

*VIBRATION MONITORING
FOR THE
MINING
INDUSTRY*



**WHEN RELIABILITY MATTERS
CONNECT TO CONFIDENCE**

Equipment used in the mining industry is subject to heavy use, dirty environments, and often high temperatures. These factors can result in increased wear and tear on rotating components, creating the threat of premature failure.

Condition monitoring programs can be used to **monitor the vibration of the bearings throughout the plant** and improve reliability of the overall process.

Other important equipment to be monitored within the mining industry includes:

- ▶ Crushers
- ▶ Mills
- ▶ Conveyors
- ▶ Precipitators
- ▶ Kilns
- ▶ Silos

This equipment relies heavily on motors, pumps, and fans which have rotating components that can be monitored.

Common faults which can be detected include:

- ▶ Unbalance
- ▶ Misalignment
- ▶ Blade pass
- ▶ Vane pass

There are several **challenges of monitoring** mining equipment, including:

- ▶ Safety concerns
- ▶ Limited accessibility
- ▶ What needs to be continuously monitored?
- ▶ The impacts of corrosion, dust, and debris



The first consideration is whether or not Process Monitoring or Dynamic Vibration Analysis is right for your condition monitoring program.

Process Monitoring requires 4-20 mA loop power sensors, which provide the overall vibration level of the machine so that it can be trended and alarmed using the plant DCS, PLC, or SCADA system. Process Monitoring requires permanently mounted loop power sensors like LP200 and LP300 Series that output a 4-20 mA signal proportional to velocity or acceleration. Process Monitoring will provide an overall understanding of machine health, but cannot provide the same level of detailed, diagnostic data as Dynamic Vibration Analysis.

Loop Power Sensor Offerings for Process Monitoring:

LP200 SERIES



4-20 mA Output Proportional to Vibration in Velocity

LP300 SERIES



4-20 mA Output Proportional to Vibration in Acceleration

Dynamic Vibration Analysis allows for trended data and machine health diagnostics. However, Dynamic Vibration Sensors can be paired with CTC's SC300 Series Signal Conditioners to create a hybrid approach for both Process Monitoring and Dynamic Vibration Analysis.

A signal conditioner converts the signal from a dynamic sensor into a 4-20 mA output, so it can be trended and alarmed using the plant DCS, PLC, or SCADA system but also used for more in-depth predictive maintenance. Regardless of whether or not a signal conditioner is the right choice for your program, CTC has a variety of accelerometers for use in mining applications.

In general, CTC multipurpose 100 mV/g sensors can be used for the majority of mining applications.

Standard Accelerometer Offerings (for environments up to 250 °F):

AC102 & AC104



Multipurpose Accelerometer,
2 Pin Connector,
100 mV/g,
±10%
±80 g, Dynamic Range

AC292 & AC294



Premium Compact Accelerometer,
2 Pin Connector,
100 mV/g,
±5%
±80 g, Dynamic Range

UEB332 & UEA332



Dynamic Vibration IEPE
Ultrasound Sensor,
1/4-28 Mounting,
2 Pin mini-MIL Connector,
100 mV/g,
±10%
±80 g, Peak

AC133 & AC134



Low Frequency Accelerometer,
2 Pin Connector,
500 mV/g,
±10%
±80 g, Peak

For applications where temperature monitoring is necessary, CTC also offers a variety of Dual Output Vibration and Temperature Sensors.

Dual Output Vibration & Temperature Offerings:

TA200 SERIES



Dual Output Sensors,
Temperature & Acceleration

Options:
25 mV/g and 10 mV/°C
100 mV/g and 10 mV/°C
500 mV/g and 10 mV/°C

TR100 SERIES



RTD Sensors,
Temperature & Acceleration

Options:
100 mV/g and 10 mV/°C
500 mV/g and 10 mV/°C

VT200 SERIES



Dual Output Piezo Velocity Sensors,
Velocity & Temperature

Options:
100 mV/in/sec and 10 mV/°C

For high temperature environments, CTC also has a variety of high temperature resistance sensors that can operate up to 325 °F.

High Temperature IEPE Offerings (for environments up to 325 °F):

AC207 & AC208



High Temperature, IEPE Accelerometer, 2 Pin Connector, 100 mV/g, ±10%

TXEA331-HT



High Temperature, Triaxial Accelerometer, Side Exit 4 Pin Mini-MIL Connector, 100 mV/g, ±5%

Pair these sensors above with our PPS connectors and recommended cabling:

A2R



High Temperature 2 Socket MIL-Style, PPS Molded Connector, Permanent Mount, 392 °F (200 °C) Max Temp

J4R



4 Socket Mini-MIL Connector, for CTC 4-Pin Triaxial Accelerometers, PPS Molded, Permanent Mount, 392 °F (200 °C) Max Temp

CB206



Low Cost, Twisted, Shielded Pair Cable, Lightweight Red FEP Jacket, with Stainless Steel Outer Armor, 0.27 in. (6.9 mm) OD, 392 °F (200 °C) Max Temp

CB218



4 Conductor Shielded Cable, Red FEP Jacket, with Stainless Steel Outer Armor, 0.27 in. (6.9 mm) OD, 392 °F (200 °C) Max Temp

For low-frequency applications (12 CPM to 30 CPM [0.2 Hz to 0.5 Hz]) like gearboxes, often used in fans and conveyors, 500 mV/g sensors should be used.

Low Frequency Application Offerings:

AC133



Low Frequency Accelerometer, Top Exit, 2 Pin Connector, 500 mV/g, ±10%

AC134



Low Frequency Accelerometer, Side Exit, 2 Pin Connector, 500 mV/g, ±10%

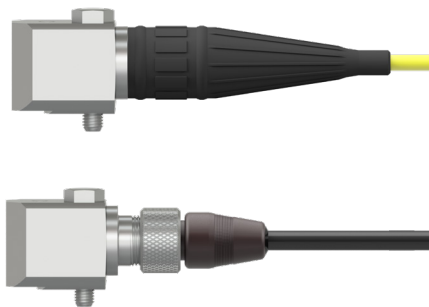
TXFA331



Low Frequency Triaxial Accelerometer, Side Exit, 4 Pin Mini-MIL Connector, 500 mV/g, ±5%

Recommended Connector Offerings:

For non-submersible applications, CTC recommends choosing rugged connectors for optimal chemical compatibility and heat resistance.



Our **Viton™ Boot Series (V Series) Connectors** are available in both single axis, dual output, and triaxial compatible options. V Series Connectors offer the best chemical resistance, an IP69 connection, and high heat resistance.

Our **A Series Connectors** are also a great option for steel industry applications, with a variety of material options.

A2R & A3R



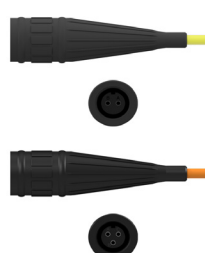
PPS Molded Standard MIL Connector, 392 °F (200 °C) Max Temp

A2Y & A3Y



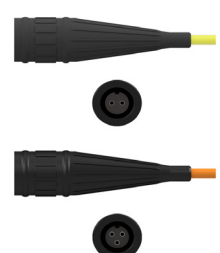
Nylon Molded Right Angle Connector, 250 °F (121 °C) Max Temp

V2N & V3N



Molded Nylon Viton™ Boot, 250 °F (121 °C) Max Temp, IP69

V2R & V3R



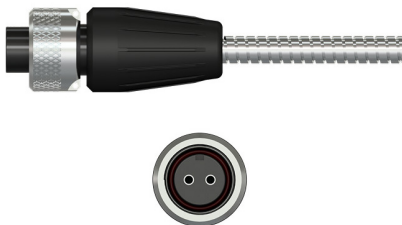
Molded PPS Viton™ Boot, 350 °F (177 °C) Max Temp, IP69

HAZARDOUS-RATED OPTIONS

Since many mining applications have hazardous environments due to gas, oil, or dust that could create a combustible atmosphere in and around machines, CTC offers hazardous rated sensors by certifying organizations including ANZEx, ATEX, CSA, IECEx, and KC.

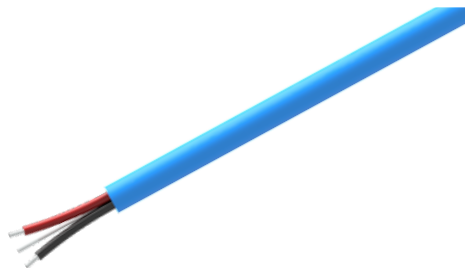
CTC also offers a variety of hazardous rated compatible accessories for a complete system:

Q SERIES CONNECTORS



MIL-Style Connectors
with Grounded Backshell

CB190 SERIES CABLES



PLTC Jacketed
Cable

CB290 SERIES CABLES



Armor Jacketed
Cables

Other considerations for mining applications:

MOTORS

Fin cooled motors present a unique challenge to sensor mounting if a flat surface cannot be achieved. As a result, CTC offers a variety of Motor Fin Mounting Pads.

Motor Fin Mount Pad Offerings:

MH118-1A



0.5 in x 1.25 in
(12.7 mm x 31.75 mm)

MH118-2A



0.5 in x 2.0 in
(12.7 mm x 50.8 mm)

MH118-3A



0.5 in x 1.75 in
(12.7 mm x 44.45 mm)

MH118-4A



0.5 in x 1.0 in
(12.7 mm x 25.4 mm)

CONVEYORS

In harsh mining environments where falling debris, dust, and dirt are common, armor jacketed cables help address durability concerns. Armor jacketed cables are commonly used in conveyor applications where conductive dust and sediment can penetrate and disrupt continuity in a standard cable and connector combination.

Jacketed Cabling Offerings:

**STANDARD ARMOR
JACKETED**



**HEAVY DUTY ARMOR
JACKETED**



**STAINLESS STEEL
BRAIDED SHEATHING**



**HYDRAULIC HOSE
JACKETED CABLING**



SLOPED TOP JUNCTION BOXES

CTC'S Sloped Top Junction Boxes are specifically designed for mining applications. Due to the presence of dust and debris in mines, the pitched roof of our sloped top boxes prohibits particles from settling on the box.

Sloped Top Junction Box Offerings:

MODULAR SLOPED TOP BOX



SB SLOPED TOP BOX



JB SLOPED TOP BOX

