

Basic Models 200 & 300, F, G and H Designs

Powreactor Dome Regulator

OPERATION AND MAINTENANCE

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Scope

These instructions give procedures for installing, adjusting, and serving the following basic models of REDQ Powreactor Air Dome Regulator:

BASIC MODEL/ SIZE		DOME LOADING		DOME PLATE	
200	300	External	Internal	Fixed	Removable
202F		*	*		*
202G	302G	*	*	*	
201H	301H	*			*
202H	302H	*	*		*

Each basic model is available in various end connection types and sizes, valve orifice sizes, and materials, to suit service requirements. ASA flanged end connections integral with body; other types of end connections may also be integral. Or they may be removable bushing-type port fittings with O-ring seals. Standard design variations are identified by a basic figure number followed by code letters.

General Description

(Refer to typical Assembly Drawing, Figures 3 thru 7)

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

It is a balanced pressure type of regulator which is actuated 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 moved out slightly and pushes the main valve open. This allows inlet line gas

to flow through the valve until outlet line pressure builds enough to balance the dome pressure. Then the diaphragm moves back to throttle or close the main valve so that dome and outlet pressure 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 be loaded with air or other gas.

Powreactors will show a slight variation in delivering fluid pressure if the inlet pressure varies over a wide range after the dome is set. Small changes of inlet pressure have to appreciable effect.

Installation

(Refer to installation diaphragms, Figures 1 and 2.)

A. REGULATOR MOUNTING

- Note that downstream pressure gage should be readable from dome loading controls. Installation of the REDQ Powreactor in a horizontal section of line with dome is recommended.
- Before mounting regulator be sure to eliminate any loose dirt particles from supply line.
- Replacement of trim parts requires removal of body plug. Sufficient clearance should be provided to permit this.
- If end connections are the removable port fitting type, use wrench to hold them against turning when end connections are tightened.

CAUTION:

Do not clamp on body plug when installing end connections.

B. DOME CONNECTION

1. If regulator is to be externally loaded, remove plug from dome. Connect to a source of gas at a pressure higher than the desired regulated downstream pressure, through suitable dome loading control device.

NOTE: Since the dome is sealed after loading, a change in temperature will cause a slight change in dome pressure, with a corresponding shift in outlet line pressure. This outlet pressure shift amounts to about 1% for each five Fahrenheit degrees. When compensating device such as the REDQ Hand Loader is used to load the dome, the dome pressure is maintained constant regardless of ambient temperature changed.

2. If regulator is to be internally loaded, use dome loading needle valves contained in the regulator. Gas from the inlet line is used to load the dome.

NOTE: The internal loading feature can be used only in gas service.

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 the controlled outlet pressure.

A. ADJUSTMENT, DOME INTERNALLY LOADED

1. Using hex key wrench per Table I, close SUPPLY needle valve. Vent dome by opening DOME needle valve.
2. Close DOME needle valve.
3. Open inlet stop valve, admitting pressure to inlet side of the regulator. If feasible, adjust outlet stop valve to allow a small amount of flow.
4. Open SUPPLY needle valve about one-half turn. This opens loading duct to inlet line. (Needle valves are not sealed so there will be some blow-by during dome loading operation).
5. Insert hex key wrench in DOME needle valve and open slowly watching outlet pressure gage as it indicated pressure building up in the outlet line.
6. When desired outlet pressure is reached in the line, as shown on outlet pressure gage, close DOME needle valve.

7. Close SUPPLY needle valve.
8. Check to see that DOME and SUPPLY needle valves are securely closed, but do not exceed 30 inch-lb torque. Excessive torque on needle valves may cause deformation or galling and leaks.
9. Slowly open outlet stop valve to wide open position. Internally loaded Powreactor is not in operation.
10. If outlet system is not sealed, outlet pressure may be reduced by opening DOME needle valve, to vent dome. When outlet falls to desired level, close DOME valve.

B. ADJUSTMENT, DOME EXTERNALLY LOADED

Adjustment of externally loaded Powreactor depends on the particular loading device used, such as REDQ Hand Loader or other device or system preferred by the user.

CAUTION:

If internally loaded regulators are to be loaded externally, DO NOT USE internal loading needle valves in regulator. Be sure both are securely closed.

1. Adjustment procedure using REDQ Hand Loader:
 - a. Turn Loader handwheel counterclockwise to its limit. This vents Powreactor dome.
 - b. Admit line pressure to inlet port of Powreactor. If feasible, adjust outlet stop valve to allow a small flow.
 - c. Slowly turn Loader handwheel clockwise until outlet pressure gage shows desired pressure in outlet line.
 - d. Slowly open outlet stop valve to side open position.No other adjustment is necessary and any temperature variation will be automatically compensated.
2. Adjustment procedure using loading manifold or other device preferred by the user:
 - a. Close dome loading line, and vent dome.
 - b. Admit line pressure to inlet port of Powreactor. If feasible, adjust outlet stop valve to allow small flow to outlet line.

- c. Admit gas pressure to dome loading line.
- d. Slowly open dome loading line, watching outlet pressure gage as it indicates pressure building up in outlet line.
- e. When desired outlet pressure is reached as shown on outlet pressure gage, close dome loading line.
- f. Slowly open outlet stop valve to wide open position.

Externally loaded Powreactor is now in operation.

Maintenance

(Refer to typical Assembly Drawing, Figures 3. thru 7. as applicable, to identify parts.)

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

A. RISE IN OUTLET PRESSURE

1. Check to see whether inlet pressure has fallen below the level it was when dome was set. Outlet will return to original setting when inlet rises to original level. If inlet is expected to remain at the lower level, re-set dome pressure per Adjustment.
2. Check temperature. As rise in temperature will cause a rise in outlet pressure (unless REDQ Hand Loader is used to load dome externally). Outlet will return to original setting when temperature returns to original level. (See Installation.B.2).
3. 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.
4. If regulator is externally loaded, check loading mechanism for malfunction.
5. If outlet continues to rise, close inlet stop valve and inspect Powreactor main valve parts for damage, Follow directions for disassembly, section C. and D.4.

B. DROP IN OUTLET PRESSURE

1. Check to see whether inlet has risen above the level it was when dome was set. Outlet will return to original setting when inlet falls to original level. If inlet is expected to remain at the lower level, re-set dome pressure per Adjustment.

2. Check temperature. A drop in temperature will cause a drop in outlet temperature (unless REDQ Hand Loader is used to load dome externally). Outlet will return to original setting when temperature returns to original level. (See Installation. B.2)
3. Check for external leaks in dome or dome venting system:
 - a. On internally loaded models, use bubble fluid on DOME needle valve. Also check dome sealing plug (external loading connection).
 - b. On externally loaded models, use bubble fluid on vent valve and connections of loading device.
 - c. On all models use bubble fluid around interface between dome, dome plate (if removable), and body.
 - d. On models with removable port fittings, use bubble fluid around outlet port fitting connection.
4. If leaks appear around DOME needle valve or dome sealing plug, vent dome, inspect valve and/or plug, and replace if necessary. Re-set dome pressure per Adjustment.
5. If leaks appear around interfaces between dome and dome plate or body, close inlet stop valve and inspect dome seal for damage. Follow directions for disassembly, Sections C. and D.5.
6. If leaks appear around outlet port fitting, close inlet stop valve and inspect port fitting seal for damage. Follow directions for disassembly, Section C. and D.6.
7. If no external dome leaks are found, and outlet continues to fall off, close inlet stop valve and check Powreactor diaphragm for damage. Follow directions for disassembly, Section C. and D. 5.

C. REPLACEMENT OF PARTS, GENERAL INSTRUCTIONS

1. 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 names of parts required.
2. To replace damaged parts other than port fittings, Powreactor Regulator need not be removed from line, but inlet and outlet stop valves must be closed securely, and pressure released from dome and line.
3. Disassembly procedure is similar for all Powreactor regulators, but wrench sizes, special tools, and

assembly torques may vary. Refer to Table I to find the information which applies. Refer to Figures 3 thru 7. as applicable, for identification of parts.

CAUTION:

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

4. Clean all parts before inspection:
 - a. Clean metal parts with suitable solvent. Wipe, flush, or vapor degrease as necessary to get desired level of cleanliness.
 - b. Clean non-metal parts by dry wipe with soft paper or cloth, or use ethyl or isopropyl alcohol, or wash in mild alkaline solution followed by thorough rinse in clean water. Any other solvents may cause damage to parts.
5. Inspect all seating and sliding metal surfaces and all soft sealing parts for damage that might cause leaks or faulty operation. Replace any defective items.
6. Before reassembly, apply lubricant sparingly to threads and to sliding contact surfaces. Apply lubricant freely to O-rings to facilitate reassembly.
7. Use lubricants as follows:
 - a. If hydrocarbons are allowed in system (best performance):
 - i. Metal parts Lubriplate Low Temp
 - ii. Non-metal parts Molykot 55M Grease (Dow Corning)
 - b. If fluorocarbons are required:
 - i. Metal Fluorolube
 - non-metals GR-362 grease
 - c. For other restrictions on lubricants, refer to specifications for system where Powreactor is to be installed.

D. DISASSEMBLY PROCEDURES

1. Close inlet stop valve. This traps pressure on inlet side of regulator.
2. Release trapped inlet pressure:
 - a. If regulator is internally loaded, open SUPPLY needle valve in regulator body, using hex key wrench per Table I.
3. Vent dome as follows:

- a. If internally loaded, open DOME needle valve, using hex key wrench per Table I.
 - b. If externally loaded using REDQ Hand Loader, turn handwheel counterclockwise to its limit and remove dome connection line.
 - c. If externally loaded using other loading devices, release gas pressure from device, open dome VENT valve, and then remove loading device from dome port.
4. Disassemble main valve as follows:
 - a. With dome vented, remove body plug, using wrench per Table I. This allows valve spring and valve to drop clear. On 3500 psig models, a separate pushrod may follow valve, or may be retained in body above valve seat.
 - b. Remove valve seat bushing, using special bushing wrench per Table I. This frees valve seat unit and gasket.
 - c. If valve seat does not fall out freely, use a wood or brass rod to work it loose.
 - d. Standard valve seat unit consists of valve seat, soft seal insert, and seal retainer. The insert may need replacing. Parts may be pried apart if necessary with any thin blade, using care not to damage insert if it is to be re-used.
 - e. Valve guide on 1000 psig models does not normally need replacing, but can be removed by using small end of bushing wrench, Table I.
 - f. Body plug gaskets on 1000 psig models are easily removed and replaced. On 3500 psig models, the gasket is recessed and does not ordinarily need replacing, but requires no special procedure to install. If necessary use soft mallet or tap into groove in body plug with wood or plastic pin.
 - g. Clean, inspect, and lubricate valve parts per Section C.
 - h. Replace valve guide, if any, in body, using special wrench and torque per Table I.

- i. Reassemble soft seal valve seat unit. Mount gasket on shoulder of valve seat unit.
 - j. Insert valve seat unit in regulator body. Screw valve seat bushing up into body using special bushing wrench and torque per Table I.
 - k. Set valve spring and valve in body of plug. If separate pushrod was removed, insert up through valve seat, oriented as shown on Assembly Drawing.
 - l. Screw body plug and valve parts up into and hand tighten body plug. Be sure all parts are securely seated, particularly separate pushrod, if any.
 - m. Tighten body plug using wrench and torque per Table I.
5. Remove and replace diaphragm and dome sealing parts as follows:
- a. Be sure dome and line are vented as directed in D.1.2.and 3. Disconnect dome loading accessories, if any.
 - b. Remove dome capscrews, using wrench per Table I.
 - c. Lift dome unit off body, using care not damage dowel pins. If regulator has fixed dome plate, remove dome gasket.
 - d. If regulator has separate dome plate, lift it off the diaphragm. Grommet may be removed from dome loading duct. Dowel pin remains in body. Remove o-ring from dome recess.
 - e. On internally loaded regulators, be sure that dome plug and loading passage plug (if any) are not loosened during handling.
 - f. Diaphragm assembly parts are now free. Lift off diaphragm, diaphragm spring, and diaphragm plate. Pushrod on 3500 psig models may also be lifted out. If regulator is mounted in a non-horizontal position, be careful pushrod does not fall out accidentally.
 - g. Clean, inspect, and lubricate dome parts per Section C.
 - h. If pushrod was removed, be sure in replacing it that it seats properly in or on top of valve, otherwise diaphragm plate will not seat properly over it.
- i. Seat diaphragm spring in groove in diaphragm plate. This is a snap fit.
 - j. Position diaphragm plate over pushrod and seat diaphragm over plate in body recess.
 - k. If regulator has fixed dome plate:
 - i. Position dome gasket on body flange so perforations line up with dowel pin(s), and loading duct.
 - l. If regulator has separate dome plate:
 - i. Replace grommet in internal loading duct, if it was removed.
 - ii. Replace dome plate over body so dowel pin seats properly in plate.
 - iii. Replace dome seal o-ring in dome recess.
 - m. Place dome over dome plate or body, aligning dowel hole with pin in body.
 - n. Secure with capscrews. Tighten evenly all around, using wrench and torque per Table I.
6. To replace port fittings, Powreactor must be removed from line. Pad vise jaws so as to avoid damage to body plug or dome bolting while working on fittings.
- a. Clamp Powreactor securely across top and bottom of unit.
 - b. Remove port fittings, using wrench per Table I.
 - c. Remove o-ring on port fitting carefully, to avoid cutting them on metal threads.
 - d. Clean, inspect, and lubricate per Section C.
 - e. Replace o-ring on port fittings carefully, to avoid cutting them on the metal threads.
 - f. Replace port fittings in body, using wrench and torque per Table I.
 - g. Replace Powreactor in line. Use wrench to hold port fittings against turning when end connections are tightened. Do not clamp on body plug.

This completes replacement of parts on REDQ Powreactors basic models 200 & 300 designs. Regulator is ready to put back in operation as directed in Adjustment.

TABLE 1 - Wrenches & Torques for Parts Replacement

PART DATA	200 SIZE MAX INLET & OUTLET		300 SIZE MAX INLET & OUTLET			200 & 300 SIZE VARIOUS DESIGNS VARIOUS PRESSURES	
	400 PSIG 1500 PSIG	3500/3000 PSIG	400 PSIG 1500 PSIG	3000 PSIG	3500/2000 PSIG		
Body Plug Unit Wrench Size Torque, ft-lb	143-30018 1 1/8	143-30018 1 1/8 50	143-50018 1 1/2	143-50018 2 1/2 hex	143-50018 1 1/2	Same as Others (Across flats)	
Valve Seat Bushing Torque, ft-lb	14-30009 30	149-30009 30	149-50010 35	149-50010 35	149-50010 35	Same as others	
Dome Needle Valves Wrench Size (hex key)	20519-1 5/32	20519-1 5/32	20520-1 5/32	20520-1 5/32	20520-1 5/32	Same as others	
Dome Capscrews Wrench Size Torque, ft-lb	3/8 - 24 5/16 (key 45-50)	3/8 - 24 5/16 (key) 45-50	##### ##### #####	##### ##### #####	1/2-20 3/8 (key) 90-100	##### ##### #####	##### ##### #####
Dome Studs Torque	#####	#####	#####	#####	#####	1/2 -20 Hand Tight	5/8 -18 Hand Tight
Dome Nuts Wrench Size (hex) Torque, ft-lb	##### ##### #####	##### ##### #####	##### ##### #####	##### ##### #####	##### ##### #####	1/2-13 13-16 55	5/8-11 1" 105
Port Fitting Wrench Size (hex) Torque, ft-lb	Various Various	Various Various	Various Various	Various Various *	Various Various *	Same of others	
Body PL Capscrews Wrench Size Torque, ft-lb	##### ##### #####	##### ##### #####	##### ##### #####	##### ##### #####	##### ##### #####	001-10313 3/32 (hex) 6-8 in-lb	

* Alternate assembly torque; tighten to 100 ft-lb and strike wrench handle one or two blows with a hammer.

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