

# TopWorx™ D-Series with 4-20mA Transmitter & HART™ Protocol Installation, Operation & Maintenance Manual



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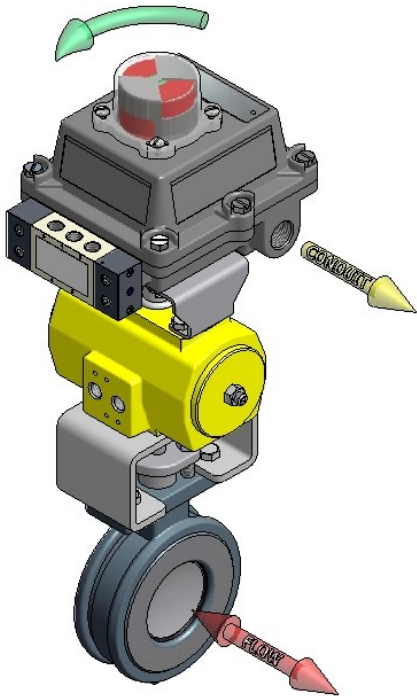
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## Installation on Actuator

### Orientations, Normal and Reverse Acting

*Normal acting* is full CW when the process valve is closed and CCW when the process valve is open. *Reverse acting* is full CW when the process valve is open and CCW when the process valve is closed.

90° indicator dome assemblies are designed to accommodate any mounting arrangement and can be adjusted up to 9° off axis if needed. 45° indicator dome assemblies can only accommodate *normal acting* applications that are *mounted parallel ±9°*. Consult your local distributor or factory representative for 45° *reverse acting* or *mounted perpendicular* applications.

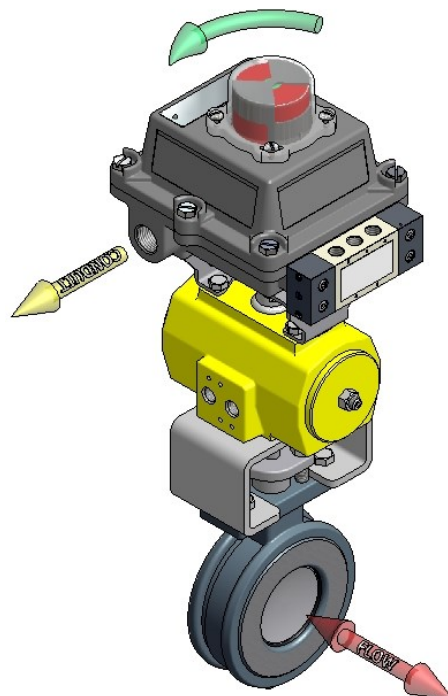


**Illustration #1**

The image to the left shows a TopWorx™ unit *mounted parallel* to the process valve in the closed position. The green arrow at the top shows the “*normal acting*” direction of travel to open the valve. This is the standard orientation and your unit unless otherwise specified will be factory set to operate in this fashion.

**Illustration #2**

The image to the right shows a TopWorx™ *mounted perpendicular* to the process valve in the closed position. The green arrow at the top shows the “*normal acting*” direction of travel to open the valve. Notice that the indicator dome has been rotated 90° compared to the unit above.



## Installation on Actuator (continued)

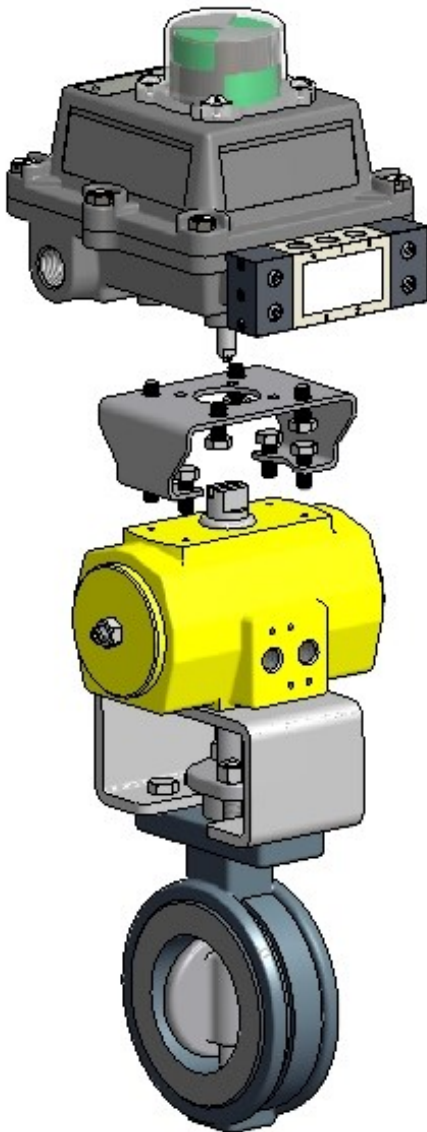
### Mounting

TopWorx has numerous mounting bracket kits available to meet your specific application, whether rotary or linear. Consult your local distributor or factory representative for ordering information. The illustration shows a direct Namur mount on a quarter turn valve. Refer to your mounting kit documentation for specific mounting instructions.



### Storage

Until conduit, conduit cover, and any applicable spool valve port connections are properly installed, the TopWorx™ unit will not support its IP/NEMA rating as the unit ships with temporary covers. Ensure that it is stored in a dry environment with a relative humidity range between 10%-95% and a temperature ranging from -40°F (-40°C) to 160°F (71°C). Once properly installed, the temperature range listed on the nameplate will supersede this storage temperature range.

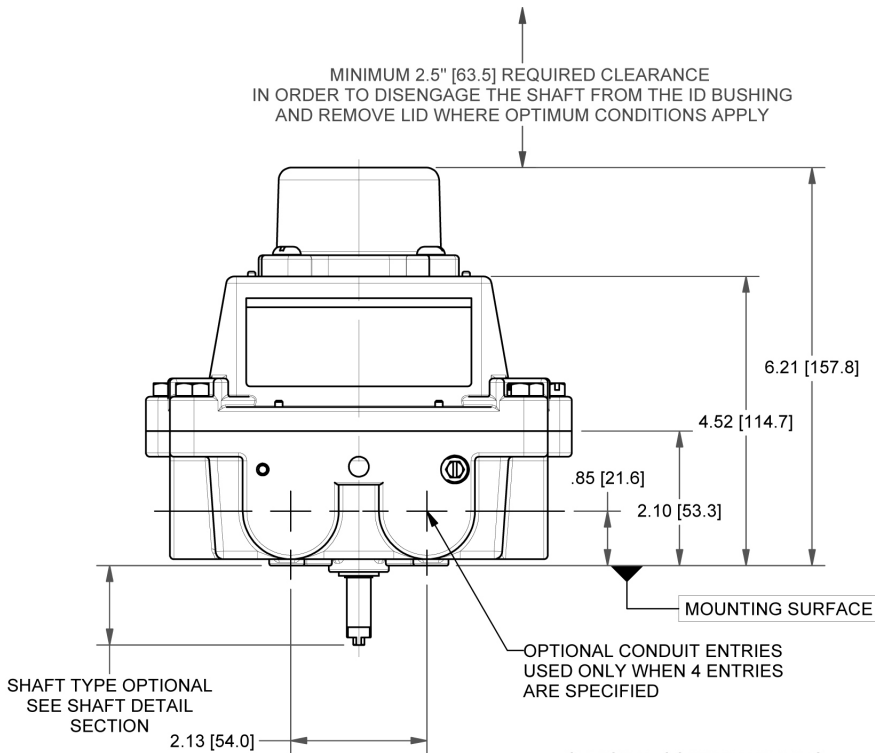
### Illustration #3: Mounting Assembly



### Installation Notes

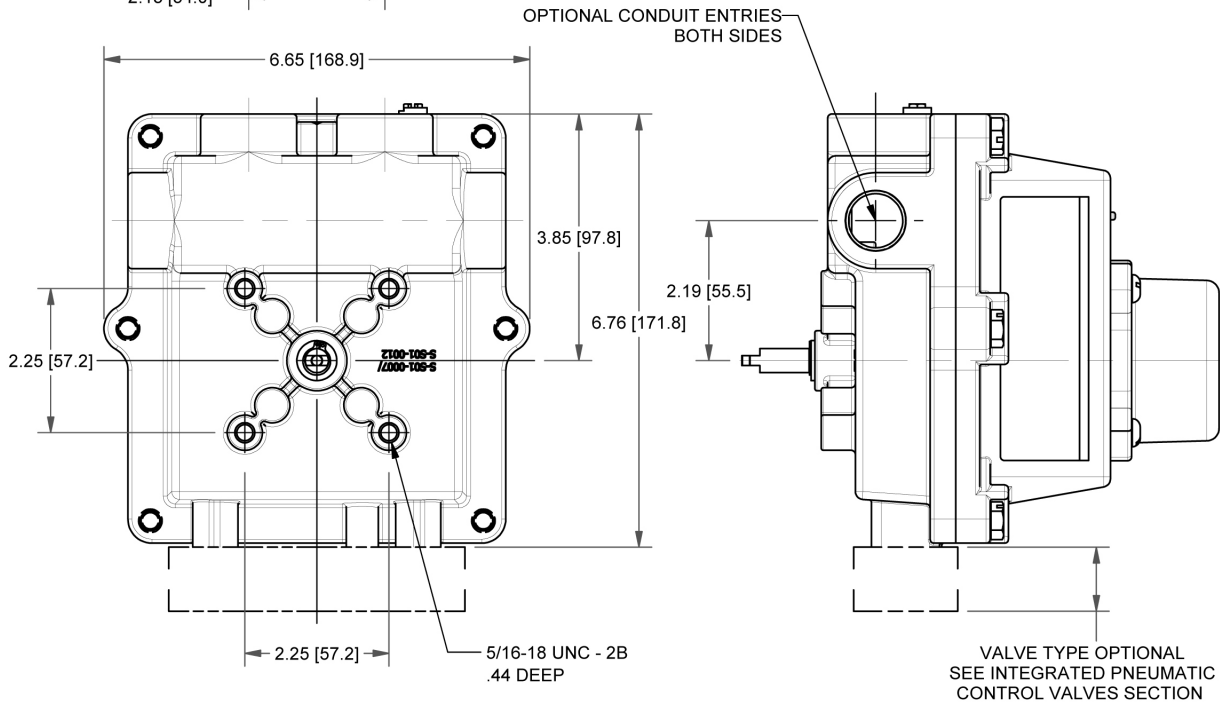
1. Use caution not to allow undue axial (thrust) load on the shaft.
2. Cycle the valve a couple of times prior to final tightening of the mounting kit hardware. This allows the shaft to self-center in the pinion slot, or coupler. Refer to the *dimensions and materials section* of this document for appropriate tightening torque.
3. Always use sound mechanical practices when torquing down any hardware or making pneumatic connections. Refer to the Integrated Pneumatic Control Valves section for detailed information on pneumatic connections.
4. This product comes shipped with conduit covers over the conduit entries in an effort to protect the internal components from debris during shipment and handling. **It is the responsibility of the receiving and/or installing personnel to provide appropriate permanent sealing devices to prevent the intrusion of debris, or moisture, when stored outdoors or when installed.** 
5. **It is the responsibility of the installer, or end user, to install this product in accordance with the National Electrical Code (NFPA 70) or any other national or regional code defining proper practices.** 

### Dimensions and Materials: TopWorx™ DXP

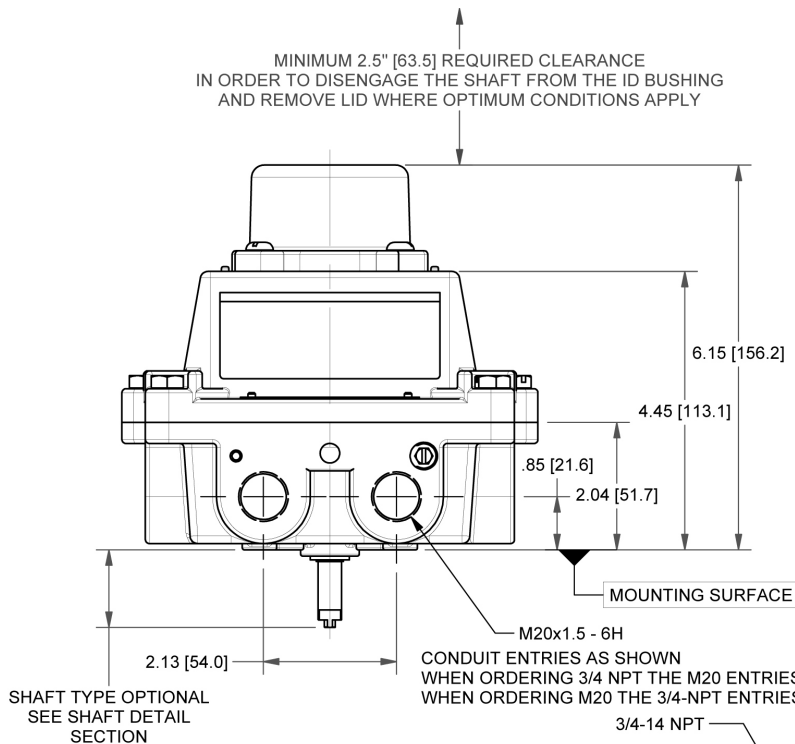


MATERIALS OF CONSTRUCTION	
<b>Enclosure</b>	Cast A360 aluminum with dichromate conversion coating inside & out, epoxy coated exterior rated for 250 hrs salt spray per ASTM B117
<b>Fasteners</b>	304 Stainless Steel standard 316 Stainless Steel optional
<b>Shaft</b>	304 Stainless Steel standard 316 Stainless Steel optional
<b>Shaft Bushing</b>	Oilite Bronze
<b>Indicator Dome</b>	Polycarbonate, UV F1 rated
<b>Seals</b>	O-ring seals available in: Buna & Silicone

Maximum Fastener Torque Specifications	
<b>Enclosure Housing Bolts</b>	8 ft-lbs [10.8 N·m]
<b>Indicator Dome Screws</b>	320 in-oz [2.3 N·m]
<b>Bottom Mounting Holes</b>	10 ft-lbs [13.6 N·m]

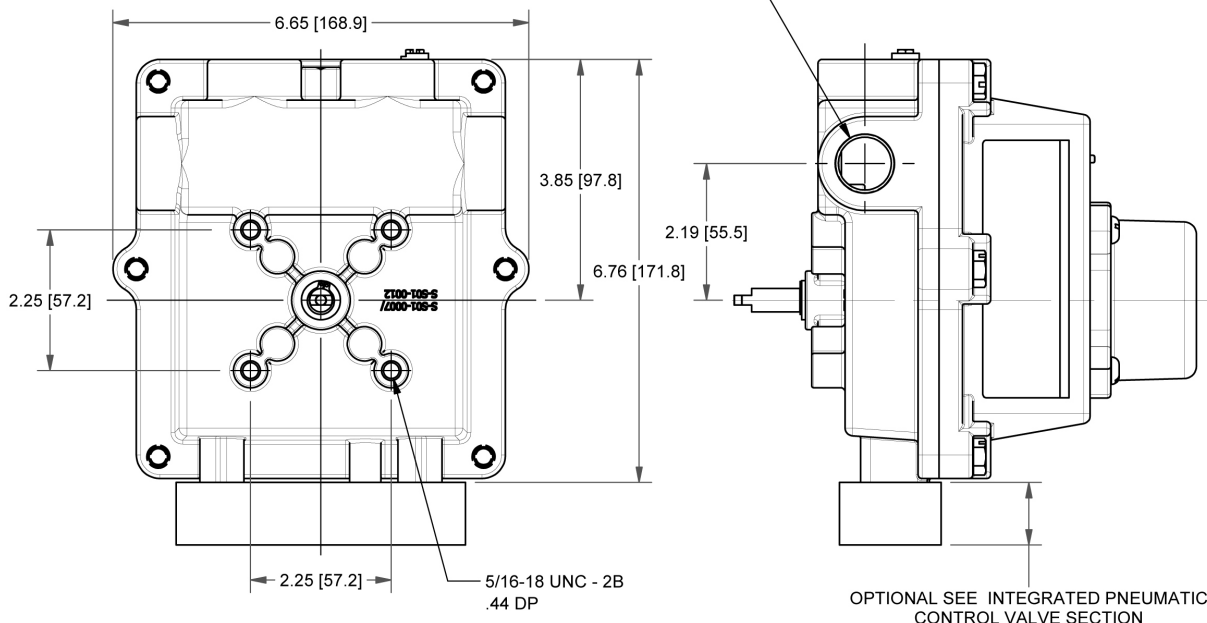


# Dimensions and Materials: TopWorx™ DXP - Flameproof Ex d IIC

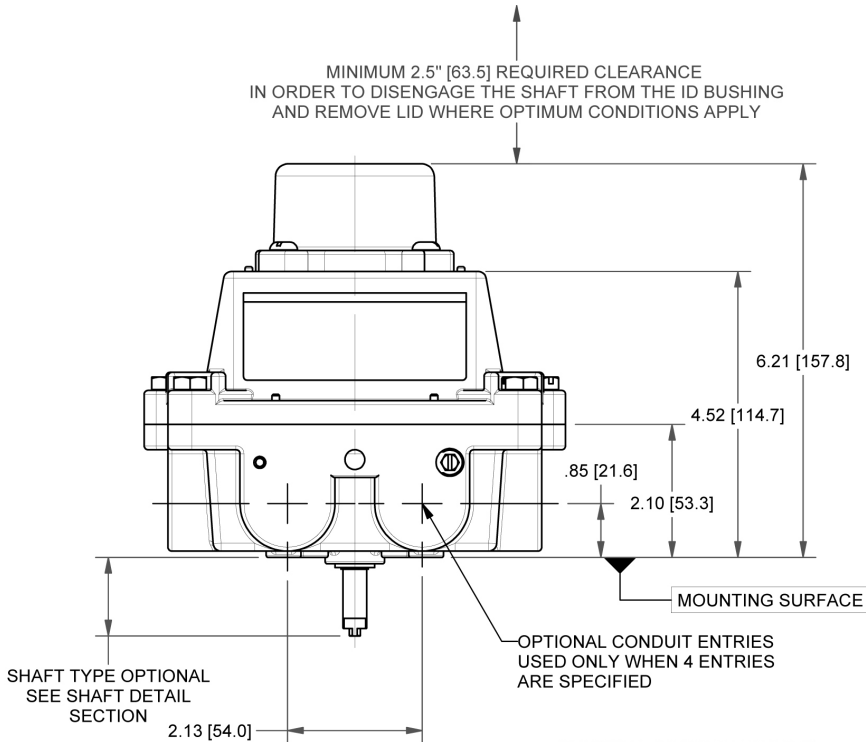


MATERIALS OF CONSTRUCTION	
Enclosure	Cast A360 aluminum with dichromate conversion coating inside & out, epoxy coated exterior rated for 250 hrs salt spray per ASTM B117
Fasteners	304 Stainless Steel standard 316 Stainless Steel optional
Shaft	304 Stainless Steel standard 316 Stainless Steel optional
Shaft Bushing	Oillite Bronze
Indicator Dome	Polycarbonate, UV F1 rated
Seals	O-ring seals available in: Buna & Silicone

Maximum Fastener Torque Specifications	
Enclosure Housing Bolts	8 ft-lbs [10.8 N-m]
Indicator Dome Screws	320 in-oz [2.3 N-m]
Bottom Mounting Holes	10 ft-lbs [13.6 N-m]

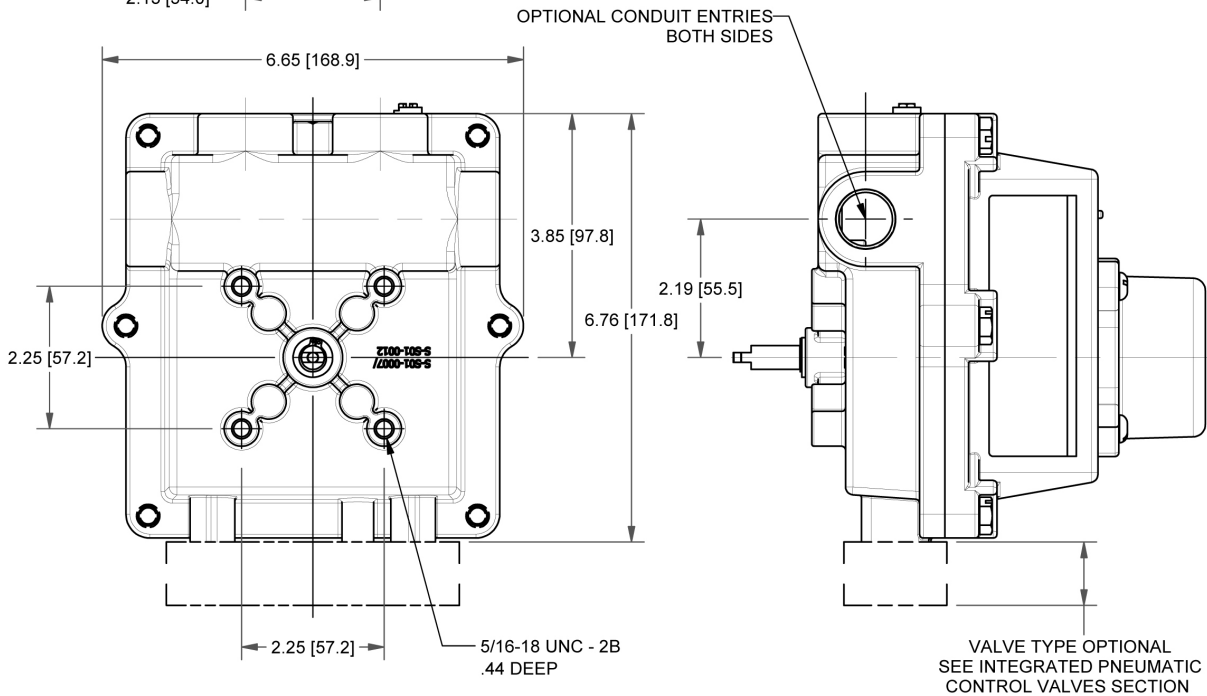


## Dimensions and Materials: TopWorx™ DXS

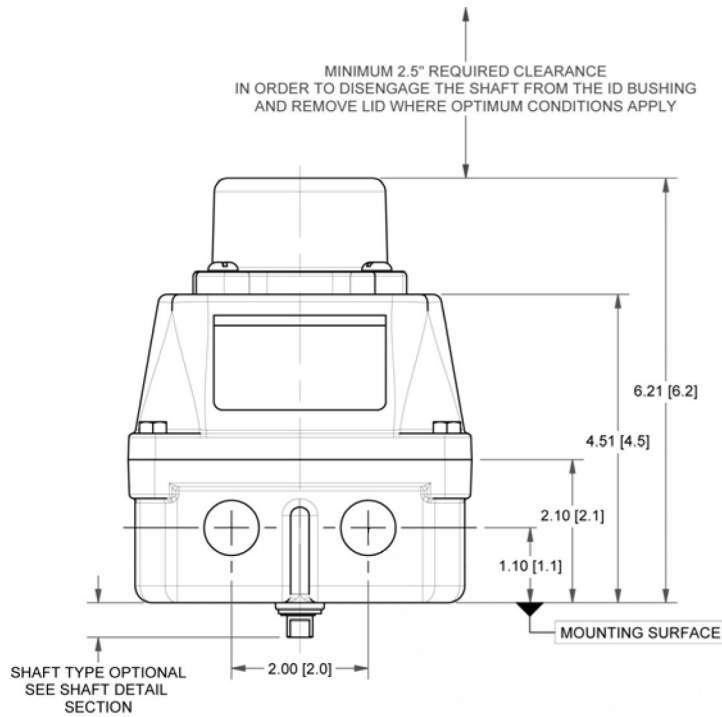


MATERIALS OF CONSTRUCTION	
Enclosure	Cast 316 Stainless Steel
Fasteners	304 Stainless Steel standard 316 Stainless Steel optional
Shaft	304 Stainless Steel standard 316 Stainless Steel optional
Shaft Bushing	N/A
Indicator Dome	Polycarbonate, UV F1 rated
Seals	O-ring seals available in: Buna & Silicone,

Maximum Fastener Torque Specifications	
Enclosure Housing Bolts	8 ft-lbs [10.8 N·m]
Indicator Dome Screws	320 in-oz [2.3 N·m]
Bottom Mounting Holes	10 ft-lbs [13.6 N·m]

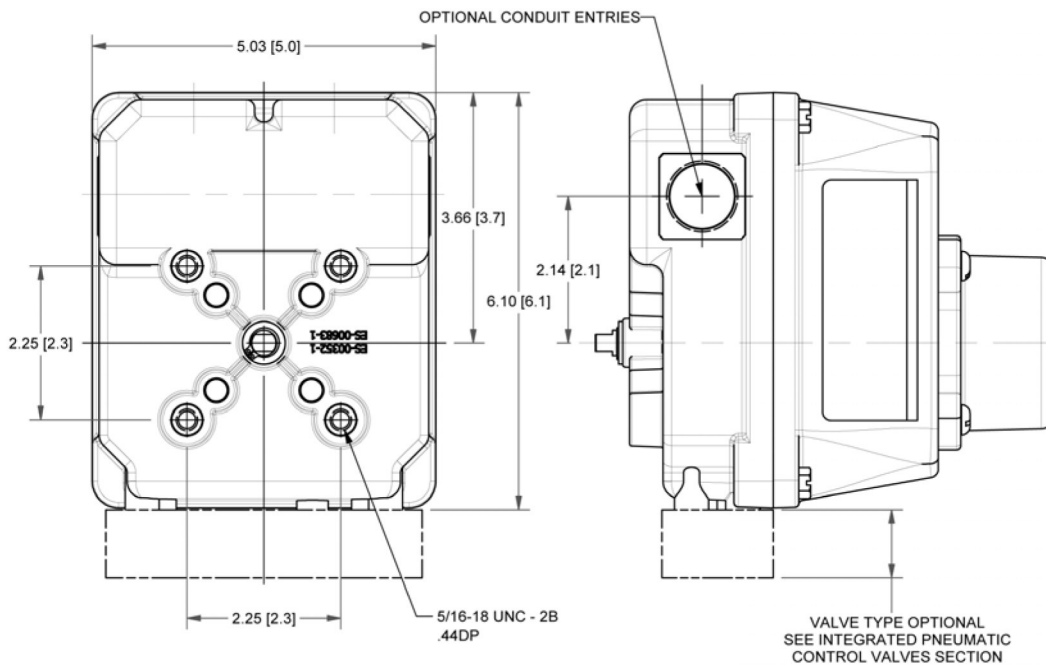


# Dimensions and Materials: TopWorx™ DXR

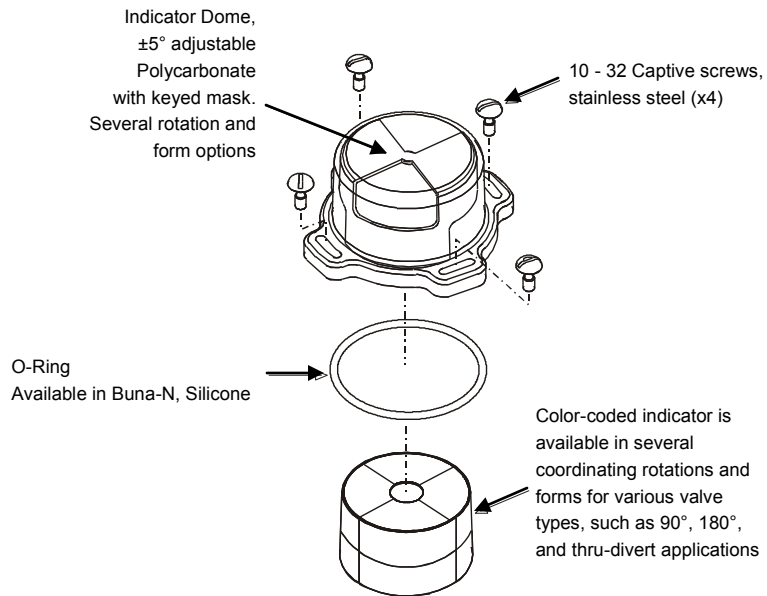


MATERIALS OF CONSTRUCTION	
Enclosure	Valox™ 364
Fasteners	304 Stainless Steel standard 316 Stainless Steel optional
Shaft	304 Stainless Steel standard 316 Stainless Steel optional
Shaft Bushing	Delrin™ 500P white
Indicator Dome	Polycarbonate, UV F1 rated
Seals	Silicone

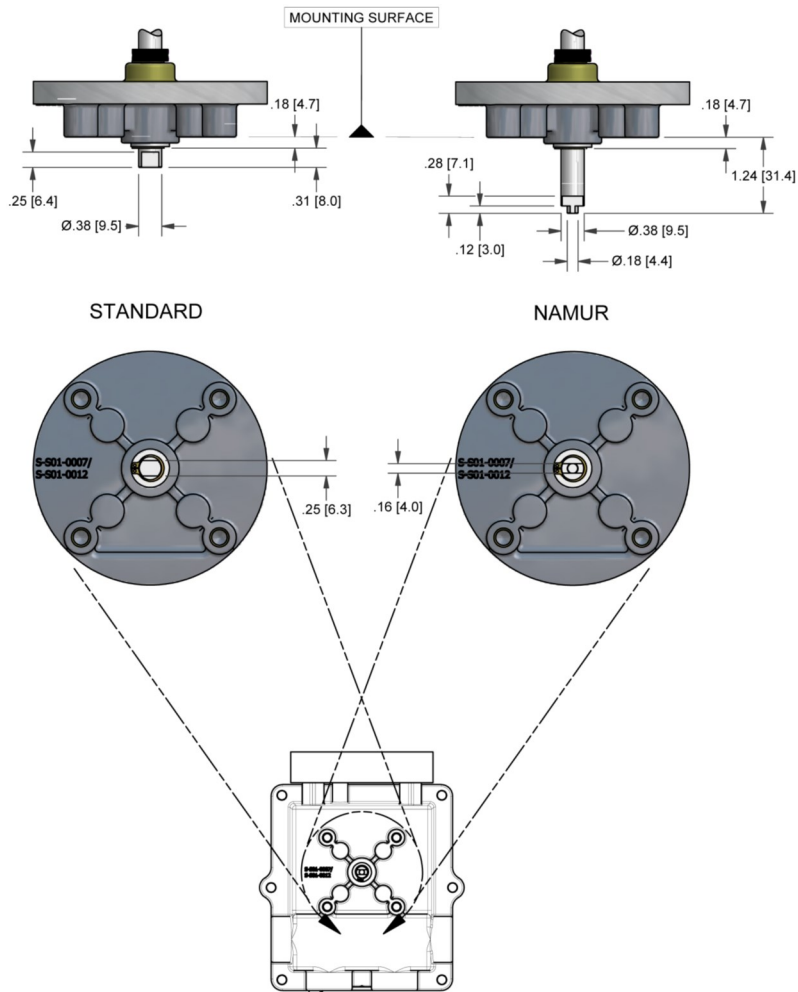
Maximum Fastener Torque Specifications	
Enclosure Housing Bolts	20 in-lbs [2.3 N·m]
Indicator Dome Screws	20 in-oz [2.3 N·m]
Bottom Mounting Holes	8 ft-lbs [10.8 N·m]



## Indicator Assembly



## Shaft Assemblies





## Features and Specifications

### 4-20mA Position with HART Protocol

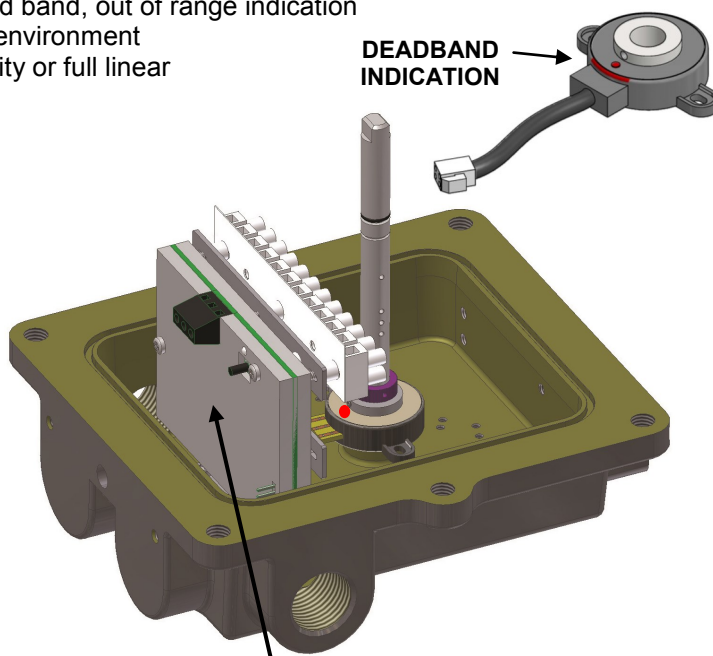
The 2-wire 4-20mA transmitter with HART will generate a nominal 4-20mA proportional to valve position output for full -range actuation of the valve. The transmitter is capable of generating signals below 4mA and above 20mA if the position sensor indicates an out of range value. With the added HART digital communication capability, remote calibration and parameter configuration can be performed.

#### Features:

- 1) Single push button easy calibration eliminates zero/span calibration interaction in both clockwise and counterclockwise actuator/valve rotation directions
- 2) Non-volatile memory of set points (set points remain after loss of power)
- 3) No internal backlash – direct shaft position feedback
- 4) No gear wear or mechanical binding
- 5) Position measurement range from 20 to 320 degrees. Factory set for 20 to 180 degrees operation in counter clockwise rotation to open and 20 to 90 degrees operation in clockwise rotation to open applications
- 6) Advanced diagnostics includes detection of dead band, out of range indication
- 7) Transmitter PCB is potted and sealed from the environment
- 8) Selectable +/- 3% over and under travel capability or full linear options set during calibration

#### HART Features:

- 1) Remote set point calibration
  - Example: Using a handheld device for calibration and monitoring
- 2) 4 to 20mA variable reading (PV)
- 3) Valve opening indication in percentage
- 4) Setting the range of the process variable
- 5) Monitoring and setting of alarms with advanced diagnostics. Includes detection of deadband, out of range indication
- 6) Selectable +/- 3% over and under travel capability (rotary) or full linear options"
- 7) Multi-drop functionality
- 8) Easy integration into AMS and DeltaV systems
- 9) DD files registered through HCF (HART Communication Foundation)



Typical HART device in a TopWorx DXP

#### Electrical Specifications:

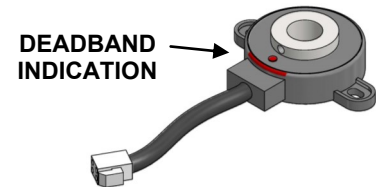
Minimum Voltage	13.5VDC Analog Signal, 15.0V HART DC
Maximum Voltage	39.0 VDC
*Linearity (Absolute, Full Scale)	+/- 2% of output span
*Repeatability (Full Scale)	0.3% of full scale.
*Hysteresis	0.3% of full scale
Temperature Range	-20° to 55° C
Input Polarity Protection	No dmg occurs from reversal of loop current

#### Electrical Data:

- Voltage Input Range: 15 - 39 Volts DC
- Standard Output Signal: Two wire 4-20mA with out of range indication

## Operation of the 4-20mA Current Position Transmitter

During run mode, the 4-20mA position transmitter will output 4-20mA for valve positions between and including the set points. In the rotary mode, the module will provide an over or under travel correction if the valve position exceeds the high or low set point within +/-3% . In other words, the output will be 4mA for +/-3% over and under travel on the low end and 20mA for +/-3% over and under travel on the high end. If the valve position exceeds 3% of over travel, then values below 4mA or above 20mA will be output. In the linear mode, no under or over travel is compensated for. The device can be set to either linear or rotary mode during calibration using the on board push button switch, or remotely using HART communications.



### Calibrating End Set Points Locally:

The 4-20 current transmitter can be used for any rotation range between 20 and 320 degrees\*\*.

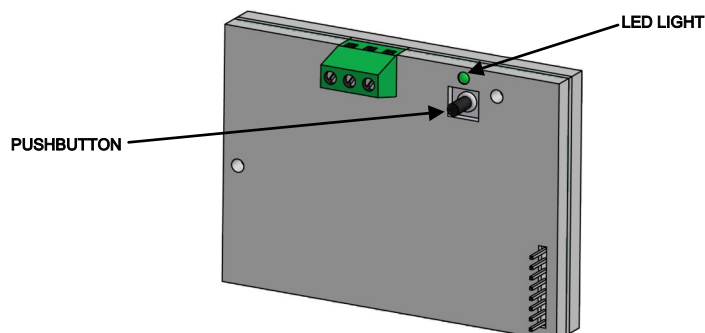
#### Option #1: +/- 3% Over and Under Travel at the Set End Points (Rotary):

- 1) As the shaft rotates, make sure the potentiometer is not rotating through its deadband area. The red dot located on the potentiometer should not rotate past the area marked with red during the full rotation of the valve. If it does, reposition the shaft.
- 2) Apply power to unit (LED should be continuously on to indicate the unit has been calibrated or flashing the 4-1 code to indicate the unit has not been calibrated)
- 3) **Counter-clockwise calibration** - Press the button greater than 0.5 seconds and less than 3 seconds if you are going to calibrate using a counter-clockwise rotation from the 4mA position to the 20mA position. (LED will start flashing a 3-1 code indicating that calibration mode is active and the unit is waiting to calibrate the 4ma position).
- 4) **Clockwise calibration** - Press the button greater than 3 seconds and less than 5.5 seconds if you are going to calibrate using a clockwise rotation from the 4mA position to the 20mA position. (LED will start flashing a 3-2 code indicating that calibration mode is active and the unit is waiting to calibrate the 4mA position).
- 5) Rotate valve to the desired position corresponding to 4mA. (This can be the open or closed position)
- 6) Press the button to capture the 4mA value (The LED will start flashing a 3-3 code indicating that the unit is waiting to calibrate the 20mA position)
- 7) Rotate valve to the desired position corresponding to 20mA (This will be the position opposite of the position in step 3 or step 4)
- 8) Press the button to capture the 20mA value (The LED will turn on continuously)

#### Option #2: No Under and Over Travel at Set End Points (Full Linear):

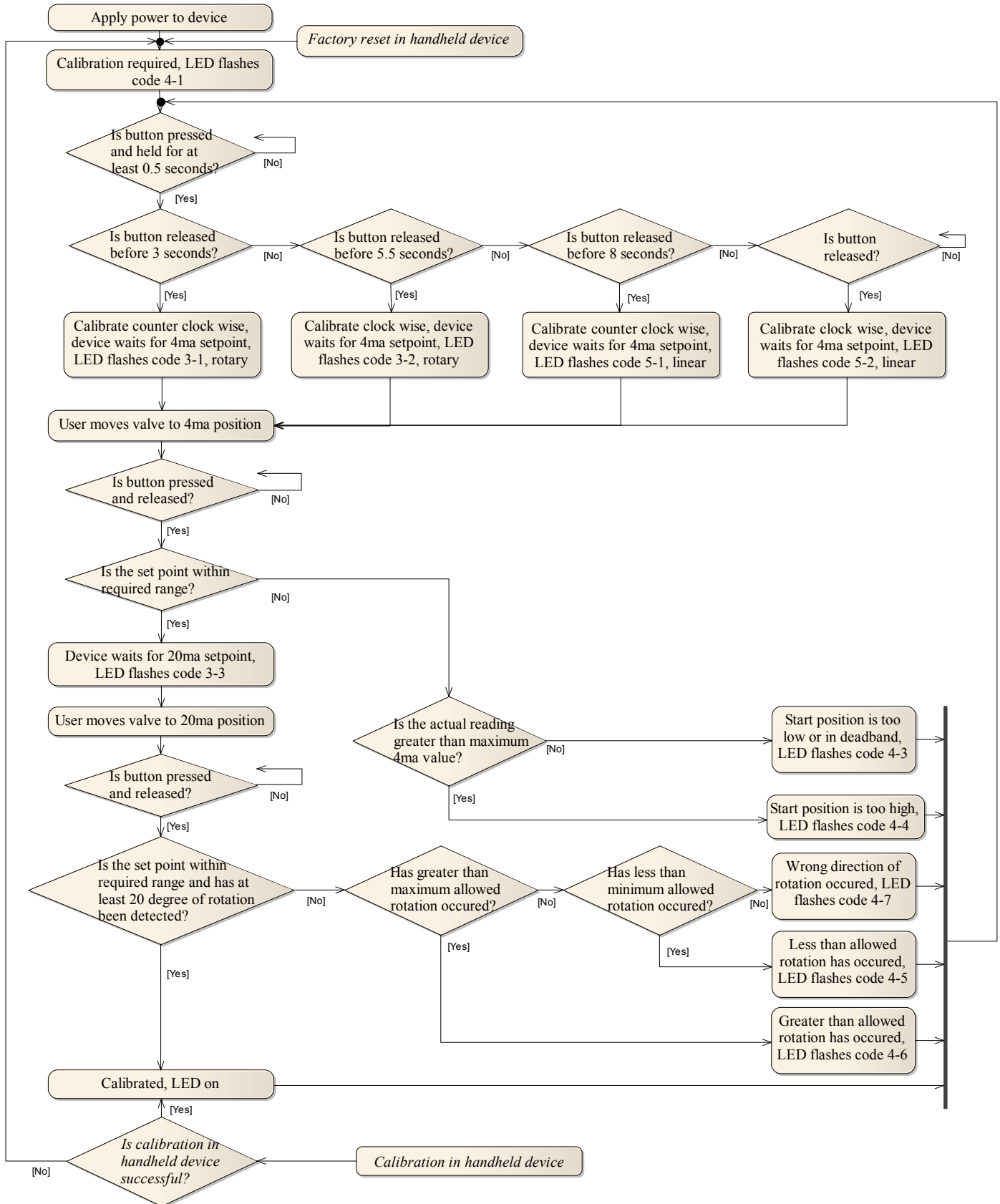
- 1) As the shaft rotates, make sure the potentiometer is not rotating through its dead band area. The red dot located on the potentiometer should not rotate past the area marked with red during the full rotation of the valve. If it does, reposition the shaft.
- 2) Apply power to unit (LED should be continuously on to indicate the unit has been calibrated or flashing the 4-1 code to indicate the unit has not been calibrated)
- 3) **Counter-clockwise calibration** - Press the button greater than 5.5 seconds and less than 8 seconds if you are going to calibrate using a counter-clockwise rotation from the 4mA position to the 20mA position. (LED will start flashing a 5-1 code indicating that calibration mode is active and the unit is waiting to calibrate the 4mA position).
- 4) **Clockwise calibration** - Press the button greater than 8 seconds if you are going to calibrate using a clockwise rotation from the 4mA position to the 20mA position. (LED will start flashing a 5-2 code indicating that calibration mode is active and the unit is waiting to calibrate the 4mA position).
- 5) Rotate valve to the desired position corresponding to 4mA. (This can be the open or closed position)
- 6) Press the button to capture the 4mA value (The LED will start flashing a 3-3 code indicating that the unit is waiting to calibrate the 20mA position)
- 7) Rotate valve to the desired position corresponding to 20mA (This will be the position opposite of the position in step 3 or step 4)
- 8) Press the button to capture the 20mA value (The LED will turn on continuously)

NOTE:\*\*The potentiometer has been factory set for typical valve rotation ranges from 20 to 180 degrees in counter-clockwise rotation applications from the 4mA position to the 20mA position and from valve rotation ranges from 20 to 90 degrees in clockwise rotation applications from the 4mA position to the 20mA position. Please contact TopWorx for proper potentiometer set up for ranges greater than specified above.



**NOTE:** Schematics are for illustration purposes only. Refer to the wiring diagram on your product to determine actual pin out location

### Calibration Flow Chart



**Table 1:  
LED Flash Code Diagram**

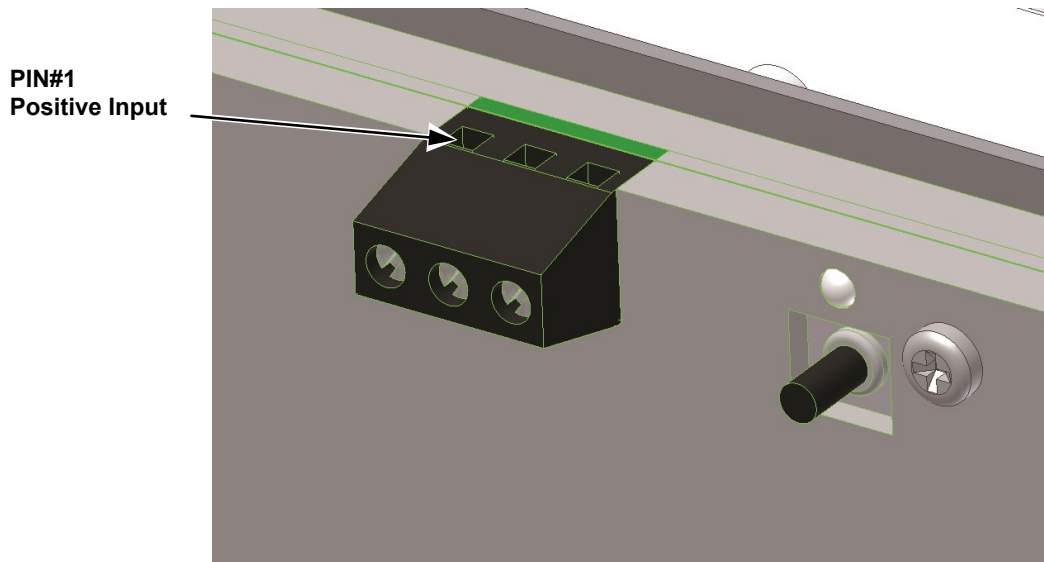
<b>Flash Codes ( first count – second count )</b>	<b>Interpretations</b>
0-0	Calibrated
3-1	Counter-Clockwise Calibration, Rotary Mode
3-2	Clockwise Calibration, Rotary Mode
3-3	Waiting for 20mA Full Open Setting Button Press
4-1	Calibration Required
4-3	Calibration Start Value is Too Low
4-4	Calibration Start Value is Too High
4-5	End Value is Too Close to Start Value
4-6	Maximum Rotation Exceeded
4-7	Wrong Direction of Rotation
5-1	Counter-Clockwise Calibration, Linear Mode
5-2	Clockwise Calibration, Linear Mode

**Table 2:  
LED Error Codes**

<b>Problem</b>	<b>Probable Cause/Solution</b>
Transmitter Module has no current output	If the LED on the Transmitter Module is not lit <ul style="list-style-type: none"> <li>- Loose or shorted signal connection (fix connection)</li> <li>- Controller Board not responding (Replace Transmitter Module)</li> </ul> If the LED on the Circuit Board is lit <ul style="list-style-type: none"> <li>- Potentiometer is disengaged from shaft (must be returned for repair)</li> <li>- Defective controller board (Replace Transmitter Module)</li> </ul>
Transmitter does not output 4 or 20mA (+/-1%) at desired end of travel	Unit not calibrated (calibrate) Unit is calibrated (recalibrate - if still fails, replace board)
Output is not linear or does not track valve position or rotation	Input signal is not linear <ul style="list-style-type: none"> <li>- Linkage or drive mechanism is introducing non-linearity</li> <li>- Unit is not calibrated (calibrate)</li> </ul>
Error Code 4-3	Start position is too low or in the dead-band position. (See illustration 9)
Error Code 4-4	Start Position is too high
Error Code 4-5	Start and stop positions are less than 20°, increase valve rotation between start and stop positions to greater than 20°.
Error Code 4-6	Rotation has exceeded the 320° limit. Decrease valve rotation between start and stop positions to less than 320°.
Error Code 4-7	Calibration rotation was in the wrong direction or the potentiometer passed through the dead-band position.
Error Code 4-1	Internal Error has occurred. Recalibrate, if error continues, replace module.

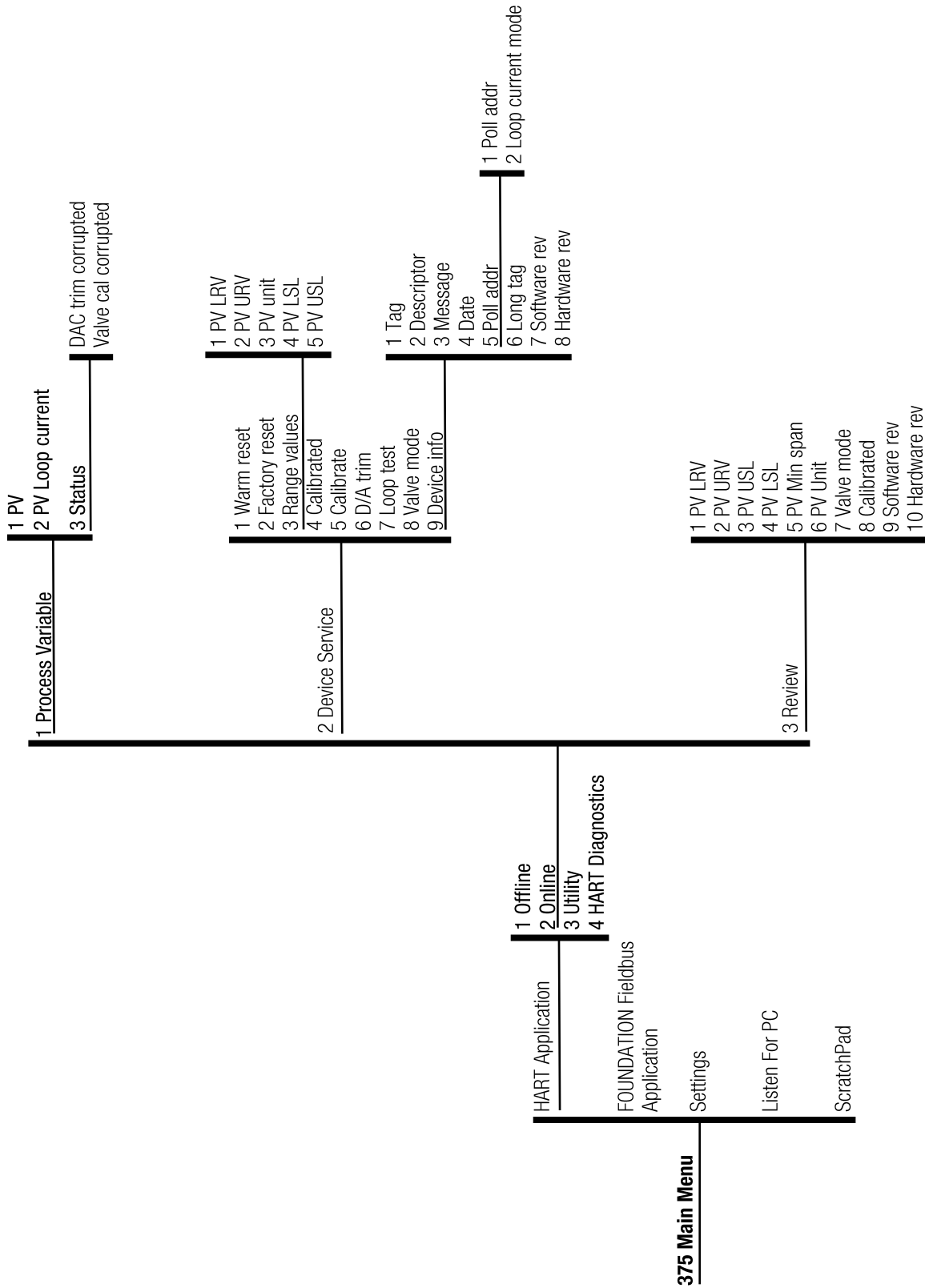
## Calibrating Remotely using the Emerson 375/475 Field Communicator:

- 1) Make sure that the HART power is not activated before attaching the signal/power wires to the HART device.
- 2) If not already connected, connect the device to the two HART signal/power lines. Pin 1 on the terminal block is the positive input and pin 2 is the negative input. Pin 1 is the first pin on the left of the module and pin 2 is the middle pin (see picture below). Once connected, activate the HART power/signal from the control system.



- 3) Connect the Emerson 375 Handheld device to the HART signal lines. Red marked lead to the positive signal line and the black lead to the negative signal line.
- 4) Activate the 375.
- 5) Select the HART Application option from the menu selections.
- 6) If a warning screen is shown. Disregard and hit "CONTINUE".
- 7) If the "Modification has been made to the configuration" screen is shown, hit "OK".
- 8) ANYTIME the non-zero status code(s) screen is shown, hit "YES".  
The main menu should now be shown indicating:
  - Process Variable
  - Device Service
  - Review
- 10) Select the "2. Device Service" option.
- 11) Select the "5. Calibrate" option.
- 12) Select "OK" when the "You are to set the valve operation ranges" screen is shown.
- 13) Select either the "1. Counter clockwise" or "2. Clockwise" options depending on the application.
- 14) Make sure the potentiometer is not rotating through its deadband area.
- 15) Follow the on screen instructions. Select "OK" when the valve is at the 4mA setpoint (Is the valve fully closed?)
- 16) After the first set point is saved, rotate the valve to the 20mA position.
- 17) Select "OK".
- 18) The set points are now calibrated.
- 19) If error occurs, the screen will display the error type and abort.
- 20) Re-calibrate if an error occurs and again make sure the potentiometer is not rotating through its deadband area.

DD Menu Tree



## Safe Use

### User instructions (in compliance with ATEX 94/9/EC Directive, Annex II, 1.0.6)

The following instructions apply to the **DXP/DXS Switchbox** covered by certificate number IECEx SIR 09.0098X, Sira 07ATEX2214X.

### Instructions for safe selection, installation, use, maintenance and repair

- 1) The equipment may be used in zones 0, 1 or 2.
- 2) The equipment may be used in the presence of flammable gases and vapors with apparatus groups IIC or IIB or IIA and with temperature classes T4 or T6.
- 3) The equipment is certified for use in ambient temperatures in the range of -60°C to +175°C and should not be used outside this range.
- 4) The equipment is to be installed by suitably trained personnel in accordance with the applicable code of practice (typically IEC 60079-14)
- 5) Under certain extreme circumstances, the plastic cover over the valve position indicator may generate an ignition-capable level of electrostatic charge. Therefore, particularly in the event of an installation in zone 0, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge, e.g. wind-blown dust, etc. Additionally the equipment shall only be cleaned with a damp cloth.
- 6) Periodic inspection of the equipment and system should be performed by suitably trained personnel in accordance with the applicable code of practice (typically IEC 60079-17) to ensure it is maintained in a satisfactory condition.
- 7) The equipment does not require assembly or dismantling.
- 8) The equipment is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approved agents, in accordance with the applicable code of practice.

### Special Conditions of Safe Use (All installations)

Clean only with a damp cloth to prevent possibility of electrostatic discharge.

For Explosion Proof installations, the internal ground connection shall be used and the external ground connection, if supplied in addition, is supplemental bonding allowed where local authorities permit, or is required.

When installing with a third party listed nipple-mount solenoid, it is the responsibility of the installer to provide fittings, and apparatus, suitable for the area classification in accordance with the National Electrical Code.

All cable entry devices or conduit stopping boxes shall be certified in type of explosion protection 'd', suitable for the conditions of use and correctly installed.

The IIC enclosures are excluded from use in carbon disulphide atmospheres.

The air pressure to the valve block, when fitted, shall not exceed 7bar.

### Preventative Maintenance

The TopWorx Discrete Valve Controller is designed to operate for one million cycles without servicing. Call TopWorx when you are approaching this milestone for a preventative maintenance kit and instructions.

## Certifications & Approvals

### D-SERIES METAL (DXP/DXS)

#### INTRINSICALLY SAFE (WITHOUT THE VALVE OPTION)



Ex ia IIC T6/T4 Ga\*, Ex t IIIC T70°C Db, IP66/IP67  
 Ex ia IIC T6/T4 Gb\*, Ex t IIIC T70°C Db, IP66/IP67  
 Ex ia IIC T4, DIP A21 Ta 85°C IP66/IP67 (marking for GOST)  
 Ex ib IIC T4 Gb, Ex tb IIIC T80°C Db, IP67 (marking for FF and FF with FISCO)  
 Class I Div 1, Groups A,B,C,D; Type 4X; IP67  
 Ex ia IIC T6 Ga, DIP A21 Ta, T6/T4 Db IP66/IP67 (marking for NEPSI)  
 -50°C ≤ Tamb ≤ +55°C (maximum\*)  
 SIRA 07ATEX2214X  
 Baseefa 11ATEX0035X (FF and FF with FISCO)  
 IECEx SIR 09.0098X  
 IECEx BAS 11.0022X (FF and FF with FISCO)  
 NCC 12.1260X  
 GOST POCC US.Γ506.B01346  
 P279671/1  
 NEPSI GYJ13.1297X

\* Reference certificates for variations to Tamb and ELP due to sensing and/or o-ring material options.

#### INTRINSICALLY SAFE (WITH THE VALVE OPTION)



Ex ia IIC T6/T4 Ga/Gb, Ex t IIIC T70°C Db, IP66/IP67  
 Ex ia IIC T4, DIP A21 Ta 85°C IP66/IP67 (marking for GOST)  
 Ex ib IIC T4 Gb, Ex tb IIIC T80°C Db, IP67 (marking for FF and FF with FISCO)  
 Class I Div 1, Groups A,B,C,D; Type 4,4X; IP67  
 Ex ia IIC T6/T4 Ga, DIP A21 Ta, T6/T4 Db IP66/IP67 (marking for NEPSI)  
 -40°C ≤ Tamb ≤ +60°C (maximum\*)  
 SIRA 07ATEX2214X  
 Baseefa 11ATEX0035X (FF and FF with FISCO)  
 GOST POCC US.Γ506.B01346  
 P279671/1  
 NEPSI GYJ13.1297X

\* Reference certificates for variations to Tamb due to pilot options and ELP due to sensing and/or o-ring material options.

#### FLAMEPROOF (WITH & WITHOUT THE VALVE OPTION)



Ex d IIB+H2 T6 Gb  
 Ex tb IIIC T85°C Db, IP66/IP67  
 Ex d IIB+H2 T4, DIP A21 Ta 85°C IP66/IP67 (marking for GOST)  
 Class I Div 1, Groups C,D; Class II Div 2, Groups A,B,C,D; Class II Div 2, Groups F,G; Type 4,4X; IP67  
 Ex d IIB+H2 T6/T5/T4 Gb, DIP A21 Ta, T6/T5/T4 Db, IP66/IP67 (marking for NEPSI)  
 -50°C ≤ Tamb ≤ +60°C (maximum\*)  
 SIRA 07ATEX1273X  
 IECEx SIR 07.0093X  
 NCC 12.1138X  
 GOST POCC US.Γ506.B01346  
 P279673/1  
 NEPSI GYJ13.1295X

\* Reference certificates for variations to Tamb.



Ex d IIC T6/T5/T4 Gb  
 Ex tb IIIC T85°C/T100°C/T135°C Db, IP66/IP67  
 Ex d IIC T4, DIP A21 Ta 85°C IP66/IP67 (marking for GOST)  
 Ex d IIC T6/T5/T4 Gb, DIP A21 Ta, T6/T5/T4 Db, IP66/IP67 (marking for NEPSI)  
 -50°C ≤ Tamb ≤ +60°C/75°C/110°C (maximum\*)  
 SIRA 07ATEX1273X  
 IECEx SIR 07.0093X  
 NCC 5614/09X  
 GOST POCC US.Γ506.B00921  
 P279673/1  
 NEPSI GYJ13.1295X

\* Reference certificates for variations to Tamb.

#### NON-INCENDIVE



Ex nC IIC T6 Gb; IP67\*  
 Class I Div 2, Groups A,B,C,D; Class II Div 2, Groups F,G; Type 4X; IP67  
 -40°C ≤ Tamb ≤ +60°C

\*Consult factory for available sensing options.

### D-SERIES RESIN (DXR)

#### INTRINSICALLY SAFE (WITHOUT THE VALVE OPTION)



Ex ia IIC T4 Gb, Ex t IIIC T70°C Db, IP67 (Silicone o-rings only)  
 Ex ib IIC T4 Gb, Ex tb IIIC T80°C DB, IP67 (marking for FF only)  
 Ex ia IIC T6 Ga, DIP A21 Ta, T6/T4 Db IP67 (marking for NEPSI)  
 -40°C ≤ Tamb ≤ +53°C (maximum\*)  
 SIRA 07ATEX2214X  
 Baseefa 11ATEX0035X (FF and FF with FISCO)  
 IECEx SIR 09.0098X  
 IECEx BAS 11.0022X (FF and FF with FISCO)  
 NEPSI GYJ13.1297X

\* Reference certificates for variations to Tamb due to sensing options.

#### INTRINSICALLY SAFE (WITH THE VALVE OPTION)



Ex ia IIC T4 Gb, Ex t IIIC T70°C Db, IP67 (Silicone o-rings only)  
 Ex ib IIC T4 Gb, Ex tb IIIC T80°C DB, IP67 (marking for FF only)  
 Ex ia IIC T6/T4 Ga, DIP A21 Ta, T6/T4 Db IP66/IP67 (marking for NEPSI)  
 -20°C ≤ Tamb ≤ +52°C (maximum\*)  
 SIRA 07ATEX2214X  
 Baseefa 11ATEX0035X (FF and FF with FISCO)  
 IECEx SIR 09.0098X  
 IECEx BAS 11.0022X (FF and FF with FISCO)  
 NEPSI GYJ13.1297X

\* Reference certificates for variations to Tamb due to pilot options.

#### INCREASED SAFETY (WITH & WITHOUT THE VALVE OPTION)



Ex e mb IIC T4 Gb  
 Ex tb IIIC T66°C Db, IP67 (Silicone o-rings only)  
 -20°C ≤ Tamb ≤ +44°C (maximum\*)  
 SIRA 09ATEX3209X  
 IECEx SIR 09.0098X  
 P279673/2

\* Reference certificates for variations to Tamb due to pilot options.

#### NON-INCENDIVE



Class I Div 2, Groups A,B,C,D; Class II Div 2, Groups F,G; Type 4,4X; IP67  
 T4 -40°C ≤ Tamb ≤ +60°C

#### GENERAL PURPOSE



Type 4X

### D-SERIES METAL (DXP/DXS)

#### GENERAL PURPOSE



Type 4X

\*Consult factory for available sensing options.



# Warranty

## TERMS AND CONDITIONS OF SALE

## EXHIBIT C

These terms and conditions, the attendant quotation or acknowledgment, and all documents incorporated by reference therein, binds TopWorx, Inc. hereinafter the Seller, and the buyer, hereinafter Buyer, and constitutes the entire agreement (Agreement) between Buyer and Seller for the provision of services (Services) and/or the sale of goods (Goods) including (except as provided in Section 10) firmware incorporated therein.

**1. PRICES:** Unless otherwise specified by Seller, Seller's price for the Goods and/or Services shall remain in effect for thirty (30) days after the date of Seller's quotation or acceptance of the order for the Goods/Services, whichever is delivered first, provided an unconditional, complete authorization for the immediate manufacture and shipment of the Goods and/or provision of Services pursuant to Seller's standard order processing procedures is received and accepted by Seller within such time period. If such authorization is not received by Seller within such thirty (30) day period, Seller shall have the right to change the price for the Goods/Services to Seller's price in effect for the Goods/Services at the time the order is released to final manufacture. Prices for Goods do not cover storing, installing, starting up or maintaining Goods unless expressly stated in Seller's quotation. Notwithstanding the foregoing, the price for Goods/Services sold by Seller, but manufactured by others, shall be Seller's price in effect at the time of shipment to Buyer.

**2. DELIVERY, ORDER ACCEPTANCE AND DOCUMENTATION:** All shipping dates are approximate and are based upon Seller's prompt receipt of all necessary information from Buyer to properly process the order. Notwithstanding any provisions to the contrary in this or other documents related to this transaction, and regardless of how price was quoted, whether FOB, FAS, CIF or otherwise, legal title to the Goods and risk of loss thereto shall transfer to Buyer as follows: for sales in which the end destination of the Goods is within the United States, upon delivery to the freight carrier at the shipping point; for sales in which the end destination of the Goods is outside of the United States, immediately after the Goods have passed beyond the territorial limits of the United States. Seller shall provide Buyer with that data/documentation which is specifically identified in the quotation. If additional copies of data/documentation or non-standard data/documentation are to be provided by Seller, they shall be provided to Buyer at Seller's price then in effect. Data/documentation marked as confidential or proprietary may not be reproduced or used for any purpose other than the purpose for which it was provided and may not be disclosed to third parties without the prior written permission of Seller.

**3. EXCUSE OF PERFORMANCE:** Seller shall not be liable for delays in performance or for non-performance due to failure or interruption of computer or telecommunication systems, acts of God, war, riot, fire, terrorism, labor trouble, unavailability of materials or components, explosion, accident, compliance with governmental requests, laws, regulations, orders or actions, or other unforeseen circumstances or causes beyond Seller's reasonable control. In the event of such delay, the time for performance or delivery shall be extended by a period of time reasonably necessary to overcome the effect of the delay.

**4. TERMINATION AND SUSPENSION BY BUYER:** Buyer may terminate or suspend its order for any or all of the Goods/Services covered by the Agreement provided that Buyer gives Seller reasonable advance written notice of such termination or suspension and reimburses Seller for all losses, damages, costs and expenses arising from such termination or suspension.

**5. LIMITED WARRANTY:** Subject to the limitations contained in Section 6 herein, Seller warrants that the licensed firmware embodied in the Goods will execute the programming instructions provided by Seller, and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care. The foregoing warranties will apply until the expiration of the applicable warranty period. All other Goods are warranted for twelve (12) months from the date of shipment by Seller. Consumables and Services are warranted for a period of 90 days from the date of shipment or completion of the Services. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, correct any errors that are found by Seller in the firmware or Services or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, use of unauthorized replacement parts, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by Seller. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel and representatives for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller. Goods repaired and parts replaced by Seller during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by Seller. THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.

**6. LIMITATION OF REMEDY AND LIABILITY:** SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE. THE REMEDIES OF BUYER SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE TO BUYER OF THE SPECIFIC GOODS MANUFACTURED OR SERVICES PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXTEND TO INCLUDE INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. THE TERM "CONSEQUENTIAL DAMAGES" SHALL INCLUDE, BUT NOT BE LIMITED TO, LOSS OF ANTICIPATED PROFITS, REVENUE OR USE AND COSTS INCURRED INCLUDING WITHOUT LIMITATION FOR CAPITAL, FUEL AND POWER, AND CLAIMS OF BUYER'S CUSTOMERS.

**7. PATENTS:** Subject to the limitations contained in Section 6, Seller shall defend any suits brought against Buyer based on a claim that use of the Goods manufactured by Seller constitutes an infringement of a valid patent of the United States, and shall pay any damages awarded therein against Buyer, provided that Buyer: promptly notifies Seller in writing of the filing of such suit or the threat thereof; permits Seller to control completely the defense or compromise of such claim of infringement; and provides all reasonable assistance and cooperation requested by Seller for the defense of such suit. In the event that only the Goods manufactured by Seller are held to be infringing in such suit and their use is enjoined, Seller shall, at its sole option and expense, provide a commercially reasonable alternative, including, but not limited to, procuring for Buyer the right to continue using the Goods, replacing them with a non-infringing product or modifying them so they become non-infringing. Buyer agrees that Seller shall not be liable for infringement, and that Buyer shall fully indemnify Seller therefore, if infringement is based upon the use of Goods in connection with goods not manufactured by Seller or in a manner for which the Goods were not designed by the Seller or if the Goods were not designed by the Seller or if the Goods were designed by the Buyer or were modified by or for the Buyer in a manner to cause them to become infringing.

**8. TAXES:** Any tax or governmental charge payable by the Seller because of the manufacture, sale or delivery of the Goods, or provision of Services, may at Seller's option be added to the price herein specified. The foregoing shall not apply to taxes based upon Seller's net income.

**9. TERMS OF PAYMENT:** Subject to the approval of Seller's Credit Department, terms are F.O.B. shipping point, net 30 days from date of Seller's invoice in U.S. currency, except for applicable milestone payments covered below or export shipments for which Seller may require other arrangements. Freight charges may include shipping and handling charges, and Buyer shall pay all such charges. If any payment owed to Seller hereunder is not paid when due, it shall bear interest at a rate 1-1/2% per month interest from the date on which it is due until it is received and future shipments may be placed on hold. Seller shall have the right, among other remedies, either to terminate the Agreement or to suspend further deliveries under this and/or other agreements with Buyer in the event Buyer fails to make any payment hereunder when due. Buyer shall be liable for all expenses attendant to collection of past due amounts, including attorneys' fees. Unless otherwise provided in Seller's written quotation, periodic milestone payments shall be made by Buyer when the purchase price of this Agreement exceeds \$100,000. In such cases, invoices shall be issued by Seller and paid by Buyer based on the following milestones: Milestone 1: 30% of price upon acceptance of order by Seller. Milestone 2: 30% of price upon release by Seller of approved bills of material to manufacturing for assembly. Milestone 3: 40% of price upon shipment of the Goods by Seller. Seller reserves the right to designate additional Milestones where the Agreement provides for Services in excess of \$50,000.

**10. SOFTWARE AND FIRMWARE:** Notwithstanding any other provision herein to the contrary, Seller or applicable third party owner shall retain all rights of ownership and title in its respective firmware and software, including all copyrights relating to such firmware and software and all copies of such firmware and software. Except as otherwise provided herein, Buyer is hereby granted a nonexclusive, royalty free license to use firmware and software, and copies of firmware and software, incorporated into the Goods only in conjunction with such Goods and only at the Buyer's plant site where the Goods are first used. Buyer may negotiate with Seller separate licenses to use such copies and firmware and software at other plant sites. Buyer's use of certain firmware (as specified by Seller) and all other software shall be governed exclusively by Seller's and/or third party owner's applicable license terms.

**11. BUYER SUPPLIED DATA:** To the extent that Seller has relied upon any specifications, information, representation of operating conditions or other data or information supplied by Buyer to Seller ("Data") in the selection or design of the Goods and/or provision of the Services and the preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer and relied upon by Seller, any warranties or other provisions contained herein which are affected by such conditions shall be null and void.

**12. EXPORT/IMPORT:** Buyer agrees that all applicable import and export control laws, regulations, orders and requirements, including without limitation those of the United States and the European Union, and the jurisdictions in which the Seller and Buyer are established or from which items may be supplied will apply to its receipt and use of Goods and Services. In no event shall Buyer use, transfer, release, import, export, or re-export Goods in violation of such applicable laws, regulations, orders, or requirements.

**13. GENERAL PROVISIONS:** (a) Buyer shall not assign its rights or obligations under the Agreement without Seller's prior written consent; (b) there are no understandings, agreements or representations, express or implied, not specified in the Agreement; (c) no action, regardless of form, arising out of transactions under the Agreement, may be brought by either party more than two years after the cause of action has accrued; (d) any modification of these terms and conditions must be set forth in a written instrument signed by a duly authorized representative of Seller; (e) the Agreement is formed and shall be construed, performed and enforced under the laws of the State of Missouri (however, Buyer and Seller agree that the proper venue for all actions arising under the Agreement shall be only in the State where the Goods involved in such actions were manufactured; (f) The 1980 United Nations Convention on Contracts for the International Sale of Goods does not apply to this Agreement; (g) If any provision of the Agreement is invalid under any statute or rule of law, such provision, to that extent only, shall be deemed to be omitted without affecting the validity of the remainder of the Agreement; (h) Seller specifically objects to the application of any Federal Acquisition Regulation ("FAR") or other governmental procurement provision or clause to the Agreement; (i) UNLESS OTHERWISE SPECIFICALLY PROVIDED IN SELLER'S QUOTATION, GOODS AND SERVICES HEREUNDER ARE NOT INTENDED FOR USE IN ANY NUCLEAR OR NUCLEAR RELATED APPLICATIONS. Buyer (i) accepts Goods and Services in accordance with the restriction set forth in the immediately preceding sentence, (ii) agrees to communicate such restriction in writing to any and all subsequent purchasers or users and (iii) agrees to defend, indemnify and hold harmless Seller from any and all claims, losses, liabilities, suits, judgments and damages, including incidental and consequential damages, arising from use of Goods and Services in any nuclear or nuclear related applications, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability; (j) The rights, remedies and protections afforded to Seller under this Agreement, including but not limited to indemnification of Seller, limitation of remedy and liability and limited warranty shall extend to Seller and to its affiliates, subsidiaries, or related companies performing or supplying work, services, or products under this Agreement or any agreement into which it is incorporated by reference; and (k) Seller does not agree to: (i) indemnify Buyer; or (ii) name Buyer as an additional insured.

**NOTES:**

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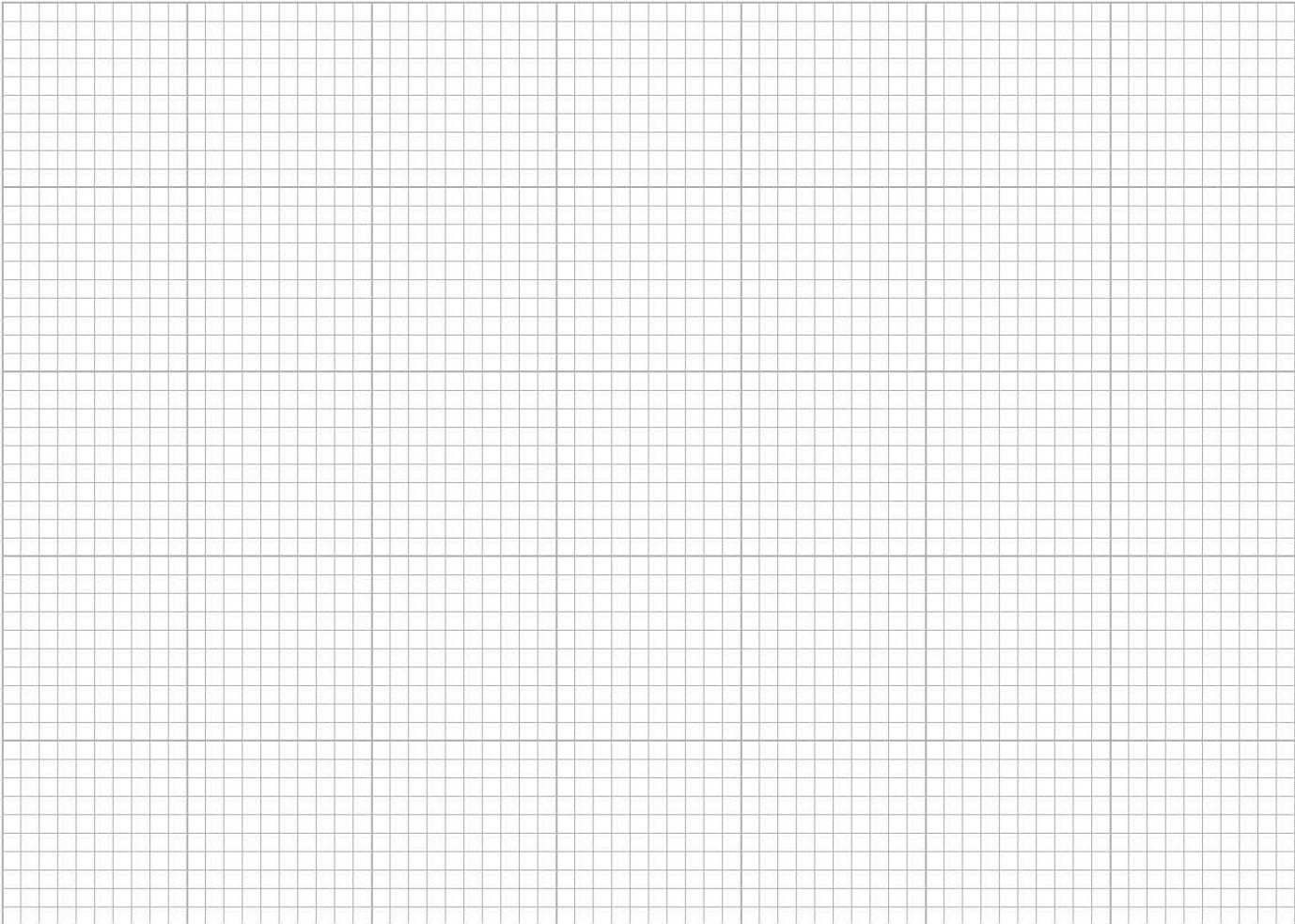
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[info.topworx@emerson.com](mailto:info.topworx@emerson.com)

[www.topworx.com](http://www.topworx.com)

#### GLOBAL SALES & GLOBAL SUPPORT OFFICES

##### Americas

3300 Fern Valley Road  
Louisville, Kentucky 40213  
USA  
+1 502 969 8000

##### Europe

Horsfield Way  
Bredbury Industrial Estate  
Stockport SK6 2SU  
United Kingdom  
+44 0 161 406 5155

##### Middle East

P.O. Box 17033  
Jebel Ali Free Zone  
Dubai 17033  
United Arab Emirates  
+971 4 811 8283

##### Middle East

P.O. Box 17033  
Jebel Ali Free Zone  
Dubai 17033  
United Arab Emirates  
+971 4 811 8283

##### Asia Pacific

1 Pandan Crescent  
Singapore 128461  
+65 6891 7550



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