OMRON

Digital Indicators
K3HB Series (Pulse Input Series)

The K3HB Series has been made complete with the addition of Digital Signal Input Models.

- Easy recognition of judgment results using two-color display that can be switched between red and green.
- Equipped with a position meter for monitoring operating status trends.
- External event inputs allows using various measurement and discrimination applications.
- Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (see note) (from behind the front panel).
- UL certification (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).

Note: Depth of 97 mm for DeviceNet models.

⚠ Refer to *Common Precautions* on page 30.

Features

Red-Green Display Allows Easy Recognition of Judgment Results

The measurement value display can be set to switch between red and green in accordance with the status of comparative outputs. This means that the status can be easily seen at a distance.

## Position Meter Enables Easy Monitoring of Operating Status Trends

The present value with respect to the measurement or display range (full scale) can be viewed on a bar display. The operating status can be grasped intuitively, allowing easy judgment of levels and threshold values.

Position meter
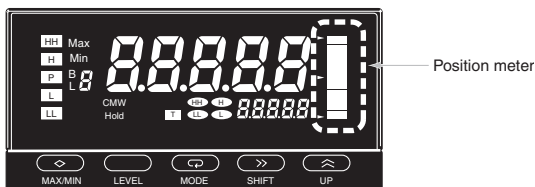
Note: This function is different from the single-LED display of the K3HB-C.

Short Body with Depth of Only 95 mm (from Behind the Front Panel)

A short body of only 95 mm (see note) contributes to the development of slimmer and smaller control panels and installations.

27% shorter than earlier models

Depth: 95 mm (See note.)
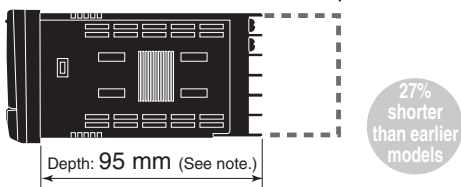
(The depth is 100 mm when mounted to the terminal cover.)

Note: Depth of DeviceNet models is 97 mm.
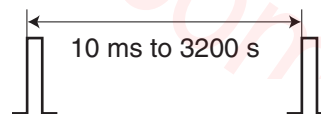
50 kHz High-speed Pulse Measurement (K3HB-R)

Supports high-speed pulse measurement (up to 50 kHz) of rotary encoders or any ON/OFF pulse signal, which enables rotational measurement of objects rotating at high speeds.

50 kHz

Note: No-voltage contacts of up to 30 Hz are supported.

Measurement of Wide Range of Pulse Interval Times (K3HB-P)

Measures and displays the results of the pulse interval between two points. The pulse interval measurement range is broad, from 10 ms to 3,200 s.

10 ms to 3200 s

High-speed Up/Down Counting Pulse Measurement (K3HB-C)

Perfect for high-speed measurement of rotary encoders or any ON/OFF pulse signals. Cumulative pulse input is 50 kHz, quadrature pulse inputs are 25 kHz, and up/down pulse inputs are 30 kHz.

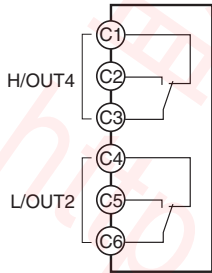**Note:** No-voltage contacts of up to 30 Hz are supported.

Features

Many I/O Variations for Discrimination, Control, and Information Applications

Digital Indicators are used in a wide variety of applications, from an electronic measurement value display or equipment/device operating status display to a host communications interface in monitoring and control systems. OMRON provides a complete lineup for a variety of input and control output applications to meet all your application requirements.
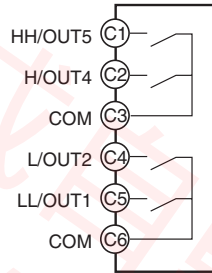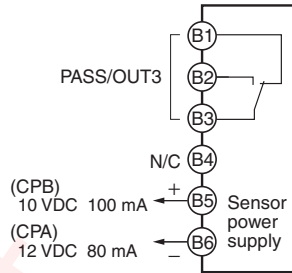
Relay Outputs

H and L: SPDT

H/OUT4
- C1
- C2
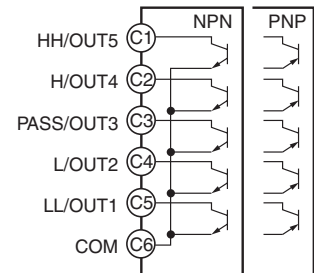- C3

L/OUT2
- C4
- C5
- C6

HH, H, L, and LL: SPST-NO

- HH/OUT5 — C1
- H/OUT4 — C2
- COM — C3
- L/OUT2 — C4
- LL/OUT1 — C5
- COM — C6

PASS: SPDT

PASS/OUT3
- B1
- B2
- B3

N/C — B4

(CPB) 10 VDC 100 mA + — B5 — Sensor power supply
(CPA) 12 VDC 80 mA − — B6

Transistor Outputs

NPN or PNP

NPN | PNP
- HH/OUT5 — C1
- H/OUT4 — C2
- PASS/OUT3 — C3
- L/OUT2 — C4
- LL/OUT1 — C5
- COM — C6

Communications Output

RS-232 or RS-485

RS-232C or RS-485

→ PLC
→ Computer

Linear Output

Voltage Output or Current Output

0 to 20 mA DC/
4 to 20 mA DC
or
0 to 5 VDC/
1 to 5 VDC/
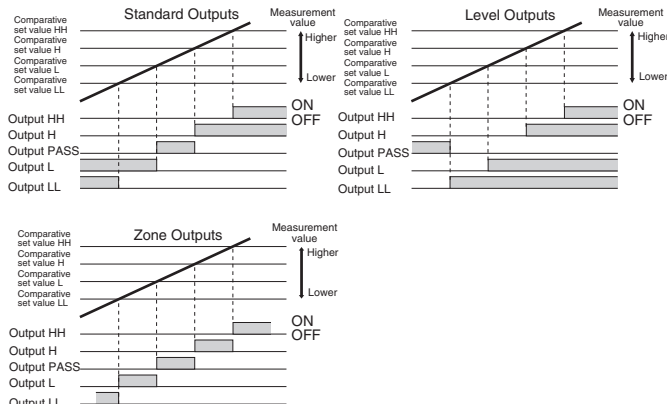0 to 10 VDC

/OUT

DeviceNet

D

BCD Output

NPN Open Collector

BCD

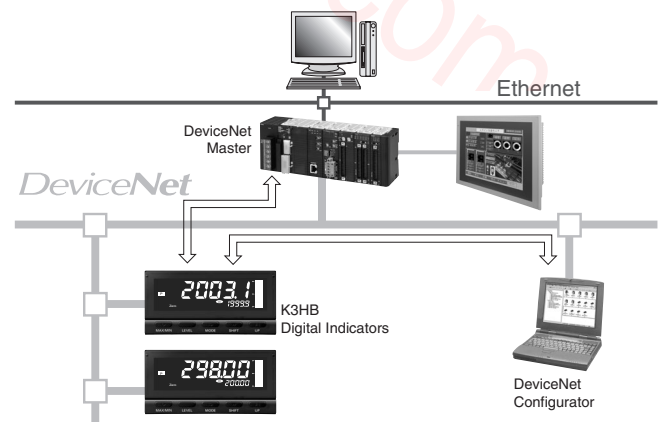## Select a Comparative Output Pattern to Suit the Discrimination or Control Application

- 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.)

Standard Outputs

Comparative set value HH
Comparative set value H
Comparative set value L
Comparative set value LL

Measurement value
↑ Higher
↓ Lower

Output HH
Output H
Output PASS
Output L
Output LL

ON
OFF

Level Outputs

Comparative set value HH
Comparative set value H
Comparative set value L
Comparative set value LL

Measurement value
↑ Higher
↓ Lower

Output HH
Output H
Output PASS
Output L
Output LL

ON
OFF

Zone Outputs

Comparative set value HH
Comparative set value H
Comparative set value L
Comparative set value LL

Measurement value
↑ Higher
↓ Lower

Output HH
Output H
Output PASS
Output L
Output LL

ON
OFF

Note: The HH, H, L or LL outputs must be set in that order for the zone outputs to output correctly.
(This is because the comparative set values and outputs for standard and level outputs are in a 1-to-1 relationship, whereas the meaning of zone outputs depends on the settings of all the comparative set values.)

Lineup Includes DeviceNet Models Enabling High-speed Data Communications with PLCs without Special Programming

- DeviceNet compliance enables high-speed data transmission by allocating setting and monitoring parameters in the I/O memory of the PLC. This capability greatly reduces labor spent in developing communications programs.

Ethernet

DeviceNet Master

DeviceNet

2003.1

K3HB Digital Indicators

2980.0

DeviceNet Configurator

OMRON

Note: The applications provided in this catalog are intended as reference only. Do not attempt to use any of them in real systems without first confirming machine and device functions and safety. For applications that require safety, ensure that there is sufficient leeway in ratings and performances, install fail-safe measures, and take any other safety measures required by the application. In addition, contact your nearest OMRON representative and confirm specifications.

K3HB-series Product Lineup

■ K3HB-R Rotary Pulse Indicator (Page 4)

Performs High-speed Rotation Measurement and Passing Time Measurement

**Displaying Bread Baking Time**
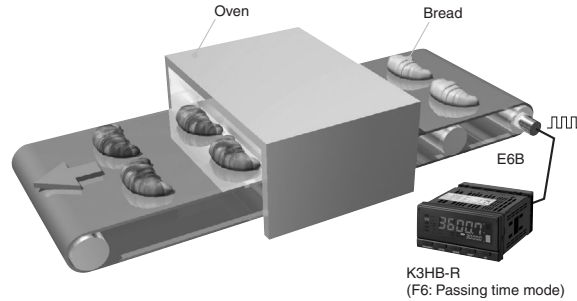
Rotary Pulse Input Model: K3HB-R

  K3HB-RNB: NPN input/voltage pulse input
  K3HB-RPB: PNP input

• Input types: rpm/circumferential speed, absolute ratio, error ratio, error, concentration, and passing time
• Measurement range: 0.5 mHz to 50 kHz

■ K3HB-P Time Interval Indicator (Page 10)

Measuring Passing Speed between Two Points and Providing Time Judgments

Measuring Shot Speed
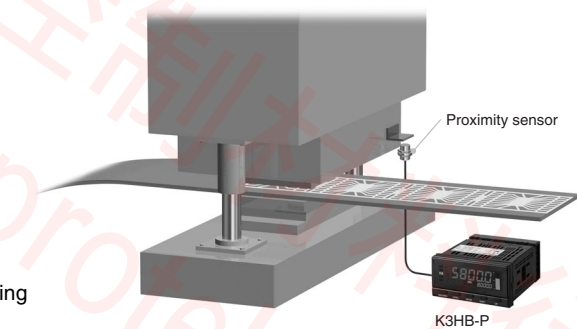
Pulse Input Model: K3HB-P

  K3HB-PNB: NPN input/voltage pulse input
  K3HB-PPB: PNP input

• Inputs: Passing speed, cycle, time difference, time band, measuring length, interval
• Measurement ranges: Functions F1, F3, and F4: 10 ms to 3200 s
                      Function F2:   20 ms to 3200 s
                      Functions F5 and F6:   0 to 4 gigacounts

■ K3HB-C Up/Down Counting Pulse Indicator (Page 15)

Measuring and Monitoring High-speed Up/Down Pulses

Counting Workpieces
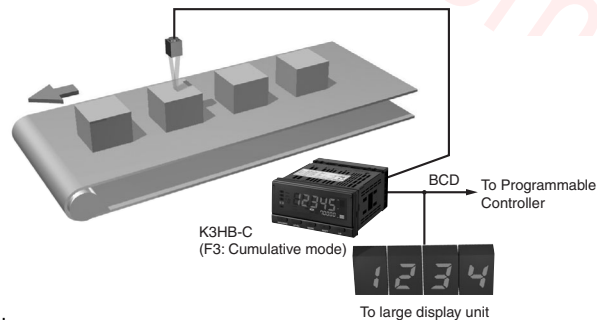
Up/down Counting Pulse Input Model: K3HB-C

  K3HB-CNB: NPN input/voltage pulse input

• Inputs: Individual inputs (up/down), quadrature inputs (up/down), cumulative input
• Response frequency: Individual inputs: 30 kHz, quadrature inputs: 25 kHz, cumulative input: 50 kHz

Note: No-voltage contacts of up to 30 Hz are supported.

• Measurement ranges: Functions F1 and F2: ±2 gigacounts
                      Function F3:   0 to 4 gigacounts

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Rotary Pulse Indicator
K3HB-R

Digital Rotary Pulse Meter Capable of 50 kHz Measurements

• Measures High-speed Pulses at 50 kHz.

 Provides high-speed pulse measurements up to 50 kHz of rotary encoder or ON/OFF pulse signals and can perform rotating measurement of high-speed rotating objects.

Note: No-voltage contacts of up to 30 Hz are supported.

• Six Measurement Operations Including Rotation (rpm)/ Circumferential Speed, Ratio, and Cumulative

 One Rotary Pulse Meter has 6 rotary pulse measurement functions to support a variety of pulse measurement applications. Select the best function for your application from the following: rotation (rpm)/ circumferential speed, absolute ratio, error ratio, error, flow rate ratio, and passing time.

⚠ Refer to *Common Precautions* on page 30.

c**UL**us CE D *NEW*

Model Number Structure

■ Model Number Legend

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

Base Units

K3HB-R ☐ ☐☐
       1 **5**

1. Input Sensor Codes
 NB: NPN input/voltage pulse input
 PB: PNP 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-R☐**-**☐☐☐ ☐
       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)
 BCD: BCD output + transistor output (NPN 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, BCD communications, or DeviceNet communications.

Accessories (Sold Separately)

 K32-DICN: Special Cable (for event inputs with 8-pin connector)
 K32-BCD: Special BCD Output Cable

Specifications

■ Ratings

Supply voltage		100 to 240 VAC, 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 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)
Current consumption		DeviceNet power supply: 50 mA max. (24 VDC)
Input		No-voltage contact, voltage pulse, open collector
External power supply		12 VDC ±10%, 80 mA (models with external power supply only)
Event inputs (See note 2.)	Startup compensation timer input	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max. ON current at 0 Ω: 4 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.
	Hold input	
	Reset input	
	Bank input	
Output ratings (depends on the model)	Relay output	250 VAC, 30 VDC, 5 A (resistive load) 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:
		    Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS
		 Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:
		    Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS
		 (1 V or less: ±0.15 V; not output for 0 V or less)

Display method		Negative LCD (backlit LED) display 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, 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.

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■ Characteristics

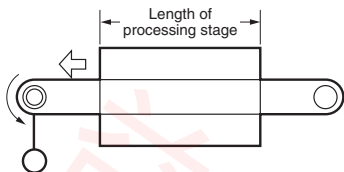| Display range	−19,999 to 99,999		
Measurement accuracy (at 23±5°C)	Functions F1, F6: ±0.006% rgd ±1 digit (for voltage pulse/open collector sensors) Functions F2 to F5: ±0.02% rgd ±1 digit (for voltage pulse/open collector sensors)		
Measurement range	Functions F1 to F6: 0.5 mHz to 50 kHz (for voltage pulse/open collector sensors)		
Input signals	No-voltage contact (30-Hz max. with ON/OFF pulse width of 15 ms min.) Voltage pulse (50-KHz max. with ON/OFF pulse width of 9 μs min.; ON voltage: 4.5 to 30 V; OFF voltage: −30 to 2 V; input impedance: 10 kΩ) Open collector (50-KHz max. with ON/OFF pulse width of 9 μs min.)		
Connectable sensors	ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: Must have a switching capacity of 20 mA or higher. Must be able to properly switch load currents of 5 mA or less.		
Comparative output response time (transistor output)	Functions F1 to F6: 100 ms max. (time until the comparative output is made when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%.)		
Linear output response time	Functions F1 to F6: 110 ms max. (time until the final analog output value is reached when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%.)		
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:
	  ±1,500 V at power supply terminals in normal or common mode
	  (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)
	24 VAC/VDC models:
	  ±1,500 V at power supply terminals in normal or common mode
	  (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) Number of rewrites: 100,000		
Applicable standards	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001		

EMC	EMI: EN61326+A1 industrial applications
	Electromagnetic radiation interference
	  CISPR 11 Group 1, Class A: CISPRL16-1/-2
	Terminal interference voltage
	  CISPR 11 Group 1, Class A: CISPRL16-1/-2
	EMS: EN61326+A1 industrial applications
	Electrostatic Discharge Immunity
	  EN61000-4-2: 4 kV (contact), 8 kV (in air)
	Radiated Electromagnetic Field Immunity
	  EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz, 1.4 to 2 GHz)
	Electrical Fast Transient/Burst Immunity
	  EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)
	Surge Immunity
	  EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)
	Conducted Disturbance Immunity
	  EN61000-4-6: 3 V (0.15 to 80 MHz)
	Power Frequency Magnetic Immunity
	  EN61000-4-8: 30 A/m (50 Hz) continuous time
	Voltage Dips and Interruptions Immunity
	  EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)		

Operation

■ Functions (Operating Modes)

F1 to F6

Functions F1 to F6 provide rpm/circumferential speed and other calculation displays by measuring continuous pulses (frequencies).

Example

Length of processing stage

Function name	Function No.
Rpm/circumferential speed	F1
Absolute ratio	F2
Error ratio	F3
Rotational difference	F4
Flow rate ratio	F5
Passing time	F6

F1: Displays rotation (rpm) or circumferential speed for one input.

F2 to F5: Displays the calculation result for two rotation (rpm) speeds.

F6: Displays the passing time calculated from the circumferential speed and the length of the processing stage for one input.
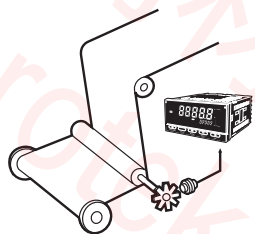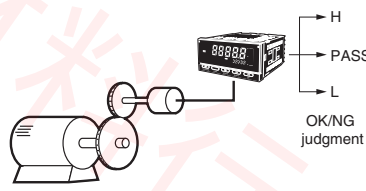
The basic principle used by the Digital Indicator to calculate the rotation speed (rpm) display is to count the ON/OFF time (T) for input sensor or other device inputs using the internal system clock, and then automatically calculate the frequency. This frequency (f) is multiplied by 60 and displayed as the rotation (rpm) speed.
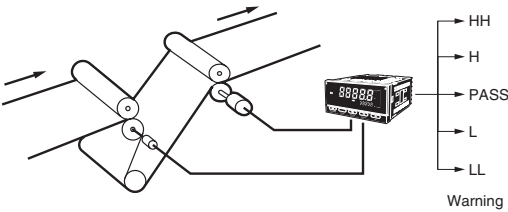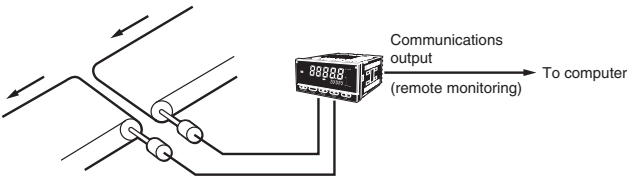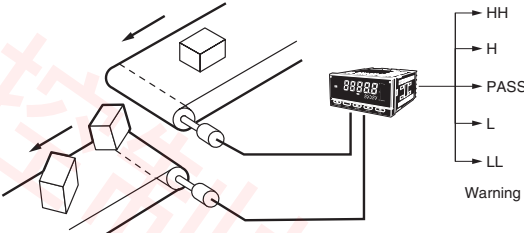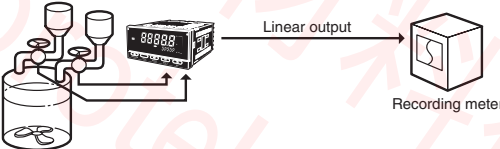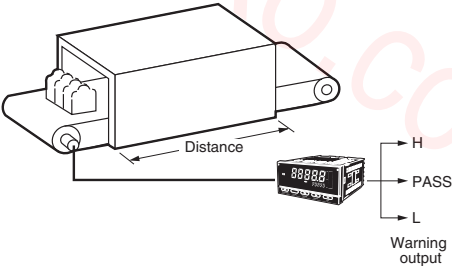
Input sensor or other input pulse ON/OFF time (T) = $\underbrace{\quad}_{T}$ Frequency (f) = $\frac{1}{T}$

- Rotation speed (rpm) = f × 60
- Circumferential speed = Roll circumference × Rotation speed (rpm)
- Passing time = $\dfrac{\text{Length of processing stage}}{\text{Circumferential speed}}$

These calculations are automatically made internally and displayed whenever any input pulse is received.

Function	Operation			Operation image (application)
F1 Rpm/circumferential speed/ Instantaneous flowrate	Measures frequency for input A and displays the rotation (rpm) or circumferential speed proportional to the input frequency.			Measuring roller winding speed Measuring motor speed (for product testing)

Calculation	Display unit	Prescale value (α)
Rotation speed	rpm	1/N
	rps	1/60 N
Frequency (of input pulse)	Hz	1/60
	kHz	1/60000
Circumferential speed	mm/s	1000 πd/60 N
	cm/s	100 πd/60 N
	m/s	πd/60 N
	m/min	πd/N
	km/h	0.06 πd/N
Instantaneous flowrate	ℓ/min	Check the output specifications of the input device and calculate the prescale value from the following equation: Display value D = ƒa × 60 × α
	ℓ/h	

N = Pulses per rotation

πd = Circumferential length per rotation

Function	Operation	Operation image (application)
F2 Absolute ratio	Multiples input B divided by input A ($\frac{B}{A}$) by 100 and displays the ratio as a percentage (%). Display unit: %	Measuring the speed ratio between two rollers HH H PASS L LL Warning
F3 Error ratio	Multiplies the error between input A and input B ($\frac{B}{A}-1$) by 100 and displays the ratio as a percentage (%). Display unit: %	Measuring the line speed error ratio between two conveyors Communications output (remote monitoring) To computer
F4 Rotational difference	Displays the difference between input A and input B (B - A) as the rotation (rpm) speed error or circumferential speed error. Display unit: rpm, rps, rph, Hz, kHz, mm/s, m/s m/min, km/h l/min, l/h, etc.	Measuring the rotation (rpm)/circumferential speed error (absolute error) between two conveyors HH H PASS L LL Warning
F5 Flow rate ratio	Displays the flow rate ratio of B from inputs A and B ($\frac{B}{A+B}$) as a ratio (%). Display unit: %	Monitoring liquid mixture flow rate ratio Linear output Recording meter
F6 Passing time	Passing time (s) = $1/fa \times \alpha$ fa: Input frequency (Hz) Set the prescale value for the desired display unit using the following table for reference. 	Calculation	Display unit	Prescale value (α)	 |---|---|---| | Passing time	s	$L/(\pi d/N)$	 N = Pulses per rotation πd = Circumferential length per rotation (m) L = Length of process (m)	Displaying the passing time for a conveyor line Distance H PASS L Warning output

■ What Is Prescaling?

To make calculations using the input pulse to display rotation (rpm) or circumferential speed, the number of pulses per rotation or the length of the circumference must be multiplied by a certain coefficient. This coefficient is called the prescale value.

Proximity
sensor — K3HB-R
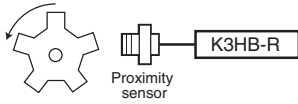
Rotation speed (rpm) = $f \times 60 \times a$

    f: Input pulse frequency (No. of pulses per second)

    a: Prescale value

If there are 5 pulses per rotation, then

    $a = 1/5$ ($= 0.2 = 2 \times 10^{-1}$)

    and an accurate rotation speed (rpm) can be calculated.

The actual setting is X = 2.0000 (mantissa) and Y = 10^{-1} (exponent).

■ What Is the Auto-zero Function?

(Set this function before using the Digital Indicator.)

If a function $F1$ to $F6$ is set, the frequency can be force-set to zero if there is no input pulse for a set period. This period is called the auto-zero time. Set the auto-zero time to slightly longer than the longest input pulse interval. (The display will not easily return to zero if the auto-zero time is too long or left at the default setting.)

Time Unit Settings

Setting	Meaning
SCAL	Prescale value menu setting
mln	Minute display
H.mm.SS	h.mm.ss display
mm.SS.d	mm.ss.d display (d = tenths of a second)

Note: Time unit can be set only when passing time (F6) is selected.

Input Type Setting

	NO: Voltage pulse high	NC: Voltage pulse low
No-contact or voltage pulse input	00	01
Contact	10	11

Note: Set to 10 or 11 when there is a large variation in the display. The largest measurement range is 30 Hz.

OMRON

Timer Interval Indicator
K3HB-P

Digital Time Interval Meter for Measuring Passing Speed, Time, or Cycle between Two Points.

- Measures Wide Range of Pulse Interval Times
  Measures, calculates, and displays pulse intervals between two points. Wide range for pulse interval measurements, from 10 ms to 3,200 s, max.

- Six Measurement Operations, Including Passing Speed, Time, and Cycle Measurement between Two Points
  One Digital Time Interval Meter has six measurement functions, to support a variety of pulse interval measurement applications. Select the best function for your application from the following: Passing speed, cycle, time difference, time band, measuring length, and interval.

⚠ Refer to *Common Precautions* on page 30.

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Model Number Structure

■ Model Number Legend

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

Base Units

K3HB-P ☐ ☐☐☐
     1   5

1. **Input Sensor Codes**
   NB: NPN input/voltage pulse input
   PB: PNP 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-P☐-☐☐☐ ☐☐☐
    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)
   BCD: BCD output + transistor output (NPN 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)

K32-DICN: Special Cable (for event inputs with 8-pin connector)
K32-BCD: Special BCD Output Cable

Specifications

■ Ratings

Supply voltage		100 to 240 VAC, 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 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)
Current consumption		DeviceNet power supply: 50 mA max. (24 VDC)
Input		No-voltage, voltage pulse, open collector
External power supply		12 VDC 10%, 80 mA (for models with external power supplies only)
Event inputs (See note 2.)	**Hold input**	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max. ON current at 0 Ω: 4 mA max. Max. applied voltage: 30 VDC max. 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) 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:
		    Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS
		 Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:
		    Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS
		 (1 V or less: ±0.15 V; not output for 0 V or less)

Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))
Main functions		Scaling function, measurement operation selection, 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
Measurement accuracy (at 23±5°C)	±0.08% rgd ±1 digit (for voltage pulse/open collector sensors)
Measurement range	Functions F1, F3, and F4: 10 ms to 3,200 s Function F2: 20 ms to 3,200 s Functions F5 and F6: 0 to 4 gigacounts

Input signals

• No-voltage contact (30 Hz max. with ON/OFF pulse width of 15 ms min.)

• Voltage pulse

Mode	Input frequency range	ON/OFF pulse width	ON voltage	OFF voltage	Input impedance
F1 to F4	0 to 50 kHz	9 µs min.	4.5 to 30 V	−30 to 2 V	10 kΩ
F5, F6	0 to 30 kHz	16 µs min.			

• Opencollector

Mode	Input frequency range	ON/OFF pulse width
F1 to F4	0 to 50 kHz	9 µs min.
F5, F6	0 to 30 kHz	16 µs min.

Note: The Digital Time Interval Meter will malfunction if a pulse greater than the input frequency range is input. SYSERR may appear on the display.

Connectable sensors	ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: Must have a switching capacity of 20 mA or higher. Must be able to properly switch load currents of 5 mA or less.
Comparative output response time (transistor output)	2 ms max. (time until the comparative output is made when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%)
Linear output response time	10 ms max. (time until the final analog output value is reached when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%)
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: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 µs/100 ns) 24 VAC/VDC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 µs/100 ns)
Vibration resistance	Frequency: 10 to 55 Hz; Acceleration: 50 m/s², 10 sweeps of 5 min each in X, Y, and Z directions
Shock resistance	150 m/s² (100 m/s² 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)

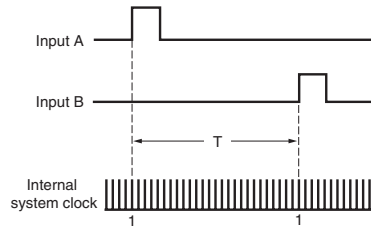| Memory protection	EEPROM (non-volatile memory) Number of rewrites: 100,000
Applicable standards	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001

EMC	EMI: EN61326+A1 industrial applications
	Electromagnetic radiation interference
	    CISPR 11 Group 1, Class A: CISPRL16-1/-2
	Terminal interference voltage
	    CISPR 11 Group 1, Class A: CISPRL16-1/-2
	EMS: EN61326+A1 industrial applications
	Electrostatic Discharge Immunity
	    EN61000-4-2: 4 kV (contact), 8 kV (in air)
	Radiated Electromagnetic Field Immunity
	    EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz, 1.4GHz to 2 GHz)
	Electrical Fast Transient/Burst Immunity
	    EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)
	Surge Immunity
	    EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)
	Conducted Disturbance Immunity
	    EN61000-4-6: 3 V (0.15 to 80 MHz)
	Power Frequency Magnetic Immunity
	    EN61000-4-8: 30 A/m (50 Hz) continuous time
	Voltage Dips and Interruptions Immunity
	    EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)

Function	Operation	Operation image (application)	
F4 Time band	Displays input A ON time (T). Measurement range: 10 ms to 3,200 s • Recovery time (TR) of 20 ms is required before starting the next measurement. Display unit: ms, s, min., min.s.1/10 s	Monitoring the ON time of a printing press	Managing the valve release time
F5 Measuring length	Displays the number of input A pulses while input B is ON. • Recovery time (TR) of 20 ms is required before starting the next measurement. Display unit: mm, cm, m, etc.	Measuring workpiece length	
F6 Interval	Displays the number of input A pulses from when input B turns ON until input B turns ON again. Measurement is made every other time input B turns ON. • Recovery time (TR) of 20 ms is required before starting the next measurement. Display unit: mm, cm, m, etc.	Measuring slit intervals	

■ What Is Prescaling?

To make calculations using the input pulse to display the passing speed between two points, the distance between the two points and the display unit must be set and the internally measured time multiplied by a certain coefficient. This coefficient is called the prescale value. (For information on settings details, refer to the User's Manual.)

Time Unit Settings

Setting	Meaning
SCAL	Prescale value menu setting
nin	Minute display
H.nn.SS	h.mm.ss display
nn.SS.d	mm.ss.d display (d = tenths of a second)

Input Type Setting

	NO: Voltage pulse high	NC: Voltage pulse low
No-contact or voltage pulse input	00	01
Contact	10	11

Note: Set to 10 or 11 when there is a large variation in the display. The largest measurement range is 30 Hz.

OMRON

Up/Down Counting Pulse Indicator
K3HB-C

Measure High-speed Up/down Pulses with this Up/down Pulse Meter.

- Perfect for Measuring Rotary Encoder and ON/OFF Pulse Signals at High Speed

  Cumulative pulse input is 50 kHz, quadrature pulse inputs are 25 kHz, and up/down pulse inputs are 30 kHz.

  Note: No-voltage contacts of up to 30 Hz are supported.

- The count value can be converted to any value.

  The length equivalent for any pulse can be set to any desired value.

  This is effective for feed amount and position monitor displays.

⚠ Refer to *Common Precautions* on page 30.

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Model Number Structure

■ Model Number Legend

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

Base Units

K3HB-C ☐ ☐
      1   5

1. **Input Sensor Codes**
   NB: NPN input/voltage pulse input
   PB: PNP 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-C☐-☐☐☐ ☐
     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)
   BCD: BCD output + transistor output (NPN 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)

K32-DICN: Special Cable (for event inputs with 8-pin connector)
K32-BCD: Special BCD Output Cable

Specifications

■ Ratings

Supply voltage		100 to 240 VAC, 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 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)
Current consumption		DeviceNet power supply: 50 mA max. (24 VDC)
Input		No-voltage, voltage pulse, open collector
External power supply		12 VDC±10% 80 mA
Event inputs	**Hold input**	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max. ON current at 0 Ω: 4 mA max. Max. applied voltage: 30 VDC max. 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) 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:
		    Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS
		Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC:
		    Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS
		(1 V or less: ±0.15 V; not output for 0 V or less)

Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))
Main functions		Scaling function, measurement operation selection, 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. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.
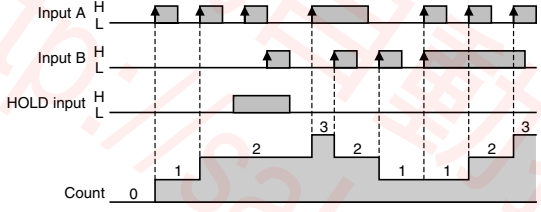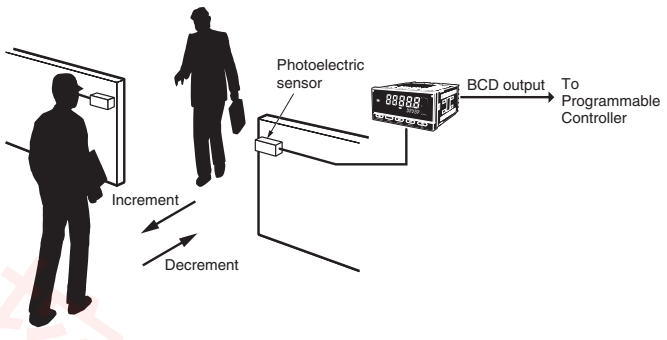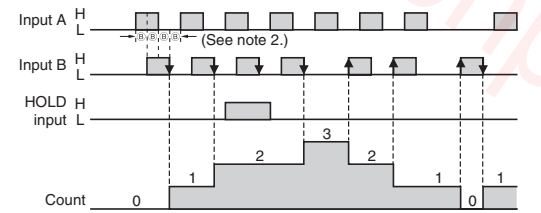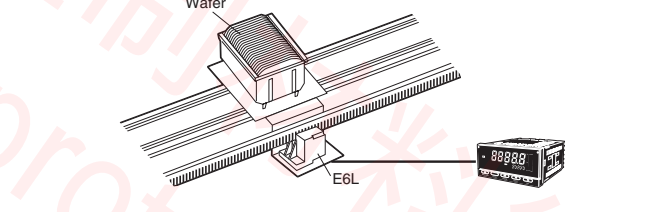
■ Characteristics

Display range	−19,999 to 99,999					
Measurement range	Functions F1, F2: ±2 gigacounts Functions F3 : 0 to 4 gigacounts					
Input signals	• No-voltage contact (30 Hz max. with ON/OFF pulse width of 15 ms min.) • Voltage pulse					

Voltage pulse

Mode	Input frequency range	ON/OFF pulse width	ON voltage	OFF voltage	Input impedance
F1	0 to 30 kHz	16 µs min.	4.5 to 30 V	−30 to 2 V	10 kΩ
F2	0 to 25 kHz	20 µs min.			
F3	0 to 50 kHz	9 µs min.			

Open collector

Mode	Input frequency range	ON/OFF pulse width
F1	0 to 30 kHz	16 µs min.
F2	0 to 25 kHz	20 µs min.
F3	0 to 50 kHz	9 µs min.

Note: The Up/Down Counting Pulse Meter will malfunction if a pulse greater than the input frequency range is input. SYSERR may appear on the display.

Connectable sensors	ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: Must have a switching capacity of 20 mA or higher. Must be able to properly switch load currents of 5 mA or less.
Max. No. of display digits	5 (−19999 to 99999)
Comparative output response time	1 ms max.: Transistor output; 10 ms max.: Relay contact output (time until the comparative output is made when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%)
Linear output response time	10 ms max. (time until the final analog output value is reached when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%)
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:
	    ±1,500 V at power supply terminals in normal or common mode
	    (waveform with 1-ns rising edge and pulse width of 1 µs/100 ns)
	24 VAC/VDC models:
	    ±1,500 V at power supply terminals in normal or common mode
	    (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) Number of rewrites: 100,000
Applicable standards	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001

EMC	EMI: EN61326+A1 industrial applications
	Electromagnetic radiation interference
	    CISPR 11 Group 1, Class A: CISPRL16-1/-2
	Terminal interference voltage
	    CISPR 11 Group 1, Class A: CISPRL16-1/-2
	EMS: EN61326+A1 industrial applications
	Electrostatic Discharge Immunity
	    EN61000-4-2: 4 kV (contact), 8 kV (in air)
	Radiated Electromagnetic Field Immunity
	    EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz, 1.4 to 2 GHz)
	Electrical Fast Transient/Burst Immunity
	    EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)
	Surge Immunity
	    EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)
	Conducted Disturbance Immunity
	    EN61000-4-6: 3 V (0.15 to 80 MHz)
	Power Frequency Magnetic Immunity
	    EN61000-4-8: 30 A/m (50 Hz) continuous time
	Voltage Dips and Interruptions Immunity
	    EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)

Operation

■ Functions (Operating Modes)

F1 to F3

Function name	Function No.
Individual inputs	F 1
Phase differential inputs	F 2
Pulse counting input	F 3

Function	Operation	Operation image (application)
F1 Individual inputs	Counts input A as incremental pulses and input B as decremental pulses. The count is incremented on the rising edge of input A and decremented on the rising edge of input B. If both inputs rise at the same time, the count is not changed. The count is incremented when input B is later than input A and decremented when input B is earlier than input A.	Counting the number of people entering an area
F2 Phase differential inputs	This function is normally used when connected to an incremental rotary encoder. The count is incremented on the falling edge of input B when input A is OFF. The count is decremented on the rising edge of input B when input A is OFF.	Detecting position and speed on a semiconductor wafer conveyor line
F3 Pulse counting input	Counted on the rising edge of input A	Counting the number of workpieces

Note: 1. Meaning of H and L in Display

Symbol	Input method	No-voltage input
H		Short-circuit
L		Open

2. Requires at least half the minimum signal width. If there is less than half, a ±1 count error may occur.

Input Type Setting

	NO: Voltage pulse high	NC: Voltage pulse low
No-contact or voltage pulse input	00	01
Contact	10	11

■ What Is Prescaling?

Prescaling converts the count value to any numeric value.

To display □□□□.□ mm in a system that outputs 250 pulses for a 0.5-m feed,

the length per pulse = 500 mm (0.5 m) ÷ 250 = 2.

1. The prescale value for the K3HB-C is set using the mantissa X × exponent Y,
   so the prescale value = 2.0000×10^{0},
   $\qquad\qquad\qquad\qquad$ X = 2.000, and Y = 00.

2. Next, set the decimal point position for one digit to the right of the decimal point: □□□□.□
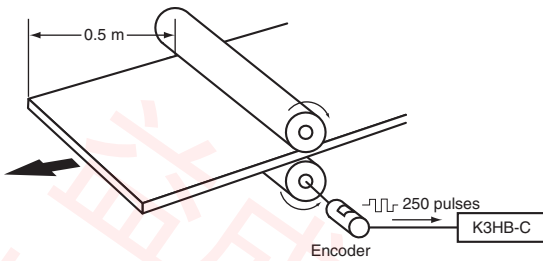
Common Specifications

■ Event Input Ratings

K3HB-R	S-TMR, HOLD, RESET, BANK1, BANK2, BANK4
K3HB-P/-C	HOLD, RESET, BANK1, BANK2, BANK4
Contact	ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact	ON residual voltage: 2 V max.
	OFF leakage current: 0.1 mA max.
	Load current: 4 mA max.
	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 5 A at 30 VDC	1 A at 250 VAC 1 A at 30 VDC
Rated through current	5 A	
Mechanical life expectancy	5,000,000 operations	
Electrical life expectancy	100,000 operations	

Transistor Outputs

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

Linear Output

Item	Outputs	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		±0.5% FS (±0.15 V for 1 V or less and no output for 0 V)		

Serial Communications Output

Item	Type	RS-232C, RS-485
Communications method	Half duplex
Synchronization method	Start-stop synchronization (asynchronous)
Baud rate	9600/19200/38400 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

BCD Output I/O Ratings
(Input Signal Logic: Negative)

I/O signal name			Item		Rating
Inputs	K3HB-R/P REQUEST HOLD MAX MIN RESET	K3HB-C REQUEST COMPEN-SATION RESET	Input signal		No-voltage contact input
			Input current for no-voltage input		10 mA
			Signal level	ON voltage	1.5 V max.
				OFF voltage	3 V min.
Outputs	DATA POLARITY OVER DATA VALID RUN		Maximum load voltage		24 VDC
			Maximum load current		10 mA
			Leakage current		100 μA max.
	K3HB-R/P HH H PASS L LL	K3HB-C OUT1 OUT2 OUT3 OUT4 OUT5	Maximum load voltage		24 VDC
			Maximum load current		50 mA
			Leakage current		100 μA max.

Refer to the *K3HB Communications User's Manual* (Cat. No. N129) for details on serial and DeviceNet communications.

DeviceNet Communications

Communications protocol		Conforms to DeviceNet
Supported communications	Remote I/O communications	Master-Slave connection (polling, bit-strobe, COS, cyclic)
		Conforms to DeviceNet communications standards.
	I/O allocations	Allocate any I/O data using the Configurator.
		Allocate any data, such as DeviceNet-specific parameters and variable area for Digital Indicators.
		Input area: 2 blocks, 60 words max.
		Output area: 1 block, 29 words max. (The first word in the area is always allocated for the Output Execution Enabled Flags.)
	Message communications	Explicit message communications
		CompoWay/F communications commands can be executed (using explicit message communications)
Connection methods		Combination of multi-drop and T-branch connections (for trunk and drop lines)
Baud rate		DeviceNet: 500, 250, or 125 Kbps (automatic follow-up)
Communications media		Special 5-wire cable (2 signal lines, 2 power supply lines, 1 shield line)
Communications distance		(see table below)

Baud rate	Network length (max.)	Drop line length (max.)	Total drop line length (max.)
500 Kbps	100 m max. (100 m max.)	6 m max.	39 m max.
250 Kbps	100 m max. (250 m max.)	6 m max.	78 m max.
125 Kbps	100 m max. (500 m max.)	6 m max.	156 m max.

The values in parentheses are for Thick Cable.

Communications power supply	24-VDC DeviceNet power supply
Allowable voltage fluctuation range	11 to 25-VDC DeviceNet power supply
Current consumption	50 mA max. (24 VDC)
Maximum number of nodes	64 (DeviceNet Configurator is counted as one node when connected.)
Maximum number of slaves	63
Error control checks	CRC errors
DeviceNet power supply	Supplied from DeviceNet communications connector

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Connections

■ External Connection Diagrams

Terminal Arrangements

Note: Refer to "Internal Block Diagram" on page 24 for information on isolation.

A Operating Power Supply

100 to 240 VAC
24 VAC/VDC

A1
A2

*Check the required power supply type.

B Sensor Power Supply/Output

Sensor power supply + PASS output

PASS
N/C B4
12 VDC 80 mA
B1 B2 B3 B5 B6 Sensor power supply

<CPA>

Sensor power supply + linear output

0-5/1-5/0-10 V
N/C
0-20/4-20 mA
12 VDC 80 mA | 12 VDC 80 mA
B1 B2 B3 B4 B5 B6 Sensor power supply

<L2A> <L1A>

Sensor power supply

N/C
12 VDC 80 mA
B1 B2 B3 B4 B5 B6 Sensor power supply

<A>

Sensor power supply + communications

B (+) SD
A (−) RD
B (+) SG
A (−) N/C
12 VDC 80 mA | 12 VDC 80 mA
B1 B2 B3 B4 B5 B6 Sensor power supply

RS-485 <FLK3A> | RS-232C <FLK1A>

C Relays, Transistors, BCD and DeviceNet

Relay Outputs <C1>

H C1 C2 C3
L C4 C5 C6

Relay Outputs <C2>

HH C1
H C2
COM C3
L C4
LL C5
COM C6

Transistor Outputs <T1> <T2>

NPN | PNP
HH C1
H C2
PASS C3
L C4
LL C5
COM C6

DeviceNet Connector (Included) <DRT>

1: V− (Power supply cable: Black)
2: CAN L (Communications cable: Blue)
3: Shield
4: CAN H (Communications cable: White)
5: V+ (Power supply cable: Red)
Applicable Connector:
HR31-5.08P-5SC (01)
(HIROSE ELECTRIC CO., LTD.)
* Attach the provided crimp terminals.

BCD (NPN Open Collector): <BCD>
Applicable Connector (Sold separately)
HDR-E50MAG1
(HONDA TSUSHIN KOGYO CO., LTD.)
Special Cable (Sold separately)
K32-BCD (OMRON)
(HDR-E50MAG1 with 0.3-m cable)

The BCD COMMON is shared.
The pins indicated in the above diagram as blank (white) boxes have been removed.
* Only one of the following can be used for each Digital Indicator: communications, BCD, or DeviceNet.

Contact Outputs

5 V
HH H L LL PASS
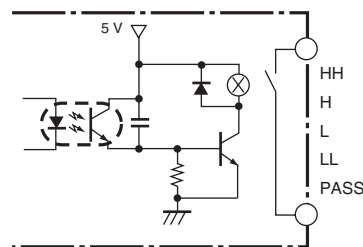
Transistor Outputs (NPN Open Collector)

HH H L LL PASS
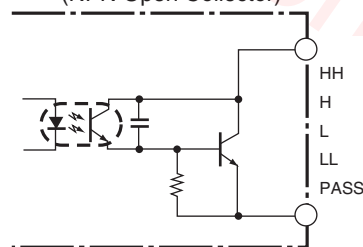
Safety Standards Conformance

• Always use a EN/IEC-compliant power supply with reinforced insulation or double insulation for the DeviceNet power supply.
• The product must be used indoors for the above applicable standards to apply.
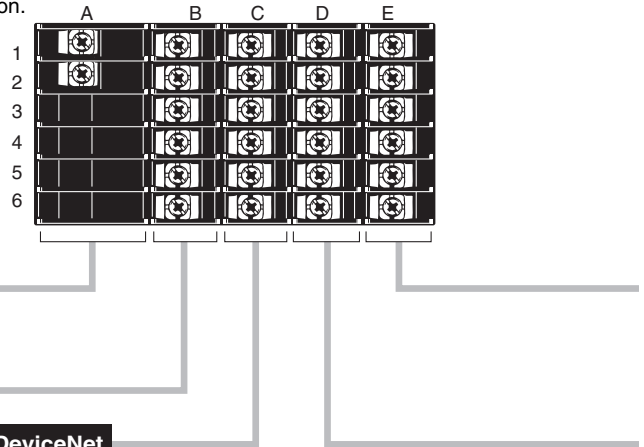
E Pulse Inputs

- Rotary Pulse Meter: K3HB-R
- Timer Interval Meter: K3HB-P
- Up/Down Counting Pulse Meter: K3HB-C

NPN Input: K3HB-□NB   PNP Input: K3HB-□PB
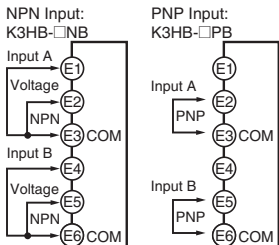
Note: E3 and E6, as well as B6, are internally connected.

Note: E3 and E6, as well as B5, are internally connected.

K3HB-R / K3HB-P / K3HB-C

NPN Input Model
- NPN input section

- Voltage pulse input section

K3HB-R / K3HB-P

PNP Input Model

D Event Inputs

Models with Terminal Blocks <1> <3>

D1 N/C
D2 S-TMR
D3 HOLD
D4 RESET
D5 COMPENSATION
D6 COM

Models with Connectors <2> <4>

1: N/C	2: S-TMR
3: HOLD	4: RESET
5: COMPENSATION	6: COM
7: BANK4	8: BANK2
9: BANK1	10: COM
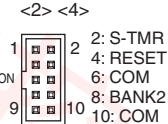
- Applicable Connector (Sold separately) XG4M-1030 (OMRON)
- Special Cable (Sold separately) K32-DICN (OMRON) (XG4M-1030 with 3-m cable)

The following signals depend on the model:
S-TMR: Used by the K3HB-R only.
COMPENSATION: Used by the K3HB-C only.

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

S-TMR : D2
HOLD : D3
RESET : D4
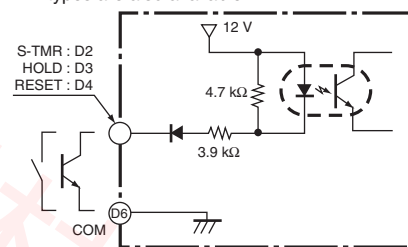
BCD Output Cable

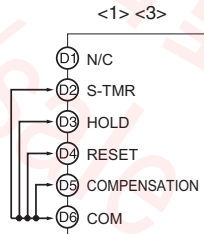| Model	Shape	Pin arrangement
K32-BCD	K3HB end ... Connected device end (PLC, display device, etc.) 300 mm, 38 mm, 46.5 mm. Cover: HDR-E50LPA5 (manufactured by Honda Tsushin Co., Ltd) Connector: HDR-E50MAG1 (manufactured by Honda Tsushin Co., Ltd) D-sub connector (37-pin female) Cover: 17JE-37H-1A (manufactured by DDK) Connector: Equivalent to 17JE-13370-02 (manufactured by DDK) Stand: 17L-002A (manufactured by DDK)	COMMON, 4/8 10^4, 10^0 1/2/4/8 OVER, DATA VALID, RUN, 10^1 1/2/4/8 COMMON, REQUEST, MAX REQ., MIN REQ., 10^2 1/2/4/8 HOLD, RESET, POLARITY, HH, 10^3 1/2/4/8 H, PASS, L, LL, 10^4 1/2 COMMON

Note: The BCD Output Cable has a D-sub plug. Cover: 17JE-37H-1A (manufactured by DDK); Connector: equivalent to 17JE-23370-02 (D1) (manufactured by DDK)

Special Cable (for Event Inputs with 8-pin Connector)

Model	Appearance	Wiring
K32-DICN	9 / 10 ... 1 / 2, 3,000 mm (3 m), Cable marking	<table><tr><th>Pin No.</th><th>Signal name</th></tr><tr><td>1</td><td>N/C</td></tr><tr><td>2</td><td>S-TMR</td></tr><tr><td>3</td><td>HOLD</td></tr><tr><td>4</td><td>RESET</td></tr><tr><td>5</td><td>N/C</td></tr><tr><td>6</td><td>COM</td></tr><tr><td>7</td><td>BANK4</td></tr><tr><td>8</td><td>BANK2</td></tr><tr><td>9</td><td>BANK1</td></tr><tr><td>10</td><td>COM</td></tr></table>

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■ Derating Curve for Sensor Power Supply (Reference Values)

For 12V
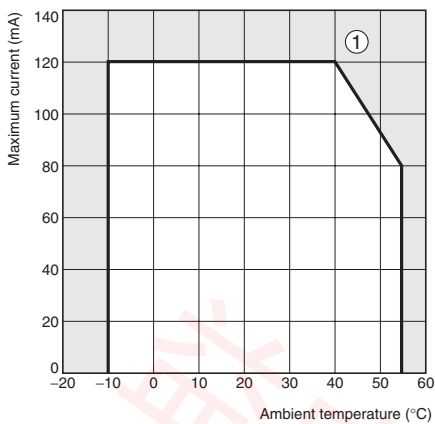
Note: 1. The above values were obtained under test conditions with the standard mounting. The derating curve will vary with the mounting conditions, so be sure to adjust accordingly.

2. Internal components may be deteriorated or damaged. Do not use the Digital Indicator outside of the derating range (i.e., do not use it in the area labeled (1), above).

■ Internal Block Diagram

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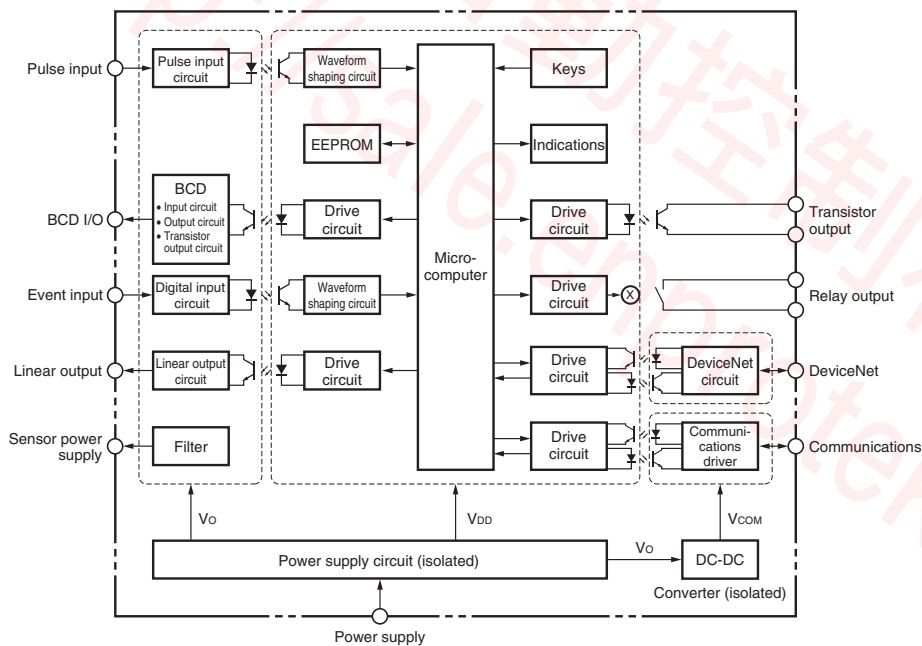
■ BCD Output Timing Chart

A REQUEST signal from a Programmable Controller or other external device is required to read BCD data.

Single Sampling Data Output
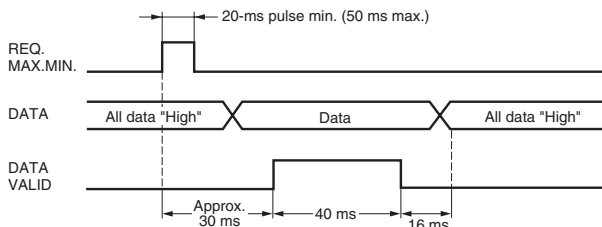
The data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output.
When reading the data from a Programmable Controller, start reading the data when the DATA VALID signal turns ON.
The DATA VALID signal will turn OFF 40 ms later, and the data will turn OFF 16 ms after that.

Continuous Data Output

Measurement data is output every 64 ms while the REQUEST signal remains ON.

Note: If HOLD is executed when switching between data 1 and data 2, either data 1 or data 2 is output depending on the timing of the hold signal. The data will not go LOW.

• The K3HB BCD output model has an open collector output, so wired OR connection is possible

DATA (including POL and OVER) and DATA VALID can be used in a wired OR. RUN, HH, H, PASS, L, and LL are always output, with or without a REQUEST signal. Do not used a wired OR connect for these signals.
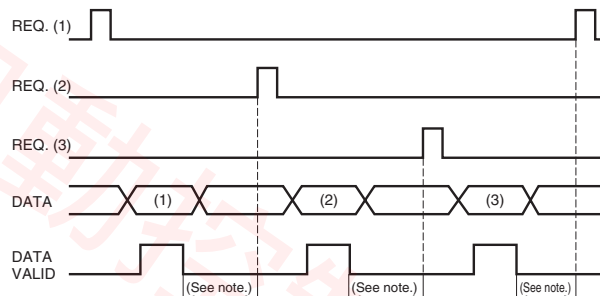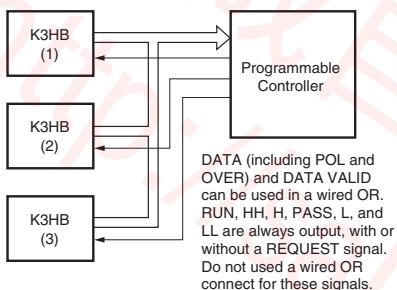
Note: Leave 20 ms min. between DATA VALID turning OFF and the REQUEST signal.

Programmable Controller Connection Example
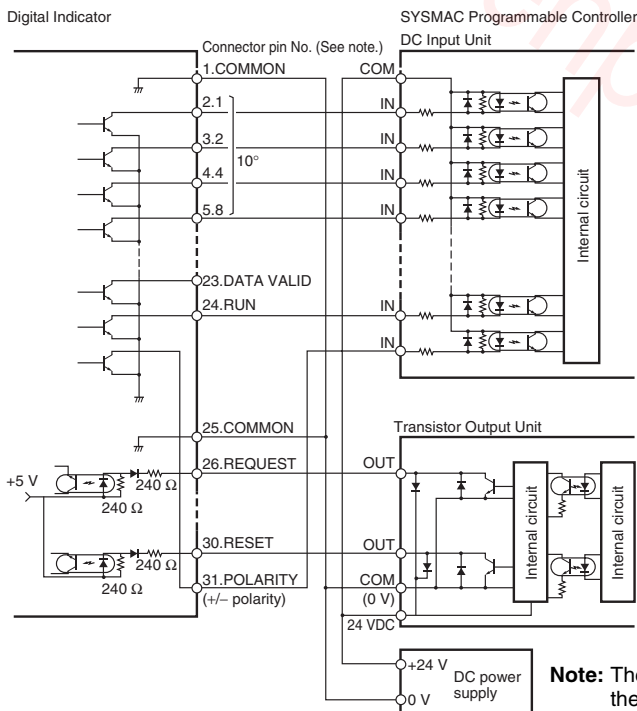
Display Unit Connection Example
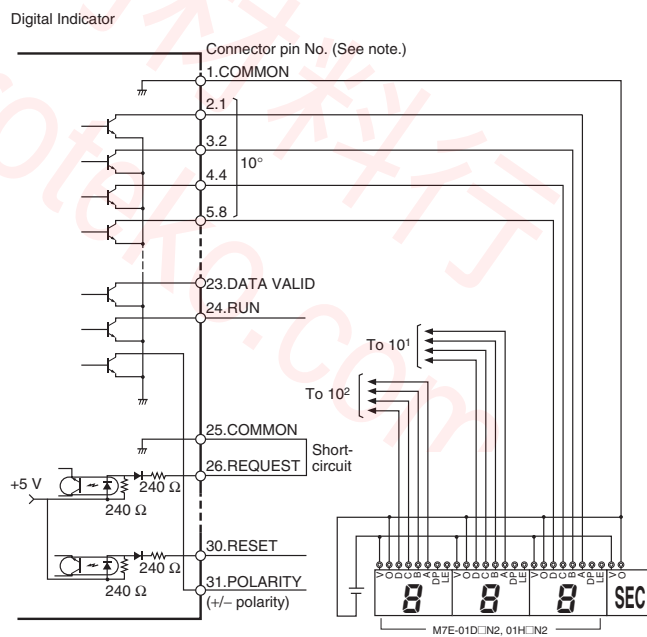
Note: The BCD output connector pin number is the D-sub connector pin number when the BCD Output Cable (sold separately) is connected. This number differs from the pin number for the Digital Indicator narrow pitch connector (manufactured by Honda Tsushin Kogyo Co., Ltd.).

Refer to the following User's Manual for application precautions and other information required when using the Digital Indicator:
K3HB-R/P/C Digital Indicator User's Manual (Cat. No. N136)
The manual can be downloaded from the following site in PDF format: OMRON Industrial Web http://www.fa.omron.co.jp

■ 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
CMW	Lit when communications writing is ON (enabled) and not lit when OFF (prohibited).
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

K3HB-R

Indicator	Function
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 value HH, H, L, or LL is displayed.

K3HB-P

Indicator	Function
HH, H, L, LL	In RUN level, turn ON when the comparative set value HH, H, L, or LL is displayed.

K3HB-C

Indicator	Function
T	Turns ON when parameters for which teaching can be performed are displayed.
5, 4, 3, 2, 1	In RUN level, turn ON when the comparative set value 1, 2, 3, 4, or 5 is 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.

■ Dimensions

101.2
91

Terminal cover (included)

Character Size for Main Display (mm)

Panel Cutout Dimensions

PV display   SV display

14.2   4.9

7.6   3.5

100
(112)

120 min.

75 min. $92^{+0.8}_{0}$

$45^{+0.6}_{0}$

12
1.3

96

48

95 *

2

44.8

MAX/MIN   LEVEL   MODE   SHIFT   UP

*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.

5.8 mm max.

5.8 mm max.

Unit Stickers (included)

• No unit stickers are attached to the Digital Indicator.
• Select the appropriate units from the unit sticker sheets provided.

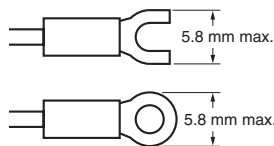| V̲	A̲	V̌	Ǎ	%	J	Pa	Ω
s	/	N	mW	℃	m³	k	
°F	g	min	mm	rpm			
VA	mV	mA	Hz				
m/min	OMRON						
OUT	OUT						

Note: For measurements for commercial purposes, be sure to use the unit required by any applicable laws or regulations.

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.

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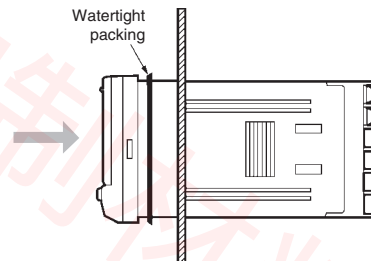
3. Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.

Adaptor
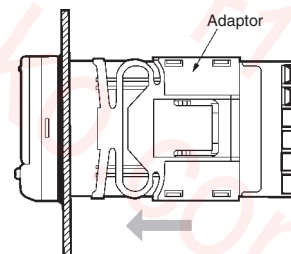
LCD Field of Vision

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

10°
30°
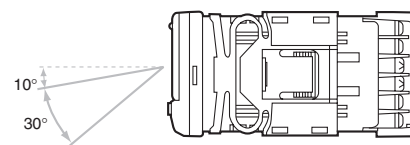
Waterproof Packing

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.

Digital Indicators **K3HB-R/-P/-C**   27

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Main Functions

■ Main Functions and Features

Measurement

| Function | `FUnC` R P C |

The K3HB-R has the following six functions for receiving and displaying input pulses.

F1: Rotation (rpm)/circumferential speed

F2: Absolute ratio

F3: Error ratio

F4: Rotational difference

F5: Flow rate ratio

F6: Passing time

The K3HB-P has the following six functions for receiving and displaying input pulses.

F1: Passing speed

F2: Cycle

F3: Time difference

F4: Time band

F5: Measuring length

F6: Interval

The K3HB-C has the following three functions for receiving and displaying input pulses.

F1: Individual inputs

F2: Phase differential inputs

F3: Pulse counting input

Filters

| Average Processing | `AuG-t, AuG-n` R |

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

| Input Types | `in-tA, in-tb` R P |
| | `in-tA` C |

Specify the types of sensor connected to input A and input B.

Input Compensation

| Auto-zero Times | `At.ΞA, At.Ξb` R |

The frequency is forced to zero if there is no pulse input for a set period.

| Input Compensation | `CõñPn, Cõñ-P` C |

The display can be changed to a preset compensation value using the compensation input.

Key Operations

| Teaching | R C |

The present measurement value can be used as a scaling value.

| Key Protection | R P C |

Key protection restricts level or parameter changes using the keys to prevent unintentional key operations and malfunctions.

Outputs

Comparative Output Pattern `ōūt-P` R P C

Standard, zone, and level comparative output patterns can be selected for comparative outputs.

Hysteresis `HYS` R

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

Output Refresh Stop `ō-StP` R P

Holds the output status when a comparative result output other than PASS turns ON.

PASS Output Change `PRSS` R P

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

Output OFF Delay `ōFF-d` R P C

Delays turning OFF comparatives for a set period. This can be used to provide sufficient time to read the comparative output ON status when the comparative result changes at short intervals.

Shot Output `SHōt` R P C

Turns ON the comparative output for a specific time.

Output Logic `ōUt-n` R P C

Reverses the output logic of comparative results.

Startup Compensation Timer `S-tōr` R

Measurements can be stopped for a set time using an external input.

Output Test `tESt` R P C

Output operation can be checked without using actual input signals by using the keys to set a test measurement value.

Linear Outputs `LSEtC, LSEtᴗ, LSEt.H, LSEtL` R P C

A current or voltage proportional to the change in the measurement value can be output.

Standby Sequence `StdbY` R P

The comparison outputs can be kept OFF until the measurement value enters the PASS range.

Display

Display Value Selection `dᴎSP` R P C

The display value can be set to the present value, the maximum value, or the minimum value.

Display Color Selection `Cōlōr` R P C

The present value display color can be set to green or red. The color of the present value can also be switched according to the comparative output.

Display Refresh Period `drEF` R P C

When the input changes rapidly, the display refresh period can be lengthened to control flickering and make the display easier to read.

Position Meter `PōS-t, PōS-H, PōS-L` R P C

The present measurement value can be displayed as a position in relation to the scaling width on a 20-gradation position meter.

Prescale `PS.Rū, PS.RY, PS.bū, PS.bY` R P C

The input signal can be converted and displayed as any value.

Comparative Set Value Display `Su.dSP` R P C

Select whether or not to display the comparative value during operation.

Display auto-return `rEt` R P C

Automatically returns the display to RUN level when there are no key operations (e.g., max./min. switching, bank settings using keys).

Other

Max./Min. Hold R P

Holds the maximum and minimum measurement values.

Bank Selection `bnᴬ-C` R P C

Switch between 8 comparative value banks using the keys on the front panel or external inputs. A set of set comparative values can be selected as a group.

Bank Copy `CōPY` R P C

Any bank settings can be copied to all banks.

Interruption Memory `ᴎEᴎō` C

The measured value can be recorded when the power supply is interrupted.

User Calibration R P C

The K3HB can be calibrated by the user.

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Common Precautions

■ 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 minor or moderate 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 II, III or IV (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, 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 heat resistance of 70°C 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.
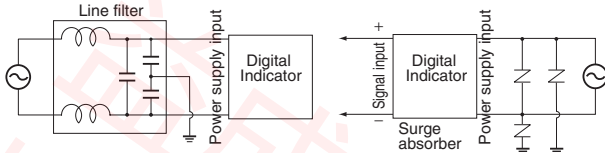
3. In order to prevent inductive noise, wire the lines connected to the terminal block separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using shield lines.

Example of Countermeasures for Inductive Noise on Input Lines
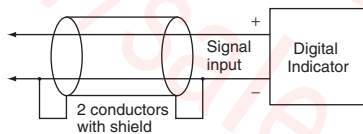
4. If a noise filter is used for the power supply, check the voltage and current, and install the noise filter as close to the product as possible.

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

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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 DIS-CLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMER-CIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLI-GENCE, 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 custom-er'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.

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K3MA-F型 頻率/速度/流量計測-數位式控制電錶

底板配備紅綠雙色 LED，數位式 LCD 顯示之控制電錶

·接點、NPN、PNP或電壓脈衝輸入。
·由前方面板按鍵操作，設定容易。
·平均化處理功能可安定顯示。
·內含比例調整、自動歸零時間、起動補償時間等功能。
·最大與最小的顯示容易確認。
·深度僅80-mm (由前方面板的邊緣量起)。
·防誤觸保護蓋（標準配備）可防止電擊。
·防水防塵的NEMA4X (IP66同級)前方面板。
·符合美國與加拿大所要求的國際安全規格UL標準。
·取得CE認證。

型號規則

■ 型號說明

K3MA-F-A2 AC100-240V
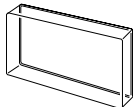　　　1　　2　　　　3
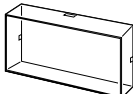
1. 輸入方式
　　F：　　　　旋轉脈衝
2. 輸出方式
　　None：　　無輸出
　　A2：　　　2 繼電器接點輸出（SPST-NO）

3. 電源電壓
　　100-240VAC
　　24VAC/VDC

訂購資訊

■ 型號種類

輸入方式	電源電壓	輸出		型號
旋轉脈衝	100 至 240 VAC	無		K3MA-F 100-240VAC
		2 繼電器接點輸出（SPST-NO）		K3MA-F-A2 100-240VAC
	24 VAC/VDC	無		K3MA-F 24VAC/VDC
		2 繼電器接點輸出（SPST-NO）		K3MA-F-A2 24VAC/VDC

■ 附件（另行訂購）

名稱	形狀	型號
防濺軟蓋		K32-49SC
硬蓋		K32-49HC

K3MA-F

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規格

■ 額定

型號	K3MA-F 100-240VDC，K3MA-F-A2 100-240VAC	K3MA-F 24VAC/VDC，K3MA-F-A2 24VAC/VDC
電源電壓	100至240 VAC	24 VAC/VDC
工作電壓範圍	額定電源電壓85%至110%	
消耗功率 (在最大負載情形下)	6 VA以下	4.5 VA以下 (24 VAC) 4.5 W以下 (24 VDC)
絕緣抗阻	在端子與外殼間至少 20 MΩ (在 500 VDC 時)。 在輸入、輸出與電源間提供絕緣。	
耐電壓	在端子與外殼間 2,000 VAC 1 分鐘。 在輸入、輸出與電源間提供絕緣。	
耐雜訊	在一般或共通模式下於電源端±1,500 V。 在1 ns方波±1 μs 或 100 ns。	在一般模式下於電源端±480 V。 在共通模式下±1,500 V。 在1 ns方波±1 μs 或 100 ns。
耐震性	震動：10至55 Hz，加速度：50 m/s^2 。 在X、Y、與Z各方向5分鐘10次掃瞄。	
耐衝擊性	在3個軸與6個方向上150 m/s^2 (繼電器輸出下 100 m/s^2) 各3次。	
環境溫度	工作於：−10℃ 至 55℃ (無凝結或結冰) 儲存於：−25℃ 至 65℃ (無凝結或結冰)	
安全標準認證	UL3121-1，符合EN61010-1(污染等級 2/過電壓類別 II) 符合 VDE0106/P100 (防止誤觸)	
EMC	(EMI) EN61326+A1 工業級 發射附件： CISPR 11 Group 1 A 級：CISRP16-1/-2 發射AC本體： CISPR 11 Group 1 A 級：CISRP16-1/-2 (EMS) EN61326+A1 工業級 ESD耐受性： EN61000-4-2：4 kV接點放電 　　　　　　　　　　 8 kV 空氣放電 RF-干擾耐受性： EN61000-4-3：10 V/m (調幅，80 MHz 至 1 GHz) 電性快速暫態雜訊： EN61000-4-4：2 kV(電源線) 放電雜訊耐受性： 1 kV 線對線(I/O訊號線) 雷擊耐受性： EN61000-4-5：1 kV(電源線) 　　　　　　　　　　 線對地2 kV(電源線) 傳導干擾耐受性： EN61000-4-6：3 V (0.15至80 MHz) 電壓突降/瞬斷耐受性： EN61000-4-11：0.5 週，0，180°，100%(額定電壓)	
重量	約200克	

K3MA-F

■特性

輸入信號	無電壓接點(最多 30 Hz，ON/OFF 脈衝寬度：至少15 ms) 電壓脈衝(最多 5 kHz，ON/OF 脈衝寬度：至少90 μs，ON電壓：4.5 至 30 V/OFF電壓：0至2 V) 開集極(最多5 kHz，ON/OFF脈衝寬度：至少90 μs) <u>可連接的感測器</u> ON殘留電壓：最多2.5 V OFF漏電流：最多0.1 mA 負載電流：切換容量至少必須有15 mA 必須能夠可靠地切換5 mA以下的負載電流
量測正確性	±0.1%FS ±1位(在23±5℃時)
量測方法	循環量測
最大顯示位數	5位數(−19999 至 99999)
顯示	7段顯示器，字元高度：14.2 mm
極性顯示	輸入信號爲負時自動顯示 "−"。
零的顯示	前置零將不顯示。
比例調整功能	可由前面按鍵規劃(顯示範圍：−19999至99999)。小數點位置可依需要設定。
保持功能	Max 保持(最大值), Min保持(最小值)
滯後設定	可由前面按鍵規劃 (0001 至 9999)。
其他功能	比例調整教導功能 改變顯示顏色(綠色 （紅色）、綠色、紅色 （綠色、）紅色) OUT方式改變(上限、下限、上下限) 平均化處理功能(單純平均 OFF/2/4/8 動作) 自動歸零時間 起動補償時間 設定變更保護功能 參數初值化 顯示自動回復時間
輸出	繼電器：2 SPST-NO
比較輸出延遲	750 ms以下
保護程度	前方面板：NEMA4X室內使用 （相當於IP66) 後面外殼：IEC標準IP20 端子部：IEC 標準 IP00 + 防誤觸保護 （VDE0106/100)
記憶保護	非揮發性記憶體 （EEPROM） (可重覆寫入100,000次)

■量測範圍

無電壓接點／開集極輸入

| 輸入	量測範圍	量測正確性	顯示範圍
ON/OFF脈衝寬度在15 ms 以下的無電壓接點(最多30 Hz)	0.05至30.00 Hz	最多±0.1% FS±1位 (在23±5℃ 時)	-19999至99999 (在比例調整功能)
ON/OFF脈衝寬度在90 μs以下的開集極(最多5 kHz)	0至5,000 Hz		

■輸入輸出額定

繼電器接點輸出

項目	電阻性負載 （cosφ = 1)	電感性負載 （cosφ = 0.4，L/R=7 ms)
額定負載(UL額定值)	5 A於250 VAC，5 A 於 30 VDC	1.5 A 於250 VAC，1.5 A 於30 VDC
額定通電電流	5 A以下(於COM端)	
接點電壓最大值	250 VAC，150 VDC	
接點電流最大值	5 A （於COM端)	
開閉容量最大值	1,250 VA，150 W	250 VA，30 W
最小適用負載(P水準、參考值)	10 mA於5 VDC	
機械壽命	5,000,000次以上(開閉頻度1,200次/分)	
電氣壽命(在20℃的環境溫度下)	100,000次以上(額定負載開閉頻度10次/分)	

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連接

■ 端子配置

100- 至 240-VAC 方式或
24-VAC/VDC 方式
(連接 24-VDC 時無極性)

比較輸出型
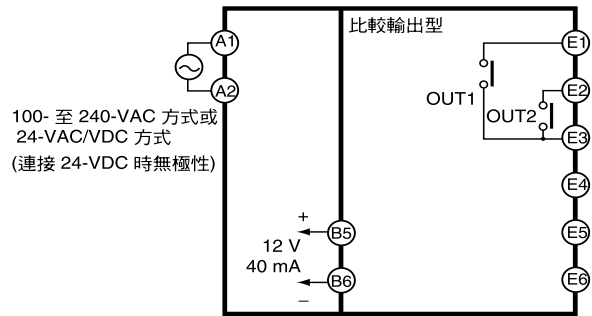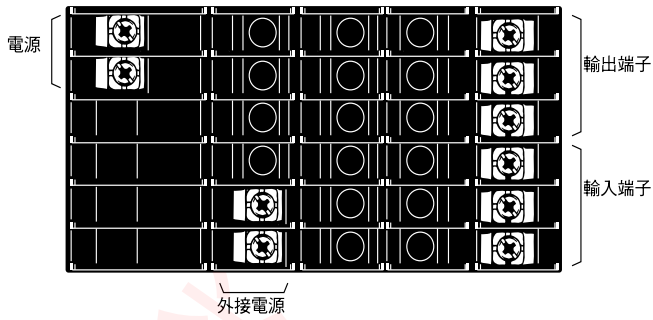
附註：參見第 5 頁的輸入電路。

端子編號	名稱	描述
(A1) - (A2)	操作電壓	連接至電源。
(E4), (E6) - (E5)	脈衝輸入	無電壓接點／開集極輸入。
(E1), (E2) - (E3)	輸出	輸出至繼電器輸出。
(B5) - (B6)	額外電源	作爲感測器的電源使用。

■ 方塊圖

附註：僅適用於繼電器輸出型。

4 **K3MA-F**

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■ 輸入電路
脈衝輸入

NPN, 接點輸入　NPN

1 kΩ　E4

200 Ω　12 V

脈衝檢測
電路

E5　12 V

PNP, 電壓脈衝輸入

電壓脈衝

PNP

電壓檢測
電路

E6

10 kΩ

＋　B5

－　B6

感測器電源的負極與
COM 為內部相連的
。

■ 輸入電路

K3MA-F　5
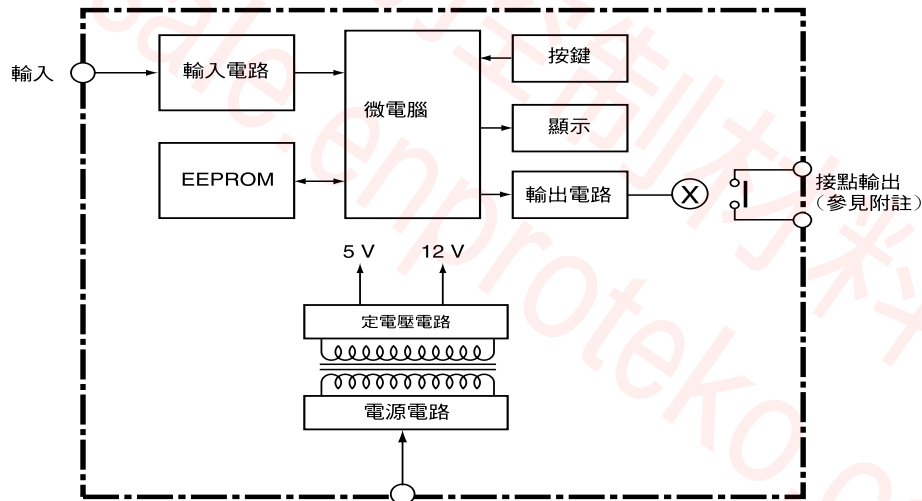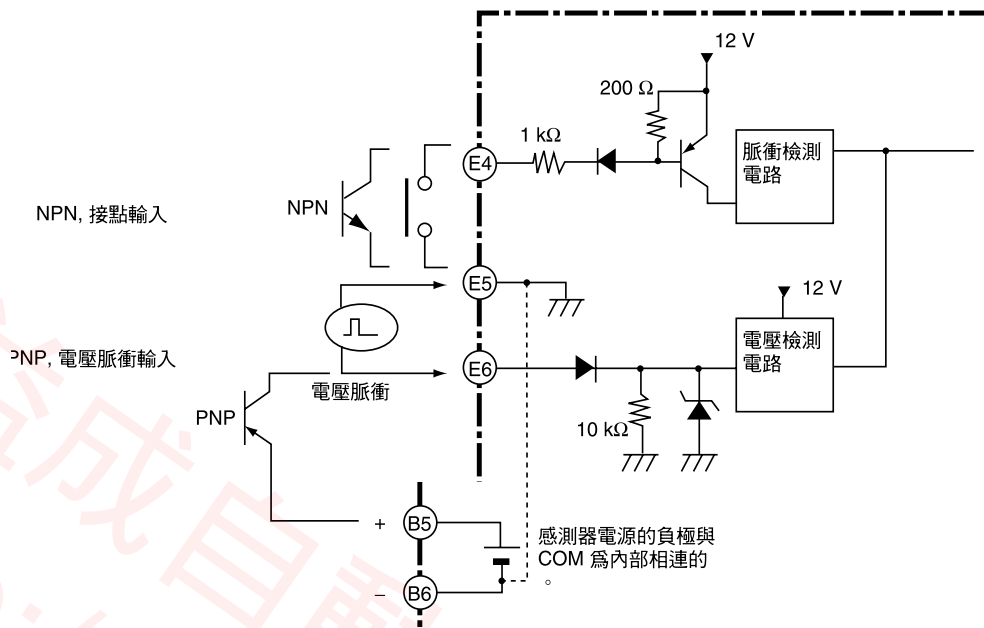
操作

■主要功能

輸入方式與範圍

頻率範圍 （設定參數）	功能	輸入範圍（設定參數）	設定範圍
脈衝頻率選擇 (P-FrE)	選擇脈輸入訊號	0.05 至 30.00 Hz(30) 0 至 5 kHz (5P)	在比例調整功能下，可顯示範圍從-19999至99999。 小數點位置可依需要設定。

脈衝頻率選擇

參數	設定值	意義
P-FrE	3	0.05 至 30.00 Hz 量測範圍
	5P	0 至 5 kHz量測範圍

附註：輸入範圍的初始值爲 "0 至 5 kHz (5P)"。

比例調整

當對相對應的輸入設定了想要的顯示值時，這個值將會顯示在決定零點之兩點間的線上。

參數	設定值	意義
CnP	0 至 99999	dSP 的輸入值
dSP	-19999 至 99999	CnP 的顯示值

參數	設定值	意義
dP	o.oooo	小數點後顯示四位數
	oo.ooo	小數點後顯示三位數
	ooo.oo	小數點後顯示二位數
	oooo.o	小數點後顯示一位數
	ooooo	無小數點

附註： 初始值將會依選擇的脈衝頻率而改變。
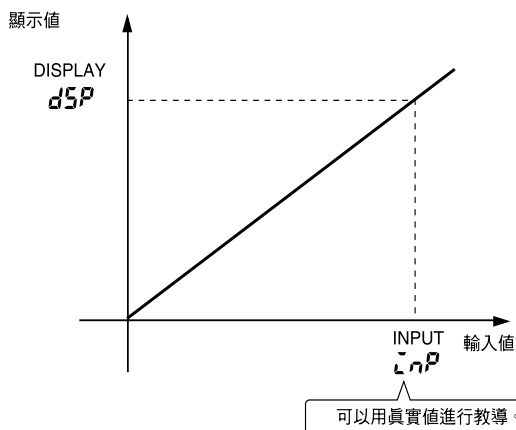
- 小數點可視需要顯示。
- 當顯示小數點時，在設定比例調整顯示值之前，請先考慮小數點後的小數位數。
- 若 P-FrE 設定爲 30，小數點顯示的預設狀態爲 ooo.oo。

可以用員實值進行教導。

除了按 ⊼ 往上鍵與 ≫ 偏移鍵來進行設定外，可以把現行值當作教導用比例調整輸入值的輸入。這在檢查 K3MA-F 的動作狀態時進行設定而言是非常有用的。

方便的功能

比例調整教導

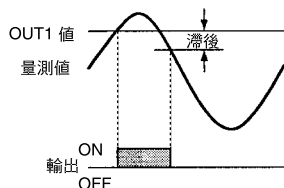K3MA-F 初始值設定階層的參數（ $ınP$ ）可以在教導功能下以真正的輸入值來設定。在參數顯示之後，可以透過以下的程序來進行真正的輸入設定。

教導模式

監控模式

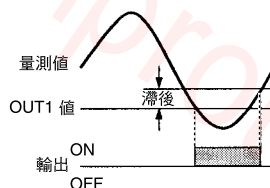用 ≫ 來切換到下一個參數而不註記

"T" 閃爍

用 ≪ 來註記並切換到監控模式

"T" 亮表示這個參數可以進行教導。

正常改變

"T" 熄滅

下一個參數
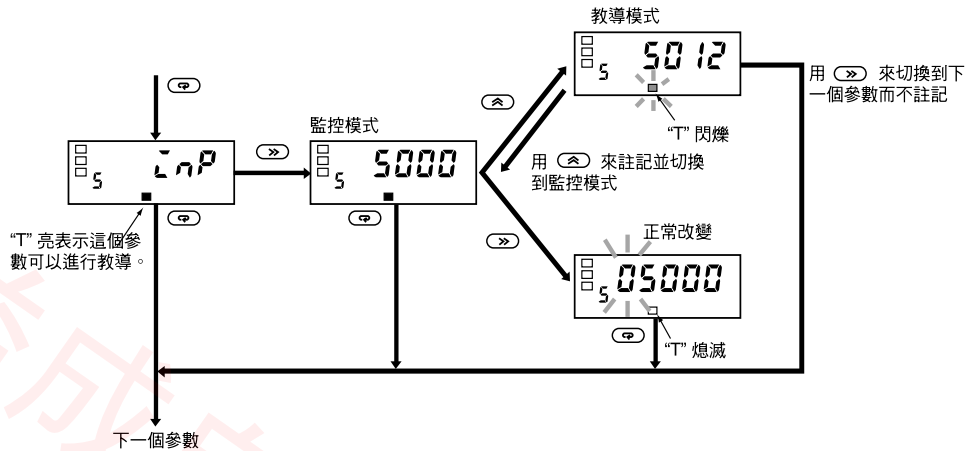
OUT 方式（ 僅適用於比較輸出型 ）

OUT 1與OUT 2可依比較值設定為以下列三種模式之一來動作：

• 上限 （ 高動作 ）：
  當量測值大於設定值時輸出為 ON。

• 下限 （ 低動作 ）：
  當量測值小於設定值時輸出為 ON。

• 上下限 （ 帶外動作 ）：
  可分別設定上限 (H 設定值) 與下限 (L 設定值)。
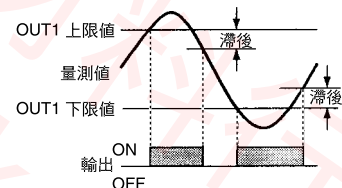 當量測值大於設定上限或小於設定下限時輸出為 ON。

上限 （高動作）
  OUT1 值
  滯後
  量測值
  輸出 ON OFF

下限 （低動作）
  量測值
  OUT1 值
  滯後
  輸出 ON OFF

上下限 （帶外動作）
  OUT1 上限值
  滯後
  量測值
  OUT1 下限值
  滯後
  輸出 ON OFF

以上三種輸出操作方式可以視需要合併使用。以下為可能的組合範例。

上限 2-階輸出
  OUT2 值
  量測值
  OUT1 值
  OUT2 ON OFF
  OUT1 ON OFF

臨界輸出
  OUT2 上限值
  量測值
  OUT1 上限值
  OUT1 下限值
  OUT2 下限值
  OUT2 ON OFF
  OUT1 ON OFF

上限與上下限的結合
  OUT2 上限值
  OUT1 值
  量測值
  OUT2 下限值
  OUT2 ON OFF
  OUT1 ON OFF
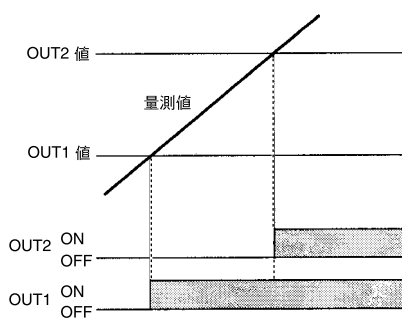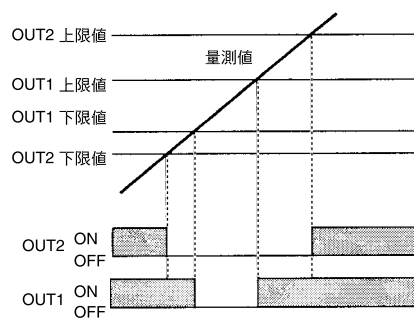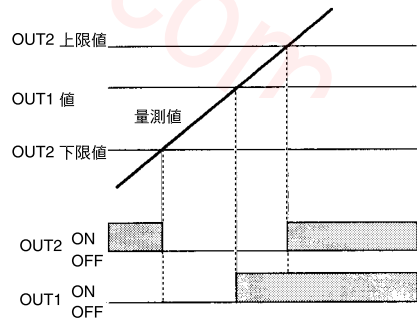
參數初值化

此功能會把所有的參數都設成它們的初始值。　在把 K3MA-F 回復為出廠狀態後以此功能來將它重置。

參數	設定值	意義
$ın$ $ı$ t	oFF	---
	on	初始化所有的參數。

K3MA-F

平均化處理

平均化處理藉著由感測器輸入脈衝寬度的跳動或由旋轉軸承中的離心力所造成的跳動與閃爍最小化將顯示穩定化。

改變顯示顏色

顯示值的顏色可以設定爲紅色或綠色。比較輸出型的裝置還可以設定爲依比較規則而由紅色改變爲綠色或由綠色改變爲紅色。

紅色
113.36

OUT1 值 ─────────── 綠色 ───────
100.05

OUT2 值
8.781
紅色
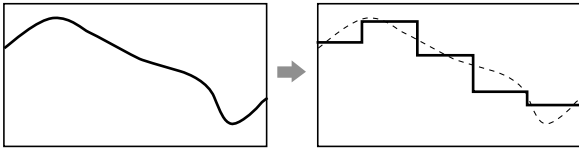
滯後 (僅適用於比較輸出型)

可以設定比較輸出的滯後以防止當量測值在 OUT 值附定有微小變動時輸出的顫動。

上限（高動作）

設定值
滯後
量測值

ON
輸出 OFF

自動回復顯示時間

此功能在經過一段預設時間（稱爲自動回復顯示時間）內均沒有按鍵時會把顯示自動回復到動作階層的現行值。

移至保護階層時間

可視需要設定切換至保護階層所需要的時間。
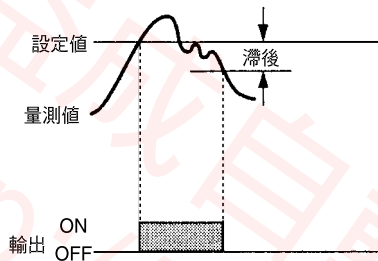
自動歸零時間

這個功能設定當輸入脈衝停止時顯示值歸零的時間。請把這個時間設得比輸入脈衝循環（ 一個輸入脈衝與下一個輸入脈衝間的期間 ）稍長些。若這個時間設得比輸入脈衝循環短，則不可能得到適當的量測。

啓動補償時間

啓動補償時間會取消電源開啓後一段預設時間的量測工作，以防止因輸入的波動而產生不想要的輸出。

顯示

下限設定
(OUT2)

啓動補償時間

顯示 00000
時間

電源送電

OUT2 輸

MAX/MIN 顯示

可以儲存並顯示由電源開啓後至現行時間內所量測（顯示）的最大值與最小值。這是非常有用的功能，譬如當我們想要量測最大值的時候。

192.0
MAX/MIN LEVEL MODE SHIFT UP

現行值
◇ MAX/MIN

Max *231.5*
MAX/MIN LEVEL MODE SHIFT UP

最大值
◇ MAX/MIN

Min *173.1*

最小值
◇ MAX/MIN

各部名稱與作用

2. 動作顯示

K3MA-F

1 Max
2 Min
SV

3. Level 顯示

1. 主要顯示區

T

MAX/MIN LEVEL MODE SHIFT UP

4. MAX/MIN 鍵

8. 向上鍵

5. Level 鍵

7. Shift 鍵

6. 模態鍵
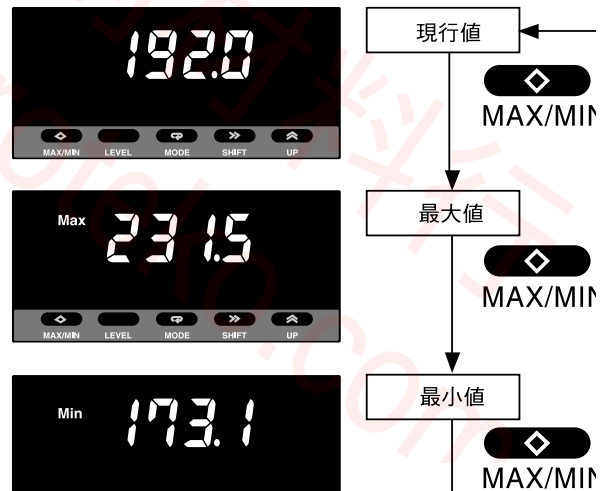
名稱		功能
1. 主要顯示區		顯示現行值、參數與設定值。
2. 動作顯示	1	當輸出 1 為 ON 時會亮。
	2	當輸出 2 為 ON 時會亮。
	SV	當顯示或改變設定值時會亮。
	Max	當主要顯示區顯示最大值時會亮。
	Min	當主要顯示區顯示最小值時會亮。
	T	在可以進行教導功能動作時會亮。當教導功能動作期間會閃爍。
3. LEVEL顯示		顯示當前狀態。
4. MAX/MIN鍵		當顯示量測值時用於顯示最大值與最小值。
5. LEVEL鍵		切換設定狀態時使用，[運轉狀態]<=>[初始值設定狀態]相互切換。
6. MODE鍵		設定狀態內的設定數據切換時使用此鍵。
7. SHIFT鍵		設定時的值或內容按SHIFT鍵時會移到設定狀態及移位到設定位數。
8. UP鍵		設定值漸漸加大，另外進行強制歸零狀態的執行/解除。

階層指示器	階層
P	保護
不亮	操作
S	初始值設定
F	進階功能設定

外觀尺寸

防誤觸保護蓋
（已附）

主要顯示區
字元大小

14.2 mm

7.6 mm

面板加工尺寸

120 以上

75 以上
92$^{+0.5}_{0}$
45$^{+0.5}_{0}$

K3MA-F 使用 M3 端子。
端子蓋已附。

101.2
91
85
97
12
1.3
96
48
80
44.8

應用實例

輸送帶傳送速度的顯示

K3MA-F

m/min

齒輪

近接感測器
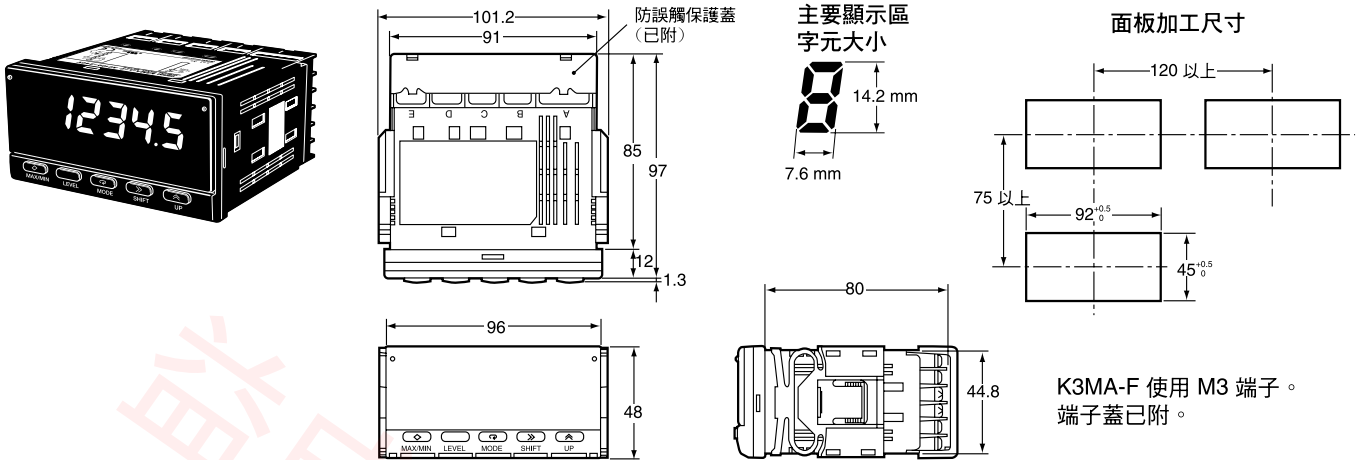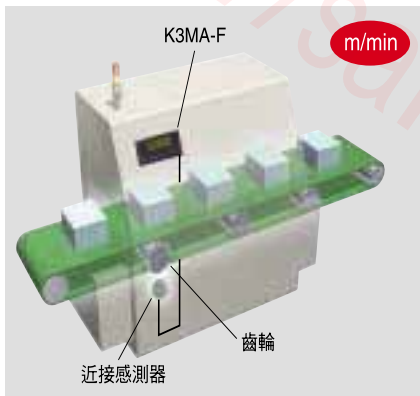
- 逆流(reflow)爐的線上速度監控
- 食品加工/搬送/加熱完成送出速度

混合器或攪拌器的轉動監控

rpm

K3MA-F

混合器或攪拌器

- 樹脂鑄模的混合器
- 磨粉機械/造粒機械，離心分離機

將變頻器的輸出變爲轉速，線速進行顯示

rpm

換流器

K3MA-F

馬達

電壓脈衝

附註：若換流器的監視器輸出爲類比的訊號，例如 0 至 10 V，請使用 K3MA-J。

- 輸送帶速度監控
- 加工機械 (切削機、研磨機)

OMRON

安裝

1. 把 K3MA-F 插入面板上已鑽好的孔內。
2. 可在 K3MA-F 的本體上加裝橡膠墊片來防水。
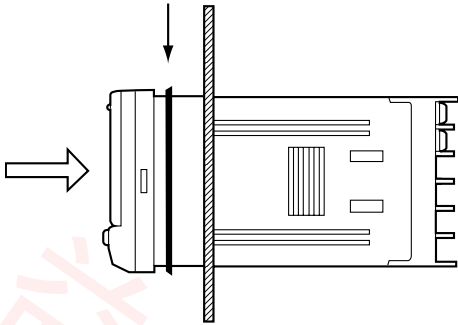
3. 把後面外殼左右的槽與轉接器密切，然後把它壓到接觸到面板以確實固定 K3MA-F。
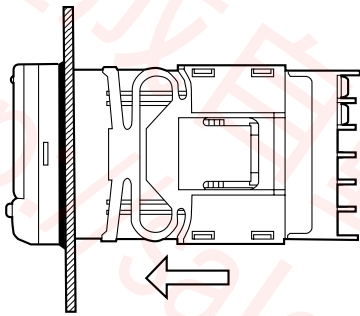
■接線前注意事項

· 使用壓接端子。
· 以大約 0.5 N‧m 的力矩鎖緊端子螺絲。
· 將訊號線與電源線分路，以避免干擾。

■接線

· 使用以下的 M3 壓接端子。

5.8 mm 以上

5.8 mm 以上
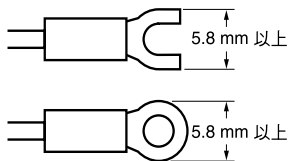
■單位標籤（已附）

· 在 K3MA-F 並沒有貼上單位標籤。請由所提供的貼紙上選用適當的標籤。

V	A	V	A	%	J	Pa	Ω
s	/	N	m	W	℃	m³	k
°F	g	min	mm	rpm			
VA	mV	mA	Hz				
m/min	OMRON						
OUT	OUT						

附註：請使用相關法規所指定尺寸規格的單位標籤。

K3MA-F

注意事項

⚠ 警告
供電時不可碰觸任何端子，以免遭到電擊。

⚠ 注意
供電時不可拆解本裝置或碰觸本裝置的端子部份，以免遭到電擊。

⚠ 注意
不可讓金屬異物或剪下來的導線進入本裝置的內部，以免發生電擊、火災或產生誤動作。

⚠ 注意
請依控制應用對本裝置進行正確的設定。否則，可能會造成非預期的動作而造成本裝置的損壞或其他的傷害。

⚠ 注意
請採行安全的量測方式，例如另外安裝監視系統，以確保在本產品故障時的安全性。產品故障可能會導致所產生的比較輸出無法正常輸出，並造成嚴重的意外。

請閱讀以下的注意事項以確保安全。

1. 維持電源電壓在規格書所指定的規格範圍內。
2. 維持負載在規格書所指定的額定之間。
3. 在連接端子之前，確認編號與極性均爲正確。不正確或反向的連接可能造成本裝置內的元件損壞或燒掉。
4. 確實鎖緊端子螺絲。建議的鎖緊力矩爲 0.43 至 0.58 N.m 之間。鬆的螺絲可能會造成火警或動作不正常。
5. 未用到的端子不可以連接任何東西。
6. 請加裝開關或斷路器，以便操作者在必要時可以容易地關掉本裝置。並請爲那些裝置提供適當的標示。
7. 請勿試圖拆解、維修或改良本裝置。
8. 請不要在有揮發性油氣或易燃性油氣的場所使用本裝置。

應用

一般注意事項

1. 請勿在以下的場所使用本裝置：
   - 受到熱的設備之幅射熱直接照射到的地方。
   - 暴露於水、油或化學物質的地方。
   - 直接受到太陽照射的地方。
   - 有灰塵或腐蝕性氣體（特別是硫磺氣或氨氣）的地方。
   - 溫度變化很大的地方。
   - 會結冰或凝結的地方。
   - 會受衝擊或震動的地方。
2. 不要把所散發的熱侷限在本裝置附近，而應該提供足夠的散熱空間。
3. 確認在電源開啓後的兩秒內能到達額定電壓。
4. 電源開啓後至少維持 15 分鐘以便能夠正確地量測。
5. 供電期間，不可碰觸狹縫區或端子，以免本裝置受靜電影響。
6. 使用或保存時請勿在上方放置重物，以免以本裝置變形或退化。
7. 請使用市售的酒精來清潔本裝置，不可以使用塗料稀釋劑。

安裝

- 安裝於 1 至 8 mm 厚的平板上。
- 安裝於水平的位置。
- 使用符合螺絲大子的壓接端子。

防止雜訊

- 安裝於遠離會產生強而高頻的電場裝置（例如高頻熔接器或縫紉機）或易受雷擊的地方。
- 在附近會產生雜訊的裝置（特別是馬達、變壓器、螺線管、電磁線圈與其他具有高電感的元件）上裝置突波吸收器或雜訊濾波器。
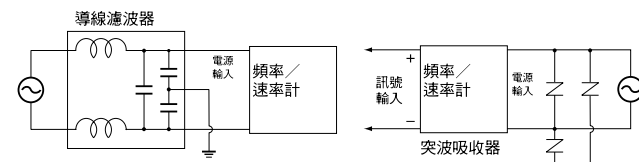
- 爲防止電感性雜訊，請讓端子區的線遠離高電壓或高電流的電源線。千萬不可以讓它和電源線平行或綁在一起。
- 當在電源使用雜訊濾波器時，請檢查電壓及電流，並把它裝在距頻率 / 速率計愈近的地方愈好。
- 不要把本裝置裝在靠近收音機電視機或無線裝置的近，以免受到不必要的干擾。

延長使用壽命

- 不要在溫度或濕度超過額定值的地方或可能發生凝結的地方使用本裝置。當把本裝置安裝在平板上時，務必確認本裝置週邊（不是平板的週邊）的溫度不超過額定值。本裝置的使用壽命與環境溫度有關。環境溫度愈高，使用壽命會愈短。要延長使用壽命，請降低本數位電錶內部的溫度。
- 請將本裝置使用與保存於規格所規定的溫度與濕度範圍內。當數個本頻率 / 速度 / 流量計測電錶成群安裝或垂直排列時，由其所產生的熱將會造成其內部的溫度上昇，這將會縮短使用壽命。在這種情形下，請考慮一些強制降溫的方法，例如加裝散熱風扇。然而，千萬不要只有降低端子部的溫度，因爲如此將會提高量測的誤差。
- 輸出繼電器的壽命會大幅地受到開閉容量與開閉條件所影響。請在這些繼電器的額定負載與電氣壽命範圍內使用它們。若超過它們的電氣壽命，則可能會造成接點熔解或燃燒。

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操作程序

■ Level（階層）

"Level(階層)" 關係到一群的參數。下表列出各種階層中可能的操作，而下圖則說明要如何在階層間變換。有些參數在某些特定型號是不會顯示的。

Level 名稱	功能	量測
保護	設定值鎖定。	繼續
動作	顯示現在值與設定 OUT 1/2 的值。	繼續
初始值設定	進行輸入方式、比例調整、輸出動作表現與其他參數的初值設定。	停止
進階功能設定	設定平均化處理、顯示顏色的設定及其他進階功能參數。	停止
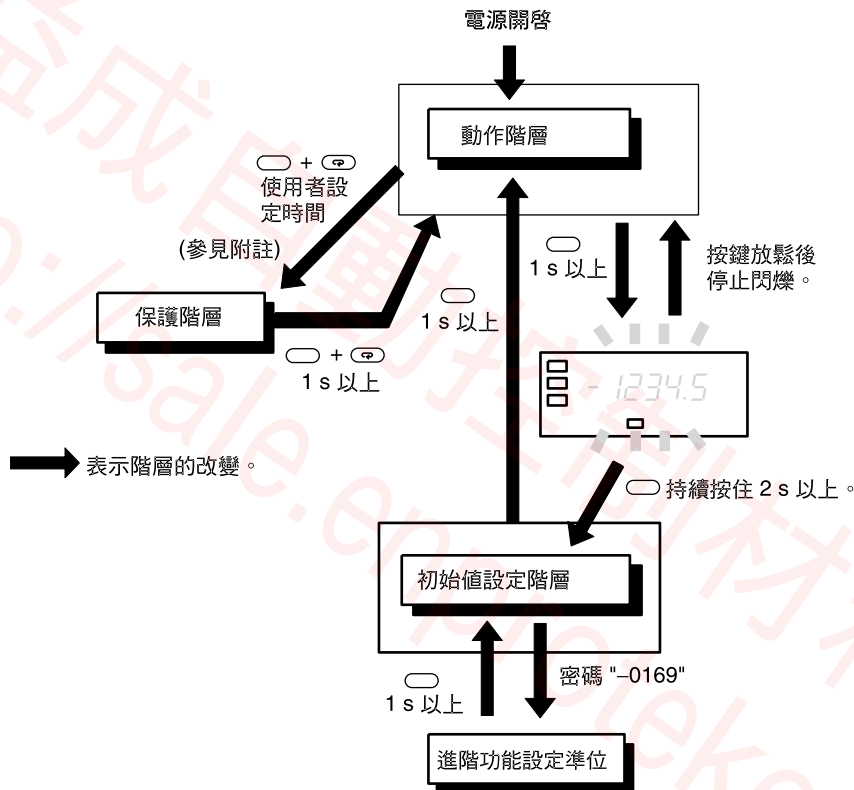
附註：移至保護階層時間可以在進階功能設定Level中設定。

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■ 參數

附註： 1.某些參數於特定型號中不會顯示。
2.當變爲初始值設定階層或進階功能設定階層時，K3MA-F 將會停止量測
。
3.輸入範圍改變時，某些參數會設爲預設值。因此，請先設定輸入範圍。

```
┌──────────┐
│  電源開啓  │
└────┬─────┘
     ↓
┌──────────┐
│  動作階層  │ ◄──────────
└────┬─────┘
```

3600 現行值

用於比較輸出型

ōUt l OUT1 值 ──► *19999 - 99999*

設定其中之一

ōUt l.H OUT1 上限値 ──► *19999 - 99999*

ōUt l.L OUT1 下限値 ──► *19999 - 99999*

ōUt 2 OUT2 值 ──► *19999 - 99999*

設定其中之一

ōUt 2.H OUT2 上限値 ──► *19999 - 99999*

ōUt 2.L OUT2 下限値 ──► *19999 - 99999*

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按住階層鍵 ◯ 1 s 以內。

| 初始值設定階層 | 進階功能設定準位 |

按住階層鍵 ◯ 1 s 以內。

鍵入密碼 "–0169"

P-FrE 脈衝頻率 — 脈衝頻率 `30/5`

LnP 比例調整 輸入值 — `0-99999`

dSP 比例調整 顯示值 — `-19999-99999`

dP 小數點位置 — `0.0000-00000`

具比較輸出功能的型號

oUt 1.t OUT1 方式 — 上限 `HL` 下限 `Lo` 上下限 `HL-Lo`

oUt 2.t OUT2 方式 — 上限 `HL` 下限 `Lo` 上下限 `HL-Lo`

Amou 移到進階功能設定階層 — `-19999-99999`

LnLt 參數初值化 — `oFF / on`

AuG 平均化處理 — `oFF / 2 / 4 / 8`
單位：次數
比較滯後

具比較輸出功能的型號

HYS1 OUT1 滯後 — `0-1-9999`

HYS2 OUT2 滯後 — `0-1-9999`

AUto0 自動歸零時間 — `0.0 / 199`

S-tLm 啟動補償時間 — `00-99.9`

CoLor 改變顯示顏色 — 紅色（綠色）`Grn-r` 綠色 `Grn` 紅色（綠色）`rEd-G` 紅色 `rEd`

rEt 自動回復顯示時間 — `0-10-99`
單位：

PrLt 移至保護準位時間 — `0-5-19`
單位：s

設定值中反相顯示的為初始設定。

MODE

按住⬭階層鍵 + 🔘 模式鍵 1 s 以上。

| 動作階層 | ← → | 保護階層 |

按住⬭階層鍵 + 🔘 模式鍵超過預設時間。

```
p ōAPt    動作／調整鎖定    →   🔘/1/2
  ↓ 🔘 MODE
p ĹĹPt    設定階層鎖定      →   0/1/2
  ↓ 🔘 MODE
p YtPt    設定變更鎖定      →   oFF/on
  ↓ 🔘 MODE
```

操作／調整鎖定

限制操作 level 與調整 level 的按鍵功能。

參數	設定	操作階層	
		處理值顯示	設定值顯示
ōAPt	0	允許	允許
	1	允許	允許
	2	允許	禁制

- 初值設定為 0。
- 在沒有配備比較輸出功能的型號上無法顯示這個參數。

設定階層鎖定

限制移到初值設定 level 或進階功能設定 level。

參數	設定	移到初值設定階層	移到進階功能設定階層
ĹĹPt	0		
	1	允許	允許
	2	允許	禁制

設定變更鎖定

限制以按鍵操作變更設定。當設定這項鎖定時，將無法移到設定變更模式。

參數	設定	以按鍵操作變更設定
YtPt	oFF	允許
	on	禁制

然而，所有的保護階層參數都還是可以改變的。

■ 初始值設定

```
( 電源開啓 )
     ⇩
按住階層鍵 ⬭ 3 s 以上，以移到初始值設定階層。
     ⇩
選擇量測的脈衝頻率。
依需要設定比例調整值並指定輸出動作。
     ⇩
[ 必要時切換到進階功能設定階層，以設定平均化處理的量測數、滯
  後值、自動歸零時間、啓動補償時間、顯示顏色改變、自動回復顯
  示時間、或移至保護階層時間。 ]
     ⇩
按住準位鍵 ⬭ 1 s 以內以回復動作階層。
     ⇩
指定 OUT 1 與 2 的設定值。
     ⇩
( 開始量測 )
```
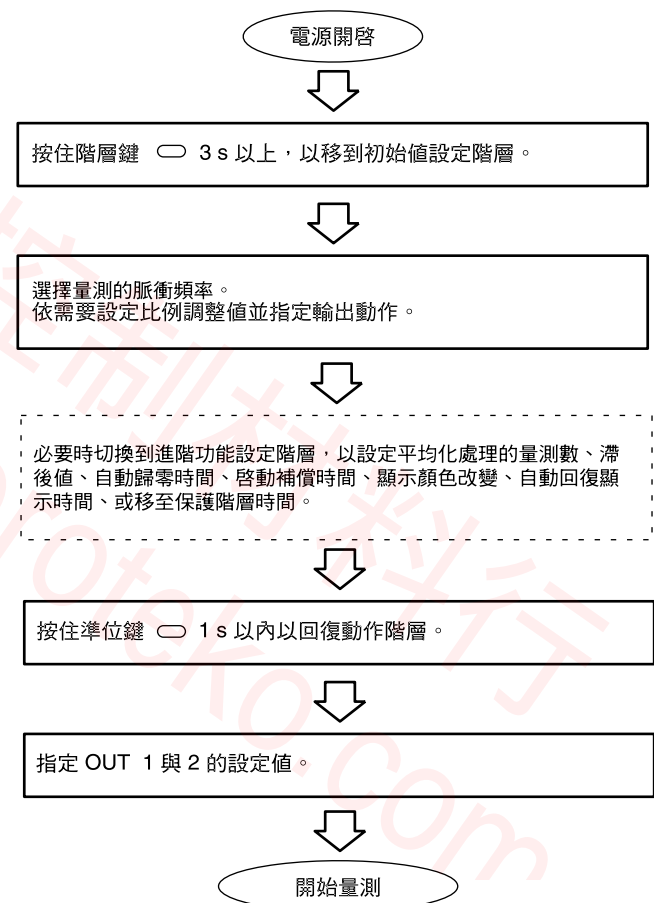
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■設定範例

初始值設定

有關以下範例的設定顯示於此。

範例：輸送帶饋送速度顯示

K3MA-F-A2 100-240VAC
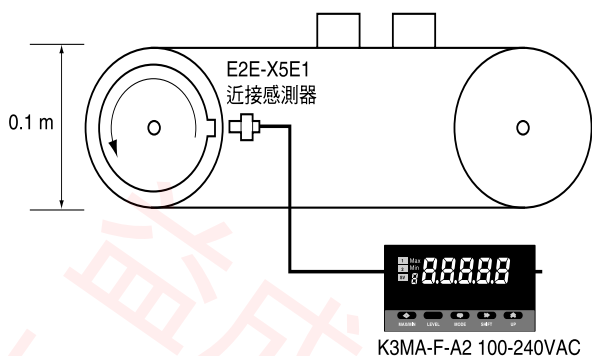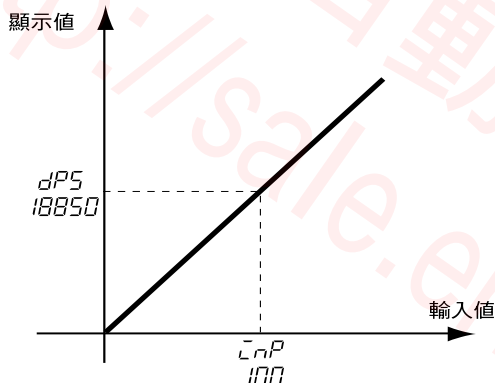
在此，輸送帶的饋送速度是以 0.1 m/min 為單位來顯示的。

・近接感測器：E2E-X5E1, NPN 輸出

1 脈衝／旋轉，滾輪直徑 0.1 m

當顯示流量（例如：單位為 ℓ/min 或 ℓ/h）時，要在確認流量感測器的 I/O 字元之後才進行比例調整設定。有些流量感測器的輸出訊號是類比的。使用這種流量感測器時，請考慮使用 K3MA-J。

1. 選擇 K3MA-F 的最大輸入頻率。
   把選擇的脈衝頻率設定為 30 Hz 或 5 kHz。在本範例中，由於輸送帶為低速運轉，故設定為 30 Hz。
   參數：$P\text{-}FrE$（脈衝頻率），設定值：30

2. 設定比例調整。顯示值與輸入值間的關係以以下方程式所示。

   旋轉數（rpm） $=$ 輸入頻率 / 每轉的脈衝數 $\times 60$

   周速度 D (m/min) $=$ 旋轉數 $\times$ 滾軸的圓周

   $= 1/N \times f \times 60 \times d \times \pi$

   N：每轉的脈衝數
   f：頻率（Hz）
   d：滾軸直徑 (m)

   把輸入狀況代入此方程式，可得：
   顯示值 $= 1/1 \times f \times 60 \times 0.1 \times \pi$
   輸入為 1 Hz 時，顯示值為 18.8495 (m/min)。
   K3MA-F 的比例調整設定值必須為整數。同時，為降低誤差，會把比例調整值乘上 1,000，以得到 1000 Hz 的輸入與 18850 的顯示值。然而，因為這個例子中顯示值是顯示到小數點以下一位，所以要依以下的方式設定比例調整才能在 100 Hz 的輸入時可以顯示 18850。

參數	設定值
InP（比例調整輸入值）	100
dSP（比例調整顯示值）	18850
dP（小數點位置）	0000.0

   附註：在此小數點位置是參考比例調整後數字。當設定比例調整值時，必需要考慮到小數點位置設定後的顯示位數。

■疑難排解

當發生錯誤時，將會在主要顯示區顯示錯誤的內容。請由主要顯示區確認錯誤狀況，並採取適當的對策。

階層顯示	主要顯示區	錯誤內容	對策
不亮	$E111$	RAM 記憶體錯誤	需要維修。 請洽 OMRON 代理商。
5	$E111$	EEPROM 記憶體錯誤	顯示這項錯誤時，按住階層鍵（Level Key）3 秒，則將會回復到出廠設定值。 若無法回復，則需要維修。 請洽 OMRON 代理商。
不亮	閃爍 99999	比例調整顯示值超過 99999。	把輸入適當地調整到落在指定的範圍內。
			比例調整值可能並不適當。重新到初始設定階層檢視比例調整值。
不亮	閃爍 -19999	比例調整顯示值低於 -19999。	把輸入適當地調整到落在指定的範圍內。
			比例調整值可能並不適當。重新到初始設定階層檢視比例調整值。

所有尺寸的顯示單位均為厘米。
要把厘米轉換為吋，請乘上 0.03937。要把克轉換為盎斯，請乘上 0.03527。

為利於產品的進步，規格變更恕不另行通知。