Continuous Vibration Monitoring and Protection of Critical Equipment

Using 4-20 mA output sensors and vibration transmitters with PLC, DCS, SCADA, and PI systems

Highlights

- Monitors and protects 24/7
- Operates off standard 24V loop power
- Interfaces with plant monitoring & PI systems
- Installs quickly and easily
- Provides critical machine information
- Avoids costly catastrophic failures

Applications

- Critical pumps and motors
- Cooling towers and fans
- Slow speed rolls
- Rotary and screw compressors

4-20 mA vibration output sensors and transmitters provide an easy, cost effective means of monitoring and protecting critical machinery, 24/7. IMI offers a full line of 4-20 mA output products that are compatible with most PLC, DCS, SCADA, and Plant Information Systems. Protect critical equipment and avoid costly downtime with cost-effective transmitters from IMI.

These products are backed up with IMI Sensors’ industry leading Lifetime Warranty+, and Best Price Guarantee. IMI has 24-hour customer service, and our promise of Total Customer Satisfaction.
# 4-20 mA Output Integrated Vibration Sensors & Transmitters

## Two-wire, Loop-powered, 4-20 mA Vibration Sensors

<table>
<thead>
<tr>
<th>2-pin MIL Connectors</th>
<th>Integral Cable</th>
<th>Integral Armored Cable</th>
<th>Customer Supplied Conduit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Side</td>
<td>Top Side</td>
<td>Top Side</td>
<td>T” NPT Body</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conduit with 1” NPT</td>
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</tbody>
</table>

## 4-20 mA Output Signal Proportional to Peak Velocity (Low Frequency) - 180 to 60k cpm (3 to 1000 Hz)

<table>
<thead>
<tr>
<th>Velocity</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0.5 ips peak</td>
<td>640B00</td>
<td>642A00</td>
<td>640B10</td>
<td>642A10</td>
</tr>
<tr>
<td>0-1.0 ips peak</td>
<td>640B01</td>
<td>642A01</td>
<td>640B11</td>
<td>642A11</td>
</tr>
<tr>
<td>0-2.0 ips peak</td>
<td>640B02</td>
<td>642A02</td>
<td>640B12</td>
<td>642A12</td>
</tr>
</tbody>
</table>

## 4-20 mA Output Signal Proportional to RMS Velocity - 600 to 60k cpm (10 to 1000 Hz)

<table>
<thead>
<tr>
<th>Velocity</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>0-0.5 ips RMS</td>
<td>641B00</td>
<td>643A00</td>
<td>641B10</td>
<td>643A10</td>
</tr>
<tr>
<td>0-1.0 ips RMS</td>
<td>641B01</td>
<td>643A01</td>
<td>641B11</td>
<td>643A11</td>
</tr>
<tr>
<td>0-2.0 ips RMS</td>
<td>641B02</td>
<td>643A02</td>
<td>641B12</td>
<td>643A12</td>
</tr>
</tbody>
</table>

## 4-20 mA Output Signal Proportional to RMS Acceleration (Low Range) - 0 to 5 g rms

<table>
<thead>
<tr>
<th>Acceleration</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 to 60k cpm (3 to 1000 Hz)</td>
<td>645B00</td>
<td>647A00</td>
<td>645B10</td>
<td>647A10</td>
</tr>
<tr>
<td>180 to 30k cpm (3 to 5000 Hz)</td>
<td>645B01</td>
<td>647A01</td>
<td>645B11</td>
<td>647A11</td>
</tr>
<tr>
<td>180 to 60k cpm (3 to 10k Hz)</td>
<td>645B02</td>
<td>647A02</td>
<td>645B12</td>
<td>647A12</td>
</tr>
</tbody>
</table>

## 4-20 mA Output Signal Proportional to RMS Acceleration (High Range) - 0 to 10 g rms

<table>
<thead>
<tr>
<th>Acceleration</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 to 60k cpm (3 to 1000 Hz)</td>
<td>646B00</td>
<td>648A00</td>
<td>646B10</td>
<td>648A10</td>
</tr>
<tr>
<td>180 to 30k cpm (3 to 5000 Hz)</td>
<td>646B01</td>
<td>648A01</td>
<td>646B11</td>
<td>648A11</td>
</tr>
<tr>
<td>180 to 60k cpm (3 to 10k Hz)</td>
<td>646B02</td>
<td>648A02</td>
<td>646B12</td>
<td>648A12</td>
</tr>
</tbody>
</table>

### Available Options - designate with prefix letters to model number as shown (e.g., RV642A01)

<table>
<thead>
<tr>
<th>Option</th>
<th>Prefix</th>
<th>Prefix</th>
<th>Prefix</th>
<th>Prefix</th>
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</thead>
<tbody>
<tr>
<td>High Temperature Range</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
</tr>
<tr>
<td>Raw Vibration Output</td>
<td>RV</td>
<td>RV</td>
<td>RV</td>
<td>RV</td>
</tr>
<tr>
<td>Temperature Output Signal</td>
<td>TO</td>
<td>TO</td>
<td>TO</td>
<td>TO</td>
</tr>
<tr>
<td>ATEX/CSA Certified</td>
<td>EX</td>
<td>EX</td>
<td>EX</td>
<td>EX</td>
</tr>
</tbody>
</table>

### Notes

1. Includes conduit elbow with 1-inch NPT fitting for conduit connection. Sensor is provided with screw terminal connections.

2. Includes hazardous area certification. See [www.imi-sensors.com](http://www.imi-sensors.com) or [www.pcb.com](http://www.pcb.com) for full details of approved environments for specific models.

### Available Options

**Option “HT”** – High Temperature (e.g., HT640B01) increases the operating temperature range of the sensor from +185 °F (+85 °C) to +257 °F (+125 °C)

**Option “RV”** – Raw Vibration (Analog Acceleration) Output (e.g., RV640B01) has a third connection that provides the analog acceleration output at 100 mV/g (10.2 mV/(m/s²)) for use with a vibration data collector. Also available with option “EX” Hazardous Area Approval.

**Option “TO”** – Temperature Output (e.g., TO640B31) has an embedded temperature sensor and two additional connections that provide a 4-20 mA output proportional to temperature. The range is -40 to +257 °F (-40 to +125 °C). Also available with “EX” Hazardous Area Approval.

**Option “EX”** – Hazardous Area Approval (e.g., EX640B01, EXRV640B01) provides ATEX and/or CSA certification for use in hazardous areas. Contact IMI for details on specific models.
Programmable and Ultra-low Frequency 4-20 mA Sensors

Programmable 4-20 mA Output Sensor
- Outputs acceleration, velocity, or displacement
- Selectable low and high pass filters
- Selectable full scale range
- English or metric units

The Model 649A04 is a fully USB programmable, integrated vibration sensor and transmitter. It is housed in a hermetically sealed industrial sensor housing and mounts with a standard ¼-28 stud. It can be programmed to output a 4-20 mA signal proportional to peak acceleration, peak or rms velocity, or peak-peak displacement in either English or SI units. The sensor also has three selectable low pass filters and two high pass filters. It is 2-wire, loop-powered and fully compatible with most plant monitoring systems. The unit is available with a 2-pin MIL connector (Model 649A04). Optional Model 070A103 USB Programmer required for programming. USB Programmer kits that include software and required accessories are optionally available using Model 600A35.

Ultra-Low Frequency Displacement Sensor
- 4-20 mA output
- Effective on slow speed machinery
- Measures absolute p-p displacement
- Accurate down to 90 CPM
- 2-wire loop powered
- Excellent for cooling towers

Displacement is the preferred measure for low frequency and balance measurements. It is often difficult to make good acceleration and even velocity measurements below 10 Hz (600 cpm). The 653A01 measures accurately down to 1.5 Hz (90 cpm) making it a very effective sensor for monitoring slow speed machinery. Since it is housed in a hermetically sealed stainless housing, it is an excellent choice for use in harsh and corrosive environments like cooling towers. The unit has a range of 40 mils p-p and a frequency range of 1.5 to 300 Hz (90 to 18,000 cpm). It is a 2-wire, loop-powered device and is fully compatible with most plant monitoring systems.

Using ICP® Accelerometers with 4-20 mA Loops
Existing ICP® accelerometers may be easily adapted for use into 4-20 mA process loops with a transmitter that converts their raw analog output into a 4-20 mA signal, which is proportional to rms or peak vibration. A variety of transmitters are available to support this technique and are shown on the back of this brochure.
ICP® Sensor to 4-20 mA Transmitter
- Provides constant-current ICP® sensor excitation
- Adjustable low-pass and high-pass filtering
- Peak or rms proportional output
- Selectable acceleration, velocity, or displacement output signal format
- 24 VDC powered
- 4-20 mA output proportional to temperature (when used with ICP® sensors having the “TO” sensor option)

Reciprocating Machinery Protector (RMP)
- Detects faults and mechanical looseness in reciprocating compressors
- Improves on existing impact monitoring technology
- Provides continuous trending with alarm and alert levels for early warning
- Field programmable set points & alarm levels optimize performance
- Hermetically sealed, loop-powered design
- Hazardous area approvals available

Electronic Vibration Switch
- Offers two set points with individual alert and alarm relays
- 4-20 mA output signal for continuous vibration monitoring
- Analog, 100 mV/g (10.2 mV/(m/s²)) output signal for fault analysis and diagnostics
- Utilizes built-in or remote vibration sensor
- Choice of AC or DC power
- Adjustable time delay
- Hazardous area approvals available

Bearing Fault Detector
- Provides early warning of bearing and gear faults
- Detects impacting associated with spalling, cracking, and lubrication problems
- Outputs 4-20 mA signals for peak acceleration and overall vibration
- Compatible with existing with PLC, DCS, SCADA, alarm, and control systems
- Offers analog output signal for spectral analysis and diagnostics
- Conducts continuous vibration monitoring- 24/7

Indicator/Alarm
- Provides 24 VDC excitation for loop-powered 4-20 mA sensors
- Powers ICP® accelerometers (optional)
- Highly visible, fully scalable LED display
- Up to four programmable set-point relays
- Time delay eliminates false alarm trips
- Optional 4-20 mA output signal
- 1/8 DIN panel mount
- User friendly, menu-driven setup

Model 682A16 ICP™ Universal Transmitter
Model 682A06 Universal Transmitter
- Powers ICP® accelerometers (Model 682A16)
- Normalizes the vibration output
- Provides loop power for 2-wire, 4-20 mA sensors
- Offers 2 set points with Form A relay outputs
- Relays independently set NO or NC
- Accepts mA, ohm, RTD, thermocouple
- Accepts VDC input (Model 682A06)
- Fully programmable via detachable display
- DIN rail mount

ICP™ Inline Transmitter
- Operates off 24 V loop power
- Powers ICP® accelerometers
- Outputs 4-20 mA proportional to velocity
- Offers 100 mV/g buffered output
- Compatible with plant monitoring equipment
- Converts installed ICP® sensors to loop power transmitters

IMI Sensors designs and manufactures a full line of accelerometers, sensors, vibration switches, vibration transmitters, cables and accessories for predictive maintenance, continuous vibration monitoring, and machinery equipment protection. Products include rugged industrial ICP® accelerometers, 4-20 mA industrial vibration sensors and transmitters for 24/7 monitoring, electronic and mechanical vibration switches, the patented Bearing Fault Detector, high temperature accelerometers to +900 °F (+482 °C), 2-wire Smart Vibration Switch, and the patented Reciprocating Machinery Protector. CE approved and intrinsically safe versions are available for most products.