



Use this guide, PL404 (QG), and PL742 (TPM) to repair a Hale pressure relief valve (QG). All referenced documents and plate (PL) drawings are available from the Tech Resource Center on the Hale website (<https://www.haleproducts.com>).

**NOTES:** If the QG portion of the Total Pressure Management system (TPM) operates correctly (bypasses water to suction) yet fails to provide the associated VALVE OPEN indication (steady amber), refer to Hale publication 101-0850-08-0 (TPM SYSTEM INSTALLATION AND OPERATION MANUAL) for instructions to remove and replace the switch portion of a Hale QG.

**Recommended O-ring Lubricant:** Synthetic Multi-Purpose Clear O-ring Lubricant (Synthetic NLGI Grade 2 Heavy Duty, Multi-Purpose)

**Recommended Grease:** Lithium Base Grease with 1% to 3% Molybdenum Disulfide (or equivalent)

**Recommended thread locking compound:** Loctite 242 (medium strength, all-purpose, removable, thixotropic, blue) (or equivalent) To remove, soak in methylene chloride and use mechanical abrasion (such as a wire brush).

**Recommended Solvent:** Safety Kleen® or Stoddard Solvent (or equivalent) (Use lime scale remover & soft bristle Brush for mineral deposits)

Install all circlips (also called snap rings) with the sharp edge in the direction of thrust support. If you examine the circlip closely you can determine which side has the sharp edge (one side will feel sharp and the other side will feel rounded).

**Table 1. Applicable QG Kit**

Kit Number	Description	Remarks
546-0200-55-0	TPM Repair Kit	Kit contains a check valve, a nipple, O-rings, retaining rings, seals, diaphragm, and gaskets

**ATTENTION ⚠ WARNING**

INDICATES A HAZARDOUS SITUATION, WHICH IF NOT AVOIDED COULD RESULT IN SERIOUS INJURY OR DEATH.

**Table 2. Tools And Consumables List**

Standard Tools	Special Tools	Consumables
PPE	Digital Multi Meter	Shop Rag(s) (As Required)
Large Snap Ring Pliers (Compression)	Variable Pressure Water Supply	O-ring Lubricant (See NOTES, page 1.)
Large Vise Grip Pliers (or Channel Locks)		Safety Kleen® or Stoddard Solvent (or Equivalent) (See NOTES, page 1.)
Small Snap Ring Pliers (Expansion)		Grease (See NOTES, page 1.)
Non Marring Hammer		Soft Bristle Brush
90° Hose Removal Tool (or Bent Rod)		Methylene Chloride (or Equivalent)
90° Dental Pick		Wire Brush

Perform the following bench procedure to remove and replace the selected components (see Table 1) of a Hale QG. Finally install and test the repaired QG on the pump.

Take Hale QG assembly to a clean stable work surface. Clean valve body, all components, and valve mounting bolt threads thoroughly.

**NOTE:** If using a vise do NOT over tighten. Over tightening, the vise may bend or distort the cage area or the valve body.

1. Remove QG cover.
  - a. Remove cover snap ring. See Figure 1.
    - 1) Using large snap ring pliers, compress QG cover snap ring.
    - 2) Lift snap ring out of QG body.



Figure 1.

**ATTENTION ⚠ WARNING**

**NEVER USE COMPRESSED AIR TO FORCE THE COVER OUT OF THE BODY. USING COMPRESSED AIR MAY VIOLENTLY LAUNCH THE COVER AND WITH DANGEROUS FORCE.**

- b. Remove cover.
  - 1) Using non marring hammer, gently tap cover in circular pattern. (Loosens cover for removal.)
  - 2) Using large vise grip (or channel lock) pliers, grasp cover around large, center, sensor, boss (Do NOT use the sensor guard plate.) simultaneously rotate and lift cover out of body. See Figure 2.

**NOTE:** If cover is stuck, attach a variable pressure water supply to the control port (plug drain port) slowly increase pressure to force the cover out of the body. The cover may be ejected by the water pressure.



Figure 2.

2. Remove and replace QG seals (five O-rings).
    - a. Remove snap ring. See Figure 3.
      - 1) Using snap ring pliers, expand snap ring.
      - 2) Lift snap ring off poppet shaft.
    - b. Lower and remove poppet.
    - c. Remove piston.
      - 1) Insert a 90° hose removal tool or bent rod into poppet shaft hole.
      - 2) Pull piston out of valve body.
    - d. Remove spring.
    - e. Using angled (or hooked) hose removal tool (or dental pick), remove following O-rings.
      - outer piston seal
      - outer cover seal
      - poppet shaft seal
      - outer cage seals (2)
- See Figure 4 and Figure 5.



Figure 3.

Clean cover, poppet, piston, and valve body thoroughly. Inspect piston and poppet for damage. Replace if damaged. Verify the top of the poppet stem (at snap ring groove) is magnetic, replace if NOT magnetic. **If valve body bore is distorted (out of round), pitted, or scarred; replace entire relief valve.**

- f. Lightly coat inside of valve body, piston O-ring groove area, poppet shaft O-ring groove area, and cover O-ring groove area with O-ring lubricant (prevents O-ring damage and aides assembly).

Install following O-rings. See Figure 4 and Figure 5.

- outer piston seal
- outer cover seal
- poppet shaft seal
- outer cage seals (2)



Figure 4.



Figure 5.

3. Assemble QG as follows.
  - a. Install poppet. (Goes into opening of QG cage, shaft first – toward cover. Use care NOT to damage poppet skirts.) (**NOTE: Coat poppet stem with O-ring lubricant to prevent damage.**)
  - b. Place spring into valve body (around poppet shaft).
  - c. Install piston. (**NOTE: Coat all piston O-rings with O-ring lubricant to prevent damage.**)
    - 1) Orientate piston (with collar down - toward QG bore).
    - 2) Push piston over poppet shaft and into QG bore until seated on poppet shaft. (Ensure spring seats around piston collar.)
    - 3) Using snap ring plyers, expand snap ring.
    - 4) Push piston down until spring is fully compressed and piston seats on poppet shaft.
    - 5) Align snap ring with snap ring groove on poppet shaft and release plyers. (Ensure snap ring is seated in groove.) See Figure 3.
  - d. Install cover as follows. (**NOTE: Coat both O-rings with O-ring lubricant to prevent damage.**)
    - 1) Align cover in QG bore.
    - 2) Push cover into QG until seated in bore.
    - 3) Using heavy (high quality) snap ring plyers, compress snap ring. See Figure 2.
    - 4) Align snap ring with snap ring groove and release plyers. (Ensure snap ring is seated in groove.)
  - e. Verify QG sensor (switch) is functional.
    - 1) Insert Ohmmeter leads into connector terminals. (One lead in each terminal.)
    - 2) Verify Ohmmeter reads open (no continuity). Greater than 10 M $\Omega$ .

**NOTES:** If Ohmmeter reads less than 10 M $\Omega$  and more than 1  $\Omega$  (~ 100  $\Omega$  for example) the sensor is defective. Order Switch Replacement Kit 200-2262-50-0 from Hale Customer Service (800-533-3569).

If Ohmmeter reads short (less than 1  $\Omega$ ), loosen sensor lock nut and push sensor into cover until fully seated. If Ohmmeter still reads short the sensor is defective. Order Switch Replacement Kit above. However, if Ohmmeter changes to open (no continuity, >10 M $\Omega$ ) the sensor is functional, and it requires adjustment.

**ADJUSTMENT:** Push sensor all-the-way into cover. Slowly, slide sensor outward (do NOT remove sensor) until Ohmmeter indicates short. Slowly slide sensor inward until Ohmmeter indicates open; slide sensor inward an additional 1/8-in and tighten sensor lock nut.

- 3) Match mark sensor position.
- 4) Loosen sensor lock nut and remove sensor from cover.
- 5) Verify Ohmmeter reads short (continuity). Less than 1  $\Omega$ .

**NOTES:** Check wires for intermittent connections (broken wire, bad crimp, etc.) by wiggling wires during continuity check.

If Ohmmeter reads more than 1  $\Omega$  (~ 100  $\Omega$  for example) or the reading is unstable when the wires are wiggled the sensor is defective. Order Switch Replacement Kit above.



**Note:** If sensor is new (replaced) do NOT use match mark; perform the ADJUSTMENT (above).

6) Reinstall sensor (per match mark) and tighten lock nut.

4. Bench Test QG.

- a. Attach a variable pressure water supply (turned off) to control port.
- b. Plug remaining port.  
(Include a valve to allow bleeding the water pressure off the QG after testing.)
- c. Slowly increase variable pressure water supply pressure while observing poppet. The poppet should transition smoothly from closed to open at or before 25 psi. Stop at normal operating pressure for the pump (typically 150 psi.)
- d. Inspect for leaks  
**(NOTE: If QG leaks, inspect for a cut O-ring (or seal) otherwise replace entire QG.)**
- e. Turn variable pressure water supply off.
- f. While observing poppet, bleed residual water pressure off QG (open valve installed in plugged port). (The poppet should transition smoothly from open to closed.)

**Note:** If poppet transition is NOT smooth, or if poppet stops in any position other than fully open or fully closed replace entire QG.

g. Remove variable pressure water supply and plug from QG ports.

5. Install QG as follows.

- a. Install new gasket (QG-to-pump).
- b. Align QG-to-pump as noted/match marked.
- c. Install four [4] 7/16 -14 x 1-1/4 inch long QG-to-pump screws.
  - 1) Apply Loctite 242 (or equivalent) to four [4] 7/16 -14 x 1-1/4 inch long QG-to-pump screws.
  - 2) Hand start all four [4] screws.
  - 3) Using 5/8 inch socket and ratchet (set CW), tighten QG-to-pump screws.
  - 4) Using 5/8 inch torque wrench, torque QG-to-pump screws to 37 lb-ft.
- d. Connect plumbing according to notes/match marks.
- e. Connect wiring according to notes/match marks.

6. Test QG.

**ATTENTION ⚠ WARNING**

**DURING TESTING, IT IS POSSIBLE TO SUPPLY GREATER PRESSURE THAN AN ATTACHED HOSE (OR OTHER EQUIPMENT) CAN WITHSTAND. ENSURE PRESSURE SUPPLIED TO THE HOSE/EQUIPMENT DOES NOT EXCEED THE PRESSURE AT WHICH THE HOSE/EQUIPMENT IS ANNUALLY TESTED BY THE DEPARTMENT.**

- a. If TPM equipped, perform the following:
  - 1) Set white pressure indicator to a position slightly above normal operating pressure. (Typically, set indicator before increasing engine RPM.)
  - 2) Obtain operating pressure (use discharge pressure gage to monitor pressure).



- 3) Slowly, turn adjustment handwheel CCW until relief valve opens. (The VALVE OPEN WHEN LIT indicator illuminates steady [indicating internal bypass] and gage drops 10 to 15 psi.)
- 4) Turn adjustment handwheel CW until relief valve closes. (The VALVE OPEN WHEN LIT indicator extinguishes and pressure returns to previous level.)

**NOTE: If the indicator flashes, the internal bypass (QG) and the external bypass (PG-30) are both active. This should not occur if pumping from tank or draft. Troubleshoot TPM.**

- 5) When testing is finished (and pump is no longer in operation), turn adjustment handwheel CW to a position slightly above normal operating pressure.
  - b. If PMD equipped, perform the following:
    - 1) Obtain desired operating pressure (use discharge pressure gage to monitor pressure) on pump.
    - 2) Slowly, turn adjustment handwheel CCW until relief valve opens. (The VALVE OPEN indicator illuminates steady [indicating internal bypass] and gage drops 10 to 15 psi.)
    - 3) Turn adjustment handwheel CW until VALVE OPEN indicator extinguishes, pressure returns to previous level, and then an additional 1/2 turn.

The relief valve now operates at the set pressure. If the pump pressure increases the indicator will illuminate (to indicate the valve is open).

- 4) When testing is finished, turn adjustment handwheel CW to a position slightly above normal operating pressure.

If the QG fails to bypass discharge to suction when adjustment handwheel is turned CCW to a setting below operating pressure the QG is NOT functioning.

If the QG is bypassing discharge water to suction and the VALVE OPEN indicator (amber) is NOT illuminated the QG sensor is NOT functioning (or NOT adjusted properly).

If the QG (/PMD/TPM) does NOT function troubleshoot the system to the cause.  
Refer to 101-0850-08-0, TPM SYSTEM INSTALLATION AND OPERATION MANUAL.

7. If functional, place apparatus in service in accordance with departmental procedures.