



USER INSTRUCTIONS

Worcester DS/DM Ultraswitch™ Switch box

FCD WCENIM0136-02-A5 07/15

Installation
Operation
Maintenance



Experience In Motion

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1. GENERAL INFORMATION

Worcester DS/DM UltraSwitch™ limit switch enclosures provide local and remote position indication for automated valves. An external visual indicator for intuitive local position determination is optional. The DS/DM 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 continuing further.

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.
- Use only Flowserve original spare parts to avoid invalidating certification.
- Inspect periodically for degradation. Replace parts if degradation is found.
- 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.
- Cleaning this housing by rubbing should be done in a non-hazardous area.
- Do not disconnect equipment unless area is known to be non-hazardous.
- Potential electrostatic charging hazard. Clean only with a damp cloth – danger of propagating discharge.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
- All grounding and bonding installation requirements must be addressed.
- Pay attention to personal protection, (clothing, glasses, gloves) when performing installation or service.

4. CERTIFICATES

ATEX II 2 GD Ex d IIC T4 Gb, Ex tb IIIC T113°C Db IP66

IECEX Ex d IIC T4 Gb, Ex tb IIIC T113°C Db IP66

cCSA Class I, Division 1/2, Groups B,C,D; Class II, Division 1/2, Groups E, F, G; Class III. Type 4X;
Tamb:-55°C to +85°C; Temp. code: T6.

CSAus Class I, Division 1/2, Groups A,B,C,D; Class II, Division 1/2, Groups E, F, G; Class III. Type 4X;
Tamb:-55°C to +85°C; Temp. code: T6.

cCSAus NI Class I. Division 2. Groups A, B, C, D.
SIL 2

5. SPECIFICATIONS

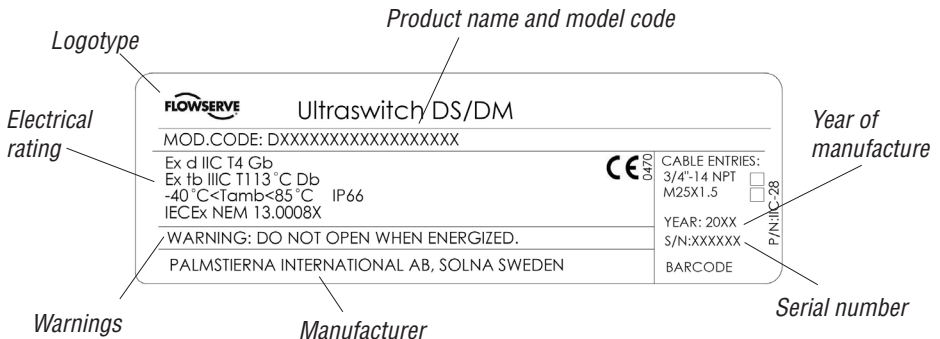
5.1 Technical data

Enclosure ratings	IP66, IEC 529
Weight Aluminum housing	1.8kg / 4 lbs
Weight Stainless Steel housing	3.5kg / 7.75 lbs
Working Temperature:	-55 °C to +85 °C / -67 °F to +185 °F
Maximum Surface Temperature:	+120 °C / +248 °F

5.2 Materials of construction

Housings & Covers	Powder epoxy painted Aluminum or Stainless Steel
Shaft	Stainless Steel
Cams/Splines	Nylon
Terminal Block	Nylon
Internal Brackets	Nylon, Aluminum or Stainless Steel
All External Fasteners	Stainless Steel
All Internal Fasteners	Stainless Steel
Indicator	Polycarbonate/Polyurethane
Label	Polyester or Stainless Steel

5.3 Product label



5.4 DS/DM UltraSwitch™ nomenclature

A = Product & Connections (cable entry)

- DS Explosion proof / Flame proof switch box with 3/4" NPT cable entries
- DM Explosion proof / Flame proof switch box with M25x1,5 cable entries

B = Number of open cable entries

- 2 2 x open cable entries (standard)
- 3 3 x open cable entries (option)

C = Housing material /Surface treatment

- B Aluminum housing, polyester powdercoating, Black base & cover
- W Aluminum housing, polyester powdercoating, Black base & White cover
- C Aluminum housing, polyester powdercoating, Black base & Optional cover color
- S Stainless Steel housing DIN 1.4408 - EN G-X 6 CrNiMo 18-10 - SAE 316

D = Shaft

- D Double 'D' Shaft 1/4"
- N Namur VDI/VDE 3845 Shaft (rotary actuators)
- T For NAF Turnex actuators
- L D style including nut for linear applications

E = Indicator option

- 0 Flat top cover, no indicator
- 1 Flat top cover, indicator below switchbox for 90 deg

F = Qty of switches

- 0 0 switches (Cam assembly for 2 x M1 only)
- 2 2 Switches
- 4 4 Switches

G = Switch options - see page 6 for switch options

H = Certificate

- 14 General Purpose
- 18 cCSA Class I, Division 1/2, Groups B,C,D; Class II, Division 1/2, Groups E, F, G; Class III CSAus Class I, Division 1/2, Groups A,B,C,D; Class II, Division 1/2, Groups E, F, G; Class III;
- 19 ATEX II 2GD, Ex d IIC T4 Gb, Ex tb IIIC
- 25 IECEx Ex d IIC T4 Gb, Ex tb IIIC
- 28 cCSAus NI Class I. Division 2. Groups A, B, C, D.

I = Product approval marking

- 0 Self-adhesive marking label, Polyester
- M Stainless steel marking plate

J = Analog Output

- 0 None
- 4 4-20mA transmitter (**F=0 only**)

K = Terminal Options

- 2 2 Extra open terminals (Standard)
- 4 4 Extra open terminals (Optional, not possible for all switch options)
- 6 6 Extra open terminals (Optional, not possible for all switch options)
- 8 8 Extra open terminals (Optional, not possible for all switch options)
- H Heavy Duty Terminal Block, 8 contact points.

L = Options/ Elastomers

- 0 Nitrile O-rings
- V Viton O-rings

M = Brand

- W Worcester

Ordering code example														
A	B	C	D	E	F	G	H	I	J	K	L	M		
DS	2	B	N	1	2	MG	-	14	-	0	0	2	0	W

Note: Contact PMV for available SIL versions

5.5 DS/DM UltraSwitch™ switch options

Code	Switch Option	Manufacturer	Part Number	Load Capacity
F3		IFM	IF5250	10-36VDC NC PNP, 150mA, 3-wire NC
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
F9		IFM	IN0097	20-250V AC/DC NO 2-Wire (H=14 only)
FB		IFM	IF5249	10-36VDC NO PNP, 150mA, 3-wire NO
FC		IFM	IF5718	10-36VDC NO PNP/NPN, 150mA, plastic
FG		IFM	IS5070	10-36 VDC NO PNP 3-wire (H=14 only)
FK		IFM	NS5002	IS-2002-N 2-wire NAMUR (H=14 only)
FL		IFM	IS5026	5-36 VDC PNP/NPN, 4-200mA NO/NC (H=14 only)
M1	SPDT	Honeywell	V7-1C13D8-201	15.1A (1/2 HP) at 125/250 AC;
		Mechanical	MicroSwitch	0,5A at 125 VDC; 1/4A at 250VDC; 5A at 120VAC
MG	SPDT	Honeywell	V7-1D19D8-201	1A at 125 VAC / 50 mA at 24 VDC
		Gold Mechanical	MicroSwitch	
N1		Pepperl+Fuchs	NJ4-12GM40-E	Proximity 3-wire NPN NO 10-60 VDC
N3		Pepperl+Fuchs	SJ3,5-S1N	NAMUR NO 8V
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	Inductive. 3 wires PNP NO 10-30VDC
ND		Pepperl+Fuchs	NCB2-12GM40-Z1	Proximity inductive 2-wire DC NC
NE		Pepperl+Fuchs	NCB2-12GM35-N0	NAMUR with LED NC 8,2V
NF		Pepperl+Fuchs	NCN4-12GM35-N0	NAMUR with LED NC 8,2V
NG		Pepperl+Fuchs	NJ5-11-N-G	NAMUR NC 8,2V
NK		Pepperl+Fuchs	NCN4-12GM40-Z0	Proximity 2-wire DC NO 8,2V
NM		Pepperl+Fuchs	NJ2-11-SN-G	NAMUR NC 5-25 VDC
NP	Solid State Proximity	Pepperl+Fuchs	SJ3.5-N	NAMUR 5-25 VDC Supply
NQ	Solid State Proximity	Pepperl+Fuchs	NJ4-12GK-N	NAMUR NC-Sensor, 8VDC
NR	Solid State Proximity	Pepperl+Fuchs	NJ4-12GM40-E1	NPN Sinking / 200 mA max. Current / 10-60 VDC
NS	Solid State Proximity	Pepperl+Fuchs	NJ4-12GM40-E2	PNP 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
NW	Solid State Proximity	Pepperl+Fuchs	SJ3,5-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

6. Installation

A variety of mounting hardware is available for mounting the DS/DM Ultraswitch™ to valve actuators. For best results, specify the NAMUR shaft option and NAMUR mounting hardware when installing to NAMUR compliant actuator.

The NAMUR mounting hardware allows direct coupling to actuators without adaptors, reducing dead band. Simply bolt bracket to actuator and DS/DM UltraSwitch™ to bracket, leaving bolts finger tight. For NAMUR applications the DS/DM UltraSwitch™ shaft features an integral alignment pin. This pin must engage the tapped hole in the actuator shaft.

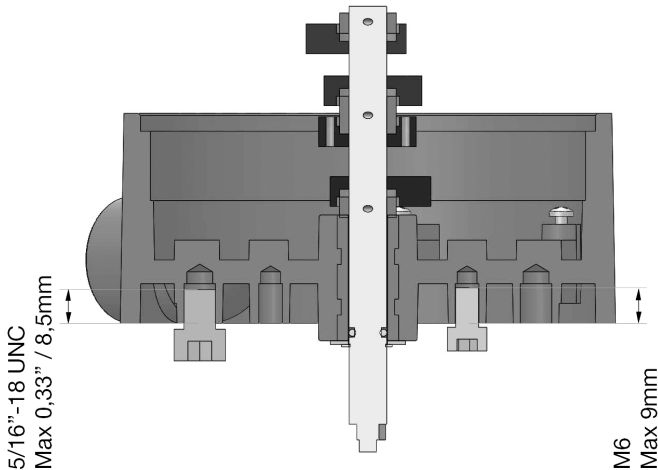
For non-NAMUR applications, make sure to properly install a coupler between DS/DM UltraSwitch™ and actuator. Once the DS/DM UltraSwitch™ is installed with fasteners loosely tightened, stroke the actuator two or three times to align the bracket. Then tighten all fasteners.



NOTE: External mounting fasteners must not be allowed to bottom. Select length of screws to allow at least one thread turn of clearance against bottom of female thread when screw is tightened (due to approval conditions). See picture below.



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



Max engaged thread length for mounting fasteners.

6.1 Wiring instructions

DS/DM UltraSwitch™ enclosures feature pre-wired switches. All user connections are made at a numbered terminal strip. Both external and internal grounding locations have been provided for use in installation (see illustration to the right). A wiring diagram is located inside the cover and indicates which terminal numbers correspond to switch contacts: normally open, normally closed, common, etc. Follow the wiring diagram and electric code to connect the 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.

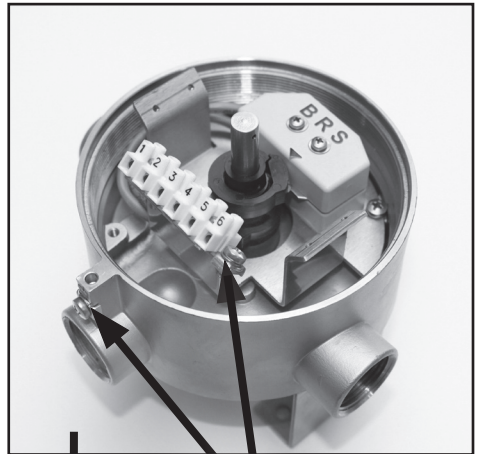
Solenoids may also be wired through the DS/DM UltraSwitch™ enclosure. At least two auxiliary terminals are included as standard. Wire the solenoid to auxiliary terminals, then connect power leads to the opposite terminal side. Be sure to properly ground the solenoid at provided ground terminals.

DS/DM UltraSwitch™ DS-Series enclosures include two 3/4" NPT conduit/cable entries and the DM-Series include two M25x1.5 conduit/cable entries.

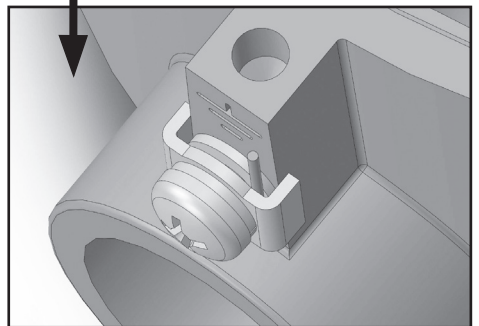


Caution!

- Proper and suitable conduit plugs must be installed in unused conduit entries before placing the unit into service.
- Install 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. Electrical connections/plugs must comply with relevant approval standards.
- Connecting cables must be rated for ambient temperature above 161°C (322°F).



Ground terminals



Note: The outside ground terminal of the Aluminum housing has a stainless steel washer underneath the grounding jumper. Make sure that the grounding cable is squeezed between the washer and the grounding jumper (see picture above).

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.

7.1 Installation in hazardous locations

Installation of this device may only be performed by authorized personnel. All wiring and other external components used to connect this device must comply with the hazardous locations regulations.



Special conditions for safe use

According to ATEX marking on the units indicates:

WARNING: Do not open when energized. After de-energizing – delay 8 minutes before opening. Seal within 50 mm of enclosure. Connecting cables must be rated for $T_{amb} > 161^{\circ}\text{C} / 322^{\circ}\text{F}$.

According to CSA marking on the units indicates:

WARNING: To prevent ignition of hazardous atmospheres – disconnect before opening.
WARNING: Conduit runs must have seal fittings installed within 50 mm of the enclosure.

7.2 Adjusting limit switches

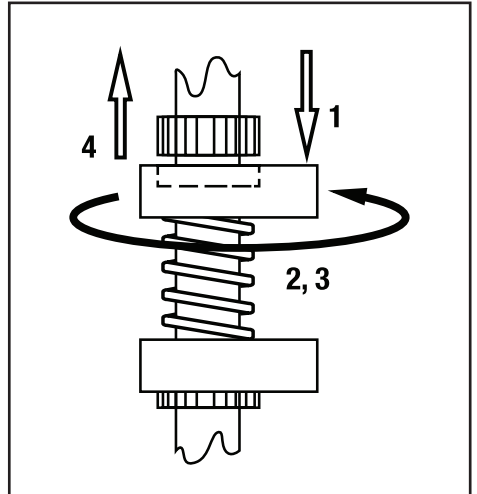
UltraSwitch™ enclosures feature Quick-Set™ cams which are used to trip the limit switches. These cams are easily adjusted without tools.

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 re-engage 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

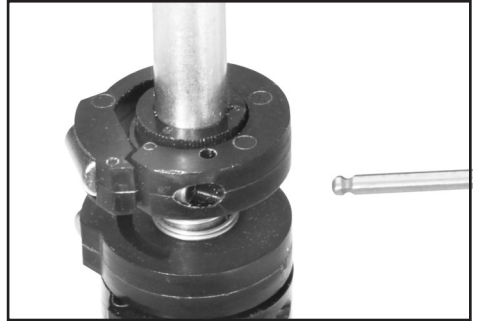


Note: factory setting is:
 Top switch = CW (closed)
 Second switch = CCW (open)
 Third switch = CW
 Fourth switch = CCW

7.3 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.

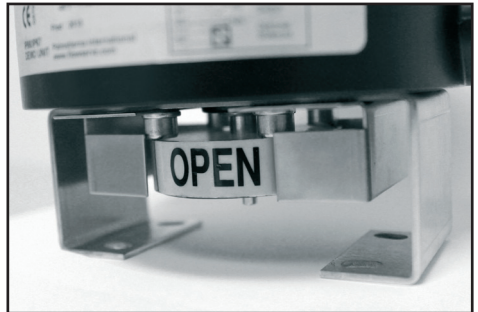


Cam fine adjustment

7.4 Adjusting Visual Position Indicator (optional part):

As an option, the DS/DM UltraSwitch™ can be equipped with a visual indicator located beneath the housing. This ring-type indicator can easily be adjusted using manual force. Simply rotate the indicator by hand to the desired position. Double check that its position corresponds to the position of the valve.

Mounting instructions are included in the box.

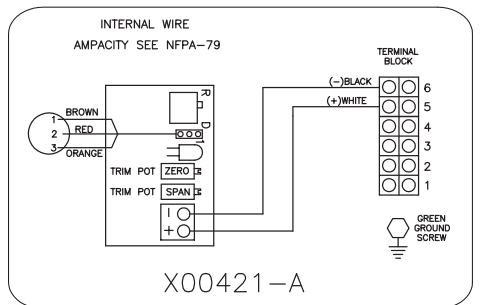


7.5 Analog feedback option specifications

Option 4 - 4-20 mA Transmitter

Voltage Supply: 6-30 VAC

Impedance: 300 Ohms at 20 mA



7.6 Calibrating 4-20 mA transmitter

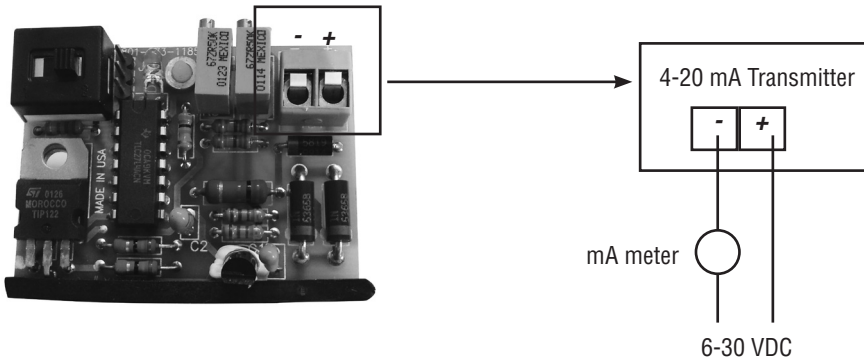
Setting direct/reverse action: A dip-switch setting controls the direction of increasing travel. For 4 mA in the full clockwise position, select "D", for 4 mA in the full counterclockwise position, select "R".

Adjusting zero/span:

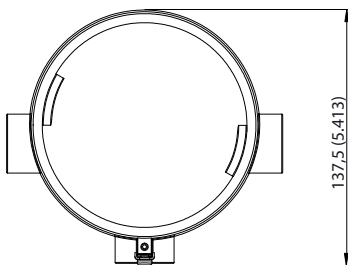
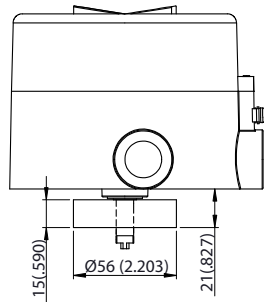
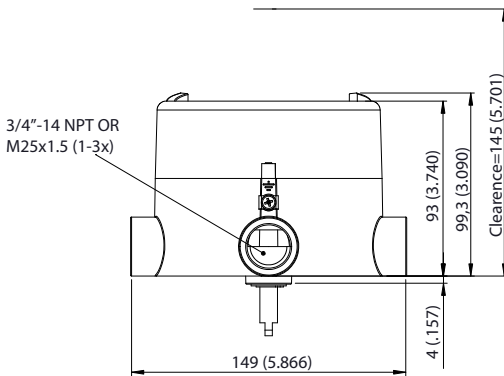
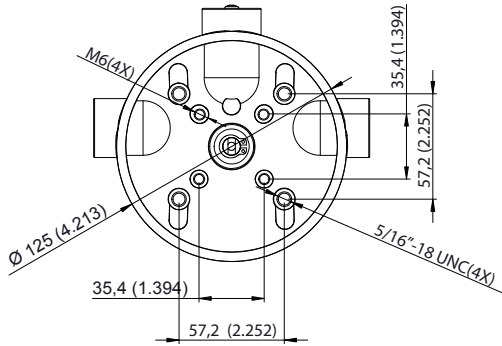
1. Attach a DC mA meter to +/- terminals.
2. Operate valve/switch box to position corresponding to 4 mA.
3. Adjust feedback board zero trim pot to yield 4 mA. (Turning CW increases value, turning CCW decreases value).

4. Operate valve/switch box 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.

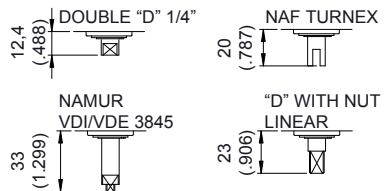
Note: If transmitter adjustment gets difficult (i.e., trim pots do not have desired effect) start again by "centering" the trim pots. This is accomplished by turning in one direction for 20 turns and reversing direction for 10 turns.



8. Dimensions (mm/Inch)



SHAFTS



9. Notes



9. Notes (continued)



9. Notes (continued)



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

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