Temperature Meter

K3MA-L

CSM_K3MA-L_DS_E_6_1

Highly Visible LCD Display with 2-color (Red and Green) LEDs

- Wide input range - select from two types of platinum-resistance thermometers and ten types of thermocouples.
- Front-panel key operation for easy setting.
- Average processing function suppresses flicker.
- Temperature input shift and temperature unit selection functions.
- Easy confirmation of max/min display.
- Short 80-mm depth (measured from edge of face plate).
- Finger protective cover (standard equipment) protects against electric shock.
- Water- and dust-proof NEMA4X (IP66 equivalent) front panel.
- Recognized to conform to U.S. and Canadian requirements under the Component Recognition Program of UL.
- CE marking.

Refer to *Safety Precautions for All Digital Panel Meters.*

Model Number Structure

■ Model Number Legend

K3MA-L-□ □
1 2 3

1. **Input Type**
   L: Platinum-resistance thermometer or thermocouple
2. **Output Type**
   None: No output
   C: With relay contact output (SPDT)
3. **Supply Voltage**
   100-240VAC: 100 to 240 VAC
   24VAC/VDC: 24 VAC/VDC

Ordering Information

■ List of Models

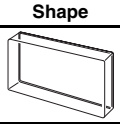
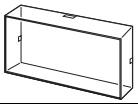
Input type	Supply voltage	Output	Model
Platinum-resistance thermometer or thermocouple	100 to 240 VAC	None	K3MA-L 100-240VAC
		1 relay contact output (SPDT)	K3MA-L-C 100-240VAC
	24 VAC/VDC	None	K3MA-L 24VAC/VDC
		1 relay contact output (SPDT)	K3MA-L-C 24VAC/VDC

■ Rubber Packing

Model
K32-P1

Note: Rubber packing is provided with the Controller.

■ Accessories (Order Separately)

Name	Shape	Model
Splash-proof Soft Cover		K32-49SC
Hard Cover		K32-49HC

Specifications

■ Ratings

	K3MA-L 100-240VAC, K3MA-L-C 100-240VAC	K3MA-L 24VAC/VDC, K3MA-L-C 24VAC/VDC
Supply voltage	100 to 240 VAC	24 VAC (50/60 Hz), 24 VDC
Operating voltage range	85% to 110% of the rated supply voltage	
Power consumption (under maximum load)	6 VA max.	4.5 VA max. (24 VAC) 4.5 W max. (24 VDC)
Insulation resistance	20 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.	
Dielectric strength	2,000 VAC for 1 min between external terminal and case. Insulation provided between inputs, outputs, and power supply.	
Noise immunity	±1,500 V on power supply terminals in normal or common mode. ±1 μs, or 100 ns for square-wave noise with 1 ns.	±480 V on power supply terminals in normal mode. ±1,500 V in common mode. ±1 μs, or 100 ns for square-wave noise with 1 ns.
Vibration resistance	Vibration: 10 to 55 Hz, Acceleration: 50 m/s^2 5 min each in X, Y, and Z directions for 10 sweeps.	
Shock resistance	150 m/s^2 (100 m/s^2 for relay contact outputs) 3 times each on 3 axes, 6 directions.	
Ambient temperature	Operating: −10°C to 55°C (with no condensation or icing) Storage: −25°C to 65°C (with no condensation or icing)	
Ambient humidity	Operating: 25% to 85% (with no condensation)	
Approved safety standards	UL61010-1, conforms to EN61010-1 (Pollution degree 2/overvoltage category II) Conforms to VDE0106/P100 (finger protection)	
EMC	(EMI) EN61326+A1 Industry Emission Enclosure: CISPR 11 Group 1 class A Emission AC Mains: CISPR 11 Group 1 class A (EMS) EN61326+A1 Industry Immunity ESD: EN61000-4-2: 4 kV contact discharge, 8 kV air discharge Immunity RF-interference: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz) Electrical Fast Transient Noise: EN61000-4-4: 2 kV (power line) Immunity Burst Noise: 1 kV line to line (I/O signal line) Immunity Surge: EN61000-4-5: 1 kV (power line), 2 kV line to ground (power line) Immunity Conducted Disturbance: EN61000-4-6: 3 V (0.15 to 80 MHz) Immunity Voltage Dip/Interrupting: EN61000-4-11: 0.5 cycle, 0, 180°, 100% (rated voltage)	
Weight	Approx. 200 g	

■ Characteristics

Indication accuracy (at 23±5°C) (See note.)	Thermocouple: (±0.5% of indication value or ±1°C, whichever greater) ±1 digit max. Platinum-resistance thermometer: (±0.5% of indication value or ±1°C, whichever greater) ±1 digit max.
Input	Thermocouple: K, J, T, E, L, U, N, R, S, B Platinum-resistance thermometer: JPt100, Pt100
Measurement method	Double integral method
Sampling period	500 ms
Display refresh period	Sampling period (sampling times multiplied by number of averaging times if average processing is selected.)
Max. displayed digits	4 digits (−1999 to 9999)
Display	7-segment digital display, Character height: 14.2 mm
Polarity display	"−" is displayed automatically with a negative input signal.
Zero display	Leading zeros are not displayed.
Input shift	Input shift equivalent to the setting value supported for all points within the sensor measurement range.
Hold function	Max hold (maximum value), Min hold (minimum value)
Hysteresis setting	Programmable with front-panel key inputs (0001 to 9999).
Other functions	Display color change (green (red), green, red (green), red) Average processing (simple average OFF/2/4/8 operations) Setting change lockout Parameter initialization
Output	Relay contact (SPDT)
Delay in comparative outputs	1 s max.
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP00 + finger protection (VDE0106/100)
Memory protection	Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)

Note: The indication accuracy of the K thermocouple at a temperature of −200 to 1300°C is ±2°C ±1 digit maximum.
The indication accuracy of the T and N thermocouples at a temperature of −100°C or less is ±2°C ±1 digit maximum.
The indication accuracy of the U and L thermocouples at any temperature is ±2°C ±1 digit maximum.
The indication accuracy of the B thermocouple at a temperature of 400°C or less is unrestricted.
The indication accuracy of the R and S thermocouples at a temperature of 200°C or less is ±3°C ±1 digit maximum.

■ Measuring Ranges

Platinum-resistance Thermometer

Input		Pt100			JPt100	
Range	°C	−200 to 850	−199.9 to 500.0	0.0 to 100.0	−199.9 to 500.0	0.0 to 100.0
	°F	−300 to 1500	−199.9 to 900.0	0.0 to 210.0	−199.9 to 900.0	0.0 to 210.0
Parameter		0	1	2	3	4

Thermocouple

Input		K		J	T		E	L	U		N	R	S	B
Range	°C	−200 to 1300	−20.0 to 500.0	−100 to 850	−20.0 to 400.0	−200 to 400	−199.9 to 400.0	0 to 600	−100 to 850	−200 to 400	−199.9 to 400.0	−200 to 1300	0 to 1700	0 to 1700	100 to 1800
	°F	−300 to 2300	0.0 to 900.0	−100 to 1500	0.0 to 750	−300 to 700	−199.9 to 700.0	0 to 1100	−100 to 1500	−300 to 700	−199.9 to 700.0	−300 to 2300	0 to 3000	0 to 3000	300 to 3200
Parameter		5	6	7	8	9	10	11	12	13	14	15	16	17	18

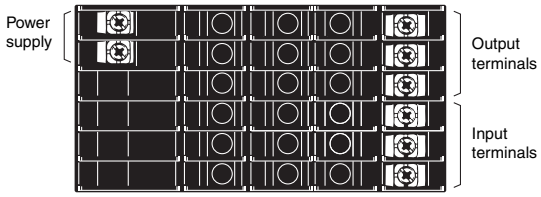
■ Input/Output Ratings

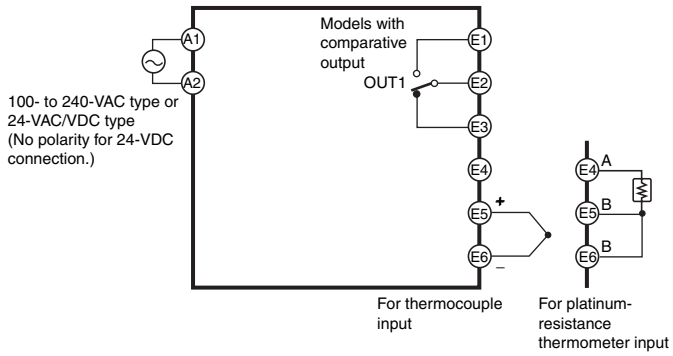
Relay Contact Output

Item	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4, L/R = 7 ms)
Rated load (UL ratings)	5 A at 250 VAC, 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC
Rated carry current	5 A max. (at COM terminal)	
Max. contact voltage	400 VAC, 150 VDC	
Max. contact current	5 A (at COM terminal)	
Max. switching capacity	2,000 VA, 192 W	375 VA, 30 W
Min. permissible load (P level, reference value)	10 mA at 5 VDC	
Mechanical life	20,000,000 times min. (at a switching frequency of 1,200 time/min)	
Electrical life (at an ambient temperature of 20°C)	100,000 times min. (at a rated load switching frequency of 10 time/min)	

Connections

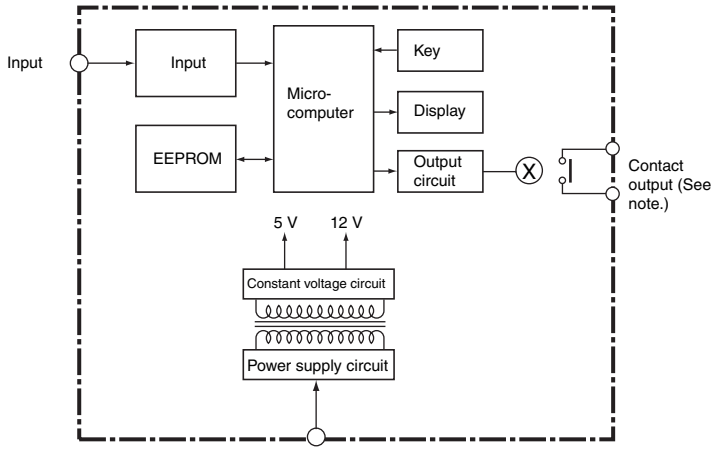
■ Terminal Arrangement





Terminal No.	Name	Description
A1 - A2	Operation power	Connects the operation power supply.
E4 - E6 - E5	Thermocouple or platinum-resistance thermometer input	Connects the thermocouple or platinum-resistance thermometer input.
E1 , E2 - E3	Outputs	Outputs the relay outputs.

■ Block Diagram



Note: Relay output models only.

Operation

■ Main Functions

Input Types and Ranges

Parameter	Setting	Input type	Meaning		
in-t	0	Platinum-resistance thermometer	Pt100	–200 to 850°C	–300 to 1500°F
	1			–199.9 to 500.0°C	–1999 to 900.0°F
	2			0.0 to 100.0°C	0.0 to 210.0°F
	3		JPt100	–199.9 to 500.0°C	–199.9 to 900.0°F
	4			0.0 to 100.0°C	0.0 to 210.0°F
	5	Thermocouple	K	–200 to 1300°C	–300 to 2300°F
	6			–20.0 to 500.0°C	0.0 to 900.0°F
	7		J	–100 to 850°C	–100 to 1500°F
	8			–20.0 to 400.0°C	0.0 to 750.0°F
	9		T	–200 to 400°C	–300 to 700°F
	10			–199.9 to 400.0°C	–199.9 to 700.0°F
	11		E	0 to 600°C	0 to 1100°F
	12		L	–100 to 850°C	–100 to 1500°F
	13		U	–200 to 400°C	–300 to 700°F
	14			–199.9 to 400.0°C	–199.9 to 700.0°F
	15		N	–200 to 1300°C	–300 to 2300°F
	16		R	0 to 1700°C	0 to 3000°F
	17		S	0 to 1700°C	0 to 3000°F
	18		B	100 to 1800°C	300 to 3200°F

Note: The initial value is "5: thermocouple K (–200 to 1300°C/–300 to 2300°F)."

Temperature Unit Selection

Either centigrade (°C) or fahrenheit (°F) can be selected as the temperature unit.

Parameter	Setting	Meaning
d-U	C	Display in °C.
	F	Display in °F.

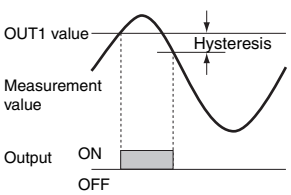
OUT Types (Comparative Output Models Only)

OUT 1 can be set to operate in one of the three following modes in accordance with the compared values:

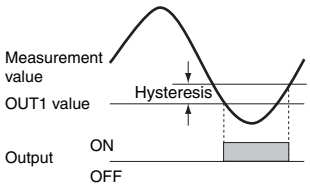
- Upper limit (High Acting):
  The output is turned ON when the measurement value is greater than its set value.
- Lower limit (Low Acting):
  The output is turned ON when the measurement value is less than its set value.
- Upper and lower limits (Outside Band Acting):
  An upper limit (H set value) and lower limit (L set value) can be set independently.
  The output is turned ON when the measurement value is greater than the upper-limit set value or less than the lower-limit set value.

Parameter	Setting	Meaning
oUt 1t	HC	Upper limit: Alarm operates at upper limit.
	Lo	Lower limit: Alarm operates at lower limit.
	HC-Lo	Upper and lower limits: Alarm operates at upper and lower limits.

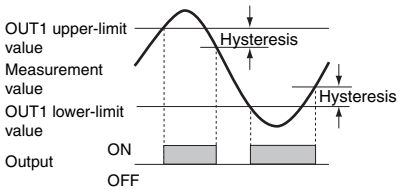
Upper Limit (High Acting)



Lower Limit (Low Acting)



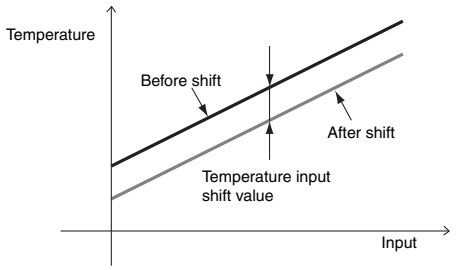
Upper and Lower Limits (Outside Band Acting)



Temperature Input Shift

Input shift equivalent to the setting value supported for all points within the sensor measurement range.

Parameter	Setting
InS	-1999 to 9999



Parameter Initialization

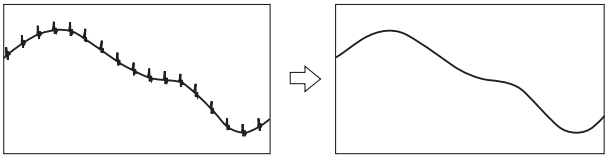
This function returns all of the parameters to their initial values.

Parameter	Setting	Meaning
InIt	oFF	---
	on	Initializes all parameters.

Use this to reset the K3MA-L after returning it to its factory-set condition.

Average Processing

Average processing stabilizes displayed values to minimize flicker by averaging the fluctuating input signals. Average processing can be performed for the measurement values in either of four steps (OFF, 2 times, 4 times, or 8 times).

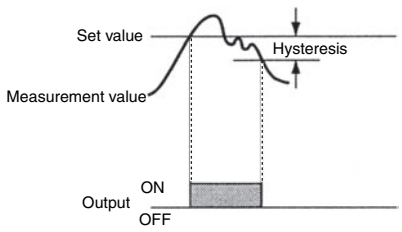


This is useful for ignoring rapid fluctuations, e.g., eliminating spike noise.

Hysteresis (Comparative Output Models Only)

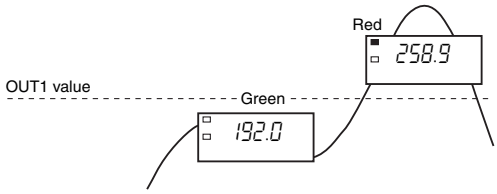
The hysteresis of comparative outputs can be set to prevent chattering in the output when the measurement value fluctuates finely near the OUT value.

Upper limit (high acting)



Changing the Display Color

The color of the value displayed can be set to either red or green. For comparative output models, the display color can be set to change from green to red, or from red to green, according to the status of the comparison criterion.



Display Auto-return Time

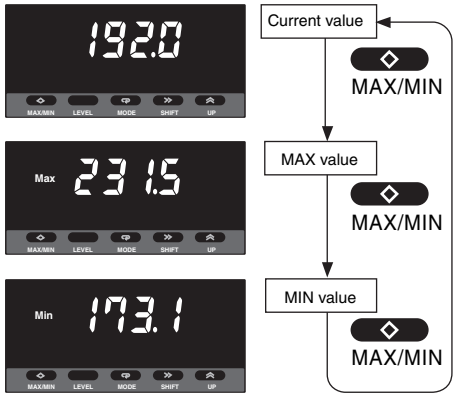
This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

Move-to-Protect-Level Time

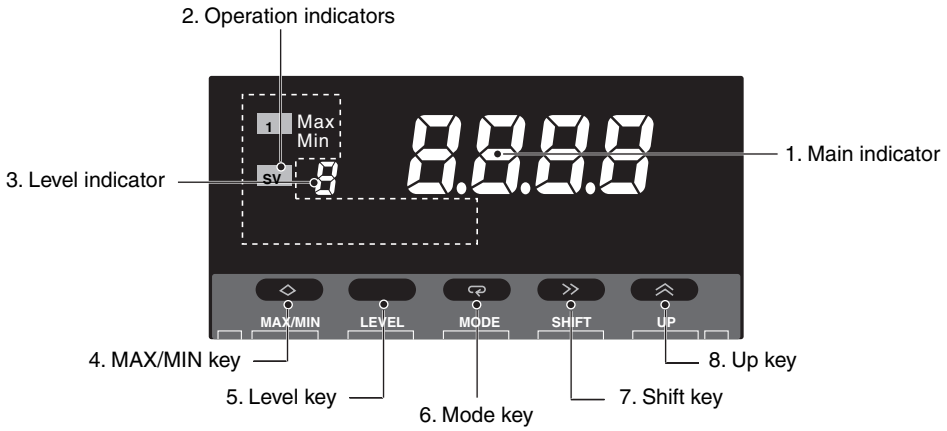
The time required to shift to the protect level can be set as desired.

MAX/MIN Display

The maximum and minimum measurement (display) values from the time the power is turned ON until the current time can be stored and displayed. This is useful, for example, when measuring the maximum value.



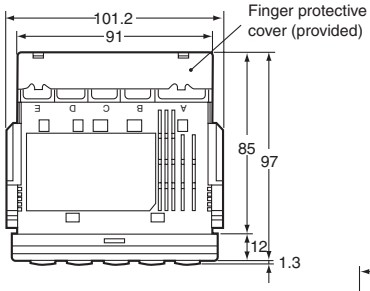
Nomenclature



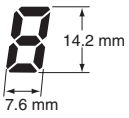
Name		Functions
1. Main indicator		Displays current values, parameters, and set values.
2. Operation indicators	1	Lit when output 1 is ON.
	SV	Lit when a set value is being displayed or changed.
	Max	Lit when the main indicator is showing the MAX value.
	Min	Lit when the main indicator is showing the MIN value.
3. Level indicator		Displays the current level that the K3MA-L is in. (See below for details.)
4. MAX/MIN Key		Used to display the MAX and MIN values when a measurement value is being displayed.
5. Level Key		Used to change the level.
6. Mode Key		Used to allow the main indicator to indicate parameters sequentially.
7. Shift Key		Used to enable a set value to be changed. When changing a set value, this key is used to move along the digits.
8. Up Key		Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed.

Level indicator	Level
P	Protect
Not lit	Operation
A	Adjustment
S	Initial setting
F	Advanced-function setting

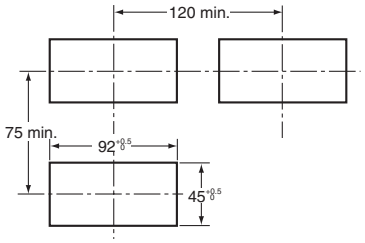
Dimensions



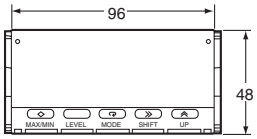
Main indicator character size

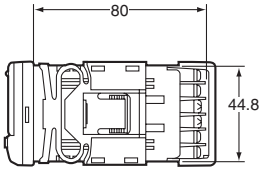


Panel cut-out



Mounting Recommended Panel Thickness
1 to 8 mm.
Mount the product horizontally.

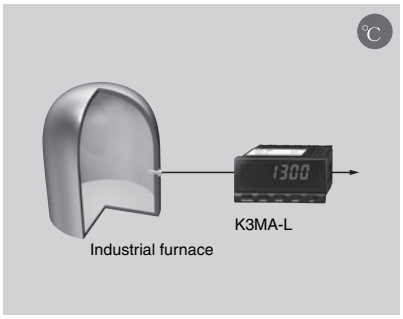




The K3MA-L uses M3 terminals.
A terminal cover is provided.

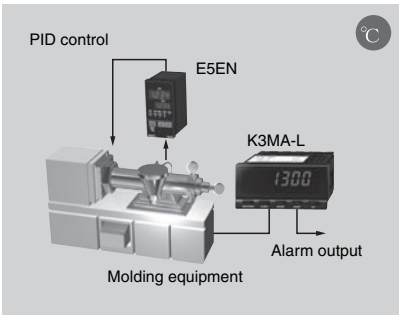
Application Examples

Monitoring the temperature of an industrial furnace



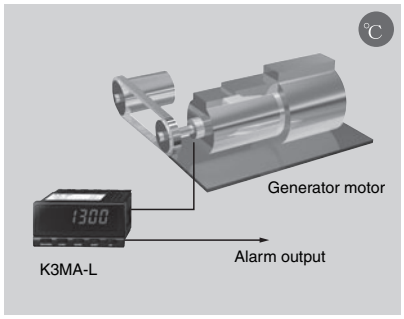
- Monitoring the temperature of an industrial furnace/sintering furnace.
- Monitoring/alarm function for disinfecting equipment.

Sending a temperature alarm for molding equipment



- Monitoring (failsafe checking) abnormal temperatures in molding equipment.
- Monitoring the liquid temperature for cleaning devices.

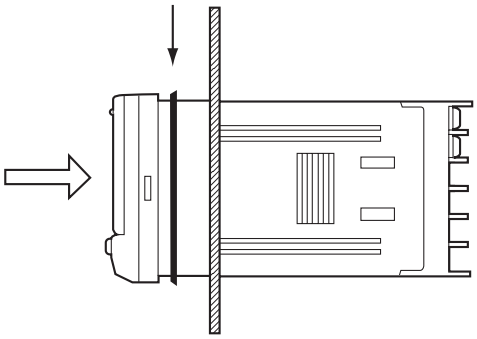
Monitoring the bearing temperature for a generator motor



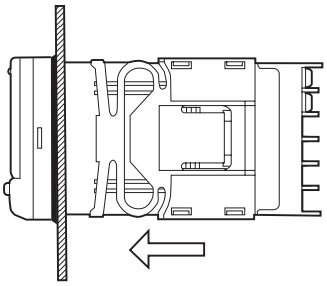
- Monitoring temperature rises in electric power generating facilities.
- Inspecting temperatures in machines and devices.

Installation

1. Insert the K3MA-L into the panel cut-out hole.
2. For a waterproof installation, insert the rubber gasket onto the body of the K3MA-L.

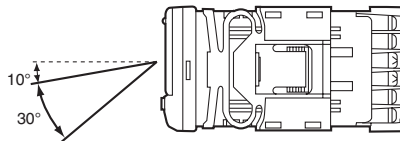


3. Fit the adaptor into the grooves on the left and right sides of the rear case, then push it until it contacts the panel to secure the K3MA-L.



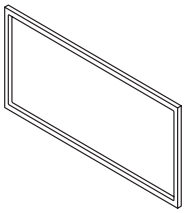
■ LCD Angle of View

The K3MA is designed to provide the best visibility at the angles shown in the following diagram.



■ Rubber Packing (Sold Separately)

K32-P1



If the rubber packing is lost or damaged, it can be ordered using the following model number: K32-P1.

(Depending on the operating environment, deterioration, contraction, or hardening of the rubber packing may occur and so, in order to ensure the level of waterproofing specified in NEMA4, periodic replacement is recommended.)

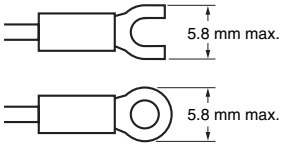
Note: Rubber packing is provided with the Controller.

■ Wiring Precautions

- Use crimp terminals.
- Tighten the terminal screws to a torque of approximately 0.5 N·m.
- To avoid the influence of noise, route signal lines and power lines separately.

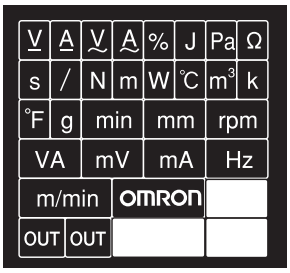
■ Wiring

- Use the following M3 crimp terminals.



■ Unit Labels (Provided)

- The unit labels are not attached to the K3MA-L. Select the desired labels from the provided sheet.



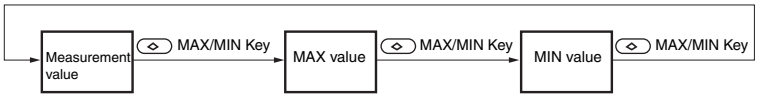
Note: For scales and gauges, use the unit labels that are specified by the relevant laws or regulations.

Operating Procedures

■ Operations in Run Mode

Checking the Maximum and Minimum Values

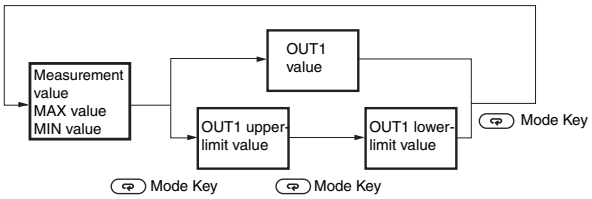
The maximum and minimum values can be displayed by pressing the MAX/MIN Key while the measurement is being displayed.



The maximum and minimum values can be reset by pressing the MAX/MIN Key for 1 s min. when the maximum or minimum value is displayed.

Checking and Setting Comparative Set Values (for Models with the Comparative Output Function)

Each time the Mode Key is pressed when the measurement value, maximum value, or minimum value is displayed, the comparative values will be displayed in the following order: OUT1 value (or OUT1 upper-limit value, OUT1 lower-limit value).

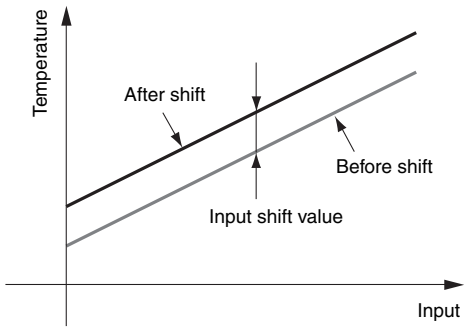


■ Adjustment Level Operation

Setting Temperature Input Shift Values

Temperature Input Shift

A shift value can be set for a temperature input.

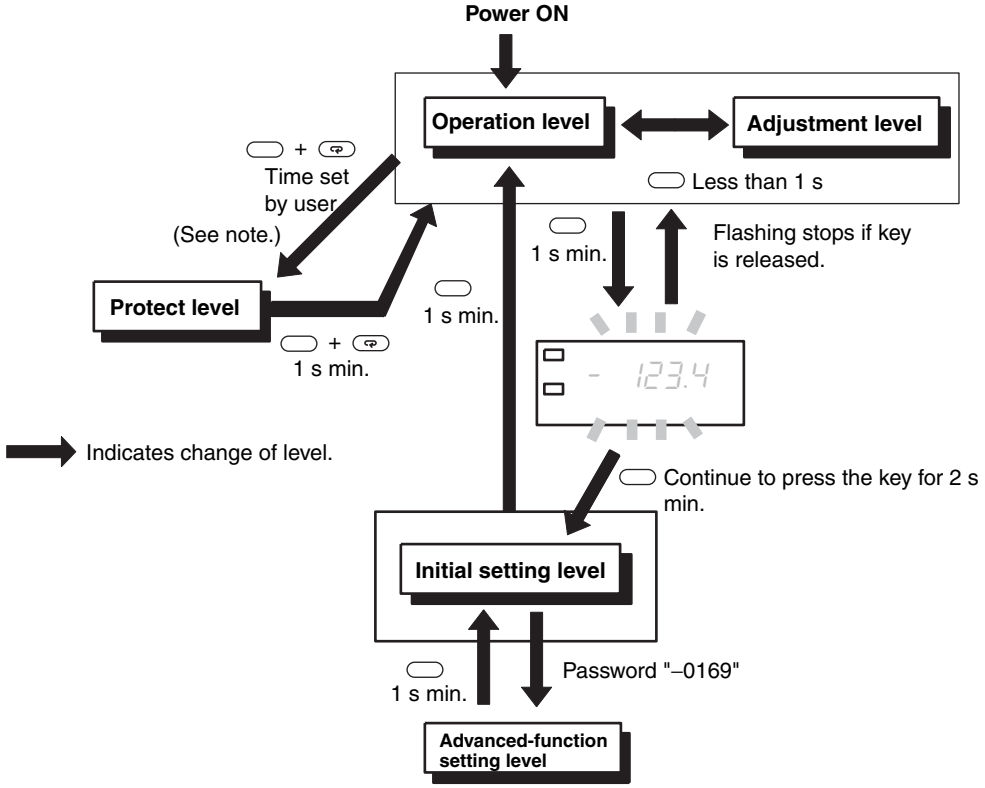


The value set for the temperature input shift is applied to the entire measurement range of the temperature sensor.

■ Levels

"Level" refers to a grouping of parameters. The following table lists the operations that are possible in each of the levels, and the diagram tells how to move between levels. There are some parameters that are not displayed for certain models.

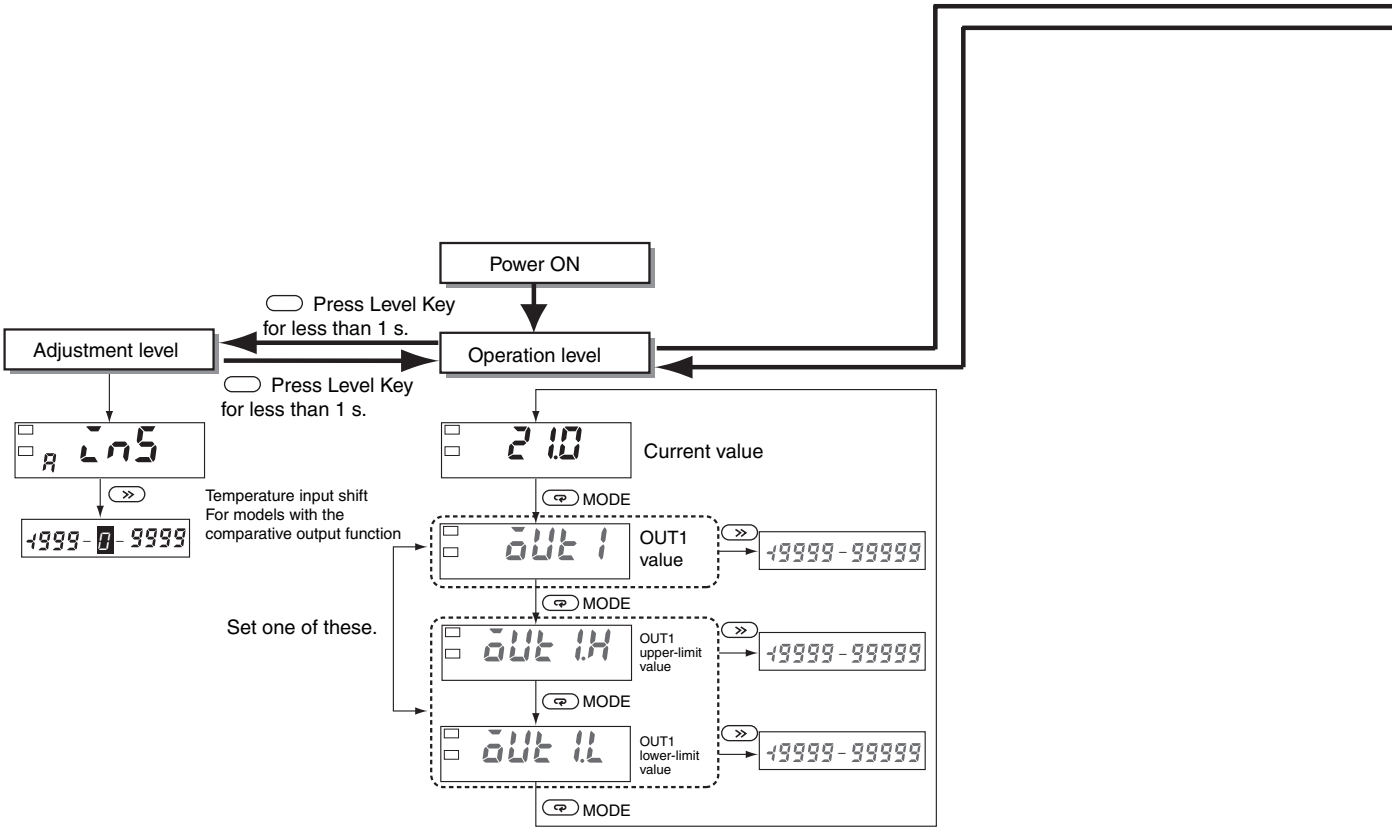
Level name	Function	Measurement
Protect	Setting lockouts.	Continue
Operation	Displaying current values, and setting OUT 1 value.	Continue
Adjustment	Setting communications writing control.	Continue
Initial setting	Making initial settings of input type, output operating action, and other parameters.	Stopped
Advanced-function setting	Setting average processing, display color settings, and other advanced function parameters.	Stopped



Note: The move-to-protect-level time can be set in the advanced-function setting level.

■ Parameters

Note: 1. Some parameters are not displayed for certain models.
2. The K3MA-L will stop measurement if the level is changed to the initial setting level or the advanced-function setting level.
3. If the input range is changed, some parameters are set to default values. Therefore, set the input range first.
4. Settings displayed in reversed colors are defaults.



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