Motor Condition Monitoring Device
K6CM-VB

24/7 monitoring of vibration and temperature to detect bearing wear of motors and other drive components.

- Bearing failures can be detected quickly.
- Using manual allows you to set the default values for the alarm threshold.
- An integrated sensor can measure vibration and temperature simultaneously.
- The software tool (set-up and simple monitoring tool) is also provided.
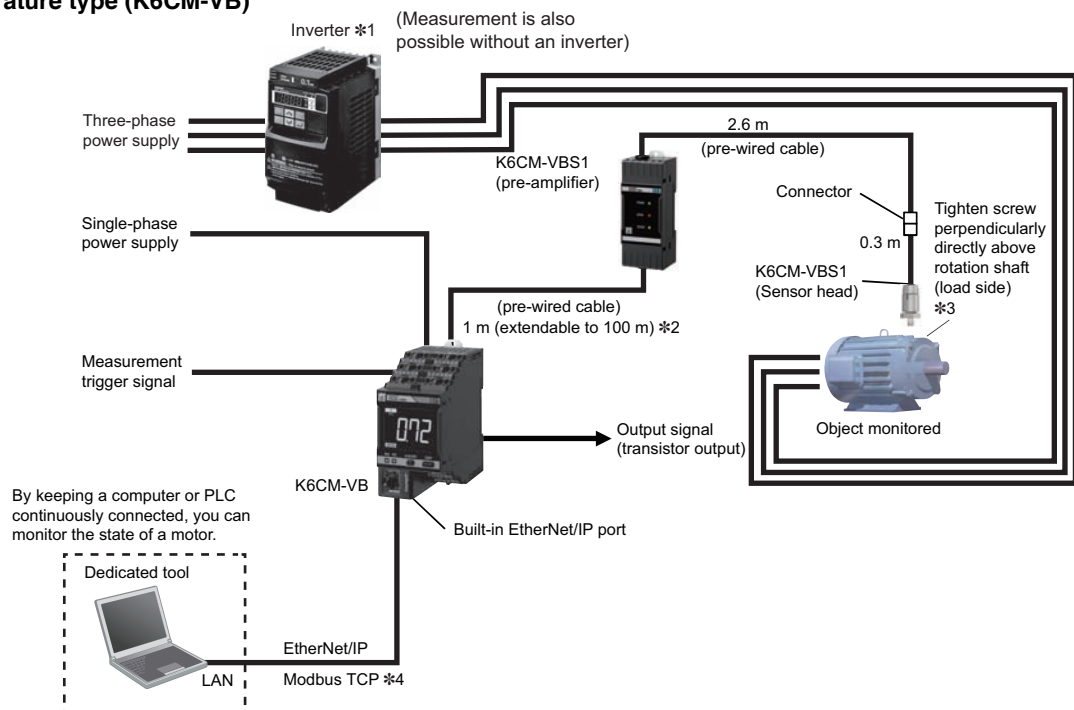- Supports Modbus TCP in addition to EtherNet/IP.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

System Configuration

Basic Configuration

Vibration & temperature type (K6CM-VB)

Note: Even without a computer, the alarm bar of the main unit notifies you of changes of motor state.

*1. When you use an inverter to drive the motor, you may not be able to check the degradation tendency of the motor. In the conditions below, acceleration fluctuations tend to occur more frequently.
  • The frequency is stable at an inverter drive frequency of 50 Hz or higher.
  • The inverter carrier frequency is stable at 12.5 KHz or higher.
  Test in the actual installation environment before use.
*2. For extension cable, use shielded twisted pair cable with wire gauges of AWG24 to 16.
*3. When using adhesive attachment, sensor head can be attached with adhesive attachment.
*4. Can be used only with EIP CPU version 1.2 or higher.

K6CM-VB

Ordering Information

List of Models

Monitoring type	Power supply voltage	Model
Vibration & temperature type	100 to 240 VAC	**K6CM-VBMA-EIP**
	24 VAC/VDC	**K6CM-VBMD-EIP**

Input part
Vibration & temperature sensor (Order separately)

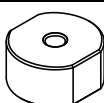| Appearance (pre-amplifier)	Appearance (sensor head)	Attachment part	Applicable Relay	Model
		M6 screw	K6CM-VB	**K6CM-VBS1**

Note: One sensor is combined with one main unit.
The vibration and temperature sensor consists of a sensor head and a pre-amplifier.
A magnet is provided for the easy attachment of the vibration and temperature sensor.
Use to determine the position to be measured. Note that measurement accuracy is not guaranteed in the case of magnet mounting.

Vibration and temperature sensor Adhesive attachment (option)

Appearance	Model
	K6CM-VBSAT1

EtherNet/IP communications cable recommended parts

Use a Category 5 or higher STP cable (shielded twisted pair cable).

Cable with Connectors

Item		Recommended manufacturer	Cable length (m)	Model
Wire Gauge and Number of Pairs: AWG26, 4-pair Cable Cable Sheath material: LSZH *2	Cable with Connectors on Both Ends (RJ45/RJ45) Standard RJ45 plug type *1 Cable color: Yellow *3	OMRON	0.3	XS6W-6LSZH8SS30CM-Y
			0.5	XS6W-6LSZH8SS50CM-Y
			1	XS6W-6LSZH8SS100CM-Y
			2	XS6W-6LSZH8SS200CM-Y
			3	XS6W-6LSZH8SS300CM-Y
			5	XS6W-6LSZH8SS500CM-Y
Wire Gauge and Number of Pairs: AWG22, 2-pair Cable	Cable with Connectors on Both Ends (RJ45/RJ45) Rugged RJ45 plug type *1 Cable color: Light blue	OMRON	0.3	XS5W-T421-AMD-K
			0.5	XS5W-T421-BMD-K
			1	XS5W-T421-CMD-K
			2	XS5W-T421-DMD-K
			5	XS5W-T421-GMD-K
			10	XS5W-T421-JMD-K

*1. Cables with standard RJ45 plugs are available in the following lengths: 0.2 m, 0.3 m, 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 5 m, 7.5 m, 10 m, 15 m, 20 m.
Cables with rugged RJ45 plugs are available in the following lengths: 0.3 m, 0.5 m, 1 m, 2 m, 3 m, 5 m, 10 m, 15 m.
For details, refer to the *Industrial Ethernet Connectors Catalog* (Cat. No. G019).
*2. The lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.
*3. Cable colors are available in yellow, green, and blue. The last character of the model changes to "-G" or "-B".

Cable/Connector

Part name	Manufacturer	Model
Cable	Hitachi Metals, Ltd.	NETSTAR-C5E SA 0.5 × 4P *
RJ45 connector	Panduit Corporation	MPS588-C *

* It is recommended to use the cable and connector in combination described above.

Industrial switching hub (recommended parts)

Product name	Appearance	Specifications			Model
		Function	No. of ports	Failure detection function	
Industrial switching hub		Priority control (QoS): EtherNet/IP control data priority Failure detection: Broadcast storm / LSI failure detection 10/100BASE-TX, Auto-Negotiation	3	No	W4S1-03B
			5	No	W4S1-05B
			5	Yes	W4S1-05C

Ratings and Specifications

List of Models
Ratings

Power Supply	Power supply voltage		K6CM-☐☐MA: 100 to 240 VAC, 50/60 Hz K6CM-☐☐MD: 24 VAC, 50/60 Hz, 24 VDC
	Allowable operating voltage range		85% to 110% of power supply voltage
	Power supply frequency range		45 to 65 Hz
	Power consumption		24 VAC/24 VDC: 3.8 VA/2.1 W max. 100 to 240 VAC: 7.1 VA max.
Input	Vibrations (vibration sensor)	Detection frequency	10 Hz to 10 kHz
		Max. operating acceleration	10 G
Applicable motor type			Three-phase induction motor (Rated voltage 600 V or less) ✱
Outputs	Output form		Transistor output
	Output capacity		3-point
	Output rating		Rated voltage: 24 VDC Max. current: 50 mA, DC
Ambient operating temperature			-10 to +55°C (with no condensation or icing)
Storage temperature			-20 to +65°C (with no condensation or icing)
Ambient operating humidity			25% to 85% RH (with no condensation)
Storage humidity			25% to 85% RH (with no condensation)
Case color			Black
Case material			Polycarbonate UL94-V0
Altitude			2,000 m max.
Applicable wires			Stranded wires, solid wires, or ferrules
Applicable wire size			0.25 to 1.5 mm^2 (AWG24 to 16)
Wire insertion force			8 N max. (AWG20)
Screwdriver insertion force			15 N max.
Wire stripping length			8 mm
Recommended flat-blade screwdriver			XW4Z-00B (Omron)
Current capacity			10 A (per pole)
Number of insertions			50 times
Weight			Approx. 200 g
Mounting			Mounts to DIN Track screw mounting
Dimensions			45 (W) × 90 (H) × 90 (D) mm
Setting method			Communications settings from a dedicated tool via EtherNet/IP
Other functions			Display value selection, self-diagnosis error output, setting value initialization, operation integration
Accessories			Operation manual, CD-ROM (Motor condition monitoring Tool)

✱ Motors other than three-phase induction motors (synchronous motors, single phase motors, servo motors, and stepping motors) are excluded.

Characteristics

Measurement range		Acceleration: 0.05 to 9.99 G, Velocity: 0.90 to 45.00 mm/s, Motor temperature: 0 to 80°C, Differential temperature: 0 to 80°C
Measurement absolute accuracy	**Acceleration**	±3 dB±2 digit (at 25°C)
	Temperature	Motor temperature: ±3°C±2 digit (±6°F±2 digit) ∗1 Temperature Gap: ±6°C±2 digit (±12°F±2 digit) ∗1
Sampling cycle		Acceleration: 50 ms, Velocity: 0.5 s, Temperature: 0.5 s
Moving average frequency		1, 2, 4, 8, 16, 32 times
External trigger	**External contact input specification**	Short-circuit: Residual voltage 1.5 V max. Open: Leakage current 0.1 mA max.
	Current during short-circuiting	Approx. 7 mA
Transistor output		Contact configuration: NPN open collector Rated voltage: 24 VDC (maximum voltage: 26.4 VDC) Max. current: 50 mA, DC
Alarm	**Parameters that can be output**	Degradation level, current
	Expression method	Transistor output, alarm bar
	Setting value	Acceleration: 0.00 to 99.99 G, Velocity: 0.00 to 99.99 mm/s, Motor temperature: 0 to 9999 deg., Differential temperature: 0 to 9999 deg.
	Hysteresis	10% width of setting value
	Reset method	Manual reset/automatic reset (switchable) ∗ Manual return method: Press the ALMRST button
LCD display		7-Segment digital display and single-shot display Font height 14 mm
Applicable standards	**Conforming standards**	EN61010-2-030 Installation environment: Pollution degree 2, overvoltage category II, measurement category II
	EMC	EN61326-1(EMI: Class A EMS: Industrial Location) Acceleration ± 0.1G, Velocity ±2.25mm/s, Temperature ± 6°C
	Safety standards	UL61010-2-030 (listing) Korean Radio Waves Act (Act 10564) RCM EAC
Insulation resistance		20 MΩ min. Between all external terminals and the case Between all power supply terminals and all other terminals Between all sensor connection terminals and trigger input terminal + output terminal + all EtherNet/IP ports
Dielectric strength		2,000 VAC for 1 minute Between all external terminals and the case Between all power supply terminals and all other terminals Between all sensor connection terminals and trigger input terminal + output terminal + all EtherNet/IP ports
Vibration resistance		Vibration frequency 10 to 55 Hz, slice amplitude 0.35 mm in each of X, Y, Z directions 5 minute × 10
Shock resistance		100 m/s², 3 times each in 6 directions along 3 axes
Degree of protection		IP20
LED display	**Alarm bar**	Red/Yellow/Green
	MS, NS ∗2	Red/Green
Ethernet communications ∗3	**Number of ports**	1
	Physical layer	Ethernet: Connector RJ45
	Type	100BASE-TX
	Transmission distance (Maximum cable length)	100 m (Between hub and node)
	Topology	Star type
	Protocol	EtherNet/IP Modbus TCP ∗4

∗1. Except when an adhesive attachment is used.
∗2. MS: Product status display, NS: Network status display.
∗3. A tag data link timeout may occur with products manufactured on or before April 30, 2019, over a network system including nodes set for multicast communications. Use the multicast blocking function of the switching hub to prevent multicast packets from reaching the K6CM.
∗4. Can be used only with EIP CPU version 1.2 or higher.

Input part
Vibration & temperature sensor
Ratings

Item	Model	K6CM-VBS1
Power supply voltage		Supplied from K6CM-VB
Sensor head	Max. acceleration	10 G
Ambient operating temperature		Pre-amplifier: -10 to +55°C (with no condensation or icing) Sensor head: -10 to +80°C (with no condensation or icing)
Storage temperature		Pre-amplifier: -20 to +65°C (with no condensation or icing) Sensor head: -20 to +90°C (with no condensation or icing)
Ambient operating humidity		25% to 85% RH (with no condensation)
Storage humidity		25% to 85% RH (with no condensation)
Altitude		2,000 m max.
Case color		Pre-amplifier: Black Sensor head: Silver
Case material		Pre-amplifier: Polycarbonate UL94-V0 Sensor head: Aluminum alloy (ADC12) / Zinc die casting (ZDC2) (the threaded part is Steel (S45C))
Weight		Pre-amplifier: Approx. 210 g (including cables) Sensor head: Approx. 40 g (including cables)
Mounting		Pre-amplifier: DIN rail mounting, screw mounting Sensor head: Screw mounting Between pre-amplifier and sensor head: Connector connection (smart click connector)
Wire length		Between pre-amplifier and sensor head: 2.6 m+0.3 m (cannot be extended) Between pre-amplifier and main unit: 1 m Can be extended up to a maximum length of 100 m ✽

✽ When extending the cable on the pre-amplifier side, use shielded twisted pair cable with wire gauges of AWG24 to 16.

Characteristics

Item	Model	K6CM-VBS1
Measurement range		Specified in main unit "Characteristics"
Applicable standards	Conforming standards	EN 61010-2-030 Installation environment: Pollution degree 2, overvoltage category II, measurement category II
	EMC	EN 61326-1 (EMI: Class A EMS: Industrial Location)
	Safety standards	UL 61010-2-030 (listing) RCM EAC
Insulation resistance		20 MΩ min.
Dielectric strength		500 VAC for one minute
Vibration resistance	Pre-amplifier	Vibration frequency 10 to 55 Hz, slice amplitude 0.35 mm in each of X, Y, Z directions 5 minute × 10
	Sensor head	Vibration frequency 10 to 55 Hz, slice amplitude 0.35 mm in each of X, Y, Z directions 5 minute × 10
Shock resistance	Pre-amplifier	100 m/s^2, 3 times each in 6 directions along 3 axes
	Sensor head	100 m/s^2, 3 times each in 6 directions along 3 axes
Degree of protection	Pre-amplifier	IP20 (excluding the sensor-side cable)
	Sensor head	Conforming to IP67G (JIS C 0920 : 2003, Appendix 1)
LED display		Pre-amplifier PWR: Green, ERR: Red, COM: Orange

Motor condition monitoring Tool (Software included with main unit)
Operating Environment

Element	Specification
Supported OS	Windows 7, Windows 8.1, Windows 10 (32 bit/64 bit) (Japanese/English)
.NET	.NET Framework 4 and .NET Framework 3.5
CPU	1 GHz or more, 32 bit or 64 bit processor
Memory	1 GB or more, or 2 GB or more (for 64 bit)
HDD	Available space of 16 GB or more, or 20 GB or more (for 64 bit)
Others	Since this software is provided on a CD-ROM, a CD-ROM reading device must be available. If data is to be collected, a LAN I/F must be available.

Functions/Specifications (For more details, refer to the catalog of each product.)

Item		Specification
Project	Number of files that can be created	No limit
Log file		CSV data format
Monitoring cycle		5 second to 366 days
Number that can be registered in one project	Number of motors (device groups)	10
	Number of devices per motor (device group)	3 *1
Graphic display	Type of graph	Line graph
	Display period *2	1 hour, 1 day, 1 month, 1 year

*1. One vibration and temperature type, one insulation resistance type, and one current comprehensive diagnosis type can be set for one motor.
*2. In the software tool version 1.2.0.0 and earlier, the graph display period can be set by selecting the tabs (1 hour, 1 day, 3 months, 6 months, 1 year, 2 years, 5 years, 10 years, 20 years).
In the software tool version 1.2.0.0 and later, you can move the graph in the time axis direction using the graph time axis movement.
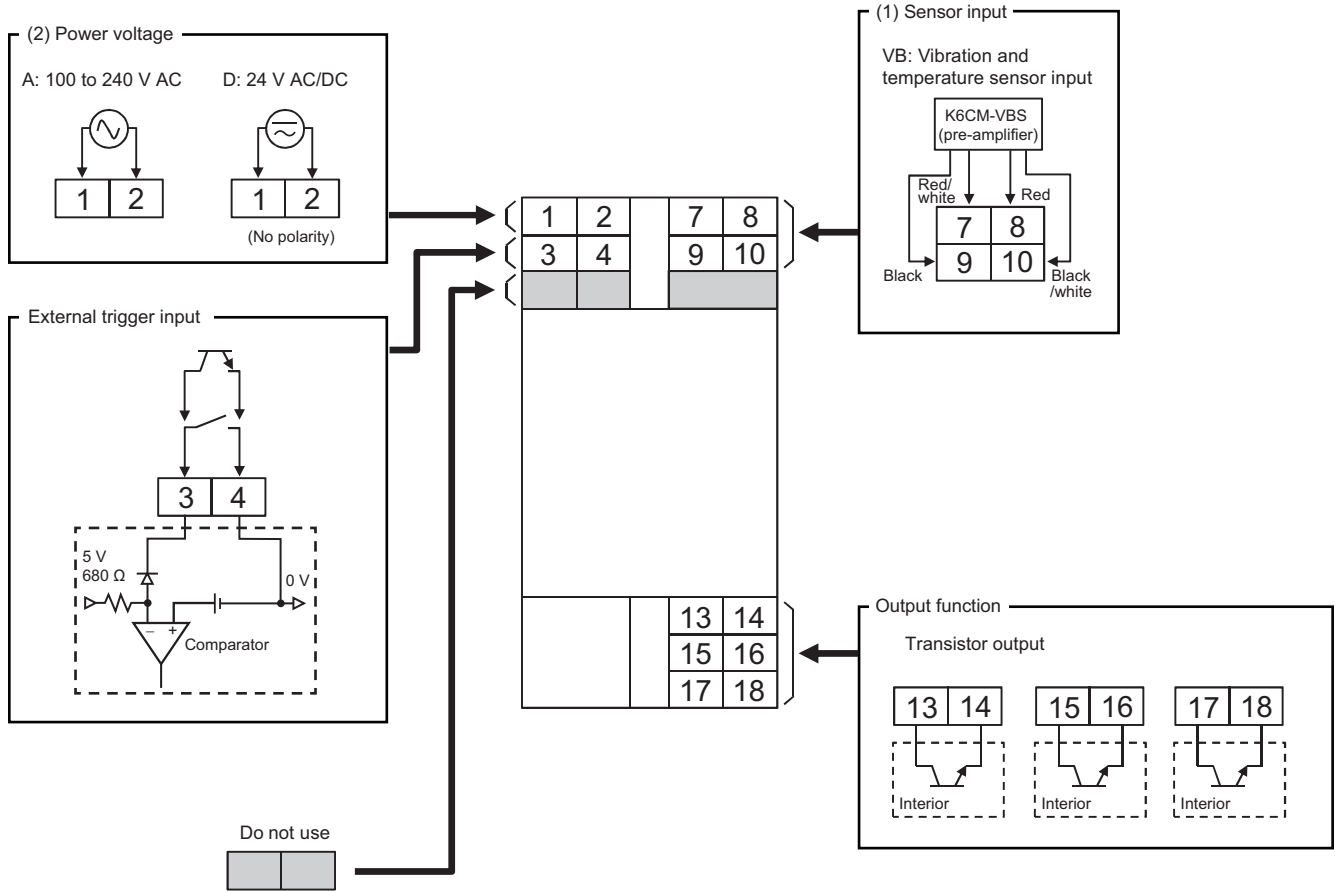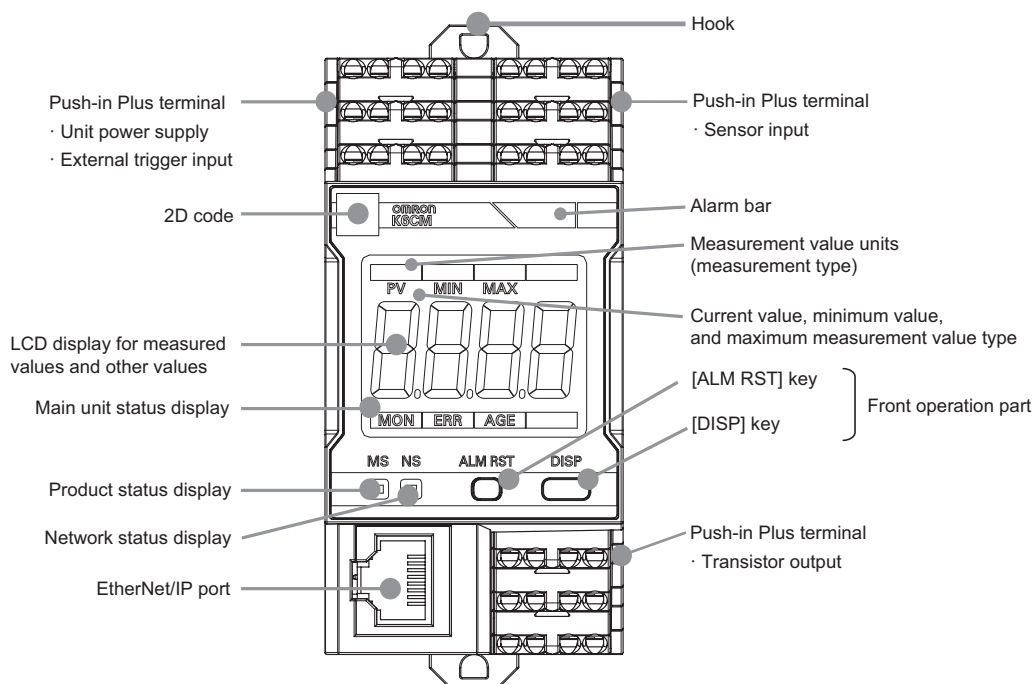
K6CM-VB

Connection Diagram

Terminal Diagram (Main Unit)

K6CM- <u>VB</u> M <u>A</u> -EIP
     (1)   **(2)**

(2) Power voltage

A: 100 to 240 V AC   D: 24 V AC/DC

| 1 | 2 |

| 1 | 2 |

(No polarity)

External trigger input

| 3 | 4 |

5 V
680 Ω   0 V

Comparator

Do not use

| 1 | 2 | | 7 | 8 |
| 3 | 4 | | 9 | 10 |

(1) Sensor input

VB: Vibration and temperature sensor input

K6CM-VBS (pre-amplifier)

Red/white   Red

| 7 | 8 |
| 9 | 10 |

Black   Black/white

13	14
15	16
17	18

Output function

Transistor output

| 13 | 14 | | 15 | 16 | | 17 | 18 |

Interior   Interior   Interior

OMRON

Nomenclature

Name		Meaning

Alarm bar		A bar on which the color of the emitted light changes according to the alarm status.	It is indicated in the following colors during measurement/monitoring.
			  Green: Alarm status (normal)
			  Yellow: Alarm status (Warning)
			  Red: Alarm status (Critical)
			The alarm bar is lit out in each of the following states:
			  When the power is OFF, when measurement is not being performed, and when a self-diagnosis error has occurred, etc.

Measurement type		Indicates the type of the measured value being displayed. The type can be switched each time the [DISP] key is pressed on the front operation part.	"G": Acceleration, "mm/s": Velocity, "T"; Motor temperature, "⊿T": Temperature Gap (difference between motor temperature and room temperature)
Front operation part	[ALM RST] key	Releases the latched alarm state.	The main use of this key is to release the latched and fixed alarm state after returning from the fault state to the normal state.
	[DISP] key	Switches the type of the measured value being displayed. You can switch between display-fixed mode and display auto switching mode by long-pressing for 3 seconds. *1	
	Others	If two keys are simultaneously pressed and held for 5 seconds or longer, all settings of the main unit are reset to factory defaults.	
Main unit status display		The status of the main unit is indicated by lighting of the LCD characters.	"MON": Measurement / monitoring is being performed "ERR": A self-diagnosis error has occurred "AGE": Running Time notification (it is recommended to replace the product main unit)

Transistor output	13-14	Output of the alarm status (Warning). Can be set to Normally Closed or Normally Open.	When measurement/monitoring is in progress,
			and the output method is Normally Closed
			  ON = Comprehensive alarm: Normal / OFF = Comprehensive alarm: Warning or Critical
			and the output method is Normally Open
			  OFF = Comprehensive alarm: Normal / ON = Comprehensive alarm: Warning or Critical

	15-16	Output of the alarm status (Critical). Can be set to Normally Closed or Normally Open.	When measurement/monitoring is in progress,
			and the output method is Normally Closed
			  ON = Comprehensive alarm: Warning or Normal / OFF = Comprehensive alarm: Critical
			and the output method is Normally Open
			  OFF = Comprehensive alarm: Warning or Normal / ON = Comprehensive alarm: Critical

	17-18	Self-diagnosis error output.	OFF: A self-diagnosis error has occurred ON: Other than the above
External trigger input	3-4	Input of the external contact signal to control measurement timing.	You can use "Trigger Type" to specify whether measurement/monitoring continue for a set time after starting by the rise or fall of the external contact, or are executed while the external contact is ON. You can also specify settings to enable selection of a trigger mode other than external trigger. *2

Note: Warning: Indicates that it is time for maintenance.
      Critical: Indicates that it is time for replacement.
*1. Can be used only with EIP CPU version 1.2 or higher.
*2. Trigger modes other than external trigger
    Always: Trigger is not used. Measurement/monitoring are performed continuously after the power of the K6CM unit is turned on.
    Internal trigger: Measurement/monitoring starts based on the relation between the measured value and set value (trigger level).
                 You can use "Trigger Type" to specify whether measurement/monitoring start and continue for a set time when the measured value is over, or under, the set value (trigger level), or are executed while the measured value exceeds the set value (trigger level).
    Also, the external trigger function can be used only when the insulation resistance type is EIP CPU version 1.1 or higher.
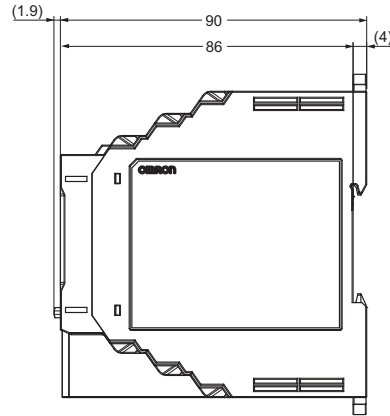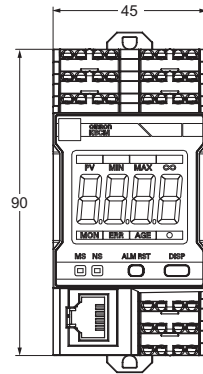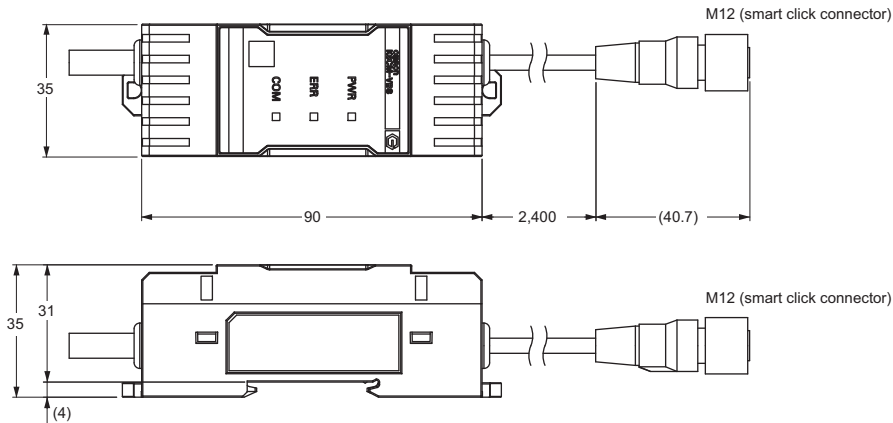
K6CM-VB

Dimensions

List of Models

K6CM-VB

Vibration & temperature sensor

K6CM-VBS1

Pre-amplifier

Sensor head

Mounting hole dimensions

M6 screw

Surface finish
20 mm dia. or more

9 mm or more

A-A´ cross section
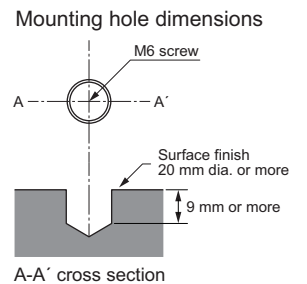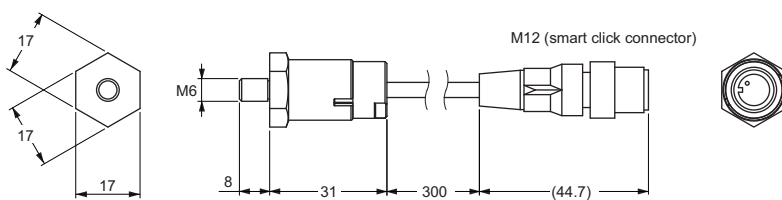
How to Attach the Sensor Head

Tap the outer casing (✶) of the motor perpendicularly for an M6 screw, and screw the vibration sensor head into the tap.
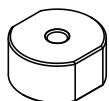
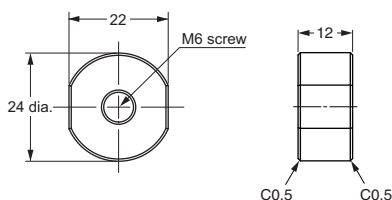✶ The position above the bearing on the load side is recommended.

K6CM-VBSAT1

Adhesive attachment

Use the adhesive attachment if the motor cannot be tapped.

Sensor head

Material: Stainless steel

How to Attach the Sensor Head

Prepare a flat surface with a radius of at least 25 mm on the motor outer casing (✶).

Attach the attachment to the flat surface you prepared with an adhesive.

Screw the vibration sensor head into the attachment.

✶ The position above the bearing on the load side is recommended.

Vibration & Temperature Type: Technical Data

Pairing of sensor head and pre-amplifier

The sensor head and the pre-amplifier are calibrated and inspected as a set at the factory shipment. Be sure to use them with the combination shipped. The sensor head cannot be replaced.

To verify the combination, check the serial numbers on the label of the sensor head and the label of the pre-amplifier. The same serial number means the correct combination.

If you change the combination of factory shipping conditions and then use them, the value of acceleration and the value of velocity will be inconsistent, so measurement cannot be correctly monitored.
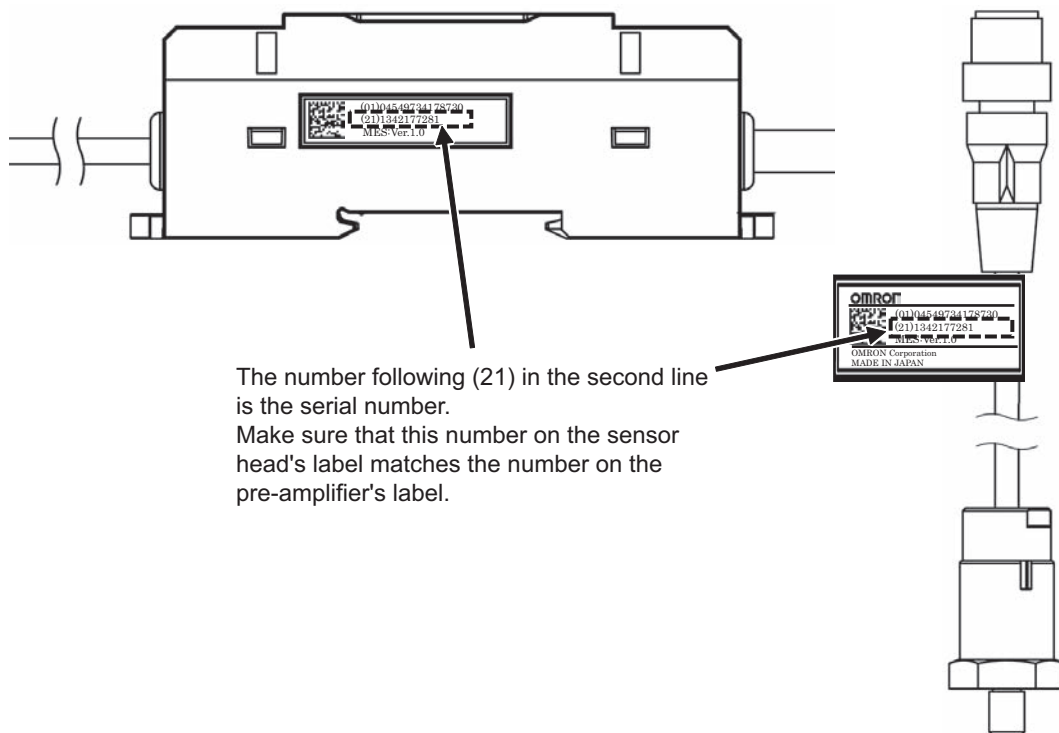
The number following (21) in the second line is the serial number.
Make sure that this number on the sensor head's label matches the number on the pre-amplifier's label.

K6CM-VB

List of Parameters

Setting values

Parameter	Content
Acceleration alarm threshold value (Critical and Warning)	0.00 to 99.99 G
Velocity alarm threshold value (Critical and Warning)	0.00 to 99.99 mm/s
Motor temperature alarm threshold value (Critical and Warning)	0 to 9999 deg.
Temperature gap alarm threshold value (Critical and Warning)	0 to 9999 deg.
Main unit IP address	Sets the IP address of the main unit. The default value is "192.168.250.10" (common to all models)
Software reset	Restarts the K6CM. Used to enable the settings after changing the setting values. 0 → 1: Execute
MAX/MIN reset	Initializes the MAX/MIN value. 0 → 1: Execute
Display value type	Sets which measurement value to display in the 7-segment display at the front of the main unit. 0: PV (Present Value), 1: MIN, 2: MAX
Trigger mode *1	Sets the trigger mode. 0: At all times, 1: External trigger, 2: Internal trigger
Trigger type	Sets Rise, Fall, or Level in the case of an internal trigger or external trigger. 0: Rise, 1: Fall, 2: Level
Trigger level	Sets the trigger level when "Internal trigger" and the trigger type "Level" have been selected.
Monitoring time	Sets the time for continuing measurement or monitoring in the case of an internal trigger or external trigger, when the trigger type is either Rise or Fall. Setting value: 0.1 to 600.0 s
Alarm latch	Sets whether to enable or disable the alarm latch function. 0: Disable (no latch), 1: Enable (latched)
Use Running Time	Sets whether or not to use the main unit residual amount function. 0: OFF (Do not use), 1: ON (Use)
Moving average times	Performs the averaging process for the past n-times of data including the sampling data of that time, each time sampling of the measurement value is performed. 0: OFF, 1: 2 times, 2: 4 times, 3: 8 times, 4: 16 times, 5: 32 times
Temperature unit	Sets the temperature unit. 0: °C, 1: °F
Transistor output method *2	0: Normally Closed/1: Normally Open
Monitoring delay time *3	Set the delay time from the trigger input to the start of measurement. Set value: 0.0 to 600.0 seconds.

*1. The external trigger function can be used only when the insulation resistance type is EIP CPU version 1.1 or higher.
*2. Can be used only with EIP CPU version 1.1 or higher.
*3. Can be used only with EIP CPU version 1.2 or higher.

OMRON

Measured values / Status data

Parameter	Content
Acceleration (Present value, MIN, MAX)	0.00 to 9.99 G
Velocity (Present value, MIN, MAX)	0.00 to 45.00 mm/s
Motor temperature	0 to 80°C (32 to 176°F)
Temperature gap (Difference between motor temperature and room temperature)	0 to 80°C (32 to 176°F)
Acceleration status	Bit 00: Present value measurement status Bit 01: Present value input error Bit 04: MAX value measurement status Bit 05: MAX value input error Bit 08: MIN value measurement status Bit 09: MIN value input error Bit 12: Individual alarm threshold value (Warning) setting Bit 13: Individual alarm threshold value (Critical) setting
Velocity status	
Motor temperature status	
Temperature gap status	
Measurement CPU version	Measurement unit version
Main CPU version	Main unit version
EIP CPU version	EtherNet/IP unit version
Measurement status	1: Measurement/monitoring in progress, 0: Measurement/monitoring stopped
Running time status	The product of the operation time and internal temperature is integrated, and ON is set if it reaches the design life. 1: Reached (Operation integration has reached 100%) 0: Not reached (Operation integration has not reached 100%)
Trigger input	Status of external trigger input. 1: ON, 0: OFF
TR1 (Transistor 1 output status)	Status of transistor 1. 1: ON, 0: OFF
TR2 (Transistor 2 output status)	Status of transistor 2. 1: ON, 0: OFF
TR3 (Transistor 3 output status)	Status of transistor 3. 1: ON, 0: OFF
Running time	Coefficient showing the extent of life of the main unit based on the product of the operation time and internal temperature. Incremented in units of 10% starting from 0%. 0000 hex to 0064 hex (0 to 100)
Trigger frequency	Total integrated number of external triggers and internal triggers. Incremented by 1 after every 100 times. 0 to 65535
Threshold value setting of integrated alarm (Warning)	State when the measurement value is "Warning".
Threshold value setting of integrated alarm (Critical)	State when the measurement value is "Critical".
Acceleration alarm (Critical and Warning)	ON, OFF
Velocity alarm (Critical and Warning)	ON, OFF
Motor temperature alarm (Critical and Warning)	ON, OFF
Temperature gap alarm (Critical and Warning)	ON, OFF

MEMO

OMRON