



*PMV D20
PMV D22
Digital Positioner*

*Installation
Operation
Maintenance*



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1. General information

1.1 Using

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on FLOWSERVE products. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance.

In most cases FLOWSERVE valves, actuators and accessories are designed for specific applications (e.g. with regard to medium, pressure, temperature). For this reason they should not be used in other applications without first contacting the manufacturer.

1.2 Terms concerning safety

The safety terms DANGER, WARNING, CAUTION and NOTE are used in these instructions to highlight particular dangers and/or to provide additional information on aspects that may not be readily apparent.



NOTE: indicates and provides additional technical information, which may not be very obvious even to qualified personnel.

Compliance with other, not particularly emphasised notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g. in the operating instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.



DANGER: indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.



WARNING: *indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.*



CAUTION: *indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.*

1.3 Protective clothing

FLOWSERVE products are often used in problematic applications (e.g. extremely high pressures, dangerous, toxic or corrosive mediums). In particular valves with bellows seals point to such applications. When performing service, inspection or repair operations always ensure, that the valve and actuator are depressurised and that the valve has been cleaned and is free from harmful substances. In such cases pay particular attention to personal protection (protective clothing, gloves, glasses etc.).

1.4 Qualified personnel

Qualified personnel are people who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorised by those responsible for the safety of the plant to perform the necessary work and who can recognise and avoid possible dangers.

1.5 Installation



DANGER: Before installation check the order-no, serial-no. and/or the tag-no. to ensure that the valve/actuator is correct for the intended application.

Do not insulate extensions that are provided for hot or cold services.

Pipelines must be correctly aligned to ensure that the valve is not fitted under tension.

Fire protection must be provided by the user.

1.6 Spare parts

Use only FLOWSERVE original spare parts. FLOWSERVE cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufactures. If FLOWSERVE products (especially sealing materials) have been on store for longer periods check these for corrosion or deterioration before using these products. Fire protection for FLOWSERVE products must be provided by the end user.

1.7 Service / repair

To avoid possible injury to personnel or damage to products, safety terms must be strictly adhered to. Modifying this product, substituting nonfactory parts, or using maintenance procedures other than outlined in this instruction could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties. Between actuator and valve there are moving parts. To avoid injury FLOWSERVE provides pinch-point-protection in the form of cover plates, especially where side-mounted positioners are fitted. If these plates are removed for inspection, service or repair special attention is required. After completing work the cover plates must be refitted.

Apart from the operating instructions and the obligatory accident prevention directives valid in the country of use, all recognised regulations for safety and good engineering practices must be followed.

WARNING:



Before products are returned to FLOWSERVE for repair or service FLOWSERVE must be provided with a certificate which confirms that the product has been decontaminated and is clean. FLOWSERVE will not accept deliveries if a certificate has not been provided (a form can be obtained from FLOWSERVE).

1.8 Storage

In most cases FLOWSERVE products are manufactured from stainless steel. Products not manufactured from stainless steel are provided with an epoxy resin coating. This means that FLOWSERVE products are well protected from corrosion. Nevertheless FLOWSERVE products must be stored adequately in a clean, dry environment. Plastic caps are fitted to protect the flange faces to prevent the ingress of foreign materials. If the positioner must be stored outdoors,

it is important that all the cover screws are tightened and that all connections and ports are properly sealed. Replace shipping plugs with proper plugs and do not leave ports open and facing upwards.

1.9 Valve and actuator variations

These instructions cannot claim to cover all details of all possible product variations, nor in particular can they provide information for every possible example of installation, operation or maintenance. This means that the instructions normally include only the directions to be followed by qualified personal where the product is being used for its defined purpose. If there are any uncertainties in this respect particularly in the event of missing product-related information, clarification must be obtained via the appropriate FLOWSERVE sales office.

2. Unpacking

Each delivery includes a packing slip. When unpacking, check all delivered valves and accessories using this packing slip.

Report transport damage to the carrier immediately.

In case of discrepancies, contact your nearest FLOWSERVE location.

3. Certificates

Please note that a full copy of certificates and approvals for Intrinsically safe and Explosion proof applications can be down loaded in pdf format from our web page:

<http://www.pmv.nu/downloads.aspx>

4. PMV D20 overview

The **PMV D20** is a two-wire loop powered, 4-20 mA input digital valve positioner.

The **PMV D20** positioner controls actuators with linear and rotary mountings.

The **PMV D20** is completely powered by the 4-20 mA input signal. The minimum input signal required to function is 3,6 mA. As an option the D20 can be equipped with HART protocol to allow bidirectional communication.

Since the positioner is insensitive to supply pressure changes and can handle supply pressures from 1,5 to 6 barg (22 to 87 psig), a supply regulator is usually not required; however, in applications where the supply pressure is higher than the maximum actuator pressure rating

a supply regulator is required to lower the pressure to the actuator's maximum rating (not to be confused with operating range). A coalescing air filter is recommended for all applications due to the close tolerances in the positioner.

PMV D20 positioner accessories: Optional analog feedback system as well as limit switch unit and a directly attachable double acting module.

NOTE: *The air supply must conform to ISA 7.0.01 or IEC 770 (a dew point at least 10°C/18°F below ambient temperature, particle size below five microns – one micron recommended – and oil content not to exceed one part per million).*

5. Specifications

5.1 Technical data

Input signal	4-20 mA
Current supply min.	3.6 mA
Current supply Max.	150 mA
Load Standard	400 ohm @ 20 mA
Load HART	470 ohm @ 20 mA
User Interface D20	Single push button, LEDs
User Interface D22	LCD menu + 5 push buttons, LEDs
Voltage drop	Standard 8 VDC @ 20mA
Voltage drop	HART 9.4 VDC @ 20mA
Angle of rotation min	0 – 40°
Angle of rotation Max	0 – 90°
Air supply range	1.5 – 6 bar / 22 – 87 psi
Output	0-100% of air supply pressure
Air supply quality	Free from oil, dust and moisture IEC 770, ISA 7.0.01
Air supply effect	<0.1%FS for 10% pressure change at 6 Bar / 87 psi
Ingress protection	IP66 / Nema 4X
Operating humidity	0–100% rh non-condensing
Air connections	1/4" NPT
Gauge ports	1/8" NPT (Bolt on block)
Cable entry	2 x 1/2" NPT or 2 x M20 x 1.5
Terminals	Screw terminals 2.5 mm ² (AWG 14)
Operating Temperature	-20 to +85°C / -4 to +179°F -40°C/F (optional)
Storage temperature	-40 to +85°C / -40 to +179°F
Air delivery capacity	7 Nm ³ /h @ 6 bar / 4.12 SCFM @ 87 psi
Air delivery capacity:	
Double acting	7 Nm ³ /h @ 6 bar / 4.12 SCFM @ 87 psi
Air consumption:	
Single acting	0.120 Nm ³ /h @ 6 bar / 0.071 SCFM @ 87 psi
Double acting	0.120 Nm ³ /h @ 6 bar / 0.071 SCFM @ 87 psi
Cv air delivery:	
Single acting	0.12
Double acting	0.12
Cut off function	Close 0.5% Open 99.5%
Linearity	<1%
Sensitivity	<0.05%
Resolution	<0.1%
Repeatability	<0.2%
Hysteresis + dead band	<0.5%
Temp effect	<0.1%/10K
Mounting position effect	<0.2%
CE	93/68/EEC, 2004/108/EEC, 2006/95/EEC

Housing material	Die cast Aluminium
Surface treatment	Powder coating, Teknos Infralite
Soft goods	Nitrile
Weight	1.4 kg / 3.1 lbs

D20EX, D22EX (as above except)

Air delivery capacity	6,3 Nm ³ /h @ 6 bar / 3,7 SCFM @ 87 psi
Cv air delivery	0.08
Gauge ports	2 x 1/8" NPT
Weight	
Al version	3 kg / 6.6 lbs
Stainless steel version	5.9 kg / 13 lbs

5.2 Limit switches

Mechanical switches

Type	SPDT
Size	Sub Sub miniature
Rating	3A, 125 VAC / 2A, 30VDC
Mechanical life	>1 x 10 ⁶ operations

Namur sensors

Type	P+F NJ2 V3 N Inductive DIN 19234
Load current	<1mA>3 mA
Voltage range	5 – 25 VDC
Hysteresis	3 – 15% (5% typical)
Temp range	-25° to +100° C (-248° to +373° F)

Namur sensors

Type	P+F SJ2-N
Normal Voltage	8 VDC
Load current	1mA<l<3 mA
Voltage range	(5 – 25 VDC)
Hysteresis (max)	0.2%
Temp range	-25° to +100° C (-248° to +373° F)

Namur sensors

Type	P+F SJ2-SN
Normal Voltage	8 VDC
Load current	1mA<l<3 mA
Voltage range	5 – 25 VDC
Hysteresis (max)	(0.2%)
Temp range	-40° to +100° C (-233° to +373° F)

Namur sensors

Type	P+F SJ2-S1N
------	-------------

Normal Voltage	8 VDC
Load current	1 mA < I < 3 mA
Voltage range	5 – 25 VDC
Hysteresis (max)	0.2%
Temp range	-25° to +100° C (-248° to +373° F)

Proximity switches

Type	SPDT
Rating	10 W
Voltage max	200 VDC
Current max	500 mA
Contact resistance max	0.2 Ohm
Operating time	1.0 ms

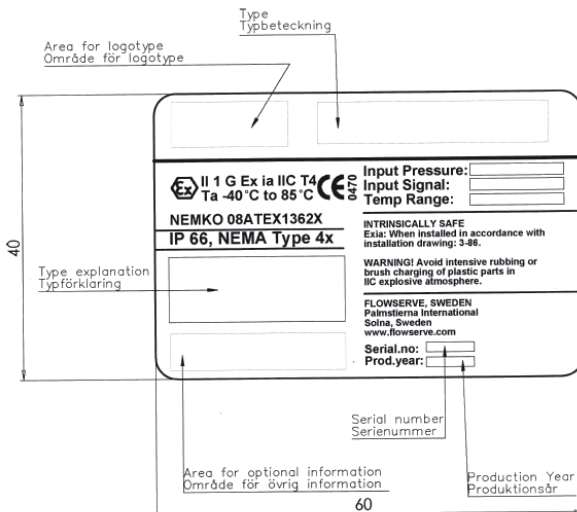
Transmitter

Power supply	12-28 VDC
Output	1 – 22 mA
Resolution	0.1%
Linearity	±0.5%
Load impedance	600 Ohm at (12 VDC and 20 mA)

Alarm Output

Supply	3-28 VDC
Output	20 mA @ 24 VDC

5.3 Type sign



5.4 D20 Model Code

D20 Compact Digital Positioner Model Code

		D20	D22
A = Model no			
D 2 0	Digital compact positioner, Single button interface, LED status		
D 2 2	Digital positioner, full LCD menu, LED status		
B = Approval, Certificate			
D	General purpose version		
I	Intrinsically safe version ATEX/FM		
B	Other, specify		
C = Connections Air, Electrical			
M	1/4" NPT air, M20 x 1,5 electrical x 2		
N	1/4" NPT air, 1/2" NPT electrical x 2		
L	1/4" NPT air, M20x1,5 electrical x 2, 1/4" NPT Aux vent		
J	1/4" NPT air, 1/2"NPT electrical x 2, 1/4" NPT Aux vent		
D = Housing/Surface treatment			
U	Aluminium/Powder epoxy, black		
R	Remote mounted feedback sensor		
Y	Other, specify		
E = Function			
S	Single acting		
D	Double acting, incl 2 x gauges Stainlees/Brass		
F = Mounting options / Spindle			
0 9	Double D type, adaptor spindle		
1 2	Flowtop, D-style+ nut, direct mounting, Kit 30144 included		
2 3	VDI/VDE 3845 rotary, Mounting kit not included		
3 0	Adaptor spindle, select between 01/06/26/30/36		
3 9	IEC 534-6, Flat D type, nut incl. Mounting kit not included		
4 0	VDI/VDE 3847 Linear, Flat D, Mounting kit 30145 included		
G = Cover and Indicator			
P V A	PMV,Black cover, Arrow indicator		
P V B	PMV, Black cover, No indicator		
P V D	PMV, Black cover, Dome indicator		
H = Temperature/seals			
Z	Standard -20°C to 85°C (-4°F to 185°F)		
Q	Low temp -40°C to 85°C (-38°F to 185°F)		
I = Input signal/Protocoll			
4	4-20 mA / none		
5	4-20 mA, / HART		
P	Profibus PA		
F	Foundation Fieldbus		
J = Feedback option, 4-20 mA transmitter, switches			
X	No feedback option		
T	4-20 mA transmitter only		
S	Limit switches Mechanical SPDT + 4-20mA		
N	Namur V3 type sensor, P+F NJ2-V3-N + 4-20mA		
P	Limit switches Proximity SPDT + 4-20mA		
4	Slot type Namur sensor, P+F SJ2-S1N + 4-20mA		
5	Slot type Namur sensor, P+F SJ2-SN + 4-20mA		
6	Slot type Namur sensor, P+F SJ2-N + 4-20mA		
K = Options, Add in electronics			
0	Standard diagnostics		
1	Advanced, Built in pressure sensors		
L = Accessories			
X	No accessories		
M	Gauge block 1/8" G (2 x gauges included)		
N	Gauge block 1/8" NPT (2 x gauges included)		

A A A B C D - **E F F G G G** - **H I J K L**

Consult factory

D20 Explosion Proof Digital Positioner Model Code

		D20E	D22E
A = Model no			
D 2 0	Digital compact positioner, Single button interface, LED status		
D 2 2	Digital positioner, full LCD menu, LED status		
B = Approval, Certificate			
E	Explosion proof ATEX + FM		
C = Connections Air, Electrical			
G	1/4" G air, M20 x 1,5 electrical x 2		
M	1/4" NPT air, M20 x 1,5 electrical x 2		
N	1/4" NPT air, 1/2" NPT electrical x 2		
D = Housing/Surface treatment			
U	Aluminium/Powder epoxy, black		
R	Aluminium/Powder epoxy, black, Remote mounted feedback sensor		
S	Explosion proof Stainless steel enclosure (Connections N only)		
E = Function			
S	Single acting		
F = Mounting options / Spindle			
0 9	Double D type 6 mm, adaptor spindle (01/06/26/30/36)		
1 2	D-style+ nut, Flowtop direct mounting		
2 3	VDI/VDE 3845 rotary, (Mounting kit not included)		
3 0	Adaptor spindle, select between 01/06/26/30/36		
3 9	IEC 534-6, D style + nut. (Mounting kit not included)		
G = Cover Color			
P V B	PMV, Black cover, No indicator		
F S W	Flowserve White		
F S Y	Flowserve Yellow		
H = Temperature/seals			
Z	Standard -20°C to 85°C (-4°F to 185°F)		
Q	Low temp -40°C to 85°C (-38°F to 185°F)		
I = Input signal/Protocol			
4	4-20 mA / none		
5	4-20 mA, / HART		
P	Profibus PA		
F	Foundation Fieldbus		
J = Feedback option, 4-20 mA transmitter, switches			
X	No feedback option		
T	4-20 mA transmitter, Alarm output		
K = Options, Add in electronics			
0	Standard diagnostics		
1	Advanced, Built in pressure sensors		
L = Accessories			
X	No accessories (gauge ports included)		
M	Gauge block 1/8" G (2 x gauges included)		
N	Gauge block 1/8" NPT (2 x gauges included)		

A A A B C D - **E F F G G G** - **H I J K L**

Consult factory

5.5 Control Drawing

Transmitter Board Options

Model no. 3-A8T1N	1	3-A8T1N
Model no. 3-A8T1D	2	3-A8T1D
Model no. 3-A8T1D4	3	3-A8T1D4
Model no. 3-A8T1D4	4	3-A8T1D4
Model no. 3-A8T1D4	5	3-A8T1D4
Model no. 3-A8T1D4	6	3-A8T1D4
Model no. 3-A8T1D4	7	3-A8T1D4
Model no. 3-A8T1D4	8	3-A8T1D4
Model no. 3-A8T1D4	9	3-A8T1D4

Remove cover and interconnect wires manually, visually verify transmitter board option.

Warnings:

- Presence of components may impair Safety Switches.
- Do not open of inflammable or combustible atmospheres, disconnect power before servicing, or reed, understand and adhere to the manufacturer's live maintenance procedures.
- Non-inflammatory the following components may impair suitability for Division 2:

All components need Safety Barriers* except the Switches on transmitter board 3-A8T1N, 3-A8T1D4, 3-A8T1D5, 3-A8T1P, D3-A838E N, D9-A838E D4, D9-A838E D9 and D9-A838E P.

Exposure hazard - Do not disconnect equipment unless area is known to be non-hazardous.

*Only OSH and FM

Further requirements for FM:

- The Empty Changer allows interconnections of intrinsically safe apparatus with associated apparatus when the following is true:
 - The apparatus to be connected is intrinsically safe.
 - The apparatus to be connected is of a rating not less than 250 Vrms or Vdc.
 - The apparatus to be connected is of a rating not less than 0.1 W.
 - The apparatus to be connected is of a rating not less than 100 mA.
 - The apparatus to be connected is of a rating not less than 100 µA.
 - The apparatus to be connected is of a rating not less than 100 nA.
 - The apparatus to be connected is of a rating not less than 100 pA.
 - The apparatus to be connected is of a rating not less than 100 fA.
- Control equipment connected to Associated Apparatus must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with ANSI/ISA 1206.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code.
- The associated apparatus must be FM approved.
- Approved by a single or multiple agencies (In Approval) is not a guarantee having parameters less than those quoted, and for which the output and the combination of output is not acceptable for the Class, Division and Group of use.

Ingress Protection IP 66, NEMA 4X

* Tested according to withstand dielectric strength requirement IEC EN 60079-11 6.3.12

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

Mechanical or Proximity switches

Model no. D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx
 D310x-xxxxx-xxx-Logix 8x-02-xxxxxxx-xxx-xxx-xxx-xxx

Normally Open
 Pin 7: Switch 1
 Pin 8: Switch 2

Normally Closed
 Pin 7: Switch 1
 Pin 8: Switch 2

HAZARDOUS AREA

UNCLASSIFIED AREA

HAZARDOUS AREA

UNCLASSIFIED AREA

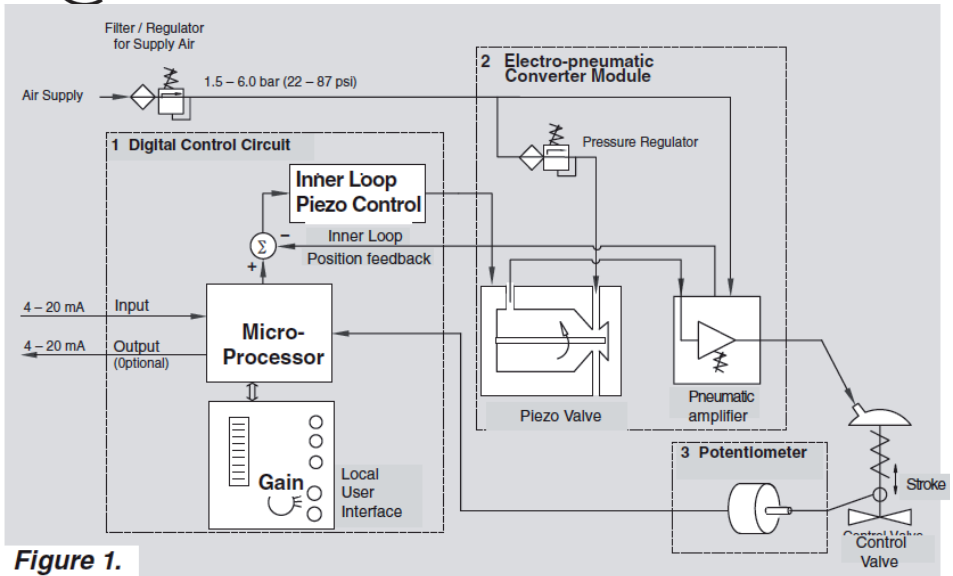


Figure 1.

6. Principle of operation

The **PMV D20** positioner is a digital positioner with various options. The positioner consists of three main modules:

1. The microprocessor-based electronic control module includes direct local user interface switches
2. The piezo valve-based electro-pneumatic converter module
3. The infinite resolution valve position sensor.

The basic positioner operation is best understood by referring to figure 1. The complete control circuit is powered by the two-wire, 4-20 mA command signal. The analog 4-20 mA command is passed to the microprocessor, where it is compared to the measured valve stem position. The control algorithm in the processor performs control calculations and produces an output command to the piezo valve, which drives the pneumatic

amplifier. The position of the pilot valve in the pneumatic amplifier is measured and relayed to the inner loop control circuit. This two-stage control provides for more responsive and tighter control than is possible with a single stage control algorithm. The pneumatic amplifier controls the airflow to the actuator. The change of pressure and volume of the air in the actuator causes the valve to stroke. As the valve approaches the desired position, the difference between the commanded position and the measured position becomes smaller and the output to the piezo is decreased. This, in turn, causes the pilot valve to close and the resulting flow to decrease, which slows the actuator movement as it approaches, the new commanded position. When the valve actuator is at the desired position, the pneumatic amplifier output is held at zero, which holds the valve in a constant position.

7. Mounting and installation

7.1 General

Before starting installation, inspect the digital positioner for any transit damages. The **PMV D20** positioner is installed with a mounting kit (according to NAMUR specification) to the left-hand actuator support rod.

Generally, the unit can be installed in any mounting position. The stroke feed-back is realized by a follower arm and stem clamps.

The mounting of rod actuators (according to NAMUR) is described in Figure 3.

For the two mounting possibilities of cast yoke actuators (according to NAMUR, IEC 534 part 6) refer to Figure 5.

After installation, ensure all screw connections are tightened correctly and all moving parts are free from excessive friction.

NOTE!

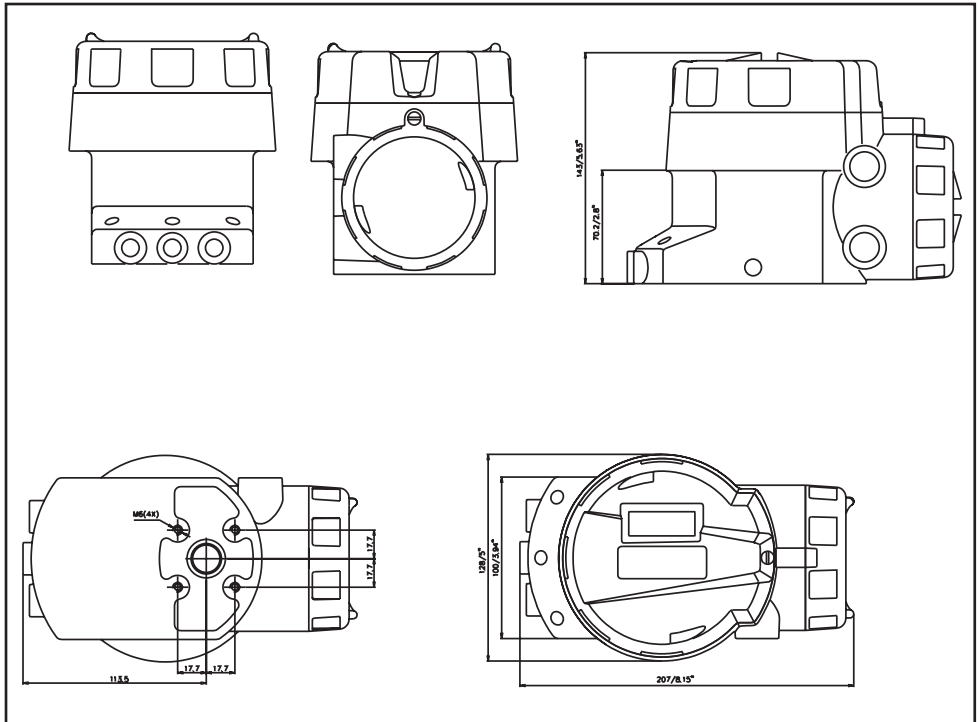
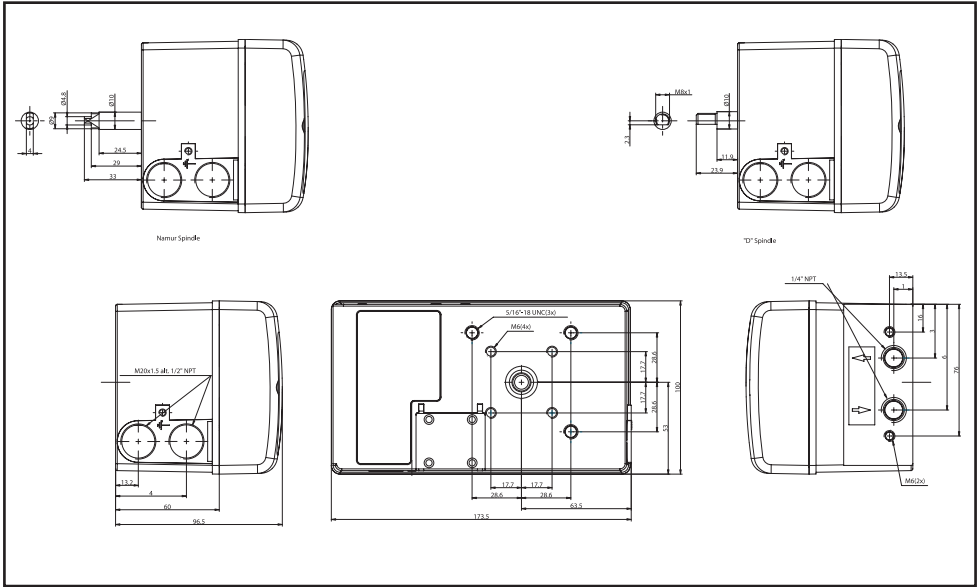
All products that are covered by an ATEX Certification number ending with an "X", special care must be taken when cleaning the surface of the product. "The enclosure must be cleaned with a damp cloth due to static electricity for plastic windows/surfaces"

For securing covers and lids, it's important to use the correct torque:

Product	Size (screw)	Torque Nm
D20	M4	0,65 Nm +/- 15%

Covers (thread on) for D20EX, tighten fully and secure.

7.2 Dimensional drawings



7.3 Mounting

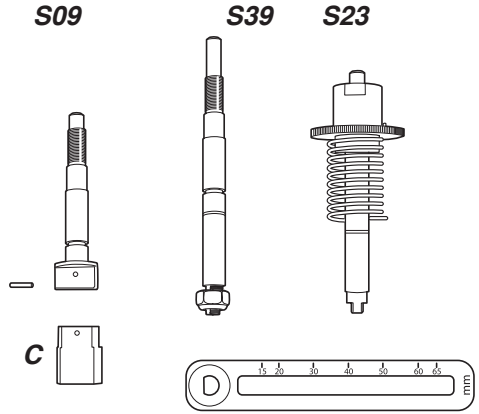
N.B. If the positioner is installed in a hazardous environment, it must be of a type approved for this purpose.

The PMV D3 positioner, all versions, has an ISO F05 footprint, A. The holes are used to attach the PMV D3 to the mounting bracket B. Please contact PMV or your local distributor representative with actuator specifics for the proper mounting bracket and hardware.

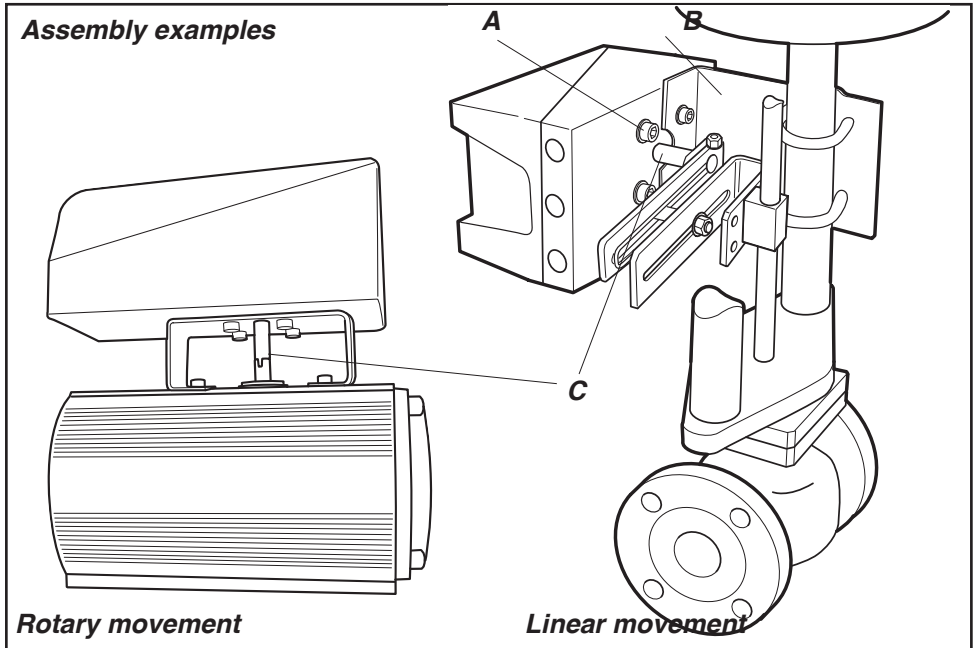
The spindle adapter C can be changed to suit the actuator in question.

Remove the existing adapter using two screwdrivers. Check that the spring ring on the positioner spindle is undamaged and fit the new adapter. Alternative, press out pin and remove adapter.

Spindles



It is important that the positioner's spindle and the arms, that transfer the actuator movements, are correctly mounted. Any tension between these parts can cause incorrect operation and abnormal wear.



Rotary movement

Linear movement

Mounting of the PMV D20 positioner on a linear pneumatic actuator (NAMUR / IEC 534 part 6)

(See Figure 1)

The mounting of a rod actuator kit (according to IEC 534 part 6) is described in an example by using the following equipment:

Valve: Standard globe valve or equivalent

Actuator: Single-acting pneumatic actuator

Positioner: PMV D20 with NAMUR mounting kit.

Pre-assembly: Valve with actuator (valve stroke is matched with the actuator stroke).

For mounting, proceed as follows:

Mounting the Follower Arm (Figures 1 and 2)

1. Unscrew the lock nut for the follower arm attachment.
2. Place the follower arm on the shaft at the back of the positioner and fasten it with the lock nut. The follower pin should point back from the positioner.



CAUTION: Maximum torque 0,25 Nm (0,18 ft-lbs).

Mounting the stem clamp bracket and take-off arm (Figure 1)

1. Attach the stem clamp bracket to the stem clamp and fasten it with two hexagon socket screws and lock washers.
2. Attach the take off arm to the stem clamp bracket and fasten it with a hexagon socket capscrew and a washer. Ensure the take-off arm slot is centered.

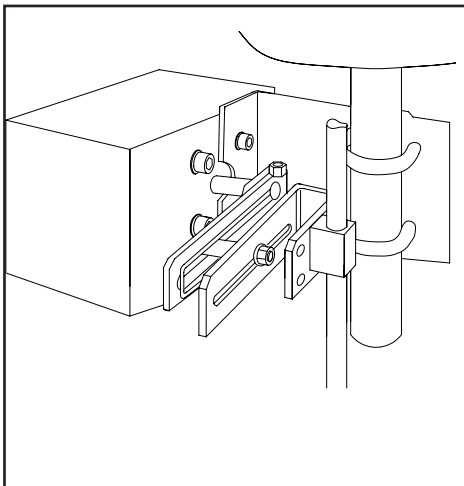


Figure 1. Mounting on a Rod Actuator (IEC 534 part 6)

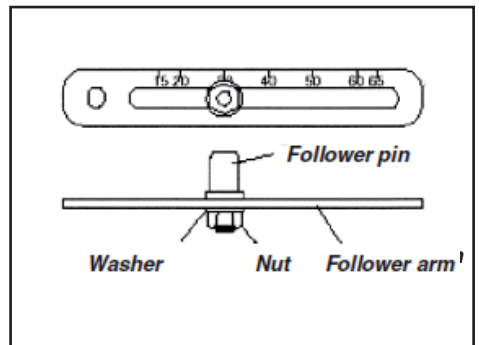


Figure 2. Follower Arm (standard)

Mounting the positioner (Figure 1)

1. Adjust the actuator to mid-stroke.
2. Pre-assemble the mounting bracket on the left actuator leg hand-tight with two U-bolts, nuts and lockwashers.
3. Attach the positioner to the pre-assembled mounting bracket and fasten it with two hexagon head screws and two lock washers. Check that the follower pin is inserted in the slot of the take-off arm and the follower arm is positioned at a right angle to the outer edge of the positioner.
4. Tighten all screws and nuts.



NOTE: A slight unsymmetrical mounting increases the linearity deviation but does not affect the

performance of the device. Depending on the actuator size and stroke it may be necessary to flip the take-off arm (Figure 3) by 180° and attach it to the opposite side of the stem clamp bracket.

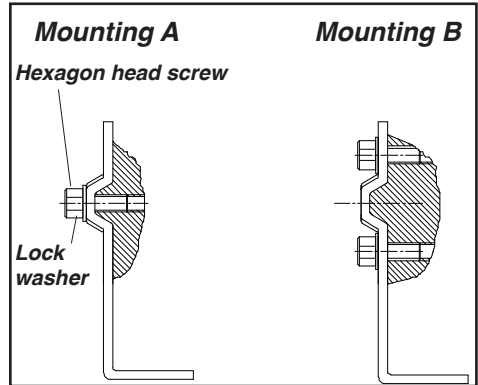


Figure 4. Yoke Actuator Mounting (according to IEC 534 part 6)

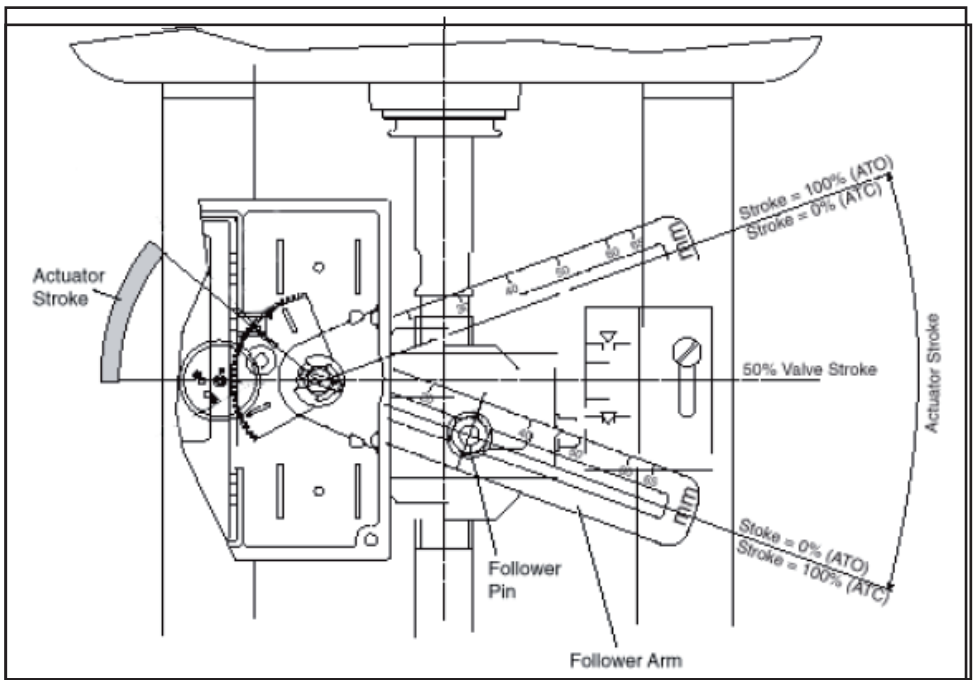


Figure 3. Basic Adjustment for a Linear Pneumatic Actuator

Follower pin adjustment (Figure 3)

The positioner follower pin must be adjusted to match the valve stroke in the following manner:

1. Adjust the follower pin (STROKE + 10 mm) as indicated on the follower arm's embossed scale (Figure 2).
2. Exhaust the actuator.
3. Loosen the follower pin and shift it along the follower arm until the control marking on the feedback gear (Figure 4) is horizontal (points to the center of the feedback potentiometer). Fasten the follower pin in this position.
4. Adjust the actuator to full stroke and check the follower pin adjustment the same way as described in step 3. As the actuator strokes, the rotation of the feedback gear should be between the inner control markings. If the length of rotation is outside the control markings, adjust the follower pin farther out on the feedback lever to reduce the angle of rotation.

NOTE: Stroke the actuator carefully and ensure the follower arm does not interfere with valve parts, actuator or positioner. Do not adjust the follower pin too near to the slot end of the take-off arm.

The minimum lateral distance should be approximately 5 mm (0,2 inches) to prevent bending of the feed-back mechanism.

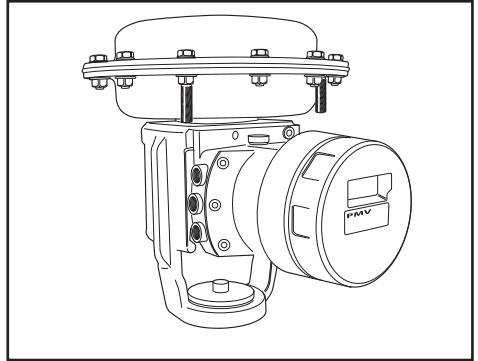


Figure 5. Direct mounting to actuator

Rotary actuators

Mounting the PMV D20 positioner on a quarter-turn actuator (closed or open by spring)

The mounting of a pneumatic double-piston part-turn valve actuator (in accordance with VDI/VDE 3845) is described as an example by using the following equipment:

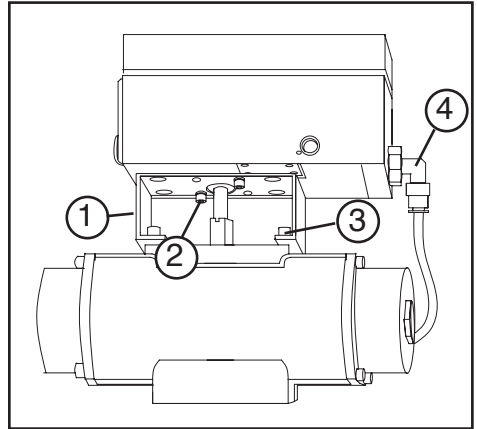
Quarter-turn valve actuator: Rack & pinion or scotch yoke, closed or open by spring.

Rotary actuator VDI/VDE 3485 (Namur)

Mount bracket **1** to positioner. Secure with 4 x M6 screws **2**.

Fit positioner on actuator and secure with 4 x screws **3**.

Install tubing **4** between actuator and positioner.
See section 7.



Linear actuator "Flow act" (Direct mounting, integrated tubing.)

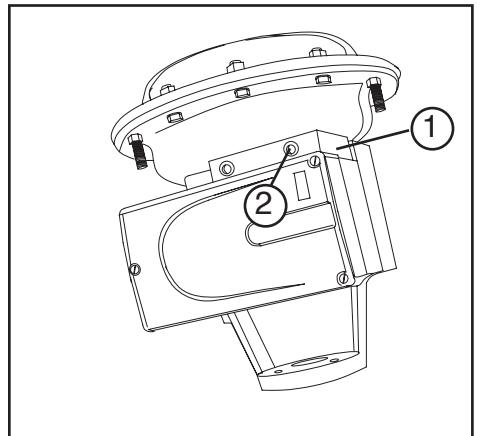
Check O-rings, Install bracket **1** to positioner and secure with screws.

Fit pin on valve stem.

Fit lever arm to positioner shaft.

Fit and check O-rings and positioner to actuator and secure with 2 x screws **2**.

No tubing needed, it's integrated with actuator, fit plug in positioner out port.



Linear actuator VDI/VDE 3847 (Direct mounting, integrated tubing.)

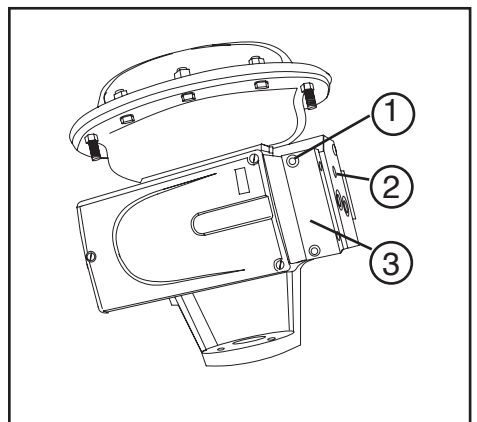
Check O-rings, Install bracket **1** to positioner and secure with 2 x screws **2**.

Fit pin on valve stem.

Fit lever arm to positioner shaft.

Fit and check O-rings and positioner to actuator and secure with 2 x screws **3**.

No tubing needed, it's integrated with actuator.



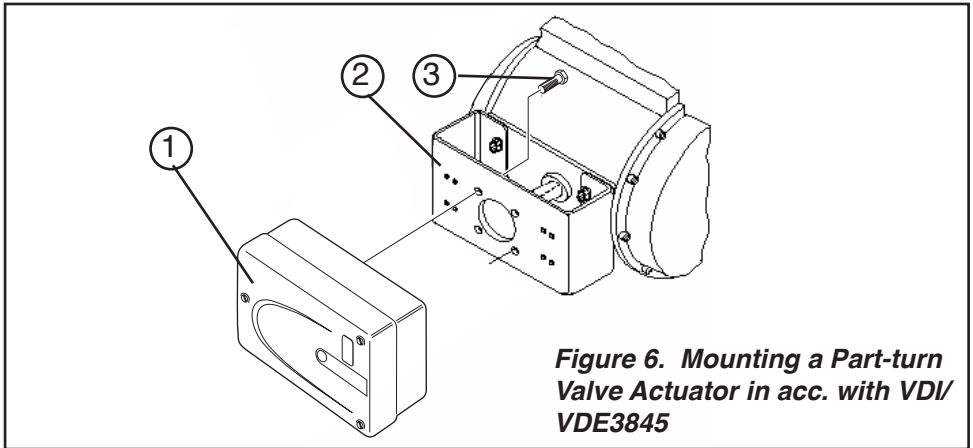
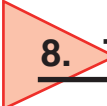


Figure 6. Mounting a Part-turn Valve Actuator in acc. with VDI/VDE3845

Mounting the positioner (Figure 6)

Place the positioner (1) onto the mounting block (2) of the actuator using four screws (3) Ensure the coupler fits on to

the shaft of the quarter-turn connection on the part-turn valve actuator.



8. Tubing positioner to actuator

After mounting has been completed, tube the positioner to the actuator using the appropriate compression fitting connectors:

Air connections: 1/4" NPT (standard air connection).

Auxiliary power: Pressurized air or permissible gases, free of moisture and dust in according with IEC 770 or ISA 7.0.01.

Pressure range: 1,5 – 6 bar (30 – 90 psi).

For connecting the air piping, the following notes should be observed:

1. The positioner passageways are equipped with filters, which remove medium and coarse size dirt from the pressurized air. If necessary, they are easily accessible for cleaning.

2. Supply air should meet IEC 770 or ISA 7.0.01 requirements. A coalescing filter should be installed in front of the supply air connection (Figure 8). Now

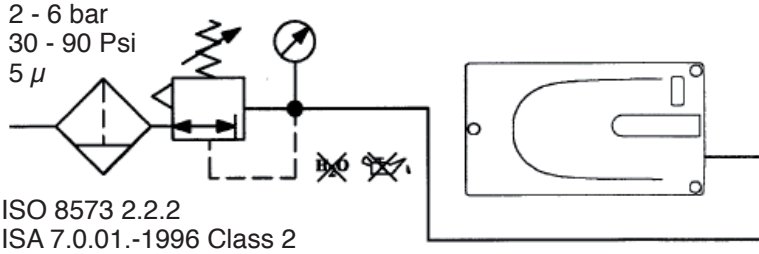
connect the air supply to the filter, which is connected to the **PMV D20** positioner.

3. With a maximum supply pressure of 6 bar (102 psi) a regulator is not required.

4. With an operating pressure of more than 6 bar (90 psi), a reducing regulator is required.

The flow capacity of the regulator must be larger than the air consumption of the positioner (7 Nm³ /h @ 6 bar / 4,12 scfm @ 90 psi).

5. Connect the outlet connector (Figure 7) of the positioner with tubing, independent of the action (direct or reverse).



9. Wiring and grounding guidelines

Electrical connections: signal cable with cable passage (1/2" NPT, or M20 x 1,5) to terminals 2 x 2,5 mm.

Input signal: 4 – 20 mA

NOTE: Observe the minimum requirements of voltage and equivalent electrical load:

- 8 VDC at 20 mA non HART version
- 9,4 VDC at 20 mA HART version

The performance is ensured only for a minimum input current of 3,6 mA.

For wiring, the following notes should be observed:

NOTE: *The input loop current signal to the **PMV D20** should be in shielded cable. Shields must be tied to a ground at only one end of the cable to provide a place for environmental electrical noise to be removed from the cable. In general, shield wire should be connected at the source. (Figure 7).*

Connection	Description
+1	Input +4-20 mA
-2	Input -4-20 mA
↑ ○	Pneumatic output signal (outlet)
↓ ○	Air supply

Connect the 4-20 mA current source to terminals +1 and -2, see connection table.

9.1 Grounding screw

The grounding screw, located inside the positioner cover, should be used to provide the unit with an adequate and reliable earth ground reference. This ground should be tied to the same ground as the electrical conduit. Additionally, the electrical conduit should be earth grounded at both ends of its run. The grounded screw must not be used to terminate signal shield wires.

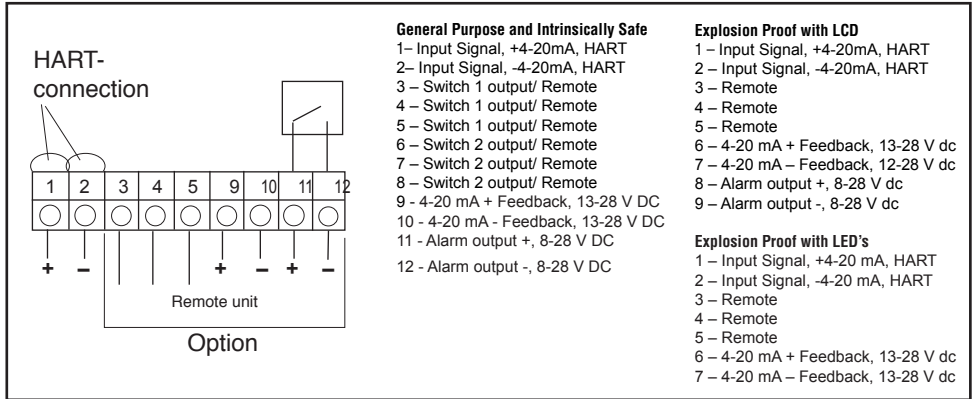


Figure 7. Connections

9.2 Electromagnetic compatibility

The **PMV D20** digital positioner has been designed to operate correctly in electromagnetic (EM) fields found in typical industrial environments. Care should be taken to prevent the positioner from being used in environments with excessively high EM field strengths (greater than 10 V/m). Portable EM devices such as hand-held two-way radios should not be used within 30 cm of the device.

Ensure proper wiring and shielding techniques of the control lines, and route

control lines away from electro-magnetic sources that may cause unwanted noise.

An electromagnetic line filter can be used to further eliminate noise.

In the event of a severe electrostatic discharge near the positioner, the device should be inspected to ensure correct operability. It may be necessary to recalibrate the **PMV D20** positioner to restore operation.

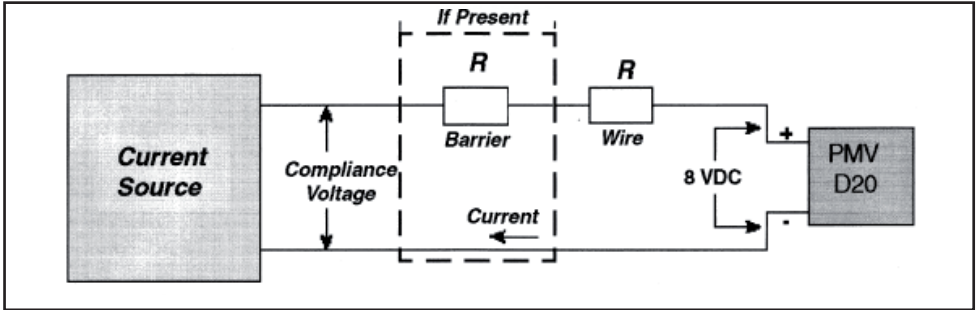


Figure 9. Compliance voltage

9.3 Compliance voltage

Output compliance voltage refers to the voltage limit the current source can provide. A current loop system consists of the current source, wiring resistance, barrier resistance (if present), and the **PMV D20** impedance.

The **PMV D20** requires that the current loop system allow for a 8.0 - 9.4 VDC drop across the positioner at maximum loop current.

CAUTION: Never connect a voltage source directly across the positioner terminals. This could cause permanent circuit board damage.

In order to determine if the loop will support the **PMV D20**, perform the following calculation:

Voltage = Compliance Voltage(@Current_{MAX})

$$- \text{Current}_{\text{MAX}}(R_{\text{barrier}} + R_{\text{wire}})$$

To support the **PMV D20** the calculated voltage must be greater than 9.4 VDC for D20 HART and 8 VDC for non-HART.

Example: DCS Compliance Voltage = 19 V

$$R_{\text{barrier}} = 300\Omega$$

$$R_{\text{wire}} = 25\Omega$$

$$\text{CURRENT}_{\text{MAX}} = 20 \text{ mA}$$



$$\text{Voltage} = 19 \text{ V} - 0.020 \text{ A}(300\Omega + 25\Omega) = \underline{12.5 \text{ V}}$$

This system will support the **PMV D20**, as the voltage 12.5 V is greater than the required 8 VDC for non-HART and 9.4 VDC for HART.

10. Operation D20

10.1 General


The D20 is operated by the yellow button. Depending on desired action, press the button:

- during a number of seconds (Ex:  5 sec.)
- or
- a number of times. (Ex:  x3)

All operation steps are indicated by lit or flashing LED(s).


10.2 Startup

Connect Air supply and a mA-simulator to the positioner.

 **Warning:** During calibration, the actuator may stroke unexpectedly.

10.3 Calibration

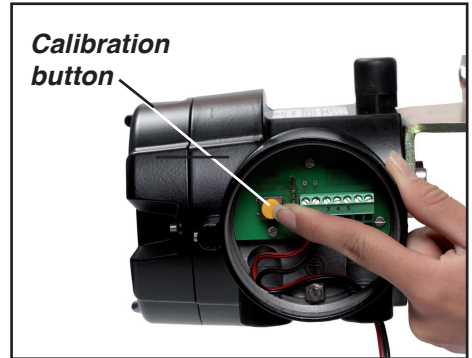
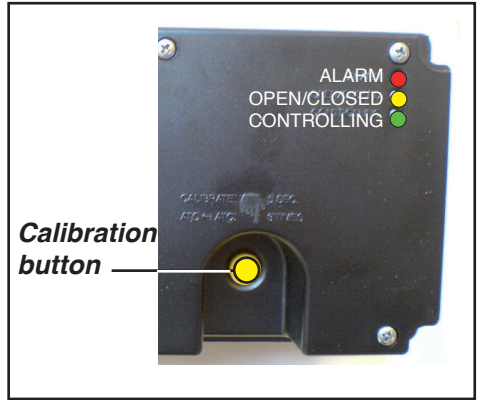
Apply 4 mA current as input signal.

 **5 sec.** Press the button for 5 sec. (Release the button when the three LED:s start to flash alternately). The calibration starts, the actuator goes to max. and min. position and calculates the control parameters.




The Calibration procedure will take between 30 seconds and some minutes depending on actuator size.

The three LED:s will flash alternately during calibration.


After calibration all the three LED:s are lit for a moment.



A successful calibration is indicated by yellow or green LED:

-  Green LED flashes = In service
-  Yellow LED flashes = In service.
-  The unit vents in max or min position.

An unsuccessful calibration is indicated by error codes:


-  **R** D20 does not reach the setpoint.

For other indications, see **Error codes**, page 46.

10.4 Set of Direct or Reverse action

Note! For safety reason, this operation has to be done max 5 minutes after calibration. If time has run out, or if power is disconnected during the five minutes, perform a new calibration, before changing the direction.

Run 4 mA. If valve is in right position, then check the position over the whole range (8, 12, 16 and 20 mA).

 If the direction need to be changed: press the button 3 times and the direction will change.

x3

Check operation at 4 – 8 – 12 – 16 and 20 mA

10.5 Show gain setting

If the actuator position is unstable or selfoscillating after calibration, the gain can be adjusted.








Gain can be set from **A** (lowest) to **G** (highest). Default is **D**.



x4

To **show** the current gain setting, press the button four times.

To indicate the current setting, the LEDs flashes according to the following:

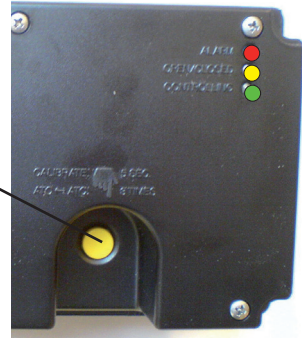
LEDs show:	Y R R 	G (Highest)
LEDs show:	Y R Y 	F
LEDs show:	Y R G 	E
LEDs show:	Y G 	D Default
LEDs show:	Y G G 	C
LEDs show:	Y G Y 	B
LEDs show:	Y G R 	A (Lowest)

The gain code sequence is repeated 5 times.

Button functions:

- Press 5 sec = Calibration**
- Press x3 = Direct/reverse action**
- Press x4 = Show gain setting**
- Press x5 - x11 = Change gain setting**

To indicate that a command is accepted, the three LED:s light up.



10.6 Change of gain setting

To lower the gain, press the button: 7, 6 or 5 times (5= lowest).








To increase the gain (if actuator is moving to slow).

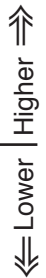
Press the button: 9, 10 or 11 times (11= highest) to increase the gain.

The LED:s flashes alternately when the button is pressed. After gain change the LED:s show the gain code (see 9.3) five times.

The default value after first calibration is **D**.

After this, the gain settings are finished.

-  **x11** G (Highest)
-  **x10** F
-  **x9** E
-  **x8** **D Default**
-  **x7** C
-  **x6** B
-  **x5** A (Lowest)




11. Operation D22

11.1 Menus and pushbuttons

The positioner is controlled using the five pushbuttons and the display, which are accessible when the aluminium cover is removed.

For normal functioning, the display shows the current value. Press the ESC button for two seconds to display the main menu.

Use the  pushbuttons to browse through the main menu and the sub-menus.

The main menu is divided up into a basic menu and a full menu, see page 30.

11.2 Other functions

ESC

Exit the menu without making any changes (as long as any changes have not been confirmed with OK).

FUNC

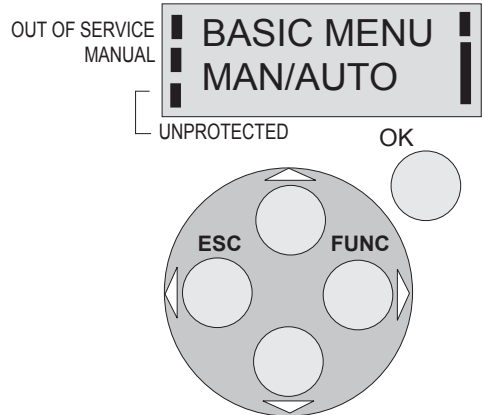
To select function and change parameters.

OK

To confirm selection or change of parameters.

MENU INDICATOR

Displays the position of the current menu row in the menu.



IN SERVICE

The positioner is following the input signal. This is the normal status when the positioner is working.

OUT OF SERVICE

The positioner is not following the input signal. Critical parameters can be changed.

MANUAL

The positioner can be adjusted manually using the pushbuttons. See section "Man/Auto", page 35".

UNPROTECTED

Most of the parameters can be changed when the positioner is in the "Unprotected" position. However, critical parameters are locked when the positioner is in the "In service" position.

11.3 Menu indicator

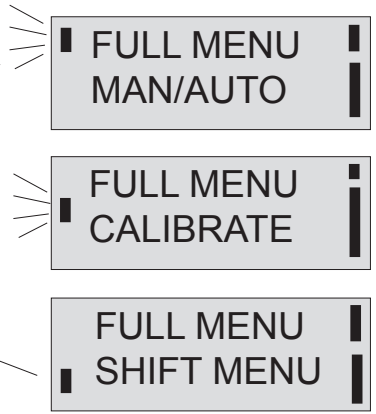
There are indicators at both sides of the display window and they indicate as follows:

Flashing in position **Out of service**

Flashing in position **Manual**

Displayed in position **Unprotected**

The indicators on the right-hand side show the position in the current menu.



11.4 Menus

To display the menus you can select:



- **Basic menu**, which means you can browse through four different steps
- **Full menu**, which comprises ten steps. Use the Shift Menu to browse through the steps

Full Menu can be locked out using a passcode.

The main menus are shown on the next page and the sub-menus on the subsequent pages.

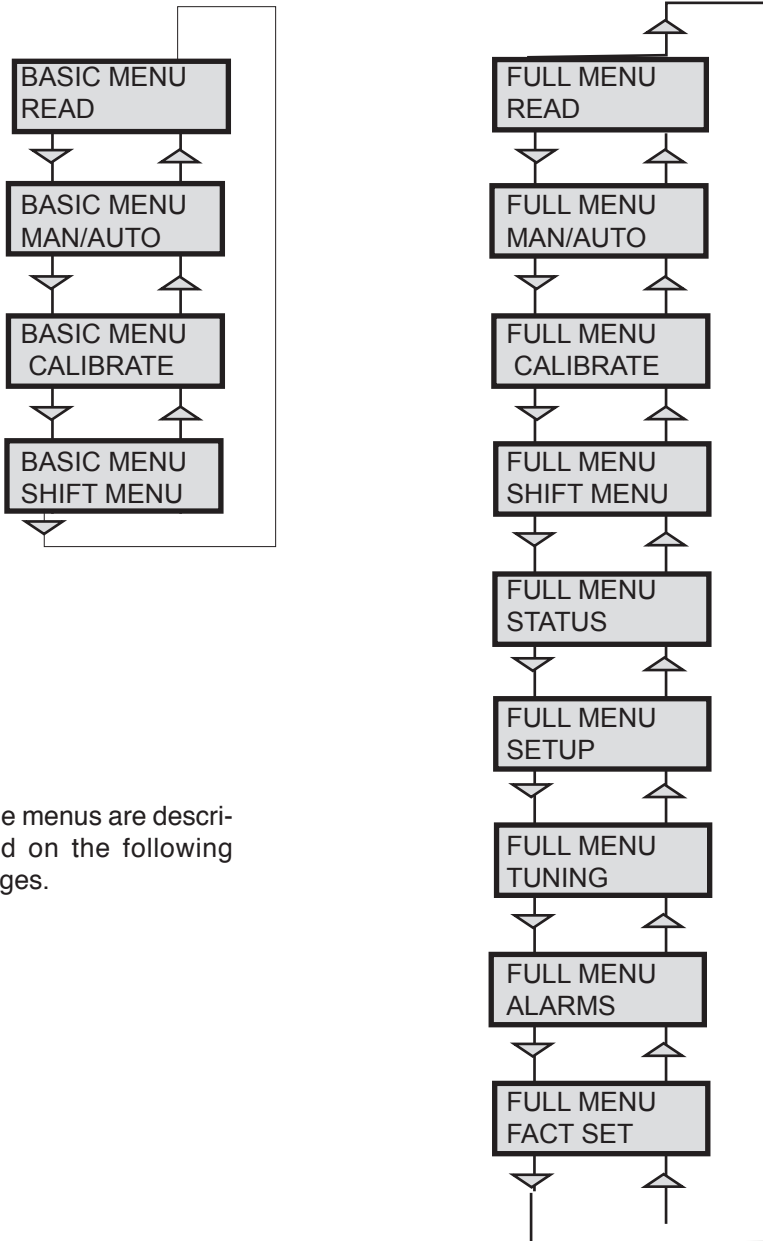
11.5 Changing parameter values

Change by pressing   until the desired figure is flashing.

Press   to step to the desired figure. Confirm by pressing OK.

A change can be undone by pressing the **ESC** button, which returns you to the previous menu.

11.6 Menu system



The menus are described on the following pages.



11.7 First start

Calibrate in the basic menu is displayed automatically the first time the power is applied, and can be selected from the basic/main menu at any later time.

A complete auto-calibration takes about 2 minutes and includes end limit calibration, auto-tuning and a check on the speed of movement. Start the automatic calibration by selecting **Auto-Cal** and then answer the questions on the display by pressing **OK** or the respective arrow. The menu is described on the next page.

Calibration error messages

If a fault occurs during calibration, one of the following error messages can be displayed:

No movement/press ESC to abort

Typically the result of an air delivery issue to the actuator, or incorrect mounting and/or linkage arrangement. Check for proper supply air to the positioner, pinched tubing, proper actuator sizing, proper linkage and mounting arrangement.

Pot uncalibrated/press ESC to abort

The potentiometer has been set to an illegal value. The potentiometer is aligned using the Calibrate - Expert cal - pot Menu. The calibration sequence must be restarted after the fault is corrected.

BASIC MENU
 CALIBRATE



The contents of the menu are shown on the next page. The various menu texts are described below.

Auto-Cal

Start tune
 ed
 tion,
 chart

Lose prev value? OK?

Direction? direct

Direction? reverse

In service? Press OK

TravelCal

Start cal

Lose prev value? OK?

In service? Press OK

Perform

Normal

A, B, C, D, E, F, G
 29.

Auto-tuning and calibration of end positions

Starts the tuning. Questions/commands are displayed during calibration. Select the type of movement, function, etc. with ∇ and confirm with **OK** as shown in the on the next page.

A warning that the value set previously will be lost (not during the first auto-tuning).

Select for direct function.

Select for reverse function.

Calibration finished. Press OK to start positioner functioning. (If ESC is pressed, the positioner assumes the "Out of service" position but the calibration is retained).

Calibration of end positions

Start end position calibration.

A warning that the previously set value will be lost. Confirm with OK.

The calibration sequence starts.

Calibration finished. Press OK to start positioner functioning. (If ESC is pressed, the positioner assumes the "Out of service" position but the calibration is retained).

Setting gain

Gain setting depending on actuator size. See page

ExpertCal

Set point LO: Use the calibrator set to 4 mA (or set another value on the display). Press OK.

Set point HI: Use a calibrator of 20 mA (or set another value on the display). Press OK.

Transmitter: Connect 10 - 28VDC. Connect an external mA meter to the loop. Read low value on mA meter and adjust with up/down key. Press OK to set low value. Repeat procedure to set High value. Also see video on www.pmv.nu

Pot: Potentiometer setting, see section 8. Also see video on www.pmv.nu

Full reset: Resets all set values.

Optional

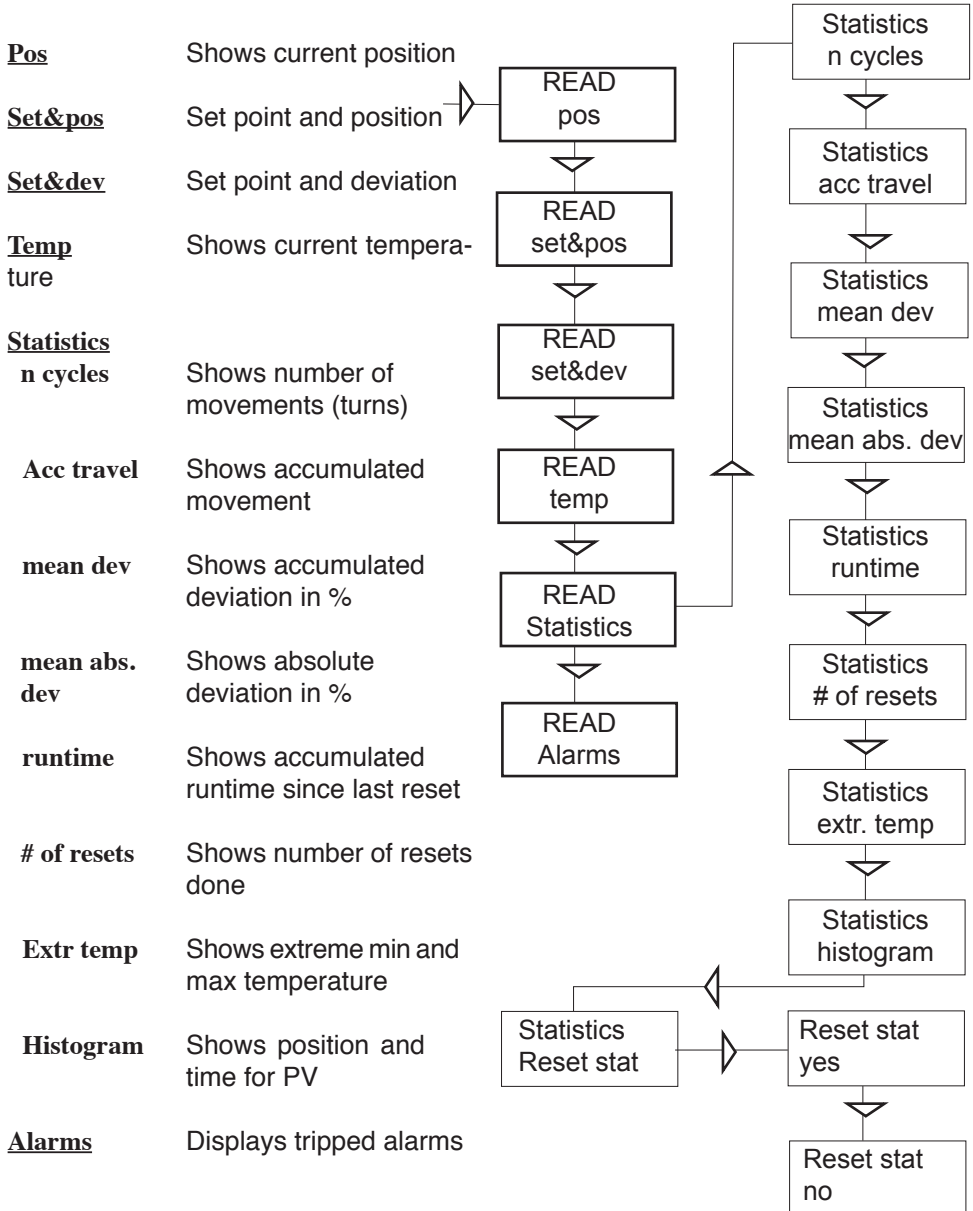
Pressure LO: Use a supply of 2 bar (30 psi) (or set another value on the display). Press OK. Pressure read out only possible on PMV D3 with built in pressure sensor.

Pressure HI: Use a supply of 7 bar (105 psi) (or set another value on the display). Press OK. Pressure read out only possible on PMV D3 with built in pressure sensor.

The menu contents are shown in the figures on the right and the texts are described below:



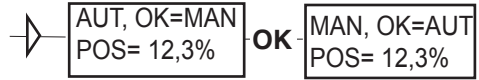
Current values can be read using the Read Menu and some values can be reset.





The Man/Auto menu is used to change between manual and automatic modes.

The menu contents are shown in the figures on the right and the various texts are described below:



AUT, OK = MAN

Positioner in automatic mode

MAN, OK = AUT

Positioner in manual mode

When changing between **MAN** and **AUT** mode, the **OK** button must be pressed for 3 seconds.

In the **MAN** mode, the value of POS can be changed using . The push-buttons increase/decrease the value in steps. The value can also be changed in the same way as for the other parameter values, as described on page 20.

Other functions

C+ can be fully opened by pressing and then immediately OK simultaneously.

C+ and C- can be fully opened for blowing clean by pressing and OK simultaneously.

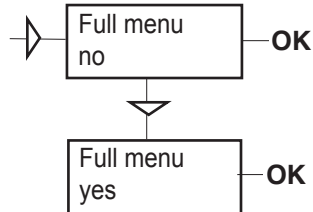


The Shift Menu is used to choose between the basic menu and the full menu.

The menu contents are shown in the figures on the right and the various texts are described below:

No Full menu selected.

Yes Basic menu selected.



Full Menu can be locked with a passcode, see Setup menu.

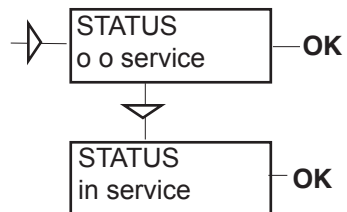


The Status Menu is used to select whether or not the positioner is in service.

The menu contents are shown in the figures on the right and the various texts are described below:

o o service Not in service.
Flashing indicator
in upper left-hand
corner of display.

in service Positioner in service.
Critical parameters
cannot be changed.



When changing between **In service** and **Out of service**, the **OK** button must be pressed for 3 seconds.

FULL MENU
SETUP



The Setup Menu is used for various settings.

The menu contents are shown in the chart on the next page and the various texts are described below:

Actuator	Type of actuator	Size of actuator	Time out
Rotating	Rotating actuator.	Small	10 s
Linear	Linear actuator.	Medium	25 s
		Large	60 s
		Texas	180 s

Lever Only for linear actuator.
Lever stroke Stroke length to achieve correct display.
Level cal Calibration of positions to achieve correct display.

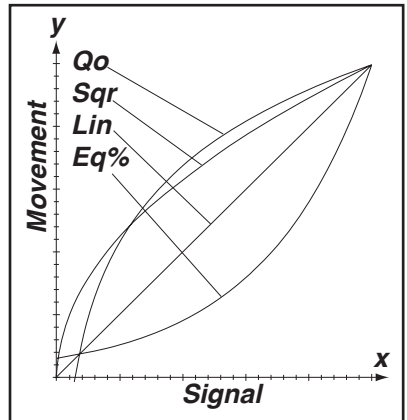
Direction

Direct Direct function (signal increase opens). Indicator/spindle rotates counter-clockwise.
Reverse Reverse function.

Character Curves that show position as a function of input signal.

Linear |
Equal % | See diagram.
Quick open |
Sqr root |
Custom | Create own curve.

Cust chr
of point Specify number of points (3, 5, 9, 17, or 33)
Cust curve Enter values on X and Y axes.



Curr range
0%=4.0 mA
100%=20.0 mA Possibility of selecting which input signal values will correspond to 0% and 100% movement respectively. Examples of settings: 4 mA = 0%, 12 mA = 100%, 12 mA = 0%, 20 mA = 100%.

<u>TRVL range</u>	<u>Setting end positions</u>	<u>Def. Display</u>	Select value(s) to be displayed during service.
0%=0.0%	Select Out of Service. Set percentage value for desired end position (e.g. 3%).		The display reverts to this value 10 minutes after any change is made.
Set 0%	Select In Service. Connect calibrator. Move forward to desired end position (0%) and press OK.	Start menu	Start in Basic menu or Full menu.
100%=100.0%	Select Out of Service. Set percentage value for desired end position (e.g. 97%).	Start logo	Show logo on start up
Set 100%	Select In Service. Connect calibrator. Move forward to desired end position (100%) and press OK.	Orient	Orientation of text on display.
		Par mode	Display of control parameters such as P, I, D or K, Ti, Td.
		HART	Menu with HART parameters. Only amendable with HART communicator. It is possible to read from display.
<u>Trvl ctrl</u>	<u>Behaviour at set end position</u>	Profibus Status	Indicates present status
Set low	Choose between Free (go to mechanical stop), Limit (stop at set end position), and Cut off (go directly to mechanical stop at set end position).	Device ID	Serial number
Set high Values	Similar to Set low. Select position for Cut off and Limit at the respective end positions.	Address	1-126
		Tag	Allotted ID
		Descriptor	ID description
		Date	N/A
		Failsafe	Value = preset pos Time = Set time +10sec= time before movement Valve act = failsafe (preset pos) or last value (present pos) Alarm out= On/Off
<u>Passcodes</u>	<u>Setting passcodes for various functions</u>	Foundation Fieldbus	
Full menu	Passcode for access to full menu.	Device ID	Serial number
Write prot	Passcode for removing write protect.	Nod address	Address on the bus provided by the DCS system
Expert	Passcode for access to Expert menu (TUNING).	TAG-PD_TAG	Name provided by the DCS system
Fact set	Passcode to return to default values applicable when positioner was delivered.	Descriptor	PMV D3 positioner
		Date	N/A (not applicable)
		Sim jumper	Simulate jumper, FF simulation functionality activated = ON
Numbers between 0000 and 9999 can be used as passcodes. 0 = no passcode required.			
<u>Appearance</u>	<u>On display</u>		
Language	Select menu language.		
Units	Select units.		



The menu contents are shown in the chart on the next page and the various texts are described below:

- Close time** Minimum time (Min 0.005) from fully open to closed.
- Open time** Minimum time (Min 0.05) from closed to fully open.
- Deadband** Setting deadband. Min. 0.2%.

- Expert** Advanced settings.
- Control** See explanations below.

- Togglestep** Test tool for checking functions. Overlays a square wave on the set value.

- Self test** Internal test of processor, potentiometer, etc.

- Leakage** Air leakage in actuator/tubing can be compensated by settings.

- Undo** You can read last 20 changes.

P, I, D and K, Ti, Td parameters

If one of the gains is changed, the corresponding value in the other gain set is changed accordingly.

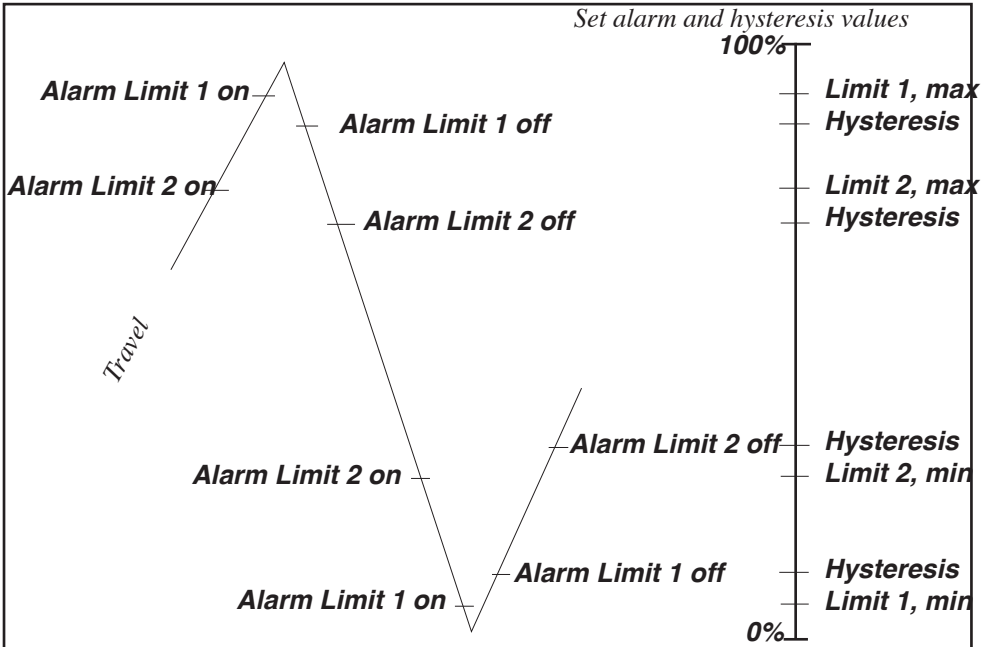
Spring adjust

The spring adjust function compensates the airflow linearly with the actuator C+ chamber volume (for a constant position error), so that low volumes get less flow. This is needed for linear single-acting actuators, where a low C+ volume means that the actuator spring is extended, its force is reduced, and less flow is needed for stable position changes.

FULL MENU
ALARMS

The menu contents are shown in the chart on the next page and the various texts are described below:

- | | |
|-------------------------|-------------------------------------------------|
| <u>Deviation</u> | <u>Alarm generated when deviation occurs</u> |
| On/Off | Alarm on/off. |
| Distance | Allowed distance before alarm is generated. |
| Time | Total deviation time before alarm is generated. |
| Alarm out | Select ON/OFF offers output on terminals. |
|
 | |
| Valve act | Behaviour of valve when alarm is generated. |
|
 | |
| <u>Limit 1</u> | <u>Alarm above/below a certain level.</u> |
| On/Off | Alarm on/off. |
| Minipos | Setting of desired min. position. |
| Maxpos | Setting of desired max. position. |
| Hysteresis | Desired hysteresis. |
| Alarm on | Select ON/OFF offers output on terminals. |
| Valve act | Behaviour of valve when alarm is generated. |
|
 | |
| <u>Limit 2</u> | <u>See Limit 1.</u> |



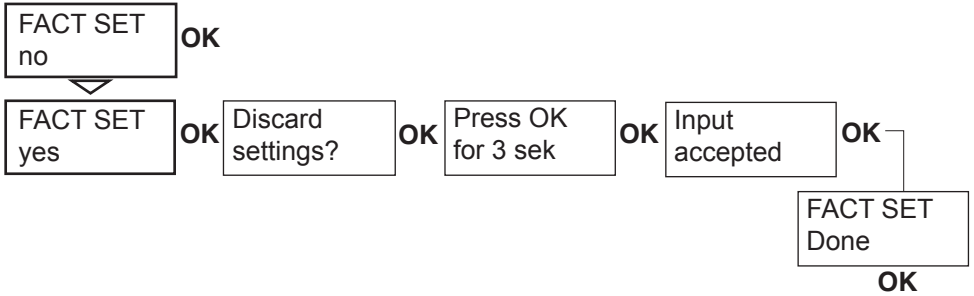
<u>Temp</u>	<u>Alarm based on temperature</u>
On/Off	Temperature alarm on/off.
Low temp	Temperature setting.
High temp	Temperature setting.
Hysteresis	Allowed hysteresis.
Alarm out	Select ON/OFF offers output on terminals.
Valve act	Behaviour of valve when alarm is generated.

<u>-Valve act</u>	
No action	Alarm generated only. Operations no affected.
Goto open	C+ gives full pressure and valve moves to fully open position. Positioner changes to position Manual.
Goto close	C- gives full pressure and valve moves to fully closed position. Positioner changes to position Manual.
Manual	Valve stays in unchanged position. Positioner moves to position Manual.



The menu contents are shown in the chart below.

The default values that were set on delivery can be reset using the Fact Set menu. Values from calibration and from other settings will then be lost.



READ			pos	set&pos		n cycles
MAN/AUTO	AUT_OK=MAN	MAN_OK=AUT	set&dev			acc travel
CALIBRATE	AutoCal		Pressure**	Supply		mean dev
	TravelCal		Pos Graph	C+		m. abs dev
	Perform		temp			runtime
	Expert cal		statistics			# of reset
		Setpoint	alarms			extr temp
		Pressure				histogram
		Transm.				reset stat
		pot				
		full reset				
SHIFT MENU	Basic menu					
	Full menu					
STATUS	O O SERVICE		Rotating	single act	small	
	IN SERVICE		Linear	double act	medium	
SETUP	Actuator		type		large	
	Lever*		function		Texas-size	
		Stroke	size			
		Lever cal				
	Direction		direct			linear
	Character		reverse			equal %
	Cust chr					quick open
						custom
						sqr root
						#of points
						X0=
						Y0=
	Curr range	0% =	0% =			
		100%=	Set 0%			
	Trvl range		Set 100%			
				Direction		direct
						reverse
	Trvl ctrl	Set low	free	Cutoff Low	Pos/Set	Position
		Set high	cutoff	Cutoff Hi		Set Point
		Values	limited	Limit Low	Trans.Card	D3-38
				Limit Hi		D3-81
	Transm.					
	Passcode	old	new (0=off)			
	Appearance	Language	English			
			Svenska	percent		
			Deutsch	mA		
			français	mm	percent	
			Italiano	cm	mm	
			español	inch	cm	
		Units	degrees	inch	degrees	
		Setpoint		degrees	bar	Grad C
		Position			psi	Grad F
		Pressure**			kPa	Kelvin
		Temp				
	Def. Displ					
	Start menu			pos		
				set&pos		
	Start Logo			set&dev		Message
		On/off	last value	menu		Tag
			basic			Descriptor
			full			Date
	Orient.					Device ID
		normal				Poll adr
		flipped				Assemblyno
	Devedata			HW rev		univ cmd
				SW rev		spec cmd
				Capability		On/off
				Hart		Burst Mode
						Burst
						4 Dynamic
						Pos (PV)
						Set (SV)
TUNING	Close time	Control	(x)			
	Open time	Togglestep		P,I,D		
	Deadband	Self test		K,Ti,Td	none	
	Expert	leakage		Spring Adj	medium	
		Undo		Friction	strong	low
						high
						run time
						cycle time
						size
						start
						Abort step
ALARMS	Deviation					
	Limit 1	On/off		On/off		
	Limit 2	Minpos		Distance		
		Maxpos		Time		
		Hysteresis	On/off	Alarm out		
		Alarm out		Valve act		
		Valve act				
	Temp	Low temp				no action
		High temp				goto open
		Hysteresis				goto close
		Alarm out				manual
		Valve act		Valve act		
FACT SET	no					
	yes					

(*) appear if Linear set
 (**) appear if pressure sensor exist
 (x) Position is show in upper row (PID, KTTTd)

12. Limit switches & 4 - 20 mA transmitter (Optional)

Caution!

The installation of electrical equipment in hazardous areas must comply with the procedures contained in the certificates of conformity. Country specific regulations may apply.

Electrical safety is determined only by the power supply device.

12.1 General

D20 can be equipped with optional plug in modules for limit switches and/or 4-20 mA feedback transmitter

12.2 Model selection

See D20 model code

12.3 Principle of operation

The stroke of the actuator/valve is picked up by the potentiometer inside the D20. Movement is transferred from actuator via lever or shaft coupling. Cams/vanes mounted on the positioner shaft actuate limit switches 1 and 2. The switching point can be adjusted on each cam/vane.

The position transmitter converts actual position into a 4-20mA output signal. This loop requires an external 12-25 VDC power supply.

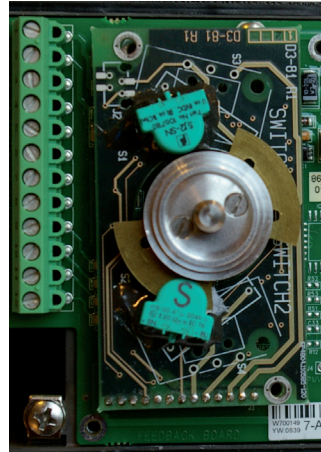
12.4 Installation



Caution! Turn off power and air supply before starting the installation.

Important!

For D20 installed in hazardous areas, maintenance and repair must only be made by authorized and trained staff.



- Remove cover, indicator if present and inner plastic cover.

- Check that spacers are installed on the printed circuit board.

- Carefully install feedback board into its position on the pins.

- Secure it with two (2) screws.

- Install cam assembly on the shaft, if feedback card has mechanical micro switches, be careful to not damage switch arms.

- Install plastic inner cover.

- Adjust cams/vanes to ensure proper switching.

- Secure cam/van position by locking them with two (2) screws.

- Calibrate 4-20 mA transmitter, (see next page).

- Install cover.

12.5 D20 Calibration of 4-20 mA input signal and/or 4-20mA feedback transmitter

- Press and hold button while switching on power to the D20, keep the button pressed for 6 sec. The eeprom will now be erased, and then all three LEDs are lighted. The LEDs will start to flash yellow-red. This starts FACTORY MODE!

To calibrate 4-20 mA input signal

- Apply 4.0 mA input signal and then push the button three (3) times until all LEDs are lighted. The LEDs will now start flash yellow-red again.

Apply 20.0 mA input signal and then push the button three (3) times until all LEDs are lighted.

To calibrate 4-20 mA transmitter output signal

Note! If no transmitter board is installed the LEDs will start flash yellow-yellow and the unit is ready for continued calibration.

If there is a transmitter board installed the LEDs will start flash yellow-green.

The feedback transmitter output signal

on pin 9 and 10 will now follow the input signal instead of the position. Apply 4.0 mA input signal. Measure the output signal and adjust the input signal up/down until the output signal is 4.0 mA. Push the button three times until all LEDs are lighted. The unit will now start to flash yellow-green again.

The output signal on pin 9 and 10 will continue to follow the input signal instead of the position. Apply 20.0 mA input signal. Measure the output signal and adjust the input signal up/down until the output signal is 20.0 mA. Push the button three times until all LEDs are lighted.



The LEDs will start flash yellow-yellow and the unit is ready for continued calibration.

Press the button for 5 sec until the LEDs start alternating, D20 starts to calibrate stroke.

After calibration the unit will start running in normal operation.


13. Trouble shooting

13.1 PMV D20 Normal operation








G 	Normal operation.	
Y 	Valve fully closed or open "Cut off" enabled.	

13.2 PMV D20 error codes

An unsuccessful calibration is indicated by the LED:s. The type of error is shown by the flash sequence.

Error code	Probable Cause	Action
R  (Alarm)	Deviation between set value and valve position.	

Calibration

R G  (No movement)	No air supply or shaft do not move.	Check air supply Check shaft movement.
R Y G 	Pot not calibrated.	Calibrate the pot.
R G R 	Hallsensor value too low.	
R R G 	Hallsensor span too low.	Check hallsensor connection.
R Y R 	Hallsensor value too high.	
Y R 	Unit in Factory Mode.	Calibrate 4 - 20 mA input signal.
Y G 	4 - 20 mA feedback installed	Calibrate output.

13.3 PMV D20 symptoms and solutions

Failure	Probable Cause	Corrective action
No LED is flashing.	Current source below 3,6 mA . Incorrect wiring polarity.	Verify current source supplies at least 3,6 mA. Check wiring for correct polarity.
Valve position reading is not what is expected.	Stem position sensor mounting D20 not calibrated. Tight shutoff MPC (Minimum position cutoff) is active.	Reposition sensor. is off 180 degrees. Calibrate D20. No action.
D20 goes in wrong direction.		Change direction (Section 9.4).
D20 is oscillating.		Decrease gain (Section 9.6).
D20 is responding slow.		Increase gain (Section 9.6).

14. Maintenance/service

When carrying out service, replacing a circuit board, etc., it may be necessary to remove and refit various parts of the positioner. This is described on the following pages.

Read the Safety Instructions on page 3 before starting work on the positioner.

Cleanliness is essential when working with the positioner. Contamination in the air ducts will infallible lead to operational disturbances. Do not disassemble the unit more than that described here.

Do not take the valve block apart because its function will be impaired.

When working with the PMV D20 positioner, the work place must be equipped with ESD protection before the work is started.



Always turn off the air and electrical supplies before starting any work.

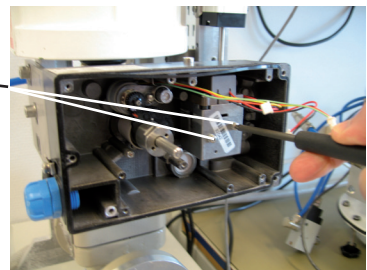
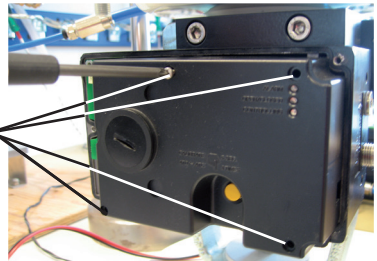


When upgrading electronically parts inside a PMV positioner approved for installation in Hazardous locations special procedures apply, permission from PMV/Flowserve is required prior to the start of work.

Please contact a Flowserve office for information regarding proper procedures.
www.pmv.nu or infolpmv@flowserve.com

14.1 Disassembling PMV D20

- Unscrew the three screws and remove the outer cover. When mounting cover – see page 14.
- Unscrew the four screws A and remove the inner cover.
- Unscrew the screws B, And remove the air relay assy.



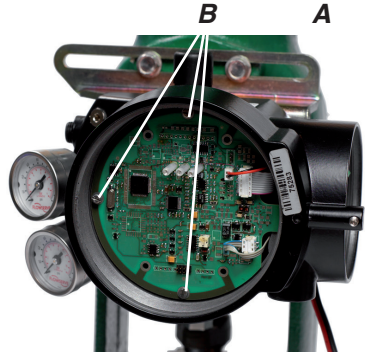
14.2 Disassembling PMV D20 Ex

Removing cover and inner cover

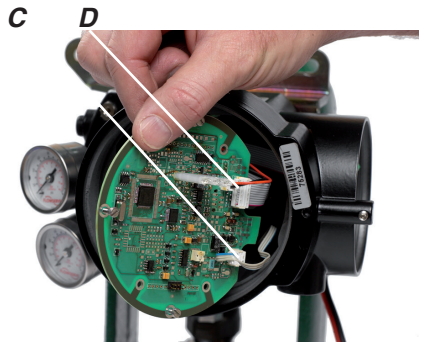
- Unscrew the screw A and remove the cover. When mounting cover – see page 14.



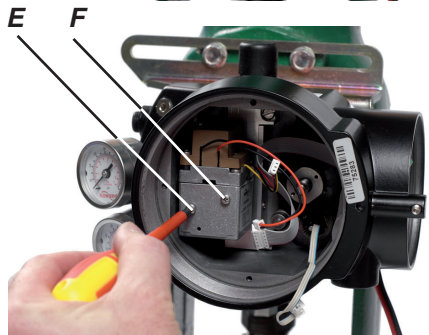
- Unscrew the three screws B, lift the circuit board.



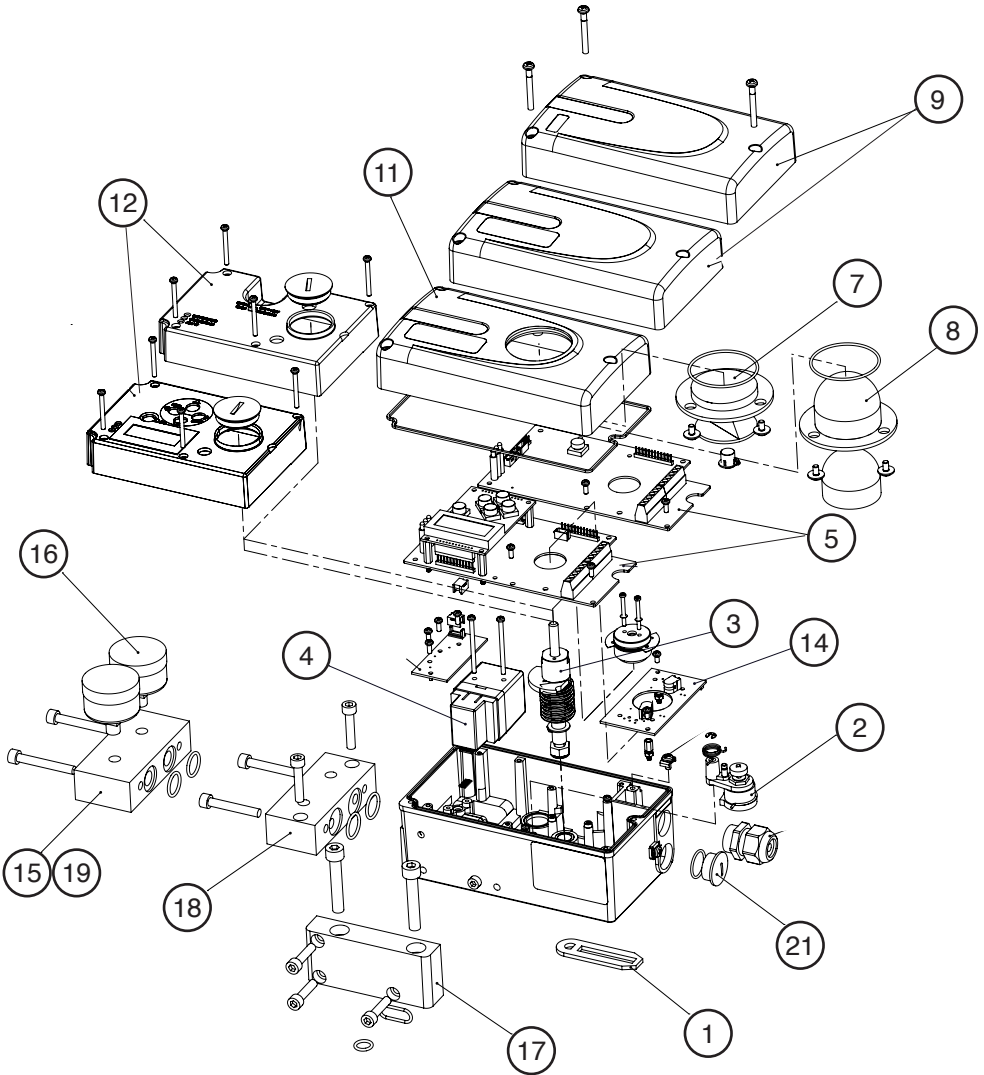
- Loosen the cables C and D.



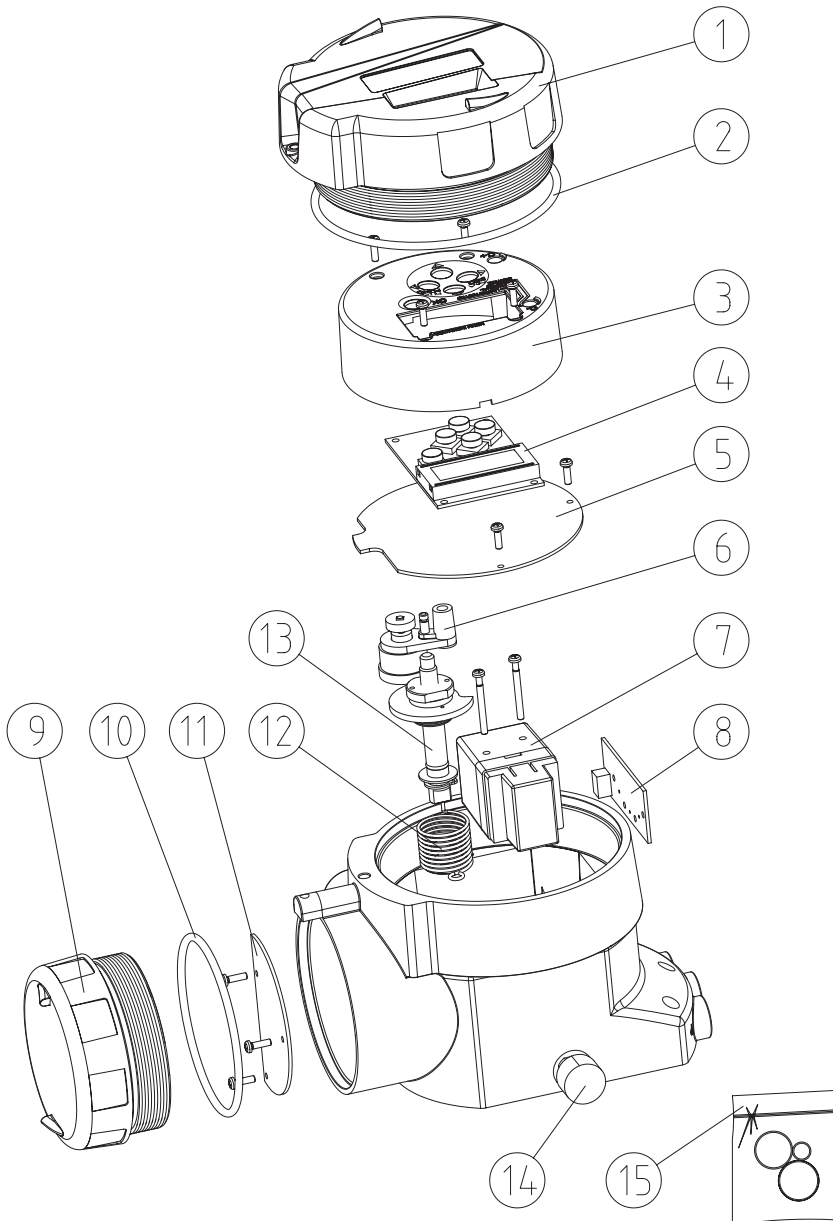
- Unscrew the two screws E and F and remove the air relay assembly.



15. Spare parts



Pos	PMV P/N	Descriptions	Remarks
		Housing	N/A
1	31947	Lever arm set	
2	30116	Potentionmeter assy. Compl	
3	D2-AS5D	Shaft D-type Linear, incl nut	
3	D2-AS5N	Shaft VDI/VDE 3845 Rotary	
	D3-S40	Shaft double D style	
	3-SXX	Spindle adaptor (XX = 01, 06, 26, 30, 36)	
4	D2-SP50 STD	Air relay assy. Ind. O-rings, screws, standard temp.	
4	D2-SP50 LT	Air relay assy. Ind. O-rings, screws, low temp.	
5	7-SP80 1X	Electronics	
5	7-SP80-I 1X	Electronics, Intrinsically Safe D20I	EEx ia
5	7-SP80-H 1H	Electronics, HART	HART
5	7-SP80-I-H 1H	Electronics, HART Intrinsically Safe D20I	EEx ia, HART
	7-SP80 3X	Electronics (for LCD version, D22)	
	7-SP80I 3X	Electronics, Intrinsically Safe (For LCD version, D22I)	EEx ia
	7-SP80 3H	Electronics, HART (For LCD version, D22)	HART
	7-SP80I 3H	Electronics, HART Intrinsically Safe (For LCD version, D22I)	EEx ia, HART
7	30125	Indicator, flat, arrow, assy. Complete	
8	D2-SP17	Indicator, dome yellow/black assy. Complete	
9	7-SP25B	Front cover, no indicator, black, ind. screws	
11	7-SP25B	Front cover, for indicator/dome, black, ind. screws	
	7-SP5B	Front cover for LCD, no indicator, black, ind. Screws	
	7-SP5BI	Front cover, for LCD & indicator/dome, black, ind. Screws,	
12	7-SP25	Inner cover assy, single button version	
	7-SP24	Inner cover assy, LCD version	
14	7-AS81T	4-20 mA transmitter only	
14	7-AS81M	Mechanical switches assy. comp (incl. cams, screws)	
14	7-AS81P	Proximity switches assy. compl.	
14	7-AS81N	P+F NJ2-V3-N sensors assy. compl.	
14	7-AS81D4	P+F SJ2 S1N sensors assy. compl.	
14	7-AS81D5	P+F SJ2 SN sensors assy. compl.	
14	7-AS81D6	P+F SJ2N sensors assy.comp.	
15	D2-SP40	Gauge block B 1/4" NPT, 1/4" NPT, 1/8" NPT, no gauges	
15	D2-SP40	Gauge block C 1/4" NPT, 1/4" NPT, 1/8" G, no gauges	
15/16	D2-SP40	Gauge block B 1/4" NPT, 1/4" NPT, 1/8" NPT, 1 gauge (SS/brass)	
15/16	D2-SP40	Gauge block C 1/4" NPT, 1/4" NPT, 1/8" G, 1 gauge (SS/brass)	
15/16	D2-SP40	Gauge block B 1/4" NPT, 1/4" NPT, 1/8" NPT, 2 gauges (SS/brass)	
15/16	S2-SP40	Gauge block C 1/4" NPT, 1/4" NPT, 1/8" G, 2 gauges (SS/brass)	
17	30144	Flowtop mounting kit incl. O-ring, screws	
18	30145	VDI/VDE 3847 mounting assy. incl. O-rings, screws	
19	30395	Double acting module incl. 2 x Gauges	
21	30738	Plug and cable gland kit, black	
	7-AS84	Pressure sensor kit	
	30737	Seal and O-ring kit	
	30135	Screw and washer kit	



Pos	PMV P/N	Descriptions	Remarks
1		Housing	N/A
2		Cover, large	N/A
3		O-ring large	N/A
3	D3E-SP4	Inner cover assy for LCD version	
4	3-SP37HR	LCD Display for D22	
5	3E-SP851X	Electronics D20, single button version D20	
5	3E-SP851XT	Electronics + 4-20mA transmitter, Single button version D20	
5	3E-SP851H	Electronics, HART, Single button version D20	HART
5	3E-SP851HT	Electronics, HART + 4-20mA transmitter, Single button version D20	HART
5	3ESP85 3X	Electronics, for LCD version D22	
5	3ESP85 3XT	Electronics + 4-20mA transmitter for LCD version D22	
5	3ESP85 H	Electronics, HART for LCD version D22	HART
5	3ESP85 HT	Electronics, HART + 4-20mA transmitter for LCD version D22	HART
6	D3E-AS4	Potentiometer compl. incl. spring, holder, cable	
7	D2-SP50 STD	Air relay assy. Ind. O-rings, screws, standard temp.	
7	D2-SP50 LT	Air relay assy. Ind. O-rings, screws, low temp version	
8	7-AS84	Pressure sensor kit	
9		Cover, terminals	N/A
10		O-ring small	N/A
11	D20-AS99	Terminal PCB D20 Single button version	
11	3E-SP83	Terminal PCB D22 LCD / Menu version	
12		Spring, see spindle assy	
13	3-AS23	Shaft assy, D-type Linear, incl nut and spring	
13	3-AS39	Shaft assy, VDI/VDE 3845 Rotary and spring	
13	3-AS09	Shaft assy, double D style and spring	
	3-SXX	Spindle adaptor (XX = 01, 06, 26, 30, 36)	
14	D3E-SP67	Bleeder cap	
15		O-ring kit Explosion proof	

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