



VIBRATION SENSOR CABLING CONSIDERATIONS



OVERVIEW

- Anatomy of a cable assembly
- 3 things to consider for cable assemblies
- Cable assemblies for walk around vibration data collection
- Connectors and cables for permanently installed vibration sensors
 - Termination
 - Connector design
 - Grounding and isolation
 - Environmental resistance
 - Temperature
 - Cable design
 - Shielding
 - Environmental resistance
- Maximum cable length



ANATOMY OF A CABLE ASSEMBLY



SENSOR
CONNECTOR

CABLE

DATA
COLLECTION
CONNECTION

① Portable or permanent

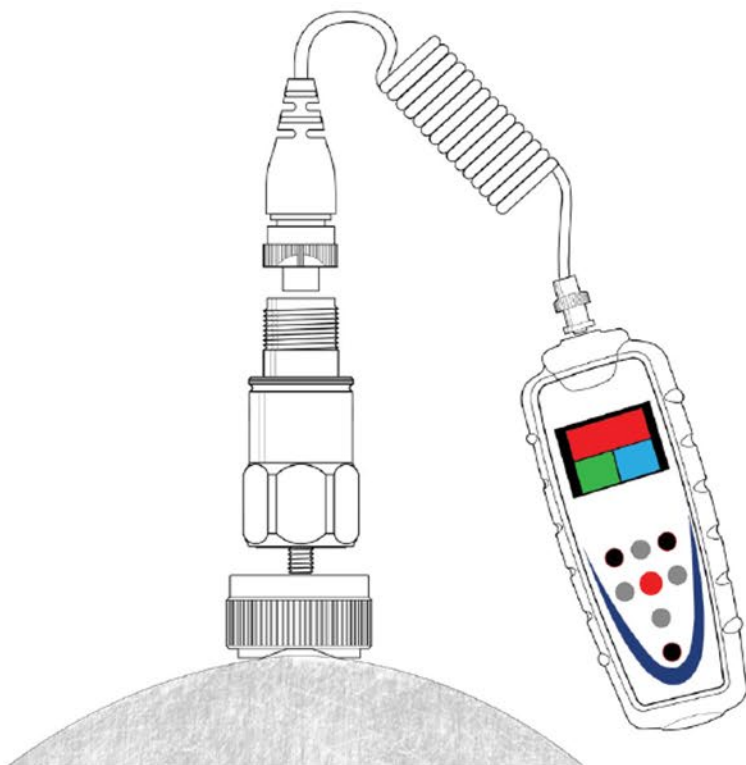
② Environment and interference

③ Cable length

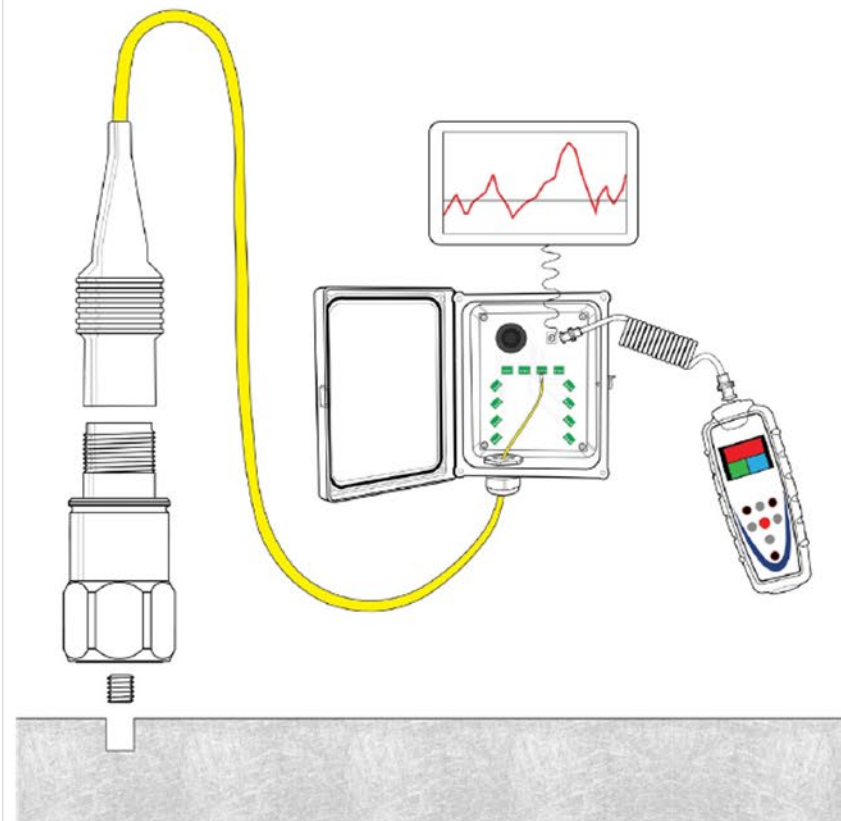
3 THINGS TO
CONSIDER FOR
CABLE
ASSEMBLIES

WALK AROUND MONITORING OR PERMANENT INSTALLATION

Walkaround monitoring



Permanent installation



CABLES FOR WALK AROUND VIBRATION DATA COLLECTION

WHAT TO LOOK FOR

- Connector compatible with sensor
 - Typically MIL-C-5015-style or M12
- Other connector compatible with data collector
 - Wilcoxon, SKF, Entek, Emerson, etc.
- Reinforced, ribbed cable joints for strength, maximum flexibility, and strain relief
- Coiled or straight cable
- EMI / RFI shielding
- Breakaway safety connector, when needed



CONNECTORS FOR PERMANENTLY INSTALLED SENSORS

CONNECTOR DESIGN MUST BE COMPATIBLE WITH SENSOR



Coaxial

- Microdot
- BNC



MIL-C-5015

- 2-socket
- 3-socket



M12

- 4 socket
- 5 socket



Specialty

- MIL-DTL-26482
- Bendix

DATA COLLECTION FOR PERMANENTLY INSTALLED ACCELEROMETERS

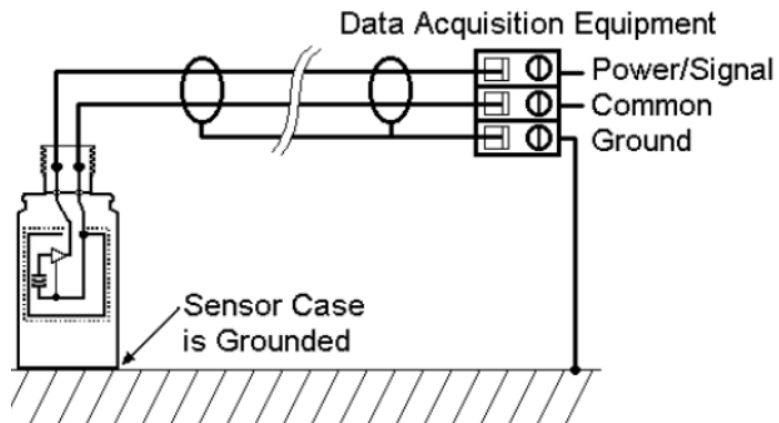
TERMINATION END STRIPPED AND TINNED FOR WIRING TO JUNCTION BOX



CONNECTORS

GROUNDING

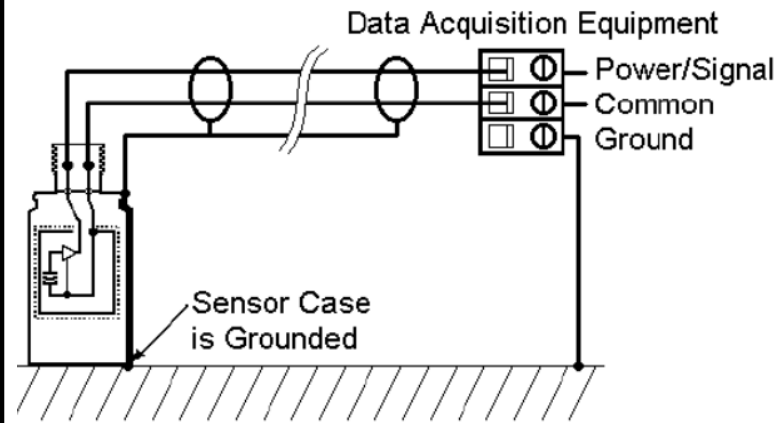
- Grounded at just one end of the measurement chain, either the sensor or the data acquisition system, to prevent ground loops



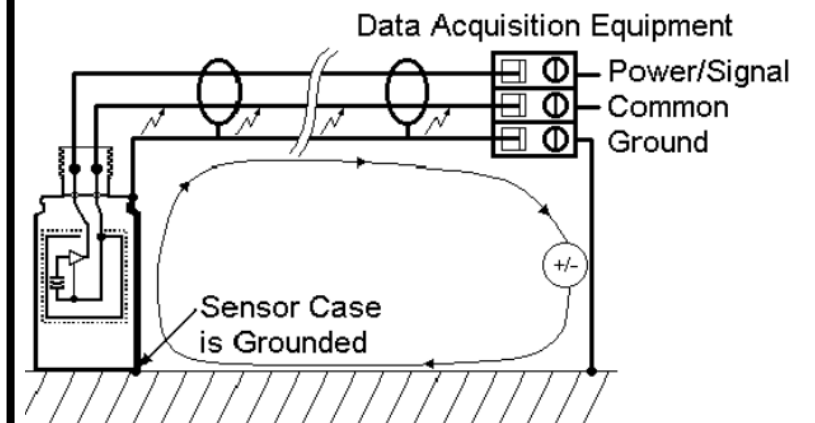
✓ Grounded at the instrumentation
Isolated at the accelerometer

ISOLATION

- Available with electrical contact between shield and transducer or with electrical isolation between shield and transducer



✓ Isolated at the instrumentation
Grounded at the accelerometer



✗ Grounded at the instrumentation
Grounded at the accelerometer

CONNECTORS

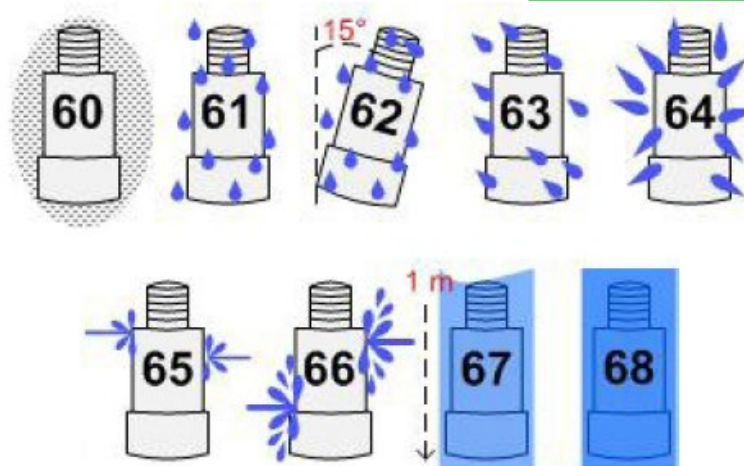
ENVIRONMENTAL RESISTANCE

- Chemical resistance
 - Oils, fuels, lubricants, and mineral acids
- EMI and RF resistance



IP RATING

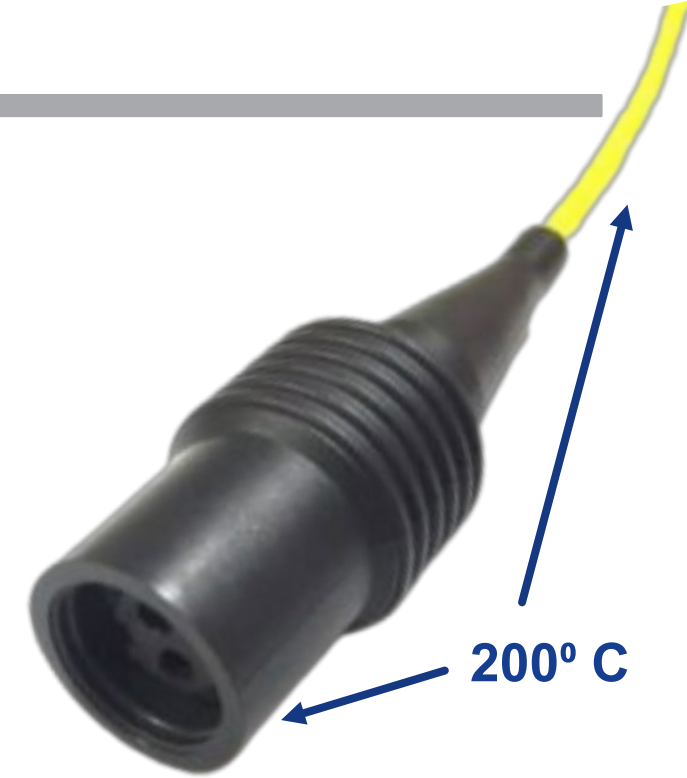
Protection against solids		Protection against liquids	
No protection	0	0	No protection
Objects >50 mm	1	1	Vertically dripping water
Objects >12.5 mm	2	2	Angled dripping water
Objects >2.5 mm	3	3	Sprayed water
Objects >1.0 mm	4	4	Splashed water
Dust-protected	5	5	Water jets
Dust-tight	6	6	Pressure jets
	—	7	Immersion to 1 meter
		8	Indefinite immersion



CONNECTORS AND CABLES

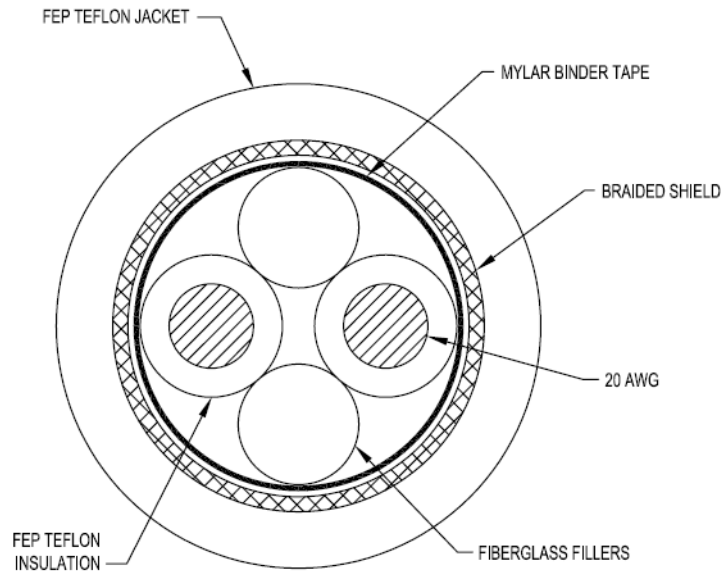
TEMPERATURE, RADIATION

- Sensor, connector and cable must be able to withstand the temperature at the measurement location
- Radiation resistance

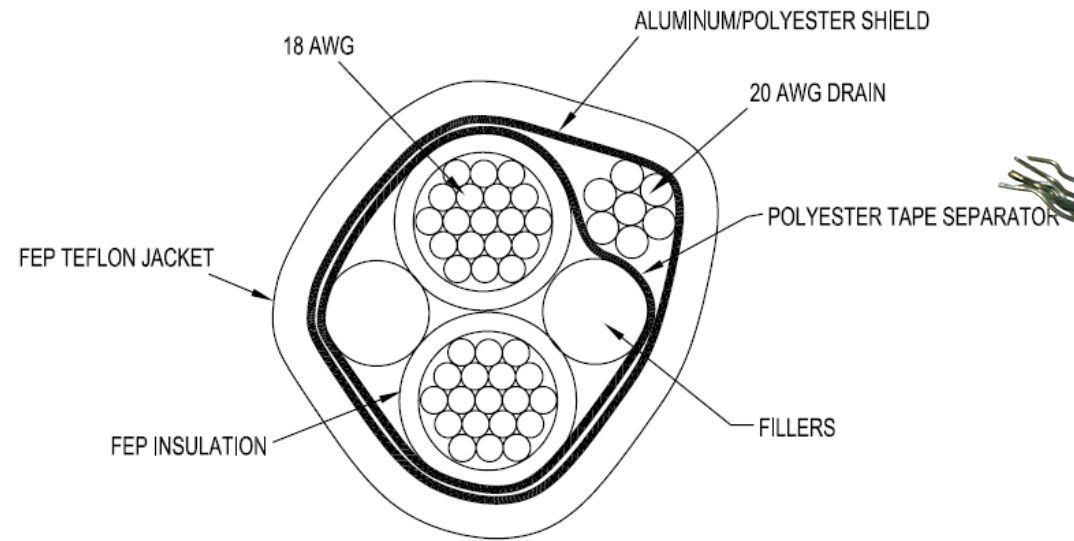


CABLE CROSS SECTIONS

Wilcoxon J9T2A

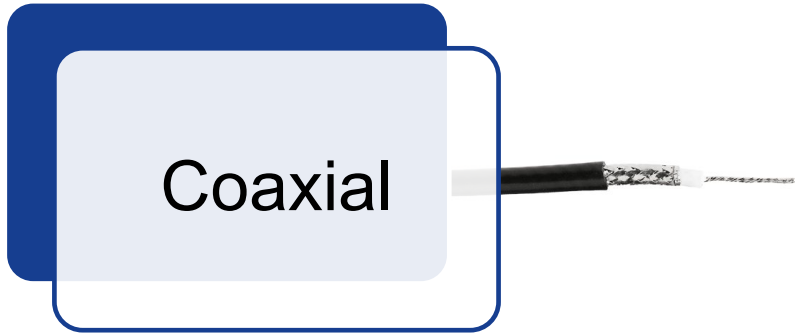


Wilcoxon J9F

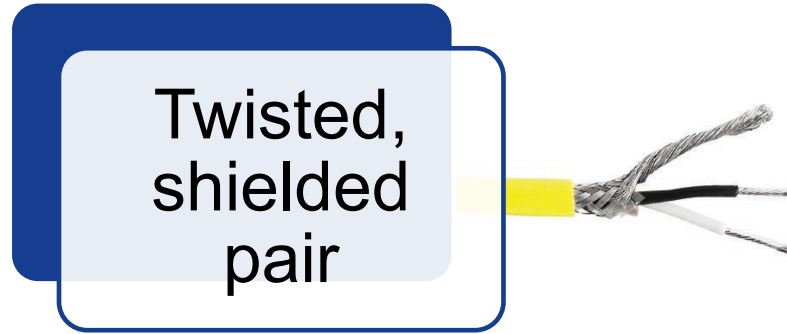


CABLES FOR PERMANENTLY INSTALLED ACCELEROMETERS

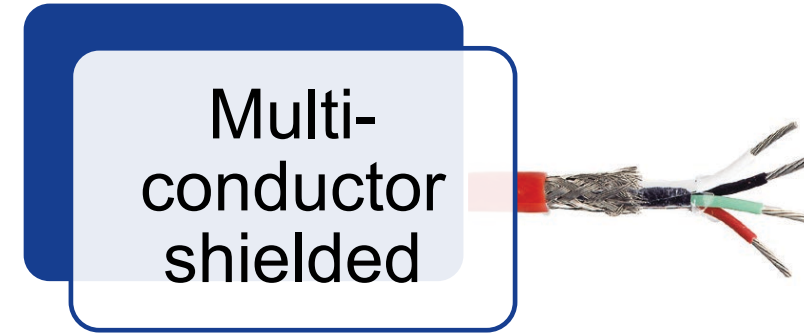
CABLE DESIGN



- Used with BNC and Microdot connectors
- Inner conductor carries power and signal, shield acts as signal common
- Low-noise mineral insulation minimizes triboelectric effects



- Most common for industrial apps
- Used with 2-pin sensors and 2-socket connectors
- Minimizes electrical noise
- Carries power/signal, common and ground capability (shield) all separate



- Used with 3-, 4- or 5-pin sensors and corresponding connector
- Dual-output or triaxial sensors, some hazardous area installations
- Minimizes electrical noise

CABLES FOR PERMANENTLY INSTALLED SENSORS

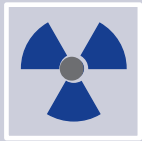


ENVIRONMENTAL RESISTANCE



Shielding

- Foil – RFI
- Braid – EMI and RFI
- Drain wire – shielding and grounding



Protection

- Spiral armored jacket - drops
- Stainless steel overbraid – cuts, abrasions

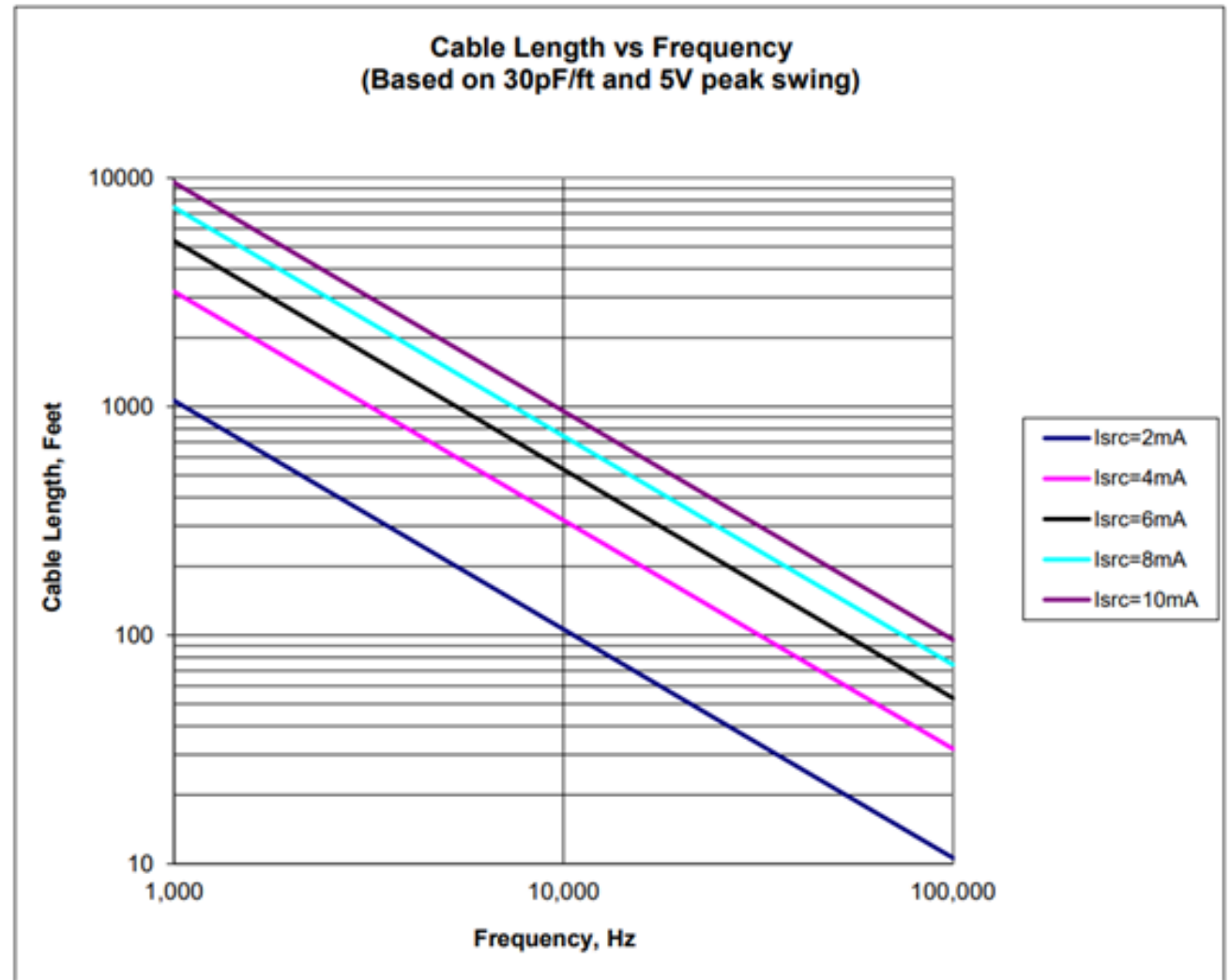


Environmental resistance

- Teflon – temps, chemicals, abrasions
- PVC – chemicals
- Polyurethane – water, abrasions

MAXIMUM CABLE LENGTH

- Not a consideration with 4-20 mA sensors
- Not relevant for cable runs <100 ft (30 m)
- For IEPE sensors requiring cable runs >100 ft, a calculation must be run to ensure signal fidelity
- Calculation can be done manually or simplified with [downloadable calculator](#)



THANK YOU!

ANY QUESTIONS?

Contact us:

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CABLING REQUIREMENTS

DIFFERS BY HAZARDOUS AREA

- Conventional shielded cables may be used in Intrinsically Safe applications
 - Cable capacitance must be factored into Zener barrier calculations
 - $C_{\text{cable}} = \text{length in feet} * \text{capacitance pF/foot}$
- Class I Division 2 requires a mechanism for connector removal, to prevent inadvertently backing off the sensor
 - Safety wire holes present on both the sensor body/screw and connector body are wired together during installation to prevent twisting off
 - Potting the back shell of the connector provides additional strength and electrical protection
- IS and CID2 installations have grounding requirements specific to the sensor and certification – check manufacturer documentation
- Explosion proof devices require rigid conduit that must also be rated as explosion proof to maintain system integrity



MANUFACTURER'S CONTROL DRAWING

TRANSDUCER DEVICE RATINGS AND INSTALLATION REQUIREMENTS

