

Data Sheet

E2S Intrinsically Safe Pressure Transducer For Hydrogen Applications

FEATURES

- FM, CSA, ATEX, IECEx Intrinsically-Safe approvals, FM and CSA 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
- Barometric pressure ranges available (standard & custom ranges)
- SIL 3 capable

TYPICAL USES

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



E2S Pressure Transducer



PERFORMANCE SPECIFICATIONS

Reference Temperature:	70 °F ±3.6 °F, (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: ±0.005% /°F from -40 °F to 257 °F (±0.009% /°C from -40 °C to 125 °C) Span: ±0.005% /°F from -40 °F to 257 °F (±0.009% /°C from -40 °C to 125 °C)
Temperature Limits:	Storage: -58 °F to 257 °F (-50 °C to 125 °C) Operating: -40 °F to 176 °F (-40 °C to 80 °C) 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:	80 g, 6 ms, Haversine
Vibration:	Random: 10 g RMS 20 - 2000 Hz
Proof Pressure:	1.2X - 1.5X
Burst Pressure:	5X - 8X

KEY BENEFITS

- Highly configurable
- Easy calibration of offset and span
- SIL Certified

ELECTRICAL SPECIFICATIONS

Circuit Protection: Reverse polarity protected

INTRINSICALLY SAFE INSTALLATIONS

Supply Voltage: Output
9-28 Vdc: 0-5 Vdc, 1-5 Vdc, 1-6 Vdc, 0.1-5 Vdc, 0.5-4.5 Vdc
14-28 Vdc: 0-10 Vdc, 1-11 Vdc, 0.1-10 Vdc
9-30 Vdc: 4-20 mA, 20-4 mA (2-wire)

NON-INCENDIVE INSTALLATIONS:

Supply Voltage: Output
9-28 Vdc: 0-5 Vdc, 1-5 Vdc, 1-6 Vdc, 0.1-5 Vdc, 0.5-4.5 Vdc
14-28 Vdc: 0-10 Vdc, 1-11 Vdc, 0.1-10 Vdc
9-30 Vdc: 4-20 mA, 20-4 mA (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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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)	±4 kV/±8 kV (Contact/Air)
	61000-4-3 (Radiated RF)	10 V/m to 1 GHz, 3 V/m to 2 GHz, 1 V/m to 2.7 GHz
	61000-4-4 (EFT/Burst)	±1 kV (5/50 ns, 5 kHz)
	61000-4-5 (Surge)	±1 kV, Earth to Shield over all I/O lines
	61000-4-6 (Conducted RF)	3 V (0.15 to 80 MHz)
	61000-4-8 (Line Freq. Magnetic)	30 A/m

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

HAZARDOUS AREA CERTIFICATIONS

Intrinsically Safe Installations

FM:

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

Class 1, Zone 0, AEx ia IIC T4 Ga -40°C < Ta < 80°C

Class 1, Zone 2, AEx ic IIC T4 Gc -40°C < Ta < 80°C

CSA:

Class 1, Division 1, Groups A, B, C, D T4, Ex ia -40°C < Ta < 80°C

Ex ia IIC T4 Ga -40°C < Ta < 80°C

Ex ic IIC T4, Gc -40°C < Ta < 80°C

ATEX:

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

IECEX:

Ex ia IIC T4 Ga -40°C < Ta < 80°C

Ex ic IIC T4 Gc -40°C < Ta < 80°C

Non-Incendive Installations

FM:

Class 1, Division 2, Groups A, B, C, D T4, -40°C < Ta < 80°C

CSA:

Class 1, Division 2, Groups 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
(psi)				
30				
45	1.4X	8X		
50	2.2X	8X		
60	1.8X	8X		
75	1.5X	8X		
100	1.5X	8X		
150	1.5X	8X		
200	1.5X	8X		
300	1.5X	8X		
500	1.2X	5X		
750	1.2X	5X		
1000	1.2X	5X		
1500	1.2X	5X		
2000	1.2X	5X		
3000	1.2X	5X		
5000	1.2X	5X	2.4X	5X
7500			1.6X	5X
10000			1.2X	5X
15000			1.7X	5X
20000			1.3X	5X
(Compound)				
V&30#				
V&45#	1.5X	8X		
V&60#	1.5X	8X		
V&100#	1.5X	8X		
V&150#	1.5X	8X		
V&200#	1.5X	8X		
V&300#	1.5X	8X		

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E2S Intrinsically Safe Pressure Transducer For Hydrogen Applications

ORDERING CODE	Example:	E2S	B	3	C	F02	42	CC	X	10	F	100#	-XNH
Model													
E2S - Intrinsically Safe		E2S											
Sensor Materials - See Table 2 on page 4 for more options													
B - 316L Stainless steel		B											
D - A286													
Accuracy													
3 - 0.25% span		3											
5 - 0.50% span													
7 - 1.00% span													
Calibration Chart													
N - Without calibration chart													
C - With calibration chart		C											
Pressure Connections - See Table 3 on page 5 for more options													
F02 - (¼ NPT Female)		F02											
Output Type - Consult factory for additional outputs													
05 - 0-5 Vdc (not available with X1L variation)													
10 - 0-10 Vdc (not available with X1L variation)													
11 - 1-11 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													
Electrical Connections - See Table 4 on page 6 for more options													
CC - (½ NPT conduit w/cable)		CC											
Mating Connector													
M - With mating connector													
X - Without mating connector		X											
Cable Length													
Max cable length of 30 ft for outputs 05, 10, 11, 12, 13, 15, 16 and 45. Max cable length of 99 ft for outputs 24 and 42.													
00 - No cable													
XX - 01 to 99		10											
Unit of Length													
F - Feet		F											
M - Meter													
N - Inches													
0 - No cable													
Pressure Ranges - Coding example only													
100# - 100 psig		100#											
Options (if choosing an option(s) must include an "X")													
NN - Paper tag													
NH - Stainless steel tag		NH											
6B - Cleaned for oxygen service													
6W - Cleaned per ASME B40.100 Level IV, NOT marked for oxygen service													
1L - SIL certification for E2 series transducer													

Accessory	Part Number
Offset and Span Adjustment Magnet	266A143-01
Accessories must be ordered separately	

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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#	•							

TruAccuracy

What Does It Mean?

Ashcroft's TruAccuracy™ specification is exclusively based on terminal point methodology instead of statistically derived schemes like 'best fit straight line'.

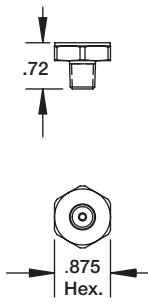
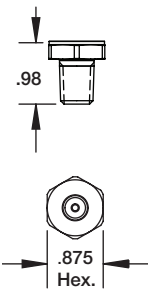
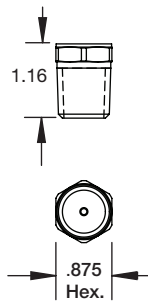
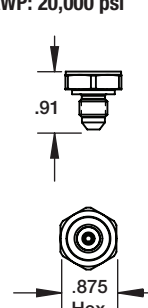
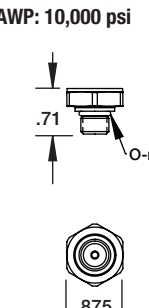
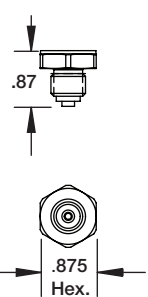
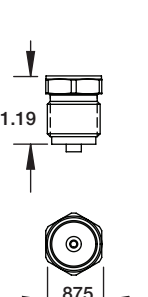
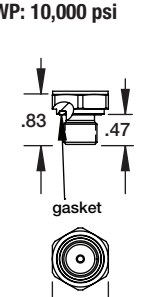
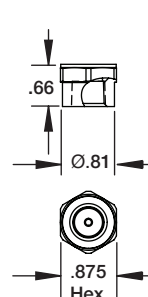
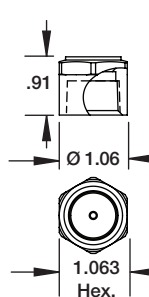
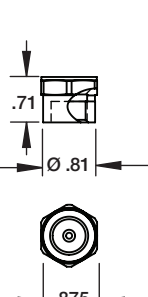
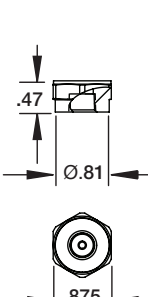
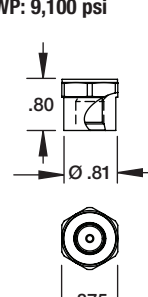
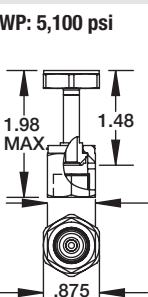
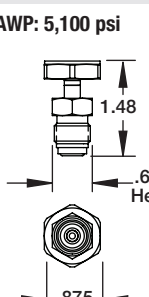
TruAccuracy™ means the Ashcroft E2S has $\pm 0.25\%$ accuracy out of the box. Zero and span setting errors are already included in the $\pm 0.25\%$ accuracy spec.

The E2S is ready to be installed with no additional calibration adjustments required.

A unit from another manufacturer advertised as $\pm 0.25\%$ best fit straight line may actually be a $\pm 1.25\%$ to $\pm 2.25\%$ device. Using best fit straight line method, the accuracy spec does not include zero and span setting errors, which can be as much as $\pm 1.00\%$ each.

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TABLE 3 - PRESSURE CONNECTION DIMENSIONS

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

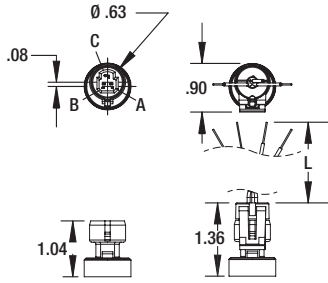
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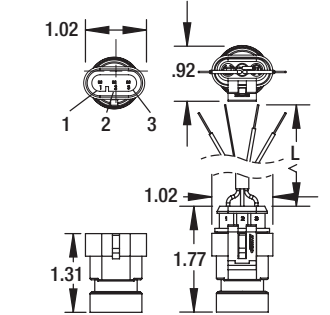
TABLE 4 - ELECTRICAL CONNECTION DIMENSIONS

Maximum temperature range listed

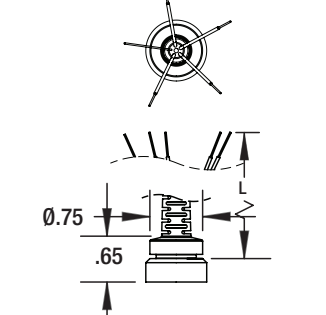
Metri-Pack® 3-Pin
Code: GN – IP67 (NEMA 4X)
-40 °F to 185 °F (-40 °C to 80 °C)



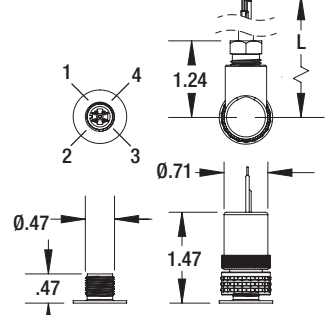
AMP® Superseal® 3-Pin
Code: AP – IP66 (NEMA 4X)
-40 °F to 185 °F (-40 °C to 80 °C)



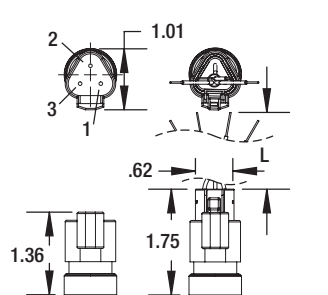
Over-Mold Cable
Code: FC, FV* – IP67 (NEMA 4X)
-40 °F to 185 °F (-40 °C to 80 °C)



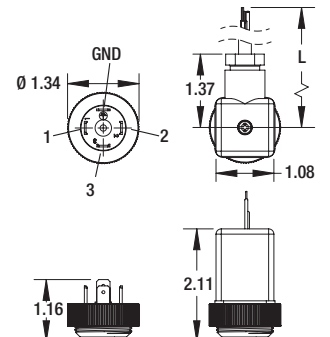
M12 4-Pin
Code: EW – IP66 (NEMA 4X)
-40 °F to 185 °F (-40 °C to 80 °C)



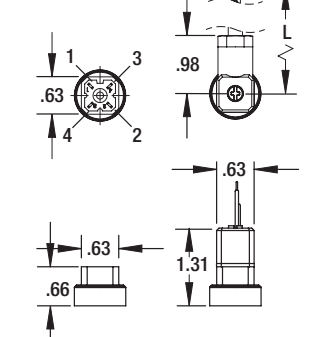
DEUTSCH® DT04 3-Pin
Code: DT – IP66 (NEMA 4X)
-40 °F to 185 °F (-40 °C to 80 °C)



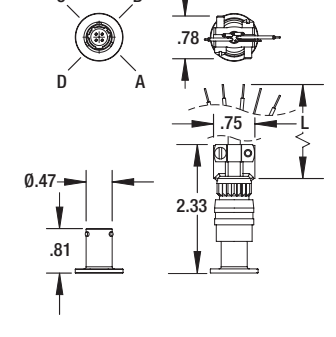
Hirschmann® EN 175301-803 Form A
Code: DA – IP66 (NEMA 4X)
-40 °F to 185 °F (-40 °C to 80 °C)



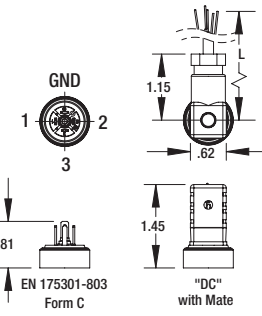
Mini-Hirschmann®
Code: HM – IP66 (NEMA 4X)
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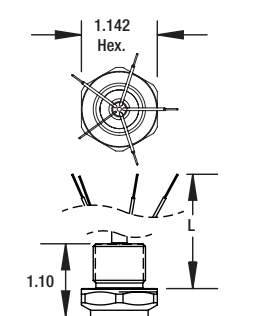
MIL DTL 26482 8 4-Pin
Code: B4 – No IP or NEMA rating
-40 °F to 221 °F (-25 °C to 80 °C)



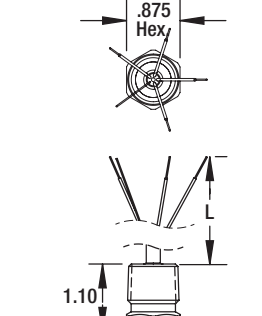
Hirschmann® EN 175301-803 Form C
Code: DC
IP66 (NEMA 4X)
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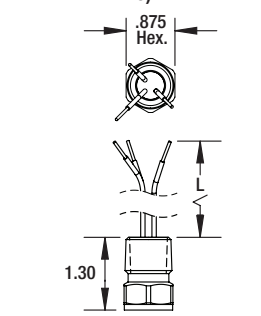
M20 Conduit With Cable
Code: MC, MV*
IP67 (NEMA 4X)
-40 °F to 176 °F (-40 °C to 80 °C)



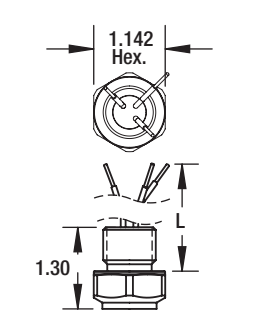
½ NPT Conduit With Cable
Code: CC, CV*
IP67 (NEMA 4X)
-40 °F to 176 °F (-40 °C to 80 °C)



½ 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)



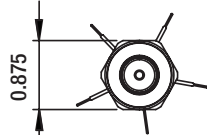
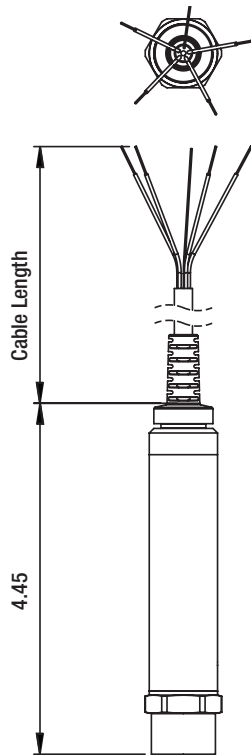
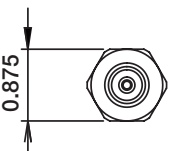
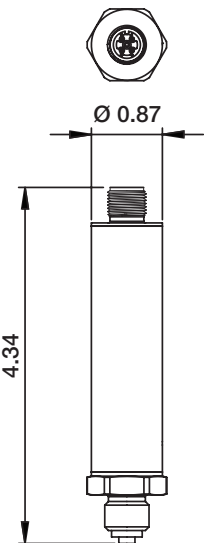
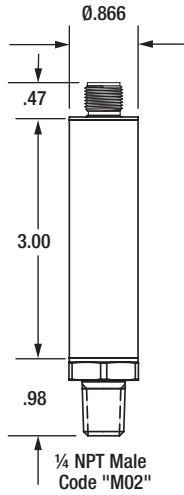
Note: * Indicates Vented Cable

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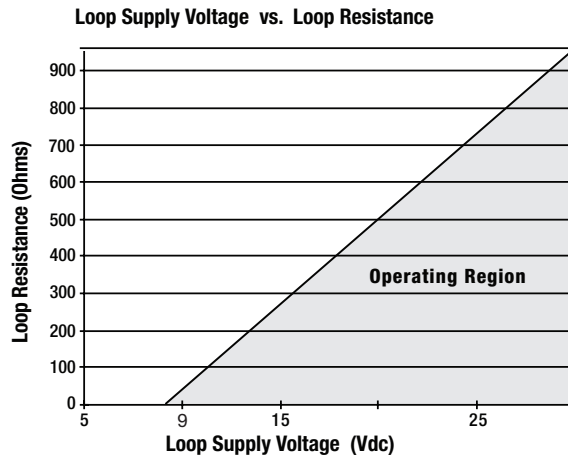
DIMENSIONS

For reference only, consult Ashcroft for specific dimensional drawings



LOOP SUPPLY VOLTAGE CHART

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



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

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

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

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

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

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