FLOWSERVE

USER INSTRUCTIONS

F5 Switch Box

PMENIM0005-05-A5 02/19

Installation

Operation

Maintenance

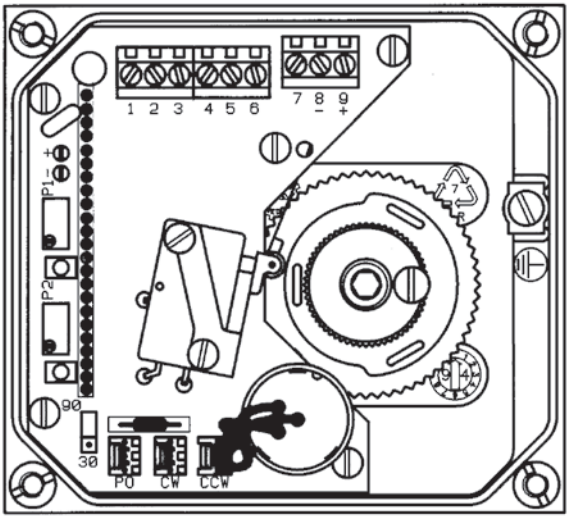
Experience In Motion

Contents

1. Introduction

The PMV F5 is a feedback unit uniquely designed to mount on top of the PMV P5, EP5 or P-2000 positioners with minimum parts required. The F5 can also be mounted on actuators with an additional mounting kit. The F5 is available in two different enclosures, standard or explosion proof.

The standard enclosure for F5 offers a gasketed enclosure with optional American and European intrinsically safe approvals. The explosion proof version carries North American and European approvals. Both enclosures can be furnished with Namur sensors, mechanical or proximity switches, potentiometer or 4-20 mA position transmitter or a combination of these items.

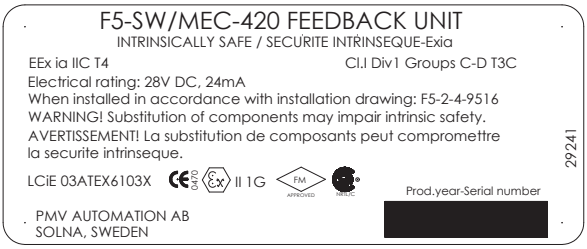


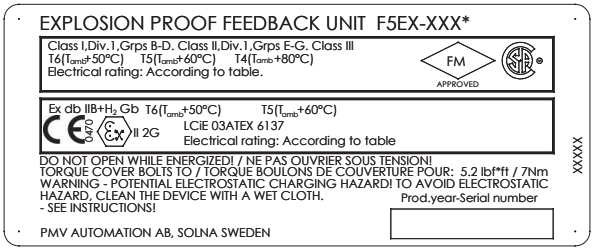
Warning!

Special Conditions for Safe Use
The enclosure of PMV F5 Intrinsically Safe version is made of aluminum and any impact or friction caused by external objects shall be avoided in the application.

The various circuits of the electrical apparatus must only be connected to intrinsically safe certified electrical apparatus, and these combinations must be compatible with the rules of intrinsic safety.

The various circuits may be considered as separated if none of the voltages applied exceeds 30 V.


F5-SW/MEC-420 FEEDBACK UNIT
INTRINSICALLY SAFE / SECURITE INTRINSEQUE-Exia
EEx ia IIC T4
Cl.I Div1 Groups C-D T3C
Electrical rating: 28V DC, 24mA
When installed in accordance with installation drawing: F5-2-4-9516
WARNING! Substitution of components may impair intrinsic safety.
AVERTISSEMENT! La substitution de composants peut compromettre la securite intrinseque.
29241
LCiE 03ATEX6103X
II 1G
FM
APPROVED
Prod.year-Serial number
PMV AUTOMATION AB
SOLNA, SWEDEN


EXPLOSION PROOF FEEDBACK UNIT F5EX-XXX*
Class I,Div.1,Grps B-D. Class II,Div.1,Grps E-G. Class III
T6(Tamb+50ºC) T5(Tamb+60ºC) T4(Tamb+80ºC)
Electrical rating: According to table.
FM
APPROVED
Ex db IIB+H2 Gb T6(Tamb+50ºC) T5(Tamb+60ºC)
0470
II 2G
LCiE 03ATEX 6137
Electrical rating: According to table
DO NOT OPEN WHILE ENERGIZED! / NE PAS OUVRIER SOUS TENSION!
TORQUE COVER BOLTS TO / TORQUE BOULONS DE COUVERTURE POUR: 5.2 lbf*ft / 7Nm
WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD! TO AVOID ELECTROSTATIC HAZARD, CLEAN THE DEVICE WITH A WET CLOTH.
- SEE INSTRUCTIONS!
Prod.year-Serial number
XXXXX
PMV AUTOMATION AB, SOLNA SWEDEN

2. Storage

PMV feedback modules are precision instruments which should be stored and handled accordingly to avoid problems or damage. Feedback modules contain electronic components which can be damaged by exposure to water. Appropriate precautions should be taken to protect units while in storage.

Warehousestorage

- Stored in original PMV shipping containers, units should be stored in an environmentally controlled area, i.e. clean, cool (15-26°C, 60-80°F) and dry, out of direct sunlight or weather exposure.

Field storage

- If feedback units must be stored outdoors, make sure front covers are tightened, all conduits entries are sealed and that units not are exposed to direct sunlight, rain or snow.

Potential damage mechanism

When units are stored in hot, humid climates, the daily heating/cooling cycle will cause air to expand/contract and be drawn in and out of the feedback housing through ports left open. Dependent on the local temperature variations, humidity and dew points and time in storage, condensation could occur and accumulate inside causing erratic operation or failure due to water and corrosion. The potential for condensation damage is especially high in southern climates and aggravated if units are exposed to direct sunlight.

For further assistance, please contact you nearest PMV office.

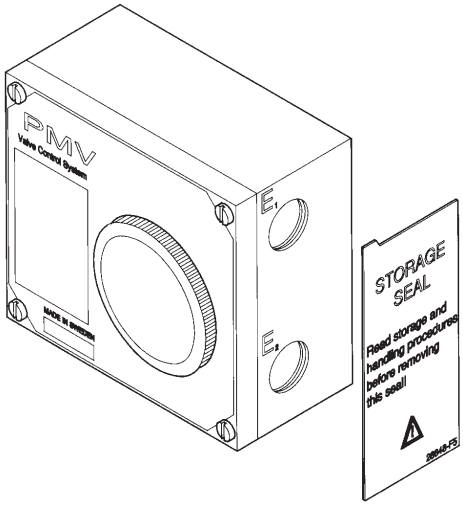
Storage Seal

F5 is supplied with conduit entry points sealed. The seal is only a storage seal, not to be used as seal when F5 is in operation.

If Storage Seal is removed or damaged, make sure conduit entry points are resealed before further shipping or storage.

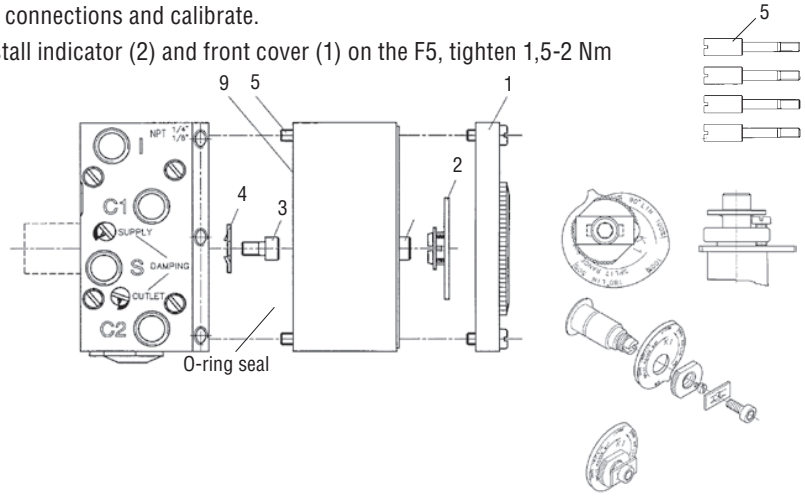
Use proper cable glands or vapour proof tape.

Mount F5 on positioner P5/EP5 or actuator/ valve package. Remove Storage Seal for conduit entry E1 & E2, make electrical connections, install proper cable glands or plugs to ensure the units sealing.



3. Mounting on P5 or EP5

- See www.pmv.nu/downloads for video clip.
- Remove the front cover and the indicator from the positioner.
- Loosen and remove the Allen head screw (3) (5mm hex-wrench)
- Install drive coupling (4) on the positioner shaft, secure it with screw (3)
- Check that F5 is fitted with 4 nos of screws (5) and O-ring (9), install the F5 on top of the positioner unit, make sure that the coupling is properly engaged before tightening the four screws (5)
- Make connections and calibrate.
- Reinstall indicator (2) and front cover (1) on the F5, tighten 1,5-2 Nm

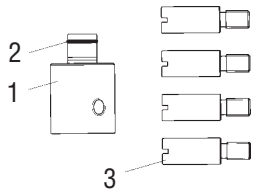


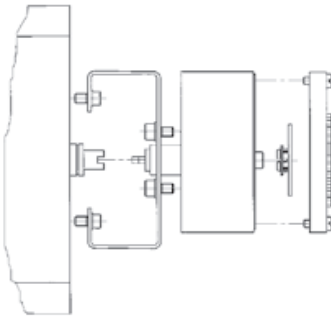
Mounting F5 on actuator (On/Off control valves)

Install the spindle adaptor (1) into F5 shaft, make sure that a spring clip (2) is fitted. A solid click should be heard when the spindle adaptor is properly installed into the F5 shaft.

Mount F5 on the actuator using a mounting kit and the ISO F05 mounting holes on the bottom of the F5. Make sure that the F5 spindle is properly alligned on top of the actuator.

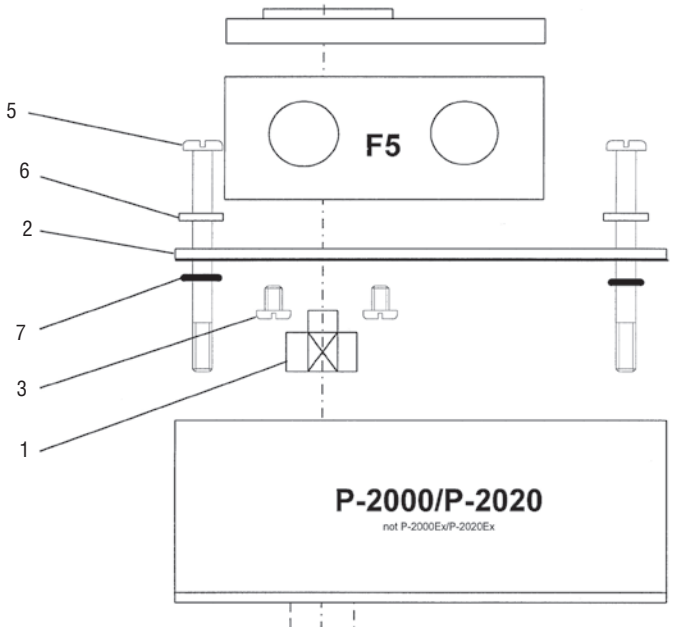
Check that the four fasteners (3) are installed into F5.





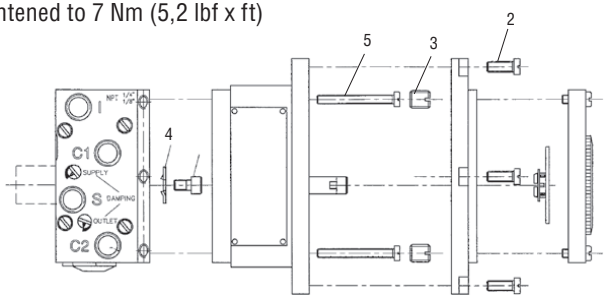
4. Mounting on P-2000/P-2020

- Remove front cover, indicator and cam nut from the positioner
- Replace the cam nut with coupling (1), calibrate the positioner.
- Check that the gasket is fitted to the bottom of plate (2), install screws (5) (3x long, 1x short) plastic washer (6) and O-rings (7).
- Secure the F5 to the plate (2) with screws (3).
- Install assembly on to the positioner, make sure that coupling (1) is properly engaged.
- Make electrical connections and calibrate.



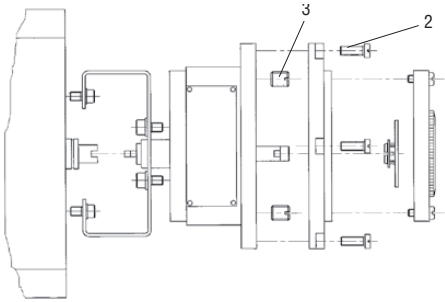
5. Installing F5-EX on P5/EP5

- See www.pmv.nu/downloads for video clip.
- Remove front cover, indicator and Allen head screw from the positioner.
- Install drive coupling (4) and secure it with the Allen head screw.
- Remove front covers and indicator from the F5-EX unit.
- Remove screws (3).
- Install F5-EX on P5/EP5, make sure drive coupling is properly engaged before tightening screws (5).
- Reinstall and tight screws (3). Connect and calibrate.
- Reinstall front covers and indicator.
- Front cover screws (2) shall be tightened to 7 Nm (5,2 lbf x ft)



6. Installing on an actuator

- Remove front covers and indicator from the F5-EX unit.
- Install drive shaft into F5-EX, a solid click should be heard when spindle adapter is properly installed.
- Mount F5-EX on the actuator using the F05 holes and a mounting kit.
- Connect and calibrate, reinstall front covers and indicator.
- Front cover screws (2) shall be tightened to 7 Nm (5,2 lbf x ft).



Connections

Conduit entries are PG13,5 (M20) or NPT 1/2“

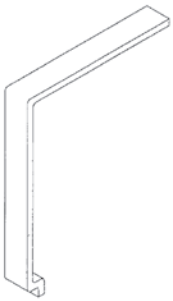
Make electrical connections according to wiring diagrams and tighten cable glands. Terminals are 2.5 mm2 (AVG 14) screw terminals.

Adjustments

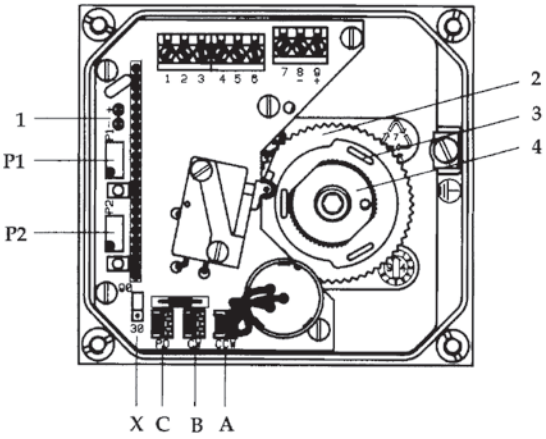
CAUTION! Moving parts – risk of injury.

The cams/gear wheel are secured in position by friction provided from the cam/shaft assembly. To adjust switches and/or position transmitter, rotate gear wheel (2) and cams (3) to desired position using tool F5-22 or tip of a screw driver that fits snuggly in one of the slotted holes. Start calibration procedure by adjusting position transmitter first, then continue with the lower switch and complete with the upper switch.

If cams exhibit high stiction, rotate them back and forth rapidly several times. Do not adjust nut (4) or lubricate cams, call PMV for assistance.



F5-22

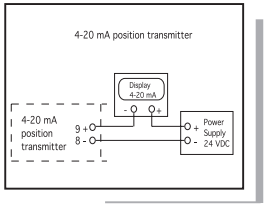


7. Calibration

4-20 m A position transm itter

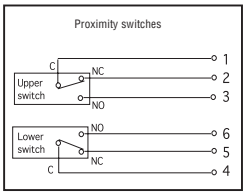
Instruction video available on www.pmv.nu/downloads

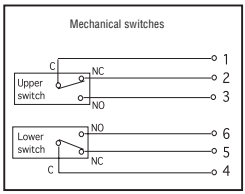
1. Set direction of rotation by placing potentiometer jumper in location A or B. (Location A for counter clockwise CCW valve/actuator rotation (Direct), location B for clockwise CW valve/ actuator rotation (Reverse).
2. Set jumper X to the desired valve rotation angle, for 30 deg or 45 deg rotation choose position 30, For 60 deg or 90 deg rotation choose position 90, for 180 deg rotation choose position 30 and for 270 deg rotations choose position 90. For 30° deg - 45° deg choose pos 30.
3. Make electrical connections according to wiring diagram. Power supply should be >9 to <28 VDC (24 VDC recommended).
4. Connect a 4-20 mA meter to testoutlet 1. Adjust potentiometer P1 20 revolutions CW & P2 20 revolutions CCW. Stroke actuator to the desired 4 mA position and check that current deflection is correct. Rotate gear wheel 2 with tool F5-22 or tip of a screw driver placed in one of the slotted holes until minimum value is reached.
5. Adjust the output signal 4,0 mA with potentio- meter P2. LED will illuminate when out put is 4 mA (±1%) or less. Stroke actuator to the desired 20 mA position and adjust the output to 20,0 mA with potentiometer P1. LED will illuminate when out put is 20 mA (±1%) or more.
6. Stroke actuator again, check and adjust 4 mA and 20 mA readings. Install front cover or set switches first, as follows:

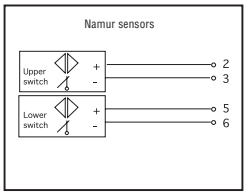


8. Switches & Sensors

Limit switches cams must be adjusted separately with valve in an open and closed position. With the valve in fully open or closed position adjust the lower cam 3 to desired position by rotating it with special tool F5-22 or by the tip of a screw driver placed in one of the slotted holes on the cam. Stroke the valve fully and repeat the procedure above to set the upper cam. Stroke valve open/ closed to check proper limit switch operation.

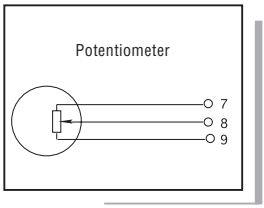






Potentiom eter only (no transmitter function)

1. Make electrical connections to terminals 7,8 and 9. Check that the potentiometer is connected to connector C on the printed circuit board.
2. Stroke the actuator to check direction of travel indicated by the potentiometer. To change direction of travel, swap wires at terminals 7 and 9.
3. Stroke the actuator to the position where the minimum potentiometer resistance is desired.
4. Adjust the potentiometer output reading to approx. 50 Ohm by rotating gear wheel 2 with special tool F5-22 or tip of a screw driver placed in one of the slotted holes.
5. Stroke the actuator to desired maximum resistance position and check reading.
6. Repeat steps 3-5 if necessary to obtain desired resistance change.
7. Set switches or install frontcover.



Technical specifications

General	
Conduit entries	2x 1/2" NPT or 2x M20x1,5
Enclosure F5/F5IS	Die cast aluminum
Enclosurel F5EX	Chill cast aluminum
Surface treatment	Electrocoated
Fasteners	Stainless steel A2/A4
Terminals	2,5 mm²(AVG 14)

Switches, mechanical	
Type	Mechanical SPDT V3
Rating	250VAC 6/2,5A
Approvals	CSA, UL,VDE
Temperature range	-40°C to 100°C (-40°F to 212°F)*

Switches Inductive Namur	
Type	Inductive Namur
Load current	≤ 1 mA ≥ 3 mA
Voltage range	5-25 VDC
Hysteresis	0,2%
Temperature range	-25°C to 85°C (-13°F to 185°F)*

Switches proximity	
Type	SPDT hermetically sealed
Contact rating	2 W or 2 VA @ 30 VDC/VAC, 0,1A
Breakdown voltage	200 VDC
Contact resistance	0,2 Ω
Operating lifetime	>10 million operations
Temperature range	-40°C to 105°C (-40°F to 221°F)*

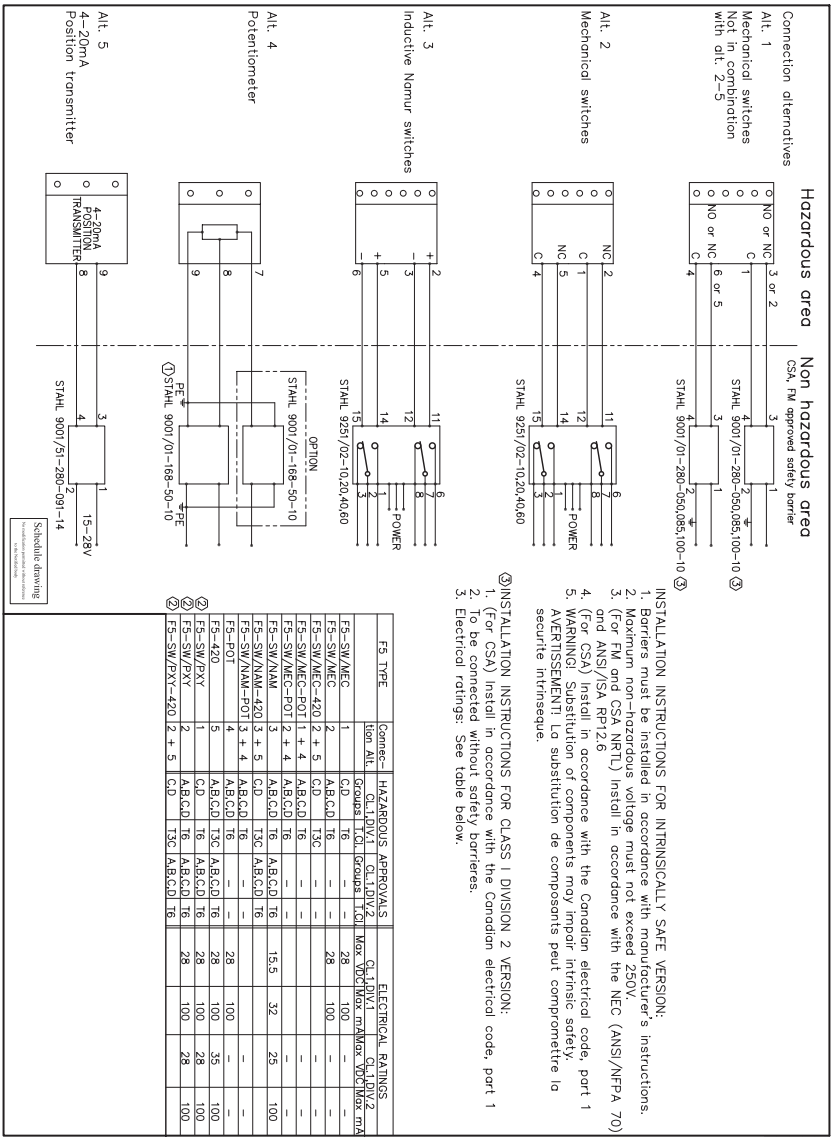
Potentiometer	
Output	5 kΩ (4kΩ at 90°)
Elements	Conductive plastic
Power rating at 70°	1W
Linearity	1%
Resolution	Essentially infinite
Temperature range	-40°C to 125°C (-40°F to 257°F)*

4-20 mA position transmitter	
Power supply	9-28VDC (24VDC recommended)
Output signal	4-20 mA
LED indication at 4 mA	±1%
LED indication at 20 mA	±1%
Resolution	Infinite
Min. rotation travel	30°
Max. rotation travel	90°
Linearity	<1% of full scale
Hysteresis	<0,5% of full scale
Output current limit	24 mA DC
Load impedance	800 Ω at 24 VDC
Temperature range	-40°C to 80°C (-40°F to 176°F)

Weight	
F5/F5IS	0,7 kg (lbs 1,5)
F5EX	2,1 kg (lbs 4,6)

* Component temperature range may differ depending on approvals for hazardous locations.

9. Connection of F5 intrinsically safe version



INSTALLATION INSTRUCTIONS FOR INTRINSICALLY SAFE VERSION:

1. Barriers must be installed in accordance with manufacturer's instructions.
2. Maximum non–hazardous voltage must not exceed 250V.
3. (For FM and CSA NRTL) Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP12.6
4. (For CSA) Install in accordance with the Canadian electrical code, part 1
5. WARNING: Substitution of components may impair intrinsic safety.
   AVERTISSEMENT! La substitution de composants peut compromettre la securite intrinseque.

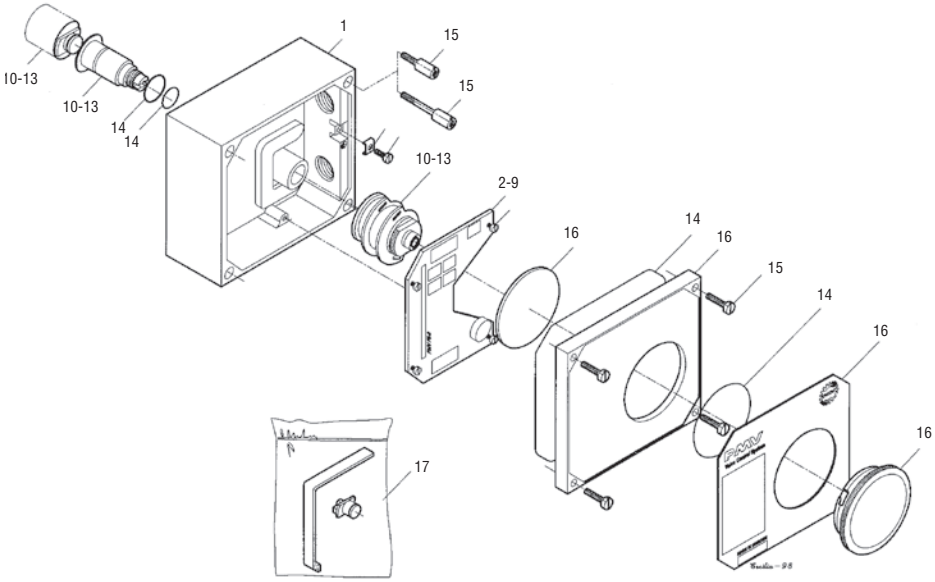
③ INSTALLATION INSTRUCTIONS FOR CLASS I DIVISION 2 VERSION:

1. (For CSA) Install in accordance with the Canadian electrical code, part 1
2. To be connected without safety barrieres.
3. Electrical ratings: See table below.

F5 TYPE	Connection Alt.	HAZARDOUS APPROVALS CL.1,DIV.1 Groups	T.Cl.	CL.1,DIV.2 Groups	T.Cl.	ELECTRICAL RATINGS CL.1,DIV.1 Max. VDC	Max. mA	CL.1,DIV.2 Max. VDC	Max. mA
F5–SW/MEC	1	C,D	T6	–	–	28	100	–	–
F5–SW/MEC	2 + 5	A,B,C,D	T6	–	–	28	100	–	–
F5–SW/MEC–420	2 + 5	C,D	T3C	–	–			–	–
F5–SW/MEC–POT	1 + 4	A,B,C,D	T6	–	–			–	–
F5–SW/MEC–POT	2 + 4	A,B,C,D	T6	–	–			–	–
F5–SW/NAM	3	A,B,C,D	T6	A,B,C,D	T6	15.5	32	–	–
F5–SW/NAM–420	3 + 5	C,D	T3C	A,B,C,D	T6			–	–
F5–SW/NAM–POT	3 + 4	A,B,C,D	T6	–	–	28	100	–	–
F5–POT	4	A,B,C,D	T6	–	–	28	100	–	–
F5–420	5	A,B,C,D	T3C	A,B,C,D	T6	28	100	35	100
F5–SW/PXY	1	C,D	T6	A,B,C,D	T6	28	100	28	100
F5–SW/PXY	2	A,B,C,D	T6	A,B,C,D	T6	28	100	28	100
F5–SW/PXY–420	2 + 5	C,D	T3C	A,B,C,D	T6				

② ② ②

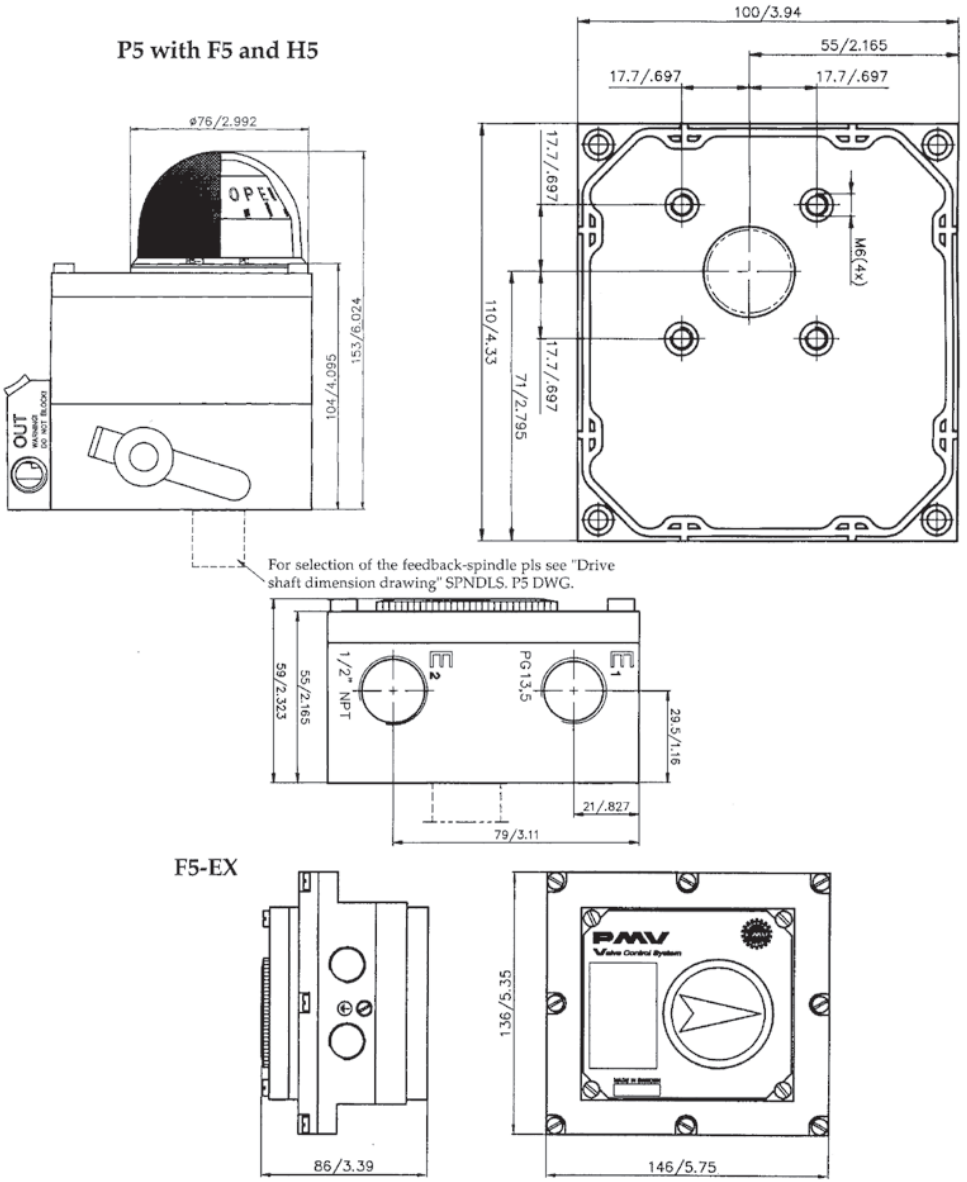
10. Spare Parts



PMV can only offer spare parts for non-certified units.

DWG No	PMV Part no	Description	Qty	Set
1		Housing		
2	28176	PC board incl. 2 x Mechanical switches	1	
3	28177	PC board incl. 2 x Mechanical switches and potentiometer	1	
4	28178	PC board incl. 2 x Mechanical switches and 4-20 mA transmitter	1	
5	28179	PC board incl. 2 x Namur sensors	1	
6	28181	PC board incl. 2 x Namur sensors and 4-20 mA transmitter	1	
7	29272	PC board incl. 2 x Proximity switches	1	
8	29270	PC board incl. 2 x Proximity switches and potentiometer	1	
9	29271	PC board incl. 2 x Proximity switches and 4-20 mA transmitter	1	
10	29227	Cam & shaft assy for Mechanical switches or Namur sensors	1	
11	29275	Gam & shaft assy for Proximity switches	1	
12	29228	Cam & shaft assy for Mechanical switches or Namur sensors + transmitter	1	
13	29276	Cam & shaft assy for Proximity switches + transmitter	1	
14	F5-SEAL-NBR	Elastomer kil, itrile NBR		1
15	F5-SCREWS	Screw kil F5		1
16	F5-AS2-PV90	Fron cover assembly incl.flat indicator		1
17	F5-SP22	Coupling F5-S00 and Adjusting Tool FS-22		1

11. Dimension drawing



12. Trouble shooting

Switches
Check electrical connections and cam settings.

Potentiometer
If there is no output signal, check electrical connec- tions and for open circuit, check that potentiometer is not out of it's mechanical range.

If output deflection is wrong reverse connection terminals 7 and 9.

4-20 m A position transmitter
If there is no output signal, check electrical connections, polarity , loop power supply , and that the potentiometer is within its range.

If full output signal cannot be achieved by adjustment, check supply voltage and jumper X settings.

If output signal increases and decreases in the wrong direction, move connector from A to B or vice versa.

If the 4 mA fine adjustment P2 does not have enough span, zero must be mechanically reali- gned as follows: Turn P2 20 revolutions counter clockwise, then repeat the transmitter calibration procedure.

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To find your local Flowserve representative:

To find your local Flowserve representative please use the Sales Locator

System found at www.flowserve.com