

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.



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 $\pm$ 10% 80 mA
Event inputs	Hold input	NPN open collector or no-voltage contact signal
	Reset input	ON residual voltage: 2 V max. ON current at 0 Ω : 4 mA max.
	Bank input	Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.
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 μ A max.
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 Ω max, Resolution: Approx. 10,000, Output error: $\pm$ 0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 k Ω max, Resolution: Approx. 10,000, Output error: $\pm$ 0.5% FS (1 V or less: $\pm$ 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, re-set
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 <table><tr><th>Mode</th><th>Input frequency range</th><th>ON/OFF pulse width</th><th>ON voltage</th><th>OFF voltage</th><th>Input impedance</th></tr><tr><td>F1</td><td>0 to 30 kHz</td><td>16 μs min.</td><td rowspan="3">4.5 to 30 V</td><td rowspan="3">-30 to 2 V</td><td rowspan="3">10 kΩ</td></tr><tr><td>F2</td><td>0 to 25 kHz</td><td>20 μs min.</td></tr><tr><td>F3</td><td>0 to 50 kHz</td><td>9 μs min.</td></tr></table>						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.
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		F3	0 to 50 kHz	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.																							
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/s², 10 sweeps of 5 min each in X, Y, and Z directions																							
Shock resistance		150 m/s² (100 m/s² for relay outputs) 3 times each in 3 axes, 6 directions																							
Weight		Approx. 300 g (Base Unit only)																							
Degree of protection	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)																							
	Rear case	IP20																							
	Terminals	IP00 + finger protection (VDE0106/100)																							
Memory protection		EEPROM (non-volatile memory) Number of rewrites: 100,000																							
Applicable standards		UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001																							
EMC		EMI: EN61326+A1 industrial applications Electromagnetic radiation interference CISPR 11 Group 1, Class A: CISPR16-1/-2 Terminal interference voltage CISPR 11 Group 1, Class A: CISPR16-1/-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	F1
Phase differential inputs	F2
Pulse counting input	F3

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

Note: 1. Meaning of H and L in Display

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

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

Input Type Setting

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

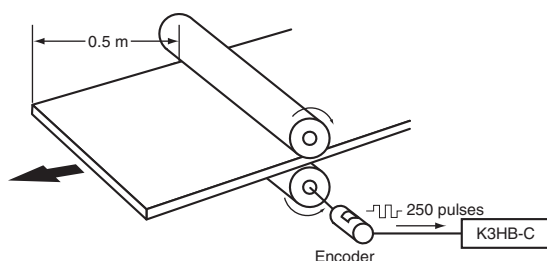
■ What Is Prescaling?

Prescaling converts the count value to any numeric value.

To display $\square\square\square.\square$ 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 = 2.0000×10^0 ,
 $X = 2.000$, and $Y = 00$.
2. Next, set the decimal point position for one digit to the right of the decimal point: $\square\square\square.\square$



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 k Ω max., OFF: 100 k Ω 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, $\cos\phi=1$; 30 VDC, L/R=0 ms)	Inductive loads (250 VAC, closed circuit, $\cos\phi=0.4$; 30 VDC, L/R=7 ms)
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 μ 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
Allowable load impedance		500 Ω max.		5 k Ω min.		
Resolution		Approx. 10,000				
Output error		$\pm 0.5\%$ FS		$\pm 0.5\%$ 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 μ A 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 μ A 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		<table><tr><th>Baud rate</th><th>Network length (max.)</th><th>Drop line length (max.)</th><th>Total drop line length (max.)</th></tr><tr><td>500 Kbps</td><td>100 m 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></table> The values in parentheses are for Thick Cable.				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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125 Kbps	100 m max. (500 m max.)	6 m max.	156 m max.																		
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

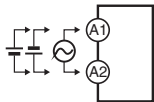
External Connection Diagrams

Terminal Arrangements

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

A Operating Power Supply

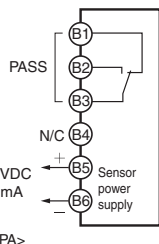
100 to 240 VAC
24 VAC/VDC



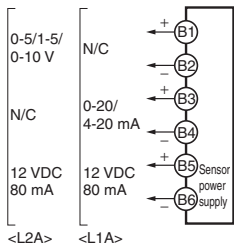
*Check the required power supply type.

B Sensor Power Supply/Output

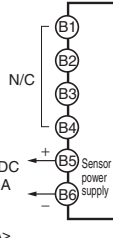
Sensor power supply + PASS output



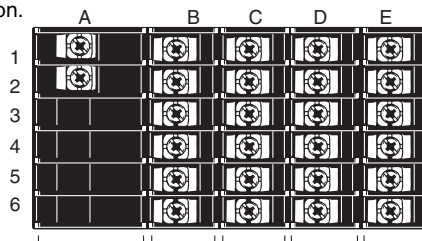
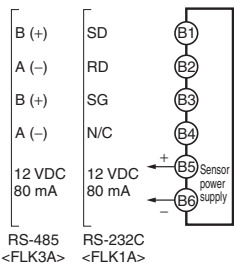
Sensor power supply + linear output



Sensor power supply

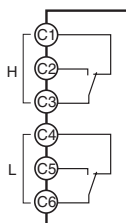


Sensor power supply + communications

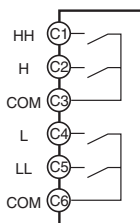


C Relays, Transistors, BCD and DeviceNet

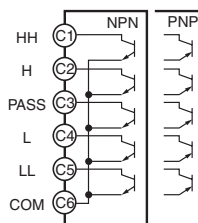
Relay Outputs
<C1>



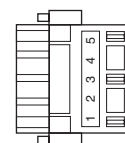
Relay Outputs
<C2>



Transistor Outputs
<T1> <T2>



DeviceNet Connector (Included)
<DRT>

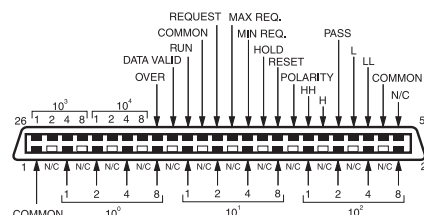


1: V- (Power supply cable: Black)
2: CAN L (Communications cable: Blue)
3: Shield
4: CAN H (Communications cable: White)
5: V+ (Power supply cable: Red)
Applicable Connector:
HR31-5.08P-5SC (01)
(HIROSE ELECTRIC CO., LTD.)
* Attach the provided crimp terminals.

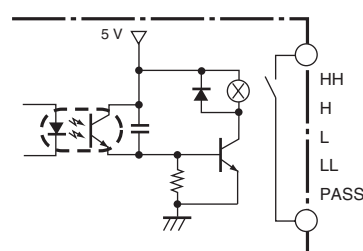
BCD (NPN Open Collector): <BCD>
Applicable Connector (Sold separately)
HDR-E50MAG1
(HONDA TSUSHIN KOGYO CO., LTD.)
Special Cable (Sold separately)
K32-BCD (OMRON)
(HDR-E50MAG1 with 0.3-m cable)

The BCD COMMON is shared.
The pins indicated in the above diagram
as blank (white) boxes have been removed.

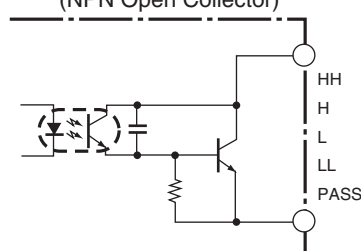
Only one of the following can be used for each Digital Indicator: communications, BCD, or DeviceNet.



Contact Outputs

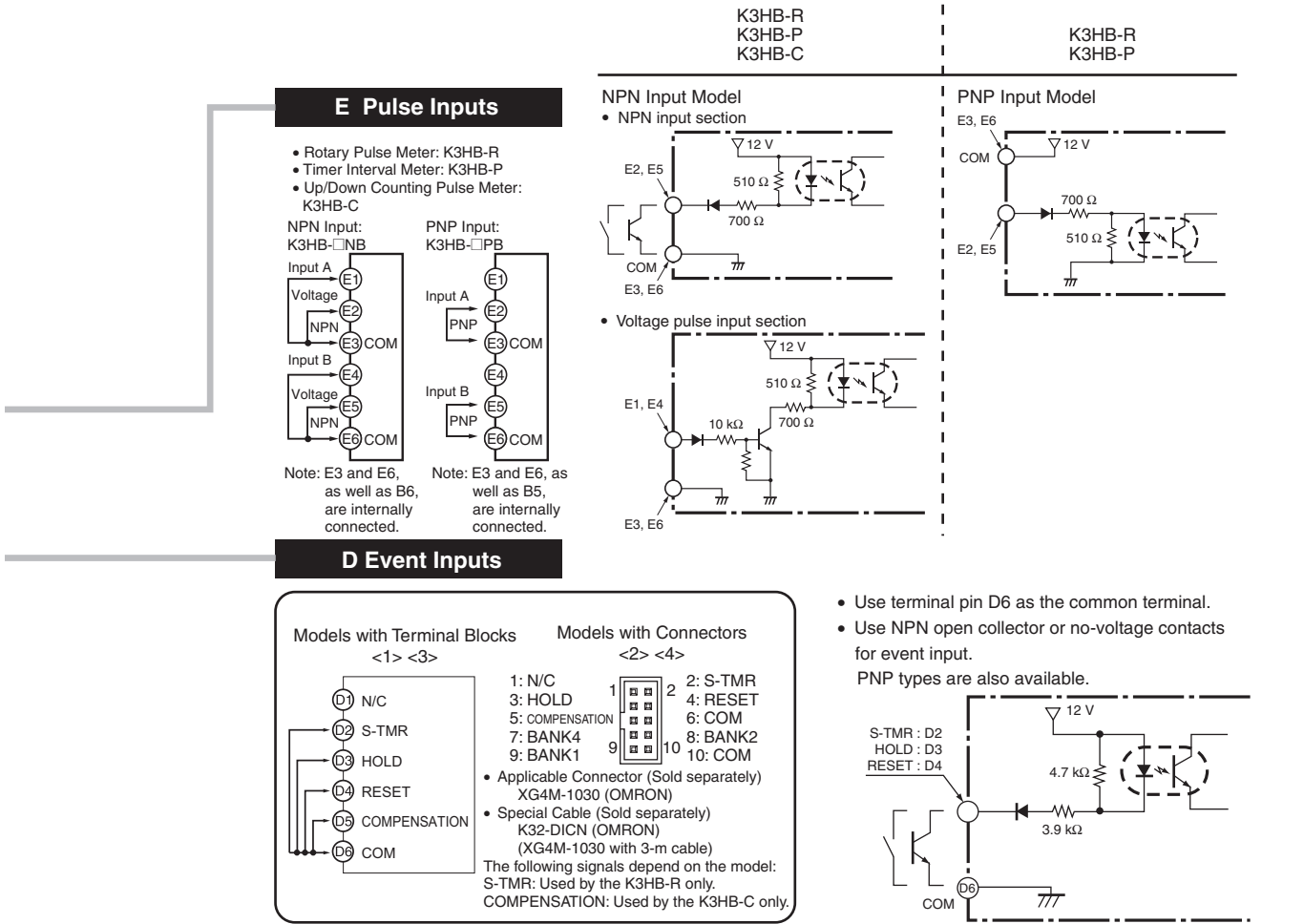


Transistor Outputs
(NPN Open Collector)



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.

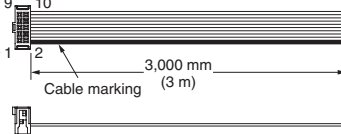


BCD Output Cable

Model	Shape	Pin arrangement
K32-BCD	K3HB end Connected device end (PLC, display device, etc.) 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)	

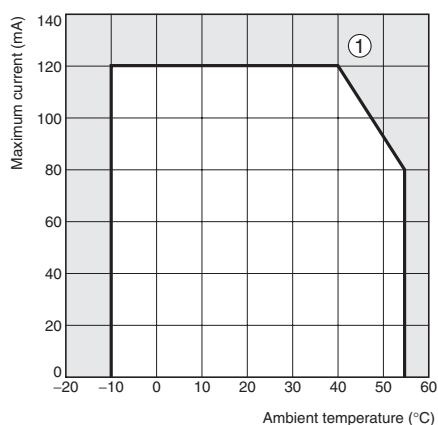
Note: The BCD Output Cable has a D-sub plug. Cover: 17JE-37H-1A (manufactured by DDK); Connector: equivalent to 17JE-23370-02 (D1) (manufactured by DDK)

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

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

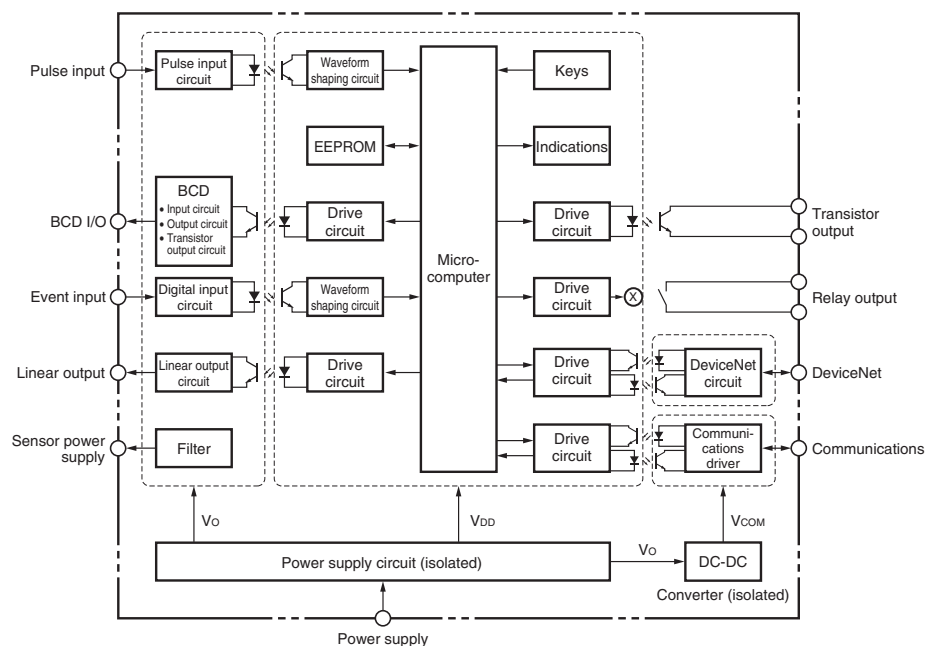
Derating Curve for Sensor Power Supply (Reference Values)

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).

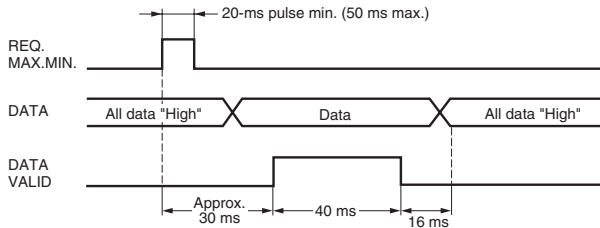
Internal Block Diagram



BCD Output Timing Chart

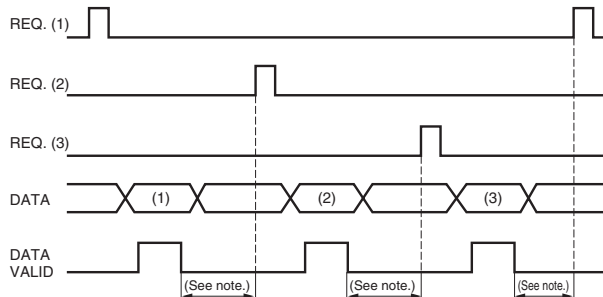
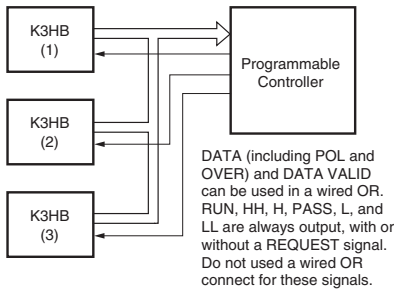
A REQUEST signal from a Programmable Controller or other external device is required to read BCD data.

Single Sampling Data Output



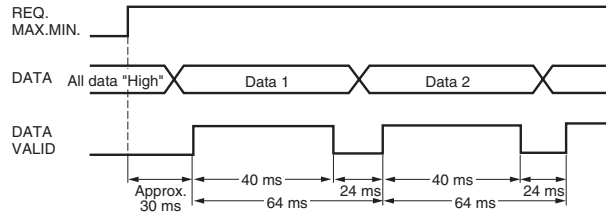
The data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output. When reading the data from a Programmable Controller, start reading the data when the DATA VALID signal turns ON. The DATA VALID signal will turn OFF 40 ms later, and the data will turn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

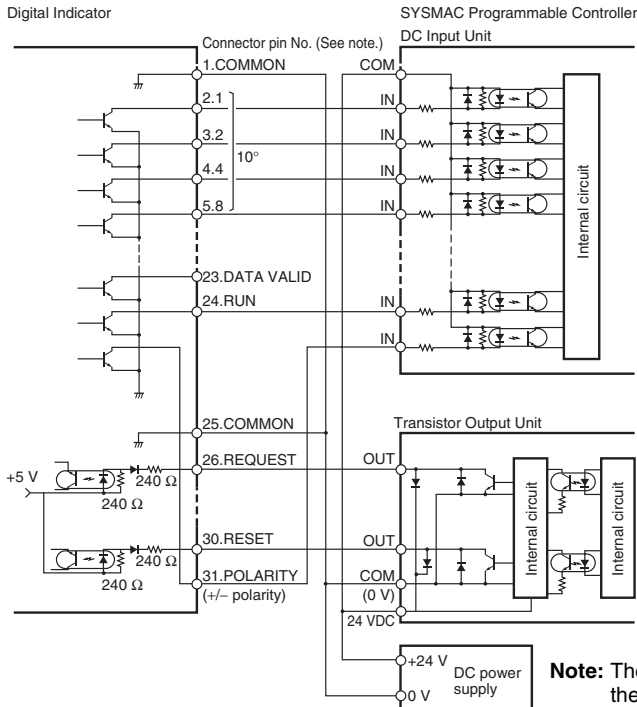
Continuous Data Output



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

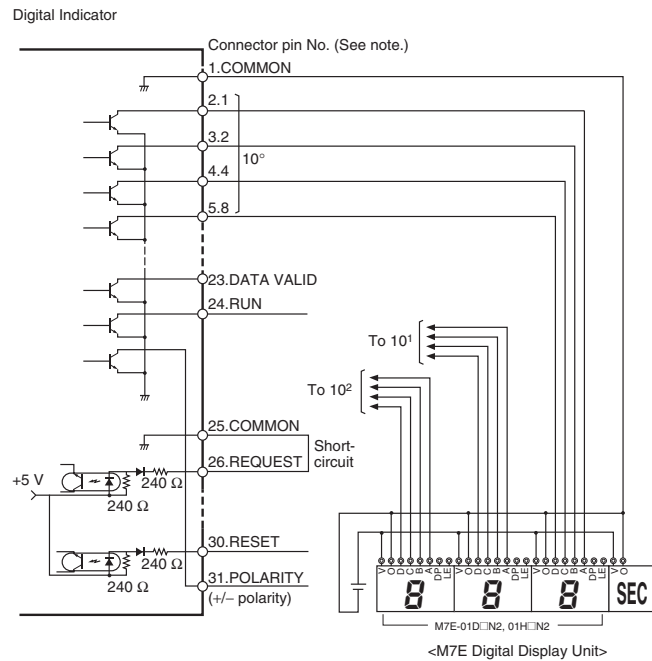
Note: If HOLD is executed when switching between data 1 and data 2, either data 1 or data 2 is output depending on the timing of the hold signal. The data will not go LOW.

Programmable Controller Connection Example



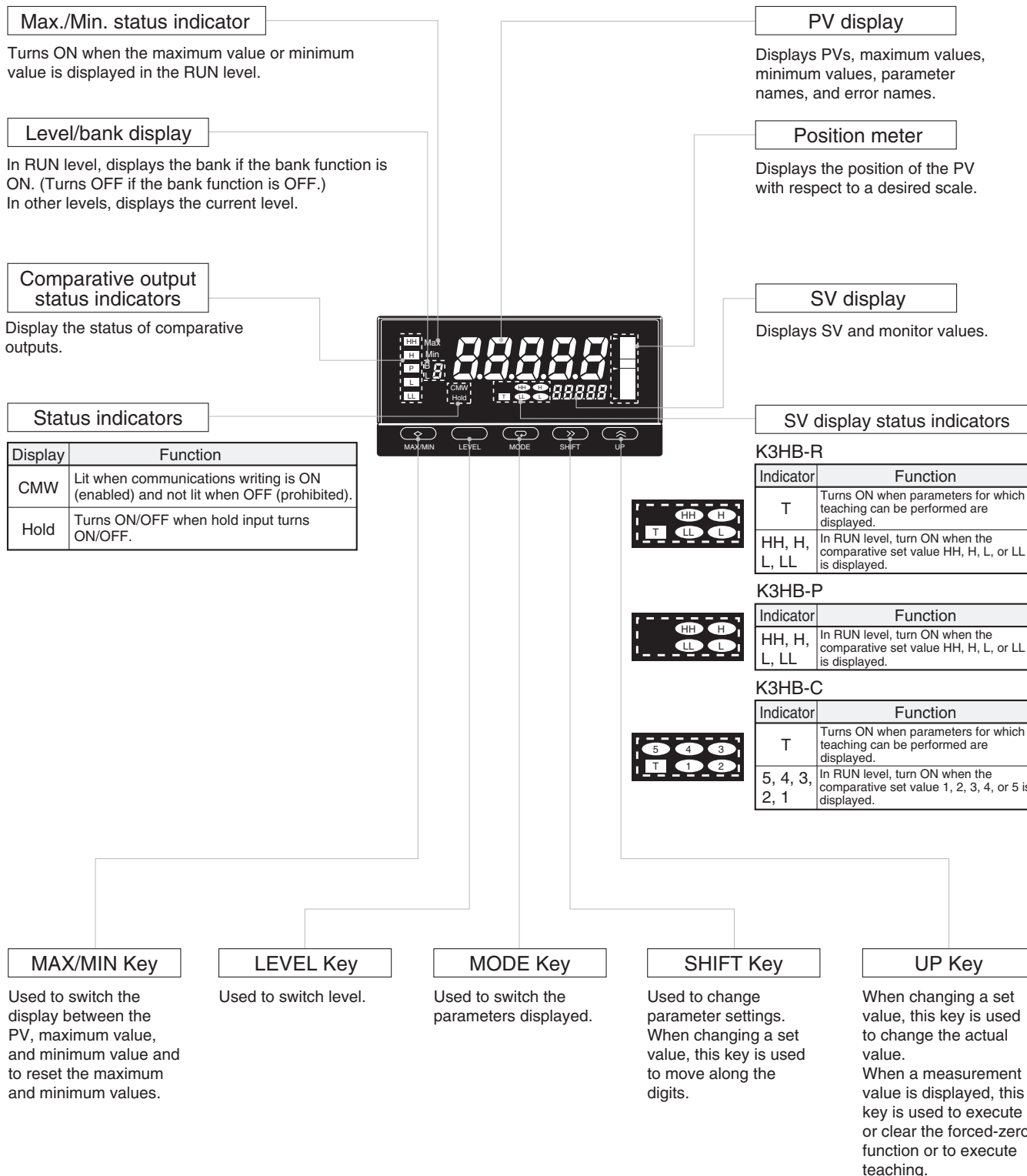
Note: The BCD output connector pin number is the D-sub connector pin number when the BCD Output Cable (sold separately) is connected. This number differs from the pin number for the Digital Indicator narrow pitch connector (manufactured by Honda Tsushin Kogyo Co., Ltd.).

Display Unit Connection Example

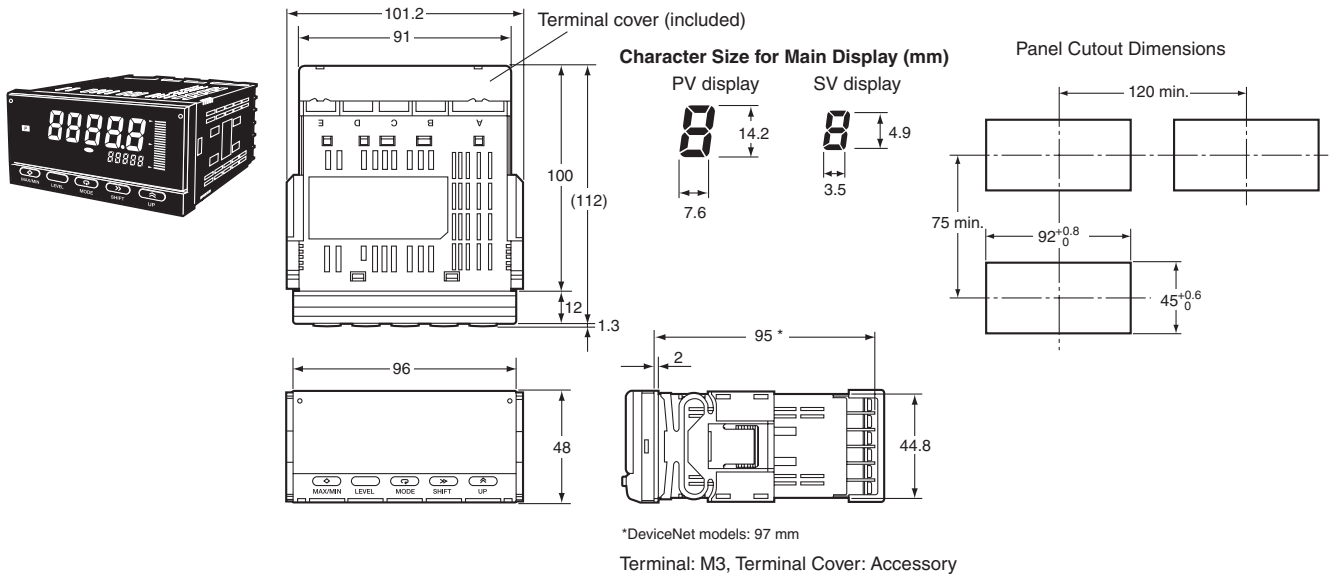


Refer to the following User's Manual for application precautions and other information required when using the Digital Indicator:
K3HB-R/P/C Digital Indicator User's Manual (Cat. No. N136)
The manual can be downloaded from the following site in PDF format: OMRON Industrial Web <http://www.fa.omron.co.jp>

Component Names and Functions



■ Dimensions

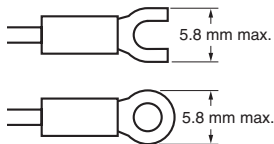


Wiring Precautions

- 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.

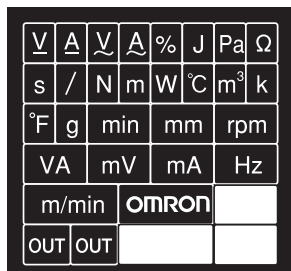
Wiring

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



Unit Stickers (included)

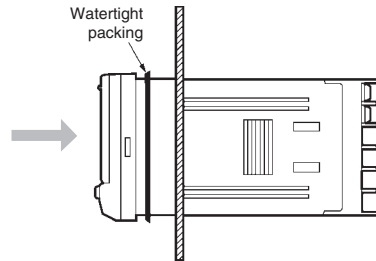
- No unit stickers are attached to the Digital Indicator.
- Select the appropriate units from the unit sticker sheets provided.



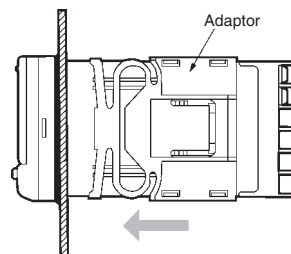
Note: For measurements for commercial purposes, be sure to use the unit required by any applicable laws or regulations.

Mounting Method

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

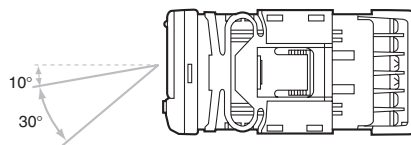


- Insert the adaptor into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.



LCD Field of Vision

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



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.