INSTALLATION & OPERATING INSTRUCTIONS

INSTALLING AND OPERATING THE KELCO P20 SERIES FLOW SWITCH

WARNING

Please read these installation and operating instructions fully and carefully before installing or servicing this flow switch. The P20 Series flow switch is a **mains voltage device**. Death or serious injury may result if this switch is not correctly installed and operated. All electrical work on this switch must be performed by a fully qualified and licensed electrician.

CHECK THE SWITCH MODEL NUMBER

Check the model number of the switch against the codes below – for example **P20-B-20**.

P20	–	B	–	20

SERIES

P20 Series inline flow switch

ELECTRICAL MODULE

B S.P.S.T. N.O. reed switch

C S.P.D.T. break before make reed switch

R S.P.S.T. N.O. solid state relay

PROCESS CONNECTION

20 20NB (suits PVC pipe)

OUTLINE

The P20 flow switch is an inline 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.

MECHANICAL INSTALLATION

The P20 flow switch can be mounted in any orientation in the pipework, 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. Pipework can be used to support the switch, or the switch can be connected directly into valve manifolds or pump ports. Overall dimensions are shown in Fig. 1 on page 4.

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 module's ratings.

SPARE PARTS

The P20 switches are fully serviceable devices. All component parts of the switch are available as spare parts, and many of the parts are interchangeable, allowing custom configuration of the switch.

ENVIRONMENTAL LIMITATIONS

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 IP67. That is, it is dust tight and protected against temporary immersion, and is suitable for all outdoor exposed applications. The switch should be protected from freezing, or from exposure to fluid temperatures in excess of 80 °C.

The P20 flow switch should not be used in applications where the line pressure exceeds 18 bar. In the interest of safety, the switch has a burst pressure rating of >97 bar. 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 table below.

PARAMETER	P20 SERIES
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 *	**80 °C** at a pressure of 1 bar absolute
Minimum liquid temperature	**–30 °C**
Maximum recommended continuous flow rate (water)	**25** litres per minute
Liquid pH range	**1 to 14**

*** WARNING** The maximum operating pressure for the P20 Series switches must be linearly de-rated as operating temperature is increased, so that at 80 °C the maximum permissible operating pressure for the switch is not more than 1 bar absolute.

Chemical Compatibility Checker ›

HAZARDOUS AREAS

The P20-B and P20-C are passive reed switches that meet the definition of simple apparatus under AS/NZS 60079.11. They are not Ex certified in their own right. They may be used in a hazardous area only as part of an intrinsically safe circuit, connected through suitably certified associated apparatus such as a Zener barrier or galvanic isolator. The design of the intrinsically safe system and its installation are the responsibility of the system designer and installer, in accordance with AS/NZS 60079.14 and AS/NZS 60079.25. Reed switch ratings: P20-B 50 W/VA, 250 VAC / 200 VDC, 1.5 A maximum; P20-C 20 W/VA, 140 VAC / 150 VDC, 1 A maximum, resistive loads only. The associated apparatus must not exceed these limits. Where the associated apparatus monitors for line faults, end-of-line resistors must be fitted as specified by its manufacturer. The P20 is of non-metallic construction; the installer must assess electrostatic charging risk under AS/NZS 60079.0 for the zone and gas group. The P20-B and P20-C are not suitable for use in a hazardous area outside an intrinsically safe circuit.

The P20-R is not certified for use in hazardous areas and must not be installed in any area classified as hazardous under AS/NZS 60079.10 (Zone 0, 1, 2, 20, 21 or 22). It contains a solid-state (triac) relay for switching mains-voltage loads, has no recognised Ex protection concept, and is not simple apparatus. It must not be connected to, or form part of, an intrinsically safe circuit.

WARNING

After installing or servicing this flow switch always replace its lid and fully tighten its lid screw. Also ensure the cable gland is fully tightened. Never leave the lid off the switch for extended periods. Without its lid in place this flow switch is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the inside of the flow switch's electrical housing when the lid is not in place. Without its lid the flow switch is not weather or insect proof and presents a potential **shock hazard that may result in death or serious injury**.

FLOW SENSITIVITY & HYSTERESIS

The table below sets out the flow required to actuate and de-actuate the P20 flow switch. Note the P20-C model is not as sensitive to flow as the P20-B and P20-R. The table refers to water at ambient temperature as the test medium.

MODEL	SWITCHING POINT ON A SLOWLY RISING FLOW (LITRES PER MINUTE)	SWITCHING POINT ON A SLOWLY REDUCING FLOW (LITRES PER MINUTE)	ELECTRICAL RESPONSE TIME (SECONDS)
P20-B & P20-R	0.14	0.065	0.4
P20-C	< 0.50	0.30	0.4

ELECTRICAL INSTALLATION

The electrical enclosure on the P20 switch is accessible by removing one screw on the lid. The lid has an integral 20 mm cable gland designed to accept flexible cable up to 10 mm diameter. If the gland nut is removed the exposed female thread will then accept a 20 mm 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.	50 W/VA	250 VAC 200 VDC	1.5 A	Not suitable	PLC and general control circuits
P20-C	Dry reed switch	S.P.D.T. break before make	20 W/VA	140 VAC 150 VDC	1 A	Not suitable	PLC and general control circuits
P20-R	Solid state relay (triac)	S.P.S.T. N.O.	740 W	12 to 240 VAC	4 A continuous (spike to 15 A)	4 A at 240 VAC	AC control circuits and AC motor control

NOTE The P20 inline 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.

SWITCH 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 pipework. 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.

DIMENSIONS

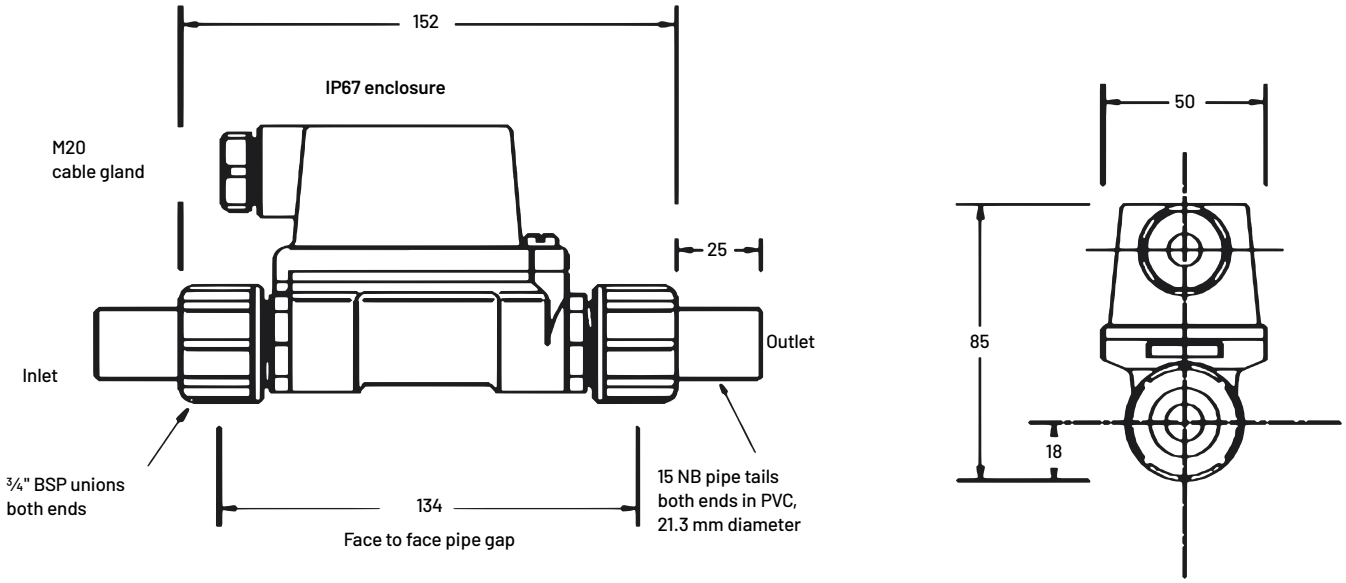


FIG. 1 Overall dimensions in millimetres – side and end views

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