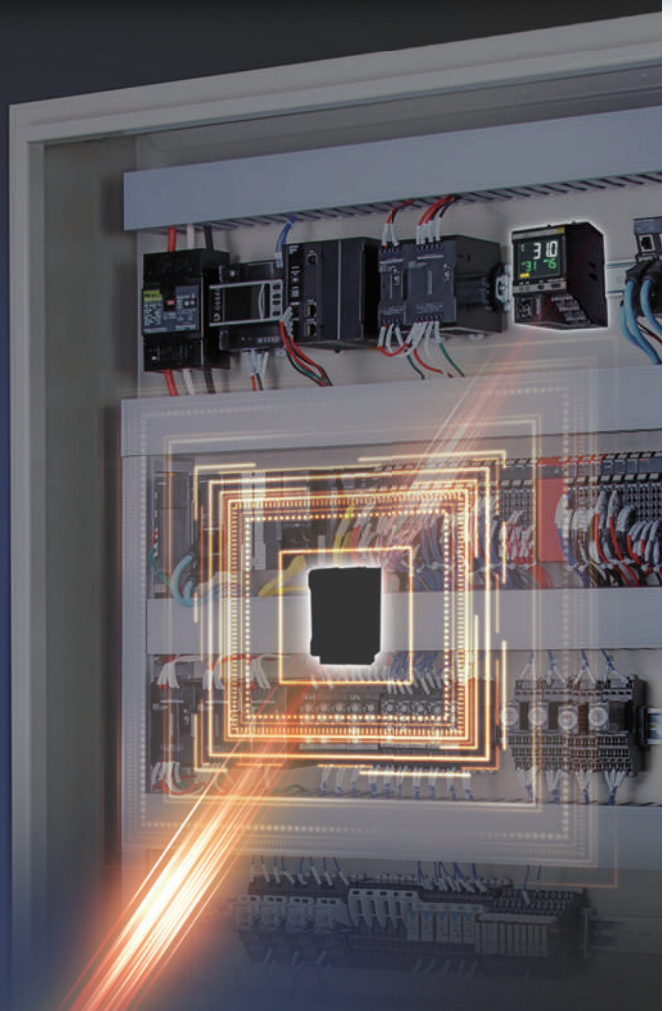# Panel condition monitoring device
K6PM

OMRON

Into the new era of
maintenance by IoT

Remote monitoring with realtime analysis of the panel status
IoT change the style of maintenance

Contributing to "Zero-downtime" of facilities and equipment.

A shortage of human maintenance resources can lead to a device failure in a panel,
which will increase a risk of serious accidents or facilities stop.
OMRON proposes you a new way of maintenance where every panel in your plant is under surveillance without
human resource through the constant temperature monitoring powered by IoT.

Reduce both of maintenance labor and risk of abnormal stop by the maintenance utilizing constant remote monitoring

Skillless

Our unique algorithm will allow inexperienced personnel to recognize an abnormality and to maintain without help from skilled engineers.

Labor-saving and maintenance-hours reduction

Constant and remote monitoring of the temperature status is available, on-site maintenance is needed only when an abnormal occurs.

Predictive maintenance

A prediction of temperature deviation over time provides early detection of an abnormal tendency and scheduled maintenance.

Note. This product is designed for monitoring of abnormal modes resulting , not for detecting a fire without any fault.

Automatic capture of temperature deviation in a panel labor-saving and significant risk mitigation of abnormal

Issues on site Parts to check are increasing as devices and wires in a panel increase for high-functioned facilities and equipment. On the other hand, maintenance frequency is decreasing due to shortage of the maintenance engineers, resulting in a higher risk of accident.
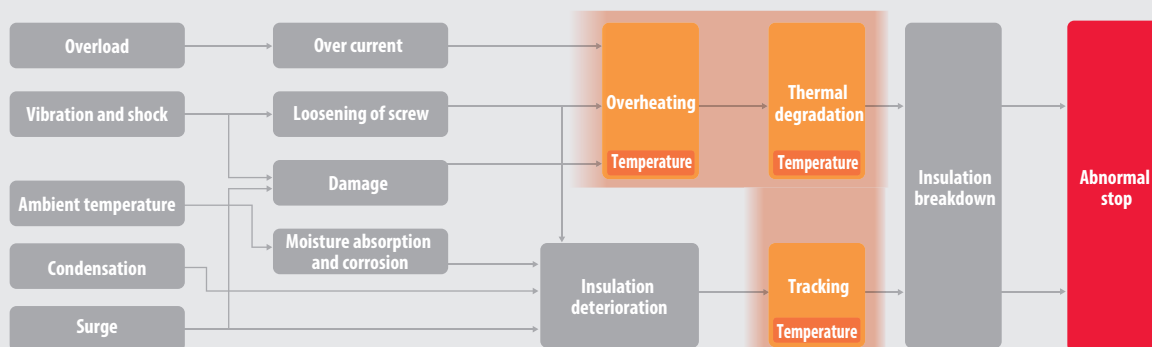
Devices and wires in panel

Human-power of the maintenance engineers

1990   2050
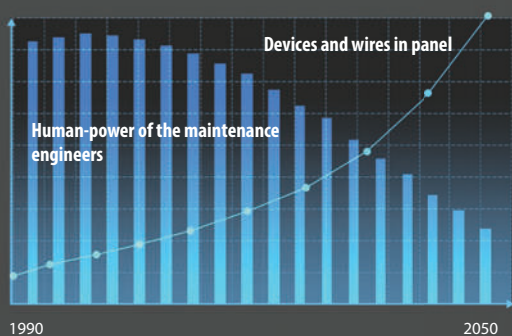
* The graph is for illustrative purposes only.

Fire/Smoke occurred

Importance of the temperature monitoring
Device failures have various causes; most of which leads to insulator breakage due to overheating, resulting in an abnormal stop.

Overload → Over current

Vibration and shock → Loosening of screw

Damage

Ambient temperature

Moisture absorption and corrosion

Condensation

Surge

Overheating Temperature → **Thermal degradation** Temperature

Insulation deterioration

Tracking Temperature

Insulation breakdown

Abnormal stop

Most of the abnormal modes show symptoms in the temperature deviation.

Current way of maintenance
- A few skilled maintenance engineers manually check relying on their experiences.
- Their checking scope covers only a part of the panel, making it impossible to constantly monitor the status of whole panel.

Measurement method of the temperature in a panel

No constant measurement method is available for temperatures in a whole panel.

Collecting and analyzing method of temperature data

Know-how of skilled engineers is necessary, only partial data can be collected.

	A part of the panel	Whole panel
Constant monitoring	One-point monitoring with a thermocouple	✕
Periodic monitoring	Terminal cap for exothermic monitoring	Thermo viewer

for maintenance labors, to achieve both stop

New way of maintenance

- Covering the skilled maintenance engineers, the thermal condition monitoring device constantly monitors temperatures of the whole panel.
- Automated collection and analysis of the temperature data enables to identify a device failure automatically.

Measurement method of the temperature in a panel

Constant measurement is possible for temperatures in the whole panel.

Collecting and analyzing method of temperature data

Identifying an abnormal part by automatic analysis, without help from skilled engineers.

Thermal condition monitoring device K6PM-TH
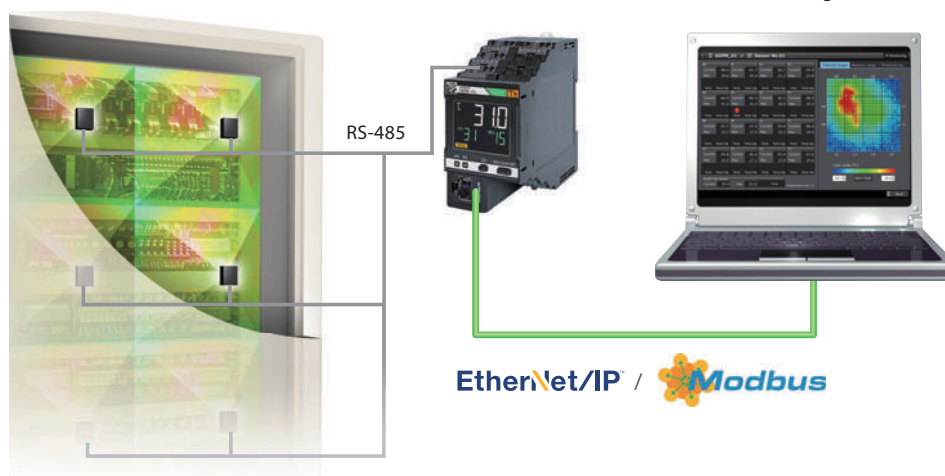
Infrared thermal sensor
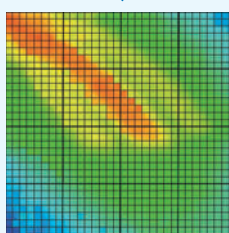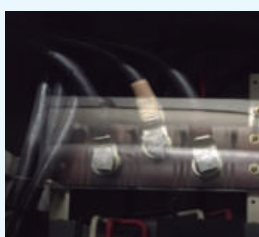(Special thermal imaging sensor)
K6PM-THS

Main Unit
K6PM-THMD

Software tool
Thermal Condition
Monitoring Tool

RS-485

EtherNet/IP / Modbus
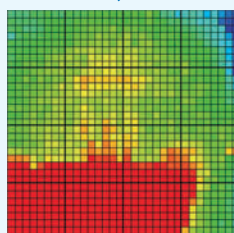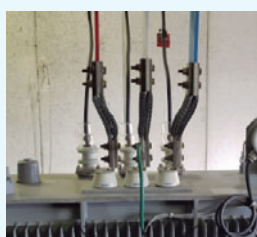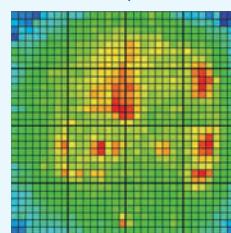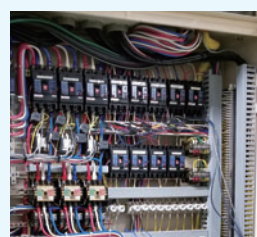
Measurement applications using K6PM-TH

An abnormal exothermic of wiring

An abnormal exothermic of a transformer
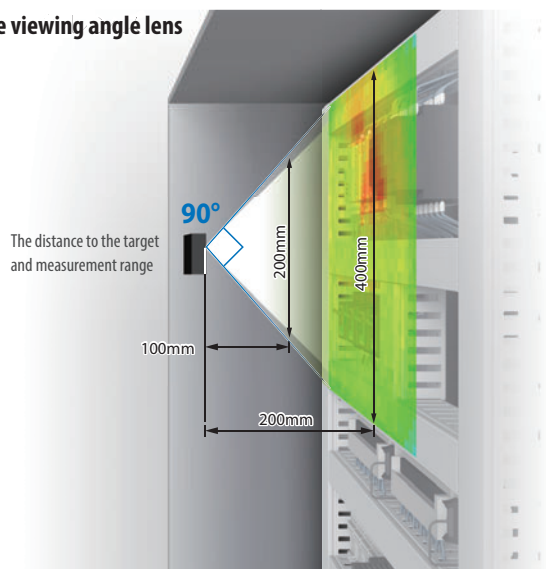
An abnormal exothermic of devices in a panel

Our shared Value Design for Panel (herein after referred to as "Value Design") concept for the specifications of products used in control panels will create new value to our customer's control panels.

Value Design for Panel

Visualizing the temperature in a panel accurately without opening the panel door

Optimal installation regardless of the locations thanks to the wide viewing angle and the compact body.
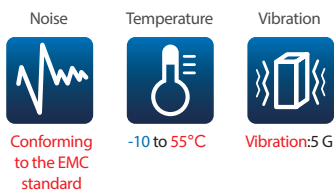
Wide viewing angle lens

90°

The distance to the target and measurement range

200mm
400mm
100mm
200mm

Compact

Infrared temperature sensor (Special thermal Imaging sensor) K6PM-THS

Actual Size

PWR   ERR COM

SW1
SW2

60mm

OMRON
K6PM-THS

Detachable terminal block

43mm   25.1mm

Environmental resistance

Assuring a normal operation under a harsh environment

Noise	Temperature	Vibration
Conforming to the EMC standard	-10 to 55°C	Vibration:5 G

Easy mount

Mount with a magnet or a commercially attachment on the backside of the door is available.

Backside: Magnet (Include)

Attachment (Commercial product)
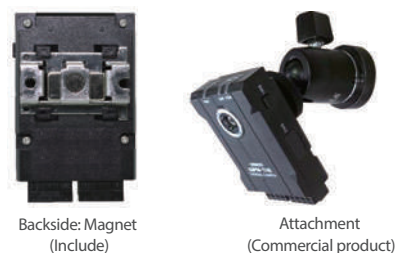
Identifying an abnormal device by segmenting the thermal image.

SEG0	SEG1	SEG2	SEG3
SEG4	SEG5	SEG6	SEG7
SEG8	SEG9	SEG10	SEG11
SEG12	SEG13	SEG14	SEG15
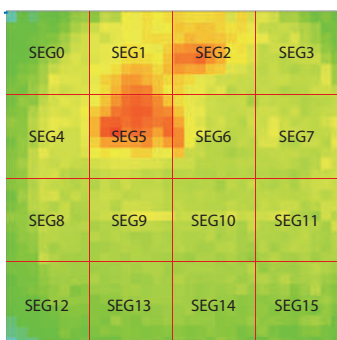
Threshold can be set to each segment of a 16-split thermal image

The resolution of a thermal image is shown as 32 × 32 cells.

Three-step indication for the temperature status

Normal   Caution   Warning

OMRON
K6PM-TH   Th

℃   31.0

CH 31   SEG 15
MON

MS NS   CH   SEG/ALM RST

EtherNet/IP

Measurement temperature (°C/°F)

Segment number

Sensor number

Alarm output

CH1   CH2   CH3   ....   CH31

Up to 31 K6PM-THS sensors can be connected with a main unit.

Main Unit

Contributing to an early detection of abnormality by our proprietary algorithm

Features 1 Predicting the temperature rise deviations, and notifying the dangerous level of abnormal exothermic.

Issues on maintenance at sites

Even a stable temperature of the device can lead to a serious abnormality over time depending on the cause of abnormality; however, analysis including history of temperature variation is very difficult with non-continuous temperature monitoring.
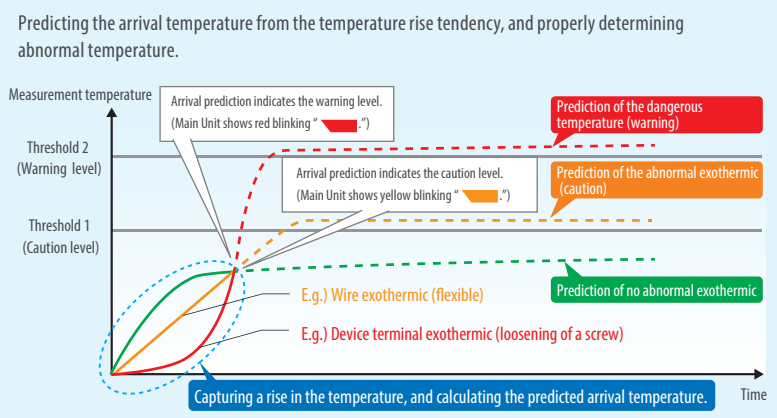
Solution! Arrival prediction algorithm `PATENT PENDING` *

Predicting the arrival temperature from the temperature rise tendency, and properly determining abnormal temperature.

Measurement temperature

Arrival prediction indicates the warning level.
(Main Unit shows red blinking " ▬▬ .")

Prediction of the dangerous temperature (warning)

Threshold 2 (Warning level)

Arrival prediction indicates the caution level.
(Main Unit shows yellow blinking " ▬▬ .")

Prediction of the abnormal exothermic (caution)

Threshold 1 (Caution level)

Prediction of no abnormal exothermic

E.g.) Wire exothermic (flexible)

E.g.) Device terminal exothermic (loosening of a screw)

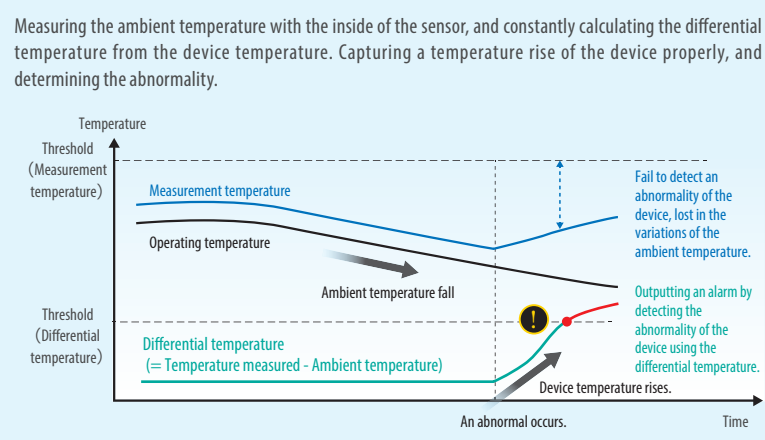Capturing a rise in the temperature, and calculating the predicted arrival temperature.

Time

Features 2 Enable to predict an abnormal exothermic of the devices in an environment where the ambient temperature significantly varies.

Issues on maintenance at sites

Unable to calculate the accurate temperature variation of a device measured under an environment to be affected by an outside air temperature.

Solution! Differential temperature detection algorithm `PATENT PENDING` *

Measuring the ambient temperature with the inside of the sensor, and constantly calculating the differential temperature from the device temperature. Capturing a temperature rise of the device properly, and determining the abnormality.

Temperature

Threshold (Measurement temperature)

Measurement temperature

Operating temperature

Fail to detect an abnormality of the device, lost in the variations of the ambient temperature.

Ambient temperature fall

Threshold (Differential temperature)

Outputting an alarm by detecting the abnormality of the device using the differential temperature.

Differential temperature
(= Temperature measured - Ambient temperature)
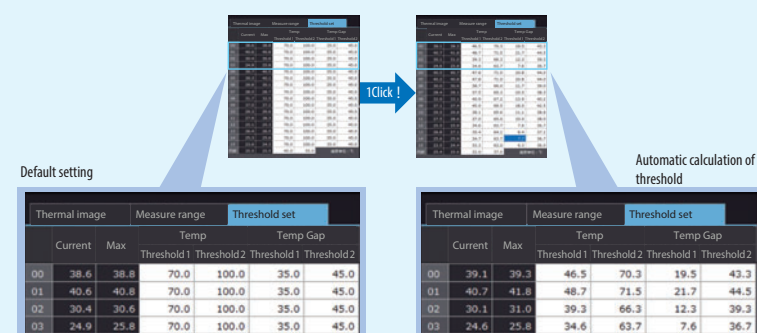
Device temperature rises.

An abnormal occurs. Time

Features 3 Auto setting of the optimum threshold for the complicated temperature distribution in a panel.

Issues on maintenance at sites

Inexperienced maintenance engineers do not know the optimum temperature threshold for each device in a panel.

Solution! Auto threshold set algorithm `PATENT PENDING` *

Automatic calculation of the optimum threshold in accordance with the environment of use and the temperature of the measurement target.

1Click !

Default setting

Automatic calculation of threshold

Thermal image	Measure range	Threshold set			
			Temp		Temp Gap
	Current	Max	Threshold 1	Threshold 2	Threshold 1	Threshold 2
00	38.6	38.8	70.0	100.0	35.0	45.0
01	40.6	40.8	70.0	100.0	35.0	45.0
02	30.4	30.6	70.0	100.0	35.0	45.0
03	24.9	25.8	70.0	100.0	35.0	45.0

| Thermal image	Measure range	Threshold set			
			Temp		Temp Gap
	Current	Max	Threshold 1	Threshold 2	Threshold 1	Threshold 2
00	39.1	39.3	46.5	70.3	19.5	43.3
01	40.7	41.8	48.7	71.5	21.7	44.5
02	30.1	31.0	39.3	66.3	12.3	39.3
03	24.6	25.8	34.6	63.7	7.6	36.7

* As of 2019 May

System configuration and software tool

"Thermal Condition Monitoring Tool" enables the setting and logging of K6PM-TH. K6PM-TH linked with a PC via an Ethernet cable enables you to recognize the temperature status in panels and warning alarms at one view on a remote PC.

System configuration

Compatible with **EtherNet/IP** / **Modbus**

HUB	
K6PM-THMD	K6PM-THMD
K6PM-THS	K6PM-THS
PC	
	Thermal Condition Monitoring Tool
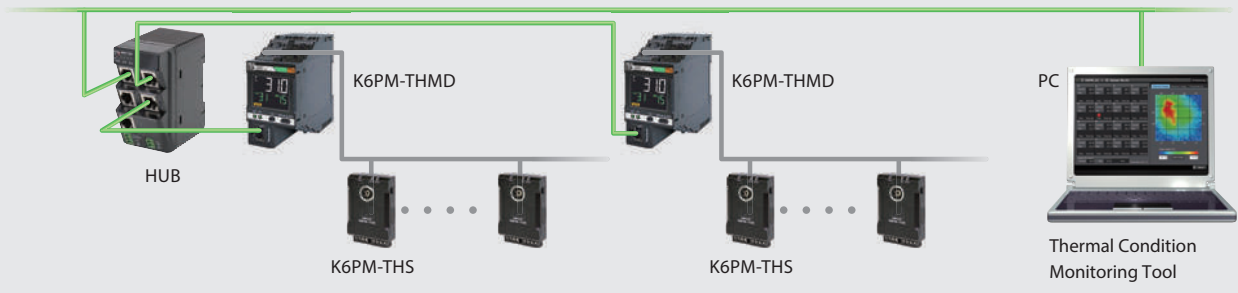
With Thermal Condition Monitoring Tool you can...

Constantly and remotely visualize the temperature status of the panel in multiple points where K6PM-TH are installed.

Display the status of the panel via K6PM-TH on the network.
Up to five K6PM-TH can be connected.
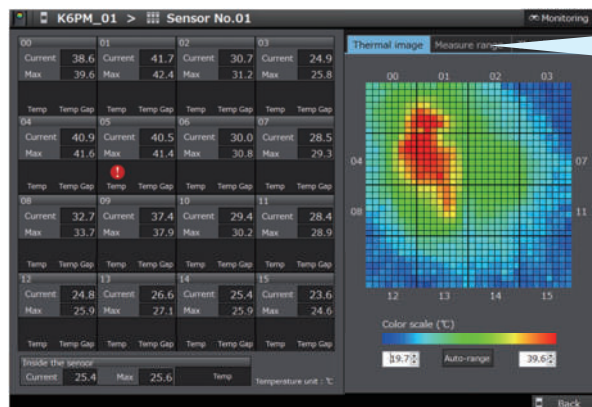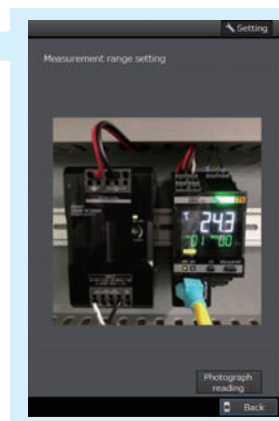
Threshold 1 exceeded
Caution

Threshold 2 exceeded
Warning

Quickly know the analyzing results of the measurements at one view

Confirm the temperature status by simultaneously displaying the temperature data and thermal image.Easily identify the device which is outputting an alarm.

Quickly confirm the exothermic part by displaying the measurement image.*

* The measurement image should by captured by customers.

MEMO

Thermal condition monitoring device
K6PM-TH

Consistently and remotely monitor and analysis the temperature status of panel devices to achieve both labor-saving and significant risk mitigation of abnormal stop
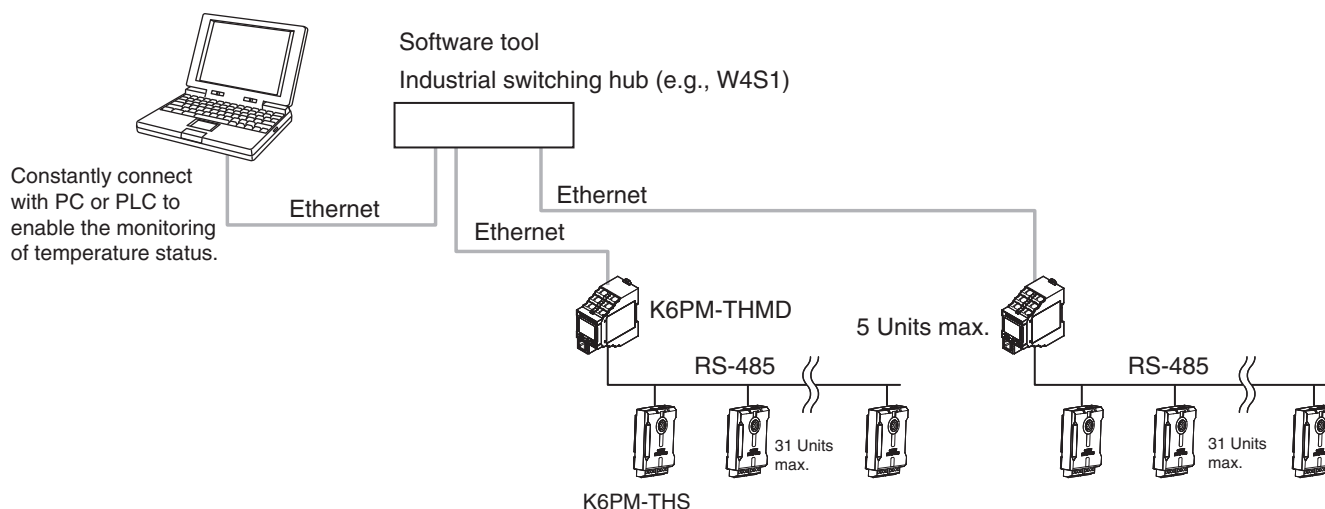
- Visualize the thermal status in a panel using the infrared thermal sensor (Special thermal image sensor) with a wide viewing angle in a compact body, specifically designed for mounting in a panel
- Detect abnormal symptoms by the algorithm analyzing the temperature status in a panel
- Dedicated monitoring tool (Thermal Condition Monitoring Tool) to provide the constant remote monitoring system

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

System Configuration

With the software tool, a maximum of five K6PM-THMD devices can be connected via an Ethernet cable, and settings and monitoring can be performed.

Software tool
Industrial switching hub (e.g., W4S1)

Constantly connect with PC or PLC to enable the monitoring of temperature status.

Ethernet

Ethernet

Ethernet

K6PM-THMD

5 Units max.

RS-485

RS-485

31 Units max.

31 Units max.

K6PM-THS

Note: Only when setting the IP address, connect the PC and the K6PM-THMD device one to one with an Ethernet cable as shown below.

Software tool

Ethernet
One-to-one connection
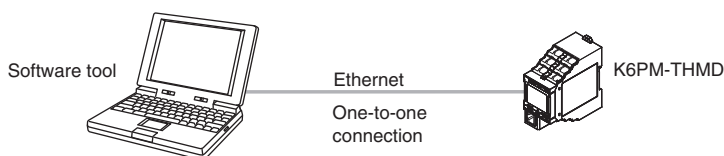
K6PM-THMD

Model Number Structure

Model Number Legend

Main Unit

K6PM- TH MD - EIP
       (1)   (2)   (3)

No.	Classification	Symbol	Meaning
(1)	Product classification	TH	Thermal condition monitoring device
(2)	Product classification	MD	Main Unit
(3)	Communications method	EIP	Supports EtherNet/IP and Modbus TCP communications

Infrared thermal sensor (Special thermal imaging sensor)

K6PM- TH S 3232
      (1) (2)   (3)

No.	Classification	Symbol	Meaning
(1)	Product classification	TH	Thermal condition monitoring device
(2)	Product classification	S	Infrared thermal sensor (Special thermal imaging sensor)
(3)	Model classification	3232	Number of K6PM sensor pixels: 32 × 32

K6PM-TH

Ordering Information

Main Unit

Power supply voltage	Model
24 VCD	**K6PM-THMD-EIP**

Infrared thermal sensor

Resolution	Model
32 × 32	**K6PM-THS3232**

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)

Recommended manufacturer	Appearance	Specifications			Model
		Function	No. of ports	Failure detection function	
OMRON		Packet priority control (QoS): EtherNet/IP control data priority Failure detection: Broadcast storm, LSI failure detection 10/100BASE-TX, Auto-Negotiation	3	Not possible	**W4S1-03B**
			5	Not possible	**W4S1-05B**
			5	Possible	**W4S1-05C**
Cisco Systems, Inc	Consult the manufacturer. https://www.cisco.com/				
Contec USA, Inc.	Consult the manufacturer. https://www.contec.com/us/				
Phoenix Contact USA	Consult the manufacturer. https://www.phoenixcontact.com/online/portal/pc				

Ratings and Characteristics

Main Unit Specifications

Ratings

Item	Model	K6PM-THMD-EIP
Power supply	Power supply voltage	24 VDC
	Allowable operating voltage range	85% to 110% of the power supply voltage
	Power supply frequency range	---
	Power consumption	1.6 W max.
Input	Compatible sensor	K6PM-THS3232
	Number of connected K6PM sensors	31 units
Output	Output form	Transistor output
	Number of outputs	3 points:
	Rated voltage	24 VDC
	Maximum current	50 mA
Ambient operating temperature		-10 to +55 °C (with no condensation or freezing)
Ambient storage temperature		-20 to +65 °C (with no condensation or freezing)
Ambient operating humidity		25% to 85% (with no condensation)
Storage humidity		25% to 85% (with no condensation)
Exterior color		Black
Case material		PC 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 AWG16)
Wire insertion force		8 N max. for AWG20 wire
Screwdriver insertion force		15 N max.
Wire stripping length		8 mm *1, 10 mm, 12 mm
Recommended Flat-blade Screwdriver		XW4Z-00B
Current capacity		10 A (per pole)
Number of insertions		50 times
Weight		Approx. 200 g
Mounting *2		DIN Track mounting
		Screw Mounting
Dimensions		45 (W) × 90 (H) × 90 (D) mm
Setting method		Communications settings from software tool
Other functions		Display value selection, Main Unit error and K6PM sensor error output, setting parameters initialization, running time
Accessories		Instruction manual, Software Tool (thermal condition monitoring tool) license number

*1. Without ferrules
*2. For details on mounting on a DIN track and screw attachment, refer to *K6PM Thermal Condition Monitoring Device User's Manual* (H231).

K6PM-TH

Characteristics

Item	Model		K6PM-THMD-EIP
Temperature measurement range			The temperature measurement range is described in the thermal sensor (K6PM-THS3232) performance.
Measurement temperature accuracy			The measurement temperature accuracy is described in the thermal sensor (K6PM-THS3232) performance.
Sampling cycle for the sensor			Approx. 1 second/Unit
External trigger	External contact input specifications		Short circuit: Residual voltage 1.5 V or less
			Open: Leakage current 0.1 mA or less
	Short circuit current		Approx. 7 mA
Alarm	Measurement parameters		Current temperature, differential temperature, sensor internal temperature
	Expression method		Transistor output, alarm bar display
	Number of variables		Two threshold values per segment (Threshold 1 and Threshold 2)
	Threshold setting range		0.0 to 999.9°C (0.0 to 999.9°F)
	Hysteresis		3.0°C width (5.4°F width)
	Resetting method		Manual resetting ✽ or automatic resetting (switching)
LCD display			7-segment digital displays and individual indicators
Display resolution			0.1°C
Applicable standards	Approved standards		UL61010-1 (Listing) installation location: Pollution level 2, South Korean Radio Law
	Conforming standards		RCM
	EMC		EN61326-1 (EMI: Class A EMS: Industrial Location)
Recommended fuse			T2A, time lag, high shut-off capacity
Insulation resistance			20 MΩ min. Between all external terminals and the case Between all power supply terminals and all other terminals Between all RS-485 communications terminals, and all external trigger input terminals, all transistor output terminals and all Ethernet 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 RS-485 communications terminals, and all external trigger input terminals, all transistor output terminals and all Ethernet ports
Vibration resistance			Frequency: 10 to 55 Hz, 0.35-mm single amplitude in X, Y, and Z directions (10 sweeps of 5 min each)
Shock resistance			150 m/s², 3 times each in X, Y, and Z axes, 6 directions
Degree of protection			IP20
Warranty period			1 year
Indicators	Alarm bar		Red, yellow, and green
	MS and NS		Red and green
Ethernet Communicaitons	Supported services		EtherNet/IP (tag data link or CIP message communications) BOOTP client Modbus TCP
	Physical layer		100 Base-TX
	Transmission specifications	Transmission speed	100 Mbps
		Transmission medium	Twisted pair cable (with shield: STP): Category 5 or higher
		Transmission distance	100 m max. (distance between hub and node)
	Tag data link	Class1	Supported.
		Connection resource	4
		Packet interval (RPI)	1,000 to 10,000 ms
		Timeout value	Multiples of RPI (4 times, 8 times, 16 times, 32 times, 64 times, 128 times, 256 times, 512 times)
		Connection type	Point To Point Connection (fixed)
	Explicit message	Class 3	Supported.
		UCMM	Supported.
		Number of clients that can communicate at one time with UCMM	2
	Modbus TCP	Number of clients that can be connected simultaneously	2
	Factory default values	IP address.	192.168.250.30
		Subnet mask.	255.255.255.0
		The default gateway.	0.0.0.0
		IP address setting method	Static IP address

✽Manual resetting method: Press and hold the SEG/ALM RST Button

OMRON

Indicator specifications

Symbol	Name	Color	Status		Operating condition
MS	Module Status	Green	Lit.		Normal status
		Red	Lit.		One of the following fatal errors (Main Unit internal error) • Internal CPU error • Internal memory error
			Flashes at 1-s intervals.		One of the following conditions • K6PM sensor communications error • The detection of the K6PM sensor angle deviation • Sensor type error • Temperature measurement range exceeded • Running time error
		---	Not lit.		No power supply
NS	Network Status	Green	Lit.		Tag data link or message connection established
			Flashes at 1-s intervals.		No tag data link or message connection established
		Red	Lit.		IP address duplication status
			Flashes at 1-s intervals.		The connection has timed out, or the BOOTP server connection error state
		---	Not lit.		No power supply

Transistor output specifications

Name	Description	
Transistor Output 1	Threshold 1 excess output of comprehensive alarm.	If threshold 1 exceeded occurs for the comprehensive alarm, transistor output 1 remains OFF and transistor output 2 remains ON.
	Transistor output type can be set to Normally Closed or Normally Open.	If threshold 2 exceeded occurs for the comprehensive alarm, both transistor output 1 and transistor output 2 turn OFF. (Normally closed type)
Transistor Output 2	Threshold 2 excess output of comprehensive alarm. Transistor output type can be set to Normally Closed or Normally Open.	
Transistor Output 3	Main Unit error and K6PM-TH sensor error output *1 • Normal: ON • Main Unit error and K6PM-TH sensor error: OFF The output type of transistor output 3 is fixed as Normally closed.	*2

*1. The Main Unit error and K6PM-TH sensor error specify any one of the following:
 • Main Unit internal error (internal CPU error or internal memory error)
 • K6PM-TH sensor communications error or sensor type error
 • The detection of the K6PM-TH sensor angle deviation
 • Temperature measurement range exceeded
 • Running time error
*2. The operation of transistor output 3 is as described below.

Status		Transistor output 3
Status of Main Unit	**Status of infrared thermal sensor**	
Operating		OFF
Main Unit internal error		
In monitoring mode	Before data acquisition	ON
	Normal	
	K6PM-TH sensor communications error or sensor type error	OFF
	The detection of the K6PM-TH sensor angle deviation	
	Temperature measurement range exceeded	
	Running time error	
K6PM-TH sensor search mode or K6PM-TH sensor position adjustment mode	Before data acquisition	ON
	Normal	
	K6PM-TH sensor communications error or sensor type error	
	The detection of the K6PM-TH sensor angle deviation	
	Temperature measurement range exceeded	
	Running time error	OFF

K6PM-TH

Measured value display

Measurement level	Methods for checking		
	Main Unit (display)	**Software tool**	**Communicaitons**
Temperature of each segment and sensor internal temperature	The segment display of each sensor can be switched on the Main Unit front-panel.	Can be checked on the Monitoring sensor screen.	• EtherNet/IP tag data link communications • EtherNet/IP message communications • Modbus TCP communications
Differential temperature per segment from the K6PM-TH sensor internal temperature	Not supported	Not supported	Not supported
Temperature of each infrared thermal sensor	Not supported	The past maximum value can be monitored on the Monitoring K6PM screen.	Not supported
Temperature of each pixel	Not supported	The temperature can be displayed when the cursor is placed on the thermal image on the Monitoring sensor screen.	• EtherNet/IP message communications • Modbus TCP communications
Alarms of each Main Unit (Alarms of all infrared thermal sensors connected to the Main Unit)	The occurrence of an alarm can be checked on the alarm bar.	The occurrence of an alarm can be checked on the Device List of K6PM screen.	The occurrence of an alarm can be checked from the Main Unit status.

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Infrared thermal sensor

Ratings

Item	Model	K6PM-THS3232
Power supply	Power supply voltage	24 VDC
	Allowable operating voltage range	85% to 110% of the power supply voltage
	Power supply frequency range	---
	Power consumption	0.4 W max./Unit at 24 VDC *1
Ambient operating temperature		-10 to +55 °C (with no condensation or freezing)
Storage temperature		-20 to +65 °C (with no condensation or freezing)
Ambient operating humidity		25% to 85% (with no condensation)
Storage humidity		25% to 85% (with no condensation)
Exterior color		Black
Case material		PC UL94-V0
Altitude		2,000 m max.
Applicable wires		Stranded wires or solid wires
Applicable wire size		0.25 to 1.5 mm² (AWG24 to AWG16)
Current capacity		8 A (per pole)
Weight		50 g max.
Mounting		Mounting *2 Screw Mounting
Dimensions		43 × 60 × 25.1 mm (W×H×D) Terminals not included
Accessories *3		Instruction manual, mounting bracket, magnet (for positioning) *4

*1. The power consumption increases according to the number of connected devices. Take note of the choice of wiring and the wiring diameter.
*2. A 1/4-20 UNC mounting hole is available (nuts are not provided).
*3. The pan head is sold separately.
*4. Use magnet mounting for positioning the sensor.

K6PM-TH

Performance

Item	Model	K6PM-THS3232
Temperature measurement	Temperature measurement range	Temperature measurement range: 0.0°C to 200.0°C (32.0°F to 392.0°F)
	Detection resolution	32 × 32 (1,024 pixels)
	Temperature accuracy	±5°C (at an ambient temperature of 25°C) *1*2
	Emissivity	0.94
	Reproducibility	1°C (at an ambient temperature of 25°C) *2
	Temperature drift	0.15°C
	Viewing angle [FOV]	90° × 90°
	Warmup time	15 minutes
Other functions	Over temperature measurement range	Temperature: 200.0°C or higher, sensor internal temperature: 80°C or higher
	Angle deviation detection *3	Angle deviations of 5° (typ) min. and those that continue for 3 seconds min. can be detected.
Output	Communications method	RS-485 communications
	Maximum cable length	500 m
Applicable standards	Approved standards	UL61010-1 (listing) installation location: Pollution degree 2
		Korean Radio Waves Act
	Conforming standards	RCM
	EMC	EN61326-1 (EMI: Class A EMS: Industrial Location) Measured temperature fluctuation range: ±6°C
Recommended fuse		T2A, time lag, high shut-off capacity
Insulation resistance		20 MΩ min. Between all terminals and the case
Dielectric strength		1,000 VAC for 1 minute Between all terminals and the case
Vibration resistance		Frequency: 10 to 55 Hz, 0.35-mm single amplitude in X, Y, and Z directions (10 sweeps of 5 min each) *4
Shock resistance		150 m/s², 3 times each in 6 directions along 3 axes *4
Degree of protection		IP20
Indicators	Power indicator	Green (when power is on: lit, when power is not on: off)
	Communications indicator	Orange (when communications are performed: Lit, when communications are not performed: Not lit)
	Alarm indicator	Red (when a sensor error occurs: Lit, when an angle deviation is detected: Flashing)

*1. Accuracy may vary depending on the measured distance, the object's emissivity, and ambient temperature.
*2. For details on temperature accuracy and reproducibility, refer to *K6PM Thermal Condition Monitoring Device User's Manual* (H231).
*3. Make ON/OFF settings on the DIP switch Pin 2 (default value: OFF).
   Since the operation is not stable at a location subject to vibrations, it may not be possible to detect angle deviation.
*4. During screw mounting

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Software tool

Item		Specification
Project	**Number of files that can be created**	No limit
Sampling cycle of infrared thermal sensor: 1 to 99		1 to 99 minutes, or 1 to 99 hours (default value: 1 minute)
Logging	**Supported file format**	Tab-delimited text file format
	Measurement interval	Sampling cycle
	Log file unit	A new file for every 1,440 rows (excluding the header) regardless of the sampling interval
1 Number that can be registered in the project	**Number of Main Unit**	5 Units max.
Files to create		The following are created in the installation folder \cfg: • Project file (INI file format) • Configuration file (INI file format) • The following is created in the installation folder \log: Log file (txt format) Refer to *Details of the File to be Created* for details.
Photo image file format that can be read and displayed		JPG/JPEG format
Temperature alarm threshold automatic setting		Supported.

Details of the file to be created

File type	Extension	Description	Save position by default
Project file	.ini	Text file including the following: • Sampling cycle • Device name (of 5 Units max.) • IP address information of Main Unit (of 5 Units max.) • Sensor image display direction (of 31 Units max.) • Sensor color scale setting (of 31 Units max.) • Measurement location image file name (of 31 Units max.)	C:\Program Files\OMRON\Thermal Condition Monitoring Tool\cfg
Configuration file	.ini	Text file including the following (file name = fixed as "app.ini"): • Language	C:\Program Files\OMRON\Thermal Condition Monitoring Tool\cfg
Log file	.txt	A file is created for each Main Unit. It is text file format, so it can be used by other applications.	The log file location is as follows: C:\Program Files\OMRON\Thermal Condition Monitoring Tool\log\[Main Unit number (2 digits)]

Operating Environment of the Software tool

Item	Description
OS	Windows 7, Windows 8.1, Windows 10 (32 bit / 64 bit) (JP / EN)
CPU	2.4 GHz or more, 32 bit or 64 bit processor
Memory	4 GB min.
Disk reserved area capacity	64 GB min.
Monitor resolution	1024 × 768 (XGA), High Color 16 bit or more
.NET Framework	. NET Framework 4.7.2 ✽
Others	LAN port: For network connection

✽ The operation requires .NET Framework 4.7.2.
  Download the software tool from the OMRON website as follows:
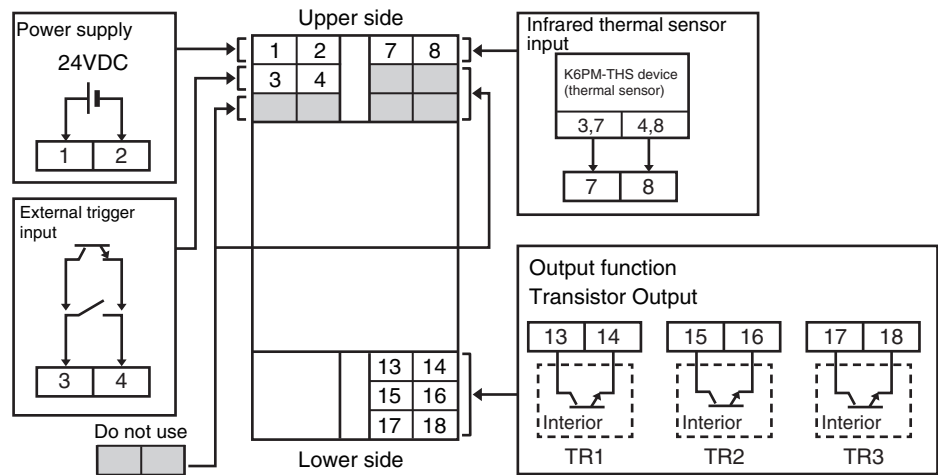 https://www.ia.omron.com/k6pm_tool

K6PM-TH

Connection Diagram

Main Unit

The diagram below shows the terminal layout of the following:
- 24 VDC
- External trigger input
- Infrared thermal sensor input
- Transistor output 1 to 3

All wiring connections are established by Push-In Plus terminals.

Terminal number	Terminal name	Function
1	Power supply input	24 VDC input terminal (polarity)
2	Power supply input	0 VDC input terminal (polarity)
3 or 4	External trigger input	ON: Interruption of temperature measurement
7	SDB(+)	RS-485 communications terminal (connected with sensor Number 3 or 7)
8	SDA(-)	RS-485 communications terminal (connected with sensor Number 4 or 8)
13 or 14	Transistor Output 1 (TR1)	Temperature error Threshold 1 exceeded
15 or 16	Transistor Output 2 (TR2)	Temperature error Threshold 2 exceeded
17 or 18	Transistor Output 3 (TR3)	Main Unit error and K6PM sensor error

Infrared thermal sensor

There are two connectors at the bottom of the infrared thermal sensor.
These two connectors are shorted internally for crossover wiring.

Infrared thermal sensor
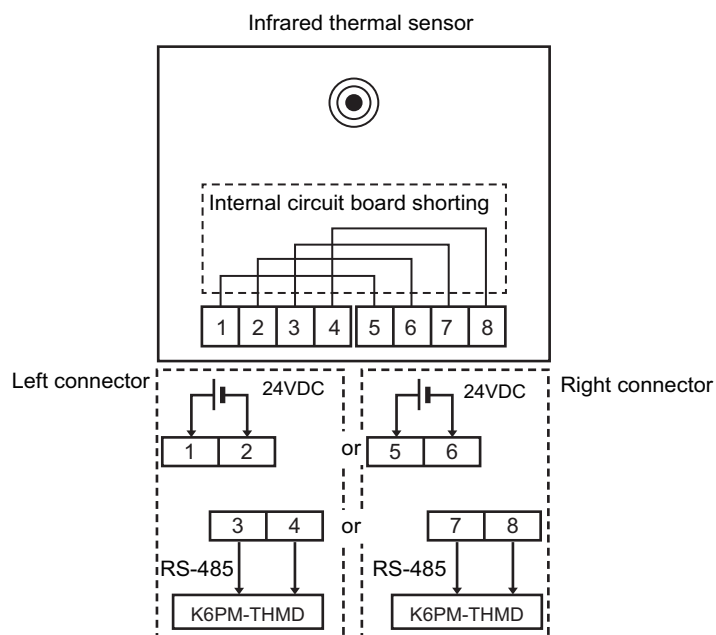
Terminal number	Terminal name	Function
1 or 5	Power supply input (+V)	24 VDC input terminal (polarity)
2 or 6	Power supply input (-V)	0 VDC input terminal (polarity)
3 or 7	RS-485 communications (B)	B (+) RS-485 communications terminal (connected with Main Unit no. 7)
4 or 8	RS-485 communications (A)	A (-) RS-485 communications terminal (connected with Main Unit no. 8)

K6PM-TH

Part names and functions

Main Unit

No.	Variable	Function
(A)	Upper terminal	Push-In Plus terminal • Power supply 24 VDC input to the Main Unit • External trigger input ON: Measurement is interrupted. OFF: Measurement is performed.
(B)	Upper terminal	Push-In Plus terminal • Infrared thermal sensor input (RS-485 communications)
(C)	Alarm bar	Displays the following states of the Main Unit. • Normal (no alarm has occurred): Lit green • No operation is being performed (power supply is not connected): Not lit • Search or position adjustment mode: Not lit • An alarm has occurred Current temperature / differential temperature over threshold 1: Lights yellow Current temperature / differential temperature over threshold 2: Lights red • When the arrival prediction function is enabled: ✳
(D)	Numeric LCD display	Depending on the operating mode, the display differs as shown below. • Monitoring mode: Current temperature of the selected segment of the selected sensor (a) When communications are not established with the sensor: "- - - -" is displayed (b) When a K6PM sensor communications error occurs: "5Err" is displayed (c) When the sensor temperature exceeds the measurement range: The current temperature flashes (d) During measurement interruption due to an external trigger: The display is fixed as the value immediately before interruption (e) K6PM sensor search mode: "on" is displayed for a sensor that sends a response, and "oFF" is displayed for a sensor that sends no response • K6PM sensor position adjustment mode: "Rdⱼ" is displayed • When a Main Unit internal error occurs: "8888" flashes
(E)	SEG	The segment number or the number of currently-connected infrared thermal sensors is displayed. Depending on the operating mode, the display differs as shown below. • In monitoring mode: The segment number selected by the SEG/ALM RST Key is displayed. 0 to 15 Sensor internal temperature: 99 • In sensor search mode: The number of infrared thermal sensors currently connected to the Main Unit is displayed. • In sensor position adjustment mode: The number of infrared thermal sensors currently connected to the Main Unit is displayed.
(F)	Status display	The status of the Main Unit is displayed as follows: • MON: K6PM sensor monitoring state. The indicator is not lit during measurement interruption due to an external trigger. • ALM: Alarm occurrence state (lit only when the corresponding K6PM sensor number is being displayed) • AGE: Running time reaches 100% • ERR: Main Unit internal error
(G)	Operation Keys	CH Key: Switching of sensor number SEG/ALM RST Key pressed for less than 5 seconds: Switching of segment number SEG/ALM RST Key pressed and held (5 seconds min.): Alarm latch released (Can be performed only by this operation. The latch cannot be released by the software tool and communications.) CH Key and SEG/ALM RST Key simultaneously pressed and held (5 seconds min.): Initialization (Operation returns to the factory state.)
(H)	Lower terminal	Connection is established by the Push-In Plus terminal. • Transistor output 1 to 3 For details, refer to *Transistor output*.

No.	Variable	Function
(I)	DIN Track mounting hook	Used for mounting to the DIN Track.
(J)	Communications connector	Connects the communications cable of the EtherNet/IP network.
(K)	Indicators	Indicates the product status or network status by LEDs. • "MS": Module Status. Displays the status of the Main Unit. It is green when it is normal. • "NS": Network Status. Displays the state of the communications. It lights or flashes green when it is normal. For details, refer to *Indicator specifications*.
(L)	Words	Indicates the K6PM sensor number. 1 to 31
(M)	°Ɛ Temperature units	Displays the temperature unit. °C or °F.

✻ The display is as follows when the arrival prediction function is enabled.
• The predicted arrival temperature exceeds threshold 1, and the current temperature or differential temperature does not exceed the threshold: Flashes yellow
• Regardless of whether the predicted arrival temperature exceeds threshold 1, the current temperature or differential temperature exceeds threshold 1: Lit in yellow
• Regardless of whether the current temperature or differential temperature exceeds threshold 1, the predicted arrival temperature exceeds threshold 2: Flashes red
• Regardless of whether the predicted arrival temperature exceeds the threshold, the current temperature or differential temperature exceeds threshold 2: Lit in red
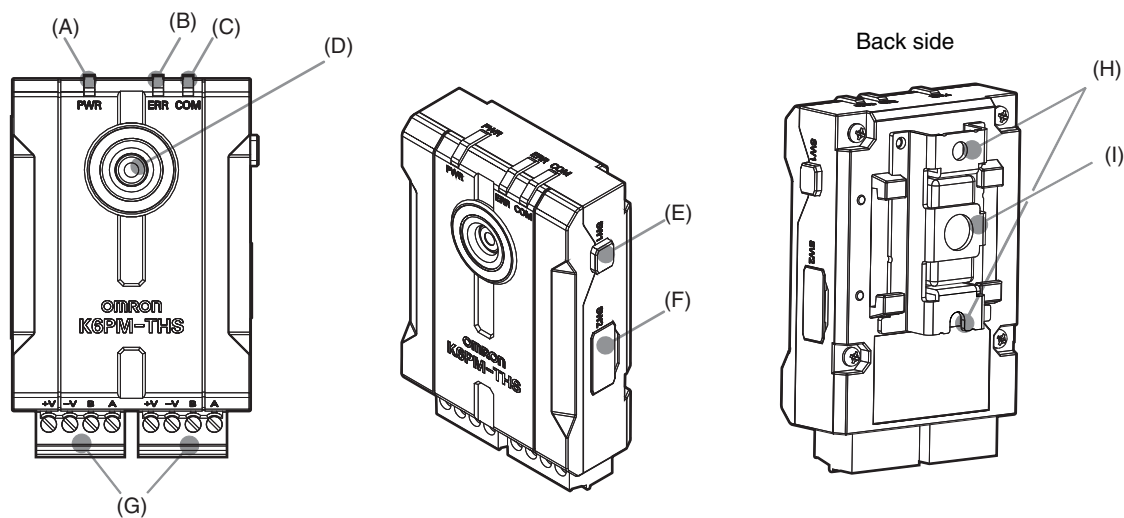
Indicator specifications

Symbol	Name	Color	Status	Operating condition
MS	Product and network status indications (Module Status)	Green	Lit.	Normal status
		Green	Flashes at 1-s intervals.	BOOTP server connection error state
		Red	Lit.	One of the following fatal errors (Main Unit internal error) • Internal CPU error • Internal memory error
		Red	Flashes at 1-s intervals.	One of the following conditions • K6PM sensor communications error • The detection of the K6PM sensor angle deviation • Sensor type error • Temperature measurement range exceeded • Running time error
		--	Not lit.	No power supply
NS	Network status indication (Network Status)	Green	Lit.	Tag data link or message connection established
		Green	Flashes at 1-s intervals.	No tag data link or message connection established
		Red	Lit.	IP address duplication status
		Red	Flashes at 1-s intervals.	Connection timed out
		--	Not lit.	No power, or IP address is not set

Transistor output

Name	Description	
Transistor Output 1	Threshold 1 excess output of comprehensive alarm. Transistor output type can be set to Normally Closed or Normally Open.	When the "Transistor output type" is set to "Normally closed": If threshold 1 exceeded occurs for the comprehensive alarm, transistor output 1 remains OFF and transistor output 2 remains ON.
Transistor Output 2	Threshold 2 excess output of comprehensive alarm. Transistor output type can be set to Normally Closed or Normally Open.	If threshold 2 exceeded occurs for the comprehensive alarm, both transistor output 1 and transistor output 2 turn OFF. (By default, it is set to "Normally closed". By setting it to "Normally open" with the software tool, ON/OFF can be reversed.)

Transistor Output 3	Main Unit error and K6PM sensor error output
	• Normal: ON
	• Main Unit error and K6PM sensor error: OFF
	
	Note: 1. The Main Unit error and K6PM sensor error specify any one of the following:
	    • Main Unit internal error (internal CPU error or internal memory error)
	    • K6PM sensor communications error or sensor type error
	    • The detection of the K6PM sensor angle deviation
	    • Temperature measurement range exceeded
	    • Running time error
	2. The output type of transistor 3 is fixed as Normally closed.	

Infrared thermal sensor

Back side

No.	Variable	Function
(A)	Power indicator (Green)	Lit when power is turned ON
(B)	Alarm indicator (Red)	• Lit in red: Measurement temperature or internal temperature over • Flashing red: K6PM sensor angle deviation occurs
(C)	Communications indicator (orange)	• Communications: Lit • Standby: Not lit (stopped)
(D)	Thermal sensor lens	----
(E)	Reset switch for the K6PM sensor angle deviation	Resets the sensor internal angle deviation occurrence flag.
(F)	DIP switches	∗
(G)	Connector-Terminal Block Conversion Unit	For Power supply and the RS-485 wiring
(H)	Screw hole for fixing mounting bracket	For direct sheet metal attachment
(I)	Connector-Terminal Block Conversion Unit	1/4-20 UNC thread compatible

∗ The setting contents of the DIP switch pin are as follows:

| SW	Setting contents	Value
1 to 5	K6PM sensor number setting	Set in binary with ON as 1 and OFF as 0 (Pin 1: Least significant bit, Pin 5: Most significant bit) 00001 to 11111: K6PM sensor number 1 to 31 00000: Not used. Factory default: 00001
6	RS-485 terminating resistance	OFF: Without terminating resistance (factory default) ON: With terminating resistance
7	The detection of the K6PM sensor angle deviation	OFF: No detection (factory default) ON: With detection
8	Reserved	----

Installation of the Infrared thermal sensor

Install the infrared thermal sensor at the back of the panel door, or on the internal side surface of the panel.
The infrared thermal sensor can be installed either directly on the panel, or can be installed by using a commercially available pan head.

- Installing on the back of the panel door either directly or by using a commercially available pan head

Panel door

Infrared thermal sensor

Commercially available pan head

Measurement target range

Measurement target range
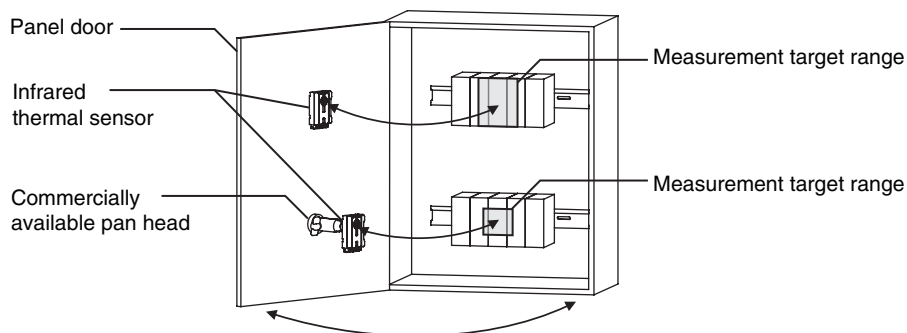
- Installing on the internal side surface of the panel by using a commercially available pan head

Infrared thermal sensor

Commercially available pan head

Panel door

Measurement target range
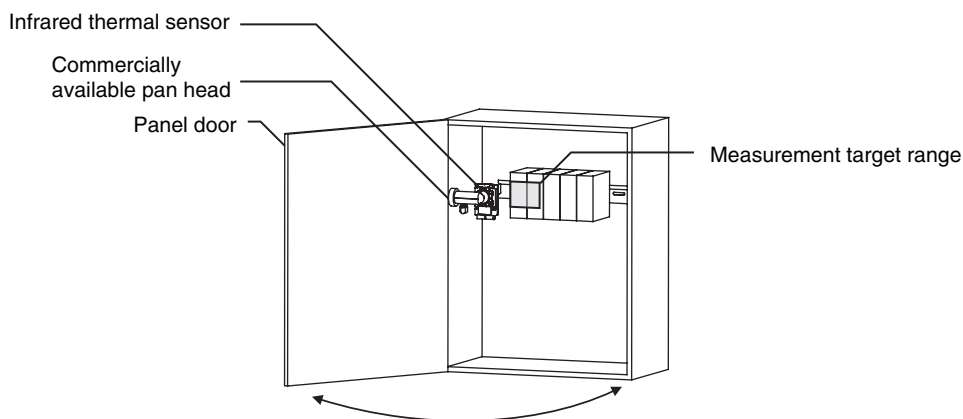
K6PM-TH

Dimensions

Main Unit

K6PM-THMD-EIP

45

90

(1.9) 90

86 (4)
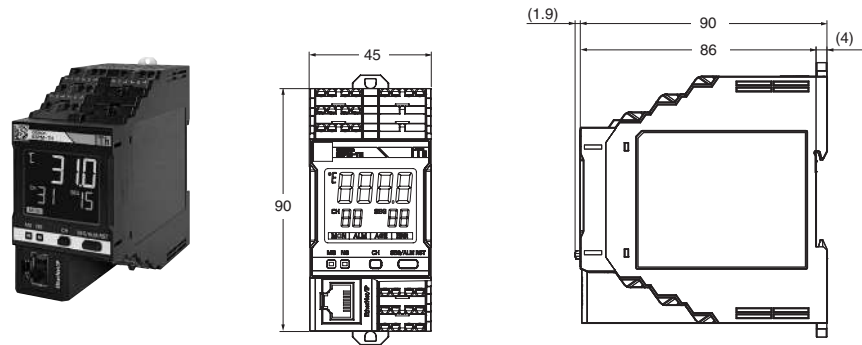
Infrared thermal sensor

K6PM-THS3232

With Mounting Bracket Attached

43 (1.4)

25.1

17.8

60

8.3
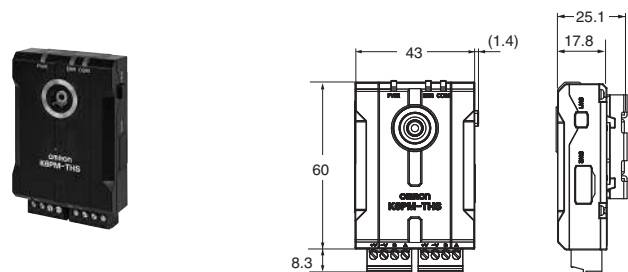
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