

Pumping Salt Solutions and Brines

With Teledyne ISCO Syringe Pumps

Overview

A brine is defined as an aqueous solution containing higher concentrations of inorganic salt than typical seawater (greater than 5% salt). Simpler brines generally contain common chlorides such as sodium, calcium, or potassium, and may be used in applications such as the oilfield industry and production facilities. Denser solutions containing zinc bromide, cesium formate, or iodine salts, can also be used in industrial applications, but are generally more corrosive.

ISCO syringe pumps are designed to pump a wide range of fluids, with standard hardware made of Nitronic 50®, a nitrogen-strengthened stainless steel originally developed for marine applications in solutions with sodium chloride concentrations of up to 3%.

To avoid the corrosive effects of salt solutions such as seawater, brines, and buffers used in core flooding and other applications, regular flushing of pump cylinders is always recommended. However, applications with higher concentrations and/or more frequent use of salt solutions may also require a wash gland or special wetted materials. A listing of standard and optional wetted materials is provided in Table 1, on the second page.

Cylinder Purging and Washing

With each upward piston stroke, the inner surface of the cylinder is wetted with a thin film of liquid. A brine solution will corrode the inside of the cylinder and may damage the seals as it dries. Lower flow rates cause more corrosion due to the liquid film having a longer drying period. A number of techniques and options for corrosion prevention are available with ISCO pumps.

Flushing

The standard Nitronic 50 pump cylinder can withstand many corrosive fluids. To minimize corrosion, flush the cylinder at the end of every experiment.

Never leave fluids sitting in the cylinder.

To flush the cylinder, fill it completely with purified water, preferably DI (deionized) or distilled water. Empty the cylinder. Perform these steps a minimum of 2 to 3 times.

Wash Gland

For additional corrosion protection and to improve seal life, the pump can be equipped with a wash gland for flushing the cylinder of any residue from pumped liquid.

The wash gland is a standard feature in the Model 1000D pump, and is available as an option with the 500D pump.

To operate, the wash gland requires the following user-supplied items:

- Inlet and Waste containers (see Figure 2)
- Purified water or appropriate solvent
- Small pump with:
 - low pressure
 - low flow (approx. 100 to 500 µL/min.)

An ISCO syringe pump equipped for cylinder washing has two 1/8" tubes on the back to feed and drain the wash gland.

The small pump delivers the wash fluid through one of the two tubes to rinse the cylinder and seals. The second tube drains the wash fluid to waste or recirculates it. If the system is configured to recirculate the wash fluid, ensure that you change the wash fluid at regular intervals.

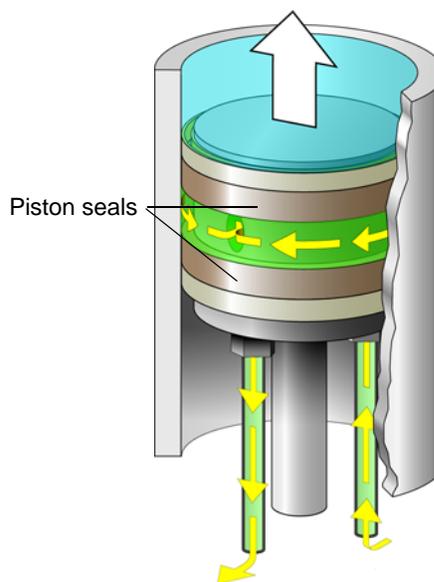


Figure 1: Illustration of wash gland operation

CAUTION

The pressure in the wash gland and line must never exceed the system pressure. A wash gland pressure greater than the system pressure may force wash liquid past the pump's main seals and contaminate the delivery fluid.

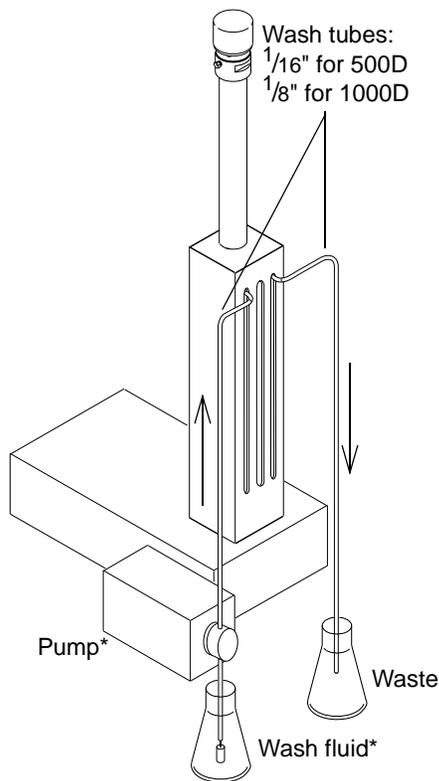


Figure 2: Wash fluid connections *user-supplied

Draining Overflow

The drip pan outlet on the back of the pump cylinder (Figure 3) drains fluid overflow in the event of seal leakage due to wear or damage. To prevent the overflow from further damaging the pump, attach the 1/4" ID flexible tubing included with the pump accessory package to the drain.

Install the tubing by pushing one end over the drip pan outlet. Route the other end away from the pump, to a waste container or drain.

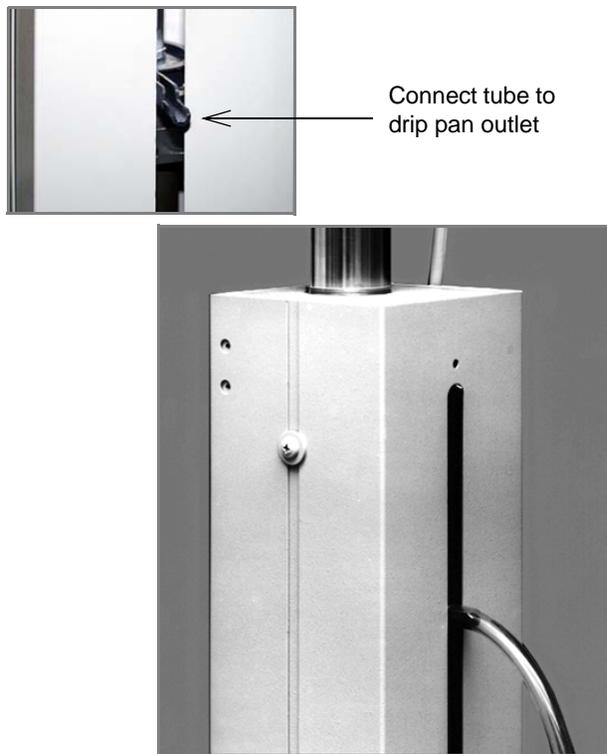


Figure 3: Connecting the drain tube

Corrosion-Resistant Materials

For added protection, ISCO pump components are optionally available in Hastelloy C-276.

Table 1: ISCO Pump Wetted Materials

Model	Transducer	Cylinder	Cap	Piston	Seals	Wash Gland	Air Valves	Electric Valves	Manual Valves
1000D	Hastelloy (internal)	Nitronic 50	Nitronic 50	Nitronic 50	Graphite/PTFE	Nitronic 50	Valves: Hastelloy Tubing: SST304 Fittings: SST316 or SST304	All Hastelloy	Stem: 17-4PH Body & fittings: SST316 Tubing: SST304
500D	Titanium (internal)					Option: Hastelloy			
260D	Options:	Option: Hastelloy	Option: Hastelloy	Option: Hastelloy		N/A	Option: All Hastelloy		Option: All Hastelloy
100DM/DX	Hastelloy (external)								

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