



## ***USER INSTRUCTIONS***

### ***PMV D3 Digital Positioner***

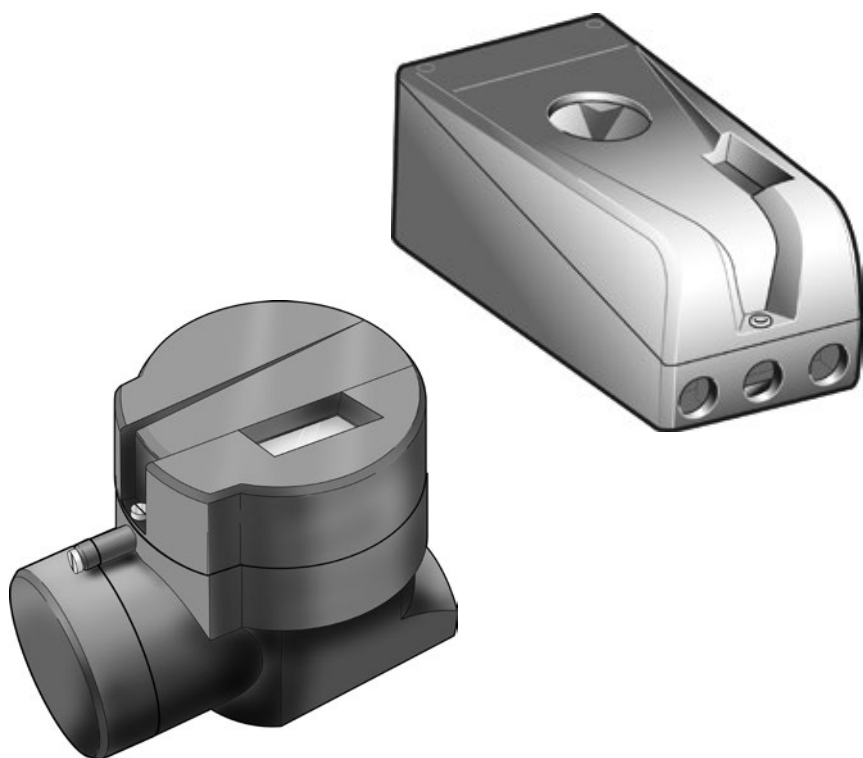
*Installation*

*Operation*

*Maintenance*

***FCD PMENIM0001-03 - 12/14***

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## 1. Introduction

The PMV D3 is a digital positioner designed primarily for controlling adjustable valves. The positioner can be used with single or double action actuators with either rotary or linear movement.

The PMV D3 can be equipped with modules for feedback, limit switches and a pressure gauge block. Pressure sensors can be installed in the pneumatic block to offer advanced diagnostics. The modules can be factory assembled before

delivery or fitted later.

The modules for feedback and limit switches can contain the following:

Feedback 4-20 mA and one of the following functions:

- Two mechanical contacts
- Two reed switches
- Two inductive sensors, EN60947-5-6



### Safety instruction

Read the safety instructions in this manual carefully before using the product. The installation, operation, and maintenance of the product must be done by staff with the necessary training and experience. If any questions arise during installation, contact the supplier/sales office before continuing work.

### Warning

- The valve package moves when in operation and can cause personal injury or damage if handled incorrectly.
- If the input signal fails or is switched off, the valve moves quickly to its end position.
- If the compressed air supply fails or is turned off, fast movements can occur.
- The valve is not controlled by the input signals when in the Out of service mode. It will open/close in the event of a leak.
- If a high value is set for Cut off, fast movements can occur.
- When the valve is controlled in the Manual mode, the valve can move quickly.
- Incorrect settings can cause self-oscillation, which can lead to damage.

### Important

- Always turn off the compressed air supply before removing or disconnecting the air supply connection or the integral filter. Remove or disconnect with care because C- is still under pressure even after the air supply is turned off.
- Always work in an ESD protected area when servicing the PCB's. Make sure the input signal is switched off.
- The air supply must be free from moisture, water, oil and particles.

### Special Conditions for Safe Use

The enclosure of PMV D3I (Intrinsically safe) is made of aluminium and any impact or friction caused by external objects shall be avoided in the application.

### All spare parts for certified products for hazardous locations

(Ex and IS) are only available for certified service facilities.

Palmstierna International AB (PMV Positioners) will only supply spare parts for Explosion proof or Intrinsically safe products to certified purchasers. In order to be allowed to purchase spare parts for IS and EX products the purchaser must be registered by proper Notified Body and covered under PMV QAN.

According to IEC 60079-19 section 4

4.4.3.2 Modifications are not permitted.

If the equipment is modified the user shall be informed in writing that the equipment is no longer suitable for use in an explosive atmosphere.

Should you have any questions with regards to this, please feel free to contact us anytime.



## 2. Storage

### General

The PMV D3 positioner is a precision instrument. Therefore it is essential that it is handled and stored in the right way. Always follow the instructions below!

**N.B.** As soon as the positioner is connected and started, internal air leakage will provide protection against corrosion and prevent the ingress of moisture. For this reason, the air supply pressure should always be kept on.

### Storage indoors

Store the positioner in its original packaging. The storage environment must be clean, dry, and cool (15 to 26°C, 59 to 79°F).

### Storage outdoors or for a longer period

If the positioner must be stored outdoors, it is important that all the cover screws are tightened and that all connections are properly sealed. The unit should be packed with a desiccant (silica gel) in a plastic bag or similar,

covered with plastic, and not exposed to sunlight, rain, or snow.

This is also applicable for long-term storage (more than 1 month) and for long transport by sea.

### Storage in a warm place

When the positioner is stored in a warm place with a high relative humidity and is subjected to daily temperature variations, the air inside the unit will expand and contract.

This means that air from outside the unit may be drawn into the positioner. Depending on the temperature variations, relative humidity, and other factors, condensation and corrosion can occur inside the unit, which in turn can give rise to functional disorders or a failure.

### 3. Design

The PMV D3 positioner contains:

- Electronic board with microprocessor, HART modem, Profibus, Foundation Fieldbus, display, etc.
- Valve block
- Positional feedback with potentiometer
- Sealed compartment for electrical connections.

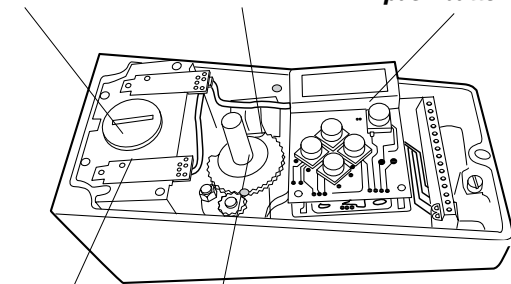
The push buttons and display are accessible underneath the aluminium cover, which is sealed with an O-ring.

A PC configurator is available free of charge on our webpage [www.pmv.nu](http://www.pmv.nu)

The only requirements are: D3 positioner must have HART communication and a HART modem for connection between PC and positioner.

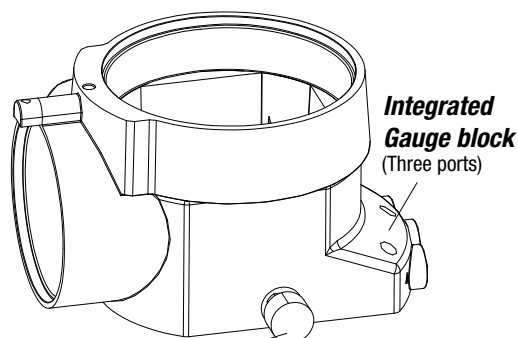
With the configurator, settings can be done and saved in the PC, then downloaded to the positioner.

**Filter**      **Pressure sensors**      **Display, control push buttons**



The figure shows the **PMV D3** with the cover removed.

**Valve block**      **Positional feedback**



The figure shows the **PMV D3E** with the covers removed.

**Air vent protection cap**  
(Make sure it is installed, facing upwards, before taking the unit into service.)

### 4. Variants

#### PMV D3 General purpose

The PMV D3 digital positioner has an easy to use user interface with 5 pushbuttons and local graphic LCD display. Communication options include 4-20mA HART, Foundation Fieldbus and Profibus PA. All PMV D3 positioners are available with Feedback, Fail Freeze (Fail in last position and hold when power is lost), 270-degree rotation (for extended travel) and Gauge block.



#### PMV D3 Intrinsically safe

The PMV D3 digital positioner is available in intrinsically safe version for installation in hazardous areas. The intrinsically safe PMV D3 has all the same features and options as the general purpose version, gauge block, local graphic LCD display and feedback option etc. Communication with Hart, Profibus and Foundation Fieldbus is possible.

ATEX:

Ex II 1G Ex ia IIC T4 Ga Ta:80°C / IP66

#### PMV D3 Explosion proof

The PMV D3 digital positioner is available in explosion proof enclosure. The explosion proof PMV D3 features the same easy to use interface for local configuration as the **general purpose** version does. Communication with Hart, Foundation Fieldbus and Profibus is possible. Further features are gauge ports and local graphic LCD display.

ATEX:

Ex II 2G Ex d IIB+H<sub>2</sub> T6 Ta:60°C  
II 2D T85°C, Ta:80°C / IP66

CSA, FM

Class I, Div.1 Grps B, C, D

Class II, Div.1 Grps E, F, G

Class III, Div.1

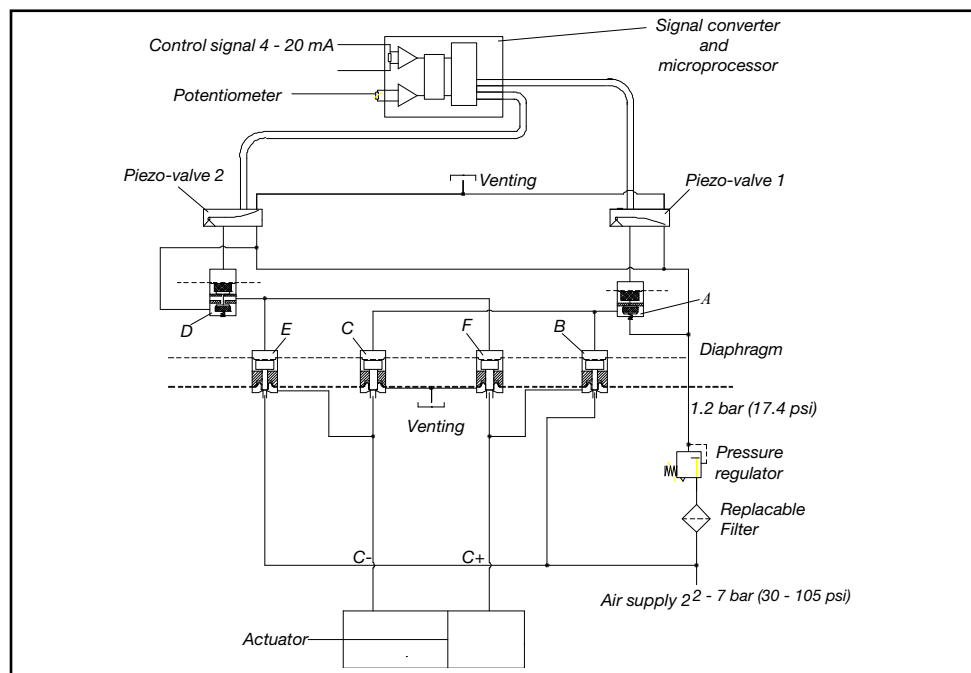
T6, T5 / Type 4X



#### Pressure sensors

Pressure sensors can be installed in the pneumatic block in order to provide advanced diagnostics in combination with ValveSight software.

## 5. Function



The control signal function and the feedback from the potentiometer position are converted to digital signals that are processed with a PID algorithm in the microprocessor. This provides control signals to the two piezo-valves.

Valves B and E deliver air to the actuator while valves C and F exhaust air from the actuator to atmosphere. Valves B and C are controlled by Piezo-valve 1 and valve A. Valves E and F are controlled by Piezo-Valve 2 and valve D.

Full supply pressure is directed to valves B and E. Air with filtered and reduced pressure is supplied to valves A, C, D and F.

For double acting actuators, connect C+ and C- to the actuator.

For single acting (spring return) actuators connect C+ to the actuator and plug port C-. Single acting versions have the air block plugged in one end as default. To convert from double to single acting function - see page 11.

Increasing input signal changes position in piezo-valve 1, causing valve A to close.

Supply pressure is then allowed to open valve B and flow to the actuator via the C+ port. When the actuator reaches its new steady state position piezo-valve 1 closes which causes valves B and C to close shutting off supply air to the actuator.

A decreasing input signal functions in the same manner, except uses piezo-valve 2 and valves D, E and F.

## 6. Installation

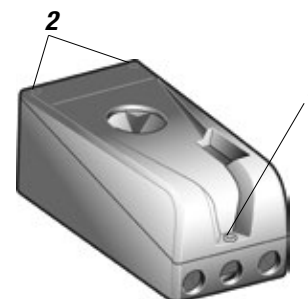
### Removal of cover

#### General purpose / Intrinsically safe

Remove cover by first loosening the screw 1 and then the two screws 2.

To install cover, first tighten the screw 1, then the two screws 2.

Tighten to 1,5 — 2 Nm.

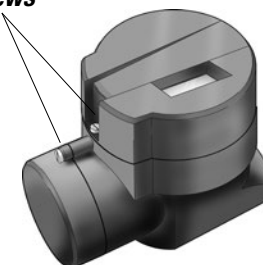


### Explosion proof

To remove covers, first unscrew securing screws, then unscrew covers.

To install, screw covers on as far as possible. Mount the securing screws. Back off slightly on the large cover to be able to screw down the securing screw completely.

#### Securing screws



### Tubing

Use tubes with a minimum inner diameter of Ø 6 mm (1/4").

### Air supply requirements

**Poor quality in air supply is the main cause of problems in pneumatic systems.**

The air supply must be free from moisture, water, oil and particles and delivered @ 2-7 bar (30-105 psi)

Standard: **DIN/ISO 8573-1-2001 3.2.3**

Filtered to 5 Micron, dew point -40°C/F

Oil 1mg/m³ (0,83 ppm by weight)

The air must come from a refrigeration dried supply or be treated in such a way that its dew point is at least 10°C (18°F) below the lowest expected ambient temperature.

To ensure a stable and problem-free air supply, we recommend the installation of a filter/pressure regulator <5µ as close to the positioner as possible.

Before the air supply is connected to the positioner, we recommend the hose is opened freely for 2 to 3 minutes to allow any contamination to be blown out. Direct the air jet into a large paper bag to trap any water, oil, or other foreign materials. If this indicates that the air system is contaminated, it should be properly cleaned.



**WARNING!** Do not direct the open air jet towards people or objects because it may cause personal injury or damage.

## Mounting

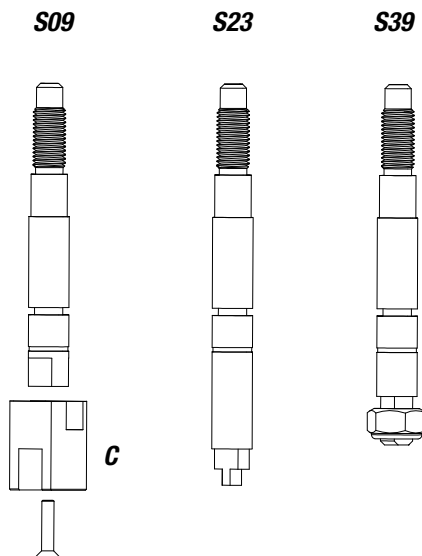
**N.B.** If the positioner is installed in a hazardous environment, it must be of a type approved for this purpose.

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.

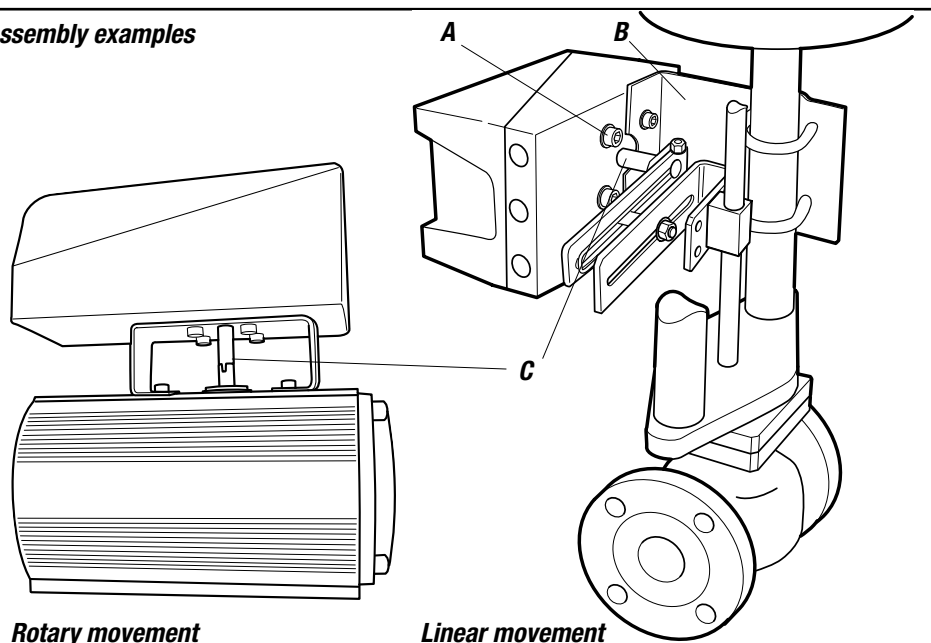
The spindle adapter C can be changed to suit the actuator in question.

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

### Spindles



### Assembly examples



## Connections

### Air:

Port S Supply air, 2-7 bar (30-105 psi)  
Port C+ Connection to actuator, opening  
Port C- Connection to actuator, closing  
(only for double action)  
Plug for single action, see below

### Electrical connection

See page 13, 14.

### Dimensions

Air connections:

1/4" NPT alt. G 1/4"

Electrical connection:

M20 x 1.5 alt. NPT 1/2"

Loctite 577 or equivalent is recommended as a sealant.

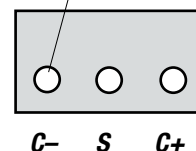
### Converting the D3 between single acting and double acting mode

When using the D3 (all versions) in single acting mode, the external C- port as well as the air block need to be blocked. (Air block plug installed per default when ordered for single acting use.)

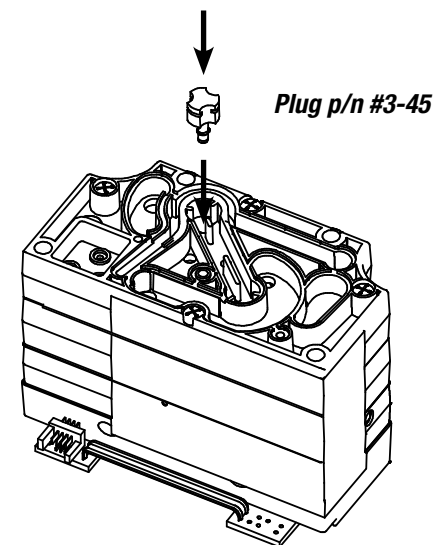
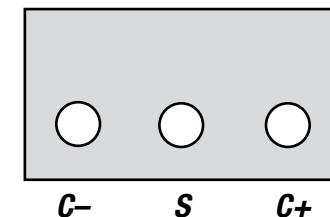
Plug the air block (acc. to the picture) with the nylon plug and o-ring. (item 3-45).

When in double acting mode, the nylon plug must be removed and the C- port connection opened.

**Must be plugged when converting to single action function.**



External air Connection



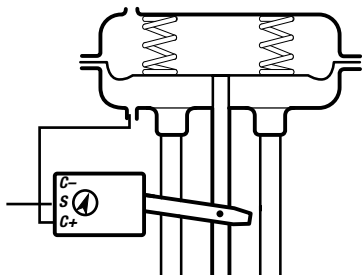
**For data for air and electrical connections, see section Technical Data on page 45.**



## Single action positioner, Direct function

### Actuator with closing spring

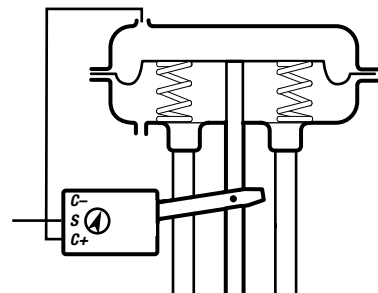
When the control signal increases, the pressure C+ to the actuator is **increased**. The valve stem moves upward and rotates the positioner spindle **counter-clockwise**. When the control signal drops to zero, C+ is vented and the valve closes.



### Reverse function

#### Actuator with opening spring

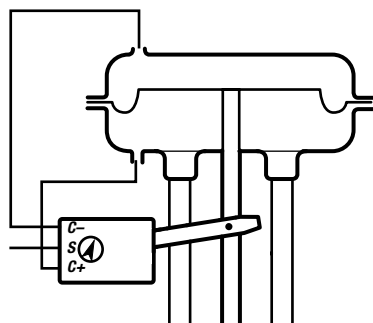
When the control signal increases, the pressure C+ to the actuator is **increased**. The valve stem moves downward and the positioner spindle rotates **clockwise**. When the control signal drops to zero, C+ is vented and the valve opens.



## Double action positioner, Direct function

### Double action actuator

When the control signal increases, the pressure C+ to the actuator is increased. The valve stem is pressed upward and rotates the positioner spindle counter-clockwise. When the control signal is reduced, the pressure C- to the actuator increases and the valve spindle is pressed downward. If the control signal disappears, the pressure goes to C-, C+ vents, and the valve closes.



### Fail in place (Fail Freeze)

When the input signal drops below 3,75 mA, the Fail Freeze function holds the actuator/valve at current position.

Drift rate in midrange <0,1% after 30 s and < 2% after 30 min.

## Electrical connections

Terminal block diagram for the PMV D3 and PMV D3 Ex.

### PMV D3

The terminal block (below) for the positioner is accessible when the aluminium cover and inner cover are removed, see Section 8.

### Remote unit

The remote unit shall be connected between terminals 3, 4 and 5 in the PMV D3 and 7, 8 and 9 in the remote unit. Use a shielded cable and ground it to the PMV D3 or to the remote unit. (Not both units at the same time.)



**Warning!** In a hazardous environment where there is a risk of explosion, electrical connections must comply with the relevant regulations.

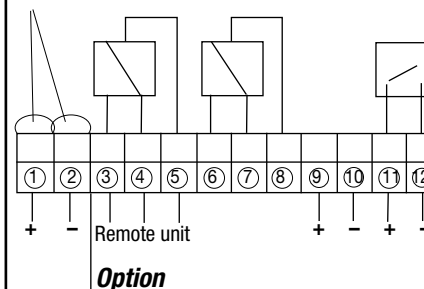
Max distance between PMV D3 and remote unit: 5 m (16,4 ft).

**Note!** When connecting the PMV D3 or PMV D3 Ex to a remote unit, modifications have to be done internally with a cable. Details found on [www.pmv.nu](http://www.pmv.nu)

**When installing the PMV D3 Intrinsically safe unit - always consider control drawing 3-86 found at [www.pmv.nu/downloads](http://www.pmv.nu/downloads).**

### PMV D3, 12 terminals

#### Connection

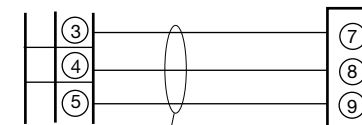


#### Option

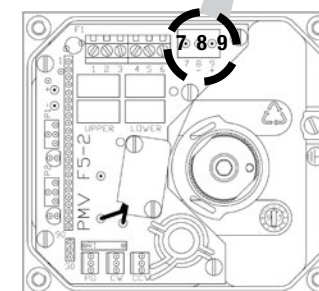
- 1 Input signal + 4-20 mA , Hart, Profibus PA, Foundation Fieldbus
- 2 Input signal - 4-20 mA , Hart, Profibus PA, Foundation Fieldbus
- 3 Switch 1 NO/Remote
- 4 Switch 1 NC/Remote
- 5 Switch 1 COM/Remote
- 6 Switch 2 NO
- 7 Switch 2 NC
- 8 Switch 2 COM
- 9 4-20 mA + Feedback, 13-28 V DC
- 10 4-20 mA - Feedback, 13-28 V DC
- 11 Alarm output +, 8-28 V DC
- 12 Alarm output -, 8-28 V DC

### Connecting a remote unit

PMV D3/D3Ex Remote unit



Shielded cables, grounded on the PMV D3.



## PMV D3 Ex

The terminal (below) for the positioner is accessible when the terminal cover is removed, see Section 8.

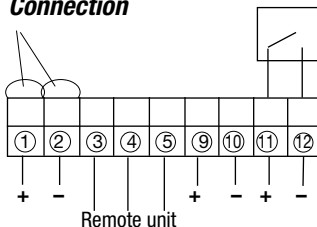
See cdwg 3-86



**Warning!** In a hazardous environment where there is a risk of explosion, electrical connections must comply with the relevant regulations.

### PMV D3 Ex

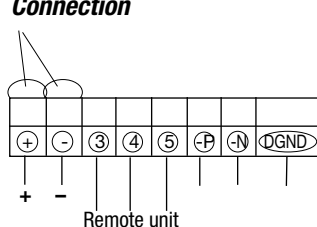
#### Connection



- 1 Input signal + 4-20 mA ,  
Hart, Profibus PA, Foundation Fieldbus
- 2 Input signal - 4-20 mA ,  
Hart, Profibus PA, Foundation Fieldbus
- 3 Remote unit
- 4 Remote unit
- 5 Remote unit
- 9 4-20 mA + Feedback, 13-28 V DC
- 10 4-20 mA - Feedback, 13-28 V DC
- 11 Alarm output +, 8-28 V DC
- 12 Alarm output -, 8-28 V DC

### PMV D3 Ex Profibus DP

#### Connection



- 1 Input signal +24V Profibus DP
- 2 Input signal -24V Profibus DP
- 3 Remote unit
- 4 Remote unit
- 5 Remote unit
- P Profibus DP Communication
- N Profibus DP Communication
- DGND Digital Ground

## Type sign examples

### General purpose and Intrinsically safe housing

|  |   |                    |  |
|--|---|--------------------|--|
|  |   | D3IGU-D23PVA-Z5XX  |  |
|  | Ex ia IIC T4 Ga , Ta=-30...+80°C, NEMKO 03ATEX110X<br><b>INTRINSICALLY SAFE/SECURITE INTRINSIQUE-Exia</b><br>When installed in accordance with installation drawing:3-86C<br><b>WARNING!</b> Substitution of components may impair intrinsic safety.<br><b>AVERTISSEMENT!</b> La substitution de composants peut compromettre a securite intrinsique. | 3-88C              |  |
|  | <b>IP66/Nema 4x</b>   | FISCO field device | Flowserve, Sweden<br>Palmstierna International<br>Solna, Sweden<br>www.flowserve.com |
|  |   |                    | S/N  |

### Explosion proof housing

|   |                          |                   |  |
|---|--------------------------|-------------------|--|
| <b>EXPLOSION PROOF DIGITAL VALVE POSITIONER</b>   |                          |                   |  |
| Product Code: D3abcdeeffghij  |                          |                   |  |
| Class I Div.1 Grps. B,C&D Class II Div1 Grps E,F&G<br>T6(Ta:+65°C/+149°F) T5(Ta:+80°C/176°F) Type 4X  |                          |                   |  |
| Ex d IIB+H <sub>2</sub>   | T6 Ta:+60°C              | IP66              |  |
| CE 0470   | Ex II 2GD T85°C Ta: 80°C | NEMKO 03ATEX 111  |  |
| Ex d IIB+H <sub>2</sub>   | T6 Gb Ta: +60°C          | IP66              |  |
| Ex tb IIIC  | T85°C Db Ta: +80°        | IECEx NEM 09.0001 |  |
| Electrical Rating: max 28V DC, max24mA, max0,67W<br>Do not open while energized! Seal within 50 mm of the enclosure.<br>Max. working pressure: 700kPa/100 psi |                          |                   |  |
| <b>PALMSTIERNA INTERNATIONAL AB, SOLNA SWEDEN</b>   |                          |                   |  |
| Prod year-serial number P/N: D3E-XX   |                          |                   |  |



## D3 Digital Positioner model code

|    |   |
|----|---|
| A= | <b>Model no</b>   |
|    | D3X Digital positioner with display and indicator, General purpose                                  |
|    | D3Z Digital positioner with display and indicator, General purpose, Direct mount to Flowact         |
|    | D3I Digital positioner with display and indicator, Intrinsically safe ATEX                          |
|    | D3Y Digital positioner with display and indicator, Intrinsically safe ATEX, Direct mount to Flowact |
|    | D3E Digital positioner with display, no indicator, Explosion proof ATEX, CSA/FM                     |
|    | D3F Digital positioner with display, Explosion proof ATEX, FM, IEC Direct mount to Flowact          |
| B= | <b>Connections</b>  |
|    | G 1/4" G air, M20 x 1,5 ectrical  |
|    | N 1/4" NPT air, 1/2" NPT electrical   |
|    | M 1/4" NPT air, M20 x 1,5 electrical  |
| C= | <b>Surface treatment</b>  |
|    | U Powder epoxy  |
| D= | <b>Function</b>   |
|    | S Single acting   |
|    | L Single acting, Fail Freeze  |
|    | P Single acting, Fail freeze remote mounted   |
|    | M Single acting, remote mounted   |
|    | D Double acting acting  |
|    | H Double acting high-flow (A=D3X only)  |
|    | T Double acting high-flow remote (A=D3X only)   |
|    | K Double acting Fail Freeze function  |
|    | Q Double acting Fail freeze remote mounted  |
|    | R Double acting Remote mounted  |
| E= | <b>Spindle</b>  |
|    | 23 Rotary VDI/VDE 3845  |
|    | 39 D type with thread/nut for Linear actuators  |
|    | 09 Double D type & adator spindle for 01/02/06/21/26/30/36/41                                       |
|    | BA BASF special unit with, Spindel 39 With adapter  |
| F= | <b>Cover and Indicator (No indicator on D3E, D3F)</b>   |
|    | PVA Black PMV, 90 deg, Arrow indicator  |
|    | PVB Black, Extended travel, 270 deg Arrow indicator   |
|    | FSW White cover, Flowserve, 90 deg, Arrow indicator   |
|    | FSY Yellow cover, Flowserve, 90 deg, Arrow indicator  |
|    | WCA Worcester Controls, Arrow indicator   |
| G= | <b>Sensors/Temperature/seals</b>  |
|    | Z No pressure sensors, NBR -30 to 80 deg C  |
|    | Y On Board pressure sensors, NBR -30 to 80 deg C  |
| H= | <b>Input signal/Protocol</b>  |
|    | 4 4-20 mA   |
|    | 5 HART, 4-20 mA   |
|    | P Profibus PA   |
|    | D Profibus DP   |
|    | F Foundation Fieldbus   |
| I= | <b>Feedback option (Limitations for D3E)</b>  |
|    | X No feedback option  |
|    | T* Plug in 4-20 mA transmitter only + Alarm module  |
|    | S* Limit switches MEC + 4-20 mA + Alarm   |
|    | N* Limit sensors NAM + 4-20 mA + Alarm  |
|    | P* Limit switches PXY + 4-20 mA + Alarm   |
|    | 4* Slot type Namur sensor, P+F SJ2 S1N + Alarm  |
|    | 5* Slot type Namur sensor, P+F SJ2 SN + Alarm   |
|    | 6* Slot type Namur sensor, P+F SJ2N + Alarm   |
| J= | <b>Accessories</b>  |
|    | X No accessories  |
|    | M Gauge block For D3X, D3I only, For D3E (default) Gauge ports D3E, D3F (default)                   |
|    | 1 Gauge block incl 1 gauge included stainless/brass   |
|    | 2 Gauge blocks incl 2 gauges included stainless/brass   |
|    | 3 Gauge blocks incl 2 gauges included stainless/brass   |

A A A B C - D E E F F F - G H I J


\*Not for D3E, D3F

## 7. Control

### Menus and pushbuttons

The positioner is controlled using the five push-buttons 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 19.

### 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.

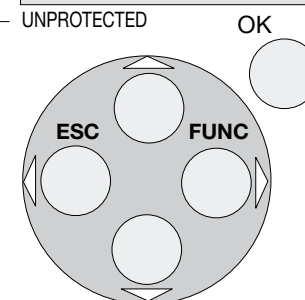
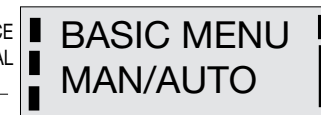
#### MENU INDICATOR

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  
MANUAL



### 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 27.

### 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.

## Menu indicator

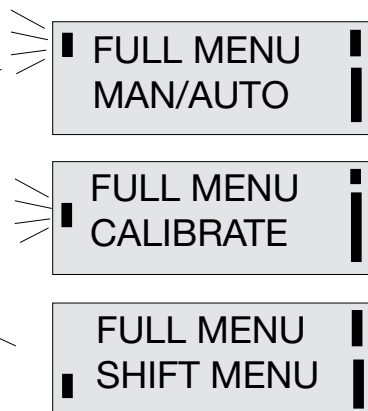
There are indicators at both sides of the display window and they indicate as follows:

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.



## 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.

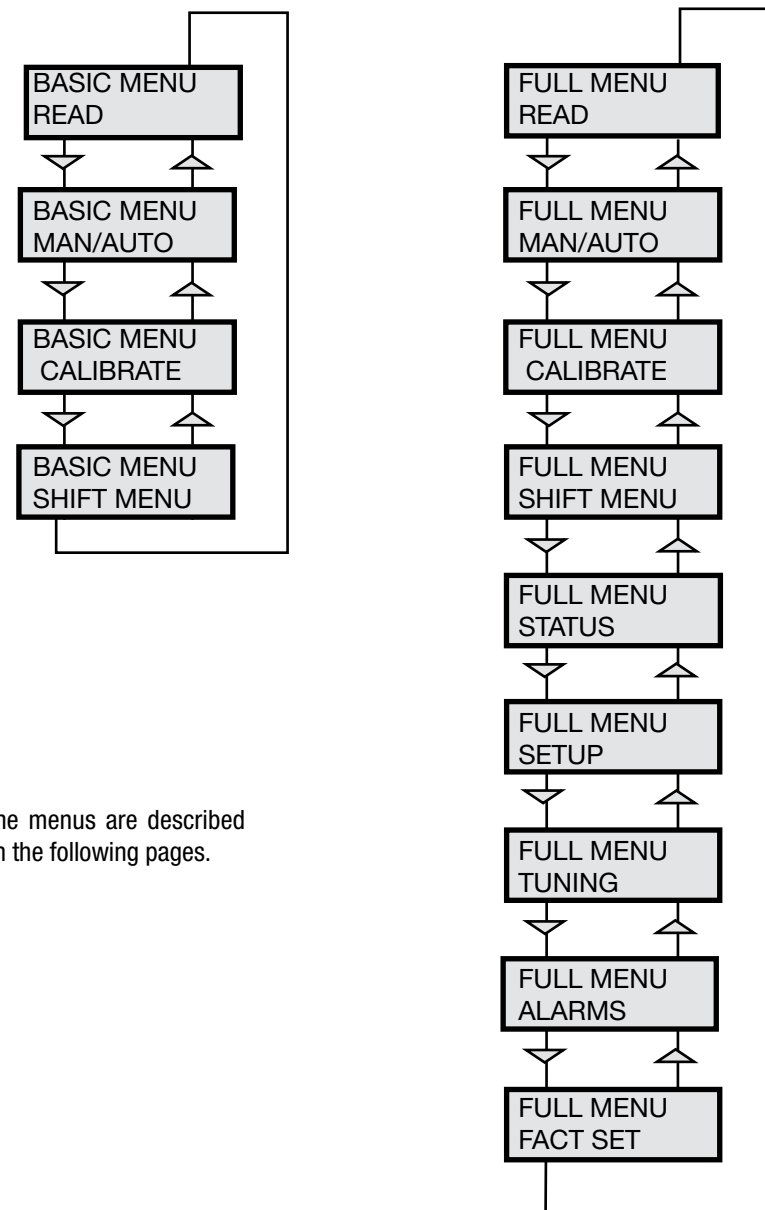
## Changing parameter values

Change by pressing  $\triangleleft$   $\triangleright$  until the desired figure is flashing.

Press  $\triangleup$   $\triangleleft$  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.

## Menu system



The menus are described on the following pages.



## First start

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

A complete auto-calibration takes up to 30 minutes depending on size of actuator and includes end limit calibration, auto-tuning, leak test and a check of the movement speed. Start the automatic calibration by selecting **Auto-Cal** and then answer the questions in the display by pressing **OK** or the respective arrow. The menu is described on page 23.

## 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.

### Air leak detected/ESC = abort

#### OK = go on

An air leak has been detected. The calibration sequence should be restarted after the fault is corrected.

### First start, Profibus PA/DP

For Profibus PA, connect the input signal at pos 1 and 2 on the terminal block. For Profibus DP, connect power to pos 1(+) and 2(-) and communication to pos 6 and 7. See Electrical connections in the manual.

In the SETUP/Devicedata/Profibus: change the address from 126 to any number between 1-125. Never use the same number with more than one unit. Install values in failsafe mode, for communication when loss of signal.

Calibrate the unit.

GSD files are available at our web-page [www.pmv.nu](http://www.pmv.nu)

### To install the D3\_PROFIBUS.DDL file to Siemens SIMATIC PDM.

1. Move the files to The directory with the DeviceInstall.exe. There should be one existing from Siemens that is included in PDM
2. Run the Program DeviceInstall.exe

| Parameter | Description      | BYTE   |
|-----------|------------------|--|
| SP        | Setpoint         | The SP has 5 bytes, 4 bytes for the float value and one status byte that has to be 128 or over (80 in hex) for the D3 to accept it.<br>Use 128 means GOOD and everything should work fine. 4+1=5 |
| READBACK  | Position         | The READBACK has 5 bytes, 4 bytes for the float value and one status byte. 4+1=5   |
| POS_D     | Digital position | Gets a position in digital form<br>0 = Not initialized<br>1 = Closed<br>2 = Opened<br>3 = Intermediate 2   |
| CHECKBACK |                  | Detailed information of the device, bit wise coded, more than one message possible at ones.3   |
| RCAS_IN   | Remote Cascade   | The RCAS_IN has 5 bytes, 4 bytes for the float value and one status byte. 4+1=5  |
| RCAS_OUT  | Remote Cascade   | The RCAS_OUT has 5 bytes, 4 bytes for the float value and one status byte. 4+1=5   |

### Status Byte Table

| MSB             | LSB meaning         | D3 use                        |
|-----------------|---------------------|-------------------------------|
| 0 0 0 0 1 0 x x | not connected       |                               |
| 0 0 0 0 1 1 x x | device failure      | PROFibus PA module failure    |
| 0 0 0 1 0 0 x x | sensor failure      | No sensor value               |
| 0 0 0 1 1 1 x x | out of service      | AI Function Block in O/S mode |
| 1 0 0 0 0 0 x x | Good -              | Non cascade measured value OK |
| 1 0 0 0 0 0 0 0 | OK                  | All Alarm values used         |
| 1 0 0 0 1 0 0 1 | Below low limit Lo  | Advisory alarm                |
| 1 0 0 0 1 0 1 1 | Above high limit Hi | Advisory alarm                |
| 1 0 0 0 1 1 0 1 | Lo-Lo               | Critical alarm                |
| 1 0 0 0 1 1 1 1 | Hi-Hi               | Critical alarm                |

Example SP = 43.7% and 50%

| Float | Hex         | Status |
|-------|-------------|--------|
| 43.7  | 42 2E CC CD | 80     |
| 50.0  | 42 48 00 00 | 80     |

## (FF) Foundation Fieldbus function blocks

Function blocks are sets of data sorted by function and use. They can be connected to each other to solve a control process, or to a controlling DCS. To get a good introduction and understanding of FF look at [www.fieldbus.org](http://www.fieldbus.org) and download the "Technical Overview" from the About FF pages.

### (TB) Transducer Block

The TB contains unit specific data. Most of the parameters are the same as parameters found on the display. The data and the order of data varies between different products. The AO-block setpoint (SP) and process value (PV) parameters are transceived to the TB through a channel. The TB has to be in AUTO for the AO-block to be in AUTO.

The positioner has to be in menu-auto mode and in service to be controlled from the fieldbus. If the positioner is placed in menu-manual mode then the transducer block will be forced to (LO) local override. In this way a person in the field will be able to control the positioner from the keypad, without collision with a control loop.

### (RB) Resource Block

The RB is a set of parameters that looks the same for all units and products. The values of the RB define unit information that concerns the Fieldbus Protocol such as MANUFAC\_ID which informs the unique manufacturer id. For Flowserve it is 0x464C53. The RB has to be in AUTO for the AO-block to be in AUTO.

### (AO) Analogue Output Block

The AO follows Fieldbus Foundation's standard on content and action. It is used for transferring (SP) setpoints from the bus to the positioner.

CAS\_IN (cascade input) and RCAS\_IN (remote cascade input) are selected as inputs to the AO block depending on the MODE\_BLK parameter.

The selected input will be relayed to the SP parameter of the AO block. BKCAL\_OUT (back calculated output) is a calculated output that can be sent back to a controlling object so that control bumps can be avoided. Usually the BKCAL\_OUT is set to be the (PV) process value of the AO-block, i.e. the actual measured position of the valve.

OUT is the primary calculated output of the AO block. During a limited action (ramping) of the AO block the RCAS\_OUT parameter will supply the final setpoint and the OUT parameter will be the limited output.

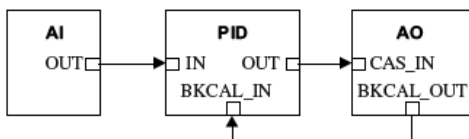
The transducer block is connected through a channel to the AO block. Through this channel the OUT value and SP are transceived.

In order to set the AO block to AUTO, the TB and the RB have to be in AUTO. Further the AO block has to be scheduled. Using National Instruments Configurator; scheduling can be done by adding the unit to a project and then click on the "upload to device"-icon.

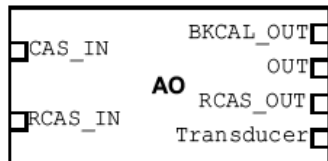
To write a setpoint value by hand, add Man to MODE->Permitted parameter, and then choose MODE->Target to Man. Make sure that the unit is scheduled.

### Example

A typical FF block loop control might look like the following:  
Where the positioner is represented by the AO-block.



AO-block overview




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

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 chart on the next page.

Lose prev value? OK?

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

Actuator? rotating

Select for rotating actuator.

Actuator? linear

Select for linear actuator.

Actuator single act

Select for single act.

Actuator double act

Select for double act.

Direction? direct

Select for direct function.

Direction? reverse

Select for reverse function.

In service? Press OK

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).

### TravelCal

Start cal

Calibration of end positions

Start end position calibration.

Lose prev value? OK?

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

The calibration sequence starts.

In service? Press OK

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).

### Perform

Normal

Setting gain

100% gain

Perform 50%, 25%,

12%, L, M, S

Possibility to select a lower gain in steps.

L, M, S

Preset values for L, M, S actuators

Factory set

Resets all set values and enters Factory Mode. **Should only be used by authorized staff.**

**Note.** Original P. I. D. will always be shown in display

## ExpertCal

**Set point L0:** 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.

**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.

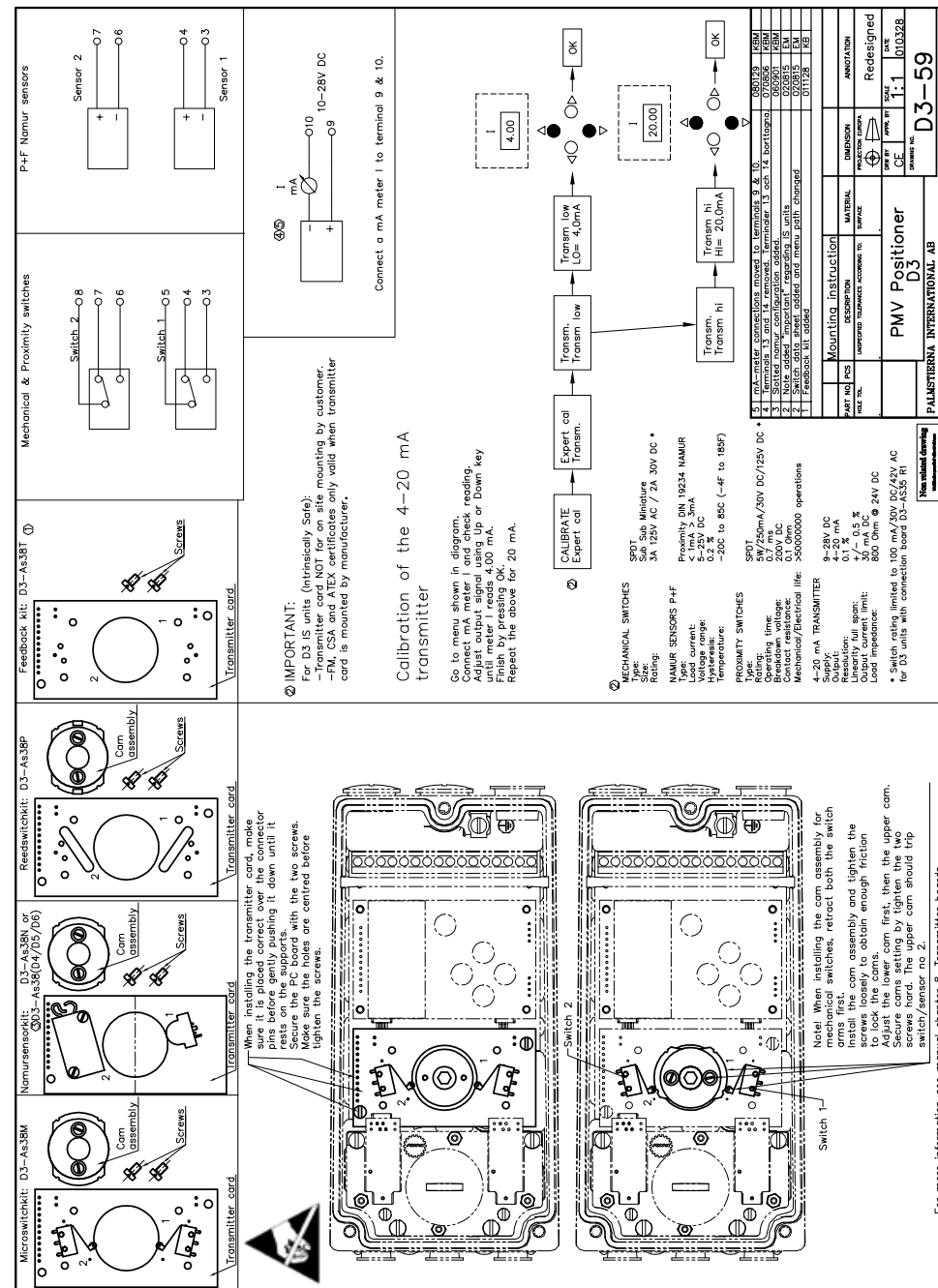
**Pressure HI:** Use a supply of 7 bar (105 psi) (or set another value on the display). Press OK. Pressure read out only possible on PMV D3 with built in pressure sensor.

**Transmitter:** Connect 10 - 28 VDC. 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](http://www.pmv.nu)

**Pot:** Potentiometer setting, see section 8.  
Also see video on [www.pmv.nu](http://www.pmv.nu)

**Full reset:** Resets all set values.

## Feedback option

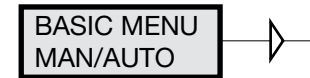
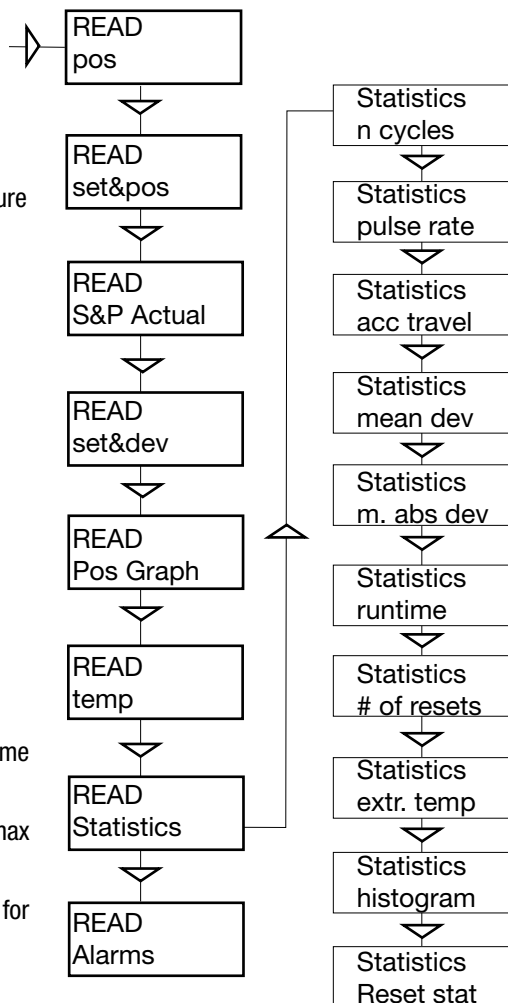


The menu contents are shown in the figures on the right and the texts are described below:



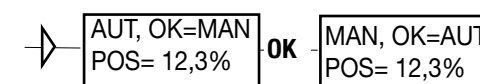
Current values can be read using the Read Menu and some values can be reset.

|                    |  |
|--------------------|--|
| <b>Pos</b>         | Shows current position                     |
| <b>Set&amp;pos</b> | Set point and position                     |
| <b>Set&amp;dev</b> | Set point and deviation                    |
| <b>Pos graph</b>   | Shows position graph                       |
| <b>Temp</b>        | Shows current temperature                  |
| <b>Statistics</b>  |  |
| <b>n cycles</b>    | Shows number of movements (turns)          |
| <b>Pulse rate</b>  | Shows pulse rate                           |
| <b>Acc travel</b>  | Shows accumulated movement                 |
| <b>mean dev</b>    | Shows accumulated deviation in %           |
| <b>m.abs dev</b>   | Shows accumulated absolute deviation in %  |
| <b># of resets</b> | Shows number of resets                     |
| <b>runtime</b>     | Shows accumulated runtime since last reset |
| <b>Extr temp</b>   | Shows extreme min and max temperature      |
| <b>Histogram</b>   | Shows position and time for position value |
| <b>Alarms</b>      | Displays tripped alarms                    |



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

In the **MAN** mode, the value of POS can be changed using  $\triangle$   $\nabla$ . 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 18

### Other functions

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

C- can be fully opened by pressing  $\nabla$  and OK simultaneously.

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

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

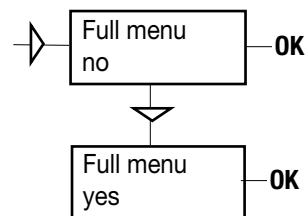


## BASIC MENU SHIFT MENU

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.



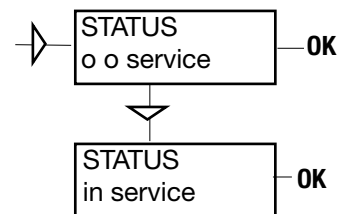
Full Menu can be locked with a passcode, see Setup menu.

## FULL MENU STATUS

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 |
|-----------------|--------------------|------------------|----------|
| <b>Rotating</b> | Rotating actuator. | Small            | 10 s     |
| <b>Linear</b>   | 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-clock wise.

**Reverse** Reverse function.

### Character

**Linear** Curves that show position as a function of input signal.

**Equal %** See diagram.

**Quick open**

**Sqr root**

**Custom** Create own curve.

### Cust chr

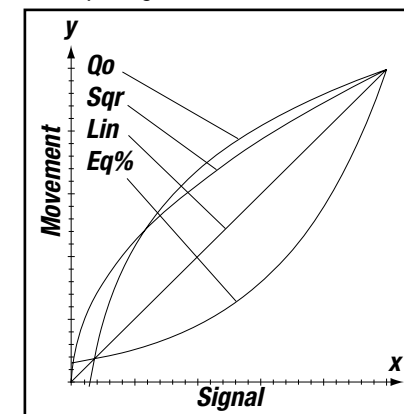
**# of point** Specify number of points (3, 5, 9, 17, or 33)

**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%.



|   |  |
|---|--|
| <b>TRVL range</b><br>0%=0.0%  | <u>Setting end positions</u><br>Select Out of Service.<br>Set percentage value for desired end position (e.g. 3%).                               |
| <b>Set 0%</b>   | Select In Service.<br>Connect calibrator.<br>Move forward to desired end position (0%) and press OK.   |
| <b>100%=100.0%</b>  | Select Out of Service.<br>Set percentage value for desired end position (e.g. 97%).  |
| <b>Set 100%</b>   | Select In Service.<br>Connect calibrator. Move forward to desired end position (100%) and press OK.  |
| <b>Trvl ctrl</b>  | <u>Behaviour at set end position</u>   |
| <b>Set low</b>  | 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). |
| <b>Set high Values</b>  | Similar to Set low.<br>Select position for Cut off and Limit at the respective end positions.  |
| <b>Passcodes</b>  | <u>Setting passcodes for various functions</u>   |
| <b>Full menu</b>  | Passcode for access to full menu.  |
| <b>Write prot</b>   | Passcode for removing write protect.   |
| <b>Expert</b>   | Passcode for access to Expert menu (TUNING).   |
| <b>Fact set</b>   | Passcode to return to default values applicable when positioner was delivered.   |
| Numbers between 0000 and 9999 can be used as passcodes. 0 = no passcode required. |  |
| <b>Appearance</b>   | <u>On display</u>  |
| <b>Language</b>   | Select menu language.  |
| <b>Units</b>  | Select units.  |

|                            |  |
|----------------------------|--|
| <b>Def. Display</b>        | Select value(s) to be displayed during service. The display reverts to this value 10 minutes after any change is made.   |
| <b>Start menu</b>          | Start in Basic menu or Full menu.  |
| <b>Orient</b>              | Orientation of text on display.  |
| <b>Par mode</b>            | Display of control parameters such as P, I, D or K, Ti, Td.  |
| <b>Devicedata</b>          | General parameters.  |
| <b>HW rew</b>              |  |
| <b>SW rew</b>              |  |
| <b>Capability</b>          |  |
| <b>HART</b>                | Menu with HART parameters. Only amendable with HART communicator. It is possible to read from display.   |
| <b>Profibus PA/DP</b>      | Indicates present status<br>Serial number 1-126<br>Allotted ID<br>ID description<br>SW release date<br>Value = preset pos<br>Time = Set time + 10sec = time before movement<br>Valve act = failsafe (preset pos) or lastvalue (present pos)<br>Alarm out= On/Off |
| <b>Status</b>              |  |
| <b>Device ID</b>           |  |
| <b>Address</b>             |  |
| <b>Tag</b>                 |  |
| <b>Descriptor</b>          |  |
| <b>Date</b>                | Name provided by the DCS system<br>PMV D3 positioner<br>SW release date<br>Simulate jumper, FF simulation functionality activated = ON   |
| <b>Failsafe</b>            |  |
| <b>Foundation Fieldbus</b> |  |
| <b>Device ID</b>           |  |
| <b>Nod address</b>         | Address on the bus provided by the DCS system  |
| <b>TAG-PD_TAG</b>          |  |
| <b>Descriptor</b>          |  |
| <b>Date</b>                |  |
| <b>Sim jumper</b>          |  |

## FULL MENU TUNING



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

|                   |  |
|-------------------|--|
| <b>Close time</b> | <u>Minimum time (Min 0.005) from fully open to closed.</u> |
| <b>Open time</b>  | <u>Minimum time (Min 0.05) from closed to fully open.</u>  |
| <b>Deadband</b>   | <u>Setting deadband. Min. 0.2%.</u>                        |

|                |                           |
|----------------|---------------------------|
| <b>Expert</b>  | <u>Advanced settings.</u> |
| <b>Control</b> | See explanations below.   |

|                   |  |
|-------------------|--|
| <b>Togglestep</b> | Test tool for checking functions. Overlays a square wave on the set value. |
|-------------------|--|

|                  |   |
|------------------|---|
| <b>Self test</b> | Internal test of processor, potentiometer, etc. |
|------------------|---|

|                |  |
|----------------|--|
| <b>Leakage</b> | Air leakage in actuator/tubing can be compensated by settings. |
|----------------|--|

|             |                               |
|-------------|-------------------------------|
| <b>Undo</b> | 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.

### Min Pulse

The minimum pulse lengths (the "minpulses") are displayed in the menu, and can be changed. Normal values are:

|           |              |
|-----------|--------------|
| DN1, DN2: | 2750 to 4300 |
| UP1, UP2: | 3750 to 5220 |

### Reduction of pulses

This function monitors the number of pulses vs time. In case of an excessive number of pulses vs. time, an automatic reduction of pulses is enabled in order to extend the service life. This function is enabled as default.

### 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



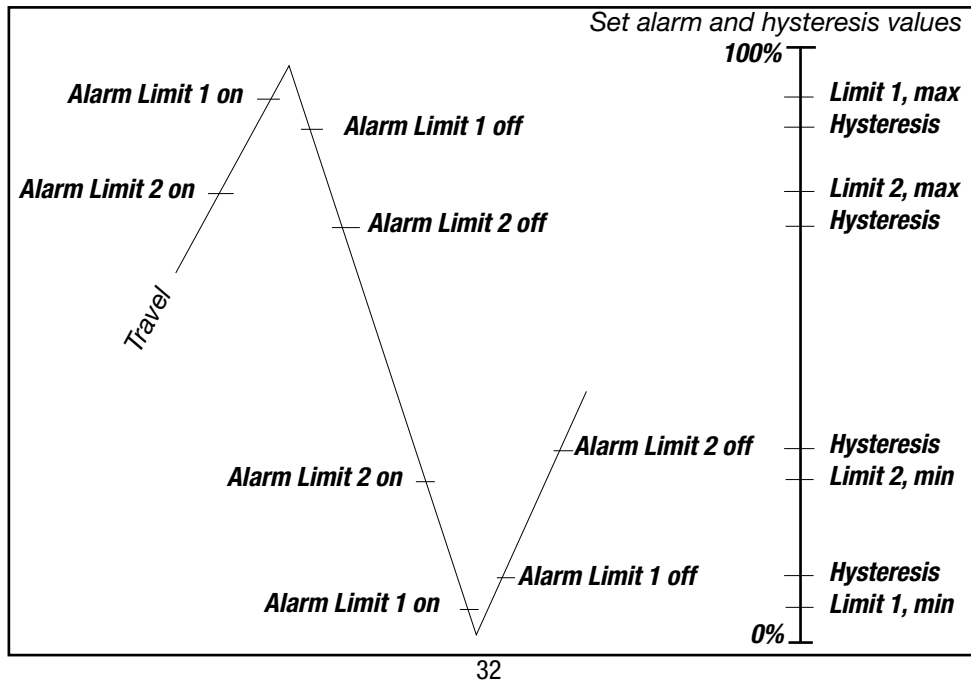
The menu contents are shown in the chart on the next page and the various texts are described below:

**Deviation** Alarm generated when deviation occurs  
**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.

**Limit 1** Alarm above/below a certain level.  
**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.

See diagram below!

**Limit 2** See Limit 1.



**Temp** Alarm based on temperature  
**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.

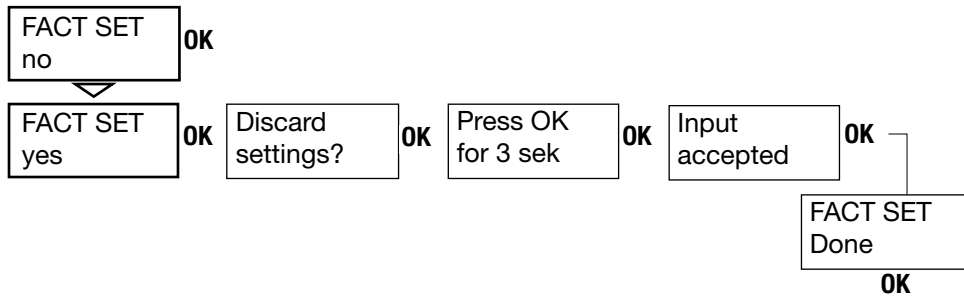
**Valve act**

**No action** Alarm generated only. Operations not 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.

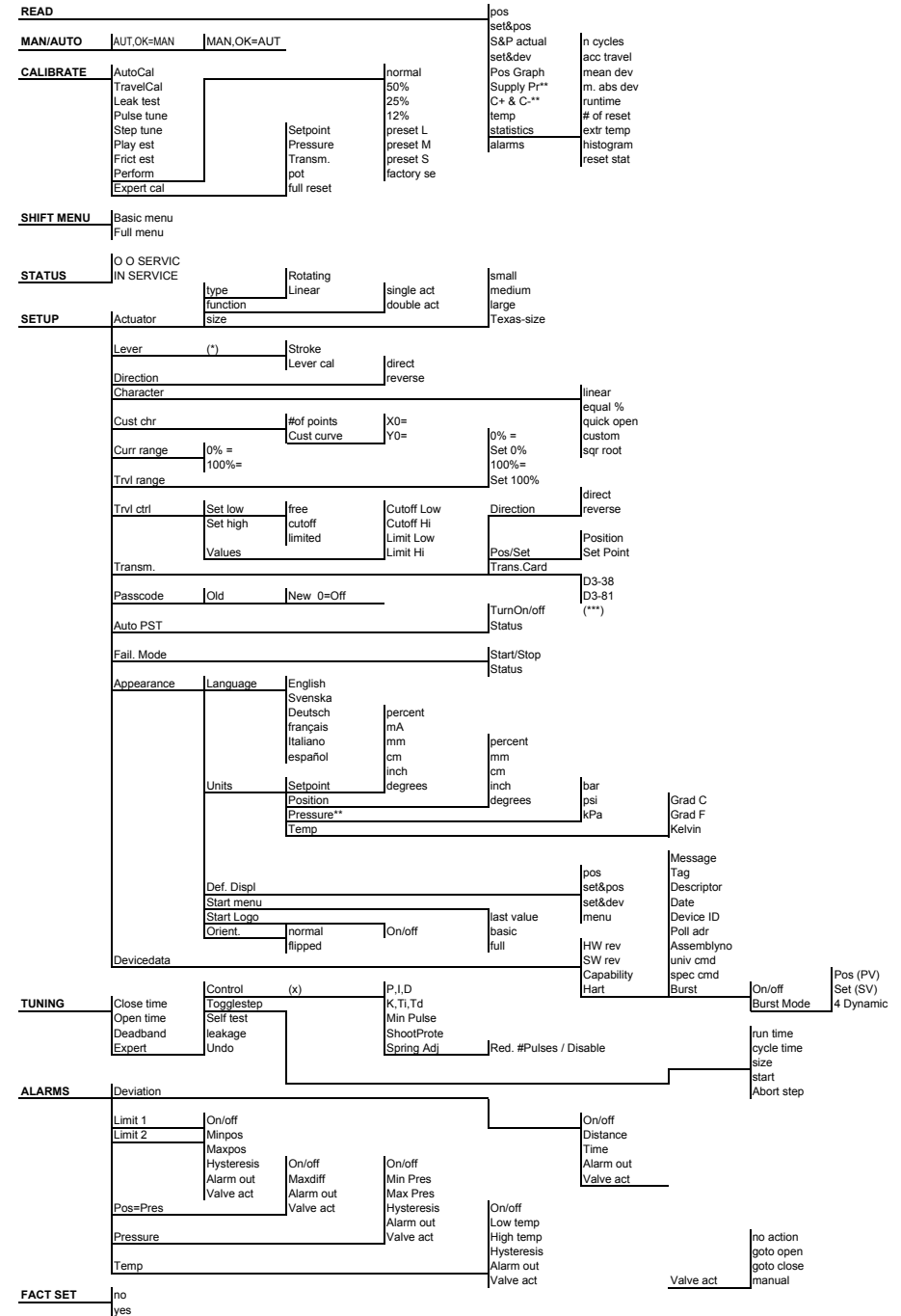
## FULL MENU FACT SET

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.



## Single Board 12 terminals



(\*) appear if Linear set  
(\*\*) appear if pressure sensor exist

## 8. 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 and 4 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 D3 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.**



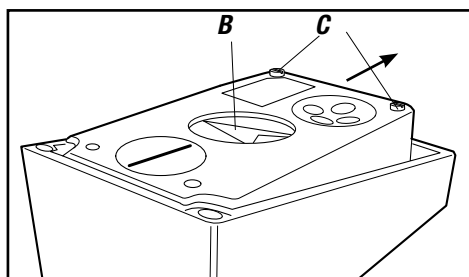
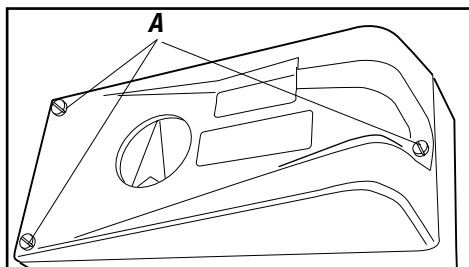
**Please see section for special conditions for safe use and spare parts on page 4!**

**Please contact a Flowserve office for information regarding proper procedures.**  
[www.pmv.nu](http://www.pmv.nu) or [infopmv@flowserve.com](mailto:infopmv@flowserve.com)

### Disassembling PMV D3

#### Removing cover and inner cover

- Unscrew the screws A and remove the cover. When mounting cover – see page 9.
- Pull off the arrow pointer, B, using a small screw driver.
- Unscrew the screws C, pull the inner cover slightly in the direction of the arrow, and remove the cover. Do not remove the filter plug.

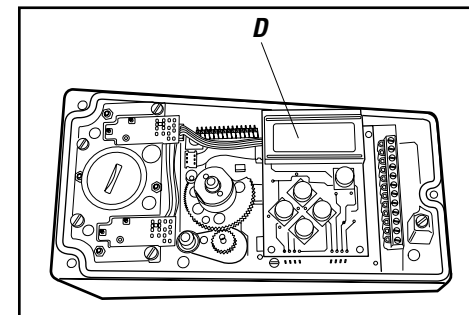


### Circuit boards (pcb)

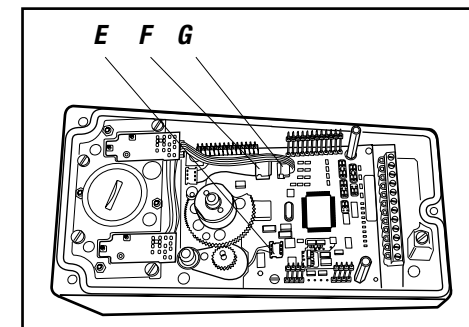


**Disconnect or switch off the electric power supply before starting any work.**

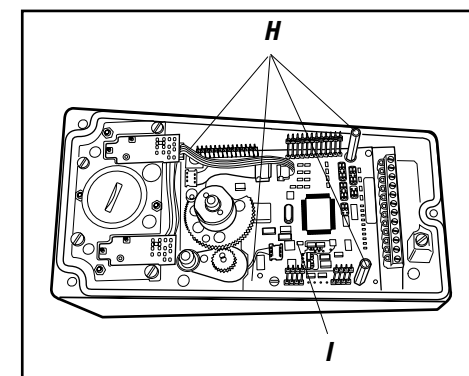
- Lift off the display pcb, D.



- Release the cable connections E, F and G,



- Unscrew the spacers H and lift up the terminal board I.

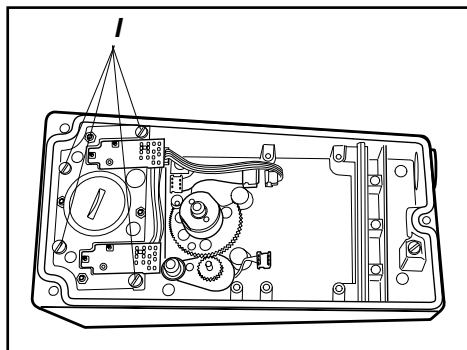


## Valve block



**Turn off the air and electric power supply before starting any work.**

- Remove the four screws I and lift out the valve block

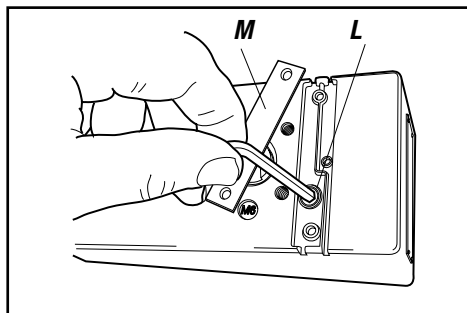


### N.B. Do not disassemble the valve block

- When installing the valve block — torque the four screws cross-wise to 2,5 Nm and seal with Locktite 222.

## Silencer

A silencer, L (option) can be mounted under the plate M on the PMV D3. Contact PMV.



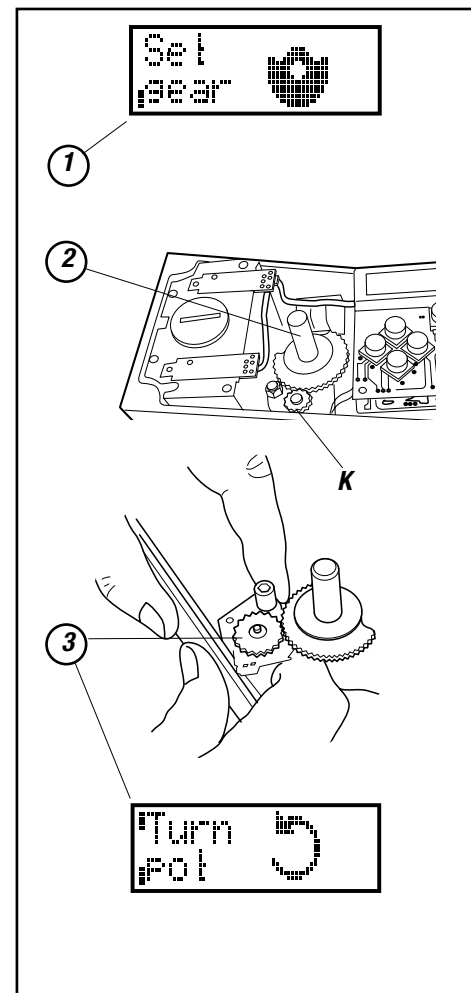
## Potentiometer

### 90° and 270° spring loaded potentiometer

The spring-loaded potentiometer **K** can be removed from the gearwheel for calibration or replacement.

If the potentiometer is replaced or the setting is changed, it must be calibrated.

- Select the menu Calibrate - Expert - Cal pot. The display shows Set gear (1).
- Turn the spindle shaft (2) cw to end position and press OK. Turn ccw to the end and press OK.
- Unmesh the potentiometer (3) and turn it according to display until OK is shown. Press OK.
- Re-align spring on potentiometer to secure it.

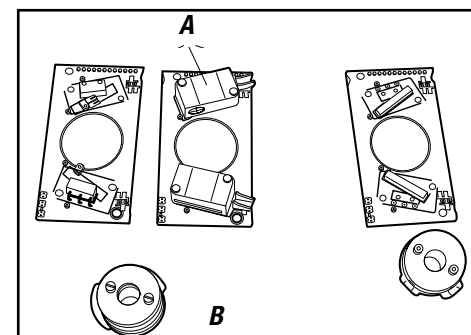


## Transmitter boards

The equipment for transmitter feedback consists of a circuit board A, cam assembly B and screws.

General pcb versions:

- with mechanical switches, SPDT
- with namur sensors, DIN 19234
- with proximity switches
- with feedback transmitter and/or remote only





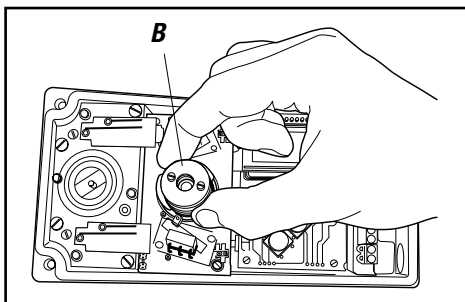
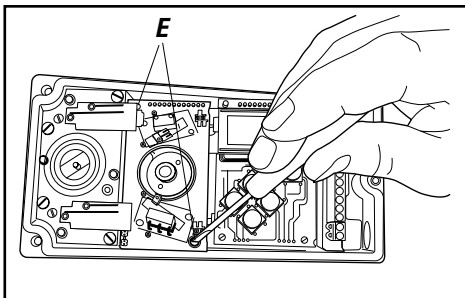
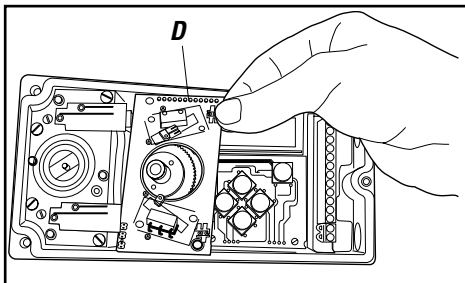
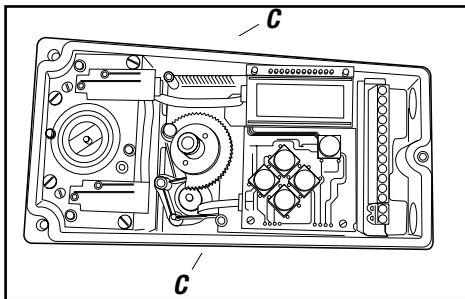
## Transmitter board installation



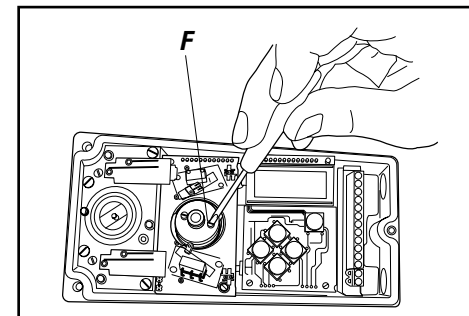
**Caution!** Turn off the power and air supply before starting the installation.

**Important for PMV D3 units with hazardous approvals:**  
Maintenance and repairs only to be made by authorized staff.

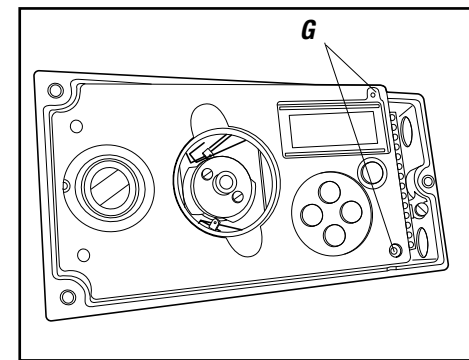
- Remove the cover, indicator and inner cover according to the description on page 36.
- Check that both spacers **C** are installed.
- Carefully mount the circuit board in its position. The pins **D** should fit in the connector and the positioners motherboard. Make sure that the feed back PC board is properly connected.
- Secure the circuit board with the enclosed screws **E**.
- Install the cam assembly **B** on the shaft and push it down to its position. If the board has microswitches, be careful not to damage the levers.



- Tighten the screws **F**, on the cam assembly. Do not tighten the screws too hard. The cams should be able to move in relation to each other.

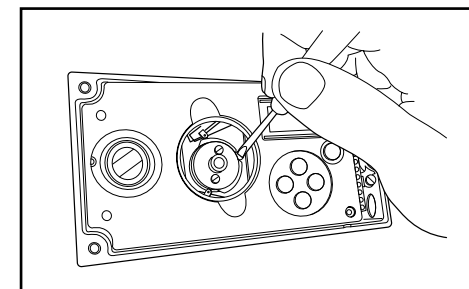


- Install the inner cover with the two screws, **G**.



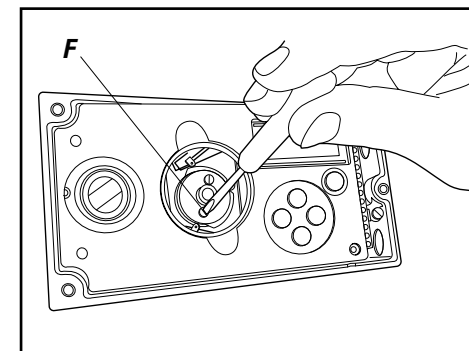
- Connect the wiring for the transmitter feedback on the terminal block, according to the drawing on next page.

- Adjust the position where the switches/sensors should be affected, by turning the cams with a screwdriver.



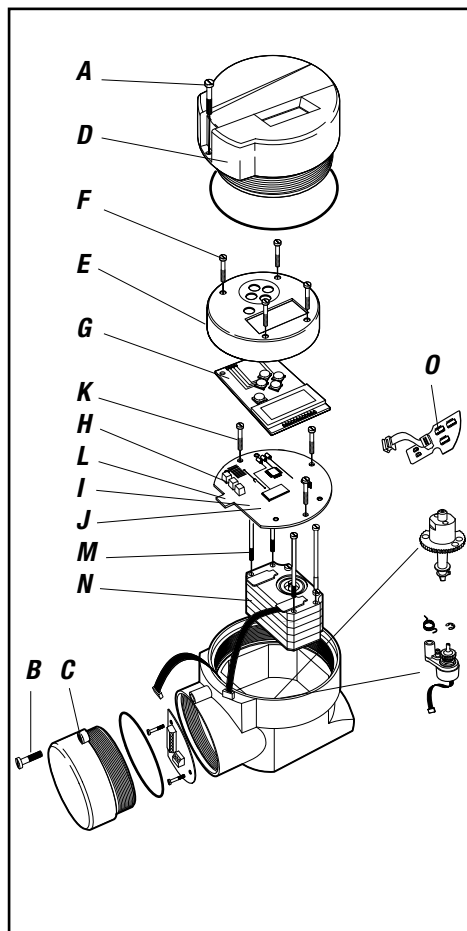
- Tighten the cam assembly screws **F** when the cams are correctly adjusted.

- Install the indicator and cover. To calibrate the feedback transmitter, see drawing on next page.



## Disassembling PMV D3 Ex

- Loosen the screws **A** and **B** and remove the caps **C** and **D**.
- Remove the inner display cover **E** by loosening the four screws **F**.
- Carefully remove the display board and loosen the connection **H** and **I**.
- Release the wide cable from the connector **J** on the terminal board.
- Loosen the three screws **K**.
- Remove the circuit board package **L**, consisting of terminal and processor board.
- Remove the four screws **M** and lift the block **N**.
- Pressure sensor board **O**, (option) can only be moved after the block **N** is removed.

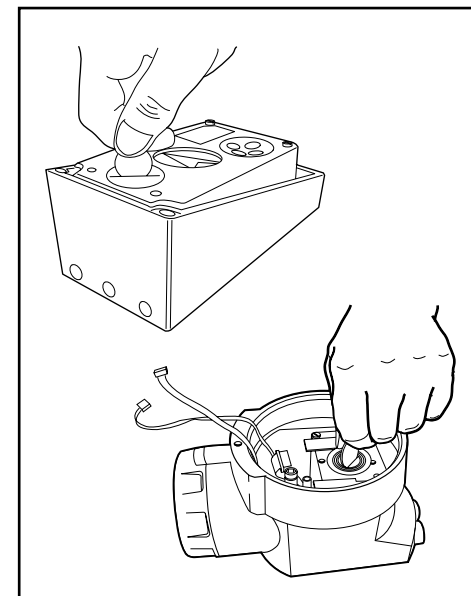


## Filter change



Turn off the compressed air supply before starting any work. Otherwise the filter can be blown out of the positioner by the air pressure, which can be dangerous.

- Remove the filter cap using a coin of suitable size.
- **Note!** Do not use a screwdriver. The filter cap might crack and cause air leakage.
- When installing the filter/filter plug, start by installing the O-ring in the **bottom** of the cavity in the pneumatic block. Do *not* try to install it on the threaded filter plug. Insert filter in the filter plug, then thread the filter plug into pneumatic block.



## 9. Trouble shooting

| Symptom   | Action  |
|---|---|
| Input signal change to positioner does not affect actuator position.          | <ul style="list-style-type: none"> <li>• Check air supply pressure, air cleanliness, and connection between positioner and actuator.</li> <li>• Out of service, in manual mode.</li> <li>• Check input signal to positioner.</li> <li>• Check mounting and connections of positioner and actuator.</li> </ul>   |
| Change in input signal to positioner makes actuator move to its end position. | <ul style="list-style-type: none"> <li>• Check input signal.</li> <li>• Check mounting and connections of positioner and actuator.</li> </ul>   |
| Inaccurate control.   | <ul style="list-style-type: none"> <li>• Perform Auto-calibration and check for any leaks.</li> <li>• Uneven air supply pressure.</li> <li>• Uneven input signal.</li> <li>• Wrong size of actuator being used.</li> <li>• High friction in actuator/valve package.</li> <li>• Excess play in actuator/valve package.</li> <li>• Excess play in mounting of positioner on actuator.</li> <li>• Dirty/humid supply air.</li> </ul> |
| Slow movements, unstable regulation.  | <ul style="list-style-type: none"> <li>• Implement auto-tuning.</li> <li>• Increase the deadband (Tuning menu).</li> <li>• Adjust Performance (Calibrate menu).</li> </ul>  |

## 10. Technical data

|                            |   |
|----------------------------|---|
| Rotation angle             | min. 30° max 100°, option 270°  |
| Stroke                     | 5-130 mm (0.2" to 5.1")   |
| Input signal               | 4-20 mA DC  |
| Air supply                 | 2-7 bar (30-105 psi)<br>DIN/ISO 8573-1 3.2.3<br>Free from oil, water and moisture.              |
| Air delivery               | 350 nl/min (13.8 scfm)  |
| Air consumption            | <0.3 nl/min (0.01 scfm)   |
| Air connections            | 1/4" G or NPT   |
| Cable entry                | 3 x M20x1,5 or 1/2" NPT (D3E 2x)  |
| Electrical connections     | Screw terminals 2.5 mm <sup>2</sup> /AWG14  |
| Linearity                  | <1%   |
| Repeatability              | <0.5%   |
| Hysteresis                 | <0.4%   |
| Dead band                  | 0.2-10% adjustable  |
| Display                    | Graphic, view area 15 x 41 mm (0.6 x 1.6")  |
| UI                         | 5 push buttons  |
| CE directives              | 93/68EEC, 89/336/EEC, 92 /31/EEC  |
| EMC                        | EN 50 081-2, EN 50 082-2  |
| Voltage drop, without HART | < 8.0 V => resistance 400 Ω   |
| Voltage drop, with HART    | < 9.4 V => resistance 470 Ω   |
| Vibrations                 | <1% up to 10 g at frequency 10-500 Hz   |
| Enclosure                  | IP66/NEMA 4X  |
| Material                   | Die-cast aluminium, A2/A4 fasteners   |
| Surface treatment          | Powder epoxy  |
| Temperatur range           | -30 to +80°C (-22 to 176° F)  |
| Weight                     | PMV D3X, 1.4 kg (3 lbs).<br>PMV D3E, 3 kg (6.6 lbs)<br>PMV D3E Stainless Steel, 6 kg (13.2 lbs) |
| Alarm output               | Transistor Ri 1 KΩ  |
| Alarm Supply Voltage       | 8-28 V DC   |
| Mounting position          | Any   |

### Mechanical switches

|             |                                |
|-------------|--------------------------------|
| Type        | SPDT                           |
| Size        | Sub Sub miniature              |
| Rating      | 3 A/125 VAC / 2 A/30 VDC       |
| Temp. range | -30°C to 80°C (-22°F to 180°F) |

### NAMUR sensors (NJ2-V3-N)

|               |   |
|---------------|---|
| Type          | Proximity DIN EN 60947-5-6:2000         |
| Load current  | $1 \text{ mA} \leq I \leq 3 \text{ mA}$ |
| Voltage range | 8 VDC                                   |
| Hysteresis    | 0.2 %                                   |
| Temp. range   | -25°C to 85°C (-13°F to 185°F)          |

### Proximity switches

|                    |                                |
|--------------------|--------------------------------|
| Type               | SPDT                           |
| Rating             | 0.4A @ 24VDC, Max 10W          |
| Operating time     | Max 1.0 ms                     |
| Max voltage        | 200 VDC                        |
| Contact resistance | 0.2 $\Omega$                   |
| Temp. range        | -30°C to 80°C (-22°F to 180°F) |

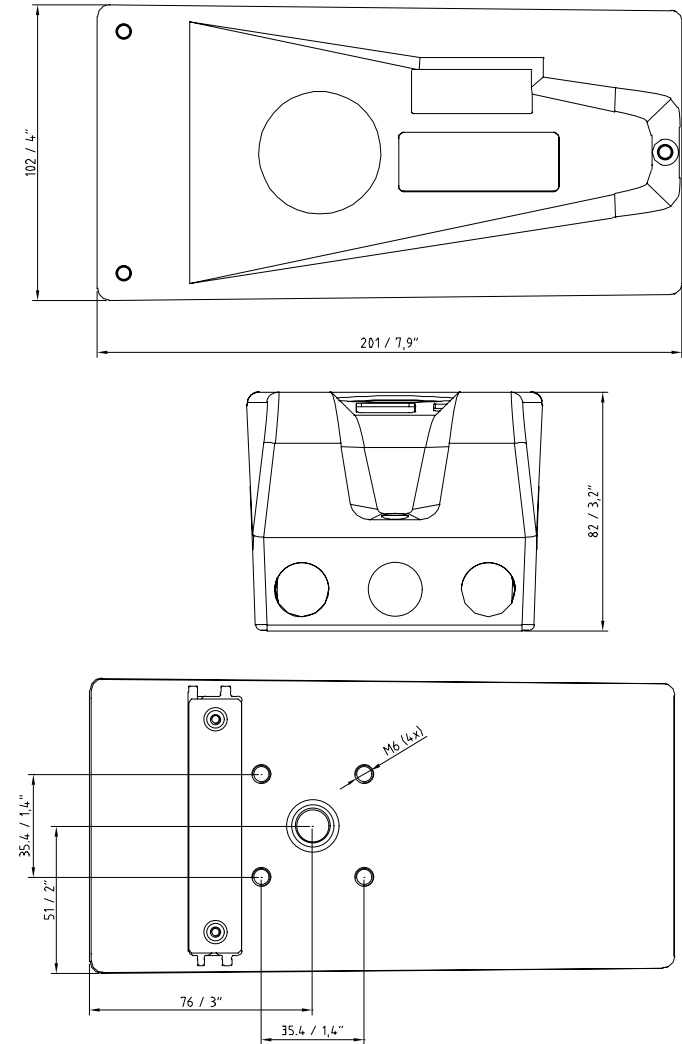
### Slot NAMUR switches (SJ2-S1N, SJ2-SN, SJ2-N)

|              |   |
|--------------|---|
| Type         | Proximity DIN EN 60947-5-6:2000         |
| Load current | $1 \text{ mA} \leq I \leq 3 \text{ mA}$ |
| Voltage      | 8 VDC                                   |
| Hysteresis   | 0.2 %                                   |
| Temp         | -25°C to 85°C (-13°F to 185°F)          |

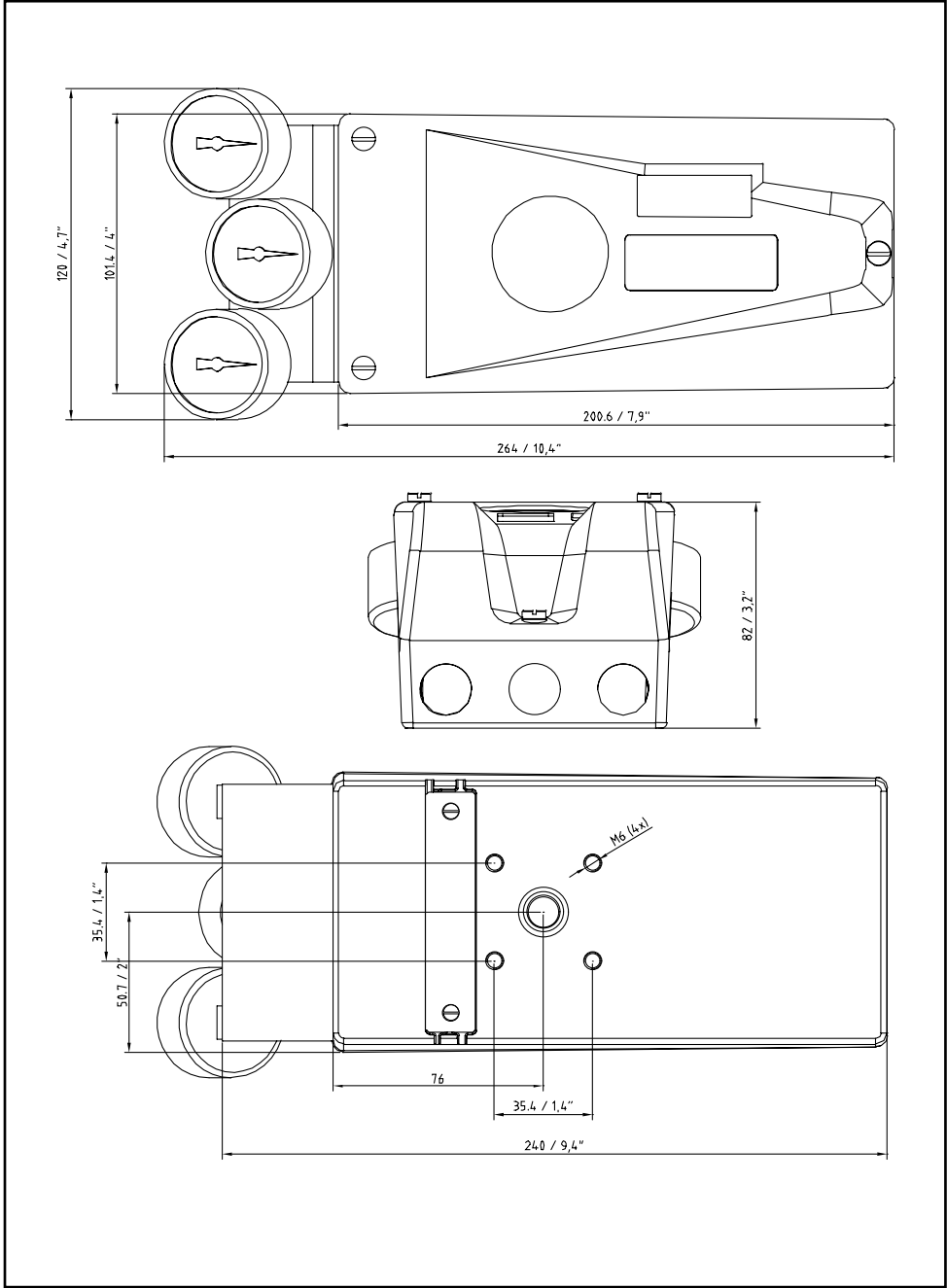
### 4-20 mA transmitter

|                      |                       |
|----------------------|-----------------------|
| Supply               | 9-28 VDC              |
| Output               | 4-20 mA               |
| Resolution           | 0.1 %                 |
| Linearity full span  | +/-0.5 %              |
| Output current limit | 30 mA DC              |
| Load impedance       | 800 $\Omega$ @ 24 VDC |

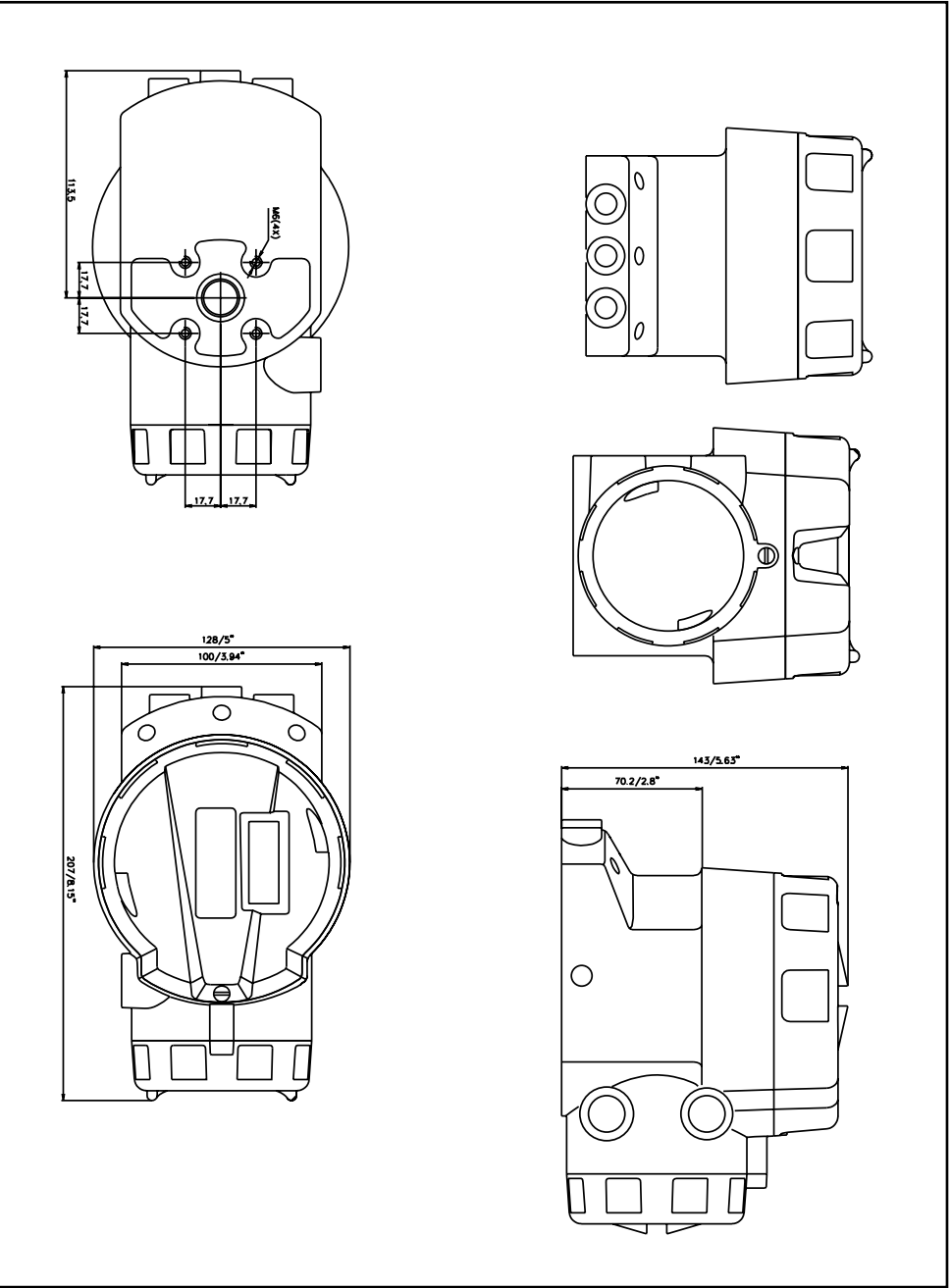
## 11. Dimensions



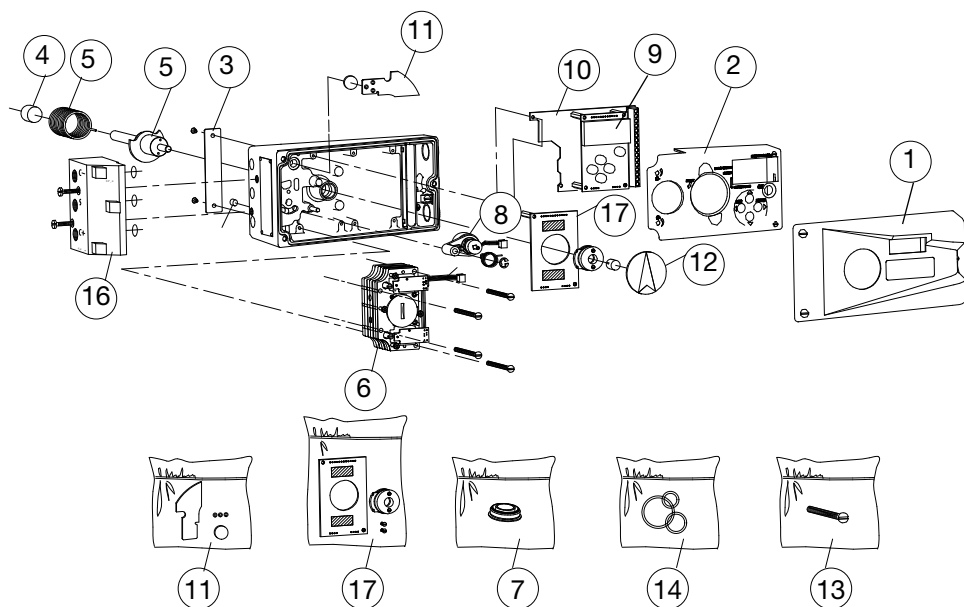
Dimensions with optional gauge block installed



Dimensions explosion proof version



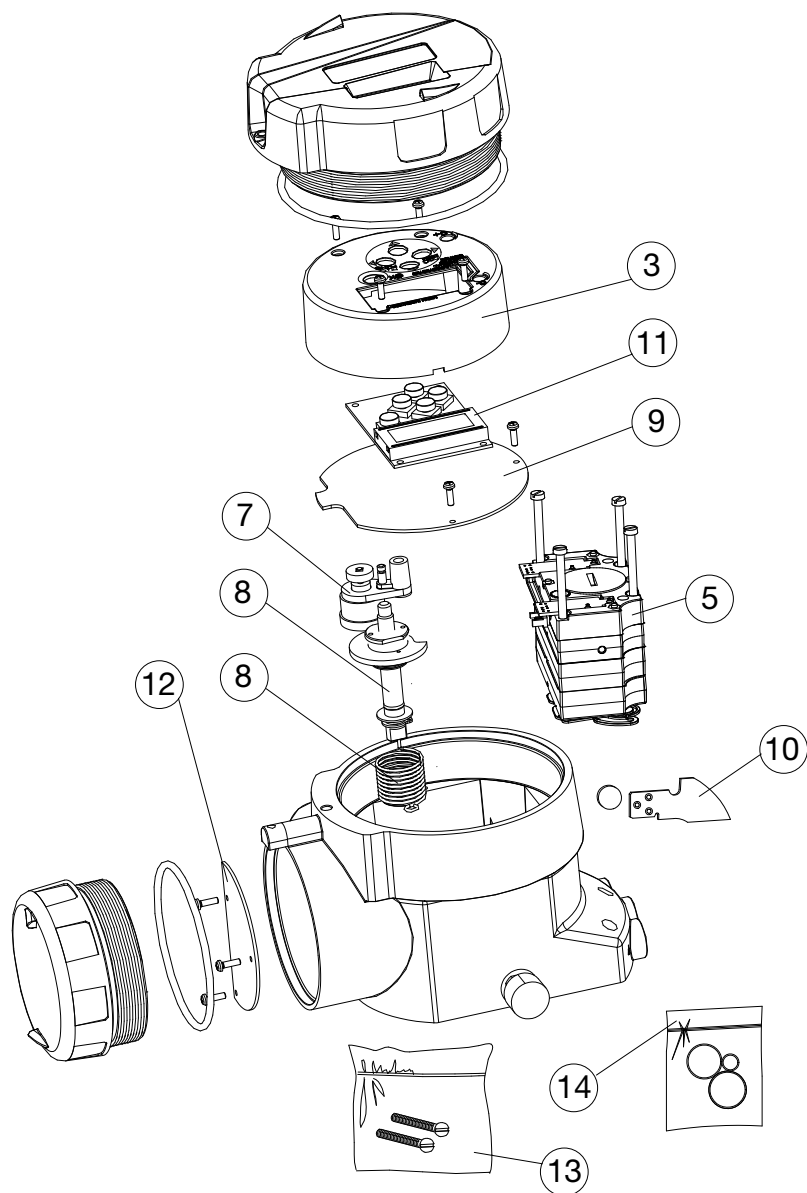
## 12. Spare parts



## General Purpose and Intrinsically safe housing

| No | Part no          | Description   |
|----|------------------|---|
| 1  | D3-SP6           | Black cover incl. Screws  |
| 2  | D3-SP11          | Internal cover incl. screws   |
| 3  | P3-SP13          | Cover plate incl. screw   |
| 4  | 3-SXX            | Spindle adaptor (XX = 01, 02, 06, 26, 30, 36, 40, 41)                               |
| 5  | 3-AS23           | S23 Shaft compl. Incl. gearwheel, friction clutch, spring                           |
| 5  | 3-AS39           | S39 Shaft compl. Incl. gearwheel, friction clutch, spring                           |
| 5  | 3-AS09           | S09 Shaft compl. Incl. gearwheel, friction clutch, spring                           |
| 6  | D3-SP1           | Block complete, incl cable, rubber seal, filter plug                                |
| 6  | D3-SP1-PS        | Block complete, Pressure sensors, incl cable, seal, filter plug                     |
| 6  | D3-SP1-FF        | Block complete, incl cable, rubber seal, filter plug, Fail Freeze                   |
| 6  | D3-SP1-PFF       | Block complete, Pressure sensors, incl cable, rubber seal, filter plug, Fail Freeze |
| 7  | D3-SP9           | Filterplug, incl. O-ring, filter  |
| 8  | 3-SP8B           | Potentiometer compl. incl. spring, holder, cable                                    |
| 9  | 3-SP37HR         | PCB LCD Display assy Hi Res type  |
| 10 | D3-SP35P         | PCBs (Terminal and processor) Profibus  |
| 10 | 3-SP80X          | PCB Motherboard   |
| 10 | 3-SP80H          | PCB Motherboard HART  |
| 11 | 3-SP84           | Pressure sensor PCB assy complete.  |
| 12 | 3-SP48A          | Indicator arrow assy  |
| 13 | D3-SP/SCREW      | Kit, bag with screws  |
| 14 | D3-SP/SEAL       | Kit, bag with O-rings, seals  |
| 16 | D3-SP34G         | Gauge block G, complete   |
| 16 | D3-SP34N         | Gauge block NPT, complete   |
| 17 | 3-AS81T          | PCB Transmitter 4-20mA assy   |
| 17 | 3-AS81M          | PCB Transmitter and Mechanical switches, assy                                       |
| 17 | 3-AS81N          | PCB Transmitter and Namur sensors, assy   |
| 17 | 3-AS81P          | PCB Transmitter and Proximity switches, assy  |
| 17 | 3-AS81N4         | PCB Transmitter, slot type Namur sensors(P+F SJ2 S1N), assy                         |
| 17 | 3-AS81N5         | PCB Transmitter, slot type Namur sensors(P+F SJ2 SN), assy                          |
| 17 | 3-AS81N6         | PCB Transmitter, slot type Namur sensors(P+F SJ2N), assy                            |
| 18 | D3-67            | Silencer, Sintered brass  |
|    | D3-SP/REPAIR KIT |   |





## Explosion proof housing

| No | Part no      | Description   |
|----|--------------|---|
| 3  | D3E-SP4      | Internal cover incl. screws                               |
| 5  | D3-SP1       | See D3 page 53  |
| 5  | D3-SP1-PS    | See D3 page 53  |
| 7  | 3E-SP8       | Potentiometer compl. incl. spring, holder, cable          |
| 8  | 3-AS23       | S23 Shaft compl. Incl. gearwheel, friction clutch, spring |
| 8  | 3-AS39       | S39 Shaft compl. Incl. gearwheel, friction clutch, spring |
| 8  | 3-AS09       | S09 Shaft compl. Incl. gearwheel, friction clutch, spring |
| 9  | 3E-SP80X     | PCB Mother board  |
| 9  | 3E-SP80XT    | PCB Mother board, 4-20mA transmitter                      |
| 9  | 3E-SP80H     | PCB Mother board HART                                     |
| 9  | 3E-SP80HT    | PCB Mother board, HART 4-20mA transmitter                 |
| 10 | 3-SP84       | See D3 page 53  |
| 11 | 3-SP37HR     | See D3 page 53  |
| 12 | 3E-SP83      | PCB Terminals   |
| 13 | D3E-SP/SCREW | Kit, bag with screws                                      |
| 14 | D3E-SP/SEAL  | Kit, bag with O-rings, seals                              |

Notes

**To find your local Flowserve representative:**

To find your local Flowserve representative please use the Sales Support Locator System found at [www.flowserve.com](http://www.flowserve.com)

**FCD PMENIM0001-03 - 12/14**

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