Weighing Indicator
K3HB-V

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

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

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-V□ □
1 5

1. Input Sensor Code

LC: Load cell input (DC low-voltage input)

5. Supply Voltage

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

Base Units with Optional Boards

K3HB-V□-□□□ □
1 2 3 4 5

2. Sensor Power Supply/Output Type Code

None:	None
CPB:	Relay output (PASS: SPDT) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 1.)
L1B:	Linear current output (0 to 20 or 4 to 20 mA DC) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
L2B:	Linear voltage output (0 to 5, 1 to 5, or 0 to 10 VDC) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
B:	Sensor power supply (10 VDC +/–5%, 100 mA)
FLK1B:	Communications (RS-232C) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
FLK3B:	Communications (RS-485) + Sensor power supply (10 VDC +/–5%, 100 mA) (See note 2.)
CPE:	Relay output (PASS: SPDT) + Sensor power supply (5 VDC +/-5%, 100 mA)
E:	None (5 VDC +/-5%, 100 mA)
FLK1E:	Communications (RS-232C) + Sensor power supply (5 VDC +/-5%, 100 mA)
FLK3E:	Communications RS-485) + Sensor power supply (5 VDC +/-5%, 100 mA)
L1E:	Linear Current (0 to 20 or 4 to 20 mA DC) + Sensor power supply (5 VDC +/-5%, 100 mA)
L2E:	Linear voltage (0 to 5 VDC, 1 to 5 VDC, or 0 to 10 VDC) (5 VDC +/-5%, 100 mA)

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

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Optional Boards

Sensor Power Supply/Output Boards

K33-□
2

Relay/Transistor Output Boards

K34-□
3

Event Input Boards

K35-□
4

3. Relay/Transistor Output Type Code

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

4. Event Input Type Code

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

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

Accessories (Sold Separately)

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

Specifications

■ Ratings

Power supply voltage		100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC
Allowable power supply voltage range		85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC
Power consumption (See note 1.)		100 to 240 V: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)
Current consumption		DeviceNet power supply: 50 mA max. (24 VDC)
Input		DC voltage
A/D conversion method		Delta-Sigma method
External power supply		10 VDC ±5%, 100 mA (models with external power supply only) or 5 VDC, 100 mA (models with external power supply only)
Event inputs (See note 2.)	**Timing input**	NPN open collector or no-voltage contact signal ON residual voltage: 3 V max. ON current at 0 Ω: 17 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 1.5 mA max.
	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	
	Forced-zero 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 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)
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, forced-zero, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset
Ambient operating temperature		−10 to 55°C (with no icing or condensation)
Ambient operating humidity		25% to 85%
Storage temperature		−25 to 65°C (with no icing or condensation)
Altitude		2,000 m max.
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, operation manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.)

Note: **1.** DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.
2. PNP input types are also available.
3. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

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■ Characteristics

Display range		−19,999 to 99,999
Sampling period		20 ms (50 times/second)
Comparative output response time		100 ms max.
Linear output response time		150 ms max.
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		2,300 VAC for 1 min between external terminals and case
Noise immunity		100 to 240 VAC models: ±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 industrial applications Electromagnetic radiation interference CISPR 11 Group 1, Class A Terminal interference voltage CISPR 11 Group 1, Class A EMS: EN61326 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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■ Input Ranges (Measurement Range and Accuracy)

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

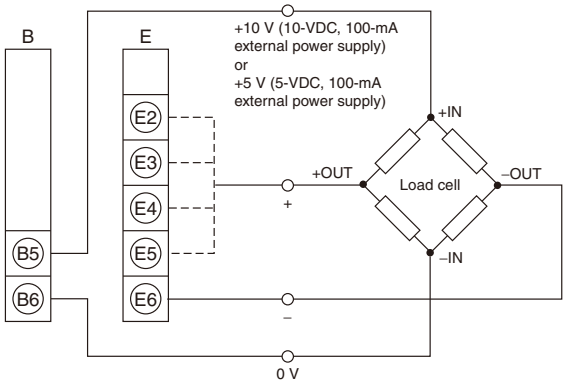
Note: 1. The accuracy is for an ambient temperature of 23±5°C. For all ranges,10% or less of max. input ±0.1% FS.

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

Input type	A LC	b LC	C LC	d LC
Connected terminals	(E2) – (E6)	(E3) – (E6)	(E4) – (E6)	(E5) – (E6)
(mV) 200.000	199.99			199.99
150.000				
100.000			100.00	
50.000		19.999		
0.00	0.00	0.000		
–50.00				
–100.00			–100.00	
–150.00				
–200.00				–199.99

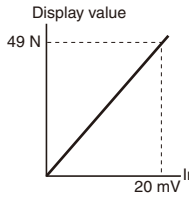
The area shown in dark shading indicates the factory setting.

■ Load Cell Wiring Example



■ Scaling Example Using Range A

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



Scaling values:
InPA1=000.00
dSPA1=00000
InPA2=020.00
dSPA2=49000
dP decimal point position: 00.000

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

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Common Specifications

■ Event Input Ratings

Input type	S-TMR, HOLD, RESET, ZERO, BANK1, BANK2, BANK4	TIMING
Contact	ON: 1 kΩ max., OFF: 100 kΩ min.	---
No-contact	ON residual voltage: 2 V max. OFF leakage current: 0.1 mA max. Load current: 4 mA max. Maximum applied voltage: 30 VDC max.	ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: 17 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	5A	
Mechanical life expectancy	5,000,000 operations	
Electrical life expectancy	100,000 operations	

Transistor Output

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

Linear Output

Item	0 to 20 mA	4 to 20 mA	0 to 5 V	1 to 5 V	0 to 10 V
Allowable load impedance	500 Ω max.		5 kΩ min.		
Resolution	Approx. 10,000				
Output error	±0.5%FS		±0.5%FS (1 V or less: no output for ±0.15 V; 0 V or less)		

Serial Communications Output

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

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

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

I/O signal name		Item		Rating
Inputs	REQUEST HOLD MAX MIN 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.
	HH H PASS L LL	Maximum load voltage		24 VDC
		Maximum load current		50 mA
		Leakage current		100 μA max.

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

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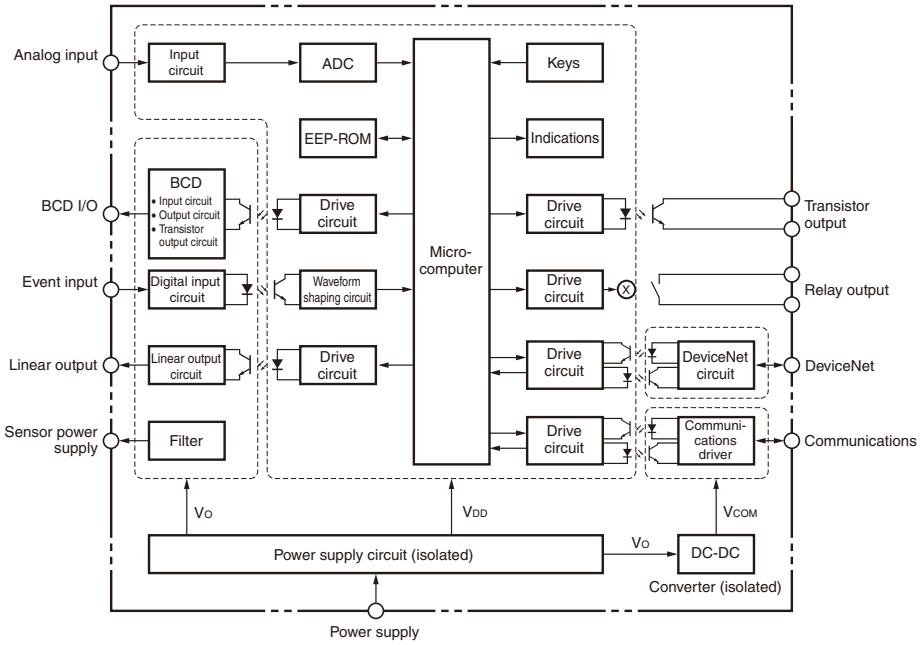
DeviceNet Communications

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 (100 m)</td><td>6 m</td><td>39 m</td></tr><tr><td>250 Kbps</td><td>100 m (250 m)</td><td>6 m</td><td>78 m</td></tr><tr><td>125 Kbps</td><td>100 m (500 m)</td><td>6 m</td><td>156 m</td></tr></table>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

■ Internal Block Diagram



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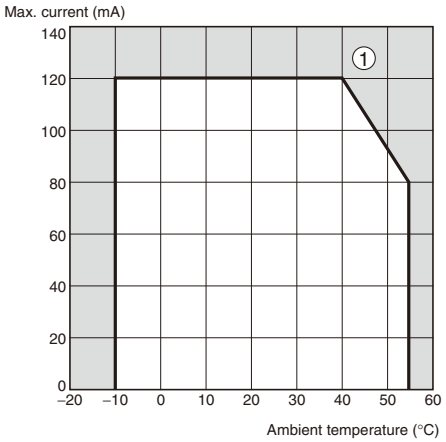
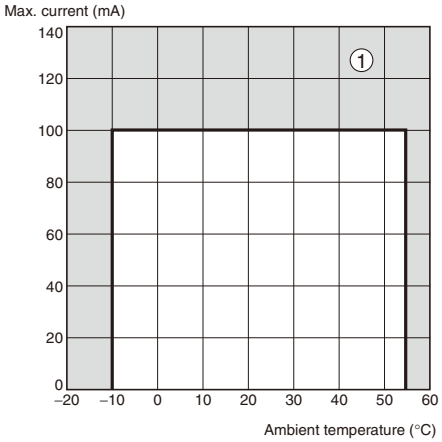
■ Power Supply Derating Curve for Sensor (Reference Value)

With 12 V



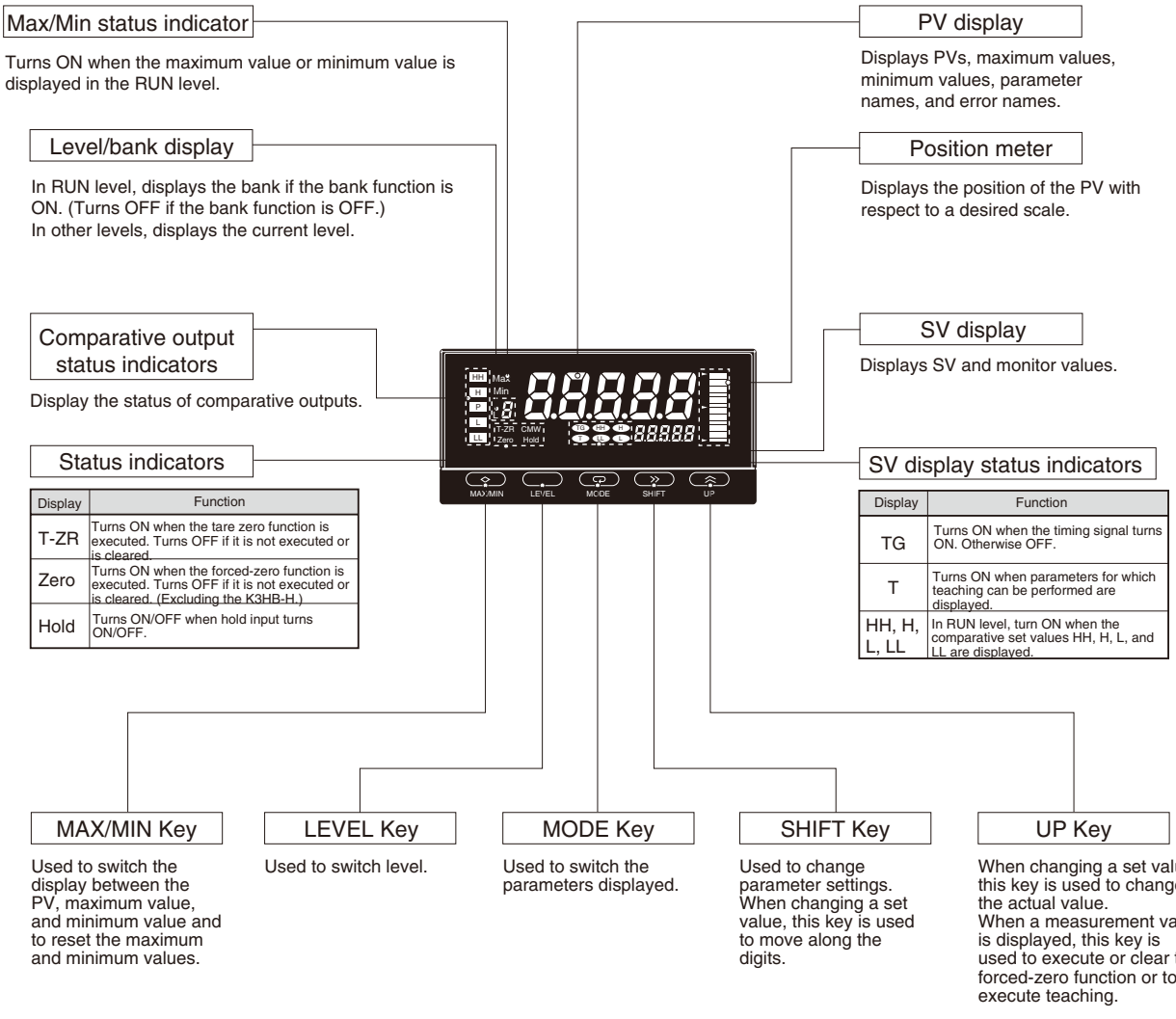
With 10 V



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

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

■ Component Names and Functions



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

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

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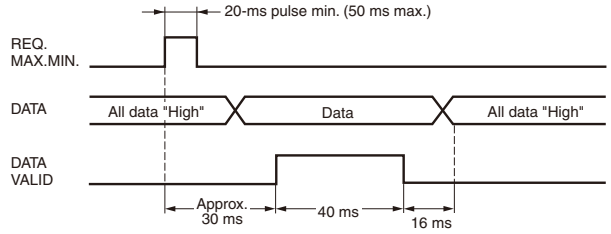
■ BCD Output Timing Chart

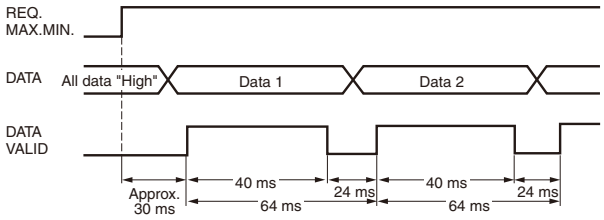
A REQUEST signal from a Programmable Controller or other external device is required to read BCD data.

Single Sampling Data Output



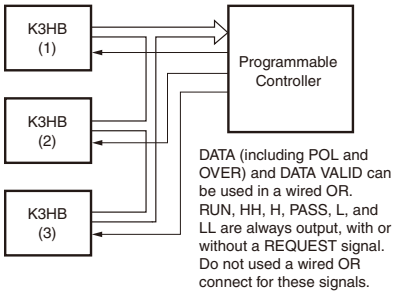
The data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output.
When reading the data from a Programmable Controller, start reading the data when the DATA VALID signal turns ON.
The DATA VALID signal will turn OFF 40 ms later, and the data will turn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

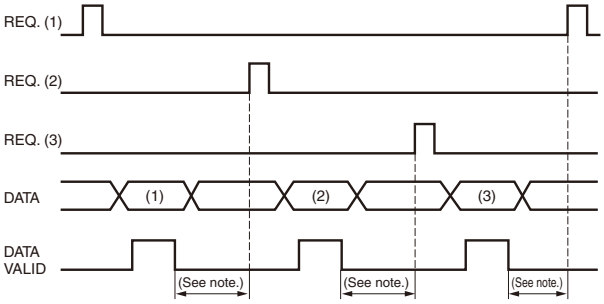
Continuous Data Output



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

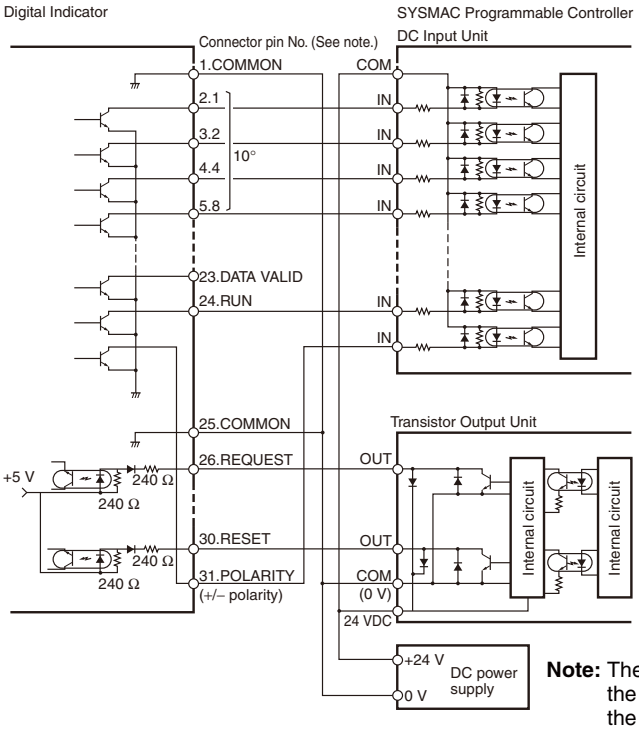
Note: If HOLD is executed when switching between data 1 and data 2, either data 1 or data 2 is output depending on the timing of the hold signal. The data will not go LOW.



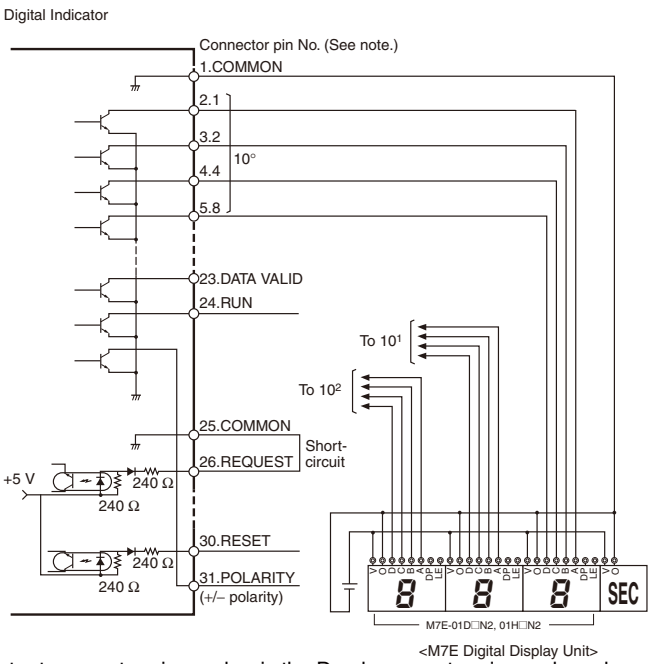


Note: Leave 20 ms min. between DATA VALID turning OFF and the REQUEST signal.

Programmable Controller Connection Example



Display Unit Connection Example



<M7E Digital Display Unit>

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-S/-X/-V/-H Digital Indicator User's Manual (Cat. No. N128)
The manual can be downloaded from the following site in PDF format: OMRON Industrial Web http://www.fa.omron.co.jp

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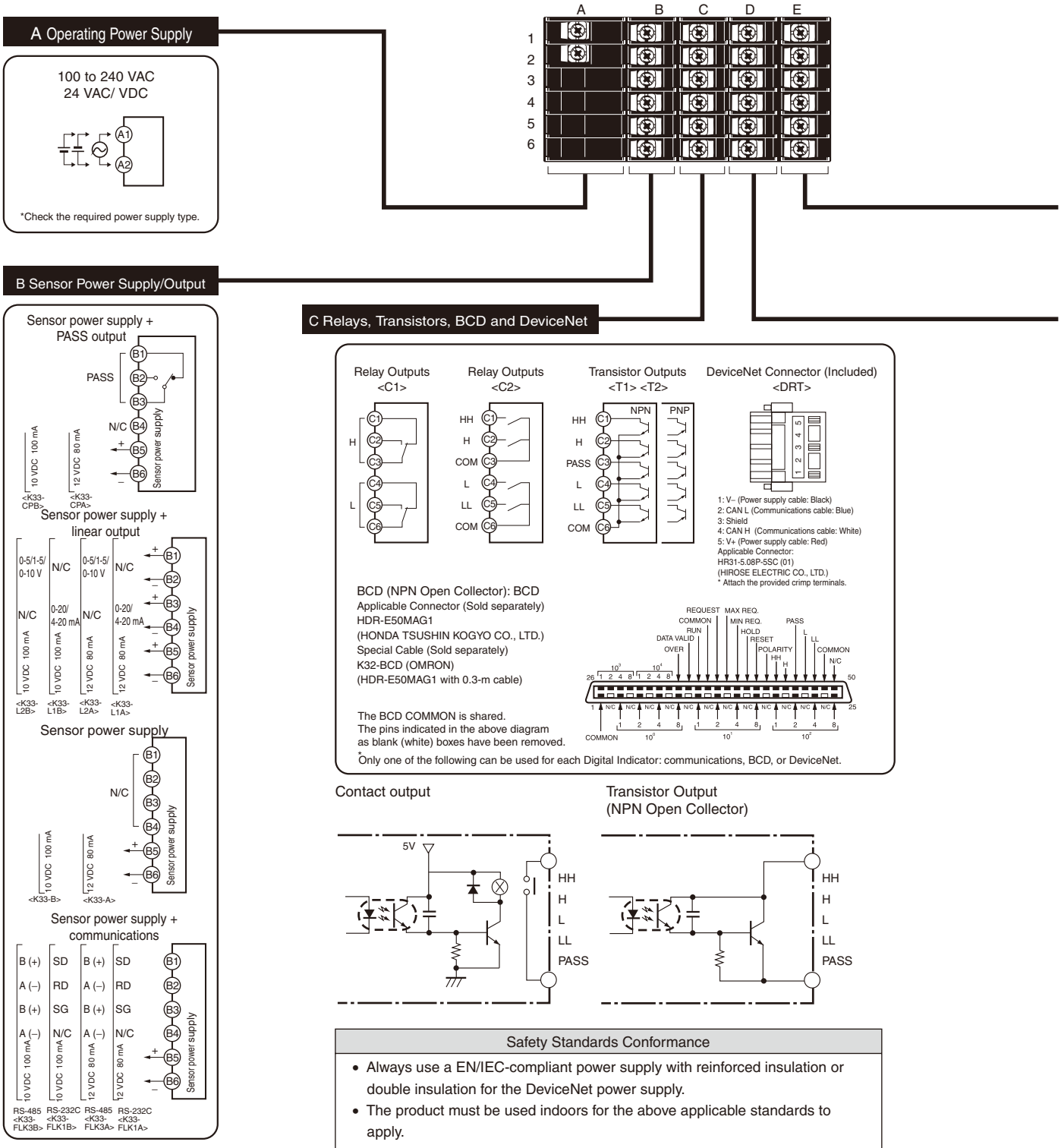
■ Connections

Terminal Arrangement

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



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

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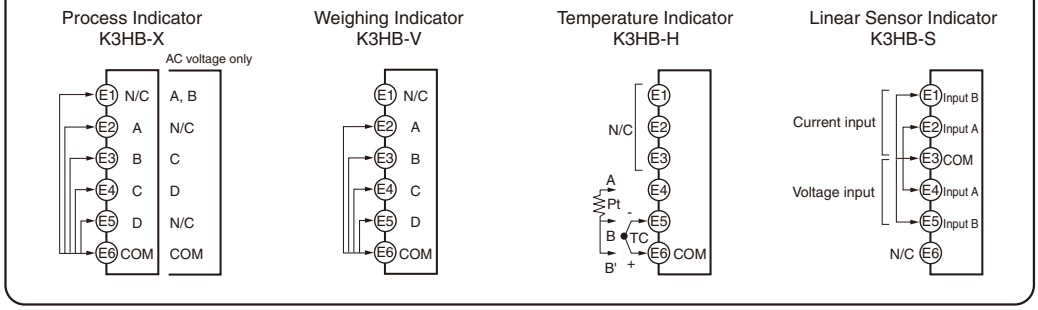
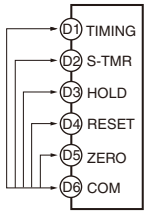
E Analog Input

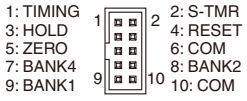


D Event Input

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

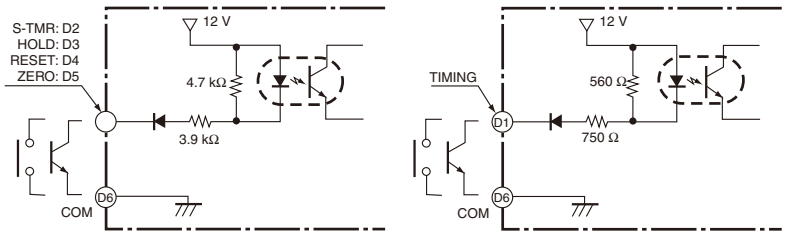


Models with Connectors
<K35-2><K35-4>

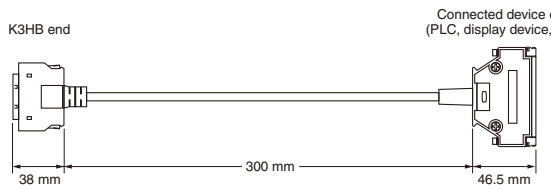
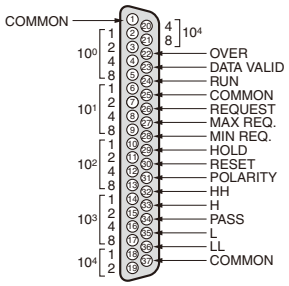


- Applicable Connector (Sold separately)
  XG4M-1030 (OMRON)
- Special Cable (Sold separately)
  K32-DICN (OMRON)
  (XG4M-1030 with 3 m cable)

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



BCD Output Cable

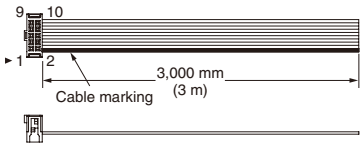
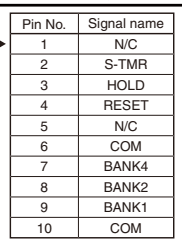
Model	Shape	Pin arrangement
K32-BCD		

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		

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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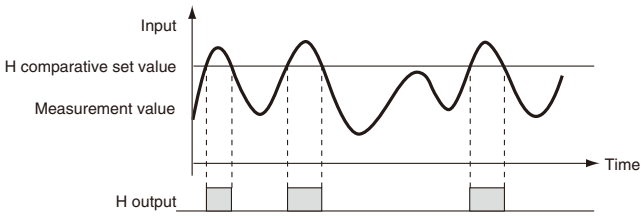
■ Main Functions

Measurement

Timing Hold

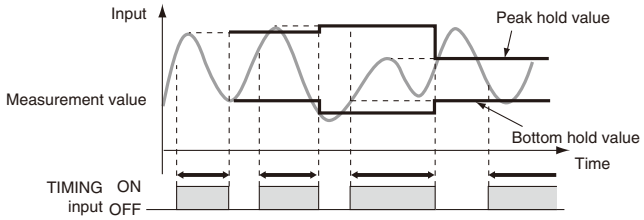
Normal

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



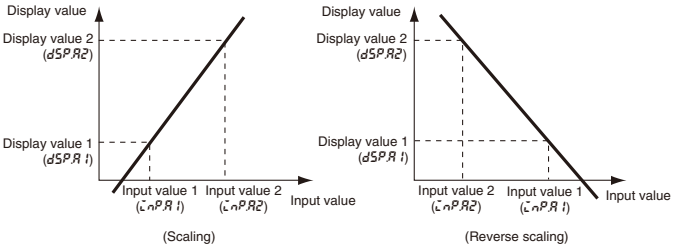
Peak Hold/Bottom Hold

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



Scaling

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



Teaching

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

Standby Sequence

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

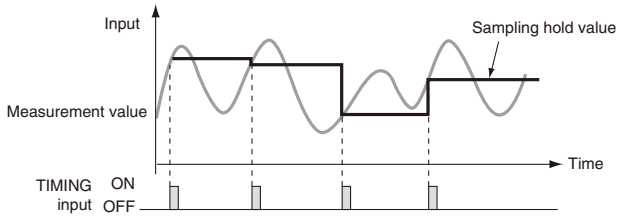
Average processing of input signals with extreme changes or noise smooths out the display and makes control stable.

Previous Average Value Comparison

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

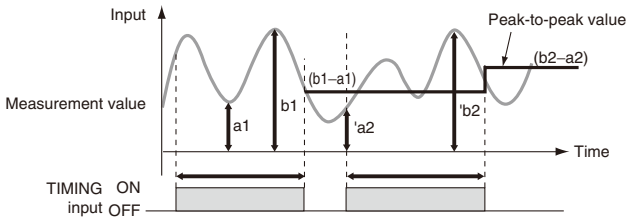
Sampling Hold

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



Peak-to-peak Hold

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



Average Processing

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■ Input Compensation/Display

Forced-zero

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

Tare Zero

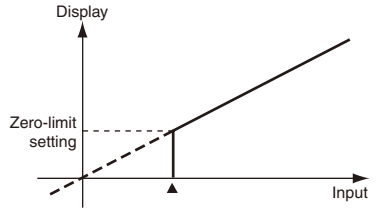
Shifts the current value measured with a forced zero to 0 again. It is possible to measure two or more compounds separately and then, by releasing the tare zero and forced-zero, measure the combined total.

Zero-trimming

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

Zero-limit

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

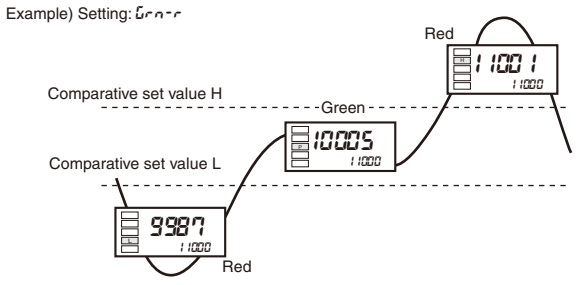


Display Refresh Period

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

Display Color Selection

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



Display Value Selection

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

Step Value

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

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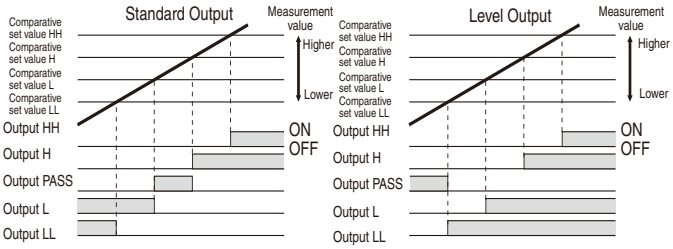
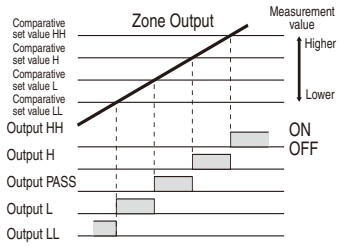
■ Output

Comparative Output Pattern

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





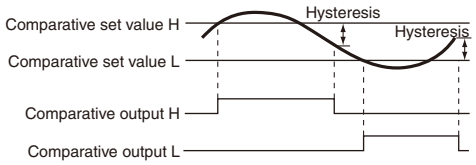
Output Logic

Reverses the output operation of comparative outputs for comparative results.

Hysteresis

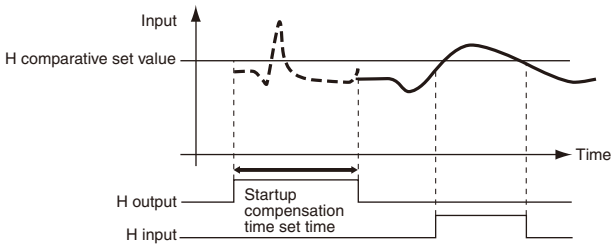
Prevents comparative output chattering when the measurement value fluctuates slightly near the set value.

Example: Comparative Output Pattern (Standard Output)



Startup Compensation Timer

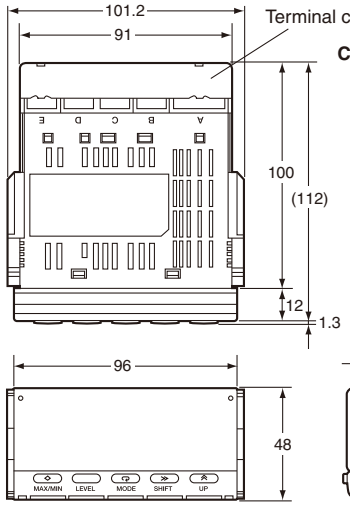
Measurement can be stopped for a set time using external input.



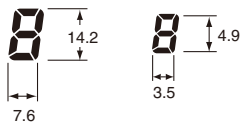
PASS Output Change

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

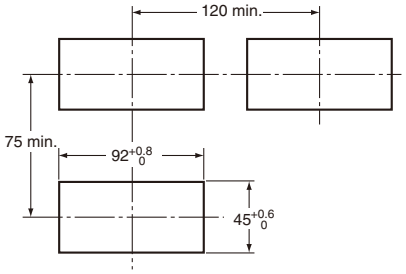
■ Dimensions



Character Size for Main Display (mm)



Panel Cutout Dimensions



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

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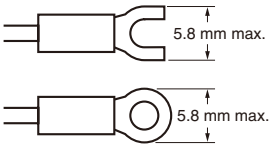
■ Wiring Precautions

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

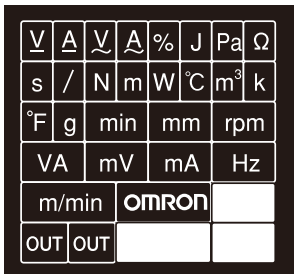
Wiring

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



Unit Stickers

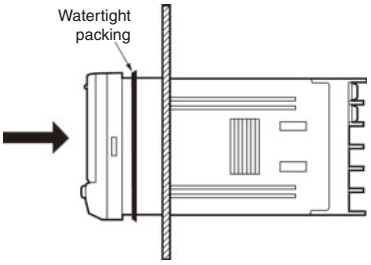
- Select the appropriate units from the unit sticker sheets provided and attach the sticker to the Indicator.



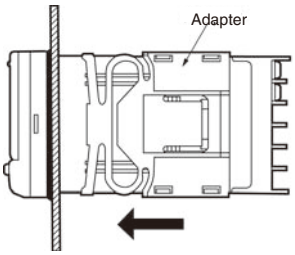
Note: When using for meters, such as weighing meters, use the units specified by regulations on weights and measures.

■ Mounting Method

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

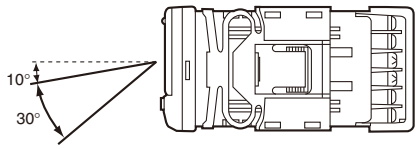


3. Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.



■ LCD Field of Vision

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



■ Waterproof Packing

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

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

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Safety Precautions for All Digital Panel Meters

Refer to the *Precautions* section for each Digital Panel Meter for specific precautions applicable to each Digital Panel Meter.

⚠ WARNING

Electrocution may possibly occur. Never touch terminals when the power is ON. During operation, be sure that all terminal covers are attached to models for which terminal covers are included.

Serious injury, significant property damage, or a serious accident resulting from abnormal operation may possibly occur. Never use the product on a network without a protective circuit. Provide double or triple safety measures, including emergency stop circuits, interlock circuits, and limit circuits, in external control circuits to ensure safety in the entire system if an abnormality occurs due to malfunction of the product or another external factor affecting the product's operation.

⚠ CAUTION

Minor electric shock, fire, or malfunction may occasionally occur. Do not allow pieces of metal, wire, or fine metal shavings or filings from installation work to enter the product.

Moderate or minor injury or property damage resulting from explosion may occasionally occur. Do not use the product in locations where flammable or explosive gases are present.

Do not use the K3HB-X for measurements within Measurement Categories III, or IV (according to IEC 61010-1), and do not use the K3HB-S, K3HB-V, K3HB-H, K3HB-R, K3HB-P, K3HB-C, K3MA-J, K3MA-L, K3MA-F, or K3GN for measurements within Measurement Categories II, III, or IV (according to IEC 61010-1). Otherwise, unexpected operation, resulting in minor or moderate injury, or damage to the equipment may occasionally occur. Use the equipment for measurements only within the Measurement Category for which the product is designed.

Minor or moderate injury, or damage to equipment resulting from unexpected operation may occasionally occur. Do not operate the product if the settings of the product do not match the application. Be sure to make the correct the settings according to the application.

Property damage to equipment or facilities connected to the product may occasionally occur if the comparative outputs cease to operate resulting from product failure. Do not operate the product unless measures, such as installing a separate monitoring system, have been taken to ensure safety.

Minor or moderate injury, or damage to equipment resulting from fire may occasionally occur if screws become loose. Do not operate the product unless the screws on the terminal block and the connector locking screws have been tightened securely using a tightening torque within the following ranges.

Terminal block screws: 0.74 to 0.90 N·m for M3.5 screws,
0.43 to 0.58 N·m for M3 screws

Confirm the designated torque for connector locking screws for each specific model.

Minor or moderate injury, or damage to equipment resulting from unexpected operation following changes to online edit programs may occasionally occur. Do not operate the product unless it has been confirmed that no adverse effects will result even if the DeviceNet cycle time is extended.

Minor or moderate injury, or damage to equipment resulting from unexpected operation may occasionally occur when transferring a program to another node or changing the contents of the I/O memory. Do not perform either of these operations without confirming safety at the destination node.

Minor or moderate injury resulting from electric shock may occasionally occur. Do not attempt to disassemble, repair, or modify the product.

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■ 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
   - Outdoor locations or 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. Heat generated by the product itself can raise its interior temperature and shorten its service life. Do not install multiple products side-by-side or stacked one on top of the other. If this kind of installation cannot be avoided, provide the products with forced cooling, such as that using fans.
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. Install each product on a designated panel of the recommended thickness.
8. When using crimp terminals or bare conductor connections, use the parts and materials that are designated for each model.

Item / Model	Crimp terminal	Bare conductor connection		Sheath stripping allowance
		Power supply	Other than power supply	
K3TF	M3.5	AWG22 to AWG14 (cross-sectional area: 0.326 to 2.081 mm^2)	AWG22 to AWG16 (cross-sectional area: 0.326 to 1.309 mm^2)	6 to 8 mm
K3HB Series K3MA Series K3GN	M3, width of 5.8 mm max.		AWG28 to AWG16 (cross-sectional area: 0.081 to 1.309 mm^2)	

9. 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 shielded wires.
10. Make sure that the rated voltage is achieved within 2 s after turning ON the power.
11. Allow the product to warm up 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 for cleaning.
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 specified supply voltage and rated load.
16. Do not connect anything to unused terminals.
17. Outputs turn OFF when the mode is changed or settings are initialized. Take this into consideration when setting up the control system.
18. Install and provide proper indications for a switch or circuit breaker that complies with the requirements of IEC 60947-1 and IEC 60947-3 to enable the operator to quickly turn OFF the power.
19. Provide a DeviceNet communications distance that satisfies the range given in the specifications, and use the designated communications cable. For cable details, refer to the *DeviceNet Catalog* (Cat. No. Q102).
20. Do not bend or pull the DeviceNet communications cable with excessive force.
21. Do not attach or remove connectors with the DeviceNet power turned ON. Doing so may cause product failure or malfunction.
22. Use wire that is capable of withstanding heat of 70°C min. to wire the K3HB series.

■ Precautions for Correct Use

For detailed information, refer to *Technical Guide for Digital Panel Meters*.

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- Systems, machines, and equipment that could present a risk to life or property.

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