

# Up/Down Counting Pulse Indicator K3HB-C

CSM\_K3HB-C\_DS\_E\_12\_1



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

- Visual confirmation of judgement results through display colors that switch between red and green. \*1
- 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.

- DeviceNet models added to the series. \*2

\*1 Visual confirmation of judgement results is not supported on models that do not have an output or models that do not support DeviceNet.  
You can change the display color by setting it, but you cannot switch it based on the judgement results.

\*2 DeviceNet models have a depth of 97 mm.



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

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

## 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 Code

NB: NPN input/voltage pulse 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 Code

None: None

CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC±10%, 80 mA) (See note 1.)

L1A: Linear current output (0 to 20 or 4 to 20 mA DC) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)

L2A: Linear voltage output (0 to 5, 1 to 5, or 0 to 10 VDC) + 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 Code

None: None

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.)

\* A Special BCD Output Cable (sold separately) is required.

##### 4. Event Input Type Code

None: None

1: 5 inputs (M3 terminal block), NPN open collector

2: 8 inputs (10-pin MIL connector), NPN open collector

3: 5 inputs (M3 terminal block), PNP open collector

4: 8 inputs (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

#### Rubber Packing

Model
K32-P1

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

# Specifications

## ■ Ratings

<b>Supply voltage</b>	100 to 240 VAC, 24 VAC/VDC, DeviceNet power supply: 24 VDC	
<b>Allowable power supply voltage range</b>	85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC	
<b>Power consumption (See note 1.)</b>	100 to 240 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)	
<b>Current consumption</b>	DeviceNet power supply: 50 mA max. (24 VDC)	
<b>Input</b>	No-voltage contact, voltage pulse, open collector	
<b>External power supply</b>	12 VDC±10% 80 mA	
<b>Event inputs</b>	<b>Hold input</b>	NPN open collector or no-voltage contact signal
	<b>Reset input</b>	ON residual voltage: 2 V max. ON current at 0 Ω: 4 mA max.
	<b>Bank input</b>	Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.
<b>Output ratings (depends on the model)</b>	<b>Relay output</b>	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations
	<b>Transistor output</b>	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 μA max.
	<b>Linear output</b>	Linear output 0 to 20 mA DC, 4 to 20 mA DC: 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; no output for 0 V or less)
<b>Display method</b>	Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))	
<b>Main functions</b>	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	
<b>Ambient operating temperature</b>	-10 to 55°C (with no icing or condensation)	
<b>Ambient operating humidity</b>	25% to 85%	
<b>Storage temperature</b>	-25 to 65°C (with no icing or condensation)	
<b>Altitude</b>	2,000 m max.	
<b>Accessories</b>	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:**
- 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.
  - For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.



# Operation

## ■ Functions (Operating Modes)

### F1 to F3

Function name	Function No.
Individual inputs	F1
Phase differential inputs	F2
Pulse counting input	F3

Function	Operation	Operation image (application)
F1 Individual inputs	<p>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.</p>	<p>Counting the number of people entering an area</p>
F2 Phase differential inputs	<p>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.</p>	<p>Detecting position and speed on a semiconductor wafer conveyor line</p>
F3 Pulse counting input	<p>Counted on the rising edge of input A</p>	<p>Counting the number of workpieces</p>

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

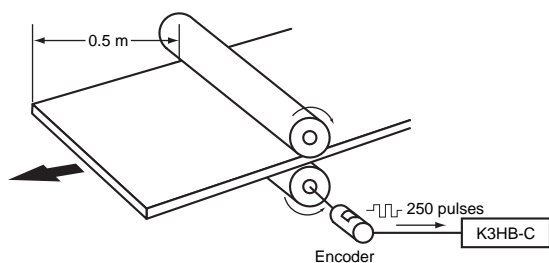
## ■ What Is Prescaling?

Prescaling converts the count value to any numeric value.

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

the length per pulse =  $500 \text{ mm} (0.5 \text{ m}) \div 250 = 2$ .

1. The prescale value for the K3HB-C is set using the mantissa X  $\times$  exponent Y, so the prescale value =  $2.0000 \times 10^0$ ,  
X = 2.000, and Y = 00.
2. Next, set the decimal point position for one digit to the right of the decimal point:  $\square\square\square\square.\square$



## Common Specifications

### ■ Event Input Ratings

<b>K3HB-P/-C</b>	HOLD, RESET, BANK1, BANK2, BANK4
<b>Contact</b>	ON: 1 k $\Omega$ max., OFF: 100 k $\Omega$ min.
<b>No-contact</b>	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, cos $\phi$ =1; 30 VDC, L/R=0 ms)	Inductive loads (250 VAC, closed circuit, cos $\phi$ =0.4; 30 VDC, L/R=7 ms)
<b>Rated load</b>	5 A at 250 VAC 5 A at 30 VDC	1 A at 250 VAC 1 A at 30 VDC
<b>Rated through current</b>	5 A	
<b>Mechanical life expectancy</b>	5,000,000 operations	
<b>Electrical life expectancy</b>	100,000 operations	

#### Transistor Outputs

<b>Maximum load voltage</b>	24 VDC
<b>Maximum load current</b>	50 mA
<b>Leakage current</b>	100 $\mu$ A 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
<b>Allowable load impedance</b>		500 $\Omega$ max.		5 k $\Omega$ min.		
<b>Resolution</b>		Approx. 10,000				
<b>Output error</b>		$\pm$ 0.5% FS		$\pm$ 0.5% FS ( $\pm$ 0.15 V for 1 V or less and no output for 0 V)		

#### Serial Communications Output

Item	Type	RS-232C, RS-485
<b>Communications method</b>	Half duplex	
<b>Synchronization method</b>	Start-stop synchronization (asynchronous)	
<b>Baud rate</b>	9600/19200/38400 bps	
<b>Transmission code</b>	ASCII	
<b>Data length</b>	7 bits or 8 bits	
<b>Stop bit length</b>	2 bits or 1 bit	
<b>Error detection</b>	Vertical parity and FCS	
<b>Parity check</b>	Odd, even	

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

I/O signal name		Item	Rating
<b>Inputs</b>	REQUEST CCOMPEN- 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.
<b>Outputs</b>	DATA POLARITY OVER DATA VALID RUN	Maximum load voltage	24 VDC
		Maximum load current	10 mA
		Leakage current	100 $\mu$ A max.
	OUT1 OUT2 OUT3 OUT4 OUT5	Maximum load voltage	24 VDC
		Maximum load current	50 mA
	Leakage current	100 $\mu$ A max.	

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

## DeviceNet Communications

<b>Communications protocol</b>		Conforms to DeviceNet																		
<b>Supported communications</b>	<b>Remote I/O communications</b>	Master-Slave connection (polling, bit-strobe, COS, cyclic) Conforms to DeviceNet communications standards.																		
	<b>I/O allocations</b>	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.)																		
	<b>Message communications</b>	Explicit message communications CompoWay/F communications commands can be executed (using explicit message communications)																		
<b>Connection methods</b>		Combination of multi-drop and T-branch connections (for trunk and drop lines)																		
<b>Baud rate</b>		DeviceNet: 500, 250, or 125 Kbps (automatic follow-up)																		
<b>Communications media</b>		Special 5-wire cable (2 signal lines, 2 power supply lines, 1 shield line)																		
<b>Communications distance</b>		<table border="1"> <thead> <tr> <th>Baud rate</th> <th>Network length (max.)</th> <th>Drop line length (max.)</th> <th>Total drop line length (max.)</th> </tr> </thead> <tbody> <tr> <td>500 Kbps</td> <td>100 m max. (100 m max.)</td> <td>6 m max.</td> <td>39 m max.</td> </tr> <tr> <td>250 Kbps</td> <td>100 m max. (250 m max.)</td> <td>6 m max.</td> <td>78 m max.</td> </tr> <tr> <td>125 Kbps</td> <td>100 m max. (500 m max.)</td> <td>6 m max.</td> <td>156 m max.</td> </tr> </tbody> </table> <p>The values in parentheses are for Thick Cable.</p>			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.
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<b>Communications power supply</b>		24-VDC DeviceNet power supply																		
<b>Allowable voltage fluctuation range</b>		11 to 25-VDC DeviceNet power supply																		
<b>Current consumption</b>		50 mA max. (24 VDC)																		
<b>Maximum number of nodes</b>		64 (DeviceNet Configurator is counted as one node when connected.)																		
<b>Maximum number of slaves</b>		63																		
<b>Error control checks</b>		CRC errors																		
<b>DeviceNet power supply</b>		Supplied from DeviceNet communications connector																		

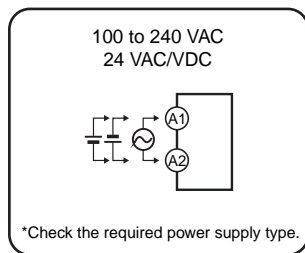
# Connections

## External Connection Diagrams

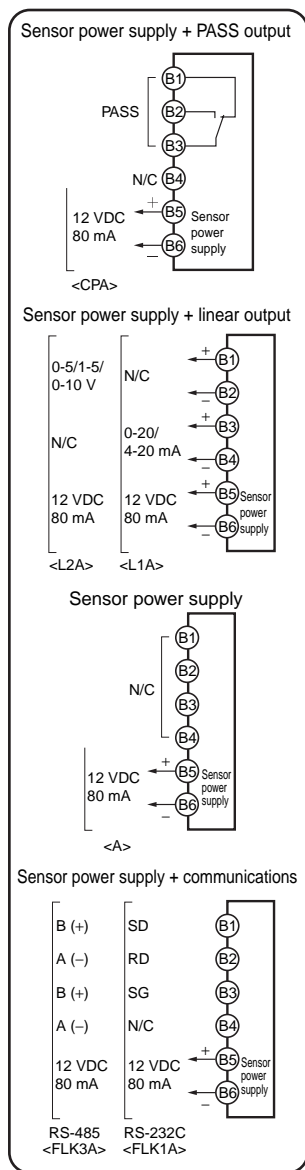
### Terminal Arrangements

Note: Refer to *Internal Block Diagram* on page 10 for information on isolation.

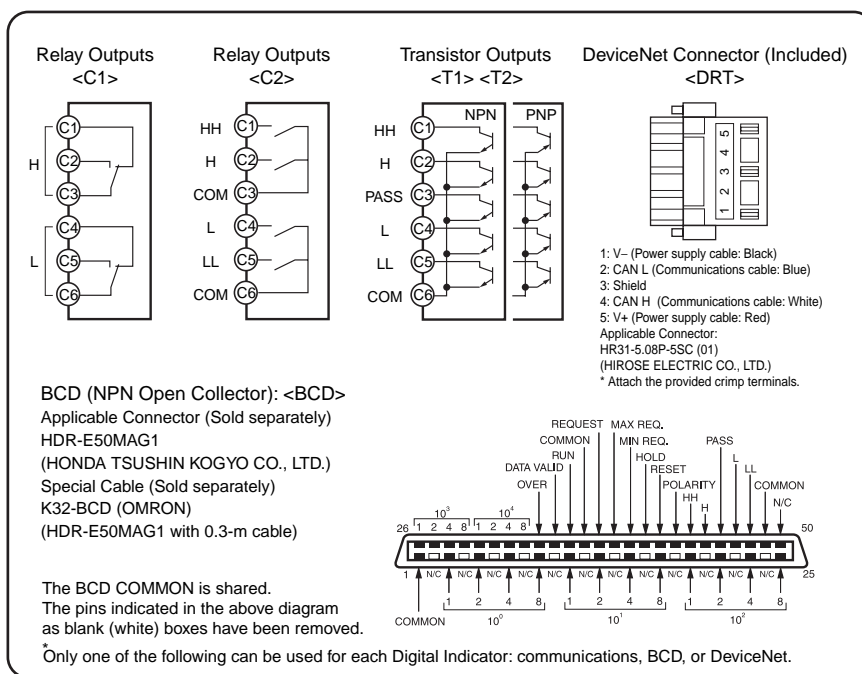
#### A Operating Power Supply



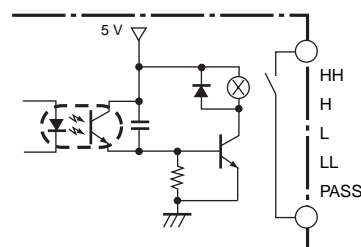
#### B Sensor Power Supply/Output



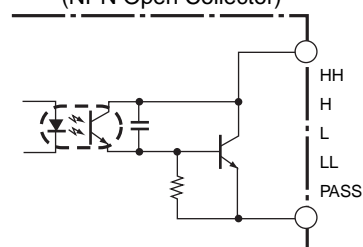
#### C Relays, Transistors, BCD and DeviceNet



#### Contact Outputs

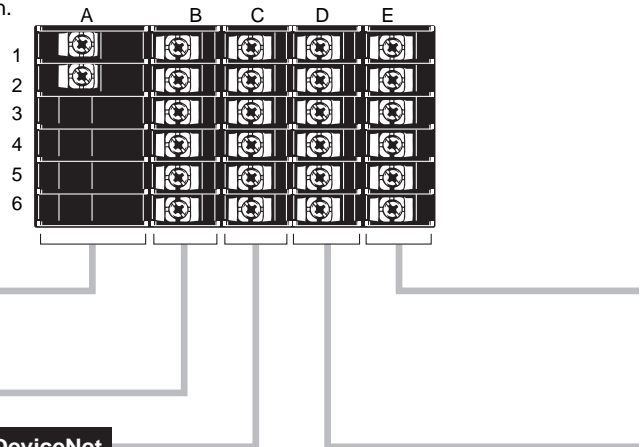


#### Transistor Outputs (NPN Open Collector)



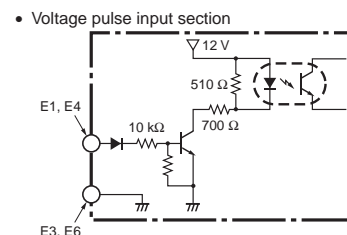
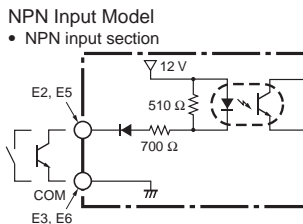
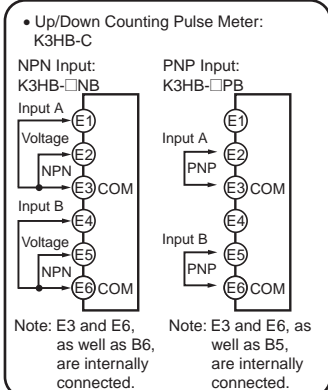
#### Safety Standards Conformance

- 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

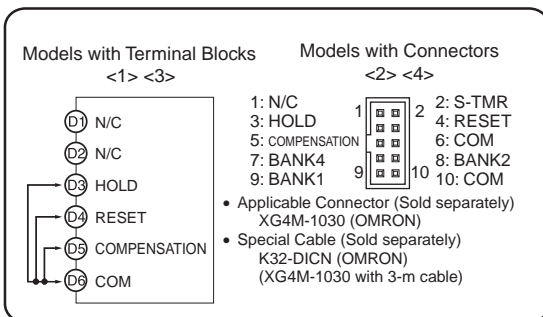


<b>Connectable Sensors</b>	ON residual voltage: 3 V
	OFF leakage current: 1.5 mA max.

<b>Connectable Sensors</b>	ON voltage: 4.5 to 30 V
	OFF voltage: -30 to 2 V

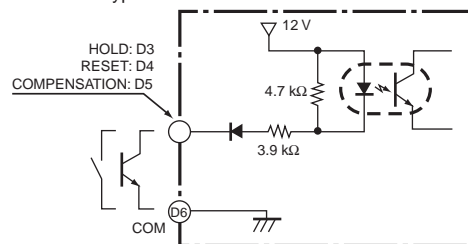
Note: A 2-wire DC sensor can also be connected. Check the ratings and characteristics tables, however, for the connection conditions.

## D Event Inputs



Note: The actual terminal label abbreviates "COMPENSATION" to "CMP."

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



## BCD Output Cable

Model	Shape	Pin arrangement
K32-BCD	<p>Cover: HDR-E50LPA5 (manufactured by Honda Tsushin Co., Ltd.) Connector: HDR-E50MAG1 (manufactured by Honda Tsushin Co., Ltd.)</p> <p>D-sub connector (37-pin female) Cover: 17JE-37H-1A (manufactured by DDK) Connector: Equivalent to 17JE-13370-02 (manufactured by DDK) Stud: 17L-002A (manufactured by DDK)</p>	

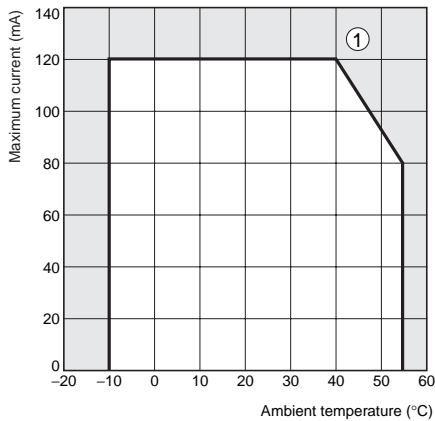
Note: The BCD Output Cable has a D-sub plug. Cover: 17JE-37H-1A (manufactured by DDK); Connector: equivalent to 17JE-23370-02 (D1) (manufactured by DDK)

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

Model	Appearance	Wiring																						
K32-DICN		<table border="1"> <thead> <tr> <th>Pin No.</th> <th>Signal name</th> </tr> </thead> <tbody> <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> </tbody> </table>	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
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9	BANK1																							
10	COM																							

## Derating Curve for Sensor Power Supply (Reference Values)

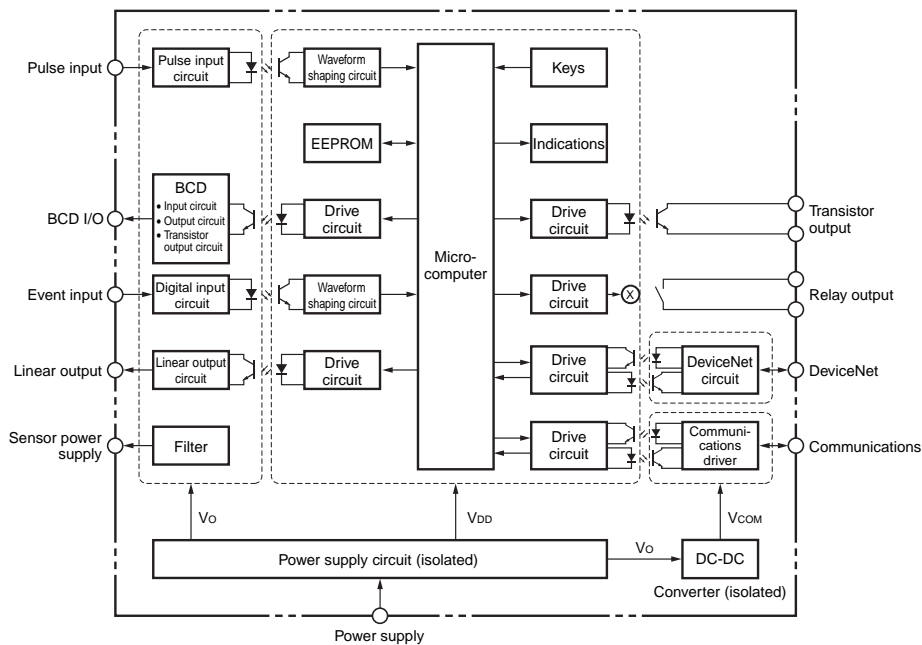
For 12V



**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).

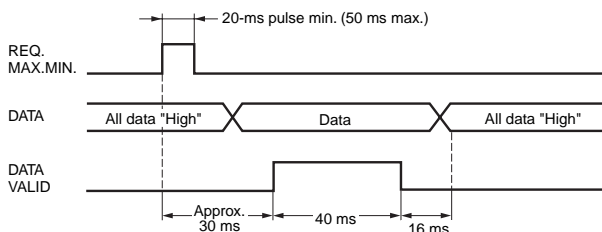
## Internal Block Diagram



## BCD Output Timing Chart

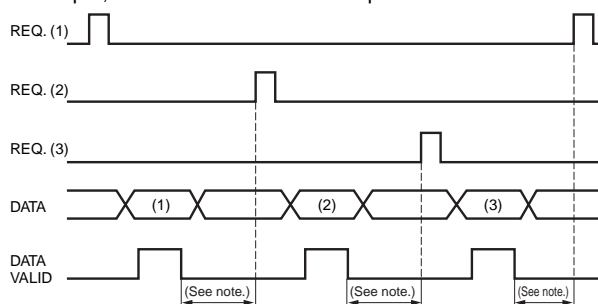
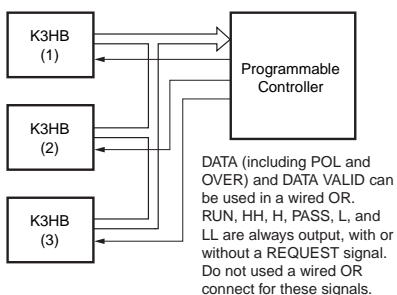
A REQUEST signal from a Programmable Controller or other external device is required to read BCD data.

### Single Sampling Data Output



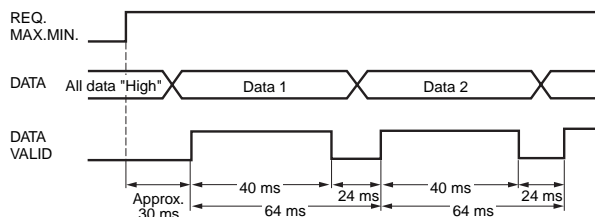
The data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output. When reading the data from a Programmable Controller, start reading the data when the DATA VALID signal turns ON. The DATA VALID signal will turn OFF 40 ms later, and the data will turn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

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



Note: Leave 20 ms min. between DATA VALID turning OFF and the REQUEST signal.

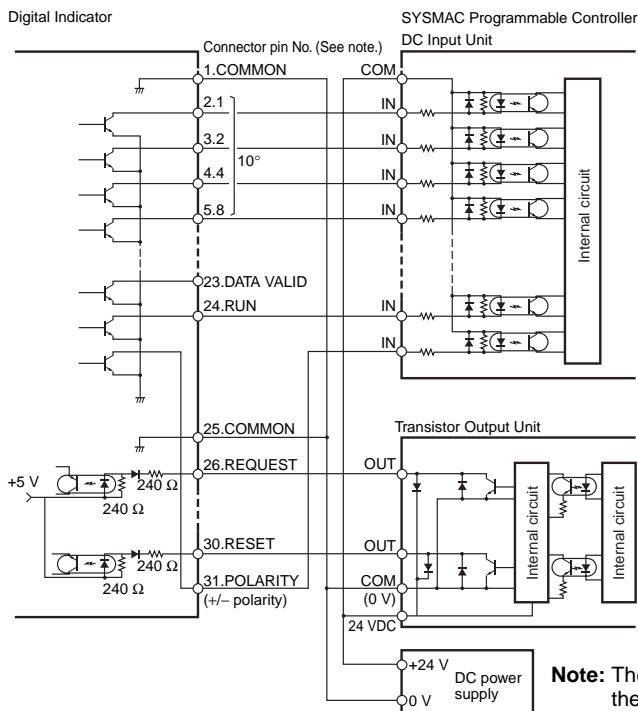
### Continuous Data Output



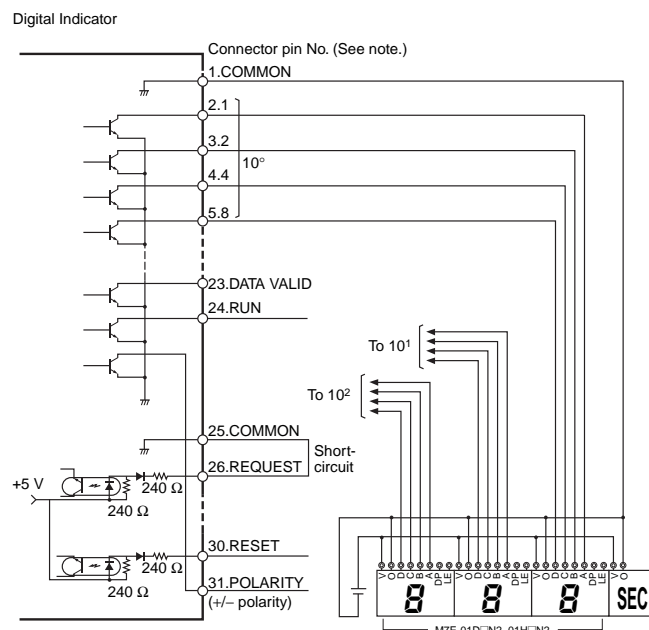
Measurement data is output every 64 ms while the REQUEST signal remains ON.

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.

### Programmable Controller Connection Example



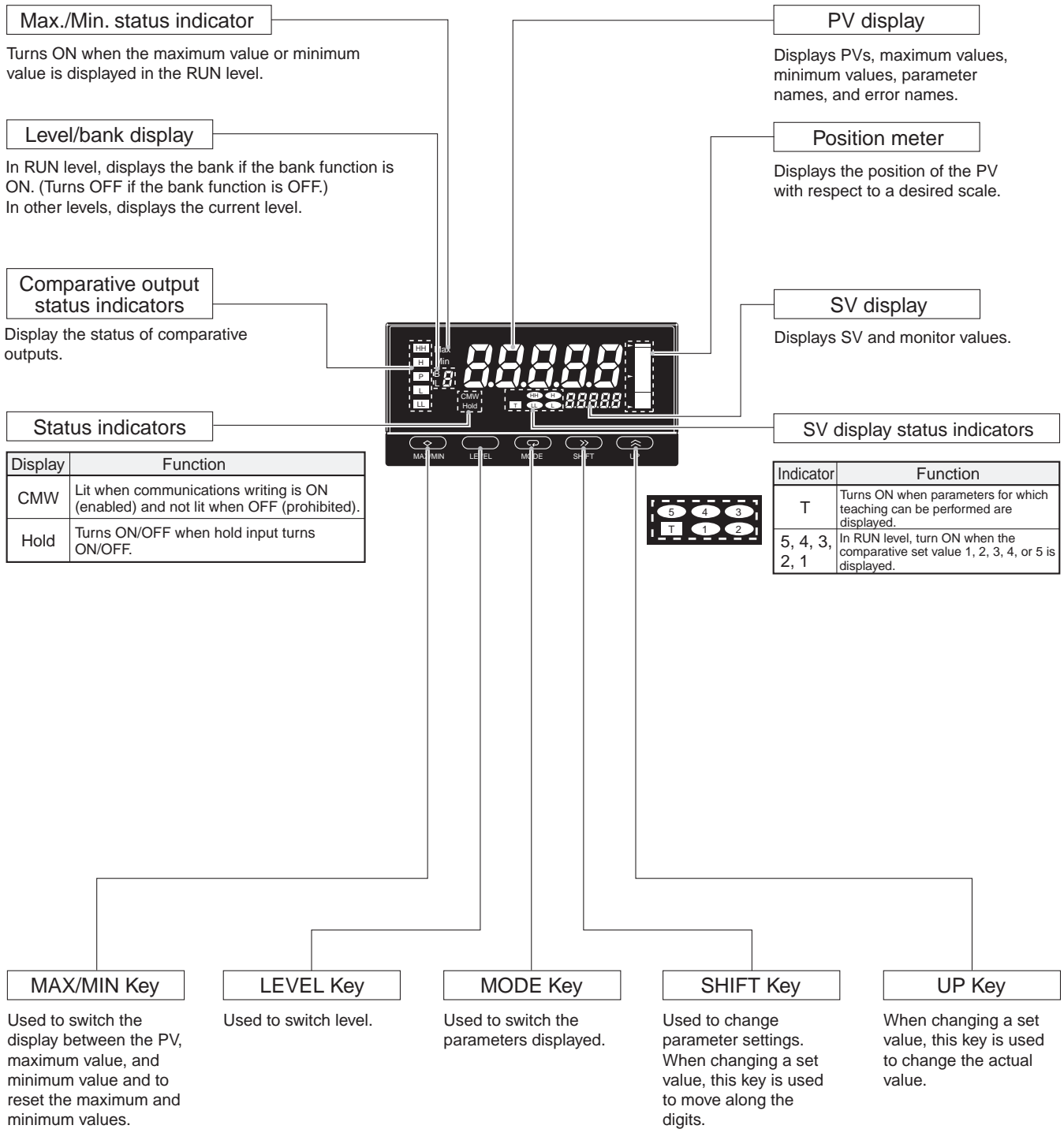
### Display Unit Connection Example



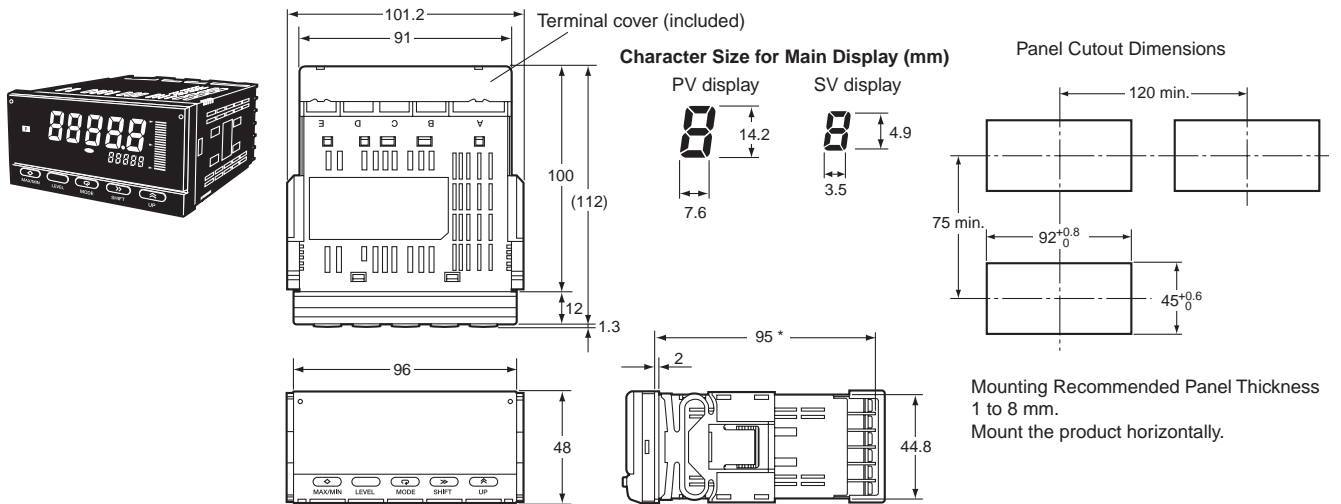
Note: The BCD output connector pin number is the D-sub connector pin number when the BCD Output Cable (sold separately) is connected. This number differs from the pin number for the Digital Indicator narrow pitch connector (manufactured by Honda Tsushin Kogyo Co., Ltd.).

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



## ■ Dimensions



\*DeviceNet models: 97 mm

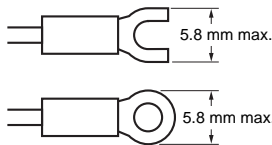
Terminal: M3, Terminal Cover: Accessory

## Wiring Precautions

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

## Wiring

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



## Unit Stickers (included)

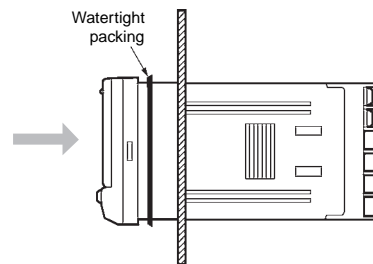
- No unit stickers are attached to the Digital Indicator.
- Select the appropriate units from the unit sticker sheets provided.

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

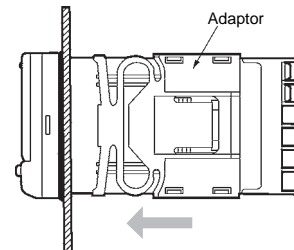
**Note:** For measurements for commercial purposes, be sure to use the unit required by any applicable laws or regulations.

## 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.

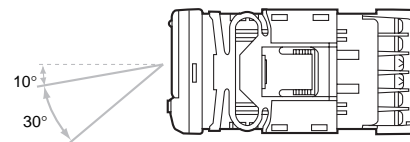


3. Insert the adaptor into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.



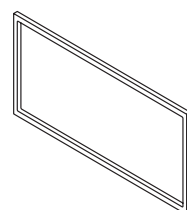
## LCD Field of Vision

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



## Rubber Packing (Sold Separately)

### K32-P1



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

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

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

# Main Functions

## ■ Main Functions and Features

### Measurement

#### Function **FUN**

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

#### Input Types **IN-TR, IN-TB, IN-TR**

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

### Compensation

#### Compensation **COMP, COMP**

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

### Key Operations

#### Teaching

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

#### Key Protection

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

### Outputs

#### Comparative Output Pattern **OUT-P**

Zone and level comparative output patterns can be selected for comparative outputs.

#### Output OFF Delay **OFF-d**

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 **SHOT**

Turns ON the comparative output for a specific time.

#### Output Logic **OUT-n**

Reverses the output logic of comparative results.

#### Output Test **TEST**

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

#### Linear Outputs **LSEEL, LSEEW, LSEEH, LSEEL**

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

#### Standby Sequence **STBY**

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

## Display

### Display Value Selection *dVSP*

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

### Display Color Selection *CLOR*

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*

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*

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

### Prescale *PSRū, PSRY, PSbū, PSbY*

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

### Comparative Set Value Display *Su.dSP*

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

### Display auto-return *rEt*

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

## Other

### Bank Selection *bnY-Œ*

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 *ŒOPY*

Any bank settings can be copied to all banks.

### Interruption Memory *ñEñō*

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

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

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

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