



Model 311B Barstock Design Powreactor Dome Regulator

OPERATION AND MAINTENANCE

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NOTE: The following drawings form a part of this Instruction:

Assembly Drawing:	W-311B-A01,	or as applicable
Parts List:	W-311B-A01-1,	or as applicable
Special Tools:	041-00015	

Scope

These Instructions give procedures for installing, adjusting and servicing the 311B models of RedQ Powreactor Air Dome Regulator, with externally loaded dome, balance valve, and either internal or external sensing. Powreactors may be supplied in various end connection types and sizes, valve orifice sizes, and materials, to suit service requirements.

General Description

(Refer to Assembly Drawings)

The RedQ Powreactor Pressure Reducing Regulator is designed to maintain a constant reduced or delivered fluid pressure in a line or closed vessel where inlet pressure or flow volume may vary.

It is a balanced pressure type of regulator which is actuated by static gas pressure in a sealed dome. There is a flexible diaphragm between the sealed dome and the outlet line fluid. When outlet line pressure drops below dome pressure, the diaphragm moves out slightly and pushes the main valve open. This allows inlet line gas to flow through the valve until outlet line pressure builds up enough to balance the dome pressure. Then the diaphragm moves back to throttle or close the main valve so that dome and outlet pressures always remain in balance.

Any change in dome pressure causes a corresponding change in outlet line pressure. When the dome is

completely vented, the main valve shuts off bubble tight. RedQ Powreactors may be used in either gas or liquid systems, but the dome must always be loaded with air or other gas.

Special Precautions for High Pressure Installation

A. DOME LOADING

Turn all manual valves slowly and smoothly. Sudden admission of high pressure gas can create very high gas temperatures. When the gas is air or other oxidizing agent, heat may cause oil or plastics to ignite. Slow changes of pressure allow heat to be dissipated, so temperatures remain at safe levels.

Installation

A. SENSING CONNECTION

Regulator is normally shipped with plugs arranged for internal sensing of downstream pressure. If external sensing is desired, prepare regulator as follows (Refer to Assembly Drawing):

1. Remove internal control plug from external sensing port.
2. Be sure O-rings are mounted on external control adapter.
3. Screw external control adapter in body external sensing port, using wrench shown in Table I.
4. Connect external sensing line from this port to the downstream line at the point where pressure

response is desired, using the correct connection type and size. Refer to Assembly Drawing. Use wrench and torque as required by connection fitting.

B. REGULATOR MOUNTING

1. Note that downstream pressure gage should be readable from dome loading controls. Installation of the RedQ Powreactor in a horizontal section of this line, with dome uppermost, is recommended.
2. Before mounting regulator, blow down or flush supply line thoroughly, to eliminate any loose dirt.
3. Replacement of trim parts is effected through removal of body plug. Sufficient clearance should be provided to accomplish this.

CAUTION:

Do not clamp on body plug when installing end connections.

C. DOME CONNECTION

1. Connect dome to a source of gas at a pressure higher than the desired regulated downstream pressure, through a suitable dome loading control device. If line fluid is gas, inlet line may be used to load dome.
2. Since the dome is sealed after loading, a rise or fall in temperature will cause a corresponding change in sealed dome pressure and therefore also in outlet pressure. Outlet will return to original setting when temperature returns to original level.

NOTE: If RedQ Hand Loader (small volume reducing and relief regulator) is used as the dome loading control device, these temperature changes are compensated automatically.

Adjustment

To put the RedQ Powreactor Regulator into operation after it has been installed, load the dome with a gas pressure which will result in the desired outlet pressure.

NOTE: Actual pressure inside the air dome will be slightly higher than desired outlet pressure, due to resistance of valve springs.

A. PROCEDURE USING REDQ HAND LOADER

1. Turn loader handwheel counterclockwise to this limit. This vents dome.

2. Admit line pressure to inlet port of Powreactor and adjust outlet stop valve to allow a small flow.
3. Slowly turn loader handwheel clockwise until outlet pressure gage shows desired pressure in the outlet line.

4. Slowly open outlet stop valve to wide open position.

No other adjustment is necessary, and any temperature variation will be automatically compensated by the RedQ Hand Loader.

B. PROCEDURE USING LOADING MANIFOLD OR OTHER DEVICE

1. Close dome loading line and vent dome.
2. Admit line pressure to inlet port of Powreactor and adjust outlet stop valve to allow a small flow to outlet line.
3. Admit gas pressure to dome loading line.
4. Slowly open dome loading line, watching outlet pressure gage as it indicates pressure being established in the outlet line.
5. When the desired outlet pressure is reached in the outlet line, as shown on the outlet pressure gage, close dome loading line.
6. Slowly open outlet stop valve to wide open position. Powreactor is now operating in the line.

Maintenance

(Refer to Assembly Drawing to identify parts)

If outlet pressure deviates from original setting, correct as follows:

A. RISE IN OUTLET PRESSURE

1. Check temperature. A rise in ambient temperature after dome is setting when temperature returns to original level. (See Installation, paragraph C.-2.)
2. Check for Dirt in valve and regulating mechanism:
 - a. Slowly open outlet line so as to increase flow through regulator.
 - b. Slowly return to normal flow.
 - c. Outlet gage should show return to original setting.
3. Check loading mechanism for malfunction.
4. If outlet continues to rise, close inlet stop valve and check for leaks in Powreactor valve. Follow directions for disassembly, Adjustment.-C.-4.

B. DROP IN OUTLET PRESSURE

1. Check ambient temperature. A drop in temperature after dome is set will cause a drop in outlet pressure. Outlet will return to original setting when temperature returns to original level. (See Adjustment-C.-2.)
2. Check for leak in dome venting system:
 - a. Use bubble fluid on vent valve of the loading device.
 - b. If leaks appear, vent dome, inspect vent valves and replace if necessary.
 - c. Re-set dome vent valve is securely closed.
 - d. Be sure dome vent valve is securely closed.
 - e. Outlet pressure gage should show outlet pressure holding steady.
3. If Powreactor is set up for external sensing, check for obstruction in sensing line.
4. If outlet continues to fall off, check for damage to Powreactor diaphragm. Follow directions for disassembly Adjustment-C.-7.

C. REPLACEMENT OF PARTS

Order spares and replacement parts by part number and name, as shown on the applicable Assembly Drawing and Parts List: or give serial number of the regulator involved and name of parts required.

To replace damaged parts, the Powreactor Regulator need not be removed from the line, but inlet and outlet stop valves must be closed tightly, and pressure released from dome and line.

Disassembly procedure is similar for all Model M-13955 Powreactors. Refer to Table I and find wrench sizes, special tools, and assembly torques. Refer to Assembly Drawing for identification of parts.

1. Close inlet stop valve. This traps pressure on inlet side of regulator.
2. Open outlet blowdown valve (if any or leave outlet stop valve open) so that trapped inlet pressure will be vented and all pressure released from Powreactor body.
3. Vent dome as follows:
 - a. On Powreactors using RedQ Hand Loader, turn Loader handwheel counterclockwise to its limit, and remove dome connecting line.

- b. On Powreactors using other loading devices, release gas pressure from device, open dome vent valve, and then remove loading device from dome port.

4. Disassemble Powreactor valve as follows:

- a. With all pressure vented from regulator, remove nuts and washers from body plug flange, using hex wrench per Table I. The following valve parts are now free:

Body Plug Flange	Valve Seat
Body Plug	Pushrod
Valve Springs (two)	Crush Ring
Valve Seat Bushing	Valve Unit

- b. If valve parts do not fall out freely, use a wood or brass rod or wire hook to work them loose. Use puller tool per Table I to remove valve seat.
 - c. O-rings, seals crush ring, and back-up rings may be removed for cleaning and inspection. Studs may be removed, if desired.

CAUTION:

If non-metal parts are to be re-used, handle with extreme care. Cuts, scratches, or overstretching will cause leaks.

- d. Disassemble balanced valve unit by unscrewing head from body, using special wrenches shown in Table I.

5. Clean and inspect valve parts as follows:

- a. Wipe metal seating surfaces with petroleum solvent. Wipe non-metal parts with soft paper or cloth.
 - b. Inspect all parts for damage which might impair sealing or smooth operation.
 - c. Replace defective parts. No adjustment or fitting is required to install RedQ replacement spares.
 - d. Lubricate threads.

NOTE: If hydrocarbons are allowed in the system, use Alpha Molykote Type G grease. If fluorocarbons are required, use Kel-F 90 or fluorolube LG-160 grease, or Fluorolube ES 5 oil. For other restrictions on lubricants, refer to specifications for the systems.

6. Reassemble valve as follows:
 - a. If body studs were removed, replace. Screw in to full thread engagement, hand tight.
 - b. Replace O-rings, crush ring, and back-up rings, oriented as shown on Assembly Drawing.
 - c. Special tool per Table I is required to install channel-section ring seal in body plug.
 - i. Be sure body plug, seal, and O-ring are clean, lubricated, and free from rough spots, slivers or burrs.
 - ii. Fit O-ring to internal groove of body plug. Be sure it is straight and free from twists.
 - iii. Carefully collapse valve seal radially with fingers just enough so it will go into body plug. This creates a “stand-off” section of the seal ring, as shown in Figure 1.

CAUTION:
In collapsing seal, keep all bends gentle, not abrupt, to avoid damage to channel-shaped seal.

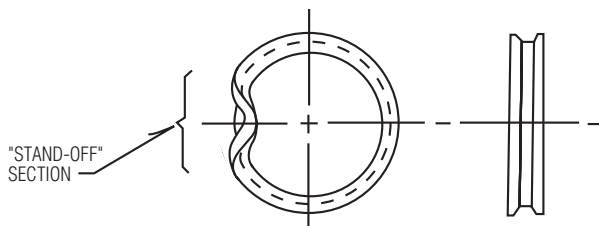


Figure 1 - “Stand off “ Section of Seal Ring

- iv. Position collapsed seal over O-ring groove in body plug, and release it. Seal should spring back to as nearly circular shape as O-ring will allow.
- v. Where seal is in constant contact with O-ring, be sure seal edges have entered groove properly, around O-ring.
- vi. Press seal firmly against O-ring with fingers so as reduces “stand-off” section to a minimum.
- vii. Lubricate small end of fitting mandrel per Table I and enter it into valve seal so that the gap or open side of the mandrel

accommodates the “stand-off” section of the seal ring.

- viii. Push mandrel into seal until seal is expanded to maximum bore size. Seal should now have almost full circular shape.
 - ix. Push seal further outward with fingers, or rotate mandrel inside body plug, to get fully circular bore inside seal.
 - x. Withdraw mandrel and examine seal and O-ring to be sure they are properly seated in body plug groove.
 - xi. Lubricate valve body and carefully push, rotate, and work it through assembled seal.
 - xii. Withdraw valve and again examine seal.
 - xiii. If there is any doubt as to the quality of the seal assembly, pull out and replace.
- d. Reassemble valve unit, using torque and special wrenches as shown in Table I.
 - e. Replace valve seat in body recess. O-ring will hold it in place surging reassembly of valve.
 - f. Replace crush ring over body plug.
 - g. Seat valve seat bushing over crush ring on body plug.
 - h. Place two concentric springs inside valve. Insert valve through bushing and seal, into body plug.
 - i. Place solid end of pushrod in recess in top of valve head.
 - j. Insert body plug and valve subassembly up into body, oriented so that one finger of valve seat bushing will line up with inlet port as shown on Assembly Drawing.
 - k. Push up so that pushrod slides up through hole in body plate and its drilled end receives guide pin at the top.
 - l. Replace body plug flange over studs and secure with nuts and washers.
 - m. Tighten nuts using wrench and torque per Table I.
7. Disassemble Powreactor dome parts, or convert internal/external sensing as follows:
 - a. Be sure dome and line are vented as directed in Installation.-C.-3. Disconnect dome loading accessories.

- b. Remove dome nuts and washers using wrench size given in Table I.
 - c. Lift dome off dome plate and remove O-ring.
 - d. Lift dome plate off diaphragm. Do not damage dowel pin. Studs may be removed for ease of access, if desired.
 - e. Remove diaphragm, diaphragm plates and guide pin.
 - f. Lift off body plate and o-ring. Pushrod guide (plastic insert) in body plate may be replaced if damaged, but normally need not be removed. Valve pushrod may be lifted out to avoid damaging it.
8. Clean and inspect as follows:
- a. Wipe metal clamping surfaces with petroleum solvent. Wipe non-metal parts with soft paper or cloth.
 - b. Inspect parts for damage which might impair sealing.
 - c. If pushrod guide (plastic insert) was removed from body plate, replace it.
 - d. Replace defective parts. No adjustment or fitting is required to install RedQ spares.
 - e. Lubricate threads as in Maintenance-C.-5.-d.
9. Reassemble dome parts as follows:
- a. If studs were removed, replace them. Screw into full thread engagement, hand tight.
 - b. Replace body plate O-ring and body plate over studs. Replace pushrod through body plate, making sure that solid end seats properly in top of valve head.
 - c. Replace guide pin in diaphragm plate and insert pin in top of pushrod, so plate rests on top of pushrod.
 - d. Fit diaphragm into recess in dome plate.
 - e. Replace dome plate with diaphragm, dome O-ring, and dome, over studs.
 - f. Replace washers and nuts on studs, finger tight.
 - g. Tighten nuts evenly all around using wrench and torque shown in Table I.

This completes replacement of parts on Powreactor Model 311B. Regulator is ready to be put back in operation as directed in Adjustment.

Appendix

Assembly Drawing	W-311B-A01, or as applicable
Parts List	W-311B-A01-1, or as applicable
Special tools:	Body Plug Wrench, 041-00015

Table 1 - Tools & Assembly Torques for 311B Powreactors

Item	Part Name	Part No. or Size	Assembly Torque
15	Dome nut Wrench	12886 15/16" Hex	120
19	Dome loading plug (Shipping seal) Wrench	035-08065-4 11/16" Hex	--- ---
	External control plug Wrench	035-12030-4 13/16" Hex	
20	Internal control plug Wrench	055-00201 1/8" Allen	25
29	Body Plug Wrench	143-50015 2-5/8" Hex	150
30	Valve head/body Wrench (head & body)	145-01410	35
		041-00015	

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