

## Authorised Distributors:-

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## Frequency/Rate Meter

# K3MA-F

CSM\_K3MA-F\_DS\_E\_5\_1

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

- Contact, NPN, PNP, or voltage pulse input.
- Front-panel key operation for easy setting.
- Average processing function suppresses flicker.
- Includes scaling, auto-zero time, startup compensation time functions.
- Easy confirmation of max/min display.
- Short 80-mm depth (measured from edge of face plate).
- Finger protective cover (standard equipment) guards against electric shock.
- Water- and dust-proof NEMA4X (IP66 equivalent) front panel.
- Recognized to U.S. and Canadian requirements under the Component Recognition Program of UL.
- CE marking.
- Built-in external power supply (12 VDC, 40 mA).



 Refer to Safety Precautions for All Digital Panel Meters.

## Model Number Structure

### Model Number Legend

K3MA-F-

1    2    3

- |   |   |
|---|---|
| <p>1. Input Type</p> <p>F: Rotary pulse</p> <p>2. Output Type</p> <p>None: No output</p> <p>A2: 2 relay contact outputs (SPST-NO)</p> | <p>3. Supply Voltage</p> <p>100-240VAC: 100 to 240 VAC</p> <p>24VAC/VDC: 24 VAC/VDC</p> |
|---|---|

## Ordering Information

### List of Models

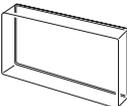
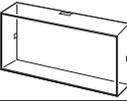
| Input type   | Supply voltage | Output                            | Model                |
|--------------|----------------|-----------------------------------|----------------------|
| Rotary pulse | 100 to 240 VAC | None                              | K3MA-F 100-240VAC    |
|              |                | 2 relay contact outputs (SPST-NO) | K3MA-F-A2 100-240VAC |
|              | 24 VAC/VDC     | None                              | K3MA-F 24VAC/VDC     |
|              |                | 2 relay contact outputs (SPST-NO) | K3MA-F-A2 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 |  | K32-49S C |
| Hard Cover              |  | K32-49HC  |



## ■ Characteristics

|                                     |  |
|-------------------------------------|--|
| <b>Input signal</b>                 | No-voltage contact (30 Hz max., ON/OFF pulse width: 15 ms min.)<br>Voltage pulse (5 kHz max., ON/OFF pulse width: 90 μs min., ON voltage: 4.5 to 30 V/OFF voltage: 0 to 2 V)<br>Open collector (5 kHz max., ON/OFF pulse width 90 μs min.)<br><b>Connectable Sensors</b><br>ON residual voltage: 2.5 V max.<br>OFF leakage current: 0.1 mA max.<br>Load current: Must have switching capacity of 15 mA min.<br>Must be able to dependably switch a load current of 5 mA max. |
| <b>Measuring accuracy</b>           | ±0.1%FS ±1 digit (at 23±5°C)   |
| <b>Measurement method</b>           | Cycle measurement  |
| <b>Max. displayed digits</b>        | 5 digits (–19999 to 99999)   |
| <b>Display</b>                      | 7-segment digital display, Character height: 14.2 mm   |
| <b>Polarity display</b>             | “–” is displayed automatically with a negative input signal.   |
| <b>Zero display</b>                 | Leading zeros are not displayed.   |
| <b>Scaling function</b>             | Programmable with front-panel key inputs (range of display: –19999 to 99999).<br>The decimal point position can be set as desired.   |
| <b>Hold function</b>                | Max hold (maximum value), Min hold (minimum value)   |
| <b>Hysteresis setting</b>           | Programmable with front-panel key inputs (0001 to 9999).   |
| <b>Other functions</b>              | Scaling teach function<br>Display color change (green (red), green, red (green), red)<br>OUT type change (upper limit, lower limit, upper/lower limit)<br>Average processing (simple average OFF/2/4/8 operations)<br>Auto-zero time<br>Startup compensation time<br>Setting change lockout<br>Parameter initialization<br>Display auto-return time  |
| <b>Output</b>                       | Relays: 2 SPST-NO  |
| <b>Delay in comparative outputs</b> | 750 ms max.  |
| <b>Degree of protection</b>         | Front panel: NEMA4X for indoor use (equivalent to IP66)<br>Rear case: IEC standard IP20<br>Terminals: IEC standard IP00 + finger protection (VDE0106/100)  |
| <b>Memory protection</b>            | Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)   |

## ■ Measuring Ranges

### No-voltage Contact/Open Collector Inputs

| Input   | Measuring range  | Measuring accuracy                    | Displayable range                          |
|---|------------------|---------------------------------------|--|
| No-voltage contact (30 Hz max.) with ON/OFF pulse width of 15 ms min. | 0.05 to 30.00 Hz | ±0.1% FS ±1 digit max.<br>(at 23±5°C) | –19999 to 99999<br>(with scaling function) |
| Open collector (5 kHz max.) with ON/OFF pulse width of 90 μs min.     | 0 to 5 kHz       |                                       |  |

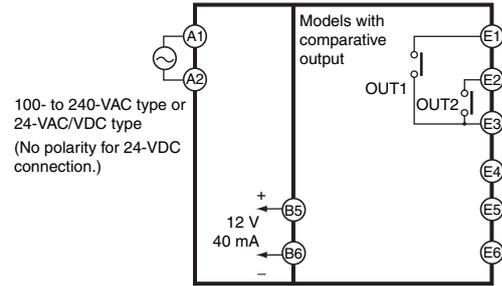
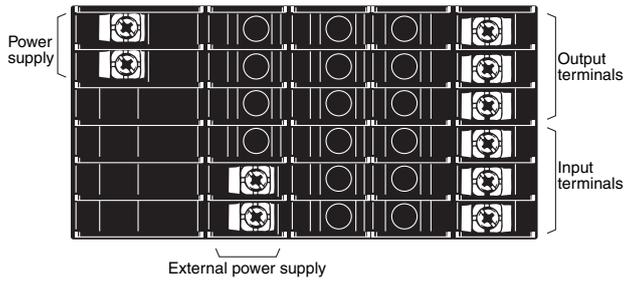
## ■ Input/Output Ratings

### Relay Contact Output

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

# Connections

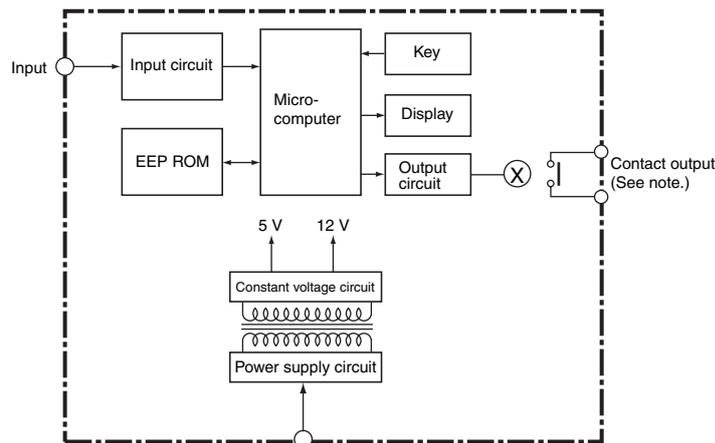
## Terminal Arrangement



**Note:** Refer to *Input Circuits* on page 5.

| Terminal No. | Name                  | Description                             |
|--------------|-----------------------|---|
| A1 - A2      | Operation power       | Connects the operation power supply.    |
| E4, E6 - E5  | Pulse input           | No-voltage contact/open collector input |
| E1, E2 - E3  | Outputs               | Outputs the relay outputs.              |
| B5 - B6      | External power supply | Use as the power supply for sensors.    |

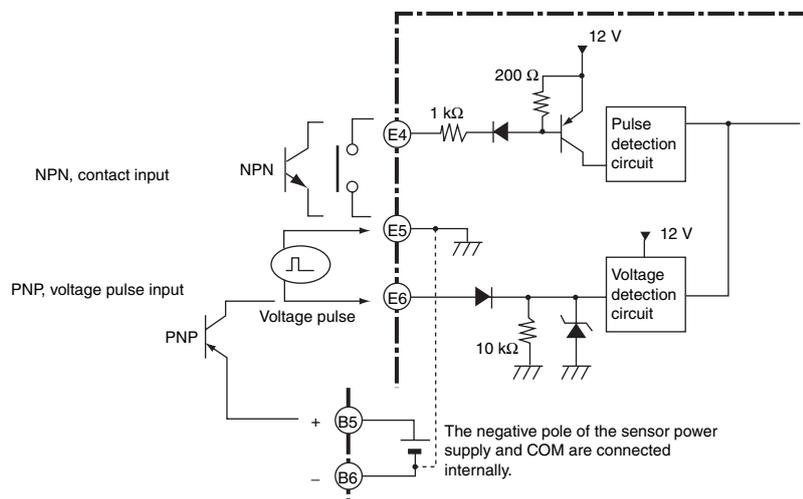
## Block Diagram



**Note:** Relay output models only.

## Input Circuits

### Pulse Input



# Operation

## ■ Main Functions

### Input Types and Ranges

| Frequency range (setting parameter) | Function                    | Input range (setting parameters) | Setting range   |
|-------------------------------------|-----------------------------|----------------------------------|---|
| Pulse frequency selection (P-FrE)   | Selects pulse input signal. | 0.05 to 30.00 Hz (30)            | Displayable from -19999 to 99999 with scaling function.<br>The position of the decimal point can be set as desired. |
|                                     |                             | 0 to 5 kHz (5P)                  |   |

### Pulse Frequency Selection

| Parameter | Setting value | Meaning                            |
|-----------|---------------|------------------------------------|
| P-FrE     | 30            | 0.05 to 30.00 Hz measurement range |
|           | 5P            | 0 to 5 kHz measurement range       |

**Note:** The default value is “0 to 5 kHz (5P).”

### Scaling

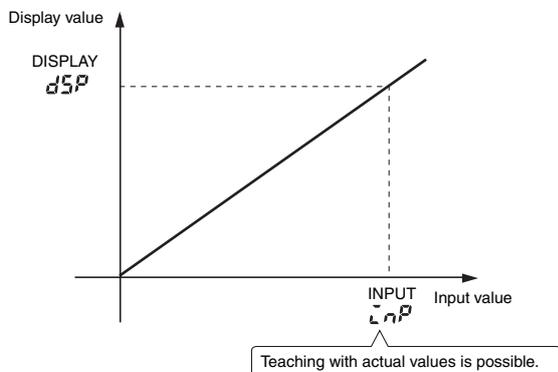
When the desired display value is set for a corresponding input, the value will be displayed on a line between two points determining the zero point.

| Parameter | Setting value    | Meaning               |
|-----------|------------------|-----------------------|
| LnP       | 0 to 99999       | Input value for dSP   |
| dSP       | - 19999 to 99999 | Display value for LnP |

| Parameter | Setting value | Meaning                                  |
|-----------|---------------|--|
| dP        | 0.0000        | Display four digits after decimal point  |
|           | 00.000        | Display three digits after decimal point |
|           | 000.00        | Display two digits after decimal point   |
|           | 0000.0        | Display one digit after decimal point    |
|           | 00000         | No decimal point                         |

**Note:** The initial value will change depending on the pulse frequency selection.

- The decimal point can be optionally displayed.
- When displaying the decimal point, consider the number of digits to follow the decimal point prior to setting the scaling display value.
- If P-FrE is set to 30, the initial setting for the decimal display will be 000.00.

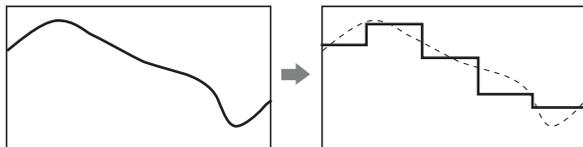


Instead of setting by inputting with the Up Key and Shift Key, current values can be input as scaling input values for teaching. This is useful for making settings while checking the operation status of the K3MA-F.



## Average Processing

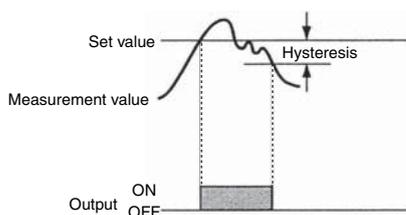
Average processing stabilizes the display by minimizing any pulsating or flicker caused by fluctuations in the pulse width of sensor input or by eccentricity in rotating shafts.



## 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)



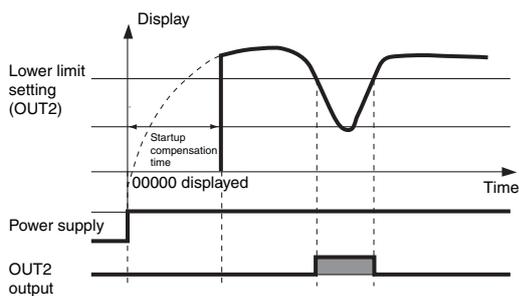
## Auto-zero Time

This function sets the time for the display to return to zero when input pulses stop. Set the time longer than the expected input pulse cycle (the interval between one input pulse and the next). Proper measurement is not possible if the time is set shorter than the input pulse cycle.

Setting range: 0.0 to 19.9 s

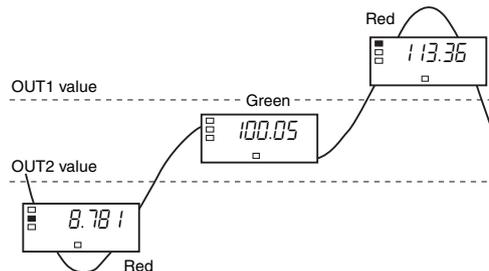
## Startup Compensation Time

The startup compensation time is the time to wait for the measurement operation to be entered after the power supply of the K3MA-F is turned ON. Use this parameter to cancel measurement and comparative output operation until the a rotating body reaches its normal speed when the power supply to the K3MA-F and rotating body are turned ON at the same time.



## 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

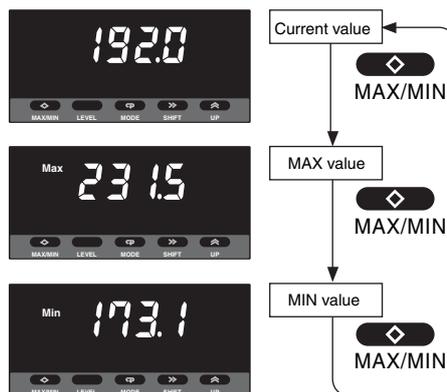
This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

## Move-to-Protect-Level Time

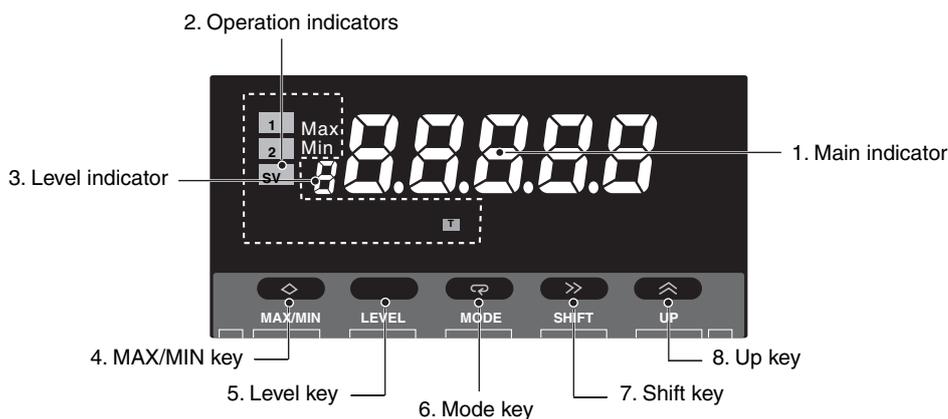
The time required to shift to the protect level can be set as desired.

## 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.



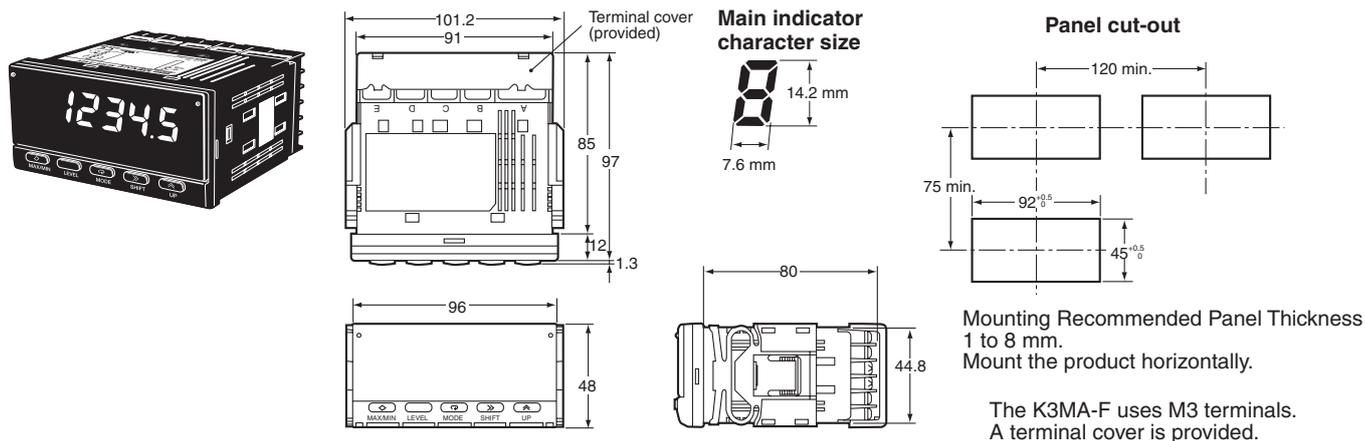
# Nomenclature



| Name                    | Functions  |  |
|-------------------------|--|--|
| 1. Main indicator       | Displays current values, parameter names (abbreviations), and comparative value settings.                            |  |
| 2. Operation indicators | 1  | Lit when output 1 is ON.   |
|                         | 2  | Lit when output 2 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.  |
|                         | T  | Lit when the teaching function is operable. Blinks while the teaching function is operating. |
| 3. Level indicator      | Displays the current level that the K3MA-F 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. The level can be switched between operation level and initial setting 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. |  |

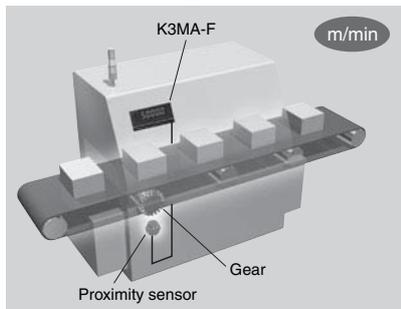
| Level indicator | Level                     |
|-----------------|---------------------------|
| $\overline{P}$  | Protect                   |
| Not lit         | Operation                 |
| $\overline{S}$  | Initial setting           |
| $\overline{F}$  | Advanced function setting |

## Dimensions



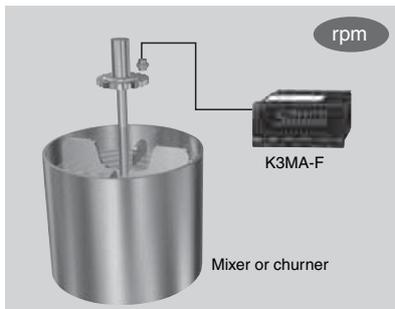
## Application Examples

### Displaying conveyor belt feed speed



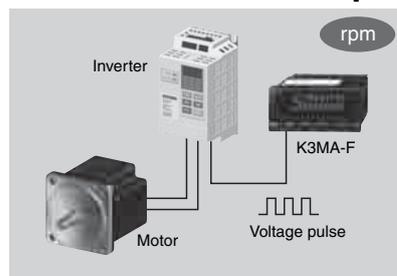
- Monitoring line speed for a reflow furnace
- Displaying feed speed for food processing, conveying, sintering

### Monitoring the rotations of a mixer or churner



- Mixers for resin molding
- Powdering/pelleting machines, centrifugal separators

### Displaying the monitor output from an inverter as rotations or line speed

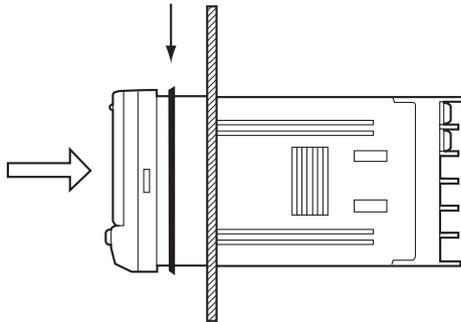


**Note:** If the monitor output from the inverter is analog, such as 0 to 10 V, use the K3MA-J.

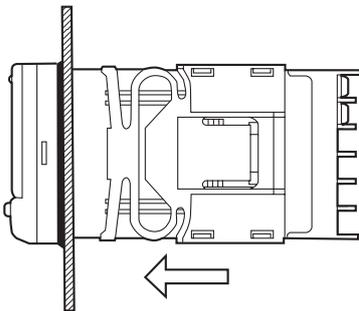
- Monitoring conveyor speed
- Machining equipment (grinders, polishers)

# Installation

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

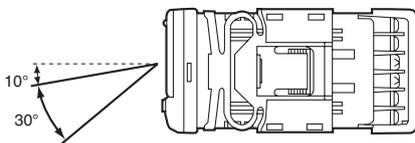


3. Fit the adaptor into the grooves on the left and right sides of the rear case, then push it until it contacts the panel to secure the K3MA-F.



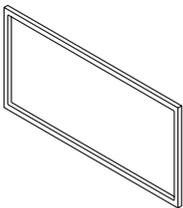
## ■ LCD Angle of View

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.)

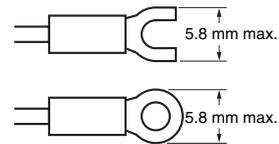
**Note:** Rubber packing is provided with the Controller.

## ■ 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-F. Select the desired labels from the provided sheet.

|       |       |     |    |     |    |                |   |
|-------|-------|-----|----|-----|----|----------------|---|
| V     | A     | V   | A  | %   | J  | Pa             | Ω |
| s     | /     | N   | m  | W   | °C | m <sup>3</sup> | k |
| °F    | g     | min | mm | rpm |    |                |   |
| VA    | mV    | mA  | Hz |     |    |                |   |
| m/min | OMRON |     |    |     |    |                |   |
| OUT   | OUT   |     |    |     |    |                |   |

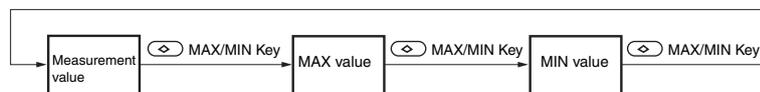
**Note:** For scales and gauges, use the unit labels that are specified by the relevant laws or regulations.

# Operating Procedures

## Operations in Run Mode

### Checking the Maximum and Minimum Values

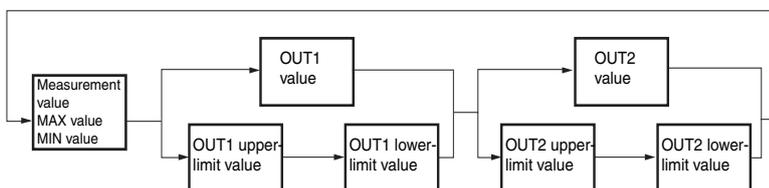
The maximum and minimum values can be displayed by pressing the MAX/MIN Key while the measurement is being displayed.



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 1), OUT 2 value (or OUT2 upper-limit value, OUT2 lower limit value 2).

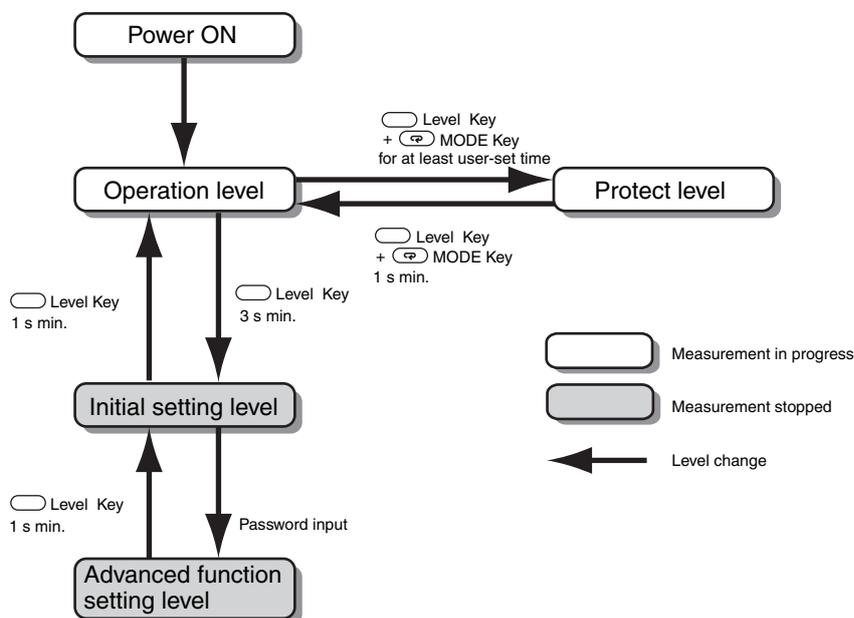


**Note:** When the comparative value is displayed, it can be changed by pressing the Shift Key and the Up Key (when key protection is OFF).

## Levels

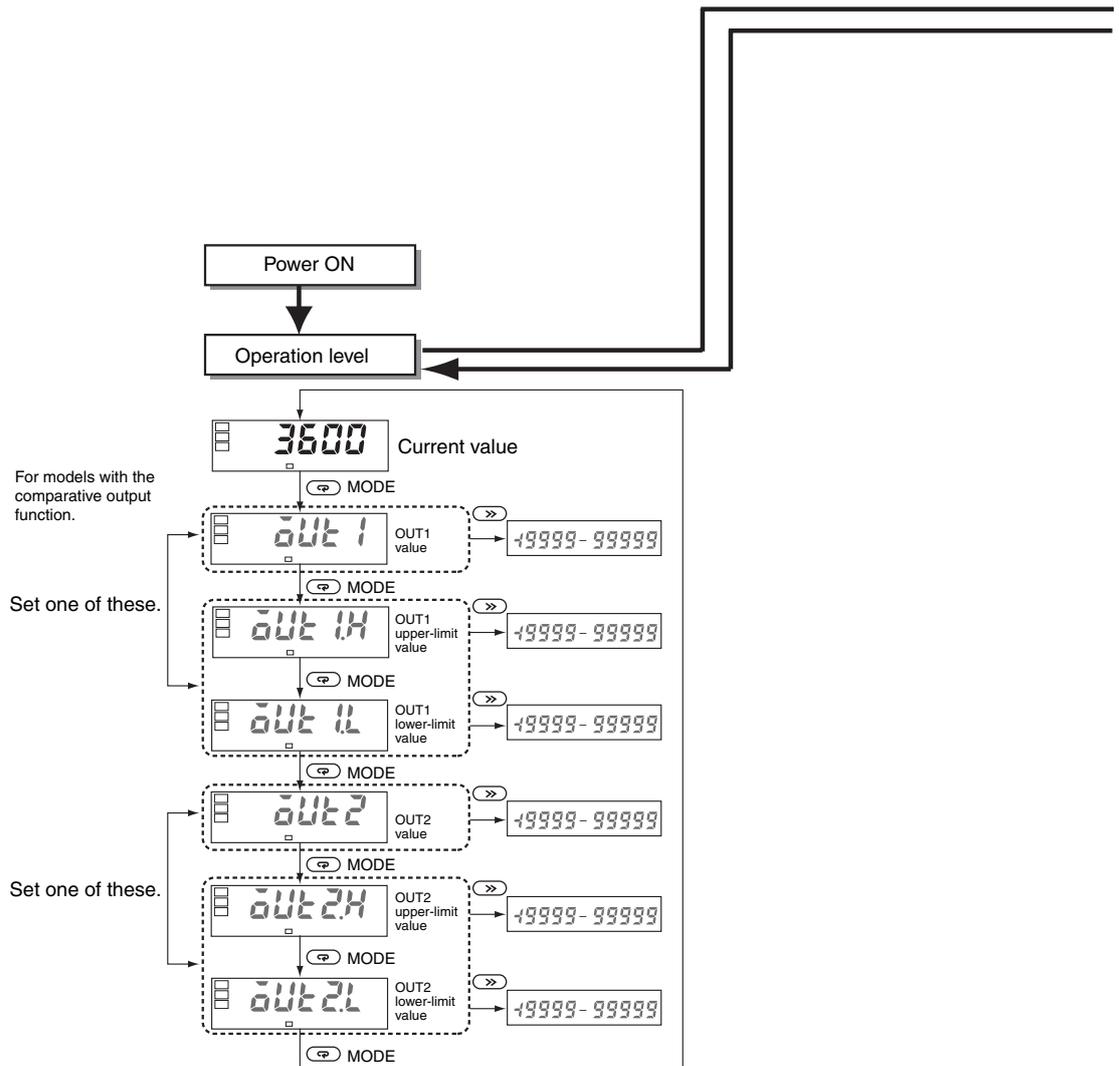
“Level” refers to a grouping of parameters. The following table lists the operations that are possible in each of the levels, and the diagram tells how to move between levels. There are some parameters that are not displayed for certain models.

| Level name                | Function   | Measurement |
|---------------------------|--|-------------|
| Protect                   | Setting lockouts.  | Continue    |
| Operation                 | Displaying current values, and setting OUT 1/2 set values.                                     | Continue    |
| Initial setting           | Making initial settings of input type, scaling, output operating action, and other parameters. | Stopped     |
| Advanced function setting | Setting average processing, display color settings, and other advanced function parameters.    | Stopped     |



## Parameters

- Note:**
1. Some parameters are not displayed for certain models.
  2. The K3MA-F 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.



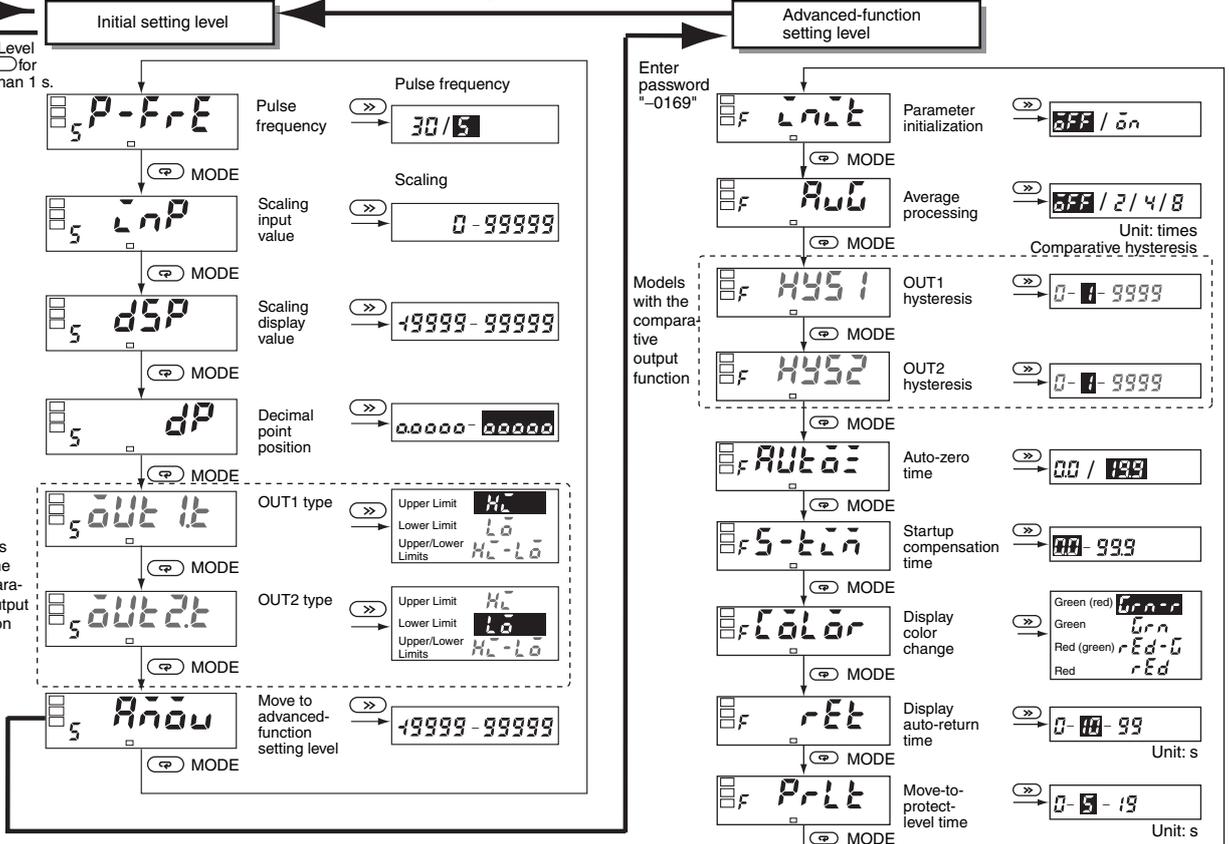
Press Level Key  $\square$  for more than 3 s.

To change a setting, press the Shift Key  $\gg$  again, and then make the change with the Up Key  $\uparrow$ .

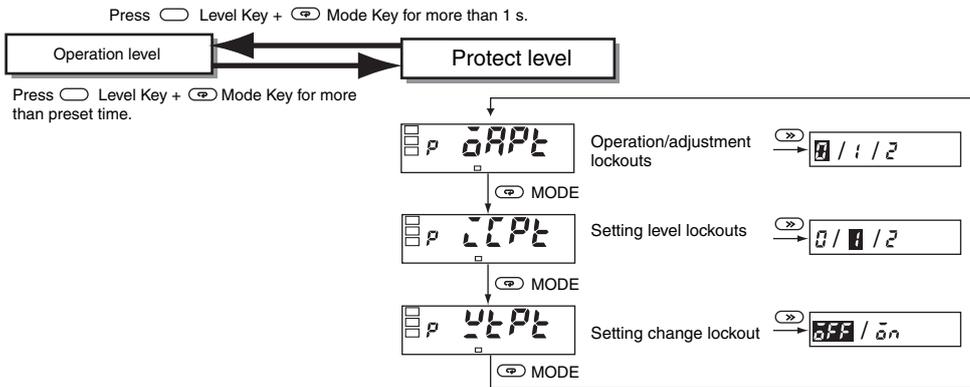
Press Level Key  $\square$  for less than 1 s.

Press Level Key  $\square$  for more than 1 s.

Models with the comparative output function



Settings displayed in reversed colors are initial settings.



## Operation/Adjustment Lockouts

Restricts key operations for operation level and adjustment level.

| Parameter | Setting | Operation level       |                   |
|-----------|---------|-----------------------|-------------------|
|           |         | Current value display | Set value display |
| 0APL      | 0       | Allowed               | Allowed           |
|           | 1       | Allowed               | Allowed           |
|           | 2       | Allowed               | Prohibited        |

- Initial setting is 0.
- This is not displayed on models with no comparative output function.

## Setting Level Lockouts

Restricts shifting to initial setting level or advanced function setting level.

| Parameter | Setting | Shift to initial setting level | Shift to advanced function setting level |
|-----------|---------|--------------------------------|--|
| LCPLE     | 0       | Allowed                        | Allowed                                  |
|           | 1       | Allowed                        | Prohibited                               |
|           | 2       | Prohibited                     | Prohibited                               |

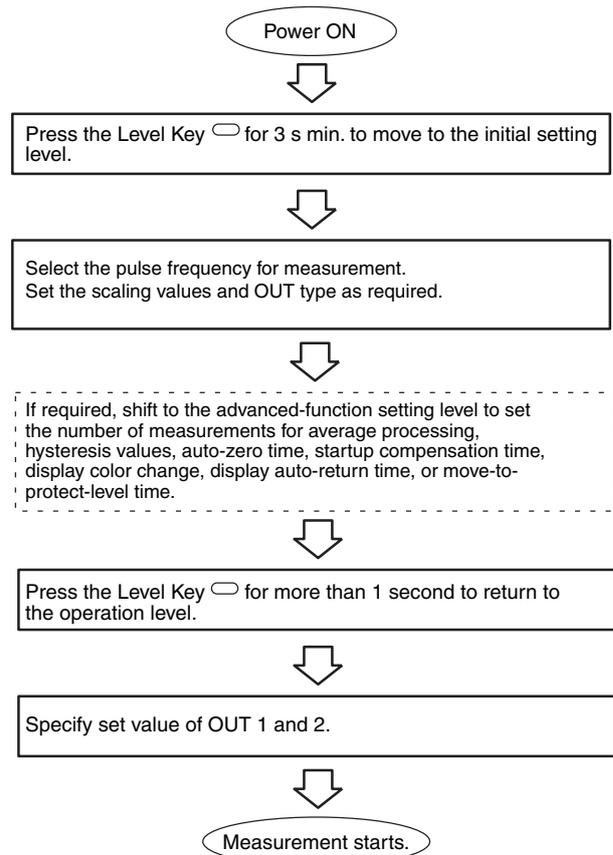
## Setting Change Lockout

Restricts setting changes by key operation. When this lockout is set, it is no longer possible to shift to a setting change mode.

| Parameter | Setting | Setting change by key operation |
|-----------|---------|---------------------------------|
| ULPLE     | 0FF     | Allowed                         |
|           | 0n      | Prohibited                      |

However, all protect level parameters can still be changed.

## Initial Settings

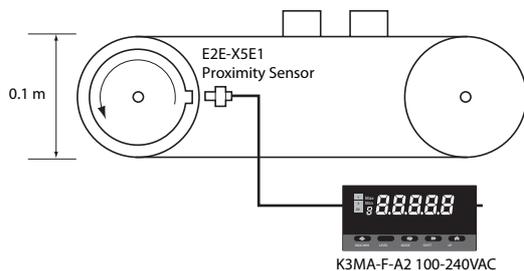


## Setting Example

### Initial Settings

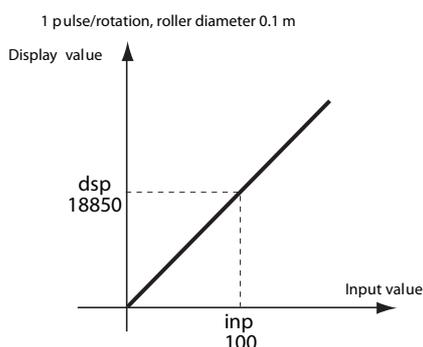
The settings for the following example are shown here.

#### Example: Display conveyor belt feed speed



Here, the conveyor belt feed speed is to be displayed in units of 0.1 m/min.

- Proximity Sensor: E2E-X5E1, NPN output



When displaying a flowrate (e.g., in l/min or l/h), make the scaling settings after confirming the I/O characteristics of the flowrate sensor. There are flowrate sensors that output analog signals. If this kind of flowrate sensor is used, consider using the K3MA-J.

- Select the maximum input frequency for the K3MA-F. Set the pulse frequency selection to either 30 Hz or 5 kHz. In the example, this is set to 30 Hz because the conveyor belt is turning at a slow speed.  
Parameter: p-fre (pulse frequency), Setting value: 30
- Set the scaling. The display value (D) is shown with the following formula.  
 $D = f \times \alpha$   
f: frequency and  
 $\alpha$ : prescaling value  
The value of  $\alpha$  will be internally calculated and registered if the input value (f) and the display value (D) are set.  
The number of rotations or speed is shown with the following formula.  
Rotations (rpm) = Frequency input/No. of pulses per rotation  $\times 60$   
Cycle speed D (m/min) = Rotations  $\times$  roll circumference  
=  $1/N \times f \times 60 \times d \times \pi$   
N: No. of pulses per rotation  
f: Frequency (Hz)  
d: Roller diameter (m)

When the input conditions are applied to this equation, we obtain the following:

$$\text{Display value} = 1/1 \times f \times 60 \times 0.1 \times \pi$$

For an input of 1 Hz, the display value is 18.8495 (m/min).

The scaling settings for the K3MA-F must be integers. Also, to decrease error, the scaling value is multiplied by 1,000, to obtain an input of 1000 Hz and a display value of 18850. However, because the display value in this case is displayed to the first decimal place, the scaling is set as shown in the following example so that 1885.0 is displayed for an input of 100 Hz.

| Parameter                   | Setting value |
|-----------------------------|---------------|
| inp (scaling input value)   | 100           |
| dsp (scaling display value) | 18850         |
| dp (decimal point position) | %%%.%         |

Note: The decimal point position here refers to the position in the number after scaling. When setting the scaling display value, it is necessary to consider the number of digits to be displayed past the decimal point.

## Troubleshooting

When an error occurs, error details will be displayed on the main indicator. Confirm the error from the main indicator and take the appropriate countermeasures.

| Level display | Main indicator | Error contents                                  | Countermeasures  |
|---------------|----------------|---|--|
| Not lit       | e111           | RAM memory error                                | Repair is necessary.<br>Consult your OMRON sales representative.   |
| 5             | e111           | EEPROM memory error                             | When this error is displayed, press the Level Key for 3 seconds, and the settings will be restored to the factory settings.<br>If the error cannot be recovered, repair is necessary. Consult your OMRON sales representative. |
| Not lit       | Flashes 99999  | The scaling display value exceeds 99999.        | Promptly change the input to a value that falls within the specified range.<br>The scaling value may be inappropriate. Review the scaling value at the initial setting level.  |
| Not lit       | Flashes -19999 | The scaling display value is lower than -19999. | Promptly change the input to a value that falls within the specified range.<br>The scaling value may be inappropriate. Review the scaling value at the initial setting level.  |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.



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