FLOWSERVE

# USER INSTRUCTIONS

## *D30 Compact Digital Positioner*

**Installation**

**Operation**

**Maintenance**

*FCD PMENIM0030-05-A5 - 12/15*

*Experience In Motion*

# Contents

**1 Introduction** ..... 3
Safety instruction ..... 3

**2. Storage** ..... 4
General ..... 4
Storage indoors ..... 4
Storage outdoors or for a longer period ..... 4
Storage in a warm place ..... 4

**3. Installation** ..... 5
Removal of covers ..... 5
Tubing ..... 5
Air supply requirements ..... 5
Mounting ..... 6
Connections ..... 7
Single action positioner, Direct function and Reverse function ..... 8
Double action positioner, Direct function ..... 8
Mounting the positioner on ¼ turn actuators ..... 9
Gauge block ..... 9
Electrical connections ..... 10
Type signs ..... 11
D30 Digital Positioner model code ..... 12

**4. Control** ..... 13
Menus and pushbuttons ..... 13
Other functions ..... 13
Menu indicator ..... 14
Menus ..... 14
Changing parameter values ..... 14
Menu system, Basic vs Full ..... 15
First start (with calibration sequence) incl. Profibus and Fieldbus ..... 16
Feedback option ..... 20
Basic Menu Read ..... 22
Basic Menu Man/Auto ..... 23
Basic Menu Shift, Full Menu Status ..... 24
Full Menu Setup ..... 25
Full Menu Tuning ..... 27
Full Menu Alarms ..... 28
Expert Calibration and Fact Set ..... 30
Menu tree – graphical overview ..... 31

**5. Maintenance/service** ..... 32
Disassembling D30 ..... 32
Potentiometer ..... 35
Transmitter boards ..... 35

**6. Trouble shooting** ..... 36

**7. Technical data** ..... 37

**8. Dimensions** ..... 39

**9. Spare parts** ..... 40

# 1. Introduction

The D30 is a digital positioner designed primarily for controlling modulating valves.
The positioner can be used with single or double acting actuators with either rotary or linear movement.

The D30 can be equipped with modules for feedback, limit switches and pressure gauges. Pressure sensors can be installed to offer advanced diagnostics.
The modules can be factory assembled before delivery or fitted later.
The modules for feedback and limit switches can contain 4-20 mA feedback and one of the following:

- Two mechanical contacts
- Two proximity switches
- Two inductive sensors

See page 12 for more options available

**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 operates 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 (Emergency Shutdown) 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 8573-1-2001 3.2.3.

# 2. Storage

## General

The D30 positioner is a precision instrument. Therefore it is essential that it is handled and stored in the correct way. Always follow the instructions in this IOM!

**Note:** As soon as the positioner is connected and started, internal air venting will provide protection against corrosion and prevent the ingress of moisture. For this reason, the air supply pressure should always be kept on unless repair/maintenance work of the positioner, actuator or valve equipment is in progress.

## 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 open ports/connections are properly sealed and/or plugged.
The red shipping plugs are not intended as a permanent outdoor plug. The unit should be packed with a desiccant (silica gel) in a plastic bag or similar, covered with plastic, and not exposed to sunlight, rain, or snow.

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

## Storage in a warm place

When the positioner is stored - without air supply pressure applied - 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. Installation

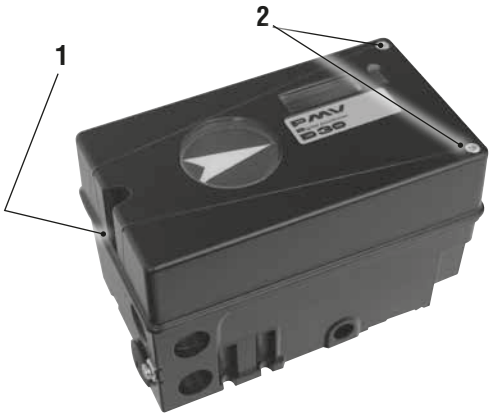
## Removal of cover

**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 Nm ± 15%.




## Tubing

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

## Air supply requirements

**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 @ 1.4-8 bar (20-115 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 coalescing filter/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 before continuing.

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

## Mounting

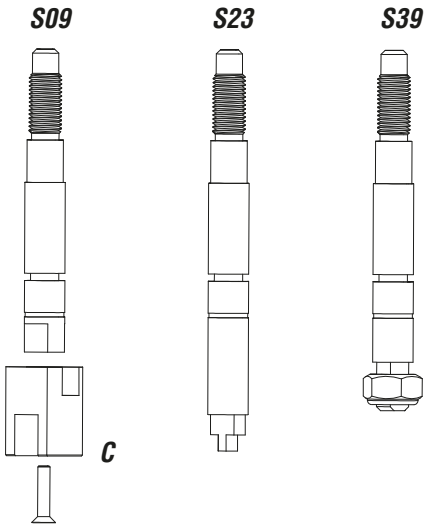
**Note:** If the positioner is installed in a hazardous environment, it must be of a type approved for this purpose.

All versions of the D30 positioner have an ISO F05 footprint. The holes are used to attach the D30 to the mounting bracket B. Please contact PMV or your local distributor representative with actuator specifics for the proper mounting bracket and hardware.

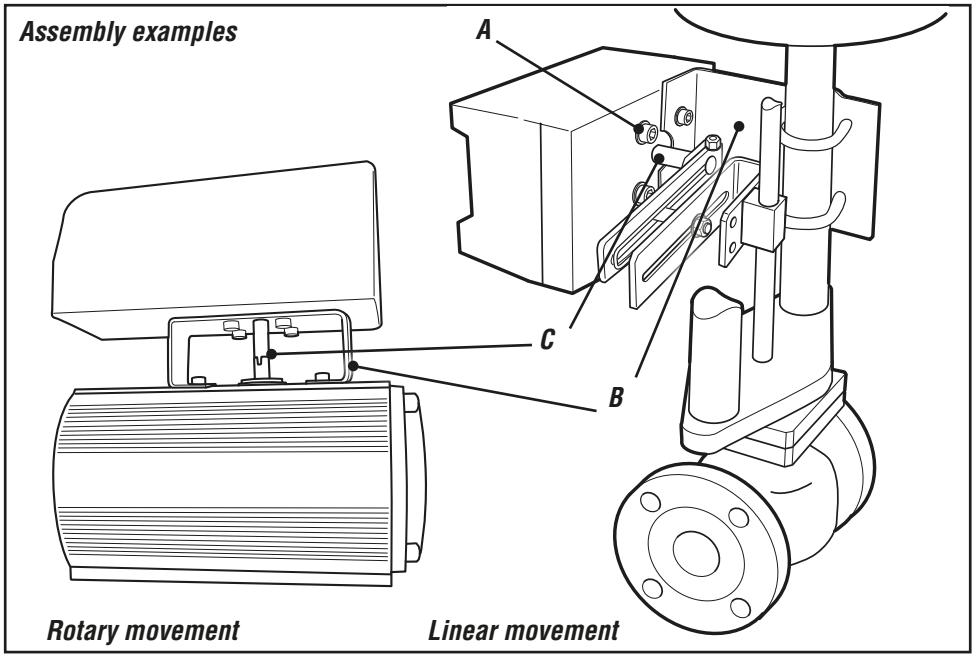
The spindle shaft adapter C can be changed to suit the actuator in question.

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.



## Connections

**Air:**

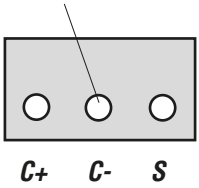
Port S Supply air, 1.4-8 bar (20-115 psi)
Port C+ Connection to actuator, opening
Port C- Connection to actuator, closing (only for double action)
Plug for single action, see below

**Electrical connection**
See page 10.

**Dimensions**
Air connections:
¼" NPT alt. G ¼"
Electrical connection:
M20 x 1.5 alt. NPT ½"

Loctite 577 or equivalent is recommended as a sealant.

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




***External air Connection***

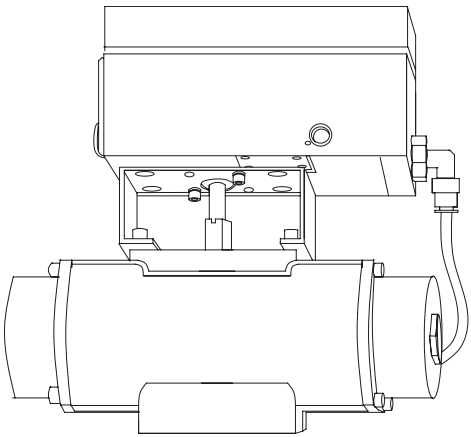
***For data on air and electrical connections, see section Technical Data on page 37/38.***

***Rotary actuators VDI/VDE 3485 (Namur)***

Fit bracket on actuator and secure with 4 x screws.

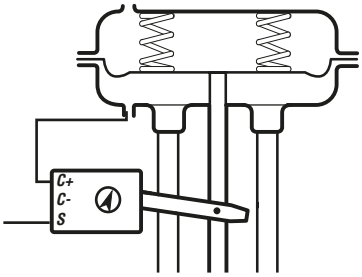
Mount positioner to bracket. Secure with 4 x M6 screws using 2.5 Nm (1.8 lb ft) torque.

Install tubing between actuator and positioner.



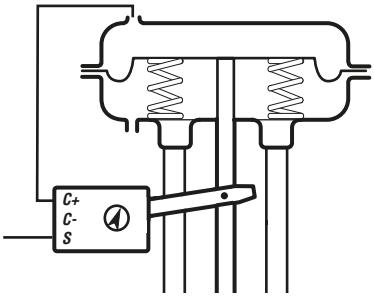
**Single acting positioner, Direct function**

**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

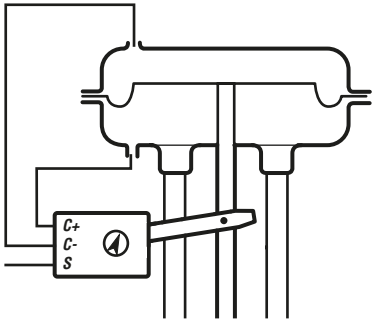
**Actuator with opening spring**
When the control signal increases the pressure C+ to the actuator is **increased**. The valve stem moves downward and the positioner spindle rotates **clockwise.** When the control signal drops to zero, C+ is vented and the valve opens.




---

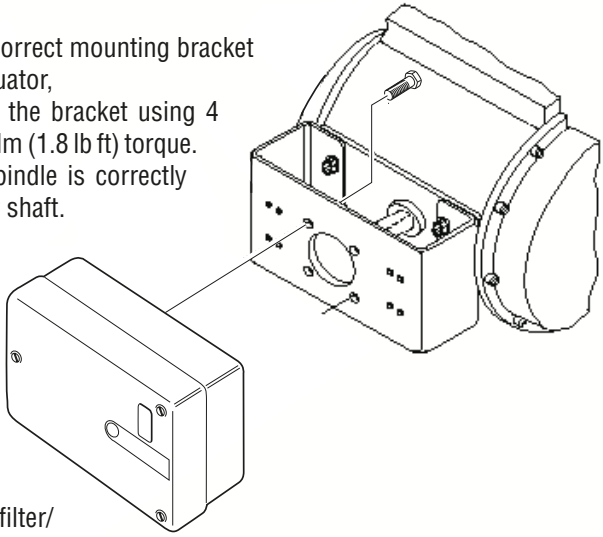
**Double acting positioner,**
**Direct function**

**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.



## Mounting the positioner

After first attaching the correct mounting bracket (not included) to the actuator, mount the positioner to the bracket using 4 each M6 bolts using 2.5 Nm (1.8 lb ft) torque. Ensure the positioner spindle is correctly aligned with the actuator shaft.



Supply air should meet requirements specified on page 5. A coalescing filter/ regulator should be installed in front of the supply air connection. Now connect the air supply to the filter, which is connected to the D30 positioner.

## Gauge block

Gauge blocks are available for D30s with ¼" G or ¼" NPT air connections. To install, ensure seals are aligned, then use 3 Nm (2.2 lb ft) of torque when fastening the gauge block to the positioner using the two screws supplied with the kit.

## Electrical connections

Terminal block diagram for the D30.

The terminal block (right) for the positioner is accessible when the aluminum cover is removed.

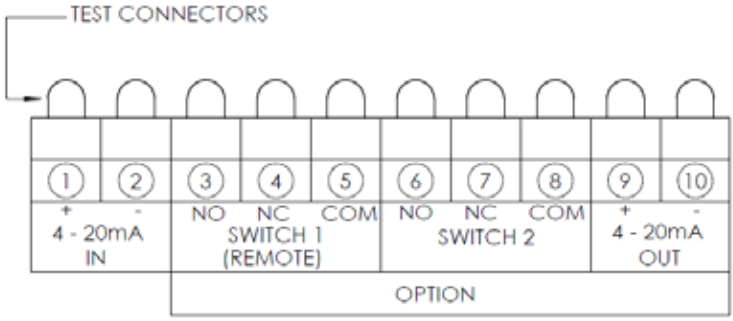
The D30 digital positioner has been designed to operate correctly in electromagnetic (EM) fields found in typical industrial environments. Care should be taken to prevent the positioner from being used in environments with excessively high EM field strengths (greater than 10 V/m). Portable EM devices such as hand-held two-way radios should not be used within 30 cm of the device.

Ensure proper wiring and shielding techniques of the control lines, and route control lines away from electro-magnetic sources that may cause unwanted noise.

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

In the event of a severe electrostatic discharge near the positioner, the device should be inspected to ensure correct operability. It may be necessary to recalibrate the D30 positioner to restore operation.

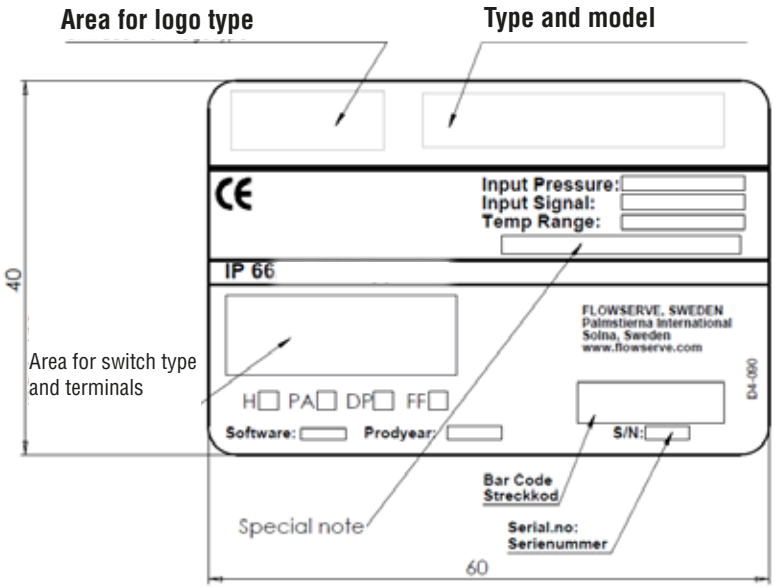
### D30, 10 terminals




1. Input signal 4 - 20mA +.
   Hart, Profibus PA, Foundation Fieldbus.
2. Input signal 4 - 20mA -.
   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 - 20mA + Feedback, 13-28 V DC.
10. 4 - 20mA - Feedback, 13-28 V DC.

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

## Type sign example



## D30 Digital Positioner model code

| | | | |
|---|---|---|---|
| **A =** | **Model No.** | | |
| | D 30 | Full LCD menu, LED status | |
| **B =** | **Approvals / Certificate** | | |
| | D | General purpose version | |
| **C =** | **Air relay** | | |
| | H | High Flow Spool Valve | |
| **D =** | **Connections Threads** | | |
| | G | ¼" G air, M20 x 1,5 electrical | |
| | M | ¼" NPT air, M20 x 1,5 electrical | |
| | N | ¼" NPT air, 1/2" NPT electrical | |
| **E =** | **Connections Qty and Aux** | | |
| | 2 | 2 Electrical conduits | |
| | T | 2 Electrical conduits, threaded aux. ventilation | |
| **F =** | **Housing material / Surface treatment** | | |
| | U | Aluminum / Powder epoxy, black | |
| **G =** | **Spindle / Mounting Options** | | |
| | 09 | Double D type, adaptor spindle | |
| | 21 | NAF Turnex including Mounting bracket | |
| | 23 | VDI/VDE 3845 rotary, Mounting kit not included | |
| | 30 | Adaptor spindle, select between 01/06/26/30/36 | |
| | 39 | IEC 534-6, Flat D type, nut incl. Mounting kit not included | |
| **H =** | **Cover / Indicator** | | |
| | P V A | PMV, Black cover, Arrow indicator | |
| | P V D | PMV, Black cover, Dome indicator | |
| | F W A | Flowserve, White cover, Arrow indicator | |
| | F W D | Flowserve, White cover, Dome indicator | |
| **I =** | **Temperature Range** | | |
| | U | -40°C to 80°C (-40°F to 176°F) | |
| **J =** | **Input signal / Protocol** | | |
| | 4 | 4-20 mA / none | |
| | 5 | 4-20 mA / HART | |
| **K =** | **Feedback option / Switches** | | |
| | X | No feedback option | |
| | T | 4-20 mA transmitter only | |
| | S | Limit switches Mechanical SPDT | |
| | N | Namur V3 type sensor, P+F NJ2-V3-N | |
| | P | Limit switches Proximity SPDT | |
| | 4 | Slot type Namur sensor, P+F SJ2-S1N | |
| | 5 | Slot type Namur sensor, P+F SJ2-SN | |
| | 6 | Slot type Namur sensor, P+F SJ2-N | |
| **L =** | **Options / Add-in electronics** | | |
| | 0 | Standard diagnostics | |
| **M =** | **Accessories** | | |
| | X | No accessories | |
| | M | Gauge block ¼" G (3 gauges included / SST, Brass) | |
| | N | Gauge block ¼" NPT (3 gauges included / SST, Brass) | |
| **N =** | **Special Options** | | |
| | N | No special options | |
| | S | Exhaust silencers | |

| A | A | A | B | C | D | E | - | F | G | G | H | H | H | - | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

* Contact PMV for additional versions

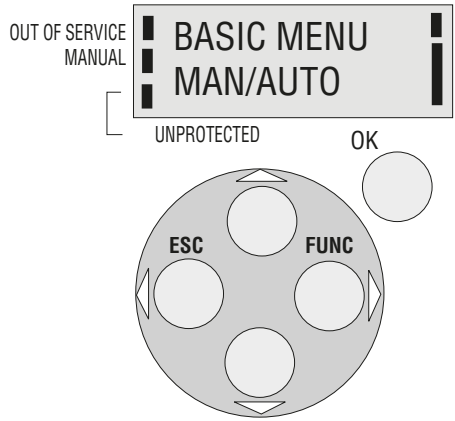
# 4. Control

## 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 15.




## 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 pushbuttons. See section “Man/Auto”, page 23.

### 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.

### LED BLINK CODES

| LED color (R = red, Y = yellow, G = green) | | | |
|---|---|---|---|
| **Codes during In Service:** | | | |
| | | R | Actual valve position deviates from requested/set position |
| | G | Y | Fully open/closed valve using Cut Off (=OK) |
| | | G | Controlling valve position (=OK) |
| **Calibration alarms:** | | | |
| | R | G | No feedback movement. Check linkage from actuator to positioner. |
| | R | Y | No air available. If air relay doesn´t work, check black/red cable inside. |
| R | G | G | No pot connection. Check pot cable inside positioner. |
| R | Y | Y | No air relay sensor. Check yellow/black/red cable inside positioner. |
| R | Y | G | Pot not calibrated. Calibrate->ExpertCal->Pot. |
| R | R | Y | Air relay problem. Replace it (located below positioner motherboard). |

## Menu indicator

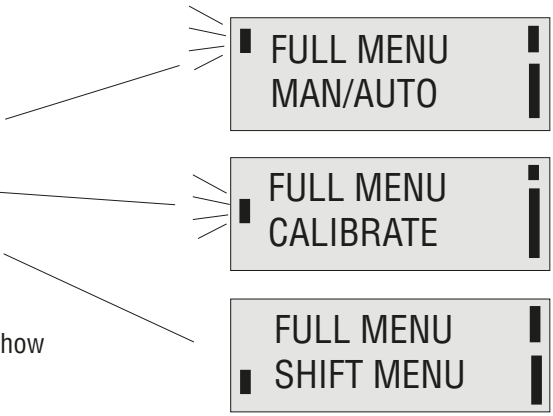
There are indicators at both sides of the display window and they indicate as follows:

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 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.

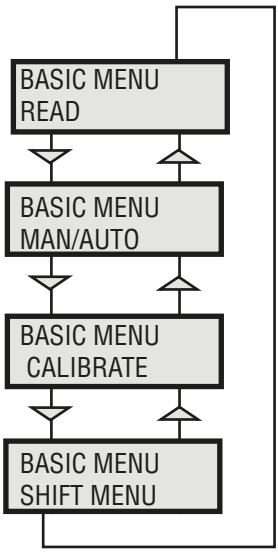
## Changing parameter values

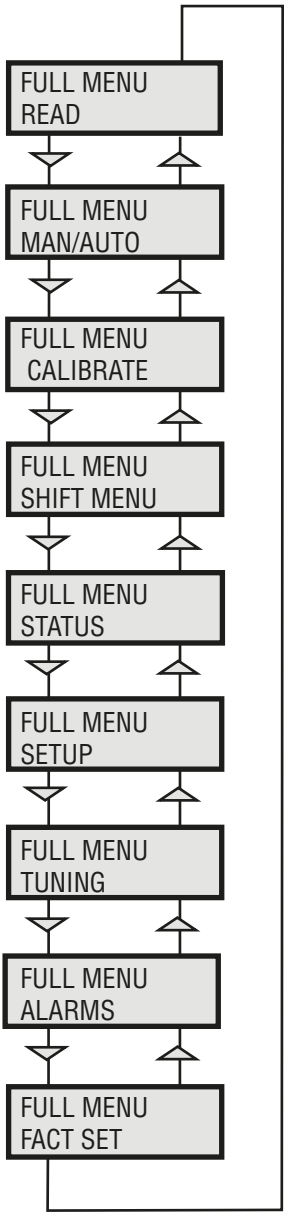
Change by pressing ◁ ▷ until the desired figure is flashing.

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 or full menu at any time.

A complete auto-calibration takes up to 10 minutes depending on size of actuator and includes end limit calibration (zero and span), auto-tuning (dynamically sets the control parameters for the actuated package the positioner is controlling) 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. More detail about these questions can be found on page 19.

**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.

**Tip! Instant quick calibration**
The D30 can be instantly calibrated by pressing the top + bottom buttons for 5 seconds (see picture). This function is available from any menu position.

**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 available at our web-page www.pmv.nu

**To install the D30_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 30!***

***For further information on calibrating the pot - see page 35***

**Instant quick calibration**

| 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 D30 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<br>0 = Not initialized<br>1 = Closed<br>2 = Opened<br>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 | D30 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<br>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 a person in the field will be able to control the positioner from the keypad, without collision with a control loop.

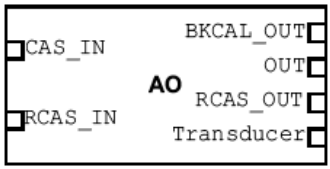
## (RB) Resource Block

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.

AO-block overview



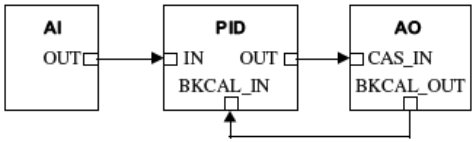

CAS_IN (cascade input) and RCAS_IN (remote cascade input) are selected as inputs to the AO block depending on the MODE_BLK parameter. The selected input will be relayed to the SP parameter of the AO block. BKCAL_OUT (back calculated output) is a calculated output that can be sent back to a controlling object so that control bumps can be avoided. Usually the BKCAL_OUT is set to be the (PV) process value of the AO-block, i.e. the actual measured position of the valve.
OUT is the primary calculated output of the AO block. During a limited action (ramping) of the AO block the RCAS_OUT parameter will supply the final setpoint and the OUT parameter will be the limited output.
The transducer block is connected through a channel to the AO block. Through this channel the OUT value and SP are transceived.

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

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

## Example

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

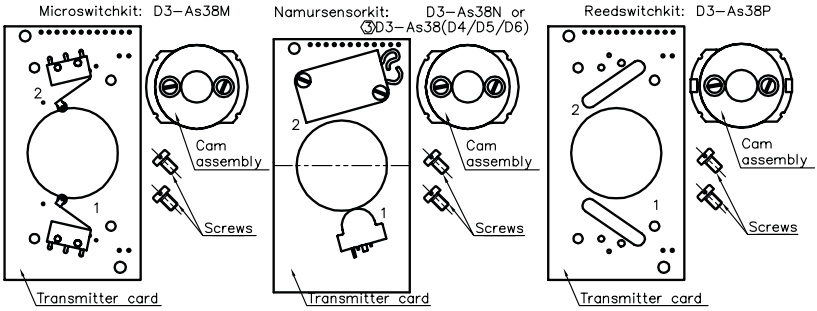


The contents of the menu are shown on the next page. The various menu texts are described below.

| | |
|---|---|
| **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** as shown in the chart on the next page. |
| **Lose prev value? OK?** | A warning that the value set previously will be lost (not during the first auto-tuning). |
| **Direction?** Air-to-open. | Select for direct function. |
| **Direction?** Air-to-close. | 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 G, F, E D, C, B, A** | Possibility to select a lower gain in steps. |

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

## Feedback option



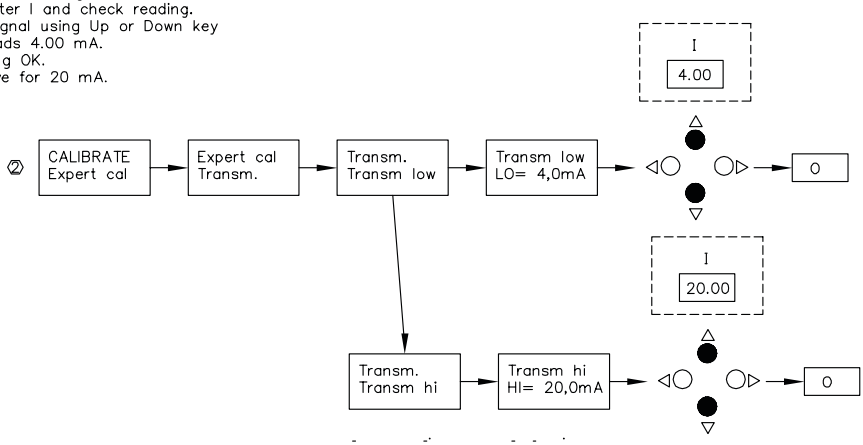

When installing the transmitter/switch card, make sure it is placed correctly over the connector pins before gently pushing it down until it rests on the supports. Secure the PC board with the two screws. Make sure the holes are centred before tightening the screws.

**Note!** When installing the cam assembly for mechanical switches, retract both 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.

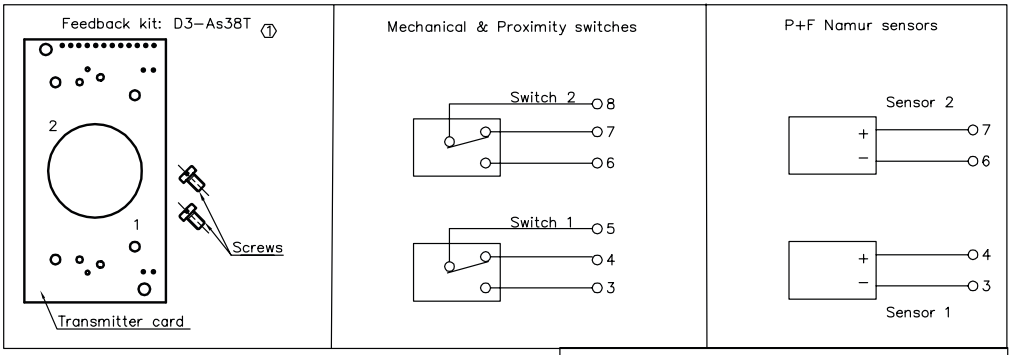
# Feedback option (cont.)

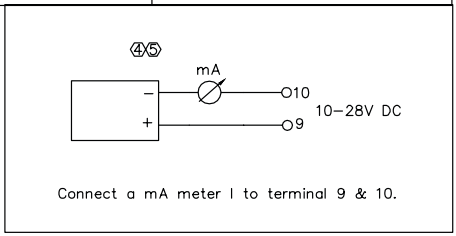
## Calibration of the 4-20 mA transmitter

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.




## Connecting the switches/sensors




**Note:** Technical data of switches and transmitter – please see page 38

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 %

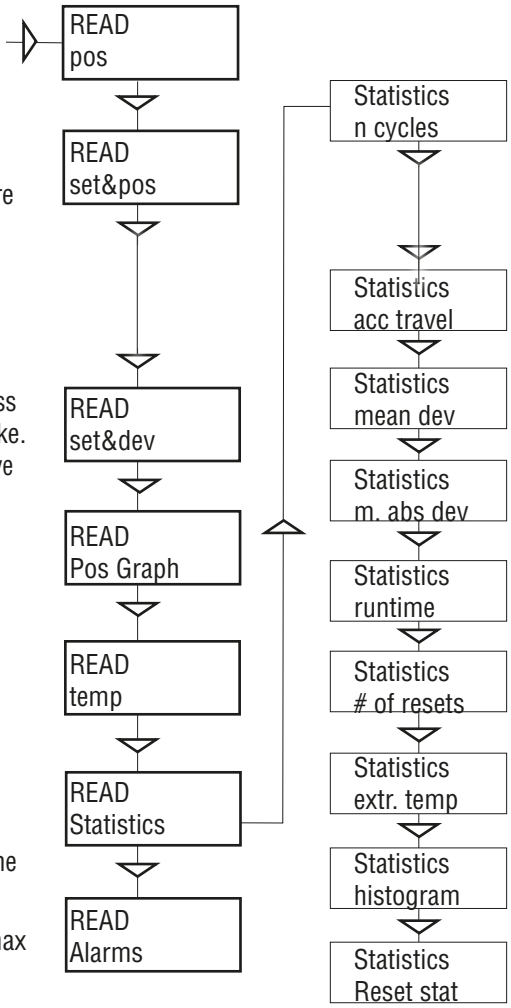
**# of resets** Shows number of resets

**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 14

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.

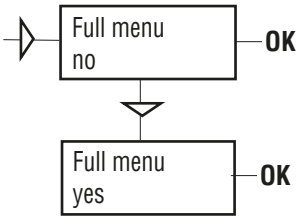
C+ and C- can be fully opened for blowing clean by pressing ▲▼ and OK simultaneously.

**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.




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

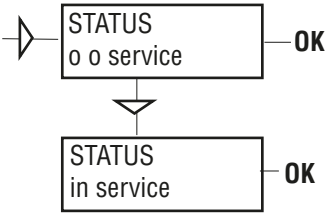
---

**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.




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 |

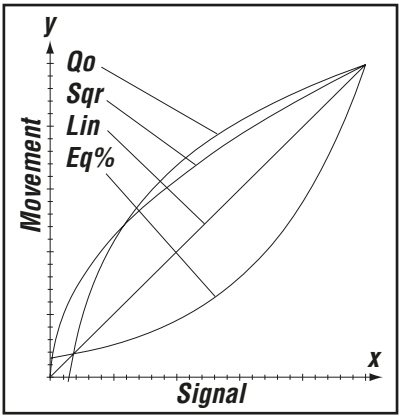
| | |
|---|---|
| **Lever** | Only for linear actuator. |
| **Lever stroke** | Stroke length to achieve correct display. Input only needed in case display value is off |
| **Level cal** | Calibration of positions to achieve correct display. |

**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**<br>**Equal %**<br>**Quick open**<br>**Sqr root** | See diagram. |
| **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**<br>**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 stop is reached), Limit (stop at set end position), and Cut off (Default value. Go directly to a mechanical stop at a predefined 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**
- **SW rew**
- **Capability**

General parameters.

- **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<br>Time = Set time +10sec= time before movement<br>Valve act = failsafe (preset pos) or last value (present pos)<br>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** D30 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 from fully open to closed.
**Open time** Minimum time from closed to fully open.
**Deadband** Setting deadband. Min. 0.1%.

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

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

**Self test** Internal test of processor

**Undo** You can read last 20 changes.

---

**P,I,D and K,Ti,Td parameters**
If one of the gains is changed, the corresponding value in the other gain set is changed accordingly.

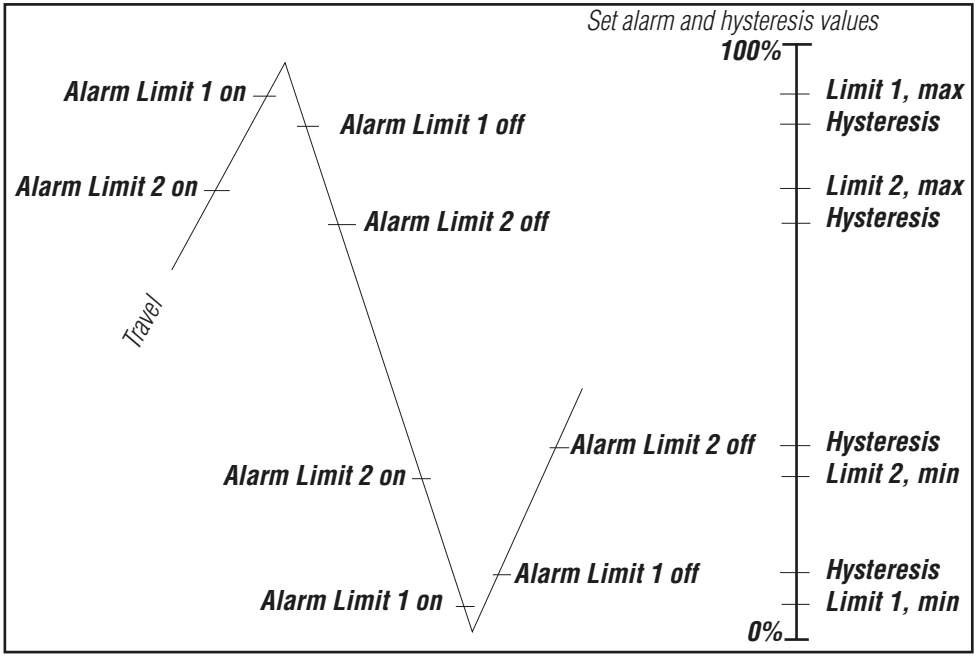
**Spring adjust**
The spring adjust function compensates the airflow linearly with the actuator C+ chamber volume (for a constant position error), so that low volumes get less flow. This is needed for linear single-acting actuators, where a low C+ volume means that the actuator spring is extended, its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

FULL MENU
ALARMS

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

| | |
|---|---|
| **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** | Valve moves to 100%. Positioner changes to position Manual. |
| **Goto close** | Valve moves to 0%. 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 1.4 bar (20 psi) (or set another value on the display). Press OK. Pressure read out only possible on D30 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 D30 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

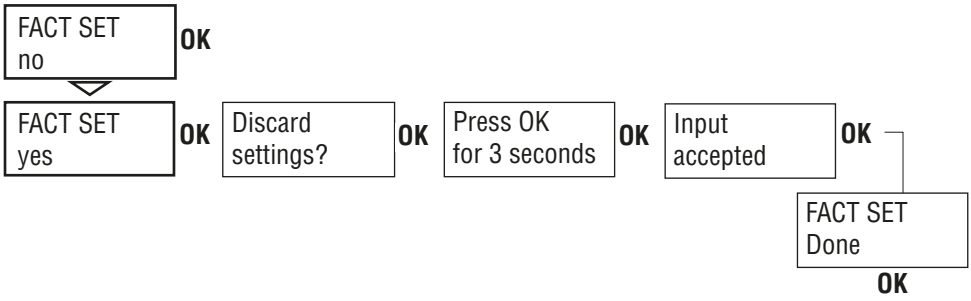
***Pot:*** Potentiometer setting, see section 8. Also see video on www.pmv.nu

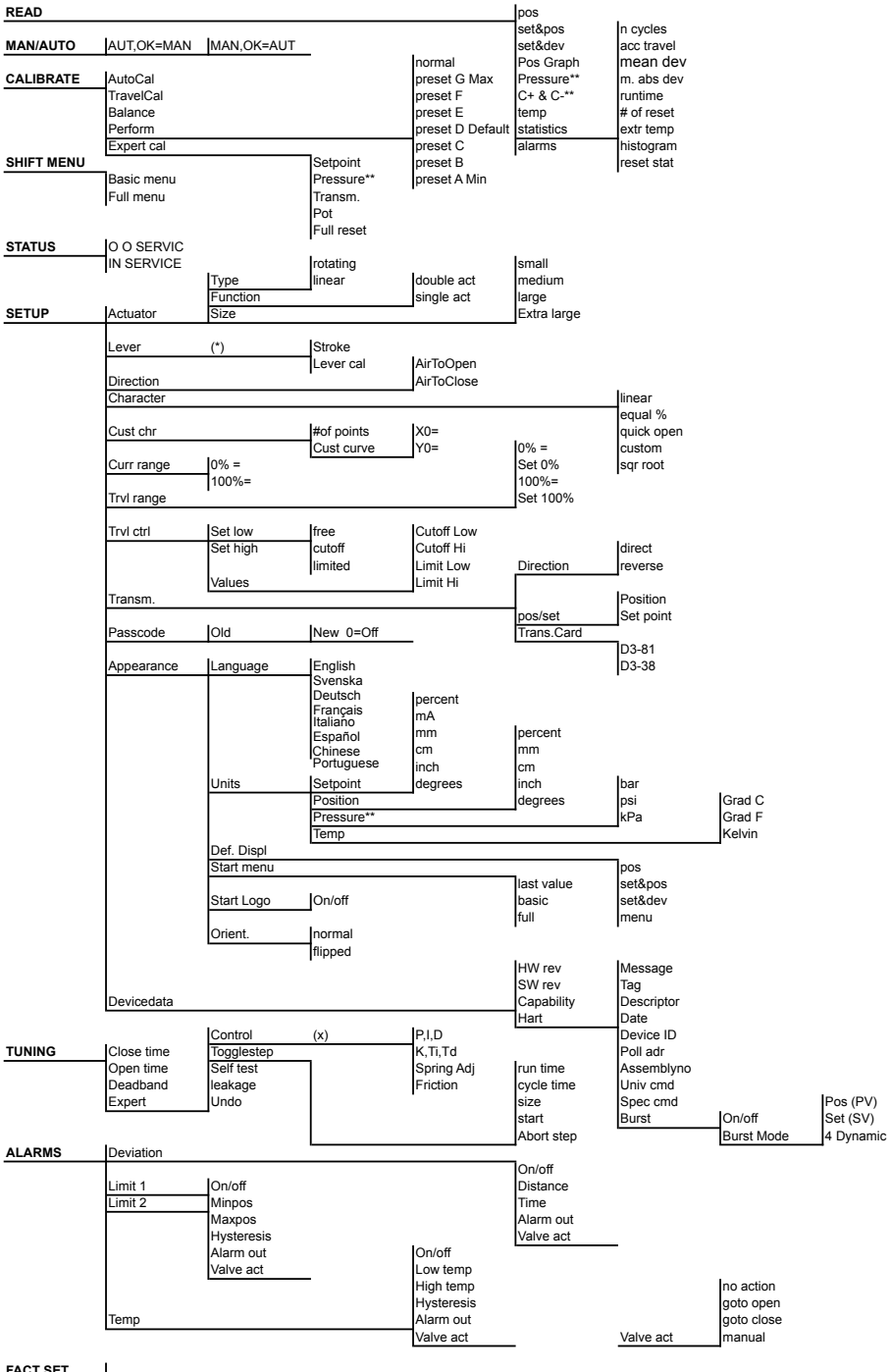
***Full reset:*** Resets all set values and enters Factory mode.
To reset the values only, use FACT SET in main menu, see below.

---

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
(x) Position is show in upper row (PID, KTiTd)

# 5. 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 D30 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.**

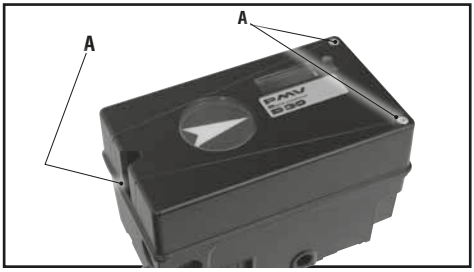
**Please see section for special conditions for safe use and spare parts on page 5!**

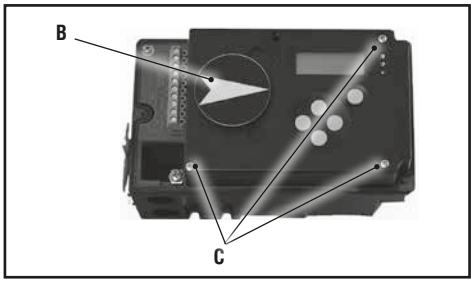
**Please contact a Flowserve office for information regarding proper procedures.**
www.pmv.nu or infopmv@flowserve.com

## Disassembling D30

**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.
- Unscrew the screws C and remove the inner cover.

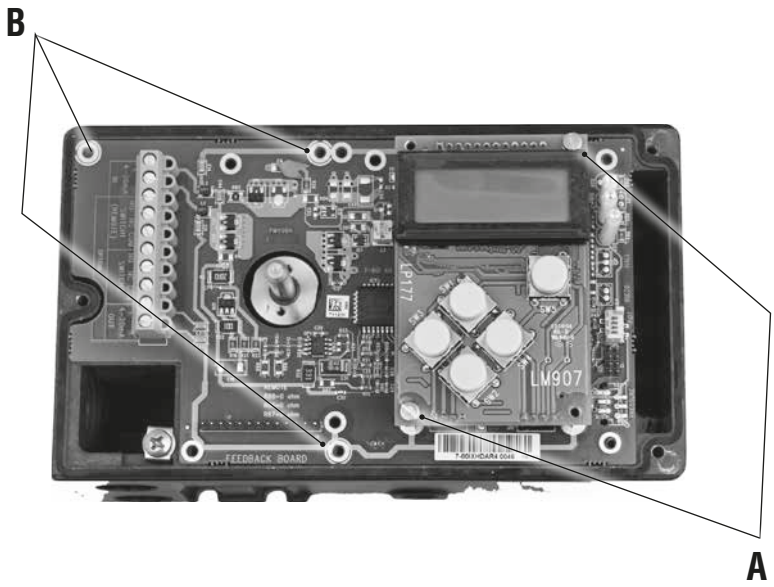


## Circuit boards (PCB)

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

To lift off the display PCB, first unscrew the two screws A.
Release the cable connections.
Unscrew the three screws B and lift up the circuit board.



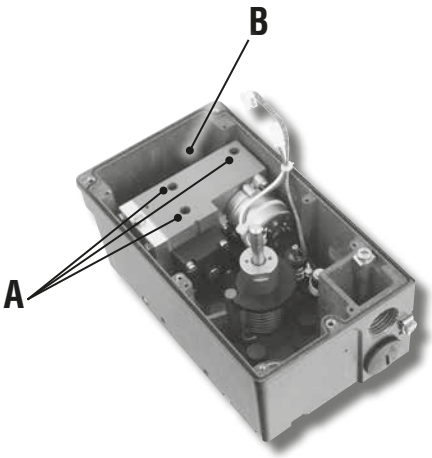
### Valve block

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

- Remove the three screws A and lift out the valve block

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

- When installing the valve block — torque the three screws to 0,4 Nm and seal with Loctite® 222.

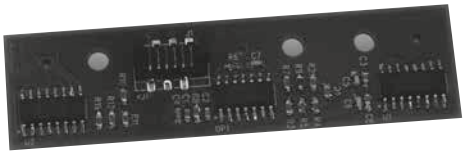



---

### Pressure sensors

Three pressure sensors are available as an option. They indicate pressure for supply, C- and C+ air,and can be used by ValveSight™ to enable advanced valve diagnostics.

The sensors are mounted on a circuit board which mounts next to the air relay on the floor of the housing at B using three screws.



Pressure sensor PCB - top view

Pressure sensor PCB - bottom view

## Potentiometer

**90° spring loaded potentiometer**
The spring-loaded potentiometer can be removed from the gearwheel for calibration or replacement.

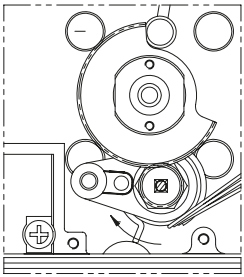
If the potentiometer is replaced or the setting is changed, it must be calibrated.

- Select the menu Calibrate - Expert - Cal pot. The display shows Set gear.
- Turn the spindle shaft clockwise to end position and press OK. Either turn manually or use the up/down arrows (with supply air) to stroke the positioner to turn the shaft clockwise (see Manual mode page 23).
- Unmesh the potentiometer and turn it according to display until OK is shown. Press OK. See diagrams below.
- Re-align spring on potentiometer to secure it. See diagrams below.

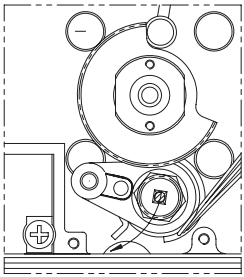
## Transmitter boards

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

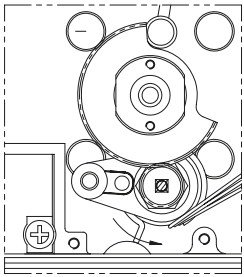
General PCB versions:
- with mechanical switches, SPDT
- with NAMUR sensors, DIN 19234
- with proximity switches
- with feedback transmitter and/or remote only



Turn the end of the stop spring clockwise until it is clear from the housing wall.



Turn the potentiometer away from the shaft gear and adjust the potentiometer gear. Release the potentiometer to let the gear teeth engage again.



Turn the end of the stop spring counter clockwise until it points towards the housing wall.

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

# 7. Technical data

| | |
|---|---|
| **Rotation angle** | min 2.5° max 100° |
| **Stroke** | From 5 mm (0.2¨) |
| **Input signal** | 4-20 mA DC |
| **Air supply** | 1.4-8 bar (20-115 psi)<br>DIN/ISO 8573-1 3.2.3<br>Free from oil, water and moisture. |
| **Air delivery** | Up to 760 nl/min @ 6 bar<br>(29.3 scfm @ 87 psi) |
| **Air consumption** | 8 nl/min @ 6 bar<br>(0.31 scfm @ 87 psi) |
| **Air connections** | ¼" G or NPT |
| **Cable entry** | 2x M20x1.5 or ½" NPT |
| **Electrical connections** | Screw terminals 2.5 $mm^2$ /AWG14 |
| **Linearity** | <0.4% |
| **Repeatability** | <0.5% |
| **Hysteresis** | <0.3% |
| **Dead band** | 0.1-10% adjustable |
| **Display** | Graphic, view area 15 x 41 mm<br>(0.6 x 1.6¨) |
| **UI** | 5 push buttons |
| **CE directives** | 93/68EEC, 89/336/EEC, 92 /31/EEC |
| **Voltage drop, w/o HART** | 8 V |
| **Voltage drop, with HART** | 9.4 V |
| **Vibrations** | < 0.25% FS 10-500 Hz 2g max |
| **Enclosure** | IP66 |
| **Material** | Die-cast Aluminum |
| **Surface treatment** | Powder epoxy |
| **Temperature range** | –40°C to +80°C (-40˚F to 176˚F) |
| **Weight** | 1.8 kg (4 lbs) |
| **Mounting position** | Any |
| **Communication protocols** | Hart<br>Profibus PA<br>Foundation Fieldbus |

| **Mechanical switches** | |
|---|---|
| Type | SPDT |
| Size | Sub miniature |
| Rating | 3 A/125 VAC / 2 A/30 VDC |
| Temperature range | -30°C to 80°C (–22°F to 180°F) |

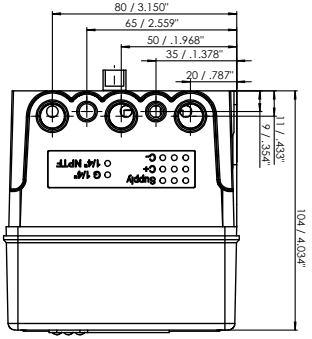
| **NAMUR sensors** | |
|---|---|
| **(NJ2-V3-N)** | |
| Type | Proximity DIN EN 60947-5-6:2000 |
| Load current | 1 mA ≤ I ≤ 3 mA |
| Voltage range | 8 VDC |
| Hysteresis | 0.2% |
| Temperature range | –25°C to 85°C (–13°F to 185°F) |

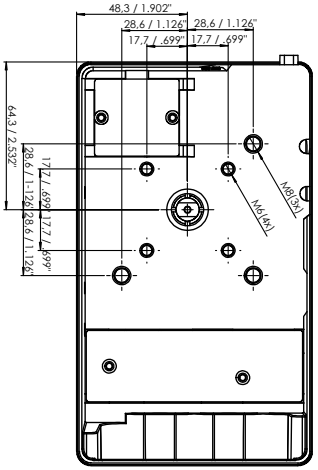
| **Proximity switches** | |
|---|---|
| Type | SPDT |
| Rating | 0.4 A @ 24 VDC, Max 10 W |
| Operating time | Max 1.0 ms |
| Max voltage | 200 VDC |
| Contact resistance | 0.2 Ω |
| Temperature range | -30°C to 80°C (–22°F to 180°F) |

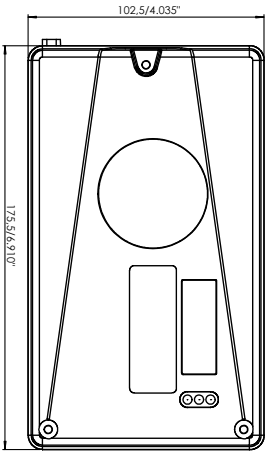
| **Slot NAMUR switches** | |
|---|---|
| **(SJ2-S1N, SJ2-SN, SJ2-N)** | |
| Type | Proximity DIN EN 60947-5-6:2000 |
| Load current | 1 mA ≤ I ≤ 3 mA |
| Voltage | 8 VDC |
| Hysteresis | 0.2% |
| Temperature range | –25°C to 85°C (–13°F to 185°F) |

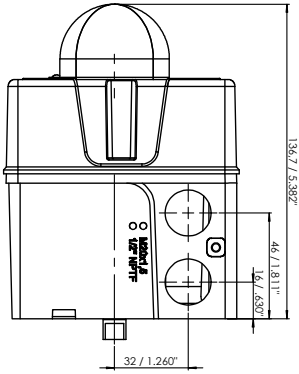
| **4-20 mA transmitter** | |
|---|---|
| Supply | 11-28 VDC |
| Output | 4-20 mA |
| Resolution | 0.1% |
| Linearity full span | +/–0.5% |
| Output current limit | 30 mA DC |
| Load impedance | 800 Ω @ 24 VDC |

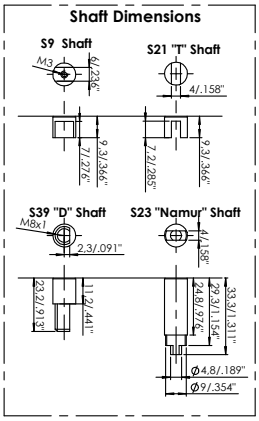
# 8. Dimensions



# 9. Spare parts

| No | Part no | Description |
|---|---|---|
| 1 | D4-SP37PVA | Black cover incl. screws and flat indicator |
| 1 | D4-SP37PVD | Black cover incl. screws and dome indicator |
| 1 | D4-SP37FWA | White cover incl. screws and flat indicator |
| 1 | D4-SP37FWD | White cover incl. screws and dome indicator |
| 2 | D4-SP40 | Internal cover incl. screws |
| 3 | D4-SP1516 | External covers SST, 2, incl screws |
| 4 | 3-SXX | Spindle adaptor (XX = 01, 02, 06, 26, 30, 36) |
| 5 | D4-SP05-09 | S09 shaft compl. incl. gear wheel, friction clutch, spring |
| 5 | D4-SP05-21 | S21 shaft compl. incl. gear wheel, friction clutch, spring |
| 5 | D4-SP05-23 | S23 shaft compl. incl. gear wheel, friction clutch, spring |
| 5 | D4-SP05-39 | S39 shaft compl. incl. gear wheel, friction clutch, spring |
| 6 | D4-SP400 | Air relay complete, incl. cable, seal, screws |
| 7 | D4-SP08 | Potentiometer compl. incl. spring, bracket, cable |
| 8 | 3-SP37HR | PCB LCD assembly |
| 9 | D4-SP7-80H | PCB mother board 4-20 mA / HART |
| 9 | D4-SP7-80P | PCB mother board Profibus PA |
| 9 | D4-SP7-80F | PCB mother board Fieldbus |
| 10 | D4-SP84-3 | Pressure sensor assembly complete |
| 11 | D4-SPGB | Bag with screws, O-rings, seals, pair of sintered brass silencers, cable gland |
| 12 | D4-SP940M | Gauge block G, complete incl. screws, seals, 3 gauges / SST, Brass |
| 12 | D4-SP940N | Gauge block G, complete incl. screws, seals, 3 gauges / SST, Brass |
| 13 | D4-SP45S | Limit switches Mechanical SPDT compl. |
| 13 | D4-SP45N | Limit switches Namur V3 P&F NJ2-V3-N compl. |
| 13 | D4-SP45P | Limit switches Proximity SPDT compl. |
| 13 | D4-SP454 | Limit switches Namur slotted P&F SJ2-S1N compl. |
| 13 | D4-SP455 | Limit switches Namur slotted P&F SJ2-SN compl. |
| 13 | D4-SP456 | Limit switches Namur slotted P&F SJ2-N compl. |

**PMV Automation AB**
Korta Gatan 9
SE-171 54 SOLNA
SWEDEN
Phone: +46 (0)8-555 106 00
E-mail: infopmv@flowserve.com

**PMV USA**
14219 Westfair West Drive
Houston, TX 77041, USA
Phone: +1 281 671 9209
Fax: +1 281 671 9268
E-mail: pmvsales@flowserve.com

**Flowserve Flow Control**
Burrell Road, Haywards Heath
West Sussex RH16 1TL
Phone: +44(0)1444 314400
E-mail: pmvuksales@flowserve.com

**Flowserve Flow Control Benelux**
Rechtzaad 17
4703 RC Roosendaal
THE NETHERLANDS
Phone: +31 (0) 30 6771946
Fax: +27 (0) 30 6772471
E-mail: fcbinfo@flowserve.com

**Flowserve Flow Control GmbH**
Rudolf-Plank Strasse 2
D-76275 Ettlingen
GERMANY
Phone: +49 (0) 7243 103 0
Fax: +49 (0) 7243 103 222
E-mail: argus@flowserve.com

**Flowserve S.p.a.**
Via Prealpi, 30
20032 Cormano (Milano)
ITALY
Phone: +39 (0) 2 663 251
Fax: +39 (0) 2 615 18 63
E-mail: infoitaly@flowserve.com

**Flowserve Corporation**
No. 35, Baiyu Road
Suzhou Industrial Park
Suzhou 215021, Jiangsu Province,
PRC
Phone: +86-512-6288-1688
Fax: +86-512-6288-8737

**Flowserve (China)**
585, Hanwei Plaza
7 Guanghau Road
Beijing, China 100004
Phone: +86 10 6561 1900

**Flowserve Pte Ltd**
No. 12 Tuas Avenue 20
Singapore 638824
Phone: +65 6879 8900
Fax: +65 6862 4940

**Flowserve do Brasil Ltda**
Rua Tocantins, 128 - Bairro Nova Gerti
São Caetano do Sul,
São Paulo 09580-130 Brazil
Phone: +5511 4231 6300
Fax: +5511 4231 6329 - 423

**To find your local Flowserve representative:**

To find your local Flowserve representative please use the Sales Locator System found at www.flowserve.com30

***FCD PMENIM0030-00-A5 12/15***

Flowserve Corporation has established industry leadership in the design and manufacture of its products. When properly selected, this Flowserve product is designed to perform its intended function safely during its useful life. However, the purchaser or user of Flowserve products should be aware that Flowserve products might be used in numerous applications under a wide variety of industrial service conditions. Although Flowserve can provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser/user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of Flowserve products. The purchaser/user should read and understand the (D3 Digital Positioner User Instructions) instructions included with the product, and train its employees and contractors in the safe use of Flowserve products in connection with the specific application.

While the information and specifications contained in this literature are believed to be accurate, they are supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Because Flowserve is continually improving and upgrading its product design, the specifications, dimensions and information contained herein are subject to change without notice. Should any question arise concerning these provisions, the purchaser/user should contact Flowserve Corporation at any one of its worldwide operations or offices.

For more information about Flowserve Corporation, contact www.flowserve.com or call USA 1-800-225-6989.

© February 2015, Flowserve Corporation, Irving, Texas