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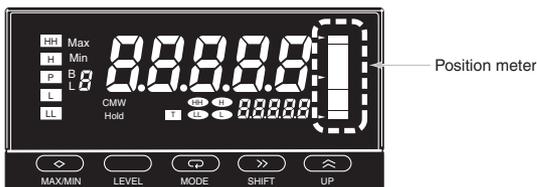
Note: This function is different from the single-LED display of the K3HB-C.

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.

Depth: 95 mm (See note.)

27% shorter than earlier models
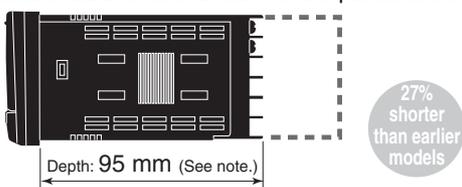
(The depth is 100 mm when mounted to the terminal cover.)

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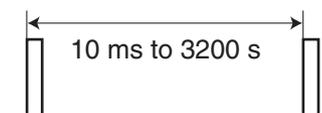
50 kHz High-speed Pulse Measurement (K3HB-R)

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.

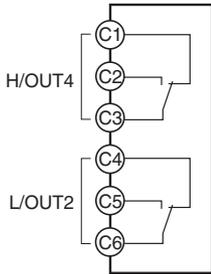**Note:** No-voltage contacts of up to 30 Hz are supported.

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.
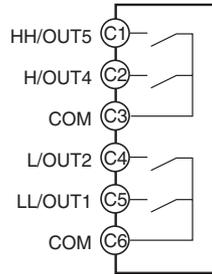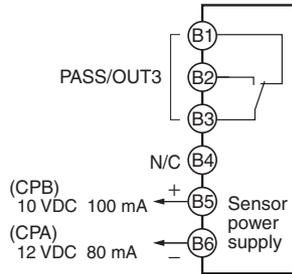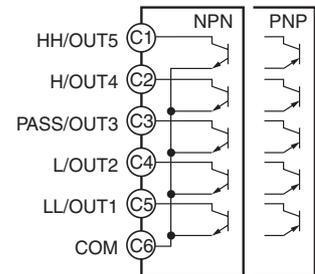
Relay Outputs

Transistor 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

NPN or PNP

NPN | PNP

HH/OUT5 C1
H/OUT4 C2
PASS/OUT3 C3
L/OUT2 C4
LL/OUT1 C5
COM C6

RS-232C or RS-485

PLC

OUT

Select a Comparative Output Suit the Pl...

...eup Includes DeviceNet Models ...nabling 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.

..., L or LL outputs must be set in that order for the zone
...s to output correctly.
...is 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.)

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


Oven   Bread

E6B

K3HB-R
(F6: Passing time mode)
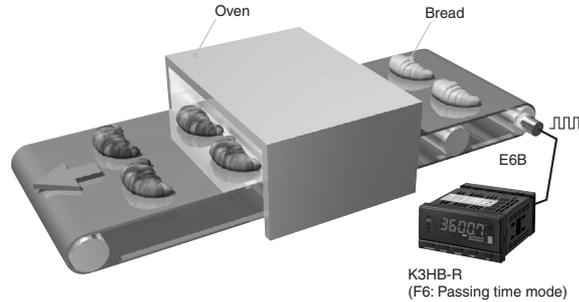
Rotary Pulse Input Model: K3HB-R

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

Proximity sensor
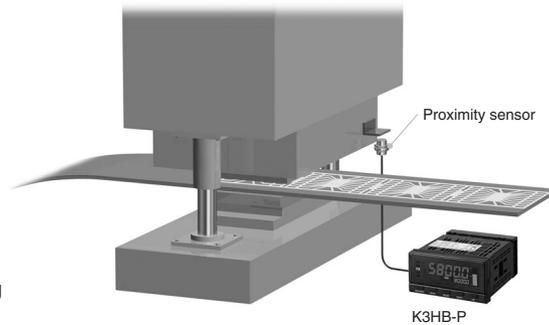
K3HB-P

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

BCD   To Programmable Controller

K3HB-C
(F3: Cumulative mode)

To large display unit
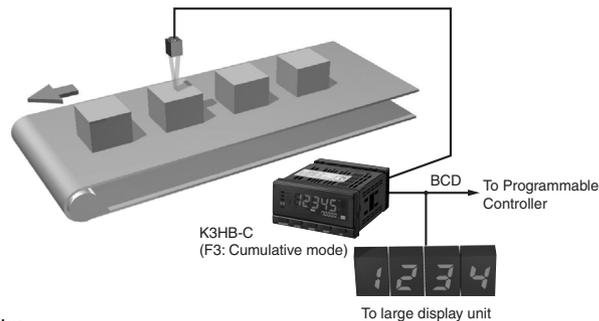
Up/down Counting Pulse Input Model: K3HB-C

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

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.

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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-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.

■ 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)

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_n)

_splayed whenever any input pulse

_on image (application)

→ H

→ PASS

→ L

OK/NG
judgmentM
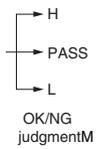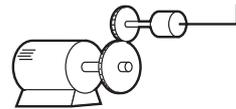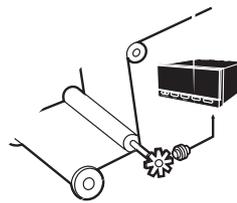
_d/N

_utput
_ons of the input
_and calcul_te the
_ale value _rom the
_owing e___ation:
_splay _alue D = fa × 60 ×

_ength 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
F5 Flow rate ratio	Displays the flow rate ratio of B from inputs A and B (　　) as a ratio (%). 　Display unit: %	Monitoring liquid mixture flow rate ratio
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. N = Pulses per rotation πd = Circumferential length per rotation (m) L = Length of process (m)	Displaying the passing time for a conveyor line
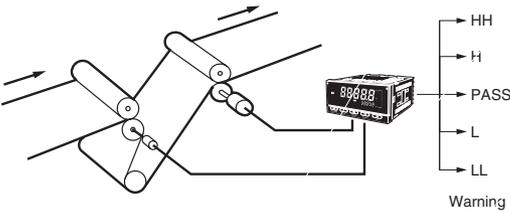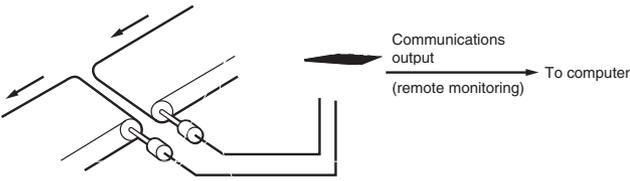
■ What Is Prescaling?

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
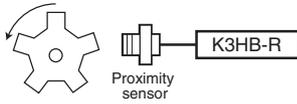
Rotation speed (rpm) = $f \times 60 \times a$

 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
ñīn	Minute display
H.ññ.SS	h.mm.ss display
ññ.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**

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/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, 1.4GHz 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)

Operation

■ Functions (Operating Modes)

F1 to F6

These functions use the internal system clock to measure the time between pulses or the pulse ON time and then display time measurements or a variety of other calculations.

Function name	Function No.
Passing speed	F1
Cycle	F2
Time difference	F3
Time band	F4
Measuring length	F5
Interval	F6

Example: F1 Passing Speed

Input A
Input B
T
Internal system clock
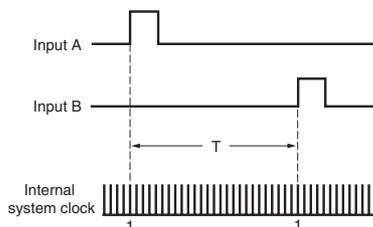
The time (T) between input A pulse and input B pulse is measured by the internal system clock. If, for example, the system clock measures 100,000 counts during time T, then

$T = 1$ system clock count ($0.5\ \mu s$) $\times 100,000$

$T = 0.05\ s$

F1 (the passing speed) is calculated internally using the formula $\frac{1}{T} \times 60$ (m/min), and the display, in this example, would be $\frac{1}{0.05\ s} \times 60 = 1200$ (m/min).

Function	Operation	Operation image (application)
F1 Passing speed	The reciprocal of the time (T) from input A ON to input B ON is multiplied by 60 and displayed. Input A Input B T_1 T_R T_2 T_R T_3 T_R T_4 HOLD input Display $\frac{1}{T_1} \times 60$ $\frac{1}{T_2} \times 60$ $\frac{1}{T_4} \times 60$ • Recovery time (T_R) of 20 ms is required before starting the next measurement. Display unit: mm/s, m/s m/min, km/h, etc.	Measuring workpiece passing speed between A and B
F2 Cycle	Measures and displays input A cycle (T). Input A T_1 T_2 T_3 T_4 T_5 HOLD input Display T_1 T_2 T_5 Measurement range: 20 ms to 3,200 s Display unit: ms, s, min., min.s.1/10 s	Measuring feed cycles for parts
F3 Time difference	Displays the time (T) from input A ON to input B ON. Input A Input B T_1 T_R T_2 T_R T_3 T_R T_4 HOLD input Display T_1 T_3 T_4 Measurement range: 10 ms to 3,200 s • Recovery time (T_R) of 20 ms is required before starting the next measurement. Display unit: ms, s, min., min.s.1/10 s	

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 Communications output
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 BCD → To Programmable Controller	
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 H PASS L OK judgment INA INB Display	

■ 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.

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.

cᴿᵁˡᵁˢ CE ☐ *NEW*

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

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 i	Counting the number of workpieces

Note: 1. Meaning of H and L in Display

Symbol	Input metho
H	
L	

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

Input Type Setting

■ 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 = $2.0000 \times 10°$,
X = 2.000, and Y = 00.

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

OMRON
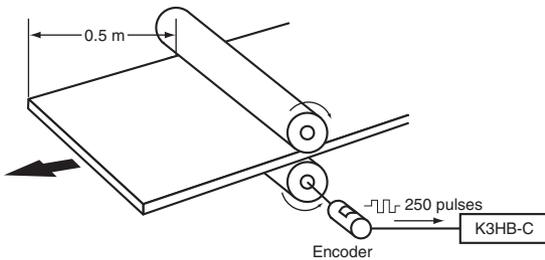
Common Specifications

■ 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.

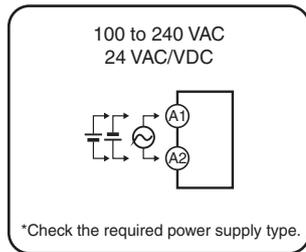| Communications power supply	24-VDC DeviceNet power supply
Allowable voltage fluctuation range	11 to 25-VDC DeviceNet power supply
Current consumption	50 mA max. (24 VDC)
Maximum number of nodes	64 (DeviceNet Configurator is counted as one node when connected.)
Maximum number of slaves	63
Error control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

Connections

■ External Connection Diagrams

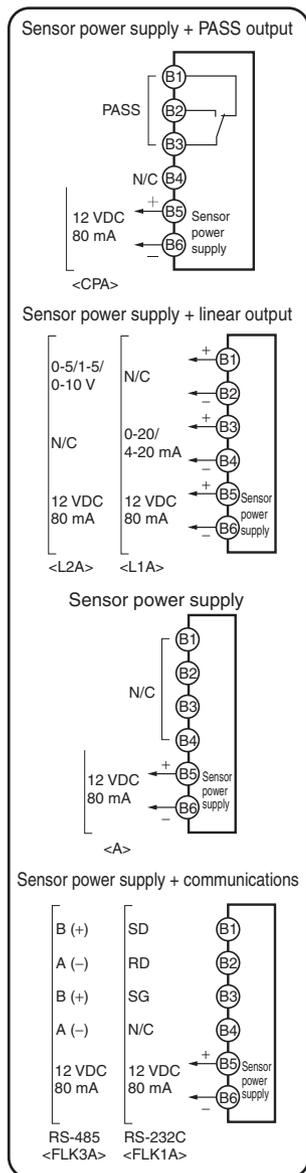### Terminal Arrangements

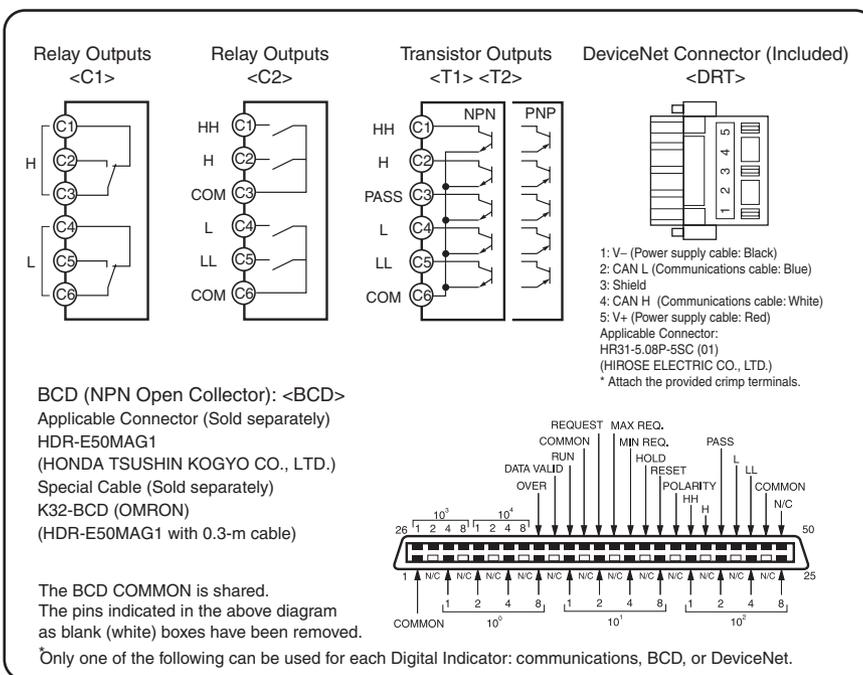**Note:** Refer to "Internal Block Diagram" on page 24 for information on isolation.
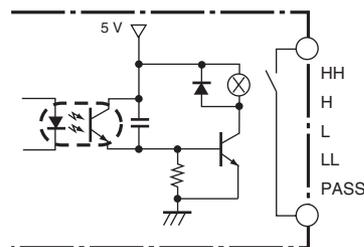
A Operating Power Supply

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

<CPA>

Sensor power supply + linear output

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

<L2A>   <L1A>

Sensor power supply

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

<A>

Sensor power supply + communications

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

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

C Relays, Transistors, BCD and DeviceNet

Relay Outputs <C1>

C1
H   C2
    C3
L   C5
    C6
C4

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

HH
H
L
LL
PASS
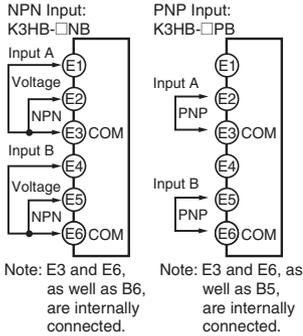
Transistor Outputs
(NPN Open Collector)
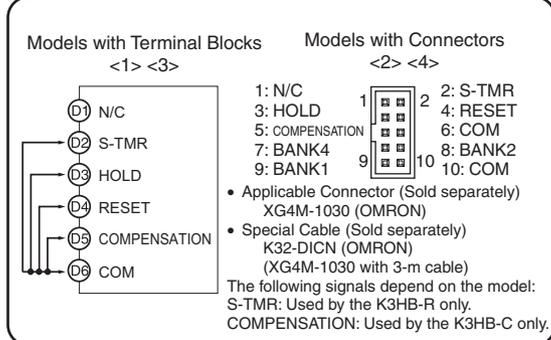
HH
H
L
LL
PASS
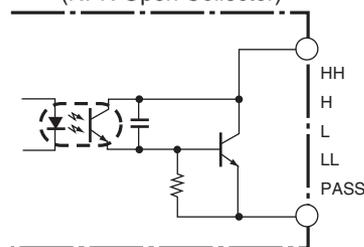
Safety Standards Conformance

• 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.

K3HB-R
K3HB-P
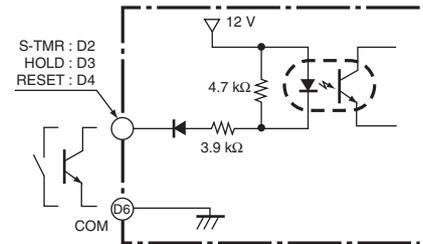K3HB-C

K3HB-R
K3HB-P

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

Input A
Voltage
NPN
Input B
Voltage
NPN

Input A
PNP
Input B
PNP

E1
E2
E3 COM
E4
E5
E6 COM

E1
E2
E3 COM
E4
E5
E6 COM

Note: E3 and E6, as well as B6, are internally connected.

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

NPN Input Model
- NPN input section

12 V
510 Ω
700 Ω
E2, E5
COM
E3, E6

- Voltage pulse input section

12 V
510 Ω
700 Ω
E1, E4
10 kΩ
E3, E6

PNP Input Model

E3, E6
COM
12 V
700 Ω
510 Ω
E2, E5

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
12 V
4.7 kΩ
3.9 kΩ
D6 COM

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 10^0 1 2 4 8 10^1 1 2 4 8 10^2 1 2 4 8 10^3 1 2 4 8 10^4 1 2 4 8 10^4 OVER DATA VALID RUN COMMON REQUEST MAX REQ. MIN REQ. HOLD RESET POLARITY HH H PASS L LL 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)

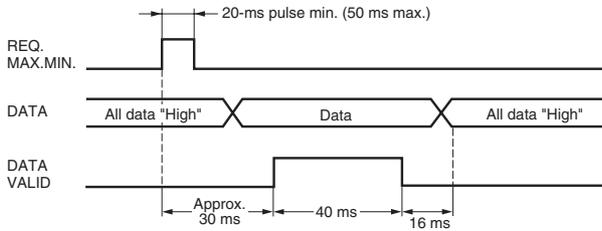| Model	Appearance	Wiring
K32-DICN	9 10 ... 1 2 ... 3,000 mm (3 m) ... Cable marking	Pin No. / Signal name: 1 N/C 2 S-TMR 3 HOLD 4 RESET 5 N/C 6 COM 7 BANK4 8 BANK2 9 BANK1 10 COM

s)

■ BCD Output Timing Chart

A REQUEST signal from a Programmable Controller or other external devic
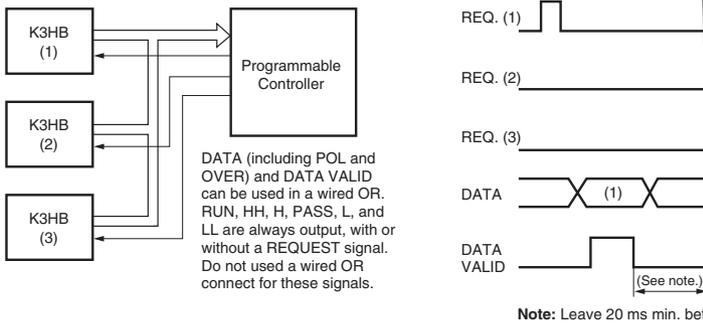
Single Sampling Data Output

```
                20-ms pulse min. (50 ms max.)
REQ.
MAX.MIN. _____|‾|_____

DATA      All data "High"  X    Data    X   All data "High"

DATA
VALID _____|‾‾‾‾‾‾|_____
                Approx.      40 ms    16 ms
                30 ms
```

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
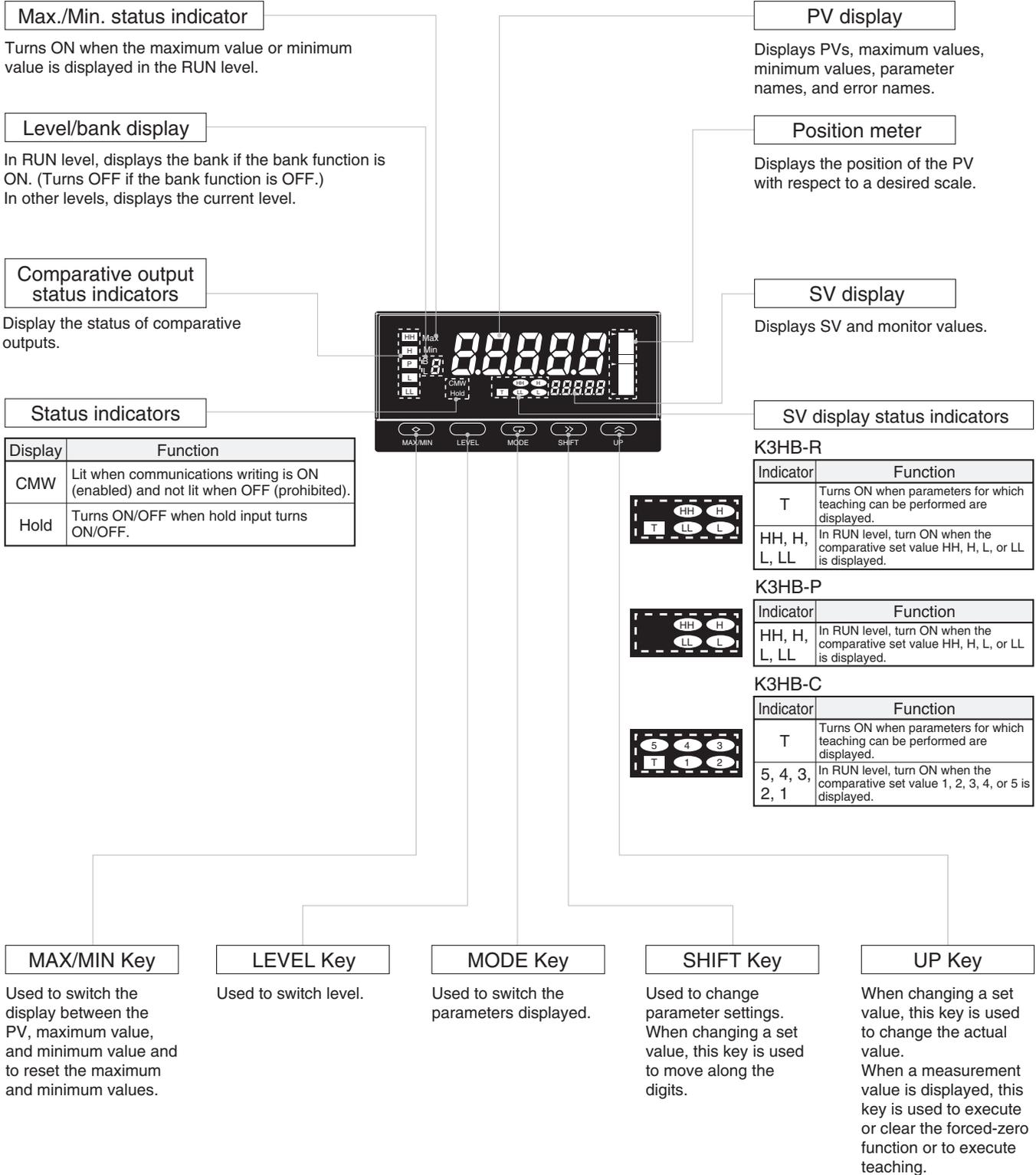turn OFF 16 ms after that.

• The K3HB BCD output model has an open collector output, so wired OR c
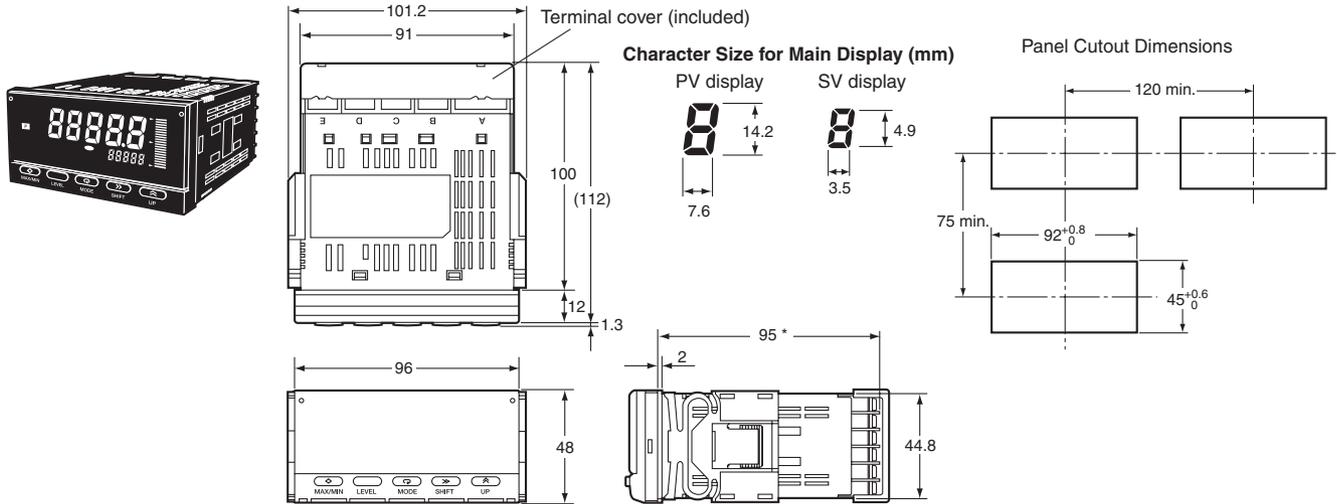
```
K3HB (1) ──┐
           ├──> Programmable
K3HB (2) ──┤     Controller
           │
K3HB (3) ──┘
```

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.

```
REQ. (1) __|‾|_____

REQ. (2) _____

REQ. (3) _____

DATA    ____X  (1)  X_____

DATA
VALID _____|‾|_____
             (See note.)
```

Note: Leave 20 ms min. betw

Programmable Controller Connection Example

Digital Indicator   SYSMAC Programmable Controller
DC Input Unit

OMRON

■ 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

Character Size for Main Display (mm)

PV display — 14.2, 7.6

SV display — 4.9, 3.5

101.2 / 91 — Terminal cover (included)

100 (112)

12 / 1.3

96

48

95 * / 2

44.8

*DeviceNet models: 97 mm

Terminal: M3, Terminal Cover: Accessory

Panel Cutout Dimensions

120 min.

75 min.

$92^{+0.8}_{0}$

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

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.
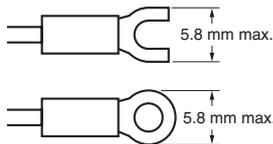
Unit Stickers (included)

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

V̱	A̱	V̌	Ǎ	%	J	Pa	Ω
s	/	N	m	W	℃	m³	k
℉	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
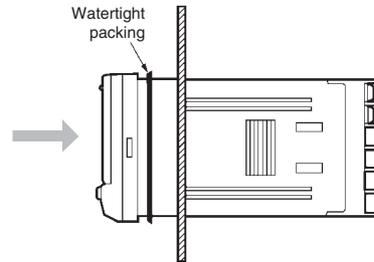
3. Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.

Adaptor
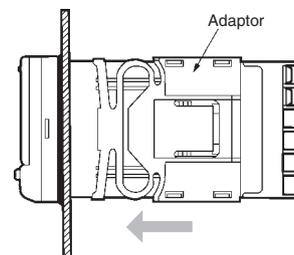
LCD Field of Vision

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

10°
30°
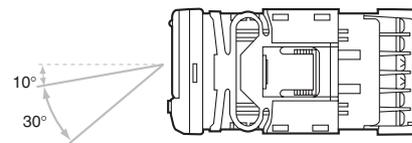
Waterproof Packing

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.

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.ZA, At.Zb` **R**

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

Input Compensation	`ComPn, Com-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 `ōut-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 `PASS` 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, LSEtu, LSEtH, 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 `dɪSP` 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.Aū, PS.AY, 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 `bnP-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 `ōEōō` 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.

# Common Precautions

■ Precautions

WARNING

CAUTION

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 D0(wit)1ng e comatih(and s)-11(n11(e c-1(rges)19(.-v)-Re1

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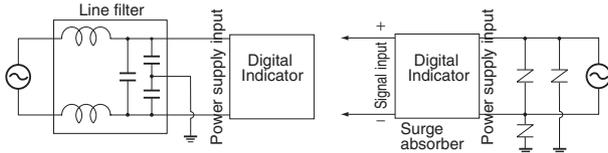
3. In order to prevent inductive noise, wire the lines connected to the terminal block separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using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

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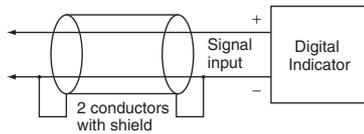
4. If a noise filter is used for the power supply, check the voltage and current, and install the noise filter as close to the product as possible.

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

eJx