

Manual P4



PMV Positioner P4



GB

Manufacturers declaration

in compliance with EC directive 89/392/EEC, annex II B.

We hereby confirm that the appliances described in this sheet has been manufactured in compliance with the applicable standards and is intended for installation in a machine/application, and that commissioning is strictly prohibited until evidence has been provided that the machine/application in question is also in compliance with EC directive 89/392/EEC.

This manufacturers declaration is applicable to the following Positioner series:

P4.

D

Hersteller-Erklärung

im sinne der EG-richtlinie 89/392/EWG, Anhang II B.

Hiermit erklären wir, daß die in diesem Blatt beschriebenen Geräte entsprechend den gültigen Normen gebaut und zum Einbau in eine Maschine oder Applikation bestimmt sind, und daß deren Inbetriebnahme so lange untersagt ist, bis festgestellt wurde, daß diese Maschine/Applikation ebenfalls der EG-Richtlinie 89/392/EWG entspricht. Diese Herstellererklärung hat für folgende Stellungsregler-Serien Gültigkeit:

P4.

F

Déclaration de fabricant

au sens de la directive de la CE 89/392/CEE, annexe II B.

Nous déclarons par la présente que les appareils décrits sur cette page sont construits en conformité avec les normes en vigueur et qu'ils sont destinés à être montés dans une machine ou une application, nous déclarons également que leur mise en service est interdite tant qu'il n'a pas été constaté que cette machine/application satisfait également à la directive CE 89/392/CEE.

Cette déclaration de fournisseur est valable pour les types d'appareils suivants:

P4.



*Mr. Jan-Eric Andersson
President, Palmstiernas Instrument AB*



General storage and handling instructions

Positioner storage and handling procedures

Positioners are precision instruments which should be stored and handled accordingly to avoid problems or damage.

Appropriate precautions should be taken to protect units while in storage.

Warehouse storage

Stored in original shipping containers, units should be stored in an environmentally controlled area, i.e. clean, cool (15-26°C, 60-80°F) and dry, out of direct sunlight or weather exposure.

Field storage

Note: Once the air supply to the positioner is connected and turned on, internal air bleed will prevent the ingress of moisture and protect the unit from corrosion. It is recommended that the air supply be left on at all times.

- If units are installed immediately, turn, and leave on, the air supply.
- If positioners must be stored outdoors, tighten all covers which may have loosened in shipment, make sure all open enclosure entry points are sealed.

Potential damage mechanism

When units are stored in hot, humid climates, the daily heating/cooling cycle will cause air to expand/contract and be drawn in and out of the positioner housing. Dependent on the local temperature variations, humidity and dew points and time in storage, condensation could occur and accumulate inside causing erratic operation or failure due to water and corrosion. The potential for condensation damage is especially high in southern climates and aggravated if units are exposed to direct sunlight.

For further assistance, please contact your nearest retail office.



Contents

	Page
1. Introduction	5
2. Function	6
3. Air requirements	7
4. Installation	7
5. Connections and Cam setting	8-9
6. Calibration	10-11
7. Maintenance	12-15
Pilot valve	12
Feedback spring	13
Diaphragm	13
Balance arm	14
Lower arm	15
O-rings	15
8. Exploded drawing	16
9. Spare part list	17
10. Trouble shooting	18
11. Technical Data	18
12. Dimensional drawing	19



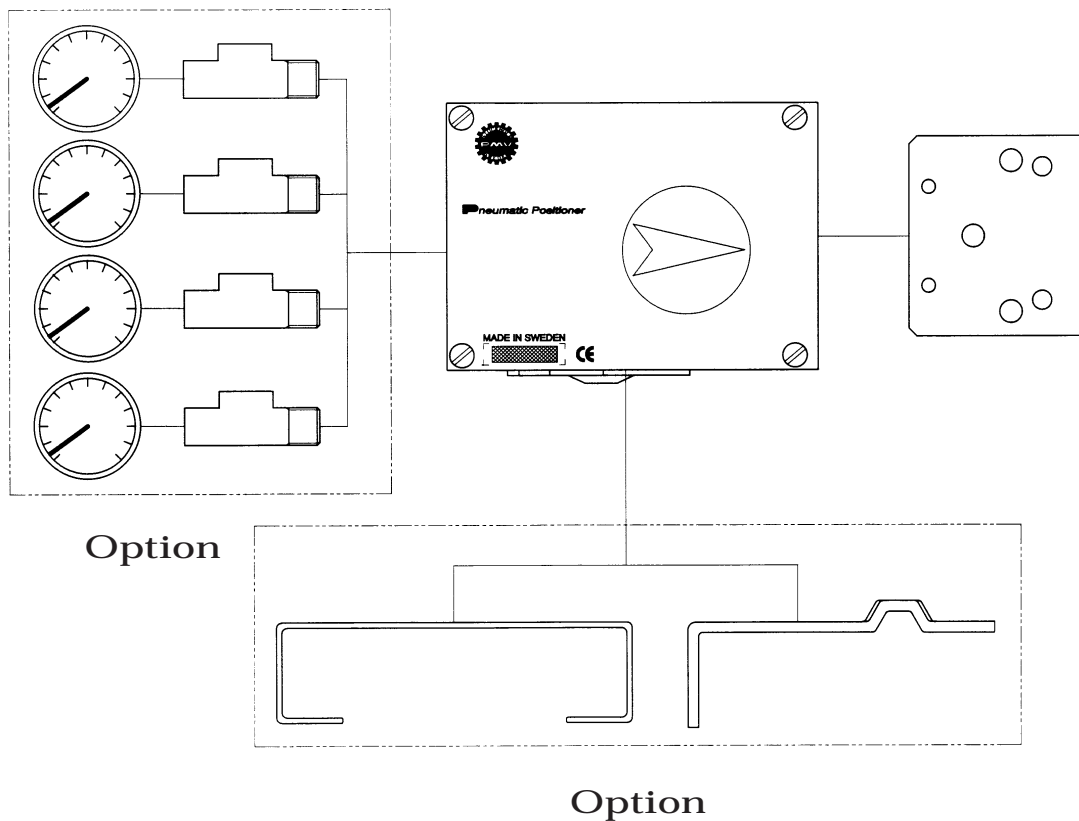
1. Introduction

The P4 is a pneumatic valve positioner for double acting actuators, rotary or linear. It can also be used for single acting applications by simply plugging one of the outlet ports, C1 or C2.

It features a standardized foot print, external zero adjustment, gold plated spool valve, positive internal pressure and a bright visible position indicator. The simple, sturdy design with few moving parts together with the well proven spool valve design provides long and trouble free operation. Together with the unit, a wide range of mounting kits are offered for quarter turn and linear applications.

Calibration and set up is quick and simple, all done by thumb wheels. The unit requires a minimum of maintenance and the only tool needed is a blade screw driver.

For installation of gauges T-connectors are required.



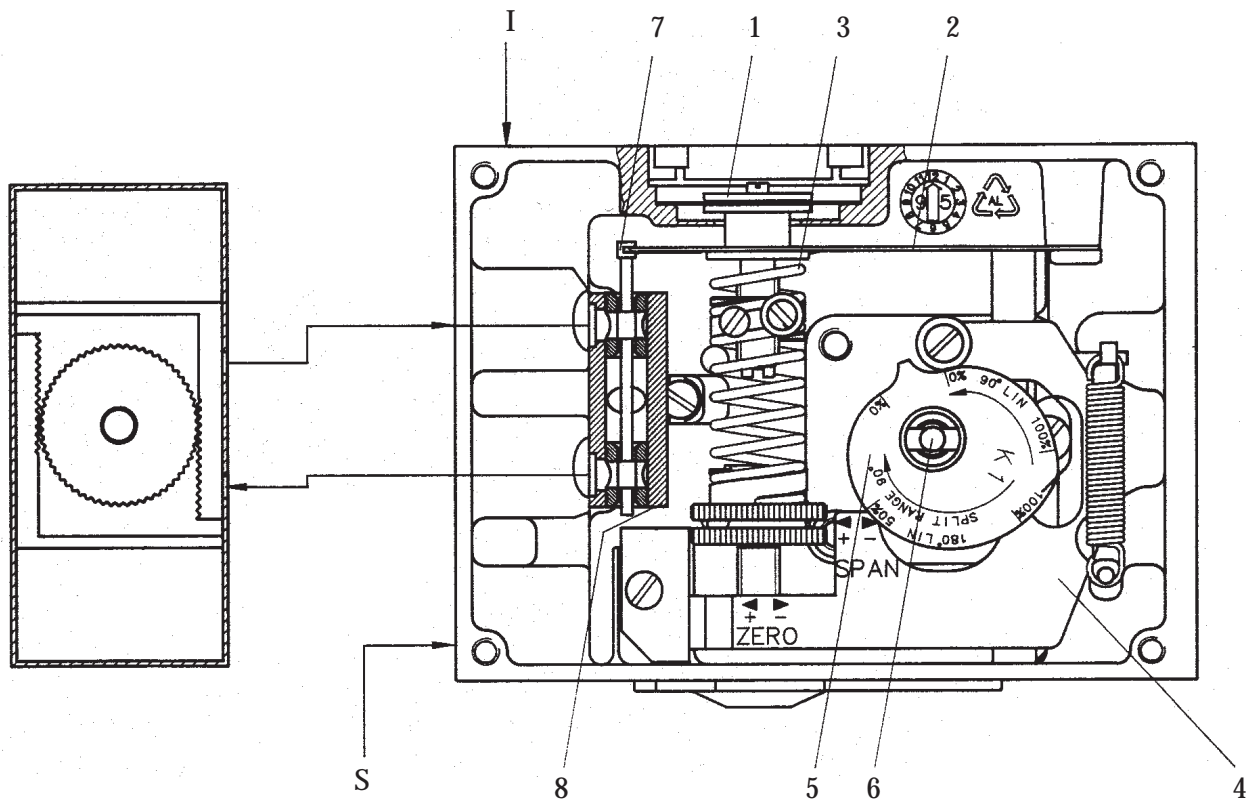
2. Function

The unit operates on a force balance principal. Force is originated by the signal pressure transmitted through a diaphragm on to the balance arm. The opposing force is achieved through the feed back spring and is proportional to the position of the lower arm. The lower arm position is determined by the position of the cam which is secured to the spindle and connected to the actuator shaft thus providing the feed-back from the actuator/valve. When these two forces are equal, the balance arm and the spool in the pilot valve are in a neutral position, the complete unit is in a balanced position. Air is supplied to the pilot valve through port S, and controls the air flow through ports C1 and C2

Assume an equilibrium position.

An increased control pressure will deflect the diaphragm 1 down, compressing the feedback spring 3. The balance arm 2 moves the spool 7 in the pilot valve 8 furnishing supply air to the actuator, while at the same time air is exhausted from actuator and is vented to atmosphere through the pilot valve.

With the increased supply air, the actuator rotates (or moves linearly) moving the positioner spindle 6. The spindle and cam 5 rotate, forcing the lower arm 4 upwards compressing the feedback spring 3. This motion will continue until the two forces are equal and the unit is in an equilibrium position.



3. Air requirements

Maximum supply pressure is 1 MPa (150 psi).

Supply air shall be clean, dry and free from oil, water, moisture, foreign parts and debris. Bad air quality leads to imprecise control or malfunction.

The air shall be freeze-dried or similar to a dew point of at least 10°C (18°F) below lowest expected ambient temperature.

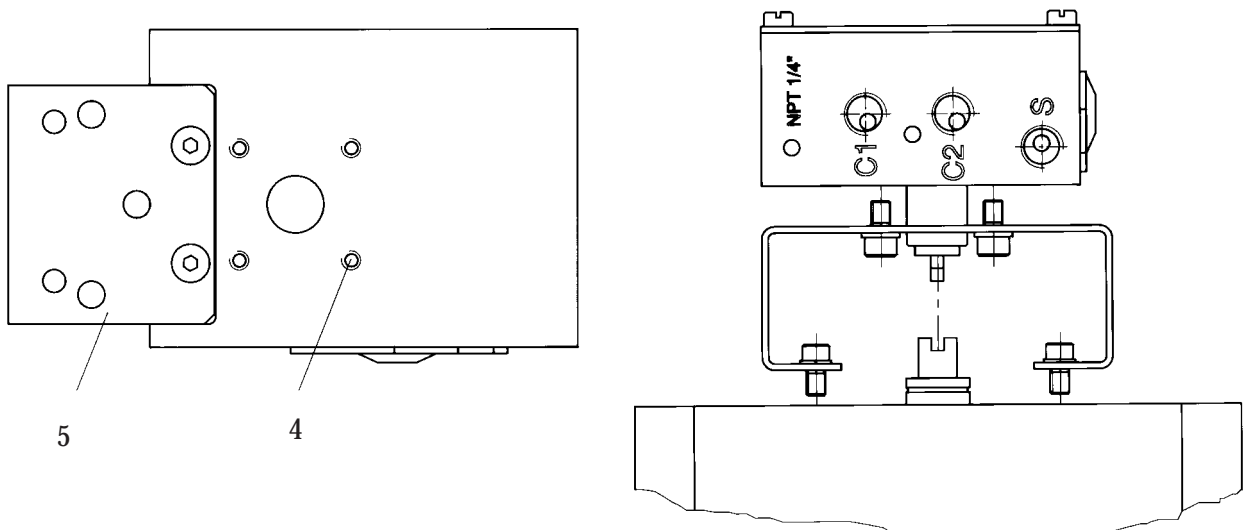
A <40µ filter/regulator is recommended to be installed as close to the positioner as possible to ensure proper supply air quality.

4. Installation

The unit features ISO F05 mounting foot print 4 and with the additional enclosed mounting adapter 5, PMV standard foot print. Mounting adapter 5 is fitted to the unit with two screws and makes it easy to retrofit the unit on actuators with existing PMV positioners and mounting kit.

Proper alignment of the positioner spindle to the actuator shaft is very important since improper alignment can cause excessive wear and friction to the positioner.

A loose fit between positioner spindle and actuator shaft leads to imprecise control and excessive wear of the coupling.



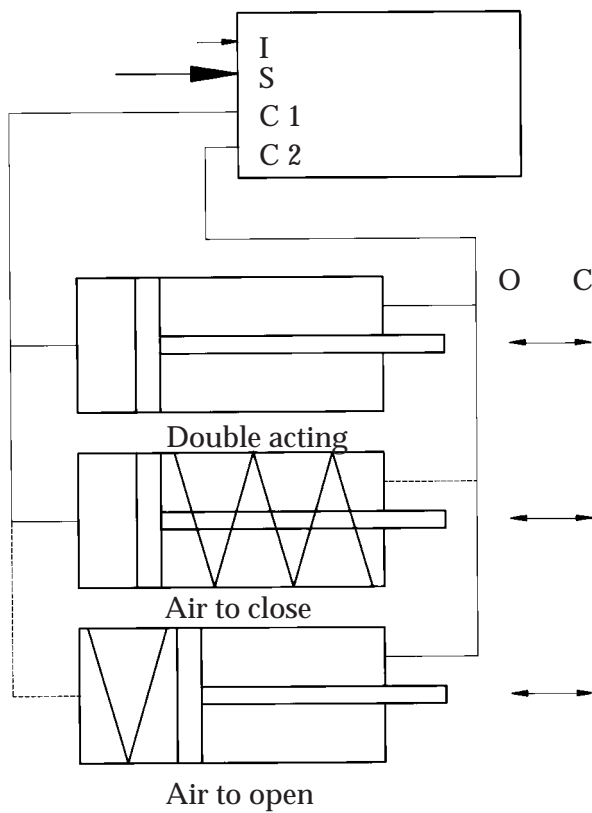
5. Connections and Cam setting

Air connections are tapped for 1/4" NPT or 1/4" G male connectors and are clearly marked.

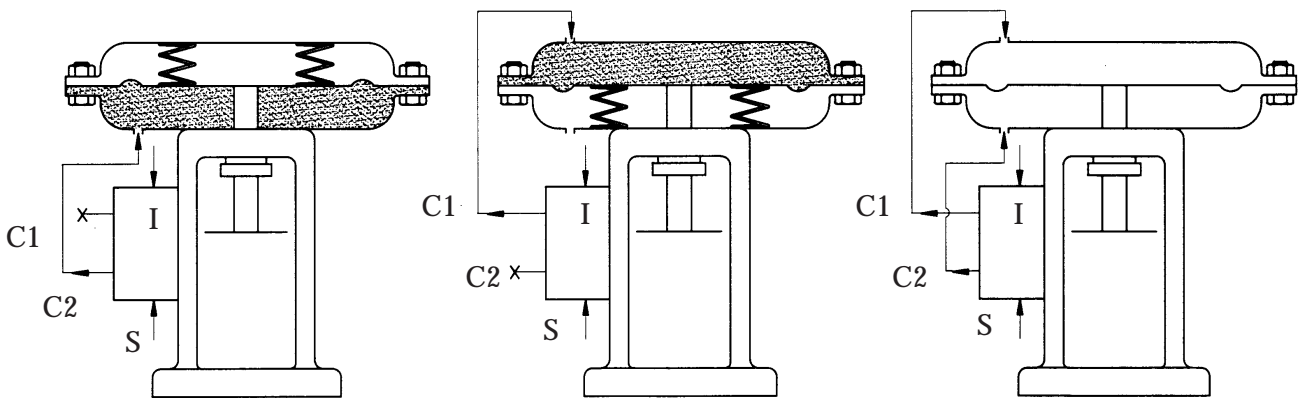
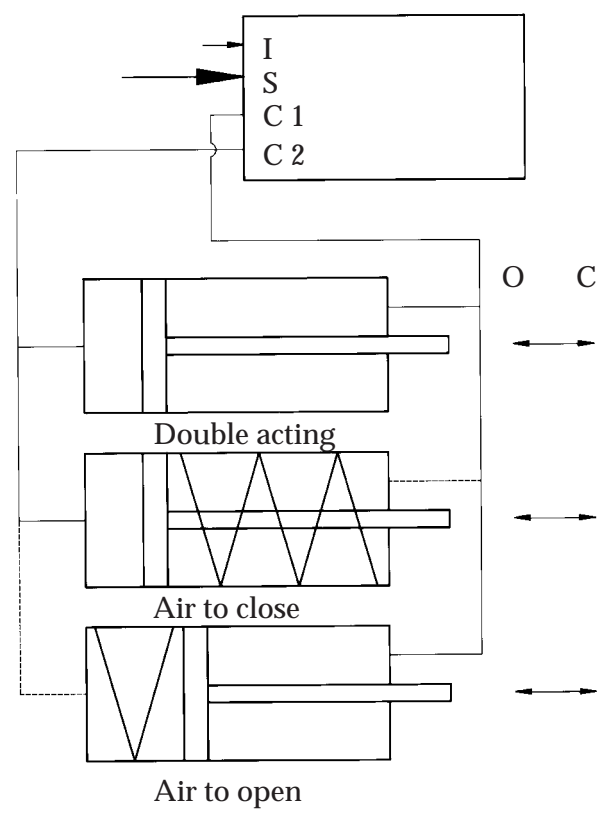
We recommend use of Loctite® 577 or similar user preferred for sealing.

Port I Input instrument pneumatic signal 20-100kPa (3-15 psi)
 Port S Supply air, maximum 1 MPa (150 psi).
 Port C1, C2 Actuator connections.

Direct function



Reverse function

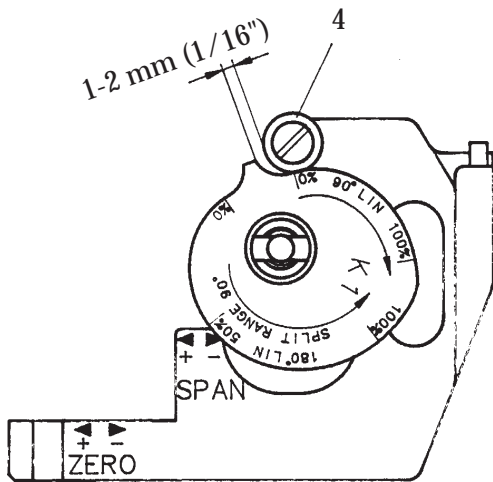
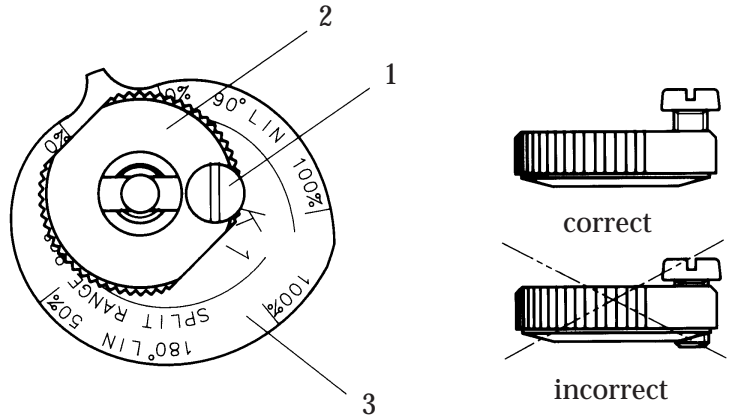


X = Port plugged

Direct function

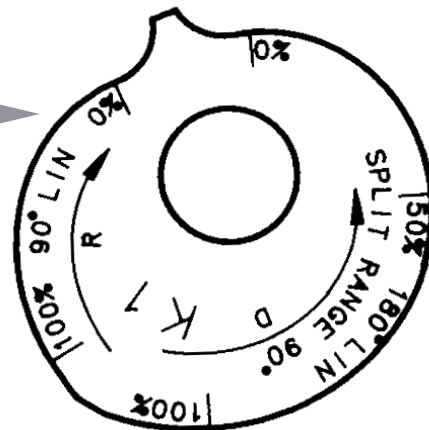


With the cover and indicator removed, loosen the screw 1 and turn the cam locking nut 2 counterclockwise until the cam loosens. Adjust the cam 3 as desired making sure that the ball bearing 4 always riding on an active lobe on the cam. To secure the cam, make sure that screw 1 is backed out from the locking nut 2 then finger tighten the locking nut and tighten screw 1. Proceed with calibration or cover.



Cam setting for direct action, increasing signal 0-100% (20-100 kPa, 3-15 Psi) to open. Ball bearing to ride on lobe D, 0-100%.

Cam setting for reverse action, decreasing signal 100-0% (100-20 kPa, 15-3 Psi) to open. Ball bearing to ride on lobe R, 0-100%.



Split range
Used to achieve a high resolution. Only a portion of the signal is used to obtain full travel. Example:
For 90 deg rotation, input signal 0-50% (20-60 kPa, 3-9 Psi).
Ball bearing to ride on split range 0-50% 90 deg lobe.



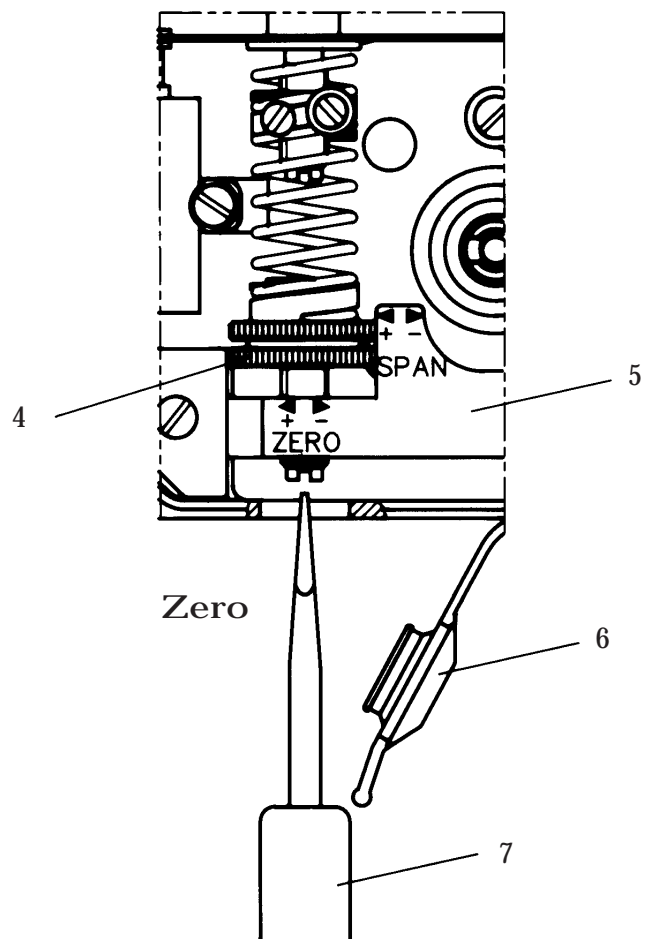
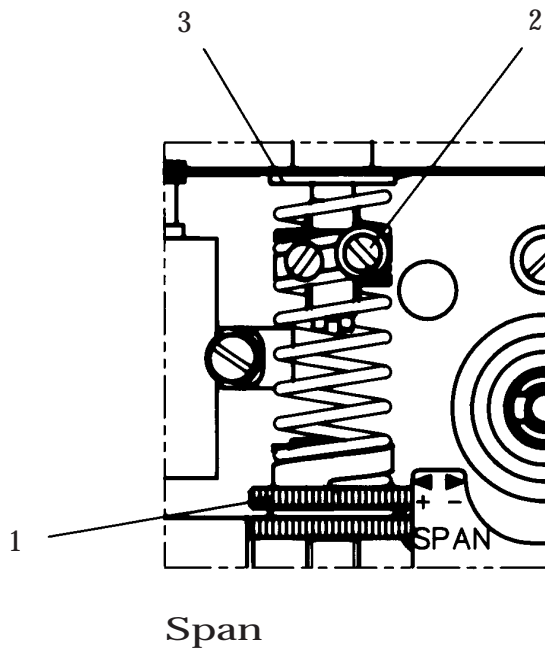
6. Calibration

The unit is shipped from factory precalibrated for 90° ($\pm 0,5$ deg rotation – can also be 30, 45 or 60 deg, see installed cam).

For most applications the valve closed position is much more critical than the valve open position. Most attention should be paid at valve closed position. Always start calibration procedure by applying 0 % input signal, then adjusting zero. The unit is calibrated by turning thumb wheels 1 & 4.

Arrows on arm 5 indicates turning direction of thumb wheels.

◀ "+" = Increase zero/span ▶ "-" = Decrease zero/span



Calibration procedure

1. Apply 0 % input signal (0% = 20 kPa, 3 psi)
2. Wait for steady state. It is important to wait for steady state, on very large actuators it can take minutes to establish.
3. Adjust zero by turning the silver (lower) thumb wheel 4 with finger or with screw driver 7 from the out side.
4. Apply 100% input signal (100% = 100 kPa, 15 psi)
5. Wait for steady state then memorize result.
6. Apply 0% input signal.
7. Adjust span if necessary. This is done by first loosening screw 2, then turning the yellow (upper) thumb wheel 1 " + " or " - " and finally tighten screw 2. Spring top must not be in contact with spring guide 3.
8. Check and adjust zero.
9. Repeat steps 2 to 8 until desired calibration is achieved.
10. Make sure cover 6 is properly installed.



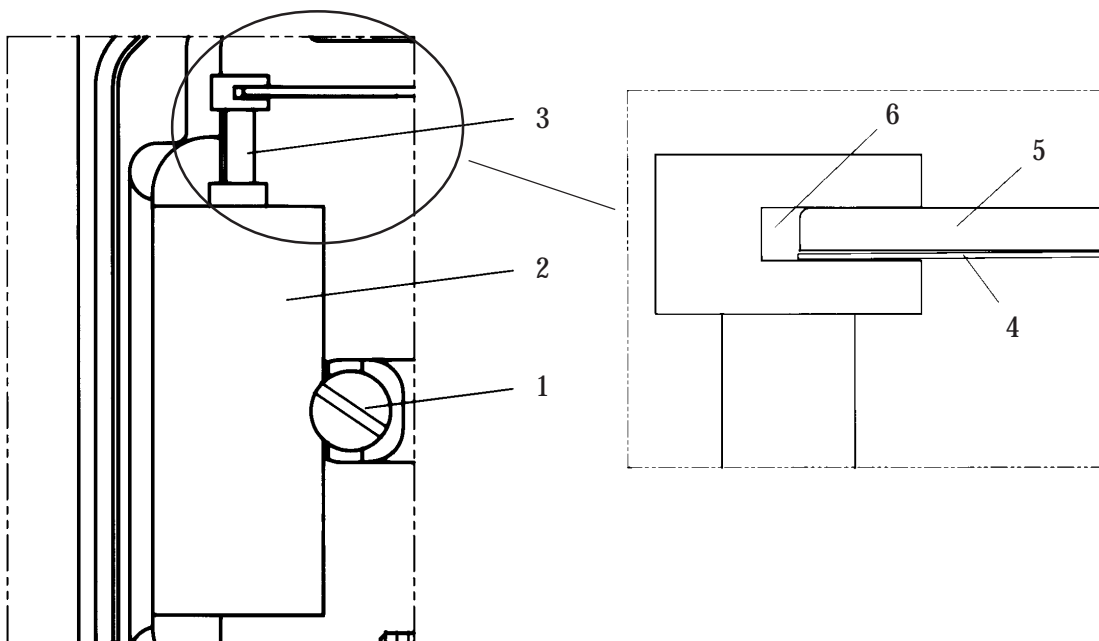
7. Maintenance

Pilot valve

To remove the pilot valve for cleaning or inspection, remove the screw 1 and carefully lift out the complete assembly 2. Gently remove the spool 3 from the block and clean the parts, using methylate cleaner or similar. Blow the parts dry with compressed air.

Should the parts show signs of wear, a new assembly is recommended. Mixing spool valves and valve bodies may result in very high bleed rates and poor performance. Check the O-rings, then secure and install the pilot valve assembly to the Positioner unit and secure it with the screw 1. Make sure that the leaf spring 4 on the balance arm 5 is properly fitted in the groove on the spool 6. Check again to insure smooth operation of the assembly.

To maintain original factory performance specifications, use only spool valve assemblies supplied from the factory.



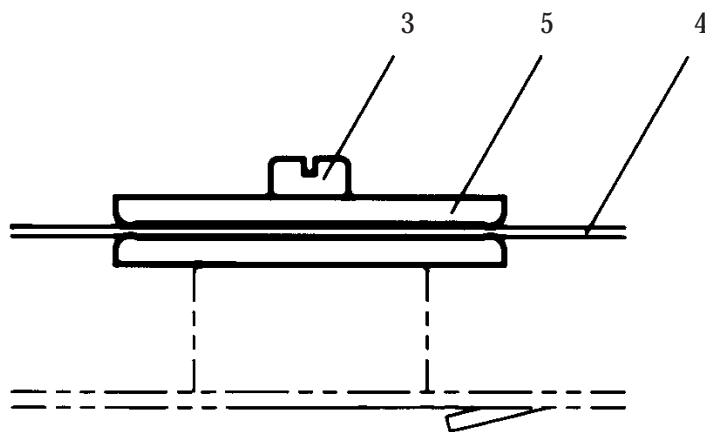
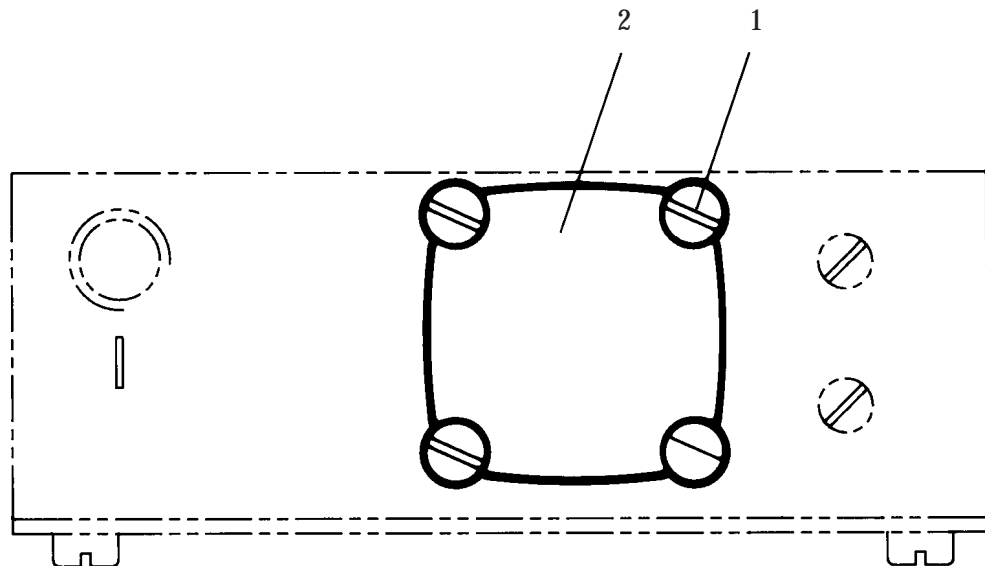
Diaphragm

Loosen screws 1 and remove the diaphragm cover 2. Loosen screw 3, diaphragm 4 and washers 5 can be removed. The diaphragm can after have being in use look wrinkled, this is fully normal due to the tension in it.

When installing the diaphragm make sure to place one washer on each side of the diaphragm.

Put some Loctite 577 on the thread, install the screw 3 and tighten.

Check the O-ring for the diaphragm cover 2, install the O-ring into the positioner housing, then install cover 2. Secure with screws 1. Torque shall be 4,5 Nm (40 in-lbs).

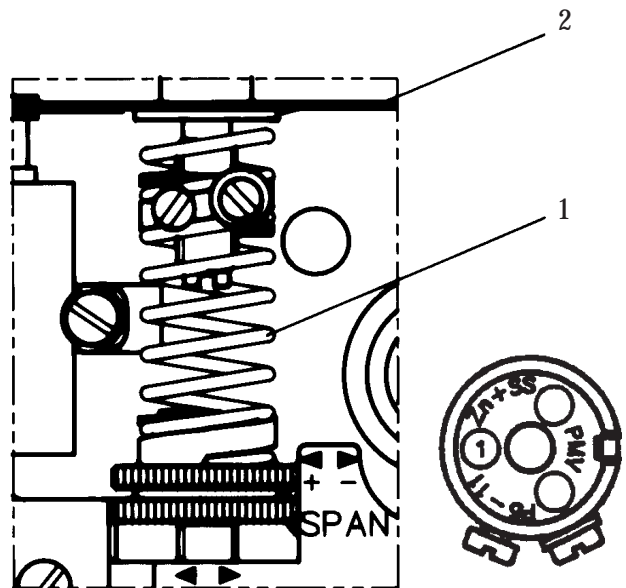


Feedback spring

Once the front cover and indicator are removed, the feedback spring can be easily accessed.

Hold the spring 1 from the top, pull down and out.

When installing, hold the assembly at the top, guide the lower part to position on the zero screw, then press down until it fits easily under the balance arm 2. Make sure that the assembly is aligned properly against the lower arm and the notch is engaged in the tab on the balance arm 2.



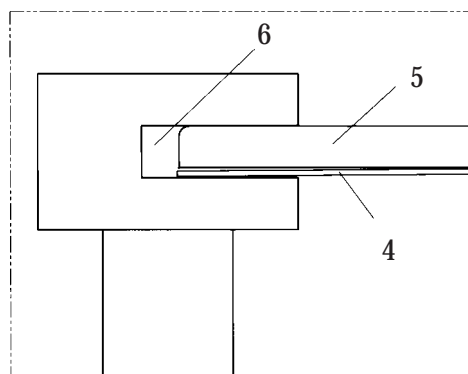
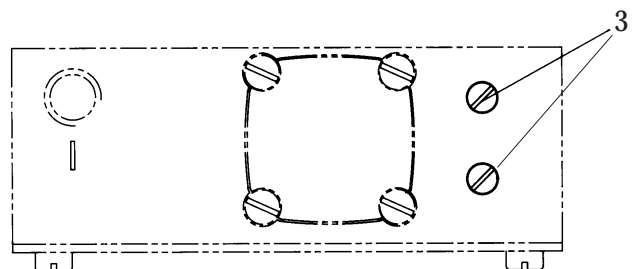
Balance arm

The balance arm can only be removed after diaphragm and feedback spring have been removed.

Loosen the screws 3 and the balance arm can be removed.

When installing the balance arm make sure that the leafspring 4 on the underside of the balance arm 5 is properly engaged into the groove 6 of the spool in the pilot valve.

Tighten the two screws 3 holding the balance arm to the positioner.



Lower arm

Once the front cover is removed, the lower arm can be easily accessed. Remove the indicator, feedback spring and the cam.

Loosen screw 2 and remove twist stop 1.

Remove screw 3, lower arm 4, rod 5 and spring 6.

Check rod and lower arm for wear, replace if necessary. Clean the rod and install it in the lower arm. The lower arm should move easily and smoothly.

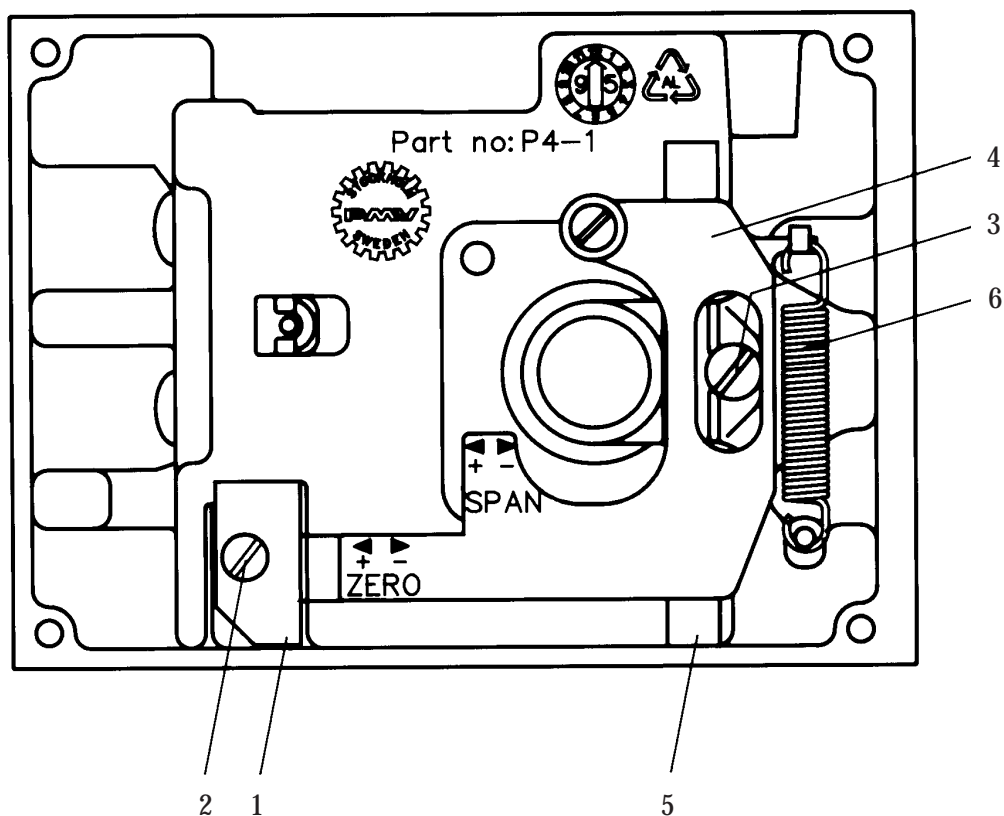
Install the lower arm and rod assembly into the positioner housing, making sure that the spring 6 is attached properly to the lower arm and positioner housing.

Secure the lower arm and rod assembly with the screw 3.

Check again that the lower arm moves smoothly.

Apply a small amount of grease or dry lubricant on the small tongue on the lower arm, then install and secure the twist stop.

Install cam, feedback spring, indicator and front cover.



O-rings

With time and use, O-rings can become brittle. This can cause poor operation and even failure of the positioner.

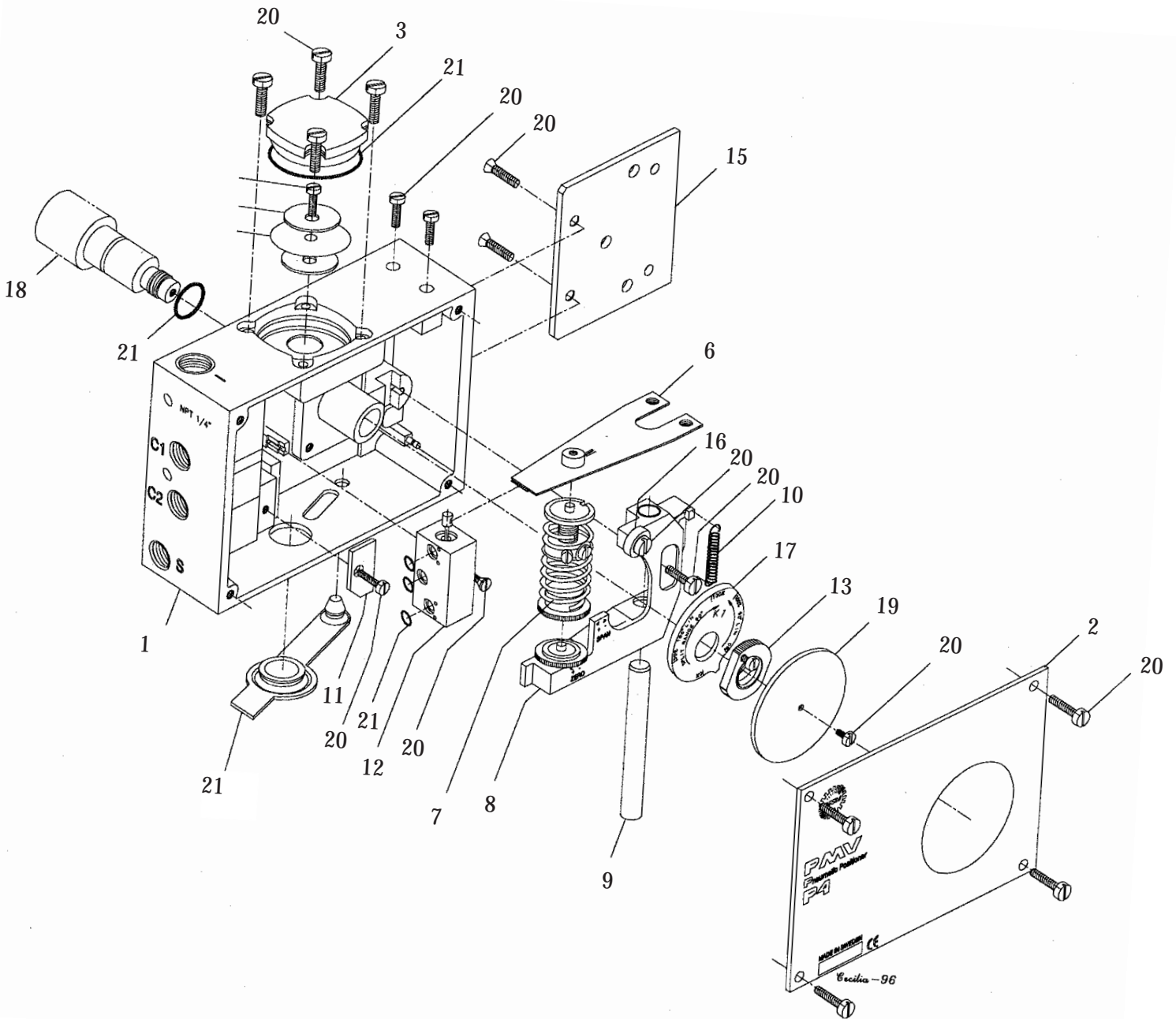
Always check O-rings when performing any work on the positioner and replace bad O-rings.

A thin layer of silicon grease applied on the NBR (Black) O-rings prolongs their life.



8. Exploded Drawing

96.1



9. Spare part list

96.1

DWG No	PMV Part no	Description	Qty	Set	Remarks
1.		Housing	1		N/A
2.	P4-xx	Front cover	1		
3.	P4-7	Diaphragm cover incl. O-ring	1		
4.	P5-8	Diaphragm	1		
5.	P5-9	Diaphragm washer	2		
6.	P5-10	Balance arm	1		
7.	P5-AS13/315	Feedback spring 3-15 Psi assembly	1		
7.	P5-AS13/630	Feedback spring 6-30 Psi assembly	1		(Green)
8.	P4-AS18	Lower arm assembly	1		
9.	P5-19	Rod	1		
10.	P5-20	Spring	1		
11.	P5-24	Twist stop	1		
12.	P4-AS25	Pilot valve incl. O-rings	1		
13.	P5-27	Cam locking nut incl. screw	1		
15.	P5-31	Mounting adapter incl. screws	1		
16.	P5-32	Ball bearing	1		
17.	P5-K1	Cam K1 90°/180° Linear 0-100%, split range 0-50-100%	1		
17.	P5-Kxx	Cam special, K2-K10 (ConsultPMV)	1		
18.	P4-Cxx	Spindle (Consult PMV)	1		
19.	12013	Indicator Arrow type	1		
20.	P4-SCREW	Screw set		Set	
21.	P4-SEAL NBR	Seal and O-ring set NBR, Nitrile rubber.		Set	(4, 21)



10. Trouble shooting

Note: All positioners are serialized. Please note down, and provide the serial number when contacting the factory for trouble shooting or service.

Signal change has no effect on the actuator position.

- Check indicator and screw.
- Check air supply to positioner and tubing to the actuator.
- Check input signal to positioner.
- Check diaphragm for damage or leakage.
- Check pilot valve function.
- Check cam for correct setting.

Signal change results in actuator running to end positions.

- Check coupling between positioner and actuator.
- Check cam position and locking screw.
- Check input signal.

Inaccurate positioning.

- Dirty or worn pilot valve.
- Defective or leaking diaphragm.
- Input signal fluctuates.
- Incorrect sizing of actuator.
- Valve/actuator "stiction".
- High valve/actuator breakaway torque.
- Loose cam.

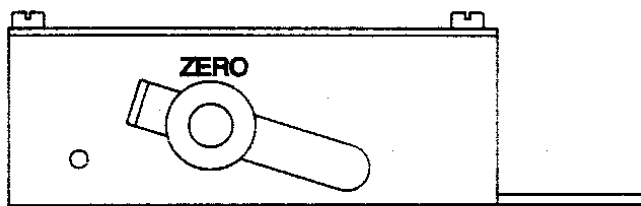
11. Technical Data

Input Signal	20-100 kPa/3-15 Psi (6-30 Psi optional)	
Linearity (%)*	0,7	
Hysteresis+deadband (%)*	0,8	
Repeatability (%)*	0,5	
Pressure gain at load 20% (%/%)	20 %/ % ISA 75.13 1989	
	(kPa/kPa)	300
Air consumption at supply pressure:		
0,6 MPa/87 Psi	8 nl/min	(0.31 SCFM)
Air delivery at supply pressure:		
0,2 MPa/29 Psi	140 nl/min	(5.46 SCFM)
0,4 MPa/58 Psi	245 nl/min	(9.55 SCFM)
0,6 MPa/87 Psi	350 nl/min	(13.65) SCFM
Supply Pressure	Max 1 MPa/150 Psi	
Temperature range	-20°C to +85°C (-4°F to 185°F)	
Connector threads	1/4" NPT	
Weight std.	0,9 kg/2 lbs	

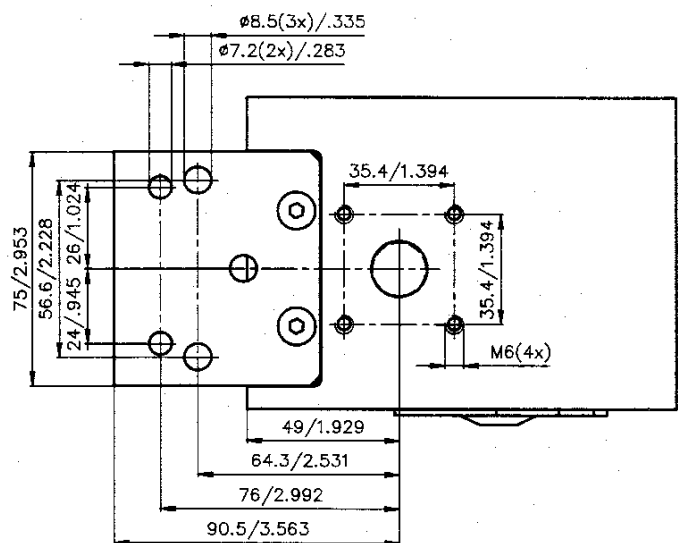
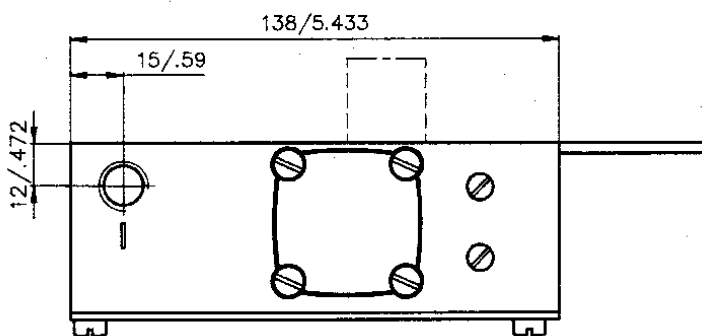
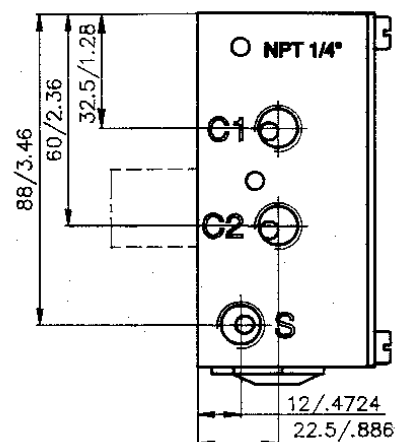
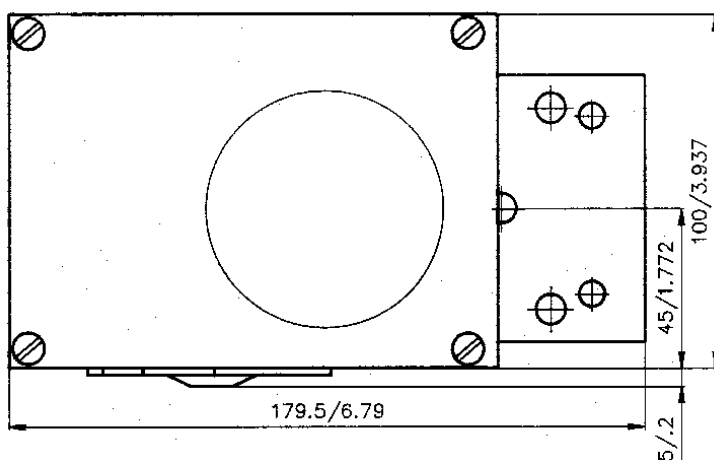
* % of full scale.



12. Dimensional drawing



For selection of the feedback-spindle pls see "Drive shaft dimension drawing" PMV P/N 12184.





Palmstiernas Instrument AB
Korta Gatan 9
SE-171 54 Solna
SWEDEN
Tel: +46 (0) 8 555 106 00
Fax: +46 (0) 8 555 106 01
E-mail: info@pmv.nu
Internet: www.pmv.nu



SUBSIDIARIES:

PMV Controls Ltd
Headlands Business Park
Ringwood
Hampshire BH24 3PB
ENGLAND
Tel: +44 (0) 1425 48 08 88
Fax: +44 (0) 1425 48 08 89
E-mail: sales@pmv-controls.ltd.uk
Internet: www.pmv-controls.ltd.uk

PMV GmbH
Postfach 2310
D-41554 Kaarst
GERMANY
Tel: +49 (0) 2131 667 081/82
Fax: +49 (0) 2131 667 083
E-mail: info@pmv-germany.de
Internet: www.pmv-germany.de

PMV-USA, Inc
1440 Lake Front Circle
Unit 160
The Woodlands, Texas 77380
USA
Tel: +1 281 292 7500
Fax: +1 281 292 7760
E-mail: pmvusa@pmvusa.com
Internet: www.pmvusa.com

Palmstiernas Svenska AB
Box 21
SE-663 21 Skoghall
SWEDEN
Tel: +46 (0) 54 52 14 70
Fax: +46 (0) 54 52 14 42
E-mail: info@palmstiernas.se
Internet: www.palmstiernas.se

(The information in this brochure is subject to change without notice.)

Distributor

(The information in this manual is subject to change without notice.)