



## **USER INSTRUCTIONS**

**PMV PS/PM Ultraswitch™**  
Switchbox

*Installation*  
*Operation*  
*Maintenance*

*FCD PMENIM0008-03 - 09/20*



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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](http://www.pmv.nu)

## 5. SPECIFICATIONS

### 5.1 Technical data

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

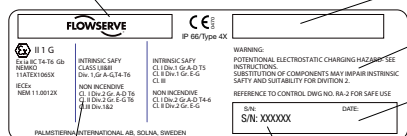


\*If the equipment is likely to come in contact with aggressive substances, it is the responsibility of the user to take suitable precautions to prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

### 5.3 Type sign

Logotype

Product name and model code



Warnings

Year of manufacture

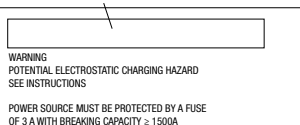
Manufacturer

Serial number

Electrical rating

Model code

Type sign for  
Atex Ex e mb



### 5.4 PS/PM UltraSwitch™ nomenclature

<b>A. Brand sticker</b>	P	PMV
<b>B. Shaft</b>	N	NAMUR VDI/VDE 3845
	D	Double D 1/4"
<b>C. Connections (cable entry)</b>	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
<b>D. Number of cable entries</b>	1	1 conduit
	2	2 conduits
	3	3 conduits
<b>E. Indicator option</b>	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)
<b>F. Switch quantity</b>	R	Reverse UltraDome™ (red=open / green=closed)
	X	180 deg 3-way UltraDome™ (white/blue)
<b>G. Switch options</b>	0	No Switches
	2	2 Switches
	4	4 Switches
<b>H. Certificate</b>	options	See page with switch options
<b>I. Analog output</b>	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	
<b>J. Wiring options</b>	0	None
	T	4-20 mA transmitter
	D	180 deg 4-20 mA transmitter
	A	0-1K Ohm Potentiometer
<b>K. Minimum extra terminals</b>	0	None
	3	Brad Harrison Connectors - 7 pins
	4	Weidmüller special AKZ 2,5
	H	Heavy Duty Terminal Block
<b>L. Special options</b>	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)
<b>L. Special options</b>	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	NPN Sinking; 200 mA max. Current; 10-60 VDC
NS	D, G	Solid State Proximity	PF NJ4-12GM40-E2	PNP 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.

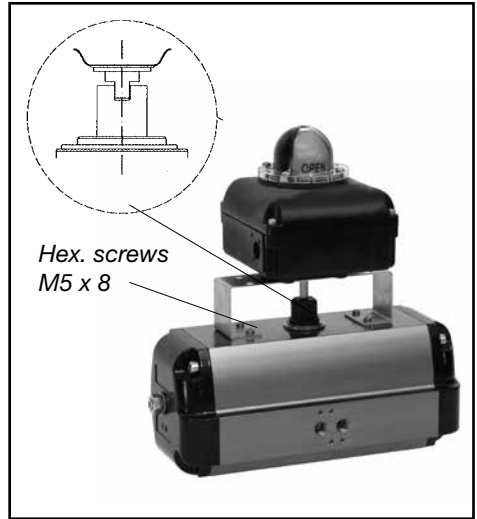
For non-NAMUR applications, make sure to properly install a coupler between the PS/PM Ultraswitch™ and actuator. Once the PS/PM Ultraswitch™ is installed with fasteners loosely tightened, stroke the actuator two or three times to align the bracket. Then tighten all fasteners.

**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.

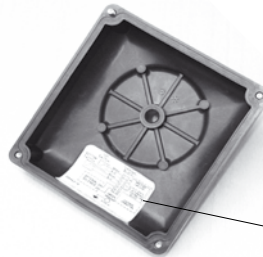
Solenoids may also be wired through the PS/PM Ultraswitch™ enclosure. At least two auxiliary terminals are included as standard.

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 :  $-40^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$ , T6 :  $-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$

Power source must be protected by a fuse of 3A with a breaking capacity of  $\geq 1500\text{A}$ . 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

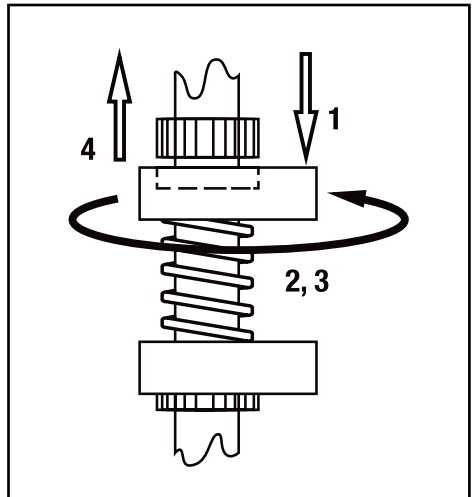
UltraSwitch™ enclosures feature Quick-Set™ cams which are used to trip the limit switches. These cams are easily adjusted without tools.

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

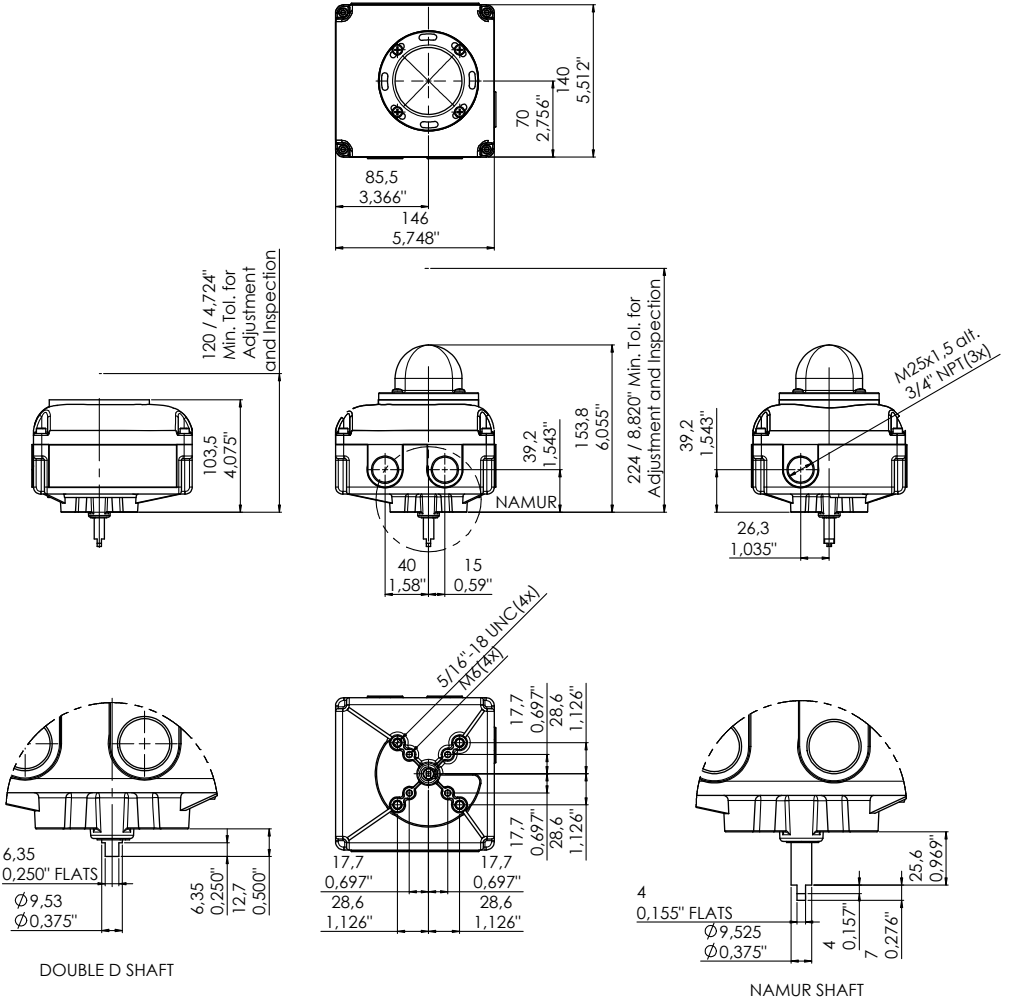
Options T, D, 4-20 mA Transmitter

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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