P4 • P5/EP5

PMV Valve Control System

IOM Instructions
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Manufacturers declaration
in compliance with EC directive 89/392/EEC, annex IIB and 89/336/EEC.
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 and 89/336/EEC.
This manufacturers declaration is applicable to the following PMV-Positioner series:
P4, P5, EP5, F5.

D

Hersteller-Erkärung
im sinne der EG-richtlinie 89/392/EWG, Anhang IIB und 89/336/EWG.
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, sowie daß deren Inbetriebnahme so lange untersagt ist, bis festgestellt wurde, daß diese Maschine/Applikation ebenfalls der EG-Richtlinie 89/392/EWG und 89/336/EWG entspricht. Diese Herstellererklärung hat für folgende PMV-Stellungsregler-Serien Gültigkeit:
P4, P5, EP5, F5.

F

Déclaration de fabricant
au sens de la directive de la CE 89/392/CEE, annexe IIB et CE/89/336/CEE.
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 et CE/89/336/CEE.
Cette déclaration de fournisseur est valable pour les types d’appareils PMV suivants:
P4, P5, EP5, F5.

Mr. Roland Wedebrand
President, Palmstiernas Instrument AB
1. Introduction

P4
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.

ATEX: \(\text{II 2 G}\)

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 flat screw driver.

For installation of gauges T-connectors are required.
**P5**
The base unit of the system is the pneumatic positioner, used in either single or double acting applications. P5 comes standard with built in dampers, a high gain spool valve assembly, gauge ports and an O-ring sealed housing. The housing utilizes a unique O-ring seal that can be adjusted to a sealed or drained position.

The modular design concept allows for easy addition of accessories such as I/P converter and/or a feedback package, both which are isolated from the basic pneumatic unit. These accessories can be factory or field mounted.

Ease of calibration and maintenance are built into to the design with easily accessible span and zero adjustment, and very simple parts replacement.

ATEX: ☑ II 2 GD

**EP5**
The EP5 has same features and benefits as the P5 positioner. It’s modular to suit several applications.

General applications, intrinsically safe, explosion proof and fail freeze versions are offered.

Intrinsically Safe: ATEX: EEX ia IIC T4 ☑ II 1 GD
CSA, FM Class I, Div, Group ABCD

Explosion proof: ATEX: EEX d IIB+H₂, T4-T6 ☑ II 2 GD
CSA, FM Div I, Class 1,2 & 3 Group BCDEFG
2. Storage instructions

PMV Positioner and feedback module storage and handling procedures
PMV Positioners and feedback modules are precision instruments which should be stored and handled accordingly to avoid problems or damage.

Electropneumatic positioners/feedback modules contain electronic components which can be damaged by exposure to water. Appropriate precautions should be taken to protect units while in storage.

Warehouse storage
Stored in original PMV 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.

Feedback modules should have cover tightened and conduits entries sealed. Positioners/Feedback modules should be wrapped and sealed air and watertight with desiccant inside the plastic, units should be securely covered with an opaque cover and not exposed to direct sunlight, rain or snow.

Pneumatic positioners
Units should have all ports sealed and be protected from direct exposure to weather. For long term storage (>1 month) or overseas shipment units should be protected with plastic and desiccant.

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/feedback housing.
Dependent on the local temperature variations, humidity and dew points and time in storage condensation could occur and accumulate inside on the I/P Converter 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 you nearest PMV office.

Storage Seal (P5/EP5)
P5/EP5 is supplied with all enclosure entry points sealed. The seal is only a storage seal, not to be used as seal when P5/EP5 is in operation. If Storage Seal is removed or damaged, make sure all open enclosure entry points are proper resealed before further shipping or storage.

Use circular stickers marked I, S and OUT, supplied on Storage Seal or vapour proof tape.

**P5**
Remove Storage Seal from connection block, mount positioner on actuator/valve, make connections according to section 5, (Page 10). Calibrate span and Zero according to section 7, (Page 13).

Clean any oil/debris off the connecting block, then reseal open enclosure entry ports, use circular stickers marked I, S and OUT, supplied on Storage Seal or vapour proof tape.

**EP5**
Follow P5 instructions as above. Remove Storage Seal for conduit entry IE, connect input signal cable and install proper cable gland to secure the units sealing.
3. Function

The P4 and P5/EP5 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 feedback 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 feedback 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 and the OUT port. 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.
4. Installation

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.

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 P4/P5/EP5 as possible to ensure proper supply air quality.

Before making pneumatic connections to the positioner, it is recommended that the supply air lines are opened up and allowed to vent for 2-3 minutes to clear any debris from the line. It is further recommended that a large paper bag is used to collect any oil or humidity that may be present in the line during this purging, direct the air flow into the bag. Should excessive amounts of oil and/or humidity be present at this stage, a review of the pneumatic system should be carried out and the problem corrected.

**Poor air quality is one of the major causes of premature failure of pneumatic equipment.**

Installation

P4 and P5/EP5 mounts on to the actuator using either the ISO F05 holes 4 and a PMV ISO mounting kit or by using the optional mounting adaptor and screws 5 to mount P5 on to existing PMV mounting kits.

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.

**P5/EP5 only**

The spindle/positioner shaft assembly allows for quick and simple spindle changes. To ensure the proper connection, the spindle 3 has a spring clip 2 that must be properly installed. A solid ”click” should be felt when assembling the two pieces insuring that the two flats 1 are engaged into the positioner shaft groove.

The spindle can be removed, by inserting two screwdrivers under the two tapered surfaces of the spindle and bending carefully. When the spring clip releases the spindle will eject.
5. Connections

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

Gauge ports are for 1/8" G or NPT.

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

Electrical connection on I/P unit accepts 1/2" NPT or PG 13,5 (M20) cable gland.

**Port I**
- Input instrument pneumatic signal 20-100kPa (3-15 psi)

**Port S**
- Supply air, maximum 1 MPa (150 psi) Minimum 0,15 MPa (21 psi) for EP5

**Port C1, C2**
- Actuator connections (0,2-1 MPa). C2 opening port.
- For single acting operation plug port C1 for increasing signal to open valve. Plug C2 for decreasing (reverse) signal to open valve.

**OUT**
- Exhaust air port. **Do not block!** Exhaust filter optional.

**Port Ip**
- Gauge port for pneumatic input signal.

**Port I**
- Input electric signal (4-20 mA) (On the I/P unit.)

**Port P**
- Gauge port for I/P unit output pressure ( On the I/P unit)

Ports Ip, P, S, C1 and C2 are sealed with plugs. To install gauges, unscrew plugs and replace with gauges.

Port OUT is for venting the unit. All air from the positioner, actuator and I/P unit is vented to atmosphere through this port. **Do not block this port.** A high flow silencer or an exhaust pipe can be connected to this port to prevent foreign objects from entering and blocking the units exhaust. Connector in exhaust port must not have less than 9 mm (3/8") orifice.

When using gases other than air for supply — Please contact PMV.

On EP5 (P5 with I/P unit installed) I/P unit is supplied with air from port S. Port I is automatically sealed off and protected. No connection shall be made to this port. See pages 13 and 14 for more information.
**Direct function**

Air to open

**Reverse function**

Air to close

**Spring Return**

**Double acting**

**Signal/connection**

Spring return actuator

PLUG C1

PLUG C2

X = Port plugged
6. Cam adjustment

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 is 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. Install and adjust the indicator and reinstall cover.
7. Calibration

P4/P5/EP5 is when shipped from PMV pre-calibrated for 90 ±0,5 deg rotation, (can also be 30, 45 or 60 deg, see installed cam). For most applications the valve closed position is more critical than valve open position, most attention should be paid at valve closed position. Always start calibration procedure by applying 0 % input signal, then adjusting zero. P4/P5/EP5 is calibrated by turning thumb wheels 1 & 4.

Arrows on arm 5 indicate turning direction of thumb wheels.

< “+“ = Increase zero/span
> “–“ = Decrease zero/span

Calibration procedure
Check cam seating, section 6 before starting calibration procedure.

1. Apply 0 % input signal (0% = 20 kPa/3 psi or 4 mA)
2. Wait for steady state.
3. Adjust zero by turning the silver (lower) thumb wheel 4 with finger or with screw-driver 7 from the outside.
4. Apply 100% input signal (100% = 100 kPa/ 15 psi or 20 mA)
5. Wait for steady state then memorize result.
6. Apply 0% input signal.
7. Adjust span if necessary. This is done by first loosing 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 zero and adjust if needed.
9. Repeat steps 2 to 8 until desired calibration is achieved.
8. Indicator adjustment

**P5/EP5:** To adjust the indicator, take off front cover and pull the indicator upwards until it comes off the Allen screw.

Before installing the indicator make sure that the Allen screw is tightened. Press the indicator on the screw and adjust it by rotating clockwise to desired position.

**P4:** Loose screw, adjust indicator, tighten screw.

9. Front cover and indicator cover

The front cover of P5 is secured to the pneumatic unit with four captured screws and sealed with an O-ring 1. The O-ring can be looped over notches 2 in the front cover to allow for drainage. There are eight locations on the front cover where the O-ring can be looped. This O-ring system is common to the Pneumatic unit, I/P unit and Feedback unit in the PMV Valve Control System P5. This unique sealing system allows for complete sealing or draining of the units by changing the position of the O-ring.

The indicator cover 3 is O-ring sealed and secured by a bayonet coupling. The indicator cover is also used to secure the identification cover 4.

To remove the indicator cover turn it slightly counterclockwise until it loosens. Identification cover and O-ring 5 are now removable.

When installing indicator cover and identification cover make sure that the O-ring is properly engaged.
The standard built in dampers located on the connecting block provide a simple means of adjusting the actuator travel speed.

For maximum actuator travel speed dampers shall be adjusted to minimum damping position. (Fig).

**Double acting actuators** – adjust only OUTLET damper, set SUPPLY damper in minimum damping position.

**Single acting actuators** – adjust both dampers for desired operation.
WARNING! Units installed in hazardous areas must have proper approvals.

The I/P unit is mounted directly on top of the positioner unit. No external air supply is needed since the I/P unit is supplied with air from the positioner unit.

Port I on the positioner unit will be plugged when the I/P unit and the appropriate gauge block gasket installed. The I/P unit accepts a 4-20 mA input signal.

The I/P unit is equipped with a built-in 30 micron filter (Fig 4).

Caution: Do not operate the unit without filter and filterplug installed. Ensure that wiring between I/P and terminals are properly seated in rubber clamp.

Do not unscrew filterplug when the positioner is pressurized.

Span and Zero for the I/P converter is factory set and can not be adjusted.
12. How to mount the I/P Unit to the positioner unit (P5/EP5)

Switch off supply air and disconnect input signal – port I.

Loosen screws 3 and remove connection block 1, the gauge or plug from port Ip, the fitting from port I and existing gasket 4. Carefully install gasket 6 supplied together with I/P unit. When correctly installed port I will be blocked by the gasket.

Make sure that relief valve spring 5 is installed properly. Install the connection block 1 to the positioner unit 2.

Remove cover on I/P unit.

Install the I/P unit to the top of the Positioner unit, making sure that the four O-rings are present and properly seated. Tighten the unit with the three screws. (See fig. 1 and 2 page 16) Screw 1 first, screw 2 last.

WARNING! Units installed in hazardous areas must have proper approvals.

Connect input signal cable to port Ie and tighten the cable gland (see fig 5 on page 16). Adjust the O-ring on the I/P Unit housing to desired position - sealed or drained. (See fig 3 on page 16 or section 9 on page 14).

A gauge indicating output signal from the I/P converter can be installed in port P. Make sure that the filter plug is tightened before supply air is switched on (Fig 4 on page 16).
13. Maintenance

When upgrading electronically parts inside a PMV positioner approved for installation in Hazardous locations special procedures apply, permission from PMV is required prior to the start of work.

⚠️ Please contact your local PMV Sales office for information regarding proper procedures.

www.pmv.nu or info@pmv.nu

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. Install the spool into the pilot valve housing, place it on a flat surface, then lift it carefully in one end. Before reaching 20 deg angle the spool should slide by itself.

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 into positioner unit, press it towards the positioner housing wall and secure it with 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 by PMV.
Diaphragm
If P5 is equipped with I/P unit (EP5), the I/P unit must be removed to access the diaphragm. 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.

Make sure the diaphragm is centered.

Check the O-ring for the diaphragm cover 2, install the O-ring into the positioner housing, then install cover 2. Secure crosswise with screws 1, first turn loosely. 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 3 can only be removed after I/P unit, diaphragm and feedback spring have been removed. (See sections above and on page 16, 18 and 19).

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

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 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. On Q (red) O-rings, use a non silicon based grease.

Filter plug (EP5)
Caution! Do not operate the unit without filter and filter plug installed. Do not attempt to unscrew filter plug while positioner is pressurized.

EP5 is equipped with a built in secondary filter located on the side of the I/P unit.

For replacement or inspection, make sure that positioner unit is not pressurized, then unscrew filter plug 1. Remove filter 3 and install a new into the filter plug. Check condition of O-ring 2 and filter compartment. If moisture is found, check upstream filters/oil-water separators.

Moisture can cause I/P failure.

Reinstall filter plug.
14. Feedback unit (P5 or EP5)

See feedback module instructions for connections and calibration.

The P5 or EP5, Valve Control System, can easily be equipped with a Feedback unit, model F5. This unit will mount directly on top of the Pneumatic positioner replacing the positioner front cover. The O-ring located on the bottom of the Feedback unit, F5, will provide the same sealing or draining capabilities as the front cover. The indicator and front cover from the positioner unit can then be installed on to the Feedback unit.

**WARNING! Units installed in hazardous locations must have proper approvals.**

Installing the feedback unit.
— Remove the front cover, indicator, and Allen head screw from the top of the positioner spindle.
— Install the drive coupling and adjust the O-ring seal on the bottom in either sealed or draining position. (See section 6, page 10).
— Install the Feedback unit on top of the Positioner unit, making sure the coupling is properly engaged before tightening the four screws.
— Make electrical connections and tighten cable glands. (See F5 manual for details).
— Adjust cams and/or potentiometer to desired position.
— Install the indicator and front cover.
15. Trouble shooting

Note: All PMV-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.
— Check I/P output

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.
## 16. Technical data

### P4

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Input Signal</td>
<td>20-100 kPa/3-15 psi (6-30 psi optional)</td>
</tr>
<tr>
<td>Linearity (%)*</td>
<td>0.7</td>
</tr>
<tr>
<td>Hysteresis+deadband (%)*</td>
<td>0.8</td>
</tr>
<tr>
<td>Repeatability (%)*</td>
<td>0.5</td>
</tr>
<tr>
<td>Pressure gain at load 20% (%/%)</td>
<td>20 %/% ISA 75.13 1989</td>
</tr>
<tr>
<td></td>
<td>(kPa/kPa) 300</td>
</tr>
<tr>
<td>Air consumption at supply pressure:</td>
<td></td>
</tr>
<tr>
<td>0.6 MPa/87 psi</td>
<td>8 nl/min (0.31 SCFM)</td>
</tr>
<tr>
<td>Air delivery at supply pressure:</td>
<td></td>
</tr>
<tr>
<td>0.2 MPa/29 psi</td>
<td>140 nl/min (5.46 SCFM)</td>
</tr>
<tr>
<td>0.4 MPa/58 psi</td>
<td>245 nl/min (9.55 SCFM)</td>
</tr>
<tr>
<td>0.6 MPa/87 psi</td>
<td>350 nl/min (13.65) SCFM</td>
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<tr>
<td>Supply Pressure</td>
<td>Max 1 MPa/150 psi</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20°C to +85°C (-4°F to 185°F)</td>
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<tr>
<td>Connector threads</td>
<td>1/4&quot; NPT</td>
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<tr>
<td>Weight std.</td>
<td>0.9 kg/2 lbs</td>
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</table>

* % of full scale.
P5

<table>
<thead>
<tr>
<th>Input Signal</th>
<th>20-100 kPa/3-15 Psi (6-30 optional)</th>
<th>4-20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>≤ 0,5%*</td>
<td>≤ 0,5%*</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ 0,75%*</td>
<td>≤ 0,5%*</td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ 0,5%*</td>
<td>≤ 0,5%*</td>
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<tr>
<td>Gain</td>
<td>(pressure 600 kPa/87 Psi)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 000 (kPa/kPa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min 66%/% ISA S75.13</td>
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Air consumption at Supply pressure:

<table>
<thead>
<tr>
<th>Supply Pressure</th>
<th>0,2 MPa/29 Psi</th>
<th>0,4 MPa/58 Psi</th>
<th>0,6 MPa/87 Psi</th>
<th>0,8 MPa/116 Psi</th>
<th>1 MPa/145 Psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5,4 nl/min 0.19 SCFM</td>
<td>12,3 nl/min 0.43 SCFM</td>
<td>20 nl/min 0.71 SCFM</td>
<td>27,8 nl/min 0.98 SCFM</td>
<td>35,7 nl/min 1.26 SCFM</td>
</tr>
<tr>
<td></td>
<td>6,1 nl/min 0.22 SCFM</td>
<td>13,6 nl/min 0.48 SCFM</td>
<td>22 nl/min 0.78 SCFM</td>
<td>30,5 nl/min 1.08 SCFM</td>
<td>39 nl/min 1.38 SCFM</td>
</tr>
</tbody>
</table>

Air delivery at Supply Pressure:

<table>
<thead>
<tr>
<th>Supply Pressure</th>
<th>0,2 MPa/29 Psi</th>
<th>0,4 MPa/58 Psi</th>
<th>0,6 MPa/87 Psi</th>
<th>0,8 MPa/116 Psi</th>
<th>1 MPa/145 Psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200 nl/min 6.9 SCFM</td>
<td>370 nl/min 12.8 SCFM</td>
<td>540 nl/min 18.8 SCFM</td>
<td>710 nl/min 24.7 SCFM</td>
<td>880 nl/min 30.6 SCFM</td>
</tr>
</tbody>
</table>

Temperature range: -20°C to +85°C (-4°F to 185°F)

Connector threads: 1/4” NPT or G

Gauge threads: 1/8” NPT or G

Weight std.: 1,1 kg/2.4 lbs 1,5 kg/3.4 lbs

Weight with gauges: 1,3 kg/2.9 lbs 1,8 kg/3.9 lbs

Ingress protection: IP 66/NEMA 4

* Per cent of full scale.

(The information in this manual is subject to change without notice.)
For selection of the feedback-spindle pin see "Drive shaft dimension drawing"
17. Spare parts
<table>
<thead>
<tr>
<th>No</th>
<th>Part no</th>
<th>Qty</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>P4-xx</td>
<td>1</td>
<td>Housing 1 N/A</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>P4-7</td>
<td>1</td>
<td>Front cover</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>P5-8</td>
<td>1</td>
<td>Diaphragm cover incl. O-ring</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>P5-9</td>
<td>2</td>
<td>Diaphragm washer</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>P5-10</td>
<td>1</td>
<td>Balance arm</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>P5-AS13/315</td>
<td>1</td>
<td>Feedback spring 3-15 Psi assembly</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>P5-AS13/630</td>
<td>1</td>
<td>Feedback spring 6-30 Psi assembly (Green)</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>P4-AS18</td>
<td>1</td>
<td>Lower arm assembly</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>P5-19</td>
<td>1</td>
<td>Rod</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>P5-20</td>
<td>1</td>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>P5-24</td>
<td>1</td>
<td>Twist stop</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>P4-AS25</td>
<td>1</td>
<td>Pilot valve incl. O-rings</td>
<td></td>
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<tr>
<td>13.</td>
<td>P5-27</td>
<td>1</td>
<td>Cam locking nut incl. screw</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>P5-31</td>
<td>1</td>
<td>Mounting adapter incl. screws</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>P5-32</td>
<td>1</td>
<td>Ball bearing</td>
<td></td>
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<tr>
<td>16.</td>
<td>P5-K1</td>
<td>1</td>
<td>Cam K1 90°/180° Linear 0-100%, split range 0-50-100% 1</td>
<td></td>
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<tr>
<td>17.</td>
<td>P5-Kxx</td>
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<td>Cam special, K2-K10 (ConsultPMV)</td>
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<tr>
<td>18.</td>
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<td>Cxx Spindle (Consult PMV)</td>
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</tr>
<tr>
<td>19.</td>
<td>12013</td>
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<tr>
<td>20.</td>
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<td>Screw set Set</td>
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<tr>
<td>21.</td>
<td>P4-SEAL NBR</td>
<td>1</td>
<td>Seal and O-ring set NBR, Nitrile rubber. Set (4, 21)</td>
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</table>
Spare parts, P5/EP5
<table>
<thead>
<tr>
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<th>Part no</th>
<th>Qty</th>
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<tr>
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<td>P5-2</td>
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<td>Housing</td>
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<td>P5-AS3N</td>
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<td>Front Cover incl. O-ring</td>
</tr>
<tr>
<td>3</td>
<td>P5-AS3G</td>
<td>1</td>
<td>Connecting block NPT 1/4&quot; assembly</td>
</tr>
<tr>
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<td>P5-4</td>
<td>1</td>
<td>Connecting block G 1/4&quot; assembly</td>
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<td>P5-6P</td>
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<td>1</td>
<td>Gasket for EP5</td>
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<td>P5-8</td>
<td>1</td>
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<td>P5-10</td>
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<td>Balance arm</td>
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<td>Feedback spring 3-15 psi assembly</td>
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<td>Feedback spring 6-30 psi assembly</td>
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<tr>
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<td>P5-18</td>
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<td>Lower arm assembly</td>
</tr>
<tr>
<td>19</td>
<td>P5-19</td>
<td>1</td>
<td>Rod</td>
</tr>
<tr>
<td>20</td>
<td>P5-20</td>
<td>1</td>
<td>Spring</td>
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<tr>
<td>21</td>
<td>P5-21A</td>
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<td>Indicator Arrow</td>
</tr>
<tr>
<td>21</td>
<td>P5-21F</td>
<td>1</td>
<td>Indicator Flag</td>
</tr>
<tr>
<td>21</td>
<td>P5-21P</td>
<td>1</td>
<td>Indicator Pointer</td>
</tr>
<tr>
<td>22</td>
<td>P5-22T</td>
<td>1</td>
<td>Indicator cover Transparent incl. O-ring</td>
</tr>
<tr>
<td>22</td>
<td>P5-22F</td>
<td>1</td>
<td>Indicator cover Flag incl. O-ring</td>
</tr>
<tr>
<td>22</td>
<td>P5-22B</td>
<td>1</td>
<td>Indicator cover Blind incl. O-ring</td>
</tr>
<tr>
<td>24</td>
<td>P5-24</td>
<td>1</td>
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</tr>
<tr>
<td>25</td>
<td>P5-25</td>
<td>1</td>
<td>Pilot valve incl. O-rings</td>
</tr>
<tr>
<td>26</td>
<td>P5-26</td>
<td>1</td>
<td>Shaft incl. O-rings, screw</td>
</tr>
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<td>1</td>
<td>Cam locking nut incl. screw</td>
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<tr>
<td>29</td>
<td>P5-29</td>
<td>1</td>
<td>Zero cover</td>
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<td>P5-30</td>
<td>1</td>
<td>Cover</td>
</tr>
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<td>31</td>
<td>P5-31</td>
<td>1</td>
<td>Mounting adapter, incl screws</td>
</tr>
<tr>
<td>32</td>
<td>P5-32</td>
<td>1</td>
<td>Ball bearing</td>
</tr>
<tr>
<td>35</td>
<td>P5-xx/xx</td>
<td>1</td>
<td>Identification cover</td>
</tr>
<tr>
<td>36</td>
<td>12047N</td>
<td>4</td>
<td>Plug NPT 1/8&quot;</td>
</tr>
<tr>
<td>36</td>
<td>12047G</td>
<td>4</td>
<td>Plug 1/8&quot; G</td>
</tr>
<tr>
<td>37</td>
<td>P5-Kxx</td>
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<td>Cam</td>
</tr>
<tr>
<td>38-45, 75-80</td>
<td>P5-Screws</td>
<td>1</td>
<td>Screw set P5/EP5</td>
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<tr>
<td>81-83, 6, 67, 70</td>
<td>P5-Seal Q</td>
<td>1</td>
<td>Nitrile, NBR</td>
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<tr>
<td>81-83, 6, 67, 70</td>
<td>P5-Sxx</td>
<td>1</td>
<td>Silicone, Q</td>
</tr>
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<td>54</td>
<td>P5-Sxx</td>
<td>1</td>
<td>Spindle adaptor</td>
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</tbody>
</table>
Spare parts, P5/EP5
<table>
<thead>
<tr>
<th>Pos</th>
<th>Part no</th>
<th>Qty</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>61</td>
<td>E5-2</td>
<td>1</td>
<td>I/P box</td>
</tr>
<tr>
<td>62</td>
<td>E5-AS3N</td>
<td>1</td>
<td>I/P cover incl. screws</td>
</tr>
<tr>
<td>63</td>
<td>E5-AS3G</td>
<td>1</td>
<td>I/P nose NPT 1/4&quot; assembly</td>
</tr>
<tr>
<td>64</td>
<td>P5-4</td>
<td>1</td>
<td>Relief valve spring</td>
</tr>
<tr>
<td>65</td>
<td>E5-5</td>
<td>1</td>
<td>Filter plug incl. Filter 66, O-ring, 81</td>
</tr>
<tr>
<td>66</td>
<td>E5-6</td>
<td>1</td>
<td>Filters (5 per package)</td>
</tr>
<tr>
<td>67</td>
<td>E5-7</td>
<td>1</td>
<td>Gasket I/P</td>
</tr>
<tr>
<td>71</td>
<td>E5-STD</td>
<td>1</td>
<td>I/P converter</td>
</tr>
<tr>
<td>73</td>
<td>E5 N-AS 11</td>
<td>1</td>
<td>Mounting bracket Round I/P</td>
</tr>
<tr>
<td></td>
<td>E5 G-AS 11</td>
<td></td>
<td>incl. screws, O-rings, I/P Nose</td>
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<tr>
<td>74</td>
<td>FU-STD</td>
<td>1</td>
<td>Enclosure incl. I/P converter Std.</td>
</tr>
<tr>
<td>74</td>
<td>E5-EX/EU</td>
<td>1</td>
<td>Enclosure incl. I/P converter, flameproof Cenelec</td>
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<tr>
<td>74</td>
<td>E5-EX/US</td>
<td>1</td>
<td>Enclosure incl. I/P converter,</td>
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<td></td>
<td></td>
<td>Explosionproof FM, CSA</td>
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<tr>
<td>84</td>
<td>E5-FS</td>
<td>1</td>
<td>I/P converter fail in last position incl. bracket</td>
</tr>
</tbody>
</table>
Translation

EC-Type Examination Certificate

- Directive 94/9/EC -
  Equipment and protective systems intended for use
  in potentially explosive atmospheres

DMT 02 ATEX E 121 X

1. General and Type

2. Description

3. Technical data

4. Thermal data

5. Special conditions for use

6. Test and assessment report

7. Appendix to

EC-Type Examination Certificate

DMT 02 ATEX E 121 X

Deutsche Monat Technologie GmbH

Sign. Eckhoff
Head of special services unit

III 2 G Ex d IIC T4/T5/T6

ABB Automation Products GmbH

18. Certificates
Cenelec Atex, black label

3.3.1 Ventail with intrinsically safe control unit shall not be used if instead of each unit, any units have been used in type of protection gas-proof enclosure from a non-intrinsically safe supply.

We confirm the correctness of the translation from the German original. In the case of arbitration only the German wording shall be valid and binding.

4267 Essen, 20. June 2002
BVS-Wz/5 A 20107772
Deutsche Maschinen Verifikations GmbH

[Signatures]

[Signatures]
[1] EC-TYPE EXAMINATION CERTIFICATE


Directive 94/9/EC

[3] EC-Type Examination Certificate Number: Nemko 03ATEX112X


[6] Address: Karla gatan 9
S-47154 Solna
Sweden

[7] This equipment or protective system and any acceptable variation thereof is specified in the schedule to this certificate and the documents therein referred to.

[8] Nemko AS, notified body number 0469, in accordance with Article 9 of Council Directive 94/9/EC of 23 March 1994, certifies that the equipment or protective system has been found to comply with the Essential Health and Safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in certificate no. 200309116.

[9] Certification with the Essential Health and Safety Requirements has been assured by compliance with:

EN 61721:1997
EN 60436:1-2002

[10] If the sign "CEx" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for use as specified in the schedule to this certificate.

[11] This EC-TYPE EXAMINATION CERTIFICATE relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC.

Further requirements of the Directive apply to the manufacturing processes and supply of this equipment or protective system. These are not covered by this certificate.

[12] The marking of the equipment or protective system shall include the following:

CEx II 1 GD

Oslo, 2003-04-30
Nemko

Rolf Beil

Certification Department

[13] Schedule

[14] EC-TYPE EXAMINATION CERTIFICATE No Nemko 03ATEX112X

[15] Description of Equipment or Protective System

The PS is a pneumatically operated valve positioner, used in either single or double acting applications. The enclosure is made of aluminium and there is circular flat or dome shaped plastic window for position indicator on the front cover.

Type Designation
P9

Data
Max Supply Pressure: 15 bar (150 PSI)
Ingress Protection Code
IP 66 according to IEC 60529
Type BX according to EN 60730

[16] Report No: 200309116

[17] Special Conditions for Safe Use

1. The enclosure is made of aluminium and impact or friction caused by external objects shall be avoided in the application.
2. Bending of the windows with dry fingers shall be avoided when the positioner is used in an IEC atmosphere in order to avoid (potentially) explosive dust discharge.
3. The ambient temperature range for the positioner is -20°C +55°C.

[18] Essential Health and Safety Requirements

See Item 9

This certificate may only be reproduced in its entirety and without any changes, schedules included.
Cenelec Atex, white label
WARNING!
Installation of any hazardous area equipment should be made in accordance with hazardous area installation codes and also of course to the installation to the installation and operating instructions provided. The manufacturer cannot be held responsible for incorrect installation or any customer modifications to, or repair of, a certified instrument as this may invalidate the certified design. If a certified instrument should fail, no attempt should be made by the user to effect repair. The unit should be returned to the factory.

HAZARDOUS AREA VERSIONS
The instrument is available in versions suitable for use in hazardous areas. The hazardous area versions carry information on their certification on a special label. This gives an indication to the correct areas of use.

WARNING!
Installation of any hazardous area equipment should be made in accordance with hazardous area installation codes and also of course to the installation to the installation and operating instructions provided. The manufacturer cannot be held responsible for incorrect installation or any customer modifications to, or repair of, a certified instrument as this may invalidate the certified design. If a certified instrument should fail, no attempt should be made by the user to effect repair. The unit should be returned to the factory.

FM APPROVED VERSION
Intrinsically Safe Approval for
Class I, Division 1, Groups A B C D hazardous locations with a temperature classification of.

T4 ambient 40°C
T3B ambient 70°C
T3A ambient 85°C
T6 ambient 55°C

These units must be installed in accordance with:

a) The National Electrical Code (ANSI/NFPA 70) and ANSI/ISA RP 12.6, "Installation of Intrinsically Safe Instrument Systems in Class 1 Hazardous (Classified) Locations*.

b) The installation drawing 96-114.

c) The Installation and Operating Instructions provided with each unit.

d) The I/P shall be installed in a properly grounded metal enclosure.

WARNING!
These instruments must be installed in accordance with local and national codes of practice, especially for hazardous area installations. The instruments are fully isolated from ground and therefore grounding is unnecessary for functional purposes. However, grounding may be necessary to conform to installation codes.

CE APPROVED VERSION
Intrinsically Safe Approval for
Class I, Groups A, B, C and D with a temperature classification of.

T4A at 85°C
T6 at 55°C

The unit must be installed according to drawing 96-111.

Division 2 Approval for
Class I, Division 2, Groups A, B, C and D

These devices are certified as components for use in a suitable enclosure subject to the acceptance of CSA or the Inspection authority having jurisdiction.

CE APPROVED VERSION
Intrinsically Safe Approval as
E Ex ia IIC T4 at 80°C
T6 at 55°C

Certificate number Ex96D2004X
Ambient -40°C to 80°C (except for T6)

The following table applies for Is input currents and ambient temperatures

<table>
<thead>
<tr>
<th>Current Is mA</th>
<th>Maximum Ambient Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>T4 80 T5 80 T6 53</td>
</tr>
<tr>
<td>60</td>
<td>T4 80 T5 80 T6 47</td>
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<td>100</td>
<td>T4 80 T5 75 T6 57</td>
</tr>
<tr>
<td>120</td>
<td>T4 80 T5 75 T6 57</td>
</tr>
<tr>
<td>150</td>
<td>T4 80 T5 75 T6 57</td>
</tr>
</tbody>
</table>

The unit must be installed alone in a metallic enclosure with
1) a magnesium content of less than 6% by weight.
2) a minimum IP rating of IP20

The distance from the terminals to any earthed metal must be greater than 3mm and the circuit must be capable of withstanding a voltage of 500 Vrms to case or earth for one minute.

The unit must be installed according to drawing 96-108.
FOR E5-IS/US WITH T CODE

T4 at 40°C
T3B at 70°C
T3A at 85°C

Vmax = 30V dc
Imax = 96mA
Cl = 0 μF
L1 = 3.7mH

T6 at 55°C
Vmax = 28V dc
IImax = 46.7mA
Cl = 0 μF
L1 = 3.7mH

NOTES

1. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE
CAPABLE OF WITHSTANDING AN A.C. TEST VOLTAGE OF 500
VOLTS RMS TO EARTH OR FRAME OF THE APPARATUS FOR
1 MINUTE.

2. CABLE CAPACITANCE AND INDUCTANCE PLUS THE I.S. APPARATUS
UNPROTECTED CAPACITANCE (Cl) AND INDUCTANCE (L1) MUST NOT
EXCEED THE ALLOWED CAPACITANCE (Co) AND INDUCTANCE (Lo)
INDICATED ON THE ASSOCIATED APPARATUS.

3. ANY POSITIVE POLARITY SAFETY BARRIER
APPROVED BY FMRC FOR GROUPS A,B,C AND D
WHOSE OUTPUT PARAMETERS ARE:

FOR E5-IS/US WITH T CODE

T4 at 40°C
T3B at 70°C
T3A at 85°C

Voc or Vi ≥ 12V and ≤ 30V
Isc or I ≤ 96mA
Pmax ≤ 0.8W
eps. MTL 728
P & F 2428/Ex

T6 at 55°C

Voc or Vi ≥ 12V and ≤ 28V
Isc or I ≤ 46.7mA
Pmax ≤ 0.33W

THE OUTPUT CURRENT MUST BE LIMITED BY A RESISTOR R
SUCH THAT R ≥ Voc / Isc

4. THE INSTALLATION INCLUDING THE BARRIER EARTHING ARRANGEMENTS
MUST COMPLY WITH THE INSTALLATION REQUIREMENTS OF THE COUNTRY
OF USE, e.g. IEC/IEC 1/2:6 (INSTALLATION OF INTRINSICALLY SAFE
SYSTEMS FOR HAZARDOUS CLASSIFIED LOCATIONS) AND THE NATIONAL ELECTRICAL CODE.
INSTALLATION MUST BE IN ACCORDANCE WITH THE MANUFACTURER'S GUIDELINES.
HAZARDOUS LOCATION

CLASS I, DIVISION 1 GROUPS A, B, C AND D

NON-HAZARDOUS LOCATION

SAFETY BARRIER
SEE NOTE 1.

ES-15/US
CURRENT TO
PRESSURE
CONVERTER

SEE NOTE 2

OPTIONAL SCREEN

I.S. SAFETY EARTH

I.S. SAFETY EARTH

TEMPERATURE

<table>
<thead>
<tr>
<th>CODE</th>
<th>AMBIENT</th>
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<td>85°C</td>
</tr>
<tr>
<td>T6</td>
<td>55°C</td>
</tr>
</tbody>
</table>

NOTES

1. ANY POSITIVE POLARITY SAFETY BARRIER
   APPROVED BY C.S.A. FOR GROUPS A, B, C AND D
   WHOSE OUTPUT PARAMETERS ARE :-
   28V (max)
   300 Ohms (min)
   eg. MTL 728 +
   P & F 2428 / Ex

2. THE INSTALLATION INCLUDING THE BARRIER EARTHING ARRANGEMENTS
   MUST COMPLY WITH THE CANADIAN ELECTRICAL CODE PART I

3. THE DEVICE IS ALSO SUITABLE FOR CLASS II, GROUPS E, F, G, & CLASS III
   HAZARDOUS LOCATIONS WHEN INSTALLED IN A SUITABLE DUST EXCLUDING ENCLOSURE.

4. SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY & DIV 2 SUITABILITY.

5. THE TYPE ES-15/US TERMINALS WHEN
   SUPPLIED AS FLYING LEADS MUST BE
   SUITABLY SECURED TO AN ENCLOSURE
   WITH AN APPROPRIATE FASTENER.

C.S.A.
CERTIFIED PRODUCT
No modifications are permitted without reference to C.S.A.