



USER INSTRUCTIONS

PMV PS/PM Ultraswitch™
Switchbox

Installation
Operation
Maintenance

FCD PMENIM0008-02 - 08/14



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1. GENERAL INFORMATION

PSPM Ultraswitch™ enclosures provide local and remote position indication for automated valves. They generally feature a visual black/yellow or red/green indicator for intuitive local position determination. The PSPM Ultraswitch™ is available with a number of limit switch options for remote indication, in a variety of electrical applications. They may also be used as a junction box for direct installation of solenoid valves.

2. SAFETY INSTRUCTION

Read the safety instructions in this manual carefully before using the product. If any questions arise during installation, contact supplier/sales office before continue working.

This equipment is suitable for use in class (as applicable), division 2, groups (as applicable) or non-hazardous locations only.

3. UNPACKING

Report transport damage to the carrier immediately. In case of discrepancies - contact your nearest FLOWSERVE location.



- Substitution of components may impair suitability for Div. 2 locations.
- Inspect periodically for degradation. Replace parts if degradation is found.
- Cleaning this housing by rubbing should be done in a non-hazardous area.
- Potential electrostatic charging hazard, clean only with a damp cloth – danger of propagating discharge.
- All grounding and bonding installation requirements must be addressed.
- Pay attention to personal protection, (clothing, glasses, gloves) when performing installation or service.
- Use only Flowserve original spare parts not to invalidate certification.
- All installation, inspection, and maintenance of the equipment should be performed by suitably trained personnel. In addition, for ATEX, all installation, inspection, maintenance and repair must be done by suitably trained personnel. For more information refer to EN 60079-14:1997, EN 60079-17, EN 60079-18, EN 60079-19.
- For ATEX Ex e mb certified units the unit must also be placed in an area where it is low risk of mechanical danger.
- Do not disconnect equipment unless area is known to be non-hazardous.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

4. CERTIFICATES

ATEX II 1G Ex ia IIC T4/T5/T6
 IEC Ex ia IIC T4/T5/T6
 ATEX II 2 G Ex e mb IIC T6
 cFMus IS Class I,II,III Division 1 Group A,B,C,D,E,F,G
 cFMus NI Class I Division 2 Group A,B,C,D; Class II Division 2 Group E,F,G; Class III Division 1&2
 cCSAus Class I, Division 1 Groups A,B,C,D; Class II Division 1 Groups E,F,G; Class III
 cCSAus Class I, Division 2, Groups A,B,C,D; Class II, Division 2, Groups E,F,G; Class III

All certificates available for download at www.pmv.nu

5. SPECIFICATIONS

5.1 Technical data

Ingress protection IP66 & Type 4x Weight 1 kg / 2.2 lbs

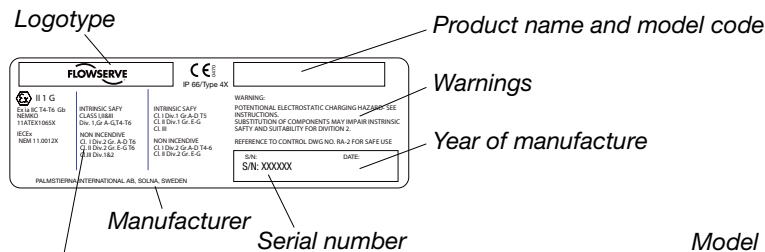
5.2 Materials of construction

| | |
|-------------------------|--|
| Part | Material |
| Housing/Cover | PA6/PA66 Nylon 25% - 33% Glass Filled Engineered Resin |
| Shaft | Stainless Steel |
| Cams/Splines | Nylon |
| Terminal Block | Nylon – Buchanan TBS Series |
| Internal Brackets | Stainless Steel or Plated Steel |
| All Internal Fasteners | Stainless Steel or Plated Steel |
| All External Fasteners | Stainless Steel |
| All Molded in Fasteners | Anodized Aluminum |
| UltraDome™ | Polycarbonate |
| Rotor | Polycarbonate |

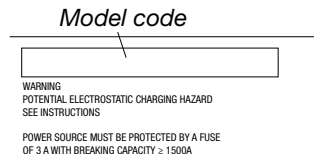


*If the equipment is likely to come in contact with aggressive substances, it is the responsibility of the user to take suitable precautions to prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

5.3 Type sign



Type sign for ATEX Ex e mb



5.4 PS/PM UltraSwitch™ nomenclature

| | | |
|-------------------------------------|---------|---|
| A. Brand sticker | P | PMV |
| B. Shaft | N | NAMUR VDI/VDE 3845 |
| | D | Double D 1/4" |
| C. Connections (cable entry) | PS | Engineered Resin Housing 1/2 NPT |
| | PM | Engineered Resin Housing M20x1,5 |
| | PN | Engineered Resin Housing 3/4 NPT |
| | PG | Engineered Resin Housing M25x1,5 |
| D. Number of cable entries | 1 | 1 conduit |
| | 2 | 2 conduits |
| | 3 | 3 conduits |
| E. Indicator option | 1 | Flat cover without indicator |
| | U | Standard UltraDome™ red/green |
| | C | 90 deg 3-way UltraDome™ |
| | D | 180 deg 3-way UltraDome™ |
| | E | 180 deg 3-way Centre-blocked UltraDome™ |
| | F | 120 deg Thru/Divert UltraDome™ |
| | H | Black/Yellow UltraDome™ |
| | K | Ektar UltraDome™ (red/green) |
| | R | Reverse UltraDome™ (red=open / green=closed) |
| | X | 180 deg 3-way UltraDome™ (white/blue) |
| F. Switch quantity | 0 | No Switches |
| | 2 | 2 Switches |
| | 4 | 4 Switches |
| G. Switch options | options | See page with switch options |
| H. Certificate | 14 | General Purpose |
| | 15 | ATEX II 1G Ex ia IIC T4/T5/T6 |
| | 21 | IEC Ex ia IIC T4/T5/T6 |
| | 22 | ATEX II 2 G Ex e mb IIC T5/T6 |
| | 27 | FM IS Cl. I Div. 1 Grp. A, B, C, D; T4 |
| | 28 | FM NI, CSA NI Cl. I Div. 2 Grp. A, B, C, D, D |
| | 40 | ATEX Ex ia, FM IS, CSA IS, IEC Ex ia |
| | 60 | ATEX Ex ia, FM IS, CSA IS, IEC Ex ia, FM NI, CSA NI |
| I. Analog output | 0 | None |
| | T | 4-20 mA transmitter |
| | D | 180 deg 4-20 mA transmitter |
| | A | 0-1K Ohm Potentiometer |
| J. Wiring options | 0 | None |
| | 3 | Brad Harrison Connectors - 7 pins |
| | 4 | Weidmüller special AKZ 2,5 |
| | H | Heavy Duty Terminal Block |
| K. Minimum extra terminals | 2 | 2 Open Terminal Locations (Standard) |
| | 4 | 4 Open Terminal Locations (2 SPST switches) |
| | 6 | 6 Open Terminal Locations (2 SPDT switches) |
| | 8 | 8 Open Terminal Locations (2 or 4 SPST switches) |
| L. Special options | 0 | None |
| | V | Viton O-rings |

5.5 PS/PM UltraSwitch™ switch options

| Code | Cert. | Switch Option | Manufacturer | Load Capacity |
|------|------------------------|--|--------------------------|---|
| M1 | | SPDT Mechanical | Honeywell MicroSwitch | 15A @ 125/250 VAC; 0,5A @ 125 VDC; 0,25A @ 250VDC; 5A @ 120VAC |
| MG | A, B, D, F | SPDT Gold Mechanical | Honeywell MicroSwitch | 1A @ 125 VAC; 50 mA @ 24 VDC |
| MA | | 3-Position Control | Honeywell MicroSwitch | 15A @ 125 VAC; 0,5A @ 125 VDC; 0,25A @ 250VDC; 5A @ 120VAC |
| M3 | | DPDT Mechanical | Cherry | 15A @ 125/250 VAC |
| MB | | DPDT Mechanical | Licon | 10A @ 125 VAC |
| MD | | 3-Pos. Control with Indication (DA) | Licon | 10A @ 125 VAC |
| MS | | 3-Pos. Control with Indication (SR) | Licon | 10A @ 125 VAC |
| P4 | A, B, D, E, F, G | SPST Proximity | Aleph | 0.35A @ 140 VAC; 0.25A @ 200VDC (50 W Max.) |
| P5 | A, B, D, E, F, G | SPDT Proximity | Hamlin | 0.25A @ 120 VAC; 0.25A @ 28 VDC (3 W Max.) |
| PE | A, B, D, E, F, G | SPDT Sabre Proximity | Flowserve | 1A @ 120 VAC; 1A @ 24 VDC |
| PP | C, E, G | SPDT Phazer Proximity | Flowserve | 3A @ 120 VAC; 2A @ 24 VDC |
| PT | A, B, C, D, E, F, G | SPST BRS Proximity | Flowserve | 3A @ 120 VAC; 0.5 @ 24 VDC |
| N8 | A, B, D, E, F | Solid State Proximity | PF NJ2 V3 N | NAMUR NC Sensor; 8 VDC |
| NP | A, B, D, F | Solid State Proximity | PF SJ3.5-N | NAMUR Sensor Output; 5-25 VDC Supply |
| NQ | A, B, D, F | Solid State Proximity | PF NJ4-12GK-N | NAMUR NC Sensor; 8 VDC |
| NR | D, F | Solid State Proximity | PF NJ4-12GM40-E1 | PNP Sinking; 200 mA max. Current; 10-60 VDC |
| NS | D, G | Solid State Proximity | PF NJ4-12GM40-E2 | NPN Sourcing; 200 mA max. Current; 10-60 VDC |
| NT | D, G | Solid State Proximity | PF NJ4-12GK40-E2 | NPN Sourcing; 200 mA max. Current; 10-60 VDC |
| N9 | | Solid State Proximity | PF NBB3-V3-Z4 | NPN Sourcing; 100 mA max. Current; 5-60 VDC |
| NW | A, B, D | Solid State Proximity | PF SJ3.5-SN | NAMUR NC Sensor; 8 VDC |

| Code | Certificate |
|------|---------------------|
| A | ATEX II 1G Ex ia |
| B | IEC Ex ia |
| C | ATEX II 2 G Ex e mb |
| D | cFMus IS |
| E | cFMus NI |
| F | cCSAus IS |
| G | cCSAus NI |



Notes

- 1) MA switch element must be ordered with qty. (2) switch elements. MD and MS switch elements must be ordered with qty. (4) switch elements.
- 2) Valid certification codes according to table in PS/PM Nomenclature on page 5 and 6.
- 3) Some models have more than (2) open terminal locations open as standards. Consult factory for details.
- 4) Heavy Duty Terminal blocks only available for two (2) SPST or two (2) SPDT type switches maximum (8 terminal points maximum).

More switch options available

Ordering code example

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | C | D | E | F | G | G | | H | H | | I | J | K | L |
| P | N | P | S | 2 | U | 2 | N | 8 | - | 1 | 5 | - | 0 | 0 | 2 | 0 |

A = brand, NAMUR shaft, Resin housing, 2 conduits, standard UltraDome™, 2 proximity switches, ATEX certificate, 2 terminals.

6. Installation

The PS/PM Ultraswitch™ may be installed to valves or valve actuators with a variety of mounting hardware.

For best results, specify the NAMUR shaft option and NAMUR mounting hardware when installing to NAMUR compliant actuator. These options allow direct coupling to actuators without couplings, reducing dead band.

Simply bolt bracket to actuator and PS/PM Ultraswitch™ to bracket, leaving bolts finger tight.

For NAMUR applications the PS/PM Ultraswitch™ switch shaft features an integral alignment pin. This pin must engage the tapped hole in the actuator shaft.

For non-NAMUR applications, make sure to properly install a coupler between the PS/PM Ultraswitch™ and actuator. Once the PS/PM Ultraswitch™ is installed with fasteners loosely tightened, stroke the actuator two or three times to align the bracket. Then tighten all fasteners.

Ambient temperature working conditions
The PS/PM Ultraswitch™ switch box is tested and operational in following temperature range:

-40° – 180°F
-40° – 80°C

Special conditions for safe use

- The Rotary Limit Switch Box is marked with the following warning marking: "WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS".
- The total electrical ratings must not exceed the values indicated in this Schedule.
- For nomenclature breakdown please see the installation instructions.



PS/PM switch mounted on rotary actuator



PS/PM switch mounted on linear actuator

6.1 Wiring instructions

- Perform all wiring according to the wiring diagram found on the label in the switch cover (see picture) and instructions given below.



- Make sure that the ground wire is correctly connected
- Seal unused entries with proper and suitable conduit plugs.

The PS/PM Ultraswitch™ enclosures feature pre-wired switches. All user connections are made at a numbered terminal strip. Both external bonding and internal grounding locations have been provided for use in installation. A wiring diagram is located inside the cover and indicates which terminal numbers correspond to switch contacts: normally open, normally closed, common, etc. Simply follow the wiring diagram, and electric code to connect switches to your system.

For field wiring: ensure that any excess wire lengths or loops are routed away from any moving parts and are short enough, or secured to ensure a 1/4" clearance between the wire and the inside surface of the switchbox cover.

Note: for all magnetically tripped proximity switches, the top switch (top and third switches for 4-switch versions) should only be used to indicate the clockwise position: the bottom switch (second and fourth switches for 4-switch versions) should only be used to indicate the counter-clockwise position. Any deviation from these settings may result in erratic indication.

Solenoids may also be wired through the PS/PM Ultraswitch™ enclosure. At least two auxiliary terminals are included as standard.

A ground screw is also included. Simply wire the solenoid to auxiliary terminals, then connect power leads to the opposite terminal side. be sure to properly ground the solenoid at provided ground terminal.

PS/PM UltraSwitch™ Series enclosures include two 3/4" NPT conduit entries and the PM Series includes two M25x1.5 conduit entries.



Terminal strip



Wiring diagram



Wiring diagram
(special configurations)



Caution!

- Proper and suitable conduit plugs must be installed in unused conduit entries before taking the unit into service.
- Installation according to National Electric Code, local codes, local certificates and manufacture instructions in all cases. Environmental seals must be used to protect ingress of water through the conduits.

• Electrostatic build up prevention for safe Use
The enclosure of the PS/PM Ultraswitch™ switch box is made of PA6/PA66 and any impact or friction caused by external objects shall be avoided in the application to prevent electrostatic build up.

7. Switches (certified)



Substitution of components may impair suitability for hazardous (classified) locations. Do not disconnect equipment unless area is known to be non-hazardous.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing, or; read, understand and adhere to the manufacturer's live maintenance procedures.

7.1 ATEX Ex e mb certificate information

Model code:
 xxxxxxPP-22-xxxx or xxxxxxPx2xxxxx: 60VDC 3A 100VA
 xxxxxxPT-22-xxxx or xxxxxxTx2xxxxx: 24VDC 3A 75VA

NEMKO 12ATEX1079X, IP66
 Ex II 2G
 Ex e mb IIC T5 (T6) Gb
 T5 : -40°C ≤ Ta ≤ +80°C, T6 : -40°C ≤ Ta ≤ +60°C

Power source must be protected by a fuse of 3A with a breaking capacity of ≥ 1500A. For ATEX and IECEx installations an appropriately rated gland is required. Any unused conduit entry must have a suitable rated blanking element.

7.2 Installation in hazardous locations

Refer to control drawing RA-2.

7.3 Adjusting limit switches

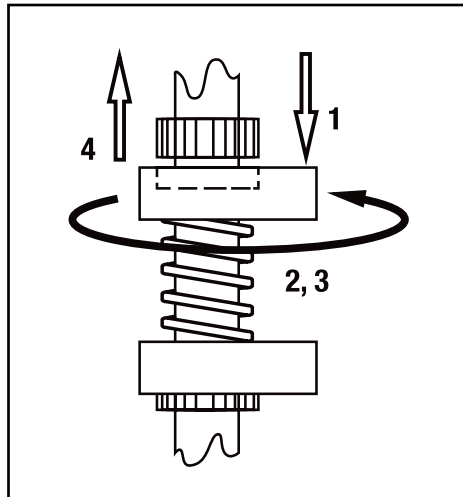
UltraSwitch™ enclosures feature Quick-Set™ cams which are used to trip the limit switches. These cams are easily adjusted without tools.

Caution: disconnect power before removing cover when installed in hazardous locations.

Remove cover and set aside. Rotate actuator/valve to full clockwise (CW) position. Adjust cam(s) associated with CW as follows:

1. Push or pull cam against spring to disengage it from splines.
2. Rotate cam CW breaking contact with switch (or moving magnet away from switch).
3. Continue rotating cam CW just until switch trips.
4. Release cam and reengage it with splines.

Rotate actuator/valve to full counter-clockwise (CCW) position. Adjust cam(s) associated with CCW as described in steps 1 through 4, except rotate cam(s) CCW.



Cam adjustment

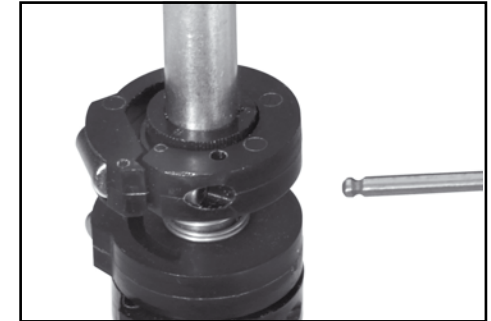


Note: factory setting is:
 Top switch = CW (closed)
 Second switch = CCW (open)
 Third switch = CW
 Fourth switch = CCW

7.4 Cam fine adjustment

Some cams have a fine adjustment available. These cams will have a small screw embedded into the side of the cam.

Adjusting this screw clockwise or counter clockwise will deform the cam, changing the trip point slightly.



Cam fine adjustment

7.5 Adjusting UltraDome™ position indicator

UltraDome™ visual indicators are easily adjusted to match the dome's clear windows to the rotor's colored sections. The dome is secured to the PS/PM UltraSwitch™ housing with screws mounted through slotted holes. The slotted holes allow approximately 20° adjustment of the dome.

In addition, the dome can be completely removed and reoriented in 45° and 90° increments. The rotor may be reoriented with respect to the shaft by removing the shaft coupler and rotating 90° before reinstalling. This may be necessary to obtain the correct orientation of windows in a multi-way application.



Adjustment screws

7.6 Calibrating 4-20 mA transmitter

Setting direct/reverse action: A dip-switch setting controls the direction of increasing travel. For 4 mA in the full clockwise position, select "D", for 4 mA in the full counterclockwise position, select "R".

Adjusting zero/span:

1. Attach a DC mA meter to +/- terminals.
2. Operate valve/switchbox to position corresponding to 4 mA.
3. Adjust feedback board zero trim pot to yield 4 mA. (Turning CW increases value, turning CCW decreases value).

4. Operate valve/switchbox to position corresponding to 20 mA feedback.

5. Adjust feedback board span trim pot to yield 20 mA. (Turning CW increases value, turning CCW decreases value).

6. The zero and span adjustments are interactive. Repeat steps 1 through 5 as necessary.

Note: If transmitter adjustment gets difficult (i.e., trim pots do not have desired effect) start over by "centering" the trim pots. This is accomplished by turning in one direction for 20 turns and reversing direction for 10 turns.



7.7 Switch option specifications (all)

| Code | Switch Option | Manufacturer | Part Number | Load Capacity |
|------|----------------------------------|-----------------------|---------------------------------|---|
| 00 | No switches (empty housing) | | | |
| F1 | | IFM | IN5129 | 10-36VDC 3-Wire (H=14 only) |
| F2 | 2-wire Foundation Fieldbus | | | (Ultra-Low Power Coil Only) |
| F3 | | IFM | IF5250 | 10-36VDC NC PNP, 150mA, 3-wire NC |
| F4 | 4-wire Foundation Fieldbus | | | (Select External Solenoid Coil) |
| F5 | | IFM | IF6001 | 18-32VDC, NO PNP, 150mA@50 C |
| F6 | | IFM | IF6034 | 10-36VDC, NO PNP, 150mA, Stainless steel |
| F7 | | IFM | IN0074 | 20-250 AC/DC, NO, 350mA/100mA |
| F8 | | IFM | IN0081 | 20-250 AC/DC, NO, 350mA/100mA w/LED (H=14 only) |
| FB | | IFM | IF5249 | 10-36VDC NO PNP, 150mA, 3-wire NO |
| FC | | IFM | IF5718 | 10-36VDC NO PNP/NPN, 150mA, plastic |
| FZ | AS-I Bus Card | | | 31VDC 28 mA |
| M1 | SPDT Mechanical | Honeywell MicroSwitch | V7-1C13D8-201 | 15.1A (1/2 HP) at 125/250 VAC; A at 125 VDC; 1/4A at 250VDC; 5A at 120Vac |
| M3 | DPDT Mechanical | Cherry | E19-00A | 15A, 125/250 VAC 3/5HP |
| MA | 3-Position | Honeywell Control | V7-1C13D8-201 MicroSwitch | 15.1A (1/2 HP) at 125 VAC;— A at 125 VDC; 1/4A at 250VDC; 5A at 120Vac |
| MB | DPDT Mechanical | Licon | 22-104 | 10A (1/2 HP) at 125 VAC |
| MC | SPDT Mechanical | Honeywell | V7-1C13D8-201 250°F MicroSwitch | 15.1A (1/2 HP) at 125 VAC; A at 125 VDC; 1/4A at 250VDC; 5A at 120Vac |
| MD | 3-Pos. Control w/Indication (DA) | Licon | 22-104 | 10A (1/2 HP) at 125 VAC |
| MG | SPDT Gold Mechanical | Honeywell MicroSwitch | V7-1D19D8-201 | 1A at 125 VAC / 50 mA at 24 VDC |
| MS | 3-Pos. Control w/Indication (SR) | Licon | 22-104 | 10A (1/2 HP) at 125 VAC |
| N1 | | Pepperl+Fuchs | NJ4-12GM40-E | |
| N2 | | Pepperl+Fuchs | NJ2-12GK-N | |
| N3 | | Pepperl+Fuchs | SJ3,5-S1N | |
| N4 | | Pepperl+Fuchs | NJ2-12GK-SN | |
| N5 | | Pepperl+Fuchs | NJ4-12GK40-E | |
| N6 | | Pepperl+Fuchs | NJ4-12GK40-E1 | |
| N7 | | Pepperl+Fuchs | NBB2-V3-E0 | |
| N8 | Solid State Proximity | Pepperl+Fuchs | NJ2-V3-N | NAMUR Sensor Output / 5-25 VDC Supply |
| N9 | Solid State Proximity | Pepperl+Fuchs | NBB3-V3-Z4 | NPN Sourcing/ 100 mA max. Current / 5-60 VDC |
| NA | | Pepperl+Fuchs | NBN4-12GM40-E2 | |
| NB | | Pepperl+Fuchs | NJ2-12GM-N | |
| NC | | Pepperl+Fuchs | NJ4-12GM-N | |
| ND | | Pepperl+Fuchs | NCB2-12GM40-Z1 | |
| NE | | Pepperl+Fuchs | NCB2-12GM35-N0 | |



7.7 Switch option specifications (continued)

| Code | Switch Option | Manufacturer | Part Number | Load Capacity |
|------|-----------------------|---------------|------------------|--|
| NF | | | NCN4-12GM35-N0 | |
| NG | | | NJ5-11-N-G | |
| NH | | | NCB4-12GM40-N0 | |
| NJ | Efector Type | | IN-2002-ABOA | (Non-certified option) |
| NK | | | NCN4-12GM40-Z0 | |
| NL | | | NCB2-V3-N0 | |
| NM | | | NJ2-11-SN-G | |
| NN | | | NBB2-V3-E2 | |
| NP | Solid State Proximity | Pepperl+Fuchs | SJ3,5-N | |
| NQ | Solid State Proximity | Pepperl+Fuchs | NJ4-12GK-N | |
| NR | Solid State Proximity | Pepperl+Fuchs | NJ4-12GM40-E1 | PNP Sinking / 200 mA max. Current / 10-60 VDC |
| NS | Solid State Proximity | Pepperl+Fuchs | NJ4-12GM40-E2 | NPN Sourcing / 200 mA max. Current / 10-60 VDC |
| NT | Solid State Proximity | Pepperl+Fuchs | NJ4-12GK40-E2 | NPN Sourcing / 200 mA max. Current / 10-60 VDC |
| NV | Solid State Proximity | Pepperl+Fuchs | NJ2-11-N-G | NAMUR Sensor Output / 5-25 VDC Supply |
| NW | Solid State Proximity | Pepperl+Fuchs | SJ3,5-SN | NAMUR Sensor Output / 5-25 VDC Supply |
| NX | | | NBB2-V3-E3 | |
| NY | Solid State Proximity | Pepperl+Fuchs | NJ4-12GK-SN | NAMUR Sensor Output / 5-25 VDC Supply |
| P4 | SPST Proximity | Aleph | PS-6132 | 0.35A at 140 VAC / .25A at 200VDC (50 W Max.) |
| P5 | SPDT Proximity | Hamlin | 59135-030 | 0.25A at 120 VAC / 0.25A at 28 VDC (3 W Max.) |
| PE | SPDT Sabre Proximity | Flowserve | XA0199 | 1A at 120 VAC / 1A at 24 VDC |
| PP | SPDT Phazer Proximity | Flowserve | XA0155 | 3A at 120 VAC / 2A at 24 VDC |
| PT | SPST BRS Proximity | Flowserve | XA0157 | 3A at 120 VAC / 0.5 at 24 VDC |
| R1 | | Pepperl+Fuchs | NBB3-V3-Z4-3G-3D | |

7.8 Analog feedback option specifications

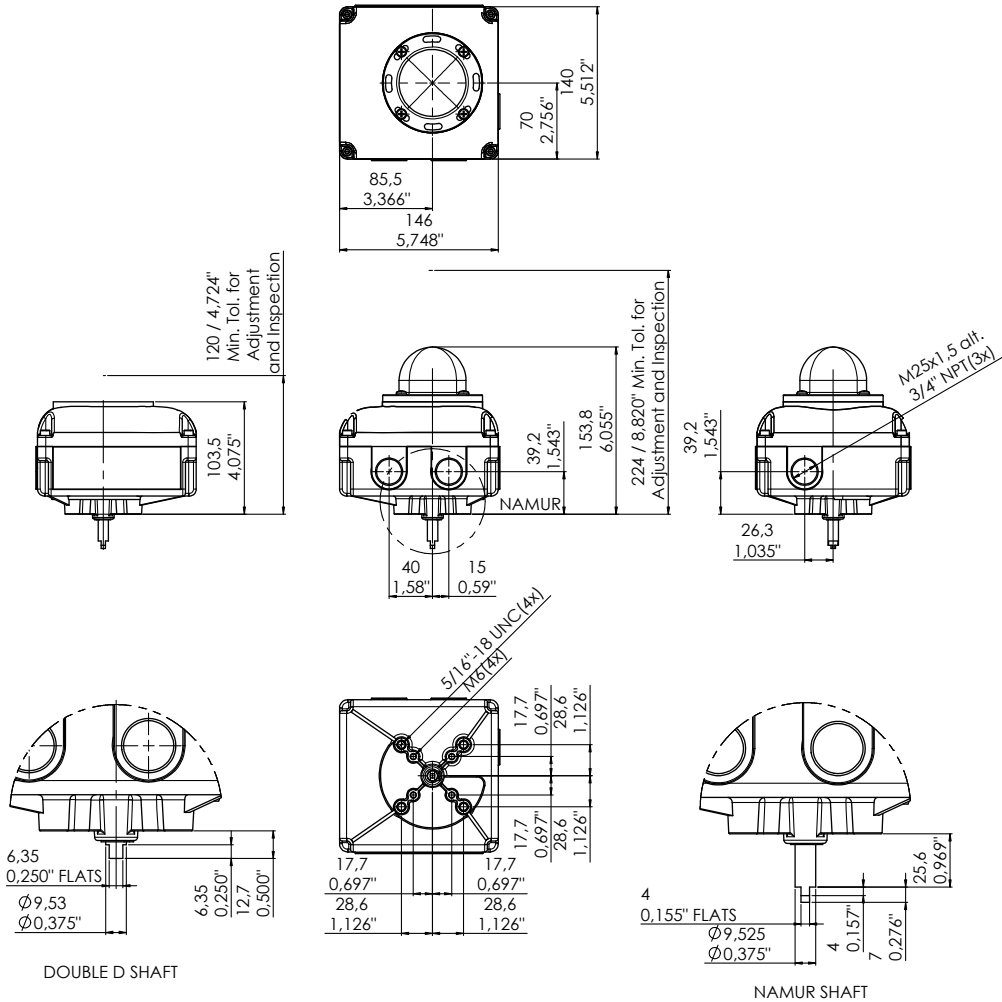
Options T, D, 4-20 mA Transmitter

Voltage Supply: 6 - 30 VAC
Impedance: 300 Ohms at 20 mA

Option A - Potentiometer Output
Maximum Load: 1 Watt

Enclosure Ratings
Type 4x
IP66/67

8. Dimensions



9. Spare parts



| Pos | Part No | Description |
|-----|---------|---|
| 1 | 31529 | Dome spare part set compl. Red/green |
| 1 | 34895 | Dome spare part set compl. Black/Yellow |

Notes



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