INSTALLING AND OPERATING P20 INLINE FLOW SWITCH

PLEASE READ THIS INSTALLATION SHEET CAREFULLY AND FULLY BEFORE INSTALLING THIS FLOW SWITCH

INTRODUCTION

The P20 flow switch is an in line piston flow switch that is supplied preset to switch on or off at a specific flow rate. The body of the switch contains a piston that obstructs the line of flow. To pass through the switch, the process fluid must push the piston back and flow over the piston and out through the outlet fitting. When fluid pushes the piston back, a magnet inside the piston actuates a reed switch in the electrical enclosure; this provides a set of closed, (or open) electrical contacts, which can be used in control circuits to indicate flow. The body of the P20 contains a fixed magnet that opposes the magnet in the piston.

The repulsive force generated between the piston and body magnets constantly pushes the piston back to the off position, against the incoming flow. This unique magnet system negates the need for metal springs and provides the switch with exceptional reliability.

OPERATING ENVIRONMENT

The P20 flow switch has no metal parts in contact with the process fluid. Inert thermoplastics are all that come in contact with the liquid passing through the switch. This means the P20 can be used in aggressive chemical solutions, seawater, bore water and in many fluids that would attack metal parts. The P20 flow switch contains a close fitting piston and should only be used in applications where the process fluid is reasonably clean and free of entrained or suspended material. Fluids containing large particulate matter, ferrous materials or fibrous matter should not be used in this switch. If the degree of contamination of the process fluid can't be guaranteed then suitable line filtration should be fitted to the system upstream of the P20 flow switch.

The standard P20 flow switch is constructed entirely from glass reinforced polypropylene with nitrile O-Ring seals. The P20 flow switch is weatherproof to IP56 That is, it is hose-proof and suitable for all outdoor exposed applications. The switch should be protected from freezing, or from exposure to fluid temperatures in excess of **60°C** (SEE IMPORTANT NOTE BELOW).

The P20 flow switch should not be used in applications where the line pressure exceeds 18 bars, in the interest of safety, the switch has a burst pressure rating of >97 bars. Care should be taken not to expose the P20 switch to excess pressures such as may be generated by water hammer. The environmental limitations of the standard P20 flow switch are set out in the operating environment table.

OPERATING ENVIRONMENT TABLE

Maximum Operating Pressure (Static or Dynamic) at Ambient Temperature	**1800 Kpa (261 PSI)**
Minimum Burst Pressure at Ambient Temperature	**9700 Kpa (1406 PSI)**
Maximum Liquid Temperature	**60°C at a pressure of 1 bar absolute, see note below.**
Minimum Liquid Temperature (Standard P20 Switch)	**-30°C**
Maximum Recommended Continuous Flow Rate (Water)	**25 Litres per Minute**
Liquid Ph Range	**1 to 14**

Warning note on Maximum Liquid Temperature in the above table: The Maximum operating pressure of the P20 in line flow switch must be linearly de-rated as operating temperature is increased so that at **60°C** the maximum permissible operating pressure for the switch is not more than one Bar Absolute.

INSTALLATION

The P20 flow switch can be mounted in any orientation in the pipe work, including upside down. There is a direction of flow arrow on the switch body. This directionality must be adhered to as the switch will not operate against a reversed flow. Pipe-work can be used to support the switch, or the switch can be connected directly into valve manifolds or pump ports.

FLOW SENSITIVITY & HYSTERESIS

Sensitivity to fluid flow is a direct function of liquid viscosity and piston clearance. There are 3 pistons supplied with the P20 flow switch. Each piston has a distinct switching point. The pistons are designated and marked A, B and C. The P20 Flow switch is supplied as standard with the "A" piston fitted. The optional "B" or "C" pistons are also supplied with each switch. The following table sets out the performance parameters of the 3 pistons.

The data is based on testing using water at 15°C as the test medium and is accurate to +/-10%. Changes in liquid viscosity will affect the switching point. Increases in viscosity will proportionally decrease the flow rate required to actuate the switch and will proportionally increase the response time. Decreasing viscosity will proportionally increase the flow rate required to actuate the switch and will proportionally decrease the response time. Please Note: The P20 in line flow switch comes fitted with the A piston. The B & C pistons are also supplied.

Piston Markings and Designation	Switching Point on a Slowly Rising Flow in Litres Per Minute	Switching Point on a Slowly Reducing Flow in Litres per Minute	Electrical Response Time in Seconds After Cessation of Flow
A	0.140	0.065	0.4
B	0.570	0.370	0.3
C	1.700	1.330	0.2

ELECTRICAL

The electrical enclosure on the P20 switch is accessible by removing one screw on the lid. The lid has an integral 20mm cable gland designed to accept flexible cable up to 10mm diameter. If the gland nut is removed the exposed female thread will then accept a 20mm conduit bush. Various electrical options are available for the P20 flow switch. Details of the specific circuit board module, including its model number are located inside the lid of the electrical housing of each switch. All the available electrical modules use a reed switch as the primary switching element.

The contacts of the reed switch open and close in response to the position of the switch piston magnet. The reed switch may be the primary switch, or it may be used to drive a triac or a relay that is included on the circuit board in the switch. Where the reed switch is used as the main switch care should be taken to ensure it is not overloaded. Reed switches are very reliable devices but may be damaged easily if overloaded.

Use interposing relays and avoid inductive loads, fit suitable protection such as diodes or rate effect suppression circuits. Avoid capacitive coupling effects associated with long cable runs, use shielded cable in such situations and fit diode protection to the reed switches in DC applications. The table below sets out details of the various electrical modules, their model numbers and their electrical specifications.

SWITCH MODEL	MODULE TYPE	CONTACT CONFIGURATION	SWITCHED POWER MAXIMUM	SWITCHED VOLTAGE MAXIMUM	SWITCHED CURRENT RESISTIVE AC (RMS) MAXIMUM	INDUCTIVE LOADS (POWER FACTOR 0.4)	TYPICAL APPLICATION
P20-B	Dry Reed Switch	S.P.S.T N.O	40 Watts	240V AC 200V DC	1 Amp	Not Suitable	PLC and General Control Circuits
P20-C	Dry Reed Switch	S.P.D.T	20 Watts	140V AC 150V DC	1 Amp	Not Suitable	PLC and General Control Circuits
P20-R	Solid State Relay (Triac)	S.P.S.T N.O	740 Watts	2 to 240V AC	4 Amp Continuous (Spike to 15A)	4A at 240V AC 5A at 30V DC	AC Control Circuits and AC Motor Control

Note: The P20 In Line Flow Switch uses reed switches as the primary switching element. Reed switches are one of the most reliable mechanical switching devices ever devised. They offer an operating life in excess of 100 million cycles, however, care needs to be taken to ensure they are not electrically overloaded or if applied in questionable applications, suitable protection should be added to the control circuit.

TESTING

The P20 switch can be tested for electrical function in the following way. With the switch isolated, place a continuity tester across terminals S1 and S2 or C and NO. (Do not use a lamp tester for this due to the high inrush current.) Use a pencil or similar object to depress the piston. Each time the piston is depressed a closed circuit should appear across S1 and S2 or C and NO.

The piston is accessed by pushing the pencil straight down the centre of the switch, through the inlet fitting. This test can be done dry and without the switch in the pipe-work. Each time the piston is released it should return to the off position due to the internal magnetic repulsion, and the switch should respond with an open circuit across its terminals.

MAINTENANCE

This flow switch is a very low maintenance device. If The P20 flow switch is correctly installed and if the process fluid is compatible with the materials of construction of this switch, then a very long service life can be expected. Factors that may contribute to early failure of this device include excess temperature, excess pressure or electrical loads in excess of the electrical modules ratings.

COMPONENT PARTS

The P20 In Line Flow Switch is a fully serviceable device. All of the component parts of the switch are available as spare parts, and many of the parts are interchangeable. These include the circuit boards, the pistons and the inlet and outlet adaptors and unions. The interchangeability of components allows custom configuration of the switch.

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