MACHINE HEALTH MONITORING SOLUTION

Predict Failures.
Prevent Downtime.
Improve Performance.

GRACESENSE™ FEATURES & BENEFITS

- **Real-Time Asset Monitoring:** Our solution continuously monitors machinery health by leveraging advanced wireless sensors, enabling real-time insights and proactive maintenance actions to minimize downtime.
- **User-Friendly Diagnostics:** Identifies likely equipment defects and presents them clearly to your team without specialized training, explaining the rationale behind each recommendation.
- **Scalable and Adaptable Solutions:** Configurable to meet diverse industrial needs, GraceSense™ offers scalable sensor and gateway options that adapt to varying operational demands, enhancing system flexibility.
- **Flexible System Integration:** Easily integrates with existing systems like PLCs, SCADA, and HMI via EtherNet/IP™ and Modbus TCP/IP; supports Studio 5000 Add-On Profile, Fiix CMMS, and offers a public API for third-party systems.

FOR MORE INFORMATION VISIT GRACESENSE.COM OR CALL 1.800.280.9517

GRACESENSE™ OVERVIEW

GraceSense™ Machine Health Monitoring Solution provides predictive insights to prevent unplanned downtime. By continuously monitoring your assets, the system detects anomalies and forecasts failures before they occur, allowing you to schedule maintenance in advance and keep production running smoothly.

Our alert system delivers early warnings through CMMS integration, user-generated SCADA alarming, SMS and/or email, ensuring your maintenance team receives critical information promptly. Because most injuries occur during reactive maintenance, our solution reduces risks by enabling scheduled, controlled operations and fostering a safer work environment.

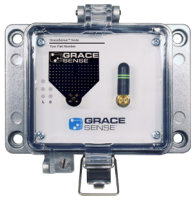
HARDWARE SOLUTIONS

Our advanced hardware solutions provide application-specific data acquisition and real-time equipment monitoring. These wireless devices enable proactive maintenance by allowing seamless integration with third-party sensors, supporting various communication standards, and ensuring reliable performance across diverse industrial applications.

- **Vibration & Temperature Sensors** wirelessly transmit precise early insights, enabling plant personnel to detect malfunctions and prevent costly downtime. With multiple mounting options, they offer versatile deployment across industrial applications, simplifying installation without the need for complex wiring.
- **Wireless I/O Portals** are designed to interface with third-party sensors, and these data acquisition units support the most common industrial sensors, including 0-10V, 4-20mA, and RTDs. The flexible hardware configuration accommodates a broad range of inputs, transducers, radios, and power options.

GATEWAY SOLUTIONS

GraceSense™ gateway solutions collect sensor data and route it to the appropriate destination in the cloud-based Maintenance Hub or your plant's control system, enabling real-time monitoring and seamless integration with existing infrastructure.



CloudGate™ bridges sensor data to the cloud-based Maintenance Hub, offering real-time, actionable insights directly through a browser interface, supporting Wi-Fi or LTE connections, and managing all wireless sensors to facilitate scalable network architecture.

ControlGate™ integrates directly with plant control systems to transmit data straight to PLCs, facilitating rapid integration with existing control networks using EtherNet/IP™ or Modbus TCP/IP protocols and allowing plant operators to receive critical information via PLC.

ComboGate™ combines CloudGate™ and ControlGate™ features, supporting LTE and Wi-Fi to securely deliver data to the cloud-based Maintenance Hub, enabling real-time browser insights and direct PLC integration via EtherNet/IP™ or Modbus TCP/IP protocols.

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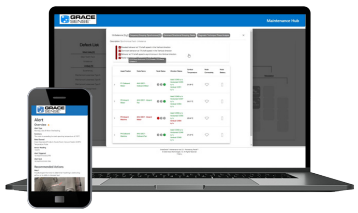
SOFTWARE SOLUTIONS

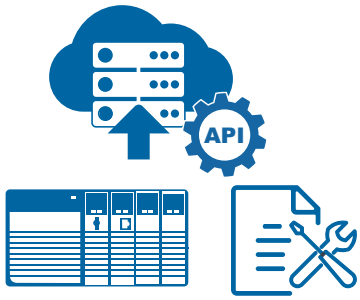
The Maintenance Hub is the heart of our Machine Health Monitoring Solution. Its web interface ingests data from GraceSense™ wireless sensors and I/O portals, delivers continuous asset visibility, and drives smarter maintenance decisions.

Maintenance Hub



- **Continuous Equipment Monitoring & Alerts:** Sensors report equipment-health data while SMS, email, and PLC/SCADA notifications provide immediate repair guidance.
- **Comprehensive Vibration Analysis:** Translates data from vibration sensors into actionable insights, enabling non-vibration analysts to make quick, informed maintenance decisions.
- **Defect Classification Insights:** Built-in analytics compare vibration signatures against 19 fault models—bearing wear, misalignment, looseness, and more—pinpointing root cause and next steps for repair.
- **Flexible Hosting:** Standard cloud-based with optional on-premises hosting with robust data protection to meet diverse security and operational needs.

Seamless Configuration and Integration



- **Direct PLC and SCADA Integration:** Funnel data into your existing PLC and SCADA systems using EtherNet/IP™ and Modbus TCP/IP protocols, simplifying maintenance by reducing the need for separate monitoring systems. Enhance decision-making capabilities by combining GraceSense™ Machine Health Monitoring data with production data.
- **Studio 5000 Add-On Profile:** Simplify integration with Rockwell PLCs using our software, which is natively available within Rockwell Automation's Studio 5000.
- **Fiix CMMS:** Native integration with Fiix CMMS enhances asset management and maintenance scheduling, turning alerts into actionable work orders.
- **Open API:** Flexibly integrate with third-party systems to customize and extend the capabilities of the Maintenance Hub.

SERVICE SOLUTIONS

Grace Technologies is dedicated to maximizing the value and efficiency of your Machine Health Monitoring Solution through our comprehensive services. From white-glove delivery to tailored training, our approach ensures your system achieves its full potential.

Comprehensive Service Offerings

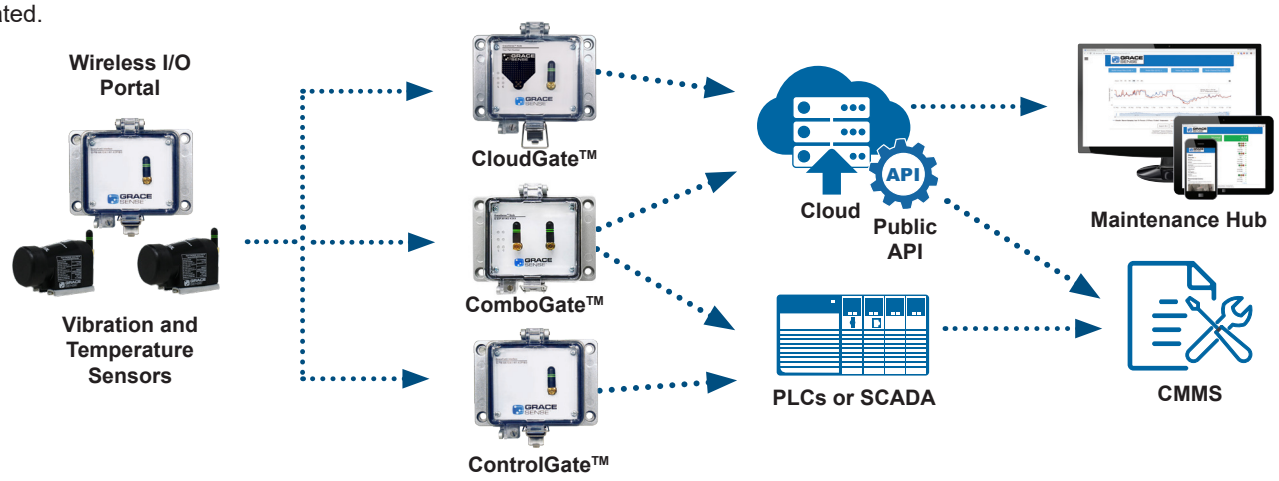
- **White-Glove Delivery:** Experience seamless account setup, assistance with data structuring, and personalized onboarding from our expert team.
- **Expert Installation and Integration:** Receive specialized support for seamless integration and expert installation, ensuring your system is up and running efficiently.
- **Customized Training:** Empower your team with tailored training sessions to ensure actionable data is obtained, prove ROI, and ensure site-wide adoption of the system.
- **Flexible Service Delivery:** Choose on-site, remote, or hybrid service options to suit your specific operational needs.

Our goal is to provide ongoing support that helps your maintenance team make informed, data-driven decisions, enhancing the overall effectiveness of your maintenance efforts.

FOR MORE INFORMATION VISIT GRACESENSE.COM OR CALL 1.800.280.9517

CYBERSECURITY

GraceSense™ integrates advanced cybersecurity measures to protect your IT infrastructure and data throughout their lifecycle. Our solutions employ secure networks, encryption, and strict access controls to ensure your systems remain safe and seamlessly integrated.

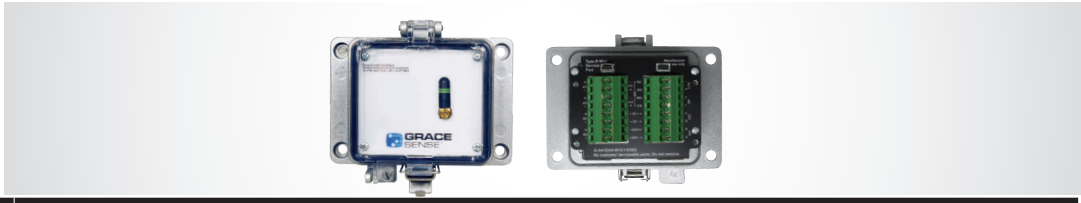


VIBRATION & TEMPERATURE SENSORS TECHNICAL SPECIFICATIONS

	SERIES	G-FM-VBT-BAT-INT-GP-MG-WB* G-FM-VBT-BAT-INT-GP-MG-WB*
Wireless	**Local Wireless Protocol**	IEEE 802.15.4, Range: 50m (164') Line of Sight
	Antenna Type	2.4GHz Internal Antenna or RP-SMA External with Right Angle Whip
	Operating Frequency	2400 - 2483.5 MHz
Vibration	**Shaft Speed Detection**	Acceleration-Based and Magnetometer
	Accelerometer	Tri-Axial MEMS
	Sampling Rate	Up to 25.6kHz
	Bandwidth	4600 Hz (XY), 2200 Hz (Z)
	Measurement Range	Auto-Ranging: ±2g, ±4g, ±8g, ±16g
	Resolution	16-Bit
Mechanical & Certifications	**Temperature Range**	**Operating Range:** -40°C to 80°C
	Temperature Measurement	Onboard Temperature Sensor
	Environmental Ratings	IP69k Internal Antenna, IP65 External Antenna
	Mounting	Magnetic and Epoxy
	Power Source	Replaceable, Non-Rechargeable Lithium Metal Battery 3.6V, 8.5Ah C Cell with Molex CA023-7A such as LS26500-ACC
	Battery Life	10 Years (at Factory Default Settings at 1 Hour Sampling at 25°C)
	Warranty	2 Years
	Special Features	Over-the-Air Updates

**The part number shown represents the base models. Final part number may vary depending on selected options.*

WIRELESS I/O PORTAL TECHNICAL SPECIFICATIONS



	SERIES	WIRELESS I/O PORTAL
Wireless	**Local Wireless Protocol**	IEEE 802.15.4, Range: 50m (164') Line of Sight
	Antenna Type	Right Angle SMA Whip, 1.8dBi
	Local Communication Frequency	2400 - 2483.5 MHz
Sensors	**Sensor Channels**	Up to 12 Sensor Channels via Terminal Block
	Sensors Available	Current, Temperature, Pressure, Flow, Load, Fluid Level, Humidity
	Supported Sensor Inputs	4 - 20mA, 0 - 10V, Thermistor, RTD, Thermocouple
Mechanical & Certifications	**Mounting**	Panel Mount or Kitted in Enclosure
	Temperature Range	**Operating Range:** 0°C to 50°C
	Power Source	24V DC, 5V USB, 5V DC
	Warranty	2 Years
	Special Features	Over-the-Air Updates

Experience Real-Time Machine Health Monitoring

Get Started with our Pilot program for $5000

- **50% Off Hardware ($5,000 Value → Yours for $2,500):** Includes 4 vibration sensors and 1 ready-to-deploy gateway.
- **Site Audit & Commissioning ($2,500):** Covers installation, RF coverage validation, and hands-on training.
- **1-Year Maintenance Hub Subscription ($1,099 Value → Yours for No Cost):** Your first year of access to our browser-based platform is on us—gain real-time monitoring, trend charts, alert setup, and full system management at no extra cost.
- **90-Day "Love It or Return It" Guarantee:** Get a full hardware refund if you're not completely satisfied.

**Return for full hardware refund ($2,500); does not include setup and service fees.*

FOR MORE INFORMATION VISIT GRACESENSE.COM OR CALL 1.800.280.9517

GATEWAY SERIES TECHNICAL SPECIFICATIONS

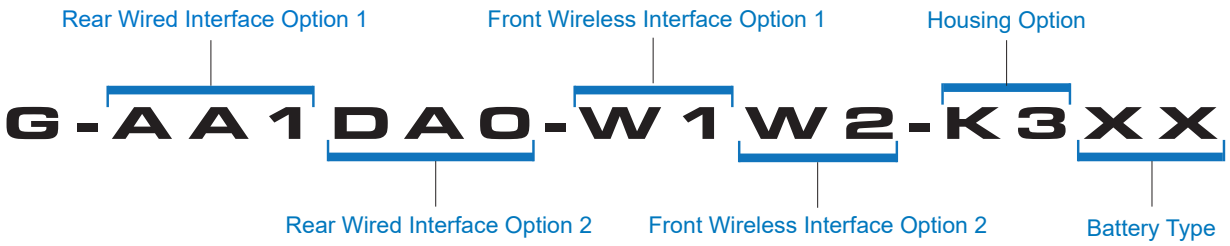
	SERIES	CloudGate™	ControlGate™	ComboGate™
Wireless/Network	**Local Wireless Protocol**	IEEE 802.15.4, Range: 50m (164') Line of Sight		
	Antenna Type	Right Angle SMA Whip, 1.8dBi		
	Local Communication Frequency	2400 - 2483.5 MHz		
	Communications Options	**Cloud:** Wi-Fi or LTE	**Control:** EtherNet/IP™, Modbus TCP/IP **Cloud:** Wi-Fi or LTE	**Control:** EtherNet/IP™, Modbus TCP/IP
	Max Number of Wireless Sensors	20-30 Nodes Recommended (limited only by the distance to the CloudGate)	38 Nodes Maximum	
Sensors	**Sensor Channels**	Up to 12 Sensor Channels via Terminal Block	N/A	
	Sensors Available	Current, Temperature, Pressure, Flow, Load, Fluid Level, Humidity		
	Supported Sensor Inputs	4 - 20mA, 0 - 10V, Thermistor, RTD, Thermocouple		
Mechanical & Certifications	**Mounting**	Panel Mount or Kitted in Enclosure		
	Temperature Range	**Operating Range:** 0°C to 50°C		
	Power Source	24V DC, 5V USB, 5V DC		
	Warranty	2 Years		
	Special Features	Over-the-Air Updates		

Third party sensors are available. Please contact your local Sales Representative for more information.

FOR MORE INFORMATION VISIT GRACESENSE.COM OR CALL 1.800.280.9517

CONFIGURATION OPTIONS

The Grace sales team is here to help you configure a part to meet the needs of your application. Contact us at Sales@GraceTechnologies.com or by calling 1-800-280-9517. Listed below are a variety of configuration options for any application.



Rear Wired Interface Options: *(Choose up to two)*			
CODE	OPTION	CODE	OPTION
SENSOR INTERFACE		COMMUNICATION	
XX	No Application Interface (CloudGate only)	EIP	EtherNet/IP™
AA1	(2) 10kΩ inputs (thermistor) and (4) 0-10 VDC Inputs, 12 bit	MIP	Modbus TCP/IP
AA2	(2) 10kΩ inputs (thermistor) and (4) 0-10 VDC Inputs, 16 bit		
AB2	(4) 4-20 mA 16 bit		
AC2	(4) 3-Wire RTD's 16 bit		
AD2	(3) 4-Wire RTD's 16 bit		
DA0	(1) I2C Port, (1) RS 485 Port, (1) SPI Port		

Sensor Conditioning not currently available for ControlGate™ and ComboGate™ configurations.

Multiple sensor procurement options available. Please call us at 1-800-280-9517 for details.

ControlGate™ Options

CloudGate™ Options

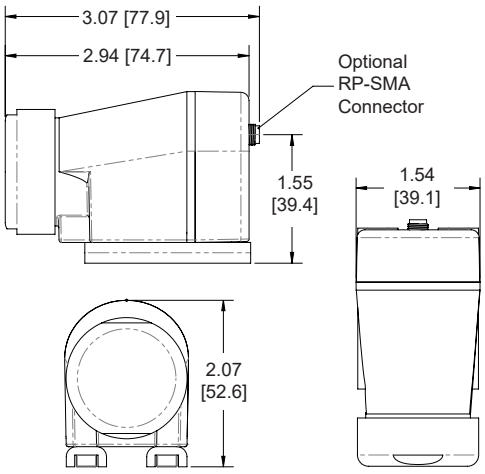
ComboGate™ Options *(contains one of each ControlGate™ and CloudGate™)*

Front Wireless Interface Options: *(Choose up to two)*	
CODE	OPTION
XX	No Wireless Communication
W1	802.15.4 (Node to Node Communication)
W2	Wi-Fi 802.11 b/g/n
C1	AT&T LTE
C2	Verizon LTE
C3	Roaming Network LTE (standard)

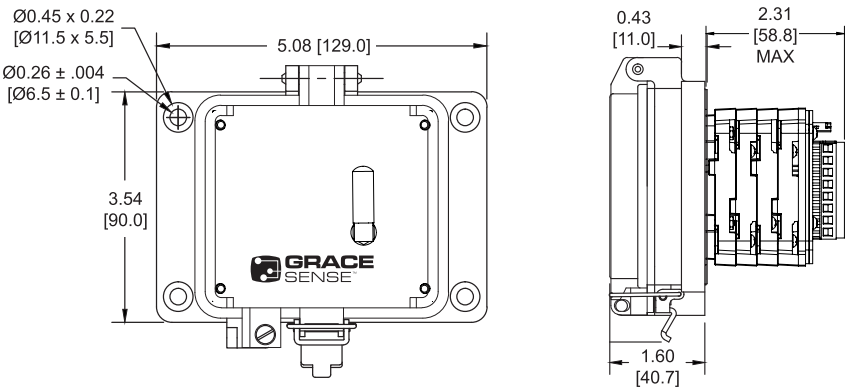
Housing Options: *(Choose one)*	
CODE	OPTION
K2	Type 4X, Panel-Mount Housing
K3	Type 4, Panel-Mount Housing
K4	Type 12, Panel-Mount Housing
M9	Type 1, 2, 3, 3X, 3R, 3RX, 4, 4X, 5, 12, 12K, 13, Panel- Mount Magnetic Housing

DIMENSIONS & DETAILS

Vibration & Temperature Sensors



Wireless I/O Portal, CloudGate™, ControlGate™, or ComboGate™



FREQUENTLY ASKED QUESTIONS

Q: What protocol is used for local wireless communication between sensors and gateways?

A: GraceSense™ sensors employ an IEEE 802.15.4, Zigbee-compatible protocol for secure and reliable communication with gateways.

Q: What is the range limit between GraceSense™ wireless sensors and a gateway?

A: Wireless sensors and gateways can be positioned up to 50 meters apart, maintaining a clear line of sight for optimal performance.

Q: How do Wireless I/O Portals differ from gateway options?

A: Wireless I/O Portals gather data from wired third-party sensors and require a gateway to transmit data to the Maintenance Hub or control systems. CloudGate™ uses Wi-Fi or LTE to connect sensor data to the cloud, ControlGate™ utilizes EtherNet/IP™ or Modbus TCP/IP for control systems, and ComboGate™ combines these functionalities for simultaneous data transmission to both cloud and control systems.

Q: What is the maximum number of wireless sensors a gateway can support?

A: While CloudGate™ can handle hundreds of sensors, a practical limit for optimal performance is 20-30 sensors. ControlGate™ and ComboGate™ can support up to 38 sensors, depending on the configuration.

Q: What alternatives are available if Wi-Fi isn't an option?

A: For environments lacking Wi-Fi, our gateways can connect via 4G LTE using Verizon or AT&T. This is particularly useful during pilot projects or in areas without Wi-Fi availability.

Q: What types of monitoring does the GraceSense™ system support?

A: GraceSense™ offers versatile sensing capabilities, including temperature, vibration, and electrical current via 4-20mA or 0-10V analog channels. Additional measurements like flow, pressure, and humidity are possible with third-party sensors connected through our sensors or gateways.

Q: Can I use my company's data plan for LTE connections?

A: While using your company's AT&T or Verizon plan is possible, GraceSense™ typically operates on a specialized machine-to-machine IoT plan, which may not be compatible with general corporate plans. Most customers opt for a Grace-provided data plan.

Q: What is a Sensor Interface, and why is it beneficial?

A: A Sensor Interface acts as an I/O module, expanding the data types that can be monitored. For example, a current transducer might be added to vibration and temperature monitoring to assess motor current draw, enhancing the depth of condition monitoring.

Q: Can sensor data be integrated into my PLC or SCADA/DCS system?

A: Absolutely. Data from sensors can be integrated directly via a ControlGate™ or ComboGate™ using EtherNet/IP™ or Modbus TCP/IP. Additionally, our RESTful API permits third-party systems to access required data from our cloud-based Maintenance Hub.

Q: What is covered under the GraceSense™ Machine Health Monitoring Solution warranty?

A: The GraceSense™ system carries a two-year warranty, which excludes batteries.

Q: What is the battery life of the VBTx?

A: The battery life of the VBTx is approximately 10 years when sampling at 1-hour intervals. Sample rate and temperature will impact battery life.

Q: How often does the sensor sample? Does it sample continuously?

A: Factory settings have a one-hour sample rate, which can be configured between 1 minute and 4 hours. The sensor does not sample continuously; it activates based on the configured settings.

Q: Where should the sensor be mounted?

A: The mounting location of the sensor depends on the asset. There are four general locations, which can vary based on the specific equipment and monitoring needs.

For a complete listing of Frequently Asked Questions please scan the QR Code to the left to go to our Knowledge Base.

GRACE TECHNOLOGIES