



F240EA Pneumatic Liquid Flow Switch

Installation Instructions

Part No. 24-7664-3132, Rev. A
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Refer to the [QuickLIT website](#) for the most up-to-date version of this document.

Applications

IMPORTANT: Do not use F240EA Pneumatic Liquid Flow Switches with fluids that are incompatible with the wetted materials (forged normal brass, free machining bronze, and Viton®) and which are classed as a hazardous material. Use in this condition may cause malfunction or improper operation.

IMPORTANT: Do not use F240EA Pneumatic Liquid Flow Switch where the fluid in the pipes drops below the fluid's freezing point, causing an internal freeze-up.

IMPORTANT: Use this F240EA Pneumatic Liquid Flow Switch only as an operating control. Where failure or malfunction of the flow switch could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the flow switch.

IMPORTANT: Utiliser ce F240EA Pneumatic Liquid Flow Switch uniquement en tant que dispositif de régulation. Lorsqu'une défaillance ou un dysfonctionnement du flow switch risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du flow switch.

The F240EA Pneumatic Liquid Flow Switch detects the increase or decrease of liquid flow in a pipe. The F240EA switch responds to liquid flow in a pipe that carries water, ethylene glycol, or other nonhazardous fluids.

The F240EA switch uses a variety of paddle sizes to respond to liquid flow rates in applications with pipe sizes greater than 1-inch trade size. The paddle has three segments. You can remove (or trim) the paddle segments for pipe sizes under 3 inches. A 6 in. paddle that can be trimmed for 4 in. and 5 in. pipe is available.

The F240EA Pneumatic Liquid Flow Switch acts as an automatic operating control in air conditioning, heating and cooling water systems and in processing work.

Typical applications include:

- Flow detection switch to start the refrigeration compressor on a liquid chiller system when flow has been established.
- Signal or alarm switch to indicate when the pump on a condenser cooling water system shuts down.
- Proving the flow of water before an electric immersion heater is turned on.

Installation

The F240EA Pneumatic Liquid Flow Switch is packaged with 1 in., 2 in., and 3 in. stainless steel flow paddles along with a paddle screw and lock washer. See Table 2 for replacement parts.

IMPORTANT: The flow paddle must not touch the pipe or any restrictions in the pipe. If the flow paddle touches the pipe (or restrictions in the pipe), the switch may not be able to properly detect changes in fluid flow.

Adjust the flow paddles to the size of the pipe used. Install the large flow paddle, if needed. Trim the flow paddle at the arc corresponding to the pipe size. See Figure 1, Figure 2, Figure 3, and Table 1.

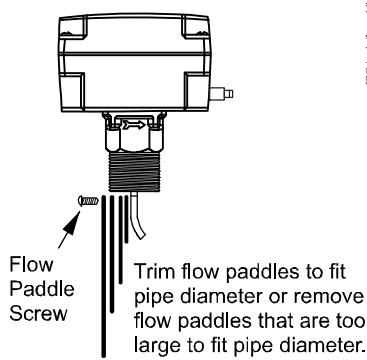


Figure 1: Installing the Flow Paddles

Note: Allow a minimum clearance of 3/16 in. (5 mm) between the end of the flow paddle and the pipe wall.

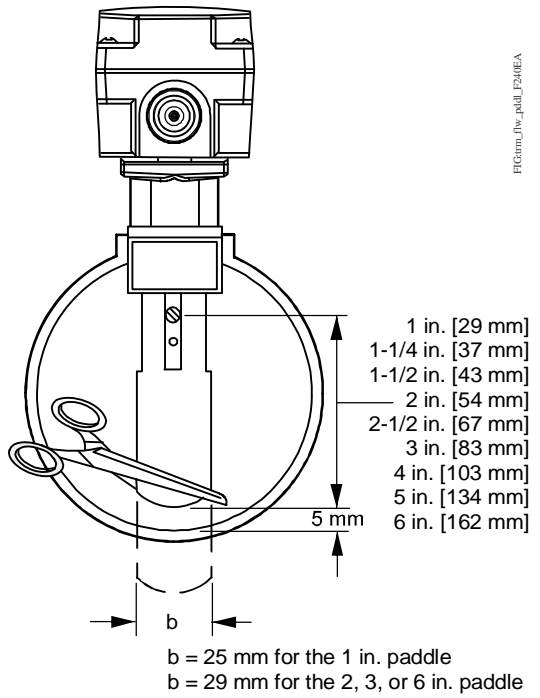


Figure 2: Trimming the Flow Paddles

Table 1: Trimming the Flow Paddles (Part 1 of 2)

Paddle Size	Use or Trim This Paddle to Fit
1 in.	1 in.
1-1/4 in.	2 in.
1-1/2 in.	2 in.
2 in.	2 in.
2-1/2 in.	3 in.
3 in.	3 in.
4 in.	6 in.

Table 1: Trimming the Flow Paddles (Part 2 of 2)

Paddle Size	Use or Trim This Paddle to Fit
5 in.	6 in.
6 in.	6 in.

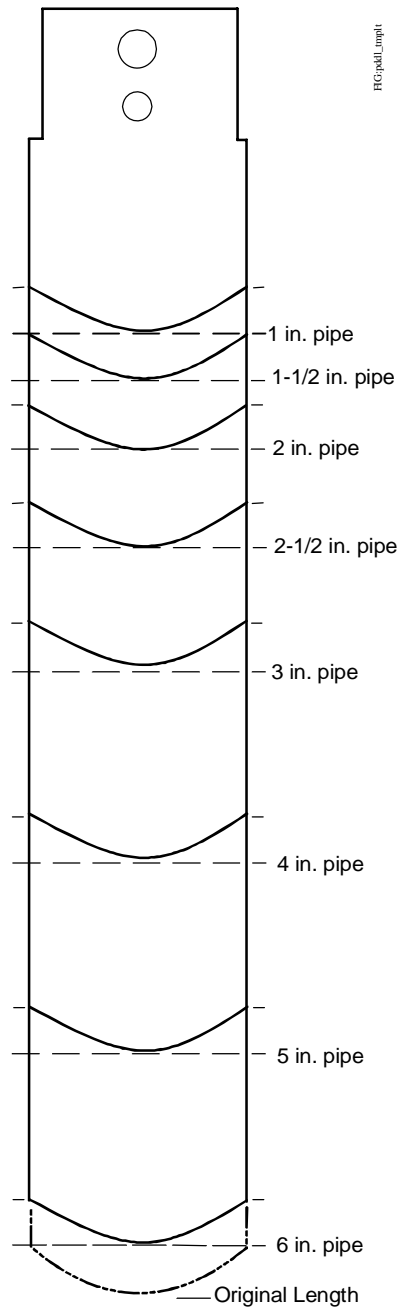


Figure 3: Trimming Diagram for the Large Flow Paddle

Dimensions

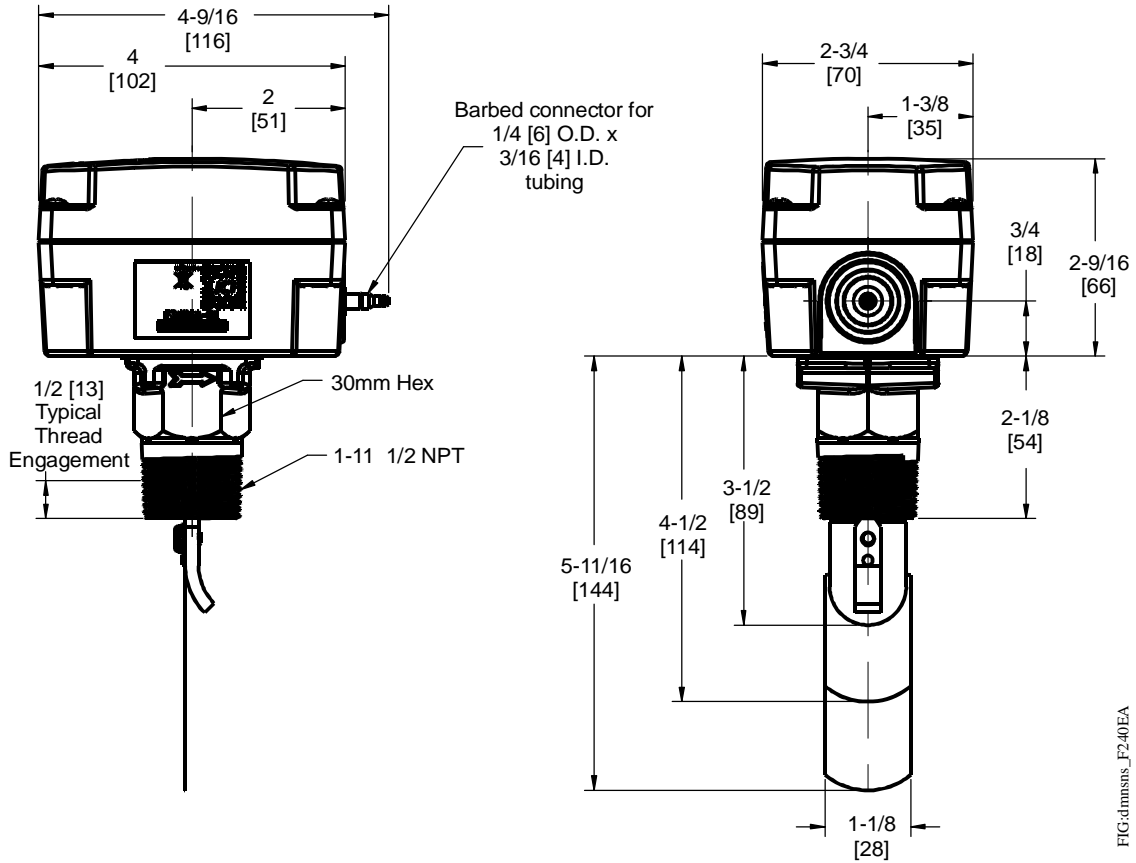


Figure 4: Dimensions for F240EA Standard Flow Switch, in. [mm]

Accessories

Table 2: Replacement Paddle Parts

Product Code Number	Description
KIT21A-600	Stainless steel 3-piece paddle (3 in., 2 in., and 1 in. segments)
KIT21A-601	Stainless steel 6 in. paddle
KIT21A-602	Stainless steel 3-piece paddle (3 in., 2 in., and 1 in. segments) and Stainless steel 6 in. paddle

Mounting

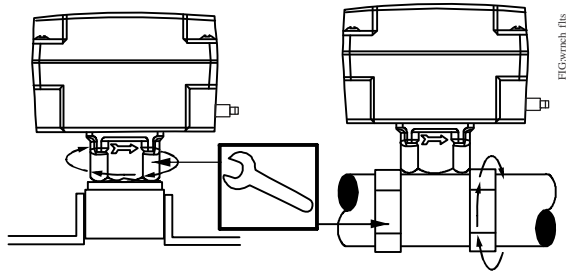


Figure 5: Use Only the Wrench Flats Provided

IMPORTANT: To avoid damaging the switch, do not tighten the switch to the tee by grasping the switch enclosure. Use only the wrench flats provided.

Mount the F240EA Pneumatic Liquid Flow Switch using the following guidelines:

- Install the switch so that the enclosure and interior are accessible.
- Mount the switch so that the flow of the fluid is in the direction of the arrow on the enclosure.
- Use a pipe union on each side of the flow switch to allow for easy removal or replacement.
- Do not allow the pipe to extend too far into the flow switch casing.
- Use pipe thread sealer or Teflon® tape on the male threads only.

For standard 1 in. x 1 in. pipe installation, mount the F240EA Pneumatic Liquid Flow Switch in a standard 1 in. x 1 in. x 1 in. tee. For larger sizes of pipe, use a reducing tee to keep the flow switch close to the pipe and provide adequate paddle length in the flow stream.

Example: Use a 2 in. x 2 in. x 1 in. tee for a 2 in. pipe. If a standard 2 in. x 2 in. x 2 in. tee is used, install a face or hex bushing in the top opening to reduce the top opening to 1 in.

Location Considerations

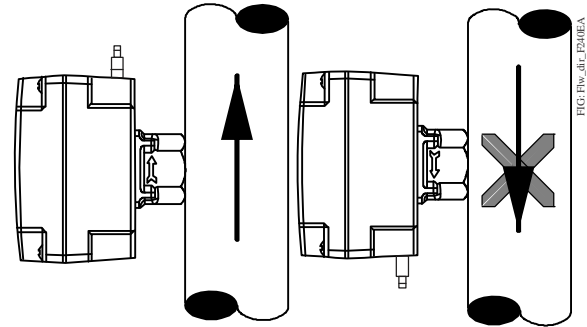


Figure 6: Flow Direction for Vertical Mounting

IMPORTANT: Do not use in a vertical pipeline with a downward flow (Figure 6).

Mount the F240EA Pneumatic Liquid Flow Switch in a horizontal pipeline or a vertical pipeline with upward fluid flow. When mounted in a vertical pipe with an upward flow, the switch trips at a slightly higher flow than shown in Table 3 and Table 4, due to the effect of gravity on the switch mechanism.

Mount the F240EA Pneumatic Liquid Flow Switch in a section of pipe where there is a straight run of at least 5 pipe diameters from the nearest elbow, valve, or other pipe restriction (Figure 7).

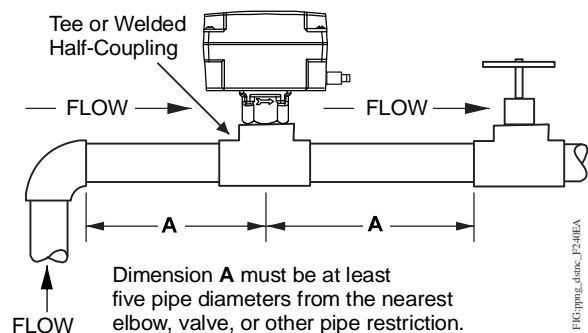


Figure 7: Required Piping Distance

When mounting the flow switch on horizontal pipe, mount the flow switch within 60 degrees of vertical. See Figure 8.

Note: Do not subject the flow switches to water hammer. Use a suitable water hammer arrester if a fast-closing valve is located downstream of the switch. See Figure 9.

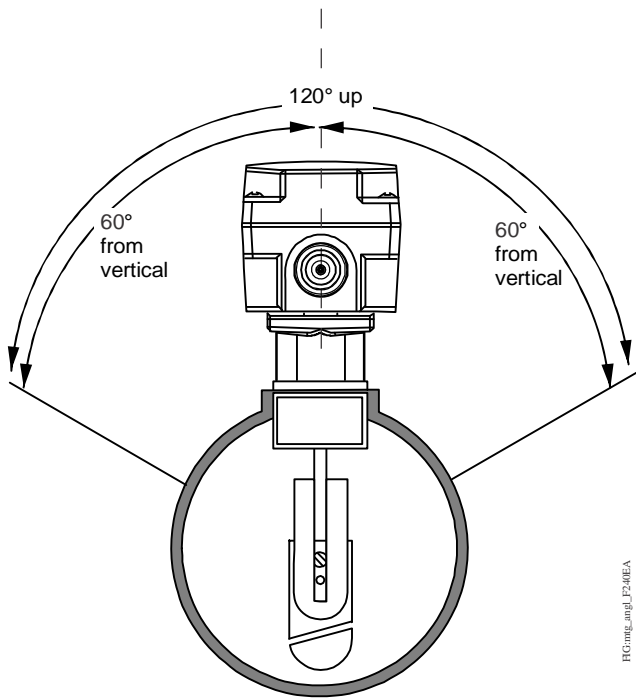


Figure 8: Angle Allowed

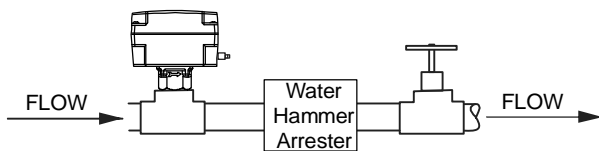


Figure 9: Water Hammer Arrester Location

Setup and Adjustments



CAUTION: Risk of Property Damage. Do not set the switch lower than the factory setting. The switch is factory set at approximately the minimum flow rate. A lower setting may result in the switch failing to return to a no-flow position which may result in damage to the controlled equipment or other property.

MISE EN GARDE : Risque de dégâts matériels.

Ne pas régler le commutateur sur une valeur inférieure au paramètre d'usine. Le commutateur est réglé en usine sur une valeur correspondant environ au débit minimum. Un réglage sur une valeur inférieure risque d'empêcher le commutateur de revenir sur une position « aucun-débit », ce qui risque d'endommager l'équipement contrôlé ou de provoquer d'autres dégâts matériels.



CAUTION: Risk of Property Damage.

Do not attempt to change sealed settings. Attempted adjustment may damage the control or cause loss of calibration or other property damage.

MISE EN GARDE : Risque de dégâts matériels.

Ne pas essayer de modifier la position des éléments de réglage bloqués. Toute tentative de réglage risque d'endommager le dispositif de contrôle ou de provoquer la perte des valeurs d'étalonnage ou d'autres dégâts matériels.

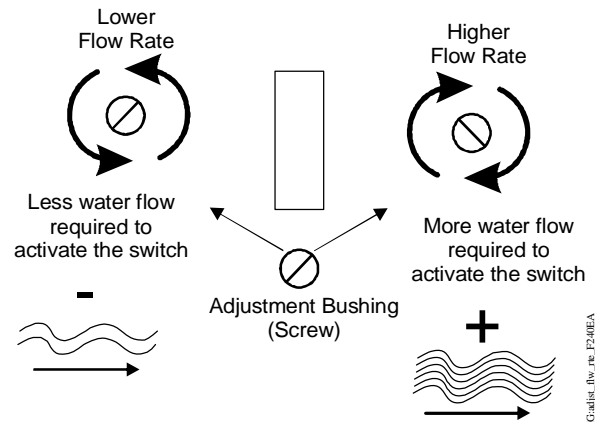


Figure 10: Flow Rate Adjustment

To adjust the setting of the flow switch:

1. Remove the enclosure cover.
2. Adjust the control's flow rate (Figure 10):
 - Turn the adjustment screw **clockwise** to **raise** the flow rate required to activate the switch.
 - Turn the adjustment screw **counterclockwise** to **lower** the flow rate required to activate the switch

Note: Do not lower the flow rate required to activate the switch, unless the flow rate required to activate the switch was raised from the factory-set flow rate.

3. Replace the enclosure cover and tighten the cover screws with 12 in·lb of torque.

To verify that the flow rate is set above the factory minimum, depress the main lever (see Figure 11) multiple times:

- If the lever clicks every time when returning to the original position, then the control's flow rate may be set at or above the factory-set minimum value.

- If the lever fails to click every time when returning to the original position, then the control's flow rate is set below the factory-set minimum value.

Turn the adjustment screw **clockwise** to **raise** the flow rate required to activate the switch. See Figure 10.

Table 3 and Table 4 show the range of flow settings typically obtainable. These values represent installation in a horizontal line with at least 10 pipe diameters of straight pipe before and after a typical tee. The typical tee has a 1 in. tapping (without bushing) facing up. The F240EA switch is threaded into this tapping. Fluid is water at 40 psi (276 kPa) pressure.

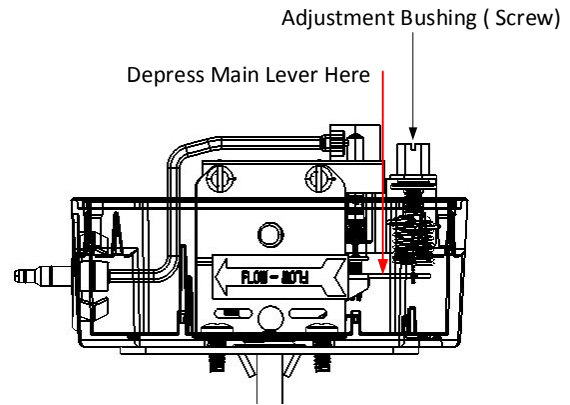


Figure 11: Minimum Adjustment

Table 3: Flow Rates for 1 in. to 3 in. Paddles

		GPM (m ³ /hr) Required to Activate Switch for Pipe Size (in.)									
		1	1-1/4 ¹	1-1/2 ¹	2	2-1/2 ²	3	4 ³	5 ³	6 ³	8 ³
Minimum Adjustment	Flow Increase (Close)	4.20 (0.95)	5.80 (1.32)	7.50 (1.70)	13.7 (3.11)	18.0 (4.09)	27.5 (6.24)	65.0 (14.8)	125 (28.4)	190 (43.2)	375 (85.2)
	Flow Decrease (Open)	2.50 (0.57)	3.70 (0.84)	5.00 (1.14)	9.50 (2.16)	12.5 (2.84)	19.0 (4.32)	50.0 (11.4)	101 (22.9)	158 (35.9)	320 (72.7)
Maximum Adjustment	Flow Increase (Close)	8.80 (2.00)	13.3 (3.02)	19.2 (4.36)	29.0 (6.59)	34.5 (7.84)	53.0 (12.0)	128 (29.1)	245 (55.6)	375 (85.2)	760 (173)
	Flow Decrease (Open)	8.50 (1.93)	12.5 (2.84)	18.0 (4.01)	27.0 (6.13)	32.0 (7.27)	50.0 (11.4)	122 (27.7)	235 (53.4)	360 (81.8)	730 (166)

1. Values for the 2 in. paddle trimmed to fit the pipe.
2. Values for the 3 in. paddle trimmed to fit the pipe.
3. Values calculated for factory-installed set of 1 in., 2 in., and 3 in. paddles.

Table 4: Flow Rates for 4 in. to 8 in. Pipe Sizes with Larger Paddle

		GPM (m ³ /hr) Required to Activate Switch for Pipe Size (in.)			
		4	5	6	8
Minimum Adjustment	Flow Increase (Close)	37.0 (8.4) ¹	57.0 (12.9) ¹	74.0 (16.8) ¹	205.0 (46.6) ¹
	Flow Decrease (Open)	27.0 (6.1) ¹	41.0 (9.3) ¹	54.0 (12.3) ¹	170.0 (38.6)
Maximum Adjustment	Flow Increase (Close)	81.0 (13.4) ¹	118.0 (26.8) ¹	144.0 (32.7) ¹	415.0 (94.2) ¹
	Flow Decrease (Open)	76.0 (17.3) ¹	111.0 (25.2) ¹	135.0 (30.7) ¹	400.0 (90.8) ¹

1. These GPM (m³/hr) values are for the switch with a 6 in. paddle. For 4 in. and 5 in. size pipe, trim the paddle to fit the pipe.

Operation

The flow switch responds to pressure exerted on the paddle by the flowing liquid. The pneumatic control port opens on flow decrease and closes on flow increase.

A range adjustment screw adjusts the rate of the flow required to activate the switch. For flow rates, see Table 3 and Table 4.

See Figure 12 for a typical installation of an F240EA Pneumatic Liquid Flow Switch in an explosion-proof application (or an application where it is more practical to run a single pneumatic line instead of electrical wiring).

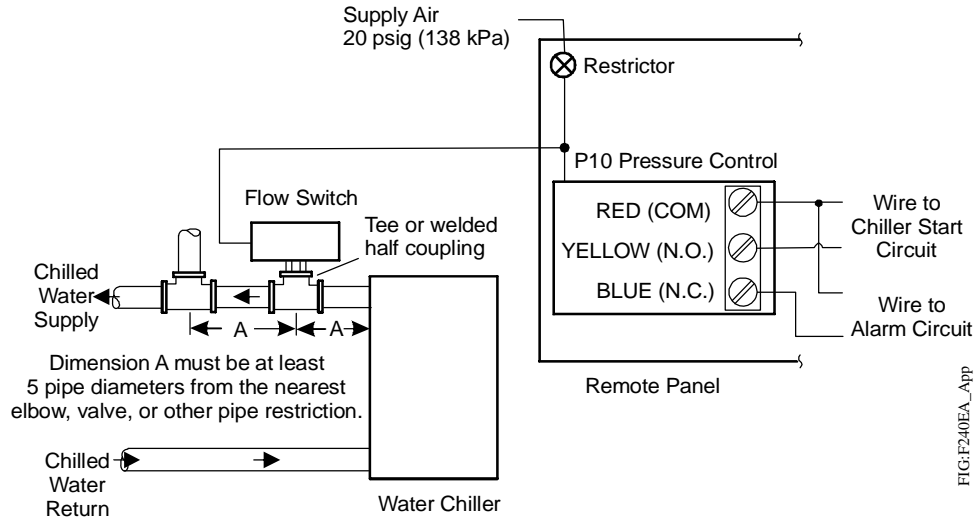


Figure 12: Typical Installation of the F240EA Pneumatic Liquid Flow Switch

Checkout Procedure

Before you leave the installation, observe at least three complete operating cycles to be sure that all components are functioning correctly.

Repair Information

Do not make field repairs, except for replacement of the flow paddle. For a replacement F240EA pneumatic fluid flow switch or paddle kit, contact the nearest Johnson Controls/PENN® distributor. For more information, contact Johnson Controls/PENN application engineering at 1-800-275-5676.

Ordering Information

Table 5: F240EA Pneumatic Liquid Flow Switch

Product Code Number	Description
F240EA-01C	Pneumatic liquid flow switch with Type 3R (NEMA) enclosure, stainless steel 3-piece paddle (3 in., 2 in., and 1 in. segments)

Table 6: Replacement Paddle Parts

Product Code Number	Description
KIT21A-600	Stainless steel 3-piece paddle (3 in., 2 in., and 1 in. segments)
KIT21A-601	Stainless steel 6 in. paddle
KIT21A-602	Stainless steel 3-piece paddle (3 in., 2 in., and 1 in. segments) and Stainless steel 6 in. paddle

Troubleshooting

Table 7: Troubleshooting

Symptom	Solution
Water (condensate) appears within the enclosure.	If the control has a Type 3R enclosure, inspect the grommet in the field-installed cable gland or conduit fitting, and replace the grommet if it is defective.
Fluid from the tank leaks into the enclosure due to a rod seal failure.	Replace the flow switch.
Switch does not activate due to debris in switch mechanism.	Clear any debris from within the switch mechanism. Test the operation of the switch several times for proper operation.
Switch action is reversed.	Ensure pneumatic connections are made properly.
Switch does not function.	Check the pneumatic connections.
Switch fails to return to the no-flow position.	The switch may be set lower than the factory setting. Increase the setting. On vertical pipes, ensure that the direction of flow is up. The arrow on the switch enclosure must point in the direction of the flow.
Switch does not activate on flow increase.	Check for a cracked or broken paddle. Replace the paddle, if necessary.

Technical Specifications

F240EA Pneumatic Liquid Flow Switch

Switch	Pneumatic
Ambient Operating Conditions	32 to 140°F (0 to 60°C)
Maximum Fluid Temperature ¹	250°F (121°C)
Maximum Fluid Pressure	290 psi (2,000 kPa)
Enclosure	Type 3R (NEMA)/IP43
Paddle	Stainless steel
Pipe Connector	1 in. 11-1/2 NPT Threads
Pneumatic Switch Action	Closes on increasing flow, opens on decreasing flow
Tubing Connector	Barb fitting for 1/4 in. O.D. plastic tubing
Shipping Weight	1.7 lb (0.8 kg)

1. Ensure that the low liquid temperature combined with the low ambient temperature does not lead to freezing the liquid inside the body (or bellows, where appropriate). Please observe the liquid freezing point.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult Johnson Controls/PENN Refrigeration Application Engineering at 1-800-275-5676. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



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