WISE-iMachine PHM AI Box

Equipment Diagnostic Smart Box

Features

- Covers 12 types of equipment fault AI models; offers plug-and-play deployment without debugging.
- Intelligent Early Warning: Enables component-level alerts 1 to 3 months in advance.
- Built-in 27+ equipment fault library; provides precise diagnostics and actionable maintenance recommendations.
- Standardized end-to-end process from selection to deployment, enabling rapid deployment and commissioning for single equipment.
- Expandable cloud applications for a wider fault library; provides precise multi-scenario management.

GB/T 6075.3 Mechanical vibration — Measurement and evaluation of machine vibration on non-rotating parts

ISO 20816 Equipment Vibration Monitoring Standard

Overview

The PHM AI Box deeply integrates AI models for equipment fault diagnosis into the equipment diagnostic smart box. It provides smart early warning and fault diagnosis services for rotating equipment in process industries. It identifies potential faults 1 to 3 months in advance, allowing equipment engineers to perform efficient inspections and precise repairs, ensuring stable and safe production operations.

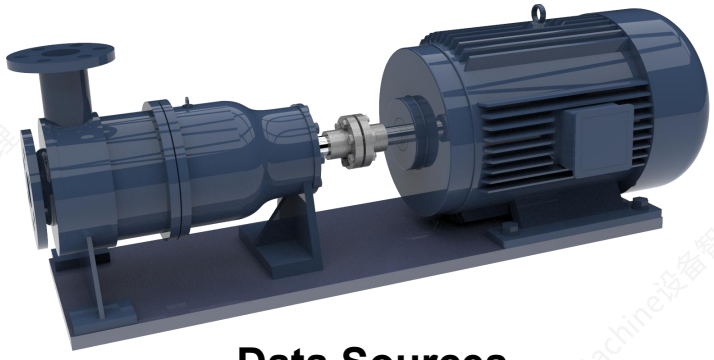
The PHM AI Box has built-in multiple AI algorithm models for common equipment. For equipment like pumps and fans, it achieves AI-based quantitative diagnosis of characteristic fault frequencies such as bearing wear and shaft misalignment. Driven by health assessment, anomaly alerting, and precise fault diagnosis, it enables predictive maintenance, reducing unplanned downtime by 30% to 50% and lowering lifecycle maintenance costs by 15% to 25%.

System Architecture

Scenario Model Capability – Pump

Typical Equipment

Cantilever Centrifugal Pump
Double Support Pump
Direct drive Pump
Multi-stage Pump
Water Ring Vacuum Pump
High-speed Pump



Components

Motor body
Motor non-drive end bearing
Motor drive end bearing
Coupling
Pump drive end bearing
Pump non-drive end bearing
Pump impeller
Pump body

Data Sources

Vibration, Temperature
Motor Operating Conditions (for Variable Frequency Drives))

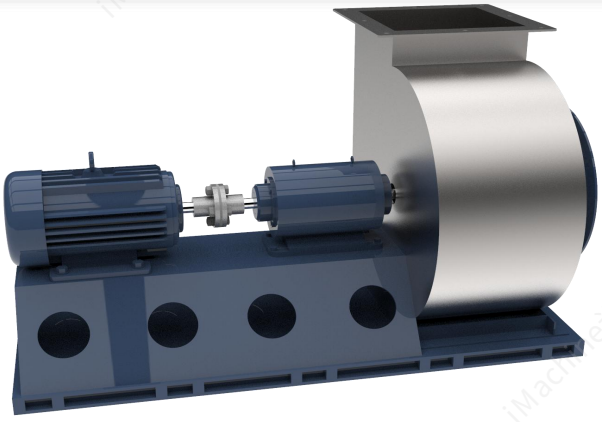
Intelligently Identifiable Faults

Motor Rolling Bearing Damage
Motor Rolling Bearing Creeping/Looseness
Motor Rolling Bearing Lubrication Deficiency
Motor Rolling Bearing High Temperature Anomaly
Poor Motor Foundation Rigidity / Excessive Vibration
Dust Accumulation on Motor Fan Blades
Motor Fan Blade Wear/Fracture
Pump Impeller Wear
Pump Blockage
Coupling Misalignment/Wear
Excessive Vibration at Pump Vane Pass Frequency
Poor Pump Foundation Rigidity / Excessive Vibration
Pump Rolling Bearing Damage
Pump Rolling Bearing Creeping/Looseness
Pump Rolling Bearing Lubrication Deficiency
Pump Rolling Bearing High Temperature Anomaly

Scenario Model Capability – Fun

Typical Equipment

Cantilever Centrifugal Fan
Double Support Fan
Direct Drive Fan
Cooling Tower Fan
Roots Blower
Axial Flow Fan



Components

Motor Body
Motor Non-Drive End Bearing
Motor Drive End Bearing
Coupling
Fan Drive End Bearing
Fan Non-Drive End Bearing
Fan Impeller
Fan Body

Data Sources

Vibration, Temperature
Motor Operating Conditions (for Fan Units)

Intelligently Identifiable Faults

Motor Rolling Bearing Damage
Motor Rolling Bearing Creeping/Looseness
Motor Rolling Bearing Lubrication Deficiency
Motor Rolling Bearing High Temperature Anomaly
Poor Motor Foundation Rigidity / Excessive Vibration
Dust Accumulation on Motor Fan Blades
Motor Fan Blade Wear/Fracture
Fan Impeller Wear
Fan Imbalance
Fan Coupling Misalignment/Wear
Excessive Vibration at Fan Vane Pass Frequency
Poor Fan Foundation Rigidity / Excessive Vibration
Fan Rolling Bearing Damage
Fan Rolling Bearing Creeping/Looseness
Fan Rolling Bearing Lubrication Deficiency
Fan Rolling Bearing High Temperature Anomaly

Feature List

Module	Feature	Features	Description
Dashboard	Real-time Data Dashboard	Equipment Health Status Dashboard	Display equipment name, equipment health status (classified as normal, Level 1 alert, Level 2 alert, Level 3 alert, Level 4 alert), fault description, maintenance recommendations, and data update time.
		Component Health Status Dashboard	Display component name, component health status (classified as normal, Level 1 alert, Level 2 alert, Level 3 alert, Level 4 alert), fault description, maintenance recommendations, and data update time.
		Measurement Point Characteristic Data Dashboard	Display the measurement point name, sensor serial number, characteristic name, characteristic unit, current characteristic data value, and update time for this device.
	Historical Data Dashboard	Equipment Health Status Historical Dashboard	Display the historical health status trends of the current device using colour-coded levels for different health statuses, with zoom in/out functionality available.
		Component Health Status History Dashboard	The historical health status trends of the current device are displayed using colours corresponding to different component health levels, with zoom in/out functionality available.
		Historical Dashboard for Monitoring Point Feature Data	Display the historical trend chart for this device, this measurement point, and this characteristic value. You may perform operations such as zooming in and out.
PHM AI Box Config	PHM AI Box Configuration Wizard	PHM AI Box Configuration Wizard	Three steps for configuring the display PHM AI Box and their descriptions: sensor access configuration, scene model configuration, and data output configuration.
	Sensor Access Config	Supported sensor libraries	Display the sensor types currently supported by the PHM AI Box for connection.
		Add/Edit Sensor	Add new sensors, enter the relevant information required for sensor integration, and support batch import of sensors.
	Scene Model Config	Built-in Scene Model Library	Display the built-in scene model library within the current PHM AI Box, organised by different device types.
		Add/Edit Device	Add new equipment: Enter the relevant details for the equipment to be monitored and assign sensors to the monitoring points for that equipment.
	Standard Collection Configuration	Configure measurement definition	Without employing Scene models, support for configuring sensor measurement definitions is provided.
	Data Output Configuration	Supported data output formats	Display the data output methods currently supported by the PHM AI Box. The default method is output to the Console, i.e. the display within the 'Data Dashboard' section.
		Add/Edit Data Output Method	New data output. For instance, when using the MQTT method, complete the relevant information required for the output method.

Feature List

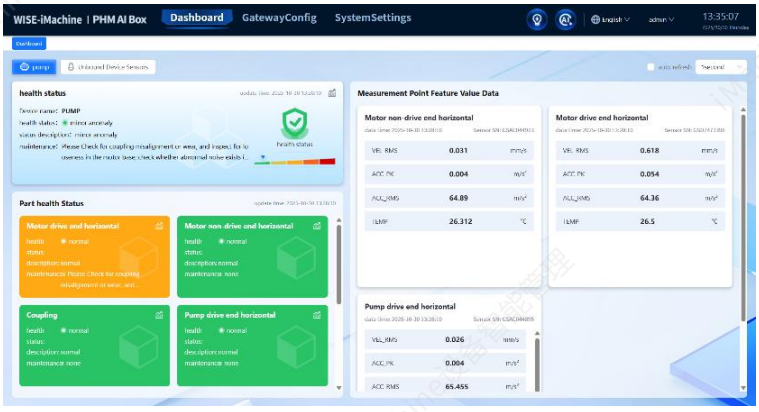
Module	Feature	Features	Description
System Settings	System Information	PHM AI Box Information	Display the current PHM AI Box MAC address, CPU, memory, storage, edge access software version, and Scene model software version.
		Customised information	Support for user-defined information: System logo, system name, system language.
	Storage Settings	Storage Settings	Sets the local storage cycle for feature data, waveform data, and health node data on the PHM AI Box.
	Time Zone/Time	Time Zone /Time	Configure the PHM AI Box time zone and time settings. Supports manual time configuration or NTP automatic synchronisation for time adjustment.
	Log	Log	PHM AI Box log list, supporting filtering by date, by run status (running, warning, error), and by log source.

Local Application

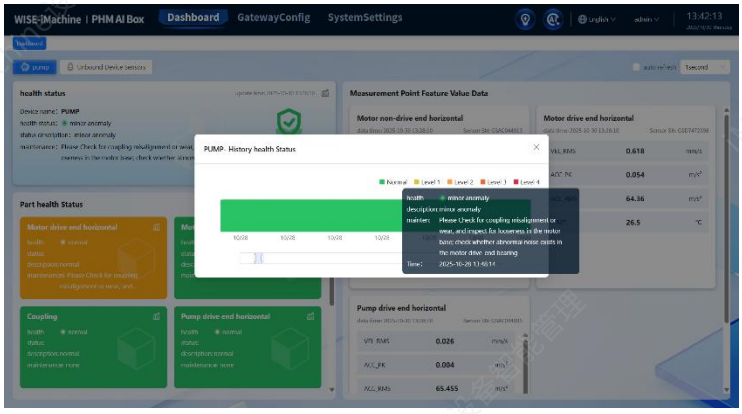
1. Ensure the computer and the PHM AI Box are on the same local area network and can ping each other successfully.
2. Access the IP address via a web browser to view and configure the PHM AI Box.

PHM AI Box

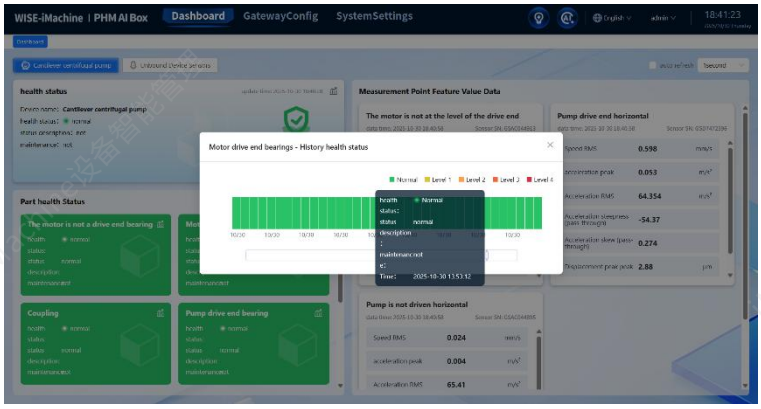
Real-Time Equipment Health Status and Data Values



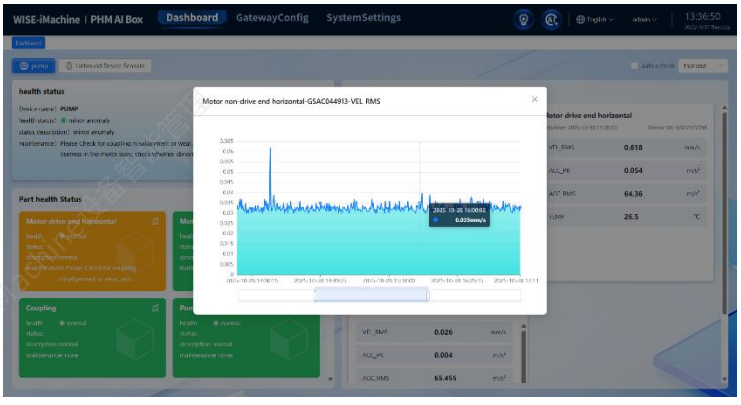
Equipment Health Status and Degradation Analysis



Component Health Status and Degradation Analysis



Data Trend Analysis



PHM AI Box Specification

Name	Type	Model	Specification	Product
PHM AI Box	Software	PHM	Supports up to 16 wired sensors	
	Hardware	UNO-247	• Intel® Celeron® J3455 processor • Robust design for high stability. • 2 x GbE, 2 x USB3.0, 2 x USB2.0, 4 x RS232, 2 x RS485, 1 x HDMI, 1 x VGA • Compact size with fanless design • Rubber stopper design for stand mount and optional kit for DIN-rail mount. • Optional 3G/GPS/GPRS/Wi-Fi communication • Threaded DC Jack design for a more stable power supply. • Optimized mechanical design for easier RAM replacement.	

Sensor Specification

Model	Description	Specifications	Products
WISE-2460	Digital Vibration & Temperature (10KHz@1-axis)	• RS-485 Serial communication through Modbus/RTU protocols • 10KHz@1-axis frequency detection range • Velocity RMS, acceleration RMS, acceleration Peak, displacement, several measurement vibration data • Support max 10 customize detection ranges between 5 ~ 10,000Hz • ISO 10816/20816 compliant • Supports wide temperature range: -20°C to 105°C. • IP68 enclosure design	

UNO-247 Equipment Diagnostic Smart Box

Features

- Intel® Celeron® J3455 processor
- Robust design with high stability
- 2 x GbE, 2 x USB3.0, 2 x USB2.0, 4 x RS232, 2 x RS485, 1 x HDMI, 1 x VGA
- Compact size with fanless design
- Rubber stopper design for stand mount and optional kit for DIN-rail mount.
- Optional 3G/GPS/GPRS/Wi-Fi communication
- Threaded DC Jack design for more steady power supply
- Optimized mechanical design for easier RAM swapping

Specifications

General

Certification	CE, FCC, UL, CCC, BSMI
Dimensions (W x D x H)	200 x 140 x 50 mm (7.8" x 5.. 5" x 1.9")
Form Factor	Regular Size
Enclosure	Aluminum Housing
Mounting	Stand Mount, DIN-Rail (Optional)
Weight (Net)	1.0kg (2.2lbs)
Power Requirement	$12V_{DC}$
Power Consumption	17W (Typical), 31W (Max)
OS Support	Win10 2019 LTSC, AdvLinux

System Hardware

BIOS	AMI UEFI64 Mbit
Watchdog Timer	Programmable 255 levels timer interval, from 1 to 255 sec
TPM	Support by project
Processor	Intel® Apollo Lake Celeron® J3455 1.5GHz
Memory	1 x slot (DDR3L SO-DIMM support up to 8GB)
Graphics Engine	Intel HD Graphics
Ethernet	10/100/1000 Mbps Realtek RTL8111G-CG
LED Indicators	LEDs for Power and HDD
Storage	1 x mSATA (full size) 1 x drive bay for SATA 2.5" HDD (Compatible with 9.5mm height HDD)
Expansion	1 x Full size mPCIe slot (PCIe/ USB Signal) 1 x M.2 (2230, E Key) 1 x Micro SIM card slot

I/O Interfaces

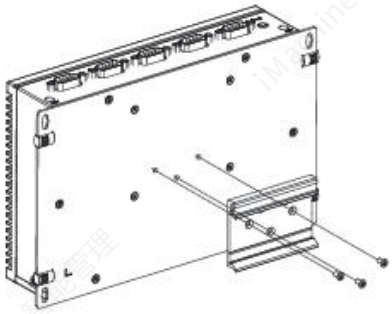
Serial Ports	4 x RS232 2 x RS485 DB9, 50bps ~ 115.2kbps
LAN Ports	2 x RJ45, 10/100/1000 Mbps IEEE 802.3u 1000BASE-T Fast Ethernet
USB Ports	2 x USB 3.0, 2 x USB 2.0
Displays	1 x HDMI 1.4b (3840x2160@30Hz) 1 x VGA (1920x1080@60Hz)
Power Connector	1 x Lockable DC Jack
Audio	1 x Line out (optional)

Environment

Operating Temperature	0~50°C with 0.7m/s air flow -20 ~ 60°C with 0.7m/s air flow (With extended temperature peripherals, refer to optional memory list on page 2)
Storage Temperature	-40 ~ 85°C (-40 ~ 185°F)
Relative Humidity	10 ~ 95% RH @ 40°C, non-condensing
Shock Protection	Operating, IEC 60068-2-27, 50G, half sine, 11ms
Vibration Protection	Operating, IEC 60068-2-64, 3Grms, random, 5 ~ 500Hz, 1hr/axis (mSATA) Operating, IEC 60068-2-64, 0.5Grms, random, 5 ~ 500Hz, 1hr/axis (HDD)

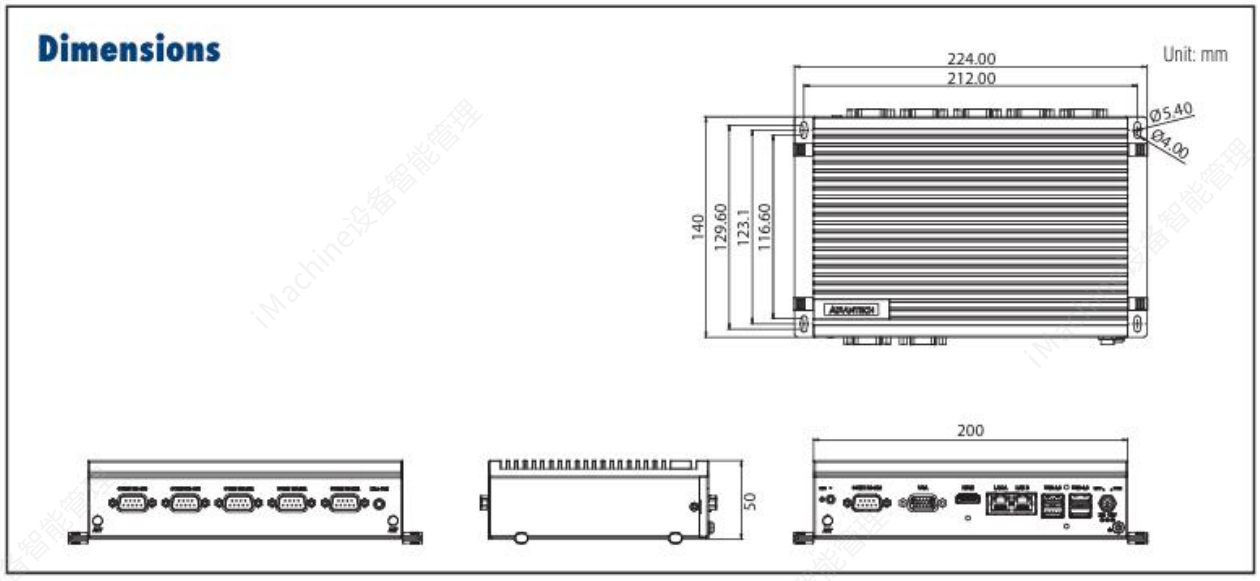
Installation Scenario

DIN-rail Mount Illustration (with optional DIN-rail kit)

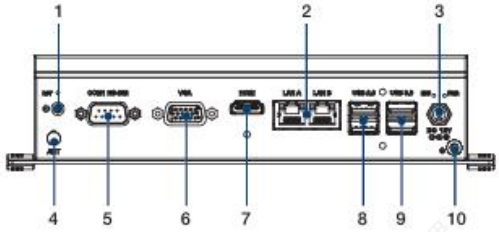


UNO-247 Equipment Diagnostic Smart Box

Dimensions

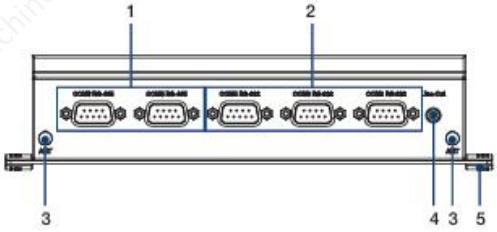


Front I/O View



1. Power Button
2. RJ45 LAN
3. DC Power
4. Reserved Antenna Hole
5. RS-232
6. VGA
7. HDMI
8. USB2.0
9. USB3.0
10. Chassis Grounding

Rear I/O View



1. RS-485
2. RS-232
3. Reserved Antenna Hole
4. Line Out (Optional)
5. Rubber Stopper

Ordering Information

	Ordering Part Number	CPU	Max. Frequency	Memory	Storage	OS	COM	USB	Display
With Audio Version	UNO-247-J1N1AE	Intel Celeron J3455	1.5GHz	NA	NA	NA	4 x RS232, 2 x RS485	2 x USB 3.0, 2 x USB 2.0	1 x HDMI, 1 x VGA
	UNO-247-J121W10	Intel Celeron J3455	1.5GHz	4G	64G SSD	Win 10 2019 LTSC	4 x RS232, 2 x RS485	2 x USB 3.0, 2 x USB 2.0	1 x HDMI, 1 x VGA
Without Audio Version	UNO-247-J1N1AD	Intel Celeron J3455	1.5GHz	NA	NA	NA	4 x RS232, 2 x RS485	2 x USB 3.0, 2 x USB 2.0	1 x HDMI, 1 x VGA

Optional Memory List

System operating Temperature	Memory capacity	Memory P/N
0~50°C	2GB	AQD-SD3L2GN16-SQ1
	4GB	AQD-SD3L4GN16-SG1
	8GB	AQD-SD3L8GN16-SG1
-20~60°C	2GB	SQR-SD3I-2G1K6SNLB
	4GB	SQR-SD3I-4G1K6SNLB
	8GB	SQR-SD3I-8G1K6SNLB

Optional Accessories

- **1700001524** Power Cable 3-pin 1.8M, USA type
- **170203183C** Power Cable 3-pin 1.8M, Europe type
- **170203180A** Power Cable 3-pin, 1.8M, UK type
- **UNO-400-DMKAE** DIN Rail Kit
- **UNO-2000G-VMKAE** UNO & FPM integration VESA Mount kit

Embedded Image

- **20703WX9ES0027** Img WIN10LTSC x64 V6.05 B023 UNO-247 Entry
- **20701U20DS0001** Image AdvLinuxTu_x64 V3.4.3 for UNO series for Ubuntu 20.04

Packing list

Part Number	Description
96PSA-A36W12W7-5	ADP A/D 100-240V 36W 12V WO/PFC

Please note: If some optional modules are offered with the system, additional system certificates may be required in certain regions/countries.
Please contact Advantech for certificate compliance.

WISE-2460

Equipment Diagnostic Smart Box

Features

- RS-485 Serial communication through Modbus/RTU protocols
- 10KHz@1-axis frequency detection range
- Velocity RMS, acceleration RMS, acceleration Peak, displacement, several measurement vibration data
- Support max 10 customize detection ranges between 5 ~ 10,000Hz
- ISO 10816/20816 compliant
- Supports wide temperature -20 ~ 105°C
- IP68 enclosure design

Introduction

WISE-2460 is a robust RS-485 smart vibration sensor integrated with an ARM Cortex-M7 processor, 10KHz@1-axis high detection range accelerometer and temperature sensor. This powerful computing device balances the bandwidth between edge devices and the application service on the user side.

WISE-2460 builds-in several measurements of vibration, such like velocity RMS, acceleration RMS, acceleration Peak, displacement and so on. By using Advantech WISE Studio utility, users can easily config all the setting, like ISO 10816 and 20816 alarm threshold setting, customize the 10 detection ranges between 5 ~ 10,000Hz and others.

Common Specification

General

Power Input	10 ~ 30V_{DC}
LED Indicator	Status, TX, RX
Configuration Interface	RS-485 (Modbus/RTU)
IP Class	IP68
Mounting	Stud mount, mounting pad and adhesives
Dimension (W x H x D)	58.4 x 36.7 x 40 mm
Certification	CE

Environment

Operating Temperature	-20°C ~ 105°C
Operating Humidity	10% ~ 95% RH
Storage Temperature	-25°C ~ 120°C
Storage Humidity	5% ~ 95% RH

1-Axis Accelerometer Sensor

Axis	Z
Frequency Range	5~10000Hz
Amplitude Range	±50g
Statistical Time-Domain	Velocity RMS
Output Data Rate	32768Hz
Accuracy	5-4000Hz (5%); 4001~10000Hz (35%)
Noise	25 μg/√Hz in ±50 g range
Sensitivity Change Due to Temperature	±5%

Ordering Information

WISE-2460-MA	10KHz@1-axis Smart Vibration Sensor

Accessories

25F7000004N000	Magnet base D30XH9mm for WISE-2460 installation
WISE-2410-MTB01	Metal base for WISE-2460 installation
1700028162-01	M12, A-code, 4 pin, Female with 1M cable
BB-RPS-V2-WR2-US	Power Supply, 12V/1A, US plug
BB-RPS-V2-WR2-EU	Power Supply, 12V/1A, EU plug

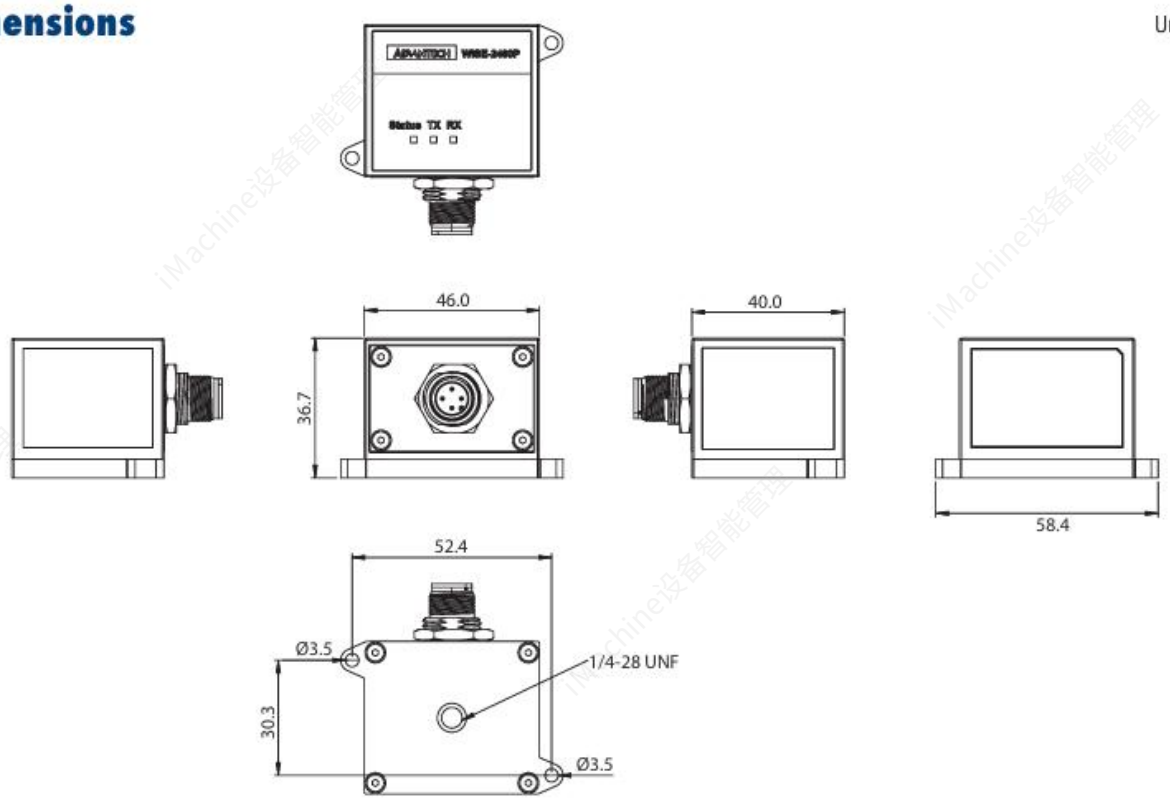
Wireless Module

WISE-4051-B	2.4G WiFi IoT Wireless I/O with 8DI/1RS-485

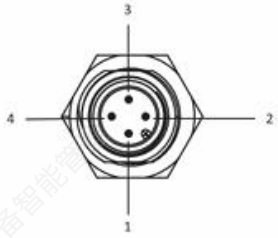
WISE-2460 Equipment Diagnostic Smart Box

Dimensions

Unit: mm



Pin Define



WISE-2460 Pin Number	Pin Name	Pin Description
1	+VS	Input power V+
2	Data+	RS-485 Data+
3	-VS	Input power V-
4	Data-	RS-485 Data-

1700028162-01 Pin Number	Wire Color
1	Brown
2	White
3	Blue
4	Black