DATA SHEET

PRESSURE SENSITIVE REGULATING UNLOADER

The Pumps with Nine Lives

Stainless Steel Model: **9970**

SPECIFICATIONS	U.S. Measure	Metric Measure
Maximum Flow	15.9 gpm	60 lpm
Pressure Range	1160 - 11600 psi	80 - 800 bar
Inlet Port (Flush Back)	1/2" BSPP (G)	1/2" BSPP (G)
Discharge	1/2" BSPP (G)	1/2" BSPP (G)
By-Pass Port	1/2" BSPP (G)	1/2" BSPP (G)
Operating Temp:	195° F	90° C
Weight	7.06 lbs.	2.5 kg
Dimensions	7.13 x 4.57 x 1.85"	181 x 116 x 47 mm

For Relief Valve version add .100 to unloader model number.

FEATURES

- Maintains full system pressure while running in by-pass without full load on pump.
- Offers pump protection against pressure fluctuations and system changes.
- Minimum pressure fluctuations with alternating use of multiple guns.
- Easy external pressure adjustment with locking nut to prevent over pressure.

SELECTION

This is a pressure sensitive regulating unloader. Designed for systems with single or multiple pumps, solenoid (gate) valves, nozzles, standard guns.

Note: For multiple pump systems, it is best to use a pressure regulator not a pressure sensitive regulating unloader.

This pressure sensitive regulating unloader should meet both the desired system flow (combined nozzle flow rate requirement) and the desired system pressure.

Note: Operation below the minimum flow of the unloader causes the unloader to cycle. Operation above the maximum flows of the unloader causes premature unloader wear, cycling and prevents attaining desired system pressure.

INSTALLATION

This unloader operates properly when mounted in any direction, however, it is preferred to keep the plumbing to a minimum and the adjusting cap easily accessible. The best mounting location is directly on the pump discharge manifold head.

The inlet connection on this unloader is a 1/2" BSPP (G) sized port and is located on the back side. There is an arrow and the word IN cast into the body indicating the direction of flow. Fluid from the discharge of the manifold goes through this connection.

The discharge connection on this unloader is a 1/2" BSPP (G) sized port and is located on the front side (hex end). There is an arrow and the word OUT cast into the body indicating the direction of flow. Plumbing for the spray guns, solenoid (gate) valves or nozzles are connected here.

The by-pass connection of this unloader is a 1/2" BSPP (G) sized port and is located on the bottom. There is an arrow and the word BY PASS cast into the body indicating the direction of flow. By-Pass fluid is directed out of this port and can be routed to a reservoir (preferred method), or to a drain or to the pump inlet.

Read all CAUTIONS and WARNINGS before commencing service or operation of any high-pressure system.

OPERATION

This pressure sensitive regulating unloader holds established system pressure in the discharge line when the trigger gun is closed or solenoid (gate) valve is closed or the nozzle is clogged, thus by-passing all unrequired flow. Squeezing the trigger gun or opening the solenoid (gate) valve will close off the by-pass and return to established system pressure without delay.

PRESSURE ADJUSTMENT

1. Setting and adjusting the unloader pressure must be done with the system "on".
2. Start the system with unloader backed off to the lowest pressure setting (counterclockwise direction).
3. Squeeze the trigger and read the pressure on the gauge at the pump.

Note: Do not read the pressure at the gun or nozzle.

4. If more pressure is desired, release the trigger, turn adjusting cap one quarter turn in clockwise direction.
5. Squeeze the trigger and read the pressure.
6. Repeat this process until desired system pressure is attained.
7. Once the desired system pressure is reached, stop turning the adjusting cap.
8. Thread locking nut down to spring retainer.

Note: Locking nut is not set at the factory.

NOTICE: A minimum by-pass flow of 5% of the unloader rated flow capacity is required for proper unloader performance. If the entire flow is directed through the unloader (zero by-pass) the "cushioning" feature of the by-pass liquid is eliminated and the unloader can malfunction or wear prematurely.

9. If desired system pressure cannot be reached, review TROUBLESHOOTING chart.
10. When servicing existing systems, back locking nut away from spring retainer.
11. Follow adjustment procedures as stated above for new unloaders.

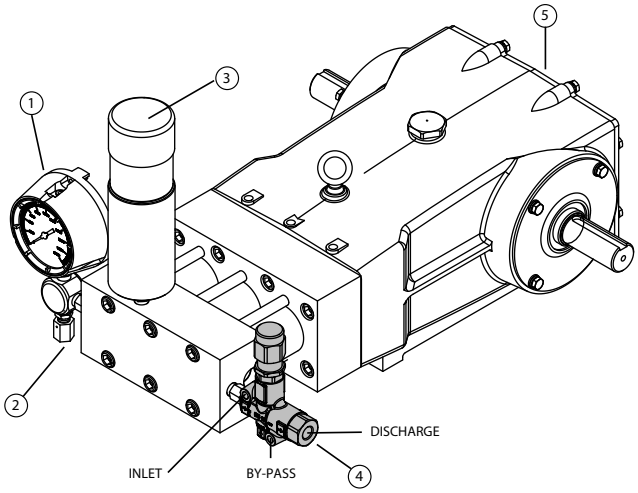
Note: Do not adjust unloader pressure setting to compensate for a worn nozzle. Check the nozzle as part of the regular maintenance and replace if worn.

Note: A secondary pressure safety relief device (i.e. pop-off valve, safety valve) should be used along with this pressure sensitive regulating unloader. Final adjustment for the relief valve should relieve at 200 psi above the system operating pressure.

Note: By removing the check valve and spring, the unloader can function as a secondary relief valve.

TYPICAL UNLOADER INSTALLATION

1. Pressure Gauge
2. Relief Valve: Shown as a secondary safety relief valve
3. Pulsation Dampener
4. Pressure Sensitive Regulating Unloader
5. Triplex Plunger Pump



SERVICING

DISASSEMBLY

1. Disconnect by-pass, discharge and inlet plumbing from unloader.
2. Remove unloader from pump.
3. Secure body of unloader in a vise with adjusting cap facing up.
4. Remove discharge fitting w/backup-ring and o-ring, spring, check valve w/o-ring, check valve seat w/o-ring and backup-ring.
5. Examine check valve seat, check valve and discharge fitting for wear, spring for wear or fatigue. Examine o-rings and backup-rings for cuts or wear and replace as needed.

Note: While the discharge fitting is removed, inspect sealing area where the check valve seat makes contact within the internal body of the unloader for grooves, pitting or wear. If damage is found, stop the repair and replace with complete new unloader. If not, proceed with disassembly.

6. Remove adjusting cap by turning in a counterclockwise direction.
7. Remove spring, spring retainer and seat ball. Examine for scale build up, fatigue or wear and replace as needed.
8. Use an adjustable wrench to remove piston retainer. Examine for fatigue or wear and replace as needed.
9. Use a needle nose pliers to remove the entire piston assembly from the body.
10. To disassemble the piston assembly, secure the piston stem end by inserting a 5 mm allen wrench into the piston stem and then grasp hex end of valve with a 16 mm open-end wrench to turn and separate piston stem from valve.

Read all CAUTIONS and WARNINGS before commencing service or operation of any high-pressure system.

DISASSEMBLY CONTINUED

11. Examine upper spacer ring for scoring, fatigue or wear and replace as needed.
12. Examine both the inner and outer upper spacer ring o-rings and backup-rings for cuts or wear and replace as needed.
13. Examine lower spacer ring for scoring, fatigue or wear and replace as needed.
14. Examine the lower spacer ring o-ring and backup-ring for cuts or wear and replace as needed.
15. Examine piston stem for scoring, fatigue or wear and replace as needed.
16. Examine piston stem o-ring and backup-ring for cuts or wear and replace as needed.
17. Examine valve for scoring or wear and replace as needed.
18. Remove unloader from vise and reposition so the by-pass port is facing up.
19. Use a small socket or tool to drive out the seat w/o-ring and backup-ring.
20. Examine seat for scoring or wear and replace as needed.
21. Examine o-ring and backup-ring for cuts or wear and replace as needed.

REASSEMBLY

Note: Reposition unloader in vise so the by-pass port is facing down.

1. Install backup-ring and then o-ring into groove of outside diameter of seat. Ensure the o-ring is on top of backup-ring with o-ring closest to small diameter hole of seat. Lubricate all parts.
2. Place seat with small diameter hole facing up into unloader body. Press into place.
3. Install o-ring and then backup-ring onto piston stem. Lubricate both parts.
4. Lubricate and install o-ring and then backup-ring into the upper spacer ring.
5. Lubricate and install backup-ring and then o-ring over tapered end of upper spacer ring.
6. Slide upper spacer ring over piston stem so the tapered end is facing down.
7. Install o-ring and then backup-ring into the grooved end of the lower spacer ring. Lubricate both parts.
8. Slide lower spacer ring over piston stem so the small diameter end is facing down.
9. Apply Loctite®242® to the bottom threads of the piston stem.
10. Hand thread valve onto piston stem.
11. Secure piston end with a 5 mm allen wrench and tighten the valve with a 16 mm open-end wrench. Lubricate entire assembly.
12. Place piston assembly with valve facing down into unloader body. Press into place.
13. Hand thread piston retainer into unloader body. Tighten with an adjustable wrench.
14. Install ball seat into end of spring retainer. Install spring retainer/ball seat with ball seat facing down. Install spring onto spring retainer.

REASSEMBLY CONTINUED

15. Hand thread adjusting cap.
16. Lubricate and install backup-ring and then o-ring onto check valve seat. Place in discharge port with tapered end of check valve seat facing in.
17. Lubricate and install o-ring onto check valve. Place check valve with o-ring facing in.
18. Install check valve spring into check valve.
19. Lubricate and install backup-ring and then o-ring onto discharge fitting.
20. Hand thread discharge fitting into unloader body.
21. Remove unloader from vise.
22. Re-install unloader onto pump.
23. Reconnect by-pass, discharge and inlet plumbing to unloader.
24. Proceed to PRESSURE ADJUSTMENT.

PRESSURE READING

Approximate Pressure Reading at Gauge	Gauge Between Pump/Unloader	Gauge Between Unloader/Gun-Nozzle-Valve
System in Operation (gun open)	System Pressure	System Pressure
System in By-Pass (all guns, valves closed)	Low Pressure 0 - 150 psi	System Pressure +200 psi

TROUBLESHOOTING

Unloader cycles	• Check for leak downstream of unloader. • Worn O-ring or check valve. • Air in system, poor connection. • O-ring in gun worn. • Insufficient flow through unloader.
Liquid leaking from bottom fitting	• O-ring for fitting cut or worn.
Liquid leaking from middle	• O-ring for piston worn or cut. • O-rings for piston stem worn or cut.
Unloader will not come up to pressure	• Not properly sized for system pressure. • Foreign material in unloader. Clean filter. • Piston stem O-rings worn. • O-ring for seat cut or worn. • Nozzle worn. • Insufficient flow to pump.
Extreme pressure spikes	• Adjusting cap turned completely into unloader. • Restricted by-pass or no by-pass. • System flow exceeds unloader rating.
Filtration	• Clean filter on regular schedule to avoid cavitation.

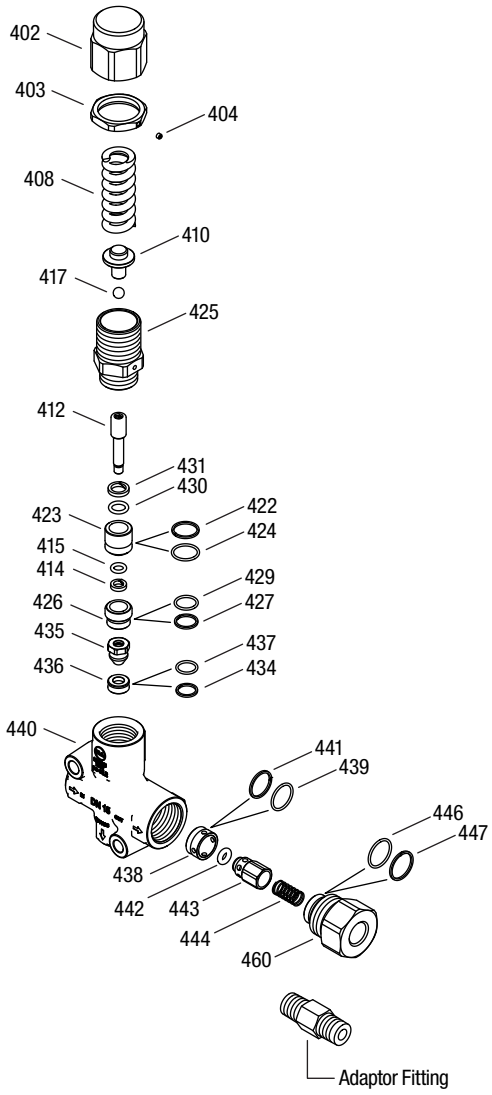
PARTS LIST

ITEM	PN	MATL	DESCRIPTION	QTY
402		BB	Cap, Ajusting	1
403		BB	Nut, Locking	1
404	33061	STZP	Screw, Set (M4 x 4)	1
408		STL	Spring	1
410		BB	Retainer, Spring	1
412		S	Stem, Piston	1
414	in kit	PTFE	Backup-Ring, Piston Stem	1
415	in kit	NBR	O-Ring, Piston Stem - 85D	1
417		S	Ball, Seat	1
422	in kit	PTFE	Backup-Ring, Upper Spacer Ring	1
423		S	Ring, Upper Spacer	1
424	in kit	NBR	O-Ring, Upper Spacer Ring - 85D	1
425		BB	Retainer, Piston	1
426		S	Ring, Lower Spacer	1
427	in kit	PTFE	Backup-Ring, Lower Spacer Ring	1
429	in kit	NBR	O-Ring, Lower Spacer Ring - 85D	1
430	in kit	NBR	O-Ring, Upper Spacer Ring (inner) - 85D	1
431	in kit	PTFE	Backup-Ring, Upper Spacer Ring (inner)	1
434	in kit	PTFE	Backup-Ring, Seat	1
435	in kit	S	Valve	1
436	in kit	S	Seat	1
437	in kit	NBR	O-Ring, Seat - 95D	1
438		S	Seat, Check Valve	1
439	in kit	NBR	O-Ring, Check Valve Seat - 85D	1
440		S	Body	1
441	in kit	PTFE	Backup-Ring, Check Valve Seat	1
442	in kit	NBR	O-Ring, Check Valve - 85D	1
443		S	Valve, Check	1
444		S	Spring, Check Valve	1
446	in kit	NBR	O-Ring, Discharge Fitting - 85D	1
447	in kit	PTFE	Backup-Ring, Discharge Fitting	1
460		S	Fitting, Discharge [1/2" BSPP(G)]	1
468	*77050*	*NBR*	*Kit, Repair (Incldes: 414, 415, 422, 424, 427, 429, 430, 431, 434 - 437, 439, 441, 442, 446, 447)*	*1*
471	*77051*	*NBR*	*Kit, Check Valve (Incldes: 438, 439, 441 - 444, 446, 447)*	*1*
—	*994783*	*SS*	*Adapter, Fitting (1/2" NPTM x 1/2" BSPP)*	*1*
—	*994784*	*STL*	*Adapter, Fitting (1/2" NPTM x 1/2" BSPP)*	*1*

Italics are optional items.

Material Codes (Not Part of Part No.): BB=Brass
NBR=Medium Nitrile (Buna-N) PTFE=Pure Polytetrafluoroethylene
S=304SS SS=316SS STL=Steel STZP=Steel/Zinc Plated

EXPLODED VIEW



⚠ CAUTIONS AND WARNINGS

All High Pressure Systems require a primary pressure regulating device (i.e. regulator, unloader) and a secondary pressure relief device (i.e. pop-off valve, relief valve). Failure to install such relief devices could result in personal injury or damage to pump or property. Cat Pumps does not assume any liability or responsibility for the operation of a customer's high pressure system.

Read all CAUTIONS and WARNINGS before commencing service or operation of any high pressure system. The CAUTIONS and WARNINGS are included in each service manual and with each Accessory Data sheet. CAUTIONS and WARNINGS can also be viewed online at www.catpumps.com/cautions-warnings or can be requested directly from Cat Pumps.

WARRANTY

View the Limited Warranty on-line at www.catpumps.com/warranty.

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