

Smart Box 4

Suggested Specifications for Isolator Ring with Onyx Smart Box-4

A. General

Pump shall be supplied with isolator ring to monitor discharge (and suction) pressure. Isolator ring shall match pump flange size. Isolator ring shall be equipped with a solid-state pressure switch.

B. Pressure Isolators

Isolation rings shall be designed to permit pressure measurement on slurries and other hard-to-handle fluids without compromising gauge function. Isolation ring shall consist of a metal ring with an elastomer inner tube filled with silicone instrument oil. Sensors shall fit inside the bolt circle of 150# ANSI flanges (or shall be provided with appropriate spacers for 300# or 600# flanges). Face to face length of the sensor shall conform to specification MSS-SP67. Sensor shall be flow through design with flexible rubber sleeve around full circumference.

All pressure instruments attached to the sensor shall be rigidly supported by a post at least 0.875 inches diameter welded to the isolator. All connections shall be 1/2" NPT as a minimum. 1/4" NPT fittings are not acceptable. The sensor ring shall not have a fill plug that can be inadvertently removed with the resultant loss of fill fluid.

The sensor shall be vacuum filled and permanently sealed at the factory with a modular seal consisting of a rubber membrane and needle fitting to allow removal and replacement of pressure instruments without compromising the vacuum fill. The needle fitting shall have both 1/4" NPT(F) thread and 1/2" NPT(M) threads. The pressure isolator shall be capable of operating under pressure with all instruments removed with no loss of fill fluid, without isolating valves. Pressure instruments shall be attached to the isolator with a hand tightened lock ring. It shall be possible to remove or attach pressure instruments to the isolator without requiring the use of any tools. The pressure sensor shall be permanently filled with high viscosity silicone instrument oil to damp out surges or pressure spikes without a separate snubber.

Max rated operating pressure: 1,000 psig

Materials of Construction:

- a) Body: Carbon steel
- b) End Plates: Acetal Homo Polymer (Alt: UHMW-PE, 316-Stainless steel)
- c) Sleeve: Buna-N (Alt: EPDM, Viton)
- d) Fill Fluid: Silicone instrument oil
- e) Fasteners: 316-Stainless steel

Pressure isolator shall be Onyx Valve Co model PSW or equal

C. Pressure Switch

The isolator ring shall be equipped with a solid-state pressure switch with a digital readout that displays the process pressure in psi.

The switch shall have:

- 4-digit 14-segment **Digital Read Out**
- Push button set point configuration.
- NEMA-4 weatherproof, stainless steel housing
- Micro processor based with no moving parts
- Accuracy < 0.5% URL
- Repeatability < 2% URL
- (2) PNP NO/NC programmable outputs
- 24 VDC operating power
- Output rating = 250 mAdc
- Approval = UL + CE
- ½” NPT Process connection,
- M-12 Micro electrical connection with 10-meter (or longer) cable.

D. Control Box

Local Control station shall be provided for each pump to protect from over-pressure, run-dry situations, or seal water failure. Local Control Station shall be a standard design compatible with either fixed speed or variable speed pumps.

The local control box shall incorporate a solid-state PLC and touchscreen for maximum reliability, with no mechanical push buttons or lights. The touch-screen interface shall display simple graphic communication, so pump status and fault conditions are easy to understand. Housing shall be a fiberglass weatherproof (NEMA-4X) enclosure (optional stainless steel). Operating voltage shall be 120-230 VAC power and shall include an internal DC power supply.

The operating program shall be pre-loaded by the manufacturer in permanent EEPROM memory. The unit must be “plug & play”, with no field or user programming required.

The PLC shall include an internal 24 VDC power supply to drive I/O inputs, touch screen, and the pressure switch.

The control panel shall be field configurable as either a “master” or “slave” controller. It shall include terminals to accept remote start/stop commands. Output shall be a set of N.O. dry contacts for connection to the pump starter or VFD. Contacts shall be rated for 250 VAC @ 2 amps.

Set points for High Pressure Trip and Low-Pressure Trip shall be set with push buttons on the pressure switch. It shall not be necessary to enter set points into the PLC program, or to use wrenches, screw drivers or other tools to adjust the pressure settings.

Control Panel Functions:

1. When power is available to the pump starter or VFD, the pump is off, and there are no system faults, the touchscreen shall display a static image of a PC pump rotor on the operator interface panel.
2. When the pump is running and everything is normal, the touchscreen shall display a dynamic animated image of a turning pump rotor on the operator display panel.
3. In the event of an over pressure condition, the controller shall stop the pump by opening a set of electrical contacts. A virtual pressure gauge on the touchscreen will flash red and the words "OVER PRESSURE FAULT" and "RESET" shall appear on the operator interface panel.
4. If the pump loses prime and runs dry, the controller shall stop the pump by opening a set of electrical contacts. A virtual pressure gauge on the touchscreen will flash red and the words "RUN DRY FAULT" and "RESET" shall appear on the operator interface panel.
5. (Optional) Upon receiving a 'start' signal, the controller shall energize the seal flush solenoid valve. It shall verify seal flush flow by examining contacts in a separate flow switch in the seal flush circuit. If seal flush is adequate, it shall allow the pump to start and run. If seal flush is interrupted at any time during pump operation, the controller shall stop the pump, and display the words "SEAL FLUSH FAULT" on the operator interface panel. When the controller receives a 'stop' signal, it shall turn off the pump and 4 seconds later, it shall turn off the seal flush solenoid valve.
6. The controller shall also function as a local START-STOP station. (The local "START" function can be blocked by deleting a jumper to the I/O input terminal strip.) The E-STOP function on the control panel shall always be available for emergency pump shut down.
7. The control program shall be designed to include broken wire detection, so that the pump will not run if there is a break in the pressure switch wiring circuits.
8. For maximum safety, the signal voltage to the pressure switch shall not exceed 24 VDC.

Controller shall be Onyx Valve 'Smart Box-4' or approved equal.