INSTALLATION & OPERATING INSTRUCTIONS

INSTALLING AND OPERATING THE KELCO MF20 SERIES MICRO FLOW SWITCH

WARNING

Please read these installation and operating instructions fully and carefully before installing or servicing this flow switch. The MF20 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.

OUTLINE

The MF20 micro flow switch is a vertically mounted 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. The process fluid, either a liquid or a gas, enters the bottom of the switch and must push the piston up until it can flow over the piston and out the top of the switch.

When the piston is pushed up by flowing fluid, a magnet inside the piston actuates a reed switch in the electrical enclosure; this provides a set of closed (or open) electrical contacts that can be used in control circuits to indicate flow. When flow stops the piston sinks down due to gravity, and in doing so moves the magnet out of proximity of the reed switch, thus de-actuating the reed switch.

MECHANICAL INSTALLATION

The MF20 micro flow switch must be mounted vertically in the pipework, with flow passing upward through the switch body. 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. A comprehensive selection of pipe spigots and tube flare fittings is supplied with each switch. In most instances these fittings will prove sufficient to allow installation of the switch without the need for any special components. Pipework can be used to support the switch, or the switch can be connected directly onto the discharge valve of a metering pump.

The MF20 is terminated with ¾" BSPP male threads. These can be screwed directly into pipe sockets, and used in ¾" piping. In addition, the switch is supplied with ¾" unions and ½" (15 NB) spigots. The spigots are thick walled and designed to be tapped ¼" BSP, for use with compression fittings, if required. The pipe spigots supplied with this switch are constructed from PVC. These are suitable for solvent gluing directly into 15 NB PVC or ABS pipe fittings. In addition to the pipe spigots, each MF20 flow switch is supplied with 3 sets of tube flare fittings; these suit 6 by 4, 8 by 4 and 12 by 9 flexible tube.

CHEMICAL COMPATIBILITY

The MF20 micro flow switch is constructed from glass reinforced polypropylene with Viton O-ring seals. Specific data on the chemical compatibility of polypropylene and Viton can be obtained from widely available chemical compatibility charts, or from Kelco, on request.

Chemical Compatibility Checker ›

IMPORTANT

Never use this flow switch with the following reagents:

1. Sodium hypochlorite at >10% concentration.
2. Ferrous or ferric solutions (ferric chloride etc.).
3. Solvents or hydrocarbon or alcohol solutions of any kind.
4. Sulphuric acid at >50% concentration.
5. Nitric acid at >20% concentration.

ENVIRONMENTAL LIMITATIONS

The MF20 micro 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. The MF20 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 MF20 flow switch. The principal environmental limitations of the MF20 micro flow switch are set out in the following table.

PARAMETER	MF20
Maximum recommended operating pressure (static or dynamic) at ambient temperature	**1800 kPa** 260 psi
Minimum burst pressure at ambient temperature	**9700 kPa** 1400 psi
Maximum liquid temperature	**80 °C** at a pressure of 1 bar absolute (see note below)
Minimum liquid temperature	**–30 °C**
Maximum recommended continuous flow rate (water)	**25 litres per minute** Head loss across the switch <100 kPa at 25 L/min
Liquid pH range	**1 to 14**
Ingress protection rating (weatherproof rating)	**IP67**

IMPORTANT NOTE

Temperature for the maximum operating pressure shown in the above operating environment table is 15 °C. In the interest of safety, maximum operating pressure must be de-rated linearly in direct proportion to temperature increase, to a maximum pressure of 1 bar absolute at 80 °C. In other words, only use this switch at elevated temperatures in non-pressurised systems that are totally open to atmosphere in all circumstances and under all conditions.

MAINTENANCE

This flow switch is a very low maintenance device. Given the switch is appropriate and installed correctly, then a very long service life can be expected.

FLOW SENSITIVITY & RESPONSE TIME

Sensitivity to fluid flow is a function of liquid viscosity and piston clearance. There are 3 pistons available to suit the MF20 flow switch. Each piston has a distinct switching point. The pistons are designated and marked A, B and C. The MF20 micro flow switch is supplied as standard with the "A" piston. The optional "B" and "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 with 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 required to actuate the switch, and will proportionally decrease the response time. Pistons are changed by unscrewing the inlet adaptor (part No. 2), and inserting the new piston.

NOTE The spanner octagon on the inlet adaptor accepts a standard gas cylinder spanner (28 mm across the flats).

NOTE In pulsed flow applications where no pulse dampener is installed, and the pulse frequency is less than the electrical response time, the MF20 flow switch may respond with a train of on/off pulses rather than with a continuous on signal.

Data in the table below refers to the MF20-B and MF20-R models only. When using the MF20-C, for any given piston, multiply the switching flow rates in the table by 2.0 to obtain the correct values.

PISTON MARKINGS AND DESIGNATION	SWITCHING POINT ON A RISING FLOW (L/H)	SWITCHING POINT ON A REDUCING FLOW (L/H)	ELECTRICAL RESPONSE TIME ON CESSATION OF FLOW (S)
A	**0.32** ±10%	**0.30** ±10%	4
B	**3.10** ±10%	**3.05** ±10%	3
C	**12.8** ±10%	**12.6** ±10%	2

PLEASE NOTE The type "A" piston is supplied as standard fitted to each switch, unless otherwise specified. The B and C pistons are included packed in with the switch.

HAZARDOUS AREAS

The MF20-B and MF20-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: MF20-B 50 W/VA, 250 VAC / 200 VDC, 1.5 A maximum; MF20-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 MF20 is of non-metallic construction; the installer must assess electrostatic charging risk under AS/NZS 60079.0 for the zone and gas group. The MF20-B and MF20-C are not suitable for use in a hazardous area outside an intrinsically safe circuit.

The MF20-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

All electrical work associated with the MF20 Series flow switch must be carried out by qualified electrical personnel and all electrical work must conform to AS/NZS (or equivalent) standards and to local wiring rules.

ELECTRICAL INSTALLATION

The electrical enclosure on the MF20 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, or the gland nut can be removed and the exposed female thread will then accept a 20 mm conduit bush. Various electrical options are available for the MF20 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 MF20 switch can be tested for electrical function in the following way. With the switch isolated and held vertically, place a continuity tester across terminals S1 and S2. (Do not use a lamp tester for this, due to the high inrush current.) Use a pencil or similar object to lift the piston within the switch. Each time the piston is lifted a closed circuit should appear across S1 and S2. The piston is accessed by pushing the pencil straight up the centre of the switch, through the centre of the inlet fitting. This test should be done dry, and without the switch in the pipework. Each time the piston is released it should fall freely to the off position, and the switch should respond with an open circuit across terminals S1 and S2.

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
MF20-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
MF20-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
MF20-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 MF20 micro 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.

SPARE PARTS

All of the components of this switch are available as spare parts, as listed below.

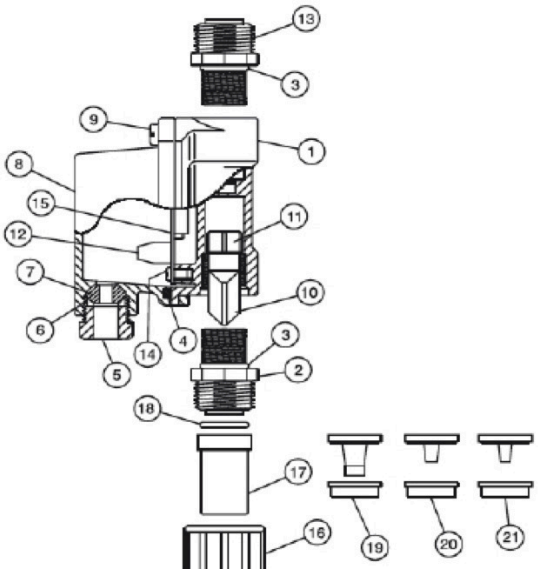


FIG. 1 Parts list, MF20 micro flow switch

ITEM	DESCRIPTION	QTY	MATERIAL
1	Switch body	1	Glass reinforced polypropylene
2	Inlet adaptor	1	Glass reinforced polypropylene
3	O-ring seal	2	Viton (FKM)
4	Main lid gasket	1	Santoprene
5	Cable gland nut	1	Glass reinforced polypropylene
6	Cable gland thrust ring	1	Glass reinforced polypropylene
7	Cable grommet	1	Santoprene
8	Lid	1	Glass reinforced polypropylene
9	Lid fixing screw	1	M5 × 16 stainless steel
10	Piston	1	Glass reinforced polypropylene
11	Magnet case	1	Glass reinforced polypropylene
12	Terminal block	1	Acetal resin
13	Outlet adaptor	1	Glass reinforced polypropylene
14	Circuit board fixing screw	2	M4 × 6 stainless steel pan head
15	Circuit board assembly	1	Complete electrical module
16	Union nut	2	Glass reinforced polypropylene
17	20 NB pipe tail	2	PVC
18	O-ring seal	2	Viton (FKM)
19	12 × 9 tube adaptors	2	ABS
20	8 × 4 tube adaptors	2	ABS
21	6 × 4 tube adaptors	2	ABS

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