



# Hills-McCanna Diaphragm Valves

## Installation, Operation and Maintenance Instructions

### Installation

Hills-McCanna diaphragm valves may be installed in any position, using good piping practices. Diaphragm valves must displace fluid in closing. Therefore, they are not suitable for use in "locked line" conditions, where the valve must close against liquid trapped between two other closed valves.

### Maintenance

Maintenance is usually limited to diaphragm replacement as necessary, plus periodic greasing and checking of bonnet bolt torques. It is *VERY IMPORTANT* to adhere to the recommended torques detailed in Section 2.

#### 1. Greasing

Bonnets should be greased on a regular schedule, four times per year. Adequate greasing is especially important when the valves are used in corrosive atmospheres, as corrosion may "freeze" the sleeve and stem unless a protective layer of grease

is present. Apply sparingly to keep the back of the diaphragm free of grease. Special lubricants are available for stem lubrication in specific services such as food processing, oxygen, chlorine, etc.

#### 2. Bonnet Bolt Torque

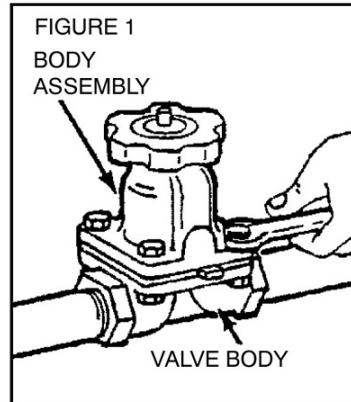
The table below represents average bonnet bolt torque values found to produce correct diaphragm "squeeze" for bonnet sealing. For elastomeric diaphragms, this correct force will produce a slight extrusion or bulge of the diaphragm between the body and bonnet flanges. Bolt fit, corrosion, bonnet roughness, bolt lubrication, bolt hole matching, etc. may modify the actual torque required to produce this condition.

#### 3. Replacing the Valve Diaphragm

**A. Bonnet Removal** - It is not necessary to remove the valve from the line. However, no disassembly should be attempted

until the line has been depressurized. Disassemble valve by removing cap screws, bolts or nuts that connect bonnet assembly to the valve body. (See FIGURE 1.)

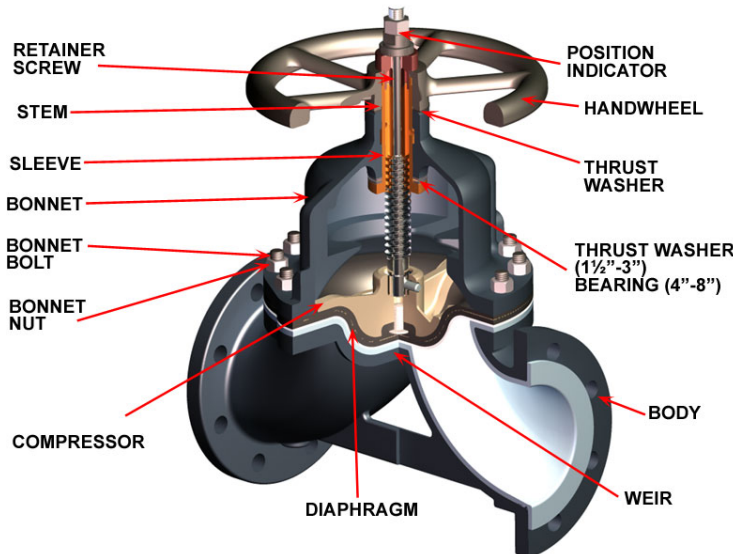
**B. Diaphragm Removal** – The diaphragms are attached to the compressor by a screw stud or by two pins.



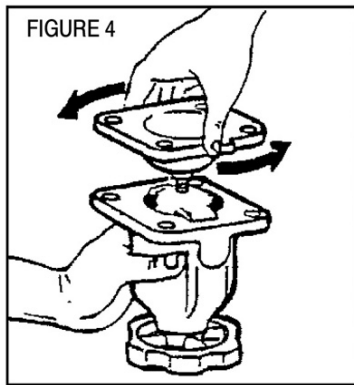
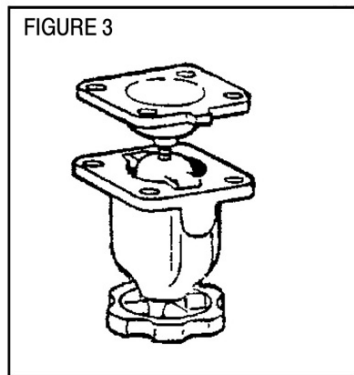
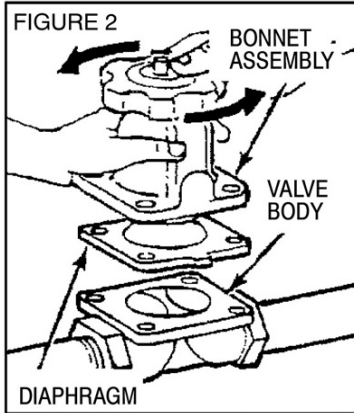
Approximate Bonnet Bolt Torque (IN-LB)

Valve Size	Elastomeric	TFE Faced
½	35	40
¾	30	40
1, 1¼	40	60
1½	100	150
2	100	240
2½	170	480
3	240	600
4	200	660
6	420	840
8	420	840
10	420	840
12	420	840

All diaphragm types are removed by turning the diaphragm in a counter clockwise direction until the stud is screwed out of the compressor. The diaphragm may then be lifted out. (See FIGURES 2, 3 & 4.)



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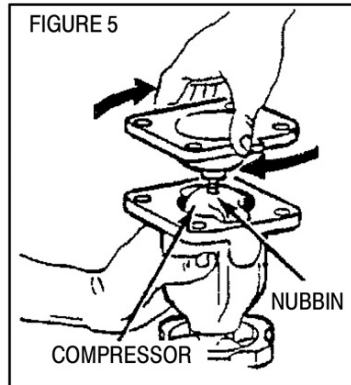


**C. Reassembly** - Sealing is effected across the weir by means of a slightly raised bead on the diaphragm. Perform following procedures to assure a good fit between this bead and the weir so that moderate compressor force is all that is necessary to close at full line pressure. Faulty installation may produce large crushing forces or lead to the use of such forces in operation. This could result in premature diaphragm failure.

**CAUTION:** When diaphragms molded in the "closed" position are used, they must be inverted and pushed firmly against the stud or retainer column. **DO NOT USE SHARP INSTRUMENTS.**

### Diaphragm with Screw Stud

Place stud in mating thread of compressor and turn diaphragm clockwise until the round nubbin bottoms out snugly in the cavity of the compressor. Do not over tighten the stud to line up the bolt holes in the diaphragm and bonnet as stud adhesion may be destroyed. If force seems excessive back off up to 180° to produce correct alignment. (See FIGURE 5.)



### VACUUM OR LIGHT GAS SERVICE

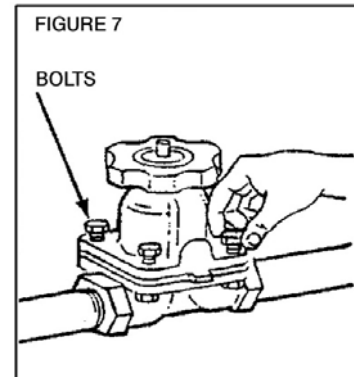
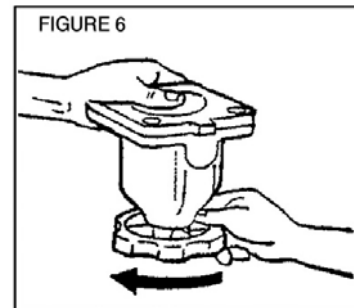
For these "hard to contain" services, we recommend that a thin layer of Mobilgrease HTS or other sealing media be applied to the diaphragm where it comes into contact with the body bonnet flange and on the edge of the diaphragm/body joint after assembly. Do not apply to the diaphragm weir bead or to the weir.

### D. Final Assembly

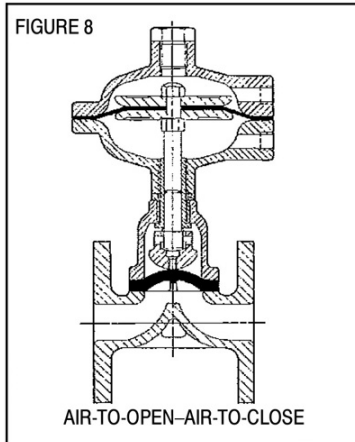
#### STANDARD BONNET

Move handwheel counterclockwise to the "valve full open" position so that the diaphragm is pulled up to its full limit of upward travel. Mount bonnet assembly on the body and install bolts, capscrews, or nuts to finger-tightness. Now turn handwheel or lever clockwise to the "full closed" position so that the diaphragm has light contact

against the weir. Tighten fasteners diagonally and evenly, gradually turning valve toward the open position to relieve compressor forces against the diaphragm as the bonnet is being clamped downward. This procedure results in the diaphragm sealing bead seating snugly against the body weir without crushing and without excessive stretching of the diaphragm in service. After the diaphragm is firmly clamped between body and bonnet, the valve may be opened and the fasteners tightened to the values shown in the Approximate Bonnet Bolt Torque table on page 1. (See FIGURES 6 & 7.)



# Installation, Operation and Maintenance Instructions



## AIR-ACTUATED BONNET

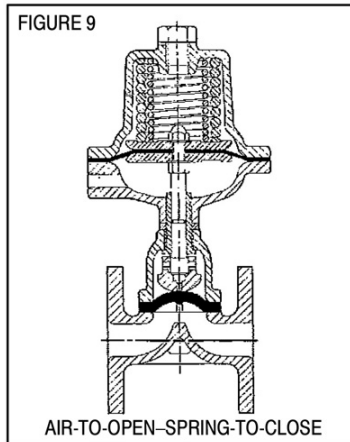
The same assembly principles apply for various air/air or air/spring-actuated valves. Operating air pressure is applied as necessary to produce the desired compressor and diaphragm position at various stages of assembly. The main difference is that no adjustment of air or spring pressure is necessary as the bonnet moves downward during tightening of the bonnet bolting. The air or spring will maintain a constant pressure without crushing forces against the weir bead of the diaphragm.

## 4. Replacing the Operator Diaphragm

### AIR-TO-OPEN - AIR-TO-CLOSE OPERATORS

Models 150, 180, 260

Isolate operator from air supply. Disconnect airlines from operator housing. Remove top cover of operator housing, then remove acorn hex nut from sliding stem. Remove the operator diaphragm plate, remove the operator diaphragm. Remove second operator diaphragm plate and check that second hex nut is secure against shoulder on sliding stem. Place second operator diaphragm plate back on sliding stem and install new operator diaphragm, making sure the holes on the diaphragm periphery line up with the holes in the operator housing. Reassemble in reverse order.



## AIR-TO-OPEN - SPRING-TO-CLOSE OPERATORS

Models 190,160,270

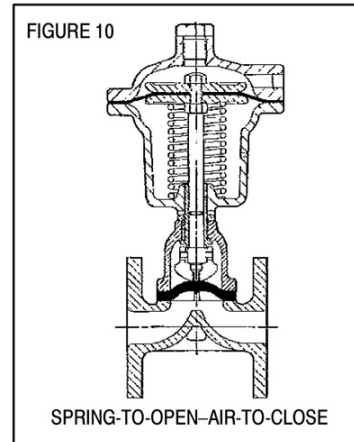
**CAUTION: The springs are sufficiently compressed to cause considerable force, making disassembly and assembly dangerous unless proper methods are employed.**

Isolate the operator from air supply. Disconnect airlines from operator housing. Removal of the spring housing can be done one of two ways:

**1. With Arbor Press.** Remove the valve from line. Place assembly in an arbor press and clamp the spring housing in place. Remove bolting holding spring housing in place. Decompress the spring by carefully releasing clamping on the arbor press.

**2. Using Threaded Rods to Secure Housing.** Remove four of the bolts and nuts, at equal spacing, that hold the spring housing to the pressure cap. Replace these four with 6" long threaded rods and secure them with nuts on each side of the connecting flange. Remove the remaining bolts and nuts that hold the housing flanges together.

Carefully, and alternately, loosen the nuts holding the threaded rods. This will relax the springs to the point where the housing can safely be removed. Remove acorn hex nut from sliding stem, remove operator diaphragm plate.



Remove operator diaphragm. Remove second operator diaphragm plate and check that second hex nut is secure against shoulder on sliding stem. Place second operator diaphragm plate back on sliding stem and install new operator diaphragm, making sure the holes on the diaphragm periphery line up with the holes in the operator housing. Reassemble in reverse order.

## SPRING-TO-OPEN - AIR-TO-CLOSE OPERATORS

Models 140, 170, 250

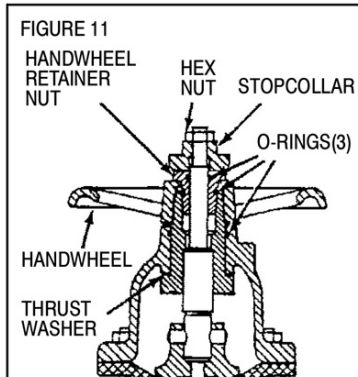
**CAUTION: The spring on this model will be almost fully relaxed when the air has been disconnected. However, care should be taken when removing the acorn nut on top of the operator diaphragm plate.**

Isolate operator from air supply. Disconnect airlines from operator housing. Remove all bolts and nuts holding the pressure cap to the spring housing. Carefully remove acorn hex nut on top of operator diaphragm plate. Remove the operator diaphragm plate and operator diaphragm. Remove second operator diaphragm plate and check that second hex nut is secure against shoulder on sliding stem. Place second operator diaphragm plate back on sliding stem and install new operator diaphragm, making sure the holes on the diaphragm periphery line up with holes in the spring housing. Reassemble in reverse order.

# Installation, Operation and Maintenance Instructions

## 5. Rebuilding a Sealed Bonnet (Model No. 97)

Disconnect drain/vent from bonnet when applicable. Remove bonnet fasteners. Remove hex nut, stopcollar, handwheel retainer (self-tapping screws and retainer washer on ½"-1 ¼"), thrust washer and the handwheel. Slide the stem assembly, with diaphragm, out of the bonnet.



Carefully replace the O-ring in the bore on the bonnet and the two O-rings on the handwheel retainer (one O-ring in the retainer washer on ½" - 1 ¼"). Replace thrust washer on sleeve, and slide assembly carefully back into the bonnet, making sure the O-ring in the bonnet is not damaged. Place thrust washer around sleeve on top of bonnet and thread the handwheel back into place. Put handwheel retainer over stem (self tapping screws and retainer washer on smaller sizes), making sure O-ring in bore is not damaged. Tighten. Place

stopcollar over stem and fasten with hex nut.

## Operation

### 1. How to Set Travel Stops (Bonnet Models 29, 49 & 97)

The stopcollar assembly is set at the factory in the proper position and at the proper torque limit. If a different setting is desired or when diaphragm "set-in" occurs after an extended use, the stopcollar assembly can be adjusted.

#### A. To Compensate for "Set-In"

Open valve, loosen top nut and back off stopcollar assembly one to two turns. Close valve until tight shutoff is obtained. Care must be taken not to overclose valve, potentially damaging the diaphragm. Lower the stopcollar assembly against the handwheel retainer nut until it makes metal-to-metal contact and secure with top nut.

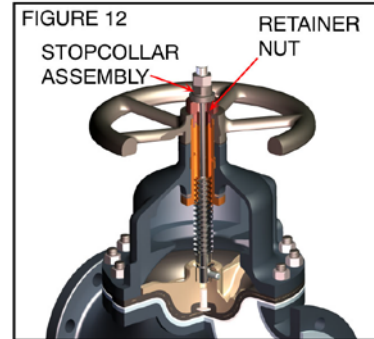
#### B. To Set for Desired Position

Open valve, back off stopcollar assembly one to two turns. Operate valve to desired position. (Fully closed or any other position needed for proper operation). Lower the stopcollar assembly against the handwheel retainer nut until it makes metal-to-metal contact, secure with top nut.

### 2. Evacuation of Bonnets Made for Vacuum Service

On diaphragm valves 4" and larger prepared for and used in vacuum service, it is recommended that the sealed bonnet be evacuated.

An easy method is to connect the tapped vent hole in the bonnet to the system drawing the vacuum on the main line. This method will assure that the pressure will always be the same on each side of the diaphragm, thereby preventing diaphragm stud pull-out.



### 3. Aids to Successful Service Life

#### A. Valve Closure

Do not use wrenches or "cheaters" to close valve, as premature diaphragm failure may result. A bonnet with indicating travel stop (Model 29) is available to eliminate overclosure if operating personnel are found to regularly overclose the valve.

#### B. Service

If the service was known, the valve materials were selected for this service. Consult Hills-McCanna before changing the valve to a new service. Many body and diaphragm materials are available to allow a change in the service without a complete valve change.

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