The field of cryogenics is typically defined as beginning at temperatures below \(-292 °F \approx -180 °C\). There are several common industrial gases (argon, helium, hydrogen, nitrogen and oxygen) and fuels (liquid natural gas and liquid propane gas) whose boiling point is below this temperature mark, thereby classifying them as cryogens.

These gases and fuels are transported and used in a variety of industrial applications as refrigerants in their liquid state, thereby requiring the use of cryogenic centrifugal and reciprocating pumps to effectively transfer them between cryogenic tanks, double-walled containers with a high vacuum between the walls to reduce heat transfer into the liquid. These applications include:

- Liquefied natural gas (LNG) processing
- Industrial gas processing (argon, helium, hydrogen, nitrogen and oxygen)
- Pharmaceutical production (statin drugs, biotech products such as vaccines)
- Frozen food production/storage

Regardless of whether the cryogenic pump is submerged in the liquid or mounted in an exterior suction vessel, these pumps can suffer the same types of faults as their non-cryogenic equivalents, including:

- Acoustical resonances
- Cavitation
- Impeller eccentricity and imbalance
- Impeller/diffuser clearance
- Oil whirl
- Recirculation
- Structural resonances
- Wear ring clearance

Detect Cavitation, Recirculation & Resonance In Cryogenic Centrifugal & Reciprocating Pumps

**TOP-EXIT CRYOGENIC ICP® ACCELEROMETER FOR PREDICTIVE MAINTENANCE**
MODEL 637A06

- Sensitivity: 25 mV/g
- Frequency Response: 4-1500 Hz
- Operating Temperature Range: -320 to +250 °F

**SIDE-EXIT CRYOGENIC ICP® ACCELEROMETER FOR PREDICTIVE MAINTENANCE**
MODEL 638A06

- Sensitivity: 25 mV/g
- Frequency Response: 4-1500 Hz
- Operating Temperature Range: -320 to +250 °F

**CABLES/CONNECTORS FOR CRYOGENIC APPLICATIONS**
MODELS 048/053 AE/AP/BP/BQ/BR

- All tested to -300 °F (-184 °C)
### PORTABLE VIBRATION CALIBRATORS FOR ON-SITE SENSOR VALIDATIONS

If a measurement is taken only to find out later that the sensor was bad, the cost of invalidating the data or re-taking it (if even possible) can range from nothing to immense. Routine calibration of sensors can eliminate this concern by periodically measuring the sensitivity and output of a sensor. Small and completely self-contained, portable vibration calibrators are ideal for field check of accelerometers, velocity transducers and proximity probes.

### VIBRATION TRANSMITTER

**MODEL 682C03**
- ICP® accelerometer input
- Outputs 4-20 mA signal proportional to acceleration, velocity, or displacement
- Analog vibration output via front BNC

### UNIVERSAL TRANSMITTER

**MODEL 682A06** *(WITH MODEL 070A80 FRONT PANEL)*
- Input 4-20 mA signal from Model 682C03
- Outputs include current re-transmit and two Form A relays
- Fully field-programmable with use of detachable display (Model 070A80)

### HANDHELD SHAKER

**MODEL 699B02**
- Fixed frequency of 159.2 Hz
- Field-adjustable measurement range in acceleration, velocity, or displacement

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**4-20 mA TRANSMITTERS FOR PROCESS MONITORING AND PROTECTION**

IMI® 4-20mA vibration transmitters are particularly well-suited for 24/7 vibration monitoring of critical rotating equipment. Simply install the transmitter in conjunction with a cryogenic ICP® accelerometer and run the 4-20 mA output to the nearest PLC, DCS, SCADA, or any plant information system. That is all it takes to begin continuous vibration monitoring and avoid costly unexpected down time. Using the reliable 4-20mA trending signal enables the user to schedule diagnostic testing based on real data rather than using time scheduled route based testing. This practice saves time and reduces overall costs of predictive maintenance. Optional hazardous area approved models also available.

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**PORTABLE VIBRATION CALIBRATOR**

**MODELS 699A06 & 699A07**
- Ruggedized, weatherproof enclosure dramatically improves durability and portability
- Precision quartz reference accelerometer and conditioning electronics for superior control and stability
- Provides NIST traceable transducer verification across a wide frequency and amplitude range

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IMI Sensors offers a wide range of industrial vibration sensors, bearing fault detectors, mechanical vibration switches, panel meters, cables, and accessories for predictive maintenance and equipment protection. For power generation and energy applications requiring precision measurements, IMI also offers pressure sensors and accelerometers.

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