Model 9000	Series 9000 Control Valves (for valves with model 9050 reversible actuator)	Instruction Manual

GENERAL

This manual provides installation, operation and maintenance instructions for the Model 9000 control valve. To insure operator safety and optimum performance, these instructions should be read, understood and followed. The Model 9000 technical brochure or appropriate engineering drawings, should be used in conduction with this manual.

UNPACKING

To minimize damage during transit, most Badger® products are shipped in heavy double wall boxes and packed in high density Insta-Pak foam.

> If the container is damaged, the carrier should be notified immediately and appropriate claims filed by your company.

> Inspect each item for possible damage and verify item quantity with the packing list.

> Leave all products in their protective packaging until ready for installation.

> Leave flange surface protectors in place until ready for installation.

INSTALLATION

> Clear pipeline of debris before installing the valve.

> Remove protective plugs or coverings from the body and instrument air connections. Note: Leave the black “vent plug” in place [in spring case opposite the air connection].

⚠CAUTION

Do Not use the “cork” flange face protector as a gasket. Use only gaskets approved by your company.

> The standard “flangeless/NPT” body can be piped with NPT fittings or clamped between companion flanges.

Note: The 2" size valve cannot be clamped between Class 300 flanges due to the flange having eight [8] bolts.

> When installing with NPT fittings, use a thread sealant to preclude galling and decrease leakage.

> Be sure to install the valve [with] the flow direction arrow on the body unless instructed by the factory to do otherwise.

> If clamping between flanges, make sure the I.D. of the gasket does not restrict the inlet or outlet openings of the valve.

> Flange bolts or studs, should be applied in accordance with ASME or your company standards.

NOTE: Although the valve will operate in any orientation, vertical is normally recommended.

NOTE: If the valve is used in a particularly hot or cold service, do not insulate the bonnet area. The length of bonnet material provides protection from hot and cold, for the stem packing.

> If vibration or shock is anticipated, a support bracket should be attached to the actuator rim screws and attached to a strong support structure. [Brackets are available from the factory]

AIR CONNECTION

> The air signal to the diaphragm should not exceed the pressure range stamped on the nameplate.

If used in conjunction with a positioner, the positioner supply pressure should be set at no more than 60 psig, although the diaphragm is capable of withstanding 90 psig.

> All instrument and supply air should be: clean, dry and free of oil and debris. Any deviation can cause malfunction or shorten the life of the valve.

> The standard air connection is 1/4" NPT.

Note: If the unit has been special ordered with a BSP Gl/4 fitting, it will be marked accordingly.

> Although conditions can vary, normally 1/4" O.D. tubing is appropriate for air signal lines of 30' or less. If the distance is longer, or if response is slow, larger air lines may be required.

UNITS WITH POSITIONERS

> Connect instrument signal and supply air line to the positoner input and supply port using a small amount of paste type thread sealant. Do Not use TFE tape.

NOTE: Normally 25-35 psi supply air pressure is appropriate. If the valve does not achieve the required travel, the supply pressure can be raised until the travel is achieved.

TESTING

> The test tag [attached to the yoke] indicates the types of tests that were performed on the valve by the factory.

> Should the packing require adjustment, do so by turning the gland in a clockwise direction, until the leakage stops. DO NOT overtighten the packing as it can unnecessarily increase stem drag and reduce performance.

> DO NOT re-orient the actuator without raising the innervalve off the seat. Rotation of the innervalve while under spring or air tension, will damage the seating surface.

ADJUSTMENTS
[Stem Packing]
> Standard stem packing is PTFE chevron rings, which are designed to energize under pressure.
If adjustments are necessary, tighten the gland 1/8th turn and check for leaks. Repeat if necessary.
> If equipped with graphite packing, the gland should be tightened only enough to stop the leak. Overtightening can cause excess stem drag. Note: Graphite packing normally requires a “break-in” period.

[Body-Bonnet Gasket]
> The bonnet flange bolts should not need re-tightening. However, if leakage does occur, tighten [in a criss-cross pattern] to the following values:
1” Valve: (5/16” bolt thread] = 17-20 ft-lbs
1.5" Valve: (3/8" bolt thread] = 30-35 ft-lbs
2" Valve: [7/16" bolt thread] = 50-55 ft-lbs.

[Bench Setting] [ATO-Without Positioner]
> Best done on a workbench with an air station and guages. If attempting to adjust spring loading while the valve is in line, it is recommended to shut off the upstream pressure to the valve while making adjustments.
> The point at which the instrument signal lifts the innervalve off the seat is pre-adjusted at the factory. If the incoming pressure is higher than the unit is adjusted to handle, additional spring loading can be attained by adjusting the stem length with the stem connector.
> To increase spring tension [bench setting], stroke the valve off the seat, using a manually operated air signal, to the desired bench setting. (Positioners must be by-passed.)

NOTE: The 3-15psi [3 spring] version, can be adjusted to 8-20 psi. The 6-30psi [6 spring] version, can be adjusted to 16-40psi.
> Loosen the jam nut on the stem connector [against the bottom of the actuator stem].
> Turn the stem connector [unscrewing it out of the actuator stem] until the innervalve touches the seat.
DO NOT attempt to increase spring tension only by turning the innervalve. Turning the innervalve while seated will damage the innervalve, causing galling and/or seat leakage.
> Re-Tighten the jam nut and reduce the air signal pressure to see if the valve now shuts off. If the anticipated [psi air] increase is not enough, repeat the above until the proper setting is achieved.
> Once the proper setting is achieved, the valve can be put back into service.

ZERO ADJUSTMENT [Positioner]
Details of the positioner are not included in this manual. However, zero adjustment is a simple matter.
Most positioners have the zero adjustment clearly marked or indicated in the manual accompanying the positioner. > Simply set the instrument signal to the positioner at aproximately 3.1 psi [if 3-15psi signal].
> Adjust the zero adjusting mechanism until the valve touches the seat [going closed].
> Check the zero point by raising and lowering the air signal to verify the setting.

DISASSEMBLY [Valve body assembly from actuator]
Although adjustments or some repairs can be performed with the valve in line, they are best done in a properly equipped workshop.

⚠CAUTION

DO NOT attempt any repairs or disassembly, other than packing adjustment, while the valve is under pressure.

> If the unit is Air to open, using a manual air station, raise the innervalve to a position between 3/4 and full open.
> While holding the stem connector with a wrench, loosen the innervalve stem jam nut and unscrew the innervalve completely, from the stem connector.
> Using a wrench or a hammer and punch, loosen and unscrew the yoke lock nut.
> Lift the actuator off the bonnet.
> If the actuator is not to be disassembled, you may want to leave the air line connected and air on the diaphragm so that it will not be forgotten during re-assembly.

DISASSEMBLY [Body/Bonnet assembly]
> Remove the innervalve jam nut
> Remove the bonnet flange screws [or studs]
NOTE: Keep these 4 screws apart from other hex screws, as they are high strength screws and other types of screws should not be substituted.
> Remove the bonnet from the body by slowly twisting and pulling, by hand, until it pulls free. DO NOT pry the bonnet out.
> Extract the seat (if so equipped] from inside the body.
> Loosen the packing gland 2-3 turns.
> Pull the innervalve out the bottom of the bonnet.
> Remove the packing gland.
> Insert a wood, plastic or soft metal [copper or brass] rod [aprx. 0.4-0.5"ø into the bottom of the bonnet and push the packing cavity components out the top of the bonnet.
> Carefully remove the graphite body-bonnet gasket from both the body and bonnet. Clean both surfaces of graphite.
> Clean out the body with an appropriate solvent or soap and water. Use a brush as necessary.

REASSEMBLY [Body/Bonnet assembly]
[Described as if installing a new innervalve, packing kit and gasket]
> Carefully thread the new seat into the body [if so equipped]
> Tighten the seat (with appropriate socket] to the torque levels below:
1" Valve = 35-40 ft-lbs
1.5" Valve = 40-50 ft-lbs
2" Valve = 45-55 ft-lbs
> Lubricate innervalve stem and guide with Silicone grease, Krytox® or other suitable lubricant. Do Not use lubricants that contain metal particles.
> [Holding the bonnet upright] in the packing cavity end of the bonnet, place [over the stem].
1. the SST metal ring [packing floor adapter), making sure it reaches the bottom of the cavity.
2. the lower TFE packing adapter [flat side down]
3. 3 rings of chevron packing.
4. the upper TFE packing follower [flat side up].
5. the packing gland [tighten only hand tight for now].

REASSEMBLY [continued]
> Install [into body] a new graphite gasket.
> Hold the bonnet in one hand and push the innervalve into the bonnet until it stops.
> Insert the bonnet into the body until it seats firmly onto the gasket.
> Place the bonnet flange over the bonnet.
NOTE: The 1" bonnet flange should have the screw head recesses facing up. The 1.5" and 2" flanges are reversible.
> Install 4 flange screws [or studs] only hand tight
> Using a criss-cross pattern, tighten the four screws, starting at 5 ft/lbs and progressing [in 5 or 10 ft/lb increments) up to the following torque values:
1" Valves = 17-20 ft/lbs
1.5" Valves = 30-35 ft/lbs
2" Valves = 50-55 ft/lbs

> While holding the innervalve plug by hand, tighten the 1/4-28 jam nut onto the innervalve stem with a wrench.
Note: Later, you will use this nut to thread the innervalve stem into the actuator stem.
DO NOT clamp innervalve in a vise or hold with pliers.
> By hand, move the innervalve up and down to check for binding.
> Tighten the packing gland by hand, until you feel the stem/packing friction as you stroke the innervalve by hand.

REINSTALLING ACTUATOR TO BODY ASSEMBLY
> Making sure the actuator stem is at the full travel position, set the actuator onto the bonnet.
> Install and tighten the yoke lock nut.
> Pull the innervalve stem up to meet the actuator stem and thread it into the stem until the jam nut contacts the actuator stem. Use the innervalve jam nut as a wrenching point.
> Lower the signal pressure until it reads 3.1 psi, [if a 3-15 signal is desired] or whatever calculated "bench setting" is desired.
> Carefully unscrew the innervalve stem out of the actuator stem until the innervalve contacts the seat.
> Tighten the innervalve jam nut against the actuator stem.
NOTE: Use a back-up wrench on the flats of the actuator stem when tightening the innervalve jam nut, to preclude rotation of the actuator stem.

DISASSEMBLY-ACTUATOR (Mod 9050]
[Air to Open configuration]
Note: To reverse the actuator from Air to open to Air to close or vice-versa, see "REVERSING ACTUATOR ACTION" later in this manual.

> With the actuator off the valve, remove the air signal line.
> Remove the 12 actuator rim screws/nuts.
> Separate the pressure cases and set the upper case aside. [May require a screw driver to separate the cases, as they may be stuck together.]
> Remove the springs from the piston.
> While holding the stem with a wrench on the flats of the bottom end of the stem, remove the center [high strength] hex screw from the upper side of the assembly (afixing the diaphragm/piston to the stem].
> Remove the hardened thrust washer [under screw head]
> Remove the piston
> Remove the diaphragm and bottom retainer plate
> Push the stem out the bottom of the yoke.
> If replacing the stem seal, stem bushing guides or "O" ring.
> Remove 6 [six] ea [7/16" hex] screws, afixing the bottom case to the yoke.
> Remove the bottom case from the yoke, noting the orientation of the case on the yoke. Make a mark on each so they can be oriented properly later.
> Remove the large composite gasket [between case and yoke].
> Clean case and yoke surfaces of gasket material [if damaged]. If not, leave alone.
> If gasket is not damaged, set aside to re-use.
> Remove black Nylatron® upper stem bushing.
> Remove "O" ring from under upper bushing.
> Remove lower bushing [if necessary or worn]. This bushing does not necessarily need to be replaced as it gets little wear. If it does need to be removed and replaced, use a metal rod [aprx. 0.650-670"] Ø to press the bushing out from the opposite side of the cavity.

REASSEMBLY
> Replace the lower stem bushing [only if necessary]
> Lubricate with Krytox® grease and install new "O" ring into yoke cavity [atop lower stem bushing]
> Install new or old upper stem bushing [small turned end facing up]
> Install gasket and align 6 holes with 6 holes in yoke
> Place lower pressure case onto yoke gasket
> Hand-Tight, install 6 grade 5 hex screws
> Push actuator stem up through the bushings from the opposite side of the yoke and hold in place.
> Tighten 6 screws to 10 ft-lbs.
> Place the diaphragm retainer plate onto the stem.
> Then place the diaphragm onto the retainer plate [fabric side up].
> Place the piston into the premolded portion of the diaphragm.
> Install thrust washer and high strength hex screw through the piston, diaphragm and retainer plate and into the stem.
> While holding the stem with a 1/2" wrench, tighten the high strength hex screw to 28-30 ft-lbs.
> Align the holes in the diaphragm with the holes in the lower pressure case.
> Place the springs back into their pockets.
> Rest the upper case onto the springs and diaphragm.
> Re-install the 12 rim screw/nuts/washers and tighten progressively to 6-8 ft-lbs or until the diaphragm just starts to extrude from between the cases.

DISASSEMBLY AND REASSEMBLY [Air to close version]
The procedures for disassembling the air to close version are similar to the air to open version. However, the piston, diaphragm, retainer plate and springs are turned upside down. NOTE: As shown in the drawing, the thrust washer that fits under the head of the high strength hex screw on the Air to open version, fits between the actuator stem and the piston, on the Air to close version.

NOTES:
If lapping of the innervalve is required, use 1000 grit compound and lap for no more than 2 minutes before cleaning both the plug and seat and checking for leakage. Consult the factory for assistance if unsure how to proceed.

REVERSING ACTUATOR ACTION

Changing from Air to open to Air to close can be accomplished without additional parts and with standard tools.

> Start by removing the actuator from the valve according to previous instructions.
> Remove the rim screws.
> Separate the pressure cases.
> Lift out the springs.
> Remove the Nylon inserted lock nut [up travel stop inside the yoke] from the stem.
> Grasp the piston and remove the entire stem/diaphragm/piston assembly from the yoke.
> Using a 1/2" open end wrench, hold the actuator stem [in the yoke area] and loosen the high strength hex screw in the center of the piston.
> Loosen and remove the screw. Note the hardened thrust washer under the head of the screw.
> Grasp the Piston, Diaphragm and Retainer plate and lift all three parts off the stem and turn them over.
> Place the high strength hex screw [WITHOUT THRUST WASHER] through the retainer plate, diaphragm, piston and thrust washer.
> Thread the hex screw into the end of the actuator stem and tighten by hand.
> Holding the opposite end of the stem with a wrench, torque the high strength hex screw to 28-30 ft-lbs.
> Set the yoke [with lower pressure case still attached] upright on the workbench.
> Set the springs inside the pressure case
> Carefully slide the threaded [end that connects to the innervalve] actuator stem down through the center stem bushing. Make sure each spring enters its own pocket and that they are evenly spaced in each pocket [if only 3 springs are used].
> Place the upper case onto the lower case, keeping the rim screw holes aligned with the holes in the diaphragm and lower case.
> Re-install the 12 rim screw/nuts/washers and tighten progressively to 6-8 ft-lbs or until the diaphragm just starts to extrude from between the cases.
> Replace the up travel stop nut [thin nylon inserted lock nut] into the actuator stem.
> Move the black plastic vent plug from the upper housing to the lower housing.

Proceed with re-mounting the actuator to the valve assembly.
NOTE: Since the springs are keeping the stem at full travel, air does not need to be applied to the actuator at this time.

> Once mounted, connect air to the upper case and make zero adjustments.
The stem length should be adjusted so that at aprx. 14.75 psi, the innervalve touches the seat.
> Reduce the signal to 3 psi
> Adjust the up travel stop nut where it just touches the underside of the yoke, providing an up travel limit.

DO'S and DON'TS

• With air to open actuators, DO NOT attempt to adjust spring tension without first raising the innervalve off the seat.
ANY rotation of the innervalve while seated will damage the seating surface.

• DO NOT use TFE tape on positioner supply air lines. Small pieces of the tape can plug the positioner pilot and cause malfunctions or improper response.

• To re-orient the actuator [to make piping the air line more suitable].
> Raise the innervalve off the seat [if Air to open].
> Loosen the yoke lock nut.
> Orient the actuator as desired.
> Re-tighten the yoke lock nut.
> Lower the innervalve to the seated position.

Badger® is a registered trademark of Badger Meter, Inc.
Krytox® is a registered trademark of E.I. du Pont de Nemours and Company.
Nylatron® is a registered trademark of The Polymer Corporation.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists.

An der Autobahn 45 ♦ 28876 Oyten ♦ Tel. 04207/91 21-0 ♦ Fax 04207/91 21 41
Email verkauf@ehlersgmbh.de ♦ Home http://www.regel-ventile.de