GENERAL CATALOGUE 2004/2005

# Industrial Components


- Electromechanical Relays
- Timers
- Counters
- Programmable Relays
- Level Controllers
- Limit Switches
- Pushbutton Switches
- Low Voltage Switch Gear
- Temperature Controllers
- Solid State Relays
- Panel Indicators
- Power Supplies

Advanced Industrial Automation

Cat. No. Y202-EN2-02 ICD

OMRON

# Panel Indicators


| | | | |
|---|---|---|---|
| **Selection Guide** | | | **K-2** |
| **K3GN** | | 1/32 DIN Digital Panel Meter | **K-7** |
| **K3MA-J** | | Process Meter | **K-29** |
| **K3MA-L** | | Temperature Meter | **K-45** |
| **K3MA-F** | | Frequency/Rate Meter | **K-61** |
| **K3HB** | | | |
| | **K3HB-X** | Process Indicator | **K-79** |
| | **K3HB-H** | Temperature Indicator | **K-83** |
| | **K3HB-V** | Weighing Indicator | **K-87** |
| | **K3HB-S** | Linear Sensor Indicator | **K-91** |
| **K3HB** | | Common Specifications | **K-95** |
| **K3NR** | | Frequency/Rate Meter | **K-107** |

# Panel Indicators

| Classification | 1/32 DIN Multifunctional Digital Panel Indicator | 1/8 DIN Process Indicator | 1/8 DIN Temperature Indicator |
|---|---|---|---|
| **Model** | **K3GN** | **K3MA-J** | **K3MA-L** |
| **Appearance** |  |  |  |
| **Features** | • 5 Digit display with programmable display colour<br>• User selectable inputs (Voltage/Current/Frequency)<br>• Easy configuration through panel keys or RS485 comms<br>• Scaling in a wide range of engineering units<br>• Programmable output operation, decimal point pos. setting, zero suppression, average processing | • 5 Digit display with colour change, 2-colour LEDs (Red and Green)<br>• Front panel key operation and configuration<br>• Scaling in a wide range of engineering units<br>• Programmable output operation, decimal point pos. setting, zero suppression, average processing, min/max hold function | • 4 Digit display with colour change, 2-colour LEDs (Red and Green)<br>• Front panel key operation and configuration<br>• Scaling in a wide range of engineering units<br>• Programmable output operation, zero suppression, average processing, min/max hold fucntion |
| **Measuring modes** | – | – | – |
| **Model Variations** | • DC Voltage/Current, NPN<br>• DC Voltage/Current, PNP | • DC Voltage/Current | • Platinum-resistance or Thermocouple thermometer |
| **Input ranges** | • DC Voltage: 0/1..5 V, -5..5 V, -10..10 V<br>• DC Current: 0/4..20 mA<br>• No voltage: 0.05..30.00 Hz<br>• Open collector: 0.1..5000.0 Hz | • DC Voltage: 0/1-5V, -5- 5V, -10- 10 V<br>• DC Current: 0/4-20 mA | • Thermocouples: K, J, T, E, L, U, N, R, S, B<br>• Pt-100 and JPt-100 |
| **Indication Accuracy** | +/- 0.1% FS max, +/- 1 digit max. | +/- 0.1% FS max, +/- 1 digit max. | +/- 0.5% FS max, +/- 1 digit max. |
| **Outputs** | • Dual Relay SPST-NO 1A at 30 VDC<br>• Triple PNP or NPN; 50 mA 24 VDC | • Dual Relay SPST-NO 5A at 30 VDC | • 1 Relay 5 A at 30 VDC |
| **Sample Rate** | 4 Hz | 4 Hz | 2 Hz |
| **Communication** | RS-485 | – | – |
| **Supply Voltage** | 24 VDC (85..110% of rated voltage) | 100..240 VAC and 24 VAC/VDC (85..110% of rated voltage) | 100..240 VAC and 24 VAC/VDC (85..110% of rated voltage) |
| **IP grade** | IP66 | IP66 | IP66 |
| **Dimensions (mm)** | 48 x 24 x 80 (W x H x D) | 96 x 48 x 85 (W x H x D) | 96 x 48 x 85 (W x H x D) |
| **Approvals** | UL, CSA, IEC, CE | UL, CE | UL, CE |
| **Page No.** | K-7 | K-29 | K-45 |

| 1/8 DIN Frequency/Rate meter | 1/8 Din Voltage and Current Process Indicator | 1/8 Din Temperature Indicator | 1/8 Din Weighing Indicator |
|---|---|---|---|
| **K3MA-F** | **K3HB-X** | **K3HB-H** | **K3HB-V** |
|  |  |  |  |
| • 5 Digit display with colour change, 2-colour LEDs (Red and Green)<br>• Front panel key operation and configuration<br>• Scaling in a wide range of engineering units<br>• Programmable output operation, decimal point pos. setting, zero suppression, average processing, min/max hold function, par. Initialization, start-up compensating time, auto-zero time | • 5 digit display, display colour change<br>• Input Calculation, User defined scaling, decimal point selection, Average Processing<br>• Timing Hold, Timing delay<br>• Forced Zero, Tare<br>• Teach Operation, bank selection<br>• Comparative Output, On/Off delays<br>• Max/Min Hold<br>• Modular structure | • Temperature input compensation<br>• 5 digit display, display colour change<br>• User defined scaling, decimal point selection, Average Processing<br>• Timing Hold, Timing delay<br>• Bank selection<br>• Comparative Output, On/Off delays<br>• Max/Min Hold<br>• Modular structure | • 5 digit display, display colour change<br>• Input Calculation, User defined scaling, decimal point selection, Average Processing<br>• Timing Hold, Timing delay<br>• Forced Zero, Tare<br>• Teach Operation, bank selection<br>• Comparative Output, On/Off delays<br>• Max/Min Hold<br>• Modular structure |
| – | – | – | Load cell input<br>Load Cell Power Supply<br>Relay Contact/NPN/PNP output |
| • Rotary Pulse | • DC Voltage Input<br>• DC Current Input<br>• AC Voltage Input<br>• AC Current Input<br>• Relay Contact/ NPN / PNP output | • Universal temperature Input<br>• Sensor Power Supply / Linear OP Voltage or Current<br>• Relay Contact/ NPN / PNP output | • Basic model with one process value display<br>• Set value model with 2 displays (PV and SV) |
| • No voltage: 0.05..30.00 Hz<br>• Open collector: 0.1..5000.0 Hz | • DC voltage, from +/-199.99 V, 1.0000 to 5.0000 V<br>• DC current from +/-199.99 mA, to 4.000 to 20.000 mA<br>• AC voltage from 0.0 to 400.0 V to 0.0000 to 1.9999 V<br>• AC current from 0.000 to 10.000 A, 0.0000 to 19.999 mA | PT100, K, J,T,E, L, U, N, R, S, B, W | 0.00 to 199.99 mV<br>0.000 to 19.999 mV<br>100.00 mV<br>199.999 mV |
| +/- 0.1% FS max, +/- 1 digit max. | From ±0.1% rdg or ±1 rdg max to ±0.5% rdg ±20 rdg max. depending on the range | Thermocouple input: ( 0.3% PV or 1 C whichever is larger)<br>1 digit max. although there may be exceptions | 0.00 to 199.99 mV or 0.000 to 19.999 mV: ±0.5% rdg ±5 rdg max.<br>100.00 mV: ±0.1% rdg ±3 rdg max.<br>199.999 mV: ±0.1% rdg ±1 rdg max. |
| • Dual Relay SPST-NO 5 A at 30 VDC | • Relay, Transistor, Linear | • Relay, Transistor, Linear | • Relay, Transistor, Linear |
| – | 50 Hz | 50 Hz | 50 Hz |
| – | DeviceNet/RS-232C/RS-485 | DeviceNet/RS-232C/RS-485 | DeviceNet/RS-232C/RS-485 |
| 100..240 VAC and 24 VAC/VDC (85..110% of rated voltage) | 100 to 240 VAC (50/60 Hz)<br>24 VAC (50/60 Hz)/VDC | 100 to 240 VAC (50/60 Hz)<br>24 VAC (50/60 Hz)/VDC | 100 to 240 VAC (50/60 Hz)<br>24 VAC (50/60 Hz)/VDC |
| IP66 | IP66, NEMA-4X | IP66, NEMA-4X | IP66, NEMA-4X |
| 96 x 48 x 85 (W x H x D) | 96 x 48 x 100 (W x H x D) | 96 x 48 x 100 (W x H x D) | 96 x 48 x 100 (W x H x D) |
| UL, CE | UL, CSA, CE | UL, CSA, CE | UL, CSA, CE |
| K-61 | K-79 | K-83 | K-87 |

# Panel Indicators

| Classification | 1/8 Din Linear Sensor Indicator | 1/8 DIN Frequency/Rate meter (single or dual input) | 1/8 DIN Period Meter |
|---|---|---|---|
| **Model** | **K3HB-S** | **K3NR** | **K3NP** |
| **Appearance** |  |  |  |
| **Features** | • 2000 Hz Sampling, Two Inputs<br>• 5 digit display, display colour change<br>• Input Calculation, User defined scaling, decimal point selection, Average Processing<br>• Timing Hold, Timing delay<br>• Forced Zero, Tare<br>• Teach Operation, bank selection<br>• Comparative Output, On/Off delays<br>• Max/Min Hold<br>• Modular structure | • 5 Digit display, 2-colour LEDs (Red and Green)<br>• Front panel key operation and configuration<br>• Scaling in a wide range<br>• Programmable output operation, decimal point pos. setting, leading zero suppression, average processing, min/max hold function, start-up compensating time, security, remote/local processing, teaching, comparative output pattern selection, memory power failure<br>• Sensor power supply (80 mA at 12 VDC) | • 5 Digit display, 2-colour LEDs (Red and Green)<br>• Front panel key operation and configuration<br>• Scaling in a wide range<br>• Programmable output operation, decimal point pos. setting, leading zero suppression, min/max hold function, time unit display, security, remote/local processing, teaching, comparative output pattern selection<br>• Sensor power supply (80 mA at 12 VDC) |
| **Measuring modes** | – | Rotational/circumferential speed, Absolute ratio, Error ratio, Rotational difference, Flow rate ratio, Passing time, Pulse counting | Passing speed, Cycle, Time difference, Elapsed time, Length measurement, Interval |
| **Model Variations** | • Process Input<br>• Sensor Power Supply / Linear OP Voltage or Current<br>• Relay Contact/ NPN / PNP output | • Basic model with one process value display<br>• Set value model with 2 displays (PV and SV) | • Basic model with one process value display<br>• Set value model with 2 displays (PV and SV) |
| **Input ranges** | 0 to 5 V<br>1 to 5 V<br>5 to 5 V<br>10 to 10 V<br>0 to 20 mA<br>4 to 20 mA | • No voltage contact: 30 Hz max.<br>• Voltage pulse: 50 kHz max.<br>• Open collector: 50 kHz max. | • No voltage contact: 30 Hz max.<br>• Voltage pulse: 50 kHz max.<br>• Open collector: 50 kHz max. |
| **Indication Accuracy** | For 1 input: ±0.1% FS ± 1 digit max. (for 23±5°C)<br>For 2 inputs: ±0.2% FS ± 1 digit max. (for 23±5°C) | +/- 0.006..0.02% FS (mode dependable) | +/- 0.08% FS max, +/- 1 digit max. |
| **Outputs** | Relay, Transistor, Linear | • 3 or 5 Relays 5 A at 30 VDC<br>• 5 Transistor (PNP or NPN) 50 mA 12..24 VDC<br>• BCD (5-digit, NPN open collector)<br>• Communications<br>• Lineair (4..20 mA, 1..5 VDC, 1 mV/10 digits, 0..5 VDC, 0..10 VDC | • 3 or 5 Relays 5 A at 30 VDC<br>• 5 Transistor (PNP or NPN) 50 mA 12..24 VDC<br>• BCD (5-digit, NPN open collector)<br>• Communications<br>• Lineair (4..20 mA, 1..5 VDC, 1 mV/10 digits, 0..5 VDC, 0..10 VDC) |
| **Sample Rate** | 2000 Hz | – | – |
| **Communication** | DeviceNet/ RS-232C/ RS-485 | RS-232C, RS-422, RS-485 | RS-232C, RS-422, RS-485 |
| **Supply Voltage** | 100 to 240 VAC (50/60 Hz)<br>24 VAC (50/60 Hz)/VDC | 100..240 VAC and 24 VAC/VDC (85..110% of rated voltage) | 100..240 VAC and 12..24 VAC/VDC (85..110% of rated voltage) |
| **IP grade** | IP66, NEMA-4X | IP66 | IP66 |
| **Dimensions (mm)** | 96 x 48 x 100 (W x H x D) | 96 x 48 x 130 (W x H x D) | 96 x 48 x 130 (W x H x D) |
| **Approvals** | UL, CSA, CE | UL, CSA, CE | UL, CSA, CE |
| **Page No.** | K-91 | K-107 | B-193 |

| 1/8 DIN Up/Down Counting Meter | 1/8 DIN Low Cost Panel Indicator DC input | 1/8 DIN Low Cost Panel Indicator AC input | 1/32 DIN Panel Indicator DC input |
|---|---|---|---|
| **K3NC** | **K3TE** | **K3TF** | **K3TG** |
|  |  |  |  |
| • 5 Digit display, 2-colour LEDs (Red and Green)<br>• Front panel key operation and configuration<br>• Scaling in a wide range<br>• Programmable output operation, decimal point pos. setting, leading zero suppression, min/max hold function, counting value reset with front panel keys, security, remote/ local processing, teaching, memory power failure, external reset<br>• Sensor power supply (80 mA at 12 VDC) | • 3 1/2 Digit display<br>• Front panel key operation and configuration<br>• Scaling in a wide range<br>• Process value hold, decimal point pos. setting | • 3 1/2 Digit display<br>• Front panel key operation and configuration<br>• Scaling in a wide range<br>• Process value hold, decimal point pos. setting | • 3 1/2 Digit display<br>• Front panel key operation and configuration<br>• Scaling in a wide range<br>• Process value hold, decimal point pos. setting |
| – | – | – | – |
| • Basic model with one process value display<br>• Set value model with 2 displays (PV and SV) | • DC Voltage<br>• DC Current | • AC Voltage (signal monitor)<br>• AC Current (signal monitor)<br>• AC Voltage (line monitor) | • DC Voltage |
| • No voltage contact: 30 Hz max.<br>• Voltage pulse: 50 kHz max.<br>• Open collector: 50 kHz max. | • DC Voltage: +/-199.9 mV, +/-1.999 V, +/- 19.99 V, +/- 199.9 V<br>• DC current: +/- 199.9 microA, +/- 1.999 mA, +/- 19.99 mA, +/- 199.9 mA | • AC Voltage: 0..199.9 mV, 0..1.999 V, 0..19.99 V<br>• AC Current: 0..1.999 mA, 0..19.99 mA, 0..199.9 mA, 0..1.999 A<br>• AC Voltage: 0..199.9 V and 0 to 400 V (line monitor) | • DC Voltage: +/-199.9 mV, +/-1.999 V, +/- 19.99 V, +/- 199.9 V |
| – | +/- 0.1% FS max, +/- 1 digit | AC Voltage: +/-0.3% FS max, +/- 1 digit | +/- 0.1% FS max, +/- 1 digit |
| • 3 or 5 Relays 5 A at 30 VDC<br>• 5 Transistor (PNP or NPN) 50 mA 12..24 VDC<br>• BCD (5-digit, NPN open collector)<br>• Communications<br>• Lineair (4..20 mA, 1..5 VDC, 1 mV/10 digits, 0..5 VDC, 0..10 VDC | – | – | – |
| – | 2.5 Hz | 2.5 Hz | 2.5 Hz |
| RS-232C, RS-422, RS-485 | – | – | – |
| 100..240 VAC and 12..24 VAC/VDC (85..110% of rated voltage) | 100..120 VAC, 200..240 VAC, 24 VAC/VDC (85..110% of rated voltage | 100..120 VAC, 200..240 VAC, 24 VAC/ VDC (85..110% of rated voltage | 5 VDC (95..105% of rated voltage) |
| IP66 | IP50 | IP50 | IP50 |
| 96 x 48 x 130 (W x H x D) | 96 x 48 x 70 (W x H x D) | 96 x 48 x 66 (W x H x D) | 48x24x70 (WxHxD) |
| UL, CSA, CE | | | |
| C-129 | This product is not shown in the catalogue.<br>For more information please contact your local Omron sales office or download the data from www.eu.omron.com | | |

# Panel Indicators

# 1/32 DIN Digital Panel Meter
# K3GN

## Compact and Intelligent Digital Panel Meter

- A single Panel Meter covering a wide range of applications.
  3 main applicable functions:
  - Process meter (DC voltage/current input).
  - RPM processor/tachometer (frequency input).
  - Digital data display for PC/PLC (RS-485 communications).
- Easy configuration
  - Multi-range analog input: applicable for all standard analog signals.
    6 input ranges available: 4 to 20 mA/0 to 20 mA, 1 to 5 VDC/ 0 to 5 VDC, ±5 VDC, ±10 VDC.
  - 5 KHz max. input-pulse frequency range.
  - Scaling in a wide range of engineering units.
  - Programmable output operation action, decimal point position setting, teaching function for input range, leading zero suppression, average processing.
- Advanced and compact design
  - Very compact 1/32 DIN housing: 48 (W) x 24 (H) x 83 (D).
  - 5-digit display with programmable display color in red or green.
  - Good visibility: High contrast backlit LCD display.
  - High protection against water and dust: NEMA4X/IP66 front panel.
- Selectable outputs: 2 relay outputs, 3 transistor outputs, RS-485, and combinations of these.
- High accuracy: ±0.1% full scale.
- Easy to configure through the front panel or via RS-485.
- EN/IEC conformity with CE marking and UL/CSA approval.

# Model Number Structure

## ■ Model Number Legend

**K3GN - □ □ - □ 24 VDC**
**1 2 3**

**1. Input Type**
ND: DC voltage/current, NPN
PD: DC voltage/current, PNP
**2. Output Type**
C: 2 relay contact outputs (SPST-NO)
T1: 3 transistor outputs (NPN open collector)
T2: 3 transistor outputs (PNP open collector)
**3. Communications Output Type**
None: Communications not supported
FLK: RS-485

# Ordering Information

## ■ List of Models

| Input type | Supply voltage | Output | Communications | |
|---|---|---|---|---|
| | | | No communications | RS-485 |
| DC voltage/current, NPN | 24 VDC | Dual relays (SPST-NO) | K3GN-NDC 24 VDC | K3GN-NDC-FLK 24 VDC |
| | | Three NPN open collector | K3GN-NDT1 24 VDC | K3GN-NDT1-FLK 24 VDC |
| DC voltage/current, PNP | | Dual relays (SPST-NO) | K3GN-PDC 24 VDC | K3GN-PDC-FLK 24 VDC |
| | | Three PNP open collector | K3GN-PDT2 24 VDC | K3GN-PDT2-FLK 24 VDC |

# Specifications

## ■ Ratings

| | |
|---|---|
| **Supply voltage** | 24 VDC |
| **Operating voltage range** | 85% to 110% of the rated supply voltage |
| **Power consumption (see note)** | 2.5 W max. (at max. DC load with all indicators lit) |
| **Insulation resistance** | 20 MΩ min. (at 500 VDC) between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. |
| **Dielectric strength** | 1,000 VAC for 1 min between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. |
| **Noise immunity** | ±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** | Malfunction: 10 to 55 Hz, 10 min each in X, Y, and Z directions; acceleration: 9.8 $m/s^2$<br>Destruction: 10 to 55 Hz, 30 min each in X, Y, and Z directions; acceleration: 19.6 $m/s^2$ |
| **Shock resistance** | Malfunction: Models with transistor outputs: 196 $m/s^2$ for 3 times each in X, Y, and Z directions<br>Models with relay contact outputs: 98 $m/s^2$ for 3 times each in X, Y, and Z directions<br>Destruction: 294 $m/s^2$ for 3 times each in X, Y, and Z directions |
| **Ambient temperature** | Operating: −10°C to 55°C (with no condensation or icing)<br>Storage: −25°C to 65°C (with no condensation or icing) |
| **Ambient humidity** | Operating: 25% to 85% (with no condensation) |
| **EMC** | (EMI) EN61326+A1 Industry<br>Emission Enclosure: CISPR 11 Group 1 class A: CISRP16-1/-2<br>Emission AC Mains: CISPR 11 Group 1 class A: CISRP16-1/-2<br>(EMS) EN61326+A1 Industry<br>Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2), 8 kV air discharge (level 3)<br>Immunity RF-interference: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz) (level 3)<br>Immunity Fast Transient Noise: EN61000-4-4: 2 kV (power line) (level 3)<br>Immunity Burst Noise: 1 kV line to line (I/O signal line)<br>Immunity Surge: EN61000-4-5: 1 kV line to line, 2 kV line to ground (power line)<br>Immunity Conducted Disturbance EN61000-4-6: 3 V (0.15 to 80 MHz) (level 2)<br>Immunity Voltage Dip/Interrupting EN61000-4-11: 0.5 cycles, 0, 180°, 100% (rated voltage) |
| **Approved standards** | UL508, CSA22.2;<br>Conforms to EN61326+A1, EN61010-1 (IEC61010-1)<br>Conforms to VDE0106/P100 (finger protection) when the terminal cover is mounted. |
| **Weight** | Approx. 100 g |

**Note:** A control power supply capacity greater than the rated capacity is required when the Digital Panel Meter is turned ON. Do not forget to take this into consideration when using several Digital Panel Meters. When power is supplied, all indicators will light and outputs will be OFF. When using startup compensation time operation, the display will read "□□□□□" and all outputs will be OFF.

# ■ Characteristics

| | | | |
|---|---|---|---|
| **Input signal** | Process voltage<br>(1 to 5 V, 0 to 5 V, ±5V, ±10 V)<br>Process current<br>(4 to 20 mA, 0 to 20 mA) | No-voltage contact<br>(30 Hz max. with ON/OFF pulse width of 16 ms min.)<br>Open collector<br>(5 kHz max. with ON/OFF pulse width of 90 μs min.) | Digital data display (by RS-485 communication) |
| **A/D conversion** | Double integral method<br>14 bit resolution | --- | |
| **Sampling period** | 250 ms | --- | |
| **Display refresh period** | Sampling period (sampling times multiplied by number of averaging times if average processing is selected.) | | |
| **Pulse measurement method** | --- | Periodic measurement | --- |
| **Connectable Sensors** | --- | ON residual voltage: 2.5 V max.<br>OFF leakage current: 0.1 mA max.<br>Load current: Must have a switching capacity of 15 mA min.<br>Must be able to reliably switch load currents of 5 mA max. | |
| **Max. displayed digits** | 5 digits (−19999 to 99999) | | |
| **Display** | 7-segment digital display, character height: 7.0 mm | | |
| **Polarity display** | "−" is displayed automatically with a negative input signal. | | |
| **Zero display** | Leading zeros are not displayed. | | |
| **Scaling function** | Programmable with front-panel key inputs (range of display: −19999 to 99999). The decimal point position can be set as desired. | | |
| **External controls (see note 1)** | HOLD: (Measurement value held)<br>ZERO: (Forced-zero) | --- | |
| **Hysteresis setting** | Programmable with front-panel key inputs (0001 to 9999). | | |
| **Other functions** | Programmable Color Display<br>Selectable output operating action<br>Teaching set values<br>Average processing (simple average)<br>Lockout configuration<br>Communications writing control (communications output models only) | | |
| | Forced-zero set with front panel keys<br>Control inputs (HOLD/ZERO) selection via front panel keys<br>Field calibration | Startup compensation time (0.00 to 99.9 s)<br>Auto-zero time (0.0 to 19.9 s) | |
| **Output** | Relays: 2 SPST-NO<br>Transistors: 3 NPN open collector<br>3 PNP open collector | | |
| | Combinations:<br>Communications output (RS-485) + relay outputs (2 SPST-NO);<br>Communications output (RS-485) + transistor outputs (3 NPN open collector);<br>Communications output (RS-485) + transistor outputs (3 PNP open collector) | | |
| **Communications** | Communications function: RS-485 | | |
| **Delay in comparative outputs (transistor outputs)** | 750 ms max. | | |
| **Degree of protection** | Front panel: NEMA4X for indoor use (equivalent to IP66)<br>Rear case: IEC standard IP20<br>Terminals: IEC standard IP20 | | |
| **Memory protection** | Non-volatile memory (EEPROM) (possible to rewrite 100,000 times) | | |

**Note 1.** The minimum input time for control signals is 80 ms.

**2.** Refer to *N102 Operation Manual* for more details.

# ■ Measuring Ranges

## Process Voltage/Current Inputs

| Input | Measuring range | Measuring accuracy | Input impedance | Displayable range |
|---|---|---|---|---|
| DC voltage | 1.000 to 5.000 V/<br>0.000 to 5.000 V | ±0.1% FS ±1 digit max.<br>(at 23±3°C) | 1 MΩ min. | −19999 to 99999<br>(with scaling function) |
| | −5.000 to 5.000 V | ±0.1% FS ±1 digit max.<br>(at 23±5°C) | | |
| | −10.00 to 10.00 V | | | |
| DC current | 4.00 to 20.00 mA/<br>0.00 to 20.00 mA | ±0.1% FS ±1 digit max.<br>(at 23±3°C) | 60 Ω | |

## No-voltage Contact/Open Collector Inputs

| Input | Measuring range | Measuring accuracy (at 23±5°C) | Displayable range |
|---|---|---|---|
| No-voltage contact (30 Hz max.) with ON/OFF pulse width of 16 ms min. | 0.05 to 30.00 HZ | ±0.1% FS ±1 digit max. | −19999 to 99999<br>(with scaling function) |
| Open collector (5 kHz max.) with ON/OFF pulse width of 90μs min. | 0 to 5000 HZ | | |

## Digital Data Display (By RS-485 Communications)

| | |
|---|---|
| **Displayable range** | −19999 to 99999 |

# ■ Input/Output Ratings

## Relay Contact Output

(Incorporating G6K Relays)

| Item | Resistive load (cosϕ = 1) |
|---|---|
| **Rated load** | 1 A at 30 VDC |
| **Rated carry current** | 1 A max. (at COM terminal) |
| **Max. contact voltage** | 60 VDC |
| **Max. contact current** | 1 A (at COM terminal) |
| **Max. switching capacity** | 30 VA |
| **Min. permissible load (P level, reference value)** | 10 mV, 10 μA |
| **Mechanical life** | 50,000,000 times min. (at a switching frequency of 36,000 times/hr) |
| **Electrical life (at an ambient temperature of 23°C)** | 100,000 times min. (at the rated load with a switching frequency of 1,800 times/hr) |

## Transistor Output

| | |
|---|---|
| **Rated load voltage** | 24 VDC |
| **Max. load current** | 50 mA |
| **Leakage current** | 100 μA max. |

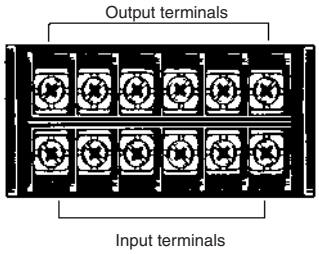
# ■ Communications Specifications

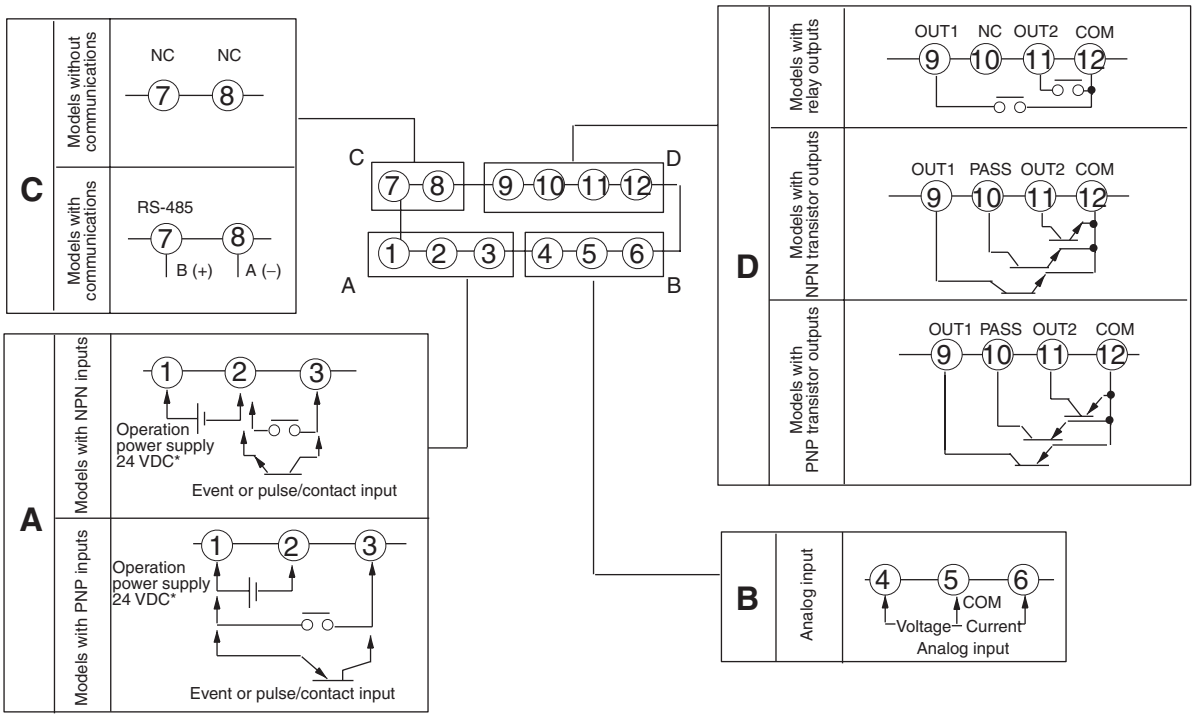
| Item | | RS-485 |
|---|---|---|
| **Transmission method** | | 2-wire, half-duplex |
| **Synchronization method** | | Start-stop synchronization |
| **Baud rate** | | 1,200/2,400/4,800/9,600/19,200 bps |
| **Transmission code** | | ASCII |
| **Communications** | **Reading/Writing to the K3GN** | Read/write set values, read/write scaling values, enable/disable the writing of data through communications, forced-zero control, and other data. |

Refer to *N102 Operation Manual* for more details.

# Connections

## ■ Terminal Arrangement



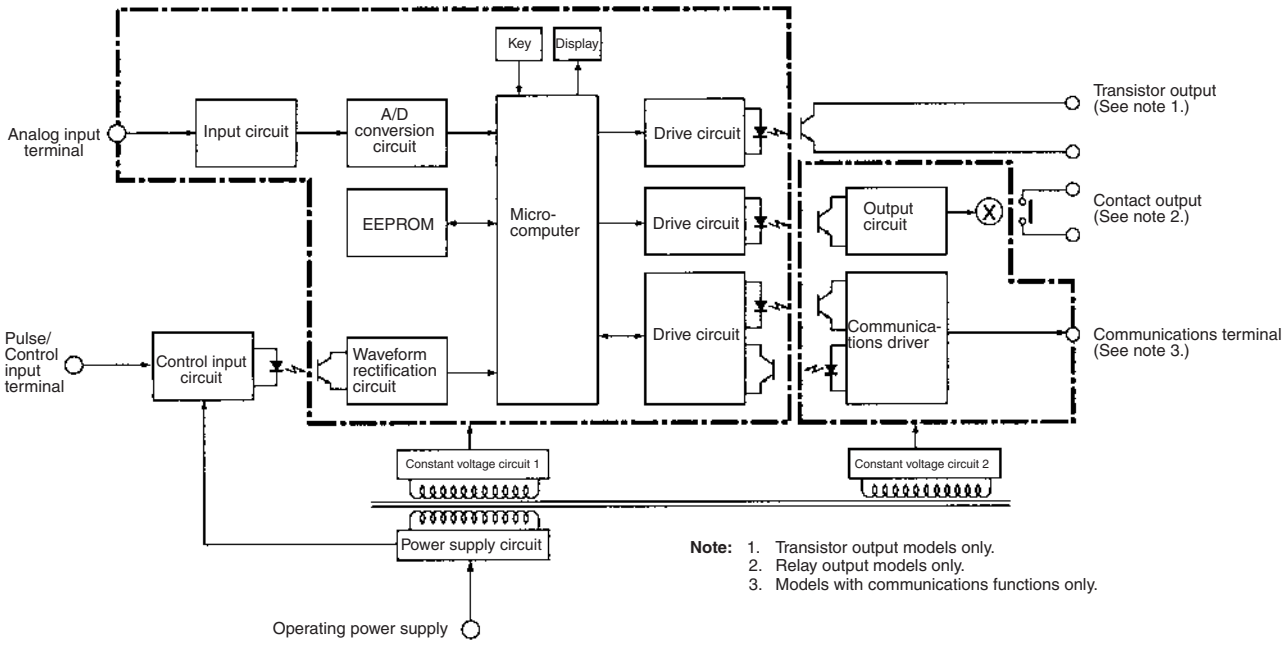




**Note:** *Operation power supply 24VDC: Recommended DC power supply: eg. OMRON s8VS

| Terminal No. | Name | Description |
|---|---|---|
| ①-② | Operation power | Connect the operation power supply. |
| ③-② | Event input or pulse/contact input | Operates as follows depending on parameter setting:<br>• Holds process value.<br>• Calibrate the process value to zero and clear the forced-zero function.<br>• Pulse or contact input. |
| ③-① | | |
| ④,⑥-⑤ | Analog input | Connect the voltage or current analog input. |
| ⑦-⑧ | Communications | RS-485 communications terminals. |
| ⑨,⑪-⑫ | Outputs | Outputs relay or transistor outputs. There is also a PASS output for models with transistor outputs. |
| ⑨,⑩,⑪-⑫ | | |

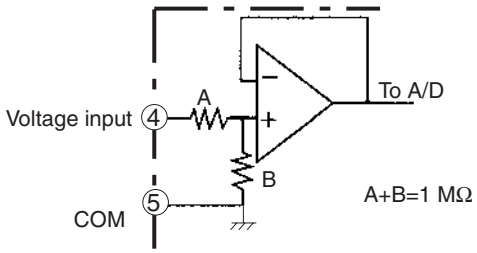
# ■ Wiring

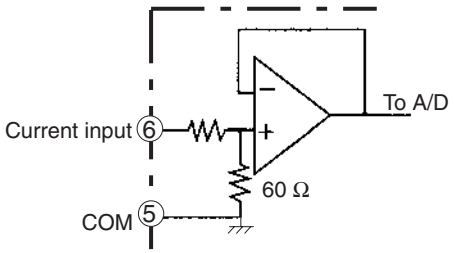
## Block Diagram




## Input Circuits

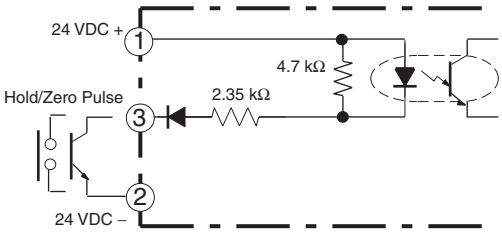
### Analog Input (DC Voltage/Current)



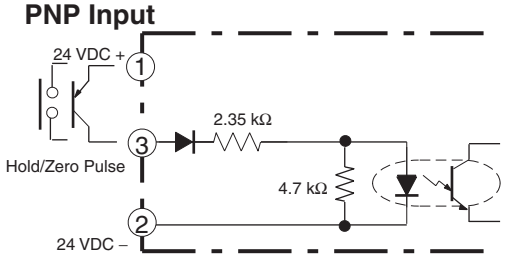




### Pulse Input/Control Event Input (HOLD/ZERO)

**NPN Input**

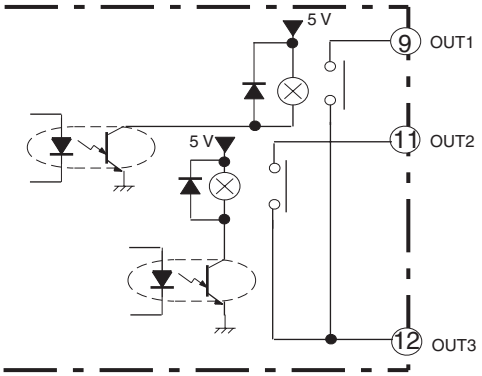



**PNP Input**



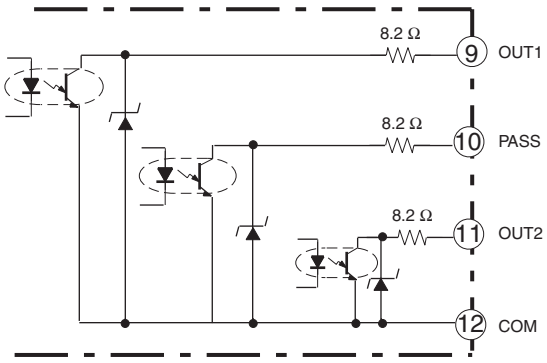
## Output Circuits

### Contact Output

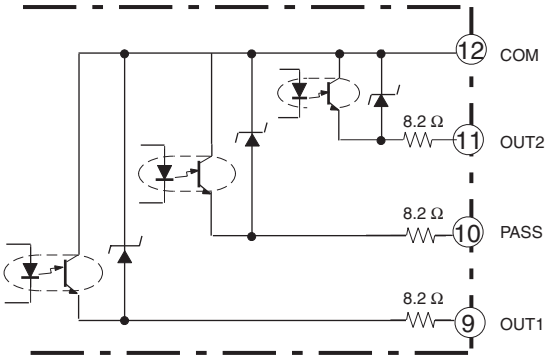



### Transistor Output

#### NPN Output




#### PNP Output



# Operation

## ■ Main Functions

### Input Types and Ranges

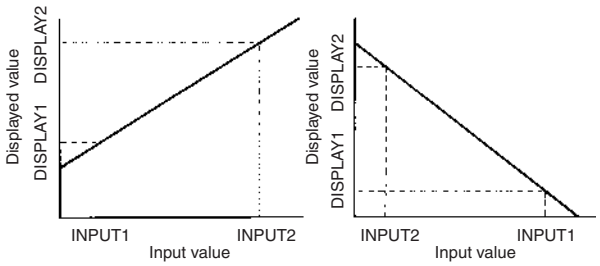
| Input type (setting parameter) | Function | Input range (setting parameters) | Setting range |
|---|---|---|---|
| Analog input (*AnALG*) | Selects DC voltage/current signal input. | 4 to 20 mA/0 to 20 mA (*4-20*) | Displayable from −19999 to 99999 with scaling function. The position of the decimal point can be set as desired. |
| | | 1 to 5 V/0 to 5 V ( *1-5*) | |
| | | ±5 V (*5*) | |
| | | ±10 V ( *10*) | |
| Pulse input (*PULSE*) | Selects pulse input signal. | 0.05 to 30 Hz (*30*) | |
| | | 0 to 5 kHz (*5K*) | |
| Remote (*rmt*) | Displays digital data from PLC or PC. | --- | |

### Scaling

#### Analog (Process) Inputs

The K3GN converts input signals into desired physical values.

INPUT2: Any input value
DISPLAY2: Displayed value corresponding to INPUT2
INPUT1: Any input value
DISPLAY1: Displayed value corresponding to INPUT1




#### Pulse Frequency

The K3GN converts pulse signal inputs into desired units such as revolutions or rotational speeds.

The slope of the linear relationship between the input value and display value is calculated automatically when an input value and its corresponding display value are entered.

Input value: Any arbitrary input value
Display value: Desired display value corresponding to input value

If scaling for pulse signals is not performed, the input frequency will be displayed.

The relationship between input, f, and display, D, is expressed in the form D = f × *a* (multiplication factor). The value of *a* will vary according to the display unit. For example, if the display unit is rpm, Y is given by the following:

D = f × 1/N × 60 (i.e., *a* = 1/N × 60)

where N is the number of pulses per revolution and f is the input pulse frequency (Hz).
If the display unit is m/min, Y is given by the following:

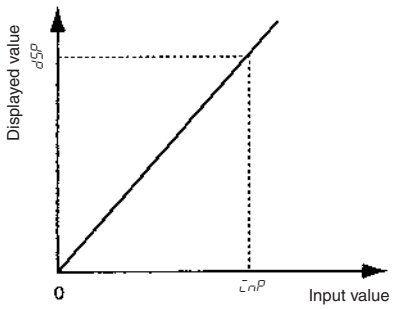
D = f × πd × 1/N × 60 (i.e., *a* = πd × 1/N × 60)

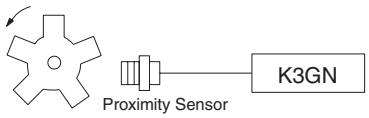
where πd = the wavelength (m) per revolution.

**Example**: When displaying the rotational speed (rpm) for a machine that generates 5 pulse signals per revolution, D is given by the following:

D = f × 1/5 × 60,

so if f = 1, then D = 12. Therefore, input 1 for *InP* and 12 for *dSP*.



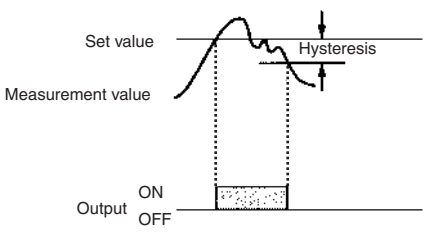

### Average Processing

The average processing function stabilizes displayed values by averaging the corresponding input signals that fluctuate dynamically.

### Hysteresis

The hysteresis of comparative outputs can be set to prevent the chattering of relay or transistor outputs.

**Upper limit (high acting)**



## Startup Compensation Time (Pulse Input Only)

The startup compensation time parameter keeps the measurement operation from sending an unnecessary output corresponding to instantaneous, fluctuating input from the moment the K3GN is turned ON until the end of the preset period.

The compensation time can be set in a range from 0.0 to 99.9 seconds as the waiting time until the devices subject to measurement become stable after the startup of the power supply.

## Changing the Display Color

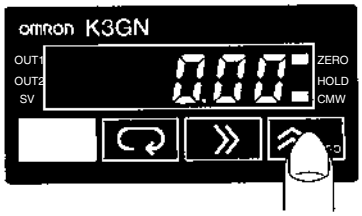
The display can be programmed to change color when an output turns ON. In an example, the K3GN can be programmed to display Green for normal, and Red for errors. The color can be set to change from either green to red or red to green when output turns ON.
K3GN can also be programmed to display only one unchanging color: Red or Green.

## Teaching

An actual measured value as a set value without any front panel key input can be set with the teaching function. Teaching is useful for making settings while checking the operation status of K3GN.

## Forced-zero Function

It is possible to shift the zero point to a desired value (such as might be required when adjusting reference values) with one touch of the Up/Zero Key on the front panel.



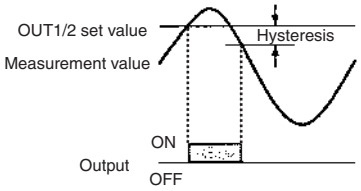

## Configurable Output Operating Action

Output 1 and output 2 can be set to operate in one of the 3 following modes:

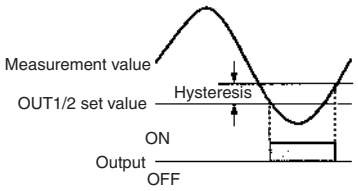
- Upper limit (High Acting):
  The output is turned ON when the measured value is greater than its set value.
- Lower limit (Low Acting):
  The output is turned ON when the measured value is less than its set value.
- Upper and lower limits (Outside band Acting):
  An upper limit (H set value) and lower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

Only transistor outputs have a PASS output which is output when both OUT1 and OUT2 are OFF.

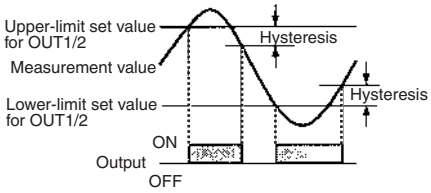
**Upper Limit (High Acting)**




**Lower Limit (Low Acting)**

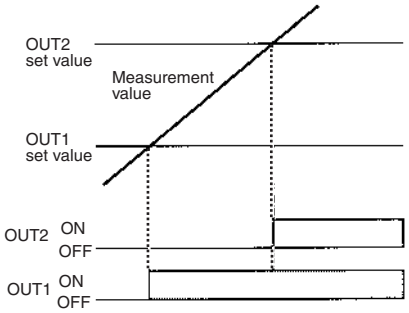



**Upper and Lower Limits (Outside Band Acting)**

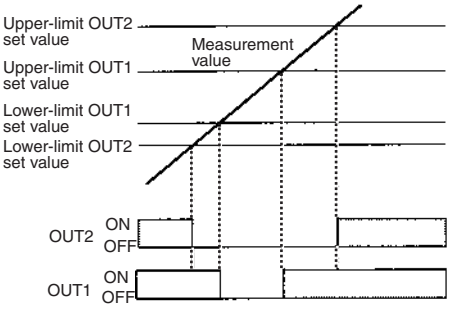



The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

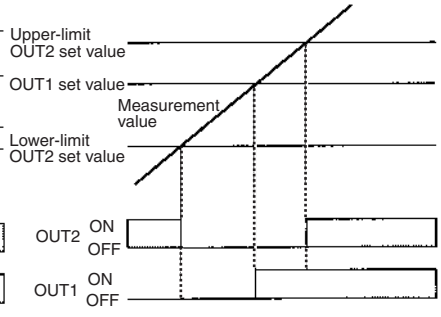
**Upper Limit 2-stage Output**



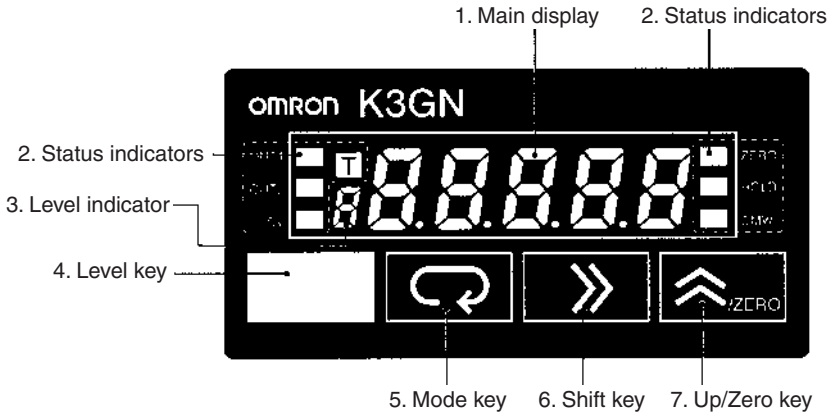

**Threshold Output**




**Combination of Upper Limit and Upper/Lower Limits**



# Nomenclature

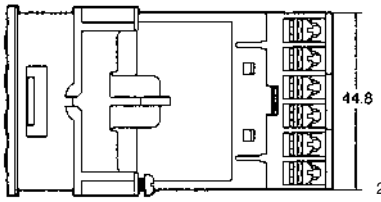


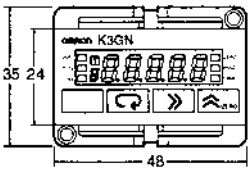

| Name | | Functions |
|---|---|---|
| **1. Main display** | | Displays process values, parameters, and set values. |
| **2. Status indicators** | **OUT1** | Lit when output 1 is ON. |
| | **OUT2** | Lit when output 2 is ON. |
| | **SV** | Lit when a set value is being displayed or changed. |
| | **T** | Lit when the teaching function is enabled. Flashes when the K3GN is in teaching operation.<br>Lit when a calibration value is being displayed during user calibration. Flashes while reading a calibration value. |
| | **ZERO** | Lit while the forced-zero function is activated. |
| | **HOLD** | Lit when HOLD input is ON. |
| | **CMW** | Lit when communications writing is “enabled” and is out when it is “disabled.” |
| **3. Level indicator** | | Displays the current level that the K3GN is in. (See below for details.) |
| **4. Level Key** | | Used to change the level. |
| **5. Mode Key** | | Used to allow the Main display to indicate parameters sequentially. |
| **6. Shift Key** | | Used to enable that set value to be changed. When changing a set value, this key is used to move along the digits. |
| **7. Up/Zero Key** | | Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed. |

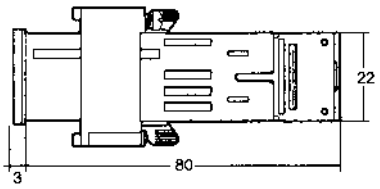
| Level indicator | Level |
|---|---|
| P | Protect |
| Not lit | Operation |
| A | Adjustment |
| S | Initial setting |
| C | Communications setting |
| F | Advanced function setting |
| U | User calibration |

# Dimensions

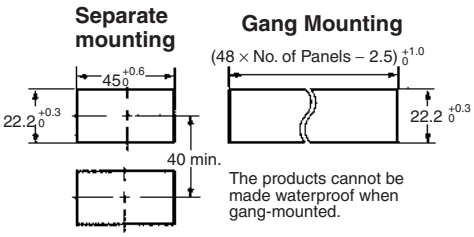
**Note:** All units are in millimeters unless otherwise indicated.



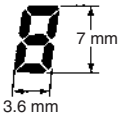

**Panel Cutouts**




The products cannot be made waterproof when gang-mounted.

The K3GN uses M3 terminals. A terminal cover is provided.

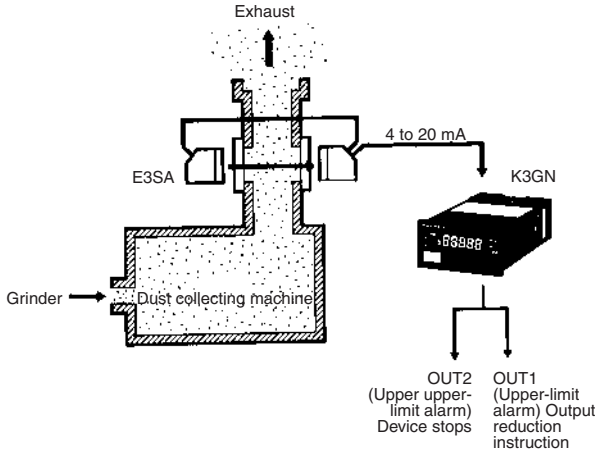
**Main Display Character Size**




# Application Examples

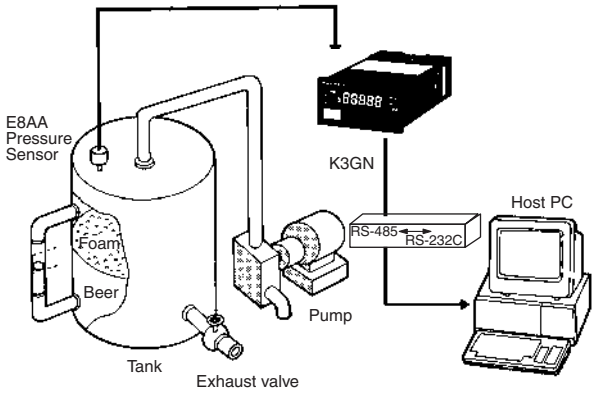
## Detection of Dust Exhaust

The change in the density of the dust is detected via the E3SA and discriminated by the K3GN.



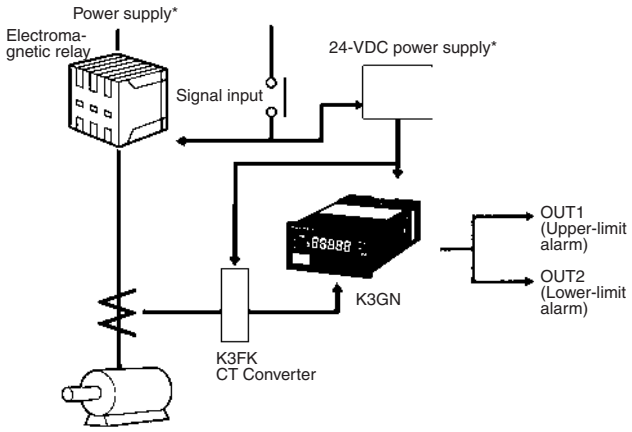

## Monitoring of Tank Pressure

The output of the pressure sensor is processed and the pressure is displayed. Remote monitoring of the operation is possible with the communications function.



## Monitoring of Motor Load Current

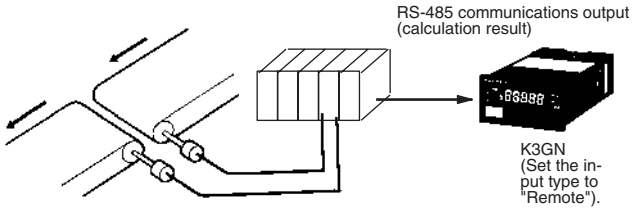
If the startup time compensation of the K3GN is enabled, the K3GN will not be influenced by the inrush current from starting the motor, and no signal will be output from the K3GN.




**Note:** *Power Supply: Recommended DC power supply: eg. OMRON S8VS.

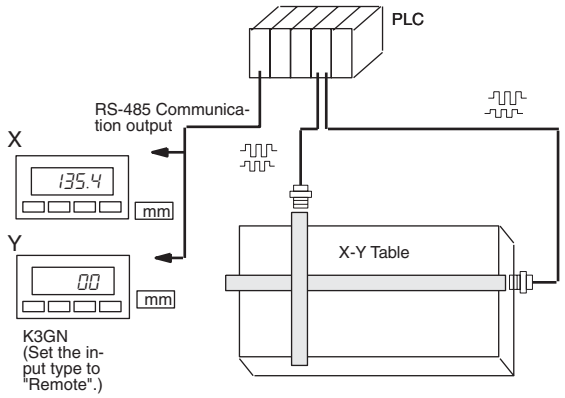
## Monitoring Difference between Two Line Speeds

The difference between the two line speeds is calculated by the PLC and the result is written via RS-485 to the K3GN where it is displayed.



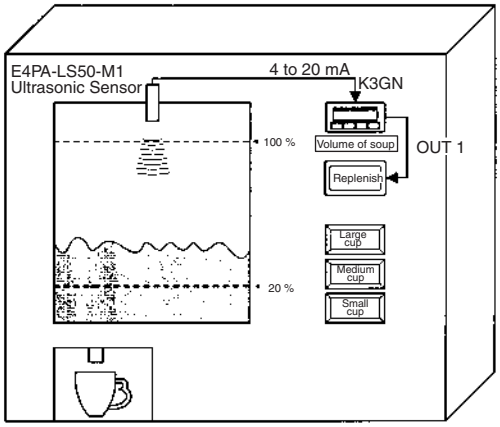

## Position Indication on X-Y Table

The position on the X-Y table is calculated by the PLC and the result is written via RS-485 to the K3GN where it is displayed. The scaling function can be used to display the result in millimeter units.

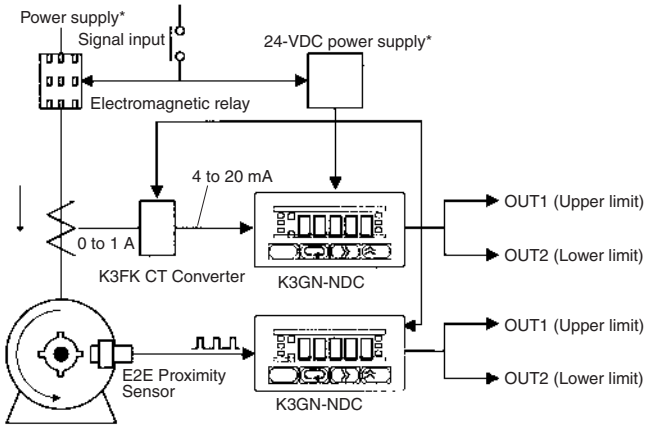



## Monitoring the Remaining Quantity of Soup

The distance to the surface of the soup is detected with an ultrasonic sensor and, based on this distance, the K3GN displays the remaining quantity. When the remaining quantity of soup decreases to less than 20%, the K3GN lights the “Replenish” indicator.




## Monitoring Number of Motor Revolutions




**Note:** *Power Supply: Recommended DC power supply: eg. OMRON S8VS.

# Precautions

**⚠ WARNING**

Do not touch any of the terminals while power is being supplied. Doing so may result in electric shock. Also, do not touch the terminals with a screwdriver while power is being supplied. Electrical shock may result via the screwdriver.

**⚠ Caution**

Do not allow metal objects or conductive wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

**⚠ Caution**

Do not attempt to disassemble, repair, or alter the product. Doing so may result in electric shock, fire, or malfunction.

**⚠ Caution**

Do not use the product where flammable or combustion gasses are present.

**⚠ Caution**

The lifetime of output relays varies greatly with the switching capacity and conditions. Consider the actual operating conditions, and use the product within the rated load and electrical service life.

**⚠ Caution**

Do not use loads exceeding the rated value. Doing so may result in damage or burning.

**⚠ Caution**

Use a power supply voltage within the specified ratings. Not doing so may result in damage or burning.

**⚠ Caution**

Be sure to tighten the terminal screws securely. The recommended tightening torque is 0.5 N·m. Loose screws may result in product failure or malfunction.

**⚠ Caution**

Perform correct setting of the product according to the application. Failure to do so may cause unexpected operation, resulting in damage to the unit or injury.

**⚠ Caution**

This product is not a safety device. Product failure may prevent operation of comparative outputs. Take safety measures, such as installing a separate monitoring system, to ensure safety and to prevent serious accidents caused by such failure, thus ensuring safety.

Observe the following precautions to ensure safety:

1. Do not connect anything to unused terminals.
2. Be sure to check each terminal for correct number and polarity before connection. Incorrect or reverse connection may damage or burn out internal components of the K3GN.
3. Do not use the product in locations subject to the following:
   - Dust or explosive gasses (e.g., sulfide gas or ammonia gas).
   - Condensation or icing as a result of high humidity.
   - Outdoors or in direct sunlight.
   - Splashing liquid or oil atmosphere.
   - Direct radiant heat from heating equipment.
   - Extreme changes in temperature.
4. Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation. Do not block the ventilation holes on the back of the product.
5. Do not use paint thinner for cleaning. Use commercially available alcohol.
6. Use a power supply meeting the power supply specifications of the K3GN. Be sure that the rated voltage is achieved within 2 s after turning ON the power.
7. Use the K3GN within the specified temperature and humidity ranges. When installing the K3GN in a panel, be sure that the temperature around the K3GN (not the temperature around the panel) does not exceed 55°C. If the K3GN is subject to radiant heat, be sure that the temperature of the surface of the K3GN exposed to the radiant heat does not exceed 55°C by providing a fan or other heat removal method.
8. Store the K3GN within the specified temperature and humidity ranges.
9. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the K3GN.
10. Conduct aging for 15 minutes min. after power is ON for correct measurement.

## Mounting

Recommended panel thickness is 1 to 5 mm.

Insert the K3GN in the square cutout, insert the adapter from the back, and push the K3GN into the cutout as far as possible. Use screws to secure the K3GN. To make the K3GN waterproof, insert watertight packing in the K3GN.

Install the watertight packing in the proper direction. Note that the packing is direction-sensitive.

When gang-mounting two or more products in a cutout, be sure that the ambient temperature does not exceed the specifications.

Mount the K3GN as horizontally as possible.

Separate the K3GN from machines generating high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines.

## Operation

A K3GN model with a relay contact or transistor output may not output any alarm signal normally if the model has an error. It is recommended that an independent alarm device be connected to the model.

The parameters are factory-set so that the K3GN will operate normally. The settings of the parameters may be changed according to the application.

## Wiring

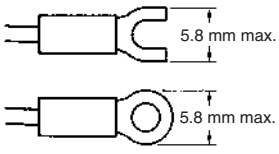
Wire the power supply with the correct polarity. Wiring with incorrect polarity may result in damage or burning.

Wire the terminals using crimp terminals.

Tighten terminal screws to a torque of approx. 0.5 N·m.

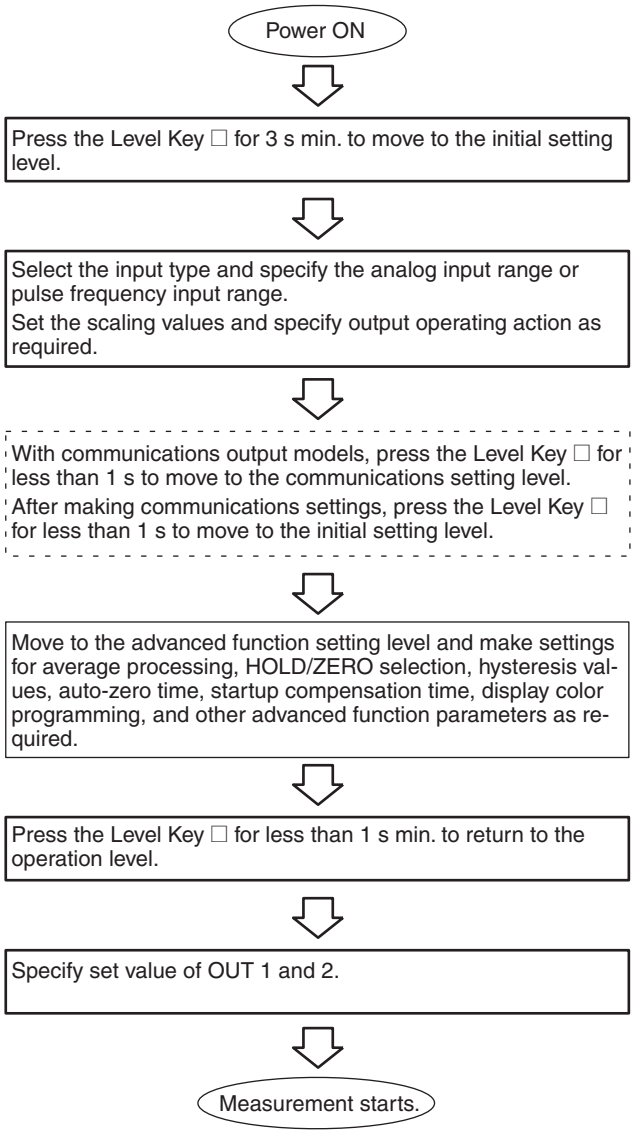
Wire signal lines and power lines separately to reduce the influence of noise.

Use M3 crimp terminals of the type shown below.



# Operating Procedures

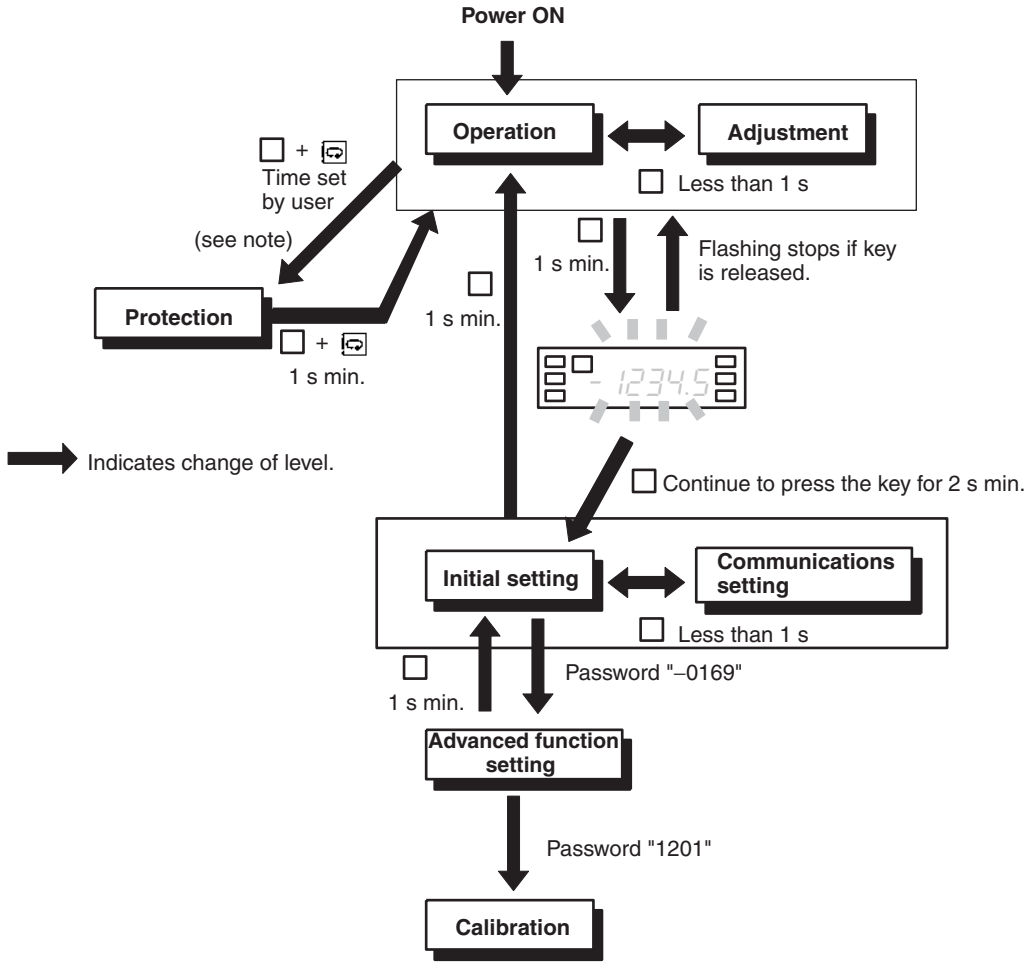
## ■ Initial Settings



## ■ Levels

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

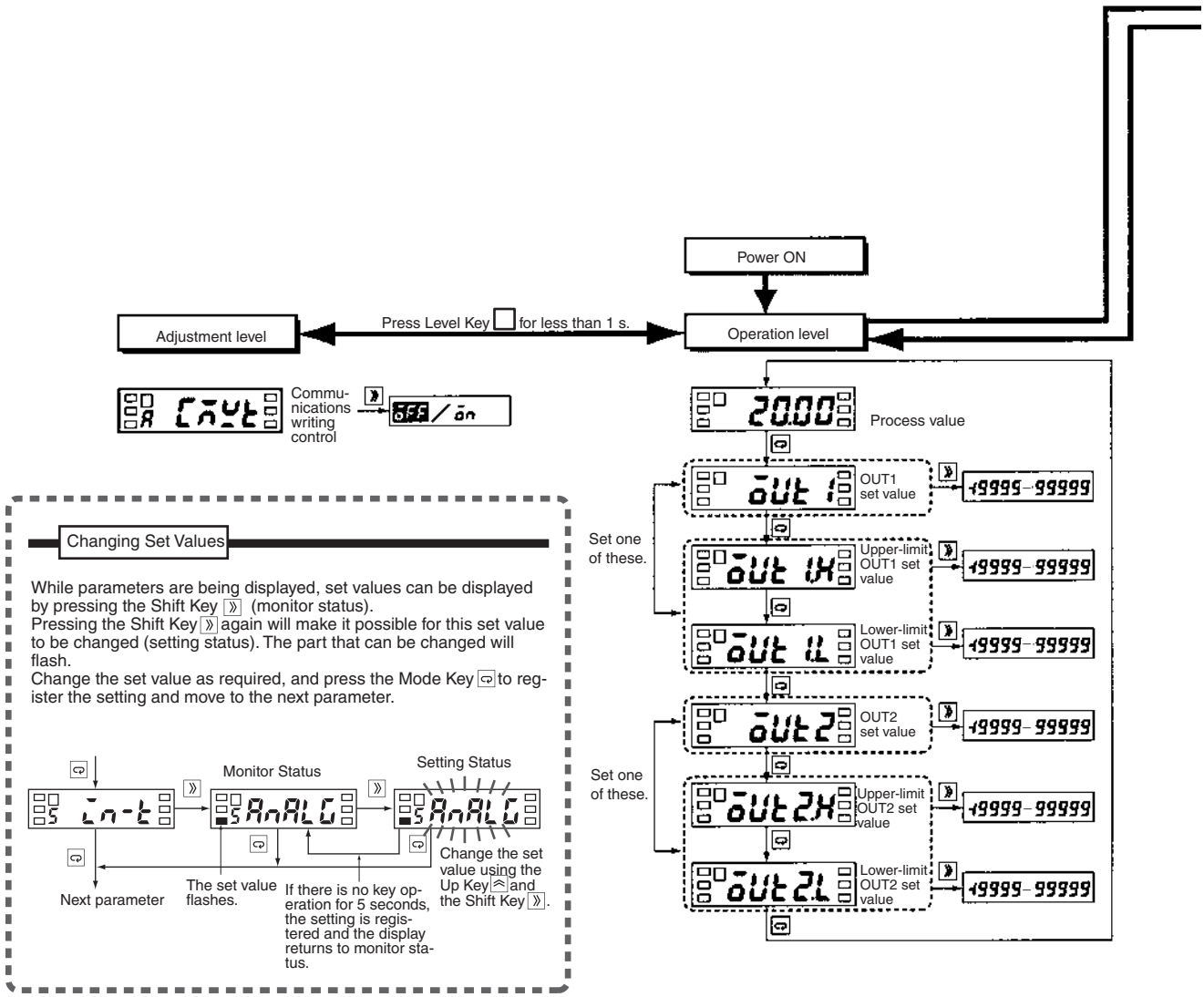
| Level name | Function | Measurement |
|---|---|---|
| Protect | Setting lockouts. | Continue |
| Operation | Displaying process values, setting/clearing forced-zero function, and setting OUT 1/2 set values. | Continue |
| Adjustment | Setting communications writing control. | Continue |
| Initial setting | Making initial settings of input type, scaling, output operating action, and other parameters. | Stopped |
| Communications setting | Setting baud rate, word length, and other communications data. | Stopped |
| Advanced function setting | Setting average processing, display color settings, and other advanced function parameters. | Stopped |
| Calibration | Setting user calibration of the inputs. | Stopped |

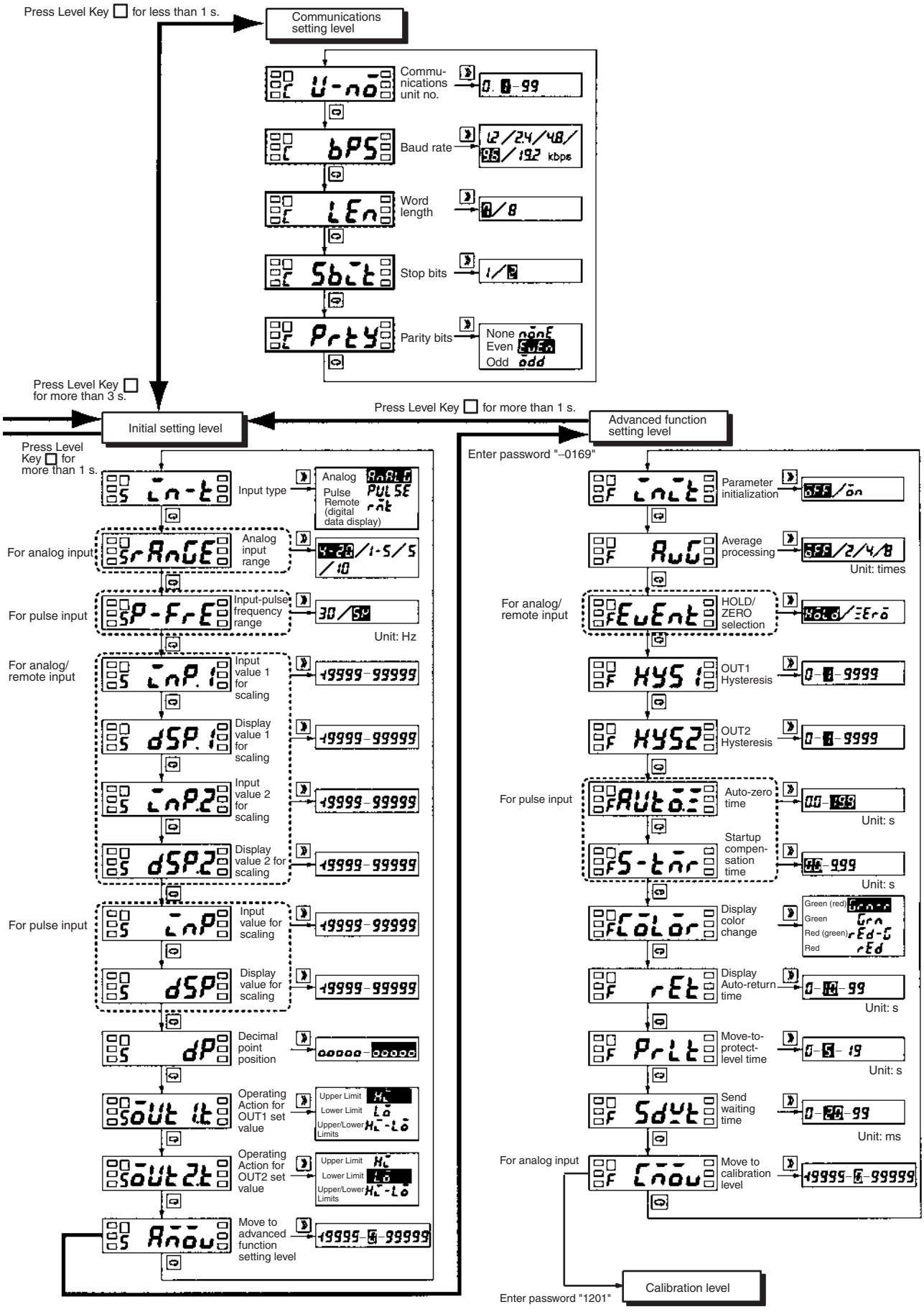



**Note:** The move to protection level time can be set in the advanced function setting level.

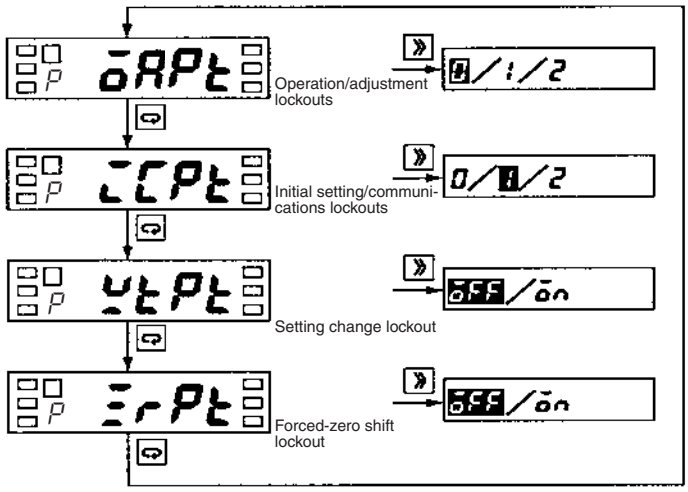
# ■ Parameters

**Note:** 1. Some parameters are not displayed for certain models.
2. The K3GN will stop measurement if the level is changed to the initial setting level, the advanced function setting level, the communications setting level, or the calibration 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 reverse black/white are defaults.




Press Level Key for less than 1 s.
Communications setting level
Communications unit no.
Baud rate
Word length
Stop bits
Parity bits
None
Even
Odd
Press Level Key for more than 3 s.
Initial setting level
Press Level Key for more than 1 s.
Advanced function setting level
Enter password "–0169"
Press Level Key for more than 1 s.
Input type
Analog
Pulse
Remote (digital data display)
For analog input
Analog input range
For pulse input
Input-pulse frequency range
Unit: Hz
For analog/ remote input
Input value 1 for scaling
Display value 1 for scaling
Input value 2 for scaling
Display value 2 for scaling
For pulse input
Input value for scaling
Display value for scaling
Decimal point position
Operating Action for OUT1 set value
Operating Action for OUT2 set value
Upper Limit
Lower Limit
Upper/Lower Limits
Move to advanced function setting level
Parameter initialization
Average processing
Unit: times
For analog/ remote input
HOLD/ ZERO selection
OUT1 Hysteresis
OUT2 Hysteresis
For pulse input
Auto-zero time
Unit: s
Startup compensation time
Unit: s
Display color change
Green (red)
Green
Red (green)
Red
Display Auto-return time
Unit: s
Move-to-protect-level time
Unit: s
Send waiting time
Unit: ms
For analog input
Move to calibration level
Enter password "1201"
Calibration level

Protect level




- Prohibits menu display, writing, etc., for operation level and adjustment level.
- Prohibits access to menu display, initial setting level, communications setting level, and advanced function setting level.
- Prohibits setting changes using front panel keys.
- Prohibits use of the forced-zero function using front panel keys.

## Operation/Adjustment Lockouts

Prohibits key operations for operation level and adjustment level.

| Setting | Operation level | | Moving to adjustment level |
|---|---|---|---|
| | Process value display | Set value display | |
| 0 | Allowed | Allowed | Allowed |
| 1 | Allowed | Allowed | Prohibited |
| 2 | Allowed | Prohibited | Prohibited |

- Initial setting is 0.
- When the set value is 0 (the initial setting), protection is not set.

## Setting Change Lockout

Prohibits setting changes.

| Setting | Meaning |
|---|---|
| **OFF** | Setting changes using front panel keys allowed (i.e., it is possible to move to the state where changes to settings can be made). |
| **ON** | Setting changes using front panel keys prohibited (i.e., it is not possible to move to the state where changes to settings can be made). |

- The initial setting is OFF.

**Note:** Changes to protection level parameters, moving to advanced function setting level, and moving to calibration level are all allowed.

## Initial Setting/Communications Lockouts

Prohibits moving to the initial setting level, the communications setting level, and the advanced function setting level.

| Setting | Moving to initial setting level | Moving to communications setting level |
|---|---|---|
| 0 | Allowed (message for moving to advanced function setting level displayed) | Allowed |
| 1 | Allowed (message for moving to advanced function setting level not displayed) | Allowed |
| 2 | Prohibited | Prohibited |

- The initial setting is 1.

## Forced-zero shift Lockout

Prohibits the setting or clearing of a forced-zero using the front panel key.

| Setting | Meaning |
|---|---|
| **OFF** | Executing and clearing of forced-zero allowed. |
| **ON** | Executing and clearing of forced-zero prohibited. |

- The initial setting is OFF.

# ■ Troubleshooting

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

| Main display | Level display | Error contents | Countermeasure |
|---|---|---|---|
| E111 (E111) | Not lit | RAM memory error | Turn the power supply OFF and ON again. If the same error is displayed even after the power is turned OFF and ON, it is necessary to replace the memory. If normal operation is restored by turning the power supply OFF and ON, it is possible that there is noise interference. Check that there is nothing in the vicinity that may be the source of noise. |
| E111 (E111) | 5 | EEPROM memory error | |
| S.Err (S.Err)<br>(Flashes at 0.5-s intervals) | Not lit | Input error or input range exceeded | All outputs turn OFF.<br>Check for incorrect input wiring, for disconnected power lines, for short-circuiting, and the input type.<br>Bring the input value within range. |
| 99999<br>(Flashes at 0.5-s intervals) | Not lit | Greater than displayable range | This is not an operational error. These messages are displayed when a value to be displayed lies outside the displayable range, even if the input value is within the input range and the range for which measurement is possible.<br>Bring the input value and display value within range. |
| -19999<br>(Flashes at 0.5-s intervals) | Not lit | Less than displayable range | |

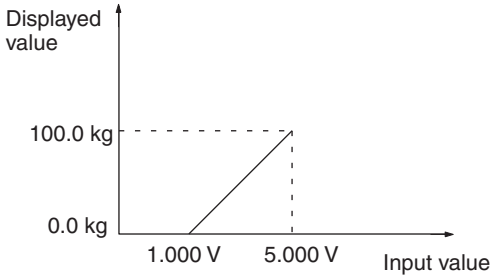
# Additional Information

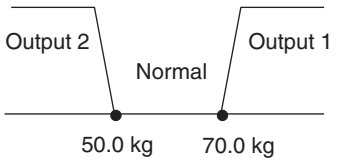
## ■ Application as a Process Meter

The initial settings required when using the K3GN a process meter are explained below using the following example.

### Setting Example

Inputs in the range 1 to 5 V are scaled to the range 0 to 100.0 kg and displayed. If the measurement value goes over 70.0 kg, output 1 turns ON. If the measurement value goes below 50.0 kg, output 2 turns ON.




### Initial Setting Procedure

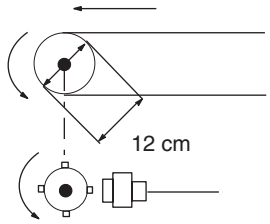
1. **Check the wiring and turn ON the power.**
2. **Set analog input as the input type.**
   If a measurement value is displayed (operation level), move to the initial setting level by holding down the Level Key for 3 s min.
   Set parameter *in-t* to *AnALG*.
3. **Set the analog range to 1 to 5 V.**
   Set parameter *rAnGE* to *1-5*.
4. **Set the scaling values.**
   Set parameter *inP.1* to *1.000*.
   Set parameter *dSP.1* to *0*.
   Set parameter *inP.2* to *5.000*.
   Set parameter *dSP.2* to *1000*.
5. **Set the position of the decimal point.**
   Set parameter *dP* to *0000.0*.
6. **Operating action for OUT1 and OUT2 set values.**
   Set parameter *out1.t* to *HI*.
   Set parameter *out2.t* to *Lo*.
7. **Set OUT1 set value to 70.0 and OUT2 set value to 50.0.**
   If an initial setting level parameter is displayed, press the Level Key for 1 s min. to return to the operation level.
   Set parameter *out1* to *70.0*.
   Set parameter *out2* to *50.0*.
8. **Start actual operation.**

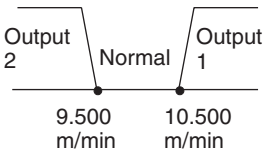
## ■ Application as a Tachometer

The initial settings required when using the K3GN as a tachometer are explained below using the following example.

### Setting Example

The speed of a conveyor belt is displayed in m/min units. For every revolution of the shaft, 4 pulses are output. The diameter of the axis of rotation is 12 cm. If the Rotational speed goes over 10.500 m/min, output 1 turns ON. If the speed goes below 9.500 m/min, output 2 turns ON.



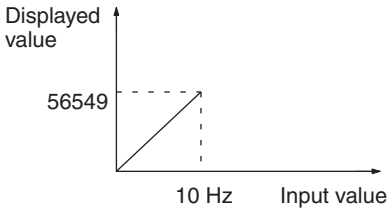

### Deciding the Scaling Value

Rotational speed (m/min) = π × Diameter (m) × Revolutions per minute (rpm)
Revolutions per minute (rpm) = Input frequency (Hz) ÷ Number of pulses per revolution × 60

Applying the appropriate values to these 2 equations gives: Speed (m/min) = 5.654866... × Input frequency (Hz)

Multiply by 1,000 to display the first 3 digits to the right of the decimal point.

Speed (m/min) = 5654.866... × Input frequency (Hz)




To limit inaccuracies due to scaling, select a round number (e.g., 10) as the input value and select a display value of as many digits as possible. In this example, scaling is performed so that an input value of 10 gives a displayed value of 56549.

## Initial Setting Procedure

1. **Check the wiring and turn ON the power.**
2. **Set pulse input as the input type.**
   If a measurement value is displayed (operation level), move to the initial setting level by holding down the Level Key for 3 s min.
   Set parameter *in-t* to *PULSE*.
3. **Set the pulse frequency to 30 Hz.**
   The input pulse frequency for the application is approximately 2 Hz and so can be assumed not to exceed 30 Hz. Set parameter *P-FrE* to *30*.
4. **Set the scaling values.**
   Set parameter *inP* to *10*.
   Set parameter *dSP* to *56549*.
5. **Set the decimal point.**
   Set parameter *dP* to *oo.ooo*.
6. **Operating action for OUT1 and OUT2 set values.**
   Set parameter *oUt1.t* to *Hi*.
   Set parameter *oUt2.t* to *Lo*.
7. **Set OUT1 set value to 10.500 and OUT2 set value to 9.500.**
   If an initial setting level parameter is displayed, press the Level Key for 1 s min. to return to the operation level.
   Set parameter *oUt1* to *10.500*.
   Set parameter *oUt2* to *9.500*.
8. **Start actual operation.**

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N101-E1-03

# Process Meter
# K3MA-J

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

- Multi-range DC voltage/current input.
- Front-panel key operation for easy setting.
- Average processing function suppresses flicker.
- Scaling, front-panel forced-zero, zero-limit 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.


# Model Number Structure

## ■ Model Number Legend

**K3MA-J-□ □ □**
**1 2 3**

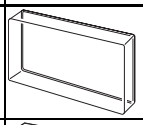
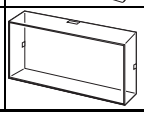
**1. Input Type**
J: DC voltage/current
**2. Output Type**
None: No output
A2: 2 relay contact outputs (SPST-NO)
**3. Supply Voltage**
100-240VAC:100 to 240 VAC
24VAC/VDC:24 VAC/VDC

# Ordering Information

## ■ List of Models

| Input type | Supply voltage | Output | Model |
|---|---|---|---|
| DC voltage/current | 100 to 240 VAC | None | K3MA-J 100-240VAC |
| | | 2 relay contact outputs (SPST-NO) | K3MA-J-A2 100-240VAC |
| | 24 VAC/VDC | None | K3MA-J 24VAC/VDC |
| | | 2 relay contact outputs (SPST-NO) | K3MA-J-A2 24VAC/VDC |

## ■ Accessories (Order Separately)

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

# Specifications

## ■ Ratings

| Model | K3MA-J 100-240VAC, K3MA-J-A2 100-240VAC | K3MA-J 24VAC/VDC, K3MA-J-A2 24VAC/VDC |
|---|---|---|
| Supply voltage | 100 to 240 VAC | 24 VAC/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)<br>4.5 W max. (24 VDC) |
| Insulation resistance | 20 MΩ min. (at 500 VDC) between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. | |
| Dielectric strength | 2,000 VAC for 1 min between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. | |
| Noise immunity | ±1,500 V on power supply terminals in normal or common mode.<br>±1 μs, or 100 ns for square-wave noise with 1 ns. | ±480 V on power supply terminals in normal mode.<br>±1,500 V in common mode.<br>±1 μs, or 100 ns for square-wave noise with 1 ns. |
| Vibration resistance | Vibration: 10 to 55 Hz, Acceleration: 50 $m/s^2$<br>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)<br>Storage:−25°C to 65°C (with no condensation or icing) | |
| Ambient humidity | Operating:25% to 85% (with no condensation) | |
| Approved safety standards | UL3121-1, conforms to EN61010-1 (Pollution degree 2/overvoltage category II)<br>Conforms to VDE0106/P100 (finger protection) | |
| EMC | (EMI)EN61326+A1Industry<br>Emission Enclosure:CISPR 11 Group 1 class A: CISRP16-1/-2<br>Emission AC Mains:CISPR 11 Group 1 class A: CISRP16-1/-2<br>(EMS)EN61326+A1Industry<br>Immunity ESD:EN61000-4-2:4 kV contact discharge<br>8 kV air discharge<br>Immunity RF-interference:EN61000-4-3:10 V/m (amplitude-modulated, 80 MHz to 1 GHz)<br>Electrical Fast Transient Noise:EN61000-4-4:2 kV (power line)<br>Immunity Burst Noise:1 kV line to line (I/O signal line)<br>Immunity Surge:EN61000-4-5:1 kV (power line)<br>2 kV line to ground (power line)<br>Immunity Conducted Disturbance:EN61000-4-6:3 V (0.15 to 80 MHz)<br>Immunity Voltage Dip/Interrupting:EN61000-4-11:0.5 cycle, 0, 180°, 100% (rated voltage) | |
| Weight | Approx. 200 g | |

# ■ Characteristics

| | |
|---|---|
| Input signal | DC voltage/current (0 to 20 mA, 4 to 20 mA, 0 to 5 V, 1 to 5 V, ±5 V, ±10 V) |
| A/D conversion | Double integral method |
| Sampling period | 250 ms |
| Display refresh period | Sampling period (sampling times multiplied by number of measurements for averaging if average processing is selected.) |
| Max. displayed digits | 5 digits (−19999 to 99999) |
| 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. |
| Scaling function | Programmable with front-panel key inputs (range of display: −19999 to 99999). The decimal point position can be set as desired. |
| Hold function | Max. hold (maximum value), Min. hold (minimum value) |
| Hysteresis setting | Programmable with front-panel key inputs (0001 to 9999). |
| Other functions | Forced-zero (with front-panel key)<br>Zero-limit<br>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) |
| Output | Relays: 2 SPST-NO |
| Delay in comparative outputs | 750 ms max. |
| Degree of protection | Front panel: NEMA4X for indoor use (equivalent to IP66)<br>Rear case: IEC standard IP20<br>Terminals: IEC standard IP00 + finger protection (VDE0106/100) |
| Memory protection | Non-volatile memory (EEPROM) (possible to rewrite 100,000 times) |

# ■ Measuring Ranges

## Process Voltage/Current Inputs

| Input | Measuring range | Measuring accuracy | Input impedance | Displayable range |
|---|---|---|---|---|
| DC voltage | 1.000 to 5.000 V | ±0.1% FS ±1 digit max. (at 23±3°C) | 1 MΩ min. | −19999 to 99999 (with scaling function) |
| | 0.000 to 5.000 V | | | |
| | −5.000 to 5.000 V | ±0.1% FS ±1 digit max. (at 23±5°C) | | |
| | −10.00 to 10.00 V | | | |
| DC current | 4.00 to 20.00 mA/ 0.00 to 20.00 mA | ±0.1% FS ±1 digit max. (at 23±3°C) | 45 Ω | |

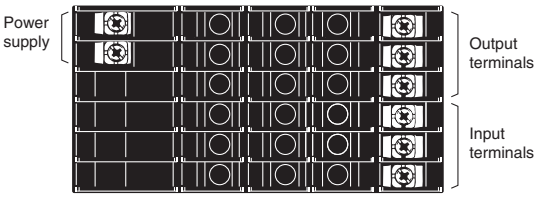
# ■ Input/Output Ratings

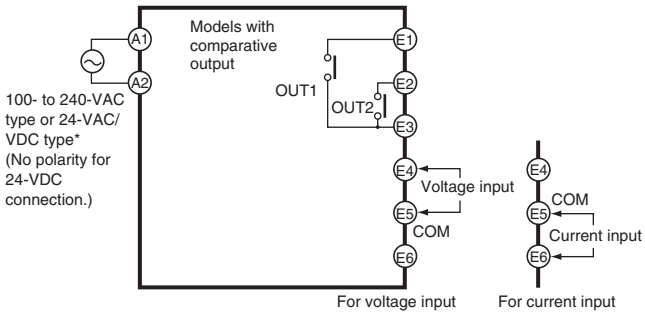
## Relay Contact Output

| 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 | 250 VAC, 150 VDC | |
| Max. contact current | 5 A (at COM terminal) | |
| Max. switching capacity | 1,250 VA, 150 W | 250 VA, 30 W |
| Min. permissible load (P level, reference value) | 10 mA at 5 VDC | |
| Mechanical life | 5,000,000 times min. (at a switching frequency of 1,200 times/min) | |
| **Electrical life (at an ambient temperature of 20°C)** | 100,000 times min. (at a rated load switching frequency of 10 times/min) | |

# Connections

## ■ Terminal Arrangement

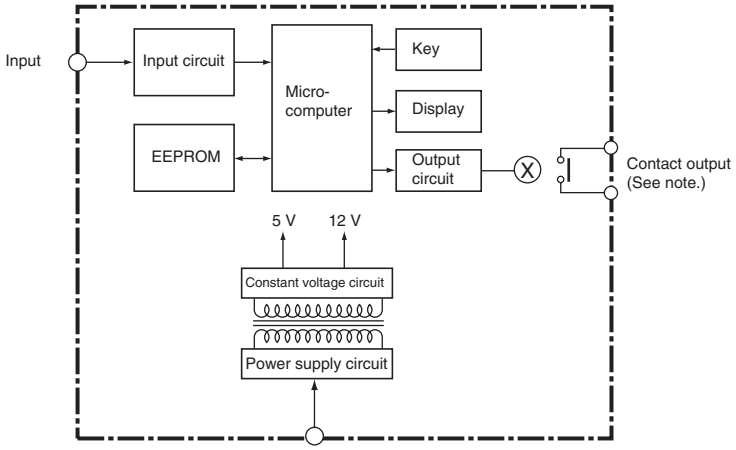



*Recommended DC power supply: eg. ORMON S8VS

| Terminal No. | Name | Description |
|---|---|---|
| (A1) - (A2) | Operation power | Connects the operation power supply. |
| (E4), (E6) - (E5) | Analog input | Connects the voltage or current analog input. |
| (E1), (E2) - (E3) | Outputs | Outputs the relay outputs. |

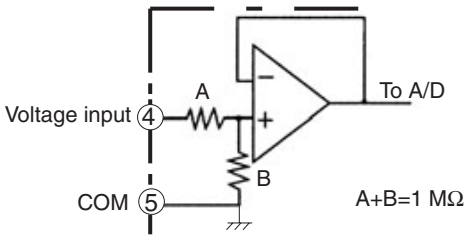
## ■ Block Diagram

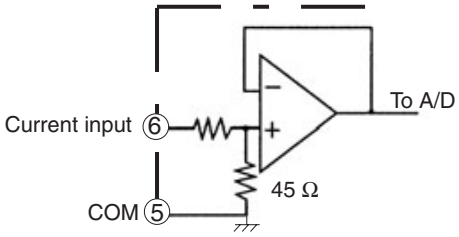



**Note:** Relay output models only.

## ■ Input Circuits

### Analog Input (DC Voltage/Current)



# Operation

## ■ Main Functions

### Input Types and Ranges

| Input type (setting parameter) | Function | Input range (setting parameters) | Setting range |
|---|---|---|---|
| Input range (in-t) | Selects DC voltage/current signal input | 0 to 20 mA (0-20) | Displayable from −19999 to 99999 with scaling function.<br>The position of the decimal point can be set as desired. |
| | | 4 to 20 mA (4-20) | |
| | | 0 to 5 V (0-5) | |
| | | 1 to 5 V ( 1-5) | |
| | | ±5 V (5) | |
| | | ±10 V ( 10) | |

**Note:** The initial value for the input range is "4 to 20 mA (4-20)."

### Scaling

• Analog (Process) Inputs

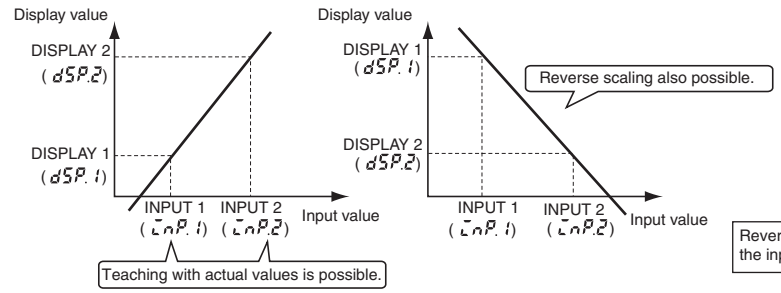
The K3MA-J converts input signals into desired physical values.

INPUT2:Any input value
DISPLAY2:Displayed value corresponding to INPUT2
INPUT1:Any input value
DISPLAY1:Displayed value corresponding to INPUT1

When DISPLAY1 is set for INPUT1, and DISPLAY2 is set for INPUT2, a line will be displayed joining the two points. (Raise shift, reverse scaling, plus/minus display, etc., can be adjusted as desired.)

| Parameter | Setting value | Meaning |
|---|---|---|
| inp.1 | -19999 to 99999 | Input value for dSP. 1 |
| dsp.1 | -19999 to 99999 | Display value for inP. 1 |
| inp.2 | -19999 to 99999 | Input value for dSP.2 |
| dsp.2 | -19999 to 99999 | Display value for inP.2 |

| Parameter | Setting value | Meaning |
|---|---|---|
| dp | %.%%%% | Display four digits after decimal point |
| | %%.%%% | Display three digits after decimal point |
| | %%%.%% | Display two digits after decimal point |
| | %%%%.% | Display one digit after decimal point |
| | %%%%% | No decimal point |




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.

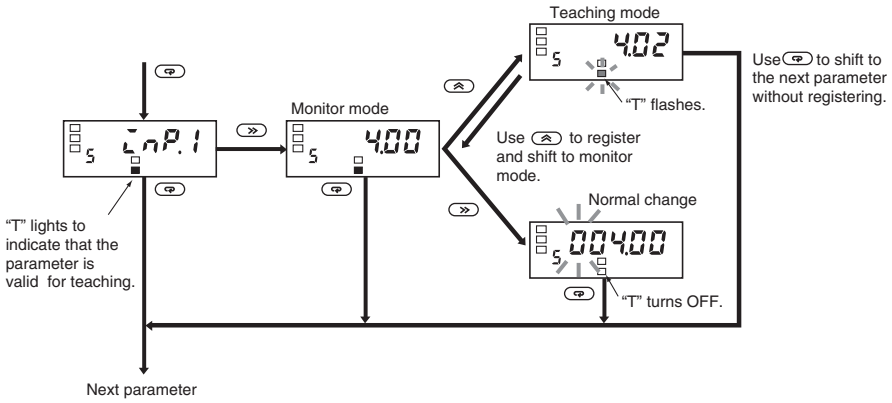
Reverse scaling, where the display value decreases as the input value increases, is also possible.

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-J.

## Convenient Functions

Scaling Teach

The parameters (InP.1, InP.2) for the K3MA-J's initial setting level can be set using actual input values with the teaching function. After displaying the parameters, the actual input settings can be made with the following operation.

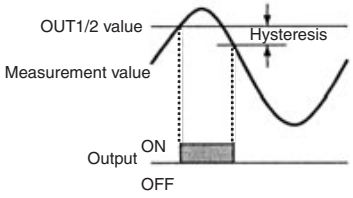



## OUT Types (Comparative Output Models Only)

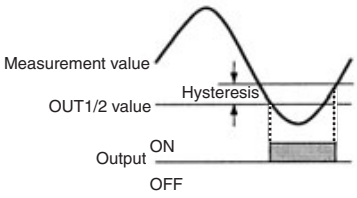
OUT 1 and OUT 2 can be set to operate in one of the three following modes in accordance with the compared values:

- 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 upper-limit set value or less than the lower-limit set value.

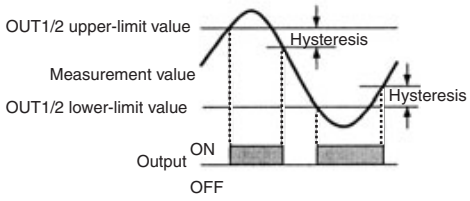
**Upper Limit (High Acting)**




**Lower Limit (Low Acting)**

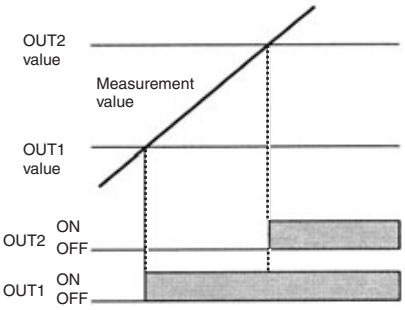



**Upper and Lower Limits (Outside Band Acting)**

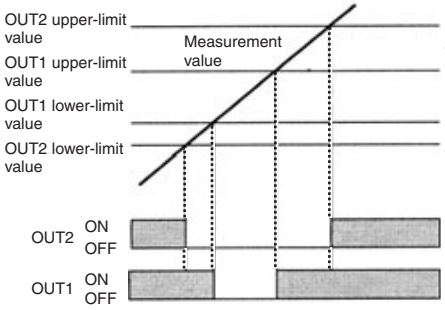



The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

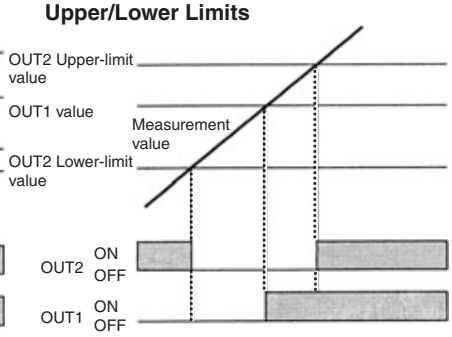
**Upper Limit 2-stage Output**




**Threshold Output**




**Combination of Upper Limit and Upper/Lower Limits**



## Parameter Initialization

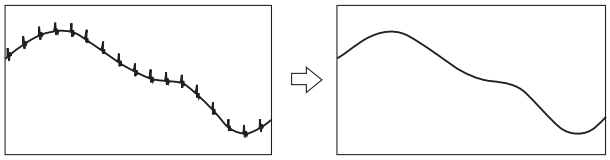
This function returns all of the parameters to their initial values.

| Parameter | Setting value | Meaning |
|---|---|---|
| init | off | --- |
| | on | Initializes all parameters. |

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

## Average Processing

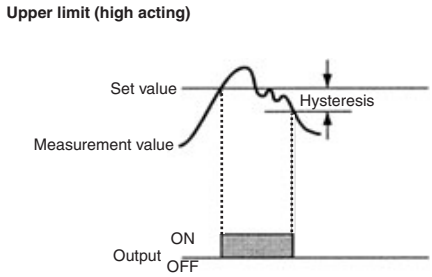
Average processing stabilizes displayed values to minimize flicker by averaging the fluctuating input signals. Average processing can be performed for the measurement values in either of four steps (OFF, 2 times, 4 times, or 8 times).



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

## Hysteresis (Comparative Output Models Only)

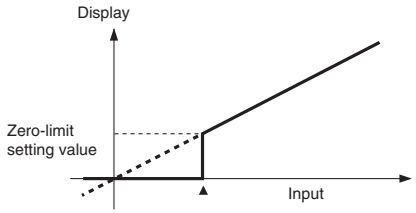
The hysteresis of comparative outputs can be set to prevent chattering in the output when the measurement value fluctuates finely near the OUT value.




## Zero-limit Function

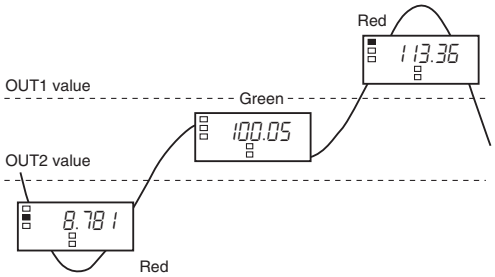
The zero-limit function changes any value below the set value to zero. This is useful when you want to change negative values to zero rather than display them, or when you want to make the display in the smallest part of the input range zero.

| Parameter | Setting value | Meaning |
|---|---|---|
| =-lim | off | OFF: No zero-limit |
| | on | ON: Zero-limit |
| lim-p | 0 to 99 | 0 to 99: Zero-limit value |




## 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

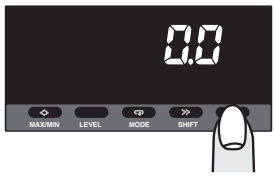
This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

## Move-to-Protect-Level Time

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

## Forced-zero Function

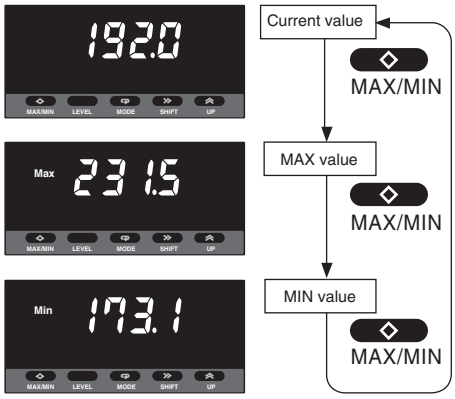
It is possible to shift from a value to the zero point with one touch of the Up Key on the front panel (for example, when adjusting reference values).



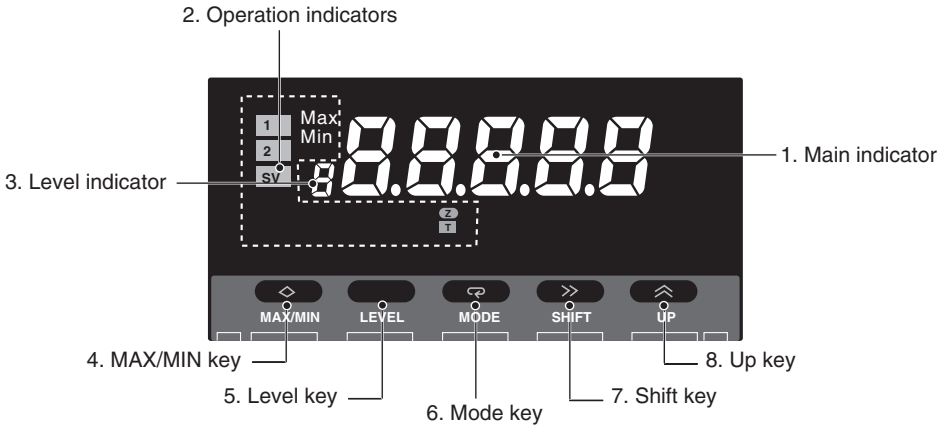

**Note:** Used only for releasing the forced-zero with the Protect menu.

## 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.



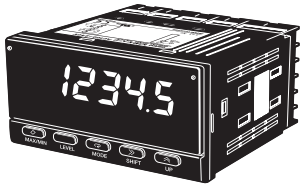
# Nomenclature

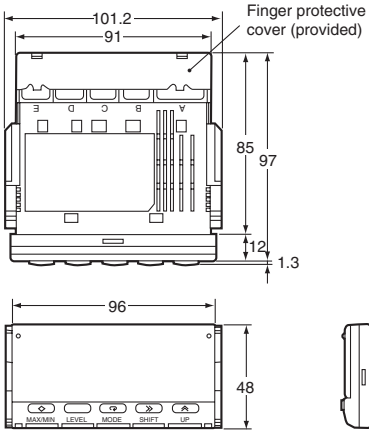



| Name | | Functions |
|---|---|---|
| 1. Main indicator | | Displays current values, parameters, and set values. |
| 2. Operation indicators | 1 | Lit when output 1 is ON. |
| | 2 | Lit when output 2 is ON. |
| | SV | Lit when a set value is being displayed or changed. |
| | Max | Lit when the main indicator is showing the MAX value. |
| | Min | Lit when the main indicator is showing the MIN value. |
| | Z | Lit during the forced-zero operation. |
| | 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-J 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. |

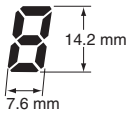
| Level indicator | Level |
|---|---|
| p | Protect |
| Not lit | Operation |
| s | Initial setting |
| f | Advanced-function setting |

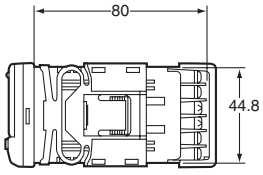
# Dimensions



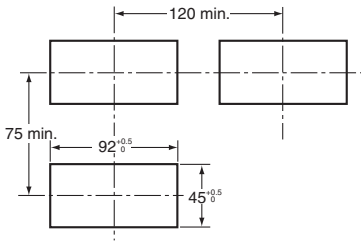




**Main indicator character size**



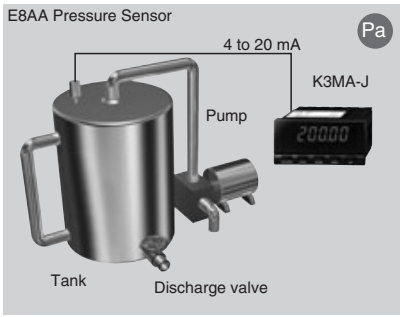

**Panel cut-out**




The K3MA-J uses M3 terminals.

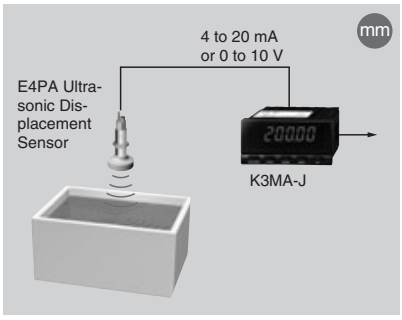
# Application Examples

## Monitoring interior tank pressure



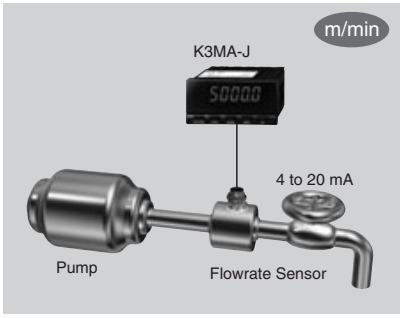

- Monitoring gas pressure
- Inspection instruments in food or pharmaceutical plants

## Displaying/outputting liquid level




- Monitoring liquid level in cleaning tanks
- Water tanks, devices using chemicals, etc.

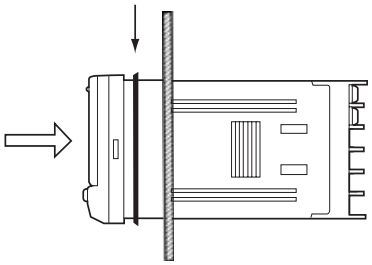
## Flowrate sensor



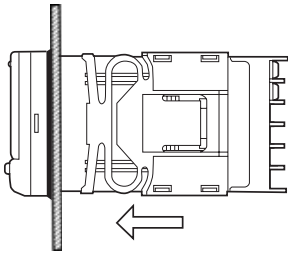

- Monitoring sendout flowrate
- Water processing devices, etc.

# Installation

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



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-J.

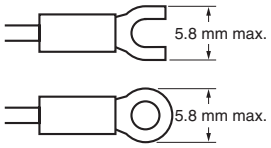


## ■ Wiring Precautions

- 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.

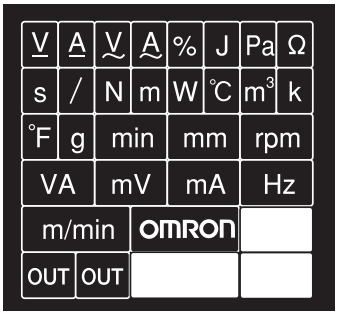
## ■ Wiring

- Use the following M3 crimp terminals.




## ■ Unit Labels (Provided)

- The unit labels are not attached to the K3MA-J. 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.

# Precautions

**WARNING**

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

**Caution**

Do not disassemble the product or touch the internal components of the product while the power is being supplied. Doing so may result in electric shock.

**Caution**

Do not allow metal objects or wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

**Caution**

Perform correct settings for the product according to the control application. Failure to do so may cause unexpected operation, resulting in damage to the product or injury.

**Caution**

Take safety measures, such as installing a separate monitoring system, to ensure safety even if the product fails. Product failure may prevent comparative outputs from being generated, resulting in serious accidents.

Observe the following precautions to ensure safety.

1. Maintain the power supply voltage within the range specified in the specifications.
2. Maintain the load within the ratings specified in the specifications.
3. Check each terminal for correct number and polarity before connecting it. Incorrect or reverse connections may damage or burn out internal components in the product.
4. Tighten the terminal screws securely. The recommended tightening torque is 0.43 to 0.58 N·m. Loose screws may cause fire or malfunction.
5. Do not connect anything to unused terminals.
6. Provide a switch or circuit breaker so that operators can easily turn OFF the power supply when necessary. Also provide appropriate indications of such devices.
7. Do not attempt to disassemble, repair, or modify the product.
8. Do not use the product where flammable or combustible gases are present.

## Application

### General Precautions

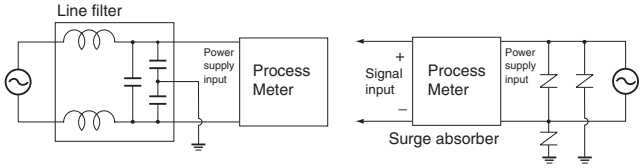
1. Do not use the product in the following locations:
   - Locations subject to direct radiant heat from heating equipment.
   - Locations subject to exposure to water, oil, or chemicals.
   - Locations subject to direct sunlight.
   - Locations subject to dust or corrosive gases (particularly sulfuric gas or ammonia gas).
   - Locations subject to severe changes in temperature.
   - Locations subject to icing or condensation.
   - Locations subject to shock or vibration.
2. Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation.
3. Ensure that the rated voltage is reached within two seconds after the power is turned ON.
4. Conduct aging for 15 minutes min. after power is turned ON for correct measurement.
5. Do not touch the slit sections or terminals while the power is being supplied to prevent the product from being affected by static electricity.
6. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the product.
7. Do not use paint thinner for cleaning. Use commercially available alcohol.

### Mounting

- Mount the product to a panel that is 1 to 8 mm thick.
- Install the product in a horizontal position.
- Use crimp terminals that match screw sizes.

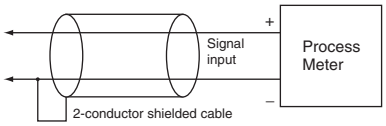
### Noise Prevention

- Install the product as far as possible from devices that generate strong, high-frequency fields (such as high-frequency welders or sewing machines) or surges.
- Install surge absorbers or noise filters on nearby devices that generate noise (particularly, motors, transformers, solenoids, magnet coils, and other devices that have a high inductance component).




- To prevent inductive noise, separate the terminal block wiring for the product from high-voltage or high-current power lines. Do not route the wiring for the product in parallel with or tie it in a bundle with power lines.
  Take the following countermeasures against inductive noise in input lines.

**Analog Signal Inputs**




- When using a noise filter for the power supply, check for the voltage and current and install it as close as possible to the Process Meter.
- Do not install the product near radios, television sets, or wireless devices. Doing so may cause reception interference.

### Increasing Service Life

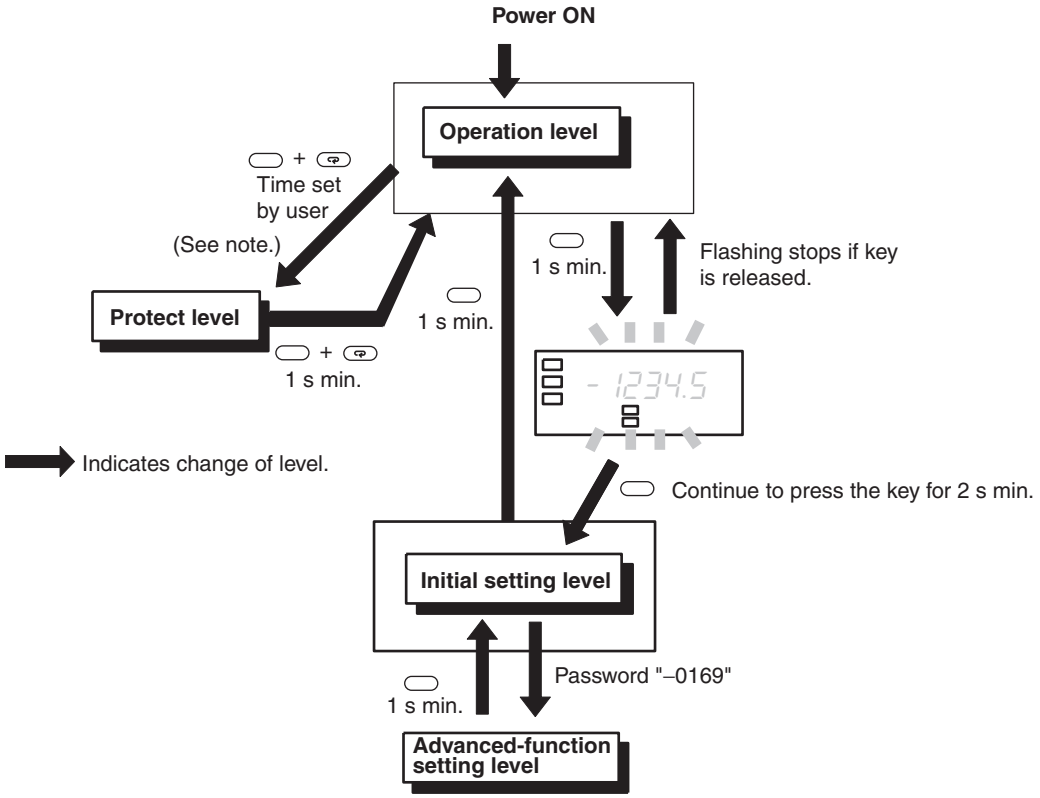
- Do not use the product in locations where the temperature or humidity exceeds the ratings or where condensation may occur. When installing the product in a panel, be sure that the temperature around the product (not the temperature around the panel) does not exceed the ratings. The product service life depends on the ambient temperature. The higher the ambient temperature, the shorter the service life. To extend the product service life, lower the temperature inside the Process Meter.
- Use and store the product within the temperature and humidity ranges given in the specifications. When gang-mounting Process Meters or arranging them vertically, heat generated by the Process Meters will cause the internal temperature to rise, reducing the service life. In such cases, consider forced cooling methods, such as using a fan to circulate air around the Process Meters. Do not, however, allow only the terminals to be cooled. Doing so will increase measurement error.
- The life of the output relays is greatly affected by the switching capacity and switching conditions. Use these relays within their rated load and electrical life. The contacts may fuse or burn if they are used past their electrical life.

# Operating Procedures

## ■ 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.

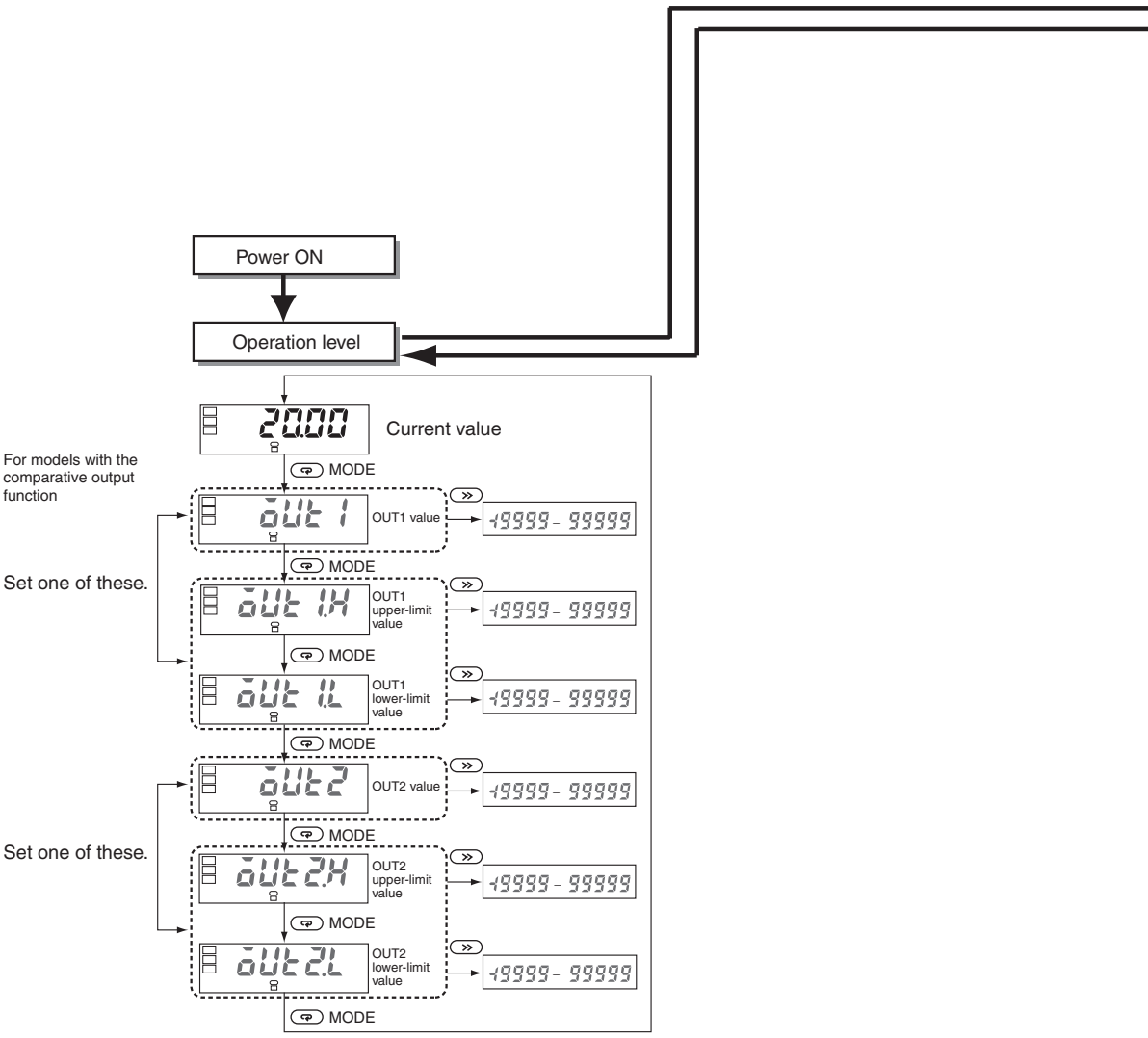
| Level name | Function | Measurement |
|---|---|---|
| Protect | Setting lockouts. | Continue |
| Operation | Displaying current values, setting/clearing forced-zero function, and setting OUT 1/2 values. | Continue |
| Initial setting | Making initial settings of input type, scaling, output operating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

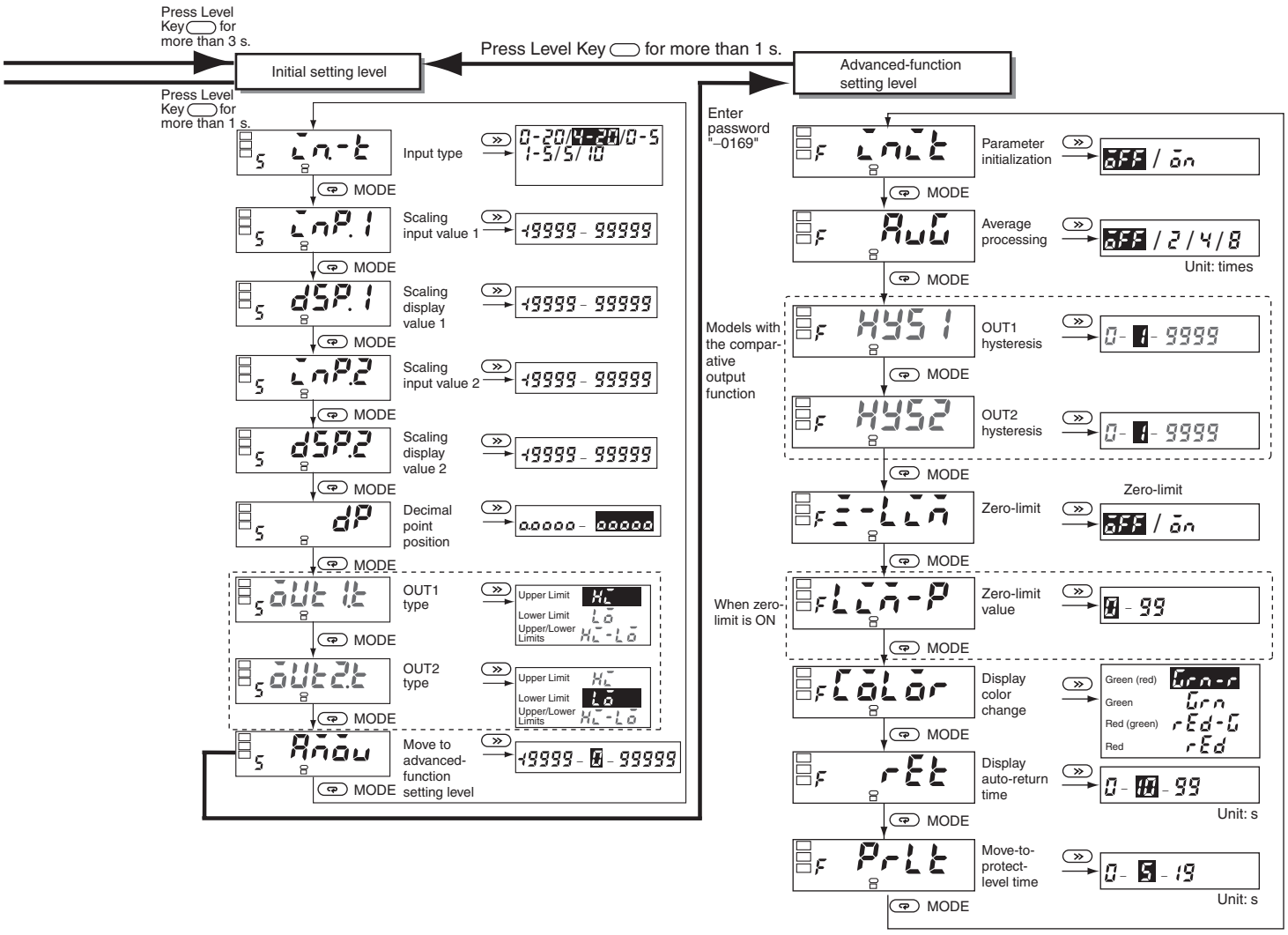


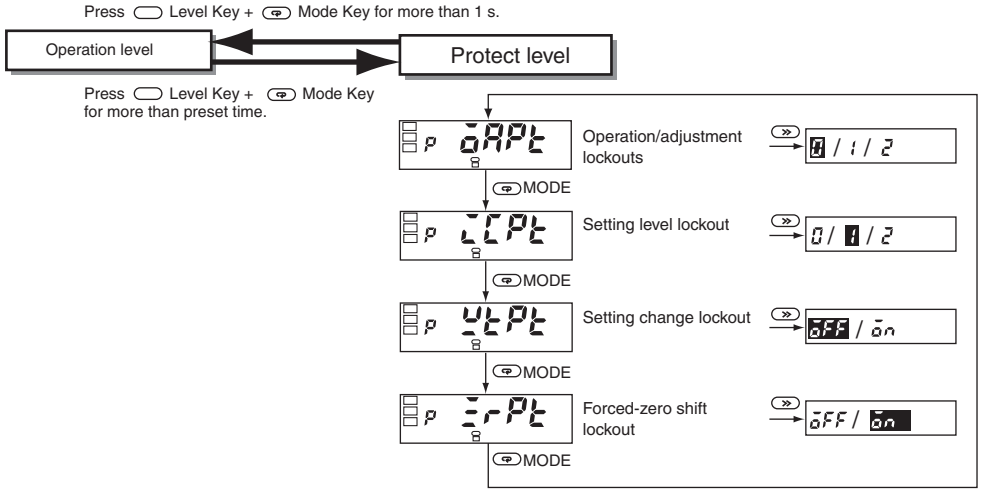

**Note:** The move-to-protect-level time can be set in the advanced-function setting level.

## ■ Parameters

**Note:** 1. Some parameters are not displayed for certain models.
2. The K3MA-J 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 for more than 3 s.
Initial setting level
Press Level Key for more than 1 s.
Press Level Key for more than 1 s.
Advanced-function setting level
Enter password "−0169"
Input type
0-20/4-20/0-5
1-5/5/10
Scaling input value 1
Scaling display value 1
Scaling input value 2
Scaling display value 2
Decimal point position
OUT1 type
OUT2 type
Upper Limit
Lower Limit
Upper/Lower Limits
Move to advanced-function setting level
MODE
Parameter initialization
Average processing
Unit: times
Models with the comparative output function
OUT1 hysteresis
OUT2 hysteresis
Zero-limit
When zero-limit is ON
Zero-limit value
Display color change
Green (red)
Green
Red (green)
Red
Display auto-return time
Unit: s
Move-to-protect-level time
Unit: s




## Operation/Adjustment Lockouts

Restricts key operations for operation level and adjustment level.

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

- Initial setting is 0.
- This cannot be displayed on models not equipped with the comparative output function.

## Setting Level Lockout

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

| Parameter | Setting | Shift to initial setting level | Shift to advanced-function setting level |
|---|---|---|---|
| icpt | 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 |
|---|---|---|
| wtpt | off | Allowed |
| | on | Prohibited |

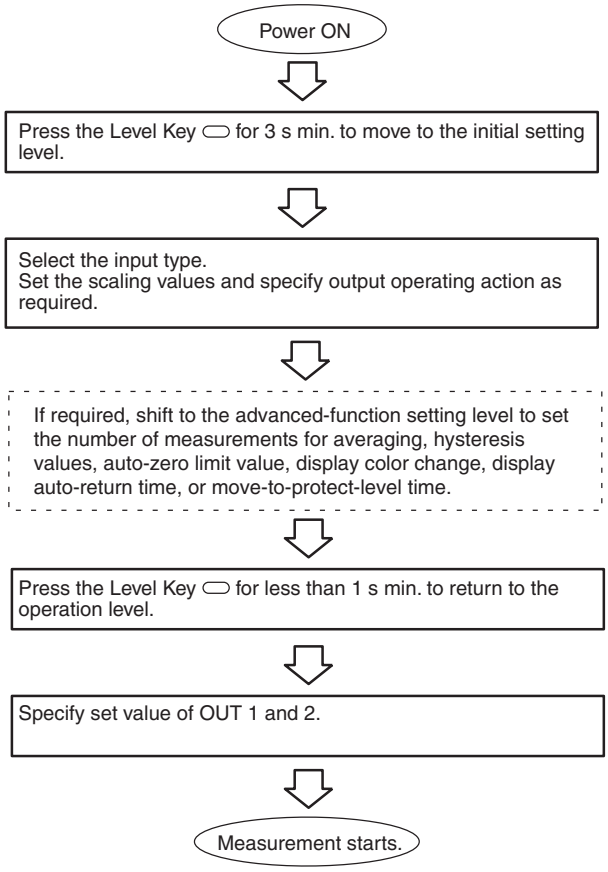
However, all protect level parameters can still be changed.

## Forced-zero Lockout

Restricts the setting or release of a forced-zero by front-panel key operation.

| Parameter | Setting | Setting/release of forced-zero by key operation |
|---|---|---|
| =rpt | off | Allowed |
| | on | Prohibited |

# ■ Initial Settings

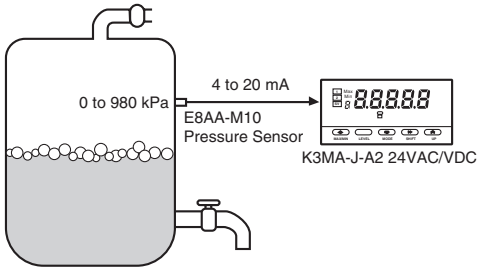


# ■ Setting Example

## Initial Settings

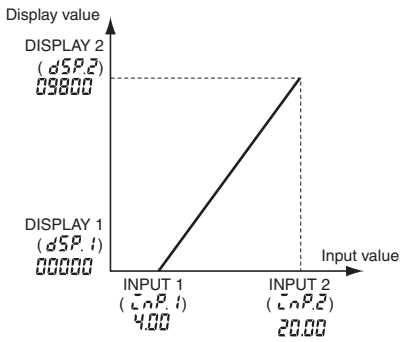
The settings for the following example are shown here.

### Example: Tank pressure display




Here, the pressure inside the tank is to be displayed in units of 0.1 kPa.

- Pressure Sensor: E8AA-M10
  Measuring range: 0 to 980 kPa, output 4 to 20 mA




1. Set the K3MA-J input type to the 4 to 20 mA input range.
   Parameter: In-t (input type), Setting value: 4-20
2. Set the display values for the corresponding input values.
   Set the scaling as shown below for the following correspondence: input 4 mA-->display 0.0, input 20 mA-->display 980.0
   ParameterSetting value
   InP.1 (scaling input value 1)4.00
   dSP.1 (scaling display value 1)00000
   InP.2 (scaling input value 2)20.00
   dSP.2 (scaling display value 2)09800
   dP (decimal point position)oooo.o

**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 S.Err | You will see this indication when turning ON the product the first time after purchase. This is because the input signal value is 0 mA at that time even though the range is factory set to 4 to 20 mA. | At the initial setting level, set the input type and other parameters according to your application. |
| | | Input error | Promptly change the input voltage/current to a value that falls within the measurement range.<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. |
| | | | 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. |
| | | | The scaling value may be inappropriate. Review the scaling value at the initial setting level. |

# Warranty and Limitations of Liability

## ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# Application Considerations

## ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. N108-E1-04A In the interest of product improvement, specifications are subject to change without notice.

# Temperature Meter
# K3MA-L

### 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.


## Model Number Structure

### ■ Model Number Legend

**K3MA-L-□ □**
**1 2 3**

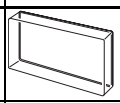
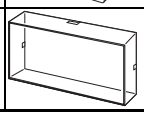
**1. Input Type**
L: Platinum-resistance thermometer or thermocouple
**2. Output Type**
None: No output
C: With relay contact output (SPDT)
**3. Supply Voltage**
100-240VAC:100 to 240 VAC
24VAC/VDC:24 VAC/VDC

## 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 |

### ■ 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)<br>4.5 W max. (24 VDC) |
| Insulation resistance | 20 MΩ min. (at 500 VDC) between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. | |
| Dielectric strength | 2,000 VAC for 1 min between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. | |
| Noise immunity | ±1,500 V on power supply terminals in normal or common mode.<br>±1 μs, or 100 ns for square-wave noise with 1 ns. | ±480 V on power supply terminals in normal mode.<br>±1,500 V in common mode.<br>±1 μs, or 100 ns for square-wave noise with 1 ns. |
| Vibration resistance | Vibration: 10 to 55 Hz, Acceleration: 50 $m/s^2$<br>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)<br>Storage:−25°C to 65°C (with no condensation or icing) | |
| Ambient humidity | Operating:25% to 85% (with no condensation) | |
| Approved safety standards | UL3121-1, conforms to EN61010-1 (Pollution degree 2/overvoltage category II)<br>Conforms to VDE0106/P100 (finger protection) | |
| EMC | (EMI)EN61326+A1Industry<br>Emission Enclosure:CISPR 11 Group 1 class A: CISRP16-1/-2<br>Emission AC Mains:CISPR 11 Group 1 class A: CISRP16-1/-2<br>(EMS)EN61326+A1Industry<br>Immunity ESD:EN61000-4-2:4 kV contact discharge<br>8 kV air discharge<br>Immunity RF-interference:EN61000-4-3:10 V/m (amplitude-modulated, 80 MHz to 1 GHz)<br>Electrical Fast Transient Noise:EN61000-4-4:2 kV (power line)<br>Immunity Burst Noise:1 kV line to line (I/O signal line)<br>Immunity Surge:EN61000-4-5:1 kV (power line)<br>2 kV line to ground (power line)<br>Immunity Conducted Disturbance:EN61000-4-6:3 V (0.15 to 80 MHz)<br>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:<br>(±0.5% of indication value or ±1°C, whichever greater) ±1 digit max.<br>Platinum-resistance thermometer:<br>(±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<br>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)<br>Average processing (simple average OFF/2/4/8 operations)<br>Setting change lockout<br>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)<br>Rear case: IEC standard IP20<br>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 indicator 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 |

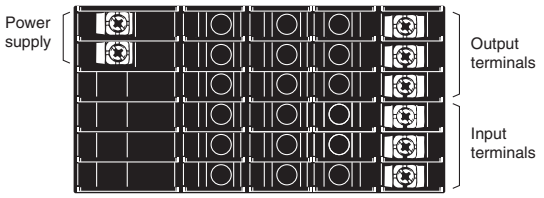
## ■ Input/Output Ratings

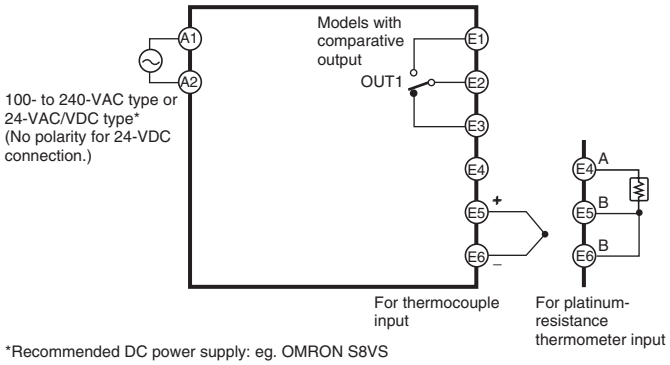
### Relay Contact Output

| 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

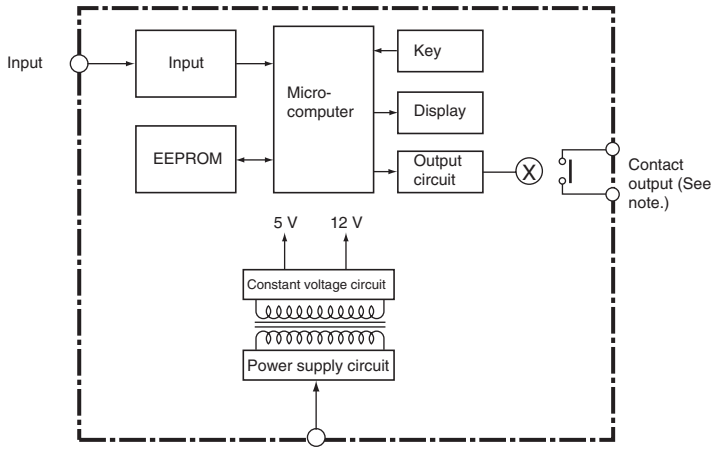



*Recommended DC power supply: eg. OMRON S8VS

| 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. |

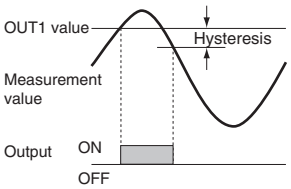
### OUT Types (Comparative Output Models Only)

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

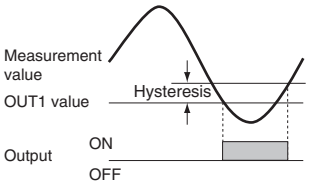
- Upper limit (High Acting):
  The output is turned ON when the measurement value is greater than its set value.
- Lower limit (Low Acting):
  The output is turned ON when the measurement value is less than its set value.
- Upper and lower limits (Outside Band Acting):
  An upper limit (H set value) 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 1.t | hi | Upper limit: Alarm operates at upper limit. |
| | lo | Lower limit: Alarm operates at lower limit. |
| | hi-lo | Upper and lower limits: Alarm operates at upper and lower limits. |

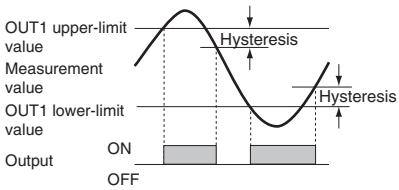
**Upper Limit (High Acting)**




**Lower Limit (Low Acting)**



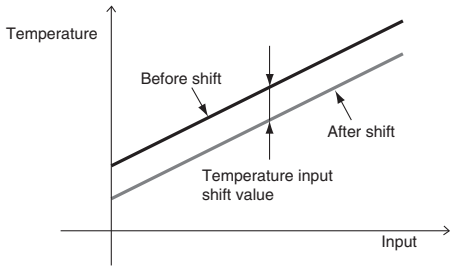

**Upper and Lower Limits (Outside Band Acting)**



## 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

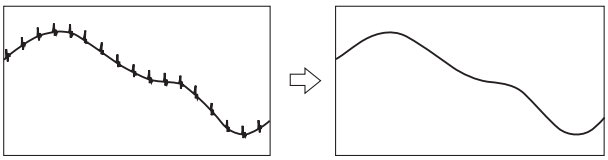
This function returns all of the parameters to their initial values.

| 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).

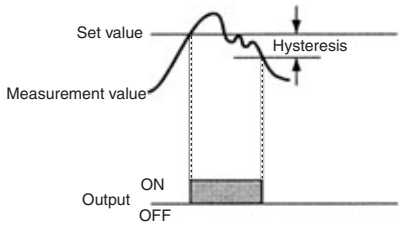


This is useful for ignoring rapid fluctuations, e.g., eliminating spike noise.

## Hysteresis (Comparative Output Models Only)

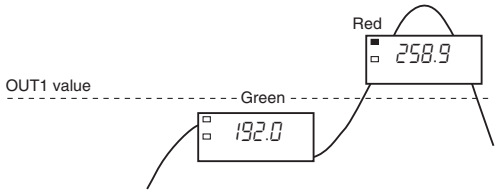
The hysteresis of comparative outputs can be set to prevent chattering in the output when the measurement value fluctuates finely near the OUT value.

**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

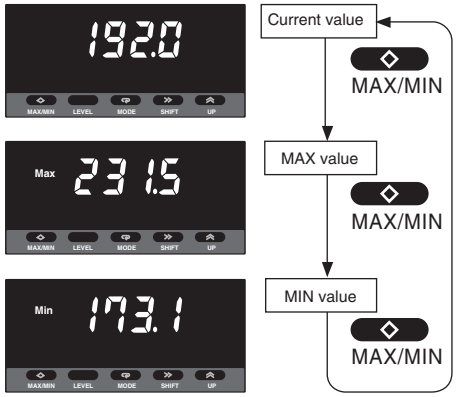
This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

## Move-to-Protect-Level Time

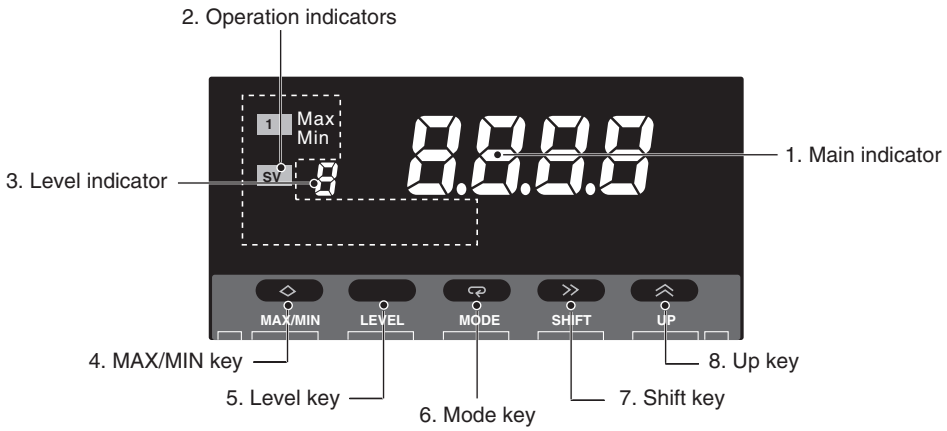
The time required to shift to the protect level can be set as desired.

## 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.



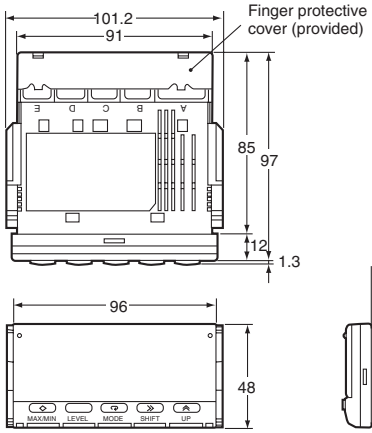
# Nomenclature



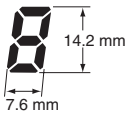

| Name | | Functions |
|---|---|---|
| 1. Main indicator | | Displays current values, parameters, and set values. |
| 2. Operation indicators | 1 | Lit when output 1 is ON. |
| | SV | Lit when a set value is being displayed or changed. |
| | Max | Lit when the main indicator is showing the MAX value. |
| | 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. |

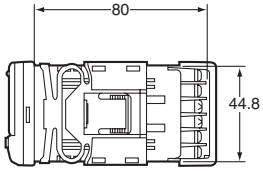
| Level indicator | Level |
|---|---|
| p | Protect |
| Not lit | Operation |
| a | Adjustment |
| s | Initial setting |
| f | Advanced-function setting |

# Dimensions

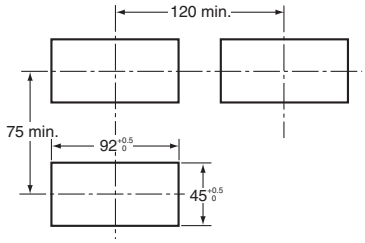



**Main indicator character size**



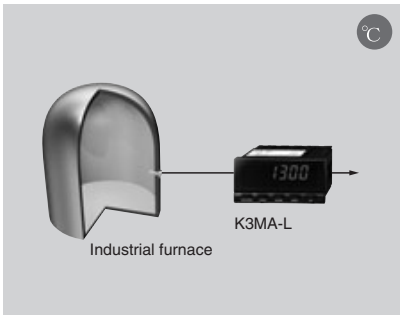

**Panel cut-out**




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

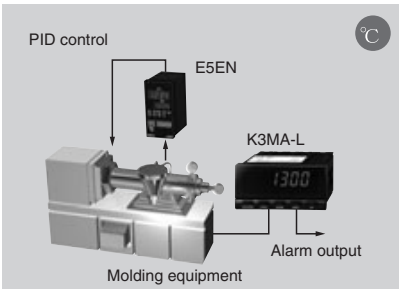
# Application Examples

## Monitoring the temperature of an industrial furnace



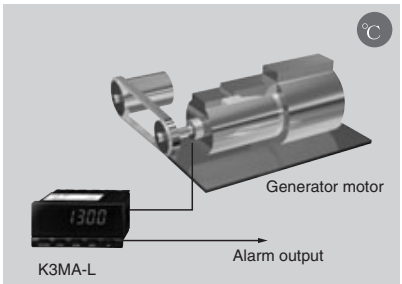

- Monitoring the temperature of an industrial furnace/sintering furnace.
- Monitoring/alarm function for disinfecting equipment.

## Sending a temperature alarm for molding equipment




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

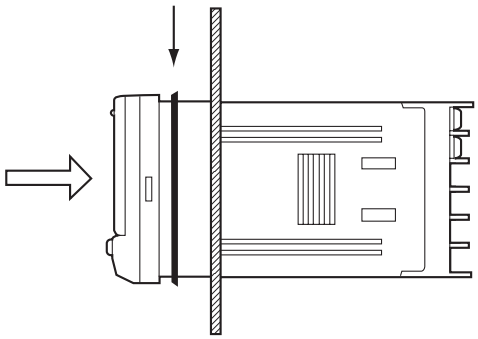
## Monitoring the bearing temperature for a generator motor



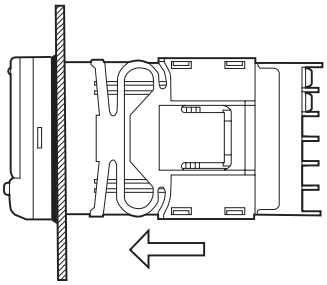

- Monitoring temperature rises in electric power generating facilities.
- Inspecting temperatures in machines and devices.

# 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.

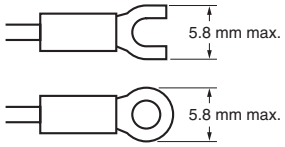


## ■ Wiring Precautions

- 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.

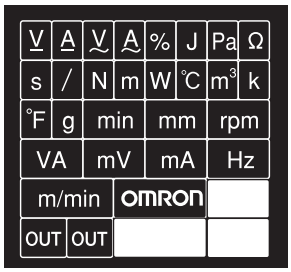
## ■ Wiring

- 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.

# Precautions

**⚠ WARNING**

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

**⚠ Caution**

Do not disassemble the product or touch the internal components of the product while the power is being supplied. Doing so may result in electric shock.

**⚠ Caution**

Do not allow metal objects or wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

**⚠ Caution**

Perform correct settings for the product according to the control application. Failure to do so may cause unexpected operation, resulting in damage to the product or injury.

**⚠ Caution**

Take safety measures, such as installing a separate monitoring system, to ensure safety even if the product fails. Product failure may prevent comparative outputs from being generated, resulting in serious accidents.

Observe the following precautions to ensure safety.

1. Maintain the power supply voltage within the range specified in the specifications.
2. Maintain the load within the ratings specified in the specifications.
3. Check each terminal for correct number and polarity before connecting it. Incorrect or reverse connections may damage or burn out internal components in the product.
4. Tighten the terminal screws securely. The recommended tightening torque is 0.43 to 0.58 N·m. Loose screws may cause fire or malfunction.
5. Do not connect anything to unused terminals.
6. Provide a switch or circuit breaker so that operators can easily turn OFF the power supply when necessary. Also provide appropriate indications of such devices.
7. Do not attempt to disassemble, repair, or modify the product.
8. Do not use the product where flammable or combustible gases are present.

## Application

### General Precautions

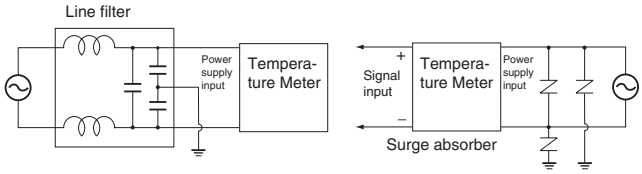
1. Do not use the product in the following locations:
   - Locations subject to direct radiant heat from heating equipment.
   - Locations subject to exposure to water, oil, or chemicals.
   - Locations subject to direct sunlight.
   - Locations subject to dust or corrosive gases (particularly, sulfuric gas or ammonia gas).
   - Locations subject to severe changes in temperature.
   - Locations subject to icing or condensation.
   - Locations subject to shock or vibration.
2. Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation.
3. Ensure that the rated voltage is reached within two seconds after the power is turned ON.
4. Conduct aging for 15 minutes min. after power is turned ON for correct measurement.
5. Do not touch the slit sections or terminals while the power is being supplied to prevent the product from being affected by static electricity.
6. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the product.
7. Do not use paint thinner for cleaning. Use commercially available alcohol.

### Mounting

- Mount the product to a panel that is 1 to 8 mm thick.
- Install the product in a horizontal position.
- Use crimp terminals that match screw sizes.

### Noise Prevention

- Install the product as far as possible from devices that generate strong, high-frequency fields (such as high-frequency welders or sewing machines) or surges.
- Install surge absorbers or noise filters on nearby devices that generate noise (particularly motors, transformers, solenoids, magnet coils, and other devices that have a high inductance component). Do not connect a surge absorber to the temperature sensor input section of the K3MA-L.




- To prevent inductive noise, separate the terminal block wiring for the product from high-voltage or high-current power lines. Do not route the wiring for the product in parallel with or tie it in a bundle with power lines.
  Take the following countermeasures against inductive noise in input lines.

  **Temperature Inputs**
  Separate the lead wire that connects the product with a temperature sensor from the load line to prevent the product from being affected by inductive noise.
- When using a noise filter for the power supply, check for the voltage and current and install it as close as possible to the Temperature Meter.
- Do not install the product near radios, television sets, or wireless devices. Doing so may cause reception interference.

### Increasing Service Life

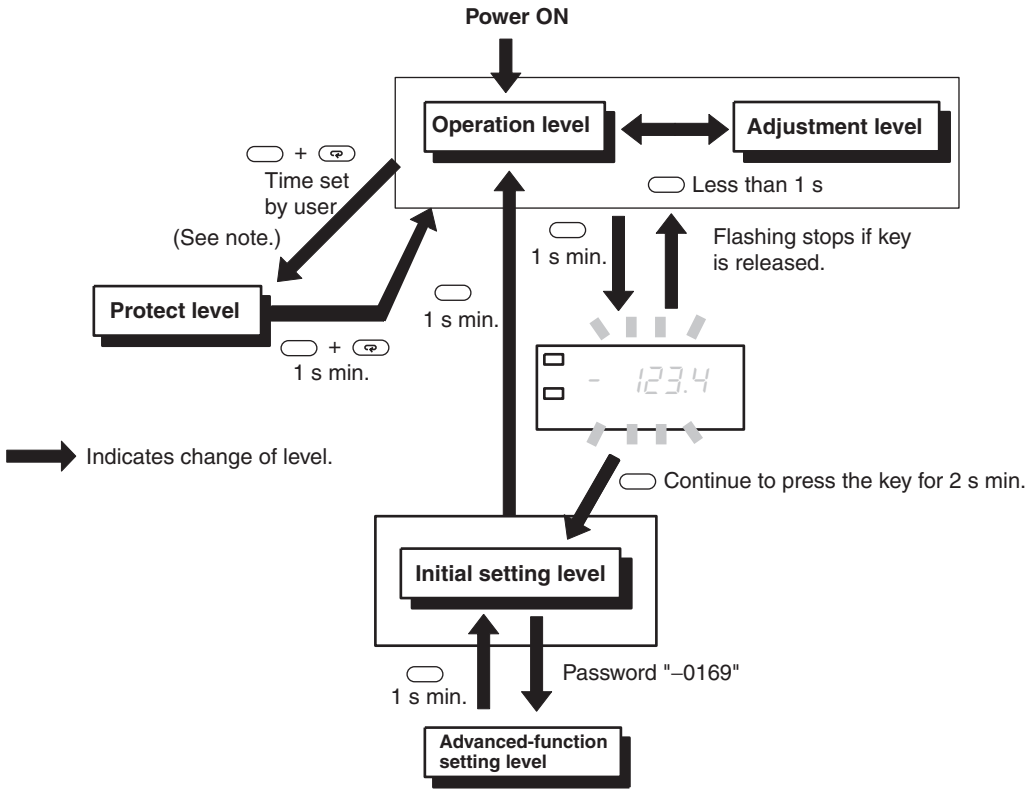
- Do not use the product in locations where the temperature or humidity exceeds the ratings or where condensation may occur. When installing the product in a panel, be sure that the temperature around the product (not the temperature around the panel) does not exceed the ratings. The product service life depends on the ambient temperature. The higher the ambient temperature, the shorter the service life. To extend the product service life, lower the temperature inside the Temperature Meter.
- Use and store the product within the temperature and humidity ranges given in the specifications. When gang-mounting Temperature Meters or arranging them vertically, heat generated by the Temperature Meters will cause the internal temperature to rise, reducing the service life. In such cases, consider forced cooling methods, such as using a fan to circulate air around the Temperature Meters. Do not, however, allow only the terminals to be cooled. Doing so will increase measurement error.
- The life of the output relays are greatly affected by the switching capacity and switching conditions. Use these relays within their rated load and electrical life. The contacts may fuse or burn if they are used past their electrical life.

# Operating Procedures

## ■ 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.

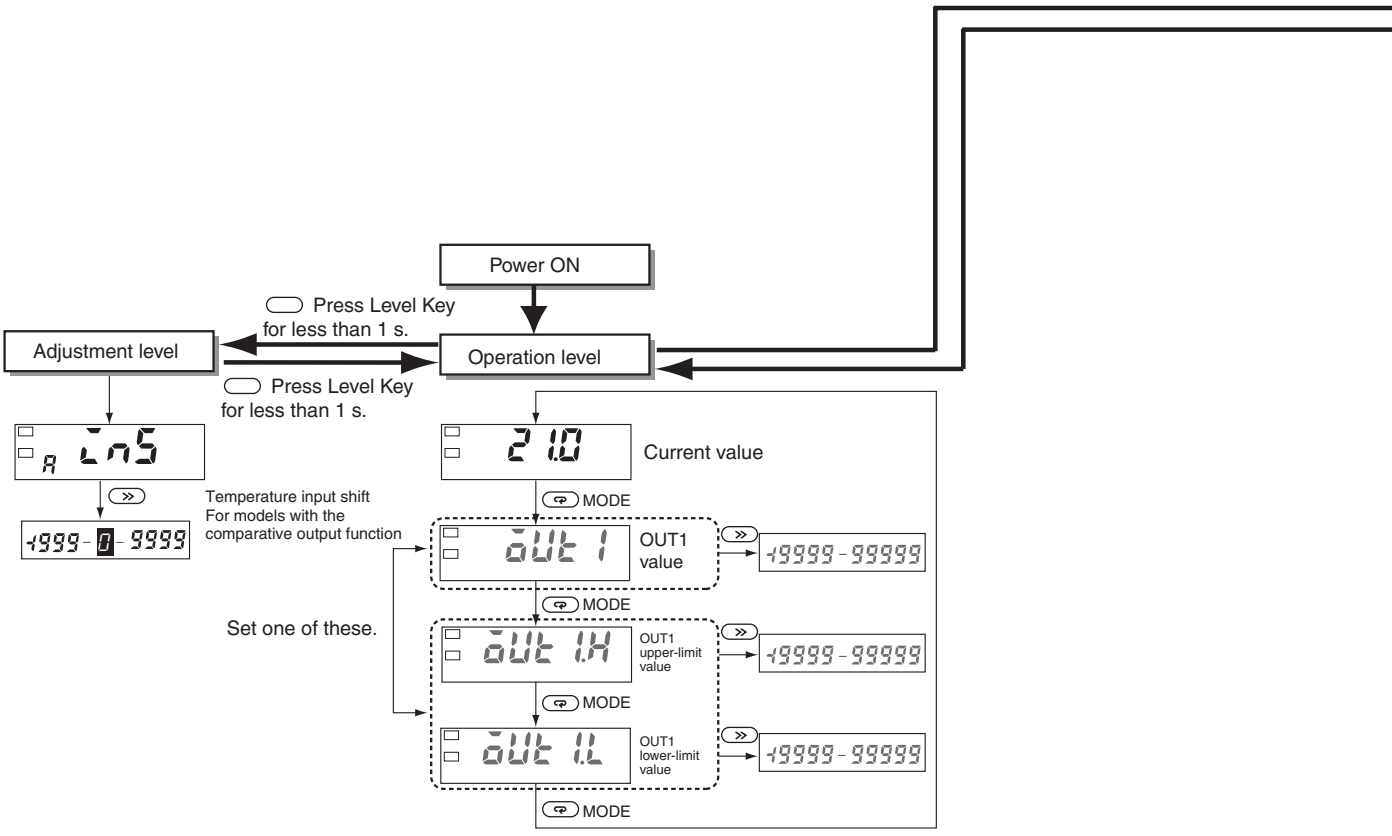
| Level name | Function | Measurement |
|---|---|---|
| Protect | Setting lockouts. | Continue |
| Operation | Displaying current values, and setting OUT 1 value. | Continue |
| Adjustment | Setting communications writing control. | Continue |
| Initial setting | Making initial settings of input type,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

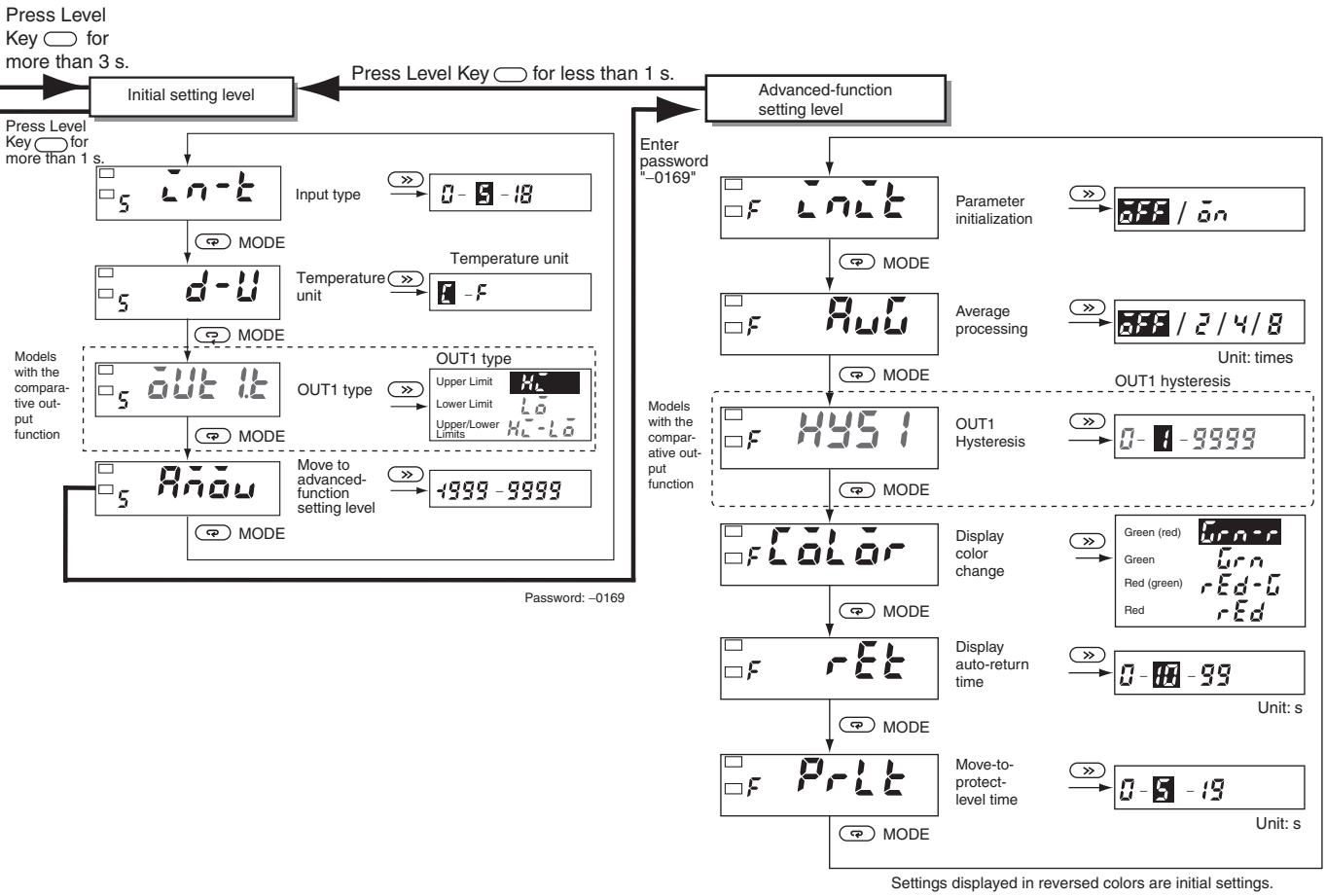



**Note:** The move-to-protect-level time can be set in the advanced-function setting level.

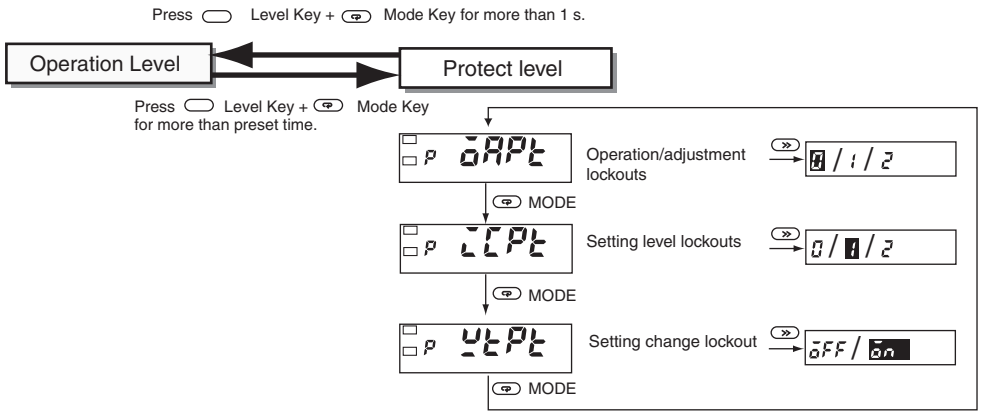
## ■ Parameters

**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.






Settings displayed in reversed colors are initial settings.




## Operation/Adjustment Lockouts

Restricts key operations for operation level and adjustment level.

| Parameter | Setting | Operation level | | Moving to adjustment level |
|---|---|---|---|---|
| | | Process value display | Set value display | |
| oapt | 0 | Allowed | Allowed | Allowed |
| | 1 | Allowed | Allowed | Prohibited |
| | 2 | Allowed | Prohibited | Prohibited |

- Initial setting is 0.
- This cannot be displayed on models not equipped with the 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 |
|---|---|---|---|
| icpt | 0 | Allowed | Allowed |
| | 1 | Allowed | Prohibited |
| | 2 | Prohibited | Prohibited |

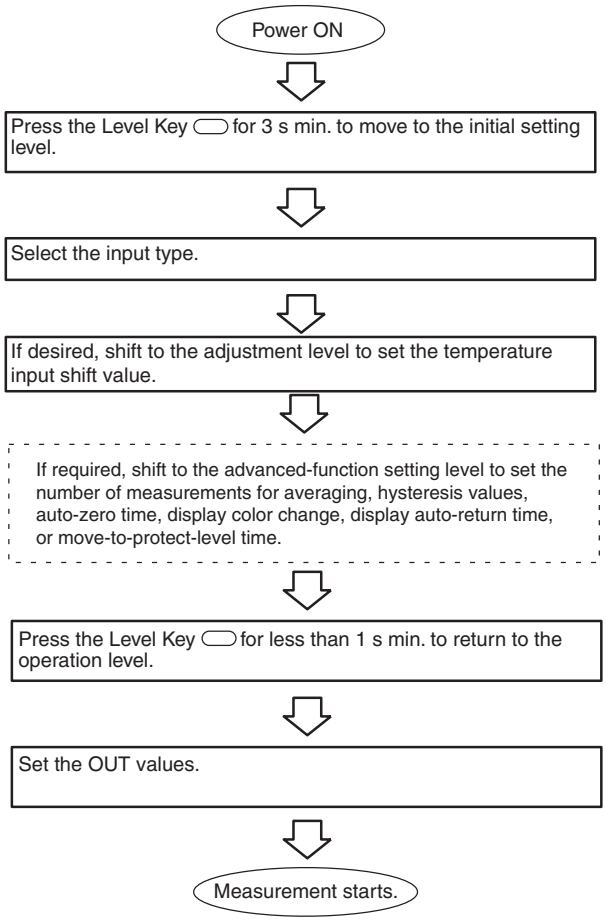
## Setting Change Lockout

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 |
|---|---|---|
| wtpt | off | Allowed |
| | on | Prohibited |

However, all protect level parameters can still be changed.

## ■ Initial Settings

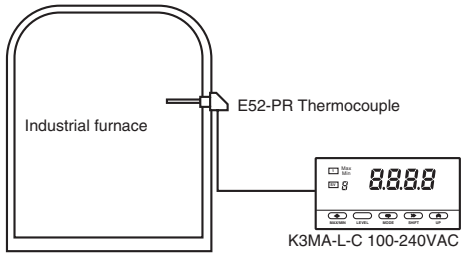


# ■ Setting Example

## Initial Settings

The settings for the following example are shown here.

### Example: Monitoring the temperature of an industrial furnace




Here, the temperature inside the furnace is to be displayed in centigrade (°C).
Temperature sensor: E52-PR Thermocouple, Measurement range: 0 to 1,400°C.

1. Set the K3MA-L input type to the thermocouple R input range.
   Parameter: in-t (input type), Setting value: 15
2. Select centigrade (°C) as the temperature unit.
   Parameter: d-U (temperature unit), Setting value: C

If you are using a comparative output model, make the setting as desired.

# ■ 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.<br>Consult your OMRON sales representative. |
| Not lit | Flashes S.Err | Input error | Confirm that the temperature sensor is correctly connected, and that there are no broken signal lines to the temperature sensor.<br>If the condition does not return to normal, repair is necessary.<br>Consult your OMRON sales representative. |
| Not lit | Flashes 9999 | The measurement value after temperature input correction exceeds 9999. | The temperature input correction value may be inappropriate.<br>Use the adjustment level to review the temperature input correction value. |
| Not lit | Flashes -1999 | The measurement value after temperature input correction is lower than −1999. | The temperature input correction value may be inappropriate.<br>Use the adjustment level to review the temperature input correction value. |

# Warranty and Limitations of Liability

## ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# Application Considerations

## ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. N109-E1-04

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

# Frequency/Rate Meter
# K3MA-F

### 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.

## Model Number Structure

### ■ Model Number Legend

**K3MA-F-□ □**
1 2 3

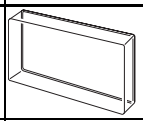
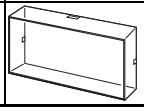
**1. Input Type**
F: Rotary pulse
**2. Output Type**
None: No output
A2: 2 relay contact outputs (SPST-NO)
**3. Supply Voltage**
100-240VAC:100 to 240 VAC
24VAC/VDC:24 VAC/VDC

## Ordering Information

### ■ List of Models

| Input type | Supply voltage | Output | Model |
|---|---|---|---|
| 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 |

### ■ Accessories (Order Separately)

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

# Specifications

## ■ Ratings

| Model | K3MA-F 100-240VDC, K3MA-F-A2 100-240VAC | K3MA-F 24VAC/VDC, K3MA-F-A2 24VAC/VDC |
|---|---|---|
| Supply voltage | 100 to 240 VAC | 24 VAC/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)<br>4.5 W max. (24 VDC) |
| Insulation resistance | 20 MΩ min. (at 500 VDC) between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. | |
| Dielectric strength | 2,000 VAC for 1 min between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. | |
| Noise immunity | ±1,500 V on power supply terminals in normal or common mode.<br>±1 μs, or 100 ns for square-wave noise with 1 ns. | ±480 V on power supply terminals in normal mode.<br>±1,500 V in common mode.<br>±1 μs, or 100 ns for square-wave noise with 1 ns. |
| Vibration resistance | Vibration: 10 to 55 Hz, Acceleration: 50 $m/s^2$<br>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)<br>Storage:−25°C to 65°C (with no condensation or icing) | |
| Approved safety standards | UL3121-1, conforms to EN61010-1 (Pollution degree 2/overvoltage category II)<br>Conforms to VDE0106/P100 (finger protection) | |
| EMC | (EMI)EN61326+A1Industry<br>Emission Enclosure:CISPR 11 Group 1 class A: CISRP16-1/-2<br>Emission AC Mains:CISPR 11 Group 1 class A: CISRP16-1/-2<br>(EMS)EN61326+A1Industry<br>Immunity ESD:EN61000-4-2:4 kV contact discharge<br>8 kV air discharge<br>Immunity RF-interference:EN61000-4-3:10 V/m (amplitude-modulated, 80 MHz to 1 GHz)<br>Electrical Fast Transient Noise:EN61000-4-4:2 kV (power line)<br>Immunity Burst Noise:1 kV line to line (I/O signal line)<br>Immunity Surge:EN61000-4-5:1 kV (power line)<br>2 kV line to ground (power line)<br>Immunity Conducted Disturbance:EN61000-4-6:3 V (0.15 to 80 MHz)<br>Immunity Voltage Dip/Interrupting:EN61000-4-11:0.5 cycle, 0, 180°, 100% (rated voltage) | |
| Weight | Approx. 200 g | |

## ■ Characteristics

| | |
|---|---|
| Input signal | 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>Connectable Sensors<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. |
| Measuring accuracy | ±0.1%FS ±1 digit (at 23±5°C) |
| Measurement method | Cycle measurement |
| Max. displayed digits | 5 digits (−19999 to 99999) |
| 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. |
| Scaling function | Programmable with front-panel key inputs (range of display: −19999 to 99999).<br>The decimal point position can be set as desired. |
| Hold function | Max hold (maximum value), Min hold (minimum value) |
| Hysteresis setting | Programmable with front-panel key inputs (0001 to 9999). |
| Other functions | 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 |
| Output | Relays: 2 SPST-NO |
| Delay in comparative outputs | 750 ms max. |
| Degree of protection | Front panel: NEMA4X for indoor use (equivalent to IP66)<br>Rear case: IEC standard IP20<br>Terminals: IEC standard IP00 + finger protection (VDE0106/100) |
| Memory protection | 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. (at 23±5°C) | −19999 to 99999 (with scaling function) |
| Open collector (5 kHz max.) with ON/OFF pulse width of 90 μs min. | 0 to 5 kHz | | |

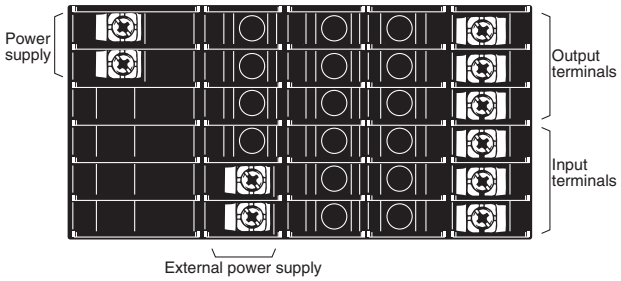
## ■ Input/Output Ratings

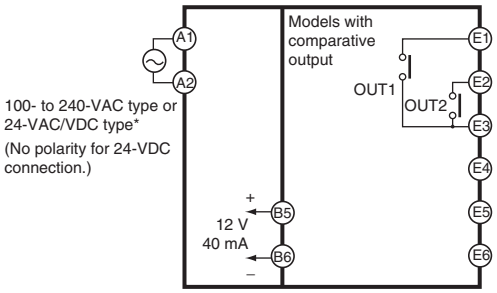
### Relay Contact Output

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

# Connections

## ■ Terminal Arrangement



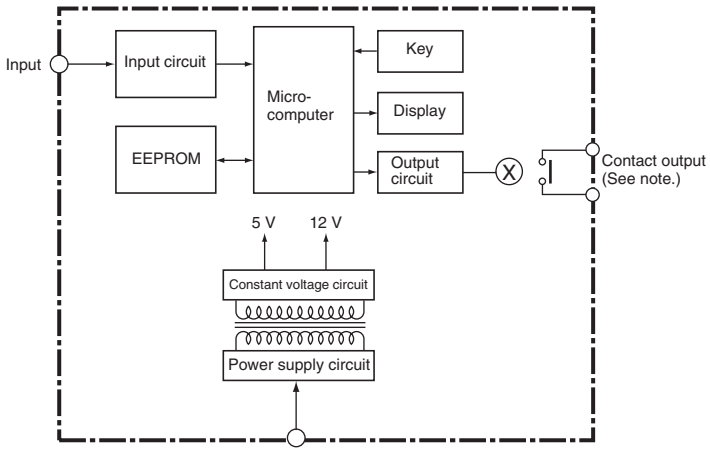




**Note:** Refer to *Input Circuits* on page 5.

*Recommended DC power supply: eg. OMRON S8VS

| 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. |

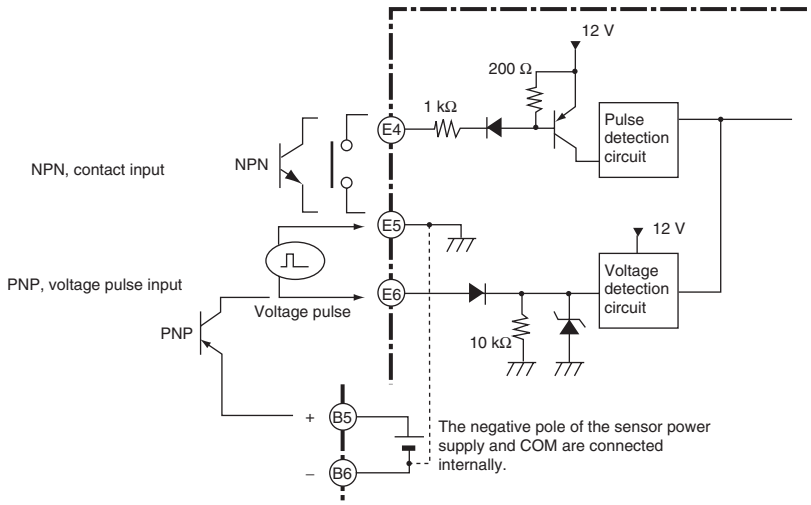
## ■ Block Diagram




**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 (5k) | |

### Pulse Frequency Selection

**Note:** The default value is "0 to 5 kHz (5k)."

| Parameter | Setting value | Meaning |
|---|---|---|
| p-fre | 3 | 0.05 to 30.00 Hz measurement range |
| | 5k | 0 to 5 kHz measurement range |

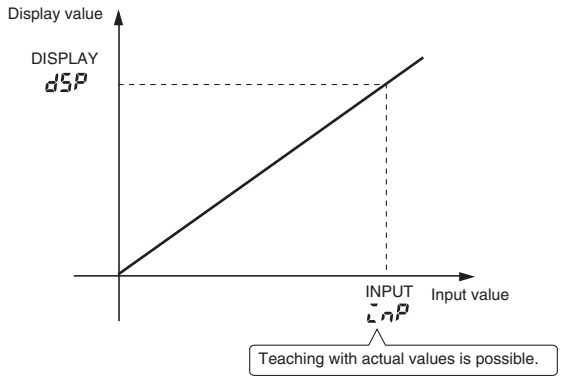
### Scaling

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 |
|---|---|---|
| inp | 0 to 99999 | Input value for dSP |
| dsp | -19999 to 99999 | Display value for InP |

| Parameter | Setting value | Meaning |
|---|---|---|
| dp | %.%%%% | Display four digits after decimal point |
| | %%.%%% | Display three digits after decimal point |
| | %%%.%% | Display two digits after decimal point |
| | %%%%.% | Display one digit after decimal point |
| | %%%%% | No decimal point |

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



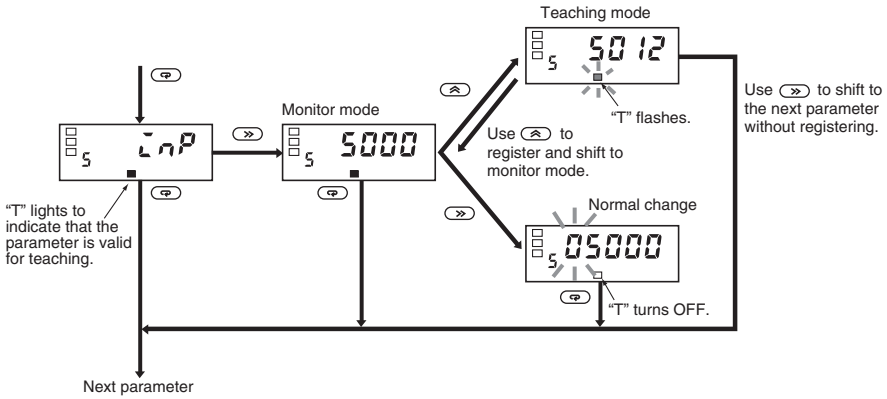

- The decimal point can be optionally displayed.
- When displaying the decimal point, consider the number of digits to follow the decimal point prior to setting the scaling display value.
- If P-FrE is set to 30, the initial setting for the decimal display will be 000.00.

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.

# Convenient Functions

Scaling Teach

The parameter (tnP) for the K3MA-F's initial setting level can be set using actual input values with the teaching function. After displaying the parameter, the actual input settings can be made with the following operation.

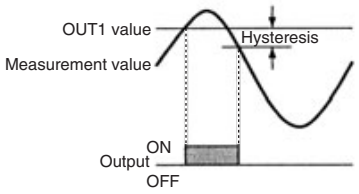



# OUT Types (Comparative Output Models Only)

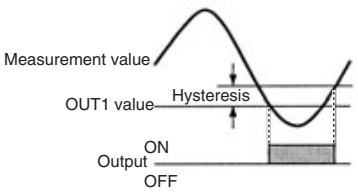
OUT 1 and OUT 2 can be set to operate in one of the three following modes in accordance with the compared values:

- 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 upper-limit set value or less than the lower-limit set value.

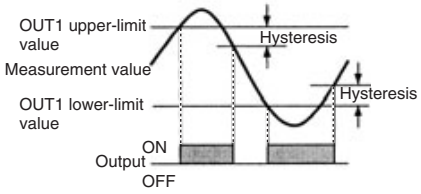
**Upper Limit (High Acting)**




**Lower Limit (Low Acting)**

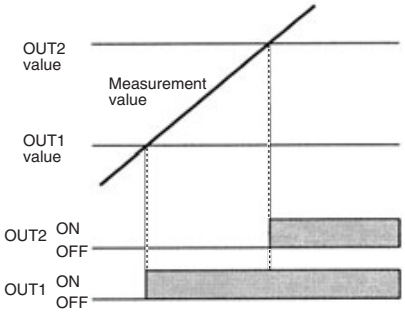



**Upper and Lower Limits (Outside Band Acting)**

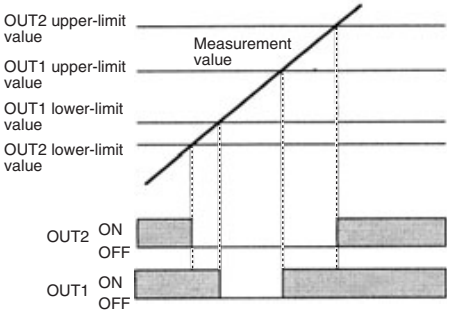



The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

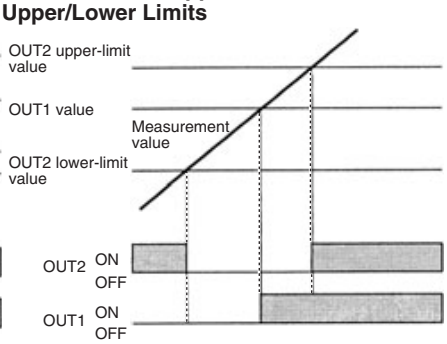
**Upper Limit 2-stage Output**




**Threshold Output**




**Combination of Upper Limit and Upper/Lower Limits**




# Parameter Initialization

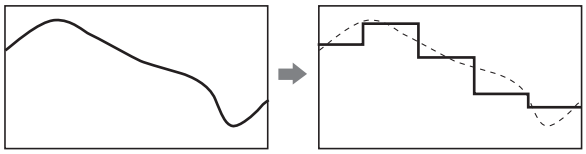
This function returns all of the parameters to their initial values.

| Parameter | Setting value | Meaning |
|---|---|---|
| init | off | --- |
| | on | Initializes all parameters. |

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

## Average Processing

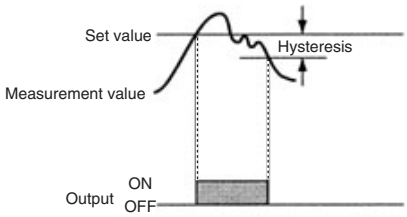
Average processing stabilizes the display by minimizing any pulsating or flicker caused by fluctuations in the pulse width of sensor input or by eccentricity in rotating shafts.



## 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)**

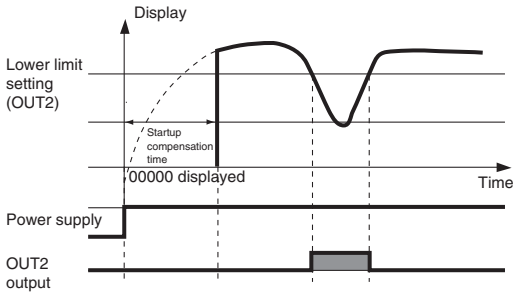



## Auto-zero Time

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.

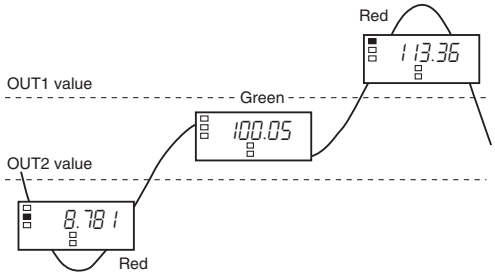
## Startup Compensation Time

The startup compensation time cancels measurement for a predetermined time when turning power ON, to prevent unwanted output due to temporary input fluctuations.




## 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

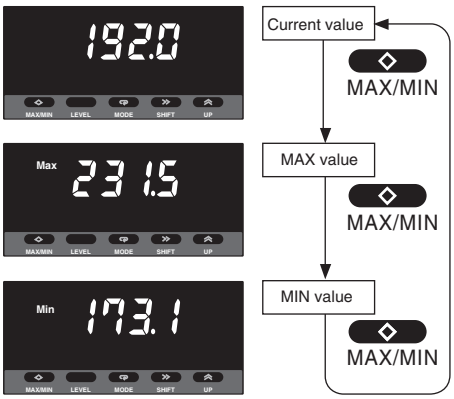
This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

## Move-to-Protect-Level Time

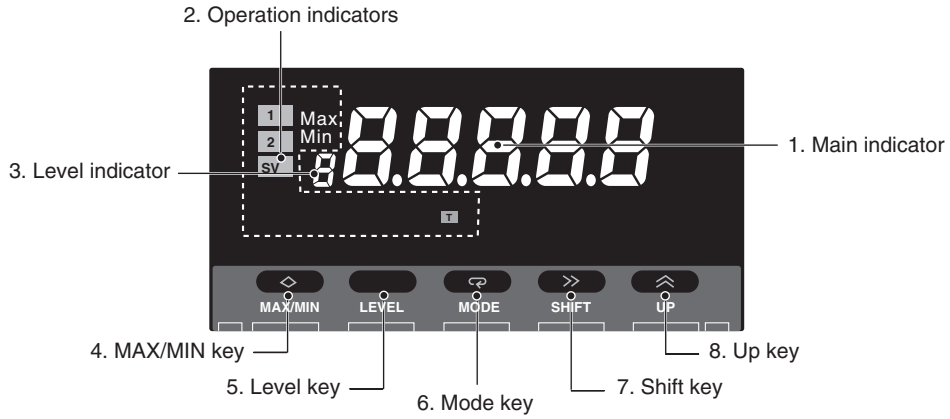
The time required to shift to the protect level can be set as desired.

## 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.



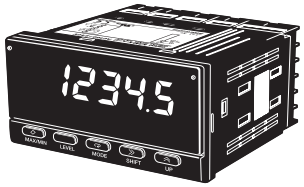
# Nomenclature

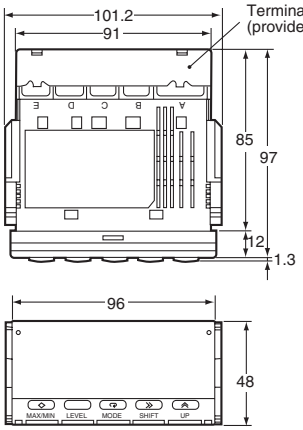



| Name | | Functions |
|---|---|---|
| 1. Main indicator | | Displays current values, parameters, and set values. |
| 2. Operation indicators | 1 | Lit when output 1 is ON. |
| | 2 | Lit when output 2 is ON. |
| | SV | Lit when a set value is being displayed or changed. |
| | Max | Lit when the main 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. |
| 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. |

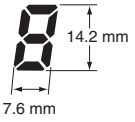
| Level indicator | Level |
|---|---|
| p | Protect |
| Not lit | Operation |
| s | Initial setting |
| f | Advanced-function setting |

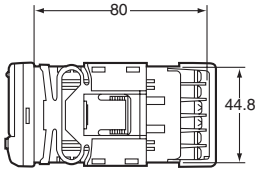
# Dimensions



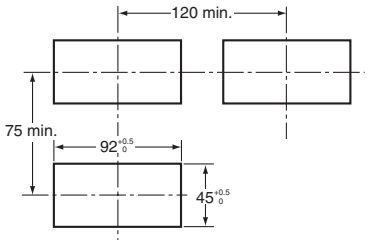



**Main indicator character size**



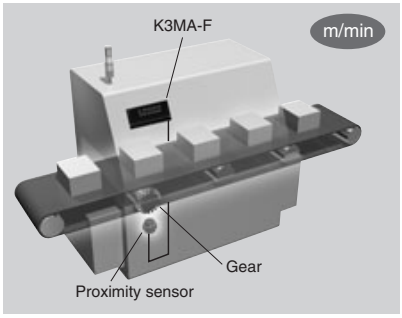

**Panel cut-out**




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

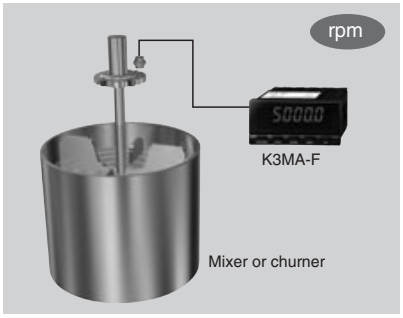
# Application Examples

## Displaying conveyor belt feed speed



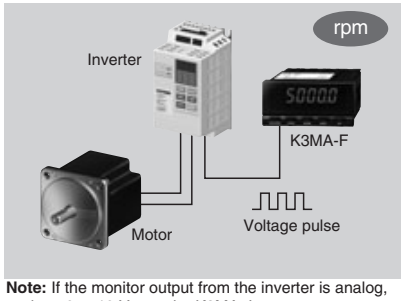

- Monitoring line speed for a reflow furnace
- Displaying feed speed for food processing, conveying, sintering

## 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

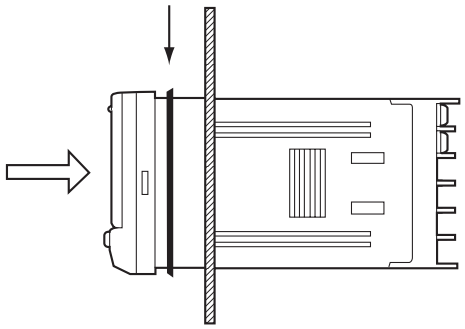



**Note:** If the monitor output from the inverter is analog, such as 0 to 10 V, use the K3MA-J.

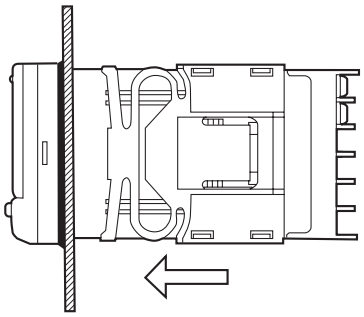
- Monitoring conveyor speed
- Machining equipment (grinders, polishers)

# 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.

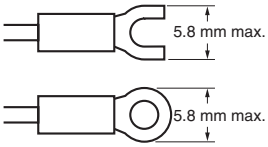


## ■ Wiring Precautions

- 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.

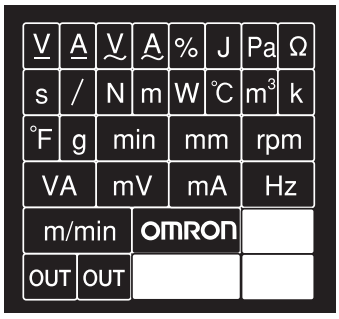
## ■ Wiring

- 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.




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

# Precautions

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

**⚠ Caution**

Do not disassemble the product or touch the internal components of the product while the power is being supplied. Doing so may result in electric shock.

**⚠ Caution**

Do not allow metal objects or wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

**⚠ Caution**

Perform correct settings for the product according to the control application. Failure to do so may cause unexpected operation, resulting in damage to the product or injury.

**⚠ Caution**

Take safety measures, such as installing a separate monitoring system, to ensure safety even if the product fails. Product failure may prevent comparative outputs from being generated, resulting in serious accidents.

Observe the following precautions to ensure safety.

1. Maintain the power supply voltage within the range specified in the specifications.
2. Maintain the load within the ratings specified in the specifications.
3. Check each terminal for correct number and polarity before connecting it. Incorrect or reverse connections may damage or burn out internal components in the product.
4. Tighten the terminal screws securely. The recommended tightening torque is 0.43 to 0.58 N·m. Loose screws may cause fire or malfunction.
5. Do not connect anything to unused terminals.
6. Provide a switch or circuit breaker so that operators can easily turn OFF the power supply when necessary. Also provide appropriate indications of such devices.
7. Do not attempt to disassemble, repair, or modify the product.
8. Do not use the product where flammable or combustible gases are present.

## Application

### General Precautions

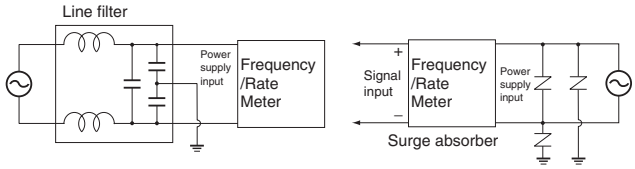
1. Do not use the product in the following locations:
   - Locations subject to direct radiant heat from heating equipment.
   - Locations subject to exposure to water, oil, or chemicals.
   - Locations subject to direct sunlight.
   - Locations subject to dust or corrosive gases (particularly sulfuric gas or ammonia gas).
   - Locations subject to severe changes in temperature.
   - Locations subject to icing or condensation.
   - Locations subject to shock or vibration.
2. Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation.
3. Ensure that the rated voltage is reached within two seconds after the power is turned ON.
4. Conduct aging for 15 minutes min. after power is turned ON for correct measurement.
5. Do not touch the slit sections or terminals while the power is being supplied to prevent the product from being affected by static electricity.
6. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the product.
7. Do not use paint thinner for cleaning. Use commercially available alcohol.

### Mounting

- Mount the product to a panel that is 1 to 8 mm thick.
- Install the product in a horizontal position.
- Use crimp terminals that match screw sizes.

### Noise Prevention

- Install the product as far as possible from devices that generate strong, high-frequency fields (such as high-frequency welders or sewing machines) or surges.
- Install surge absorbers or noise filters on nearby devices that generate noise (particularly motors, transformers, solenoids, magnet coils, and other devices that have a high inductance component).




- To prevent inductive noise, separate the terminal block wiring for the product from high-voltage or high-current power lines. Do not route the wiring for the product in parallel with or tie it in a bundle with power lines.
- When using a noise filter for the power supply, check for the voltage and current and install it as close as possible to the Frequency/Rate Meter.
- Do not install the product near radios, television sets, or wireless devices. Doing so may cause reception interference.

### Increasing Service Life

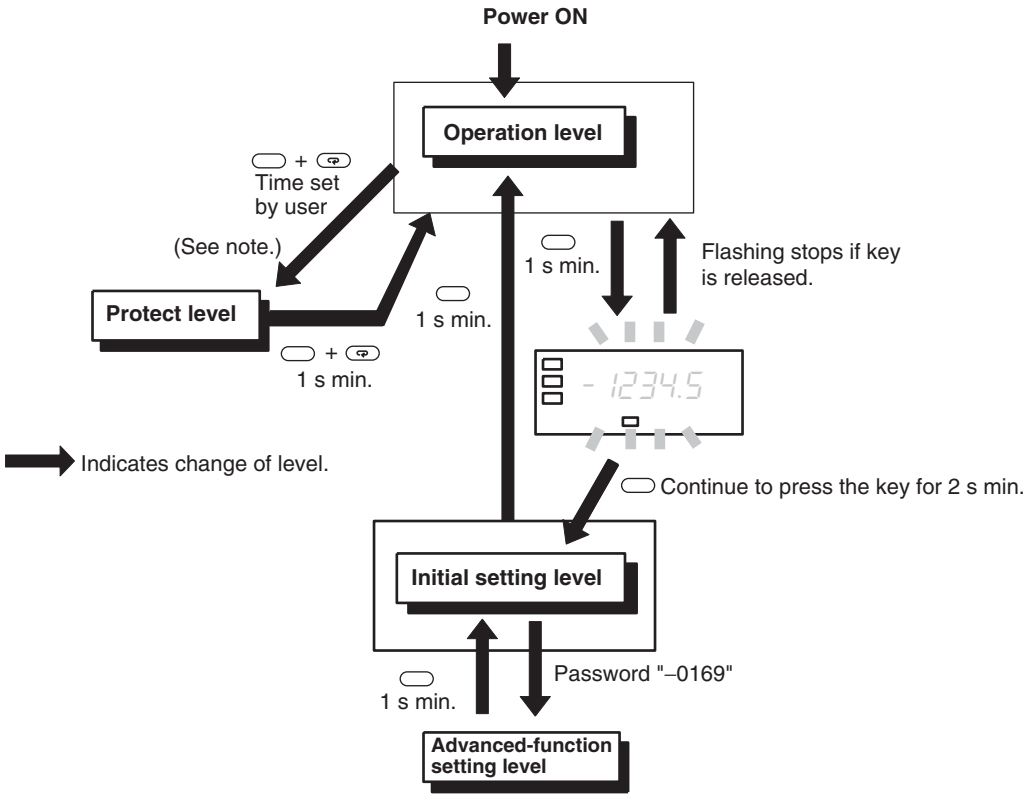
- Do not use the product in locations where the temperature or humidity exceeds the ratings or where condensation may occur. When installing the product in a panel, be sure that the temperature around the product (not the temperature around the panel) does not exceed the ratings. The product service life depends on the ambient temperature. The higher the ambient temperature, the shorter the service life. To extend the product service life, lower the temperature inside the Frequency/Rate Meter.
- Use and store the product within the temperature and humidity ranges given in the specifications. When gang-mounting Frequency/Rate Meters or arranging them vertically, heat generated by the Frequency/Rate Meters will cause the internal temperature to rise, reducing the service life. In such cases, consider forced cooling methods, such as using a fan to circulate air around the Frequency/Rate Meters. Do not, however, allow only the terminals to be cooled. Doing so will increase measurement error.
- The life of the output relays is greatly affected by the switching capacity and switching conditions. Use these relays within their rated load and electrical life. The contacts may fuse or burn if they are used past their electrical life.

# Operating Procedures

## ■ 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 |

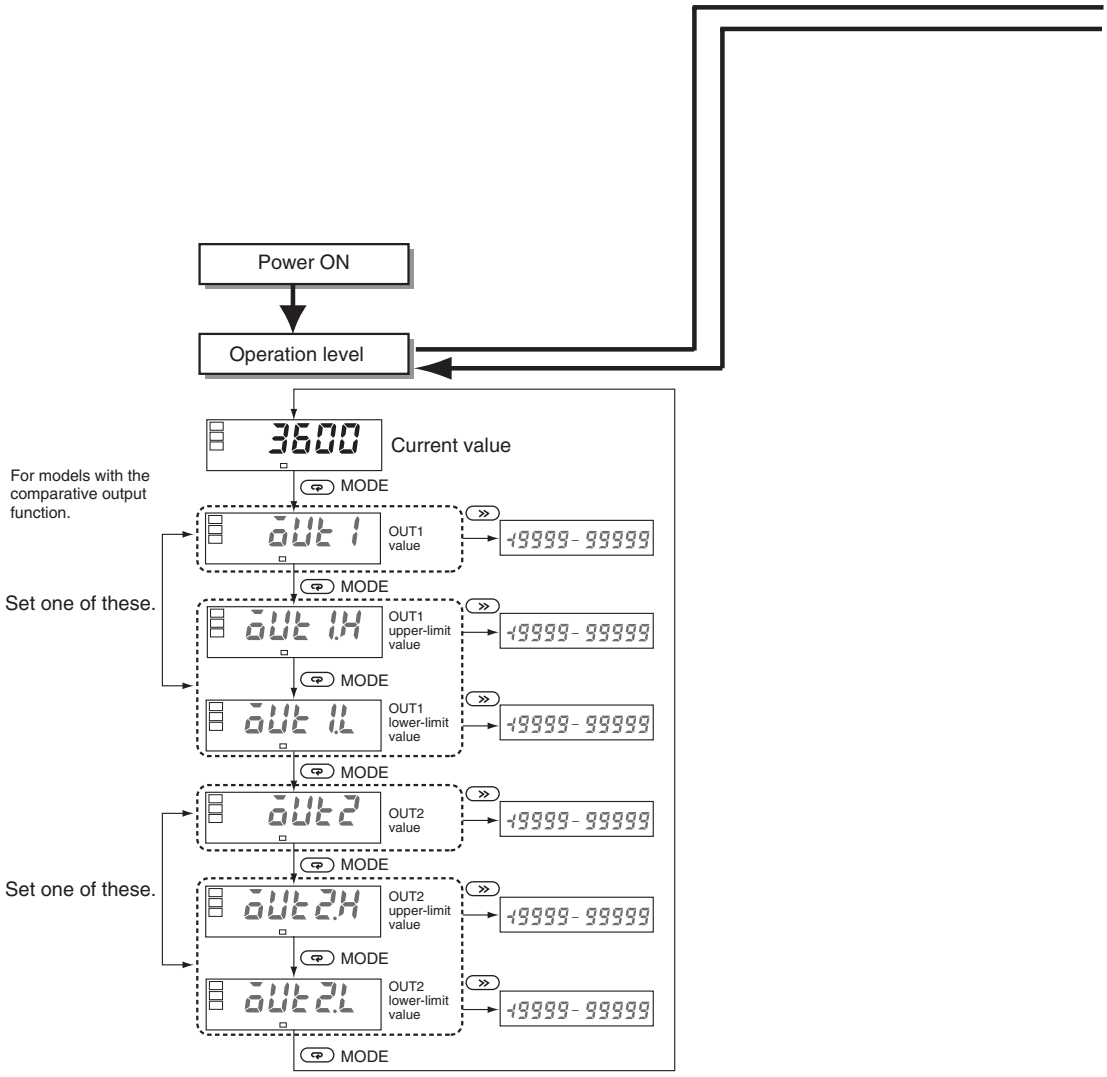


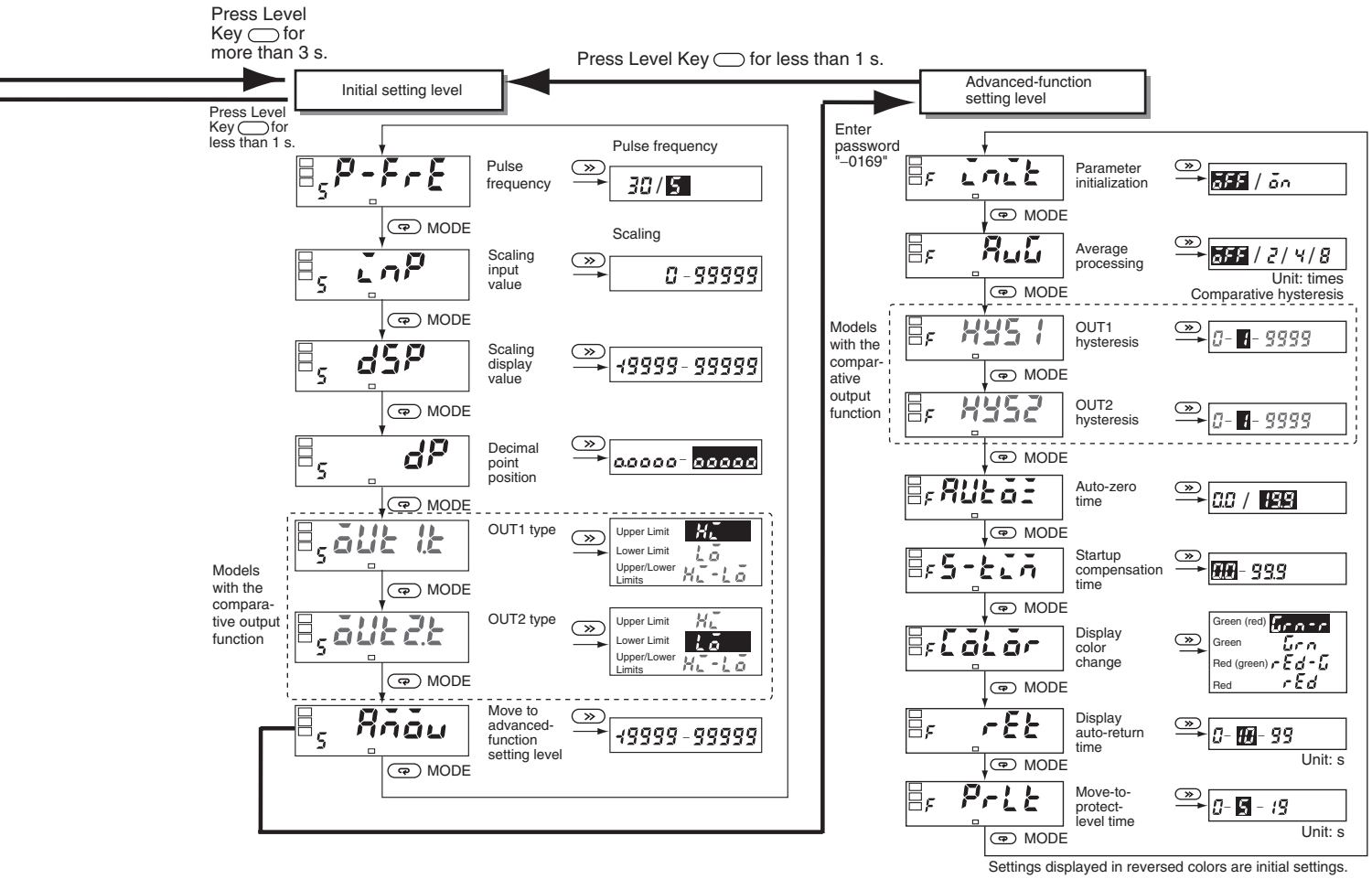

**Note:** The move-to-protect-level time can be set in the advanced-function setting level.

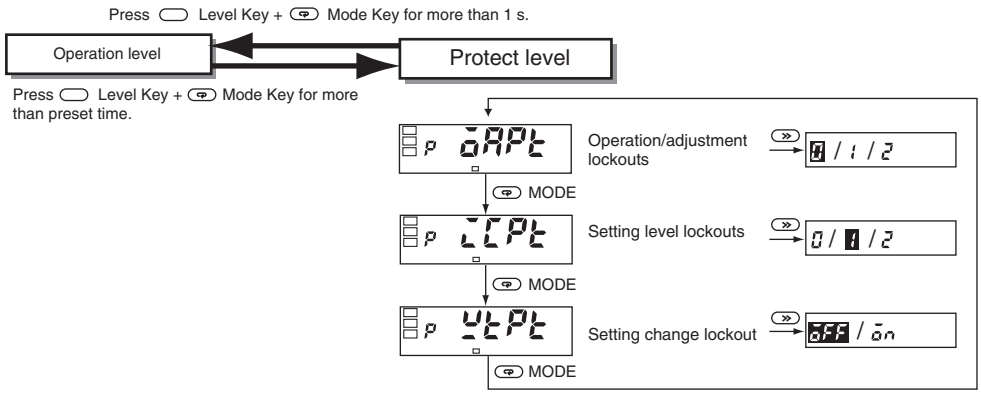
## ■ Parameters

**Note:** 1. Some parameters are not displayed for certain models.

2. The K3MA-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 for more than 3 s.
Initial setting level
Press Level Key for less than 1 s.
Advanced-function setting level
Press Level Key for less than 1 s.
P-FrE
Pulse frequency
Pulse frequency
30/5
MODE
inP
Scaling input value
Scaling
0-99999
MODE
dSP
Scaling display value
-19999-99999
MODE
dP
Decimal point position
00000-00000
MODE
Models with the comparative output function
out1t
OUT1 type
Upper Limit
Lower Limit
Upper/Lower Limits
HL
Lo
HL-Lo
MODE
out2t
OUT2 type
Upper Limit
Lower Limit
Upper/Lower Limits
HL
Lo
HL-Lo
MODE
Anou
Move to advanced-function setting level
-19999-99999
MODE
Enter password "-0169"
Parameter initialization
oFF / on
MODE
AvG
Average processing
oFF / 2/4/8
Unit: times
MODE
Comparative hysteresis
Models with the comparative output function
HYS1
OUT1 hysteresis
0-1-9999
MODE
HYS2
OUT2 hysteresis
0-1-9999
MODE
AUtoZ
Auto-zero time
0.0 / 19.9
MODE
S-tCn
Startup compensation time
00-999
MODE
CoLor
Display color change
Green (red)
Green
Red (green)
Red
Grn-r
Grn
rEd-G
rEd
MODE
rEt
Display auto-return time
0-10-99
Unit: s
MODE
PrLt
Move-to-protect-level time
0-5-19
Unit: s
MODE
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 |
| oapt | 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 |
|---|---|---|---|
| icpt | 0 | Allowed | Allowed |
| | 1 | Allowed | Prohibited |
| | 2 | Prohibited | Prohibited |

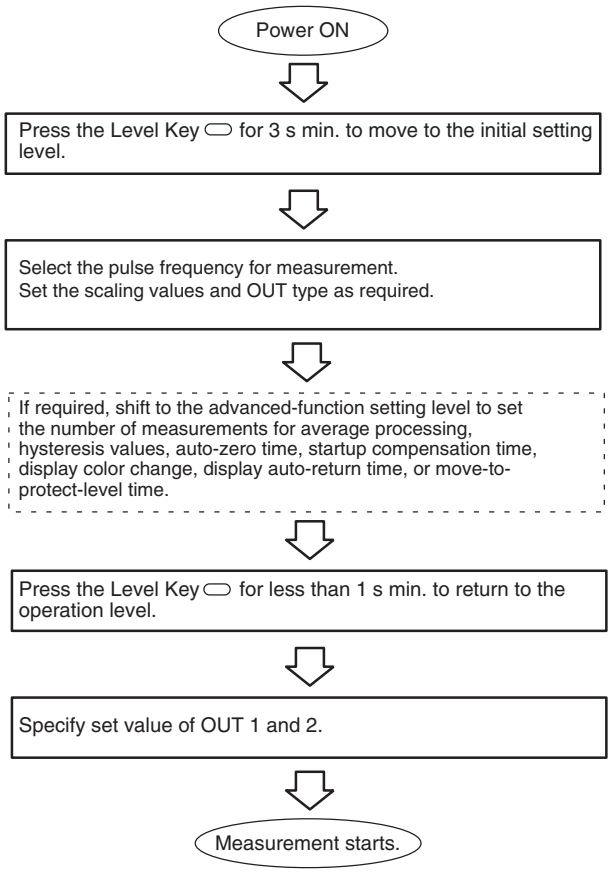
## Setting Change Lockout

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 |
|---|---|---|
| wtpt | off | Allowed |
| | on | Prohibited |

However, all protect level parameters can still be changed.

# ■ Initial Settings

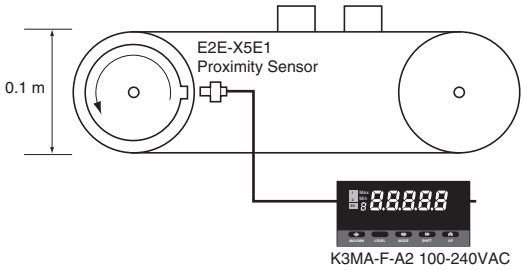


# ■ Setting Example

## Initial Settings

The settings for the following example are shown here.

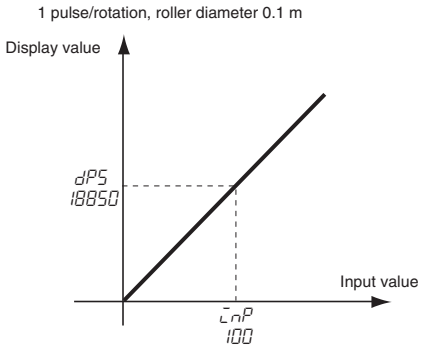
### Example: Display conveyor belt feed speed




K3MA-F-A2 100-240VAC

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.

1. 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
2. Set the scaling. The relationship between the display value and the input value is shown in the following equation.
   Rotations (rpm)=Frequency input/No. of pulses per rotation × 60
   Cycle speed D (m/min)=Rotations × roll circumference
   =1/N × f × 60 × d × π
   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:
   Display value = 1/1 × f × 60 × 0.1 × π
   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 18850 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) | 0000.0 |

**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. |
| | | | 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. |
| | | | The scaling value may be inappropriate. Review the scaling value at the initial setting level. |

# Warranty and Limitations of Liability

## ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## ■ LIMITATIONS OF LIABILITY

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In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# Application Considerations

## ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. N107-E1-03

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

# Process Indicator
# K3HB-X

## A Process Indicator Ideal for Discriminating and Displaying Measurements for Voltage/ Current Signals

- Easy recognition of judgement results using color display that can be switched between red and green.
- Equipped with a position meter for monitoring operating status trends.
- External event input allows use in various measurement and discrimination applications.
- Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).
- Capable of high-speed sampling at 50 times per second (20 ms)
- Easy-to-set two-point scaling allows conversion and display of any user-set values.


# Model Number Structure

## ■ Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

### Base Units

**K3HB-X□ □**
**1 5**

**1. Input Sensor Codes**

VD: DC voltage input
AD: DC current input
VA: AC voltage input
AA: AC current input

5. Supply Voltage

100-240 VAC: 100 to 240 VAC
24 VAC/VDC: 24 VAC/VDC

### Optional Board

**Sensor Power Supply/Output Boards**

**K33-□**
**2**

**Relay/Transistor Output Boards**

**K34-□**
**3**

**Event Input Boards**

**K35-□**
**4**

### Base Units with Optional Boards

**K3HB-X□-□□□ □**
**1 2 3 4 5**

**2. Sensor Power Supply/Output Type Codes**

None: None
CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 1.)
L1A: Linear current output (DC0(4) − 20 mA) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)
L2A: Linear voltage output (DC0(1) − 5 V, 0 to 10 V) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)
A: Sensor power supply (12 VDC +/−10%, 80 mA)
FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)
FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)

**3. Relay/Transistor Output Type Codes**

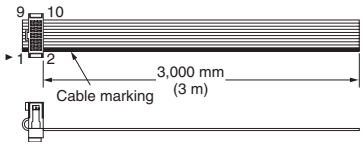
None: None
C1: Relay contact (H/L: SPDT each)
C2: Relay contact (HH/H/LL/L: SPST-NO each)
T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
DRT: DeviceNet (See note 2.)

**4. Event input Type Codes**

None: None
1: 5 points (M3 terminal blocks) NPN open collector
2: 8 points (10-pin MIL connector) NPN open collector
3: 5 points (M3 terminal blocks) PNP open collector
4: 8 points (10-pin MIL connector) PNP open collector

**Note 1.** CPA can be combined with relay outputs only.
**2.** Only one of the following can be used by each Digital Indicator: RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

## ■ Accessories (Sold Separately)

| Name | Appearance | Wiring | Model number |
|---|---|---|---|
| Special Cable (for event inputs with 8-pin connector) |  | ▶<br>Pin No. / Signal name<br>1 TIMING<br>2 S-TMR<br>3 HOLD<br>4 RESET<br>5 ZERO<br>6 COM<br>7 BANK4<br>8 BANK2<br>9 BANK1<br>10 COM | K32-DICN |

# Specifications

## ■ Ratings

| | | |
|---|---|---|
| Power supply voltage | | 100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC |
| Allowable power supply voltage range | | 85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC |
| Power consumption (See note 1.) | | 100 to 240 V: 18 VA max. (max. load)<br>24 VAC/DC: 11 VA/7 W max. (max. load) |
| Current consumption | | DeviceNet power supply: 50 mA max. (24 VDC) |
| Input | | DC voltage, DC current, AC voltage, AC current |
| A/D conversion method | | Delta-Sigma method |
| External power supply | | See Sensor Power Supply/Output Type Codes |
| Event inputs (See note 2.) | Timing input<br>Startup compensation timer input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 3 V max.<br>ON current at 0 Ω: 17 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 1.5 mA max. |
| | Hold input<br>Reset input<br>Forced-zero input<br>Bank input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 2 V max.<br>ON current at 0 Ω: 4 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 0.1 mA max. |
| Output ratings (depends on the model) | Relay output | 250 VAC, 30 VDC, 5 A (resistive load)<br>Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations |
| | Transistor output | Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 μA max. |
| | Linear output | Linear output 0 to 20 mA DC, 4 to 20 mA:<br>Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:<br>Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>(1 V or less: ±0.15 V; not output for 0 V or less) |
| Display method | | Negative LCD (backlit LED) display<br>7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green) |
| Main functions | | Scaling function, measurement operation selection, averaging, previous average value comparison, forced-zero, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset |
| Ambient operating temperature | | −10 to 55°C (with no icing or condensation) |
| Ambient operating humidity | | 25% to 85% |
| Storage temperature | | −25 to 65°C (with no icing or condensation) |
| Altitude | | 2,000 m max. |
| Accessories | | Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.) |

**Note 1.** DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

**2.** PNP input types are also available

**3.** For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

## ■ Characteristics

| | | |
|---|---|---|
| Display range | | −19,999 to 99,999 |
| Sampling period | | 20 ms (50 times/second) |
| Comparative output response time | | DC input: 100 ms max.; AC input: 300 ms max. |
| Linear output response time | | DC input: 150 ms max.; AC input: 420 ms max. |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 2,300 VAC for 1 min between external terminals and case |
| Noise immunity | | 100 to 240 VAC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)<br>24 VAC/VDC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns) |
| Vibration resistance | | Frequency: 10 to 55 Hz; Acceleration: 50 $m/s^2$, 10 sweeps of 5 min each in X, Y, and Z directions |
| Shock resistance | | 150 $m/s^2$ (100 $m/s^2$ for relay outputs) 3 times each in 3 axes, 6 directions |
| Weight | | Approx. 300 g (Base Unit only) |
| Degree of protection | Front panel | Conforms to NEMA 4X for indoor use (equivalent to IP66) |
| | Rear case | IP20 |
| | Terminals | IP00 + finger protection (VDE0106/100) |
| Memory protection | | EEPROM (non-volatile memory)<br>Number of rewrites: 100,000 |
| Applicable standards | | UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL)<br>EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II<br>EN61326: 1997, A1: 1998, A2: 2001 |
| EMC | | EMI: EN61326+A1 industrial applications<br>Electromagnetic radiation interference<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>Terminal interference voltage<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>EMS: EN61326+A1 industrial applications<br>Electrostatic Discharge Immunity<br>EN61000-4-2: 4 kV (contact), 8 kV (in air)<br>Radiated Electromagnetic Field Immunity<br>EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)<br>Electrical Fast Transient/Burst Immunity<br>EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)<br>Surge Immunity<br>EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)<br>Conducted Disturbance Immunity<br>EN61000-4-6: 3 V (0.15 to 80 MHz)<br>Voltage Dips and Interruptions Immunity<br>EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage) |

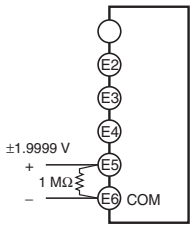
# ■ Input Range (Measurement Range and Accuracy) CAT II

| Input type | Range | Set value | Measurement range | Input impedance | Accuracy | Allowable instantaneous overload (30 s) |
|---|---|---|---|---|---|---|
| K3HB-XVD DC voltage | A | a Ud | ±199.99 V | 10 MΩ min. | ±0.1%rdg ± 1 digit max. | ±400 V |
| | B | b Ud | ±19.999 V | 1 MΩ min. | | ±200 V |
| | C | c Ud | ±1.9999 V | | | |
| | D | d Ud | 1.0000 to 5.0000 V | | | |
| K3HB-XAD DC current | A | a ad | ±199.99 mA | 1 Ω max. | ±0.1%rdg ± 1 digit max. | ±400 mA |
| | B | b ad | ±19.999 mA | 10 Ω max. | | ±200 mA |
| | C | c ad | ±1.9999 mA | 33 Ω max. | | |
| | D | d ad | 4.000 to 20.000 mA | 10 Ω max. | | |
| K3HB-XVA AC voltage (See note 4.) | A | a Ua | 0.0 to 400.0 V | 1 MΩ min. | ±0.3%rdg ± 5 digits max. | 700 V |
| | B | b Ua | 0.00 to 199.99 V | | | |
| | C | c Ua | 0.000 to 19.999 V | | ±0.5%rdg ± 10 digits max. | 400 V |
| | D | d Ua | 0.0000 to 1.9999 V | | | |
| K3HB-XAA AC current | A | a aa | 0.000 to 10.000 A | (0.5 VA CT) (See note 3.) | ±0.5%rdg ± 20 digits max. | 20 A |
| | B | b aa | 0.0000 to 1.9999 A | (0.5 VA CT) (See note 3.) | | |
| | C | c aa | 0.00 to 199.99 mA | 1 Ω max. | ±0.5%rdg ± 10 digits max. | 2 A |
| | D | d aa | 0.000 to 19.999 mA | 10 Ω max. | | |

**Note 1.** The accuracy is for an input frequency range of 40 Hz to 1 kHz (except for AD current input A and B ranges) and an ambient temperature of 23 ±5°C. The error, however, increases below 10% of the maximum input value.
DC voltage input (all ranges): 10% or less of max. input = ±0.15% FS
DC current input (all ranges): 10% or less of max. input = ±0.1% FS
AC voltage input (A: 0.0 to 400.0 V): 10% or less of max. input = ±0.15% FS
AC voltage input (B: 0.00 to 199.99 V): 10% or less of max. input = ±0.2% FS
AC voltage input (C: 0.000 to 19.999 V; D: 0.0000 to 1.9999 V): 10% or less of max. input = ±1.0% FS
AC current input (A: 0.000 to 10.000 A): 10% or less of max. input = ±0.25% FS
AC current input (B: 0.0000 to 1.9999 A): 10% or less of max. input = ±0.5% FS
AC current input, (C: 0.00 to 199.99 mA; D: 0.000 to 19.999 A): 10% or less of max. input = ±0.15% FS
When DC voltage input models are used with a ±1.9999 V range, make sure that the connections between input terminals are not open. If the input terminals are open, the display will show large variations. Connect resistance of approximately 1 MΩ between the input terminals if they are open.

**2.** The letters “rdg” mean “reading” and refer to the input error.

**3.** The value (0.5 VA CT) is the VA consumption of the internal CT (current transformer).




**4.** The K3HB-XVA□□ complies with UL standards when the applied input voltage is within the range 0 to 150 VAC.
If the input voltage is higher than 150 VAC, install an external transformer or take other measures to drop the voltage to 150 VAC or lower.

# Temperature Indicator
# K3HB-H

## New High-speed, High-precision Temperature Indicator

- Easy recognition of judgement results using color display that can be switched between red and green.
- Equipped with a position meter for monitoring operating status trends.
- External event input allows use in various measurement and discrimination applications.
- Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).
- Capable of high-speed sampling at 50 times per second (20 ms).
- High-resolution of 0.01°X ωιτη πλατινυμ–ρεσιστανχε τηερ μομετερ Πτ100 ινπυτ. Thermocouple sensor inputs also support a resolution of 0.1°C for all ranges.
- Temperature input shift is easily set using two points.

# Model Number Structure

## ■ Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

### Base Units

**K3HB-H□ □**
**1 5**

**1. Input Sensor Codes**

TA: Temperature input
Thermocouple input/Platinum-resistance thermometer input

5. Supply Voltage

100-240 VAC: 100 to 240 VAC
24 VAC/VDC: 24 VAC/VDC

### Base Units with Optional Boards

**K3HB-H□-□□□ □**
**1 2 3 4 5**

**2. Sensor Power Supply/Output Type Codes**

None: None
CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC +/–10%, 80 mA) (See note 1.)
L1A: Linear current output (DC0(4) – 20 mA) + Sensor power supply (12 VDC +/–10%, 80 mA) (See note 2.)
L2A: Linear voltage output (DC0(1) – 5 V, 0 to 10 V) + Sensor power supply (12 VDC +/–10%, 80 mA) (See note 2.)
A: Sensor power supply (12 VDC +/–10%, 80 mA)
FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC +/–10%, 80 mA) (See note 2.)
FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/–10%, 80 mA) (See note 2.)

### Optional Board

**Sensor Power Supply/Output Boards**

**K33-□**
**2**

**Relay/Transistor Output Boards**

**K34-□**
**3**

**Event Input Boards**

**K35-□**
**4**

**3. Relay/Transistor Output Type Codes**

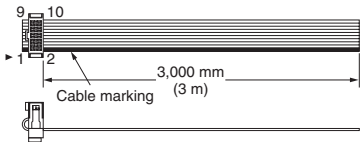
None: None
C1: Relay contact (H/L: SPDT each)
C2: Relay contact (HH/H/LL/L: SPST-NO each)
T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
DRT: DeviceNet (See note 2.)

**4. Event input Type Codes**

None: None
1: 5 points (M3 terminal blocks) NPN open collector
2: 8 points (10-pin MIL connector) NPN open collector
3: 5 points (M3 terminal blocks) PNP open collector
4: 8 points (10-pin MIL connector) PNP open collector

**Note 1.** CPA can be combined with relay outputs only.
**2.** Only one of the following can be used by each Digital Indicator: RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

## ■ Accessories (Sold Separately)

| Name | Appearance | Wiring | Model number |
|---|---|---|---|
| Special Cable (for event inputs with 8-pin connector) |  | ▶<br>Pin No. / Signal name<br>1 TIMING<br>2 S-TMR<br>3 HOLD<br>4 RESET<br>5 ZERO<br>6 COM<br>7 BANK4<br>8 BANK2<br>9 BANK1<br>10 COM | K32-DICN |

# Specifications

## ■ Ratings

| | | |
|---|---|---|
| Power supply voltage | | 100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC |
| Allowable power supply voltage range | | 85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC |
| Power consumption (See note 1.) | | 100 to 240 V: 18 VA max. (max. load)<br>24 VAC/DC: 11 VA/7 W max. (max. load) |
| Current consumption | | DeviceNet power supply: 50 mA max. (24 VDC) |
| Input | | Platinum-resistance thermometer: Pt100<br>Thermocouple: K, J, T, E, L, U, N, R, S, B, W |
| A/D conversion method | | Delta-Sigma method |
| External power supply | | See Sensor Power Supply/Output Type Codes |
| Event inputs (See note 2.) | Timing input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 3 V max.<br>ON current at 0 Ω: 17 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 1.5 mA max. |
| | Startup compensation timer input | |
| | Hold input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 2 V max.<br>ON current at 0 Ω: 4 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 0.1 mA max. |
| | Reset input | |
| | Bank input | |
| Output ratings (depends on the model) | Relay output | 250 VAC, 30 VDC, 5 A (resistive load)<br>Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations |
| | Transistor output | Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 μA max. |
| | Linear output | Linear output 0 to 20 mA DC, 4 to 20 mA:<br>Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:<br>Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>(1 V or less: ±0.15 V; not output for 0 V or less) |
| Display method | | Negative LCD (backlit LED) display<br>7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green) |
| Main functions | | Scaling function, measurement operation selection, averaging, previous average value comparison, zero-limit, output hysteresis, output OFF delay, output test, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset |
| Ambient operating temperature | | −10 to 55°C (with no icing or condensation) |
| Ambient operating humidity | | 25% to 85% |
| Storage temperature | | −25 to 65°C (with no icing or condensation) |
| Altitude | | 2,000 m max. |
| Accessories | | Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.) |

**Note 1.** DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

**2.** PNP input types are also available

**3.** For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

## ■ Characteristics

| | | |
|---|---|---|
| Display range | | −19,999 to 99,999 |
| Accuracy | | Thermocouple input: (±0.3% PV or ±1°C, whichever is larger) ± 1 digit max. (See note.)<br>Platinum resistance thermometer input: (±0.2% PV or ±0.8°C, whichever is larger) ± 1 digit max. |
| Sampling period | | 20 ms (50 times/second) |
| Comparative output response time | | Platinum-resistance thermometer input range: 120 ms max.<br>Thermocouple input range: 180 ms max. |
| Linear output response time | | Platinum-resistance thermometer input range: 170 ms max.<br>Thermocouple input range: 230 ms max. |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 2,300 VAC for 1 min between external terminals and case |
| Noise immunity | | 100 to 240 VAC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)<br>24 VAC/VDC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns) |
| Vibration resistance | | Frequency: 10 to 55 Hz; Acceleration: 50 $m/s^2$, 10 sweeps of 5 min each in X, Y, and Z directions |
| Shock resistance | | 150 $m/s^2$ (100 $m/s^2$ for relay outputs) 3 times each in 3 axes, 6 directions |
| Weight | | Approx. 300 g (Base Unit only) |
| Degree of protection | Front panel | Conforms to NEMA 4X for indoor use (equivalent to IP66) |
| | Rear case | IP20 |
| | Terminals | IP00 + finger protection (VDE0106/100) |
| Memory protection | | EEPROM (non-volatile memory)<br>Number of rewrites: 100,000 |
| Applicable standards | | UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL)<br>EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II<br>EN61326: 1997, A1: 1998, A2: 2001 |
| EMC | | EMI: EN61326+A1 industrial applications<br>Electromagnetic radiation interference<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>Terminal interference voltage<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>EMS: EN61326+A1 industrial applications<br>Electrostatic Discharge Immunity<br>EN61000-4-2: 4 kV (contact), 8 kV (in air)<br>Radiated Electromagnetic Field Immunity<br>EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)<br>Electrical Fast Transient/Burst Immunity<br>EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)<br>Surge Immunity<br>EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)<br>Conducted Disturbance Immunity<br>EN61000-4-6: 3 V (0.15 to 80 MHz)<br>Voltage Dips and Interruptions Immunity<br>EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage) |

**Note:** K, T, N (–100°C or less): ±2°C ±1 digit max.
U, L: ±2°C ±1 digit max.
B (400°C max.): Nothing specified.
R, S (200°C max.): ±3°C ±1 digit max.
W: (±0.3% PV or ±3°C whichever is larger) ±1 digit max.

# ■ Input Ranges

## Platinum-resistance Thermometer/ Thermocouple

| Input type | Platinum-resistance thermometer | | Thermocouple | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | Pt100 | | K | | J | | T | E | L | U | N | R | S | B | W (W/Re 5-26) |
| Connected terminals | Ⓔ5 – Ⓔ6 | | Ⓔ4 – Ⓔ5 – Ⓔ6 | | | | | | | | | | | | |
| Temperature range (°C) | 2300 | | | | | | | | | | | | | | 2300.0 |
| | 1800 | | | | | | | | | | | 1700.0 | 1700.0 | 1800.0 | |
| | 1300 | | 1300.0 | | | | | | | | 1300.0 | | | | |
| | 900 | 850.0 | | | 850.0 | | | | 850.0 | | | | | | |
| | 800 | | | | | | | | | | | | | | |
| | 700 | | | | | | | | | | | | | | |
| | 600 | | | | | | | | | | | | | | |
| | 400 | | | 500.0 | | | | 600.0 | | | | | | | |
| | 200 | | | | | 400.0 | 400.0 | | | 400.0 | | | | | |
| | 100 | | 150.00 | | | | | | | | | | | | |
| | 0 | | | | | | | | | | | | | 100.0 | |
| | –100 | | | | | | | 0.0 | | | | 0.0 | 0.0 | | 0.0 |
| | –200 | | | –20.0 | –100.0 | –20.0 | | | –100.0 | | | | | | |
| | | –200.0 | – 150.00 | –200.0 | | | –200.0 | | | –200.0 | –200.0 | | | | |
| Setting code | | 0-pt | 1-pt | 2-k | 3-k | 4-j | 5-j | 6-t | 7-e | 8-l | 9-u | 10-n | 11-r | 12-s | 13-b | 14-w |
| Minimum setting unit (comparative set value) | | 0.1°C | 0.01°C | 0.1°C | | | | | | | | | | | | |

The range shown in dark shading indicates the factory setting.

Celsius/Fahrenheit Correlation Values and Setting/Specified Ranges

| Input type | Setting range | | Indication range | |
|---|---|---|---|---|
| | °C | °F | °C | °F |
| Pt100 (1) | –200.0 to 850.0 | –300.0 to 1500.0 | –305.0 to 955.0 | –480.0 to 1680.0 |
| Pt100 (2) | –150.00 to 150.00 | –199.99 to 300.00 | –180.00 to 180.00 | –199.99 to 350.00 |
| K (1) | –200.0 to 1300.0 | –300.0 to 2300.0 | –350.0 to 1450.0 | –560.0 to 2560.0 |
| K (2) | –20.0 to 500.0 | 0.0 to 900.0 | –72.0 to 552.0 | –90.0 to 990.0 |
| J (1) | –100.0 to 850.0 | –100.0 to 1500.0 | –195.0 to 945.0 | –260.0 to 1660.0 |
| J (2) | –20.0 to 400.0 | 0.0 to 750.0 | –62.0 to 442.0 | –75.0 to 825.0 |
| T | –200.0 to 400.0 | –300.0 to 700.0 | –260.0 to 460.0 | –400.0 to 800.0 |
| E | 0.0 to 600.0 | 0.0 to 1100.0 | –60.0 to 660.0 | –110.0 to 1210.0 |
| L | –100.0 to 850.0 | –100.0 to 1500.0 | –195.0 to 945.0 | –260.0 to 1660.0 |
| U | –200.0 to 400.0 | –300.0 to 700.0 | –260.0 to 460.0 | –400.0 to 800.0 |
| N | –200.0 to 1300.0 | –300.0 to 2300.0 | –350.0 to 1450.0 | –560.0 to 2560.0 |
| R | 0.0 to 1700.0 | 0.0 to 3000.0 | –170.0 to 1870.0 | –300.0 to 3300.0 |
| S | 0.0 to 1700.0 | 0.0 to 3000.0 | –170.0 to 1870.0 | –300.0 to 3300.0 |
| B | 100.0 to 1800.0 | 300.0 to 3200.0 | –70.0 to 1970.0 | 10.0 to 3490.0 |
| W | 0.0 to 2300.0 | 0.0 to 4100.0 | –230.0 to 2530.0 | –410.0 to 4510.0 |

# Weighing Indicator
# K3HB-V

**An Ideal Indicator for OK/NG Judgements in Automated and Picking Machines, Measuring Factors such as Pressure, Load, Torque, and Weight Using Load Cell Signal Input.**

- Easy recognition of judgement results using color display that can be switched between red and green.
- Equipped with a position meter for monitoring operating status trends.
- External event input allows use in various measurement and discrimination applications.
- Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).
- Capable of high-speed sampling at 50 times per second (20 ms)
- Easy-to-set two-point scaling allows conversion and display of any user-set values.


# Model Number Structure

## ■ Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

### Base Units

**K3HB-V□ □**
**1 5**

**1. Input Sensor Codes**
LC: Load cell input (DC low-voltage input)

5. Supply Voltage
100-240 VAC: 100 to 240 VAC
24 VAC/VDC: 24 VAC/VDC

### Base Units with Optional Boards

**K3HB-V□-□□□ □**
**1 2 3 4 5**

**2. Sensor Power Supply/Output Type Codes**
None: None
CPB: Relay output (PASS: SPDT) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 1.)
L1B: Linear current output (DC0(4) – 20 mA) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
L2B: Linear voltage output (DC0(1) – 5 V, 0 to 10 V) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
B: Sensor power supply (10 VDC +/–5%, 100 mA)
FLK1B: Communications (RS-232C) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
FLK3B: Communications (RS-485) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)

### Optional Board

**Sensor Power Supply/Output Boards**

**K33-□**
**2**

**Relay/Transistor Output Boards**

**K34-□**
**3**

**Event Input Boards**

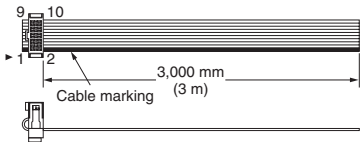
**K35-□**
**4**

**3. Relay/Transistor Output Type Codes**
None: None
C1: Relay contact (H/L: SPDT each)
C2: Relay contact (HH/H/LL/L: SPST-NO each)
T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
DRT: DeviceNet (See note 2.)

**4. Event input Type Codes**
None: None
1: 5 points (M3 terminal blocks) NPN open collector
2: 8 points (10-pin MIL connector) NPN open collector
3: 5 points (M3 terminal blocks) PNP open collector
4: 8 points (10-pin MIL connector) PNP open collector

**Note 1.** CPB can be combined with relay outputs only.
**2.** Only one of the following can be used by each Digital Indicator: RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

## ■ Accessories (Sold Separately)

| Name | Appearance | Wiring | Model number |
|---|---|---|---|
| Special Cable (for event inputs with 8-pin connector) |  | ▶ | K32-DICN |

| Pin No. | Signal name |
|---|---|
| 1 | TIMING |
| 2 | S-TMR |
| 3 | HOLD |
| 4 | RESET |
| 5 | ZERO |
| 6 | COM |
| 7 | BANK4 |
| 8 | BANK2 |
| 9 | BANK1 |
| 10 | COM |

# Specifications

## ■ Ratings

| | | |
|---|---|---|
| Power supply voltage | | 100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC |
| Allowable power supply voltage range | | 85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC |
| Power consumption (See note 1.) | | 100 to 240 V: 18 VA max. (max. load)<br>24 VAC/DC: 11 VA/7 W max. (max. load) |
| Current consumption | | DeviceNet power supply: 50 mA max. (24 VDC) |
| Input | | DC voltage |
| A/D conversion method | | Delta-Sigma method |
| External power supply | | See Sensor Power Supply/Output Type Codes |
| Event inputs (See note 2.) | Timing input<br>Startup compensation timer input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 3 V max.<br>ON current at 0 Ω: 17 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 1.5 mA max. |
| | Hold input<br>Reset input<br>Forced-zero input<br>Bank input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 2 V max.<br>ON current at 0 Ω: 4 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 0.1 mA max. |
| Output ratings (depends on the model) | Relay output | 250 VAC, 30 VDC, 5 A (resistive load)<br>Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations |
| | Transistor output | Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 μA max. |
| | Linear output | Linear output 0 to 20 mA DC, 4 to 20 mA:<br>Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:<br>Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>(1 V or less: ±0.15 V; not output for 0 V or less) |
| Display method | | Negative LCD (backlit LED) display<br>7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green) |
| Main functions | | Scaling function, measurement operation selection, averaging, previous average value comparison, forced-zero, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset |
| Ambient operating temperature | | −10 to 55°C (with no icing or condensation) |
| Ambient operating humidity | | 25% to 85% |
| Storage temperature | | −25 to 65°C (with no icing or condensation) |
| Altitude | | 2,000 m max. |
| Accessories | | Watertight packing, 2 fixtures, terminal cover, unit stickers, operation manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.) |

**Note 1.** DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

**2.** PNP input types are also available

**3.** For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

## ■ Characteristics

| | | |
|---|---|---|
| Display range | | −19,999 to 99,999 |
| Sampling period | | 20 ms (50 times/second) |
| Comparative output response time | | 100 ms max. |
| Linear output response time | | 150 ms max. |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 2,300 VAC for 1 min between external terminals and case |
| Noise immunity | | 100 to 240 VAC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)<br>24 VAC/VDC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns) |
| Vibration resistance | | Frequency: 10 to 55 Hz; Acceleration: 50 $m/s^2$, 10 sweeps of 5 min each in X, Y, and Z directions |
| Shock resistance | | 150 $m/s^2$ (100 $m/s^2$ for relay outputs) 3 times each in 3 axes, 6 directions |
| Weight | | Approx. 300 g (Base Unit only) |
| Degree of protection | Front panel | Conforms to NEMA 4X for indoor use (equivalent to IP66) |
| | Rear case | IP20 |
| | Terminals | IP00 + finger protection (VDE0106/100) |
| Memory protection | | EEPROM (non-volatile memory)<br>Number of rewrites: 100,000 |
| Applicable standards | | UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL)<br>EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II<br>EN61326: 1997, A1: 1998, A2: 2001 |
| EMC | | EMI: EN61326+A1 industrial applications<br>Electromagnetic radiation interference<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>Terminal interference voltage<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>EMS: EN61326+A1 industrial applications<br>Electrostatic Discharge Immunity<br>EN61000-4-2: 4 kV (contact), 8 kV (in air)<br>Radiated Electromagnetic Field Immunity<br>EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)<br>Electrical Fast Transient/Burst Immunity<br>EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)<br>Surge Immunity<br>EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)<br>Conducted Disturbance Immunity<br>EN61000-4-6: 3 V (0.15 to 80 MHz)<br>Voltage Dips and Interruptions Immunity<br>EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage) |

# ■ Input Ranges (Measurement Range and Accuracy)

| Input type | Range | Set value | Measurement range | Input impedance | Accuracy | Allowable instantaneous overload (30 s) |
|---|---|---|---|---|---|---|
| K3HB-VLC Load Cell, mV | A | a Ud | 0.00 to 199.99 mV | 1 MΩ min. | ±0.1%rdg ± 1 digit max. | ±200 V |
| | B | b Ud | 0.000 to 19.999 mV | | ±0.1%rdg ± 5 digits max. | |
| | C | c Ud | ±100.00 mV | | ±0.1%rdg ± 3 digits max. | |
| | D | d Ud | ±199.99 mV | | ±0.1%rdg ± 1 digit max. | |

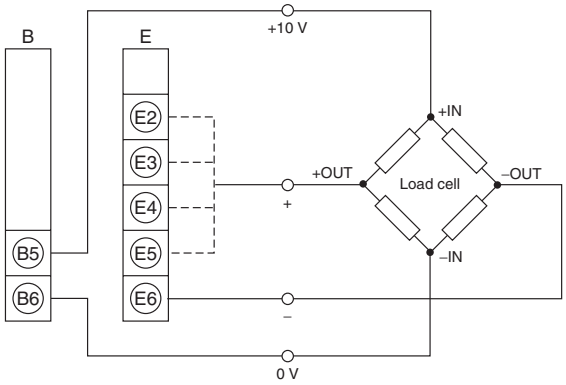
**Note 1.** The accuracy is for an ambient temperature of 23±5°C. For all ranges,10% or less of max. input ±0.1% FS.

**2.** The letters "rdg" mean "reading."

| Input type | a Ic | b Ic | c Ic | d Ic |
|---|---|---|---|---|
| Connected terminals | (E2) – (E6) | (E3) – (E6) | (E4) – (E6) | (E5) – (E6) |
| (mV) | 199.99 | | | 199.99 |
| 200.000 | | | | |
| 150.000 | | | 100.00 | |
| 100.000 | | 19.999 | | |
| 50.000 | | | | |
| 0.00 | 0.00 | 0.000 | | |
| –50.00 | | | | |
| –100.00 | | | –100.00 | |
| –150.00 | | | | |
| –200.00 | | | | |
| | | | | –199.99 |

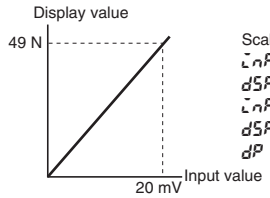
The area shown in dark shading indicates the factory setting.

# ■ Load Cell Wiring Example




# ■ Scaling Example Using Range A

Indicated on the K3HB-V as 0 to 49N in the load cell specifications (rated load 49N, recommended applied voltage 10 V, rated output 2 mV/V) (See note.)




Scaling values:
SCPA1=000.00
SDPA1=00000
SCPA2=020.00
SDPA2=49000
dP decimal point position: 00.000

**Note:** 2 mV/V indicates a load cell output of 2 mV for 1 V applied voltage for the rated load (when using a load of 1 N). When the applied voltage is 10 V, the load cell output is 20 mV (2 mV × 10).

# Linear Sensor Indicator
# K3HB-S

### A Linear Sensor Indicator Capable of High-speed Response at 2,000 Times per Second

- Effective for high-speed measurement and discrimination with a sampling period of 0.5 ms and output response time of 1 ms max.
- Easy recognition of judgement results using color display that can be switched between red and green.
- Equipped with a position meter that represents measured amounts and relative positions.
- Zero calibration can be performed easily with the forced zero function.
- Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).


# Model Number Structure

## ■ Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

### Base Units

**K3HB-S□ □**
**1 5**

**1. Input Sensor Codes**

SD: DC Process input

5. Supply Voltage

100-240 VAC: 100 to 240 VAC
24 VAC/VDC: 24 VAC/VDC

### Base Units with Optional Boards

**K3HB-S□-□□□ □**
**1 2 3 4 5**

**2. Sensor Power Supply/Output Type Codes**

None: None
CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 1.)
L1A: Linear current output (DC0(4) − 20 mA) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)
L2A: Linear voltage output (DC0(1) − 5 V, 0 to 10 V) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)
A: Sensor power supply (12 VDC +/−10%, 80 mA)
FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)
FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/−10%, 80 mA) (See note 2.)

### Optional Board

**Sensor Power Supply/Output Boards**

**K33-□**
**2**

**Relay/Transistor Output Boards**

**K34-□**
**3**

**Event Input Boards**

**K35-□**
**4**

**3. Relay/Transistor Output Type Codes**

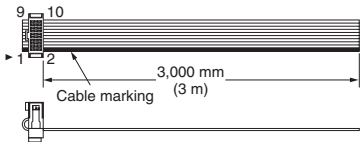
None: None
C1: Relay contact (H/L: SPDT each)
C2: Relay contact (HH/H/LL/L: SPST-NO each)
T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
DRT: DeviceNet (See note 2.)

**4. Event input Type Codes**

None: None
1: 5 points (M3 terminal blocks) NPN open collector
2: 8 points (10-pin MIL connector) NPN open collector
3: 5 points (M3 terminal blocks) PNP open collector
4: 8 points (10-pin MIL connector) PNP open collector

**Note 1.** CPA can be combined with relay outputs only.
**2.** Only one of the following can be used by each Digital Indicator: RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

## ■ Accessories (Sold Separately)

| Name | Appearance | Wiring | Model number |
|---|---|---|---|
| Special Cable (for event inputs with 8-pin connector) |  | ▶ | K32-DICN |

| Pin No. | Signal name |
|---|---|
| 1 | TIMING |
| 2 | S-TMR |
| 3 | HOLD |
| 4 | RESET |
| 5 | ZERO |
| 6 | COM |
| 7 | BANK4 |
| 8 | BANK2 |
| 9 | BANK1 |
| 10 | COM |

# Specifications

## ■ Ratings

| | | |
|---|---|---|
| Power supply voltage | | 100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC |
| Allowable power supply voltage range | | 85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC |
| Power consumption (See note 1.) | | 100 to 240 V: 18 VA max. (max. load)<br>24 VAC/DC: 11 VA/7 W max. (max. load) |
| Current consumption | | DeviceNet power supply: 50 mA max. (24 VDC) |
| Input | | DC voltage/current |
| A/D conversion method | | Sequential comparison system |
| External power supply | | See Sensor Power Supply/Output Type Codes |
| Event inputs (See note 2.) | Timing input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 3 V max.<br>ON current at 0 Ω: 17 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 1.5 mA max. |
| | Startup compensation timer input | |
| | Hold input | NPN open collector or no-voltage contact signal<br>ON residual voltage: 2 V max.<br>ON current at 0 Ω: 4 mA max.<br>Max. applied voltage: 30 VDC max.<br>OFF leakage current: 0.1 mA max. |
| | Reset input | |
| | Forced-zero input | |
| | Bank input | |
| Output ratings (depends on the model) | Relay output | 250 VAC, 30 VDC, 5 A (resistive load)<br>Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations |
| | Transistor output | Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 μA max. |
| | Linear output | Linear output 0 to 20 mA DC, 4 to 20 mA:<br>Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:<br>Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS<br>(1 V or less: ±0.15 V; not output for 0 V or less) |
| Display method | | Negative LCD (backlit LED) display<br>7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green) |
| Main functions | | Scaling function, 2-input calculation function, measurement operation selection, averaging, previous average value comparison, forced-zero, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset |
| Ambient operating temperature | | −10 to 55°C (with no icing or condensation) |
| Ambient operating humidity | | 25% to 85% |
| Storage temperature | | −25 to 65°C (with no icing or condensation) |
| Altitude | | 2,000 m max. |
| Accessories | | Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.) |

**Note 1.** DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

**2.** PNP input types are also available

**3.** For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

## ■ Characteristics

| | | |
|---|---|---|
| Display range | | −19,999 to 99,999 |
| Sampling period | | One input: 0.5 ms; Two inputs: 1.0 ms |
| Comparative output response times (transistor outputs) | One input | OFF to ON: 1 ms max., ON to OFF: 1.5 ms max. |
| | Two inputs | OFF to ON: 2 ms max., ON to OFF: 2.5 ms max. |
| Linear output response time | One input | 51 ms max. |
| | Two inputs | 52 ms max. |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 2,300 VAC for 1 min between external terminals and case |
| Noise immunity | | 100 to 240 VAC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)<br>24 VAC/VDC models:<br>±1,500 V at power supply terminals in normal or common mode<br>(waveform with 1-ns rising edge and pulse width of 1 μs/100 ns) |
| Vibration resistance | | Frequency: 10 to 55 Hz; Acceleration: 50 $m/s^2$, 10 sweeps of 5 min each in X, Y, and Z directions |
| Shock resistance | | 150 $m/s^2$ (100 $m/s^2$ for relay outputs) 3 times each in 3 axes, 6 directions |
| Weight | | Approx. 300 g (Base Unit only) |
| Degree of protection | Front panel | Conforms to NEMA 4X for indoor use (equivalent to IP66) |
| | Rear case | IP20 |
| | Terminals | IP00 + finger protection (VDE0106/100) |
| Memory protection | | EEPROM (non-volatile memory)<br>Number of rewrites: 100,000 |
| Applicable standards | | UL61010C-1, CSA C22.2 No. 1010.1(evaluated by UL)<br>EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II<br>EN61326: 1997, A1: 1998, A2: 2001 |
| EMC | | EMI: EN61326+A1 industrial applications<br>Electromagnetic radiation interference<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>Terminal interference voltage<br>CISPR 11 Group 1, Class A: CISPRL16-1/-2<br>EMS: EN61326+A1 industrial applications<br>Electrostatic Discharge Immunity<br>EN61000-4-2: 4 kV (contact), 8 kV (in air)<br>Radiated Electromagnetic Field Immunity<br>EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)<br>Electrical Fast Transient/Burst Immunity<br>EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)<br>Surge Immunity<br>EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)<br>Conducted Disturbance Immunity<br>EN61000-4-6: 3 V (0.15 to 80 MHz)<br>Voltage Dips and Interruptions Immunity<br>EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage) |

## ■ Input Ranges (Measurement Ranges and Accuracy)

| Input | Input type | Measurement range | Indication range | Input impedance | Accuracy (at 23±5°C) | Maximum absolute rated input |
|---|---|---|---|---|---|---|
| K3HB-SSD<br>DC voltage/current input | 0 to 20 mA | 0.000 to 20.000 mA | −2.000 to 22.000 mA | 120 Ω max. | One input:<br>±0.1% F.S.<br>±1 digit max.<br>Two inputs:<br>±0.2% F.S.<br>±1 digit max. | ±31 mA |
| | 4 to 20 mA | 4.000 to 20.000 mA | 2.000 to 22.000 mA | | | |
| | 0 to 5 V | 0.000 to 5.000 V | −0.500 to 5.500 mA | 1 MΩ min. | | ±10 V |
| | 1 to 5 V | 1.000 to 5.000 V | 0.500 to 5.500 V | | | |
| | ±5 V | ±5.000 V | ± 5.500 V | | | |
| | ±10 V | ±10.000 V | ± 11.000 V | | | ±14.5 V |

**Note:** The accuracy is for an ambient temperature of 23±5°C.

| Input type | | DC current input | | Input type | | DC voltage input | | | |
|---|---|---|---|---|---|---|---|---|---|
| Connected terminals | | 0-20 | 4-20 | Connected terminals | | 0-5 | 1-5 | 5 | 10 |
| Input A | in-ta | (E2) – (E3) | | Input A | in-ta | (E4) – (E3) | | | |
| Input B | in-tb | (E1) – (E3) | | Input B | in-tb | (E5) – (E3) | | | |
| DC current range (mA) | 24.000<br>20.000<br>16.000<br>12.000<br>8.000<br>4.000<br>0.000<br>–4.000 | 22.000<br>–2.000 | 22.000<br>2.000 | DC voltage range (V) | 10.000<br>5.000<br>0.000<br>–5.000<br>–10.000 | 5.500<br>–0.500 | 5.500<br>0.500 | 5.500<br>–5.500 | 11.000<br>–11.000 |

The range shown in dark shading indicates the factory setting.

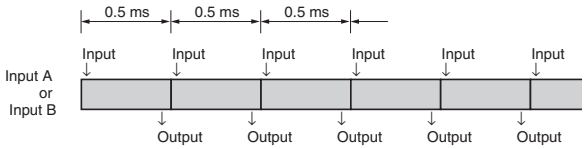
# Sampling and Comparative Output Response Times

The K3HB-S sampling and comparative output response times depend on the calculation methods, timing hold type, and, for simple averaging, the averaging times. Refer to the following description for details.

## ■ Output Refresh Period

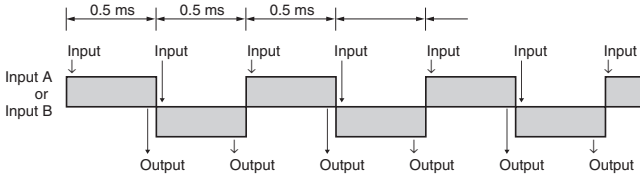
The K3HB-S repeats input reads, calculation, and judgement output processing. The output refresh period differs depending on whether there are one or two inputs, as outlined below.

### One Input




| | |
|---|---|
| Input read | Every 0.5 ms |
| Output refresh | Every 0.5 ms |

### Two inputs

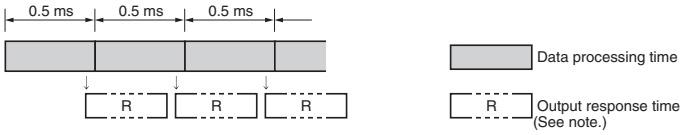



| | |
|---|---|
| Input read | Input A: Every 1 ms |
| | Input B: Every 1 ms |
| Output refresh | Every 0.5 ms |

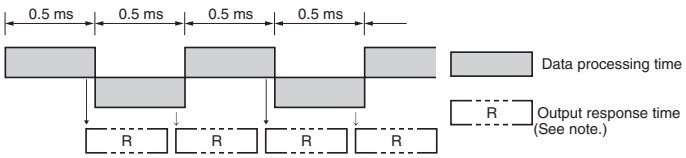
## ■ Output Response Time

The comparative output response time is the sum of the data processing time and the output (relay or transistor) response time.

### One Input




### Two Inputs




**Note:** For transistor outputs:
For one input: OFF to ON 1 ms and ON to OFF 1.5 ms
For two inputs: OFF to ON 2 ms and ON to OFF 2.5 ms
For relay outputs:
The relay operation time of 15 ms is added to the transistor output response times.

# Common Specifications

## ■ Event Input Ratings

| Input type | S-TMR, HOLD, RESET, ZERO, BANK1, BANK2, BANK4 | TIMING |
|---|---|---|
| Contact | ON: 1 kΩ max., OFF: 100 kΩ min. | --- |
| No-contact | ON residual voltage: 2 V max.<br>OFF leakage current: 0.1 mA max.<br>Load current: 4 mA max.<br>Maximum applied voltage: 30 VDC max. | ON residual voltage: 3 V max.<br>OFF leakage current: 1.5 mA max.<br>Load current: 17 mA max.<br>Maximum applied voltage: 30 VDC max. |

## ■ Output Ratings

### Contact Output

| Item | Resistive loads (250 VAC, cosϕ=1; 30 VDC, L/R=0 ms) | Inductive loads (250 VAC, closed circuit, cosϕ=0.4; 30 VDC, L/R=7 ms) |
|---|---|---|
| Rated load | 5 A at 250 VAC<br>5 A at 30 VDC | 1 A at 250 VAC<br>1 A at 30 VDC |
| Rated through current | 5A | |
| Mechanical life expectancy | 5,000,000 operations | |
| Electrical life expectancy | 100,000 operations | |

### Transistor Output

| | |
|---|---|
| Maximum load voltage | 24 VDC |
| Maximum load current | 50 mA |
| Leakage current | 100 μA max. |

### Linear Output

| Item | 0 to 20 mA | 4 to 20 mA | 0 to 5 V | 1 to 5 V | 0 to 10 V |
|---|---|---|---|---|---|
| Allowable load impedance | 500 Ω max. | | 5 kΩ min. | | |
| Resolution | Approx. 10,000 | | | | |
| Output error | ±0.5%FS | | | | |

### Serial Communications Output

| Item | RS-232C, RS-485 |
|---|---|
| Communications method | Half duplex |
| Synchronization method | Start-stop synchronization |
| Baud rate | 9,600, 19,200, or 38,400 bps |
| Transmission code | ASCII |
| Data length | 7 bits or 8 bits |
| Stop bit length | 2 bits or 1 bit |
| Error detection | Vertical parity and FCS |
| Parity check | Odd, even |

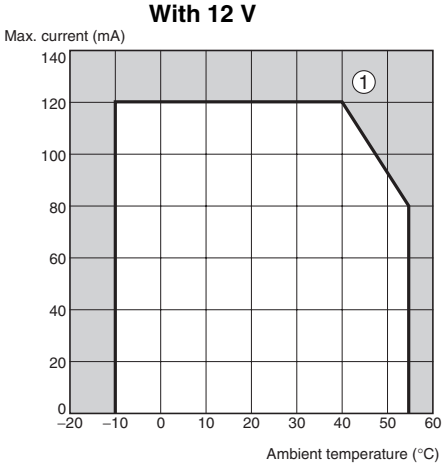
**Note:** For details on serial and DeviceNet communications, refer to the *Digital Indicator K3HB Communications User's Manual* (Cat.No. N129).

## DeviceNet Communications

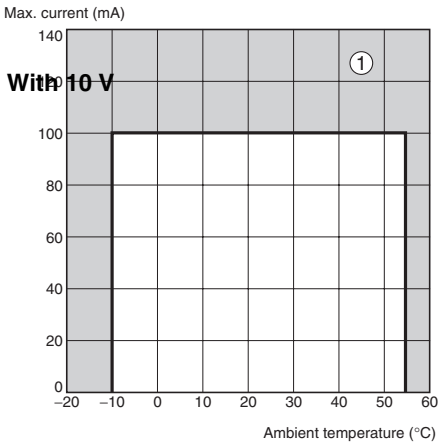
<table>
<tr><td colspan="2">Communications protocol</td><td>Conforms to DeviceNet</td></tr>
<tr><td rowspan="3">Supported communications</td><td>Remote I/O communications</td><td>Master-Slave connection (polling, bit-strobe, COS, cyclic)<br>Conforms to DeviceNet communications standards.</td></tr>
<tr><td>I/O allocations</td><td>Allocate any I/O data using the Configurator.<br>Allocate any data, such as DeviceNet-specific parameters and variable area for Digital Indicators.<br>Input area: 2 blocks, 60 words max.<br>Output area: 1 block, 29 words max.<br>(The first word in the area is always allocated for the Output Execution Enabled Flags.)</td></tr>
<tr><td>Message communications</td><td>Explicit message communications<br>CompoWay/F communications commands can be executed (using explicit message communications)</td></tr>
<tr><td colspan="2">Connection methods</td><td>Combination of multi-drop and T-branch connections (for trunk and drop lines)</td></tr>
<tr><td colspan="2">Baud rate</td><td>DeviceNet: 500, 250, or 125 Kbps (automatic follow-up)</td></tr>
<tr><td colspan="2">Communications media</td><td>Special 5-wire cable (2 signal lines, 2 power supply lines, 1 shield line)</td></tr>
<tr><td colspan="2">Communications distance</td><td>
<table>
<tr><th>Baud rate</th><th>Network length (max.)</th><th>Drop line length (max.)</th><th>Total drop line length (max.)</th></tr>
<tr><td>500 Kbps</td><td>100 m (100 m)</td><td>6 m</td><td>39 m</td></tr>
<tr><td>250 Kbps</td><td>100 m<br>(250 m)</td><td>6 m</td><td>78 m</td></tr>
<tr><td>125 Kbps</td><td>100 m<br>(500 m)</td><td>6 m</td><td>156 m</td></tr>
</table>
The values in parentheses are for Thick Cable.
</td></tr>
<tr><td colspan="2">Communications power supply</td><td>24-VDC DeviceNet power supply</td></tr>
<tr><td colspan="2">Allowable voltage fluctuation range</td><td>11 to 25-VDC DeviceNet power supply</td></tr>
<tr><td colspan="2">Current consumption</td><td>50 mA max. (24 VDC)</td></tr>
<tr><td colspan="2">Maximum number of nodes</td><td>64 (DeviceNet Configurator is counted as one node when connected)</td></tr>
<tr><td colspan="2">Maximum number of slaves</td><td>63</td></tr>
<tr><td colspan="2">Error control checks</td><td>CRC errors</td></tr>
<tr><td colspan="2">DeviceNet power supply</td><td>Supplied from DeviceNet communications connector</td></tr>
</table>

## ■ Power Supply Derating Curve for Sensor (Reference Value)

**With 12 V**




**With 10 V**




**Note 1.** The above values are for standard mounting. The derating curve differs depending on the mounting conditions.

**2.** Do not use the Sensor outside of the derating area (i.e., do not use it in the area labeled ① in the above graphics). Doing so may occasionally cause deterioration or damage to internal components.

## ■ Component Names and Functions


**Max/Min status indicator**

Turns ON when the maximum value or minimum value is displayed in the RUN level.

**Level/bank display**

In RUN level, displays the bank if the bank function is ON. (Turns OFF if the bank function is OFF.)
In other levels, displays the current level.

**Comparative output status indicators**

Display the status of comparative outputs.

**Status indicators**

| Display | Function |
|---|---|
| T-ZR | Turns ON when the tare zero function is executed. Turns OFF if it is not executed or is cleared. |
| Zero | Turns ON when the forced-zero function is executed. Turns OFF if it is not executed or is cleared. (Excluding the K3HB-H.) |
| Hold | Turns ON/OFF when hold input turns ON/OFF. |

**PV display**

Displays PVs, maximum values, minimum values, parameter names, and error names.

**Position meter**

Displays the position of the PV with respect to a desired scale.

**SV display**

Displays SV and monitor values.

**SV display status indicators**

| Display | Function |
|---|---|
| TG | Turns ON when the timing signal turns ON. Otherwise OFF. |
| T | Turns ON when parameters for which teaching can be performed are displayed. |
| HH, H, L, LL | In RUN level, turn ON when the comparative set values HH, H, L, and LL are displayed. |

**MAX/MIN Key**

Used to switch the display between the PV, maximum value, and minimum value and to reset the maximum and minimum values.

**LEVEL Key**

Used to switch level.

**MODE Key**

Used to switch the parameters displayed.

**SHIFT Key**

Used to change parameter settings. When changing a set value, this key is used to move along the digits.

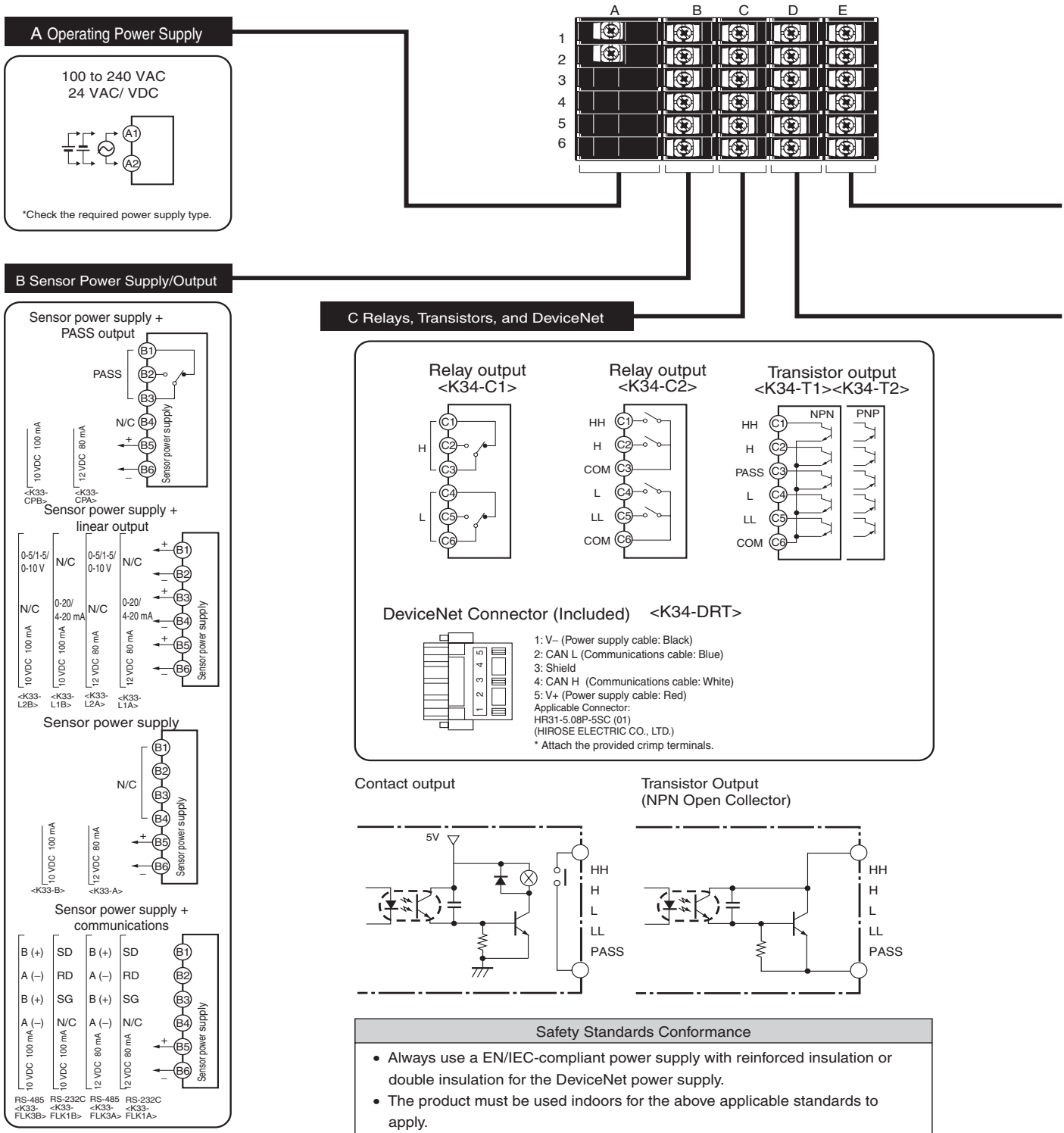
**UP Key**

When changing a set value, this key is used to change the actual value.
When a measurement value is displayed, this key is used to execute or clear the forced-zero function or to execute teaching.

# ■ Connections

## Terminal Arrangement

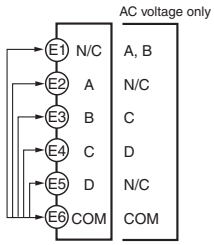
**Note:** Insulation is used between signal input, event input, output, and power supply terminals.



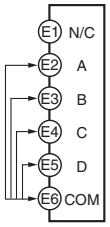

| Safety Standards Conformance |
|---|
| • Always use a EN/IEC-compliant power supply with reinforced insulation or double insulation for the DeviceNet power supply.<br>• The product must be used indoors for the above applicable standards to apply.<br>• The K3HB-XVA□□ complies with UL standards when the applied input voltage is within the range 0 to 150 VAC. |

## E Analog Input

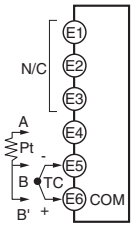
Process Indicator
K3HB-X



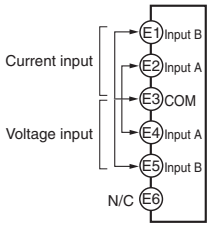

Weighing Indicator
K3HB-V




Temperature Indicator
K3HB-H

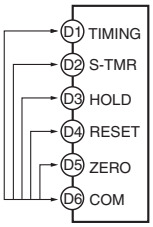



Linear Sensor Indicator
K3HB-S

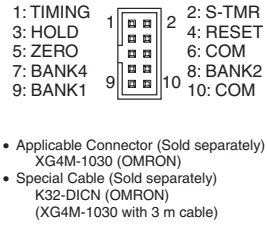



## D Event Input

Models with Terminal Blocks
<K35-1><K35-3>

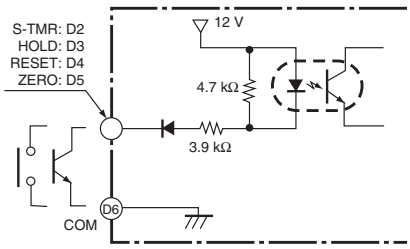


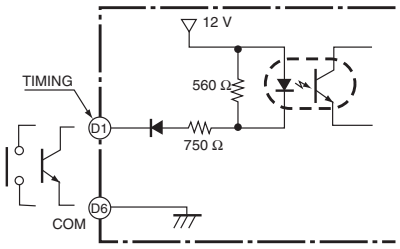

Models with Connectors
<K35-2><K35-4>




- Applicable Connector (Sold separately)
  XG4M-1030 (OMRON)
- Special Cable (Sold separately)
  K32-DICN (OMRON)
  (XG4M-1030 with 3 m cable)

- Use terminal pin D6 as the common terminal.
- Use NPN open collector or no-voltage contacts for event input.
  PNP types are also available.



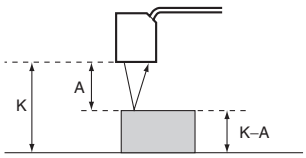



# ■ Main Functions

## Measurement

### [redacted] S

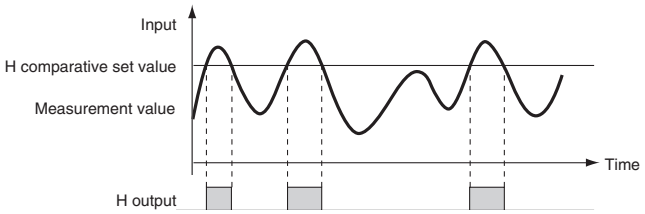
- Two input circuits are provided. The input ranges for these circuits can be set independently. For example, one can be set to 4 to 20 mA and the other can be set to 1 to 5 V.
- In addition to calculations such as K (constant)–A (input for one circuit), it is possible to perform calculations based on the inputs for both circuits, such as A+B and A–B, making it possible to perform thickness measurement and level-difference measurement using displacement and length-measuring sensors.




### [redacted] X V H S

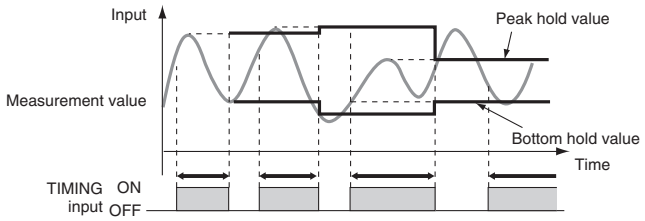
#### Normal

- Continuously performs measurement and always outputs based on comparative results.



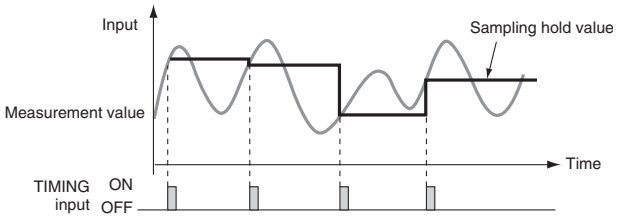

#### Peak Hold/Bottom Hold

- Measures the maximum (or minimum) value in a specified period.



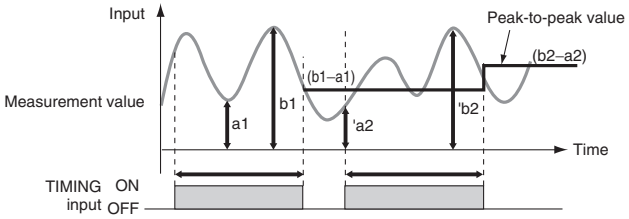

#### Sampling Hold

- Holds the measurement at the rising edge of the TIMING signal.



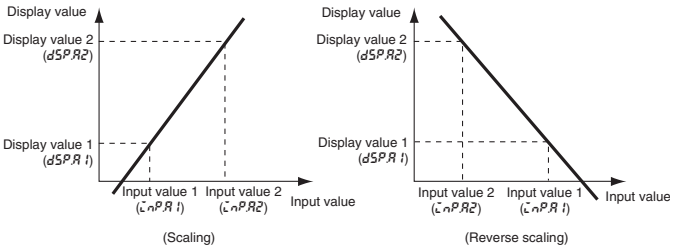

#### Peak-to-peak Hold

- Measures the difference between the maximum and minimum values in a specified period.




### [redacted] X V S

Scaling converts input signals in any way required before displaying them. The values can be manipulated by shifting, inverting, or +/– reversing.




### [redacted] X V S

Settings for scaling can be made using the present measurement values instead of inputting values with the SHIFT and UP Keys. This is a convenient function for making the settings while monitoring the operating status.

### [redacted] X V H S

### [redacted] X V H S

Turns the comparative output OFF until the measurement value enters the PASS range.

Average processing of input signals with extreme changes or noise smooths out the display and makes control stable.

### [redacted] X V H S

Slight changes can be removed from input signals to detect only extreme changes.

### [redacted] H

Shifts the temperature input value.

#### Supported Models

The models that support the functions shown here are indicated by symbols as follows:

- X K3HB-X
- V K3HB-V
- H K3HB-H

## ■ Input Compensation/Display

### [redacted] X V S

Forces the present value to 0. (Convenient for setting reference values or deducting tares for weight measurement.)

### [redacted] V S

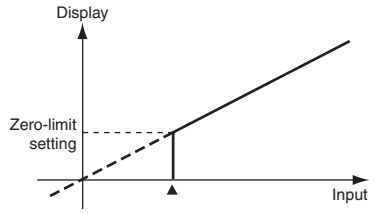
Shifts the current value measured with a forced zero to 0 again. It is possible to measure two or more compounds separately and then, by releasing the tare zero and forced-zero, measure the combined total.

### [redacted] X V H S

Compensates for mild fluctuations in input signals due to factors such as sensor temperature drift, based on OK (PASS) data at measurement. (This function can be used with sampling hold, peak hold, or bottom hold.).

### [redacted] X V H S

Changes the display value to 0 for input values less than the set value. It is enabled in normal mode only. (This function can be used, for example, to stop negative values being displayed or to eliminate flickering and minor inconsistencies near 0.)

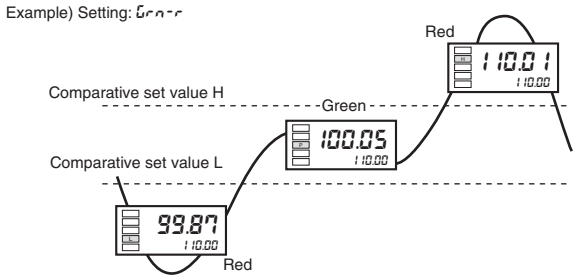



### [redacted] X V H S

The display refresh period can be lengthened to reduce flickering and thereby make the display easier to read.

### [redacted] X V H S

Values can be displayed in either red or green. With comparative output models, the display color can also be set to change according to the status of comparative outputs (e.g., green to red or red to green).




### [redacted] X V H S

The current display value can be selected from the present value, the maximum value, and the minimum value.

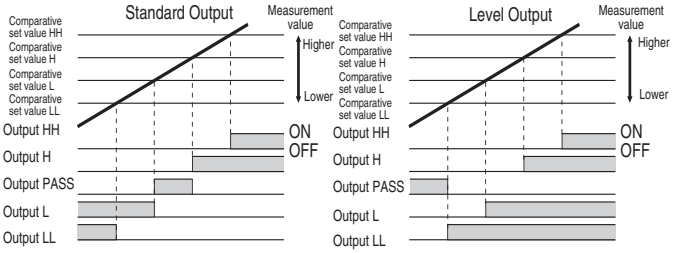
### [redacted] X V H S

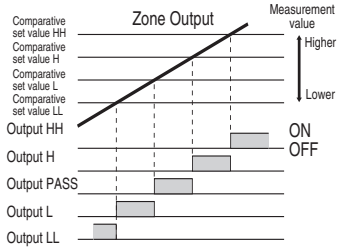
It is possible to specify (i.e., restrict) the values that the smallest displayed digit can change by. For example, if the setting is 2, the smallest digit will only take the values 0, 2, 4, 6, or 8 and if the setting is 5, it will only take the values 0 or 5. If the setting is 10, it will only take the value of 0.

# ■ Output

## [redacted] X V H S

The output pattern for comparative outputs can be selected. In addition to high/low comparison with set values, output based on level changes is also possible. (Use the type of output pattern appropriate for the application.)



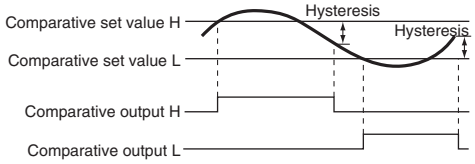

## [redacted] X V H S

Reverses the output operation of comparative outputs for comparative results.

## [redacted] X V H S

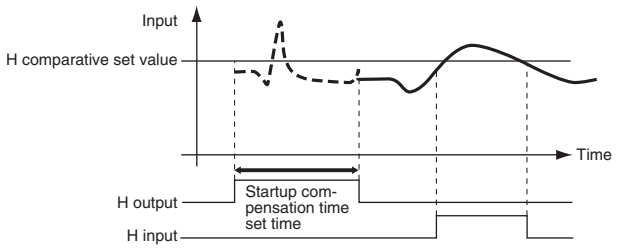
Prevents comparative output chattering when the measurement value fluctuates slightly near the set value.

Example: Comparative Output Pattern (Standard Output)




## [redacted] X V H S

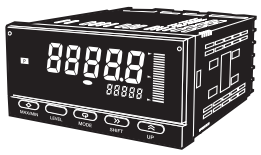
Measurement can be stopped for a set time using external input.

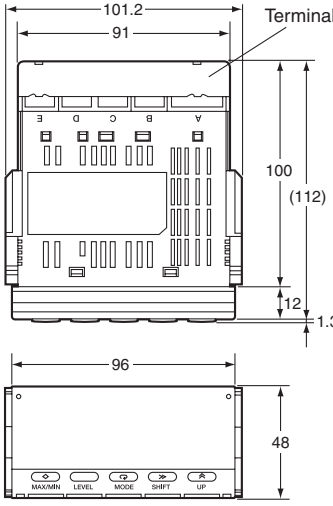



## [redacted] X V H S

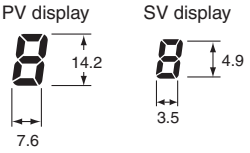
Comparative results other than PASS and error signals can be output from the PASS output terminal.

# ■ Dimensions

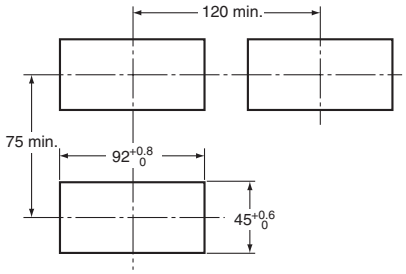


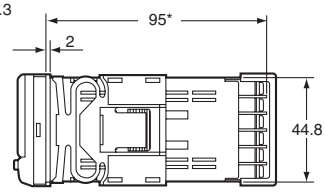



**Character Size for Main Display (mm)**




**Panel Cutout Dimensions**



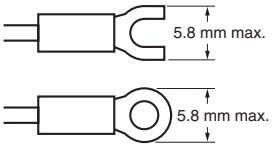

*DeviceNet models: 97 mm
Terminal: M3, Terminal Cover: Accessory

## ■ Wiring Precautions

- For terminal blocks, use the crimp terminals suitable for M3 screws.
- Tighten the terminal screws to the recommended tightening torque of approx. 0.5 N·m.
- To prevent inductive noise, separate the wiring for signal lines from that for power lines.

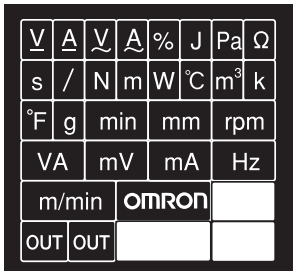
### Wiring

- Use the crimp terminals suitable for M3 screws shown below.




### Unit Stickers

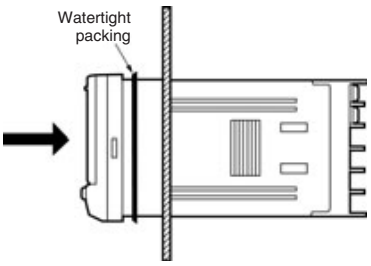
- Select the appropriate units from the unit sticker sheets provided and attach the sticker to the Indicator.



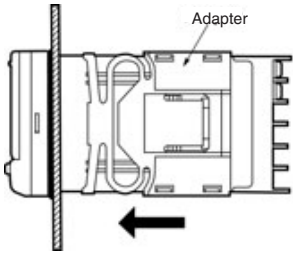

**Note:** When using for meters, such as weighing meters, use the units specified by regulations on weights and measures.

## ■ Mounting Method

1. Insert the K3HB into the mounting cutout in the panel.
2. Insert watertight packing around the Unit to make the mounting watertight.

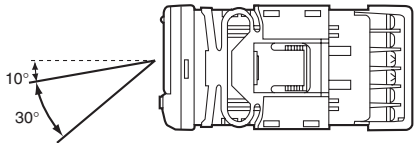



3. Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.




## ■ LCD Field of Vision

The K3HB is designed to have the best visibility at the angles shown in the following diagram.




## ■ Waterproof Packing

The waterproof packing ensures a level of waterproofing that conforms to NEMA 4X. Depending on the operating environment, deterioration, contraction, or hardening may occur and replacement may be necessary. In this case, consult your OMRON representative.

# ■ Precautions

**⚠ WARNING**

Do not touch the terminals while power is being supplied. Doing so may possibly result in electric shock. Make sure that the terminal cover is installed before using the product.

Always provide protective circuits in the network. Without protective circuits, malfunctions may possibly result in accidents that cause serious injury or significant property damage.

Provide double or triple safety measures in external control circuits, such as emergency stop circuits, interlock circuits, or limit circuits, to ensure safety in the system if an abnormality occurs due to malfunction of the product or another external factor affecting the product's operation.

**⚠ CAUTION**

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in minor electric shock, fire, or malfunction.

Do not use the product in locations where flammable or explosive gases are present. Doing so may occasionally result in explosion, causing minor or moderate injury, or property damage.

Do not attempt to disassemble, repair, or modify the product. Doing so may occasionally result in minor or moderate injury due to electric shock.

Do not use the equipment for measurements within Measurement Categories III and IV for K3HB-X and II, III, and IV for K3HB-S, K3HB-V, and K3HB-H (according to IEC61010-1). Doing so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment. Use the equipment for measurements only within the Measurement Category for which the product is designed.

Perform correct setting of the product according to the application. Failure to do so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.

Ensure safety in the event of product failure by taking safety measures, such as installing a separate monitoring system. Product failure may occasionally prevent operation of comparative outputs, resulting in damage to the connected facilities and equipment.

Tighten the screws on the terminal block and the connector locking screws securely using a tightening torque within the following ranges. Loose screws may occasionally cause fire, resulting in minor or moderate injury, or damage to the equipment.

Terminal block screws: 0.43 to 0.58 N·m

Connector locking screws:0.18 to 0.22 N·m

Make sure that the product will not be adversely affected if the DeviceNet cycle time is lengthened as a result of changing the program with online editing. Extending the cycle time may cause unexpected operation, occasionally resulting in minor or moderate injury, or damage to the equipment.

Before transferring programs to other nodes or changing I/O memory of other nodes, check the nodes to confirm safety. Changing the program or I/O memory of other nodes may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.

## Precautions for Safe Use

1. Do not use the product in the following locations.
- Locations subject to direct radiant heat from heating equipment
- Locations where the product may come into contact with water or oil
- Locations subject to direct sunlight
- Locations where dust or corrosive gases (in particular, sulfuric or ammonia gas) are present
- Locations subject to extreme temperature changes
- Locations where icing or condensation may occur
- Locations subject to excessive shocks or vibration

2. Do not use the product in locations subject to temperatures or humidity levels outside the specified ranges or in locations prone to condensation. If the product is installed in a panel, ensure that the temperature around the product (not the temperature around the panel) does not go outside the specified range.
3. Provide sufficient space around the product for heat dissipation.
4. Use and store the product within the specified temperature and humidity ranges. If several products are mounted side-by-side or arranged in a vertical line, the heat dissipation will cause the internal temperature of the products to rise, shortening the service life. If necessary, cool the products using a fan or other cooling method.
5. The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may result in contact welding or burning.
6. Install the product horizontally.
7. Mount to a panel between 1 and 8-mm thick.
8. Use the specified size of crimp terminals (M3, width: 5.8 mm max.) for wiring. To connect bare wires, use AWG22 (cross section: 0.326 $mm^2$) to AWG14 (cross section: 2.081 $mm^2$) to wire the power supply terminals and AWG28 (cross section: 0.081 $mm^2$) to AWG16 (cross section: 1.309 $mm^2$) for other terminals. (Length of exposed wire: 6 to 8 mm)
9. In order to prevent inductive noise, wire the lines connected to the product separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using shield lines.
10. Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON.
11. Allow the product to operate without load for at least 15 minutes after the power is turned ON.
12. Do not install the product near devices generating strong high-frequency waves or surges. When using a noise filter, check the voltage and current and install it as close to the product as possible.
13. Do not use thinner to clean the product. Use commercially available alcohol.
14. Be sure to confirm the name and polarity for each terminal before wiring the terminal block and connectors.
15. Use the product within the noted supply voltage and rated load.
16. Do not connect anything to unused terminals.
17. Output turns OFF when the mode is changed or settings are initialized. Take this into consideration when setting up the control system.
18. Install an external switch or circuit breaker that complies with applicable IEC60947-1 and IEC60947-3 requirements and label them clearly so that the operator can quickly turn OFF the power.
19. Use the specified cables for the communications lines and stay within the specified DeviceNet communications distances. Refer to the User's Manual (Cat. No. N129) for details on communications distance specifications and cables.
20. Do not pull the DeviceNet communications cables with excessive force or bend them past their natural bending radius.

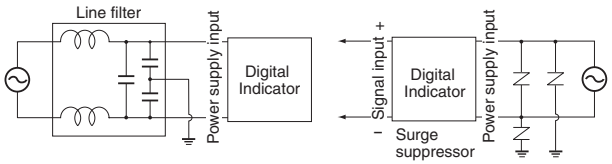
**21.** Do not connect or remove connectors while the DeviceNet power is being supplied. Doing so will cause product failure or malfunction.

**22.** Use cables with a heat resistance of 70ºC min.

## ■ Noise Countermeasures

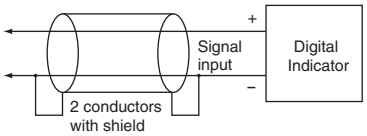
**1.** Do not install the product near devices generating strong high-frequency waves or surges, such as high-frequency welding and sewing machines.

**2.** Mount a surge suppressor or noise filter to peripheral devices generating noise, in particular, motors, transformers, solenoids, and magnet coils.




**3.** In order to prevent inductive noise, wire the lines connected to the terminal block separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using shield lines.

### Example of Countermeasures for Inductive Noise on Input Lines




**4.** If a noise filter is used for the power supply, check the voltage and current, and install the noise filter as close to the product as possible.

**5.** Reception interference may occur if the product is used close to a radio, television, or wireless.

# Warranty and Limitations of Liability

## ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# Application Considerations

## ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

Cat. No. N131-E1-02

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

# Frequency/Rate Meter
# K3NR

## High-speed, Intelligent Interface Modules with Seven Operating Modes Convert Single or Dual Input Pulses to Display Values

- 50-kHz input range and 0.006% accuracy for sophisticated control.
- A wide selection of outputs: relay, transistor, BCD, linear, or communications.
- Maximum/Minimum value hold, set value write protection, and more.
- Banks with four comparative output values and four prescale values.
- Prescale function available, which displays in units of actual physical parameters (length, volume, etc.).
- Set value teaching, linear output range teaching, and prescale teaching are available using actual measured values.
- Displays values in hours, minutes, and seconds in operating mode 6.
- A startup compensation time parameter keeps the measurement operation from sending an unnecessary output for a preset period up to 99.9 s.
- Built-in sensor power supply (12 VDC, 80 mA).
- Compact 1/8 DIN size.
- Conforms to EMC standards, EN61010-1 (IEC61010-1).
- UL/CSA approved.

# Model Number Structure

## ■ Model Number Legend

Base Units and Output Boards can be ordered individually or as sets. Refer to the *Output Board Combinations* table on page 108.

### Base Units

**K3NR - □ □ □ □**
**1 2 3 4**

**1, 2. Input Sensors Codes**

NB: NPN inputs/Voltage pulse inputs
PB: PNP inputs

**3. Supply Voltage**

1: 100 to 240 VAC
2: 12 to 24 VDC

**4. Display**

A:Basic
C:Set Value LED Display

**5, 6, 7, 8. Output Type Codes**

C1: 3 comparative relay contact outputs (H, PASS, L: SPDT)
C2: 5 comparative relay contact outputs (HH, H, L, LL: SPST-NO; PASS: SPDT)
C5: 5 comparative relay contact outputs (HH, H, L, LL: SPST-NC; PASS: SPDT)
T1: 5 comparative transistor outputs (NPN open collector)
T2: 5 comparative transistor outputs (PNP open collector)
B2: BCD output (NPN open collector) (see note)
B4: BCD output + 5 transistor outputs (NPN open collector)
L1: Linear output (4 to 20 mA) (see note)

**Note:** These output types are available on Basic Models only.

### Output Boards

**K31 - □ □ □ □**
**5 6 7 8**

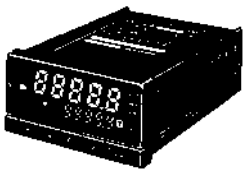
L2: Linear output (1 to 5 VDC) (see note)
L3: Linear output (1 mV/10 digits) (see note)
L4: Linear output, 4 to 20 mA + 5 transistor outputs (NPN open collector)
L5: Linear output, 1 to 5 V + 5 transistor outputs (NPN open collector)
L6: Linear output, 1 mV/10 digits+ 5 transistor outputs (NPN open collector)
L7: Linear output, 0 to 5 VDC (see note)
L8: Linear output, 0 to 10 VDC (see note)
L9: Linear output, 0 to 5 VDC + 5 transistor outputs (NPN open collector)
L10: Linear output, 0 to 10 VDC + 5 transistor outputs (NPN open collector)
FLK1: Communication RS-232C (see note)
FLK2: Communication RS-485 (see note)
FLK3: Communication RS-422 (see note)
FLK4: RS-232C + 5 transistor outputs (NPN open collector)
FLK5: RS-485 + 5 transistor outputs (NPN open collector)
FLK6: RS-422 + 5 transistor outputs (NPN open collector)

### Base Units with Output Boards

**K3NR - □ □ □ □ -□ □ □ □**
**1 2 3 4 5 6 7 8**

# Ordering Information

## ■ Base Unit

| Input type | | NPN/Voltage pulse | | PNP | |
|---|---|---|---|---|---|
| Supply voltage | | 100 to 240 VAC | 12 to 24 VDC | 100 to 240 VAC | 12 to 24 VDC |
| **Basic Models**<br>These models provide a present value LED and front-panel control keys. Can be connected to any Output Board, or can be used for display only without an Output Board. |  | K3NR-NB1A | K3NR-NB2A | K3NR-PB1A | K3NR-PB2A |
| **Set Value LED Models**<br>These models provide a present value LED, set value LED, and front-panel control keys. Can be connected to Relay, Transistor, or Combination Output Boards. |  | K3NR-NB1C | K3NR-NB2C | K3NR-PB1C | K3NR-PB2C |

## ■ Available Output Board Combinations

| Output type | Output configuration | Output boards | Base units | |
|---|---|---|---|---|
| | | | Basic | Set Value LED Display |
| **Relay contact** | 3 outputs: H, PASS, L (SPDT) | K31-C1 | Yes | Yes |
| | 5 outputs: HH, H, L, LL (SPST-NO), and PASS (SPDT) | K31-C2 | Yes | Yes |
| | 5 outputs: HH, H, L, LL (SPST-NC), and PASS (SPDT) | K31-C5 | Yes | Yes |
| **Transistor** | 5 outputs (NPN open collector) | K31-T1 | Yes | Yes |
| | 5 outputs (PNP open collector) | K31-T2 | Yes | Yes |
| **BCD (see note)** | 5-digit output (NPN open collector) | K31-B2 | Yes | --- |
| **Linear** | 4 to 20 mA DC | K31-L1 | Yes | --- |
| | 1 to 5 VDC | K31-L2 | Yes | --- |
| | 1 mV/10 digits | K31-L3 | Yes | --- |
| | 0 to 5 VDC | K31-L7 | Yes | --- |
| | 0 to 10 VDC | K31-L8 | Yes | --- |
| **Communication boards (see note)** | RS-232C | K31-FLK1 | Yes | --- |
| | RS-485 | K31-FLK2 | Yes | --- |
| | RS-422 | K31-FLK3 | Yes | --- |
| **Combination output and communication boards** | BCD output + 5 transistor outputs (NPN open collector) | K31-B4 | Yes | Yes |
| | 4 to 20 mA + 5 transistor outputs (NPN open collector) | K31-L4 | Yes | Yes |
| | 1 to 5 V + 5 transistor outputs (NPN open collector) | K31-L5 | Yes | Yes |
| | 1 mV/10 digits + 5 transistor outputs (NPN open collector) | K31-L6 | Yes | Yes |
| | 0 to 5 VDC + 5 transistor outputs (NPN open collector) | K31-L9 | Yes | Yes |
| | 0 to 10 VDC + 5 transistor outputs (NPN open collector) | K31-L10 | Yes | Yes |
| | RS-232C + 5 transistor outputs (NPN open collector) | K31-FLK4 | Yes | Yes |
| | RS-485 + 5 transistor outputs (NPN open collector) | K31-FLK5 | Yes | Yes |
| | RS-422 + 5 transistor outputs (NPN open collector) | K31-FLK6 | Yes | Yes |

**Note:** For details, refer to the *Communication Operation Manual.*

# Specifications

## ■ Ratings

| | |
|---|---|
| **Supply voltage** | 100 to 240 VAC (50/60 Hz); 12 to 24 VDC |
| **Operating voltage range** | 85% to 110% of supply voltage |
| **Power consumption (see note)** | 15 VA max. (max. AC load with all indicators lit)<br>10 W max. (max. DC load with all indicators lit) |
| **Sensor power supply** | 80 mA at 12 VDC±10% |
| **Insulation resistance** | 20 MΩ min. (at 500 VDC) between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. |
| **Dielectric strength** | 2,000 VAC for 1 min between external terminal and case.<br>Insulation provided between inputs, outputs, and power supply. |
| **Noise immunity** | ±1,500 V on power supply terminals in normal or common mode ±1 μs, 100 ns for square-wave noise with 1 ns |
| **Vibration resistance** | Malfunction: 10 to 55 Hz, 0.5-mm for 10 min each in X, Y, and Z directions<br>Destruction: 10 to 55 Hz, 0.75-mm for 2 hrs each in X, Y, and Z directions |
| **Shock resistance** | Malfunction: 98 m/s$^2$ for 3 times each in X, Y, and Z directions<br>Destruction: 294 m/s$^2$ for 3 times each in X, Y, and Z directions |
| **Ambient temperature** | Operating: −10°C to 55°C (with no icing)<br>Storage: −20°C to 65°C (with no icing) |
| **Ambient humidity** | Operating: 25% to 85% (with no condensation) |
| **EMC** | (EMI) EN61326+A1 Industry<br>Emission Enclosure: CISPR 11 Group 1 class A: CISRP16-1/-2<br>Emission AC Mains: CISPR 11 Group 1 class A: CISRP16-1/-2<br>(EMS) EN61326+A1 Industry<br>Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2)<br>8 kV air discharge (level 3)<br>Immunity RF-interference: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz) (level 3)<br>Immunity Fast Transient Noise: EN61000-4-4: 2 kV (power line) (level 3)<br>Immunity Burst Noise: 1 kV line to line (I/O signal line)<br>Immunity Surge: EN61000-4-5: 1 kV line to line<br>2 kV line to ground (power line)<br>Immunity Conducted Disturbance EN61000-4-6: 3 V (0.15 to 80 MHz) (level 2)<br>Immunity Voltage Dip/Interrupting EN61000-4-11: 0.5 cycles, 0, 180°, 100% (rated voltage) |
| **Approved standards** | UL508, CSA22.2;<br>Conforms to EN61326+A1, EN61010-1 (IEC61010-1)<br>Conforms to VDE0106/P100 (finger protection) when the terminal cover is mounted. |
| **Weight** | Approx. 400 g |

**Note:** A K3NR with DC supply voltage requires approximately 1 A DC as control power supply current the moment the K3NR is turned ON. Do not forget to take this into consideration when using several K3NR units. When the K3NR is not in measuring operation (e.g., the K3NR has been just turned ON or is operating for startup compensation time), the display will read "00000" and all outputs will be OFF.

# ■ Characteristics

| | |
|---|---|
| **Input signal** | No-voltage contact (30 Hz max., ON/OFF pulse width: 15 ms min.)<br>Voltage pulse (50 kHz max., ON/OFF pulse width: 9 μs min., ON voltage: 4.5 to 30 V/OFF voltage: −30 to 2 V)<br>Open collector (50 kHz max., ON/OFF pulse width: 9 μs min.)<br>**Connectable Sensors**<br>ON residual voltage: 3 V max.<br>OFF leakage current: 1.5 mA max.<br>Load current: Must have switching capacity of 20 mA min.<br>Must be able to dependably switch a load current of 5 mA max. |
| **Measuring accuracy (at 23±5°C)** | Operating modes 1 and 6: ±0.006%rdg±1 digit<br>Operating modes 2 to 5: ±0.02%rdg±1 digit |
| **Measuring modes and ranges (Operating modes 1 to 6 are for no-contact sensor models)** | Operating mode 1: Rotational/circumferential speed 0.0005 to 50,000 Hz<br>Operating mode 2: Absolute ratio 0.0005 to 50,000 Hz<br>Operating mode 3: Error ratio 0.0005 to 50,000 Hz<br>Operating mode 4: Rotational difference 0.0005 to 50,000 Hz<br>Operating mode 5: Flow rate ratio 0.0005 to 50,000 Hz<br>Operating mode 6: Passing time 0.0005 to 50,000 Hz<br>Operating mode 7: Pulse counting 0 to 4G count (32-bit counter) |
| **Max. displayed digits** | 5 digits (−19999 to 99999) |
| **Display** | 7-segment LED |
| **Polarity display** | "−" is displayed automatically with a negative input signal. |
| **Zero display** | Leading zeros are not displayed. |
| **Prescale function** | Programming via front-panel key inputs. ($0.0001 \times 10^{-9}$ to $9.9999 \times 10^{9}$, decimal point can be set freely)<br>Can be set using prescale value teaching. |
| **HOLD functions (see note 2)** | Max. value (peak) hold, Min. value (bottom) hold |
| **External control** | HOLD (Process value held)<br>RESET (Maximum/minimum data reset, counting value reset)<br>BANK (Selection of one bank out of 4 banks of set values)<br>(Selection of one bank out of 4 banks of prescale values) |
| **Comparative output hysteresis setting** | Programmable with front-panel key inputs (1 to 9999). |
| **Other functions** | Variable linear output range (for models with linear outputs only) (note 1)<br>Remote/Local processing (available for communications output models only)<br>Maximum/Minimum value data reset with front panel keys<br>Comparative output pattern selection<br>Process time for averaging measured values<br>Startup compensation time (0.0 to 99.9 s)<br>Time unit display<br>Security<br>Memory power failure |
| **Output configuration** | Relay contact output (3 or 5 outputs)<br>Transistor output (NPN and PNP open collector), BCD (NPN open collector)<br>Parallel BCD (NPN open collector) + transistor output (NPN open collector)<br>Linear output (4 to 20 mA, 1 to 5 V) + transistor output (NPN open collector)<br>Communication functions (RS-232C, RS-485, RS-422)<br>Communication functions (RS-232C, RS-485, RS-422) + transistor output (NPN open collector) |
| **Delay in comparative outputs (at transistor output)** | Operating modes 1 to 6: 200 ms max.<br>Operating mode 7: 1 ms max. |
| **Linear output response time** | Operating modes 1 to 6: 220 ms max.<br>Operating mode 7: 20 ms max. |
| **Degree of protection** | Front panel: NEMA4X for indoor use (equivalent to IP66)<br>Rear case: IEC standard IP20<br>Terminals: IEC standard IP00 |
| **Memory protection** | Non-volatile memory (EEPROM) (possible to rewrite 100,000 times) |

**Note: 1.** The linear output range cannot be set when connected to a 1 mV/10-digit Linear Output Board.

**2.** Not effective for operating mode 7.

# ■ Input/Output Ratings

## Relay Contact Output

(Incorporating a G6B Relay)

| Item | Resistive load (cosϕ = 1) | Inductive load (cosϕ = 0.4, L/R = 7 ms) |
|---|---|---|
| **Rated load** | 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** | 380 VAC, 125 VDC | |
| **Max. contact current** | 5 A max. (at COM terminal) | |
| **Max. switching capacity** | 1,250 VA, 150 W | 375 VA, 80 W |
| **Min. permissible load (P level, reference value)** | 10 mA at 5 VDC | |
| **Mechanical life** | 50,000,000 times min. (at a switching frequency of 18,000 times/hr) | |
| **Electrical life (at an ambient temperature of 23°C)** | 100,000 times min. (at a rated load switching frequency of 1,800 times/hr) | |

## Transistor Output

| | |
|---|---|
| **Rated load voltage** | 24 VDC max. |
| **Max. load current** | 50 mA |
| **Leakage current** | 100 μA max. |

## BCD Output

| I/O signal name | | Item | Rating |
|---|---|---|---|
| Inputs | REQUEST, HOLD, MAX, MIN, RESET | Input signal | No-voltage contact input |
| | | Input current with no-voltage input | 10 mA |
| | | Signal level | ON voltage: 1.5 V max.<br>OFF voltage: 3 V min. |
| Outputs | DATA, POLARITY, OVERFLOW, DATA VALID, RUN | Rated load voltage | 24 VDC max. |
| | | Max. load current | 10 mA |
| | | Leakage current | 100 μA max. |

**Note:** Logic method: negative logic

## Linear Output

| Item | 4 to 20 mA | 1 to 5 V | 1 mV/10 digits (see note) |
|---|---|---|---|
| **Resolution** | 4,096 | | |
| **Output error** | ±0.5% FS | | ±1.5% FS |
| **Permissible load resistance** | 600 Ω max. | 500 Ω min. | 1 KΩ min. |

**Note:** For the 1 mV/10-digit output, the output voltage changes for every 40 to 50 increment in the display value.

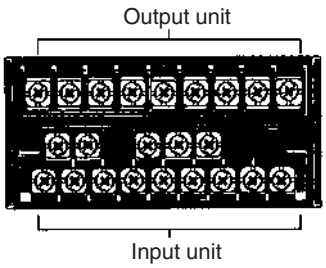
# ■ Communications Specifications

| Item | | RS-232C, RS-422 | RS-485 |
|---|---|---|---|
| **Transmission method** | | 4-wire, half-duplex | 2-wire, half-duplex |
| **Synchronization method** | | Start-stop synchronization | |
| **Baud rate** | | 1,200/2,400/4,800/9,600/19,200/38,400 bps | |
| **Transmission code** | | ASCII (7-bit) | |
| **Communications** | **Write** | Comparative set value, prescaling value, remote/local programming, reset control of maximum/minimum values, and other setting mode items excluding communications conditions. | |
| | **Read** | Process value, comparative set value, maximum value, minimum value, model data, error code, and others | |

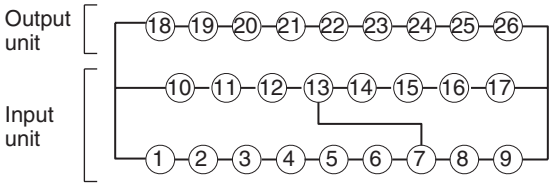
For details, refer to *Communication Operation Manual.*

# Connections

## ■ Terminal Arrangement

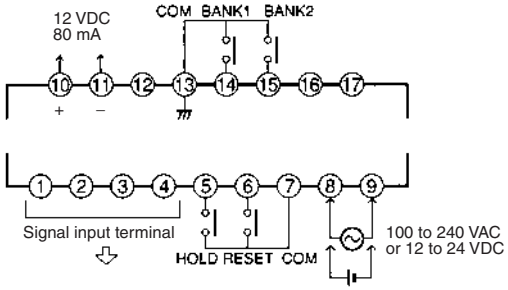



**Terminal Numbers**




**Note:** Terminals 7 to 13 are connected internally.
Terminals 7 and 11 are mutually isolated.

## Input Unit




**Note:** Check the power supply specifications of the model used before connecting the power supply*.

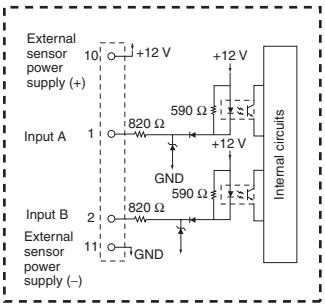
*Recommended DC power supply: eg. OMRON S8VS

When inputting the external control signals and input signals through the open collector:

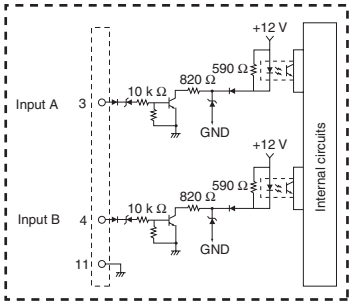
Transistor Inputs:
ON: Residual voltage must be 3 V max.
OFF: Leakage current must be 1.5 mA max.
The switching capacity must be 20 mA or greater.

When the external signal input is short-circuited, a voltage of approximately 5 V will be applied to between the terminals 5 to 7 and the COM terminal, and a current of approximately 18 mA (nominal value) will flow.

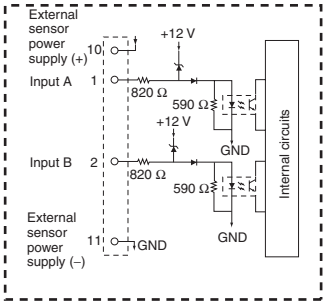
**NPN Inputs**




**Voltage Pulse Inputs**



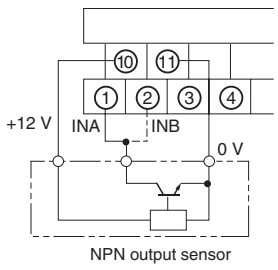

**PNP-Inputs**




### K3NR-NB (NPN Input/Voltage Pulse Input)

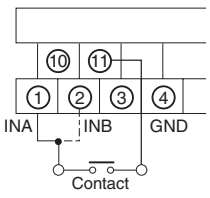
### K3NR-PB (PNP Input)

**NPN Open Collector Output (NPN Linear 2-wire Output)**



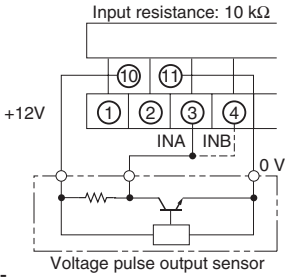

**Note:** Connect the + side of the NPN linear 2-wire input to terminal 1 and the – side to terminal 11.

**Contact Output**



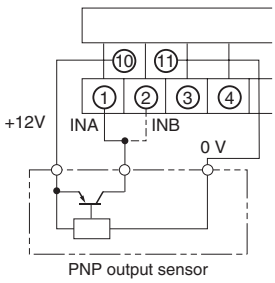

**Note:** When the contact is short-circuited, a current of approximately 13 mA will flow at a voltage of approximately 12 V.

**Voltage Output**



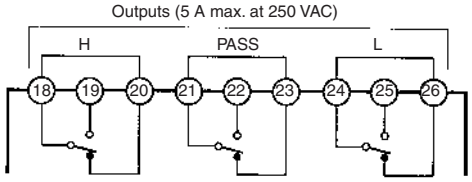

**Note:** With voltage pulse input not from a 3-wire sensor, connect the + side to terminal 3 and the – side to terminal 11.

**PNP Open Collector Output**

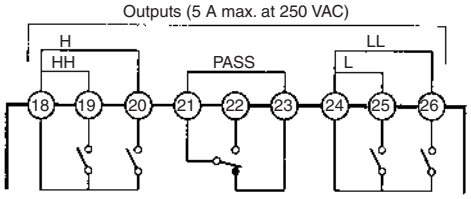


# Output Units

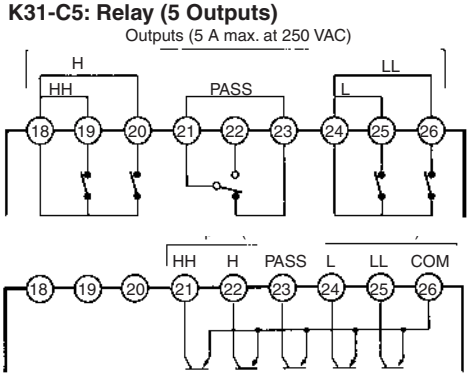
### K31-C1: Relay (3 Outputs)



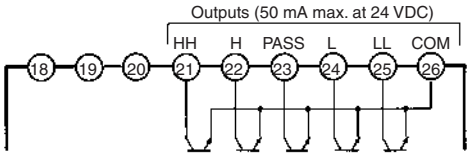

### K31-C2: Relay (5 Outputs)




### K31-C5: Relay (5 Outputs)



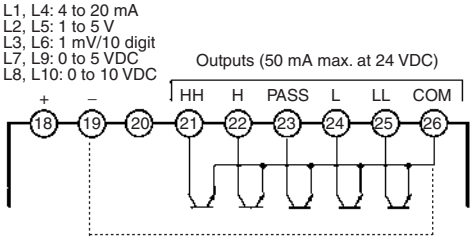

### K31-T1: Transistor (NPN Open Collector)



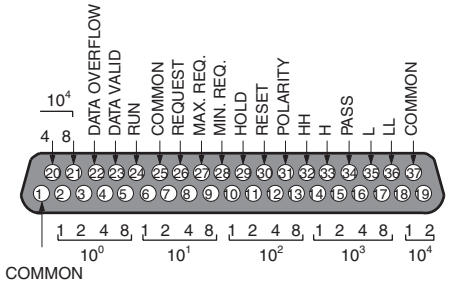

### K31-L1, L2, L3,-L4, -L5, -L6, -L7, -L8, -L9, -L10: Linear

(Terminals 21 to 26 are provided only on K31-L4, -L5, -L6, -L9, -L10.)

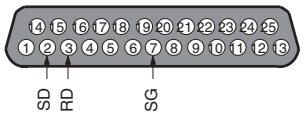
L1, L4: 4 to 20 mA
L2, L5: 1 to 5 V
L3, L6: 1 mV/10 digit
L7, L9: 0 to 5 VDC
L8, L10: 0 to 10 VDC




**Note:** With K31-L4/-L5/-L6/-L9/-L10 models, terminals 19 and 26 are connected internally.

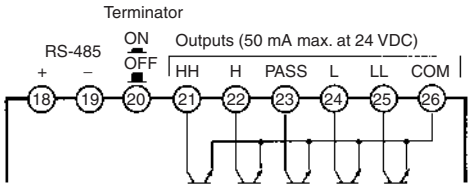



### K31-FLK1: RS-232C



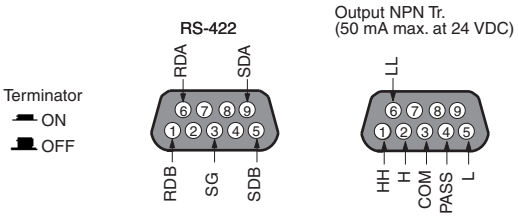

### K31-FLK2, -FLK5: RS-485

(Terminals 21 to 26 are provided only on K31-FLK5.)

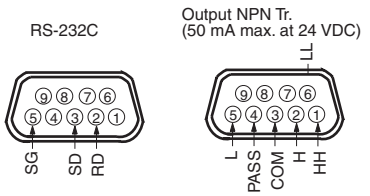



### K31-FLK3, -FLK6: RS-422

(The right connector is provided only on K31-FLK6)

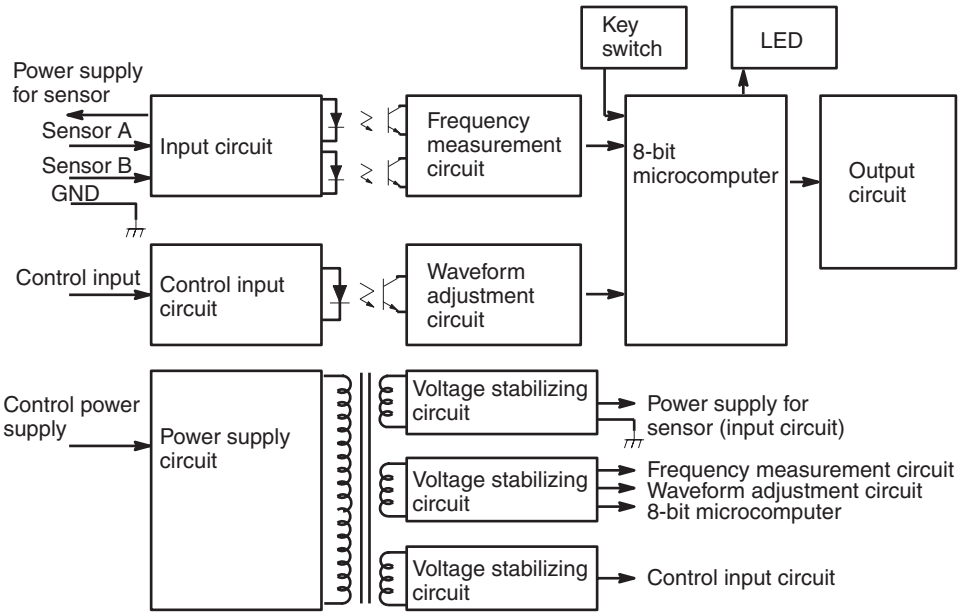



### K31-FLK4: RS-232C + Transistor (NPN Open Collector)




- D-sub 37P Connectors for BCD output (attachment)
  Plug: XM2A-3701
  Hood: XM2S-3711
- D-sub 25P connectors for RS-232C output (K31-FLK1) (order separately)
  Plug: XM2A-2501
  Hood: XM2S-2511
- D-sub 9P connectors for RS-422 output (K31-FLK3 and K31-FLK6) (order separately)
  Plug: XM2A-0901
  Hood: XM2S-0911
- D-sub 9P connectors for RS-232C output (K31-FLK4) (order separately)
  Plug: XM2D-0901
  Hood: XM2D-0911

## ■ Block Diagram

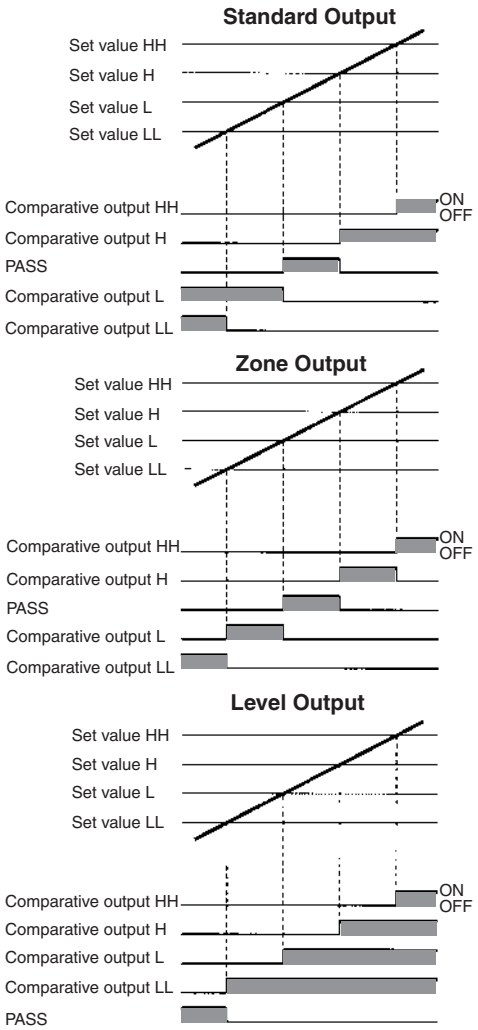


# Operation

## ■ Main Functions

### Output Pattern Selection C-oUt

The patterns of comparative output are selectable according to the level change. Select the pattern according to the application.

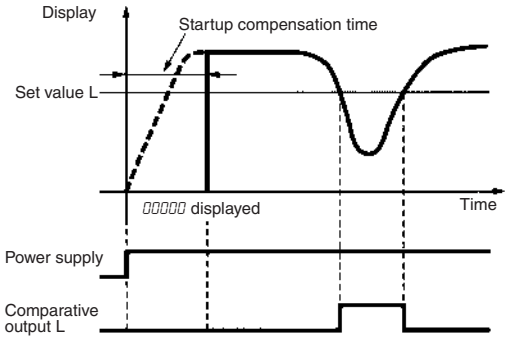



**Note:** The following setting conditions must be satisfied, otherwise no zone output will turn ON correctly.
LL < L < H < HH

### Startup Compensation Time StAnE

The startup compensation time parameter keeps the measurement operation from sending an unnecessary output corresponding to instantaneous, fluctuating input from the moment the K3NR is turned ON until the end of the preset period.

The compensation time can be set in a range from 0.0 to 99.9 seconds as the waiting time until the devices subject to measurement become stable after the startup of the power supply.

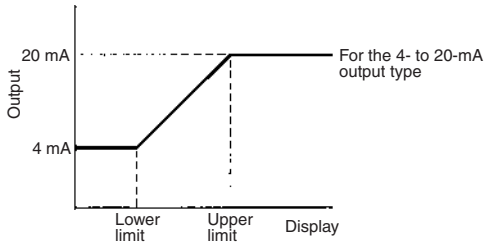



### Hysteresis HYS

The hysteresis of comparative outputs can be set to prevent the chattering of comparative outputs. Refer to page 130 for more details.

### Linear Output Range LSEt

A linear output range can be set as required. A value corresponding to the maximum output value and that corresponding to the minimum output value can be set.




### Remote/Local Selection r-L

Select remote programming when performing all settings through the host devices and select local programming when performing settings through key operation.

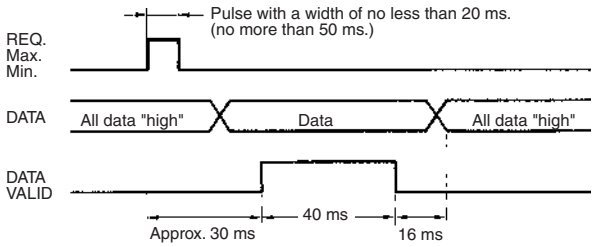
### Process Time for Averaging Measured Value

Process time for averaging measured value is the time over which the measured values will be averaged. If this time is shorter than the input pulse interval, processing will be based on the input pulse interval.

# ■ BCD Output Timing Chart

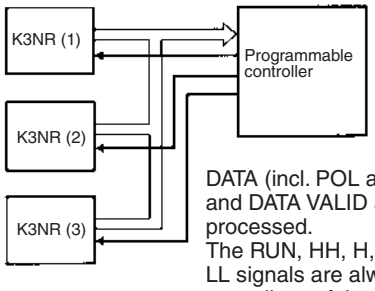
A request signal from an external device (such as a Programmable Controller) is required to read BCD data.

## Single Sampling Data Output

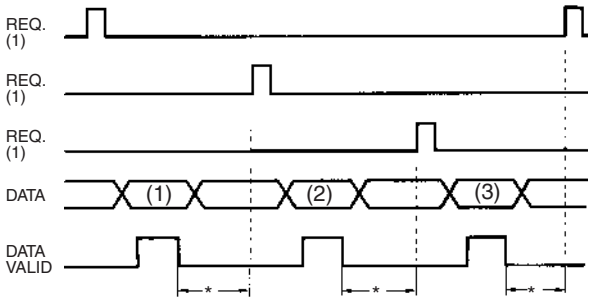



Approximately 30 ms after the REQ signal rises, a sample is taken and the DATA VALID signal is output. Read the data when the DATA VALID signal is ON.
The DATA VALID signal will turn OFF in 40 ms, and then in 16 ms, the data will go OFF.

Models with a BCD output have an open collector output configuration so that wired-OR connection is possible.

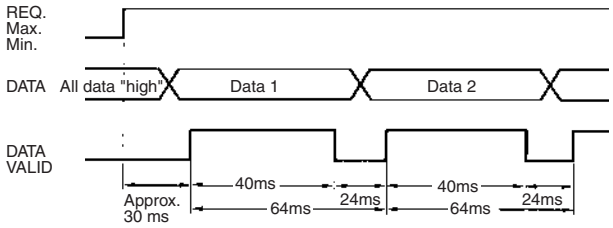



DATA (incl. POL and OVER) and DATA VALID are wired-OR processed.
The RUN, HH, H, PASS, L, and LL signals are always output regardless of the status of the REQ signal. Do not OR-wire these signals.



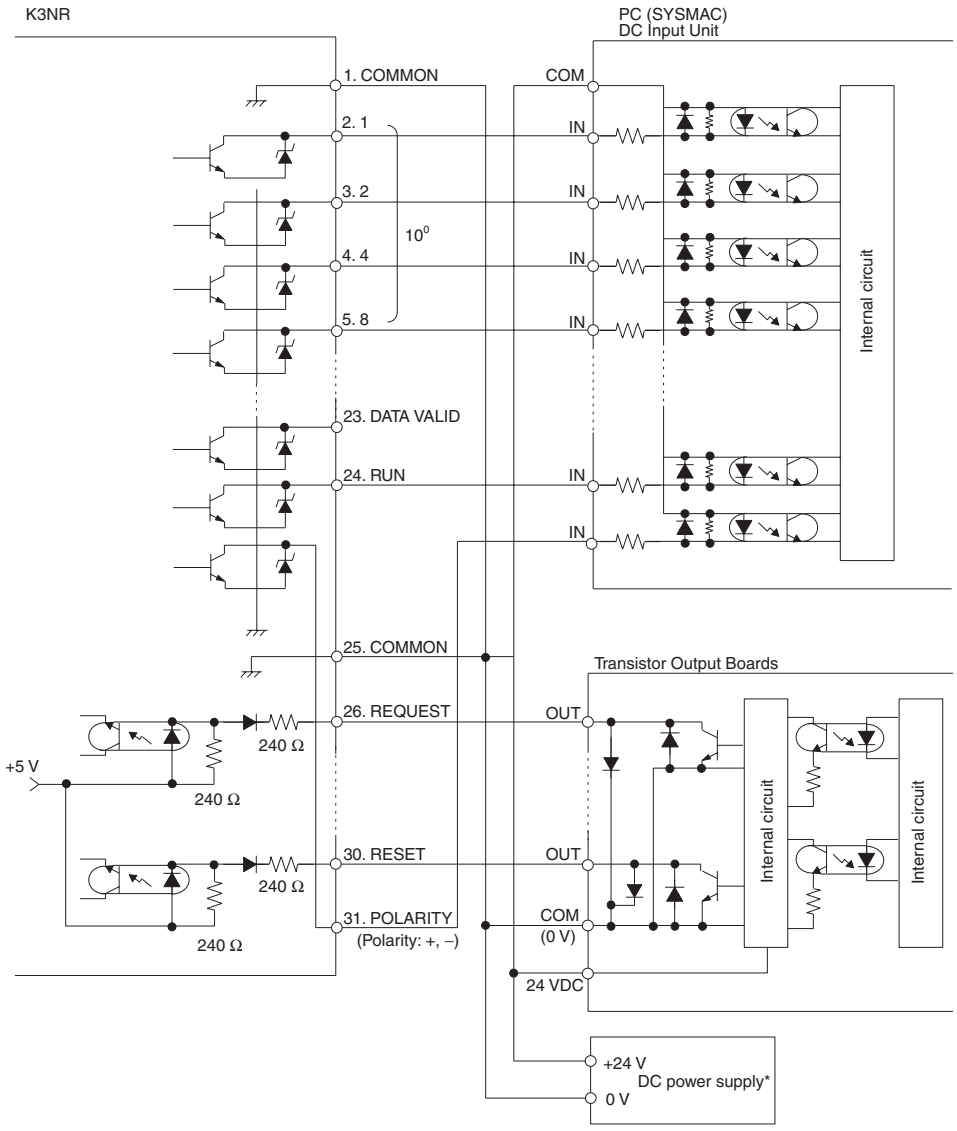

*The period between the DATA VALID signal and the REQ signal should be no less than 20 ms max.

## Continuous Data Output



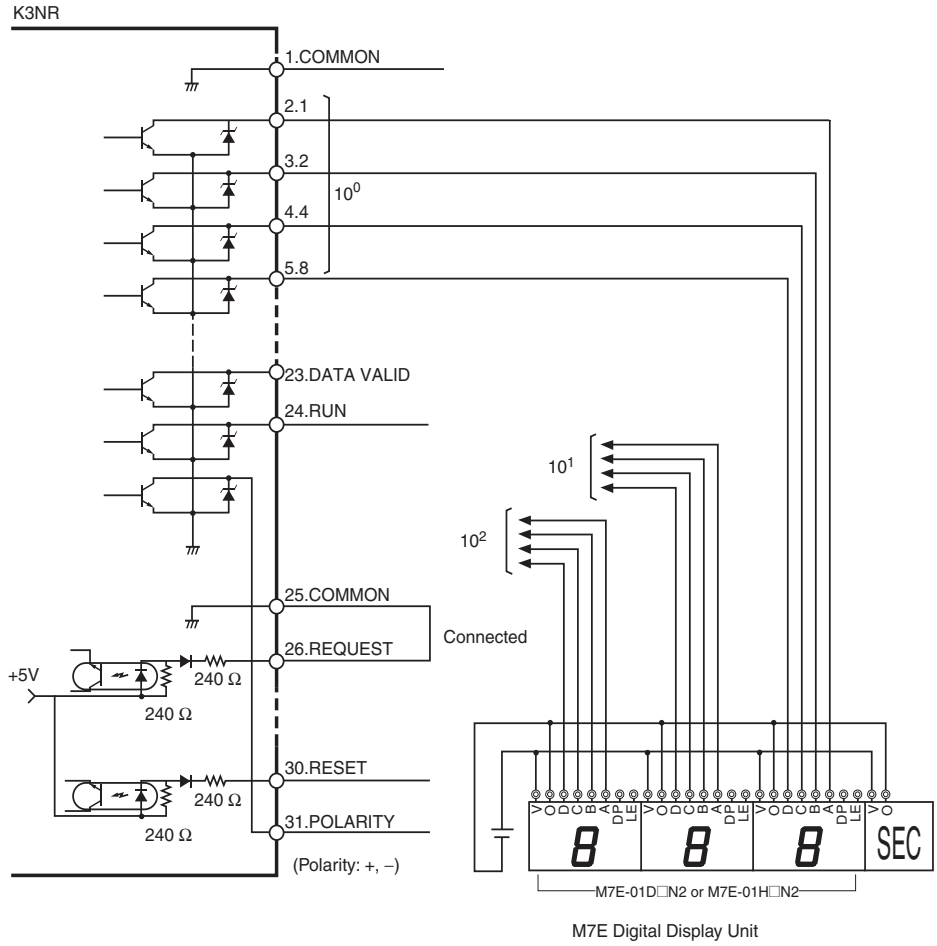

The K3NR outputs each measurement at an interval of 64 ms when a REQ signal is ON continuously.
If the HOLD signal is ON at the moment the DATA output is switched from Data 1 to Data 2 or vice versa, the output BCD data will be either Data 1 or Data 2 according to the timing of the HOLD signal. However, output data will never be below.

## Example of Connection to Programmable Controller

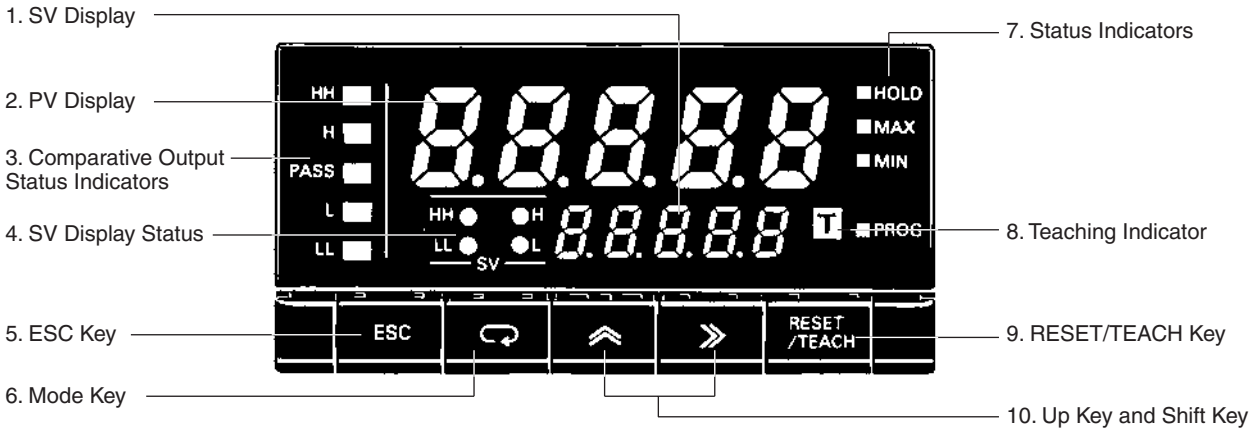



*Recommended DC power supply: eg. OMRON S8VS

## Example of Connection to Display Unit



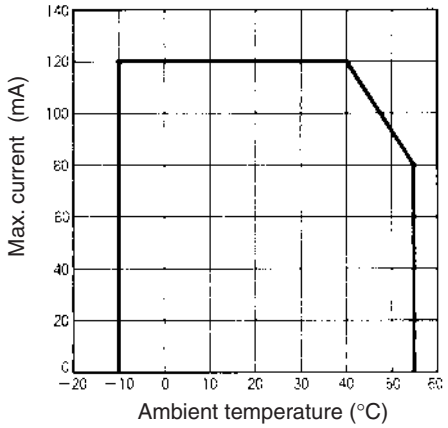
# Nomenclature




| Name | Functions |
|---|---|
| **1. SV display** | Displays the set value or parameter. Available for Set Value LED Models only. |
| **2. PV display** | Displays the process value in addition to the max./min. value or parameter. |
| **3. Comparative output status indicators** | Displays the status of comparative output. |
| **4. SV display status** | Indicates which comparative set value is currently on the SV display. |
| **5. ESC Key** | Used to return to the RUN mode from the Setting, Protect, or Maintenance mode.<br>The process value, maximum value, or minimum value to be displayed can be selected. |
| **6. Mode Key** | Used to enter the Setting mode.<br>Used to allow the PV display to indicate set values sequentially. Available for Basic Models only.<br>Used to indicate set values sequentially on the SV display. Available for Set Value LED Models only. |
| **7. Status indicators** | HOLD: Lit when HOLD input is ON.<br>MAX: Lit when the maximum value is indicated on the PV display.<br>MIN: Lit when the minimum value is indicated on the PV display.<br>PROG: Lit or flashes while parameters are being set. |
| **8. Teaching indicator** | Lit when the teaching function is enabled and flashes when the K3NR is in teaching operation. |
| **9. RESET/TEACH Key** | The maximum value, minimum value, and counting values are reset by pressing this key.<br>Teaching is available when the teaching function is enabled. |
| **10. Up Key and Shift Key** | The digit being set is scrolled by pressing the Shift Key. The set value increases by one whenever the Up Key is pressed. |

# Engineering Data

## Derating Curve for Sensor Power Supply

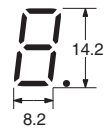


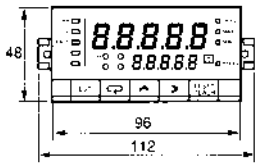

**Note:** The derating curve shown is for standard installation.
The derating curve depends on the mounting direction.

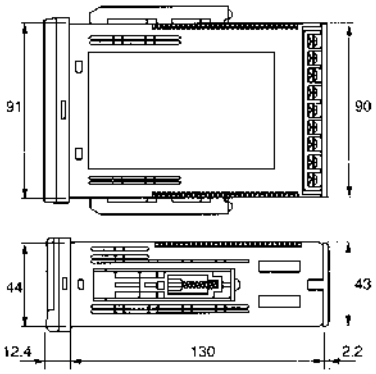
# Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

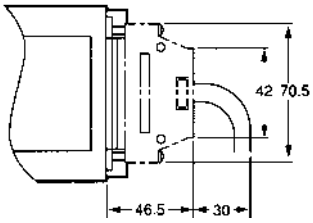
**PV Display**



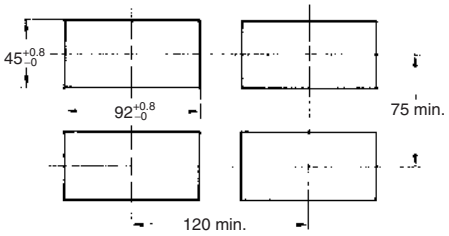




**Note:** The K3NR uses M3.5 terminals.
A terminal cover is provided.




**Panel Cutouts**



# Precautions

**⚠ WARNING**

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

**⚠ Caution**

Do not allow metal objects or conductive wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

**⚠ Caution**

Do not attempt to take the product apart or touch any internal parts while the power is being supplied. Doing so may result in electric shock.

**⚠ Caution**

Do not use the product in locations subject to flammable or explosive gases. Doing so may result in explosion.

**⚠ Caution**

The lifetime of output relays varies greatly with the switching capacity and conditions. Consider the actual operating conditions, and use the relays within the rated load without exceeding the number of operations specified as the rated electrical life. Using relays beyond their rated electrical life may result in contact deposit or burning.

**⚠ Caution**

Do not use loads exceeding the rated value. Doing so may result in damage or burning.

**⚠ Caution**

Use a power supply voltage within the specified range. Not doing so may result in damage or burning.

**⚠ Caution**

Use settings that are appropriate for the control system. Discrepancies between the settings and the actual control conditions may result in unexpected operation leading to damage or accidents.

**⚠ Caution**

Be sure to tighten terminal screws to the specified torque.
Specified torque for M3.5 screws: 0.74 to 0.90 N·m
Loose screws may result in burning or malfunction.

## ■ Application Precautions

- Use a power supply voltage within the specified range. Not doing so may result in damage or burning.
- Be sure to perform wiring correctly, verifying the terminal names. Incorrect wiring may result in burning.
- Be sure to tighten the screws on the terminal block properly.
- Do not connect anything to unused terminals.

## ■ Correct Use

### Long-term Use

Use all products within the specified ranges. When using inside a control panel, ensure that the temperature around the product, rather than the temperature around the control panel, does not exceed the specified temperature range. Electronic products, such as this product, have a lifetime that is dependent on the lifetime of internal electronic components, as opposed to the lifetime related to the number of relay switching operations. The lifetime of these components varies with the temperature; the higher the temperature, the shorter the lifetime. Therefore, the product lifetime can be extended by lowering the internal temperature of the product.

When several Frequency/Rate Meters are mounted close together (either horizontally or vertically), the internal temperature of the Frequency/Rate Meters may rise, leading to a reduction in the lifetime. In this case, take measures to cool the Frequency/Rate Meters, such as installing fans. Ensure, however, that the terminals are not cooled as this may lead to incorrect measurement.

### Operating Environment

Do not use the product in locations subject to temperatures or humidity levels above the specified ranges, or in locations subject to condensation.

Do not use the product in locations subject to severe shocks or vibrations.

Separate the product from machines that generate high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines.

Do not use the product in locations subject to dust or corrosive gases.

Do not use the product outdoors or in locations subject to direct sunlight.

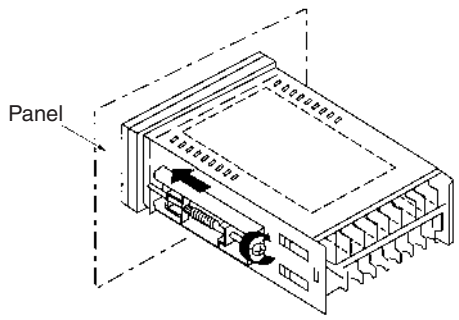
### Operation

When using models with comparative outputs, if an error occurs at the Frequency/Rate Meter, comparative output may not operate correctly. We therefore recommend that you consider providing an alarm system separately as a countermeasure.

Parameter settings that allow the functions to operate properly are made, using the setting menu, at the factory prior to delivery. When using the product, change the settings as required for the application.

### Mounting

Recommended panel thickness is 1 to 3.2 mm.



Attach the mounting bracket on the left and right sides of the Frequency/Rate Meter as shown in the illustration above and gradually tighten each screw evenly in turn by considering the balance of the tightening force until the ratchets start slipping without being further tightened.

Mount the Frequency/Rate Meter as horizontally as possible.

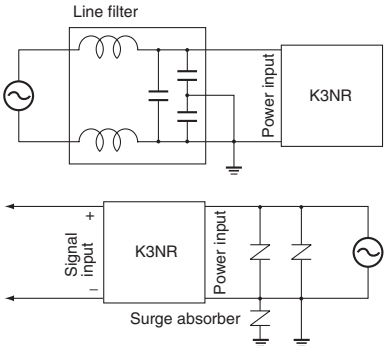
## Waterproof Specifications

Products for which the degree of protection is not specified or models with IP□0 degree of protection do not have waterproof specifications.

## Noise Countermeasures

Separate the product as far as possible from machines that generate high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines, and machines that generate surges.

Attach surge absorbers or noise filters to noise-generating peripheral devices (in particular, devices with inductance such as motors, transformers, solenoids, and magnet coils).

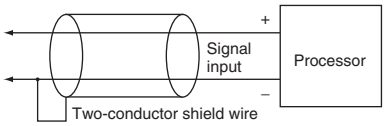



In order to prevent inductive noise, wire the lines connected to the terminal block separately from power lines carrying high voltages or large currents. Also, do not wire in parallel to, or in the same cable as power lines. There are other methods that are effective for reducing noise, such as running wires along ducts and using shield lines.

When using a noise filter for the power supply, check the voltage and current and install as close to the Frequency/Rate Meter as possible.

### Inductive Noise Countermeasure for Input Line

#### Analog Input




#### Temperature Input

In order to prevent the influence of induction, separate the lead wire joining the temperature sensor and the Frequency/Rate Meter from power and load lines.

Using the product near radios, television sets, or other wireless devices may result in reception interference.

## Unit Label (Provided)

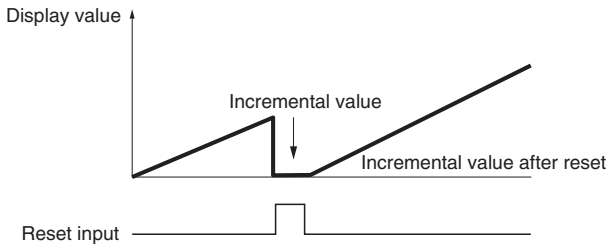
No product is shipped with the unit label attached. Select a unit label from the sheet provided and attach it to the Frequency/Rate Meter.

# Operating Procedures

## ■ Operation in RUN Mode

### Reset (Enabled in operating mode 7 only.)

The incremental display value can be reset using key operations.

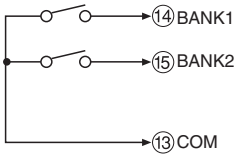



- Press the RESET/TEACH Key [RESET/TEACH] during incremental display to reset the incremental value and continue incremental counting operation.
- Reset using the RESET/TEACH Key [RESET/TEACH] is not possible if reset of counting values was prohibited in Protect Mode.

### Checking the Bank Number

Press the Shift Key [»] for 1 s min. during measurement to display the bank number in the PV display. (The display will return to the measurement value if there is no key operation for 5 seconds.)

### Bank Selection



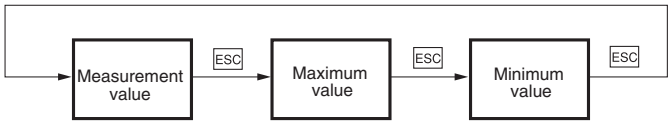

- Switch between the comparative set values and the prescaling values for banks 1 to 4 using the BANK 1 and BANK 2 signals.
- The relationship between the BANK 1 and BANK 2 signals and the bank numbers is shown in the following table.

| Bank number | BANK 1 | BANK 2 | Comparative set value | Prescaling value |
|---|---|---|---|---|
| 1 | OFF | OFF | Su 1.** | PS 1.** |
| 2 | ON | OFF | Su2.** | PS2.** |
| 3 | OFF | ON | Su3.** | PS3.** |
| 4 | ON | ON | Su4.** | PS4.** |

**Note:** If the prescale value bank is set to OFF, then the prescaling value for each bank is fixed.

### Confirming Maximum and Minimum Values

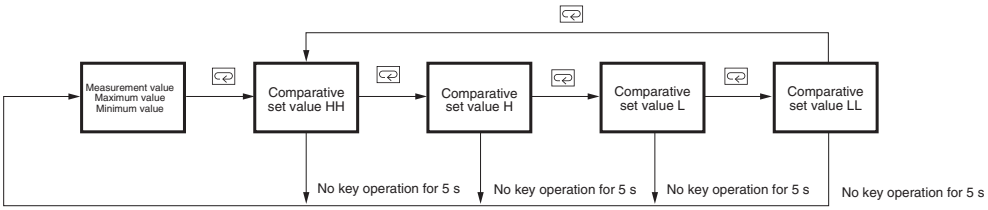
Press the ESC Key [ESC] during measurement to display the maximum and minimum values.




Press the RESET/TEACH Key [RESET/TEACH] while the maximum or minimum value is displayed to reset the value. (This is not possible, however, if maximum/minimum value reset was prohibited in Protect Mode.)

### Confirming and Setting Comparative Set Values

When the measurement value, the maximum value, or the minimum value is displayed, press the Mode Key [↵] repeatedly to display the comparative set values in the order HH, H, L, and LL. (With models that have an SV display, the comparative set values are displayed in the SV display.)

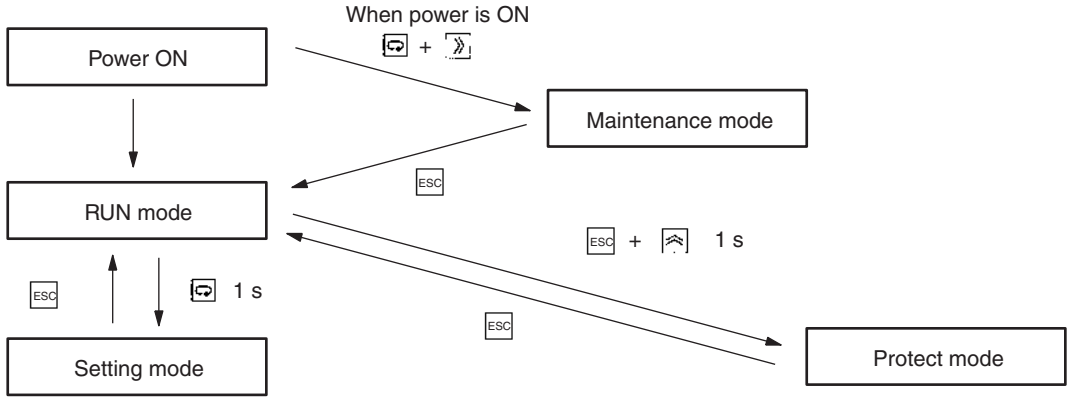



**Note:** When a comparative set value is displayed, it can be changed using the Up Key [^] and Shift Key [»] (if key protection is OFF).

# ■ Setting Procedures

The K3NR has four modes: RUN mode for normal operations, Setting mode for initial parameter input, Protect mode for lock-out configuration, and Maintenance mode for initializing set values. The parameters that are accessible on any individual K3NR will vary depending on the Output Board installed. Refer to the *K3NR Operation Manual* for details.

| | |
|---|---|
| RUN Mode: | Remains in this mode under normal operation.<br>The process value or the max./min. value can be monitored.<br>Using the front panel keys, the comparative set value can be changed and max./min. value and counting value reset can be performed. |
| Setting Mode: | Used for making initial settings.<br>Includes settings for four menus (Set value (SuSEt), prescaling (PSCL), setup (SEtUP), option (oPt)) and the output test. |
| Protect Mode: | Used for locking the front key operation or parameter changes. |
| Maintenance Mode: | Used for initializing set values. |




SuSEt - Program set values

- S.bAnK Select bank no. of set values
- Su*.HH Enter set value HH of bank 1
- Su*. H Enter set value H of bank 1
- Su*. L Enter set value L of bank 1
- Su*. LL Enter set value LL of bank 1

**Note:** The above is an example when the bank number is set to 1.

PSCL - Display prescaling

- P.bAnK Select bank no. of prescale values
- PS*.Ao Set the mantissa (X) of the prescale value of input A
- PS*.AY Set the exponent (Y) of the prescale value of input A
- PS*.bo Set the mantissa (X) of the prescale value of input B
- PS*.bY Set the exponent (Y) of the prescale value of input B
- dECP.* Select decimal point

**Note:** The above is an example when the bank number is set to 1.

SEtUP - Program operating mode/input sensor/serial communications

- FUnC Specify operating mode
- InA Select a sensor type of input A
- Inb Select a sensor type of input B
- Zro.Ao Set the mantissa (X) of the auto zero time of input A
- Zro.AY Set the exponent (Y) of the auto zero time of input A
- Zro.bo Set the mantissa (X) of the auto zero time of input B
- Zro.bY Set the exponent (Y) of the auto zero time of input B

oPt - Supplementary settings related to display or control

- Ao Set the process time for averaging measured value
- StIn Set startup compensation time
- oFFo Select power failure memory function
- HYS Enter hysteresis value
- O-oUt Select the output pattern
- LSEt.H Enter the upper limit (H) of linear output range
- LSEt.L Enter the lower limit (L) of linear output range
- r-L Select the remote/local programming

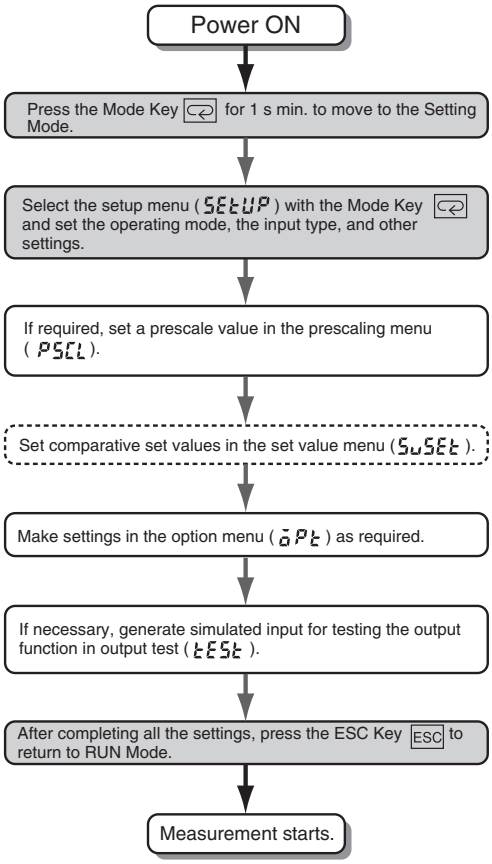
tESt - Generating simulated input for testing the output function

Prot - Program lock-out configuration

- ALL Enable all key protection
- SuSEt Enable set value change prohibition
- rESEt Enable prohibition of counting value reset using the front panel keys
- oo.rSt Enable prohibition of max./min. value reset using the front panel keys
- SECr Specify the menus to be protected against setting in the setting mode

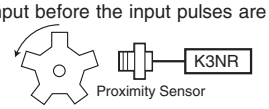
- tUnE Select the display time unit
- U-no Enter the unit no. for the host
- bPS Select the baud rate
- LEn Select the word bit length
- SbIt Select the stop bits
- PrtY Select the parity bits

## ■ Initial Settings




**Prescaling**

To display rotational speeds, circumferential speeds, or other values based on input pulse calculations, the rotational speed must be multiplied by a factor input before the input pulses are measured. This factor is called a prescale value.




Rotation speed (rpm) = $f \times 60 \times a$
Where,
f: Input pulse frequency (p/s)
a: Prescale value
If there are 5 pulses per rotation, then an accurate rotation speed can be calculated if a = 1/5 (= 0.2 = $2 \times 10^{-1}$).
In actual application, input as follows:
Mantissa X = 2.0000
Exponent Y = $10^{-1}$

**Auto-zero Time (Set before use.)**

In operation modes 1 to 6, the time to force-zero the frequency if no pulse is received for a specified period can be set. This time is called the auto-zero time. Set the auto-zero time to a value that is somewhat longer than the longest input pulse interval. (If the time setting is too long or if the factory-set value is used, the display may not return to zero even if no input pulse is received.)

**Time Unit Setting**

| Setting | Meaning |
|---|---|
| SCAL | Set in the prescaling menu |
| SEC | Seconds |
| nin | Minutes |
| H.nn.SS | Minutes and seconds |
| nn.SS.d | Hours, minutes, and seconds |

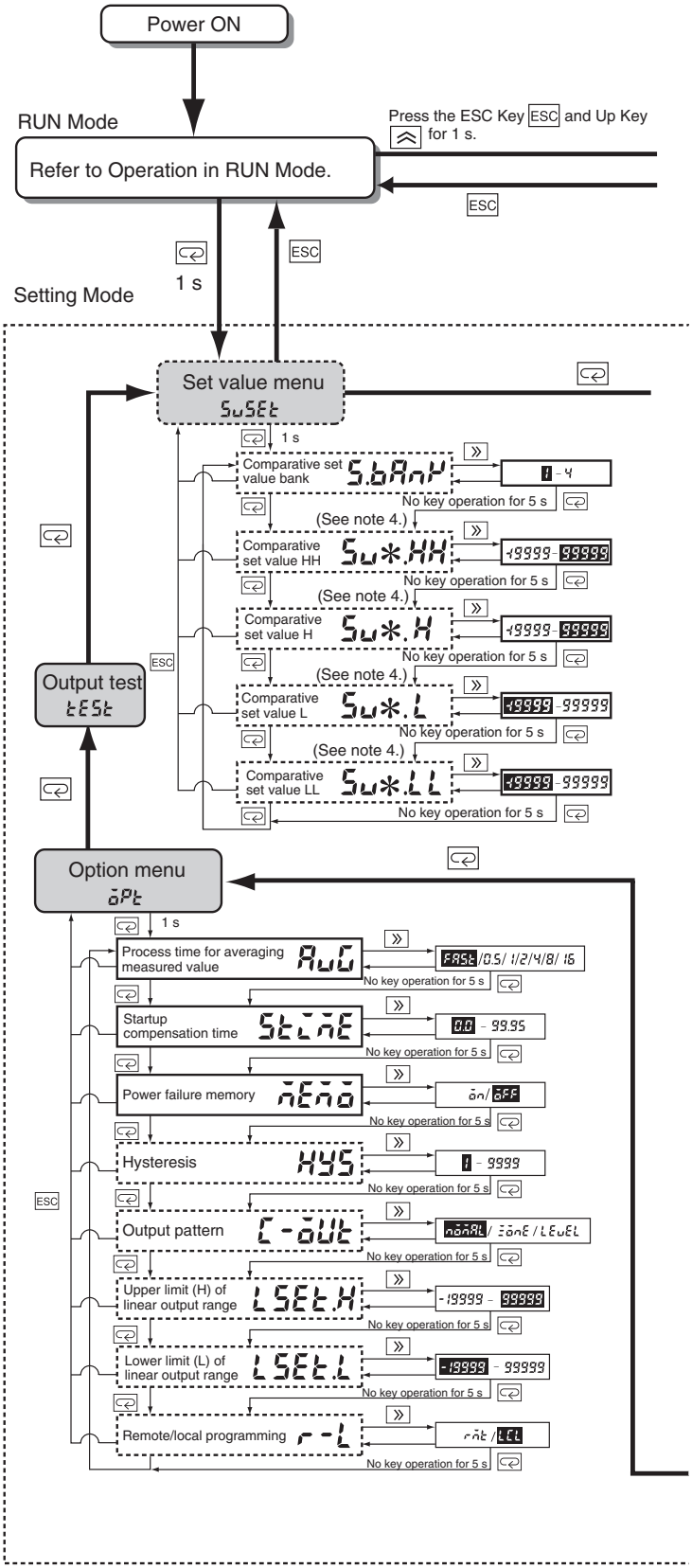
**Note:** The time unit can be set only if operating mode 6 (passing time) is selected.

**Selecting the Sensor Type**

| | NO: Voltage pulse H | NC: Voltage pulse L |
|---|---|---|
| No-contact or voltage pulse input | 00 | 01 |
| Contact input | 10 | 11 |

**Note:** If there are large discrepancies in the display select 10 or 11. Note, however, that the maximum counting frequency is 30 Hz.

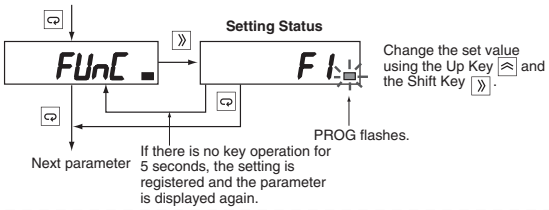
## ■ Parameters

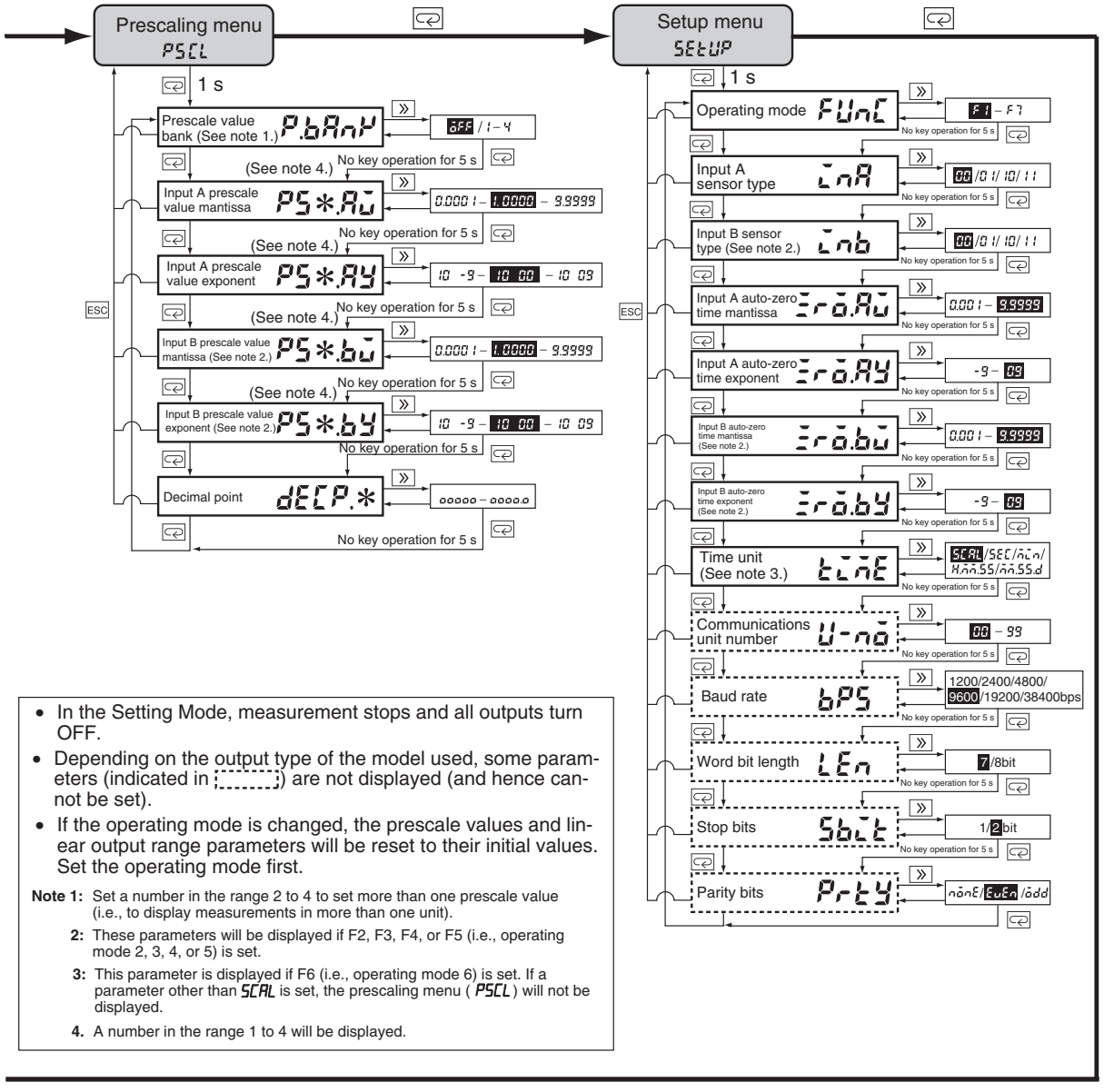


Protect Mode

**Changing Set Values**

By pressing the Shift Key » while a parameter is displayed, the set value can be changed (setting status). The PROG status indicator will flash. Change the set value as required, and press the Mode Key to register the setting and move to the next parameter.




- In the Setting Mode, measurement stops and all outputs turn OFF.
- Depending on the output type of the model used, some parameters (indicated in ⋯) are not displayed (and hence cannot be set).
- If the operating mode is changed, the prescale values and linear output range parameters will be reset to their initial values. Set the operating mode first.

**Note 1:** Set a number in the range 2 to 4 to set more than one prescale value (i.e., to display measurements in more than one unit).

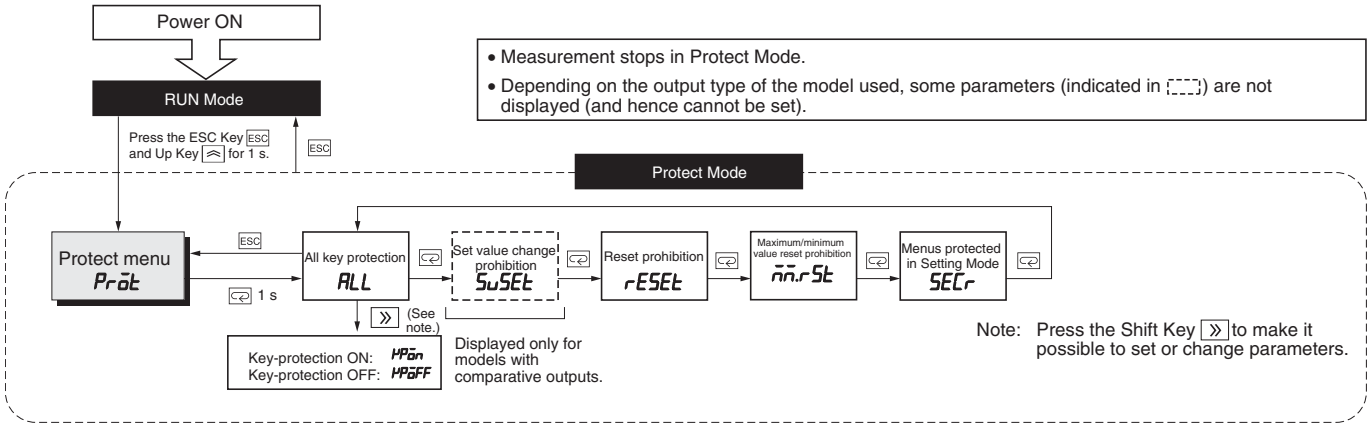
**2:** These parameters will be displayed if F2, F3, F4, or F5 (i.e., operating mode 2, 3, 4, or 5) is set.

**3:** This parameter is displayed if F6 (i.e., operating mode 6) is set. If a parameter other than SCAL is set, the prescaling menu ( PSCL ) will not be displayed.

**4.** A number in the range 1 to 4 will be displayed.

Settings displayed in reverse colors are defaults.

Panel indicators




| Menu display | Parameter display | Meaning of parameter | Setting range | Setting key (See note.) |
|---|---|---|---|---|
| Prot<br>Press the Mode Key to display the parameter.<br>Press the ESC Key to return to the menu. | ALL Setting: »<br>Next parameter: ↺ | All key protection:<br>All key operations are prohibited in RUN Mode. (If all key protection is ON, only the key for going to Protect Mode is enabled.) | Key protection ON: Hpon<br>Key protection OFF: HpoFF | Use the Up Key to change the setting.<br>Hpon → HpoFF<br>Use the Mode Key to enable the setting and move to the next parameter. |
| | SuSEt Setting: »<br>Next parameter: ↺ | Set value change prohibition:<br>Changes to comparative set values are prohibited in RUN Mode. (Displayed only for models with comparative outputs.) | | |
| | rESEt Setting: »<br>Next parameter: ↺ | Reset prohibition:<br>Resetting using the front panel keys is prohibited. (Resetting by external signals is not prohibited.) | | |
| | mm.rSt Setting: »<br>Next parameter: ↺ | Maximum/minimum value reset prohibition:<br>Resetting of maximum and minimum values using the front panel keys is prohibited. (Resetting by external signals is not prohibited.) | | |
| | SECr Setting: »<br>Next parameter: ↺ | Menus protected in Setting Mode:<br>Setting operations in Setting Mode are prohibited in the way shown below. | 0 / 1/2 | Use the Up Key to change the setting.<br>0 → 1 → 2<br>Use the Mode Key to enable the setting and move to the next parameter. |

| Setting menu | Setting | | |
|---|---|---|---|
| | 0 | 1 | 2 |
| Set value menu | | | × |
| Prescaling menu | | | × |
| Setup menu | | × | × |
| Option menu | | | × |

**Note:** If there is no key operation for 5 seconds, the setting is automatically registered.

# ■ Troubleshooting

When an error occurs, error details will be displayed in the PV display. Take the appropriate countermeasures according to the error displayed.

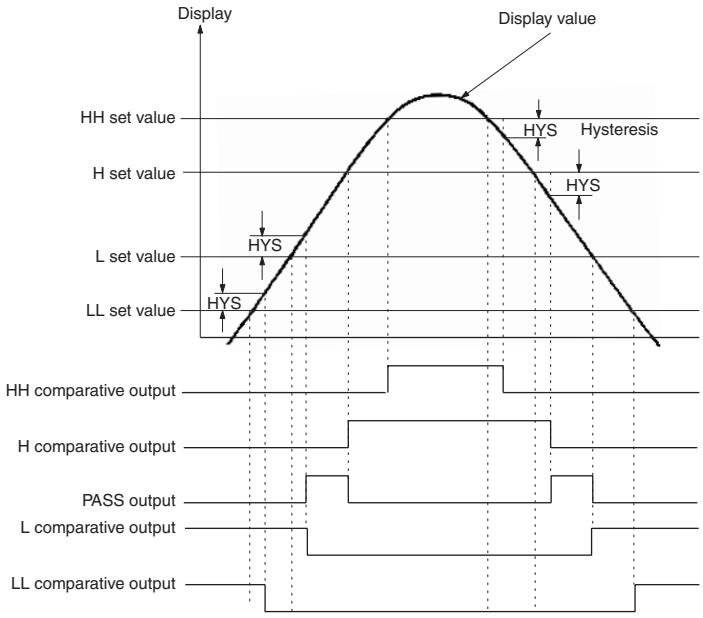
| Error display | Error contents | Output status | | | | Countermeasure |
|---|---|---|---|---|---|---|
| | | Comparative output | BCD output | Communications output | Linear output | |
| M1.Err (M1.ERR)<br>M2.Err (M2.ERR) | Memory error | OFF | OFF (all outputs in "H" status) | OFF | OFF | Reset the power. If the same error occurs, repair is necessary. |
| M3.Err (M3.ERR) | | OFF | OFF (all outputs in "H" status) | OFF | OFF | Reset the power while holding down the ESC Key, the Up Key, and the RESET/TEACH Key. The settings will be returned to their initial values. Redo the settings. If the same error occurs, repair is necessary. |
| Err-O (ERR-O)<br>CHG-O (CHG-O) | Output error | OFF | OFF (all outputs in "H" status) | OFF | OFF (minimum value) | Reset the power. If the same error occurs, repair is necessary. If normal operation is restored, it is possible that the original error was caused by the influence of noise. Check that there are no sources of noise in the vicinity. |
| (Display value flashes.) | The input range and display range were exceeded. | Continues | Continues<br>The OVER signal turns ON. | Continues<br>The OVER or UNDER signal turns ON. | Continues | Take steps to ensure that the input values and display values are within the allowable ranges. |
| rmt (RMT)<br>(Flashes for 3 s.) | The remote/local section is set to remote. | Continues | Continues | Continues | Continues | If an attempt to change a setting using key operations is made with the remote/local selection set to remote, this error will flash for 3 s. To enable settings to be changed, set the remote/local selection to local. |

# Additional Information

## ■ Output Operation Timing in RUN Mode (Relay or Transistor Outputs)

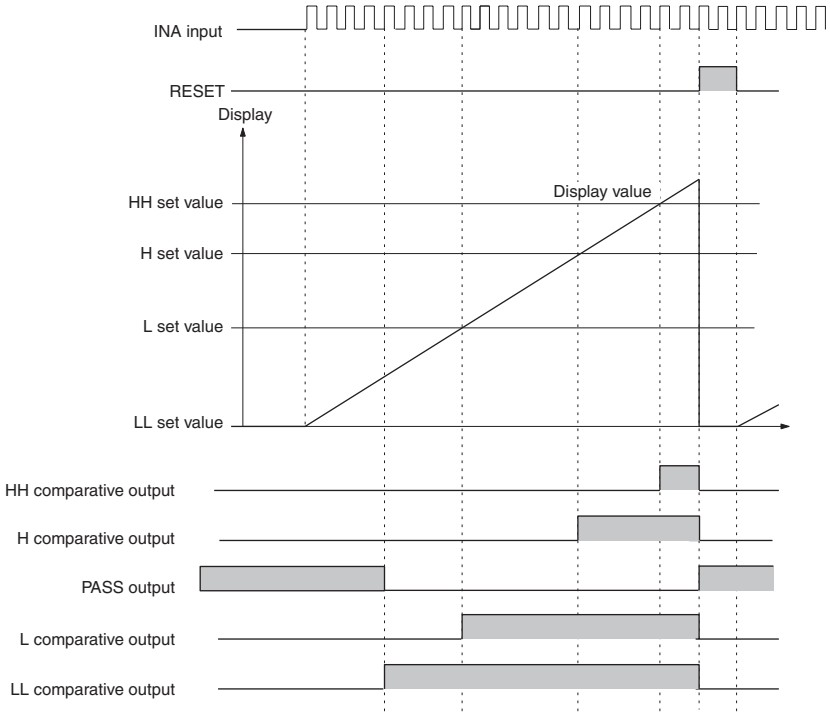
The following timing chart is for a 5-comparative Output Board when the standard output pattern is selected.

### For Operating Mode 1 to 6




**Note:** The hysteresis is set in setting mode and the hysteresis value will be applied to all set values.

### For Operating Mode 7




**Note:** Comparative output L or LL turns ON when the measured value exceeds the set value.

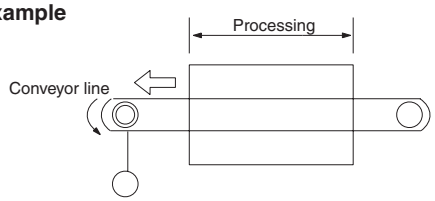
# ■ Operating Modes

The K3NR provides 7 operating modes for converting input pulses to display values. The mode can be selected via key operations on the front panel.
Basically, the operating modes can be divided into the following two groups.

## Operating Modes 1 to 6

Rotational speed and other displays are based on calculations for continuous pulses (frequency).

**Example**




| Operating mode no. | Use |
|---|---|
| 01 | Rotational/Circumferential speed |
| 02 | Absolute ratio |
| 03 | Error ratio |
| 04 | Rotation difference |
| 05 | Flow rate ratio |
| 06 | Passing time |

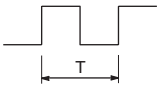
Mode No. 1: Rotational or circumferential speed display for 1 input

Mode No. 2 to 5: Display of calculations for two rotational speeds

Mode No. 6: Passing time display based on 1 input frequency and processing length

**Basic Principles of Rotational Speed Displays**
The ON/OFF time (T) of a sensor input or other input is measured with the internal system clock to automatically calculate the frequency. This frequency is multiplied by 60 and displayed as a rotational speed.

Input sensor pulse ON/OFF time (T) =




Frequency (f) = 1/T

Rotational speed (rpm) = f x 60

Circumferential speed = Circumference x Rotational speed

Passing time = Processing length/Circumferential speed

Automatic measuring by the K3NR is enabled simply by providing an input pulse.

## Operating Mode 7

The number of pulses is measured. Each pulse is counted as 1 count up to a maximum of 99,999 counts. Decrementing the count is not possible. Although the limits of the display enables displaying only up to 99,999 counts, prescaling can be used to count up to 4 gigacounts.

| Operating mode no. | Use |
|---|---|
| 07 | Pulse counting |

The count is reset by shorting terminals 6 and 7 (RESET ON) or by pressing the RESET/TEACH Key on the front panel

Because only incrementing is possible, the L and LL comparative outputs turn ON when the measured values exceed set values.

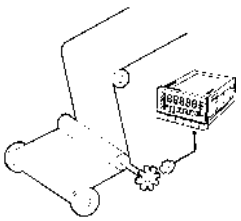
## Operating Mode 1: Rotational/Circumferential Speed

The frequency of input A is calculated and displayed as a rotational or circumferential speed.

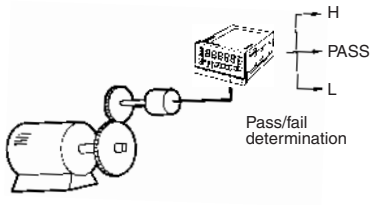
**Units:** rpm; rps; rph; Hz; kHz; mm/s; m/s; m/min; km/h; /min; /h; etc.

### Application Example

**Measuring Roller Winding Speed**



**Measuring Motor Speed (for Product Testing)**



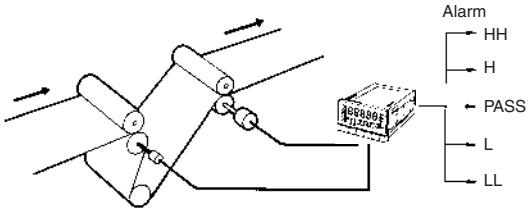
## Operating Mode 2: Absolute Ratio

Input B is divided by input A (B/A) and then multiplied by 100 for display as a percentage.

**Unit:** %

### Application Example

**Measuring Ratio between Rotational Speed of Two Rollers**



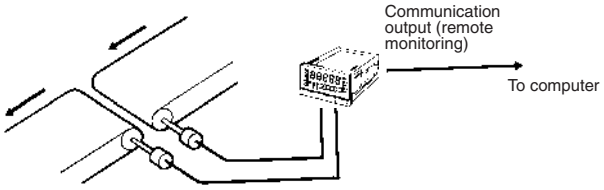

## Operating Mode 3: Error Ratio

The error between input A and input B (B/A − 1) is multiplied by 100 for display as a percentage.

**Unit:** %

### Application Example

**Measuring Difference between Two Line Speeds (Two Conveyors)**



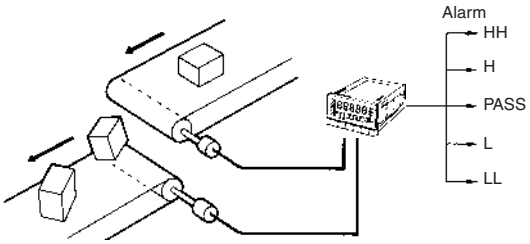

## Operating Mode 4: Rotational Difference

The difference between input B and input A (B − A) is displayed as a rotational speed error or circumferential speed error.

**Units:** rpm; rps; rph; Hz; kHz; mm/s; m/s; m/min; km/h; ⁄/min; ⁄/h; etc.

### Application Example

**Measuring the Absolute Difference between the Speeds of Two Conveyors**



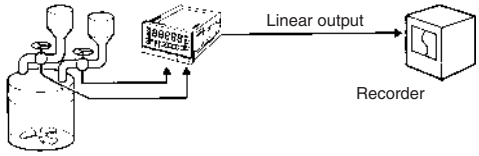

## Operating Mode 5: Flow Rate Ratio

Input A and input B are used to find the concentration (B/(A+B)) as a percentage.

**Unit:** %

### Application Example

**Monitoring the Concentration of a Liquid Mixture**



## Operating Mode 6: Passing Time

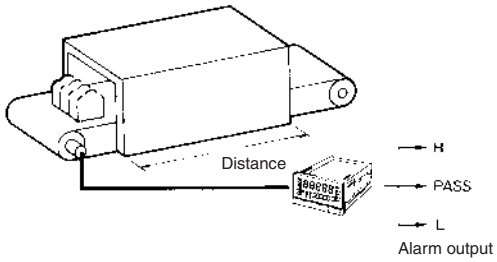
The pulse frequency of input A is calculated and is displayed as the passing time for a preset distance.

**Units:** s; min; h, min, s; min, s, 1/10 s; etc.

The passing time measurement operation in operating mode 6 is ideal for measuring time corresponding to a frequency change. Operating mode 6 allows the real-time, continuous time measurement of the revolutions of any rotating object without recovery time.

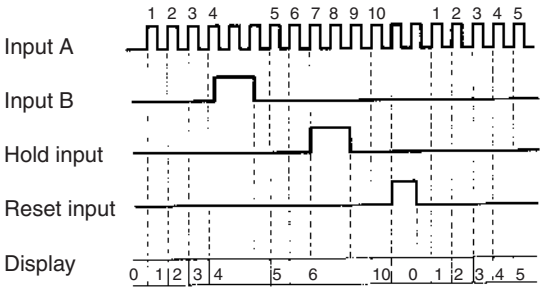
### Application Example

**Passing Time for a Conveyor Line**




## Operating Mode 7: Pulse Counting

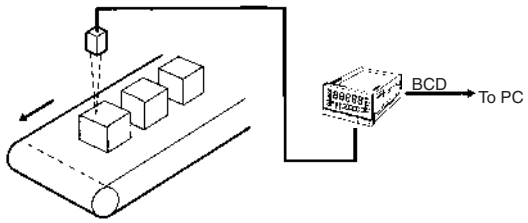
The total number of pulses on input A is displayed.




**Units:** count; mm; cm; m; l; kl; etc.

### Application Example

**Counting Workpieces**




**Note:** The operation of comparative outputs in operating mode 7 is different to that in other modes. Because only incrementing is possible, the L and LL comparative outputs turn ON when the measured values exceed set values.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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