

# Wireless Motor Monitor Transceiver Node: Wireless Vibration, Current, & Temperature

Phase IV Datasheet Leap Sensors® Motor Monitor Transceiver Node

## Applications

- Industrial motor monitoring
- Industrial pump, compressor, chiller, fan, or conveyor motor monitoring
- Bearing monitoring
- Engine monitoring in maritime and transportation industries

## Special Features

- Option for 6 vibration & temperature sensors to 1 transceiver node
- Transmission range of 1,500 ft in open air
- Simultaneous sensing of AC current, temperature, and vibration parameters for complete insight into motor health and performance
- Edge computing for small, actionable data
- Configurable sample and transmit intervals to fit many application requirements
- Simple integration into existing Leap Sensors system
- Transceiver nodes are factory-preconfigured to pair with new or existing gateway for simple integration – up and running in 5 minutes.
- LED indicators for power, thread network connection, gateway connection, and database connection statuses

## Description & Product Highlights

Phase IV's Leap Sensors Single and Dual Motor Monitoring transceiver nodes were developed to be a revolutionary tool for predictive maintenance and monitoring of industrial motors. The system simultaneously monitors the three most relevant predictive indicators for impending motor failure. Monitoring current, vibration, and temperature parameters provide critical insight into not only industrial motor health, but the surrounding components as well, including gearboxes, bearings, structural stiffness, belts, fans, and others.

Unscheduled downtime is costly in a manufacturing environment, so we designed this sensor system to mitigate that risk. In addition, component-level failure diagnosis is possible through our reported sensor parameters. For these reasons, typical ROI for this system is less than 3 months.

Programmable sensor excitation and user configurable sensor calibration allows for the integration of analog amp clamps.

The Leap Sensors system is intended primarily for the purpose of performing industrial sensor measurements.



## Motor Monitor Node Model

### Modularity and customizability

Each Motor Monitor Transceiver Node is customizable to meet any application-specific needs. The Single and Dual Motor Monitor devices come standard with a 0-10 V output split core amp clamp and K-type thermocouples, but any current sensor type with a 0-10 V output can be interfaced with the device, and all thermocouple types are available.

### Ease of implementation

All Leap Sensors Single and Dual Motor Monitor devices come pre-configured, calibrated, and connected to an existing or new Leap Sensors gateway. Split-core amp clamps, and optional magnet mounting for both the vibration module and thermocouples allow for rapid and easy installations.

### Real-time data viewing and alerts

All Leap Sensors transceiver nodes send data to Leap Sensors gateway devices at configurable intervals. This data is accessible and viewable in real time. In addition to real-time viewing and graphing of sensor parameters, alerts based on any sensor condition are configurable, which can be sent directly to an email or cellphone for instant communication of a sensor reaching an alert condition.

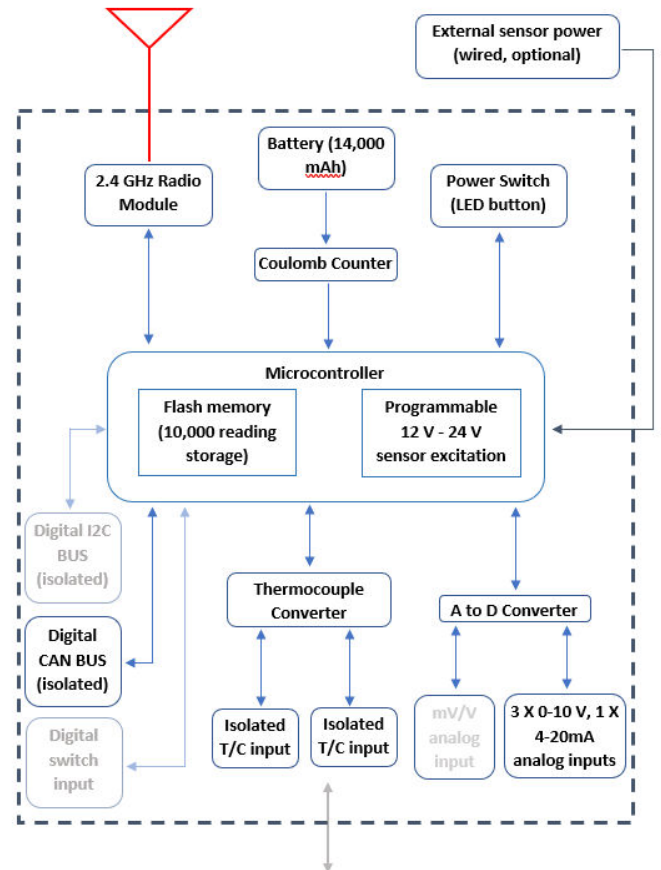
Leap Sensors® Motor Monitor Node Specifications		
<b>General Node Specifications</b>		
<b>Analog Input Signals</b>	<b>24-Bit ADC:</b> 2 x 0-10 V (for Amp Clamps)	<b>Thermocouple Chip:</b> 2 x Isolated Thermocouple
<b>Digital Input Signals</b>	1 X CAN bus (for up to 6 vibration modules)	
<b>Sensor Interfaces</b>	Pre-configured 6 pin M8 (vibration module), female thermocouple connector, and M8 (amp clamp)	
<b>Output units</b>	User and factory configurable	
<b>Vibration Module Specifications:</b>		
<b>Accelerometer Type</b>	Tri-Axial MEMS, 0 Hz (DC) to 5000 Hz range, +/- 8 G's RMS	
<b>Sample Rate</b>	3 second raw data sample intervals, user configurable	
<b>Measured Parameters</b>	See Table 2 for all reported parameters	
<b>AC Amp Clamp Specifications</b>		
<b>Description</b>	Split core, energy harvesting, 0-10 V output or 4-20 mA	
<b>Accuracy</b>	1 %, FSR	
<b>Measurement Ranges</b>	0-10, 0-20, 0-50, 0-100, 0-150, 0-200 [A AC] options	
<b>Overload Protection:</b>	Consult factory for range specific overload protection	
<b>Integrated Temperature Chip &amp; Thermocouple Specifications</b>		
<b>Chip Specifications</b>	+0.0625 °C resolution, open and short circuit detection	
<b>Compatible Thermocouple Types</b>	K, J, T, N, S, E, B, R K-type is standard	
<b>Accuracy</b>	+/- 0.5 °C (typical)	
<b>Power Specifications</b>		
<b>Battery Power</b>	3.6 V, 14,000 mAh D-cell, lithium thionyl chloride	
<b>Battery Life</b>	4-6 years at 10 minute transmit & sample intervals. On-board battery passivation prevention circuit assures long life.	
<b>Power / Current Consumption</b>	Low sleep current assures long life	
<b>Wireless Specifications</b>		
<b>Wireless Transmission Range</b>	Industrial Environments*	Open-Air*
	500 ft	1,500 ft
<b>Range Extenders</b>	Range extenders available to extend transmission distance.	
<b>RF Transmission Power</b>	User configurable 0-20 dBm, factory configured to 20 dBm***	
<b>RF Communication Protocol</b>	Internet Protocol based Thread, IPV6LoWPAN, IEEE 802.15.4	
<b>RF Frequency &amp; Modulation</b>	2.4 GHz (16 Channels), DSSS provides higher noise and interference resistance	
<b>Data Security</b>	AES 128-bit encryption with secure join and key exchange (J-PAKE)	

\* Transmission ranges vary with environmental conditions. Reported values are test averages.

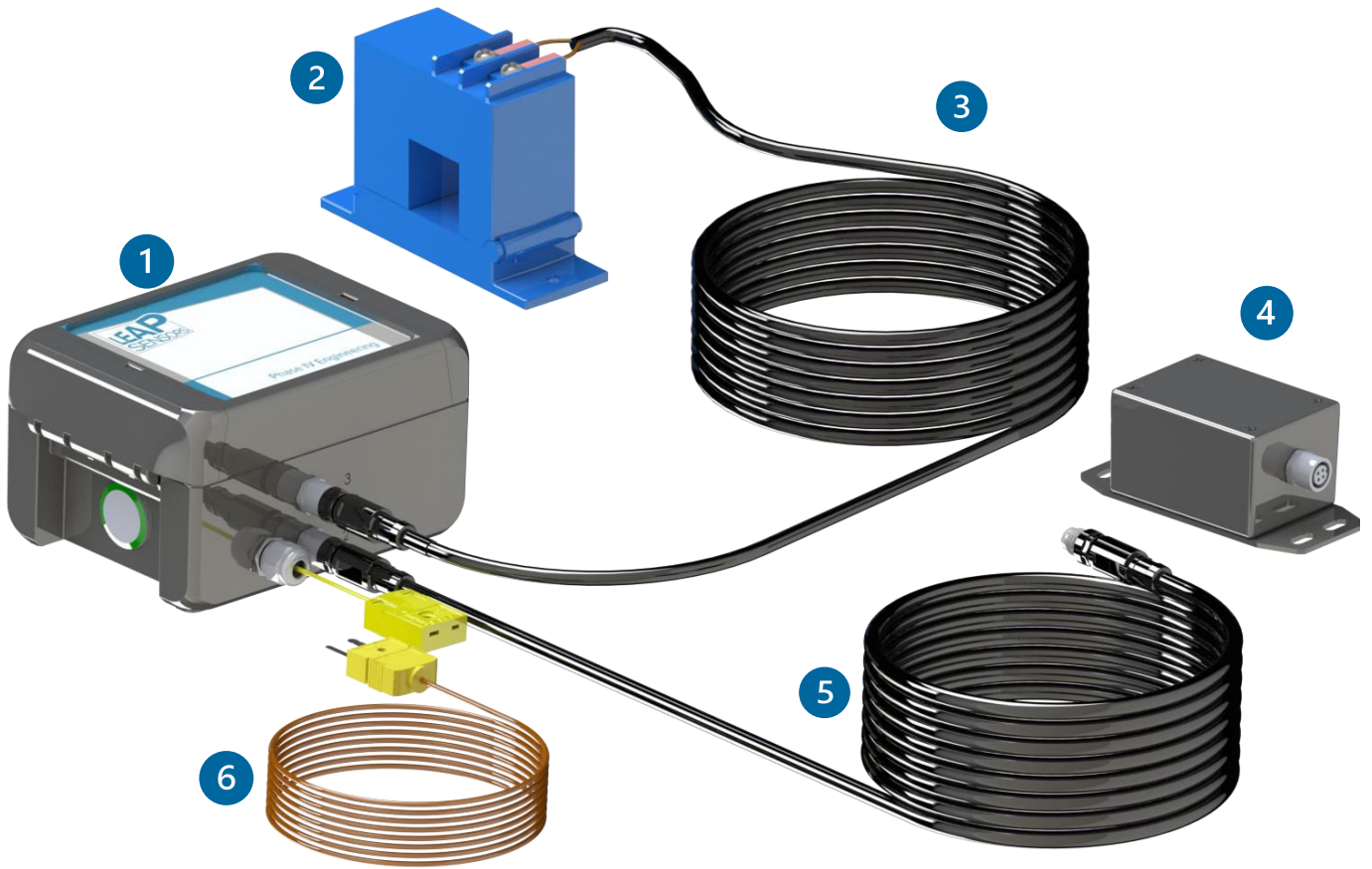
\*\* Transmission power requirements are governed regionally.

Other Features	
<b>Operating Temp.</b>	- 40 °C to 60 °C, -40°C to 120°C available – special order
<b>Gateway Compatibility</b>	Compatible with all Leap Sensors wireless gateways
<b>Firmware</b>	Over-the-air upgradeable via web interface
<b>Certifications</b>	FCC (USA), IC (Canada)
<b>Gateway Communication</b>	Send and receive (data, acknowledgements, updates, and device configuration). Data stored in node until confirmed write to database.
<b>LED Power Switch</b>	Recessed in the enclosure to prevent accidental power cycling. On-switch is recessed. Off-switch flush with surface. Immediately resets transceiver node when turned off. Integrated green and red LED indicate wireless connection status at power-up.
<b>Node Internal Memory</b>	110,000 time-stamped device readings stored on transceiver node if gateway or software does not acknowledge writing data to database.
<b>Enclosure &amp; Hardware Specifications</b>	
<b>Dimensions</b>	80 mm x 113 mm x 60 mm
<b>Weight</b>	400 grams (dual model), 350 grams (single model)
<b>Material</b>	Polycarbonate (UL 94 rated and 120C rated)
<b>Mounting Options</b>	Optional feet (shown in drawing) can be mounted horizontally or vertically. Screws can also be passed through the enclosure (when the lid is open) for mounting without feet.
<b>Ingress Protection</b>	IP68 enclosure. IP67 glands, cables, switch.
<b>Node Antenna</b>	Internal antenna (typical). External antenna (optional).

[Outbound sensor data, inbound device configurations, firmware updates, and transmission acknowledgements]



[External vibration modules (1-2), thermocouples (1-2), and amp clamps (1-2), device powered or energy harvesting]



Motor Monitor System Legend (Single Shown)	
1	Motor Monitor Node & Enclosure
2	Split-Core AC Amp Clamp
3	20' Extension Cable (for Amp clamp)
4	Vibration (& Optional On-Board Temperature) Module
5	20' Extension Cable (for Vibration Module)
6	Thermocouple Probe & 20' Extension Cable

Table 2: Vibration Module Edge Computed Parameters	
<b>Axial Acceleration [RMS]</b>	General driveshaft run out, for bearing health, lubrication tracking, and rotor health.
<b>Axial Acceleration [Max]</b>	Shock / impact forces, caused by gearbox teeth meshing, or faulty bearings.
<b>Axial Velocity [RMS]</b>	Weighs & monitors lower-frequency events, such as Oil whirl, Looseness, Belts, & Resonances.
<b>Radial Acceleration [RMS]</b>	General driveshaft run out, bearing health, lubrication tracking, and rotor health.
<b>Radial Acceleration [MAX]</b>	Shock & impact forces, caused by gearbox teeth meshing, or faulty bearings.
<b>Radial Velocity [RMS]</b>	Weighs & monitors lower-frequency events, such as Oil whirl, Looseness, Belts, & Resonances.

