

# INSTALLING AND OPERATING THE KELCO F SERIES FLOW SWITCH



## WARNING

Please read these installation and operating instructions fully and carefully before installing or servicing this Flow Switch. The F 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 must be performed by a fully qualified and licenced electrician.

## INTRODUCTION

This F Series flow switch may have been supplied in one of several available configurations. The model number of the specific switch is located inside the lid of the electrical housing. The F Series flow switch is a versatile heavy-duty paddle flow switch suitable for detecting flow of liquids in pipes of any diameter from 25 mm (1") upward. This flow switch has several unique features: **A)** The complete electrical assembly can be removed from the switch by undoing and removing the locking screw in the split clamp on the side of the switch's electrical housing. With the locking screw removed, the electrical housing can be pulled straight off the wet end of the switch. Removing the electrical housing allows the wet end of the switch to be unscrewed from pipework without disturbing the cable connection to the switch. This means the paddle of the switch can be changed, inspected or trimmed without the need to disturb the electrical connection to the switch. Replace and tighten the locking screw after completing any work on the wet end of the switch. **B)** The standard version of the F Series flow switch has a built-in spring loaded push button manual override, which is located on the end of the switch body underneath the cable entry port. Pressing this button actuates the switch, regardless of the state of flow. Pumping systems can be manually started by pressing this button and holding it in until flow is established. The override button can be used to test control circuits and wiring during commissioning, without the need for water in the pipework. The button is spring loaded so it can't be inadvertently left in the on position and only overrides the flow switch while it is pressed.

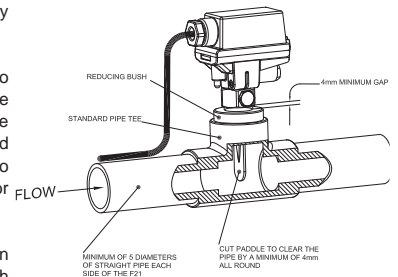
## INSTALLATION

Select a location for the flow switch in a straight run of pipe, ideally with five pipe diameters of straight pipe either side of the switch. This will ensure a linear non turbulent flow acts against the paddle of the switch. Do not install the flow switch in any location likely to expose it to turbulence, such as close to valves, pumps or pipe bends. The idea is to install the switch in a location where there is a smooth flow of liquid past the paddle, and to obtain a stable non-chattering response from the flow switch. The F Series flow switch can be mounted in either the suction or discharge pipe of a pump, the switch will work equally well in positive or negative pressure applications.

The F Series flow switch has an extra long paddle so it can be used in large diameter pipes. The paddle will require trimming if the flow switch is to be used in smaller diameter pipes. The paddle can be cut and shaped as required using tin snips or a hacksaw. Note, the paddle can be cut both in length and if required, in width. Many installers maintain a more stable flow response can be obtained by narrowing down the paddle and avoiding turbulence close to the walls of the pipe. The F Series flow switch can be installed in any required orientation except on the under side of horizontal pipes.

Depending on the thread on the switch (please see available models for details), a threaded socket must be provided on the piping, to fit the flow switch. This may be a tapping saddle or a pipe tee fitted with a threaded reducing bush, or a socket welded directly to the pipe. Ensure that whatever fitting is used, sufficient clearance is allowed for the free movement of the paddle. Normally a clearance to the full inside diameter of the 1" pipe thread will be required. The F Series flow switch can be installed in a 1" pipe socket attached to a short stand off pipe, at 90° to the main pipe. This method of mounting increases the sensitivity of the switch to low flows due to the extra leverage against the tip of a longer paddle. If this mounting method is used make sure to leave extra clearance to allow for the full arc movement of the longer paddle.

Use a suitable thread sealant and tighten the switch into the socket using the spanner flats provided on the switch body. Do not tighten the switch into its socket by twisting the electrical housing of the switch, as damage to the flow switch may result. Align the flow switch squarely to the axis of the pipe, with the direction of flow arrow on the side of the switch body parallel to the axis of the pipe and aligned in the direction of flow. The F Series will not function correctly unless alignment is correct. When installing the flow switch in vertically aligned pipework, the sensitivity of the switch will be slightly increased; it will detect lower flows when flow is downward, and the sensitivity will be slightly decreased when flow is upward. This is due to the effect of gravity on the dead weight of the paddle itself. This effect is more noticeable in larger pipes and low flows where long paddles may be used.



## ELECTRICAL DATA MICROSWITCH MODELS

RATED VOLTAGE	NON INDUCTIVE LOADS				INDUCTIVE LOADS			
	RESISTIVE LOAD		LAMP LOAD		INDUCTIVE LOAD		MOTOR LOAD	
	NO	NC	NO	NC	NO	NC	NO	NC
125 VAC	15A		3A	1.5A	15A		5A	2.5A
250 VAC	15A		2.5A	1.25A	15A		3A	1.5A
500 VAC	10A		1.5A	0.75A	6A		1.5A	0.75
8 VDC	15A		3A	1.5A	15A		5A	2.5A
14 VDC	15A		3A	1.5A	10A		5A	2.5A
30 VDC	6A		3A	1.5A	5A		5A	2.5A
125 VDC	0.5A		0.5A	0.25A	0.05A		0.05A	0.05A
250 VDC	0.5A		0.5A	0.25A	0.03A		0.03A	0.03A

**Warning note on operating limitations:** Maximum operating pressure of the Polypropylene F20-S & F21-S 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.

## OPERATING LIMITATIONS

Model	F20 -S / F21-S (All Poly)	F20-S/F21-SS (Stainless)	F20-D / F21-D (Diesel)
Maximum operating pressure (Static or Dynamic) at ambient temperature	18 Bars (261 PSI)	200 Bars (2900 PSI)	200 Bars (2900 PSI)
Minimum burst pressure at ambient temperature	45 Bars (652 PSI)	500 Bars (7251 PSI)	500 Bars (7251 PSI)
Maximum operating temperature	60°C See note below	80°C	80°C
Minimum operating temperature	0°C	0°C	0°C
Minimum liquid S.G.	0.8	0.8	0.8
Ingress protection rating	IP67	IP67	IP67

## ELECTRICAL DATA REED SWITCH MODELS

The reed switch models are supplied with a high compliance single pole double throw reed switch suitable for all low wetting current and low voltage applications. Such applications include PLC control, signalling in telemetry systems and relay logic circuits. **Note:** the reed switch models are not suitable for use with inductive loads such as contactors or high wattage relays.

SWITCH TYPE	CONTACT	SWITCHED POWER	SWITCHED VOLTAGE MAXIMUM	SWITCHED CURRENT (RESISTIVE)	CARRY CURRENT	BREAKDOWN VOLTAGE	TYPICAL APPLICATIONS
DRY CONTACT REED SWITCH	S.P.D.T BREAK BEFORE MAKE	20W / VA MAXIMUM	140V AC 150V DC	1 AMP MAXIMUM	2 AMP MAXIMUM	200V MINIMUM	PLC, TELEMETRY & GENERAL LOW VOLTAGE CONTROL APPLICATIONS

## ELECTRICAL



### WARNING

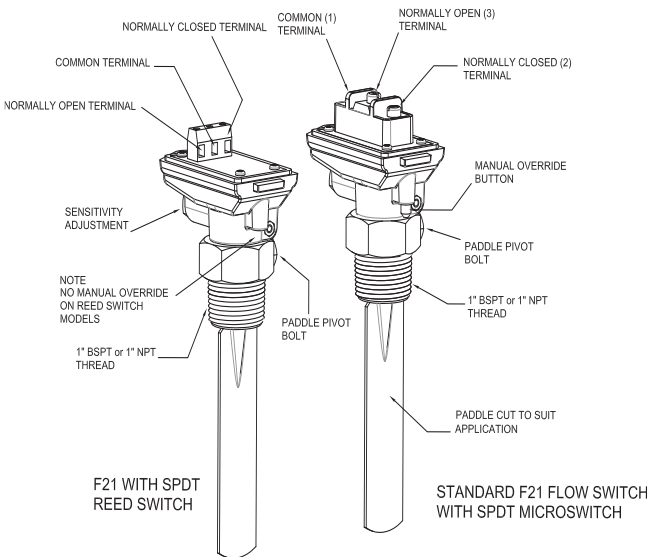
All electrical work associated with the F Series flow switch must be carried out by qualified electrical personnel and all electrical work must conform to AS/NZ (or equivalent) standards and to local wiring rules.

The F Series flow switch is available in one of two basic configurations. The standard version of the flow switch is supplied with an SPDT microswitch fitted. A special reed switch version of the flow switch is also available for low power applications. The model number of the switch is located on a label inside the switch lid. The standard flow switch houses a magnetically coupled high current high voltage single pole double throw microswitch that is suitable for most general-purpose control circuit applications at any voltage up to 500VAC. The special reed switch version of the F Series houses a gas filled reed switch that provides a single pole double throw break before make action. The cable gland on the F Series flow switch is threaded M20 and will accept standard M20 conduit bushes in addition to flexible cable. When wiring an F Series flow switch, ensure the lid and cable gland are securely tightened and in fully exposed locations use secondary precautions such as cable drip loops to make sure no water can enter the switch housing.



### 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 switch is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the inside of the level switch's electrical housing when the lid is not in place. Without its lid the switch is not weather or insect proof and presents a potential shock hazard that may result in death or serious injury.



## PADDLE TRIMMING AND FLOW SENSITIVITY

There are two methods of setting the sensitivity of the F Series flow switch. By far the most effective method is by the correct trimming of the paddle. For fine tuning, a sensitivity adjustment screw is provided, as shown in the accompanying drawing. As supplied by the factory, the sensitivity screw is wound fully in, and is set to least sensitivity. The adjusting screw can be wound out, and the sensitivity slightly increased. The maximum effect is achieved with the screw wound out to a point where the screw head is 4mm in from the face of the switch body.

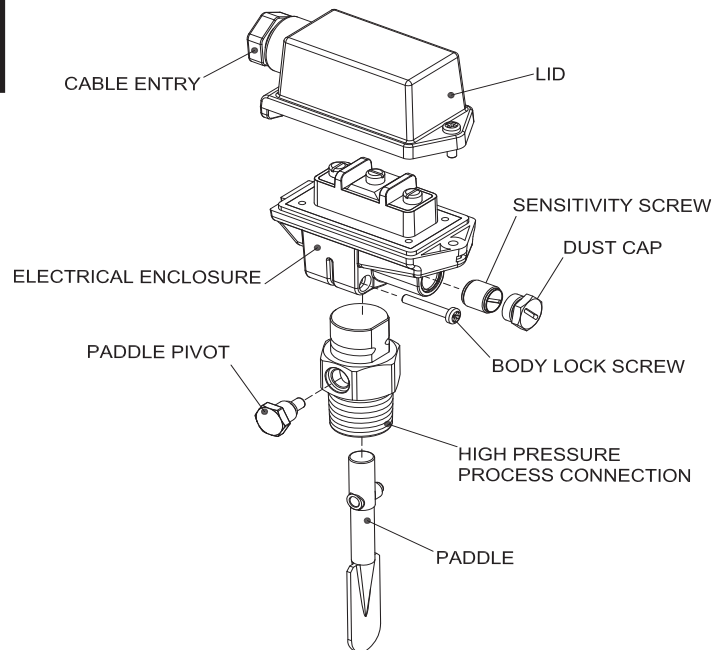
By far the best way to set the F Series flow switch is to make a judgment on the likely flow rate in the pipe, and to trim the paddle accordingly. If the flow is going to be high then trim the paddle fairly short, and if you know the flow rate will be low then leave the paddle as long as possible. If the flow rate is unknown then generally trimming the paddle to half way across the pipe will achieve a satisfactory compromise and will work well. Trimming the paddle is a compromise between sensitivity to the duty flow and stress on the intruding paddle. Fluid flow generates force, and a certain minimum amount of force is required by the flow switch in order to function. Excessive force however can bend or break paddles.

The exact flow rates required to actuate the F Series will depend on many variables such as turbulence, liquid viscosity and the exact area of the paddle face exposed to the flow. For an accurate estimation of the switching point for any given paddle size, an online flow calculator is available at: -

<http://www.kelco.com.au/paddle-trimming-calculator-2>

## MAINTENANCE

If the F Series flow switch is correctly installed and if the process liquid is compatible with the materials of construction of the switch then a very long maintenance free service life can be expected. Factors that may contribute to early failure of the F Series flow switch include excess temperature, excessive pressure or electrical loads in excess of the switch's rating. Should service be required, an exploded view of the flow switch is included to show the main components and how they fit together. The F Series is a very simple switch to service, and all components are available as spare parts.



## HAZARDOUS APPLICATIONS

The F Series flow switch can be used in hazardous areas. The flow switch is classed as a simple device and does not contain components capable of storing or producing an electric charge. As a simple device the F Series can be used in hazardous applications provided an intrinsically safe barrier (a zener barrier) isolates it.

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