

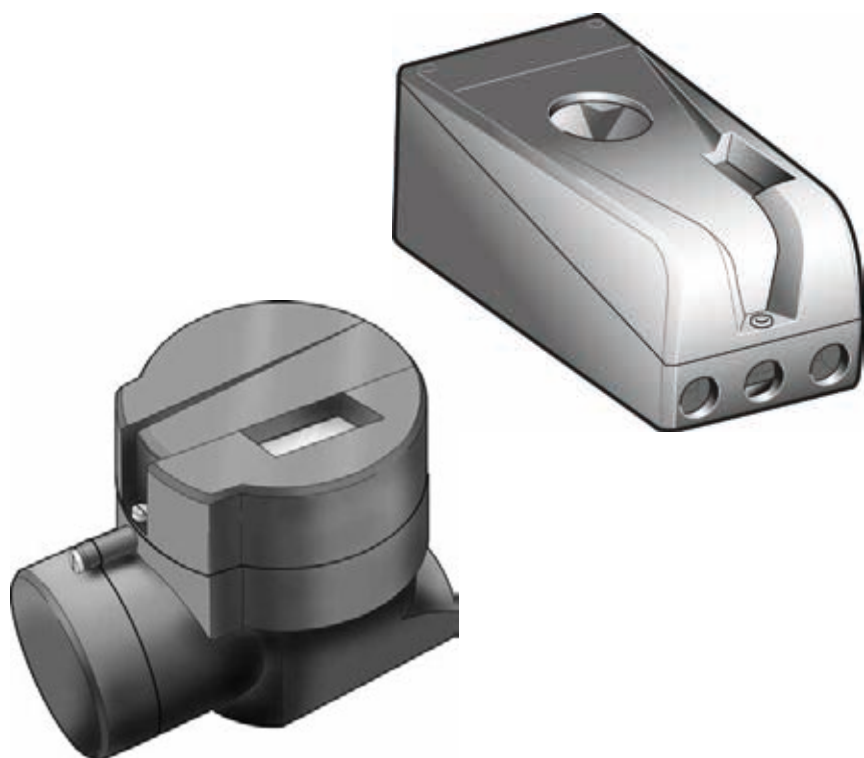


USER INSTRUCTIONS

PMV D3 Digital Positioner

FCD PMENIM0001-05-A5 - 07/15

Installation
Operation
Maintenance



Experience In Motion

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1. Introduction

The Flowserve PMV D3 is a digital positioner designed primarily for controlling modulating control valves.

The positioner can be used with single or double acting actuators with either rotary or linear movement.

The PMV D3 can be equipped with modules for feedback, limit switches and pressure gauges. 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 severe personal injury or property 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 air connection "C-" is still under pressure even after the air supply is turned off.
- Always work in an ESD protected area when servicing the circuit boards. 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 aluminum and any impact or friction caused by external objects should be avoided in the application.

Spare parts for certified products for hazardous locations

Flowserve will only supply spare parts for PMV 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 a proper Notified Body and covered under PMV QAN.

According to IEC 60079-19 section 4 - 4.4.3.2 modifications to the positioner 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 regarding the above, please feel free to contact us anytime.



2. Storage



General

The PMV D3 positioner is a precision instrument. It is essential that it is handled and stored correctly. Always follow the instructions below!

Note: 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 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.

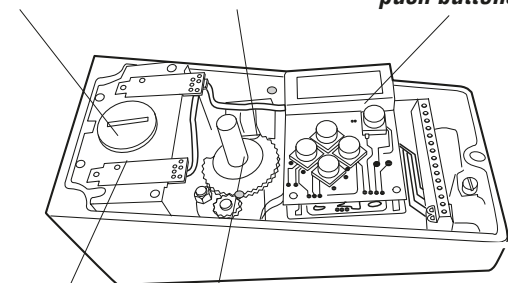
The push buttons and display are accessible underneath the aluminum cover, which is sealed with an O-ring.

A PC configurator is available free of charge on our webpage 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.

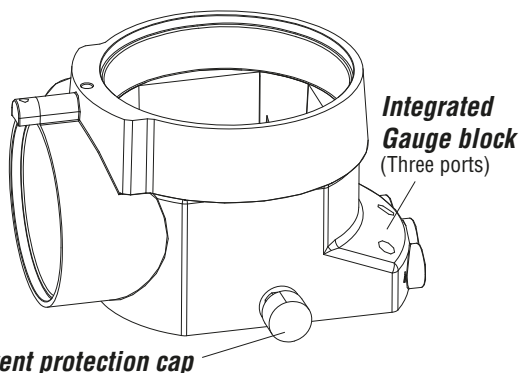
Filter **Pressure sensors** **Display, control push buttons**



Valve block **Positional feedback**

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

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



Air vent protection cap
(Make sure it is installed, facing upwards, before putting 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:

 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. Communication with Hart, Foundation Fieldbus and Profibus is possible. Further features are gauge ports and local graphic LCD display.

ATEX:

II 2G Ex d IIB+H₂ T6 Gb (-20°C to +60 °C)

 II 2D Ex tb IIIC T100°C Db (-20°C to +80°C)

CSA, FM:

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

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

Class III, Div.1

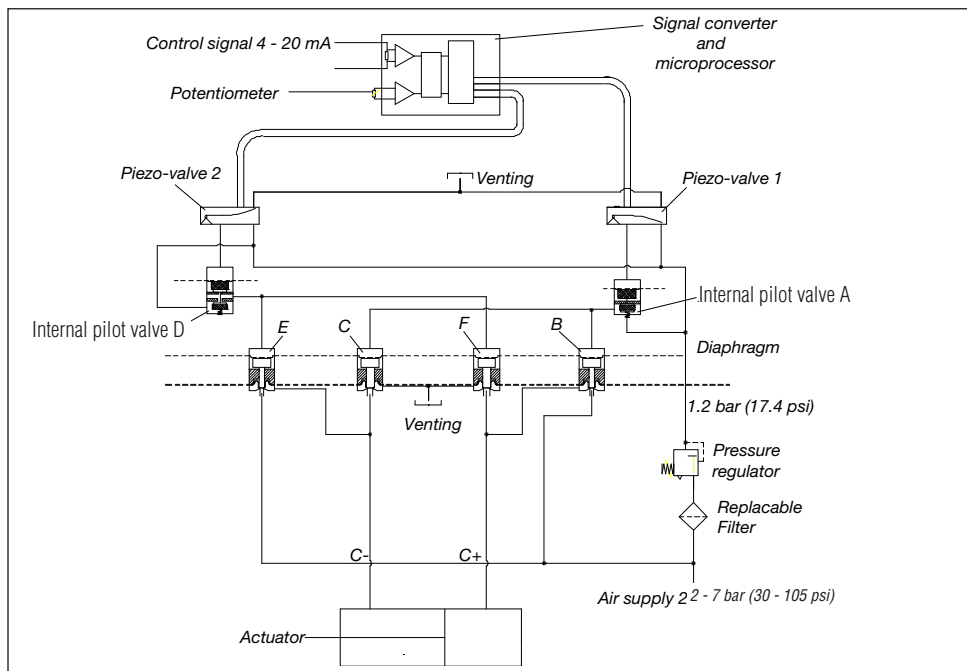
T6, T5 / Type 4X

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

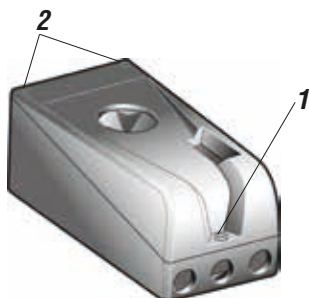
Removal of cover

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.

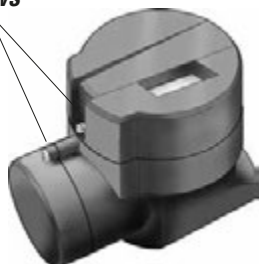


Explosion proof

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

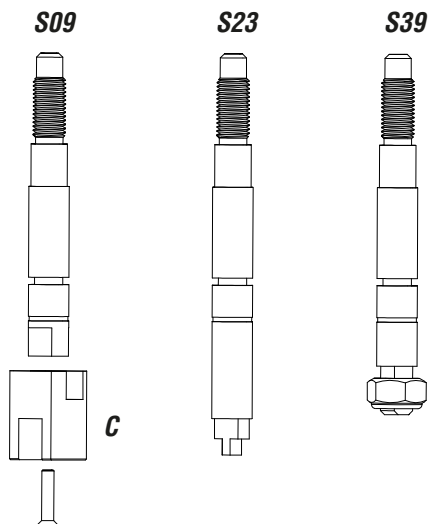
Note: If the positioner is installed in a hazardous environment, it must be of a type approved for this purpose.

All versions of the PMV D3 positioner have 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.

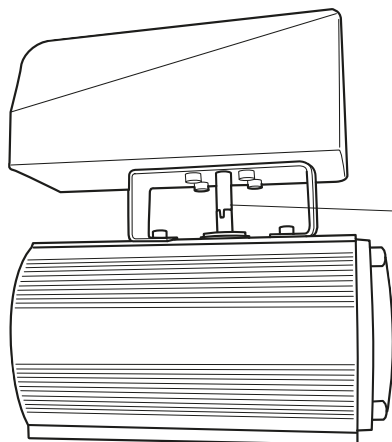
The spindle adapter C can be changed to suit the actuator in question.

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.

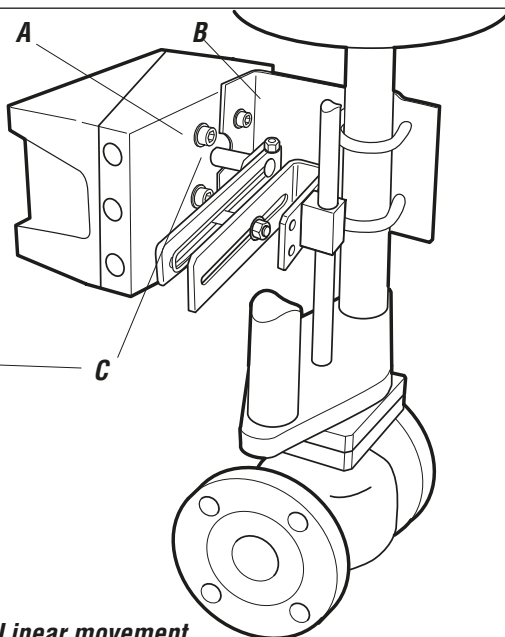
Spindles



Assembly examples



Rotary movement



Linear movement

Connections

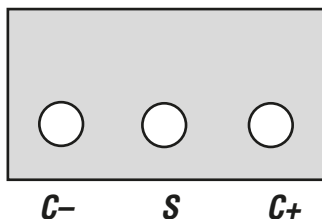
Air:

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 pages 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 to protect all connections.

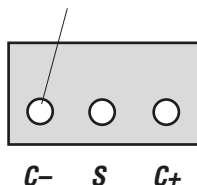
Converting the D3 between single acting and double acting mode

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.)

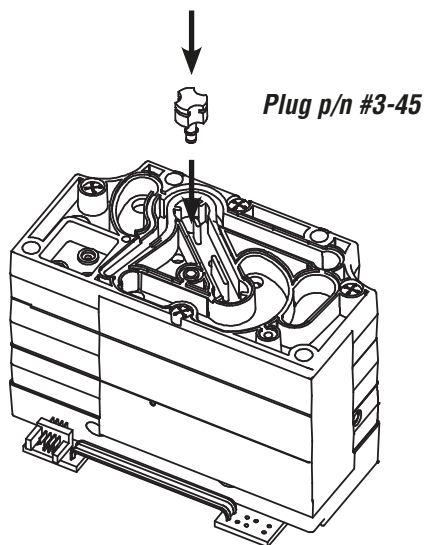
Plug the air block (acc. to the picture) with the nylon plug and o-ring. (item 3-45).

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***

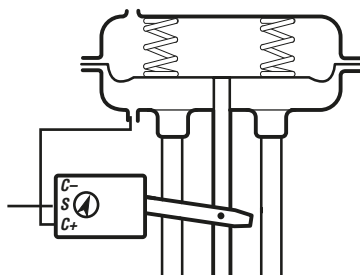


***For data for air and electrical
connections, see section
Technical Data on page 46.***

Single acting positioner, Direct function

Actuator with closing spring

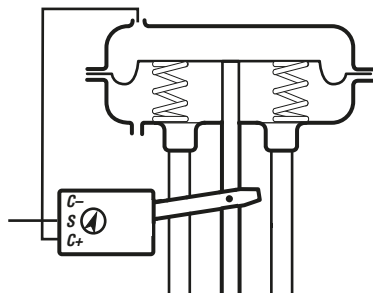
When the control signal increases, the pressure C+ to the actuator is **increased**. The valve stem moves upward and rotates the positioner spindle **counter-clockwise**. When the control signal drops to zero, C+ is vented and the valve closes.



Reverse function

Actuator with opening spring

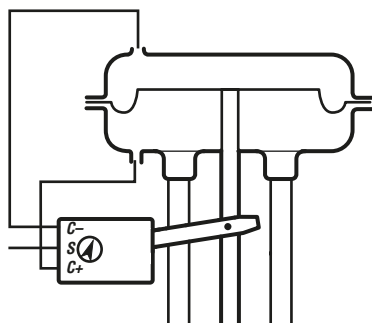
When the control signal increases the pressure C+ to the actuator is **increased**. The valve stem moves downward and the positioner spindle rotates **clockwise**. When the control signal drops to zero, C+ is vented and the valve opens.



Double acting 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 seconds and < 2% after 30 minutes.

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 aluminum 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.)



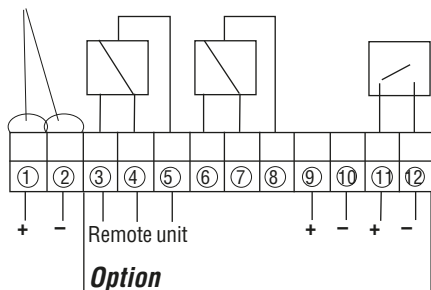
Warning! In a hazardous environment where there is a risk of explosion, electrical connections must comply with the relevant regulations.

Max distance between PMV D3 and remote unit: 5m (16.4 ft).

When installing the PMV D3 Intrinsically safe unit - always consider control drawing 3-86 found at www.pmv.nu/downloads.

PMV D3, 12 terminals

Connection



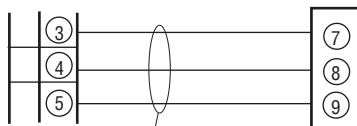
Option

- 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, 11-28 V DC
- 10 4-20 mA - Feedback, 11-28 V DC
- 11 Alarm output +, 8-28 V DC
- 12 Alarm output -, 8-28 V DC

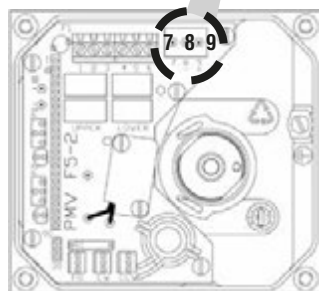
Connecting a remote unit

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.

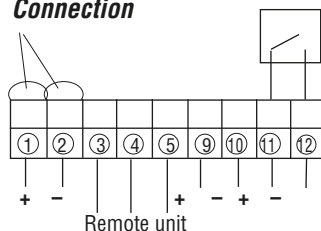
For more data with electrical ratings and barrier values - please download control drawing **cdwg 3-86** from www.pmv.nu/downloads



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

PMV D3 Ex

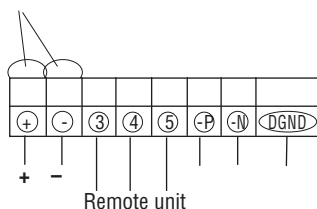
Connection



- 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, 11-28 V DC
- 10 4-20 mA - Feedback, 11-28 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 INTRINSICALLY SAFE/SECURITE INTRINSIQUE-Exia When installed in accordance with installation drawing:3-86C WARNING! Substitution of components may impair intrinsic safety. AVERTISSEMENT! La substitution de composants peut compromettre a securite intrinsique.		
	IP66/Nema 4x FISCO field device		
		Flowserve, Sweden Palmstierna International Solna, Sweden www.flowserve.com S/N	

Explosion proof housing

EXPLOSION PROOF DIGITAL VALVE POSITIONER			
Product Code: D3abcdeeffghij			
Class I Div.1 Grps. B,C&D		Class II Div1 Grps E,F&G	
T6(Ta:+65°C/+149°F)		T5(Ta:+80°C/176°F) Type 4X	
	Ex d IIB+H ₂	T6 Gb (-20°C to +60°C)	NEMKO 03ATEX 111
	Ex tb IIIC	T100°C Db (-20°C to +80°C)	IP66
Ex d IIB+H ₂		T6 Gb (-20°C to +60°C)	IECEx NEM 09.0001
Ex tb IIIC		T100°C Db (-20°C to +80°C)	IP66
Electrical Rating: max 28V DC, max24mA, max0,67W Do not open while energized! Seal within 50 mm of the enclosure. Max. working pressure: 700kPa/100 psi			
PALMSTIERNA INTERNATIONAL AB, SOLNA SWEDEN			
		Prod year-serial number P/N: D3E-XX	

D3 Digital Positioner model code

A=	Model no
	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=	Connections
	G 1/4" G air, M20 x 1,5 electrical
	N 1/4" NPT air, 1/2" NPT electrical
	M 1/4" NPT air, M20 x 1,5 electrical
C=	Surface treatment
	U Powder epoxy
D=	Function
	S Single acting
	L Single acting, Fail Freeze
	P Single acting, Fail freeze remote mounted
	M Single acting, remote mounted
	D Double 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=	Spindle
	23 Rotary VDI/VDE 3845
	39 D type with thread/nut for Linear actuators
	09 Double D type & adaptor spindle for 01/02/06/21/26/30/36/41
	BA BASF special unit with, Spindel 39 With adapter
F=	Cover and Indicator (No indicator on D3E, D3F)
	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=	Sensors/Temperature/seals
	Z No pressure sensors, NBR -30 to 80 deg C (-40 deg C for non-certified versions)
	Y On Board pressure sensors, NBR -30 to 80 deg C (-40 deg C for non-certified versions)
H=	Input signal/Protocol
	4 4-20 mA
	5 HART, 4-20 mA
	P Profibus PA
	D Profibus DP
	F Foundation Fieldbus
I=	Feedback option (Limitations for D3E)
	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=	Accessories
	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

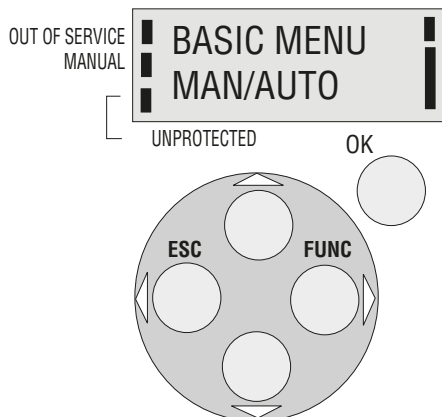
7. Control

Menus and pushbuttons

The positioner is controlled using the five pushbuttons and the display, which are accessible when the aluminum 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

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 28.

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

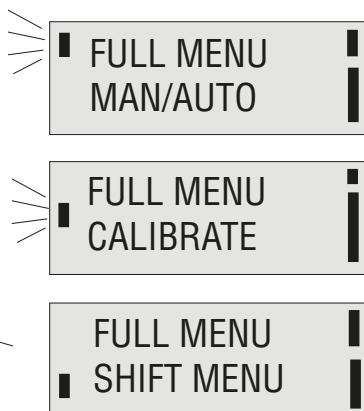
There are indicators at both sides of the display window and they indicate as follows:

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.

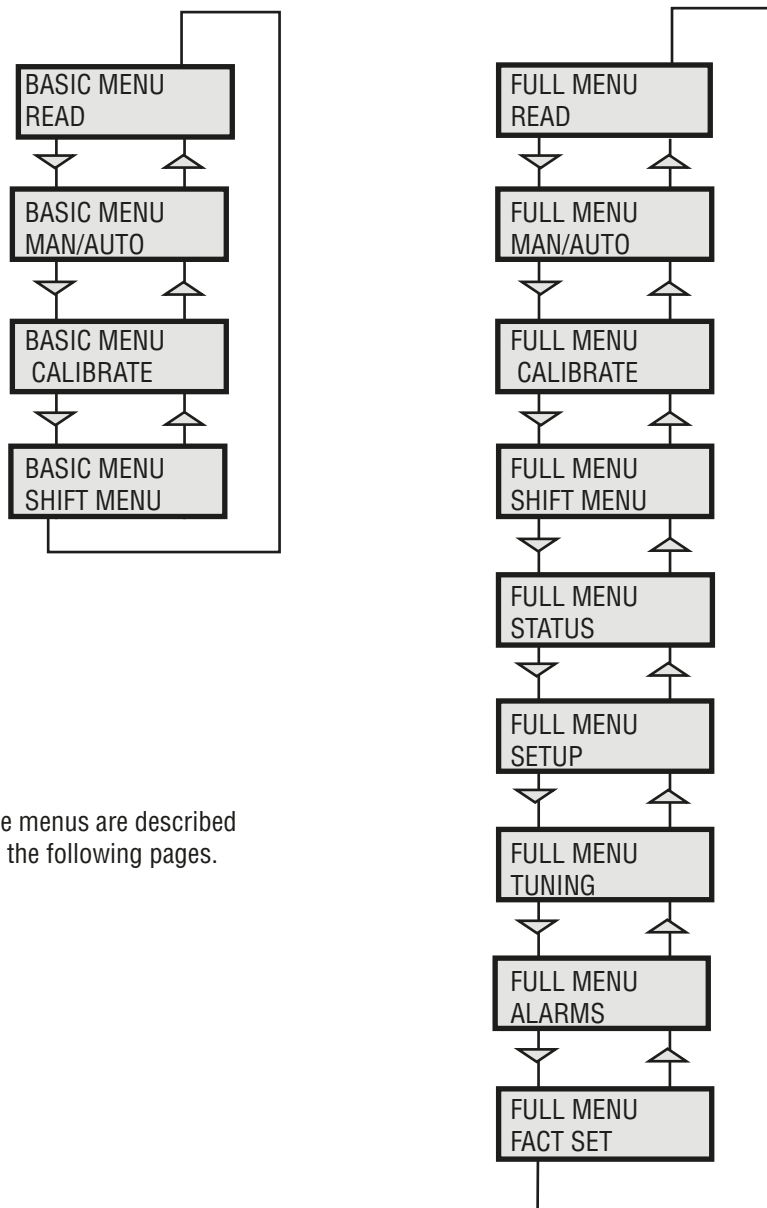
Changing parameter values

Change by pressing   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.

Menu system



The menus are described on the following pages.

BASIC MENU
CALIBRATE



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 24.

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 on Page 13.

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 there is loss of signal. Calibrate the unit.

GSD files are available at our web-page www.pmv.nu

To install the D3_PROFIBUS.DDL file to Siemens SIMATIC PDM.

1. Move the files to the directory where the DeviceInstall.exe is located.
2. Run DeviceInstall.exe

For Expert Calibration parameters - see page 35

Parameter		Description	BYTE
SP	Setpoint	The SP has 5 bytes, 4 bytes for the float value and one status byte. The status byte needs to be 128 (0x80Hex) or higher for the D3 to accept it.	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	Returns actual position as a digital value with definitions as below 0 = Not initialized 1 = Closed 2 = Opened 3 = Intermediate	2
CHECKBACK		Detailed information of the device, coded bit wise. Several messages can occur at the same time.	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 info			
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 All Alarm values used
1	0	0	0	0	0	0	0	OK	
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 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 an operator in the field will be able to control the positioner from the keypad, without affecting 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.

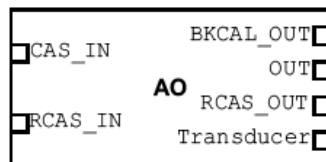
(AO) Analogue Output Block

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.

AO-block
overview



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.

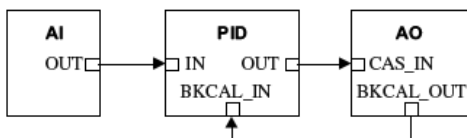
The transducer block is connected through a channel to the AO block. Through this channel the OUT value and SP are transceived.

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 a fieldbus configurator from, for example, National Instruments or Honeywell, scheduling can be done by adding the unit to a project and then clicking 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.

(WL) ISA100 Wireless function

The wireless D3 can be connected to an ISA100 wireless control system and perform regular control tasks. A normal update rate of the wireless AO block automatic control setpoint (OP) is 1 second. This setpoint is published to the device from the gateway. The variable to publish is configured in a wireless configurator tool. The readback value is also configured in this tool.

After configuring the wireless network and gateway, the D3 will join the network after a joining time. The D3 is then ready to start receiving the OP setpoint and do control work. The OP status is then Good Cascade and the AO block mode is Cascade/Auto.

In case the setpoint is lost for a time of the stale limit + FSTATE_TIME, the D3 will go into a safe state as defined by the FSTATE_OPT parameter.

D3 parameters can be viewed and set by a device management application that communicates with the gateway.

This application is DD-based. Before starting to get the D3 to join the network, the D3 has to be autocalibrated and provisioned for the network.

With a provisioning tool, the network number and device tag can be set.

To get the wireless D3 DD and recommendations for configuration tools, please contact PMV at:

Palmstierna International AB
Korta gatan 9
171 54 Solna
Sweden
infopmv@flowserve.com

BASIC MENU
CALIBRATE

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**.

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

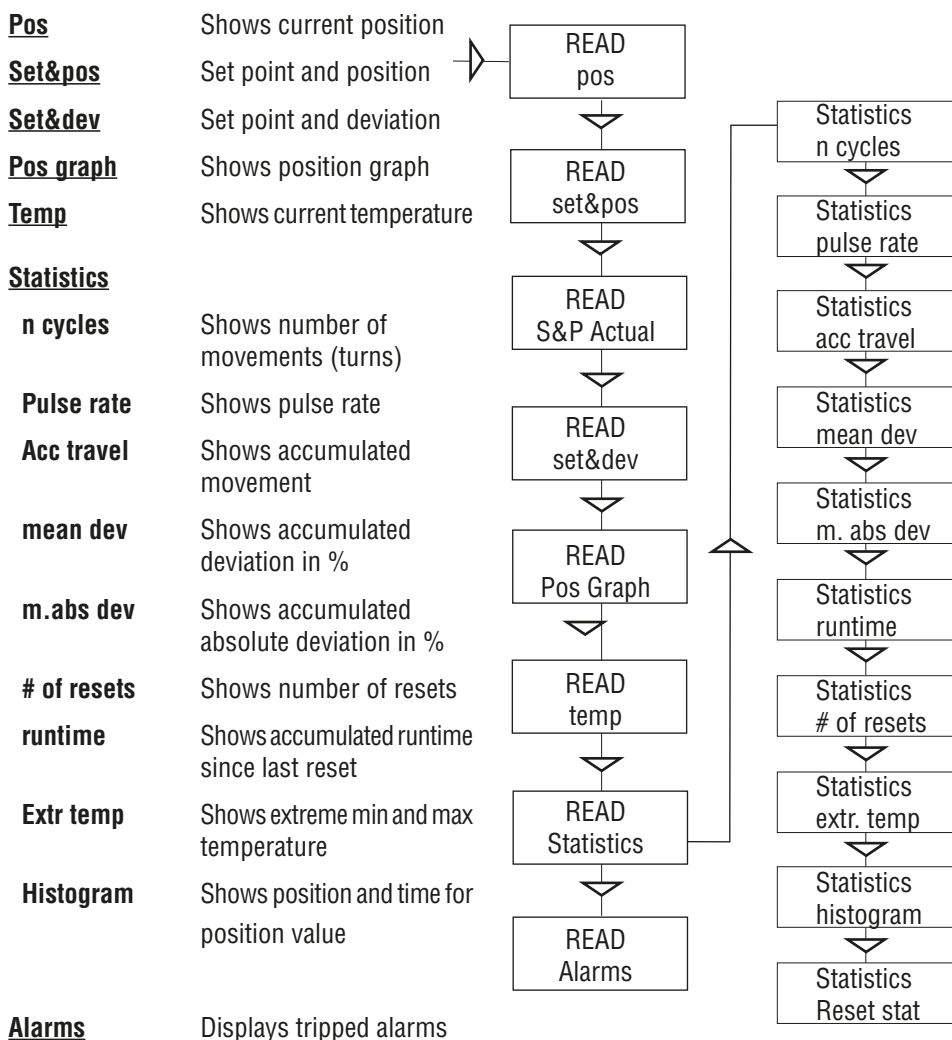
Resets all set values and enters Factory Mode. **Should only be used by authorized staff.**

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

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 18

Other functions

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

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

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

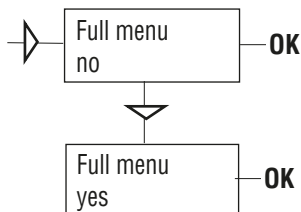


The Shift Menu is used to choose between the basic menu and the full menu.

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.

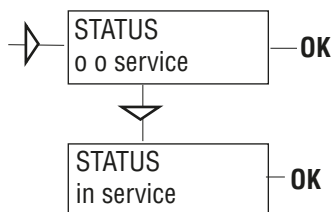


The Status Menu is used to select whether or not the positioner is in service.

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.



The Setup Menu is used for various settings.

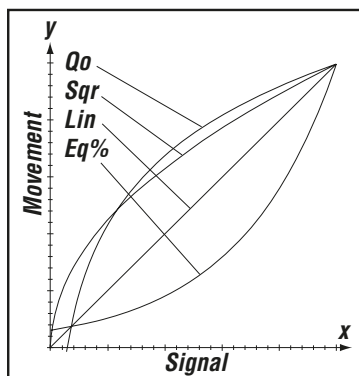
<u>Actuator</u>	<u>Type of actuator</u>	<u>Size of actuator</u>	<u>Time out</u>
Rotating	Rotating actuator.	Small	10 s
Linear	Linear actuator.	Medium	25 s
		Large	60 s
		Texas	180 s

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

<u>Direction</u>	
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	} See diagram.
Equal %	
Quick open	
Sqr root	
Custom	Create own curve.



<u>Cust chr</u>	
# 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%.

TRVL range 0%=0.0%

Set 0%

100%=100.0%

Set 100%

Trvl ctrl

Set low

Set high Values

Passcodes

Full menu

Write prot

Expert

Fact set

Setting end positions
Select Out of Service.
Set percentage value
for desired end position
(e.g. 3%).
Select In Service.
Connect calibrator.
Move forward to desired
end position (0%) and
press OK.
Select Out of Service.
Set percentage value for
desired end position
(e.g. 97%).
Select In Service.
Connect calibrator. Move
forward to desired end
position (100%) and
press OK.

Behavior at set end
position
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).
Similar to Set low.
Select position for Cut off
and Limit at the
respective end positions.

Setting passcodes for
various functions
Passcode for access to
full menu.
Passcode for removing
write protect.
Passcode for access to
Expert menu (TUNING).
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.

Appearance Language

On display
Select menu language.

Units Def. Display

Start menu

Orient

Par mode

Devicedata

HW rew SW rew Capability

Select units.
Select value(s) to be
displayed during service.
The display reverts to
this value 10 minutes
after any change is made.
Start in Basic menu or
Full menu.
Orientation of text on
display.
Display of control para-
meters such as P, I, D or
K, Ti, Td.

General parameters.

HART

Profibus PA/DP

Status Device ID Address Tag Descriptor Date Failsafe

Menu with HART para-
meters. Only amendable
with HART communi-
cator. It is possible to read
from display.

Indicates present status
Serial number
1-126
Allotted ID
ID description
SW release date
Value = preset pos
Time = Set time +10sec=
time before movement
Valve act = failsafe
(preset pos) or last value
(present pos)
Alarm out= On/Off

Foundation Fieldbus

Device ID Nod address

TAG-PD_TAG

Descriptor Date Sim jumper

Serial number
Address on the bus
provided by the DCS
system
Name provided by the
DCS system
PMV D3 positioner
SW release date
Simulate jumper, FF
simulation functionality
activated = ON

FULL MENU
TUNING

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

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

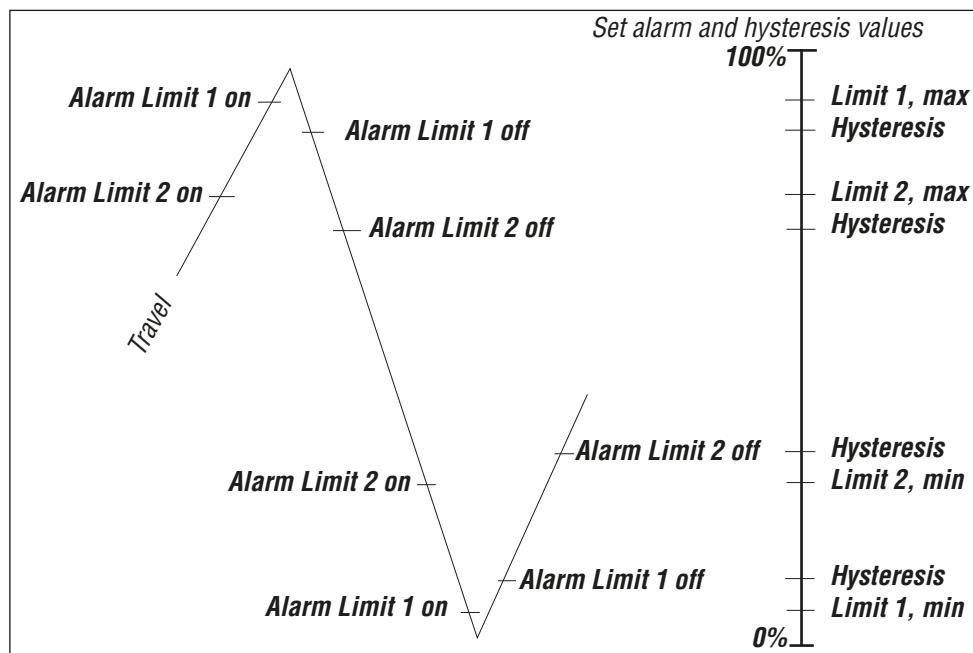


Deviation Alarm generated when deviation occurs
On/Off Alarm on/off.
Distance Allowed distance before alarm is generated.
Time Total deviation time before alarm is generated.
Alarm out Select ON/OFF offers output on terminals.
Valve act Behavior of valve when alarm is generated.

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.



<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	Behavior 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.

Expert Calibration

When entering "ExpertCal" mode - walk through the list of parameters described below. Set values where applicable. Confirm by pressing OK.

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.

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

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

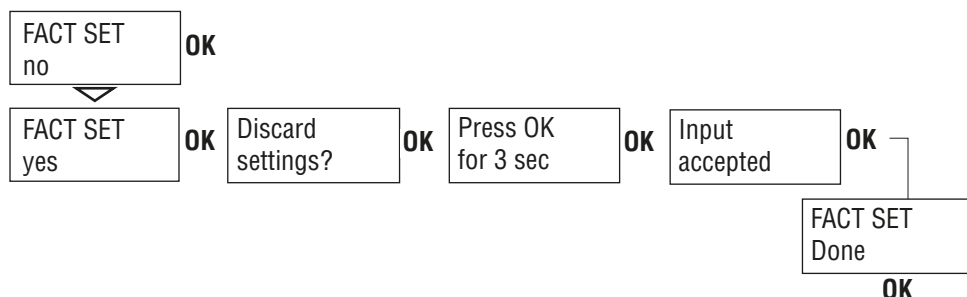
Full reset: Resets all set values.

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.



(*) appear if Linear set
 (**) appear if pressure sensor exist
 (***) only setttable when In Service mode
 (x) Position is show in upper row (PID, KTiTd, Min Pulse)

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 inevitably 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.



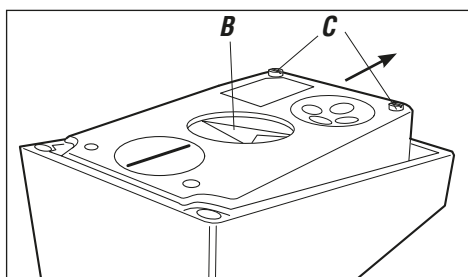
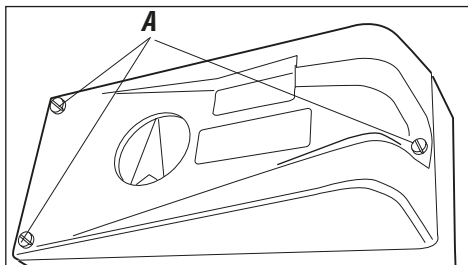
Please see section for special conditions for safe use and spare parts on page 4.

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

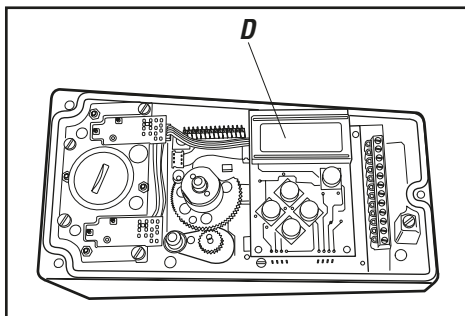


Circuit boards (PCB)

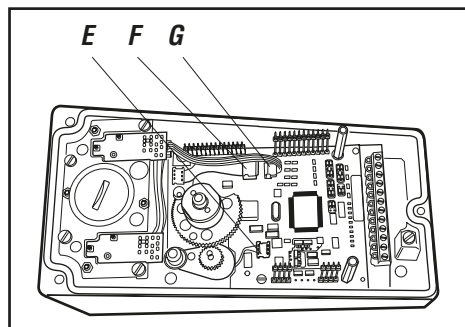


Disconnect or switch off the electric power supply before starting any work.

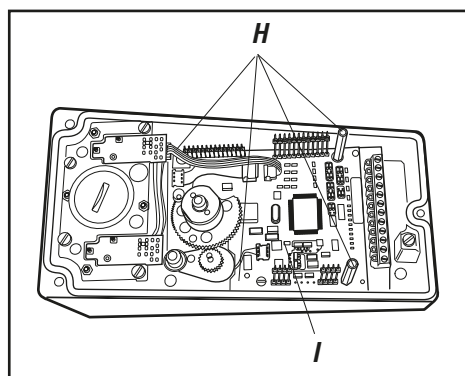
- Lift off the display PCB, D.



- Release the cable connections E, F and G,



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



Valve block

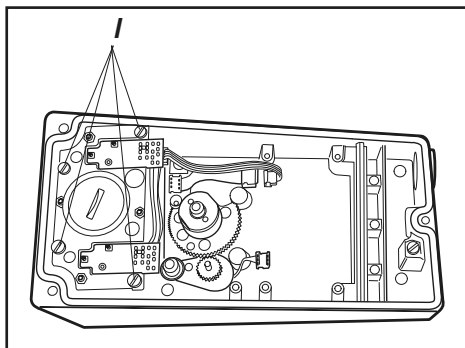


Turn off the air and electric power supply before starting any work.

- Remove the four screws and lift out the valve block

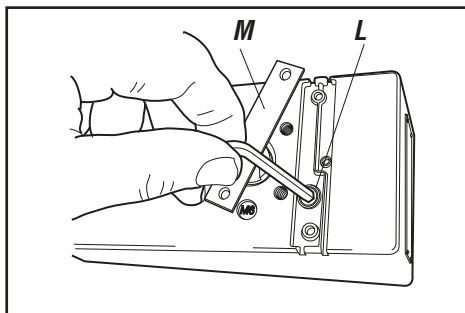
Note: Do not disassemble the valve block

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



Silencer

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



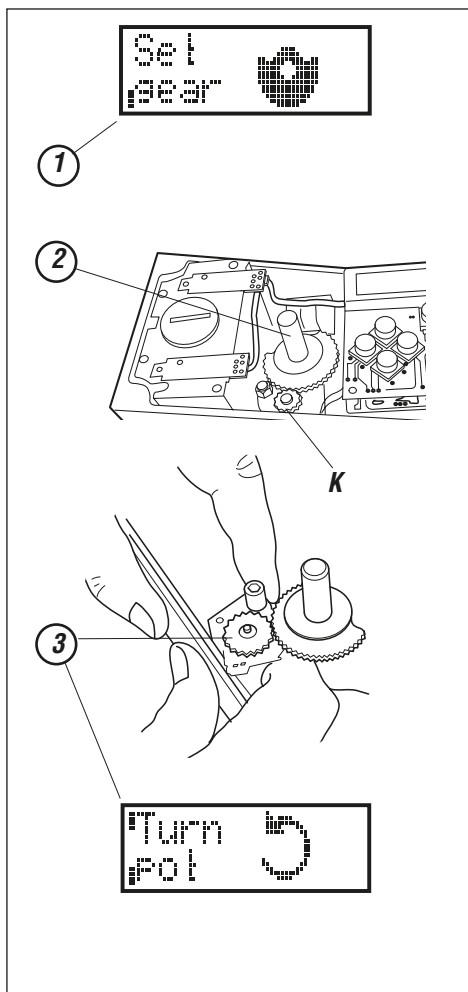
Potentiometer

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) clockwise to end position and press OK. Turn counter clockwise 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.

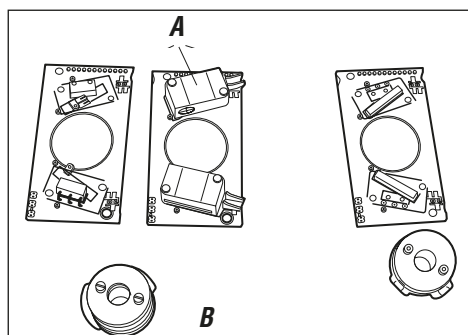


Transmitter boards

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.



Maintenance and repairs on PMV D3 units with hazardous area approvals should only be made by authorized staff.

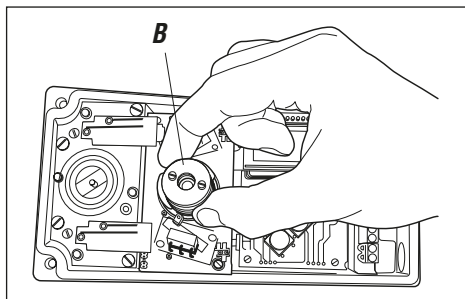
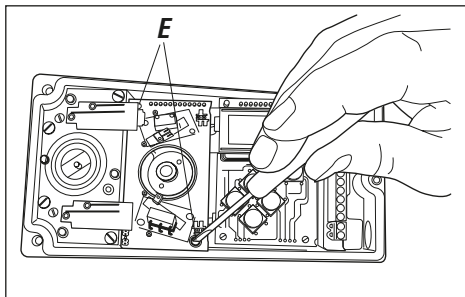
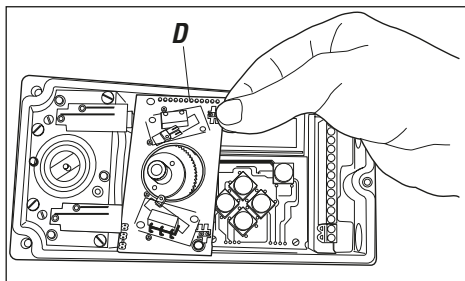
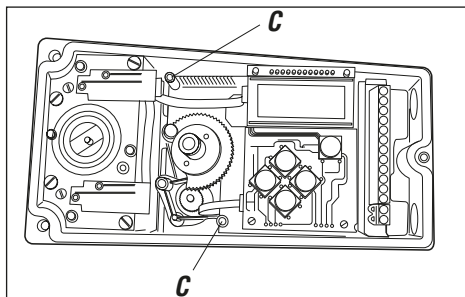
- Remove the cover, indicator and inner cover according to the description on page 37.

- Check that both spacers **C** are installed.

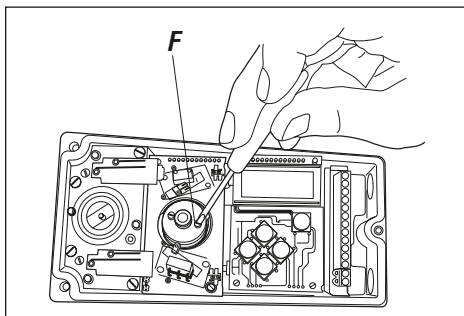
- Carefully mount the PCB in its position. The pins **D** should fit in the connector and the positioner's motherboard. Make sure that the feedback PCB is properly connected.

- Secure the PCB with the enclosed screws **E**.

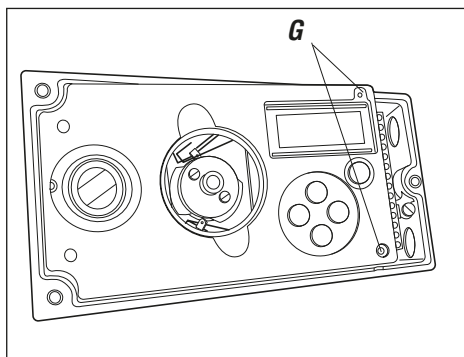
- Install the cam assembly **B** on the shaft and push it down to its position. If the board has microswitches, be careful not to damage the levers.



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

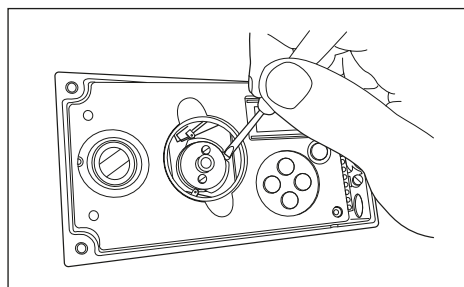


- Install the inner cover with the two screws, **G**.



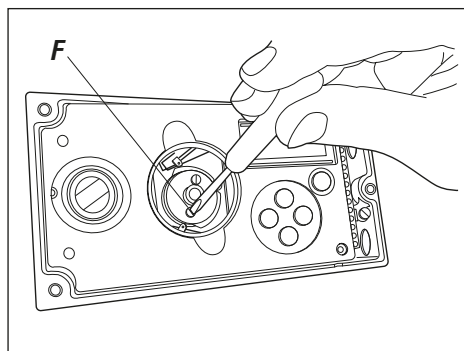
- Connect the wiring for the transmitter feedback on the terminal block, according to the drawings on the following two pages.

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

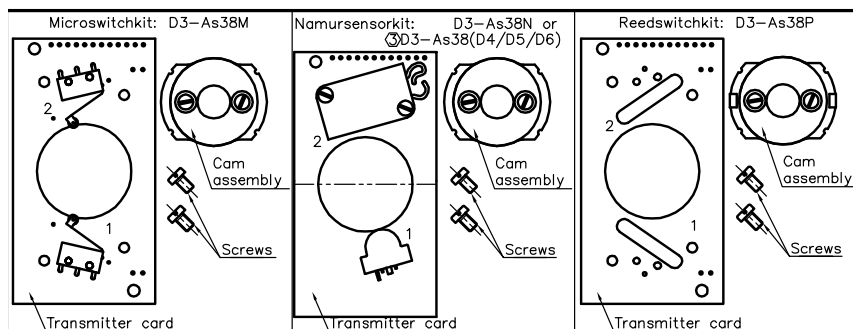


- Tighten the cam assembly screws **F** when the cams are correctly adjusted.

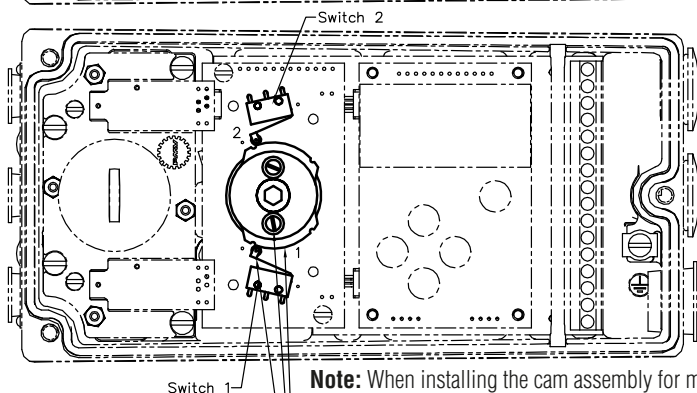
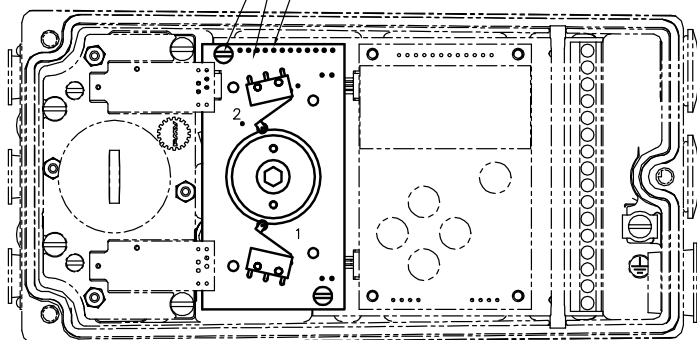
- Install the indicator and cover. To calibrate the feedback transmitter, see drawings on the following two pages.



Feedback option

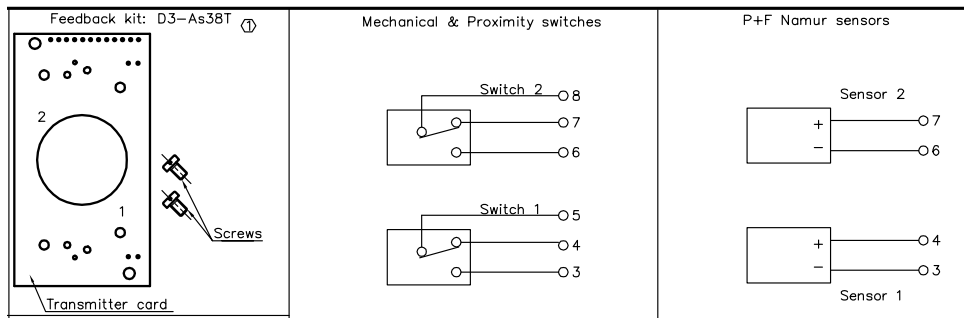


When installing the transmitter card, make sure it is placed correctly over the connector pins before gently pushing it down until it rests on the supports. Secure the PC board with the 2 screws. Make sure the holes are centred before tightening the screws.



Note: When installing the cam assembly for mechanical switches, retract both the switch arms first. Install the cam assembly and tighten the screws loosely to obtain enough friction to lock the cams. Adjust the lower cam first, and then the upper cam. Secure cams setting by tightening the two screws hard. The upper cam should trip switch/sensor no. 2.

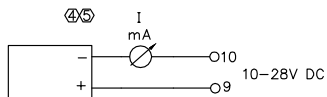
Feedback option (cont.)



IMPORTANT:

For D3 IS units (Intrinsically Safe):

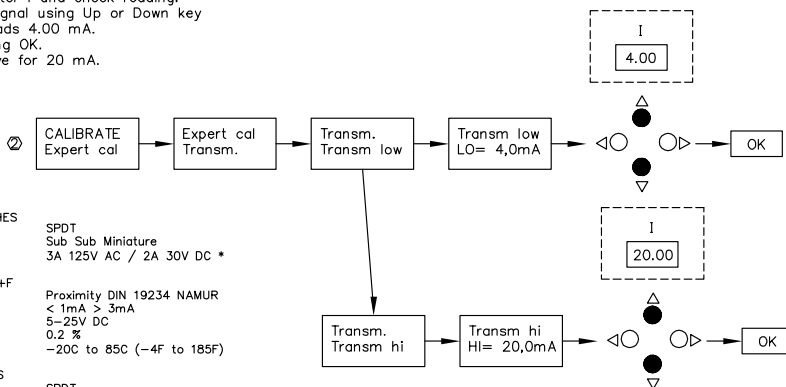
- Transmitter card NOT for on site mounting by customer.
- FM, CSA and ATEX certificates only valid when transmitter card is mounted by manufacturer.



Connect a mA meter I to terminal 9 & 10.

Calibration of the 4–20 mA transmitter

Go to menu shown in diagram.
Connect mA meter I and check reading.
Adjust output signal using Up or Down key
until meter I reads 4.00 mA.
Finish by pressing OK.
Repeat the above for 20 mA.



MECHANICAL SWITCHES

Type: SPDT
Size: Sub Miniature
Rating: 3A 125V AC / 2A 30V DC *

NAMUR SENSORS P+F

Type: Proximity DIN 19234 NAMUR
Load current: < 1mA > 3mA
Voltage range: 5–25V DC
Hysteresis: 0.2 %
Temperature: -20C to 85C (-4F to 185F)

PROXIMITY SWITCHES

Type: SPDT
Rating: 5W/250mA/30V DC/125V DC *
Operating time: 0.7 ms
Breakdown voltage: 200V DC
Contact resistance: 0.1 Ohm
Mechanical/Electrical life: >50000000 operations

4–20 mA TRANSMITTER

Supply: 11–28V DC
Output: 4–20 mA
Resolution: 0.1 %
Linearity full span: +/- 0.5 %
Output current limit: 30 mA DC
Load impedance: 800 Ohm @ 24V DC

* Switch rating limited to 100 mA/30V DC/42V AC for D3 units with connection board D3-AS35 R1

Non related drawing
Indicates partial replacement
with identical parts

5	mA-meter connections moved to terminals 9 & 10.	080129	KBM
4	Terminals 13 and 14 removed. Terminal 13 och 14 borttagna.	070806	KBM
3	Slotted namur configuration added.	060901	KBM
2	Note added "important" regarding IS units	020815	EM
2	Switch data sheet added and menu path changed	020815	EM
1	Feedback kit added	011128	KB

Mounting instruction				
PART NO.	PCS	DESCRIPTION	MATERIAL	ANNOATION
HOLE TOL.		UNSPECIFIED TOLERANCES ACCORDING TO:	SURFACE	PROJECTION EUROPA
PMV Positioner D3			DRW BY	Redesigned
			APPR. BY	SCALE 1:1
PALMSTIERNA INTERNATIONAL AB			DATE	010328
			DRAWING NO.	D3-59

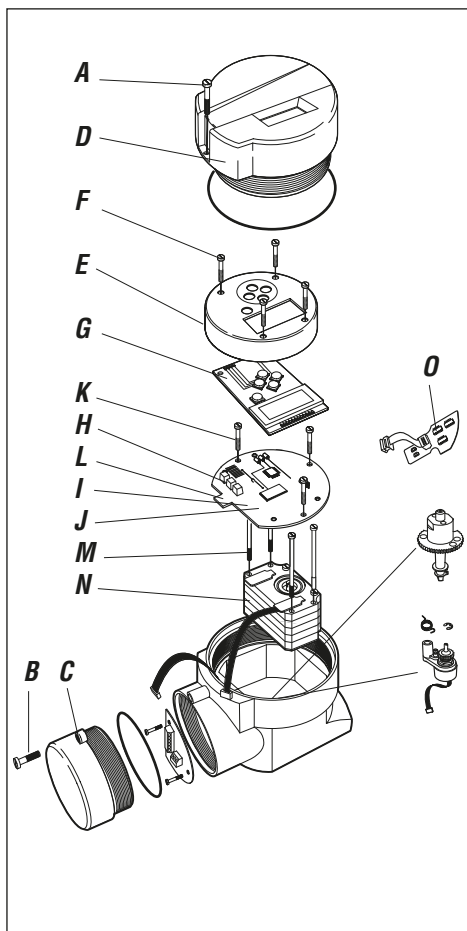
KORTA GATAN 9 SE-171 54 SOLNA SWEDEN – Tel:+46(0)8 555 106 00-Fax:+46(0)8 555 106 01 – www.pmv.se

Disassembling PMV D3 Ex



Caution! Turn off the power and air supply before disassembling the 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



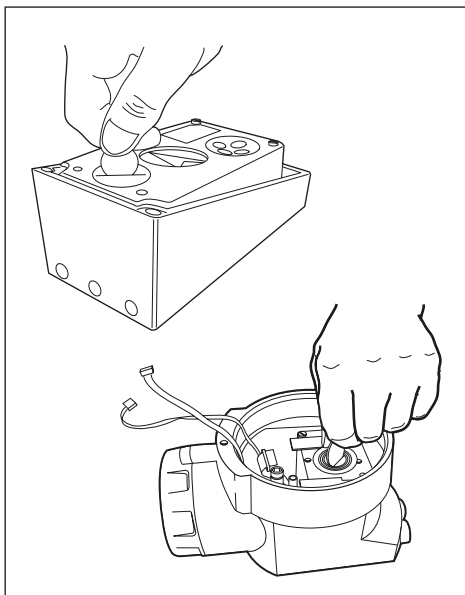
Turn off the compressed air supply before starting any work.

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.	• Check air supply pressure, air cleanliness, and connection between positioner and actuator. • Out of service, in manual mode. • Check input signal to positioner. • Check mounting and connections of positioner and actuator.
Change in input signal to positioner makes actuator move to its end position.	• Check input signal. • Check mounting and connections of positioner and actuator.
Inaccurate control.	• Perform Auto-calibration and check for any leaks. • Uneven air supply pressure. • Uneven input signal. • Wrong size of actuator being used. • High friction in actuator/valve package. • Excess play in actuator/valve package. • Excess play in mounting of positioner on actuator. • Dirty/humid supply air.
Slow movements, unstable regulation.	• Implement auto-tuning. • Increase the deadband (Tuning menu). • Adjust Performance (Calibrate menu).

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) DIN/ISO 8573-1 3.2.3 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	¼" G or NPT
Cable entry	3 x M20x1,5 or ½" NPT (D3E 2x)
Electrical connections	Screw terminals 2.5 mm ² /AWG14
Linearity	<1%
Repeatability	<0.5%
Hysteresis	<0.4%
Dead band	0.2-10% adjustable
Display	Graphic, view area 15 x 41mm (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 Aluminum/Stainless Steel A2/A4 fasteners
Surface treatment	Powder epoxy (Aluminum version only)
Temperature range	-30 to +80 °C / -22 to 176 °F (-40 °C / -40 °F for non-certified versions)
Weight	PMV D3X, 1.4 kg (3 lbs). PMV D3E, 3 kg (6.6 lbs) 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 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 Ω
Temp. range	-30 °C to 80 °C (-22 °F to 180 °F)

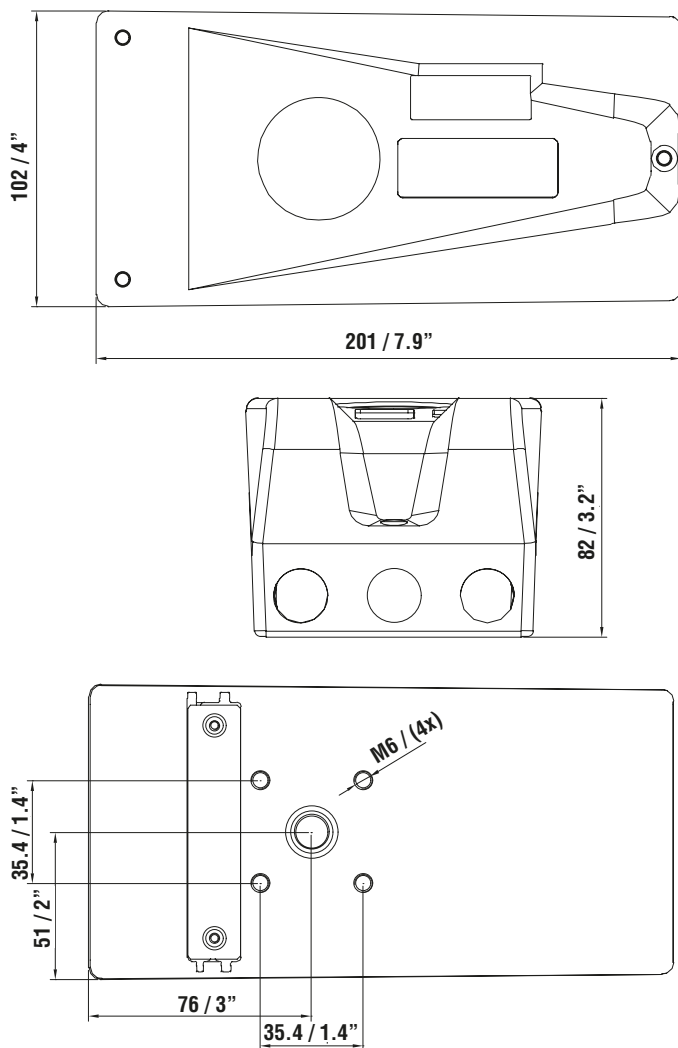
Slot NAMUR switches (SJ2-S1N, SJ2-SN, SJ2-N)

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)

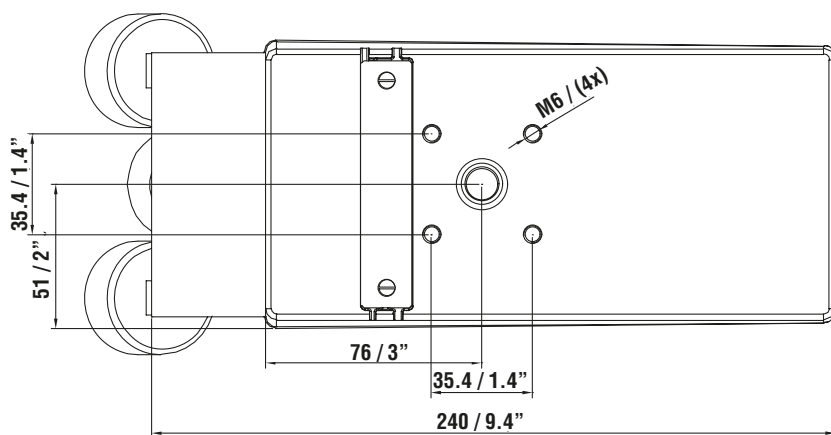
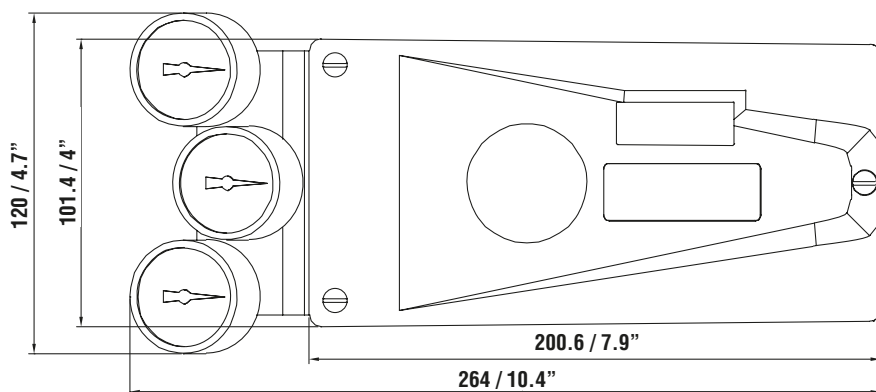
4-20 mA transmitter

Supply	11-28 VDC
Output	4-20 mA
Resolution	0.1 %
Linearity full span	+/-0.5 %
Output current limit	30 mA DC
Load impedance	800 Ω @ 24 VDC

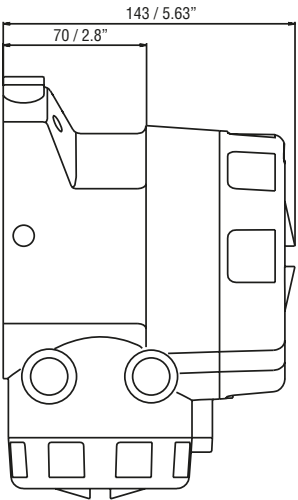
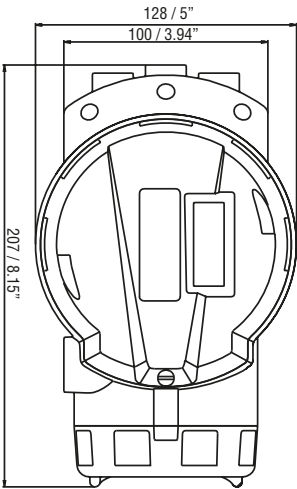
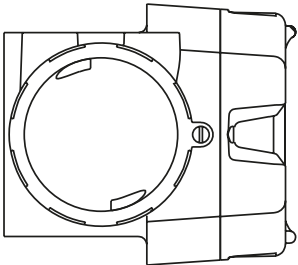
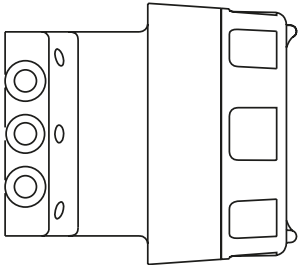
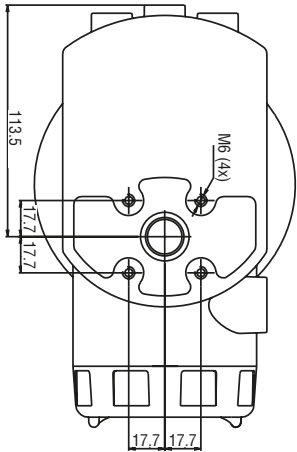
11. Dimensions



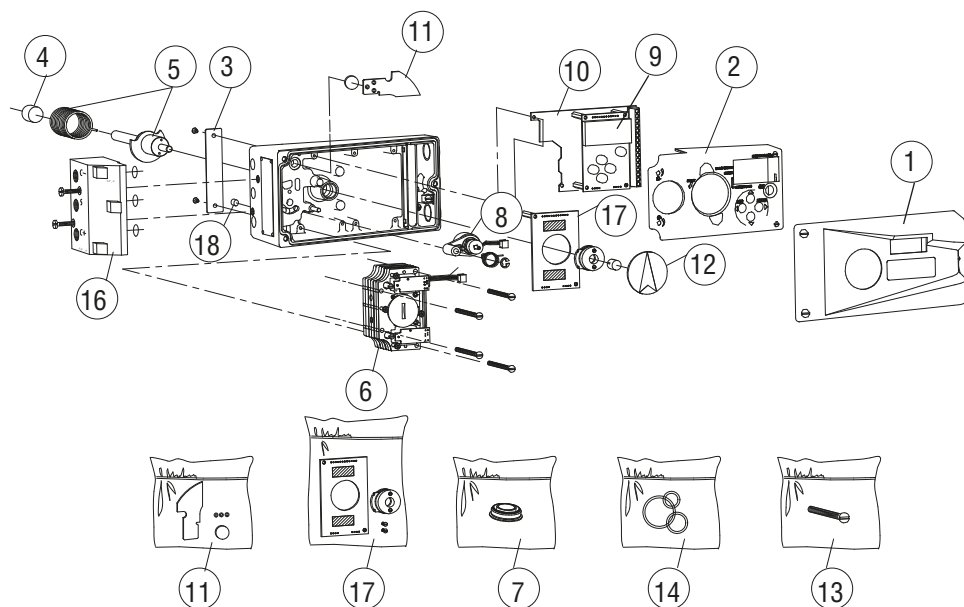
Dimensions with optional gauge block installed



Dimensions explosion proof version

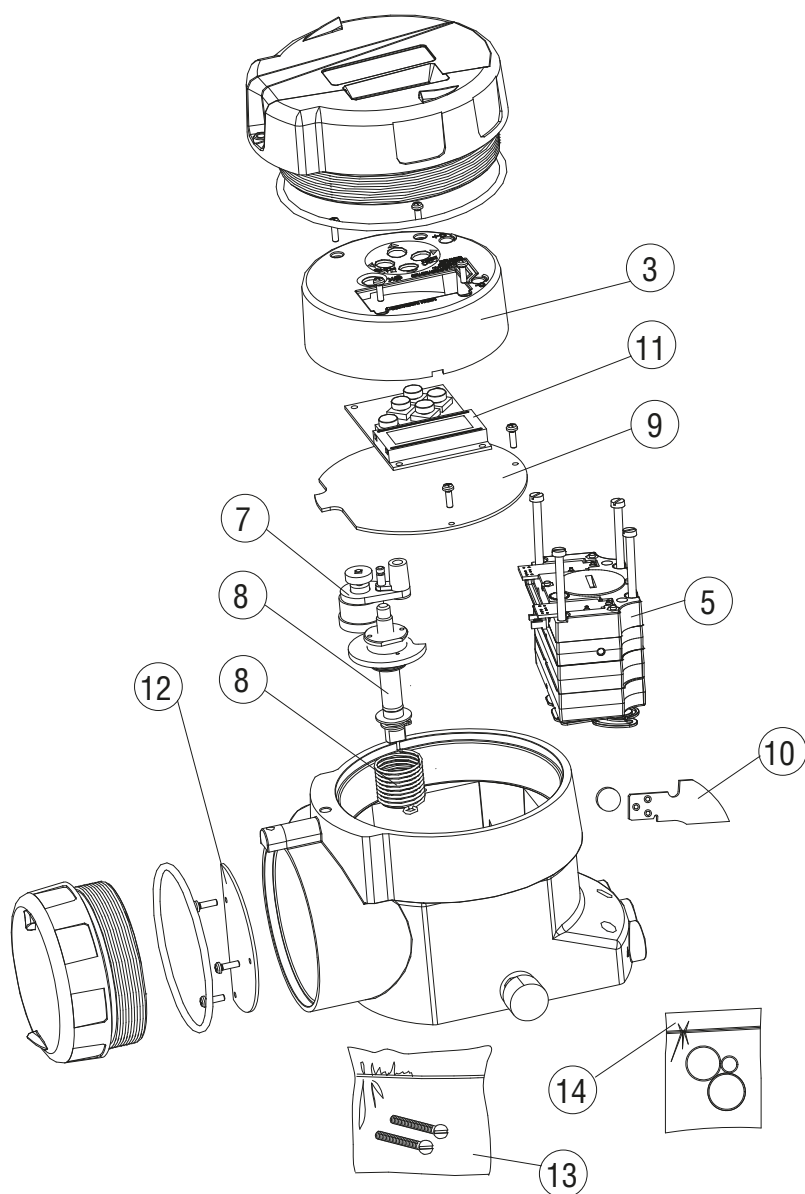


12. Spare parts



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 complete incl. gearwheel, friction clutch, spring
5	3-AS39	S39 Shaft complete incl. gearwheel, friction clutch, spring
5	3-AS09	S09 Shaft complete 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	Filter plug, incl. O-ring, filter
8	3-SP8B	Potentiometer complete incl. spring, holder, cable
9	3-SP37HR	PCB LCD Display assembly 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 assembly complete
12	3-SP48A	Indicator arrow assembly
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 assembly
17	3-AS81M	PCB Transmitter and Mechanical switches, assembly
17	3-AS81N	PCB Transmitter and Namur sensors, assembly
17	3-AS81P	PCB Transmitter and Proximity switches, assembly
17	3-AS81N4	PCB Transmitter, slot type Namur sensors (P+F SJ2 S1N), assembly
17	3-AS81N5	PCB Transmitter, slot type Namur sensors (P+F SJ2 SN), assembly
17	3-AS81N6	PCB Transmitter, slot type Namur sensors (P+F SJ2N), assembly
18	D3-67	Silencer, Sintered brass
	D3-SP/REPAIR KIT	Kit containing membranes and gasket for the air block and the O-ring for the filter plug cap.



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 complete incl. spring, holder, cable
8	3-AS23	S23 Shaft complete incl. gearwheel, friction clutch, spring
8	3-AS39	S39 Shaft complete incl. gearwheel, friction clutch, spring
8	3-AS09	S09 Shaft complete 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

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JOHANNESBURG

Tel: 011 397 2833

DURBAN

Tel: 031 579 2593

South Africa:
0861 103 103

E-mail:
sales@valve.co.za
www.valve.co.za

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