

Solenoid-Operated Unloader Kit for Woodward XX Herringbone Gear Pumps and IMO Pumps

Features

- Reduces maintenance time and costs by replacing obsolete pilot valve and bushing assemblies with a pre-engineered upgrade kit comprised of standard parts
- Increases reliability using solenoid control
- Eliminates “snap-action” pilot valves and mechanical switches
- Improves lead/lag operation
- Provides remote alarm indication from unmanned sites
- Easy-to-install pre-wired kit includes all tubing, fittings and backing plates as well as step-by-step instructions
- Field adjustable capability simplifies post installation service



Introduction

Emerson's pre-engineered pilot unloader upgrade kits reduce maintenance time and costs associated with obsolete “snap-action” unloader pilot valves and mechanical unloader switches. The solenoid operated pilot valve kit is designed to replace the mechanical pilot valves on Woodward XX herringbone type gear pumps. The kit can also be applied to systems where IMO screw type pumps are used when the unloader assemblies are the same as those used in XX pump systems. The kits are available in four sizes to match any Woodward pump system. Custom designed kits and filter replacement kits for older pump systems are available.

Each kit is designed for easy installation with step-by-step instructions, wiring diagrams and field connection explanations. All required components are included to replace existing snap-action unloader pilot valves with industry-standard solenoid valves controlled by standard pressure switches.

Standard components include:

- Flange-mounted solenoid valves
- User-adjustable pressure switches
- Installation hardware (mounting brackets, tubing, fittings and blanking plates)
- Control enclosure with lead/lag selector switch, time-delay relays and terminal blocks
- Complete installation instructions

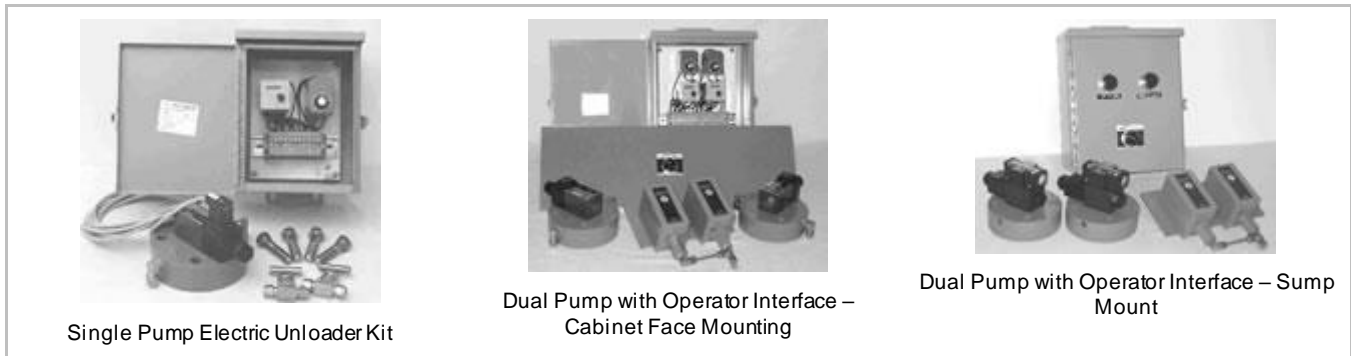
Kit Description

Emerson's solenoid operated system reduces maintenance costs by eliminating the need for mechanical overhauls and increase operating reliability using automated solenoid controls. The mechanical pilot valve assembly and pump motor switch are replaced by a solenoid-operated hydraulic valve, a pressure switch and time-delay relay. Loading and unloading rates are adjusted using two flow control valves.

The time-delay relays provide external indication when a pump has been running in the loaded state for an extended period of time as determined by the customer (between 0.10 and 10 minutes). Additional alarm indications are provided for:

- Low oil level
- Loading malfunctions
- Motor or pump problems
- Excessive governor oil user

Dry contacts can be used for remote monitoring and triggering alarms (rated 10 amps at 120VAC, 3 amps at 24VDC, and 0.20 amps at 125VDC).



Principles of Operation

XX Herringbone pumps

When the system pressure drops, a pressure switch contact closes causing a time delay relay to pick-up and start the pump motor. At the same time, the solenoid valve is energized which ports the oil in the upper unloader assembly to tank (drain). This allows the unloader piston to rise which causes the pump to load. The rate of loading is controlled by the needle valve between the 'T' outlet port and the tank.

The alarm timer starts counting when the solenoid valve is energized. If the pump remains loaded until the time delay expires (user defined, 3-5 minutes typical), the contact output is closed which can be used to trigger a customer defined alarm circuit.

When the hydraulic system reaches the proper pressure, the pressure switch resets and the solenoid valve is de-energized, admitting system oil pressure into the upper unloader chamber. The pump motor is still running due to the delay-on-break timer. The unloader piston is forced down causing the pump to unload. The oil being pumped

is cycled back to the sump. The rate of unloading is controlled by the needle valve between the 'P' inlet port and the filter assembly. When the delay-on-break time delay expires, the pump motor is turned off. This is usually 3-5 seconds after the pump has unloaded. When in continuous run mode, the theory of operation remains the same except that the oil motor controls have no effect because the motor is running continuously. The loading and unloading functions are not affected.



XX Pump Before



Large XX Flange – After

IMO Pumps

The screw pump is the successor to the Woodward XX Herringbone gear pump. The pump has three moving parts including a power rotor and two idle rotors and comes in either horizontal or vertical configuration depending upon the space available in the actuator cabinet.



IMO Pump Before



Upgraded IMO Pilot Unloader Valve

IMO Screw Type Pumping Unit

Oil is drawn in by the pump suction, through the inlet head. The oil fills the openings between the rotor threads and moves in a continuous flow to the outlet as the rotors turn. The idler rotors turn due to the action of the oil pumped and act as sealing elements. The sealed closures formed by the meshing of the rotors enfold the oil being pumped. As the rotors turn, these enclosures move axially providing a continuous uniform flow. Pressure oil is routed to the balance pistons at the inlet to provide hydraulic balance to the rotors. Because the rotors are hydraulically balanced, bearing wear is minimal and little routine maintenance is required. Bearing and seal kits are available if needed.

Pilot Valve – Operated Unloader

Early applications of the screw pump on Woodward governors came with a modified version of the “snap-action” pilot unloader system used on XX Herringbone pumps. The sequence of operation and adjustments for this unloader assembly is the same as described for the XX pumping system. Solenoid-operated conversion kits are available to eliminate this hard-to-adjust system and improve lead-lag operation.

Solenoid–Operated Unloader

The next generation of unloading systems used a solenoid-operated unloading system that was triggered by a pressure switch. When the system pressure drops below a pre-set level, the pressure switch contacts close, energizing a four-way solenoid valve. When the solenoid valve is energized, oil pressure is switched to the port leading to the top of the unloader case while the port leading to the bottom of the unloader case goes to drain.

With pressure at the top of the unloader piston, it moves downward and the unloader rod moves away from the limit switch, closing the contacts and starting the pump motor. When the pump starts, the piston is still above the unloader drain port, thus the pump starts in an unloaded position (pumping to drain).

As the unloader piston continues its downward movement, it covers the drain port, causing the pump to be loaded (pumping to the pressure accumulator). When the tank pressure reaches a pre-set point, the pressure switch contacts open, and the solenoid valve de-energizes. This switches the port leading to the top of the unloader case to drain and the port leading to the bottom of the case to pressure.

Pressure to the bottom of the unloader case moves the piston upward. As the piston moves, the unloader drain port is uncovered. The pump is now unloaded and again pumping to sump. As the piston continues its upward travel, the rod trips the limit switch, opening the contacts and stopping the pump motor. The system is now ready for the next pumping cycle.



Single Pump Electric Unloader Kit



*Solenoid – Operated Unloader (upper left)
and Screw Pump (right)*

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