Mining Equipment Monitoring & Protection

Sensors approved for hazardous locations, underground mining, corrosive and high temperature areas
Mines And Safety

Mining is inherently a dangerous business and safety is of the utmost importance to mining companies and miners. Mining companies spend a great deal of time and money on training and safety procedures to help keep miners safe. In America, The Mine Safety and Health Administration (MSHA) is tasked with “Protecting Miners’ Safety and Health” and has many regulations involving mine safety. Included in their directives are requirements for instrumentation used in mines having potentially explosive atmospheres. Other countries have similar requirements.

IMI Sensors manufactures a series of vibration sensors that meet these and other intrinsically safe requirements that help ensure the safety of miners in both underground and above ground mines.

In this brochure, you will find information on:

Vibration Monitoring
- Underground Mining Approved Sensors
- Hazardous Area Approved Sensors
- Harsh, Corrosive & High Temp Area Sensors
- Wireless Sensors for Dangerous Areas
- General Purpose Sensors & Transmitters

IMI Sensors Platinum Stock Products represent some of our most popular models and can be used in a wide range of applications. As you browse this brochure, you will find Platinum Stock Products indicated with the “Platinum Shield” icon (right) and with RED Model Numbers (i.e: Model 607A11).

Our Platinum Stock Products are available with our Lifetime Warranty and fast delivery. If for any reason you are not 100% satisfied with your IMI Sensors Platinum Stock Product, we will repair, replace or exchange the product at no charge. For U.S. customers, all IMI Sensors Platinum Stock Products will ship within 24 hours. IF NOT, YOUR SHIPPING IS FREE! Visit www.imi-sensors.com/platinum for complete details.

Industrial Hygiene
- Worker Safety Products
- Environmental & Handheld Equipment
- Microphones

Accessories
- Cables & Connectors
- Mounting Hardware
- BNC Enclosures
- Safety Equipment
- Portable Calibration Units
- Acoustic Calibrators
- Modal Hammers

Visit www.larsondavis.com for more information.
Underground Mining Approved Sensors

Mining operation involves a variety of heavy machinery that is used for exploration and processing of precious metals and minerals extracted from the ground. This industrial machinery is subject to moderate, and in some cases heavy vibration while in use. It’s critical to trend vibration levels to ensure equipment health and to avoid catastrophic failures. There are different types of mining operations, both underground and surface, each requiring approved monitoring instrumentation.

For underground mining where methane gas or coal dust present the possibility of an explosive atmosphere, IMI offers vibration sensors and related products that are Mine Safety and Health Administration (MSHA) Approved Intrinsically Safe and ATEX Approved Intrinsically Safe for Mining.
Sensors for Hazardous and Extreme Environments

Hazardous Area Approved Sensors

Due to the dangerous nature of the mining operation and the process of extracting metals and minerals from the ground, the world has adopted very strict regulations to moderate the negative impacts of mining. Worker safety has long been a key concern, while mining equipment monitoring now requires instrumentation that is approved for hazardous areas. In addition to underground mining approved sensors, IMI® has a full line of sensors and related products, such as intrinsic safety barriers, that meet both CSA and ATEX requirements for various classes of hazardous environments. When properly installed, IMI sensors meet the approval outlined below.

The sensors below are also available in Temperature Output versions (prefix “TO”).

Hazardous Area Approved
Low Cost ICP® Accelerometer
Model EX602D01
- Easy installation in tight spaces

Hazardous Area Approved
Low Cost ICP® Accelerometer
Series EX607A
- Ideal for submersible applications
- Armored integral cable options available
- 100 mV/g to 500 mV/g sensitivity

Hazardous Area Approved
Low Cost ICP® Accelerometer
Model EX608A11
- Ideal for submersible applications
- Small installation footprint
- Various mounting options available (shown, right)

Hazardous Area Approved
Low Cost ICP® Accelerometer
Model EX603C01
- General purpose, hermetically sealed

Hazardous Area Approved
Precision ICP® Accelerometer
Model EX628F01
- ISO 17025 accredited frequency sweep calibration

Hazardous Area Approvals

For use in hazardous areas, the “EX” prefix designates a vibration sensor compliant with the National Electric Code (North America) and the ATEX directive (Europe), when used with a properly installed, intrinsic safety barrier in environments shown on the table below.

<table>
<thead>
<tr>
<th>North American Hazardous Classifications</th>
<th>Class 1</th>
<th>Gases, Vapors and Liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Acetylene</td>
<td></td>
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<tr>
<td>Group B</td>
<td>Hydrogen</td>
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<tr>
<td>Group C</td>
<td>Ethylene</td>
<td></td>
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<tr>
<td>Group D</td>
<td>Propane</td>
<td></td>
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<tr>
<td>Class 2</td>
<td>Dusts</td>
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</tr>
<tr>
<td>Group E</td>
<td>Metals</td>
<td></td>
</tr>
<tr>
<td>Group F</td>
<td>Coal</td>
<td></td>
</tr>
<tr>
<td>Group G</td>
<td>Grain</td>
<td></td>
</tr>
<tr>
<td>Class 3</td>
<td>Fibers</td>
<td></td>
</tr>
</tbody>
</table>

| North American Hazardous Classifications | Division 1 | Continuous or intermittent presence of ignitable substances under normal operation conditions |
|------------------------------------------|------------|

| North American Hazardous Classifications | Division 2 | Unlikely presence of ignitable substances under normal operation conditions |
|------------------------------------------|------------|

Complete specifications available at www.imi-sensors.com

Toll-free in the USA 800-959-4464    716-684-0003
Corrosive and High Temperature Environments

In harsh, caustic, or high temperature areas, IMI provides sensors and cables that meet these demands as well. Cables and connectors made of materials such as PTFE and FKM are available for higher temperature applications and caustic environments. ICP® Sensors are available with temperature ratings up to 325°F (162°C). For higher temperatures up to 900°F (482°C), IMI offers charge output sensors with inline electronics and appropriate cables, including very high temperature hardline cables.

**High Temperature ICP® Accelerometer**
Model HT622A01
- Ceramic sensing element
- Short settling time
- Welded hermetic

**High Temperature ICP® Accelerometer**
Model HT628F01
- Quartz sensing element
- Excellent thermal stability
- Welded hermetic

**High Temperature Accelerometer Kit**
Model 600A02
- Includes accelerometer, cable and charge amplifier
- Sensor temperature range up to 500 °F (260 °C)
- Compatible with ICP® signal conditioners

**Very High Temperature Accelerometer**
Series EX600B1X
- Sensitivity: 10 to 100 mV/g
- Frequency Range: (±5%) 282 to 240000 cpm
- Measurement Range: ±50 to 500 g peak

**Product Spotlight**

High Temperature ICP® Accelerometer
Model HT602D
Industry leading high temperature performance in ICP® designs
- Ceramic sensing element, withstands temperatures up to 325 °F (162 °C)
- Very low profile design & through-bolt mount for ease of installation
- Platinum Stock Product: In stock, ready to ship immediately and with our Lifetime Warranty!

IMI Sensors Platinum Stock Products represent some of our most popular models. These models are indicated with the “Platinum Shield” icon (right) and with RED Model Numbers (i.e: Model 607A11). For complete information, see page 2 of this brochure or visit www.imi-sensors.com/platinum
Wireless Vibration Monitoring for Mining

Wireless Sensors for Dangerous Areas

Why have people risk injury and venture into unsafe areas to collect vibration data on healthy machines? IMI Sensors offers the Echo® Wireless Vibration Monitoring System that can automatically collect machinery health data in dangerous areas without having a miner venture into those areas. Using this alarm based system, personal intervention is only required when the system identifies a problem.

- Easily integrates with legacy vibration and plant monitoring systems via Modbus®
- Eliminates expensive cable runs
- Transmits distances of 1/3 – 1/2 miles in typical industrial environments, through obstructions (Up to 5 mile radius in direct line-of-sight tests)
- Runs stand alone or with junction box
- Stores data in an ODBC compliant database
- Requires no repeaters, gateways, or mesh

COMING SOON! Class I, Division 2 Hazardous Area Certification

Echo® sensor data is stored by the Echo® Data Client Service software in a Microsoft SQL database. The database structure is available from IMI® so it can be accessed by users directly using any ODBC compliant application. The Echo® Data Client Service can also be configured as a Modbus® TCP/IP Server to service Modbus® requests from an existing Modbus® Client application.

Echo® data can also be exported from the Echo® Data Presentation Software to a tab delimited spreadsheet file that is suitable for use with Excel or other data viewing applications for post processing. Contact IMI® to discuss other interfaces to legacy condition monitoring programs and plant monitoring systems.

Microsoft is a registered trademark of Microsoft Corporation
Wireless Monitoring of Pumps in Tailings Ponds

Barge pumps in tailings ponds are critical to the operation of a mine. These ponds can be very acidic and dangerous, as well as inaccessible, which is why most plants don’t monitor them. Because it takes a host of people, safety gear, and a lot of time to get a crew safely to the pump to make measurements, the Echo® Wireless Vibration Monitoring System can be used to safely collect machinery health data.

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**Suggested Sensor Placement**

1. **Water**
2. **Main Shaft**
3. **Intake**
4. **Sub Pump**
5. **Barge Pump**
6. **EchoPlus® Wireless Junction Box** (with sensors connected via cables)
7. **Motor**
8. **Echo® Receiver**
9. **Cables From Mounted Sensors** (connected to EchoPlus, enabling wireless transmission of vibration data)
10. **Tailings Pond**

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Complete specifications available at www.imi-sensors.com

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General Purpose Vibration Sensors & Transmitters

**Low Cost Accelerometers**

- **Low Cost ICP® Accelerometer Series 601**
  - Low noise
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

- **Low Cost ICP® Accelerometer Model 602D01**
  - Easy installation in tight spaces
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

- **Low Cost ICP® Accelerometer Model 603C01**
  - Small footprint
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

- **Low Cost ICP® Accelerometer Model 604B31**
  - General purpose, hermetically sealed accelerometer
  - Perfect for permanent mount applications

- **Low Cost ICP® Accelerometer Series 607A**
  - Patented 360º swivel mount
  - 100 mV/g or 500 mV/g

- **Low Cost ICP® Accelerometer Series 601**
  - Low noise
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

- **Low Cost Triaxial Accelerometer Model 608A11**
  - Ideal for submersible applications
  - Small installation footprint, with swivel mount option available

**Precision Accelerometers**

- **Very High Frequency Accelerometer Model 621B40**
  - 30 kHz frequency, even with magnet
  - Titanium housing
  - Smallest available footprint

- **Precision Accelerometer Model 622B01**
  - 15 kHz high frequency response
  - Ideal for route-based data collection
  - Dual output option available (“TO” prefix)

- **Precision Triaxial Accelerometer Model 629A31**
  - Full frequency sweep calibration, superior frequency response
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

- **Precision Quartz ICP® Accelerometer Model 624B01**
  - Low frequency response to 48 cpm (0.8 Hz)
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

- **Precision ICP® Accelerometer Model 625B01**
  - Low frequency response to 12 cpm (0.2 Hz)
  - 100 mV/g or 500 mV/g
  - Dual output option available (“TO” prefix)

Complete specifications available at www.imi-sensors.com

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Mining Equipment Monitoring & Protection

**4-20 mA Transmitters**

**4-20 mA Output Transmitter**
Series 64X
- Multiple ranges available
- Peak or RMS, acceleration or velocity
- Intrinsically safe / explosion proof versions available
- Temperature output and raw vibration output options available
- 24 volt loop powered

**Bearing Condition Transmitter**
Series 649A03
- Provides early warning of roller element bearing (REB) faults
- Works on constant and variable speed drives
- Normalizes output using compensated peak

**4-20 mA Output Transmitter**
Series 653A01
- Effective on slow speed machinery
- Measures absolute p-p displacement
- Accurate down to 90 cpm

**Vibration Switches**

**USB Programmable Smart Switch**
Model 686C01
- Programmable delay eliminates false trips
- Competitive price compared to mechanical switches
- Hazardous area approvals available

**Mechanical Vibration Switch**
Model 685A09
- Linear trip adjustment
- Provides better control over trip sensitivity than traditional mechanical vibration switches

**Electronic Vibration Switch**
Model 685B
- Lower cost than competitive models
- Dual set points (relays)
- Explosion proof options available
- On-board or remote piezoelectric accelerometer

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Mines can be a very noisy environment and employers have a responsibility to protect workers from noise induced hearing damage. To help access the noise exposure risk and verify the effectiveness of a hearing protection program, Larson Davis offer a line of noise dosimeters, sound level meters, and software to measure noise exposure. Because exposure to vibration has also been shown to be a health risk, we offer the HVM100 with all the necessary sensors to measure human exposure to vibration.
Accessories

Cables & Connectors

- Polyurethane jacketed cables
- High temp PTFE jacketed cables
- Armored jacket options
- Molded composite connectors
- Viton push-on boot options
- Steel locking-ring options

BNC Switch Boxes & Termination Enclosures

Safe, convenient, centralized access for efficient data collection

- Consolidate up to 48 channels of outputs into one enclosure
- Switch boxes save time and extend cable life; connect once, change the channel
- Factory installed cord grips provide simple quick and convenient sensor hookup

Mounting Hardware

- Sensor mounting pads
- Curved surface magnets
- Flat surface magnets

Safety Equipment

Breakaway Safety Connector

- Prevents technicians from being pulled into rotating machinery
- Many popular data collector terminations in stock

Data Collector Extension Pole

- Keeps workers on the ground and away from heat sources, reducing the need for safety harnesses and other equipment
- Spring loaded head tilts 180° for proper sensor placement (Patent #27076130)
- Available in 4 ft. to 8 ft. range or 6 ft. to 11 ft. range

Portable Calibration Units

Portable Reference Shaker

Model 699A02
- Calibrates permanently mounted accelerometers at the machine
- Verifies system performance

Portable Industrial Calibration Unit

Model 699A06
- Perform variable frequency & amplitude calibration
- Portable, plug in or use battery power

Acoustic Calibrators

Acoustic Calibrator

CAL200
- Class 1 Acoustic calibrator
- Opening for 1/2" microphones
- IEC 60942 & ANSI S1.40 compliant

Modal Hammers

ICP® Impact Hammer

Series 086D
- Sensitivity: (±15%)
  1 mV/lbf (0.23 mV/N)
- Multiple hammer masses available:
  - Model 086D50: 12.1 lb (5.5 kg)
  - Model 086D20: 2.4 lb (1.1 kg)
  - Model 086D05: 0.7 lb (0.32 kg)

Complete specifications available at www.imi-sensors.com

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and Commitment to Total Customer Satisfaction

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Total Customer Satisfaction

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PROTECTING your two most valuable assets:
employees & machinery

IMI has Field Application Engineers that are MSHA
Certified for Surface and Metal mining who can visit
your plant and provide assistance in determining
which products may be right for you.

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