INSTALLATION & OPERATING INSTRUCTIONS

INSTALLING AND OPERATING THE KELCO FM FLOW SWITCH

FOR FM-H MODELS · STANDARD MICROSWITCH

WARNING

Read these instructions fully before installing or servicing this flow switch. The FM Series is a **mains voltage device** – incorrect installation can cause death or serious injury. All electrical work must be carried out by a licensed electrician.

1. CHECK THE MODEL NUMBER

Check the part number on the label inside the lid against the codes below – for example **FM-H-25B-D**.

FM	–	H	–	25B	–	D

SERIES

FM flow switch (aluminium)

SWITCH

H Standard switch

PROCESS CONNECTION

20B ¾" BSP thread
20N ¾" NPT thread
25B 1" BSP thread
25N 1" NPT thread

PADDLE

Blank Polypropylene paddle for water use
D Nickel copper alloy paddle for diesel and high temperature applications

2. MECHANICAL INSTALLATION

1. Check the part number (label inside the lid) against the tables in this sheet for pressure, temperature and electrical load.
2. Trim the paddle with a hacksaw or tin snips so it clears the pipe wall by at least 4 mm all round. To find the paddle length, use the Paddle Trimming Calculator. As a guide:

LOW FLOW	Paddle just clears the bottom of the pipe
UNKNOWN FLOW	¾ of the way across the pipe
HIGH FLOW	¼ to ½ of the way across the pipe

Spare paddles are available if too much is cut off.

Paddle Trimming Calculator ›

Not sure how much to trim? Go to **www.kelco.com.au/en/tools/paddle-calculator** and use the calculator – enter your pipe inside diameter, flow rate and liquid to check the switch will operate reliably before you cut the paddle.

3. The switch can go in suction or delivery pipework, horizontal or vertical. In vertical pipe, flow must be upward. Do not mount on the underside of horizontal pipe.

   Where possible, mount the switch away from pumps, valves and bends. A fitting directly upstream makes the flow uneven and turbulent at the paddle, which can shift the switching point slightly or make the paddle flutter near the switching point. Downstream fittings have little effect. If the switch has to go close to a fitting, enter the upstream straight length in the Paddle Trimming Calculator and check operation on commissioning.
4. Mount in a pipe tee, tapping saddle or weld-on socket, square to the flow so liquid hits the flat face of the paddle. The arrow on the switch must point in the direction of flow.
5. Seal the thread with PTFE tape or thread sealant, leaving at least 4 mm of thread above the socket. Tighten with a spanner on the spanner flats only – never twist the switch body.
6. Switches are supplied at maximum sensitivity (adjuster wound fully in). To decrease sensitivity, remove the red dust cap and wind the adjusting screw out (anti-clockwise) with a wide flat screwdriver. The further out, the more flow is needed to operate the switch. Refit the dust cap.

TYPICAL SMALL PIPE INSTALLATION

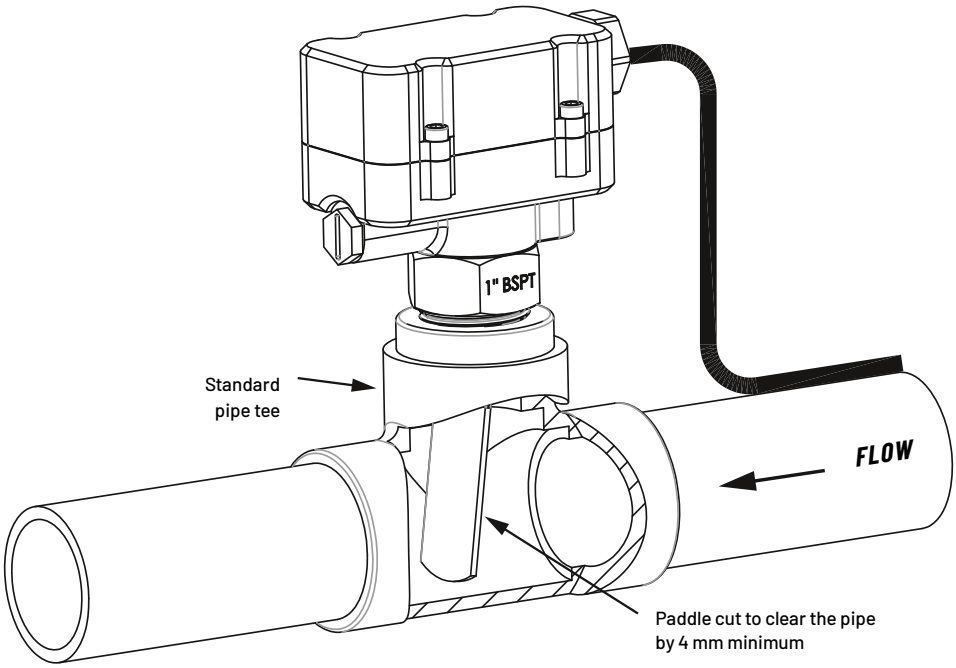


FIG. 1 FM Series mounted in a standard pipe tee

3. ELECTRICAL INSTALLATION

1. This sheet covers the **FM-H** models: a standard S.P.D.T. microswitch for control circuits from 5 to 500 VAC. Check the part number on the lid label before wiring – FM-L models have their own installation sheet.
2. Confirm the load is within the electrical ratings on page 3.
3. The switch has terminals marked C (common), NO (normally open) and NC (normally closed). For a two-wire connection use C plus either NO or NC to suit the application.
4. Connect the earth terminal inside the housing. The FM must be earthed when operated at mains voltage.
5. Fully tighten the cable gland nut, check the lid gasket is in place and tighten the lid down.
6. Test: press the red manual override button under the cable gland. The switch changes state as if liquid were pushing the paddle.

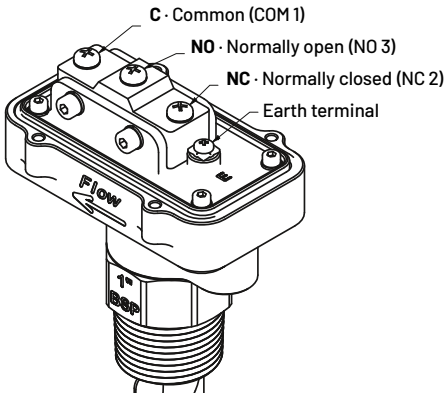


FIG. 2 Switch terminals

WARNING

Always refit the lid and fully tighten the lid screw and cable gland after installing or servicing. Without its lid the switch is not water, weather or insect proof and presents a **shock hazard that may cause death or serious injury**. Never splash water into the open housing or leave the lid off for extended periods.

'H' SWITCH ELECTRICAL DATA

The 'FM-H' models use an S.P.D.T. (single pole, double throw) microswitch for general control circuits up to 500 VAC – ideal for pump starters, relay logic, contactors and timers.

IMPORTANT

Use at any voltage from 5 to 500 VAC (minimum load 160 mA at 5 VDC). Directly switches pump motors up to ¼ HP (approx. 185 W) at 240 VAC – use a contactor or relay for larger motors.

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

NOTE Absolute limits: 500 VAC maximum; 15 A maximum (10 A at 500 VAC); 5 VDC and 160 mA minimum. Maximum voltage and maximum current cannot be applied together – use the table for the limit at each voltage and load type.

HAZARDOUS AREAS

The FM-H 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 silver-contact microswitch rated for mains voltage, has no recognised Ex protection concept, and is not suitable as simple apparatus in an intrinsically safe circuit because its contacts require a minimum load of 160 mA at 5 VDC. Suitability of -D models for diesel refers only to the chemical resistance of the wetted materials.

MAINTENANCE

The FM is low maintenance and should give years of service when correctly installed. Its life is shortened by pressures, temperatures or electrical loads beyond its ratings.

Spare parts, including paddles, are available from your supplier.

REPLACING THE FM FLOW SWITCH PADDLE

The paddle and its associated pivot bearings are replaceable items. Spare paddles can be obtained from your supplier. Please quote the part number of the flow switch when ordering spare paddles.

REMOVING THE PADDLE ASSEMBLY FROM THE SWITCH

1. Unscrew and remove the locking bolt located on the side of the process adaptor (right-hand thread).
2. Pull the paddle assembly straight out of the process adaptor. Do not twist the paddle when doing this; pull the paddle in a straight line outwards and away from the process adaptor thread.
3. Check the inside of the process adaptor and ensure it is perfectly clean. If needed, clean the inside of the process adaptor thoroughly.

FITTING A REPLACEMENT PADDLE ASSEMBLY

1. Replacement paddles are supplied with new bearing shells and a large retaining O-ring. Assemble the two bearing shells onto the paddle so the bearing holes in the bearing shells engage with the bearing journals on the paddle.

   Note: The bearing shells have an O-ring groove at one end. Ensure this groove is towards the long end of the paddle. Also ensure the three tiny locating pins on one of the bearing shells locate in the three holes in the opposite bearing shell.
2. Fit the large O-ring into the groove in the assembled bearing shells so the O-ring holds the two shell halves together and the bearing holes in the bearing shells are engaged on the bearing journals on the paddle.
3. One of the two bearing shells has a flat face. Ensure this flat face is aligned with the locking bolt hole in the side of the process adaptor.
4. Push the paddle assembly straight into the process adaptor, ensuring the flat face and locating hole in the bearing shell align with the locking bolt hole in the process adaptor.
5. Push the paddle assembly all the way into the process adaptor until the bearing shells reach the dead stop in the process adaptor. Check and ensure the location hole in the bearing shell aligns perfectly with the locking bolt hole in the process adaptor. Rotate the paddle assembly to align the location hole with the locking bolt hole if the initial alignment is slightly out of position.
6. Check and replace (if required) the small O-ring that sits under the head of the locking bolt.
7. Apply silicone grease or Vaseline to the thread on the locking bolt.
8. Fit and screw the locking bolt into the locking bolt hole in the side of the process adaptor.
9. Fully tighten the locking bolt.
10. Test the replacement paddle by pushing it back and forward to ensure it swings freely. When pushed into the forward position, the paddle should return to the off position under its own volition when released.

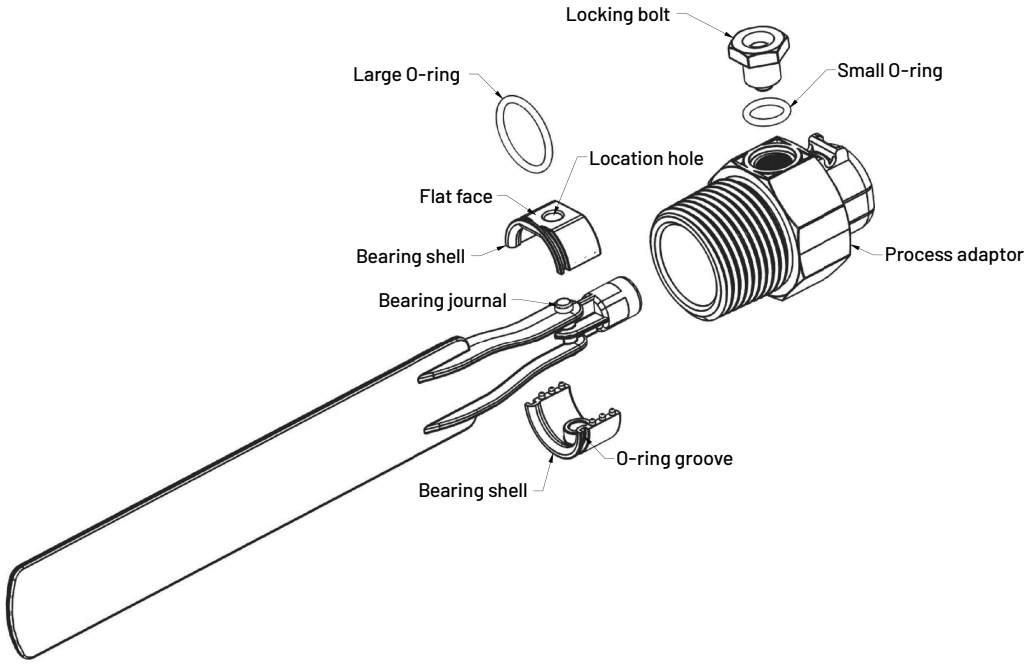


FIG. 3 Polypropylene paddle assembly (FM)

REPLACING THE FM-D METAL PADDLE AND ARM

The nickel copper alloy paddle and its associated arm and pivot bearing are replaceable items. Spare parts can be obtained from your supplier. Please quote the part number of the flow switch when ordering spare parts.

REMOVING AND REPLACING THE METAL PADDLE

1. The metal paddle is terminated at its top end with 2 Allen screws secured with lock washers.
2. Using an Allen key, remove the paddle from the main switch arm (right-hand threads).
3. Fit the replacement paddle and fully tighten the 2 Allen screws. For additional security a drop of Loctite Stud Lock can be placed on the threads.
4. Trim the paddle to match the original paddle or to suit the application using heavy duty tin snips.

FITTING A REPLACEMENT ARM ASSEMBLY

1. Replacement arms are supplied complete with a new bronze bearing. To fit a replacement arm, first ensure a metal paddle is attached to the end of the replacement arm.
2. To remove an arm, first undo the pivot bolt located on the side of the process adaptor (it has a right-hand thread). Completely remove the pivot bolt and then withdraw the main arm from the process connector by pulling on the paddle.
3. Do not under any circumstances undo or remove the hexagonal cap at the top end of the main arm. It is sealed and is not intended to be opened. It houses a magnet that is oriented for proper operation of the switch.
4. Place the new bronze bearing through the bearing hole in the replacement main arm. Prepare the pivot bolt by ensuring its O-ring is in good order and apply a small amount of silicone oil or Vaseline to the thread on the pivot bolt.
5. Insert the main arm with its bronze bearing into the process adaptor. Use the paddle to rotate the arm into a position where the hole in the bronze bearing lines up with the pivot bolt hole in the process adaptor.
6. Fit the pivot bolt and screw it into the process adaptor, ensuring the pin on the nose of the pivot bolt engages in the bore of the bronze bearing bush.
7. Fully tighten the pivot bolt.
8. Test the replacement arm by pushing the paddle back and forward to ensure it swings freely. When pushed into the forward position, the paddle should return to the off position under its own volition when released.

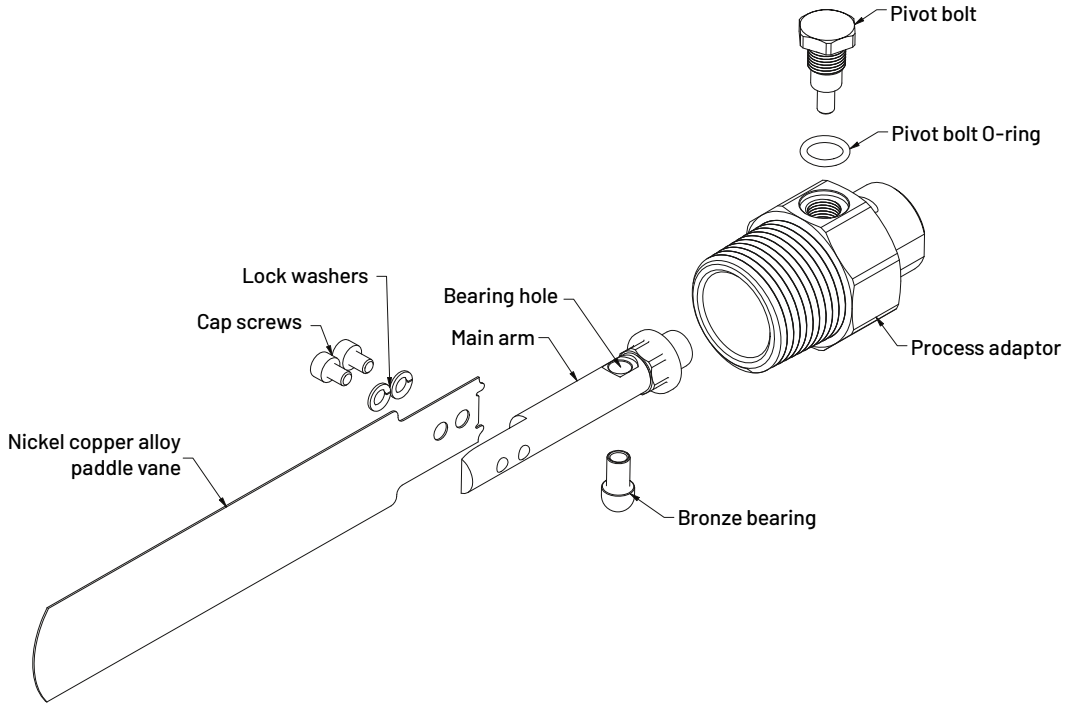


FIG. 4 Nickel copper alloy paddle and arm assembly (FM-D)

ENVIRONMENTAL LIMITATIONS

MODEL	FM (POLY PADDLE)	FM-D (METAL PADDLE)
Maximum operating pressure *	**400 bar** 5800 psi	**400 bar** 5800 psi
Minimum burst pressure *	**800 bar** 11 600 psi	**800 bar** 11 600 psi
Maximum operating temperature	**80 °C** 176 °F	**100 °C** 212 °F
Minimum operating temperature	**–60 °C** –76 °F	**–60 °C** –76 °F
Ingress protection	**IP67**	**IP67**

*** NOTE** Pressures are at ambient temperature, static or dynamic. One-piece 316 stainless steel process connection and billet aluminium housing.

Check that the switch materials suit the liquid being monitored:

Chemical Compatibility Checker ›

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