

IMPORTANT START-UP PROCEDURE

It is the responsibility of the user to read and understand all instructions, important safeguards, and safety precautions before operating or servicing any pump. Failure to do so may result in property damage, personal injury or death. Proper system installation, monitoring and maintenance of components are necessary for optimum pump performance. Cat Pumps does not assume any liability or responsibility for the design or operation of a customer's system.

Prior to operation, please review additional safety instructions found at www.catpumps.com/cautions

- 1. MOUNTING AND PIPING:** A rigid horizontal base with shock mounts is recommended. There must be no stress on the pump from a warped base or misaligned piping. Mount pumping system in areas away from direct spray, standing water or freezing temperatures. Enclose or protect the pump when used in highly contaminated conditions. Do not store or operate in excessively high temperature areas without proper ventilation.
- 2. INLET PLUMBING:** Check and open all valves in the inlet line to maintain adequate supply of water to pump. **DO NOT RUN PUMP DRY.** Inlet plumbing must be at least the same diameter as the inlet port, **PREFERABLY ONE SIZE LARGER.** Limit the number of 90° elbows and valves as they add considerable flow resistance to the pumped liquid. **Restriction in the inlet plumbing can cause cavitation in the pump,** drastically reducing seal, cup or valve life. All joints must be air tight.
IMPORTANT: Use appropriate flexible hose to inlet and from discharge ports. Failure to do so could result in loosening or breakage of rigid piping and damage to the pump and accessories.
- 3. INLET FILTER:** Inlet filter should be sized for the rated capacity of the pump, preferably greater. If new pump is installed in existing system, clean filter before starting pump and at regulator intervals during operation. 80 mesh is recommended minimum.
- 4. LUBRICATION:** Before starting pump, fill crankcase to red dot on oil gauge with amount specified in pump data sheet. Use Cat Pumps specially formulated, premium grade crankcase oil with anti-wear, oxidizer, and rust inhibitor additives (Part No. 6107 for 21 oz. bottle; Part No. 6100 for case of (12) 21 oz. bottles; Part No. 6105 for 5-gallon container). **Change initial fill after 50-hour run-in period.** Thereafter, change oil every 3 months or at 500 hour intervals. Do not lubricate wicks at initial start-up, if applicable. Operate for 10-15 minutes to allow grease from low-pressure seals to penetrate the plunger surface, then lubricate as needed. See Tech Bulletin 024.
- 5. INLET PRESSURE:** Optimum performance is obtained with flooded to 40 psi inlet pressure. Plunger pump inlet pressure range: minimum of -5 psi to a maximum of 70 psi. Piston pump inlet pressure range: -8.5 psi to a maximum of 40 psi. (Note: see pump Data Sheet for specific pump rating!) Excessive pressure or excessive suction will void the warranty. An inlet pressure regulator to reduce excessively high inlet pressure is recommended. Use of inlet stabilizer is highly recommended for all booster feed, industrial, and reverse osmosis applications. A shut-off valve is recommended to facilitate maintenance. Review INLET CONDITION CHECK- LIST in pump Service Manual before start-up.
- 6. DISCHARGE:** Check discharge line to assure all valves are open. **NOTE: Failure to do this can result in severe damage to the pump due to over-pressurization.** ADJUST regulator or unloader adjustment to MINIMUM PRESSURE SETTING prior to start-up. **NOTE: Gauge should be located at the pump discharge** to register operating pressure conditions at start-up and during operation.
- 7. BELT ALIGNMENT:** (if applicable): Turn pump over by hand several revolutions. Check alignment and tension of belt drive. Be sure that the belt drive is capable of handling system required horsepower. **NOTE: The motor or engine driving the pump must be of adequate horsepower to maintain full RPM when the pump is under load.** For electric motor sizing, refer to "Electric Horsepower Requirements" located on pump Data Sheets. Consult the manufacturer of gas or diesel engine for proper selection. **NOTE: It is recommended the belt drive be examined for tension and alignment after approximately 10 hours of operation.** Thereafter, refer to Preventive Maintenance Check-List in Service Manual.
- 8. SHAFT ROTATION:** Engage motor briefly to confirm proper rotation of crankshaft. Forward rotation is recommended. For reverse rotation, fill crankcase to top of oil gauge.
- 9. PRIME:** Disconnect discharge fitting or port and allow pump to run until air is purged from system.
- 10. SYSTEM PRESSURE:** Set system pressure in small increments until desired system pressure is reached. A primary and secondary Relief Valve are recommended on a high pressure system. Check gauge pressure periodically to monitor system performance. Review Hose, Line and Fitting Charts in Service Manual to assure proper line size and length to meet system requirements.

11. **CAUTION:** Check system for any leaks or evidence of cavitation. Do not operate system if pump does not reach pressure or flow specifications and excessive pulsation exists or if unusually loud noise is present. Re-check all start-up steps, Inlet Condition Check List or consult Cat Pumps.
12. **SAFETY:** Do not aim or point high pressure spray at any human or animal. Test area to verify pressure will not cause damage to surface. Shut-off system when not in use or unattended. Use qualified electrician for all electrical connections.

See Cat Pumps Standard Warranty for additional information.

Email questions to techsupport@catpumps.com. Please reference Model and S/N.

PUMP WARRANTY REGISTRATION

To register your pump(s) for warranty consideration, please visit www.catpumps.com/register

You will be required to have the following information:

Date of Purchase	Pump Model Number	Pump Serial Number
Application or Machine/ Process Name	Pumped Liquid	Place of Purchase

The pump serial number is located stamped just above the front right foot on all 3 frame and above pumps, or on a silver sticker for all direct drive pumps.

Cat Pumps Limited Warranty can be viewed by visiting www.catpumps.com/warranty

ADDITIONAL SUPPORTING LITERATURE

Data Sheets

Data Sheets provide details on each individual pump and include specifications, features and benefits, horsepower selection chart, parts list, exploded view, dimensional drawing and cutaway view.

Service Manuals

Service Manuals are designed to offer assistance when periodic maintenance is necessary. This is a "must read and retain" document that will assure optimum performance for your Cat Pump. Each manual includes a step-by-step disassembly and re-assembly of the pump with additional information on:

Tools used for manifold removal and seal and valve servicing	Preventative Maintenance
Inlet Condition Check-List	Typical Reservoir Tank Diagram
Torque Chart and Tool Sizing	Fittings, Pipe & Hose Friction Lost Charts
Handy formulas for determining RPM, GPM and horsepower	Troubleshooting

Technical Bulletins

Technical Bulletins include detailed descriptions of important product changes and improvements

All of the above can be found at www.catpumps.com/pump-literature

For any additional information, please feel free to contact us at 763-780-5440 or email us at techsupport@catpumps.com



Power Unit Systems

Installation and Start-Up



This system has been custom built to your specifications. **Before operation, all service manuals, data sheets, specification sheets, cautions and warnings should be read and understood.** It is the responsibility of the user to establish appropriate safety, health and training measures for personnel installing, servicing and operating this equipment.

Optimum performance of the pump and accessories is dependent upon the entire liquid system and will be obtained only with the proper selection, installation and plumbing of any added components.

POWER SOURCE

⚠ WARNING: Do not service pump while energized. Moving, rotating or reciprocating parts can crush and cut, causing personal injury, death or property damage.

Electric Motor: If equipped with an electric motor, it must be connected to an electrical source by a qualified electrician and must meet all local and state electrical codes. See specific application for the proper phase and voltage. Check for proper rotation.

Combustion Engine: If equipped with a combustion engine, it must be properly filled with crankcase oil, coolant (if applicable) and the proper fuel before operation. Units fitted with a clutch must have the clutch **disengaged** before starting the engine. Check for proper polarity of battery cables before wiring to the battery.

Hydraulic Motor: If equipped with a hydraulic motor, the oil requirements are located on the nameplate of the unit. The oil must meet the specifications set by the hydraulic motor manufacturer for type of oil and filtration necessary.

HIGH PRESSURE WATER PUMP

Positive displacement pumps can cause severe injury. Read and understand all specification sheets, service manuals, cautions and warnings before operation. Identify your specific accessories and their functions before operation. Check oil level on pump.

PUMP ROTATION

The high pressure pump is designed with internal splash lubrication. Forward rotation (toward the liquid-end) is recommended to allow optimum lubrication of the crosshead area. Reverse rotation is acceptable if the crankcase oil level is increased slightly above the centerline of sight gauge to assure adequate lubrication.

LOCATION

If the pump is used in extremely dirty or humid conditions, it is recommended the pump be enclosed. Do not store or operate in excessively high temperature areas or without proper ventilation.

INLET CONDITIONS

Refer to Inlet Plumbing Recommendations in the Cat Pumps "High-Pressure System Design Guide" before starting system.

DO NOT RESTRICT THE PUMP'S INLET FEED OR RUN DRY. Installation of an inlet pressure stabilizer is recommended in applications with stressful inlet conditions such as high temperatures, booster pump feed, long inlet lines or quick closing valves. The inlet pressure stabilizer should not be used with a negative suction inlet.

DISCHARGE CONDITIONS

OPEN ALL VALVES BEFORE STARTING SYSTEM to avoid a deadhead or overpressure condition and severe damage to the pump or system. Use reinforced, flexible hose of appropriate pressure rating upstream of connection to rigid plumbing. Review Typical Installation diagram or contact factory for assistance in placement of system accessories.

Pressure Gauge of appropriate pressure rating should be installed at the pump discharge manifold or in the discharge line near the head. This is extremely important in adjusting the pressure regulating devices and also for proper sizing of the nozzle or restricting orifice. The pump is rated for a maximum pressure; this is the pressure that is read at the discharge manifold (head) of the pump, not at the gun or nozzle.

⚠ WARNING: Do not operate high-pressure pumping system unless extraordinary safety precautions are observed. A high-pressure pumping system can deadhead or over-pressurize, causing serious personal injury and property damage.

All high-pressure systems require a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve, rupture disc) to provide proper pressure setting and over-pressure protection.

Pressure Regulator or Unloader Valve (primary device) of appropriate pressure rating must be installed on the discharge side of the pump. Its function is to prevent over pressurizing the pump in the event the discharge or downstream plumbing becomes plugged or is turned off. Severe damage to the pump will result if this condition occurs without a relief valve in the line.

NOTE: Failure to install such a pressure regulating valve will void the warranty on the pump. Discharge regulating devices should be at minimum pressure setting at start-up.

Relief or Pop-off Valve (secondary device) of appropriate pressure rating must be installed between the primary device and pump. It serves as additional protection in the event the primary pressure regulating device malfunctions.

NOTE: Failure to install such a safety valve will void the warranty on the pump. Secondary relief device should not be tampered with.

Pulsation Dampening device of appropriate pressure rating should be installed directly onto the discharge manifold (head) or in the discharge line near the head. Be certain the pulsation dampener is properly sized for the system specification and pre-charged for the system pressure (see individual pulsation dampener data sheet.)

Bypass line can be routed to a supply tank, drain or to the pump inlet. If routed to the pump inlet, the bypass liquid can quickly develop excessive heat and result in damage to the pump. A thermal relief valve installed in the bypass line is recommended to protect the pump. An auto shut-off assembly may also be used.

NOZZLES

A worn nozzle will result in loss of pressure. Do not adjust pressure regulating device to compensate. Replace nozzle(s) and reset regulating device to system pressure and secondary safety relief valve approximately 200 PSI above primary valve.

PUMPED LIQUIDS

Some liquids may require a pump flush between operations or before storing. Standard pH range for Cat Pumps is 5 to 9. Viscosity should not exceed 500 cP or 2500 SSU. High temperature or high vapor liquids may require special installation. For pumping liquids other than water, contact your Cat Pumps supplier.

STORING

For extended storing or between use in cold climates, drain all pumped liquids from pump and flush with antifreeze solution to prevent freezing and damage to the pump. (Refer to Tech Bulletin 083).

⚠ CAUTION: Do not operate the pump with frozen liquid. Operating the pump under this condition could over pressurize and jettison the manifold from the crankcase, causing personal injury and property damage.

IMPORTANT SAFETY INSTRUCTIONS

It is the responsibility of the user to read and understand all instructions, important safeguards and safety precautions before operating or servicing any pump. Failure to do so may result in property damage, personal injury or death.



General Safety Information and Symbols

Pay special attention to the following signal words, safety alert symbols and statements:

-  **DANGER** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
-  **WARNING** Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
-  **CAUTION** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.
-  **NOTICE** Indicates a hazardous situation which, if not avoided, could result in property damage.
-  Indicates a potential personal injury hazard. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

A. FLAMMABLE OR EXPLOSIVE LIQUID HAZARD

Do not operate pump with flammable or explosive liquids unless extraordinary safety precautions are observed. Leaks of flammable or explosive liquids, if exposed to elevated temperatures, static electricity, sparks or other hazards, will result in flame or possible explosion, causing serious personal injury, death or property damage.

1. Before operating pump with flammable or explosive liquids, ensure proper maintenance has been performed.
2. Do not operate pump with flammable or explosive liquids if leaks are detected.
3. Only pump flammable or explosive liquids that are compatible with pump component materials.
4. Do not operate pump with flammable or explosive liquids without safeguards or safety systems to detect leaks, elevated temperatures, spark prevention or any other hazards defined by the NFPA systems.
5. Do not remove *Flammable Liquids Product Suitability Hang Tag* to assure proper safety.
6. Follow ATEX guidelines for potentially-explosive atmospheres.

WARNING

A. ELECTRICAL SHOCK HAZARD

Do not service pump or electrical equipment while energized. Electricity can cause personal injury, death or property damage.

1. Adhere to "Lock Out" and "Tag Out" procedures for electrical equipment.
2. Before commencing pump service, turn power supply off.
3. Keep water away from electrical outlets and electrical devices.
4. Electrical components must be installed by a qualified electrician to avoid risk of electrocution.

B. ROTATING PARTS HAZARD

Do not service pump while energized. Moving, rotating or reciprocating parts can crush and cut, causing personal injury, death or property damage.

1. Adhere to "Lock Out" and "Tag Out" procedures for electrical equipment.
2. Before commencing pump service, turn power supply off, turn water supply off, squeeze trigger on gun to relieve system pressure.
3. For mobile equipment, be sure engines and hydraulics are turned off and secured to avoid accidental start.
4. Do not operate with safety guards removed.
5. Always use safety guards on all belt drives, couplings and shafts.

C. HOT SURFACE HAZARD

Do not touch pump, accessories or drive system while operating and until cool down is complete. Touching hot surface areas of the pump, accessories or drive system can cause severe burns or personal injury.

D. SKIN PUNCTURE HAZARD

Do not allow spray to contact any part of the body or animals. Pumped liquids under high pressure can pierce skin and underlying tissue or can deflect debris leading to serious personal injury or death.

1. Relieve all line pressure in the inlet line to the pump and discharge line from the pump before performing any maintenance on the pump.
2. When a high-pressure gun is not in use, set safety trigger lock (safety latch) to avoid accidental high-pressure operation and personal injury or property damage.
3. Do not check for leaks with hand. Use a piece of cardboard to check for leaks.
4. Review cleaning procedures to minimize heavy back blasting.
5. Wear adequate safety equipment and clothing when operating a high-pressure sprayer. Never use high-pressure spray with bare feet or exposed skin, and always wear safety glasses.

E. PUMPING LIQUIDS HAZARD

Do not operate pump with hot water, chemicals or other hazardous liquids unless extraordinary safety precautions are observed. Pumping hot water, chemicals or other hazardous liquids can expose personnel to serious injury.

1. Provide guards or shields around equipment to protect personnel.
2. Wear mask, goggles or eye protection while operating high-pressure equipment.
3. Obtain a Safety Data Sheet (SDS) and take appropriate safety measures for the liquid being handled.

F. OVER PRESSURIZATION HAZARD

Do not operate high-pressure pumping system unless extraordinary safety precautions are observed. A high-pressure pumping system can deadhead or over pressurize causing serious personal injury and property damage.

1. All high-pressure systems require a primary pressure regulating device (e.g., regulator or unloader) and a secondary pressure safety relief device (e.g., pop-off valve, safety valve, rupture disc) to assure proper pressure setting and overpressure protection.
2. All high-pressure systems require a pressure gauge to monitor pressure settings and avoid overpressure of equipment or personal harm.
3. Install primary pressure relief device on the discharge side of the pump.
4. Install secondary pressure relief device between the primary device and pump.
5. Install pressure gauge onto the discharge manifold or in the discharge line near the manifold.
6. Open all valves on discharge side of plumbing before operation.

G. OXYGEN HAZARD

Do not charge pulsation dampeners with oxygen. Oxygen may cause an explosion causing personal injury, death or property damage.

1. Use nitrogen only when charging pulsation dampeners, DO NOT USE OXYGEN.
2. Use proper charging tools to charge pulsation dampeners.
3. Charge pulsation dampener within specifications stated on data sheet to assure proper pulsation dampening and prevent failure of bladder.

H. FALL HAZARD

Do not operate pressure washer while standing on slippery or unstable surface unless extraordinary safety precautions are observed. Pressure washing may create slippery surface on which a person may slip and fall causing personal injury or death.

1. Wear suitable footwear to maintain a good grip on wet surfaces.
2. Do not stand on ladders or scaffolding.
3. Do not over reach or stand on unstable supports.
4. Keep good footing and balance and hold gun with both hands to control kick back.

CAUTION

A. IMPROPER USE OF FITTINGS HAZARD

Do not operate the pump with improperly-connected, sized, worn or loose fittings, pipes or hoses. Operating the pump under these conditions could result in personal injury and property damage.

1. Ensure all fittings, pipes and hoses are properly rated for the maximum pressure rating and flow of the pump.
2. Check all fittings and pipes for cracks or damaged threads.
3. Check all hoses for cuts, wear, leaks, kinks or collapse before each use.
4. Ensure all connections are tight and secure.
5. Use PTFE thread tape or pipe thread sealant (sparingly) to reconnect plumbing. Do not wrap tape beyond the last thread, this will prevent loose tape from becoming lodged in the pump or accessories.
6. Apply proper sealants to assure secure fit or easy disassembly when servicing.

B. FROZEN LIQUID HAZARD

Do not operate the pump with frozen liquid. Operating the pump under this condition could over pressurize and jettison the manifold from the crankcase causing personal injury and property damage.

1. Store pump or pumping system in an environmentally-controlled room protected from freezing temperatures.
2. Follow procedures in *TECH BULLETIN 083* to winterize pump.

C. CLEANING PUMP HAZARD

Do not use solvents that are flammable and toxic to clean or degrease equipment. Use of these solvents could result in personal injury and property damage.

1. Follow safety instructions as found in SDS or on packaging of each liquid.
2. Clean equipment in a well-ventilated area.
3. Disposal of solvents to be in accordance with local, state and federal regulations.

D. OPERATING BEYOND SPECIFICATIONS HAZARD

Do not operate the pump outside the specifications of individual pump data sheet or service manual. Operating the pump under these conditions could result in personal injury and property damage.

1. Do not operate the pump faster than the maximum recommended RPM.
2. Do not operate the pump at pressures higher than the maximum recommended pressure.
3. Do not operate the pump at temperatures higher than the maximum recommended temperatures.
4. Do not use accessories that are not compatible or rated for the pump.

E. LIFTING DEVICE HAZARD

Do not lift pump with unsuitable lifting devices. Use of unsuitable lifting devices may cause pump to fall, resulting in personal injury, damage to pump and/or pump with drive/base plate.

1. Lifting eyes installed on the pump must be used only to lift the pump.
2. Special lifting eyes should be installed on the base for lifting the pumping system (e.g. base, drive and accessories)
3. If slings or chains are used for lifting, they must be safely and securely attached to properly balance the weight of the unit.
4. Inspect slings and chains prior to use and replace worn and damaged slings and chains.

NOTICE

A. OIL HAZARD

Use only genuine Cat Pumps custom-blend, premium-grade, petroleum-based hydraulic oil. Use of other oil may not provide proper lubrication of drive-end components and may result in damage to the crankcase of the pump.

1. Fill pump crankcase to specific capacity indicated on data sheet or service manual prior to startup.
2. Cat Pumps premium custom-blend oil is available worldwide in 21-ounce bottles, (single and 12-pack cases), 2.5 gallon jugs (single and 2-pack) or 30 gallon drums. Use of other oils may void the warranty.

B. PUMP ROTATION DIRECTION HAZARD

Do not rotate pump crankshaft in reverse direction. Rotation of pump crankshaft in reverse direction may not provide proper lubrication and may result in damage to the drive-end components.

1. Forward rotation is the top of the crankshaft turning towards the manifold head of the pump.
2. Ensure oil is filled to the center red dot on sight gauge for forward rotation.
3. If reverse rotation is unavoidable, ensure oil is filled to slightly above center red dot on sight gauge.

C. BELT TENSION HAZARD

Do not operate pump with excessive belt tension. Excessive belt tension may damage the pump's bearings or reduce horsepower.

1. Rotate pump crankshaft before starting to ensure shaft and bearings are moving freely.
2. Ensure pulleys are properly sized.
3. Periodically replace belts to assure full horsepower transmission.
4. Ensure center distance dimensions between pulleys is correct.

D. BY-PASS OPERATION HAZARD

Do not operate the pump in by-pass for extended lengths of time. Operating the pump under this condition can quickly cause heat build-up resulting in damage to the pump.

1. Route by-pass line to supply reservoir to dissipate heated by-pass liquid into a large reservoir of cool water to reduce excessive temperature build-up.
2. Route by-pass line to inlet of pump using a thermo valve in the by-pass line or auto shut-off assembly that will sense temperature rise and either by-pass or shut down system before damage occurs.

E. DRY OPERATION HAZARD

Do not operate the pump without water or liquid. Operating pump under these conditions could result in damage to the pump.

1. Open all valves on inlet side of pump before starting operation to prevent starving the pump.
2. Do not exceed inlet suction pressure limit specified in pump data sheet.
3. Ensure inlet feed exceeds the maximum flow being delivered by the pump.
4. Ensure all fittings, pipes and hoses are properly-sized for the pump to avoid restricted flow.
5. Review and implement all other recommendations appropriate for your system from the *Inlet Condition Check-List*.

WARRANTY

View the Limited Warranty on-line at www.catpumps.com/literature/cat-pumps-limited-warranty

Power Units

Hydrostatic Test Performance



DATE: 6/30/2022

ORDER INFORMATION

CUSTOMER NAME	PUMPS & PRESSURE
PACKING LIST NO.	655256
MODEL NUMBER	60AG6760.222122
WORK ORDER NO.	191364

PUMP INFORMATION

MODEL NO.	6760
SERIAL NO.	62105124

TEST INFORMATION

PURPOSE OF TEST:

To confirm the absence of leaks and verify capability of unit to withstand the test pressure.

TEST PROCEDURE:

A high pressure pump is plumbed to the unit discharge.

A secondary pressure transducer is installed to verify the system pressure.

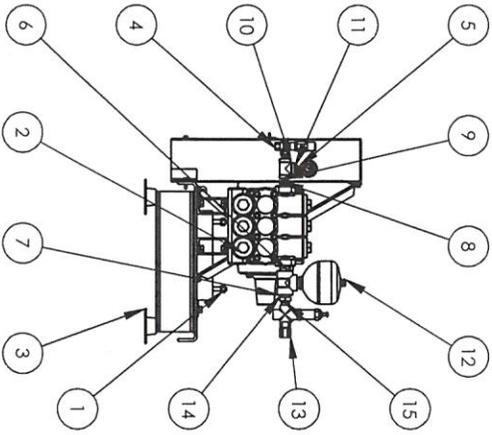
The unit is run for 5 minutes and observed for leaks/failures.

TEST RESULTS

PRESSURE (PSI)	926
WATER TEMP (°F)	67
TIME HELD	5 MIN
EFFECTS	NO LEAKS
PASS/FAIL	PASS
TECHNICIAN	Steve Harmon

SIGNED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	990121	COMPLETE BASE	1
2	6760	60PPR PUMP NABG 520GPM/110PSI 620GPM/1200PSI	1
3	990944	SHOCK MOUNT	4
4	7595	VALVE,RELIEF,3/4 BB R,53GPM,2600PSI	1
5	6086	GAUGE,1500PSI BB	1
6	990254	NIPPLE,CLOSE,1-1/4 SCH 80 S	1
7	991639	TEE,1-1/4"NPT 3000PSI SS	1
8	991633	BUSHING,1-1/4X3/4 SS,6000PSI	1
9	991623	NIPPLE,CLOSE,3/4" SS 2000PSI	2
10	991637	TEE,3/4"NPT SS 3000PSI	1
11	997986	BUSHING	1
12	6022	DAMPENER,PULS SS 70CGPM/1500PSI 1-1/4"NPTM,120CLINBR-BLD	1
13	7590	UNLOADER	1
14	991634	BUSHING,1-1/4X1 SS 6000PSI,REDUCER,NPT	1
15	991624	NIPPLE,CLOSE,1" SS,2000PSI	1



60AG6760.222122

Built by Cot Pumps for

PUMPS & PRESSURE

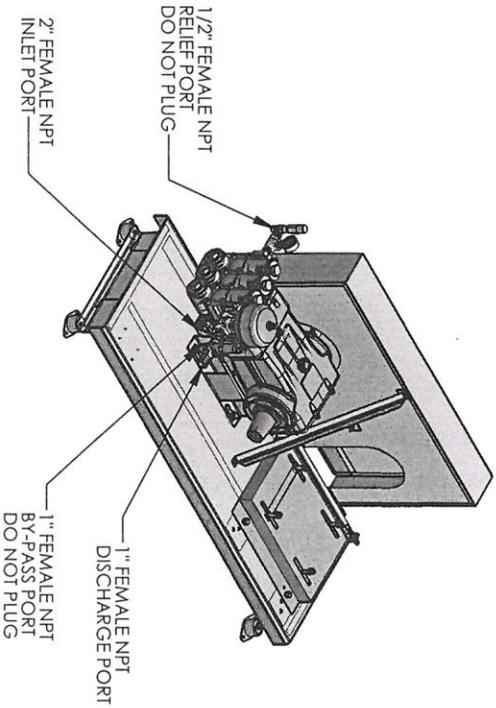
MODEL 60AG6760.222122

GPM 51.5 PSI 926

NEW ORLEANS, LA 70114
1447 Ken Lowe Rd. Hammond, LA 70424 USA



UNIT SET TO RUN AT 51.51GPM, 926PSI, 455 RPM
HYDROSTATIC TEST, SET REG/REL
CUSTOMER WILL INSTALL MOTOR AFTER THEY RECEIVE UNIT



DATA SHEET

60 FRAME PLUNGER PUMPS



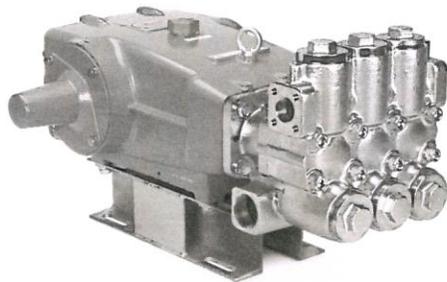
**Chrome
Plated**
6760

**Stainless
Steel**
6761

**Duplex
SS**
6762

**Nickel Aluminum
Bronze**
6767

**Nickel Aluminum
Bronze Flushed**
6767C



Model 6760 Shown
(Box rails and shaft protector included)

FEATURES

- Triplex plunger design ensures high efficiency and low pulsation.
- V-packings and low-pressure seals are completely lubricated and cooled, greatly increasing service life.
- Special high-density, polished, concentric ceramic plungers provide a true wear surface and extended seal life.
- Model 6767C provides an external flush for high-temperature or low-lubricity liquids.
- Pump comes standard with NBR seals. Alternative seal materials are available for higher temperature or chemical compatibility.

SPECIFICATIONS

	U.S.	Metric
Flow	60 gpm	227 lpm
Pressure Range	100–1200 psi	6.9–83 bar
Pump RPM*	520 rpm	520 rpm
Inlet Pressure Range	Flooded to 50 psi	Flooded to 3.5 bar
Max. Liquid Temperature	140° F	60° C
Above 130°F call Cat Pumps for inlet conditions and elastomer recommendations.		
Bore	2.165"	55 mm
Stroke	2.579"	65.5 mm
Crankcase Capacity	10 qts	9.46 l
Inlet Ports (2)	2" NPT(F)	2" NPT(F)
Flush Ports (2) (6767C)	¼" NPT(F)	¼" NPT(F)
Discharge Ports (2)	1¼" NPT(F)	1¼" NPT(F)
Shaft Diameter	1.772"	45 mm
Pulley Mounting	Either Side	Either Side
Weight	335 lbs	152 kg
Dimensions		
6760, 6767, 6767C	31.14 x 24.37 x 17.87"	791 x 619 x 454 mm
6761, 6762	30.71 x 24.37 x 17.44"	780 x 619 x 443 mm

* Pump minimum is 100 RPM.

ALTERNATIVE SEAL CONFIGURATION

MATERIAL	SUFFIX CODE	MAXIMUM TEMPERATURE	
NBR	—	140° F	(60° C)
FPM	.0110	180° F	(82° C)
EPDM	.0220	160° F	(71° C)

See **Tech Bulletin 002** for inlet conditions and RPM at high-temperature.

$$\text{DETERMINING THE PUMP RPM} \quad \frac{\text{Rated gpm}}{\text{Rated rpm}} = \frac{\text{Desired gpm}}{\text{Desired rpm}}$$

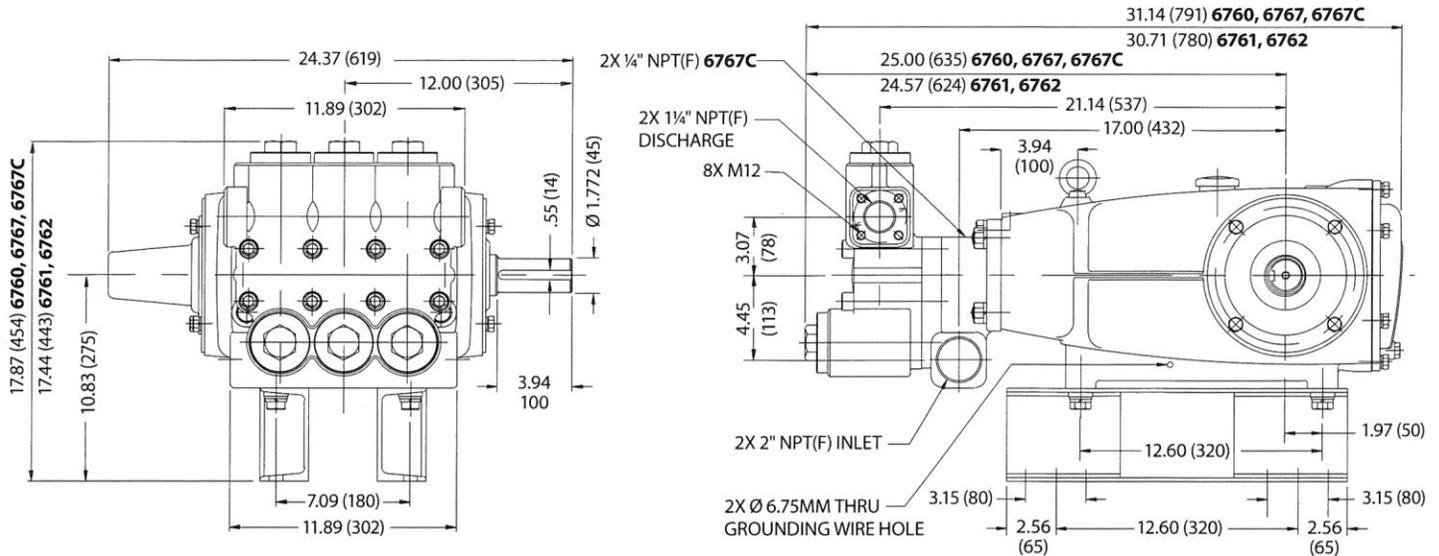
$$\text{DETERMINING THE REQUIRED HP} \quad \frac{\text{hp (Electric Brake)}}{1460} = \frac{\text{gpm} \times \text{psi}}{1460}$$

$$\text{DETERMINING MOTOR PULLEY SIZE} \quad \frac{\text{Motor Pulley OD}}{\text{Pump rpm}} = \frac{\text{Pump Pulley OD}}{\text{Motor rpm}}$$

Refer to pump **Service Manual** for repair procedure and additional technical information.

PARTS LIST

ITEM	PART NUMBER								DESCRIPTION	QTY
	6760	MATL	6761	MATL	6762	MATL	6767/C	MATL		
5	126532	STCP R	89728	S	89728	S	89728	S	Screw, HH (M10 x 40) (See Tech Bulletin 074)	8
6	126231	STCP R	—	—	—	—	—	—	Lockwasher (M10)	8
7	126574	STCP R	19934	S	19934	S	19934	S	Washer, Flat (M10)	8
8	29443	ALE	29443	ALE	29443	ALE	29443	ALE	Cover, Bearing, Outer (See Tech Bulletin 118)	2
10	29444	NBR	29444	NBR	29444	NBR	29444	NBR	O-Ring, Bearing Cover-70D	2
11	11443	NBR	11443	NBR	11443	NBR	11443	NBR	Seal, Oil, Crankshaft	2
12	126594	STCP R	126594	STCP R	126594	STCP R	126594	STCP R	Washer, Shim (M120 x 0.3)	0-2
13	126595	STCP R	126595	STCP R	126595	STCP R	126595	STCP R	Washer, Shim (M120 x 0.5)	0-2
15	29441	STL	29441	STL	29441	STL	29441	STL	Bearing, Roller	2
16	29442	STL	29442	STL	29442	STL	29442	STL	Cover, Bearing, Inner	2
17	29444	NBR	29444	NBR	29444	NBR	29444	NBR	O-Ring, Bearing Cover-70D	2
20	126612	BBHS	126612	BBHS	126612	BBHS	126612	BBHS	Rod, Connecting (Includes: 21, 22) (See Tech Bulletin 074)	3
21	126560	STCP R	126560	STCP R	126560	STCP R	126560	STCP R	Washer, Locking	3
22	126593	STCP R	126593	STCP R	126593	STCP R	126593	STCP R	Washer, Shim (M10.5 x 1.5)	6
25	29440	FCM	29440	FCM	29440	FCM	29440	FCM	Crankshaft, Dual End (M65.5)	1
32	43211	ABS	43211	ABS	43211	ABS	43211	ABS	Cap, Oil Filler	1
33	14177	NBR	14177	NBR	14177	NBR	14177	NBR	O-Ring, Oil Filler Cap-70D	1
34	126743	STCP R	126743	STCP R	126743	STCP R	126743	STCP R	Bolt, Eye (M12) (For Lifting Pump Only)	1
38	129343	RBR	129343	RBR	129343	RBR	129343	RBR	Gasket, Flat Flex	1
39	27769	ABS	27769	ABS	27769	ABS	27769	ABS	Stick, Dip	1
40	126531	STCP R	89627	S	89627	S	89627	S	Screw, HH (M10 x 30) (See Tech Bulletin 074)	8
41	126231	STCP R	15847	S	15847	S	15847	S	Lockwasher (M10)	8
42	126574	STCP R	19934	S	19934	S	19934	S	Washer, Flat (M10)	8
48	25625	STCP	25625	STCP	25625	STCP	25625	STCP	Plug, Drain (1/4" x 19 BSP)	1
49	23170	NBR	23170	NBR	23170	NBR	23170	NBR	O-Ring, Drain Plug-70D	1
50	29438	ALE	29438	ALE	29438	ALE	29438	ALE	Cover, Rear (See Tech Bulletin 118)	1
51	129386	NBR	129386	NBR	129386	NBR	129386	NBR	Gasket, Rear Cover	1
53	133667	ALE	133667	ALE	133667	ALE	133667	ALE	Crankcase with Guide Pins (Includes: 34, 54) (See Tech Bulletin 118)	1
54	43282	S	43282	S	43282	S	43282	S	Pin, Guide	2
55	126553	STCP R	89615	S	89615	S	89615	S	Stud (M16 x 70)	2
64	29481	CM	29481	CM	29481	CM	29481	CM	Pin, Crosshead	3
65	† 45384	SSZZ	45384	SSZZ	45384	SSZZ	45384	SSZZ	Rod, Plunger	3
69	126588	STCP R	126588	STCP R	126588	STCP R	126588	STCP R	Washer, Oil Seal	3
70	29454	NBR	29454	NBR	29454	NBR	29454	NBR	Seal, Oil	3
75	44752	NBR	44752	NBR	44752	NBR	44752	NBR	Slinger, Barrier-85D	3
88	45677	SS	45677	SS	45677	SS	45677	SS	Washers, Keyhole (M14)	3
90	44749	CC	44749	CC	44749	CC	44749	CC	Plunger (M55 x 185)	3
95	89783	S	44748	SS	44748	SS	44748	SS	Stud, Plunger Retainer (M14 x 147)	3
96	20214	PTFE	20214	PTFE	20214	PTFE	20214	PTFE	Backup Ring, Plunger Retainer	3
97	17616	NBR	17616	NBR	17616	NBR	17616	NBR	O-Ring, Plunger Retainer-80D	3
98	44751	SS	44751	SS	44751	SS	44751	SS	Gasket, Plunger Retainer	3
99	45276	S	44750	SS	48959	SSD	44750	SS	Retainer, Plunger (M14) (See Tech Bulletin 074)	3
100	855000	PVDF	855000	PVDF	855000	PVDF	855000	PVDF	Retainer, Seal, 2-Piece	3
101	44762	—	44762	—	44762	—	44762	—	Wick, Long Tab (M55 x 185)	3
106	44757	NBR	44757	NBR	44757	NBR	44757	NBR	Seal, Low-Pressure with SS-Spring	3
110	49457	NABC	45769	SS	48980	SSD	44754	NAB	Manifold, Inlet	1
	—	—	—	—	—	—	49305	NAB	Manifold, Inlet, Flushed (Model 6767C)	1
112	18175	NBR	18175	NBR	18175	NBR	18175	NBR	O-Ring, Spacer, Inner-80D	3
114	† 44767	SS	44767	SS	48957	SSD	44767	SS	Spacer, Inlet Manifold	3
115	18175	NBR	18175	NBR	18175	NBR	18175	NBR	O-Ring, Spacer, Outer-80D	3
116	126569	STCP R	19086	S	19086	S	19086	S	Lockwasher (M16)	4
117	126537	STCP R	89729	S	89729	S	89729	S	Screw, HH (M16 x 55) (See Tech Bulletin 074)	4
126	48392	D	48392	D	48392	D	48392	D	Adapter, Female (See Tech Bulletin 087)	3
127	44764	STG*	44764	STG*	44764	STG*	44764	STG*	V-Packing	6
128	† 45772	SS	45772	SS	48962	SSD	45772	SS	Adapter, Male	3
141	44943	SS	44943	SS	44943	SS	44943	SS	Coil Spring, Spacer	24
142	48501	BB	45383	SS	48982	SSD	45383	SS	Spacer with Coil Springs	3
155	18178	NBR	18178	NBR	18178	NBR	18178	NBR	O-Ring, Spacer-80D	3
157	† 45321	SS	45321	SS	48961	SSD	45321	SS	Spacer, V-Packing	3
159	18178	NBR	18178	NBR	18178	NBR	18178	NBR	O-Ring, Spacer-80D	3
160	44756	S	44756	S	44756	S	44756	S	Pin, Guide	2
163	18176	NBR	18176	NBR	18176	NBR	18176	NBR	O-Ring, Seat-80D	6
164	† 44772	SS	44772	SS	48964	SSD	44772	SS	Seat	6
166	† 44774	SS	44774	SS	48958	SSD	44774	SS	Valve	6
167	44773	SS	44773	SS	44773	SS	44773	SS	Spring	6
168	44775	PVDF	44775	PVDF	44775	PVDF	44775	PVDF	Retainer, Spring	6
170	† 44776	SS	44776	SS	48956	SSD	44776	SS	Washer, Retainer	6
171	44780	SS	44780	SS	44780	SS	44780	SS	Spring, Coil, Valve Plug	6
172	18177	NBR	18177	NBR	18177	NBR	18177	NBR	O-Ring, Valve Plug-80D	6
174	49461	NABC	48572	SSD	48572	SSD	44778	NAB	Plug, Valve	6
175	—	—	48573	S	48573	S	—	—	Screw, HSH (M16 x 35) (See Tech Bulletin 074)	24
185	49459	NABC	48489	SS	48984	SSD	44769	NAB	Manifold, Discharge	1
186	126569	STCP R	19086	S	19086	S	19086	S	Lockwasher (M16)	2
188	126744	STCP R	89694	S	89694	S	89694	S	Screw, HSH (M16 x 110) (See Tech Bulletin 074)	8
194	126525	STCP R	81291	S	81291	S	81291	S	Nut, Hex (M16)	2
250	29445	ALE	29445	ALE	29445	ALE	29445	ALE	Protector, Shaft (See Tech Bulletin 118)	1
255	33243	—	33243	—	33243	—	33243	—	Mount, Direct	1
256	29649	STCP	29649	STCP	29649	STCP	29649	STCP	Washer, Slant (M16) (To Shim and Align Mounting Bolts [Not Included] Through the Box Rail and Mounting Base)	4
259	126604	STCP R	126604	STCP R	126604	STCP R	126604	STCP R	Rail, Box	2



SEAL KITS

One (1) seal kit required per pump

PUMP MODEL	NBR (STD)	FPM (.0110)	EPDM (.0220) ♦
6760, 6761, 6762, 6767, 6767C	34091*	34093*	76091*
ITEM (Included in Seal Kits)			
97	17616	11686	703369
106	44757	45882	702228
112	18175	13266	702442
115	18175	13266	702442
127	44764	44764	44764
155	18178	13338	701657
159	18178	13338	701657

DESCRIPTION	QTY
O-Ring, Plunger Retainer	3
Seal, Low-Pressure with SS-Spring	3
O-Ring, Inner Spacer	3
O-Ring, Outer Spacer	3
V-Packing	6
O-Ring, Spacer	3
O-Ring, Spacer	3

* Review material codes for individual items (STG generally may be used as alternative)

♦ Silicone Oil/Grease required

VALVE KITS

Two (2) valve kits required per pump

PUMP MODEL	NBR (STD)	FPM (.0110)	EPDM (.0220) ♦
6760, 6761, 6767, 6767C	34092	31273	76092
6762	39400	—	—
ITEM (Included in Valve Kits)			
163	18176	13278	702445
164	44772	44772	44772
164	48964	—	—
166	44774	44774	44774
166	48958	—	—
167	44773	44773	44773
168	44775	44775	44775
170	44776	44776	44776
170	48956	—	—
172	18177	13279	701988

DESCRIPTION	QTY
O-Ring, Seat	3
Seat	3
Seat (Model 6762)	3
Valve	3
Valve (Model 6762)	3
Spring	3
Retainer, Spring	3
Washer, Retainer	3
Washer, Retainer (Model 6762)	3
O-Ring, Valve Plug	3

♦ Silicone Oil/Grease required

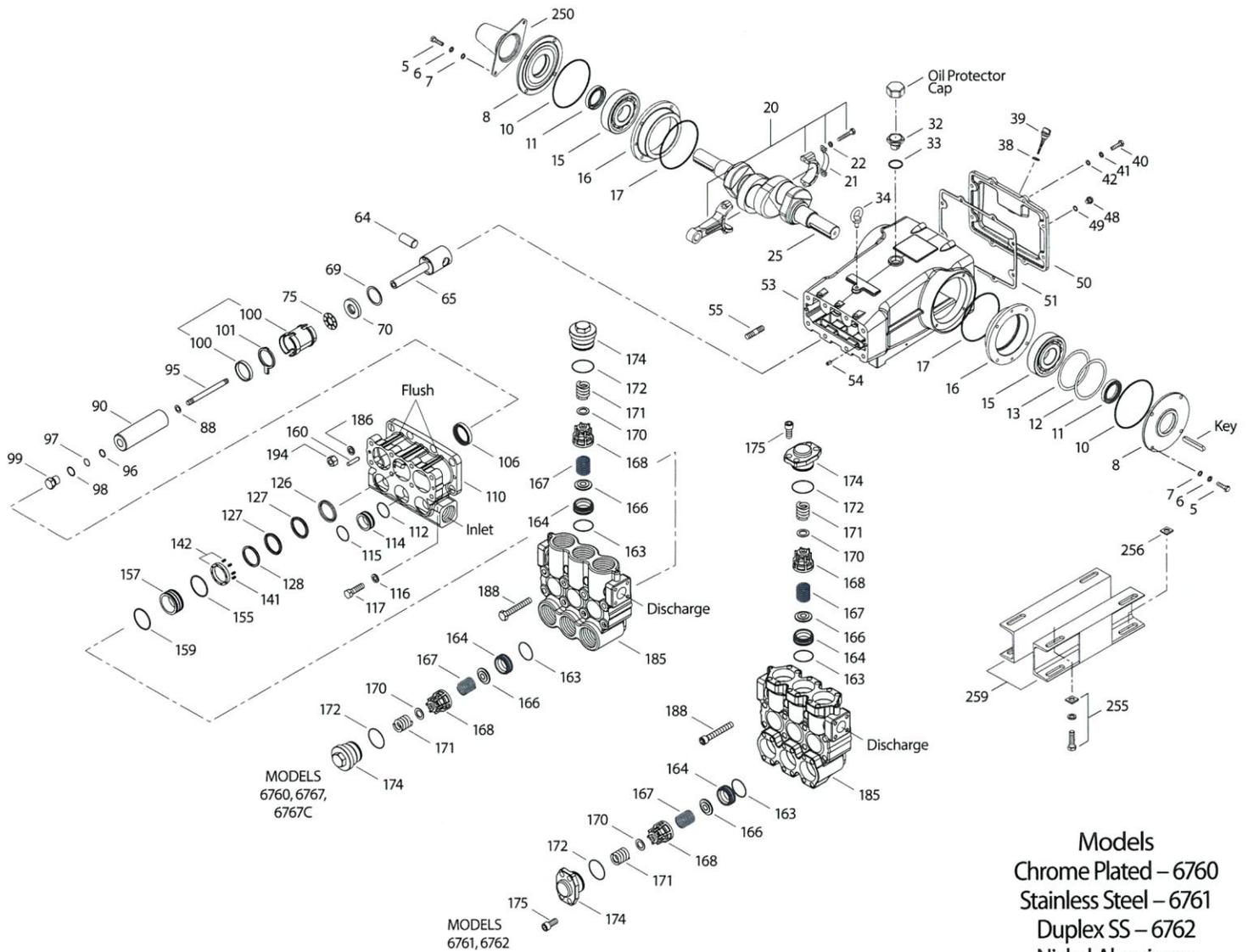
CAUTIONS AND WARNINGS

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/dynamic-literature/cautions-and-warnings or can be requested directly from Cat Pumps.

WARRANTY

View the Limited Warranty online at www.catpumps.com/literature/cat-pumps-limited-warranty

EXPLODED VIEW



Models
 Chrome Plated – 6760
 Stainless Steel – 6761
 Duplex SS – 6762
 Nickel Aluminum
 Bronze – 6767, 6767C
 May 2022

OPTIONAL PARTS AND ACCESSORIES

PART	DESCRIPTION	QTY
43048	Key (M14 x 9 x 90)	1
828710	Protector, Oil Cap with Foam Gasket	1
990014	Hub, "B", M45 with Keyway (Not Shown)	1
30429	Oiler (10 oz) (Not Shown)	3
34314	Kit, Oil Drain (3/8" x 48") (Not Shown)	1
88902	Stud, (M16 x 277) (For Removal of DM and IM) (Not Shown)	1
819010	Assembly, Crankcase, Cast Iron Conversion (Not Shown)	1

SERVICE PARTS

PART	DESCRIPTION	QTY
34091	Kit, Seal – Standard NBR	1
34092	Kit, Valve – Standard NBR	2
39400	Kit, Valve – Standard NBR (Model 6762)	2
6102	Oil, Jug (2.5 gal) ISO-68 Hydraulic (Fill to Specified Crankcase Capacity Prior to Start-up)	1
6124	Gasket, Liquid (3 oz)	1
6139	Lubricant, Anti-seize (8 oz) (See Tech Bulletin 095)	1
816760	Head, Complete with NBR Seals and O-Rings (Model 6760)	1
816667	Head, Complete with NBR Seals and O-Rings (Model 6761)	1
816865	Head, Complete with NBR Seals and O-Rings (Model 6762)	1
814820	Head, Complete with NBR Seals and O-Rings (Model 6767)	1

Bold print part numbers are unique to a particular pump model. Italics are optional items. [] Date of latest production change.

† Production parts 304SS, replacement parts are 316SS. R Components comply with RoHS Directive. For additional technical information see www.catpumps.com/literature/tech-bulletins.

MATERIAL CODES (Not Part of Part Number): ABS=ABS Plastic ALE=Aluminum Epoxy BB=Brass BBHS=Brass/High Strength CC=Ceramic CM=Chrome-Moly D=Acetal F=Cast Iron FCM=Forged Chrome-moly FPM=Fluorocarbon NAB=Nickel Aluminum Bronze NABC=Nickel Aluminum Bronze Chrome Plated NBR=Medium Nitrile (Buna-N)

PE=Polyethylene PTFE=Pure Polytetrafluoroethylene PVDF=Polyvinylidene Fluoride RBR=Rubber S=304SS SS=316SS SSD=Duplex SS SSZZ=316SS/Zamak

STCP=Steel/Chrome Plated STG=Special Blend PTFE White STL=Steel STZP=Steel/Zinc Plated

Kits – NBR, FPM (.0110), EPDM (.0220) listed on Page 4.

60PFR PLUNGER PUMP SERVICE MANUAL



60 FRAME SPLIT MANIFOLD

6747, 6760, 6761, 6767

INSTALLATION AND START-UP INFORMATION

Optimum performance of the pump is dependent upon the entire liquid system and will be obtained only with the proper selection, installation of plumbing, and operation of the pump and accessories.

SPECIFICATIONS: Maximum specifications refer to individual attributes. It is not implied that all maximums can be performed **simultaneously**. If more than one maximum is considered, check with your CAT PUMPS supplier to confirm the proper performance and pump selection. Refer to individual pump Data Sheet for complete specifications, parts list and exploded view.

LUBRICATION: Fill crankcase with special CAT PUMP oil per pump specifications [60FR-10 Qts.]. DO NOT RUN PUMP WITHOUT OIL IN CRANKCASE. Change initial fill after 50 hours running period. Thereafter, change oil every **3 months or 500 hour intervals**. Additional lubrication may be required with increased hours of operation and temperature.

PUMP ROTATION: Pump was designed for forward rotation to allow optimum lubrication of the crosshead area. Reverse rotation is acceptable if the crankcase oil level is increased slightly above center dot to assure adequate lubrication.

PULLEY SELECTION: Select size of motor pulley required to deliver the desired flow from Horsepower Requirement and Pulley Selection Chart (refer to Tech Bulletin 003 or individual Data Sheet).

DRIVE SELECTION: The motor or engine driving the pump must be of adequate horsepower to maintain full RPM when the pump is under load. Select the electric motor from the Horsepower Requirement Chart according to required pump discharge flow, maximum **pressure at the pump** and drive losses of approximately 3-5%. Consult the manufacturer of gas or diesel engine for selection of the proper engine size.

MOUNTING: Mount the pump on a rigid, horizontal surface in a manner to permit drainage of crankcase oil. An uneven mounting surface will cause extensive damage to the pump base. To minimize piping stress, **use appropriate flexible hose to inlet and discharge ports**. Use the correct belt; make sure pulleys are aligned. Excessive belt tension may be harmful to the bearings. Hand rotate pump before starting to be certain shaft and bearings are free moving.

Location: If the pump is used in extremely dirty or humid conditions, it is recommended pump be enclosed. Do not store or operate in excessively high temperature areas or without proper ventilation.

Inlet Conditions: Refer to complete **Inlet Condition Check-List** in this manual before starting system. DO NOT STARVE THE PUMP OR RUN DRY. Temperatures above 130°F are permissible. Add 1/2 PSI inlet pressure per each degree F over 130°F. Elastomer or RPM changes may be required. See Tech Bulletin 002 or call CAT PUMPS for recommendations

C.A.T.: Installation of a C.A.T. (Captive Acceleration Tube) is recommended in applications with stressful inlet conditions such as high temperatures, booster pump feed, long inlet lines or quick closing valves.

DISCHARGE CONDITIONS: OPEN ALL VALVES BEFORE STARTING SYSTEM to avoid deadhead overpressure condition and severe damage to the pump or system.

Install a **Pulsation Dampening** device on the discharge head or in the discharge line as close to the head as possible. Be certain the pulsation dampener (Prrrrr-olator) is properly precharged for the system pressure (see individual Data Sheet.)

A **reliable Pressure Gauge** should be installed near the discharge outlet of the high pressure manifold. This is extremely important for adjusting pressure regulating devices and also for proper sizing of the nozzle or restricting orifice. The pump is rated for a maximum pressure; this is the **pressure** which would be read **at the discharge manifold of the pump, NOT AT THE GUN OR NOZZLE**.

Use PTFE thread tape or pipe thread sealant (sparingly) to connect accessories or plumbing. Exercise caution not to wrap tape beyond the last thread to avoid tape from becoming lodged in the pump or accessories. This condition will cause a malfunction of the pump or system.

PRESSURE REGULATION: All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). The primary pressure device must be installed on the discharge side of the pump. The function of the primary pressure regulating device is to protect the pump from over pressurization, which can be caused by a plugged or closed off discharge line. Over pressurization can severely damage the pump, other system components and can cause bodily harm. The secondary safety relief device must be installed between the primary device and pump. This will ensure pressure relief of the system if the primary regulating device fails. Failure to install such a safety device will void the warranty on the pump.

If a large portion of the pumped liquid is by-passed (not used) when the high pressure system is running, this by-pass liquid should be routed to an adequately sized, baffled supply tank or to drain. If routed to the pump inlet, the **by-pass liquid can quickly develop excessive heat and result in damage to the pump**. A temperature control device to shut the system down within the pump limits or multiple THERMO VALVES must be installed in the by-pass line to protect the pump.

Nozzles: A worn nozzle will result in loss of pressure. Do not adjust pressure regulating device to compensate. Replace nozzle and reset regulating device to system pressure.

Pumped Liquids: Some liquids may require a **flush between operations or before storing**. For pumping liquids other than water, contact your CAT PUMPS supplier.

STORING: For extended storing or between use in cold climates, drain all pumped liquids from pump and **flush with antifreeze solution to prevent freezing and damage** to the pump. DO NOT RUN PUMP WITH FROZEN LIQUID (refer to Tech Bulletin 083).

⚠ WARNING

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

World Headquarters

CAT PUMPS

1681 - 94th Lane N.E. Minneapolis, MN 55449-4324

Phone (763) 780-5440 — FAX (763) 780-2958

e-mail: techsupport@catpumps.com

www.catpumps.com

International Inquiries

FAX (763) 785-4329

e-mail: intlsales@catpumps.com



The Pumps with Nine Lives

CAT PUMPS (U.K.) LTD.

1 Fleet Business Park, Sandy Lane, Church Crookham, Fleet

Hampshire GU52 8BF, England

Phone Fleet 44 1252-622031 — Fax 44 1252-626655

e-mail: sales@catpumps.co.uk

N.V. CAT PUMPS INTERNATIONAL S.A.

Heiveldekens 6A, 2550 Kontich, Belgium

Phone 32-3-450.71.50 — Fax 32-3-450.71.51

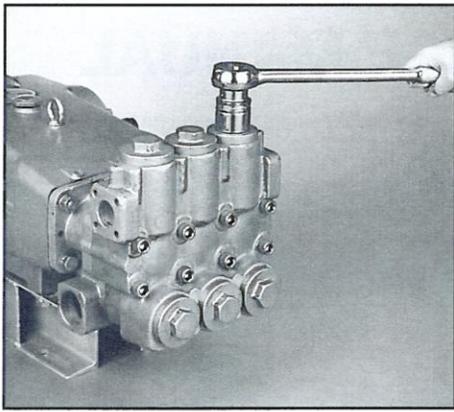
e-mail: cpi@catpumps.be www.catpumps.be

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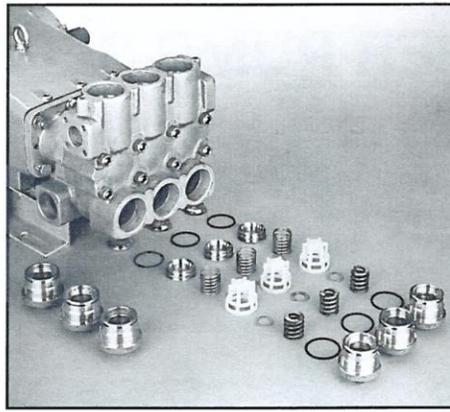
Buchwiese 2, D-65510 Idstein, Germany

Phone 49 6126-9303 0 — Fax 49 6126-9303 33

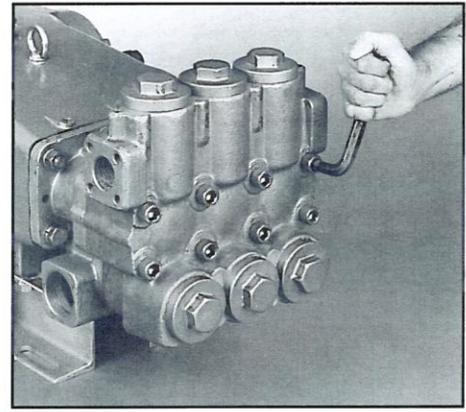
e-mail: catpumps@t-online.de www.catpumps.de



Removing Valve Plug (6760)



Complete Valve Assembly



Removing screws from Discharge Manifold

SERVICING THE VALVES

Disassembly

1. On the models 6747, 6760 and 6767, remove six (6) M70 Hex Valve Plugs. On the model 6761, remove four (4) Hex Socket Screws from each Valve Plug, then remove Valve Plug.
2. Remove Coil Spring and Washer under Valve Plug.
3. Thread an M12 bolt into the top of the Spring Retainer and pull out the Valve Assembly (including Retainer, Spring, Valve Seat, O-Ring and Back-up-Ring) from the valve chamber.
4. The valve assembly should remain together. If the valve assembly separates, the parts can easily be removed without any tools except for the Seat. Use a reverse pliers or slip the head of a bolt under the edge of the Valve Seat to remove.

Reassembly

NOTE: For certain applications apply liquid gasket to the o-ring crevices and seal surfaces. See Tech Bulletin 053 for model identification.

1. Examine the O-Rings on the Valve Seat and replace if cut or worn. Lubricate the O-Rings before installing on the Valve Seat.
2. Examine the surface of the Valve and Valve Seat for pitting, grooves or wear and replace if necessary.
3. Examine the Spring for fatigue, scale or breaks and replace.
4. The Valve Assembly comes as one piece in the service kit. Using individual parts, assemble Valve Retainer, Spring, Valve and Seat (with **O-Ring and Back-up-Ring**) and snap **together securely**.
5. Lubricate the O.D. of the Valve Assembly and the I.D. of the valve chamber and press Valve Assembly squarely into chamber until completely seated.
6. Replace Washer over top of Retainer, then Coil Spring.
7. Examine the O-Ring on the Valve Plug and replace if cut or worn. Lubricate new O-Ring before installing on Valve Plug. Exercise caution not to cut O-Ring on threads of Valve Plug.
8. Lubricate O.D. of Valve Plug O-Ring and thread into valve chamber. Exercise caution to avoid extruding O-Ring. Torque to specifications in chart.

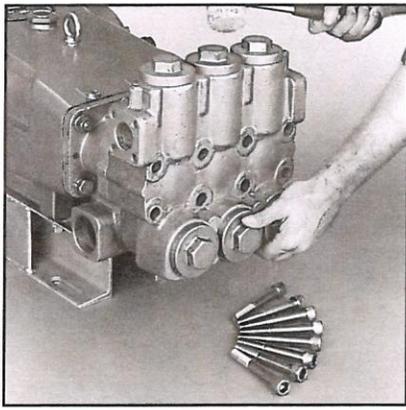
REMOVING THE DISCHARGE MANIFOLD

1. Remove eight (8) M16 Hex Socket Head Screws.
2. To assure alignment use two M16 Studs (PN 88902) as guides while removing manifold. Tap the back side of the Discharge Manifold with a soft mallet and gradually work head from pump. Properly support Discharge Manifold to avoid damage to the Ceramic Plungers.

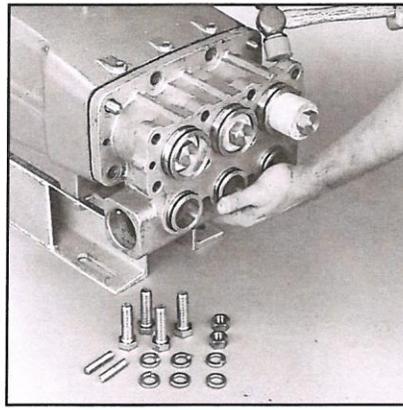
REMOVING THE INLET MANIFOLD

1. Remove the center four (4) M16 Hex Head Screws and the two (2) M16 Hex Nuts from the Studs.
2. Rotate Crankshaft to separate Inlet Manifold from the Crankcase.
3. Tap the rear of the Inlet Manifold with a soft mallet and gradually work from pump.

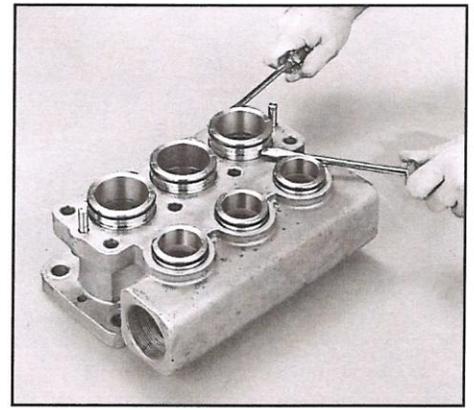
NOTE: Exercise caution and keep Manifold aligned with Plungers to avoid damage to the Plungers as the Inlet Manifold is removed.



Gently working Discharge Manifold over plungers



Gently removing Inlet Manifold over plungers



Removing V-Packing Spacer from Inlet Manifold

SERVICING THE SEALS - ALL MODELS

Disassembly

1. To service the seals and packings, it is necessary to remove both the Discharge Manifold and the Inlet Manifold. Follow disassembly procedures for REMOVING THE DISCHARGE MANIFOLD and REMOVING THE INLET MANIFOLD.

NOTE: The V-Packing Spacer with Coil Springs and V-Packing Cylinder (6747) or V-Packing Spacer (6760, 6761, 6767) Assemblies may stay in the Discharge Manifold or Inlet Manifold.

2. If the V-Packing Spacer (6760, 6761, 6767) stays in either the Discharge or Inlet Manifold, insert two screwdrivers on opposite sides of the secondary groove and pry from the valve chamber.

CAUTION: Exercise caution as the screwdrivers may score o-ring sealing surface.

3. If the V-Packing Spacer with Coil Springs and V-Packing Cylinder (6747) stays in either the Discharge or Inlet Manifold, remove exposed O-Rings and Back-up-Rings and insert two screwdrivers into the groove on opposite sides and pry from valve chamber.

CAUTION: Exercise caution as the screwdrivers may score o-ring sealing surface.

4. On the model 6747, separate V-Packing Spacer from V-Packing Cylinder by inserting two screwdrivers on opposite sides of the groove formed between components and pry apart. Remove one Male Adapter, two V-Packings and one Female Adapter from each V-Packing Cylinder.

5. On the models 6760, 6761, 6767, remove one Spacer w/ Coil Spring, one Male Adapter, two V-Packings and one Female Adapter from each seal chamber.

6. Place Inlet Manifold on the work surface **crankcase side up**.

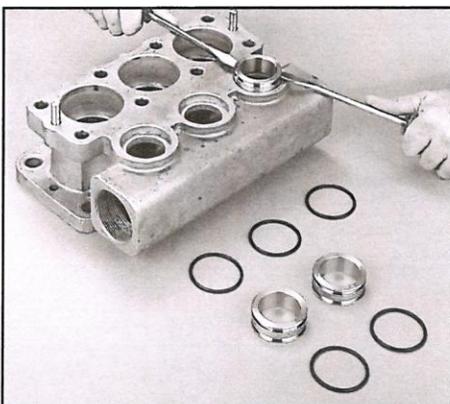
7. Using a screwdriver, remove LPS from each seal chamber.

CAUTION: Exercise caution as the screwdriver may damage sealing surface.

8. On the model 6747, place the Inlet Manifold on blocks with crankcase side down using a screwdriver tap on opposite sides of the LPS Adapter to drive out LPS Adapter and Lo-Pressure Seal from each chamber. Remove Lo-Pressure Seals from backside of LPS Adapter.

CAUTION: Exercise caution as the screwdrivers may damage sealing surface.

9. On the models 6760, 6761, 6767 remove Lo-Pressure Seal from each seal chamber.



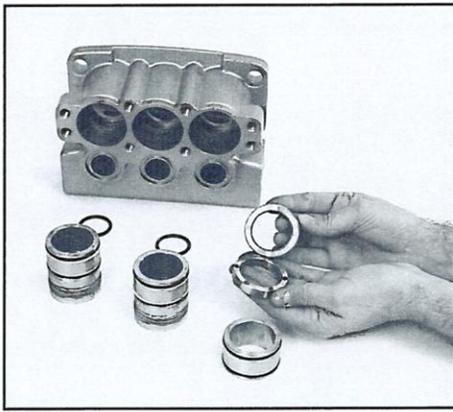
Removing Inlet Spacer from Inlet Manifold



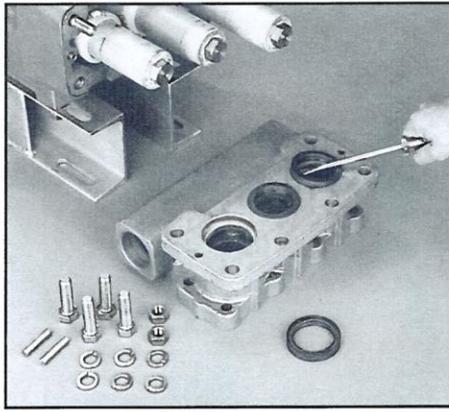
Complete packing arrangement (6760-6767)



Complete packing arrangement (6747)



Matching the spacer with coil springs and the Packings



Removing the Lo-Pressure Seals from the Inlet Manifold



Lo-Pressure Seals and Adapter arrangement (6747)

SERVICING THE SEALS - ALL MODELS

Reassembly

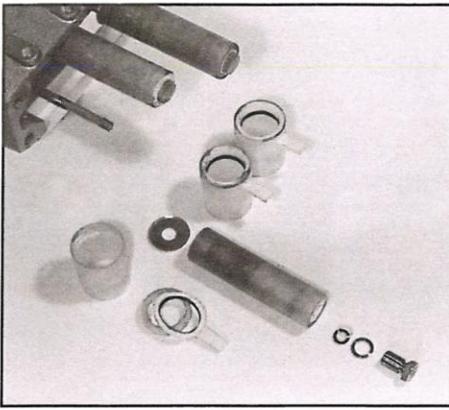
NOTE: If your pump has been built with special seals and O-Rings, service same type of special parts. Refer to pump Data Sheet for correct parts and kits.

NOTE: For certain applications apply liquid gasket to the O-Ring crevices and seal surfaces. See Tech Bulletin 053 for model identification.

NOTE: EPDM elastomers require silicone-base lubricant.

1. Examine Lo-Pressure Seals for wear to the internal ridges and outer surfaces, or for broken springs and replace as needed.
2. **Examine LPS Adapters for scale build up or wear and the O-Rings for cuts or deterioration and replace as needed.**

NOTE: When using alternate materials, the fit of the special materials may be snug and require gently driving the LPS into position with a cylinder of the same diameter to assure a square seating and no damage to the LPS.
3. On the model 6747, press new Lo-Pressure Seal into each LPS Adapter **with the garter spring up.**
4. Place Inlet Manifold on flat work surface **with crankcase side up.**
5. On the model 6747, press LPS Adapter Assembly into each seal chamber of the Inlet Manifold **with the garter spring down.**
6. On the models 6760, 6761, 6767, press Lo-Pressure Seal into each seal chamber **with the garter spring down.**
7. Examine the V-Packing Cylinders, V-Packing Spacers and V-Packing Spacer w/Coil Springs for scale build-up and wear. Examine O-Rings and Back-up-Rings for cuts or deterioration and replace as needed.
8. Examine Male Adapters and Female Adapters for wear and replace as needed.
9. Examine Spacer w/Coil Springs for scale build-up, wear, broken or fatigued Coil Springs and replace as needed.
10. Examine V-Packings for frayed edges or uneven wear and replace as needed.
11. Place Inlet Manifold on flat work surface **with crankcase side down.**
12. On the model 6747, install O-Ring on grooved end of V-Packing Cylinder. Place V-Packing Cylinder **with large opening facing up** on work surface.
13. Place Female Adapter **with flat side down/"V" side up** inside each V-Packing Cylinder.
14. Insert two V-Packings **with "V" side down** into the V-Packing Cylinder. The "V" will mate with "V" side of the Female Adapter.
15. Place Male Adapter **with "V" side down** inside each V-Packing Cylinder.
16. Press V-Packing Cylinder Assembly into each seal chamber with V-Packings facing **into the manifold chamber.**
17. On the models 6760, 6761, 6767, place Female Adapter **with flat side down/"V" side up** inside each seal chamber.
18. Insert two V-Packings **with "V" side down** into each seal chamber. The "V" will mate with "V" side of the Female Adapter.
19. Press Male Adapter **with "V" side down** into each seal chamber.
20. Position Spacer w/Coil Springs so that the small springs **do not line up** with grooves on top surface of Male Adapter.
21. On the model 6747, install two O-Rings and two Back-up-Rings on V-Packing Spacer w/Coil Springs with O-Rings to the outside. Press V-Packing Spacer into each V-Packing Cylinder.
22. On the models 6760, 6761, 6767, install O-Rings on each end of V-Packing Spacer. Press Spacer into each seal chamber.
23. Examine Inlet Spacer for scale build-up, wear and replace as needed. Examine Inlet Spacer O-Rings for cuts and deterioration and replace as needed.
24. Press Inlet Spacer into each lower manifold chamber.



Complete plunger arrangement

25. Support the Inlet Manifold from the under side and align manifold with Crankcase Guide Pins. Keep manifold aligned to avoid damaging Plungers. To assure alignment use two M16 studs (PN 88902) as guides and remove when manifolds are in place. Apply Loctite 242 to Hex Head screw threads and thread in hand tight. Torque in sequence to specification in torque chart.
26. Lubricate the exposed O-Rings on the V-Packing Spacer and valve chamber walls.
27. Support the Discharge Manifold from the under side and align with Inlet Manifold holes. Apply Loctite 242 to HSH screw threads and thread in hand tight. Torque in sequence to specifications in torque chart.

SERVICING THE PLUNGERS

Disassembly

1. To secure the plungers, it is necessary to remove both the Discharge and Inlet Manifolds. Follow disassembly procedures for REMOVING THE DISCHARGE MANIFOLD and REMOVING THE INLET MANIFOLD.
2. Remove the Seal Retainers from each Ceramic Plunger.
3. Remove the Adapter Front Seal Retainer from the Rear Seal Retainer.
4. Remove the used Wick and install new wick.
5. Replace Front and Rear Seal Retainer.
6. Loosen Plunger Retainer 4 to 5 turns. **Push Plunger towards Crankcase** until Plunger Retainer pops out.
7. Unscrew and remove Plunger Retainer, Gasket, O-Ring, Back-up-Ring, Ceramic Plunger, Keyhole Washer and Barrier Slinger.

Reassembly

1. Replace Barrier Slinger then Keyhole Washer on each Plunger Rod.
2. Carefully examine each Plunger for scoring or cracks and replace if worn.

NOTE: Ceramic Plunger can only be installed one direction (front to back). Do not force onto rod.
3. Examine Gasket, O-Ring and Back-up-Ring on Plunger Retainer and replace if cut or worn. Lubricate O-Ring for ease of installation and to avoid damaging O-Rings. **First install Gasket, O-Ring then Back-up-Ring.**

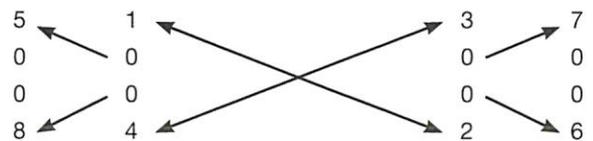
4. Apply a small amount of Loctite 242 to exposed threaded end and thread Plunger Retainer onto Plunger Rod. Torque per chart.5. Slip Seal Retainers over Plungers. Insert smaller diameter first.

NOTE: Line up Wicks with the oil holes in the Crankcase and tabs down towards the Oil Pan.

NOTE: No wick is used on 6747.

6. Rotate Crankshaft by hand so the two outside Plungers are extended equally.
7. Carefully slide Inlet Manifold over Plungers and press towards Crankcase. Keep manifold aligned to avoid damaging Plungers. To assure alignment use two M16 studs (PN 88902) as guides and remove when manifolds are in place.
8. Replace four (4) Hex Head Screws and two (2) Hex Nuts and torque per chart.
9. Lubricate the exposed O-Rings on the V-Packing Spacer and valve chamber walls and carefully slip Discharge Manifold over Plungers and snug up to the Inlet Manifold.
10. Hand tighten the outer top two (2) Hex Socket Head Screws first. Then hand tighten the remaining six (6) Hex Socket Head Screws. Torque in sequence to specifications in torque chart.

TORQUE SEQUENCE



SERVICING THE CRANKCASE SECTION

1. While Manifolds, Plungers and Seal Retainers are removed examine Crankcase Oil Seals for wear.
2. Check oil level and check for evidence of water in oil.
3. Rotate Crankshaft by hand to feel for smooth bearing movement.
4. Check for any signs of leaking at Rear Cover, Drain Plug and Bubble Gauge.
5. Examine Crankshaft Oil Seals externally for drying, cracking or leaking.
6. Consult CAT PUMPS or your local distributor if Crankcase service is required. Refer to Tech Bulletin 035.

See Section V of the Plunger Pump Service Video for additional information.

PREVENTATIVE MAINTENANCE CHECK-LIST

Check	Daily	Weekly	50 hrs.	500 hrs.*	1500 hrs.**	3000 hrs.**
Clean Filters	x					
Oil Level/Quality	x					
Oil Leaks	x					
Water Leaks	x					
Belts, Pulley		x				
Plumbing		x				
Initial Oil Change			x			
Oil Change				x		
Seal Change					x	
Valve Change						x
Accessories					x	

* If other than CAT PUMPS special multi-viscosity ISO68 oil is used, change cycle should be every 300 hours.

** Each system's maintenance cycle will be exclusive. If system performance decreases, check immediately. If no wear at 1500 hours, check again at 2000 hours and each 500 hours until wear is observed. Valves typically require changing every other seal change.

Duty cycle, temperature, quality of pumped liquid and inlet feed conditions all effect the life of pump wear parts and service cycle.

** Remember to service the regulator/unloader at each seal servicing and check all system accessories and connections before resuming operation.

Refer to video for additional assistance.

TORQUE CHART

Pump Item Pump Model	Thread	Tool Size [Part No.]	Torque		
			in. lbs.	ft. lbs.	Nm
Plunger Retainer	M14	M30 Hex	520	43.4	59
Inlet Manifold Screws	M16	M24 Hex [44046]	565	47.0	64
Discharge Manifold Screws	M16	M14 Allen [33049]	565	47.0	64
Valve Plugs 6747, 6760, 6767	M70	M41 Hex	1390	115.7	157
Valve Plugs Screws 6761	M16	M14 Allen [33049]	250	21.0	28
Crankcase Cover/ Bearing Cover Screws	M10	M17 Hex [25083]	220	18.1	25
Connecting Rod Screws	M10	M17 Hex [25083]	390	32.5	44
Bubble Oil Gauge	M28	Oil Gauge Tool [44050]	45	3.6	5

TECHNICAL BULLETIN REFERENCE CHART

No.	Subject	Models
002	Inlet Temperature VS Liquid Temperature	All Models
003	Drive Packages - Power Units	3FR - 68FR PFR
024	Lubrication of Lo-Pressure Seals	All Models
036	Cylinder and Plunger Reference Chart	All Models
043	Plunger Pump LPS and HPS Servicing	All Plunger Models
052	Plunger Rod and Stud Change - CR Pumps	3PFR, 5PFR, 15PFR, 35PFR, 60PFR
053	Liquid Gasket	All Plunger NAB-SS Models
074	Piston and Plunger Pump Torque Chart	All Models
077	Oil Drain Kit	All Models
082	Discharge Manifold	6761
083	Winterizing a Pump	All Models
084	Crankcase Change - 60 Frame	60FR
087	Female Adapters	15PFR, 35PFR, 60PFR

INLET CONDITION CHECK-LIST

Review Before Start-Up

Inadequate inlet conditions can cause serious malfunctions in the best designed pump. Surprisingly, the simplest of things can cause the most severe problems or go unnoticed to the unfamiliar or untrained eye. REVIEW THIS CHECK-LIST BEFORE OPERATION OF ANY SYSTEM. Remember, no two systems are alike, so there can be no **ONE** best way to set-up a system. All factors must be carefully considered.

INLET SUPPLY should exceed the maximum flow being delivered by the pump to assure proper performance.

- Open inlet shut-off valve and turn on water supply to avoid starving pump. **DO NOT RUN PUMP DRY.**
- Temperatures above 130°F are permissible. Add 1/2 PSI inlet pressure per each degree F over 130°F. Elastomer or RPM changes may be required. See Tech Bulletin 002 or call CAT PUMPS for recommendations.
- Avoid closed loop systems especially with high temperature, ultra-high pressure or large volumes. Conditions vary with regulating/unloader valve.
- Low vapor pressure liquids, such as solvents, require a booster pump and C.A.T. to maintain adequate inlet supply.
- Higher viscosity liquids require a positive head and a C.A.T. to assure adequate inlet supply.
- Higher temperature liquids tend to vaporize and require positive heads and C.A.T. to assure adequate inlet supply.
- When using an inlet supply reservoir, size it to provide adequate liquid to accommodate the maximum output of the pump, generally a minimum of 6-10 times the GPM (however, a combination of system factors can change this requirement); provide adequate baffling in the tank to eliminate air bubbles and turbulence; install diffusers on all return lines to the tank.

INLET LINE SIZE should be adequate to avoid starving the pump.

- Line size must be a minimum of one size larger than the pump inlet fitting. Avoid tees, 90 degree elbows or valves in the inlet line of the pump to reduce the risk of flow restriction and cavitation.
- The line **MUST** be a FLEXIBLE hose, NOT a rigid pipe, and reinforced on SUCTION systems to avoid collapsing.
- The simpler the inlet plumbing the less the potential for problems. Keep the length to a minimum, the number of elbows and joints to a minimum (ideally no elbows) and the inlet accessories to a minimum.
- Use pipe sealant to assure air-tight, positive sealing pipe joints.

INLET PRESSURE should fall within the specifications of the pump.

- Acceleration loss of liquids may be increased by high RPM, high temperatures, low vapor pressures or high viscosity and may require pressurized inlet and C.A.T. to maintain adequate inlet supply. **DO NOT USE C.A.T. WITH SUCTION INLET.**
- Optimum pump performance is obtained with +20 PSI (1.4 BAR) inlet pressure and a C.A.T. for certain applications. With adequate inlet plumbing, most pumps will perform with flooded suction. Maximum inlet pressure is 50 PSI (3.5 BAR).
- After prolonged storage, pump should be rotated by hand and purged of air to facilitate priming. Disconnect the discharge port and allow liquid to pass through pump and measure flow.

INLET ACCESSORIES are designed to protect against over pressurization, control inlet flow, contamination or temperature and provide ease of servicing.

- A shut-off valve is recommended to facilitate maintenance.
- Installation of a C.A.T. is essential in applications with stressful conditions such as high temperatures, booster pump feed or long inlet lines. **Do not use C.A.T. with negative inlet pressure.**
- A stand pipe can be used in some applications to help maintain a positive head at the pump inlet line.
- Inspect and clean inlet filters on a regular schedule to avoid flow restriction.
- A pressure transducer is necessary to accurately read inlet pressure. **Short term, intermittent cavitation will not register on a standard gauge.**
- All accessories should be sized to avoid restricting the inlet flow.
- All accessories should be compatible with the solution being pumped to prevent premature failure or malfunction.
- Optional inlet protection can be achieved by installing a pressure cut off switch between the inlet filter and the pump to shut off pump when there is no positive inlet pressure.

BY-PASS TO INLET Care should be exercised when deciding the method of by-pass from control valves.

- It is recommended the by-pass be directed to a baffled reservoir tank, with at least one baffle between the by-pass line and the inlet line to the pump.
- Although not recommended, by-pass liquid may be returned to the inlet line of the pump if the system is properly designed to protect your pump. When a pulsation dampener is used, a PRESSURE REDUCING VALVE must be installed on the inlet line (**BETWEEN THE BY-PASS CONNECTION AND THE INLET TO THE PUMP**) to avoid excessive pressure to the inlet of the pump. It is also recommended that a THERMO VALVE be used in the by-pass line to monitor the temperature build-up in the by-pass loop to avoid premature seal failure.
- A low-pressure, flexible cloth braid (not metal braid) hose should be used from the by-pass connection to the inlet of the pump.
- Caution should be exercised not to undersize the by-pass hose diameter and length. Refer to Technical Bulletin 064 for additional information on the size and length of the by-pass line.
- Check the pressure in the by-pass line to avoid over pressurizing the inlet.
- The by-pass line should be connected to the pump inlet line at a gentle angle of 45° or less and no closer than 10 times the pump inlet port diameter e.g. 1-1/2" port size = 15" distance from pump inlet port.

HOSE FRICTION LOSS

Water* Flow Gal/Min	PRESSURE DROP IN PSI PER 100 FT OF HOSE WITH TYPICAL WATER FLOW RATES Hose Inside Diameters, Inches						
	1/4	5/16	3/8	1/2	5/8	3/4	1"
0.5	16	5	2				
1	54	20	7	2			
2	180	60	25	6	2		
3	380	120	50	13	4	2	
4		220	90	24	7	3	
5		320	130	34	10	4	
6			220	52	16	7	1
8			300	80	25	10	2
10			450	120	38	14	3
15			900	250	80	30	7
20			1600	400	121	50	12
25				650	200	76	19
30					250	96	24
40					410	162	42
50					600	235	62
60						370	93

*At a fixed flow rate with a given size hose, the pressure drop across a given hose length will be directly proportional. A 50 ft. hose will exhibit one-half the pressure drop of a 100 ft. hose. Above values shown are valid at all pressure levels.

WATER LINE PRESSURE LOSS PRESSURE DROP IN PSI PER 100 FEET

Water GPM	Steel Pipe—Nominal Dia.				Brass Pipe—Nominal Dia.				Copper Tubing O.D. Type L					
	1/4	3/8	1/2	3/4	1 1/4	1 1/2	1 3/4	2	1/4	3/8	1/2	5/8	3/4	7/8
1	8.5	1.9			6.0	1.6			120	13	2.9	1.0		
2	30	7.0	2.1		20	5.6	1.8		400	45	10	3.4	1.3	
3	60	14	4.5	1.1	40	11	3.6		94	20	6.7	2.6		
5	150	36	12	2.8	100	28	9.0	2.2	230	50	17	6.1	3.0	
8	330	86	28	6.7	220	62	21	5.2	500	120	40	15	6.5	
10	520	130	43	10	320	90	30	7.8	180	56	22	10		
15	270	90	21	6.2	190	62	16	5.0	120	44	20			
25	670	240	56	16	470	150	40	12	330	110	50			
40		66	17	8.0		39	11	5.0	550	200	88			
60			37	17			23	11						
80			52	29			40	19						
100			210	107	48		61	28						

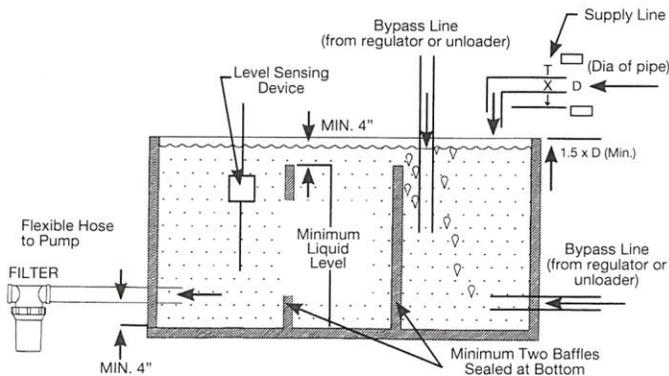
RESISTANCE OF VALVES AND FITTINGS

Nominal Pipe Size Inches	Inside Diameter Inches	Equivalent Length of Standard Pipe in Feet							
		Gate Valve	Globe Valve	Angle Valve	45° Elbow	90° Elbow	180° Close Ret	Tee Thru Run	Tee Thru Branch
1/2	0.622	0.41	18.5	9.3	0.78	1.67	3.71	0.93	3.33
3/4	0.824	0.54	24.5	12.3	1.03	2.21	4.90	1.23	4.41
1	1.049	0.69	31.2	15.6	1.31	2.81	6.25	1.56	5.62
1 1/4	1.380	0.90	41.0	20.5	1.73	3.70	8.22	2.06	7.40
1 1/2	1.610	1.05	48.0	24.0	2.15	4.31	9.59	2.40	8.63
2	2.067	1.35	61.5	30.8	2.59	5.55	12.30	3.08	11.60
2 1/2	2.469	1.62	73.5	36.8	3.09	6.61	14.70	3.68	13.20
3	3.068	2.01	91.5	45.8	3.84	8.23	18.20	4.57	16.40
4	4.026	2.64	120.0	60.0	5.03	10.80	23.90	6.00	21.60

Arriving at a total line pressure loss, consideration should then be given to pressure loss created by valves, fittings and elevation of lines.

If a sufficient number of valves and fittings are incorporated in the system to materially affect the total line loss, add to the total line length, the equivalent length of line of each valve or fitting.

TYPICAL RESERVOIR TANK RECOMMENDED 6 TO 10 TIMES SYSTEM CAPACITY



Handy Formulas to Help You

Q. How can I find the RPM needed to get specific GPM (Gallons Per Minute) I want?

A. $\text{Desired RPM} = \text{Desired GPM} \times \frac{\text{Rated RPM}}{\text{Rated GPM}}$

Q. I have to run my pump at a certain RPM. How do I figure the GPM I'll get?

A. $\text{Desired GPM} = \text{Desired RPM} \times \frac{\text{Rated GPM}}{\text{Rated RPM}}$

Q. Is there a simple way to find the approximate horsepower I'll need to run the pump?

A. $\text{Electric Brake Horsepower Required} = \frac{\text{GPM} \times \text{PSI}}{1460} \quad (\text{Standard } 85\% \text{ Mech. Efficiency})$

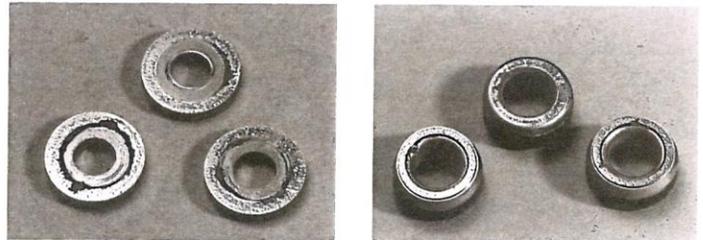
Q. What size motor pulley should I use?

A. $\text{Pump Pulley (Outer Diameter)} \times \frac{\text{Pump RPM}}{\text{Motor/Engine RPM}} \quad (\text{Consult Engine Mfr.})$

Q. How do I calculate the torque for my hydraulic drive system?

A. $\text{Torque (ft. lbs.)} = 3.6 \left(\frac{\text{GPM} \times \text{PSI}}{\text{RPM}} \right)$

Avoid Cavitation Damage



One or several of the conditions shown in the chart below may contribute to cavitation in a system resulting in premature wear, system downtime and unnecessary operating costs.

CONDITION	SOLUTION
Inadequate inlet line size	<ul style="list-style-type: none"> • Increase line size to the inlet port or one size larger
Water hammering liquid acceleration/deacceleration	<ul style="list-style-type: none"> • Install C.A.T. Tube • Move pump closer to liquid supply
Rigid Inlet Plumbing	<ul style="list-style-type: none"> • Use flexible wire reinforced hose to absorb pulsation and pressure spikes
Excessive Elbows in Inlet Plumbing	<ul style="list-style-type: none"> • Keep elbows to a minimum and less than 90°
Excessive Liquid Temperature	<ul style="list-style-type: none"> • Use Thermo Valve in bypass line • Do not exceed pump temperature specifications • Substitute closed loop with baffled holding tank • Adequately size tank for frequent or high volume bypass • Pressure feed high temperature liquids • Properly ventilate cabinets and rooms
Air Leaks in Plumbing	<ul style="list-style-type: none"> • Check all connections • Use PTFE thread tape or pipe thread sealant
Agitation in Supply Tank	<ul style="list-style-type: none"> • Size tank according to pump output — Minimum 6-10 times system GPM • Baffle tank to purge air from liquid and separate inlet from discharge
High Viscosity Liquids	<ul style="list-style-type: none"> • Verify viscosity against pump specifications before operation • Elevate liquid temperature enough to reduce viscosity • Lower RPM of pump • Pressure feed pump • Increase inlet line size
Clogged Filters	<ul style="list-style-type: none"> • Perform regular maintenance or use clean filters to monitor build up • Use adequate mesh size for liquid and pump specifications

DIAGNOSIS AND MAINTENANCE

One of the most important steps in a high pressure system is to establish a regular maintenance program. This will vary slightly with each system and is determined by various elements such as the duty cycle, the liquid being pumped, the actual specifications vs rated specifications of the pump, the ambient conditions, the inlet conditions and the accessories in the system. A careful review of the necessary inlet conditions and protection devices required before the system is installed will eliminate many potential problems.

CAT PUMPS are very easy pumps to service and require far less frequent service than most pumps. Typically, only common tools are required, making in-field service convenient, however, there are a few custom tools, special to certain models, that do simplify the process. This service manual is designed to assist you with the disassembly and reassembly of your pump. The following guide will assist in determining the cause and remedy to various operating conditions. You can also review our **FAQ** or **SERVICE** sections on our **WEB SITE** for more facts or contact CAT PUMPS directly.

PROBLEM	PROBABLE CAUSE	SOLUTION
Low pressure	<ul style="list-style-type: none"> •Worn nozzle. •Belt slippage. •Air leak in inlet plumbing. •Pressure gauge inoperative or not registering accurately. •Relief valve stuck, partially plugged or improperly adjusted. •Inlet suction strainer (filter) clogged or improperly sized. •Abrasives in pumped liquid. •Leaky discharge hose. •Inadequate liquid supply. •Severe cavitation. •Worn seals. •Worn or dirty inlet/discharge valves. 	<ul style="list-style-type: none"> •Replace with properly sized nozzle. •Tighten belt(s) or install new belt(s). •Tighten fittings and hoses. Use PTFE liquid or tape. •Check with new gauge. Replace worn or damaged gauge. •Clean/adjust relief valve. Replace worn seats/valves and o-rings. •Clean filter. Use adequate size filter. Check more frequently. •Install proper filter. •Replace discharge hose with proper rating for system. •Pressurize inlet and install C.A.T. •Check inlet conditions. •Install new seal kit. Increase frequency of service. •Clean inlet/discharge valves or install new valve kit.
Pulsation	<ul style="list-style-type: none"> •Faulty Pulsation Dampener. •Foreign material trapped in inlet/discharge valves. 	<ul style="list-style-type: none"> •Check precharge. If low, recharge, or install a new dampener. •Clean inlet/discharge valves or install new valve kit.
Water leak		
<ul style="list-style-type: none"> •Under the manifold •Into the crankcase 	<ul style="list-style-type: none"> •Worn V-Packings or Lo-Pressure Seals. •Worn adapter o-rings. •Humid air condensing into water inside the crankcase. •Excessive wear to seals and V-Packings. 	<ul style="list-style-type: none"> •Install new seal kit. Increase frequency of service. •Install new o-rings. •Install oil cap protector. Change oil every 3 months or 500 hours. •Install new seal kit. Increase frequency of service.
Knocking noise		
<ul style="list-style-type: none"> •Inlet supply •Bearing •Pulley 	<ul style="list-style-type: none"> •Inadequate inlet liquid supply. •Broken or worn bearing. •Loose pulley on crankshaft 	<ul style="list-style-type: none"> •Check liquid supply. Increase line size, pressurize or install C.A.T. •Replace bearing. •Check key and tighten set screw.
Oil leak		
<ul style="list-style-type: none"> •Crankcase oil seals. •Crankshaft oil seals and o-rings. •Drain plug •Bubble gauge •Rear cover •Filler cap 	<ul style="list-style-type: none"> •Worn crankcase oil seals. •Worn crankshaft oil seals or o-rings on bearing cover. •Loose drain plug or worn drain plug o-ring. •Loose bubble gauge or worn bubble gauge gasket. •Loose rear cover or worn rear cover o-ring. •Loose filler cap or excessive oil in crankcase. 	<ul style="list-style-type: none"> •Replace crankcase oil seals. •Remove bearing cover and replace o-rings and/or oil seals. •Tighten drain plug or replace o-ring. •Tighten bubble gauge or replace gasket. •Tighten rear cover or replace o-ring. •Tighten filler cap. Fill crankcase to specified capacity.
Pump runs extremely rough		
<ul style="list-style-type: none"> •Inlet conditions •Pump valves •Pump seals 	<ul style="list-style-type: none"> •Restricted inlet or air entering the inlet plumbing •Stuck inlet/discharge valves. •Leaking V-Packings or Lo-Pressure seals. 	<ul style="list-style-type: none"> •Correct inlet size plumbing. Check for air tight seal. •Clean out foreign material or install new valve kit. •Install new seal kit. Increase frequency of service.
Premature seal failure		
	<ul style="list-style-type: none"> •Scored plungers. •Over pressure to inlet manifold. •Abrasive material in the liquid being pumped. •Excessive pressure and/or temperature of pumped liquid. •Running pump dry. •Starving pump of adequate liquid. •Eroded manifold. 	<ul style="list-style-type: none"> •Replace plungers. •Reduce inlet pressure per specifications. •Install proper filtration at pump inlet and clean regularly. •Check pressure and inlet liquid temperature. •DO NOT RUN PUMP WITHOUT LIQUID. •Increase hose one size larger than inlet port size. Pressurize and install C.A.T. •Replace manifold. Check liquid compatibility.





FEATURES

- Optional STL, S, SS, BB materials for liquid compatibility.
- Optional pressure ratings to meet system pressure requirements.
- Multiple sizes and styles to match pump ports and accessories keeping mounting compact and well supported.

High Pressure Fittings

Models **990620**
thru **991667**

Nipple				Elbow			Tee			Cross			Reducing Bushing				
Close		Hex															
Part No.	Fitting Size	Matl.	Weight (Lbs.)	Part No.	PSI	Fitting Size	Type	Matl.	Weight (Lbs.)	Part No.	Fitting Size	Matl.	Weight (Lbs.)				
150 PSI														150 PSI			
991756	1/4" NPTM x Close	STL	.09	991876	125	1" NPTF	Elbow (Street)	BB	.65	991683	1-1/2" NPTM x 1" NPTF	SS	.82				
991677	3/4" NPTM x Close	SS	.15	991617	150	1/2" NPTF	Elbow (Street)	SS	.22	3000 PSI							
991650	1-1/2" NPTM x Close	SS	.26	991675	150	1" NPTF	Elbow (Street)	SS	.65	990647	1-1/2" NPTM x 1" NPTF	S	.61				
2000 PSI				991648	150	1-1/4" NPTF	Elbow (Street)	SS	1.26	991954	2-1/2" NPTM x 2" NPTF	SS	1.10				
990620	1/4" NPTM x Close	STL	.03	991676	150	1-1/2" NPTF	Elbow (Street)	SS	1.35	991955	2" NPTM x 1-1/2" NPTF	SS	.79				
990621	3/8" NPTM x Close	STL	.04	991684	150	3/4" NPTF	Elbow	SS	.45	6000 PSI							
990622	1/2" NPTM x Close	STL	.07	991651	150	3/4" NPTF	Tee	SS	.60	990626	3/8" NPTM x 1/4" NPTF	STL	.04				
990623	3/4" NPTM x Close	STL	.13	991652	150	1" NPTF	Tee	SS	1.05	990627	1/2" NPTM x 1/4" NPTF	STL	.09				
990624	1" NPTM x Close	STL	.18	991649	150	1-1/2" NPTF	Tee	SS	1.83	990628	1/2" NPTM x 3/8" NPTF	STL	.06				
990645	1-1/4" NPTM x Close	STL	.50	991613	150	1/2" NPTF	Cross	SS	.75	990629	3/4" NPTM x 3/8" NPTF	STL	.15				
991620	1/4" NPTM x Close	SS	.03	990660	200	3/4" NPTF	Cross	BB	.75	990630	3/4" NPTM x 1/2" NPTF	STL	.10				
991621	3/8" NPTM x Close	SS	.04	991654	1000	1/4" NPTF	Elbow	SS	.41	990631	1" NPTM x 1/2" NPTF	STL	.28				
991622	1/2" NPTM x Close	SS	.07	990661	1000	1/2" NPTF	Cross	BB	.51	990632	1" NPTM x 3/4" NPTF	STL	.21				
991623	3/4" NPTM x Close	SS	.14	991609	3000	1/2" NPTF	Elbow (Street)	SS	.44	990633	1-1/4" NPTM x 3/4" NPTF	STL	.48				
991624	1" NPTM x Close	SS	.19	991665	3000	1/2" NPTF	Elbow	SS	.37	990634	1-1/4" NPTM x 1" NPTF	STL	.36				
6000 PSI				990635	2000	3/8" NPTF	Tee	STL	.34	991626	3/8" NPTM x 1/4" NPTF	SS	.04				
990615	1/2" NPTM x 3/8" NPTM (Hex)	STL	.08	990636	2000	1/2" NPTF	Tee	STL	.62	991627	1/2" NPTM x 1/4" NPTF	SS	.09				
990640	1/4" NPTM x Hex	STL	.09	990637	2000	3/4" NPTF	Tee	STL	.98	991628	1/2" NPTM x 3/8" NPTF	SS	.06				
990641	3/8" NPTM x Hex	STL	.15	990638	2000	1" NPTF	Tee	STL	1.79	991629	3/4" NPTM x 3/8" NPTF	SS	.07				
990642	1/2" NPTM x Hex	STL	.15	990639	2000	1-1/4" NPTF	Tee	STL	2.7	991630	3/4" NPTM x 1/2" NPTF	SS	.10				
990643	3/4" NPTM x Hex	STL	.25	991614	2000	1/4" NPTF	Tee	SS	.51	991631	1" NPTM x 1/2" NPTF	SS	.27				
990644	1" NPTM x Hex	STL	.38	991635	2000	3/8" NPTF	Tee	SS	.40	991632	1" NPTM x 3/4" NPTF	SS	.18				
991612	3/8" NPTM x 1/4" NPTM (Hex)	SS	.04	991636	2000	1/2" NPTF	Tee	SS	.69	991633	1-1/4" NPTM x 3/4" NPTF	SS	.48				
991608	1/2" NPTM x 3/8" NPTM (Hex)	SS	.16	991637	2000	3/4" NPTF	Tee	SS	1.01	991634	1-1/4" NPTM x 1" NPTF	SS	.33				
991616	1/2" NPTM x 1/4" NPTM (Hex)	SS	.17	991638	2000	1" NPTF	Tee	SS	3.01	10,000 PSI							
991640	1/4" NPTM x Hex	SS	.09	991639	2000	1-1/4" NPTF	Tee	SS	4.65	991667	1/2" NPTM x 1/4" NPTF	SS	.10				
991647	3/8" NPTM x Hex	SS	.09	990949	2000	1/2" NPTF	Cross	STL	.90	991660	3/4" NPTM x 1/2" NPTF	SS	.13				
991646	1/2" NPTM x Hex	SS	.17	991615	2000	3/4" NPTF	Cross	SS	.98	991662	1" NPTM x 3/4" NPTF	SS	.30				
991641	3/8" NPTM x Close	SS	.07	990614	5000	1/4" NPTF	Elbow	STL	.08								
991643	3/4" NPTM x Close	SS	.18	990608	4500	3/8" NPTF	Elbow (Street)	STL	.22								
991644	1" NPTM x Close	SS	.29	991671	4500	3/8" NPTF	Elbow (Street)	SS	.23								
991645	1-1/4" NPTM x Close	SS	.56	990609	4500	3/8" NPTF	Tee (Male Branch)	STL	.30								
10,000 PSI				990616	6000	1/4" NPTF	Elbow	SS	.15								
991661	1/2" NPTM x Close	S	.20	990655	6000	3/8" NPTF	Tee	STL	.26								
991663	3/4" NPTM x Close	S	.35	990656	6000	1/2" NPTF	Tee	STL	2.24								
				990657	6000	3/4" NPTF	Tee	STL	3.69								
				990658	6000	1" NPTF	Tee	STL	5.23								
				991655	6000	3/8" NPTF	Tee	SS	.45								
				991656	6000	1/2" NPTF	Tee	SS	2.38								
				991657	6000	3/4" NPTF	Tee	SS	3.76								
				991658	6000	1" NPTF	Tee	SS	5.39								
				991659	6000	1-1/4" NPTF	Tee	SS	7.75								
				990448	10,000	1/2" NPTF	Tee	SSS	5.15								
				991669	10,000	3/4" NPTF	Tee	S	5.25								

Material Codes: BB=Brass S=304SS SS=316SS SSS=416SS STL=Steel

"Customer confidence is our greatest asset"

SELECTION: Select the fittings to match the system pressure rating and the type of material compatible with the pump head and pumped liquid. Do not restrict the inlet or discharge of the pump.

INSTALLATION: Install inlet and discharge accessories directly to the pump ports when possible or use a tee to accommodate multiple accessories. See typical installation views.

MAINTENANCE: With each seal and valve change, check all fitting connections for any leaks. Low pressure, fluctuating pressure or vibration are often the result of poor connections. Use PTFE thread tape or pipe thread sealant to assure a leak proof fit.

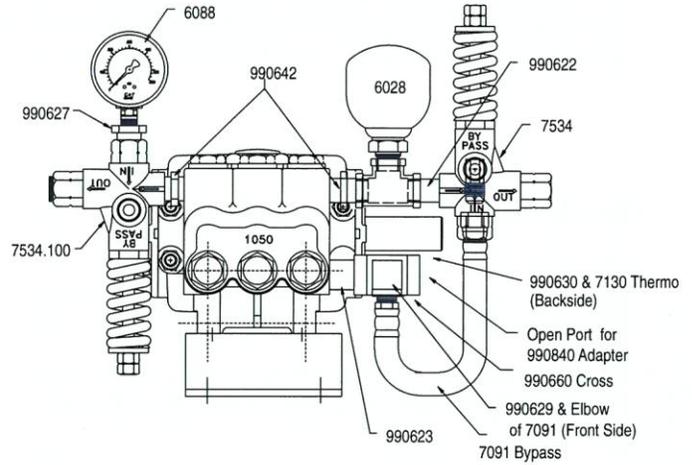
WARRANTY

90 Day Warranty

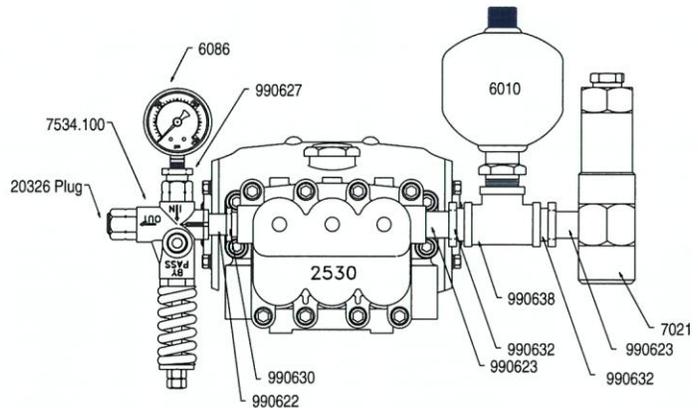
Refer to complete CAT PUMPS Warranty for further information.

TYPICAL INSTALLATIONS

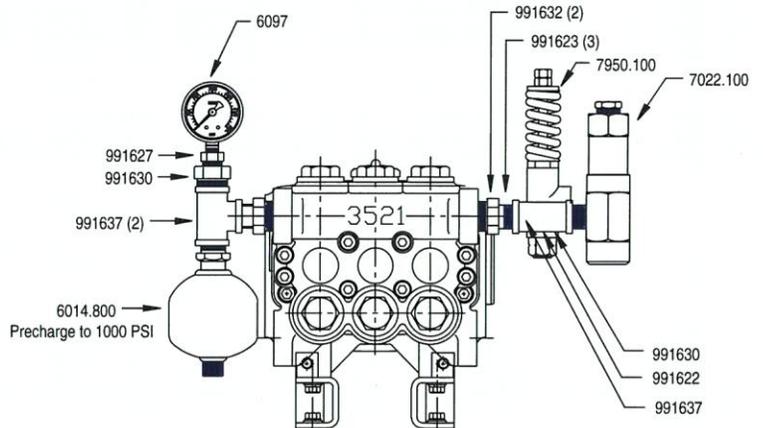
10 GPM at 1500 PSI - STL



20 GPM at 1000 PSI - STL



23 GPM at 2000 PSI - SS



World Headquarters

CAT PUMPS

1681 - 94th Lane N.E. Minneapolis, MN 55449-4324

Phone (763) 780-5440 — FAX (763) 780-2958

e-mail: techsupport@catpumps.com

www.catpumps.com

International Inquiries

FAX (763) 785-4329

e-mail: intl@catpumps.com



The Pumps with Nine Lives

CAT PUMPS (U.K.) LTD.

1 Fleet Business Park, Sandy Lane, Church Crookham, Fleet

Hampshire GU52 8BF, England

Phone Fleet 44 1252-622031 — Fax 44 1252-626655

e-mail: sales@catpumps.co.uk

N.V. CAT PUMPS INTERNATIONAL S.A.

Heiveldekens 6A, 2550 Kontich, Belgium

Phone 32-3-450.71.50 — Fax 32-3-450.71.51

e-mail: cpi@catpumps.be www.catpumps.be

CAT PUMPS DEUTSCHLAND GmbH

Buchwiese 2, D-65510 Idstein, Germany

Phone 49 6126-9303 0 — Fax 49 6126-9303 33

e-mail: catpumps@t-online.de www.catpumps.de

DATA SHEET

HIGH-FLOW RELIEF VALVE



Standard Model: 7595



FEATURES

- Provides system pressure setting and protection for single or multiple gun and pump systems.
- Heavy duty, high flow design quickly and conveniently mounts directly into discharge line.
- Functions as a secondary pressure relief to assure system and pump protection from deadhead or excessive pressure.
- Standard NBR o-rings with alternative options for temperature and chemical compatibility
 - FPM – .0110 (7595.0110)
 - EPDM – .0220 (7595.0220)

SPECIFICATIONS

	U.S. Measure	Metric Measure
Flow Range	1-53 gpm	3.8-200 lpm
Pressure Range	260-2600 psi	18-180 bar
Maximum Relief Setting	2860 psi	197 bar
Maximum Operating Temperatures:		
Standard Buna o-rings	140° F	60° C
Standard Buna o-rings (intermittent)	195° F	90° C
Optional FPM o-rings	240° F	115° C
Inlet Port	3/4" NPT(F)	3/4" NPT(F)
By-Pass Port	1/2" NPT(F)	1/2" NPT(F)
Weight	29.0 oz.	0.82 kg
Dimensions	6.25 x 2.05 x 1.46"	159 x 52 x 37 mm

SELECTION

Select a relief valve to meet or exceed the flow and pressure requirements of the system.

INSTALLATION

The relief valve should be mounted in the discharge line **before any other accessories in the system** to provide optimum protection to the pump. The by-pass port 1/2" NPT(F) is at the bottom. Relief valve by-pass liquid may be returned to the reservoir or drain to the floor. By-pass returned to the inlet of the pump should be done with caution to avoid pressure spikes or excessive heat build-up from recirculating liquids. The inlet port 3/4" NPT(F) is located at the side.

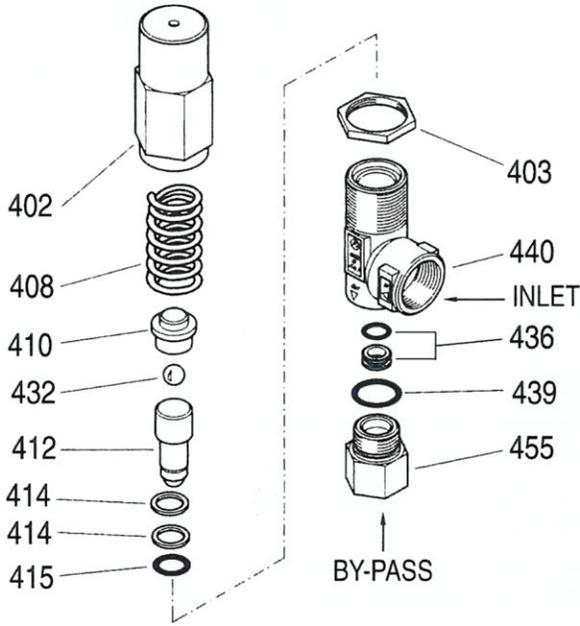
OPERATION

The adjusting cap is located at the top of the relief valve. Using a wrench, the pressure setting may be increased by turning clockwise or decreased by the turning counterclockwise.

The relief valve should be set in small increments. Check your pressure gauge following each adjustment. It may be convenient to set your unloader or regulating device for the system working pressure in small increments, as you are setting the relief valve. The final adjustment for the relief valve should be set to relieve at approximately 200 psi above the system working pressure.

NOTE: THE RELIEF VALVE IS A SECONDARY SAFETY DEVICE. IT DOES NOT REPLACE A PRESSURE REGULATOR OR UNLOADER.

EXPLODED VIEW



PARTS LIST

ITEM DESCRIPTION	P/N	MATL	QTY
402 Cap, Adjusting	—	BB	1
403 Nut, Locking	—	BB	1
408 Spring	—	STL	1
410 Retainer, Spring	—	BB	1
412 Piston	701601	S	1
414 Back-up-Ring, Piston	—	PTFE	2
415 O-Ring, Piston - 70D	—	NBR	1
O-Ring, Piston	—	FPM	1
O-Ring, Piston	—	EPDM	1
432 Ball, Seat, 13/32"	31075	SSSS	1
436 Seat, w/O-Ring	33806	NBR	1
439 O-Ring, By-Pass Fitting - 85D	—	NBR	1
O-Ring, By-Pass Fitting	—	FPM	1
O-Ring, By-Pass Fitting	—	EPDM	1
440 Body w/3/4" NPTF Port	—	BB	1
455 Fitting, By-Pass [1/2" NPT(F)]	39634	BB	1
<i>468 Kit, Repair (Standard)</i> <i>(Incls: 412,414,415,432,436,439)</i>	<i>39078</i>	<i>NBR</i>	<i>1</i>
<i>Kit, Repair (.0110)</i> <i>(Incls: 412,414,415,432,436,439)</i>	<i>76078</i>	<i>FPM</i>	<i>1</i>
<i>Kit, Repair (.0220)</i> <i>(Incls: 412,414,415,432,436,439)</i>	<i>76178</i>	<i>EPDM</i>	<i>1</i>

Italics are optional items.

MATERIAL CODES (Not Part of Part Number):

BB=Brass EPDM=Ethylene Propylene Diene Monomer FPM=Fluorocarbon
NBR=Medium Nitrile (Buna-N) PTFE=Pure Polytetrafluoroethylene
S=304SS SSSS=440SS STL=Steel

TROUBLESHOOTING

Valve chatters	• Valve is improperly set. Repeat adjustment procedure.
Valve continually by-passes	• Seat, ball or retainer is worn. Replace as needed.
Leaking out the top of valve	• O-Rings on piston are worn or cut. Replace as needed.

⚠ 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.



CAT PUMPS

1681 - 94TH LANE N.E. MINNEAPOLIS, MN 55449-4324
PHONE (763) 780-5440 — FAX (763) 780-2958
e-mail: techsupport@catpumps.com
www.catpumps.com

DATA SHEET

REGULATING UNLOADERS



Brass Models

7590, 7592



Model 7590 Shown

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.
 - Lightweight flow through design for compact installation.
 - Standard NBR O-Rings with alternative options for temperature and chemical compatibility.
- FPM - .0110 (7590.0110, 7592.0110)

COMMON SPECIFICATIONS

	U.S.	Metric
Inlet Port (Flush Back)	1" NPT(F)	1" NPT(F)
Discharge Port (Extended Front)	1" NPT(F)	1" NPT(F)
By-Pass Port (Flush Bottom)	1" NPT(F)	1" NPT(F)
Max. Operating Temp.		
Standard Buna O-rings	140° F	60° C
Standard Buna O-Rings (Intermittent)	195° F	90° C
Optional FPM O-Rings	240° F	116° C
Weight	4.46 lbs.	2.02 kg
Dimensions	8.85 x 5.08 x 1.625"	225 x 129 x 41 mm

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

SPECIFICATIONS

	U.S.	Metric
7590		
Flow Range	10 - 52 gpm	38 - 197 lpm
Pressure Range	400 - 2175 psi	28 - 150 bar
7592		
Flow Range	10 - 52 gpm	38 - 197 lpm
Pressure Range	450 - 2500 psi	31 - 172 bar

SELECTION

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

CAUTION: When operating multiple guns, be certain to establish a minimum of 10 GPM per gun to avoid cycling of the unloader.

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.

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

INSTALLATION

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

The inlet connection on this unloader is a 1" NPT(F) 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" NPT(F) 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" NPT(F) 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.

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 pressure adjuster/adjusting handle 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 pressure adjuster/adjusting handle.
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 out 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.

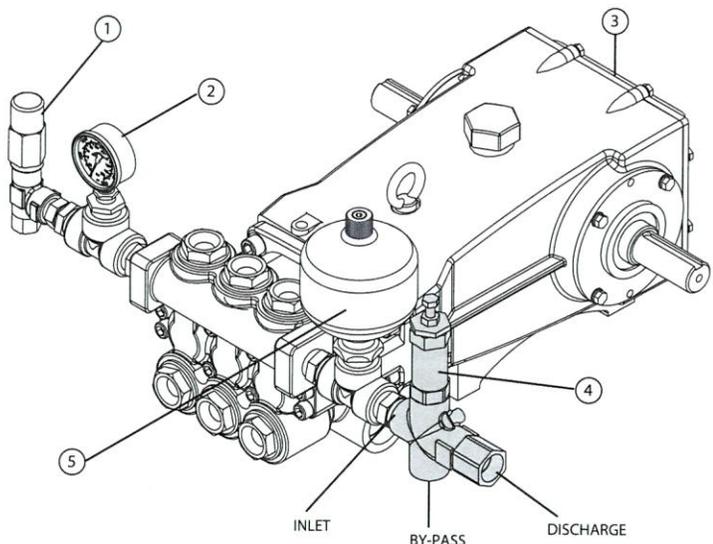
9. If desired system pressure cannot be reached, review TROUBLESHOOTING chart.
10. When servicing existing systems, back locking nut away from spring retainer.
11. Follow adjustment procedures as stated above for new unloaders.

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.

TYPICAL UNLOADER INSTALLATION

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



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

SERVICING

Disassembly:

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

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

6. Unscrew and remove pressure adjuster/adjusting handle, locking nut, spacer (7592 only), spring retainer, upper spring retainer, spring, lower spring retainer and ball. Inspect all parts for scale build up or wear and replace as needed. Examine spring for fatigue or wear and replace as needed.
7. Unscrew upper body from lower body.
8. Secure the valve on the flat surfaces and using an 8mm allen wrench unthread the piston stem from the valve.
9. Remove piston retainer, o-rings and back-up-ring. Examine piston retainer for wear. Examine o-rings and back-up-ring for cuts or wear and replace as needed.
10. Examine the valve and piston stem for wear. Examine o-rings and back-up-rings for cuts or wear and replace as needed.
11. Press the seat out of the lower body from the by-pass port. Examine seat for grooves and o-ring for cuts or wear and replace as needed.

Reassembly:

1. Lubricate and install o-ring on outside diameter of seat and press seat squarely into position in the lower body.
2. Lubricate and install o-ring and then back-up-ring onto piston stem. Press piston stem with threads facing down into the top end of the upper body.
3. Lubricate and install back-up-ring and then o-ring into inside diameter of piston retainer. Insert piston retainer into the bottom of the upper body.
4. Apply Loctite®242® to the threads of the piston stem and valve. Thread valve onto piston stem and tighten with wrench.
5. Lubricate and install o-ring on to bottom of the upper body. Carefully hand thread upper body into lower body and tighten with a wrench.
6. Replace the ball, lower spring retainer, spring, upper spring retainer, spring retainer and spacer (7592 only) into top of upper body.
7. Thread in locking nut and pressure adjuster/adjusting handle.
8. Lubricate and install o-ring onto check valve. Place spring inside check valve. Insert check valve with o-ring and spring into discharge port of lower body.
9. Lubricate and install o-ring onto threaded end of discharge fitting. Thread in discharge fitting to discharge port of lower body and tighten with wrench.
10. Remove unloader from vise.
11. Re-install unloader onto pump.
12. Reconnect by-pass, discharge and inlet plumbing to unloader.
13. Proceed to PRESSURE ADJUSTMENT.

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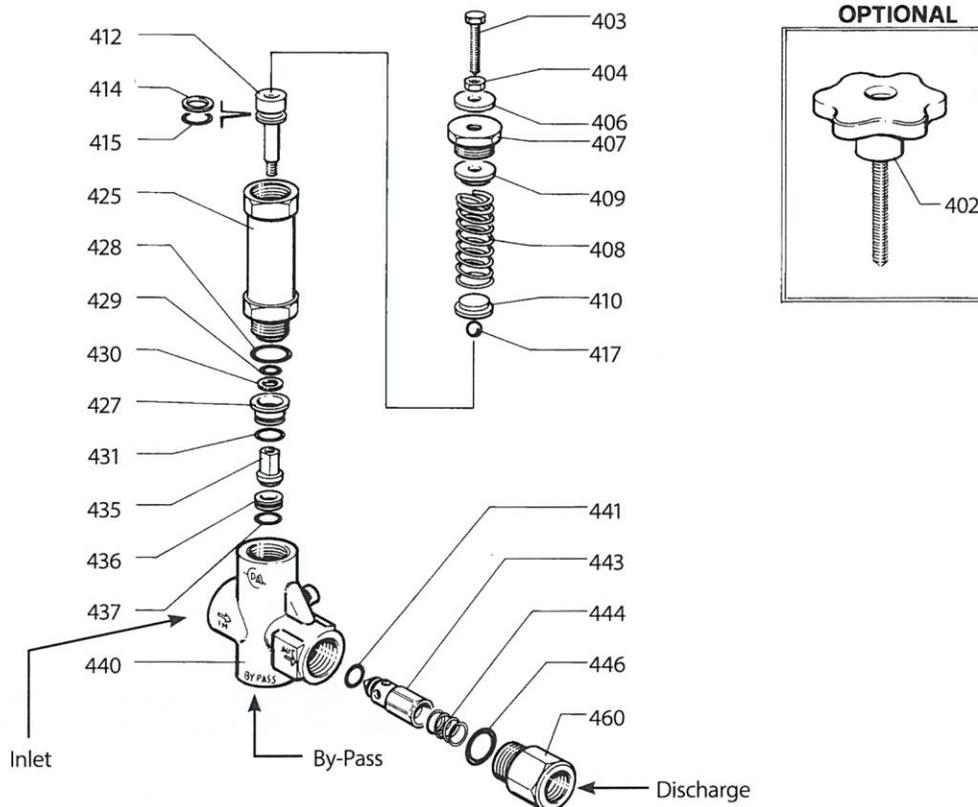
PRESSURE READING

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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • O-ring for fitting cut or worn. • O-ring for seat cut or worn.
Liquid leaking from middle	<ul style="list-style-type: none"> • O-ring for piston worn or cut. • O-rings for piston stem worn or cut.
Unloader will not come up to pressure	<ul style="list-style-type: none"> • Not properly sized for system pressure. • Foreign material in unloader. Clean filter. • Piston stem O-rings worn. • Nozzle worn. • Insufficient flow to pump.
Extreme pressure spikes	<ul style="list-style-type: none"> • Adjusting nut turned completely into unloader. • Restricted by-pass or no by-pass. • System flow exceeds unloader rating.
Filtration	<ul style="list-style-type: none"> • Clean filter on regular schedule to avoid cavitation.

EXPLODED VIEW



PARTS LIST

ITEM	P/N	MATL	DESCRIPTION	QTY	ITEM	P/N	MATL	DESCRIPTION	QTY
402	33089	NY	Handle, Adjusting w/Screw	1	435	In Kit	S	Valve	1
403	39061	STZP	Adjuster, Pressure (M10 x 42)	1	436	In Kit	S	Seat	1
404	—	STZP	Nut, Hex Locking (M10) (7590)	1	437	In Kit	NBR	O-Ring, Seat - 85D	1
406	—	AL	Spacer (7592)	1	440	—	BB	Body, Lower	1
407	39062	BB	Retainer, Spring	1	441	In Kit	NBR	O-Ring, Check Valve	1
408	39016	STL R	Spring (Silver)	1	443	In Kit	BB	Valve, Check w/O-Ring	1
409	32781	BB	Retainer, Spring, Upper	1	444	In Kit	S	Spring, Check Valve	1
410	32778	BB	Retainer, Spring, Lower	1	446	In Kit	NBR	O-Ring, Discharge Fitting	1
412	32776	S	Stem, Piston	1	460	32780	BB	Fitting, Discharge [1" NPT(F)]	1
414	In Kit	PTFE	Back-up-Ring, Piston Stem	1	468	32773	NBR	Kit, O-Ring (Incls: 414, 415, 428 - 431, 437, 441, 446)	1
415	In Kit	NBR	O-Ring, Piston Stem	1		77063	FPM	Kit, O-Ring (Incls: 414, 415, 428 - 431, 437, 441, 446)	1
417	31075	SSSS	Ball, Seat	1	470	77299	NBR	Kit, Repair (Incls: 414, 415, 428 - 431, 435 - 437, 441, 446)	1
425	—	BB	Body, Upper	1		77064	FPM	Kit, Repair (Incls: 414, 415, 428 - 431, 435 - 437, 441, 446)	1
427	32777	BB	Retainer, Piston	1	471	77298	NBR	Kit, Check Valve (Incls: 441, 443, 444, 446)	1
428	In Kit	NBR	O-Ring, Upper Body	1		77065	FPM	Kit, Check Valve (Incls: 441, 443, 444, 446)	1
429	In Kit	NBR	O-Ring, Piston	1					
430	In Kit	PTFE	Back-up-Ring, Piston	1					
431	In Kit	NBR	O-Ring, Piston Retainer	1					

Italics are optional items. R Components comply with RoHS Directive.

AL=Aluminum BB=Brass FPM=Fluorocarbon NBR=Medium Nitrile (Buna-N) NY=Nylon PTFE=Pure Polytetrafluoroethylene
S=304SS SSSS=440SS STL=Steel STZP=Steel/Zinc Plated

CAUTIONS AND WARNINGS

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WARRANTY

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

DATA SHEET

Pressure Gauges



Models

6086, 6088, 6089



FEATURES

- Glycerine filled for consistent, accurate readings, shock and pulsation protection.
- Hermetically sealed 304 stainless steel case eliminates corrosion risk and liquid or humidity within gauge.
- Built-in snubber to reduce pressure fluctuations.
- Install on pump discharge manifold to allow accurate monitoring of pump performance and enhance system safety.

SPECIFICATIONS

MODEL 6086	U.S. Measure		Metric Measure
Pressure Range	0 - 1500 psi		0 - 105 bar
Temperature Range	-4 to 140°F		-20 to 60°C
Fitting [Bottom Mount]	1/4" NPT(M)		1/4" NPT(M)
Accuracy [FSD]	±1-3%		±1-3%
Weight	6.9 lbs.		.19 kg
Dimensions	Diameter	2.64"	67.1 mm
	Depth	1.12"	28.4 mm
	Full Height	3.5"	89 mm

MODEL 6088

Pressure Range	0 - 3000 psi		0 - 210 bar
Temperature Range	-4 to 140°F		-20 to 60°C
Fitting [Bottom Mount]	1/4" NPT(M)		1/4" NPT(M)
Accuracy [FSD]	±1-3%		±1-3%
Weight	8.60 lbs.		.24 kg
Dimensions	Diameter	2.64"	67.1 mm
	Depth	1.12"	28.4 mm
	Full Height	3.5"	89 mm

MODEL 6089

Pressure Range	0 - 6000 psi		0 - 415 bar
Temperature Range	-4 to 140°F		-20 to 60°C
Fitting [Bottom Mount]	1/4" NPT(M)		1/4" NPT(M)
Accuracy [FSD]	±1-3%		±1-3%
Weight	8.60 lbs.		.24 kg
Dimensions	Diameter	2.64"	67.1 mm
	Depth	1.12"	28.4 mm
	Full Height	3.5"	89 mm

SELECTION: Select a pressure gauge with a rating that exceeds the system operating pressure by at least 25%. This gauge is designed for the discharge line (high pressure side of system).

INSTALLATION: These pressure gauges are designed to monitor high pressure typically **read at the pump** or downstream to verify the performance of other components. To assure the operating pressure does not exceed the rated pump pressure, mount the **pressure gauge at the pump discharge manifold. Always read your system pressure at the pump or between the pump and regulating device.** Excessive pressure spikes may occur while the unit is in by-pass and could result in damage to the pump or void the warranty.

OPERATION: Best performance will be received from the gauge if used with system pressures up to 75% of maximum gauge rating. The pressure gauge automatically reads the system pressure during operation and will register pressure spikes, fluctuations and low pressure. Sudden changes or fluctuations in set system pressure or continued low pressure readings are the first signs that system maintenance is necessary.

MAINTENANCE: The pressure gauge is air tight and trouble free. Avoid overpressure, overheating, freezing or harsh chemicals to receive optimum life from your gauge. Replace when damaged.

TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE
Fluctuating pressure	• Lack of liquid to pump.
	• Foreign object in valves of pump.
	• Worn seals or o-rings in pump or accessories.
	• Air leak in system.
Low pressure with gun open	• Lack of liquid to pump.
	• Worn seals in pump.
	• Worn valves in pump.
	• Gauge's rubber orifice plugged.
Pressure spikes	• Unloader or Regulator malfunction or improper adjustment.

⚠ CAUTIONS AND WARNINGS

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CAT PUMPS

1681 - 94TH LANE N.E. MINNEAPOLIS, MN 55449-4324
PHONE (763) 780-5440 — FAX (763) 780-2958
e-mail: techsupport@catpumps.com
www.catpumps.com

DATA SHEET

PULSATION DAMPENERS



Carbon Steel Model: **6011**

Carbon Steel/Stainless Steel Models: **6018, 6022**



FEATURES

- Nitrogen pre-charged to eliminate moisture and bladder deterioration.
- Broader bladder design provides greater pulsation reduction for smoother performance and longer system component life.
- Sealed valve for positive pressure lock

SHIPMENT REGULATIONS

- Pre-charged pulsation dampeners are defined as hazardous articles. **These articles use the proper shipping name of "Articles, Pressurized, Hydraulic" and use the identification number of "UN3164."**
- Uncharged pulsation dampeners require no special handling and can be shipped via standard shipping methods.
- All domestic shipments of hazardous articles must follow Department of Transportation CFR 49, parts 100 to 185 regulations (DOT).
- International shipments of hazardous articles must follow either International Air Transport Association regulation (IATA) or International Maritime Dangerous Goods Codes (IMDG).

ORDERING INFORMATION

Use base part number for rechargeable models 6011, 6018, 6022 if factory pre-charge is desired.

Add .800 to base part number for rechargeable models (i.e. 6018.800) for:

1. No pre-charge (remove factory pressure)
2. A pre-charge different from factory (indicate desired pre-charge on purchase order)

Note: A handling charge will apply.

SPECIFICATIONS

	U.S.	Metric
Model 6011 - Rechargeable and Re-buildable		
Maximum Flow	25 gpm	95 lpm
Maximum Working Pressure	7200 psi	496 bar
Pre-charge	2000 psi	138 bar
Maximum Operating Temperature	180° F	82° C
Volume	15 cu. in.	0.25 L
Safety Factor	4/1	4/1
Bladder Construction	NBR	NBR
Lower Body (Wetted Parts)	Carbon Steel	Carbon Steel
Port Size	1/2" NPT(F)	1/2" NPT(F)
Diameter	4.5"	115 mm
Length	5.59"	142 mm
Weight	6.4 lbs.	2.9 kg

Model 6018 - Rechargeable

Maximum Flow	40 gpm	151 lpm
Maximum Working Pressure	3000 psi	207 bar
Pre-charge	450 psi	31 bar
Maximum Operating Temperature	180° F	82° C
Volume	45 cu. in.	0.74 L
Safety Factor	4/1	4/1
Bladder Construction	NBR	NBR
Lower Body (Wetted Parts)	SS	SS
Upper Body	Carbon Steel	Carbon Steel
Port Size	1" NPT(M)	1" NPT(M)
Diameter	4.78"	121 mm
Length	7.57"	192 mm
Weight	7.28 lbs.	3.3 kg

Model 6022 - Rechargeable

Maximum Flow	70 gpm	265 lpm
Maximum Working Pressure	1500 psi	103 bar
Pre-charge	450 psi	31 bar
Maximum Operating Temperature	180° F	82° C
Volume	120 cu. in.	1.97 L
Safety Factor	4/1	4/1
Bladder Construction	NBR	NBR
Lower Body (Wetted Parts)	SS	SS
Upper Body	Carbon Steel	Carbon Steel
Port Size	1 1/4" NPT(M)	1 1/4" NPT(M)
Diameter	6.25"	158 mm
Length	8.88"	225 mm
Weight	9.3 lbs.	4.2 kg

INSTALLATION INSTRUCTIONS

⚠ WARNING

Do not charge pulsation dampeners with oxygen. Oxygen may cause an explosion causing personal injury, death or property damage.

1. Use nitrogen only when charging pulsation dampeners, DO NOT USE OXYGEN.
2. Use proper charging tools to charge pulsation dampeners.
3. Charge pulsation dampener within specifications stated on data sheet to assure proper pulsation dampening and prevent failure of bladder.

SELECTION: The pulsation dampener should be selected to match the flow and pressure requirements of the system and satisfy the liquid compatibility.

INSTALLATION: The pulsation dampener should be mounted directly onto the pump discharge manifold for optimum pulsation dampening and to avoid system vibration damage. Before installing the pulsation dampener, be certain the sealed valve at the top of the pulsation dampener is securely tightened to assure no loss of pressure during operation.

OPERATION: The pulsation dampener should be pre-charged with **dry Nitrogen only**.

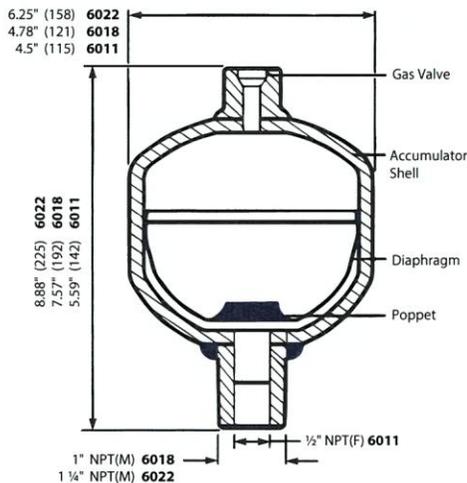
Note the standard pre-charge of the pulsation dampener. This may be adjusted to offer a more precise control of pulsation in critical applications such as reverse osmosis. Check this pre-charge every 12 months for normal operation and more frequently for continuous-duty operation.

At a standard temperature of 70°F optimum accumulator performance is obtained when the pre-charge is calibrated at 50% of the system operating pressure.

NOTE: When operating at the lower temperatures, pre-charge should be 15% higher or 65% of system pressure. When operating at higher temperatures, pre-charge should be 15% lower or 35% of system pressure.

NOTE: Up to 50 psi pre-charge pressure can be lost during the checking of your pre-charge.

DIMENSIONAL



⚠ CAUTIONS AND WARNINGS

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WARRANTY

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

FILLING AND GAUGING INSTRUCTIONS

The following are the steps in both checking the pre-charge of the pulsation dampener and recharging if there should be a loss of pressure or a need for adjustment.

NOTE: A gas regulator must be mounted between the nitrogen tank and the hose connection from the Filling and Gauging Assembly to enable you to regulate 50% of the desired system pressure and to prevent excessive pressure being transmitted directly to the pulsation dampener. Over pressurization will void the warranty.

1. Before checking your pre-charge, system pressure should be at zero, turn system off.
2. Slightly loosen the sealed valve at the top of the pulsation dampener using a 6 mm long handled allen wrench. Thread on the Filling and Gauging Assembly hand tight.
3. Be certain the side bleed valve on the gauging assembly is closed.
4. Slowly open the large "T" valve at the top of the gauging assembly until completely open. The gauge on the assembly will read the pre-charge on the pulsation dampener.
5. Completely back off (close) the valve on the gas regulator, open the nitrogen tank valve and read the nitrogen tank pressure on the first gauge.
6. If the reading on the gauge assembly is 50% of the system pressure, close the top "T" valve and proceed to step 9.
7. If the pre-charge is too high, keep the top "T" valve open and slowly open the small "T" valve on the side of the gauging assembly to bleed off pressure.
8. If the pressure is less than 50% of the system pressure, slowly open the gas regulator valve until the desired pre-charge is reached on the second gauge.
9. When the gauge reads the required pre-charge, close the "T" valve on the top of the gauging assembly to lock the pre-charge in the pulsation dampener.
10. Back off (close) the gas regulator.
11. Proceed with opening the small side "T" valve on the gauging assembly to relieve (bleed-off) pressure in the assembly and on the second gauge on the gas regulator.
12. Close the side "T" valve on the gauging assembly and remove the assembly from the pulsation dampener.
13. Tighten the pulsation dampener sealed valve and resume operation.

OPTIONAL TOOLS AND SPARE PARTS

- 30940 Complete Filling and Gauging Assembly (Optional)
- 30941 Allen Wrench (Included in Assembly)
- 6099 Pressure Gauge (Included in Assembly)
- 76501 Charging Screw w/Seal Washer



DATA SHEET

CRANKCASE OIL INDICATOR AND OIL DRAIN KITS



Brass Models: 76144

Oil Level Indicator

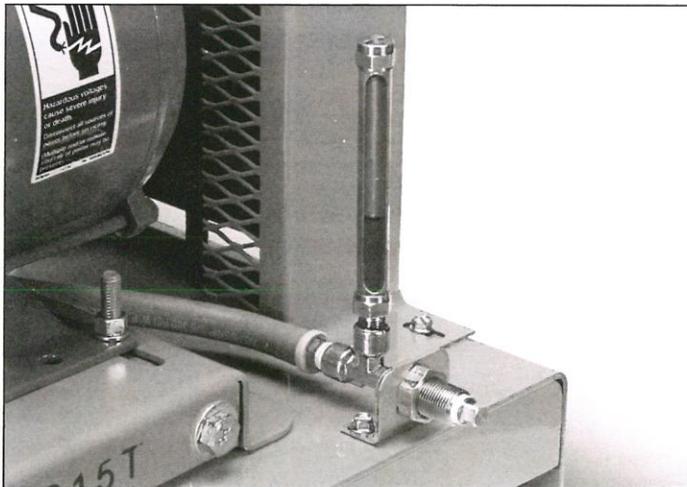
Oil Level Indicator w/Drain Kit **76334**

Brass Models: 34314, 34334, 990394

Oil Drain Kits

Stainless Steel Model 76074

Oil Level Indicator w/Drain kit



FEATURES

- Easily monitor crankcase oil level at-a-glance and avoid unplanned shutdowns, improving profitability.
- Improve pump maintenance management processes.
- Conveniently monitor oil when existing bubble gauge is obscured (Model 76144).
- Easily drain crankcase oil for scheduled maintenance (Model 76334, 76074).
- Indicator shield can rotate 360° for optimum viewing.
- 76074 brass nickel plated for corrosion resistance.

SPECIFICATIONS

VENTED STYLE

Maximum working temperature 250 °F (121°C)

Models	Weight lbs.	Weight kg.
76144	4 oz.	0.11
76334, 76074	1.16	0.53
34314	1.19	0.54
34334	14.5 oz.	0.41
990394	1.08	0.49

Dimensions for model 76144 assembly:

Indicator only – $\frac{1}{16}$ " hex flats x 6.0" (17.5 x 152.4 mm).

2.50" (63.5 mm) extension from rear cover to end of assembly.

Selection Chart

Crankcase Oil Level Indicator and Drain Kit

MODEL	DESCRIPTION	PUMP MODELS
76144	Crankcase oil level indicator with adapter and plug	Piston pumps: 2520 thru 6041 Plunger pumps: 2510 thru 6861K except 35 and 38 frame series
76334	Crankcase oil level indicator with oil drain kit 34334	All piston and plunger pumps and 66DX, except plunger pumps 1DX, 2DX, 2SF, 2SFX, 3DX, 3DNX, 3SP, 3SPX, 4DNX, 4DX, 4SF, 4SP, 4SPX, and 5SP Series
76074	Corrosion resistant oil level indicator with oil drain kit	All piston and plunger pumps and 66DX, except plunger pumps 1DX, 2DX, 2SF, 2SFX, 3DX, 3DNX, 3SP, 3SPX, 4DNX, 4DX, 4SF, 4SP, 4SPX, and 5SP Series

Oil Drain Kits (without crankcase oil level indicator)

MODEL	DESCRIPTION	PUMP MODELS
34334	Oil drain kit with 3/8" x 24" drain hose, bracket, 1/4" NPT(M) square end oil drain plug and other fittings	All piston and plunger pumps and 66DX, except plunger pumps 1DX, 2DX, 2SF, 2SFX, 3DX, 3DNX, 3SP, 3SPX, 4DNX, 4DX, 4SF, 4SP, 4SPX, and 5SP Series
34314	Oil drain kit with 3/8" x 48" drain hose, bracket, 1/4" NPT(M) square end oil drain plug and other fittings	Piston pumps: 6020 thru 6041 Plunger pumps: 3501 thru 3560, 3801 thru 3841K, 6747 thru 67102, and 6801 thru 6861K
990394	Oil drain kit with 3/8" x 24" drain hose, bracket, 1/4" NPT(M) square end oil drain plug and other fittings	Plunger pumps: 1DX, 2DX, 2SF, 2SFX, 3DX, 3DNX, 3SP, 3SPX, 4DNX, 4DX, 4SF, 4SP, 4SPX and 5SP Series

Assembly Instructions Crankcase Oil Level Indicator (76144)

1. If retrofitting an existing pump – Drain oil from pump.
2. Remove chrome-plated drain plug and o-ring from rear cover of pump.
Note: Use PTFE thread tape or pipe thread sealant (sparingly) to prevent leakage at threaded connections.
3. Install 1/4" BSP fitting (Figure1, item 4) with o-ring (5) into rear cover of pump.
4. Thread in tee (2) to fitting (4).
5. Thread in square end plug (3) into tee (2).
6. Thread in crankcase oil level indicator (1) into open port of vertical leg of tee (2).
7. Rotate shield for optimum viewing.

Filling Instructions

1. Ensure square end plug (3) is installed at end of tee (2).
2. Remove red oil cap from top of pump.
3. Fill pump to capacity as stated in pump data sheet. Add an additional .25 oz of oil to fill crankcase oil level indicator (1) to center of indicator.
4. Reinstall red oil cap.
5. Position silver label on crankcase oil level indicator (1) so that the "FULL" line is level with the oil when pump is not running (Figure 1).

NOTE: Wipe indicator (1) with mild solvent to remove oil residue before applying label.

Parts List

ITEM	PN	MTL	DESCRIPTION	QTY
1	—	BB	Indicator, Level, Oil	1
2	—	BB	Tee, Straight, 1/4" NPT	1
3	—	BB	Plug, Square End, 1/4" NPT(M)	1
4	—	BB	Fitting, 1/4" -19 BSP	1
5	—	NBR	O-Ring, Fitting, 70 D	1
6	31536	—	Kit, Repair (Inclds glass, gaskets)	1

MATERIAL CODES (Not part of part number)
BB = Brass NBR = Medium Nitrile (Buna-N)

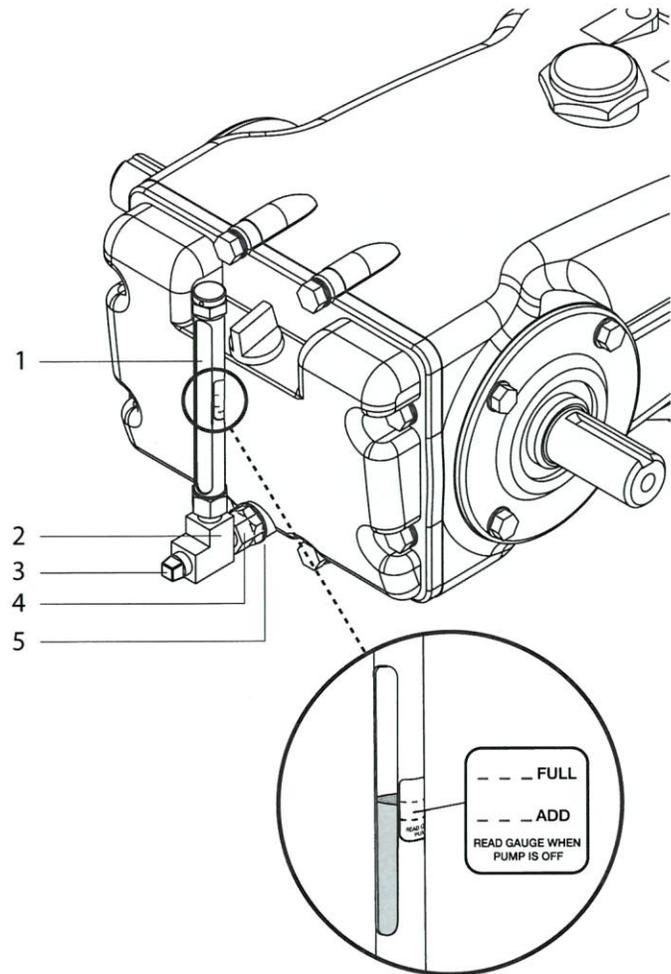


Figure 1

Assembly Instructions Crankcase oil level indicator with drain kit (76334, 76074)

1. If retrofitting an existing pump – Drain oil from pump.
2. Remove chrome-plated drain plug and o-ring from rear cover of pump. Note: Use PTFE thread tape or pipe thread sealant (sparingly) to prevent leakage at threaded connections.
3. Install ¼" BSP fitting (Figure 2, item 2) with o-ring (3) into rear cover of pump.
4. Attach hose barbs (7) to each end of ⅜" hose (8).
5. Thread one end of hose (8) into fitting (2) of rear cover.
6. On opposite end of hose (8), thread in tee (4). Position tee (4) with female threads up.
7. Remove nut from ¼" union fitting (6).
8. Thread in hose (8) with tee (4) to large end of union fitting (6).
9. Mount bracket (9) with screws (10) into desired position such that the centerline of the sight area of the crankcase oil level indicator (1) is at the same center line of the pump (See Figure 3)
10. Install hose assembly through mounting bracket (9)
11. Reinstall nut onto threads of union fitting (6) and tighten.
12. Thread in square end plug (5) into open end of union fitting (6).
13. Thread in crankcase oil level indicator (1) into open port of vertical leg of tee (4).
14. Rotate shield for optimum viewing.

Filling Instructions

1. Ensure square end plug (5) is installed in union fitting (6)
2. Remove red oil cap from top of pump.
3. Fill pump to capacity as stated in pump data sheet. Add an additional 2 oz. of oil to fill crankcase oil level indicator (1) and drain hose (8) to center of indicator.
4. Reinstall red oil cap.
5. Position silver label on crankcase oil level indicator (1) so that the "FULL" line is level with the oil when pump is not running (See Fig. 1)

NOTE:

Wipe indicator (1) with mild solvent to remove oil residue before applying label.

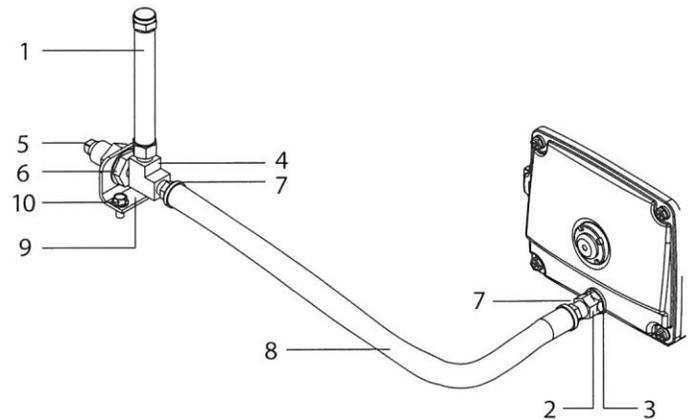


Figure 2

Parts List

ITEM	PN	MTL	DESCRIPTION	QTY
1	—	BB	Indicator, Level, Oil (76334)	1
—	—	BBNP	Indicator, Level, Oil (76074)	1
2	—	BB	Fitting, ¼" -19 BSP (76334)	1
—	—	BBNP	Fitting, ¼" -19 BSP (76074)	1
3	—	NBR	O-Ring, Fitting, 70 D (76334)	1
—	—	NBR	O-Ring, Fitting, 70 D (76074)	1
4	—	BB	Tee, ¼" NPT straight (76334)	1
—	—	BBNP	Tee, ¼" NPT straight (76074)	1
5	—	BB	Plug, Square End, ¼" NPT(M) (76334)	1
—	—	BBNP	Plug, Square End, ¼" NPT(M) (76074)	1
6	—	BB	Union, ¼" NPT (76334)	1
—	—	BBNP	Union, ¼" NPT (76074)	1
7	—	BB	Barb, Hose, ¼" NPT(M) x ⅜" Hose (76334)	2
—	—	BBNP	Barb, Hose, ¼" NPT(M) x ⅜" Hose (76074)	2
8	—	—	Hose, ⅜" x 24", 300psi (76334)	1
—	—	—	Hose, ⅜" x 24", 300psi (76074)	1
9	—	STZP	Bracket, Oil Drain (76334)	1
—	—	S	Bracket, Oil Drain (76074)	1
10	—	STZP R	Screw, ¼"- 20 x ½" (76334)	2
—	—	SS	Screw, ¼"- 20 x ½" (76074)	2
11	31536	—	Kit, Repair (Inclds glass, gaskets) (76334, 76074)	1

MATERIAL CODES (Not part of part number)

BB = Brass BBNP=Brass/Nickel Plated NBR = Medium Nitrile (Buna-N)
S=304SS SS=316SS STZP = Steel/Zinc Plated

R Components comply with RoHS Directive.

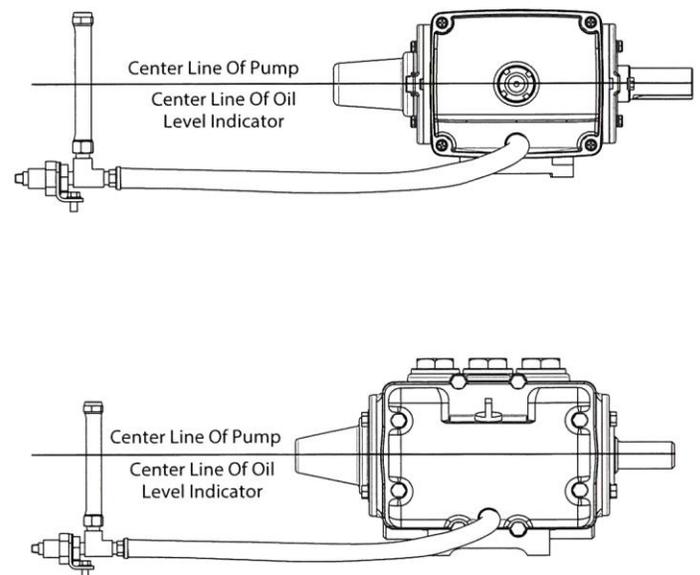


Figure 3

Assembly Instructions Oil Drain Kits (34314 and 34334)

1. If retrofitting an existing pump – Drain oil from pump.
2. Remove chrome-plated drain plug and o-ring from rear cover of pump. Note: Use PTFE thread tape or pipe thread sealant (sparingly) to prevent leakage at threaded connections.
3. Install ¼" BSP fitting (Figure 4, item 1) with o-ring (2) into rear cover of pump.
4. Attach hose barbs (5) to each end of ⅜" hose (6).
5. Thread one end of hose (6) into fitting (1) of rear cover.
6. Remove nut from ¼" union fitting (4).
7. Thread in hose (6) with barb end into large end of union fitting (4).
8. Mount bracket (7) with screws (8) into desired position to maximize drainage.
9. Install hose assembly with union fitting end through mounting bracket (7) or panel (Bulkhead hole is .78" diameter).
10. Reinstall nut onto threads of union fitting (4) and tighten. NOTE: Centerline to centerline dimension for bracket (7) hole is 1.50", drill two - .209 diameter holes.
11. Thread in square end plug (3) into threaded end of union fitting (4).

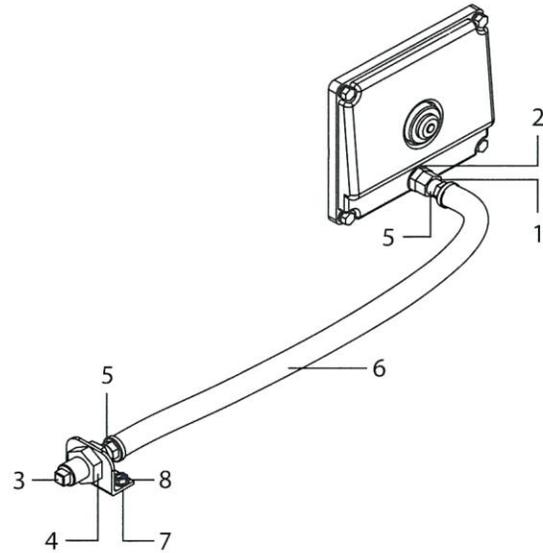


Figure 4

Assembly Instructions Oil Drain Kit (990394)

1. If retrofitting an existing pump – Drain oil from pump.
2. Remove black drain cap and o-ring from crankcase body. Note: Use PTFE thread tape or pipe thread sealant (sparingly) to prevent leakage at threaded connections.
3. Install adapter (9) into crankcase body drain hole.
4. Thread in elbow (10) into adapter (9).
5. Attach hose barbs (5) to each end of 3/8" hose (6).
6. Thread one end of hose (6) into elbow (10).
7. Remove nut from ¼" union fitting (4).
8. Thread in hose (6) with barb end into large end of union fitting (4).
9. Mount bracket (7) with screws (8) into desired position to maximize drainage. NOTE: Centerline to centerline dimension for bracket (7) hole is 1.50", drill two - .209 diameter holes.
10. Install hose assembly with union fitting end through mounting bracket (7) or panel (Bulkhead hole is .78" diameter).
11. Reinstall nut onto threads of union fitting (4) and tighten.
12. Thread in square end plug (3) into threaded end of union fitting (4).

Parts List

ITEM	DRAIN KIT	MTL	DESCRIPTION	QTY
1	34334, 34314	BB	Fitting, ¼"-19 BSP	1
2	34334, 34314	NBR	O-Ring, Fitting,70D	1
3	34334, 34314 990394	BB	Plug, Square End,¼" NPT(M)	1
4	34334, 34314 990394	BB	Union, 1/4" NPT	1
5	34334, 34314 990394	BB	Barb, Hose, ¼" NPT(M) x ⅜" Hose	2
6	34334, 34314 990394	—	Hose, ⅜" x 24", 300 psi	1
7	34334, 34314 990394	STZP	Bracket, Oil Drain	1
8	34334, 34314 990394	STZP R	Screw, ¼" - 20 x ½"	2
9	990394	BB	Adapter (Not Shown)	1
10	990394	BB	Elbow, ¼"NPT(M) x ¼"NPT(F) 1 (Not Shown)	1

MATERIAL CODES (Not part of part number)
BB = Brass, NBR = Medium Nitrile (Buna-N), STZP = Steel/Zinc Plated
R Components comply with RoHS Directive.

Filling Instructions

1. Ensure square end plug (3) is installed in union fitting (4).
2. Remove red oil cap from top of pump.
3. Fill pump to capacity as stated in pump data sheet. Add more oil as required to fill drain hose (6).
4. Loosen square end plug (3) to release potential air in hose (6).
5. Tighten square end plug (3).
6. Add more oil as necessary, reinstall red oil cap.

⚠ 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/dynamic-literature/cautions-and-warnings or can be requested directly from Cat Pumps.

WARRANTY

View the Limited Warranty on-line at www.catpumps.com/literature/cat-pumps-limited-warranty

TROUBLESHOOTING (Problem: Leaking Oil)

PROBABLE CAUSE	SOLUTION
Loose Connection	Tighten or use PTFE thread tape
Worn Seals	Install Repair Kit
Cracked Glass	Install Repair Kit
Too Much Oil	Drain Oil
Damaged Hose	Replace Hose
Position of Mounting Bracket is incorrect	Reposition Bracket

Safety Data Sheet
Cat Pump Crankcase Oil ISO 68
Revision Date: 10/05/2020



Prepared according to Global Harmonized System (GHS) standards

SECTION 1 CHEMICAL PRODUCT IDENTIFICATION

Cat Pumps
 1681 94th Lane NE., Minneapolis, MN 55449-4324
 Tel: 763-780-5440

Product Trade Name:	High-Pressure Pump Oil
CAS Number:	Mixture
Synonyms/Other:	N/A
Part Number(s):	6100, 6102, 6105, 6107, 6109, 6123 and 6126
Recommended Use:	Crankcase Pump Oil
Restrictions on Use:	Not determined
Created Date:	2/17/2015
Preparation/Revision Date:	10/05/2020
Emergency Phone Number:	1-800-535-5053 (INFOTRAC)
SDS CODE:	13343

SECTION 2 HAZARD IDENTIFICATION

Appearance:	Clear, Dark Green
Odor:	Petroleum
Classification:	Hazardous to the aquatic environment (chronic hazard) category 3.
Target Organs:	Not applicable.
Pictogram(s):	None required.
Signal Word:	None required.
Hazard Statement:	H412 - Harmful to aquatic life with long lasting effects.
Other Hazards:	Not determined.
Prevention:	P273 - Avoid release to the environment.
Response:	None required.
Storage Procedures:	None required.
Disposal:	P501 - Dispose of contents and container in accordance with federal, state and local regulations.
Other:	See section 11 for complete health hazard information.

SECTION 3 COMPOSITION OF INGREDIENTS

Component	CAS Number	Percentage (by weight)
Butylated phenol	128-39-2	0.1% – 0.5%
Aryl phosphite	101-02-0	<0.05%

SECTION 4 FIRST AID MEASURES

Eye Contact:	If irritation occurs, cautiously rinse eyes with lukewarm, gently flowing water for 5 minutes, while holding the eyelids open. If eye irritation persists: Get medical advice/attention.
Skin Contact:	Call a doctor if you feel unwell.
Inhalation:	Get medical advice or attention if you feel unwell or are concerned.
Ingestion:	If you feel unwell or concerned: Get medical advice/attention. Rinse mouth. Do NOT induce vomiting. If vomiting occurs naturally, lie on your side, in the recovery position.
Other:	No additional information

Safety Data Sheet

Cat Pump Crankcase Oil ISO 68

Revision Date: 10/05/2020

SECTION 5	FIRE FIGHTING MEASURES
Flash Point:	226° C by Cleveland Open Cup Tester.
Flammable limits:	Not determined.
Extinguishing media:	Use dry chemical, alcohol foam, all purpose AFFF or carbon dioxide to extinguish fire.
Special firefighting procedures:	DO NOT direct a solid stream of water or foam into hot, burning pools of liquid since this may cause frothing and increase fire intensity. Frothing can be violent and possibly endanger any firefighter standing too close to the burning liquid. Use water spray to cool fire exposed containers and structures until fire is out if it can be done with minimal risk. Avoid spreading burning material with water used for cooling purposes. Wear full firefighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).
Unusual fire & explosion hazards:	Dense smoke may be generated while burning. Toxic fumes, gases or vapors may evolve on burning. High temperatures may create heavy flammable vapors that may settle along ground level and low spots to create an invisible fire hazard.
Byproducts of combustion:	Fires involving this product may release oxides of carbon, phosphorus, nitrogen and sulfur; reactive hydrocarbons and irritating vapors.
Autoignition temperature:	Not determined.
Explosion data:	Not determined. Care should always be exercised in dust/mist areas.
Other:	Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.
SECTION 6	ACCIDENTAL RELEASE MEASURES
Spill control procedures (land):	Immediately turn off or isolate any source of ignition (pilot lights, electrical equipment, flames, heaters, etc.). Evacuate area and ventilate. Personnel wearing proper protective equipment should contain spill immediately with inert materials (sand, earth, chemical spill pads of cotton) by forming dikes. Dikes should be placed to contain spill in a manner that will prevent material from entering sewers and waterways. Large spills, once contained, may be picked up using explosion proof, non-sparking vacuum pumps, shovels, or buckets, and disposed of in suitable containers for disposal. Cleanup residue with an appropriate solvent. If a large spill occurs notify appropriate authorities. In case of road spill or accident contact INFOTRAC (800-535-5053).
Spill control procedures (water):	Try to contain large spills with floating booms to prevent spill from spreading. Remove from surface by skimming or with suitable adsorbents. If a large spill occurs notify appropriate authorities (normally the National Response Center or Coast Guard at 800- 424-8802).
Waste disposal method:	Do not empty into drains. All disposals must comply with federal, state, and local regulations. The material, if spilled or discarded may be a regulated waste. Refer to state and local regulations. Department of Transportation (DOT) regulations may apply for transporting this material when spilled. See Section 14.
Other:	CAUTION - If spilled material is cleaned up using a regulated solvent, the resulting waste mixture will be regulated.
SECTION 7	HANDLING AND STORAGE
Handling procedures:	Keep containers closed when not in use. Do not transfer to unmarked containers. Empty containers retain product residue which may exhibit hazards of material, therefore do not pressurize, cut, glaze, weld, or use for any other purposes. Return drums to reclamation centers for proper cleaning and reuse. Handling temperatures should not exceed 60°C (140°F) to minimize danger of burns. Open containers carefully in a well ventilated area or use appropriate respiratory protection. Wash thoroughly after handling.
Storage procedures:	Store containers away from heat, sparks, open flame, or oxidizing materials. Extended storage at excessive temperatures may produce odorous and toxic fumes from product decomposition.
Additional information:	No additional information.

Safety Data Sheet

Cat Pump Crankcase Oil ISO 68

Revision Date: 10/05/2020

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product:			
Contains highly refined petroleum oil	OSHA TWA *5 mg/m ³ (PEL)	OSHA STEL *10 mg/m ³	ACGIH TWA *5 mg/m ³ (TLV)
	* Exposure limits not defined. Limits used are for, "oil mist".		
	TWA – Time Weighted Average is the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week which shall not be exceeded.		
	STEL – Short Term Exposure Limit is the employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified.		
	All base oils, including additive carriers, contain <3.0% DMSO extractable material.		
Personal protection:	Applicable mainly to persons in repeated contact situations such as packaging of product, service/maintenance, and cleanup/spill control personnel.		
Respiratory protection:	None required if ventilation is adequate. Otherwise a respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements must be followed. Where misting may occur, wear an MSHA/NIOSH approved (or equivalent) half-mask form dust/mist air purifying respirator.		
Eye protection:	Eye protection is strongly recommended. Wear safety glasses with side shields or vented/splash proof goggles (ANSI Z87.1 or approved equivalent).		
Hand protection:	Impervious, chemically resistant gloves such as neoprene or nitrile rubber to avoid skin sensitization and absorption.		
Other protection:	Use of an apron and overboots of chemically impervious materials such as neoprene or nitrile rubber is recommended based on level of activity and exposure. If handling hot material use insulated protective equipment. Launder soiled clothes. Properly dispose of contaminated leather articles and other materials which cannot be decontaminated.		
Local control measures:	Use adequate ventilation when working with material in an enclosed area. Mechanical methods such as fume hoods or area fans may be used to reduce localized vapor/mist areas. If vapor or mist is generated when the material is handled, adequate ventilation in accordance with good engineering practice must be provided to maintain concentrations below the specified exposure. Eyewash stations and showers should be available in areas where this material is used and stored.		
Other:	Consumption of food and drink should be avoided in work areas where product is present. Always wash hands and face with soap and water before eating, drinking or smoking.		

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, Dark Green
Odor:	Petroleum.
Odor threshold:	Not determined.
pH:	Not applicable.
Melting/Freezing point:	Not determined.
Initial boiling point:	Not determined.
Boiling range:	Not determined.
Flash point:	226° C
Evaporation rate:	Not determined.
Flammability:	Not determined.
Upper flammable limit:	Not determined.
Lower flammable limit:	Not determined.
Vapor pressure:	Not determined.
Vapor density:	Not determined.
Relative density:	0.88 at 15.6° C
Solubility:	Negligible in water, miscible in most petroleum solvents.
Partition Coefficient:	Not determined.

Safety Data Sheet
Cat Pump Crankcase Oil ISO 68
Revision Date: 10/05/2020

SECTION 9 continued	PHYSICAL AND CHEMICAL PROPERTIES
Auto-ignition temperature:	Not determined.
Decomposition temperature:	Not determined.
Viscosity:	68 cSt at 40°C.
Other	Not applicable.

SECTION 10	STABILITY AND REACTIVITY
Reactivity Chemical stability:	Material is chemically stable at room temperatures and pressure.
Hazardous polymerization:	Will not occur.
Conditions to avoid:	Avoid high temperatures and product contamination.
Incompatibility with other materials:	Avoid contact with acids and strong oxidizing materials.
Decomposition products:	Smoke, carbon monoxide, carbon dioxide, and other aldehydes of incomplete combustion. Oxides of carbon, nitrogen, and sulfur; reactive hydrocarbons and irritating vapors.
Other:	Not applicable.

SECTION 11	TOXICOLOGICAL INFORMATION
Acute toxicity (LD50) *See note at the bottom of the section	
Oral:	>5000 mg/kg
Dermal:	>5000 mg/kg
Inhalation:	>20.0 mg/l
Skin irritation:	Non-irritant
Eye irritation:	Non-irritant
Dermal sensitization:	Not expected to have a sensitizing effect.
Respiratory sensitization:	Not expected to have a sensitizing effect.
Aspiration Hazard:	Not applicable
Chronic Toxicity	
Mutagenicity:	Not suspected of causing genetic defects
Carcinogenicity:	Not suspected of causing cancer.
Reproductive toxicity:	Not expected to have adverse effects on reproduction.
STOT-single exposure:	Not expected to have adverse effects.
STOT-repeated exposure:	Not expected to have long term adverse effects.
Other:	*All data in this section is based off calculations from Part 3 of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) utilizing information from the constituent components.

SECTION 12	ECOLOGICAL INFORMATION
Environmental toxicity	
Fish:	> 100 mg/l.
Invertebrates:	> 100 mg/l.
Aquatic plants:	> 100 mg/l.
Microorganism:	> 100 mg/l.
Persistence/Degradability:	This product is not expected to be readily biodegradable.
Bioaccumulation:	Not determined.
Mobility in soil:	Not determined.
Other:	All classifications are based on calculations in Part 4 of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) utilizing information from the constituent components.

Safety Data Sheet

Cat Pump Crankcase Oil ISO 68

Revision Date: 10/05/2020

SECTION 13	DISPOSAL CONSIDERATIONS
Waste disposal:	This product unadulterated by other materials can be classified as a non-hazardous waste. Depending on use, used product may be regulated. Dispose of in a licensed facility. Do not discharge product in to sewer system. Dispose of containers by crushing or puncturing, so as to prevent unauthorized use of used containers. Waste management should be in full compliance with federal, state, and local laws.
Other	The transportation, storage, treatment and disposal of RCRA waste material must be conducted in compliance with 40 CFR 262, 263, 264, 268 and 270. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this SDS incomplete, inaccurate or otherwise inappropriate.

SECTION 14	TRANSPORT INFORMATION
Land Transport (DOT):	Not regulated for land transport.
Proper Shipping Name:	Not Applicable.
Land Transport (TDG):	Not regulated for land transport.
Proper Shipping Name:	Not Applicable.
Sea Transport (IMDG):	Not regulated for sea transport.
Proper Shipping Name:	Not Applicable.
Air Transport (IATA):	Not regulated for air transport.
Proper Shipping Name:	Not Applicable.
Other:	Not Applicable.

SECTION 15	REGULATORY INFORMATION
Federal Regulation	
WHMIS:	Not Controlled.
Clean water act/oil:	Under Section 311 of the Clean Water Act (40 CFR 110) and the Oil Pollution Control Act of 1990, this material is considered an oil. Any spill or discharges that produce a visible sheen or film on surface of water, or in waterways, ditches, or sewers leading to surface water must be reported. Contact the National Response Center at 800-424-8802.
TSCA:	All components of this material are listed in the U.S. TSCA Inventory.
Other TSCA:	Not applicable.
SARA title III:	Section 302/304 extremely hazardous substances: None
	Section 311, 312 hazard categorization:
	Acute (immediate health effects): NO
	Chronic (delayed health effects): NO
	Fire (hazard): NO
	Reactivity (hazard): NO
	Pressure (sudden release hazard): NO
	Section 313 toxic chemicals: No components present are at or greater than the de minimis (minimum reportable) concentration requirements for reporting.
CERCLA:	For stationary/moving sources – reportable quantity (due to): Not hazardous due to the petroleum exclusion.
State Regulations	
California Proposition 65	This product can expose you to chemical(s) which are known to the State of California to cause cancer and reproductive harm. For more information go to www.P65Warnings.ca.gov
Right-to-know	Not determined.

Safety Data Sheet
Cat Pump Crankcase Oil ISO 68
Revision Date: 10/05/2020

SECTION 15 continued	REGULATORY INFORMATION
Other:	<p>A release of this product, as supplied, is exempt from reporting under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). However, releases may be reportable to the Nation Response Center under the Clean Water Act, 33 U.S.C. 1321(b)(3) and (5) - see head of Section 15. Failure to report may result in substantial civil and criminal penalties.</p> <p>Recommend contacting the local authorities in the event of any type of spill to determine local reporting requirements and also to aid in the cleanup.</p>

SECTION 16	OTHER INFORMATION		
	NFPA 704	NPCA-HMIS	KEY
HEALTH:	1	1	0 = Minimal
FIRE:	1	1	1 = Slight
REACTIVITY:	0	0	2 = Moderate
SPECIFIC HAZARD:	None	N/A	3 = Serious
PROTECTION INDEX:	N/A	B	4 = Severe

Version: IV

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Revisions / Comments:	None. 02/17/2015
	Document review: 11/18/2016
	Update to section 15: 03/03/2017
	Document review and update to section 3: 10/05/2020

	<p>CAT PUMPS 1681 - 94TH LANE N.E. MINNEAPOLIS, MN 55449-4324 PHONE (763) 780-5440 — FAX (763) 780-2958 e-mail: techsupport@catpumps.com www.catpumps.com</p>
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