FLOWSERVE

USER INSTRUCTIONS

D3-series
Digital Positioner

FCD PMENIM0001-08-A5 – 07/25

Installation
Operation
Maintenance

Experience In Motion

Contents

1. Introduction

The D3-series is a digital positioner designed primarily for controlling adjustable valves.

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

The D3-series 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, NAMUR 19234

Note: *Only qualified technicians (according to IEC 60079 series of standards) are allowed to work with certified products.*

2. Warning

Special Conditions for Safe Use

The enclosure of PMV D3-series Intrinsically safe version is made of aluminum and any impact or friction caused by external objects shall be avoided in the application. Control Drawing 3-86C contains the parameters for intrinsic safety. The intrinsic safe circuits D3-series is insulated from earth and complies with the dielectric strength test of 500 V ac.

Special Conditions for Safe Use (ATEX/IEC specific)

The surface area of the plastic parts on the cover exceeds the limits specified in EN 60079-0 for II 1G (EPL Ga) for gas group IIC and intensive rubbing or brush charging should be avoided when used in an IIC explosive atmosphere.

The enclosure is made of aluminium and impact or friction caused by external objects shall be avoided in the application.

The cable connection th D3I Remote Unit with the D3-unit shall be type A or B in accordance with EN 60079-25. The cable must be adequate mechanically protected in all instance and have a temperature rating for the ambient temperature range at the site.

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

Do not disconnect equipment unless area is known to be non-hazardous. or; read, understand and adhere to the manufacturer's live maintenance procedures. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Repairs of flameproof joints must be made in accordance with structural specifications provided by the manufacturer. Repairs must not be made on the basis of the values provided in Table 3 of EN 60079-1: 2014.

Substitutions of components may impair suitability for hazardous (classified) locations.

Special Conditions for Safe Use (FM specific)

Potential risk of sparking from aluminum alloy enclosure. In Division 1 or Zone 0 installations, equipment shall be installed in such manner as to prevent the possibility of sparks resulting from friction or impact against the enclosure.

Potential risk of electrostatic sparking. Clean only with a damp cloth.

Environmental requirements

Some switch options may decrease the temperature working range see Control Drawing 3-86Cfor details.

Maintenance/service

Warning!

When upgrading electrical parts inside a PMV positioner approved for installation in Hazardous locations special procedures apply, permission from PMV/Flowserve is required prior to the start of work. Please contact a Flowserve office for information regarding proper procedures. www.pmv.nu or infopmv@flowserve.com

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

Always turn off the air and electrical supplies (input signals) when shutting down the PMV positioner for any purpose.

General safety

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 can open or close very quickly when in operation and, if handled incorrectly, may cause damages to fingers. There may also be unintentional effects due to it fully opening or shutting off the flow in the process pipe. Please note the following:

- If the input signal fails or is switched off, the valve operates quickly to its default position.
- If the compressed air supply fails or is turned off, rapid 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 an internal or external 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 operate 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 as air connection "C-" is still under pressure even after the air supply is turned off.
- Always work in an ESD (Electrostatic Discharge) protected area when servicing the Printed circuit boards (PCB´s). Make sure the input signal is switched off.
- The air supply must be free from moisture, water, oil and particles according to DIN/ISO 8573-1-2010 3.2.2
- Failure to comply with instructions specified in this IOM leads to warranty void.
- Work on D3 can void the warranty.

3. Storage

General

The D3-series positioner is a precision instrument. Therefore it is essential that it is handled and stored in the right way. Always follow the instructions in this IoM

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 (-40°C to 80°C, -40 °F to 176°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 and/or plugged. 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.

4. Unpacking

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

Report transport damage to the carrier immediately.

In case of discrepancies, contact your nearest FLOWSERVE location.

5. Description

The D3-series positioner contains:

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

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

5.1 Variants

D3i 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.

D3i 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 -30˚C ≤ Ta ≤ 80 ˚C / IP66

D3E Explosion proof

The D3-series digital positioner is available in explosion proof enclosure. The explosion proof D3E features the same easy to use interface for local configuration as the general purpose

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.

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

ATEX:

 II 2 G Ex db IIB +H2 T6 Gb -20°C ≤ Ta ≤ 60°C

II 2 D Ex tb IIIC T100°C Db -20°C ≤ Ta ≤ 80°C

CSA, FM:
Class I, Div.1 Grps 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.

6. Principle of operation

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.

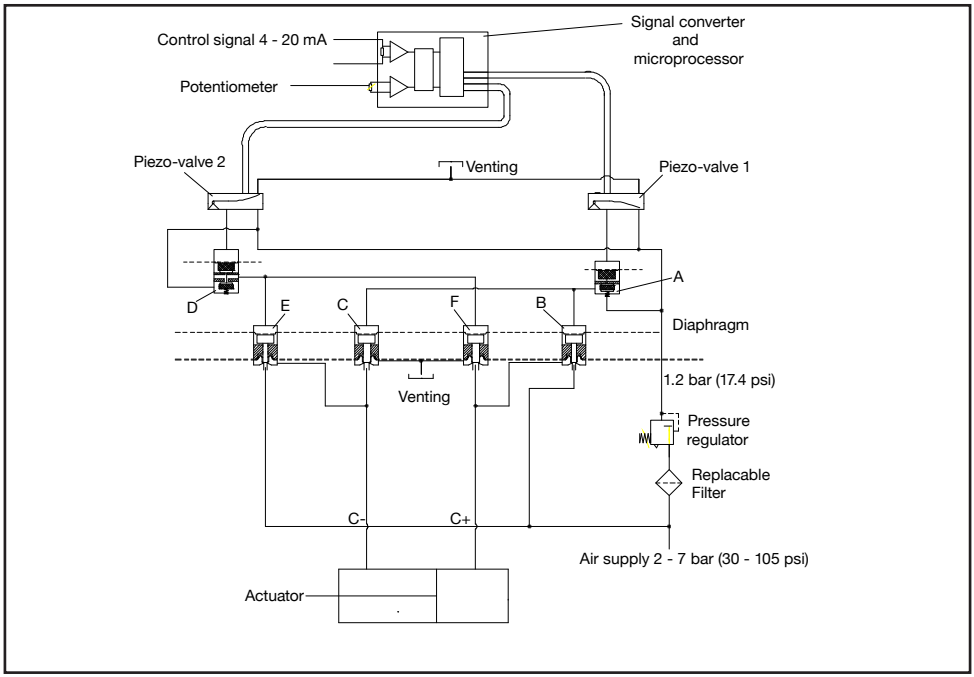
For double acting actuators, connect C+ and C- to the actuator.

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 16**.

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

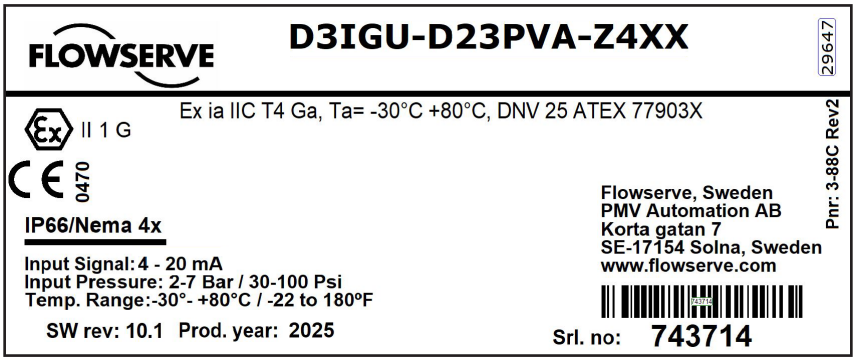
Supply pressure is then allowed to open valve B and flow to the actuator via the C+ port. When the actuator reaches its new steady state position piezo-valve 1 closes which causes valves B and C to close shutting off supply air to the actuator.

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

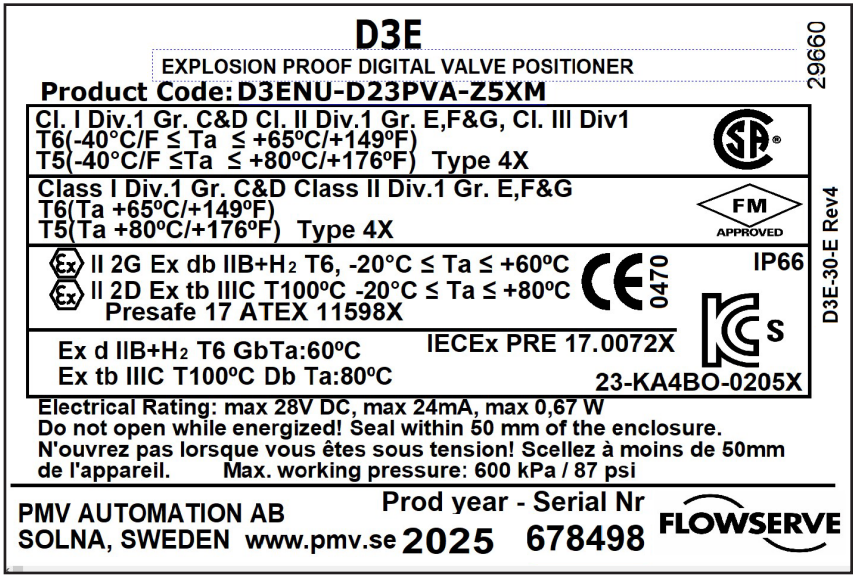


7. Type sign example

General purpose and Intrinsically safe housing



Explosion proof housing



8. Order Code

8.1 D3 digital positioner order code

		D3X	D3I
A=	**Model no**		
	D3X Digital positioner with display and indicator, General purpose	☐	■
	D3I Digital positioner with display and indicator, Intrinsically safe ATEX Ex ia	■	☐
	D3IB Digital positioner with display and indicator, Intrinsically safe INMETRO DNV 12.0056 X/03	■	☐
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 (I=T & E= XX or 09) (position sensing unit sold separately)	☐	☐
	M Single acting, remote mounted (I=T & E=XX or 09) (position sensing unit sold separately)	☐	☐
	D Double acting	☐	☐
	K Double acting, Fail Freeze function	☐	☐
	Q Double acting, Fail freeze remote mounted (I=T & E=XX or 09) (position sensing unit sold separately)	☐	☐
	R Double acting, Remote mounted (I=T & E=XX or 09) (position sensing unit sold separately)	☐	☐
E=	**Spindle**		
	XX No shaft, For D3X Remote version only	☐	■
	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. Double D type 1/4"	☐	☐
FCover and Indicator			
	PVA Black PMV, 90 deg, Arrow indicator	☐	☐
	PVB Black, Extended travel, 270 deg Arrow indicator	☐	☐
	FSW White cover, Flowserve, 90 deg, Arrow indicator	☐	☐
	WCA Worcester Controls,Pulsair III, Arrow indicator	☐	☐
G=	**Sensors/Temperature/seals**		
	Z No pressure sensors, NBR -30 °C to 80 °C	☐	☐
	Y On Board pressure sensors, NBR -30 °C to 80 °C	☐	☐
H=	**Input signal/Protocoll**		
	4 4-20 mA	☐	☐
	5 HART, 4-20 mA	☐	☐
	P Profibus PA	☐	☐
	F Foundation Fieldbus	☐	☐
I=	**Feedback option**		
	X No feedback option	☐	☐
	T Plug in 4-20 mA transmitter only	☐	☐
	S Limit switches MEC + 4-20 mA transmitter	☐	☐
	N Limit sensors NAM + 4-20 mA transmitter	☐	☐
	P Limit switches PXY + 4-20 mA transmitter	☐	☐
	5 Slot type Namur sensor, P+F SJ2 SN + 4-20mA transmitter	☐	☐
	6 Slot type Namur sensor, P+F SJ2N + 4-20 mA transmitter	☐	☐
J=	**Accessories**		
	X No accessories	☐	☐
	2 Gauge block incl 2 gauges stainless/brass,p/n 30447 (If B=G use D34M, If B= M or N use D34N)	☐	☐
	3 Gauge block incl 3 gauges stainless/brass,p/n 30447 (If B=G use D34M, If B= M or N use D34N)	☐	☐

D	3	A	B	C	-	D	E	E	F	F	F	-	G	H	J			
D	3	A	A	B	C	-	D	E	E	F	F	F	-	G	H	J		

Note: For latest version of valid order code please see www.pmv.nu

8.2 D3 Explosion proof digital positioner order code

Related Document – No modification permitted without reference to the authorized person

					D3
A=	Model no				
	D 3 D	Digital positioner with display, no indicator, Not certified			
	D 3 E	Digital positioner with display, no indicator, Explosion proof ATEX, IEC, FM,CSA			
	D 3 E C	Digital positioner with display, no indicator, CSA			
	D 3 E N	Digital positioner with display, no indicator, Explosion proof NEPSI / CCC			
	D 3 E F	Digital positioner with display, no indicator, FM			
	D 3 E B	Digital positioner with display, no indicator, Inmetro			
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				
	E . Stainless steel enclosure (B=N only)				
D=	**Function**				
	S . Single acting				
	L . Single acting, Fail Freeze				
	P . Single acting, Fail freeze Prepared for remote mounted feedback				
	M . Single acting, Prepared for remote mounted feedback	(Use spindle 09,no adapter)			
	D . Double acting				
	K . Double acting, Fail Freeze function				
	Q . Double acting, Fail freezePrepared for remote mounted feedback				
	R . Double acting,Prepared for remote mounted feedback	(Use spindle 09,no adapter)			
E=	**Spindle**				
	2 3	Rotary VDI/VDE 3845			
	3 9	D type with thread/nut for Linear actuators			
	0 9	Double D type & adator spindle for 01/02/06/21/26/30/36			
	4 1	Double D type 1/4"			
F=	**Cover (No indicator)**				
	P V A	Black PMV, 90 deg			
	P V B	Black, Extended travel, 270 deg			
	F S W	White cover, Flowserve, 90 deg			
	W C A	Worcester Controls, Pulsair III			
G=	**Sensors/Temperature/Seals**				
	Q . No pressure sensors, Silicon -30 °C to 80 °C			* Only A=D3EC	*
	R . On Board pressure sensors, Silicon -30 °C to 80 °C	(Not for Input signal/protocol H=4)	* Only BB=EC	* Only A=D3EC	*
	S . No pressure sensors, Viton -30 °C to 80 °C			* Only A=D3EC	*
	T . On Board pressure sensors, Viton -30 °C to 80 °C	(Not for Input signal/protocol H=4)	* Only BB=EC	* Only A=D3EC	*
	Z . No pressure sensors, NBR -30 °C to 80 °C				
	Y . On Board pressure sensors, NBR -30 °C to 80 °C	(Not for Input signal/protocol H=4)			
H=	**Input signal/Protocol**				
	4 . 4-20 mA				
	5 . HART, 4-20 mA				
	P . Profibus PA				
	F . Foundation Fieldbus				
I=	**Feedback option**				
	X . No feedback option				
	T . 4-20 mA transmitter only + Alarm module	(not for Input signal/protocol H=P or F)			
J=	**Accessories**				
	M . Gauge block 3 x ports (1/8" NPT)				
	2 . Gauge block and 2 gauges included stainless/brass p/n 30447				
	3 . Gauge block and 3 gauges included stainless/brass p/n 30447				

D	3	A	B	C	-	D	E	E	F	F	F	-	G	H	J

D	3	A	A	B	C	-	D	E	E	F	F	F	-	G	H	J

Note: For latest version of valid order code please see www.pmv.nu

9. 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.

Tubing

It is recommended to use tubes with a minimum inner diameter of Ø 6 mm (¼").

Air supply requirements

Note: Poor quality 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)TBC

Standard: DIN/ISO 8573-1-2010 3.2.2
Filtered to 5 Micron, dew point -40°C/F Oil 0.1 mg/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.

9.1 Mounting

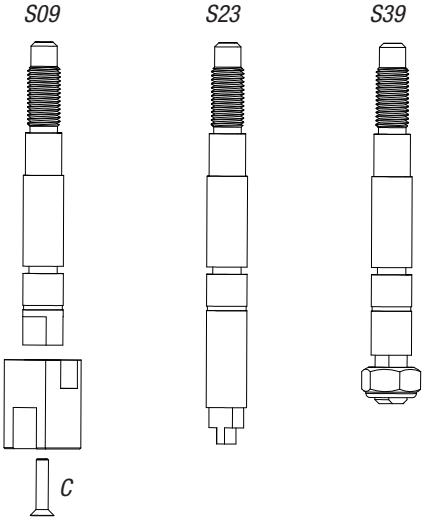
Note: If the positioner is installed in a hazardous environment, it must be of a type approved for this purpose.

All versions of the D3 positioner have an ISO F05 footprint ***(A)***. The holes are used to attach the D3 to the mounting bracket ***(B)***. Please contact PMV or your local distributor representative with actuator specifics for the proper mounting bracket and hardware.

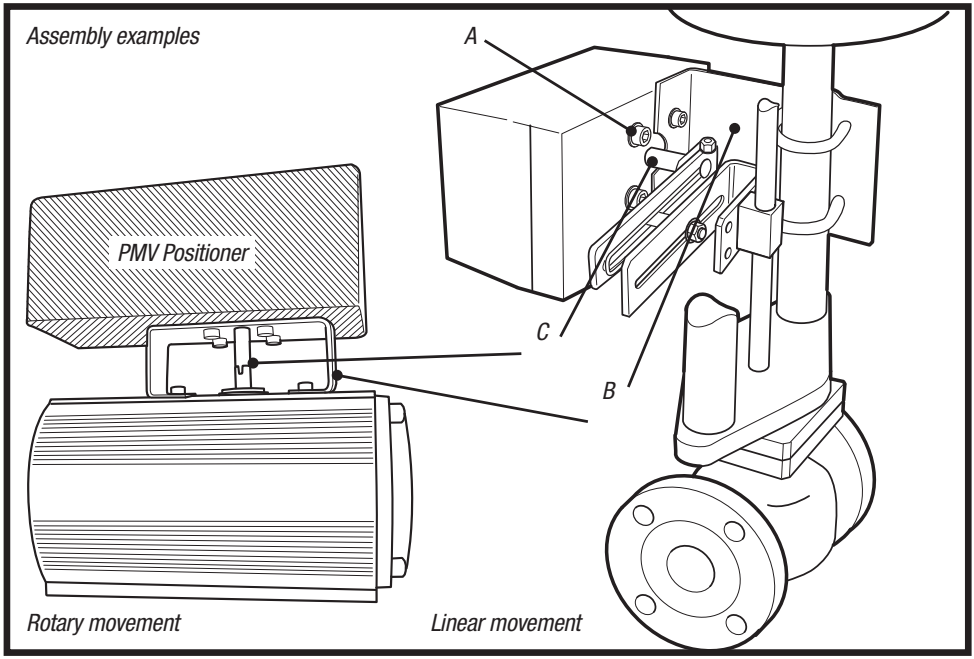
The spindle shaft S09 ***(C)*** can be used to suit various actuators in question by the use of adapters.

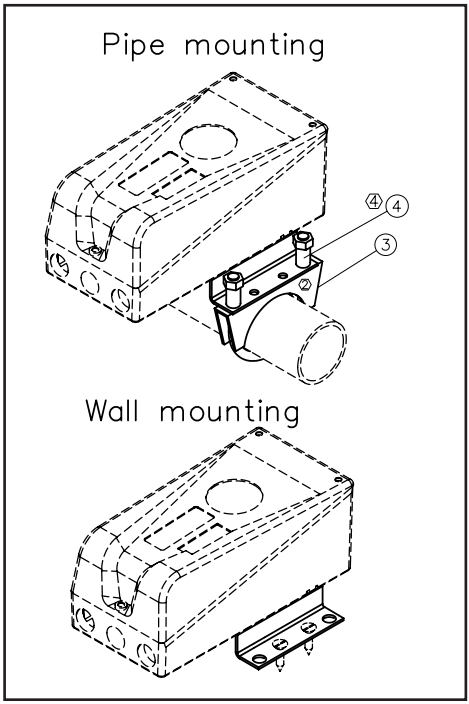
It is important that the positioner's spindle shaft and the lever arms, that transfer the actuator movements, are correctly mounted. Any tension between these parts can cause incorrect operation and abnormal wear.

Spindle shafts



Note: There are many spindle options available depending on the actuator. Please contact your local PMV supplier for all options available.

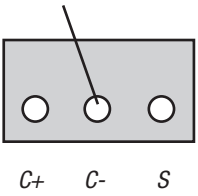




Kit D3R-AS6 for remote mounting of D3

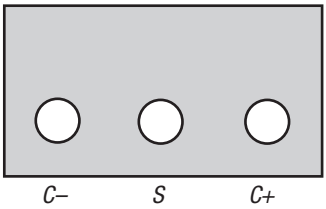
9.2 Air Connection

Must be plugged when converting to single action function.



External air Connection

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 18**, **19**.

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.

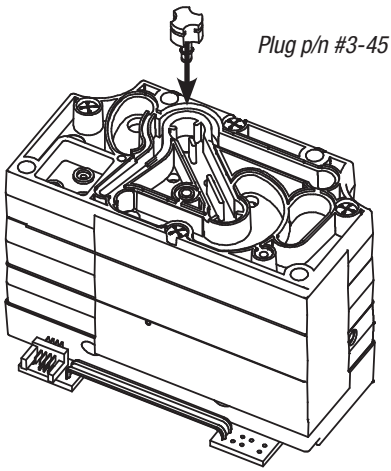
Converting the D3 between single acting and double acting mode
When using the D3 (all versions) in single acting mode, the external C- port as well as the air block need to be blocked. (Air block plug installed per default when ordered for single acting use.)

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.

Ensure that the vent cap always is installed and facing upwards.

Plug p/n #3-45

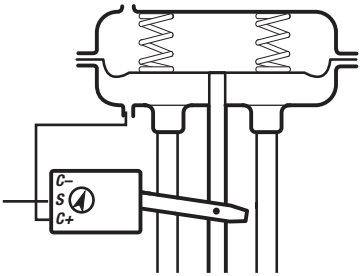


Note: For data for air and electrical connections, see section Technical Data on **page 48**, **49.**

Single acting positioner, Direct function

Actuator with closing spring

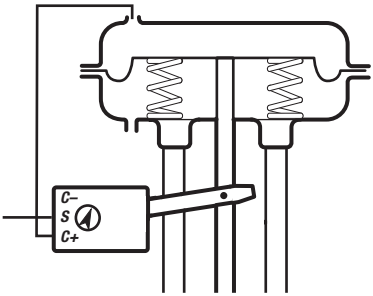
When the control signal increases, the pressure C+ to the actuator is *increased*. The valve stem moves upward and rotates the positioner spindle *counter-clockwise*. When the control signal drops to zero, C+ is vented and the valve closes.



Reverse function

Actuator with opening spring

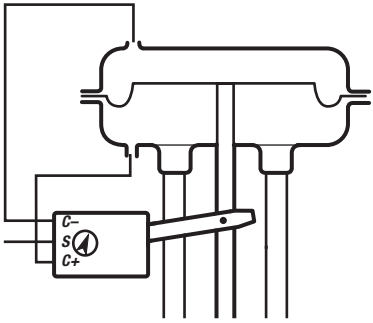
When the control signal increases the pressure C+ to the actuator is *increased*. The valve stem moves downward and the positioner spindle rotates *clockwise*. When the control signal drops to zero, C+ is vented and the valve opens.



Double acting positioner, Direct function

Double acting 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.

9.3 Electrical connections

Terminal block diagram for the D3i and D3 Ex.

9.3.1 D3

The terminal block (below) for the positioner is accessible when the aluminum cover and inner cover are removed.

Remote unit

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

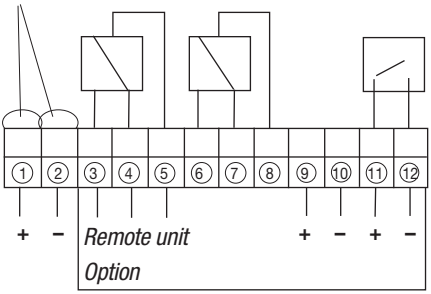
Max distance between D3 and remote unit: 10 m (30 ft).

Note! When connecting the D3i or D3 Ex to a remote unit, modifications have to be done internally with a cable. Details found on www.pmv.nu

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

D3, 12 terminals

Connection



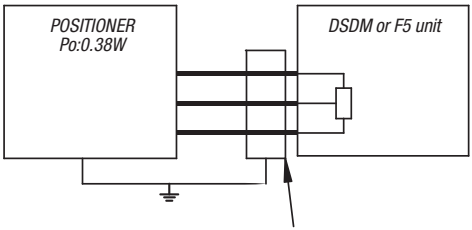
1. Input signal + 4-20 mA , Hart, Profibus PA, Foundation Fieldbus
2. Input signal – 4-20 mA , Hart, Profibus PA, Foundation Fieldbus
3. Switch 1 NO/Remote
4. Switch 1 NC/Remote
5. Switch 1 COM/Remote

Optional

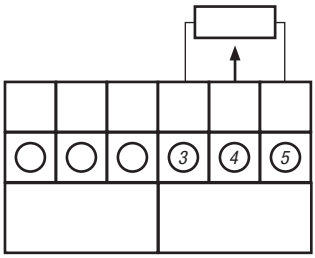
6. Switch 2 NO
7. Switch 2 NC
8. Switch 2 COM
9. 4-20 mA + Feedback, 13-28 V DC
10. 4-20 mA – Feedback, 13-28 V DC
11. Alarm output +, 8-28 V DC

12 Alarm output –, 8-28 V DC

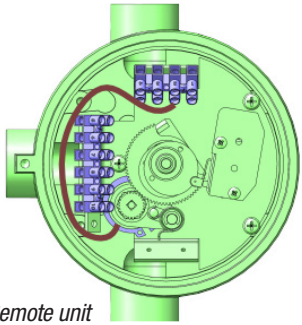
Remote Unit



Requires shielded cable shorter than 10 m or 30 feet



Connection of remote unit



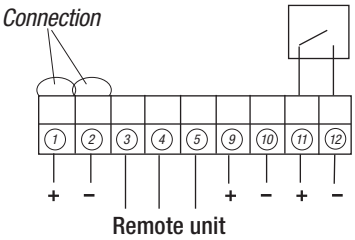
DS/DM Remote unit

9.3.2 D3 Ex

The terminal (below) for the positioner is accessible when the terminal cover is removed.

For data regarding electrical ratings, see certificate or marking label. See **www.pmv.nu**.

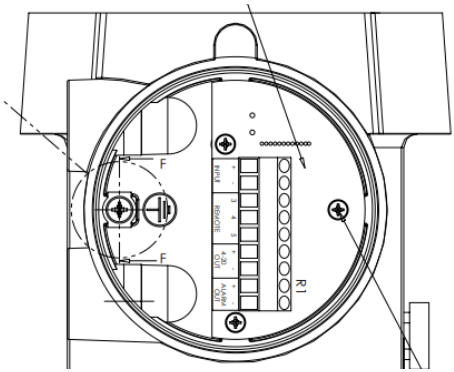
D3 Ex



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

Optional

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



9.4 Grounding Screws

The grounding screws, located inside the positioner cover and near the electrical conduit connections, should be used to provide the unit with an adequate and reliable earth ground reference. Tie this ground to the same earth ground reference as the electrical metallic conduit. Additionally, the electrical metallic conduit should be earth grounded at both ends of its run.

Note: Any of the positioner ground screws must not be used to terminate signal shield wires. Shield wires should be terminated only at the signal source.

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

10. Control

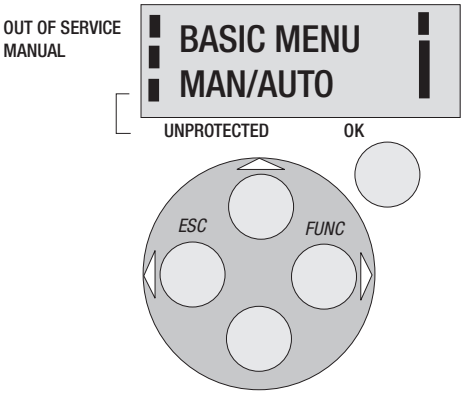
10.1 D3 5 Push Buttons

The positioner is controlled using the five push buttons 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 push buttons ⇕ to browse through the main menu and the sub-menus.

The main menu is divided up into a basic menu and a full menu.



10.1.1 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 stroked manually using the push buttons. See section “Man/Auto”, **page 31**.

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.

10.1.2 Menu indicator

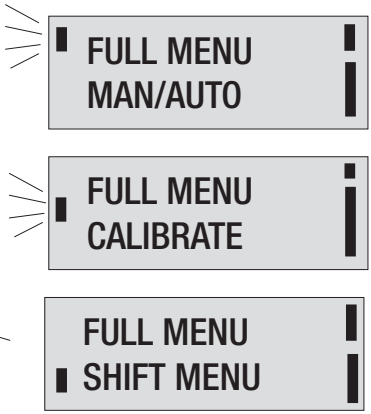
There are indicators at both sides of the display window and they indicate as follows:

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.



10.1.3 Menus

To display the menus you can select:

- *Basic menu*, which means you can browse through four different menu items

- *Full menu*, which comprises ten steps. Use the Shift Menu to browse through the menu items

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.

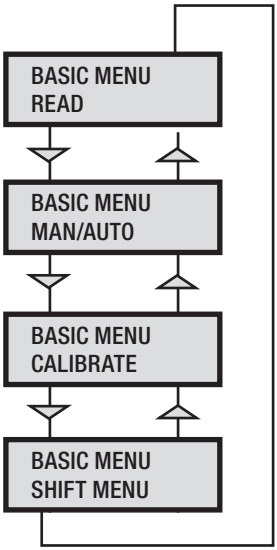
10.1.4 Changing parameter values

Change by pressing ◁ ▷ until the desired figure is flashing.

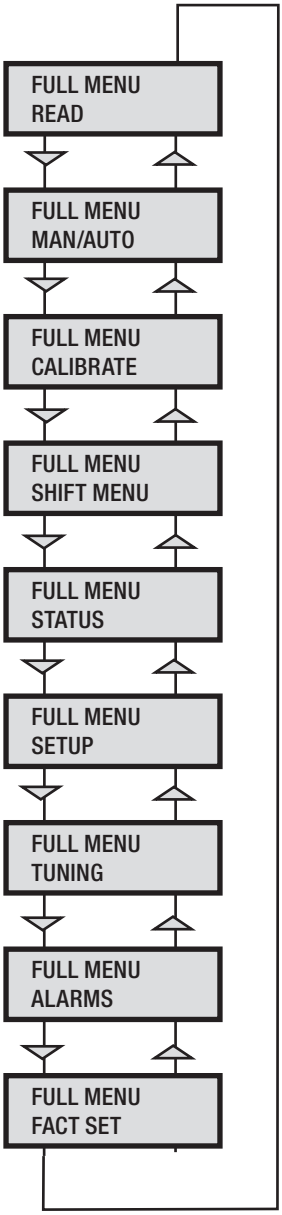
Press △ ▽ to step to the desired figure. Confirm by pressing OK.

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

10.1.5 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 or full 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 22**.

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, a stuck valve or 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 is out of range. The potentiomenter 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

For Profibus PA, connect the input signal at pos 1 and 2 on the terminal block. 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 a vailable a t 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

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 obove 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.

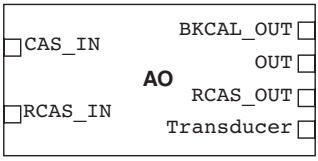
The positioner has to be in menu-auto mode and in service to be controlled from the Fieldbus. If the positioner is placed in menu-manual mode then the transducer block will be forced to (LO) local override. In this way a person in the field will be able to control the positioner from the keypad, without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

AO-block overview

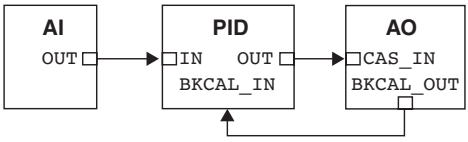


control bumps can be avoided. Usually the BKCAL_OUT is set to be the (PV) process value of the AO-block, i.e. the actual measured position of the valve. OUT is the primary calculated output of the AO block. During a limited action (ramping) of the AO block the RCAS_OUT parameter will supply the final 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.

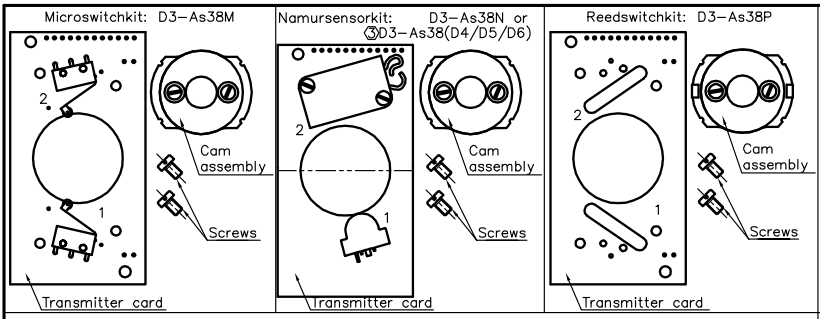


The contents of the menu are shown on the next page. The various menu texts are described below.

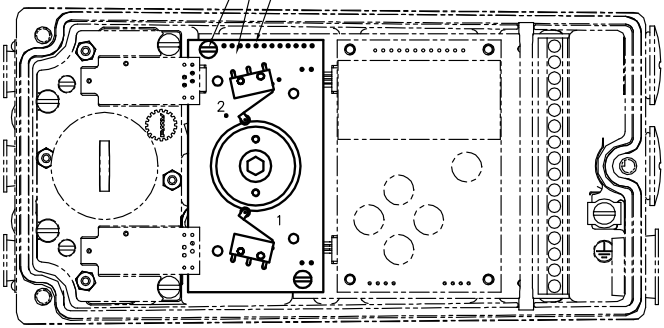
Auto-Cal	Auto-tuning and calibration of end positions
Start tune	Starts the tuning. Questions/commands are displayed during calibration. Select the type of movement, function, etc. with ▽ and confirm with **OK**.
Lose prev value? OK?	A warning that the value set previously will be lost (not during the 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	Calibration of end positions
Start cal	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	Setting gain
Normal	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.**

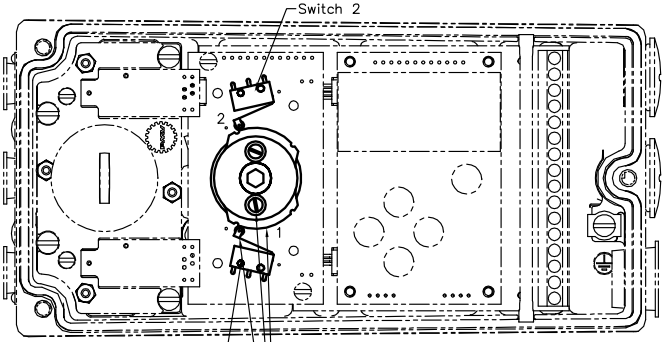
Note: Original P. I. D. will always be shown in display

Feedback option



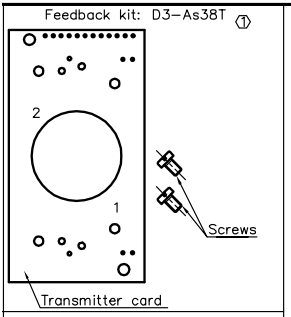
When installing the transmitter card, make sure it is placed correct over the connector pins before gently pushing it down until it rests on the supports.
Secure the PC board with the two screws.
Make sure the holes are centred before tighten the screws.

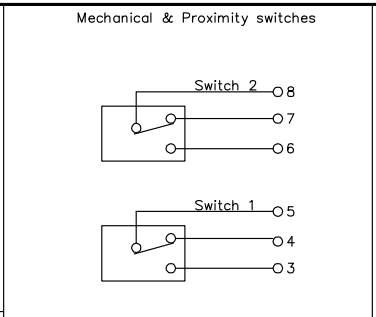


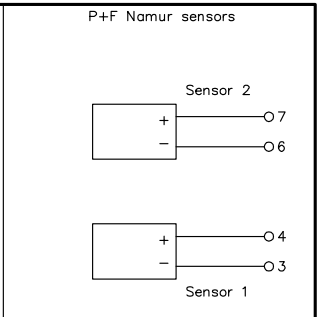


Note! When installing the cam assembly for mechanical switches, retract both the switch arms first.
Install the cam assembly and tighten the screws loosely to obtain enough friction to lock the cams.
Adjust the lower cam first, then the upper cam.
Secure cams setting by tighten the two screws hard. The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

For more information see manual chapter 11.5, Transmitter boards.

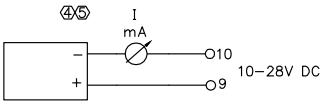






② IMPORTANT:

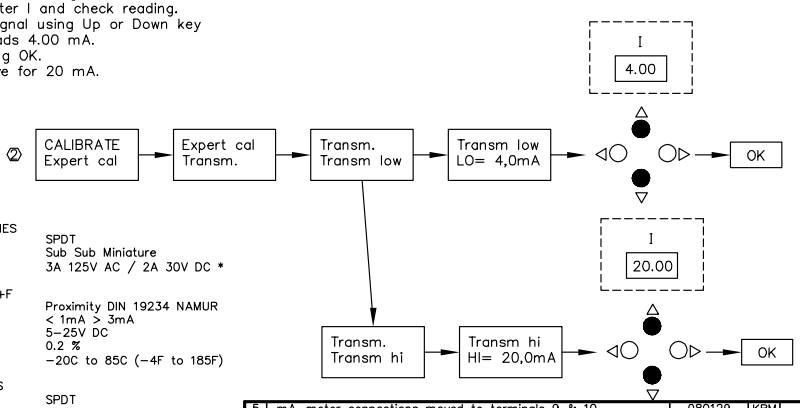
For D3 IS units (Intrinsically Safe):
–Transmitter card NOT for on site mounting by customer.
–FM, CSA and ATEX certificates only valid when transmitter card is mounted by manufacturer.



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.



②

MECHANICAL SWITCHES

Type:	SPDT
Size:	Sub 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

5	mA–meter connections moved to terminals 9 & 10.	080129	KBM
4	Terminals 13 and 14 removed. Terminaler 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	DIMENSION	ANNOTATION
HOLE TOL.		UNSPECIFIED TOLERANCES ACCORDING TO:	SURFACE	PROJECTION EUROPA	Redesigned
		PMV Positioner D3		DRW BY: CE; APPR. BY: ; SCALE: 1:1; DATE: 010328	
				DRAWING NO. D3–59	

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

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 1.4 bar (20 psi) (or set another value on the display). Press OK. Pressure read out only possible on D3 with built in pressure sensor.

Pressure HI: Use a supply of 8 bar (115 psi) (or set another value on the display). Press OK. Pressure read out only possible on 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 11.4.
Also see video on www.pmv.nu

Full reset: Resets all set values and enters Factory mode. To reset the values only, use FACT SET in main menu, see below.

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.

Pos Shows current position
Set&pos Set point and position
Set&dev Set point and deviation
Pos graph Shows position graph
Temp Shows current temperature

Statistics

n cycles Shows number of cycles. 1 cycle = [move of valve +change direction+move opposite direction] regardless of size of each move/stroke.

Acc travel Travel = [accumulated % valve has moved/100].

Example: move 60% up + move 40% down =>Acc travel = 1

mean dev Shows accumulated deviation in %

m.abs dev Shows accumulated absolute deviation in %

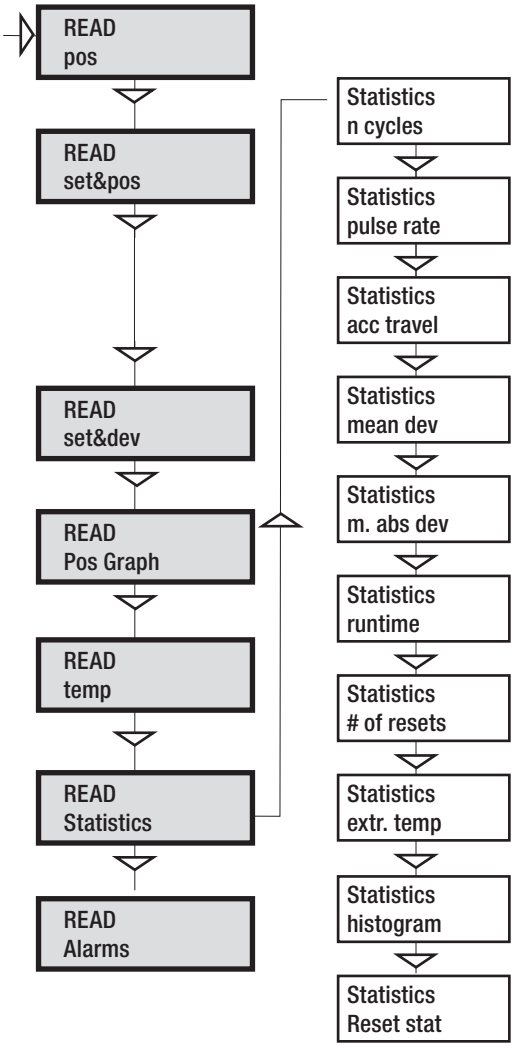
# of resets Shows number of resets

runtime Shows accumulated runtime since last reset

Extr temp Shows extreme min and max temperature

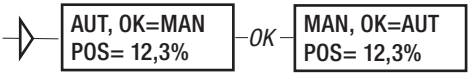
Histogram Shows position and time for position value

Alarms 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 ▲ ▼. 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 30.**

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

Other functions

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

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

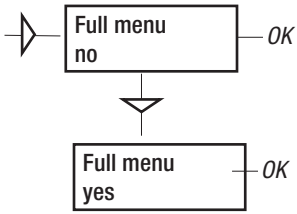
C+ and C- can be fully opened for blowing clean by pressing ▲▼ and *OK* simultaneously.

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.



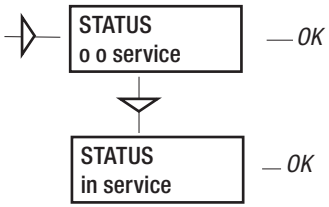
Note: The Menu can be locked with a passcode, see Setup menu.

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.



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

FULL MENU
SETUP

The Setup Menu is used for various settings.

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

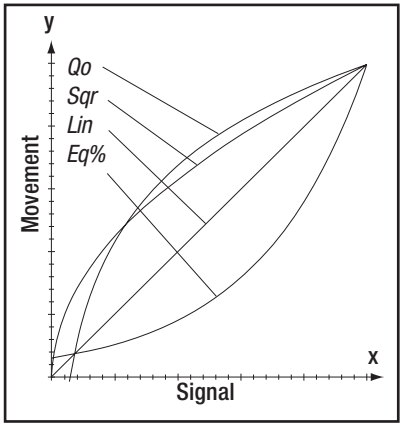
Actuator	***Type of actuator***	***Size of actuator***	***Time out***
Rotating	Rotating actuator.	Small	10 s
Linear	Linear actuator.	Medium	25 s
		Large	60 s
		Extra large	180 s

Lever	***Only for linear actuator.***
Lever stroke	Stroke length to achieve correct display. Input only needed in case display value is off
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	***Curves that show position as a function of input signal.***
Linear	See diagram.
Equal %	
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 (Use this function to split 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	***Setting end positions***
0%=0.0%	Select Out of Service. Set percentage value for desired end position (e.g. 3%).
Set 0%	Select In Service. Connect calibrator. Move forward to desired end position (0%) and press OK.
100%=100.0%	Select Out of Service. Set percentage value for desired end position (e.g. 97%).
Set 100%	Select In Service. Connect calibrator. Move forward to desired end position (100%) and press OK.
Trvl ctrl	***Behavior at set end position***
Set low	Choose between Free (positioner will control until a mechanical top is reached), Limit (stop at set end position), and Cut off (Default value. Go directly to a mechanical stop at a redefined setpoint).
Set high	Similar to Set low.
Values	Select position for Cut off and Limit at the respective end positions.
Passcode	***Setting passcode for access to the menu***

Numbers between 0000 and 9999 can be used as passcodes. 0 = no passcode required.

Appearance	***On display***
Language	Select menu language.
Units	Select units.
Def. Display	Select value(s) to be displayed during service. The display reverts to this value 10 minutes after any change is made.
Start menu	Start in Basic menu or Full menu.
Orient	Orientation of text on display.
Par mode	Display of control parameters such as P, I, D or K, Ti, Td.

Devicedata	
HW rew	General parameters.
SW rew	
Capability	
HART	Menu with HART parameters. Only amendable with HART communicator. It is possible to read from display.

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

Foundation Fieldbus	
Device ID	Serial number
Nod address	Address on the bus provided by the DCS system
TAG–PD_TAG	Name provided by the DCS system
Descriptor	D3 positioner
Date	SW release date
Sim jumper	Simulate jumper, FF simulation functionality activated = ON

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

Close time	Minimum time (Min 0.005) from fully open to closed.
Open time	Minimum time (Min 0.05) from closed to fully open.
Deadband	Setting deadband. Min. 0.2%.
Expert	Advanced settings.
Control	See explanations below.
Togglestep	Test tool for checking functions. Overlays a square wave on the set value.
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

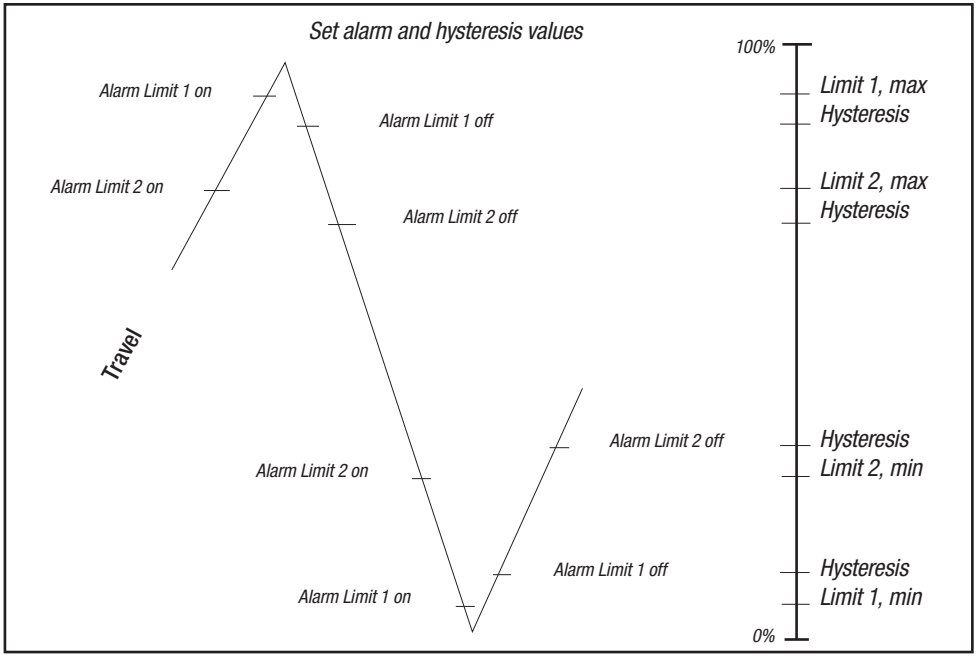
The spring adjust function compensates the airflow linearly with the actuator C+ chamber volume (for a constant position error), so that low volumes get less flow. This is needed for linear single-acting actuators, where a low C+ volume means that the actuator spring is extended, its force is reduced,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

FULL MENU
ALARMS

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	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	Behavior of valve when alarm is generated.
Limit 2	*See Limit 1.*

} See diagram below!



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	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.

10.1.4 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 D3with 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.

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.

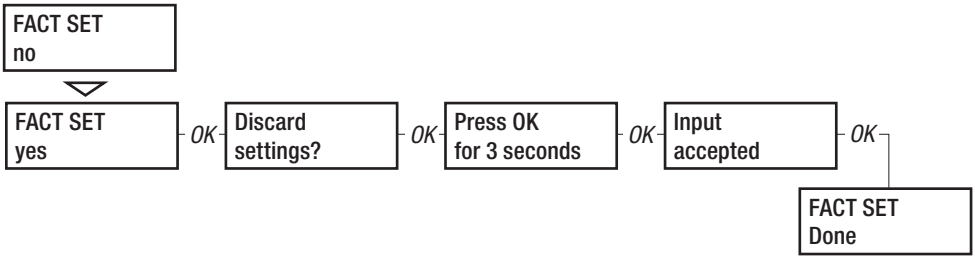
Transmitter: Connect 10 - 28 VDC. Connect an external mA meter to the loop. Read low value on mA meter and adjust with up/down key. Press OK to set low value. Repeat procedure to set High value. Also see video on www.pmv.nu

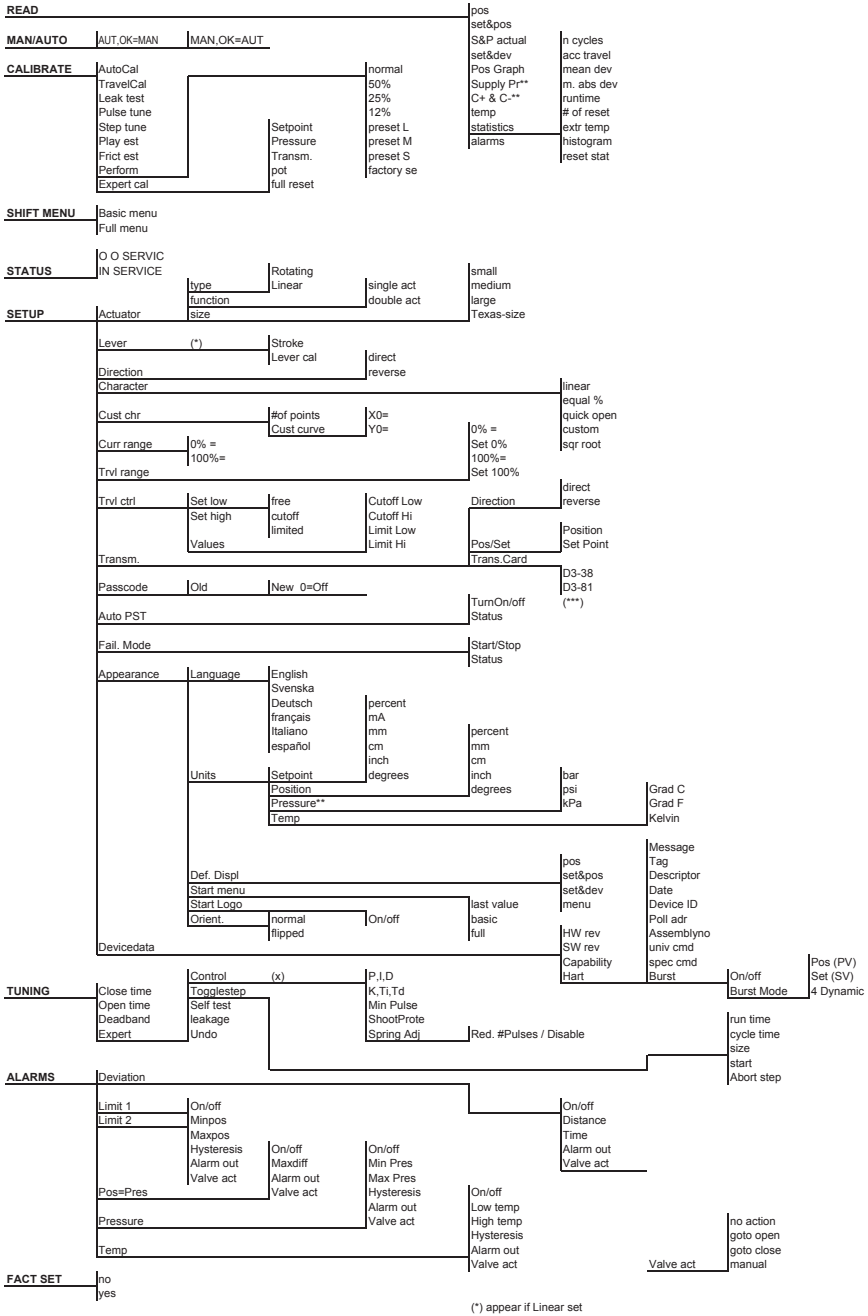
Pot: Potentiometer setting, see section 11.4. Also see video on www.pmv.nu

Full reset: Resets all set values.

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 settable when In Service mode

11. 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 4** *and* **page 5** *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 disassemble the valve block apart because its function will be impaired.

When working with the D3 positioner, the work place must be equipped with ESD protection before the work is started.

Work on D3 can void the warranty

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

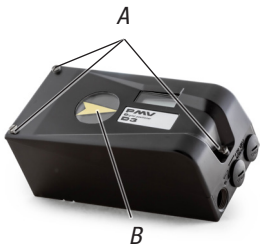
Please see section for special conditions for safe use and spare parts on **page 5***!*

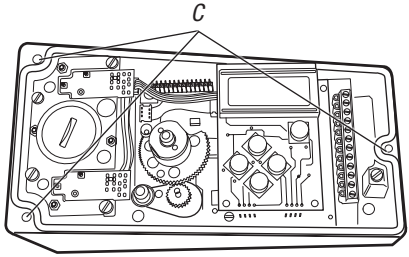
Please contact a Flowserve office for information regarding proper procedures.
www.pmv.nu or infopmv@flowserve.com

11.1 Disassembling D3

Removing cover and inner cover

- Unscrew the screws ***(A)*** and remove the cover. When mounting cover – see **page 5**.
- 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.

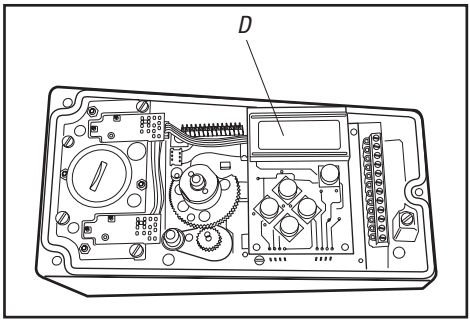




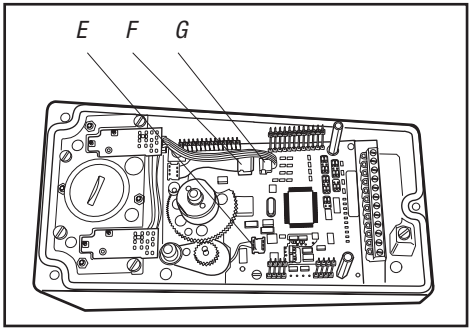
11.2 Circuit boards (PCB)

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

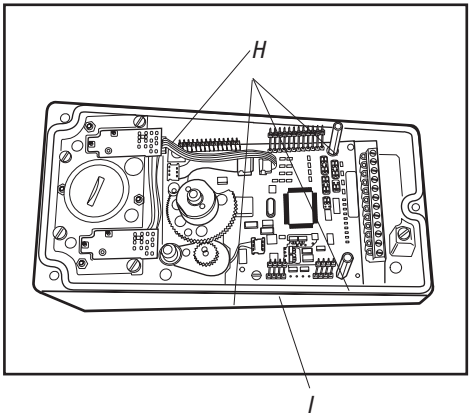
- Lift off the display PCB, D



- Release the cable connections E, F and G,



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



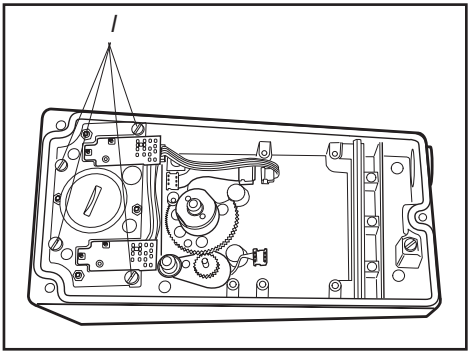
11.3 Valve block

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

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

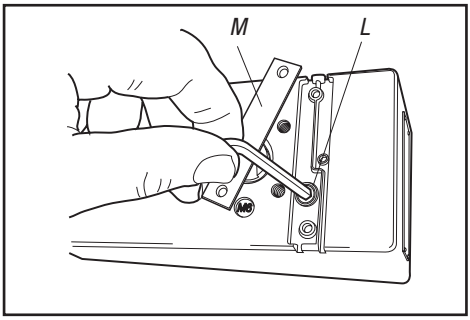
Note!. Do not disassemble the valve block

- When installing the valve block — torque the four screws cross-wise to 1,8 Nm and seal with Loctite® 222. Insert the gasket to the block, then install the pneumatic block. Great caution must be taken when disconnecting the ribbon cable.



Silencer

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



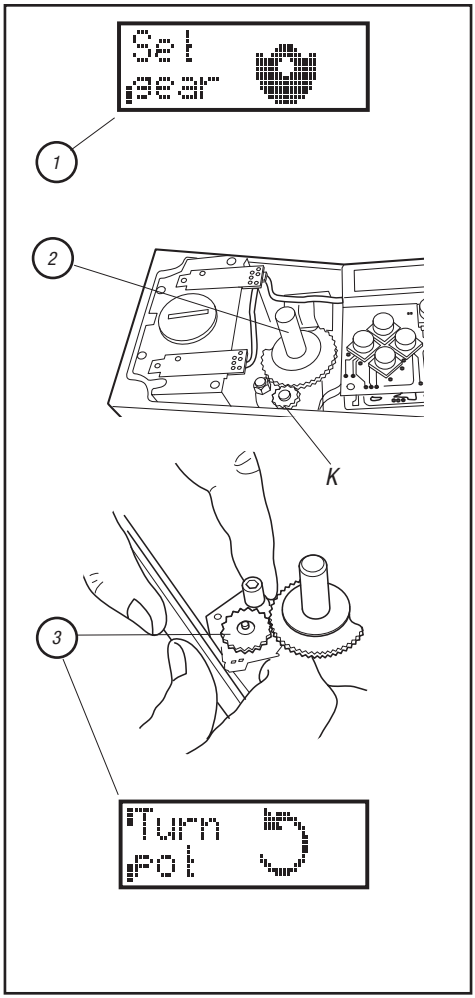
11.4 Potentiometer

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 counter clockwies 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.

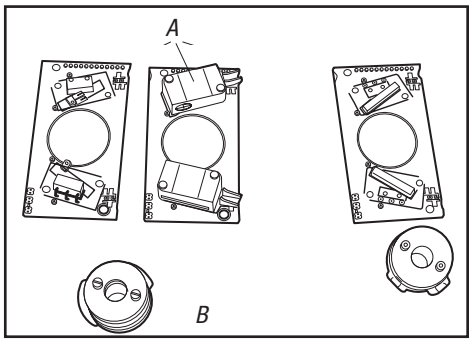


11.5 Transmitter boards

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, NAMUR 19234
- with proximity switches
- with feedback transmitter and/or remote only



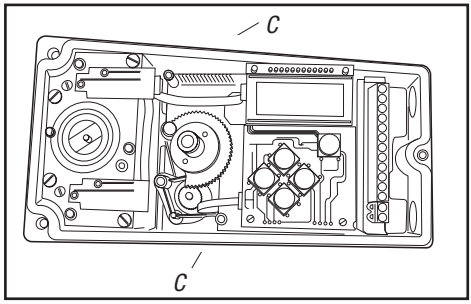
Transmitter board installation

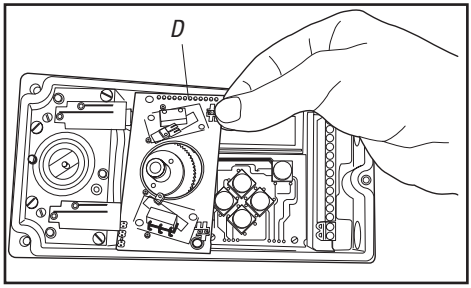
Caution! Turn off the power and air supply before starting the installation.

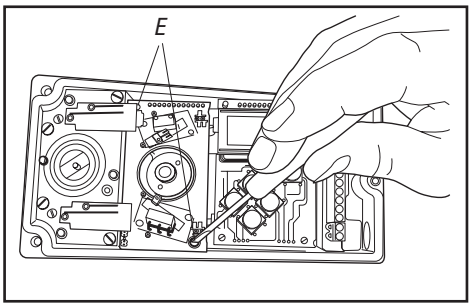
Important for PMV D3 units with hazardous approvals:

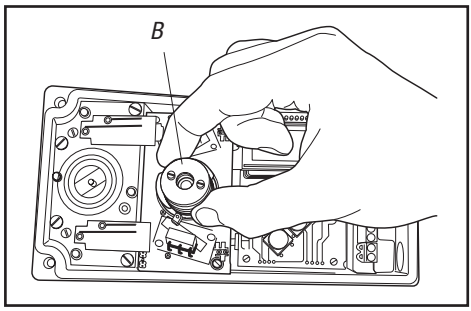
Maintenance and repairs only to be made by authorized staff.

- Remove the cover, indicator and inner cover according to the description on **page 40**.
- 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 positioner's motherboard. Make sure that the feed back PC board is properly connected.
- Secure the circuit board with the enclosed screws E.
- Install the cam asssembly B on the shaft and push it down to its position. If the board has microswitches, be careful not to damage the levers.



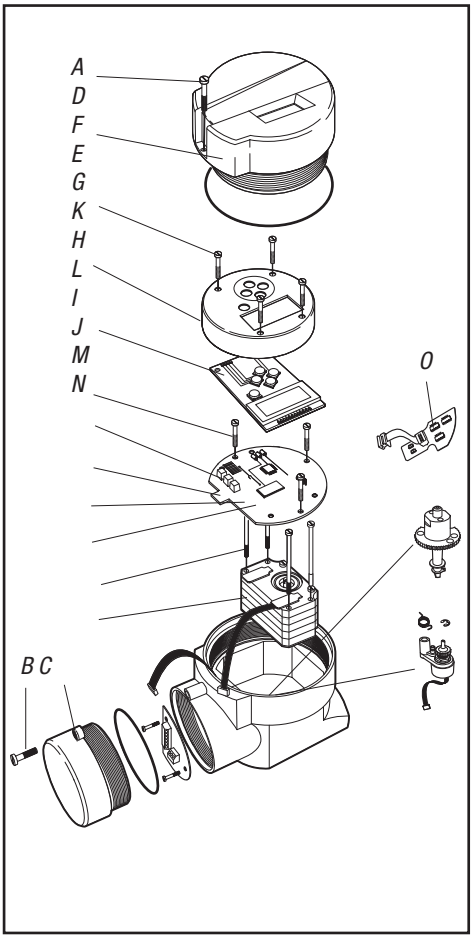






11.6 Disassembling PMV D3 Ex

- 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.



11.7 Filter change

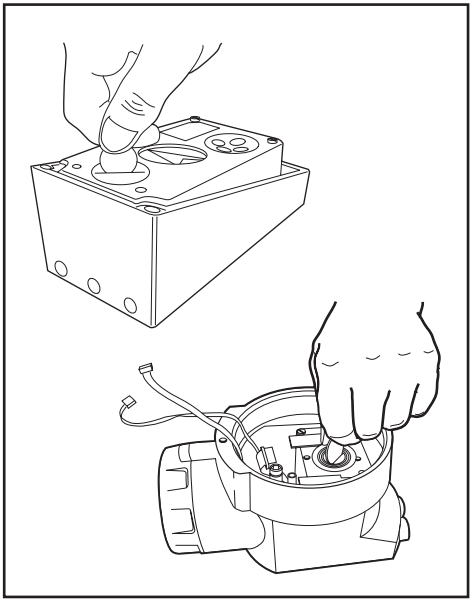
Warning! Turn off the compressed air supply before starting any work.

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.**



12. Troubleshooting

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).

13. 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	1/4" G or NPT
Cable entry	3 x M20x1,5 or 1/2" NPT (D3E 2x)
Electrical connections	Screw terminals 2.5 mm2 /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	LCD, menu & 5 buttons, Hanheld unit or PC
CE directives	See separate declaration
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 ers / 1.4408
Enclosure	IP66/NEMA 4X
Material	Die-cast aluminum, A2/A4 fasteners
Surface treatment	Powder epoxy
Temperature range	–30 to +80°C (–22 to 176° F)
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)

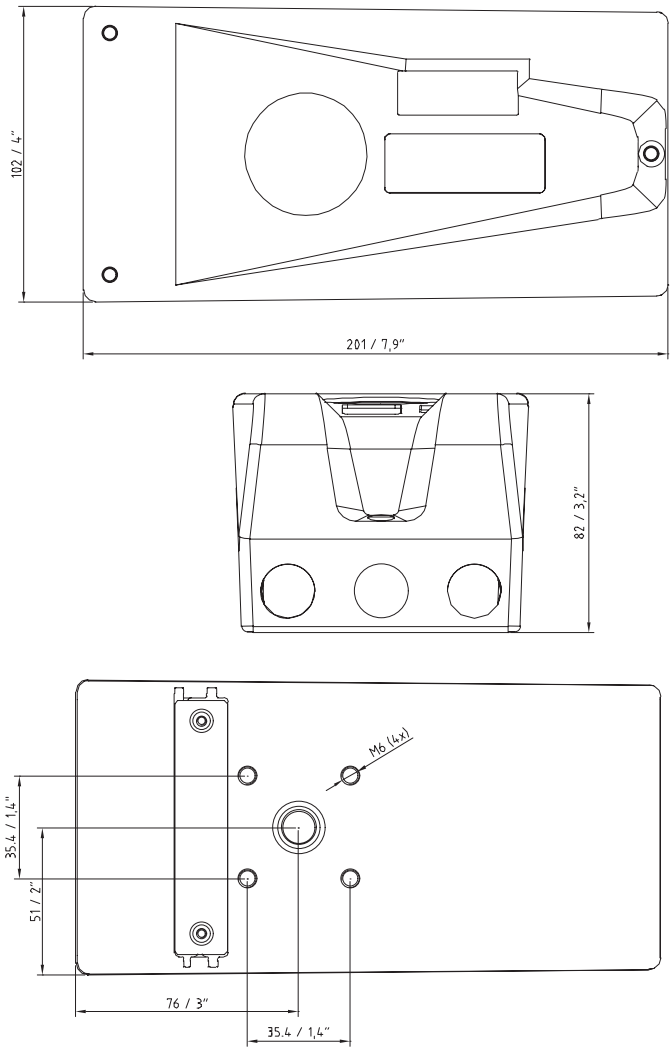
NAMUR sensors	
(NJ2-V3-N)	
Type	Proximity NAMUR 19234
Load current	1 mA ≤ I ≤ 3 mA
Voltage range	8 VDC
Hysteresis	0.2 %
Temp. range	–25°C to 85°C (–13°F to 185°F)

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)

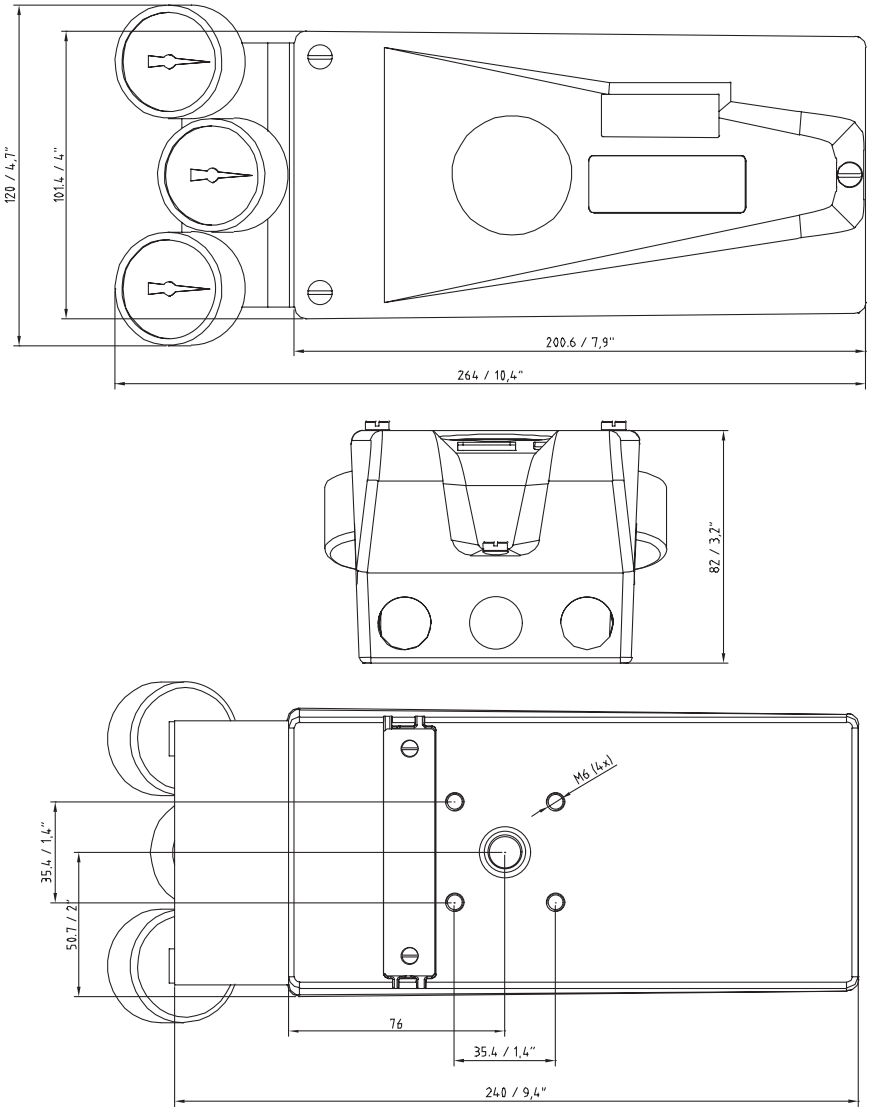
Slot NAMUR switches	
Type	Proximity NAMUR 19234
Load current	1 mA ≤ I ≤ 3 mA
Voltage	8 VDC
Hysteresis	0.2 %
Temp	–25°C to 85°C (–13°F to 185°F)

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 Ω @ 24 VDC

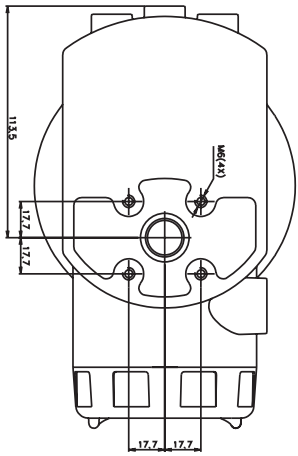
14. Dimensional Drawing

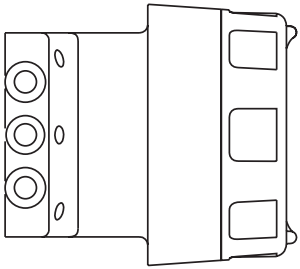


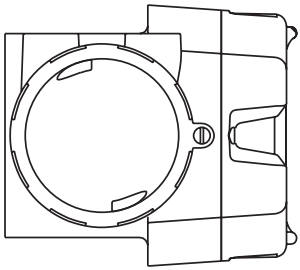
14.1 Dimensions with optional gauge block installed

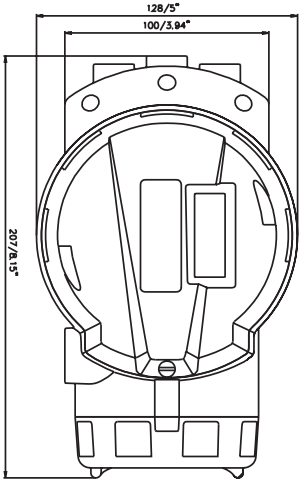


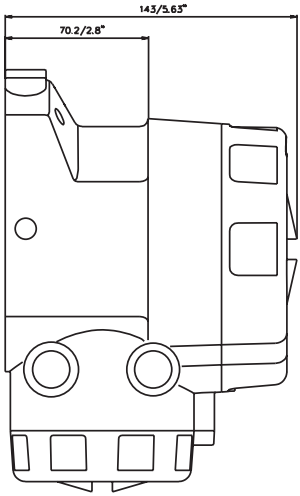
14.2 Dimensions explosion proof version







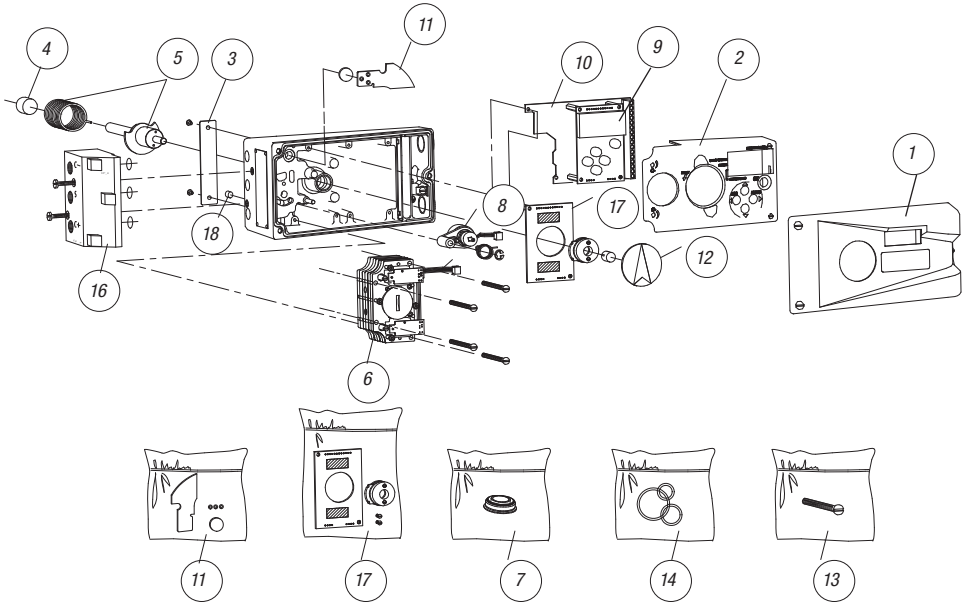




15. Spare parts

15.1 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,
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-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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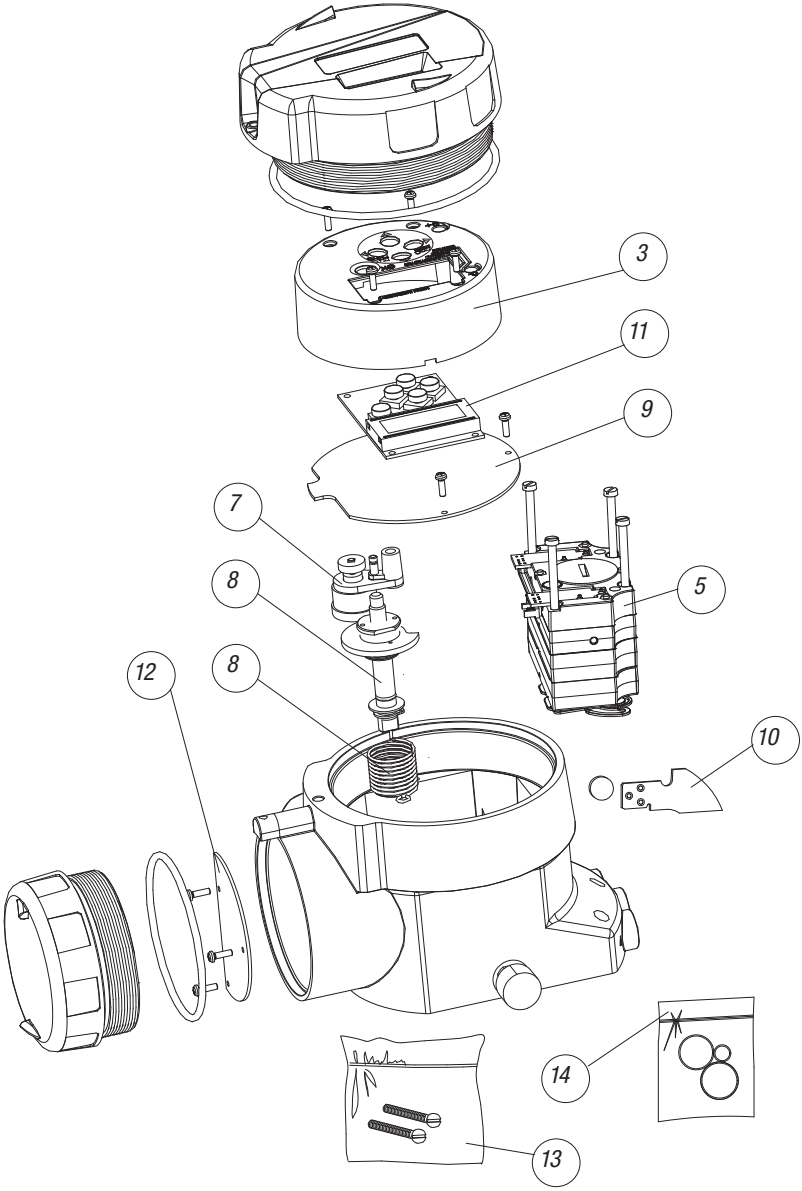
15.2 Explosion proof housing

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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16. Declaration of Conformity

FLOWSERVE

EU Declaration of Conformity

We, **PMV Automation AB, Korta Gatan 9, SE-171 54 Solna**, declare under our sole responsibility that, our product,

D3 – Digital Valve Positioner

is in conformity with the following harmonized legislation:

2014/30/EU – Electromagnetic compatibility (EMC) directive, based on conformity with the requirements of harmonized standards:

EN IEC 61000-6-2:2019,
EN IEC 61000-6-4:2019

2011/65/EU- RoHS Restriction of Hazardous Substances

2014/35/EU – Low voltage (LV) directive[1], based on conformity with the requirements of harmonized standards:

EN 60204-1:2018

2014/34/EU – Equipment for explosive atmospheres (ATEX) directive, based on conformity with the requirements of harmonized standards:

Intrinsically safety Ex ia	**EN IEC 60079-0:2018**, **EN 60079-11:2012**, and **EN 60079-26:2015**

Conformity assessment procedures, Modul B and Mode D of the ATEX directive, have been carried out, and the following Notified Bod- ies attest the compliance of our product type(s) and of the quality assurance of the involved production processes respectively:

EU-type examination Ex ia	**NB 2460** **DNV Product Assurance AS** Veritasveien 1, 1363 Høvik, Norway	
Quality assurance	**NB 0470** **NEMKO Group AS** Philip Pedersens vei 11, 1366 Lysaker, Norway	
Product marking(s)	**Certificate(s)**	**Model code(s)**
Ⓔx II 1 G Ex ia IIC T4 Ga Ta+80°C Ⓔx II 1 G Ex ia IIC T4 Ga Ta+80°C FISCO Field Device	DNV 25 ATEX 77903X DNV 25 ATEX 77903X2	D3Ixxx-xxxxxx-xxxx

Signed for and on behalf of: **PMV Automation AB**

Mikael Ekman
General Manager

.....
Solna, Sweden,
2025-07-08

1 The directive, 2014/35/EU, on the safety of low voltage equipment only applicable if the Digital Valve Positiner itself is outside the potentially explosive atmosphere, but it has an impact on the safety.
2 The certificate of the quality assurance system of the manufacturing process.

FLOWSERVE

EU Declaration of Conformity

We, **PMV Automation AB, Korta Gatan 9, SE-171 54 Solna**, declare under our sole responsibility that, our product,

D3 – Digital Valve Positioner

is in conformity with the following harmonized legislation:

2014/30/EU – Electromagnetic compatibility (EMC) directive, based on conformity with the requirements of harmonized standards:

EN IEC 61000-6-2:2019
EN IEC 61000-6-4:2019

2011/65/EU- RoHS, Restriction of Hazardous Substances

2014/35/EU – Low voltage (LV) directive[1], based on conformity with the requirements of harmonized standards:

EN 60204-1:2018

2014/34/EU – Equipment for explosive atmospheres (ATEX) directive, based on conformity with the requirements of harmonized standards:

Flameproof **Ex db**	**EN IEC 60079-0:2018**, and **EN 60079-1:2014**
Dust ignition protection **Ex tb**	**EN IEC 60079-0:2018**, and **EN IEC 60079-31:2014**

Conformity assessment procedures, Modul B and Mode D of the ATEX directive, have been carried out, and the following Notified Bod- ies attest the compliance of our product type(s) and of the quality assurance of the involved production processes respectively:

EU-type examination	Ex db Ex tb	**NB 2460** **DNV Product Assurance AS** Veritasveien 1, 1363 Høvik, Norway	
Quality assurance		**NB 0470** **NEMKO Group AS** Philip Pedersens vei 11, 1366 Lysaker, Norway	
Product marking(s)		**Certificate(s)**	**Model code(s)**
Ⓔx II 2 G Ex db IIB+H2 T6 -20°C ≤Ta≤+60°C Ⓔx II 2 D Ex tb IIIC T100°C -20°C ≤Ta≤+80°C		**Presafe 17 ATEX 11598X** Issue 0 Nemko 03ATEX4122Q[2]	D3EAxx-xxxxxx-xxxx

Singed for and on behalf of: **PMV Automation AB**

Mikael Ekman
General Manager

.....
Solna, Sweden,
2025-07-08

1 The directive, 2014/35/EU, on the safety of low voltage equipment only applicable if the Digital Valve Positioner itself is outside the potentially explosive atmosphere, but it has an impact on the safety.
2 The certificate of the quality assurance system of the manufacturing process.

17. Control Drawing

The control drawing 3-86C is available on the webpage www.pmv.nu under D3 Positioner section.

18. Annex: Diagnostic Alarms

Online diagnostic alarms	*D3*	*D3/D3E*	*D22*	*D3*
Actuator parts worn out	X	X	X	X
Auto PST failed	X	X	X	X
C- leakage	X		X*	X*
C- pressure sensor failure	X		X*	X
C+ leakage	X		X*	X*
C+ pressure sensor failure	X		X*	X
Calibration error	X	X	X	X
Control out of tune	X	X	X	X
CPU failure or memory failure	X	X	X	X
Current sensor failure	X	X	X	X
Deviation	X	X	X	X
Deviation of lower spring range	X		X*	X*
Deviation of lower travel range	X		X*	X*
Deviation of upper spring range	X		X*	X*
Deviation of upper travel range	X		X*	X*
Excessive closing force	X		X*	X
Excessive number of cycles	X	X	X	X
Excessive number of high cutoffs	X	X	X	X
Excessive number of low cutoffs	X	X	X	X
Excessive number of piezo valve pulses	X			
Excessive opening force	X		X*	X
Feedback linkage failure	X	X	X	X
Feedback linkage play	X*		X*	X*
Foreign object in valve	X		X*	X*
High air consumption	X			
High current	X	X	X	X
High cutoff failure	X		X*	X*
High EP stress	X	X	X	
High friction	X		X*	X*
High friction at closed position	X		X*	X*
High supply pressure	X		X*	X
Leakage between C+ and C-	X		X*	X
Limit 1	X	X	X	X
Limit 2	X	X	X	X
Low available force	X		X*	X*
Low CPU voltage	X	X	X	X
Low cutoff failure	X		X*	X*
Low friction	X		X*	X*
Low supply pressure	X		X*	X
Manual mode	X	X	X	X
Out of service	X	X	X	X
Packing worn out	X	X	X	X
Position vs. pressure difference	X		X*	X
Potentiometer failure	X	X	X	X
Potentiometer not calibrated	X	X	X	X
Pressure sensor disconnected	X		X*	X
Seat worn out	X	X	X	X
Setpoint oscillation	X	X	X	X
Small minimum pulse parameter	X		X*	X*
Spring range deviation	X		X*	X*
Spring too weak to reach failsafe position	X		X*	X*
Stuck valve	X		X*	X
Supply pressure sensor failure	X		X*	X
Temperature	X	X	X	X
Temperature sensor failure	X	X	X	X
Travel span deviation	X			

X* Require pressure sensor for diagnostics

Note: For more information, please check the ValveSight IOM.

FLOWSERVE

FCD PMENIM0001-08-A5 – 07/25

To find your local Flowserve representative please use the Sales Locator

System found at www.flowserve.com

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