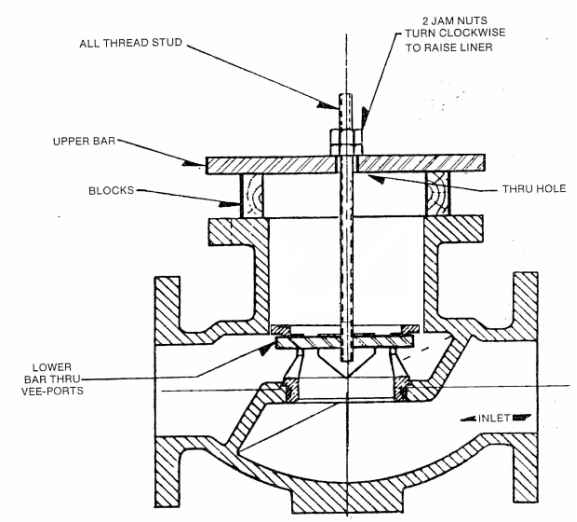


Figure 5

Installing a new water service seat crown:

1. Lubricate and install a new seat crown O-ring (35) in seat crown (21)
2. Clean the surface in the body where the seat crown (21) will sit
3. Lubricate the inside of the bore in the body where the seat crown is inserted
4. Carefully lower the seat crown (21) with O-ring (35) through the top of the body (large valves will require overhead lifting equipment) until it is inserted into the body bore being careful not
5. Ensure it is fully inserted and seated before continuing with reassembly step 14 on page 4.

REPLACEMENT PARTS

Genuine replacement parts are available from your local GA Industries representative or from the factory:

VAG USA, LLC
234 Clay Avenue
Mars, PA 16046 USA
Telephone: 724-776-1020
Fax: 724-776-1254
E-mail: quotes-ga@vag-group.com

Please have the nameplate data available when ordering parts.

REPAIR KITS

The below Soft Goods Repair Kits are applicable to 12" to 20" GA Industries differential piston main valves. Prior to 2014 the first two digits of the SO number are the year (660217 = 1966, 800907, 80 = 1980, 020100, 02 = 2002), followed by a sequential number. Beginning in 2014 the SO numbers start with 432 (43203718) followed by a sequential number and do not indicate the year.

The water service kits contain part numbers 4, 7, 10, 15, 18, 24 and 35. Part number 35 is not included in the reducing service kits.

Water Service Kits

Size	Kit Number	Part Number
12"	WS12	2-80-23000-008
14"	WS14	2-80-23000-008
16"	WS16	2-80-23000-010
18" & 20"	WS18/20	2-80-23000-014

Reducing Service Kits

Size	Kit Number	Part Number
12"	R12	2-80-23000-007
14"	R14	2-80-23000-007
16"	R16	2-80-23000-009
18" & 20"	R18/20	2-80-23000-012

All other parts are ordered separately.

Consult factory for valves with older serial numbers.

PARTS LIST

Refer to Figures 6, 7, 8 and 9 for parts location.

Item	Part Name
1	Body
2	Piston
2a	Baffle
3	Liner
4	Piston Cup
5	Piston Cup Follower
6	Piston Cup Follower Screw
7	Liner Cup
8	Liner Cup Follower
9	Liner Cup Follower Screw
10	Seat Ring
11	Seat Ring Follower
12	Sear Ring Follower Screws
13	Cover
14	Cover Bolts/Nuts
15	Cover Gasket
16	Indicator Rod
17	Indicator Gland
18	Indicator Packing
19	Indicator Bushing
20	Indicator Lock Nut
21	Seat Crown
22	Vent Tube
23	Vent Tube Gland
24	Vent Packing
35	Seat Crown O-Ring

WARRANTY:

The Warranty for GA Industries valves is included in our Terms and Conditions which can be found here: https://gaindustries.com/terms

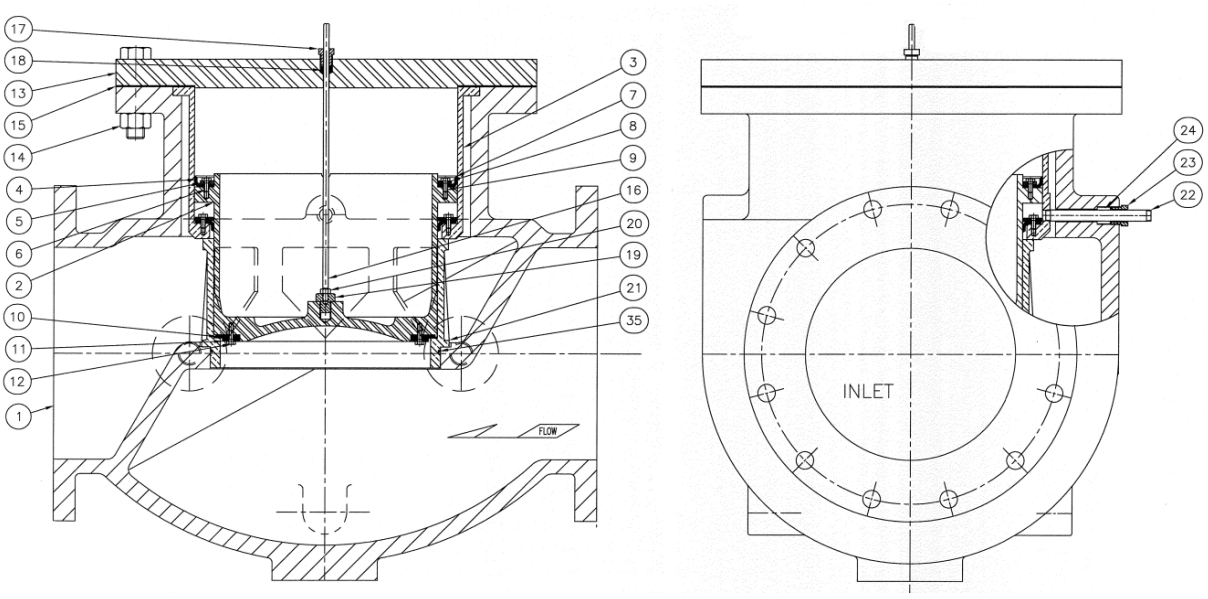


Figure 6 Globe Body, Reducing Service

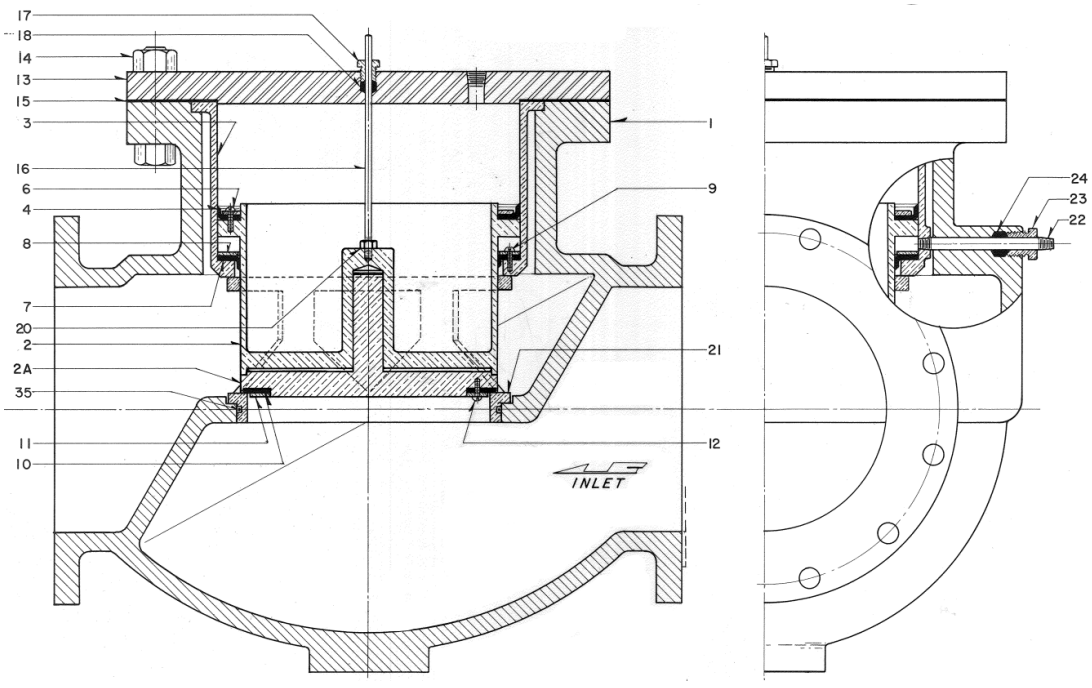


Figure 7 Globe Body Stop Check Piston, Water Service

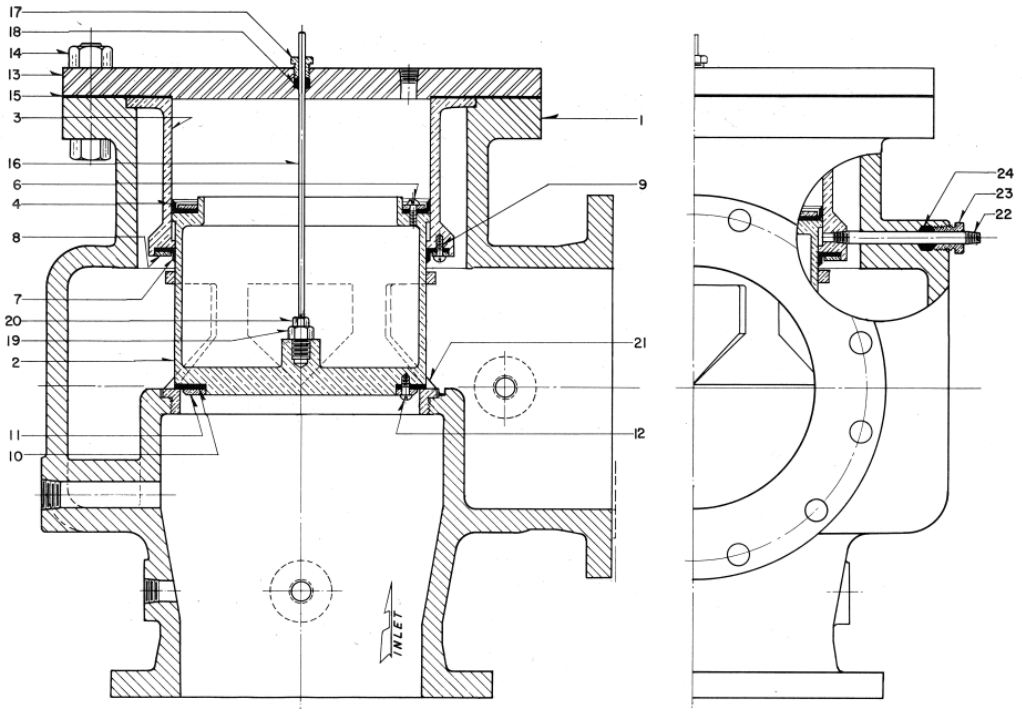


Figure 8 Angle Body, Reducing Service

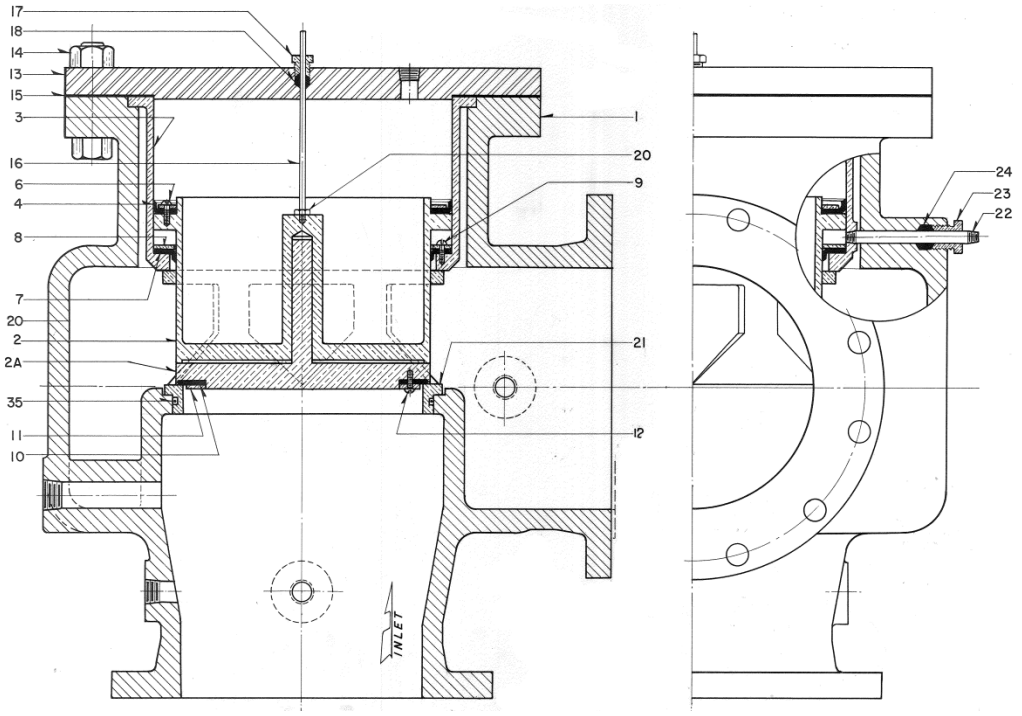


Figure 9 Angle Body, Stop Check, Water Service

Section 4

Installation & Maintenance Instructions

3–WAY INTERNAL OR EXTERNAL PILOTED SOLENOID VALVES
NORMALLY CLOSED OPERATION — AIR OR INERT GAS SERVICE
1/4″, 3/8″ OR 1/2″ NPT — 5/16″ OR 5/8″ ORIFICE

SERIES

8316

Form No.V6928R3 – Sec. 1
(Section 1 of 2)

NOTICE: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Causes of Improper Operation, and Solenoid Replacement.

For exploded views, see Form No. V6928R3 – Section 2 of 2.

DESCRIPTION

Series 8316 valves are 3–way solenoid valves designed for air or inert gas service. Depending upon requirements, this valve may be used in either the **Internal Piloting Mode** or **External Piloting Mode** of operation. This unique valve design allows the user to relocate (*turn over*) the **Support with Flow Gaskets** to change the mode of valve operation. For additional information on valve operation, see sections on ***OPERATION*** and ***CHANGING MODE OF OPERATION***.

Series 8316 valves are available in three solenoid versions; standard, low power and intrinsically safe. Valves are rugged forged brass with internal parts of stainless steel and low temperature Buna N elastomers.

NOTICE

This valve is supplied from the factory in the **Internal Piloting Mode** of operation. Refer to ***OPERATION – INTERNAL PILOTING MODE*** following.

To change valve mode of operation to **External Piloting Mode,** see section on ***CHANGING MODE OF OPERATION*** on page 2 of 6**.**

OPERATION – INTERNAL PILOTING MODE

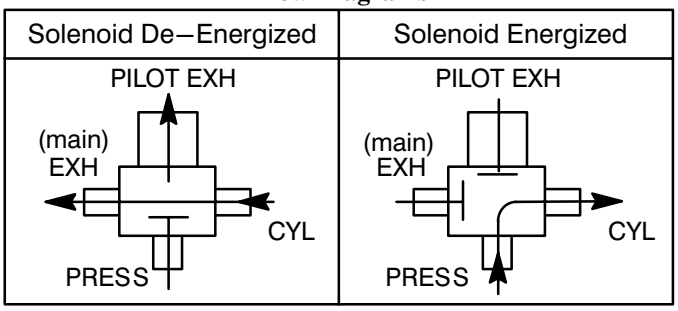
IMPORTANT: Internal piloted valves require a minimum operating pressure differential of 15 psi.

Normally Closed

Solenoid De–energized: Flow is from cylinder **"CYL"** to main exhaust **"EXH".** Internal pressure is vented briefly through pilot exhaust. Pressure **"PRESS"** is closed.

Solenoid Energized: Flow is from pressure **"PRESS"** to cylinder **"CYL"**. Main exhaust **"EXH"** and pilot exhaust are closed.

Flow Diagrams



OPERATION – EXTERNAL PILOTING MODE

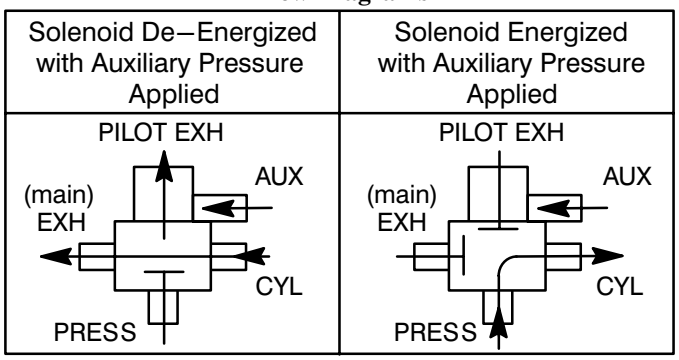
The external piloting mode of operation allows a zero minimum main line pressure with the application of proper auxiliary air pressure. Refer to operating instructions (to follow) and the graph ***Auxiliary Pilot Pressure vs Main Line Pressure***. Use this graph to determine the minimum auxiliary air pressure required for a given main line pressure.

Normally Closed

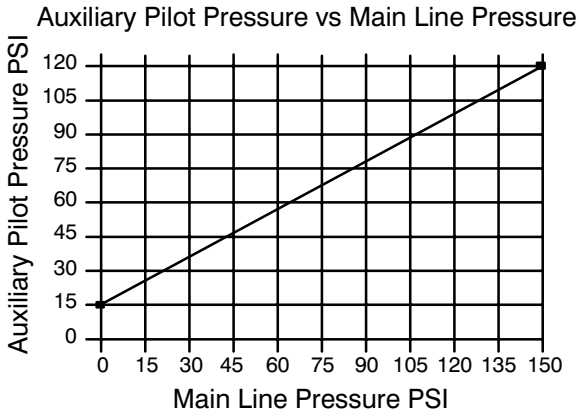
Solenoid De–energized with Auxiliary Pressure Applied: Flow is from cylinder **"CYL"** to main exhaust **"EXH".** Internal pressure is vented briefly through pilot exhaust. Pressure **"PRESS"** is closed.

Solenoid Energized with Auxiliary Pressure Applied: Flow is from pressure **"PRESS"** to cylinder **"CYL"**. Main exhaust **"EXH"** and pilot exhaust are closed.

Flow Diagrams



Note: If main line pressure is lost, with solenoid de–energized or energized external piloted valves will not change position as long as auxiliary pilot pressure is present. If auxiliary pilot pressure is lost while main line pressure is present, valve will change position if solenoid is energized, but will not change position if solenoid is de–energized.



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CHANGING MODE OF OPERATION

⚠ WARNING: To prevent the possibility of death, personal injury or property damage, turn off electrical power, depressurize valve, and vent fluid to a safe area before changing mode of operation.

The piloting (Mode of Operation) of the valve is determined by the positioning of the **Support with Flow Gaskets** on the side of the valve body. See Figures 1 & 2 for proper positioning of **Support with Flow Gaskets** for internal or external piloting mode of operation.

Positioning of Support with Flow Gaskets for Internal Piloting Mode

To change to the **Internal Piloting Mode** of operation if previously installed in the external piloting mode or rebuild after valve disassembly for maintenance, proceed as follows:

1. Install a 1/8″ NPT pipe plug in the port marked AUX, auxiliary pressure connection.

NOTE: To change to internal piloting, remove cover screws (2), cover and support with large and small flow gaskets. Just ***turn over*** the support 180° to change piloting and reassemble. To verify piloting selection, follow rebuild instructions steps below.

2. Refer to views in Figure 1 for proper location and position of parts for **Internal Piloting Mode** of operation.
3. Position large and small flow gaskets in support. Large gasket must be compressed to fit support configuration.
4. Line up support (with flow gaskets) on side wall of valve body using machine screw holes as a guide. When support is correctly positioned (as shown in Figure 1.) the letters INT are visible and letters EXT on opposite side are covered by the support. Confirm proper alignment with views in Figure 1. Then replace cover and cover screws. Torque cover screws evenly to 13 ± 1 in−lbs [1,5 ± 0,1 Nm].
5. Refer to ***OPERATION − INTERNAL PILOTING MODE*** section.

Positioning of Support with Flow Gaskets for External Piloting Mode

To change to the **External Piloting Mode** of operation before valve installation or rebuild after valve disassembly for maintenance, proceed as follows:

1. Remove a 1/8″ NPT pipe plug from auxiliary pressure connection port marked AUX, using a 5/16″ hex key wrench and connect auxiliary pilot pressure piping.

NOTE: To change to external piloting, remove cover screws (2), cover and support with large and small flow gaskets (2). Just ***turn over*** the support 180° to change piloting and reassemble. To verify piloting selection, follow rebuild instructions steps below.

2. Refer to views in Figure 2 for proper location and position of parts for **External Piloting Mode** of operation.
3. Position large and small flow gaskets in support. Large gasket must be compressed to fit support configuration.
4. Line up support (with flow gaskets) on side wall of valve body using machine screw holes as a guide. When support is correctly positioned (as shown in Figure 2.) the letters EXT are visible and letters IN T on opposite side are covered by the support. Confirm proper alignment with views in Figure 2. Then replace cover and cover screws. Torque screws evenly to 13 ± 1 in−lbs [1,5 ± 0,1 Nm].
5. Refer to ***OPERATION − EXTERNAL PILOTING MODE*** section.

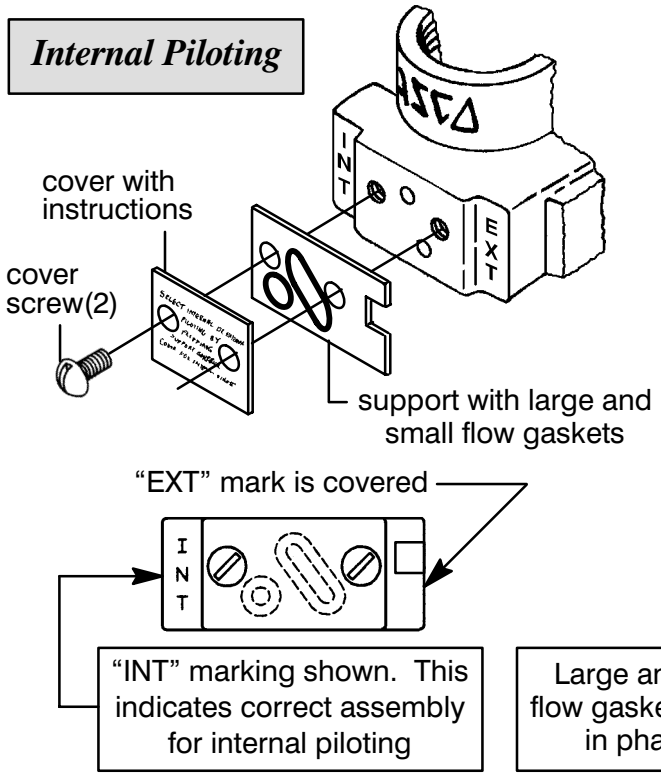

Figure 1. Positioning of support with flow gaskets for internal piloting mode.

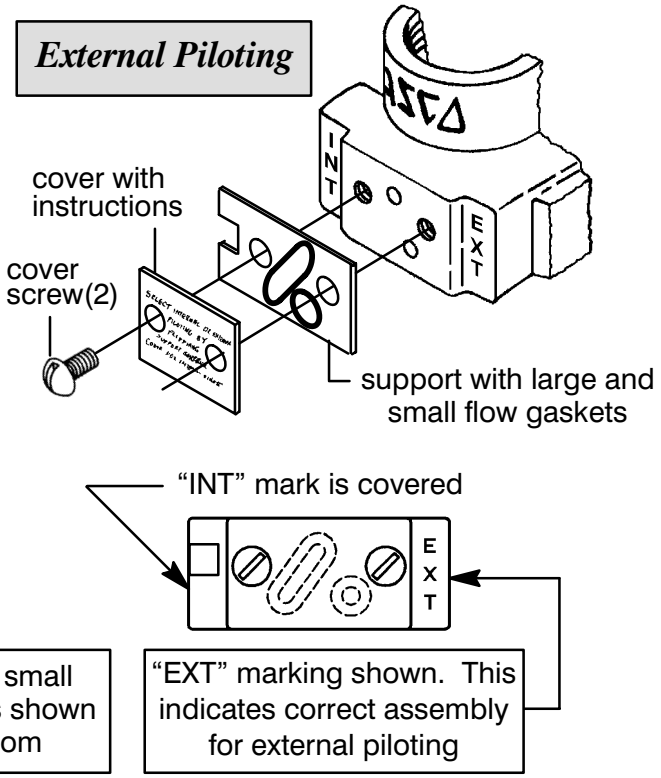

Figure 2. Positioning of support with flow gaskets for external piloting mode.

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INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Temperature Limitations

Ambient and Fluid Temperature Ranges:

- Standard Valves:

  AC Construction −4°F (− 20°C) to 125°F (54°C)⁎

  DC Construction − 4°F (− 20°C) to 104°F (40°C)⁎

- Low Power & Intrinsically Safe: −20°F (− 29°C) to 140°F (60°C)⁎

⁎ For optimum performance, not recommended below 32°F (0°C) on "Suffix V" elastomer constructions.

Positioning

Valve may be mounted in any position.

Mounting

Mounting brackets (2) are optional. For valves with a 5/16″ orifice, 1/4″ or 3/8″ NPT refer to Figure 3; for 5/8″ orifice, 3/8″ or 1/2″ NPT Figure 4. Check nameplate to determine orifice size and pipe size.

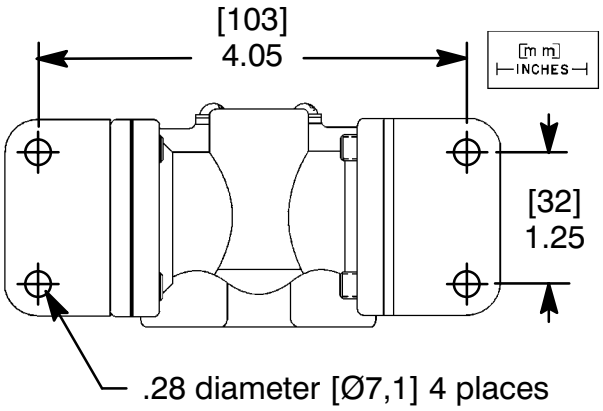

Figure 3. Mounting dimensions − 5/16″ Orifice

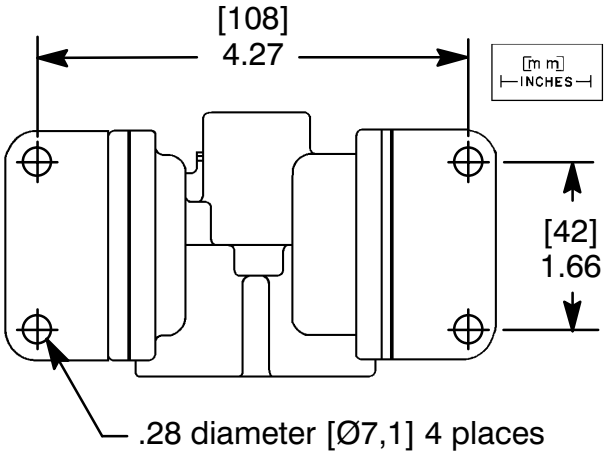

Figure 4. Mounting dimensions − 5/8″ Orifice

Piping

There are two exhaust flows in the exhaust mode. There is pilot exhaust from the top of the solenoid when the valve shifts.

⚠ CAUTION: Debris entering 1/8″ or 1/4″ NPT connection at top of solenoid may cause valve to malfunction. Use a muffler to vent to atmosphere or connect to main exhaust system if the air or inert gas cannot be exhausted directly to the atmosphere.

Connect piping or tubing to valve according to markings on valve body. Refer to flow diagrams in ***OPERATION*** section.

⚠ CAUTION: To avoid damage or accidental disengagement of cartridge assembly from valve body, hold cartridge assembly securely by wrenching flats when installing or removing muffler or piping at top of solenoid.

Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

Internal Piloting Mode Only: To insure proper operation of the valve, the pressure and exhaust piping must be full area without restriction. A minimum differential pressure (15 psi), as stamped on the nameplate, must be maintained between pressure and exhaust at the moment of shifting. Air reservoirs must have adequate capacity to maintain this minimum pressure during shifting. To check pressure during shifting, install a pressure gauge in the pressure piping as close to the valve as possible.

⚠ CAUTION: These solenoid valves are intended for use on clean dry air or inert gas, filtered to 50 micrometres or better. The dew point of the media should be at least 10° C (18° F) below the minimum temperature to which any portion of the clean air/inert gas system could be exposed to prevent freezing. If lubricated air is used, the lubricants must be compatible with Buna N elastomers. Diester oils may cause operational problems. Instrument air in compliance with ANSI/ISA Standard S7.3−1975 (R1981) exceeds the above requirements and is, therefore, an acceptable media for these valves.

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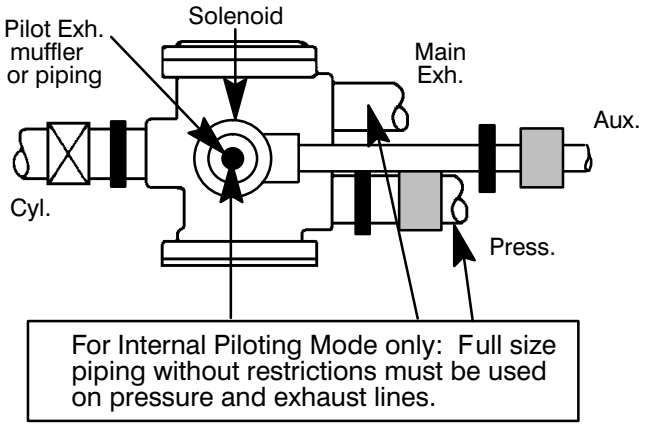
Flow Controls (Speed or Metering Devices)

Flow control valves may be added to control cylinder speed. If used, these flow control valves must be located in cylinder piping between the solenoid valve and the cylinder.

IMPORTANT: Do not install flow controls (speed or metering devices) or any type of restrictive device in the pressure (inlet), exhaust or pilot exhaust (outlet) ports of the valve. Restricting any of these lines may cause valve malfunction.



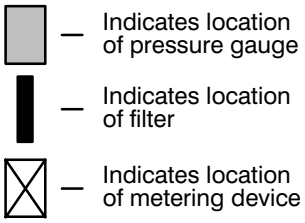


Figure 5. Piping diagram

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, personal injury or property damage, turn off electrical power, depressurize valve, and vent fluid to a safe area before servicing the valve.

NOTE: It is not necessary to remove the valve from the pipeline for repairs. However, piping or tubing must be removed from pilot exhaust on top of the solenoid if present. See ***Piping*** section.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to shift. Clean filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up or other conditions that could impede solenoid valve shifting are possible. In many cases, solenoid valves are periodically exercised during normal system use or as part of routine maintenance or surveillance activities and no additional exercise is necessary. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

NOTICE: Basic valve constructions are identified by orifice size and pipe size (NPT). Check valve nameplate for orifice and pipe size. See Figure 7 for 5/16″ orifice, 1/4″ or 3/8″ NPT; Figure 8 for 5/8″ orifice, 3/8″ or 1/2″ NPT. For Standard valve solenoid parts see Figure 6 in addition to Figures 7 or 8. Figures 7 and 8 show *Low Power and Intrinsically Safe* solenoid parts.

Determine valve construction and proceed as follows:

1. Disassemble valve in an orderly fashion using exploded views for identification and placement of parts.
2. ***Low Power & Intrinsically Safe*** – Using a suitable wrench hold cartridge assembly securely by wrenching flats. Then unscrew muffler or piping from 1/8″ NPT connection on top of cartridge assembly.
   Standard Valves – Hold pipe adapter securely and unscrew muffler or piping from 1/4″ NPT connection on top of solenoid base sub–assembly.
3. Remove solenoid, see separate instructions.
4. ***Low Power & Intrinsically Safe*** – Unscrew cartridge assembly from valve body. Then remove cartridge gasket from valve body and orifice gasket from recess in base of cartridge assembly.
   Standard Valves – Unscrew solenoid base sub–assembly from valve body. Then remove solenoid base gasket and core assembly with core spring and core guide. Core guide present on AC construction only. Remove plugnut gasket from groove in solenoid base sub–assembly.
5. Remove cover screws (2), cover, and support containing large and small flow gaskets from side of valve body.
6. At exhaust end, remove bonnet screws, lockwashers, valve bonnet, body passage gasket, retaining ring, diaphragm assembly, diaphragm support (see note below) and body gasket from valve body.

NOTE: Retaining ring and diaphragm support are only present on 5/8″ orifice valve constructions. ***However, they are not present on all 5/8″ orifice valve constructions.***

7. At opposite end remove bonnet screws, lockwashers, end cap, disc spring, body gasket, disc assembly and valve stem.
8. All parts are now accessible for cleaning or replacement. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

continued on Form No. V6928R3 – Section 2 of 2

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Installation & Maintenance Instructions

3–WAY INTERNAL OR EXTERNAL PILOTED SOLENOID VALVES
NORMALLY CLOSED OPERATION — AIR OR INERT GAS SERVICE
1/4″, 3/8″ OR 1/2″ NPT — 5/16″ OR 5/8″ ORIFICE

SERIES 8316

Form No.V6928R3 – Sec. 2 (Section 2 of 2)

NOTICE: See Form No. V6928R3 – Section 1 of 2.

continued from Form No. V6928R3 – Section 1 of 2

Valve Reassembly

1. Lubricate cartridge gasket, orifice gasket, plugnut gasket, solenoid base gasket and large and small flow gaskets with DOW CORNING® 200 Fluid lubricant or an equivalent high–grade silicone fluid lubricant.
2. Lubricate body gaskets (2), body passage gasket and retaining ring with DOW CORNING® 111 Compound lubricant or an equivalent high–grade silicone grease.
3. Install valve stem in disc assembly. Then install disc assembly (with valve stem), body gasket, disc spring, end cap, and bonnet screws with lockwashers. Hand thread screws a few turns into valve body. Then torque bonnet screws in a crisscross manner to 95 ± 10 in–lbs [10,7 ± 1,1 Nm].
4. Install diaphragm support (see note below), body gasket, diaphragm assembly (engaged to valve stem), body passage gasket, retaining ring, valve bonnet and bonnet screws with lockwashers. Torque bonnet screws according to instructions in step 3.

NOTE: Retaining ring and diaphragm support are only present on 5/8″ orifice valve constructions. ***However, they* are *not present on all 5/8″ orifice valve constructions.***

5. ***Low Power & Intrinsically Safe*** – Position cartridge gasket in valve body. Then install orifice gasket in recess in base of cartridge assembly. Thread cartridge assembly with orifice gasket into valve body. Then torque cartridge assembly to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].

   Standard Valves – Replace solenoid base gasket, core assembly and solenoid base sub–assembly. Torque solenoid base sub–assembly to 175 ± 25 in–lbs [19,8 ± 2,8 Nm]. Install plugnut gasket on solenoid base sub–assembly.
6. Before installing flow gaskets, support, cover and cover screws, refer to section on ***CHANGING MODE OF OPERATION*** for the proper mode of operation and positioning of parts.
7. Install large and small flow gaskets in the support. Large gasket must be compressed to fit support configuration.
8. Orient the support (with flow gaskets) to the proper pilot flow mode of operation and position against side wall of valve body with flow orifices. Then install cover and two cover screws. Torque screws evenly to 13 ± 1 in–lbs [1,5 ± 0,1 Nm].
9. Install solenoid, see separate instructions. Then make electrical connection to solenoid.
10. Install muffler or make up piping to pilot exhaust on top of solenoid.

⚠ WARNING: To prevent the possibility of death, personal injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

11. Restore line pressure and electrical power supply to valve.
12. After maintenance is completed, operate the valve a few times to be sure of proper operation.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

Lubrication Chart

Lubrication	Parts to be lubricated	
DOW CORNING® 111 Compound lubricant or an equivalent high–grade silicone grease.	body passage gasket body gaskets (2)	retaining ring
DOW CORNING® 200 Fluid lubricant or an equivalent high–grade silicone fluid.	orifice gasket cartridge gasket large flow gasket small flow gasket	plugnut gasket solenoid base gasket

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Torque Chart

Part Name (see note)	Wrench Size or Tool	Torque Value Inch—Pounds	Torque Value Newton—Meters
Cartridge assembly	1 1/8″	175 ± 25	19,8 ± 2,8
Solenoid base sub—assembly	1″		
Bonnet screws	7/16″	95 ± 10	10,7 ± 1,1
Cover screws	screw driver	13 ± 1	1,5 ± 0,1
Pipe adapter	11/16″	90 maximum	10,2 maximum

Note: Thread all parts by hand as far as possible. Then torque evenly in a crisscross manner where applicable.

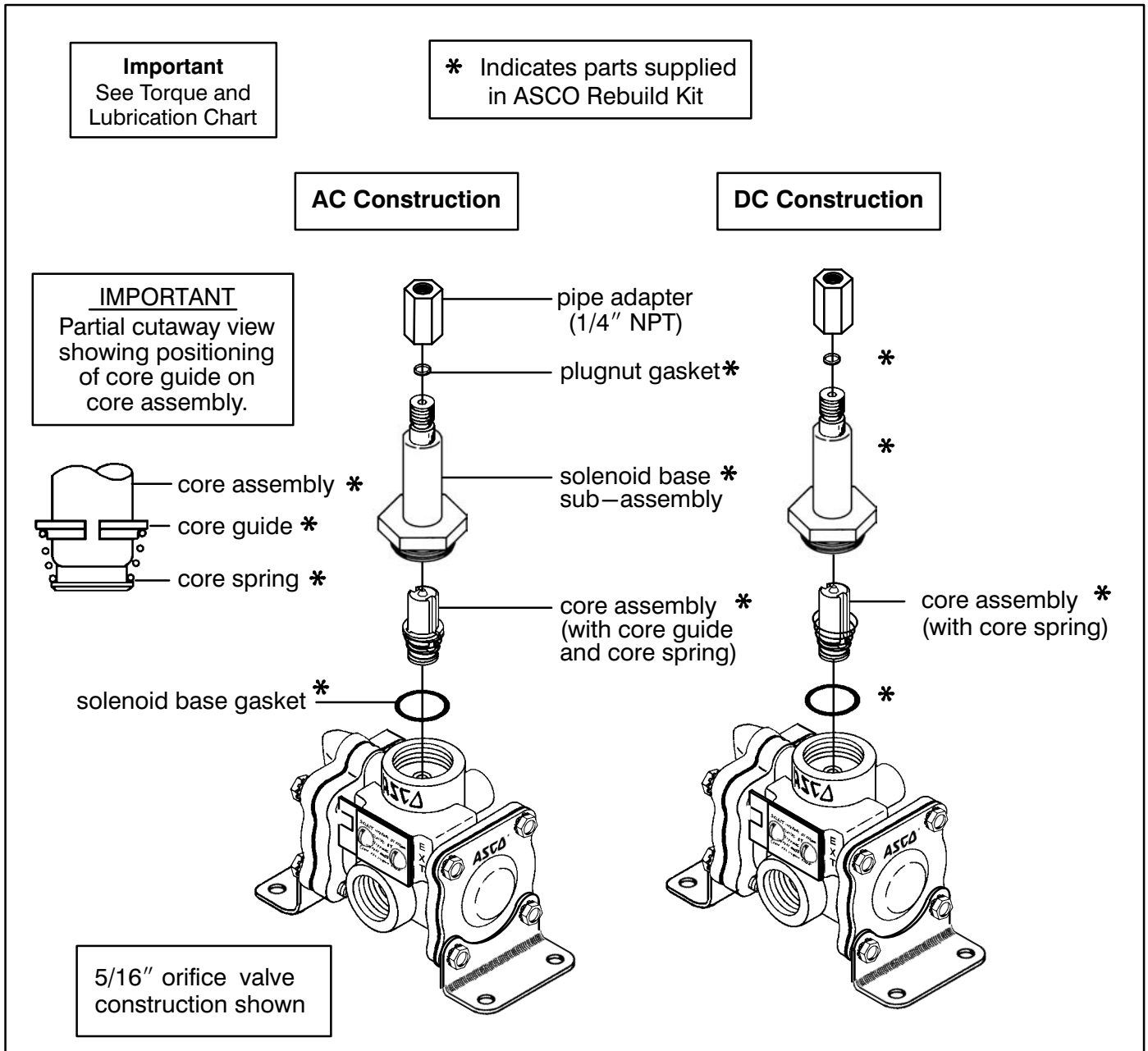

Figure 6. Partial view of solenoid parts for standard valve constructions. See Figures 7 or 8 for disassembly and reassembly of main valve body.

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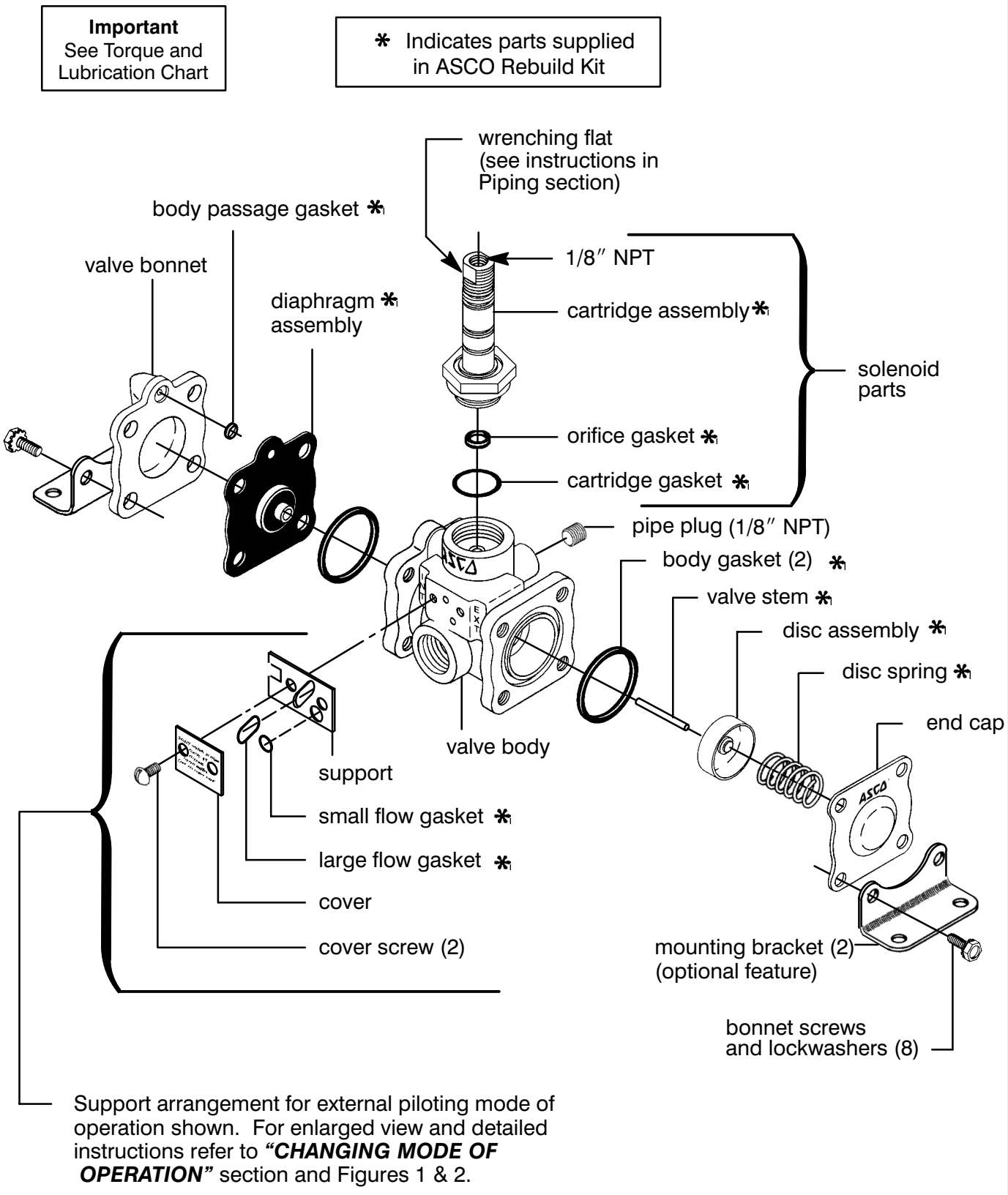

Figure 7. Series 8316, 5/16″ Orifice, 1/4″ or 3/8″ NPT with solenoid parts for Low Power or Intrinsically Safe constructions. For standard valve solenoid parts see Figure 6.

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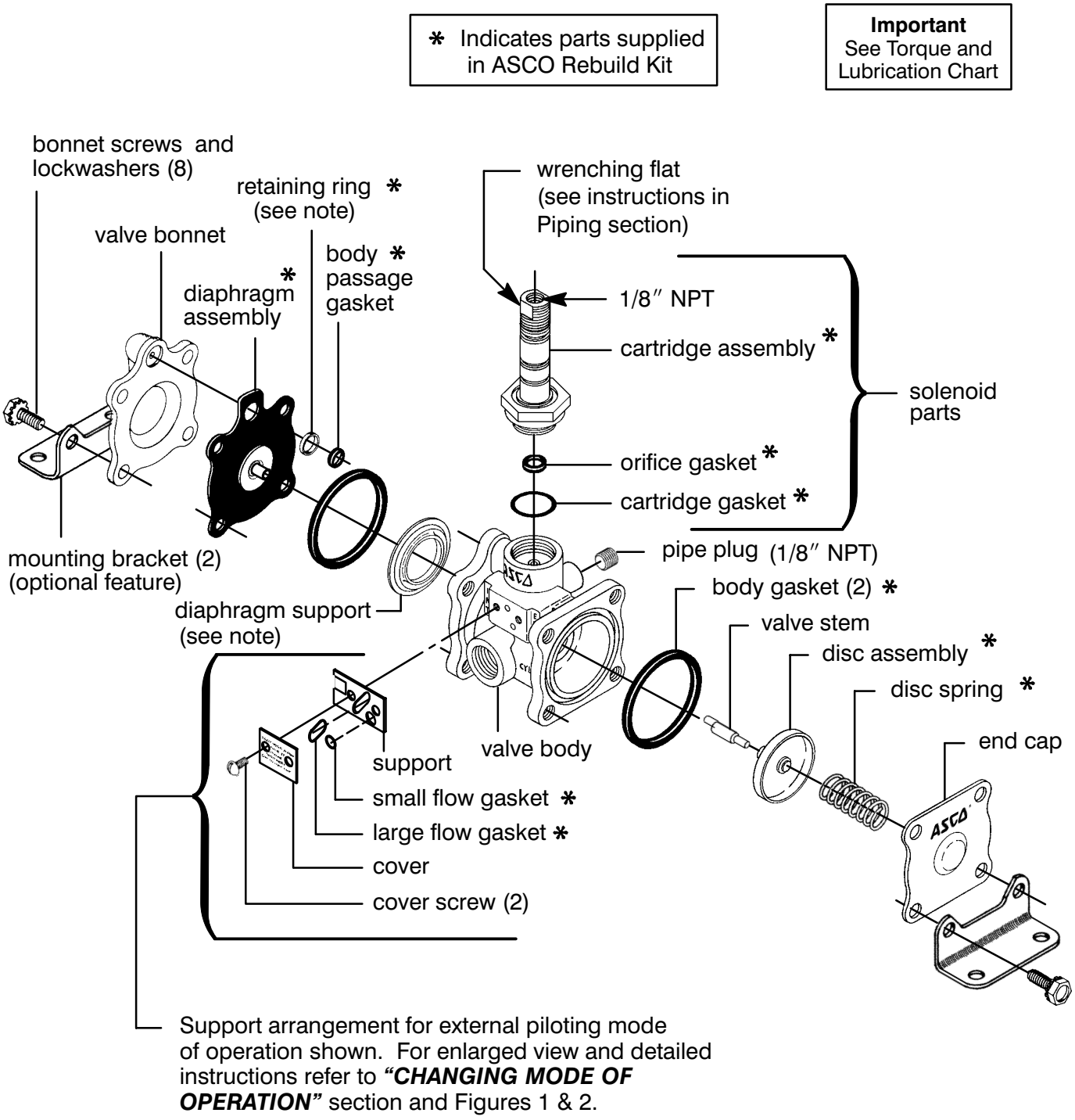

Note: Diaphragm support and retaining ring are not present on all valve constructions.

Figure 8. Series 8316, 5/8″ Orifice, 3/8″ or 1/2″ NPT with solenoid parts for Low Power or Intrinsically Safe constructions. For standard valve solenoid parts see Figure 6.

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GB CE

GENERAL INSTALLATION AND MAINTENANCE INSTRUCTIONS

Note: These General Installation and Maintenance Instructions must be read in conjunction with the Instruction Sheet for the specific product.

INSTALLATION

ASCO/JOUCOMATIC components are intended to be used only within the technical characteristics as specified on the nameplate. Changes to the equipment are only allowed after consulting the manufacturer or its representative. Before installation depressurize the piping system and clean internally.
The equipment may be mounted in any position if not otherwise indicated on the product by means of an arrow.
The flow direction and pipe connection of valves are indicated on the body.

The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.
Caution:
- Reducing the connections may cause improper operation or malfunctioning.
- For the protection of the equipment install a strainer or filter suitable for the service involved in the inlet side as close to the product as possible.
- If tape, paste, spray or a similar lubricant is used when tightening, avoid particles entering the system.
- Use proper tools and locate wrenches as close as possible to the connection point.
- To avoid damage to the equipment, DO NOT OVERTIGHTEN pipe connections.
- Do not use valve or solenoid as a lever.
- The pipe connections should not apply any force, torque or strain to the product.

ELECTRICAL CONNECTION

In case of electrical connections, they are only to be made by trained personnel and have to be in accordance with the local regulations and standards.
Caution:
- Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.
- All electrical screw terminals must be properly tightened according to the standards before putting into service.
- Dependent upon the voltage electrical components must be provided with an earth connection and satisfy local regulations and standards

The equipment can have one of the following electrical terminals:
- Spade plug connections according to ISO-4400 or 3 x DIN-46244 (when correctly installed this connection provides IP-65 protection).
- Embedded screw terminals in metal enclosure with "Pg" cable gland.
- Spade terminals (AMP type).
- Flying leads or cables.

PUTTING INTO SERVICE

Before pressurizing the system, first carry-out an electrical test. In case of solenoid valves, energize the coil a few times and notice a metal click signifying the solenoid operation.

SERVICE

Most of the solenoid valves are equipped with coils for continuous duty service. To prevent the possibility of personal or property damage do not touch the solenoid which can become hot under normal operation conditions.

SOUND EMISSION

The emission of sound depends on the application, medium and nature of the equipment used. The exact determination of the sound level can only be carried out by the user having the valve installed in his system.

MAINTENANCE

Maintenance of ASCO/JOUCOMATIC products is dependent on service conditions. Periodic cleaning is recommended, the timing of which will depend on the media and service conditions. During servicing, components should be examined for excessive wear. A complete set of internal parts is available as a spare parts or rebuild kit. If a problem occurs during installation/maintenance or in case of doubt please contact ASCO/JOUCOMATIC or authorised representatives.

A separate Declaration of Incorporation relating to EEC-Directive 89/392/EEC Annex II B is available on request. Please provide product identification number and serial numbers of products concerned.
The product complies with the essential requirements of the EMC Directive 89/336/EEC and amendments and the Low Voltage directives 73/23/EEC and 93/68/EEC. A separate Declaration of Conformity is available on request. Please provide product identification number and serial numbers of the products concerned.

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INSTRUCTIONS GÉNÉRALES D'INSTALLATION ET D'ENTRETIEN

Nota : Ces instructions générales d'installation et d'entretien complètent la notice spécifique du produit.

MONTAGE

Les composants ASCO/JOUCOMATIC sont conçus pour les domaines de fonctionnement indiqués sur la plaque signalétique ou la documentation. Aucune modification ne peut être réalisée sur le matériel sans l'accord préalable du fabricant ou de son représentant. Avant de procéder au montage, dépressuriser les canalisations et effectuer un nettoyage interne.
A moins qu'une flèche ou la notice n'indique un sens de montage spécifique de la tête magnétique, le produit peut être monté dans n'importe quelle position.
Le sens de circulation du fluide est indiqué par repères sur le corps et dans la documentation.

La dimension des tuyauteries doit correspondre au raccordement indiqué sur le corps, l'étiquette ou la notice.
Attention :
- Une restriction des tuyauteries peut entraîner des dysfonctionnements.
- Afin de protéger le matériel, installer une crépine ou un filtre adéquat en amont, aussi près que possible du produit.
- En cas d'utilisation de ruban, pâte, aérosol ou autre lubrifiant lors du serrage, veiller à ce qu'aucun corps étranger ne pénètre dans le circuit.
- Utiliser un outillage approprié et placer les clés aussi près que possible du point de raccordement.
- Afin d'éviter toute détérioration, NE PAS TROP SERRER les raccords des tuyauteries.
- Ne pas se servir de la vanne ou de la tête magnétique comme d'un levier.
- Les tubes de raccordement ne devront exercer aucun effort, couple ou contrainte sur le produit.

RACCORDEMENT ÉLECTRIQUE

Le raccordement électrique doit être réalisé par un personnel qualifié et selon les normes et règlements locaux.
Attention :
- Avant toute intervention, couper l'alimentation électrique pour mettre hors tension les composants.
- Toutes les bornes à vis doivent être serrées correctement avant la mise en service.
- Selon la tension, les composants électriques doivent être mis à la terre conformément aux normes et règlements locaux.

Selon les cas, le raccordement électrique s'effectue par :
- Connecteur débrochable ISO4400 ou 3 x DIN46244 avec degré de protection IP65 lorsque le raccordement est correctement effectué.
- Bornes à vis solidaires du bobinage, sous boîtier métallique avec presse-étoupe "Pg - -".
- Cosses (type AMP).
- Fils ou câbles solidaires de la bobine.

MISE EN SERVICE

Avant de mettre le circuit sous pression, effectuer un essai électrique. Dans le cas d'une électrovanne, mettre la bobine sous tension plusieurs fois et écouter le "clic" métallique qui signale le fonctionnement de la tête magnétique.

FONCTIONNEMENT

La plupart des électrovannes comportent des bobinages prévus pour mise sous tension permanente. Pour éviter toute brûlure, ne pas toucher la tête magnétique qui, en fonctionnement normal et en permanence sous tension, peut atteindre une température élevée.

BRUIT DE FONCTIONNEMENT

Le bruit de fonctionnement varie selon l'utilisation, le fluide et le type de matériel employé. L'utilisateur ne pourra déterminer avec précision le niveau sonore émis qu'après avoir monté le composant sur l'installation.

ENTRETIEN

L'entretien nécessaire aux produits ASCO/JOUCOMATIC varie avec leurs conditions d'utilisation. Il est souhaitable de procéder à un nettoyage périodique dont l'intervalle varie suivant la nature du fluide, les conditions de fonctionnement et le milieu ambiant. Lors de l'intervention, les composants doivent être examinés pour détecter toute usure excessive. Un ensemble de pièces internes est proposé en pièces de rechange pour procéder à la réfection. En cas de problème lors du montage/entretien ou en cas de doute, veuillez contacter ASCO/JOUCOMATIC ou ses représentants officiels.

Conformément à la directive CEE 89/392/CEE Annexe II B, une Déclaration d'incorporation peut être fournie sur demande. Veuillez nous indiquer le numéro d'accusé de réception (AR) et les références ou codes des produits concernés.
Ce produit est conforme aux prescriptions les plus importantes de la directive CEM 89/336/CEE et amendements et aux directives basse tension 73/23/CEE et 94/68/CEE. Une déclaration de conformité peut être fournie sur simple demande. Veuillez nous indiquer le numéro d'accusé de réception (AR) ainsi que les numéros de série des produits concernés.

DE CE

ALLGEMEINE BETRIEBSANLEITUNG

ACHTUNG: Diese Allgemeine Betriebsanleitung gilt in Zusammenhang mit der jeweiligen Betriebsanleitung für die speziellen Produkte.

EINBAU

Die ASCO/JOUCOMATIC-Komponenten dürfen nur innerhalb der auf den Typenschildern angegebenen Daten eingesetzt werden. Veränderungen an den Produkten sind nur nach Rücksprache mit ASCO/JOUCOMATIC zulässig.
Vor dem Einbau der Ventile muß das Rohrleitungssystem drucklos geschaltet und innen gereinigt werden.
Die Einbaulage der Produkte ist generell beliebig. **Ausnahme:** Die mit einem Pfeil gekennzeichneten Produkte müssen entsprechend der Pfeilrichtung montiert werden.
Die Durchflußrichtung und der Eingang von Ventilen sind gekennzeichnet.

Die Rohranschlüsse sollten entsprechend den Größenangaben auf den Typenschildern mit handelsüblichen Verschraubungen durchgeführt werden. **Dabei ist folgendes zu beachten:**
- Eine Reduzierung der Anschlüsse kann zu Leistungs- und Funktionsminderungen führen.
- Zum Schutz der Ventile sollten Schmutzfänger oder Filter so dicht wie möglich in den Ventileingang integriert werden.
- Bei Abdichtung am Gewinde ist darauf zu achten, daß kein Dichtungsmaterial in die Rohrleitung oder das Ventil gelangt.
- Zur Montage darf nur geeignetes Werkzeug verwendet werden.
- Konische Verschraubungen sind sorgfältig anzuziehen. Es ist darauf zu achten, daß beim Anziehen das Gehäuse nicht beschädigt wird.
- Spule und Führungsrohr von Ventilen dürfen nicht als Gegenhalter benutzt werden.
- Die Rohrleitungsanschlüsse sollen fluchten und dürfen keine Spannungen auf das Ventil übertragen.

ELEKTRISCHER ANSCHLUß

Der elektrische Anschluß ist von Fachpersonal entsprechend den geltenden VDE- und CEE-Richtlinien auszuführen. **Es ist besonders auf folgendes zu achten:**
- Vor Beginn der Arbeiten ist sicherzustellen, daß alle elektrischen Leitungen und Netzteile spannungslos geschaltet sind.
- Alle Anschlußklemmen sind nach Beendigung der Arbeiten vorschriftsmäßig entsprechend den geltenden Regeln anzuziehen.
- Je nach Spannungsbereich muß das Ventil nach den geltenden Regeln einen Schutzleiteranschluß erhalten.

Der Magnetantrieb kann je nach Bauart folgende Anschlüsse haben:
- Anschluß für Gerätesteckdose nach DIN 43650 Form A/ISO 4400 oder 3x DIN 46244 (durch ordnungsgemäße Montage der Gerätesteckdose wird Schutzklasse IP 65 erreicht).
- Anschlüsse innerhalb eines Blechgehäuses mittels Schraubklemmen. Kabeleinführung ins Gehäuse mit PG-Verschraubung.
- Offene Spulen mit Flachsteckern (AMP-Fahnen) oder mit eingegossenen Kabelenden.

INBETRIEBNAHME

Vor Druckbeaufschlagung des Produktes sollte eine elektrische Funktionsprüfung erfolgen:
Bei Ventilen Spannung an der Magnetspule mehrmals ein- und ausschalten. **Es muß ein Klicken zu hören sein.**

BETRIEB

Die meisten Ventile sind mit Spulen für Dauerbetrieb ausgerüstet. Zur Vermeidung von Personen- und Sachschäden sollte jede Berührung mit dem Ventil vermieden werden, da die Magnetspule bei längerem Betrieb sehr heiß werden kann.

GERÄUSCHEMISSION

Diese hängt sehr stark vom Anwendungsfall, den Betriebsdaten und dem Medium, mit denen das Produkt beaufschlagt wird, ab. Eine Aussage über die Geräuschemission des Produktes muß deshalb von demjenigen getroffen werden, der das Produkt innerhalb einer Maschine in Betrieb nimmt.

WARTUNG

Die Wartung hängt von den Einsatzbedingungen ab. In entsprechenden Zeitabständen muß das Produkt geöffnet und gereinigt werden. Für die Überholung der ASCO/JOUCOMATIC-Produkte können Ersatzteilsätze geliefert werden. Treten Schwierigkeiten bei Einbau, Betrieb oder Wartung auf, sowie bei Unklarheiten, ist mit ASCO/JOUCOMATIC Rücksprache zu halten.

(ASCO/JOUCOMATIC Produkte sind entsprechend der EG-Richtlinie 89/392/EWG gefertigt.

Eine separate Herstellererklärung im Sinne der Richtlinie 89/392/EWG Anhang IIB ist auf Anfrage erhältlich. Geben Sie bitte für die Produkte die Nummer der Auftragsbestätigung und die Seriennummer an.

Dieses Produkt entspricht den grundlegenden Bestimmungen der EMV-Richtlinie 89/336/EWG, einschl. Nachtrage, sowie den Niederspannungsrichtlinien 73/23/EWG u. 93/68/EWG. Bitte geben Sie die Auftragsbestätigungsnummer und die Seriennummern der betreffenden Produkte an.

ASCO
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Florham Park, New Jersey 07932
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ES CE

INSTRUCCIONES GENERALES DE INSTALACION Y MANTENIMIENTO

Nota: Estas instrucciones Generales de Instalación y Mantenimiento deben considerarse en conjunción con la Hoja de Instrucciones de cada producto.

INSTALACION

Los componentes ASCO/JOUCOMATIC sólo deben utilizarse dentro de las especificaciones técnicas que se especifican en su placa de características o catálogo. Los cambios en el equipo sólo estarán permitidos después de consultar al fabricante o a su representante. Antes de la instalación despresurice el sistema de tuberías y limpie internamente.
El equipo puede utilizarse en cualquier posición si no estuviera indicado lo contrario sobre el mismo mediante una flecha o en el catálogo.
En el cuerpo o en el catálogo se indican el sentido del fluido y la conexión de las válvulas a la tubería.

Las conexiones a la tubería deben corresponder al tamaño indicado en la placa de características la etiqueta o el catálogo y ajustarse adecuadamente.
Precaución:

- La reducción de las conexiones puede causar operaciones incorrectas o defectos de funcionamiento.
- Para la protección del equipo se debe instalar, en la parte de la entrada y tan cerca como sea posible del producto, un filtro adecuado.
- Si se utilizara cinta, pasta, spray u otros lubricantes en el ajuste, se debe evitar que entren partículas en el producto.
- Se debe utilizar las herramientas adecuadas y colocar llaves inglesas lo mas cerca posible del punto de conexión.
- Para evitar daños al equipo, NO FORZAR las conexiones a la tubería.
- No utilizar la válvula o el solenoide como palanca.
- Las conexiones a la tubería no producirán ninguna fuerza, par o tensión sobre el producto.

CONEXION ELECTRICA

Las conexiones eléctricas serán realizadas por personal cualificado y deberán adaptarse a las normas y regulaciones locales.
Precaución:

- Antes de comenzar el trabajo, desconecte el suministro de energía eléctrica y desenergice el circuito eléctrico y los elementos portadores de tensión.
- Todos los teminales eléctricos deben estar apretados adecuadamente según normas antes de su puesta en servicio.
- Según el voltaje, los componentes eléctricos deben disponer de una conexión a tierra y satisfacer las normas y regulaciones locales.

El equipo puede tener uno de los siguientes terminales eléctricos:

- Conexiones desenchufables segun ISO 4400 o 3 x DIN-46244 (cuando se instala correctamente esta conexión proporciona una protección IP-65).
- Terminales de tornillo con carcasa metálica con entrada de cable de conexión roscada "PG".
- Conector desenchufable (tipo AMP).
- Salida de cables.

PUESTA EN MARCHA

Se debe efectuar una prueba eléctrica antes de someter a presión el sistema. En el caso de las válvulas solenoides, se debe energizar varias veces la bobina y comprobar que se produce un sonido metálico que indica el funcionamiento del solenoide.

SERVICIO

La mayor parte de las válvulas solenoides se suministran con bobinas para un servicio continuo. Con el fin de evitar la posibilidad de daños personales o materiales no se debe tocar el solenoide, ya que puede haberse calentado en condiciones normales de trabajo.

EMISION DE RUIDOS

La emisión de ruidos depende de la aplicación, medio y naturaleza del equipo utilizado. Una determinación exacta del nivel de ruido sólamente se puede llevar a cabo por el usuario que disponga la válvula instalada en su sistema.

MANTENIMIENTO

El mantenimiento de los productos ASCO/JOUCOMATIC depende de las condiciones de servicio. Se recomienda una limpieza periódica, dependiendo de las condiciones del medio y del servicio. Durante el servicio, los componentes deben ser examinados por si hubieran desgastes excesivos. Se dispone de un juego completo de partes internas como recambio o kit de montaje. Si ocurriera un problema durante la instalación/mantenimiento o en caso de duda contactar con ASCO/JOUCOMATIC o representantes autorizados.

Se dispone, por separado y bajo demanda, de una Declaración de incorporación conforme a la Directiva CEE 89/392/EEC Anexo II B. Rogamos que nos faciliten los códigos y números de acepta-ción de pedido correspondientes.
Este producto es conforme a las principales prescripciones de la directiva CEM 89/336/CEE y a las enmiendas y directivas baja tension 73/23/CEE y 94/68/CEE. Si lo desea, podemos facilitarle una Declaración de Conformidad por separado. Rogamos faciliten el número de confirmación de pedido y los números de serie de los respectivos productos.

IT CE

ISTRUZIONI DI INSTALLAZIONE E DI MANUTENZIONE GENERALE

Nota: Queste istruzioni devono essere lette in congiunzione con il manuale specifico del prodotto.

INSTALLAZIONE

Le elettrovalvole devono essere utilizzate esclusivamente rispettando le caratteristiche tecniche specificate sulla targhetta. Variazioni sulle valvole o sui piloti sono possinili solo dopo aver consultato il costruttore o i suoi rappresentanti. Prima dell'installazione depressurizzare i tubi e pulire internamente.
Le elettrovalvole possone essere montate in tutte le posizioni. Diversamente, una freccia posta sulla valvola indica che deve essere montata in posizione verticale e diritta.
La direzione del flusso e' indicata sul corpo della valvola per mezzo di una freccia oppure con l'etichetta "IN", "1", "A", o "P".

I raccordi devono essere conformi alla misura indicata sulla targhetta apposta.
Attenzione:

- Ridurre i raccordi puo' causare operazioni sbalgliate o malfunzionamento.
- Per proteggere il componente installare,il più vicino possibile al lato ingresso, un filtro adatto al servizio.
- Se si usano nastro, pasta, spray o lubrificanti simili durante il serraggio, evitare che delle particelle entrino nel corpo della valvola.
- Usare un'attrezzatura appropriate e utilizzare le chiavi solo sul corpo della valvola.
- Per evitare danni al corpo della valvola, NON SERRARE ECCESSIVAMENTE i tubi.
- Non usare la valvola o il pilota come una leva.
- I raccordi non devono esercitare pressione, torsione o sollecitazione sull'elettrovalvola.

ALLACCIAMENTO ELETTRICO

L'allacciamento elettrico deve essere effetuato esclusivamente dal personale specializzato e deve essere conforme alle Norme locali.
Attensione:

- Prima di mettere in funzione togliere l'alimentazione elettrica, diseccitare il circuito elettrico e le parti sotto tensione.
- I morsetti elettrici devono essere correttamente avvitati, secondo le Norme, prima della messa in servizio.
- Le elettrovalvole devone essere provviste di morsetti di terra a seconda della tensione e delle Norme di sicurezza locali.

I piloti possono avere una delle seguenti caratteristiche elettrice:

- Connettore ISO-4400 o 3 x DIN-46244 (se installato correttamente e' IP-65).
- Morsetteria racchiusa in custodia metallica. Entrata cavi con pressacavi tipo "PG".
- Bobina con attacchi FASTON (tipo AMP).
- Bobine con fili o cavo.

MESSA IN FUNZIONE

Prima di dare pressione alla valvoa, eseguire un test elettrico. Eccitare la bobina diverse volte fino a notare uno scatto metallico che dimostra il funzionamento del pilota.

SERVIZIO

Molte elettrovalvole sono provviste di bobine per funzionamento continuo. Per prevenire la possibilita' di danneggiare cose o persone, non toccare il pilota.
La custodia della bobina o del pilota puo' scaldarsi anche in normali condizioni di funzionamento.

EMISSIONE SUONI

L'emissione di suoni dipende dall'applicazione e dal tipo di elettrovalvola. L'utente puo' stabilire esattamente il livello del suono solo dopo aver installato la valvola sul suo impianto.

MANUTENZIONE

Generalmente questi componenti non necessitano spesso di manutenzione. Comunque, in alcuni casi e' necessario fare attenzione a depositi o ad eccessiva usura. Questi componenti devono essere puliti periodicamente, il tempo che intercorre tra una pulizia e l'altra varia a seconda delle condizioni di funzionamento. Il ciclo di durata dei componenti dipende dalle condizioni di funzionamento. Incaso di usura e' disponibile un set completo di parti interne per per la revisione.
Se si incontrano problemi durante l'installazione e la manutenzione o se si hanno dei dubbi, consultare ASCO/JOUCOMATIC o i suoi rappresentanti.

L'utente puo'richiedere al costruttore una dichiarazione separate riguardante le Direttive EEC 89/392/EEC e 91/368/EEC (vedere allegato II B) fornendo il numero di serie e il riferimento dell'ordine relativo.
Questo prodotto soddisfa i requisiti essenziali della direttiva CEM 89/336/CEE nonche' gli emendamenti e le directtive sulla bassa tensione 73/23/CEE e 93/68/CEE. Una Dichiarazione di Conformitá separata può essere ottenuta su richiesta. Si prega di fornire il numero della conferma dell'ordinativo ed i numeri di serie dei relativi prodotti.

NL CE

ALGEMENE INSTALLATIE- EN ONDERHOUDSINSTRUKTIES

N.B.: Deze algemene instruktties t.a.v. installatie en onderhoud moeten in acht worden genomen tezamen met de specifieke voorschriften van het produkt.

INSTALLATIE

ASCO/JOUCOMATIC produkten mogen uitsluitend toegepast worden binnen de op de naamplaat aangegeven specificaties. Wijzigingen, zowel elektrisch als mechanisch, zijn alleen toegestaan na overleg met de fabrikant of haar vertegenwoordiger. Voor het inbouwen dient het leidingssysteem drukloos gemaakt te worden en inwendig gereinigd.
De positie van de afsluiter is naar keuze te bepalen, behalve in die gevallen waarbij het tegendeel door pijlen wordt aangegeven.
De doorstroomrichting wordt bij afsluiters aangegeven op het afsluiterhuis.

De pijpaansluiting moet overeenkomstig de naamplaatgegevens plaatsvinden.
Hierbij moet men letten op:

- Een reductie van de aansluitingen kan tot prestatie- en funktie-stoornis leiden.
- Ter bescherming van de interne delen wordt een filter in het leidingnet aanbevolen.
- Bij het gebruik van draadafdichtingspasta of tape mogen er geen deeltjes in het leidingwerk geraken.
- Men dient uitsluitend geschikt gereedschap voor de montage te gebruiken.
- Bij konische/tapse koppelingen moet met een zodanig koppel worden gewerkt dat het produkt niet wordt beschadigd.
- Het produkt, de behuizing of de spoel mag niet als hefboom worden gebruikt.
- De pijpaansluitingen mogen geen krachten of momenten op het produkt overdragen.

ELEKTRISCHE AANSLUITING

In geval van elektrische aansluiting dient dit door vakkundig personeel te worden uitgevoerd volgens de door de plaatselijke overheid bepaalde richtlijnen.
Men dient in het bijzonder te letten op:

- Voordat men aan het werk begint moeten alle spannings-voerende delen spanningsloos worden gemaakt.
- Alle aansluitklemmen moeten na het beëindigen van het werk volgens de juiste normen worden aangedraaid.
- Al naar gelang het spanningsbereik, moet het produkt volgens de geldende normen van een aarding worden voorzien.

Het produkt kan de volgende aansluitingen hebben:

- Stekeraansluiting volgens ISO-4400 of 3x DIN-46244 (bij juiste montage wordt de dichtheidsklasse IP-65 verkregen).
- Aansluiting binnen in het metalen huis d.m.v. schroefaansluiting. De kabeldoorvoer heeft een "PG" aansluiting.
- Spoelen met platte steker (AMP type).
- Losse of aangegoten kabels

IN GEBRUIK STELLEN

Voordat de druk aangesloten wordt dient een elektrische test te worden uitgevoerd. Ingeval van magneetafsluiters, legt men meerdere malen spanning op de spoel aan waarbij een duidelijk "klikken" hoorbaar moet zijn bij juist funktioneren.

GEBRUIK

De meeste magneetafsluiters zijn uitgevoerd met spoelen voor continu gebruik. Omdat persoonlijke of zakelijke schade kan ontstaan bij aanraking dient men dit te vermijden, daar bij langdurige inschakeling de spoel of het spoelhuis heet kan worden.

GELUIDSEMISSIE

Dit hangt sterk af van de toepassing en het gebruikte medium. De bepaling van het geluidsniveau kan pas uitgevoerd worden nadat het ventiel is ingebouwd.

ONDERHOUD

Het onderhoud aan de afsluiters is afhankelijk van de bedrijfs-omstandigheden.
In bepaalde gevallen moet men bedacht zijn op media welke sterke vervuiling binnen in het produkt kunnen veroorzaken.
Men dient dan regelmatig inspecties uit te voeren door de afsluiter te openen en te reinigen. Indien ongewone slijtage optreedt dan zijn reserve onderdelensets beschikbaar om een inwendige revisie uit te voeren.
Ingeval problemen of onduidelijkheden tijdens montage, gebruik of onderhoud optreden dan dient men zich tot ASCO of haar vertegenwoordiger te wenden.

Een aparte fabrikanten verklaring van inbouw, in de zin van EU-richtlijn 89/392/EEG aanhangsel IIB kan door de afnemer na opgave van orderbevestigingsnummer en serienummer verkregen worden.
Dit product voldoet aan de essentiele vereisten van de EMC Richtlijn 89/336/EEG en amendementen, net als aan de richtlijnen 73/23/EEG en 93/68/EEG inzake laagspanning. Een afzonderlijke verklaring van overeenstemming is op verzoek verkrijgbaar. Vermeld a.u.b. het nummer van de opdrachtbevestiging en de serienummers van de betreffende produkten.

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Section 5

Honeywell

Installation Instructions for the
MICRO SWITCH Heavy Duty Limit Switch Series

Issue 6

81116

⚠WARNING
PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

MOUNTING

All MICRO SWITCH Heavy Duty Limit Switches (HDLS) have exactly the same mounting dimensions. They may be mounted by either of two methods: (a) use two #10 screws from the front, or (b) use two #10-32 UNF screws from the back. The HDLS Series offers the advantage of front mount construction. The electrician will find a complete switch, with no parts missing and ample wiring space.

With plug-in construction, wiring and conduit connection is made to the base receptacle. This feature also reduces downtime, since the plug-in unit can be removed without disconnecting wiring or conduit.

To mount either type of HDLS switch, tighten mounting screws, tighten the plug-in unit or cover screws, and make sure conduit section is sealed. Use of sealant (Teflon® tape, pipe dope, etc.) is recommended to seal conduit connection. Torque 1.4 Nm to 1.8 Nm [12 in-lb to 16 in-lb].

Because of moisture condensation, it is not advisable to mount the switch upside down or at the low point of conduit runs.

Sealing	IP65/IP66/IP67
Enclosure type	NEMA 1, 3, 4, 4X, 6, 6P, 12, 13

Rated Operational Voltages (Ue) and Currents (IE)

Ue	**Ie**
120 Vac	6 A
600 Vac	1.2 A
125 Vdc	0.22 A
250 Vdc	0.11 A

Figure 1. MICRO SWITCH HDLS SPDT Dimensions

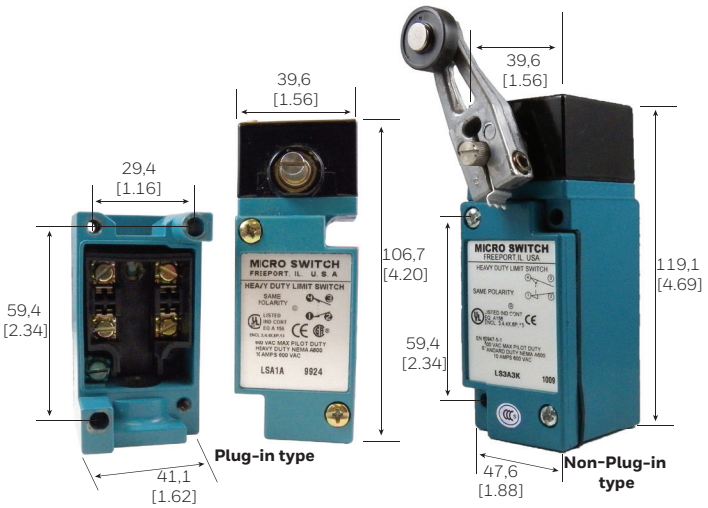
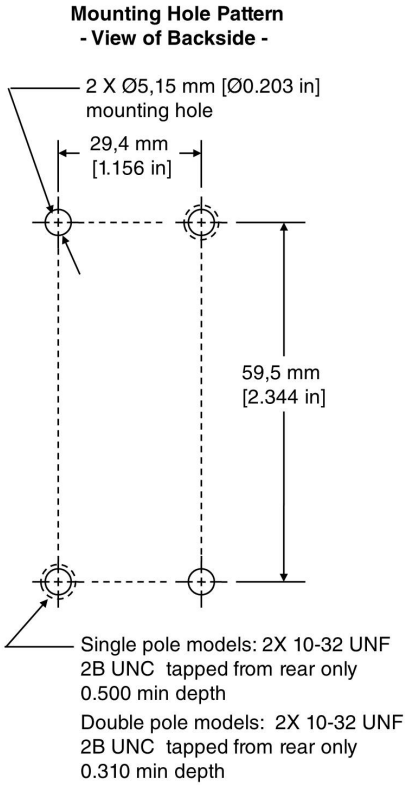


Figure 2. MICRO SWITCH HDLS Mounting Diagram



WIRING

Use size #12AWG or smaller solid or stranded wire to connect to the pressure type connector terminals. Spades may be up to 0.312 inches wide, rings up to 0.312 inches dia. With spade or ring type connections, pre-insulated connectors or heat-shrinkable tubing should be used to provide insulation between terminals. The switch's circuit diagram is shown on the nameplate.

Figure 3. HDLS Plug-in Receptacle

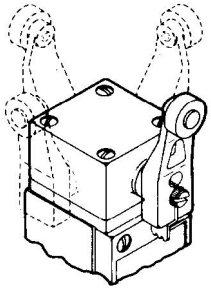
It is easier to wire the HDLS double-pole units by connecting lead wires to the terminals nearest the conduit opening first. A grounding screw is located in the housing near the conduit opening.

MICRO SWITCH™ HDLS switch units with an indicator light in the cover are furnished with lead wires from the light connected to the normally open male terminals (#3 and #4) unless otherwise specified. Wires can be unsoldered and reconnected to the normally closed male terminals or ordered connected to the normally closed terminals by using a modification code. Always connect these wires to the same set of terminals used for the load. Across the normally open male terminals (#3 and #4), the light will be on with switch not actuated. Across the normally closed terminals (#1 and #2) the light will be off.

ADJUSTING INSTRUCTIONS

Actuator head. For application flexibility, the HDLS's actuator head may be indexed at 90° intervals. Loosen the four captive head screws, place head in the desired position, and then securely re-tighten the four screws. Torque 1,4 NM to 1,8 Nm [12 in-lb to 16 in-lb].

Figure 4. Actuator Head Positions



Reversing the roller lever. Except for the offset roller levers, the roller arm may be reversed to face the roller to the inside or outside of the arm.

Positioning the lever. The lever on rotary actuated units is adjustable through 360° around the shaft. Loosen the screw with a 9/64 inch hexagon key wrench, move lever to desired position, and securely tighten the screw until "teller tab" can no longer be moved by hand. Then tighten the screw another 1/8 to 1/4 turn to assure lever is tight on the shaft. Hexagon key wrenches are provided in adjusting tool set (part number LSZ4005).

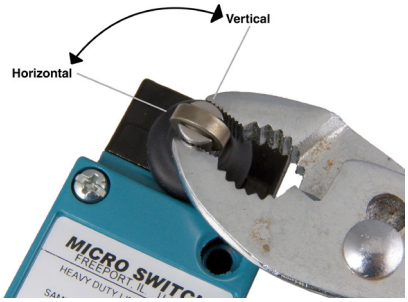
Figure 5. Teller Tab

Adjustable Length Levers. A 9/64 hexagon key wrench is required to adjust length of adjustable levers.

Top Roller Plunger. Position top roller plunger on desired roller plane by adjusting the head as explained in the Actuator Head section above.

Side Roller Plunger. Grasp roller with pliers to rotate it to the desired horizontal or vertical plane.

Figure 6. Side Roller Plunger Adjustment



CHANGING DIRECTION OF ACTUATION

Side Rotary. LSM (center neutral) and LSN (maintained) HDLS listings operate in both directions and cannot be changed. Listings with the first three letters LSA, LSH, LSL, LSP, LSU, and LSR may be changed to operate clockwise, counterclockwise, or both. NOTE: Instructions for adjusting switch operation are cast into the hinged cover (Figure 7). To change, follow these steps:

1. Loosen the head screws and remove the head from the switch housing.
2. On the bottom of the head, insert a screwdriver in slot provided (Figure 8) and lift open hinged cover.
3. Referring to Figures 7/8/9, slide cam all the way back, so cam is free to rotate on the shaft.
4. Using a screwdriver or similar tool, rotate cam to desired actuating position (Figures 10, 11, and 12.)
5. Slide cam all the way forward to its original position, and close hinged cover.
6. Replace operating head on switch housing and securely tighten head screws. Torque 1,4 NM to 1,8 Nm [12 in-lb to 16 in-lb].

Figure 7. MICRO SWITCH HDLS Cam Slide

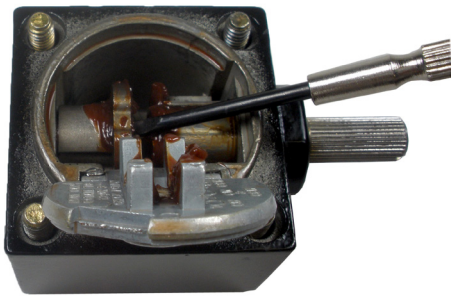


Figure 8. MICRO SWITCH HDLS Side Rotary Actuator Head Terminology

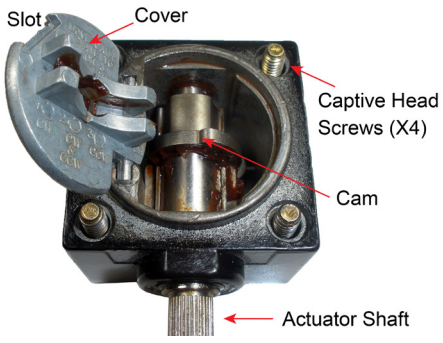


Figure 9. MICRO SWITCH HDLS

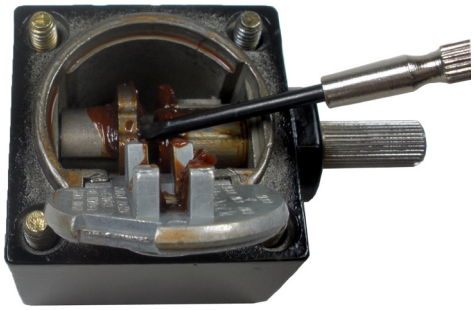


Figure 10. MICRO SWITCH HDLS Cam Lobes for CW and CCW

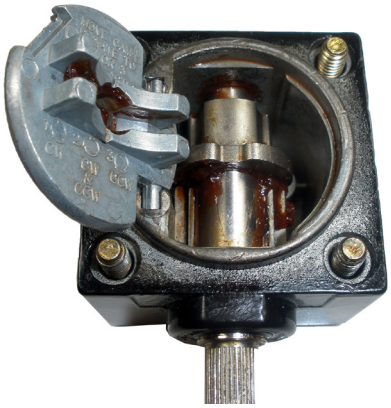


Figure 11. MICRO SWITCH HDLS Cam Lobe for CW

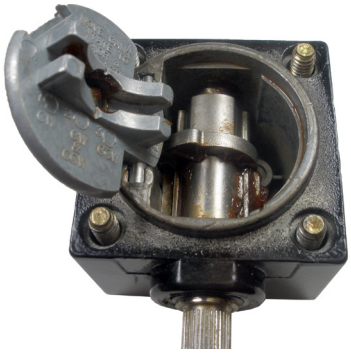
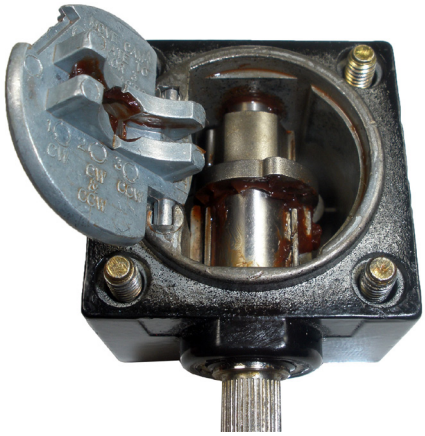


Figure 12. MICRO SWITCH HDLS Cam Lobe for CCW



Top Rotary. Follow these steps to change operating direction of LSB type switches:

1. Loosen head screws and remove head from the switch housing.
2. From bottom of head grasp end of pin plunger and remove pin (Figure 13). It may be necessary to rotate actuating shaft to expose end of pin plunger.
3. Refer to Figure 14 and select correct pin plunger position for desired direction of actuation.
4. Insert the pin plunger in the position providing desired direction of actuation.
5. Replace the operating head on switch housing and securely tighten head screws (Torque 1,4 Nm to 1,8 Nm [12 in-lb to 16 in-lb]).

Figure 13. MICRO SWITCH HDLS Top Rotary Actuator

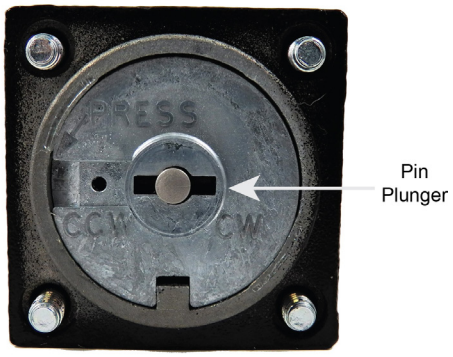
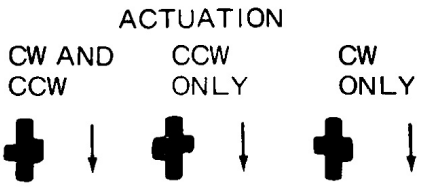


Figure 14. MICRO SWITCH HDLS Top Rotary Actuation Diagram

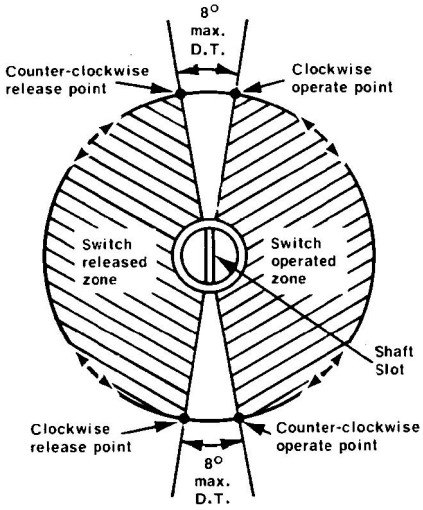


GRAVITY RETURN HDLS

Listings beginning with LSS are gravity return devices. During installation and setup, note the following:

1. Operate and release points exchange locations when shaft is rotated 180° (Figure 15).
2. Switch is near operate-release points when shaft slot is parallel to switch's long axis (Figure 15).
3. The switch should be installed so that the weight of the actuator returns to the switch's free position.

Figure 15. MICRO SWITCH HDLS Gravity Return Operate and Release Points



Replacement parts

When replacing parts, please follow the instructions included with the part.

Should a specific switch catalog listing not appear in this parts list, contact nearest Honeywell Sensing and Control authorized distributor or Honeywell sales office.

For ease of making switch adjustments, order LSZ4005 (lever and switch adjusting tool set). This set consists of a special 3/32-inch open wrench and necessary hexagon key wrenches to adjust all types of levers.

Replacement Levers. To order replacement levers, order the same part number that is metal stamped on either lever or lever hub. For additional options, see Table 7 of Heavy-Duty Limit Switch (HDLS) data sheet available on www.sensing.honeywell.com or follow this link: https://sensing.honeywell.com/honeywell-sensing-micro-switch-hdls-limit-product-sheet-002345-10-en.pdf

Table 1. MICRO SWITCH HDLS Plug-in Type Replacement Components

Catalog Listing* on Switch Nameplate	Complete Plug-in Unit Less Base Receptacle	Plug-in Base Recept. Only	Operating Head Only	Contact Block (Basic Switch Only)
LSA1A	LSZ7A1A	LSZ4001	LSZ1A	LSZ3A
LSA1J	LSZ7A1J	LSZ4001	LSZ1A	LSZ3J
LSA2B	LSZ7A2B	LSZ4002	LSZ1A	LSZ3B
LSB1A	LSZ7B1A	LSZ4001	LSZ1B	LSZ3A
LSC1A	LSZ7C1A	LSZ4001	LSZ1C	LSZ3A
LSC1J	LSZ7C1J	LSZ4001	LSZ1C	LSZ3J
LSD1A	LSZ7D1A	LSZ4001	LSZ1D	LSZ3A
LSD1J	LSZ7D1J	LSZ4001	LSZ1D	LSZ3J
LSD2B	LSZ7D2B	LSZ4002	LSZ1D	LSZ3B
LSE1A	LSZ7E1A	LSZ4001	LSZ1E	LSZ3A
LSE1J	LSZ7E1J	LSZ4001	LSZ1E	LSZ3J
LSE2B	LSZ7E2B	LSZ4002	LSZ1E	LSZ3B
LSF1A	LSZ7F1A	LSZ4001	LSZ1F	LSZ3A
LSF1J	LSZ7F1J	LSZ4001	LSZ1F	LSZ3J
LSF2B	LSZ7F2B	LSZ4002	LSZ1F	LSZ3B
LSH1A	LSZ7H1A	LSZ4001	LSZ1H	LSZ3A
LSH1J	LSZ7H1J	LSZ4001	LSZ1H	LSZ3J
LSH2B	LSZ7H2B	LSZ4002	LSZ1H	LSZ3B
LSJ1A-7A	LSZ7J1A-7A	LSZ4001	LSZ1JGA	LSZ3A
LSJ1A-7M	LSZ7J1A-7M	LSZ4001	LSZ1JGM	LSZ3A
LSJ2B-7A	LSZ7J2B-7A	LSZ4002	LSZ1JGA	LSZ3B
LSJ2B-7M	LSZ7J2B-7M	LSZ4002	LSZ1JGM	LSZ3B
LSK1A-8A	LSZ7K1A-8A	LSZ4001	LSZ1KHA	LSZ3A
LSK2B-8A	LSZ7K2B-8A	LSZ4002	LSZ1KHA	LSZ3B
LSL2C	LSZ7L2C	LSZ4002	LSZ1L	LSZ3C
LSM2D	LSZ7M2D	LSZ4002	LSZ1M	LSZ3C
LSN1A	LSZ7N1A	LSZ4001	LSZ1N	**
LSN2B	LSZ7N2B	LSZ4002	LSZ1N	**
LSP1A	LSZ7P1A	LSZ4001	LSZ1P	LSZ3A
LSP1J	LSZ7P1J	LSZ4001	LSZ1P	LSZ3J
LSP2B	LSZ7P2B	LSZ4002	LSZ1P	LSZ3B
LSR1A	LSZ7R1A	LSZ4001	LSZ1R	LSZ3A
LSR1J	LSZ7R1A	LSZ4001	LSZ1R	LSZ3J
LSH2B	LSZ7R2B	LSZ4002	LSZ1R	LSZ3B
LSU1A	LSZ7U1A	LSZ4001	LSZ1U	LSZ3A
LSV1A	LSZ7V1A	LSZ4001	LSZ1V	LSZ3J
LSV1J	LSZ7V1J	LSZ4001	LSZ1V	LSZ3A
LSV5A	LSZ7V5A	LSZ4001	LSZ1V	LSZ3A
LSV8A	LSZ7V8A	LSZ4001	LSZ1V	LSZ3A

Table 2. MICRO SWITCH HDLS Non-Plug-in Type Replacement Components

Catalog Listing on Switch Nameplate	Operating Head Only	Contact Block (Basic Switch Only)
LSA3K	LSZ1A	LSZ3K
LSA4L	LSZ1A	LSZ3L
LSB3K	LSZ1B	LSZ3K
LSB4L	LSZ1B	LSZ3L
LSC3K	LSZ1C	LSZ3K
LSC4L	LSZ1C	LSZ3L
LSD3K	LSZ1D	LSZ3K
LSD4L	LSZ1D	LSZ3L
LSE3K	LSZ1E	LSK3K
LSE4L	LSZ1E	LSZ3L
LSF3K	LSZ1F	LSZ3K
LSF4L	LSZ1F	LSZ3L
LSG3K	LSF1G	**
LSH3K	LSZ1H	LSZ3K
LSH4L	LSZ1H	LSZ3 L
LSJ3K-7A	LSZ1JGA	LSZ3 L
LSJ3K-7M	LSZ1JGM	LSZ3 K
LSJ4L-7A	LSZ1JGA	LSZ3 L
LSJ4L-7M	LSZ1JGM	LSZ3 L
LSK3K-8A	LSZ1KHA	LSZ3 K
LSK4L-8A	LSZ1KHA	LSZ3 L
LSL4M	LSZ1L	LSZ3 M
LSM4N	LSZ1M	LSZ3M
LSN3K	LSZ1N	**
LSN4L	LSZ1N	* *
LSP3K	LSZ1P	LSZ3 K
LSP4L	LSZ1P	LSZ3 L
LSR3K	LSZ1R	LSZ3 K
LSR4L	LSZ1R	LSZ3 L
LSU3K	LSZ1U	LSZ3 K
LSU4L	LSZ1U	LSZ3L

*Only the listing portion which determines the replacement part is shown. Listings with -7A, -7M, or -8A are complete listings.

**Not user-replaceable.

Figure 16. MICRO SWITCH HDLS Plug-in Unit and Base

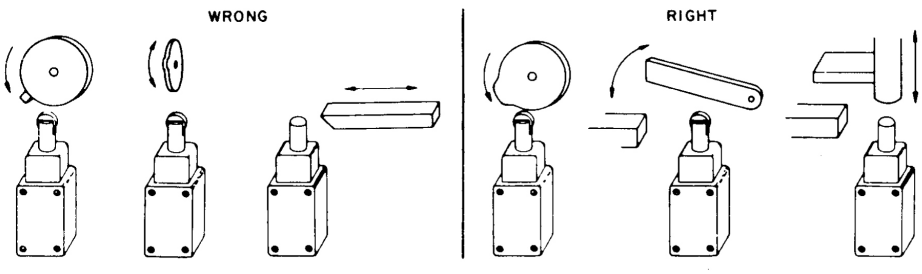
Replacement Parts for gravity return LSS1H (extra/low torque LST1H) and two examples of a standard size rotary LSA1A type (LSYAC1A with Viton seals and LSYAB1A low-temperature version) are listed below.

Catalog Listing	Plug-in Units Only*	Base Receptacle	Operating Head	Contact Block
LSS1H	LSZ7S1H	LSZ4001	LSZ1S	LSZ3H
LST1H	LSZ7T1H	LSZ4001	LSZ1T	LSZ3H
LSYAB1A	LSZ7YAB1A	LSZ4001	LSZ1AB	LSZ3A
LSYAC1A	LSZ7YAC1A	LSA4001	LSZ1AC	LSZ3A

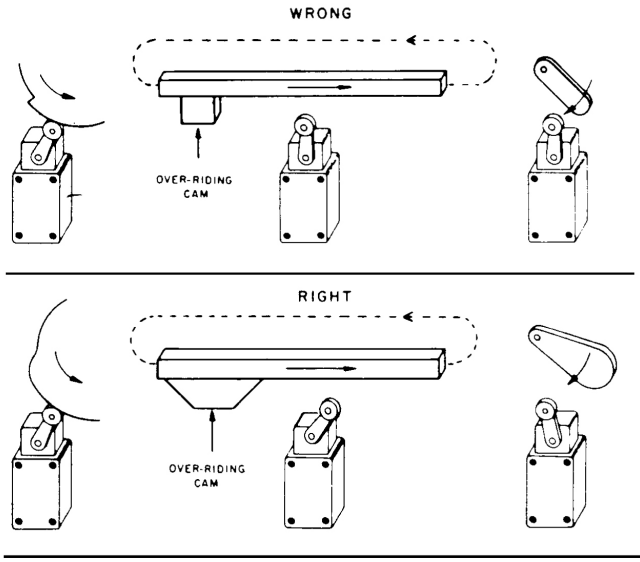
* Reference page 5 for complete plug-in unit less base receptacle.

Proper Application of Limit Switches

To achieve greatest reliability and longest life possible, limit switches should be installed as outlined in NEMA lCS2-225.



For limit switches with pushrod actuators, the actuating force should be applied as nearly as possible in line with the pushrod axis.



Cam or dog arrangements should be such that the actuator is not suddenly released to snap back freely.

Warranty/Remedy
Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

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