

## Data Sheet

# E2S Intrinsically Safe Pressure Transducer For Hydrogen Applications

### FEATURES

- FM, ATEX, IECEx Intrinsically-Safe approvals, FM Non-Incendive approval
- Ranges vac through 20,000 psi/1400 bar
- IP66/67 Ingress rating
- Thick pressure sensing diaphragm using our proven CVD technology:
  - 316L SS ranges to 5000 psi/350 bar
  - A286 ranges to 20,000 psi/1400 bar
- External magnetic offset & span adjustment

### TYPICAL USES

- Hydrogen filling stations
- Hydrogen compressors
- Hydrogen storage tanks
- Reactor vessels
- Fuel cells for vehicles



**E2S**  
Pressure Transducer

### PERFORMANCE SPECIFICATIONS

|                        |  |
|------------------------|--|
| Reference Temperature: | 21 °C ±2°C   |
| Static Accuracy:       | ±0.25% of span, ±0.50% of span, ±1.0% of span, Terminal Point Method includes: hysteresis, linearity, repeatability, offset and span |
| Stability:             | ±0.25% year at reference conditions  |

### ENVIRONMENTAL SPECIFICATIONS

|                       |  |
|-----------------------|--|
| Thermal Coefficients: | Offset: ±0.009% /°C from -40°C to 80°C<br>Span: ±0.009% /°C from -40°C to 80°C   |
| Temperature Limits:   | Storage: -58°F to 257°F (-50°C to 125°C)<br>Operating: -40°F to 176°F (-40°C to 80°C)<br>Media: -40°F to 176°F (-40°C to 80°C) |
| Humidity:             | 0-100% (non-condensing)  |

### FUNCTIONAL SPECIFICATIONS

|                                 |                            |
|---------------------------------|----------------------------|
| Response Time (Output)          | 4 ms                       |
| Gauge/Compound Pressure Ranges: | VAC to 20,000 psig         |
| Shock:                          | 80g, 6 ms, Haversine       |
| Vibration:                      | Random: 10g RMS 20-2000 Hz |
| Proof Pressure:                 | 1.2x - 1.5x                |
| Burst Pressure:                 | 5x - 8x                    |



### KEY BENEFITS

- Highly configurable
- Easy calibration of offset and span

### ELECTRICAL SPECIFICATIONS

Circuit Protection: Reverse polarity protected

#### INTRINSICALLY SAFE INSTALLATIONS

##### Supply Voltage Output

**9-28Vdc:** 0-5Vdc, 1-5Vdc, 1-6Vdc, 0-10Vdc, 1-11Vdc, 0.1-5Vdc, 0.1-10Vdc, 0.5-4.5Vdc

**9-30Vdc:** 4-20mA, 20-4mA (2-wire)

#### NON-INCENDIVE INSTALLATIONS

##### Supply Voltage Output

**9-28Vdc:** 0-5Vdc, 1-5Vdc, 1-6Vdc, 0-10Vdc, 1-11Vdc, 0.1-5Vdc, 0.1-10Vdc, 0.5-4.5Vdc

**9-30Vdc:** 4-20mA, 20-4mA (2-wire)

Adjustability: ±5% of span non-interactive offset & span

Supply Current: <8 mA (Vout)

Current Source/Sink for Voltage Output: 1 mA (source)/ 0.1 mA (sink) MAX.

Withstand/Breakdown: 100 Vdc/Vac, optional 500 Vdc/Vac

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# E2S Intrinsically Safe Pressure Transducer For Hydrogen Applications

### PHYSICAL SPECIFICATIONS

Ingress Rating: IP66 (NEMA 4X) (STD.)  
IP67 (IP69K Consult Factory)

### WETTED MATERIAL

Diaphragm: Sensor: Material:  
B 316L Stainless steel  
D A286

Process Connection: 316L Stainless steel

### NON-WETTED MATERIAL

Housing: 316L Stainless steel

### EMC TESTING

EMC: Directive 2014/30/EU, and EN61326-1,  
EN61326-2-3 (Industrial Env.)

|           |                                 |  |
|-----------|---------------------------------|--|
| Immunity: | 61000-4-2 (ESD)                 | ±4kV/±8kV (Contact/Air)                        |
|           | 61000-4-3 (Radiated RF)         | 10 V/m to 1GHz, 3 V/m to 2GHz, 1 V/m to 2.7GHz |
|           | 61000-4-4 (EFT/Burst)           | ±1kV (5/50ns, 5kHz)                            |
|           | 61000-4-5 (Surge)               | ±1kV, Earth to Shield over all I/O lines       |
|           | 61000-4-6 (Conducted RF)        | 3V (0.15 to 80MHz)                             |
|           | 61000-4-8 (Line Freq. Magnetic) | 30A/m  |

Emissions: EN 55011 (CISPR 11) Class A, Group 1 & FCC (47 CFR 15)

### HAZARDOUS AREA CERTIFICATIONS

#### Intrinsically Safe Installations –

##### FM:

Class I, Division 1, Group A, B, C, D T4 -40°C < Ta < 80°C

##### ATEX/IECEx:

Class I, Zone 0, AEx ia IIC T4 Ga -40°C < Ta < 80°C

Class I, Zone 2, AEx ic IIC T4 Gc -40°C < Ta < 80°C

II 1 G Ex ia IIC T4 Ga -40°C < Ta < 80°C

II 3 G Ex ic IIC T4 Gc -40°C < Ta < 80°C

#### Non-Incendive Installations –

##### FM:

Class I, Division 2, Group A, B, C, D T4 -40°C < Ta < 80°C

### TABLE 1: PROOF & BURST PRESSURE MULTIPLIERS

| Sensor Range      | B Sensor - 316L SS |       | D Sensor - A286 |       |
|-------------------|--------------------|-------|-----------------|-------|
|                   | Proof              | Burst | Proof           | Burst |
| <b>(psi)</b>      |                    |       |                 |       |
| 30                |                    |       |                 |       |
| 45                | 1.5×               | 8×    |                 |       |
| 50                | 1.5×               | 8×    |                 |       |
| 60                | 1.5×               | 8×    |                 |       |
| 75                | 1.5×               | 8×    |                 |       |
| 100               | 1.5×               | 8×    |                 |       |
| 150               | 1.5×               | 8×    |                 |       |
| 200               | 1.5×               | 8×    |                 |       |
| 300               | 1.5×               | 8×    |                 |       |
| 500               | 1.2×               | 5×    |                 |       |
| 750               | 1.2×               | 5×    |                 |       |
| 1000              | 1.2×               | 5×    |                 |       |
| 1500              | 1.2×               | 5×    |                 |       |
| 2000              | 1.2×               | 5×    |                 |       |
| 3000              | 1.2×               | 5×    |                 |       |
| 5000              | 1.2×               | 5×    | 1.5×            | 5×    |
| 7500              |                    |       | 1.5×            | 5×    |
| 10000             |                    |       | 1.2×            | 5×    |
| 15000             |                    |       | 1.2×            | 5×    |
| 20000             |                    |       | 1.2×            | 5×    |
| <b>(Compound)</b> |                    |       |                 |       |
| V&30#             |                    |       |                 |       |
| V&45#             | 1.5×               | 8×    |                 |       |
| V&60#             | 1.5×               | 8×    |                 |       |
| V&100#            | 1.5×               | 8×    |                 |       |
| V&150#            | 1.5×               | 8×    |                 |       |
| V&200#            | 1.5×               | 8×    |                 |       |
| V&300#            | 1.5×               | 8×    |                 |       |

## Data Sheet

### E2S Intrinsically Safe Pressure Transducer For Hydrogen Applications

| ORDERING CODE  | Example: | E2S  | B | 3 | C | F02 | 42 | CC | X | 10 | F | 100# | -XNH |
|--|----------|------|---|---|---|-----|----|----|---|----|---|------|------|
| <b>Model</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| E2S - Intrinsically Safe   |          | E2S  |   |   |   |     |    |    |   |    |   |      |      |
| <b>Sensor Materials - See Table 2 on page 4 for more options</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| B - 316L Stainless steel   |          | B    |   |   |   |     |    |    |   |    |   |      |      |
| D - A286   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| <b>Accuracy</b>  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 3 - 0.25% span   |          | 3    |   |   |   |     |    |    |   |    |   |      |      |
| 5 - 0.50% span   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 7 - 1.00% span   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| <b>Calibration Chart</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| N - Without calibration chart  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| C - With calibration chart   |          | C    |   |   |   |     |    |    |   |    |   |      |      |
| <b>Pressure Connections - See Table 3 on page 5 for more options</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| F02 - (1/4 NPT Female)   |          | F02  |   |   |   |     |    |    |   |    |   |      |      |
| <b>Output Type</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 05 - 0-5 Vdc   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 10 - 0-10 Vdc  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 11 - 1-11 Vdc  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 12 - 0.1-10 Vdc  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 13 - 0.1-5 Vdc   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 15 - 1-5 Vdc   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 16 - 1-6 Vdc   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 24 - 20-4 mA   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 42 - 4-20 mA   |          | 42   |   |   |   |     |    |    |   |    |   |      |      |
| 45 - 0.5-4.5 Vdc non-ratiometric   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 00 - Custom  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| <b>Electrical Connections - See Table 4 on page 6 for more options</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| CC - (1/2 NPT conduit w/cable)   |          | CC   |   |   |   |     |    |    |   |    |   |      |      |
| <b>Mating Connector</b>  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| M - With mating connector  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| X - Without mating connector   |          | X    |   |   |   |     |    |    |   |    |   |      |      |
| <b>Cable Length</b>  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| Max cable length of 30ft for outputs 05, 10, 11, 12, 13, 15, 16 and 45. Max cable length of 99ft for outputs 24 and 42 |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 00 - No cable  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| XX - 01 to 99  |          | 10   |   |   |   |     |    |    |   |    |   |      |      |
| <b>Unit of Length</b>  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| F - Feet   |          | F    |   |   |   |     |    |    |   |    |   |      |      |
| M - Meter  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| N - Inches   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 0 - No cable   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| <b>Pressure Ranges - Coding example only</b>   |          |      |   |   |   |     |    |    |   |    |   |      |      |
| 100# - 100 psig  |          | 100# |   |   |   |     |    |    |   |    |   |      |      |
| <b>Options (if choosing an option(s) must include an "X")</b>  |          |      |   |   |   |     |    |    |   |    |   |      |      |
| NN - Paper tag   |          | -X   |   |   |   |     |    |    |   |    |   |      |      |
| NH - Stainless steel tag   |          | NH   |   |   |   |     |    |    |   |    |   |      |      |

| Accessory | Part Number |
|-----------|-------------|
|-----------|-------------|

|                                   |            |
|-----------------------------------|------------|
| Offset and Span Adjustment Magnet | 266A143-01 |
|-----------------------------------|------------|

Accessories must be ordered separately

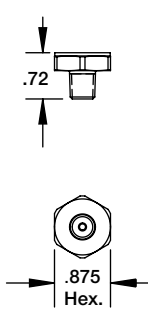
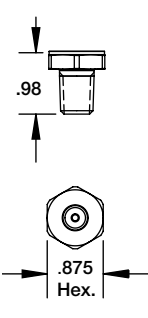
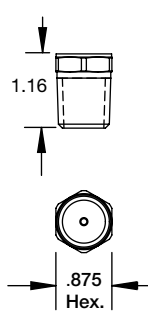
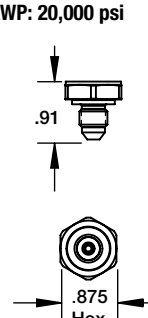
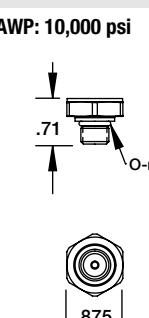
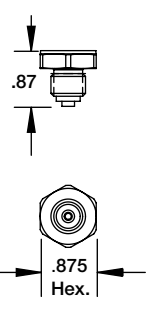
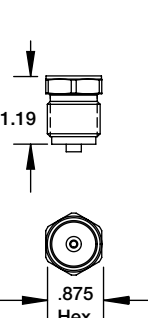
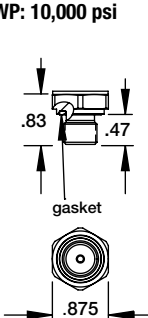
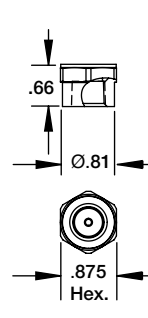
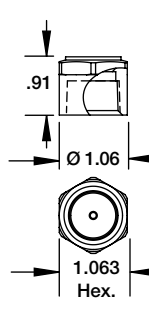
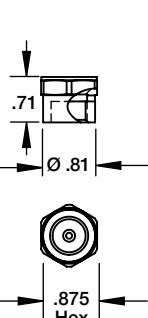
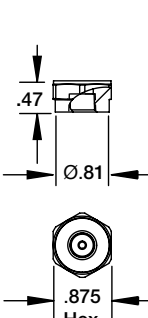
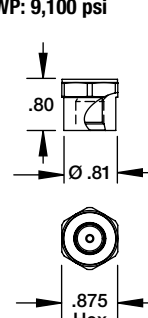
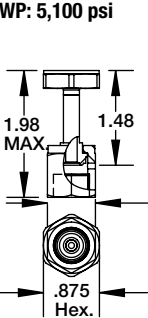
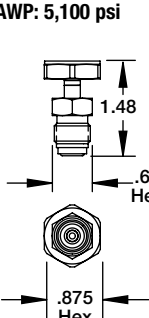
**E2S Intrinsically Safe Pressure Transducer  
 For Hydrogen Applications**
**TABLE 2 - SENSOR PRESSURE RANGE**

| psi    | Sensor Material |      | bar     | Sensor Material |      | inHg    | Sensor Material |      |
|--------|-----------------|------|---------|-----------------|------|---------|-----------------|------|
|        | B               | D    |         | B               | D    |         | B               | D    |
|        | 316L SS         | A286 |         | 316L SS         | A286 |         | 316L SS         | A286 |
| 30#    | •               |      | 1.6BR   | •               |      | 50IM    | •               |      |
| 45#    | •               |      | 2BR     | •               |      | 100IM   | •               |      |
| 50#    | •               |      | 2.5BR   | •               |      | 200IM   | •               |      |
| 60#    | •               |      | 4BR     | •               |      | 300IM   | •               |      |
| 75#    | •               |      | 6BR     | •               |      | 500IM   | •               |      |
| 100#   | •               |      | 10BR    | •               |      | 1000IM  | •               |      |
| 150#   | •               |      | 16BR    | •               |      | V&30IM  |                 |      |
| 200#   | •               |      | 20BR    | •               |      | V&60IM  | •               |      |
| 250#   | •               |      | 25BR    | •               |      | V&100IM | •               |      |
| 300#   | •               |      | 40BR    | •               |      | V&200IM | •               |      |
| 500#   | •               |      | 60BR    | •               |      |         |                 |      |
| 750#   | •               |      | 100BR   | •               |      |         |                 |      |
| 1000#  | •               |      | 160BR   | •               |      |         |                 |      |
| 1500#  | •               |      | 200BR   | •               |      |         |                 |      |
| 2000#  | •               |      | 250BR   |                 | •    |         |                 |      |
| 2500#  | •               |      | 400BR   |                 | •    |         |                 |      |
| 3000#  | •               |      | 600BR   |                 | •    |         |                 |      |
| 5000#  | •               | •    | 1000BR  |                 | •    |         |                 |      |
| 7500#  |                 | •    | 1400BR  |                 | •    |         |                 |      |
| 10000# |                 | •    | V&1.6BR | •               |      |         |                 |      |
| 15000# |                 | •    | V&2BR   | •               |      |         |                 |      |
| 20000# |                 | •    | V&4BR   | •               |      |         |                 |      |
| V&30#  | •               |      | V&6BR   | •               |      |         |                 |      |
| V&45#  | •               |      |         |                 |      |         |                 |      |
| V&60#  | •               |      |         |                 |      |         |                 |      |
| V&100# | •               |      |         |                 |      |         |                 |      |
| V&150# | •               |      |         |                 |      |         |                 |      |
| V&200# | •               |      |         |                 |      |         |                 |      |
| V&300# | •               |      |         |                 |      |         |                 |      |

# Data Sheet

## E2S Intrinsically Safe Pressure Transducer For Hydrogen Applications

**TABLE 3 - PRESSURE CONNECTION DIMENSIONS**

|  |  |   |   |  |
|--|--|---|---|--|
| <p><b>1/8 NPT Male</b><br/>Code: M01<br/>MAWP: 20,000 psi</p>             | <p><b>1/4 NPT Male</b><br/>Code: M02<br/>MAWP: 20,000 psi</p>             | <p><b>1/2 NPT Male</b><br/>Code: M04<br/>MAWP: 10,000 psi</p>                              | <p><b>7/16-20 UNJF-3A 37° Flare (SAE AS4395)</b><br/>Code: M76<br/>MAWP: 20,000 psi</p>          | <p><b>7/16-20 UNJF-2A SAE-Male (SAE J1926 O-Ring Boss seal)</b><br/>Code: MEK<br/>MAWP: 10,000 psi</p>  |
| <p><b>G1/4 B-Male (EN837-1)</b><br/>Code: MG2<br/>MAWP: 20,000 psi</p>  | <p><b>G1/2 B Male (EN837-1)</b><br/>Code: MG4<br/>MAWP: 20,000 psi</p>  | <p><b>G1/4 A-MALE (stud end DIN 3852-E G1/4)</b><br/>Code: MGA<br/>MAWP: 10,000 psi</p>  | <p><b>1/4-18 NPT Female</b><br/>Code: F02<br/>MAWP: 10,000 psi</p>                             | <p><b>1/2-14 NPT Female</b><br/>Code: F04<br/>MAWP: 5,000 psi</p>                                     |
| <p><b>9/16-18 UNF-2B Female</b><br/>Code: F09<br/>MAWP: 25,000 psi</p>  | <p><b>1/8 -27 NPT Female</b><br/>Code: F01<br/>MAWP: 10,000 psi</p>     | <p><b>7/16-20 UNF-2B SAEJ1926</b><br/>Code: FRW<br/>MAWP: 9,100 psi</p>                  | <p><b>1/4" VCR gland with 9/16-18 Female Swivel Nut</b><br/>Code: FV2<br/>MAWP: 5,100 psi</p>  | <p><b>1/4" VCR gland with 9/16-18 Male Swivel Nut</b><br/>Code: MV2<br/>MAWP: 5,100 psi</p>           |

**Data Sheet**

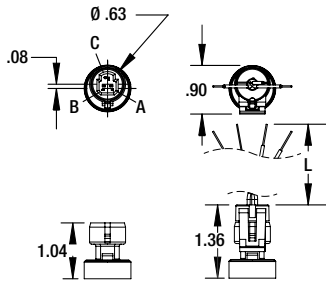
**E2S Intrinsically Safe Pressure Transducer  
For Hydrogen Applications**

**TABLE 4 - ELECTRICAL CONNECTION DIMENSIONS**

Maximum temperature range listed

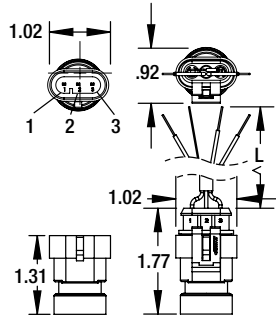
**Metri Pack 3-Pin**

Code: GN – IP67 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



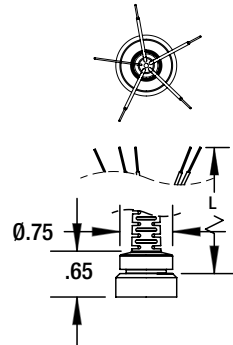
**AMP Superseal 3-Pin**

Code: AP – IP66 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



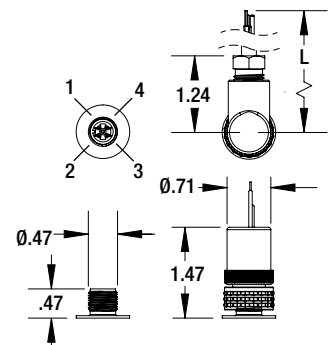
**Over-Mold Cable**

Code: FC, FV\* – IP67 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



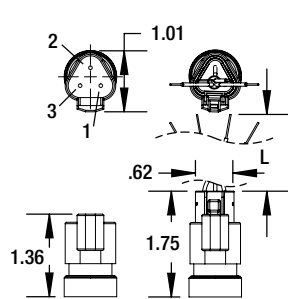
**M12 4-Pin**

Code: EW – IP66 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



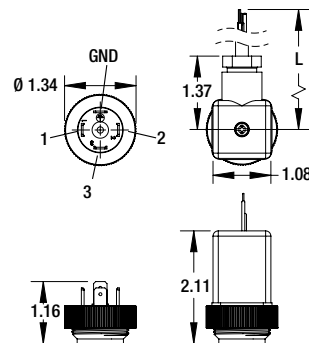
**DEUTSCH DT04 3-Pin**

Code: DT – IP66 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



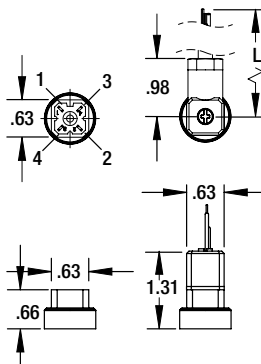
**Hirschmann EN 175301-803  
Form A**

Code: DA – IP66 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



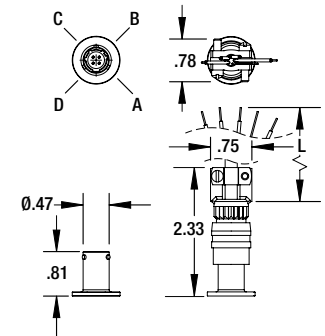
**Mini-Hirschmann**

Code: HM – IP66 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



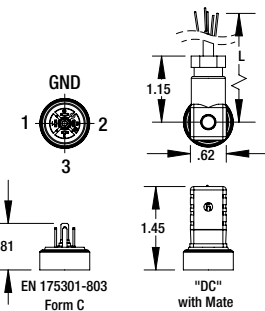
**MIL DTL 26482 8 4-Pin**

Code: B4 – No IP or NEMA rating  
-40°F to 221°F (-25°C to 80°C)



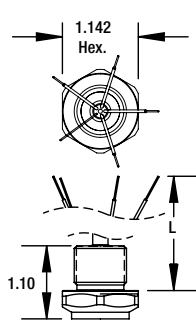
**Hirschmann EN 175301-803 Form C**

Code: DC  
IP66 (NEMA 4X)  
-40°F to 185°F (-40°C to 80°C)



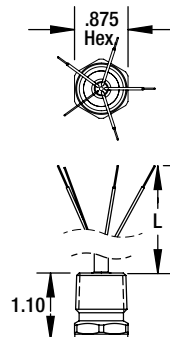
**M20 Conduit  
With Cable**

Code: MC, MV\*  
IP67 (NEMA 4X)  
-40°F to 176°F (-40°C to 80°C)



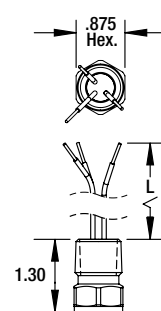
**1/2 NPT Conduit  
With Cable**

Code: CC, CV\*  
IP67 (NEMA 4X)  
-40°F to 176°F (-40°C to 80°C)



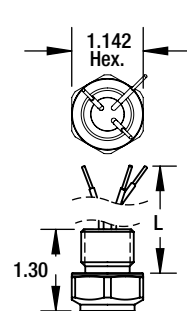
**1/2 NPT Conduit  
With Flying Leads**

Code: CF  
IP67 (NEMA 4X)  
-40°F to 176°F (-40°C to 80°C)



**M20 Conduit  
With Flying Leads**

Code: MF  
IP67 (NEMA 4X)  
-40°F to 176°F (-40°C to 80°C)



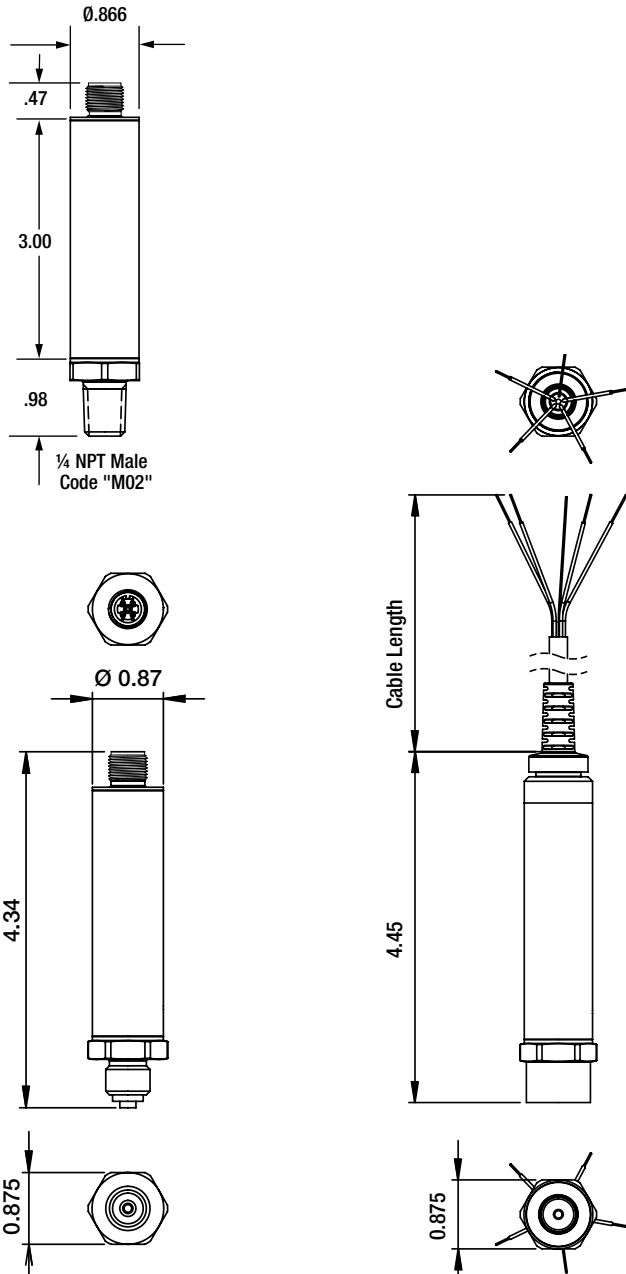
Note: \* Indicates Vented Cable

**Data Sheet**

**E2S Intrinsically Safe Pressure Transducer  
For Hydrogen Applications**

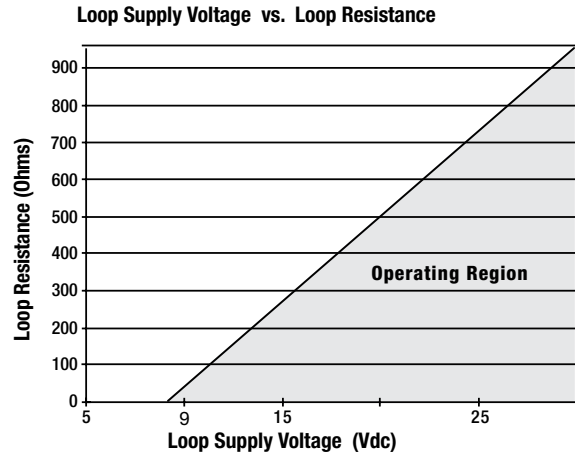
**DIMENSIONS**

For reference only, consult Ashcroft for specific dimensional drawings



**LOOP SUPPLY VOLTAGE CHART**

FOR TRANSMITTERS WITH 4-20mA OUTPUT SIGNAL,  
THE MINIMUM VOLTAGE AT THE TERMINAL IS 9VDC



$$V_{MIN} = 9V + (0.022 * A * R_{LOOP}) \text{ (*includes a 10\% safety factor)}$$

$$R_{LOOP} = R_{SENSE} + R_{WIRING}$$

$$R_{LOOP} = \text{Loop Resistance (Ohms)}$$

$$R_{SENSE} = \text{Sense Resistance (Ohms)}$$

$$R_{WIRING} = \text{Wire Resistance (Ohms)}$$

**NOTE:** See power supply requirement chart for maximum supply voltage limits