Common to all K3HB-X/-V/-H/-S

■ 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				

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).

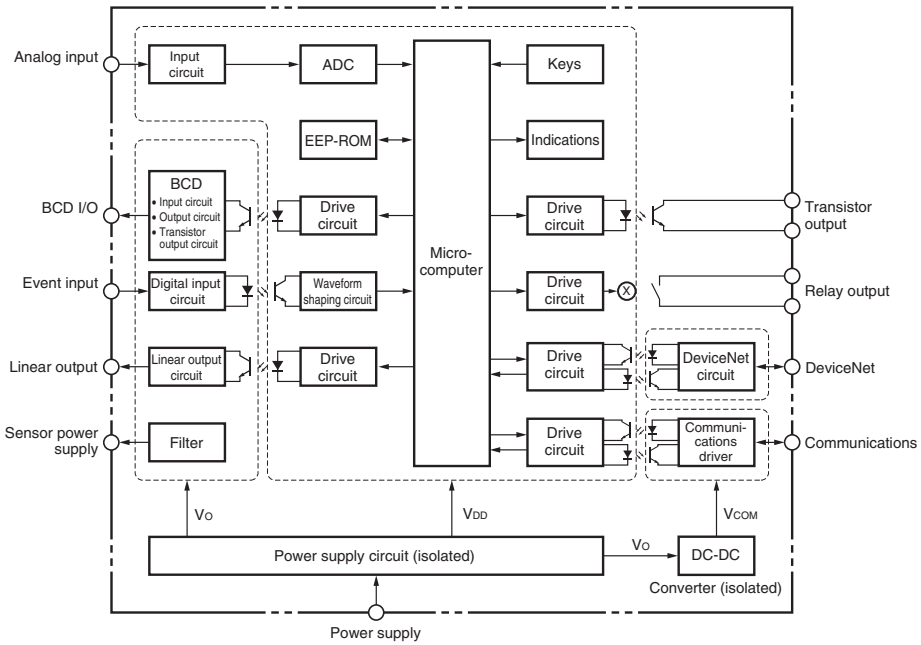
DeviceNet Communications

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

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

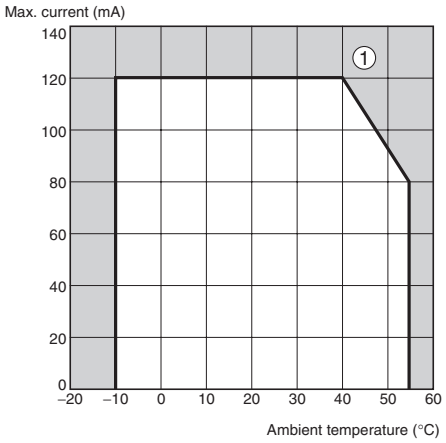
The values in parentheses are for Thick Cable.

■ Internal Block Diagram

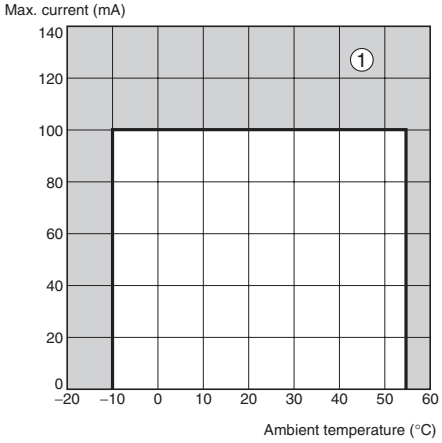


■ Power Supply Derating Curve for Sensor (Reference Value)

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

Max/Min status indicator

Turns ON when the maximum value or minimum value is displayed in the RUN level.

Level/bank display

In RUN level, displays the bank if the bank function is ON. (Turns OFF if the bank function is OFF.)
In other levels, displays the current level.

Comparative output status indicators

Display the status of comparative outputs.

Status indicators

Display	Function
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.

PV display

Displays PVs, maximum values, minimum values, parameter names, and error names.

Position meter

Displays the position of the PV with respect to a desired scale.

SV display

Displays SV and monitor values.

SV display status indicators

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.

MAX/MIN Key

Used to switch the display between the PV, maximum value, and minimum value and to reset the maximum and minimum values.

LEVEL Key

Used to switch level.

MODE Key

Used to switch the parameters displayed.

SHIFT Key

Used to change parameter settings. When changing a set value, this key is used to move along the digits.

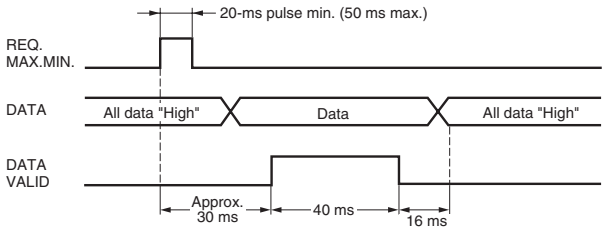
UP Key

When changing a set value, this key is used to change the actual value.
When a measurement value is displayed, this key is used to execute or clear the forced-zero function or to execute teaching.

■ BCD Output Timing Chart

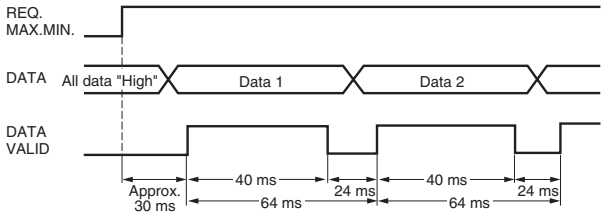
A REQUEST signal from a Programmable Controller or other external device is required to read BCD data.

Single Sampling Data Output



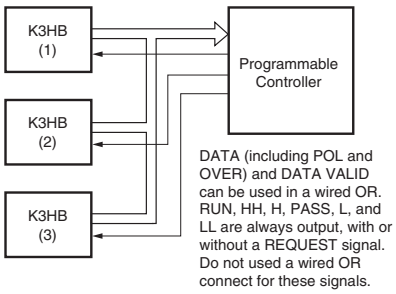
The data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output.
When reading the data from a Programmable Controller, start reading the data when the DATA VALID signal turns ON.
The DATA VALID signal will turn OFF 40 ms later, and the data will turn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

Continuous Data Output

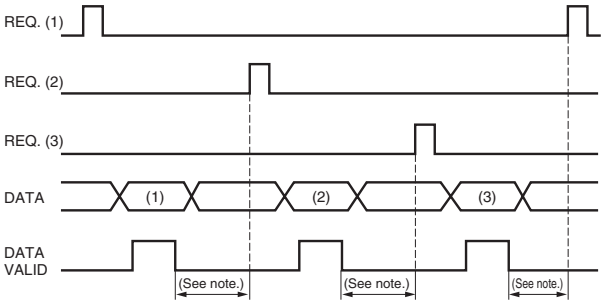


Measurement data is output every 64 ms while the REQUEST signal remains ON.

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.

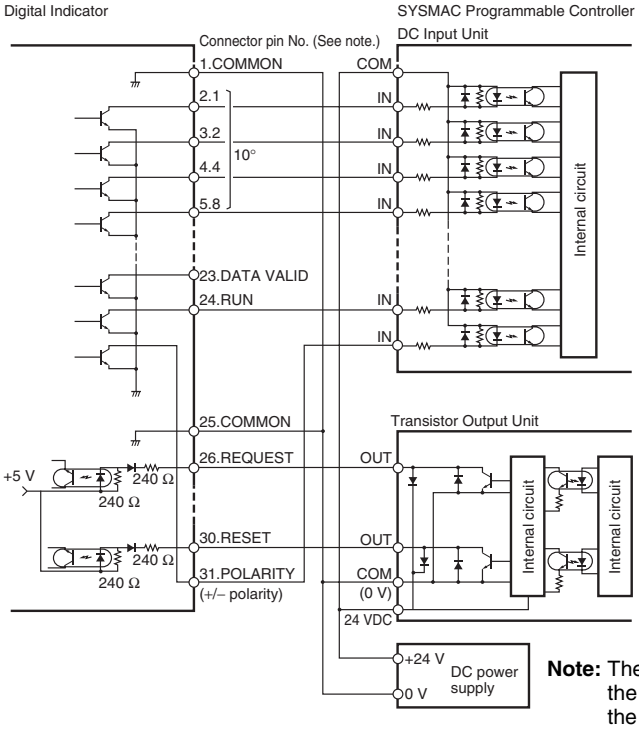


DATA (including POL and OVER) and DATA VALID can be used in a wired OR. RUN, HH, H, PASS, L, and LL are always output, with or without a REQUEST signal. Do not used a wired OR connect for these signals.

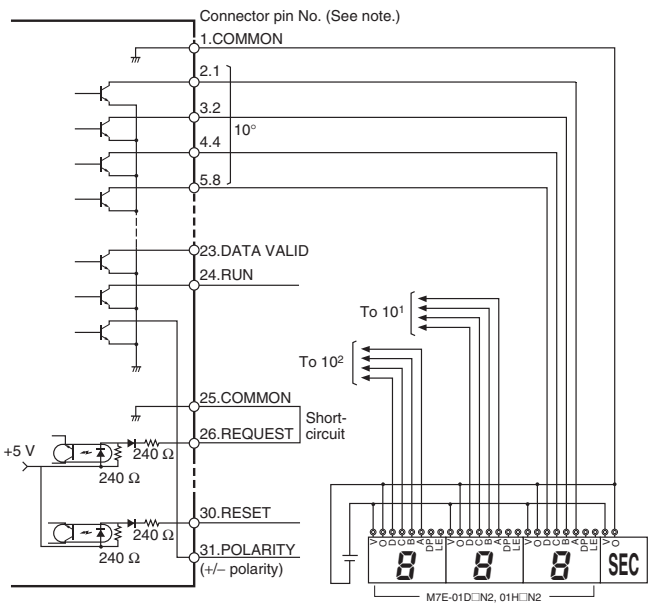


Note: Leave 20 ms min. between DATA VALID turning OFF and the REQUEST signal.

Programmable Controller Connection Example



Display Unit Connection Example



<M7E Digital Display Unit>

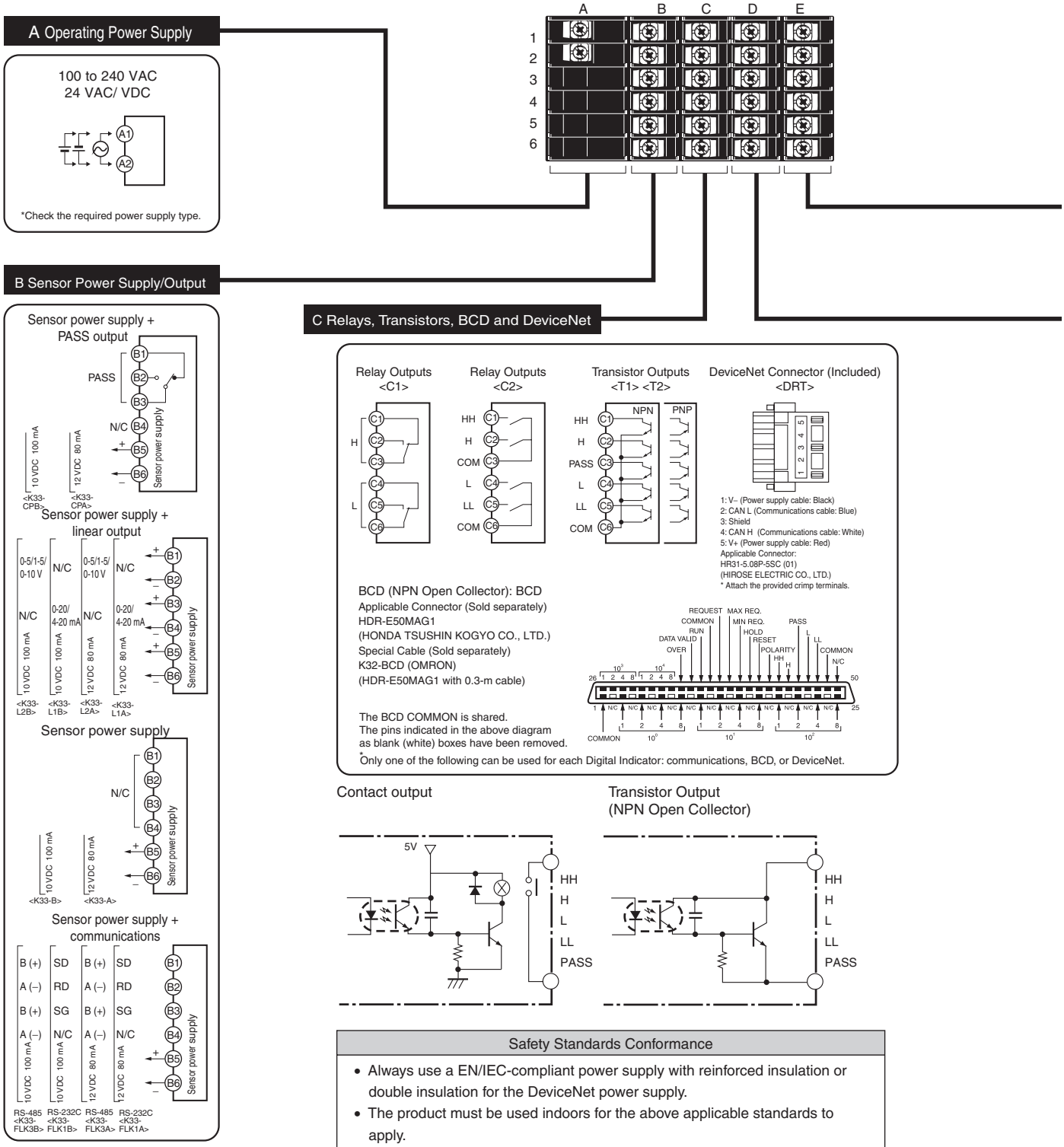
Note: The BCD output connector pin number is the D-sub connector pin number when the BCD Output Cable (sold separately) is connected. This number differs from the pin number for the Digital Indicator narrow pitch connector (manufactured by Honda Tsushin Kogyo Co., Ltd.).

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

■ Connections

Terminal Arrangement

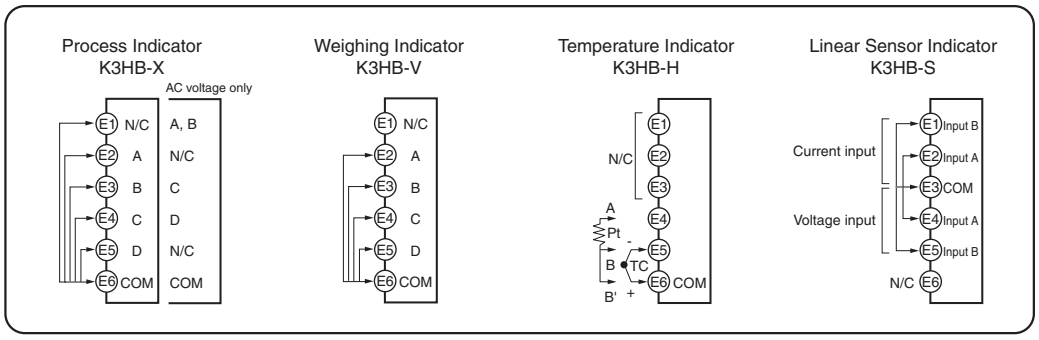
Note: Insulation is used between signal input, event input, output, and power supply terminals.



Safety Standards Conformance

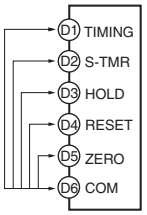
- Always use a EN/IEC-compliant power supply with reinforced insulation or double insulation for the DeviceNet power supply.
- The product must be used indoors for the above applicable standards to apply.
- The K3HB-XVA□□ complies with UL standards when the applied input voltage is within the range 0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

E Analog Input

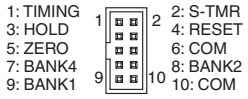


D Event Input

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

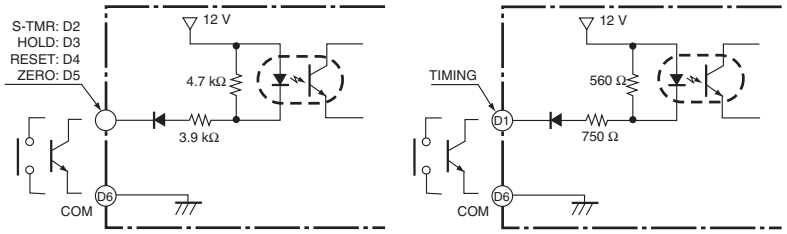


Models with Connectors
<K35-2><K35-4>

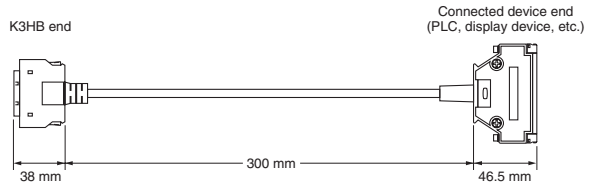
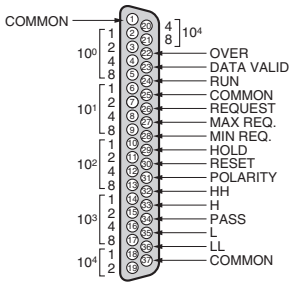


- Applicable Connector (Sold separately)
  XG4M-1030 (OMRON)
- Special Cable (Sold separately)
  K32-DICN (OMRON)
  (XG4M-1030 with 3 m cable)

- 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

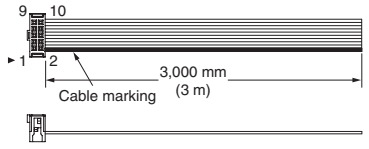
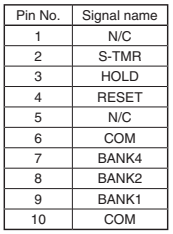
Model	Shape	Pin arrangement
K32-BCD		

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

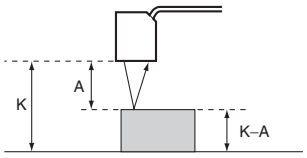
■ Main Functions

Measurement

Input Calculation

S

- Two input circuits are provided. The input ranges for these circuits can be set independently. For example, one can be set to 4 to 20 mA and the other can be set to 1 to 5 V.
- In addition to calculations such as K (constant)–A (input for one circuit), it is possible to perform calculations based on the inputs for both circuits, such as A+B and A–B, making it possible to perform thickness measurement and level-difference measurement using displacement and length-measuring sensors.

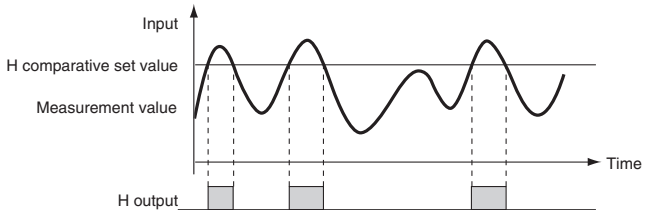


Timing Hold

X V H S

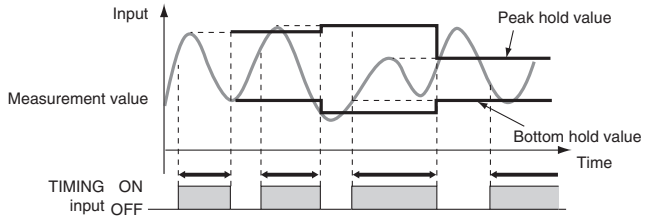
Normal

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



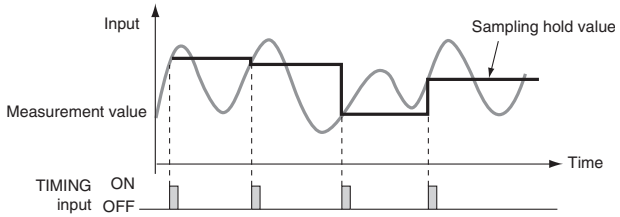
Peak Hold/Bottom Hold

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



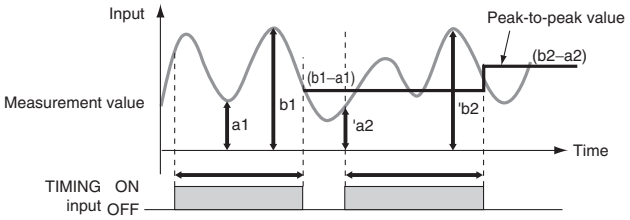
Sampling Hold

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



Peak-to-peak Hold

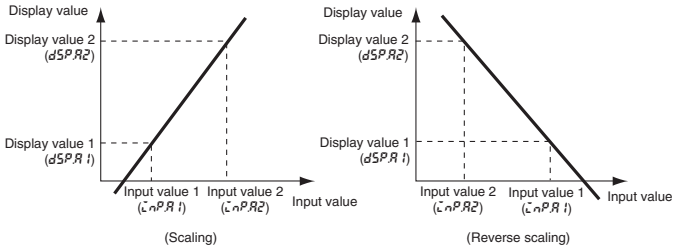
- Measures the difference between the maximum and minimum values in a specified period.



Scaling

X V S

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



Teaching

X V S

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

X V H S

Average Processing

X V H S

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

X V H S

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

Temperature Input Shift

H

Shifts the temperature input value.

Supported Models

The models that support the functions shown here are indicated by symbols as follows:

- X K3HB-X
- V K3HB-V
- H K3HB-H
- S K3HB-S

■ Input Compensation/Display

Forced-zero X V S

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

Tare Zero V S

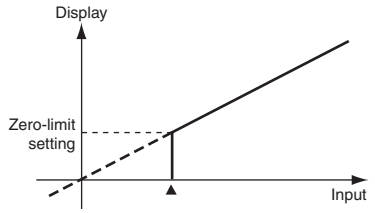
Shifts the current value measured with a forced zero to 0 again. It is possible to measure two or more compounds separately and then, by releasing the tare zero and forced-zero, measure the combined total.

Zero-trimming X V H S

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 X V H S

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.)

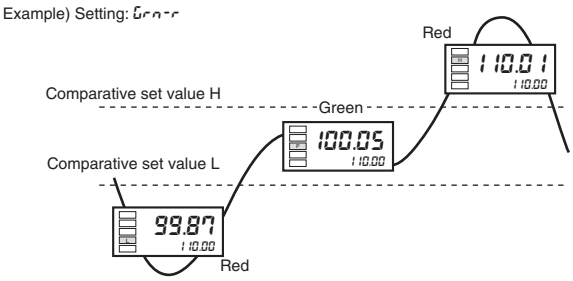


Display Refresh Period X V H S

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

Display Color Selection X V H S

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 X V H S

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

Step Value X V H S

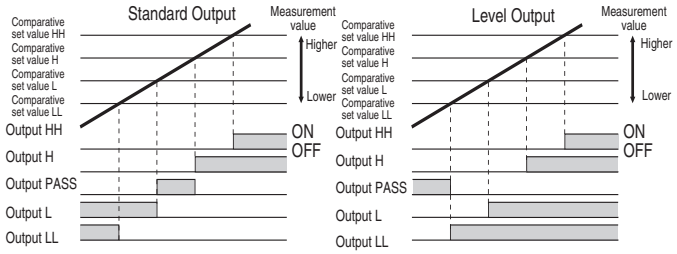
It is possible to specify (i.e., restrict) the values that the smallest displayed digit can change by. For example, if the setting is 2, the smallest digit will only take the values 0, 2, 4, 6, or 8 and if the setting is 5, it will only take the values 0 or 5. If the setting is 10, it will only take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

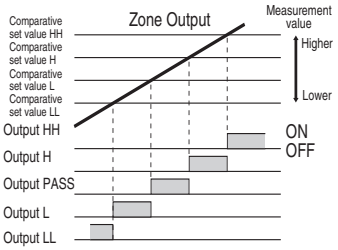
■ Output

Comparative Output Pattern

X V H S

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

X V H S

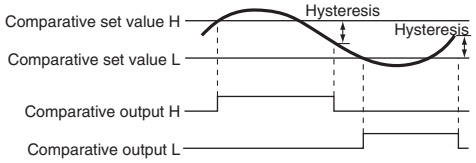
Reverses the output operation of comparative outputs for comparative results.

Hysteresis

X V H S

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

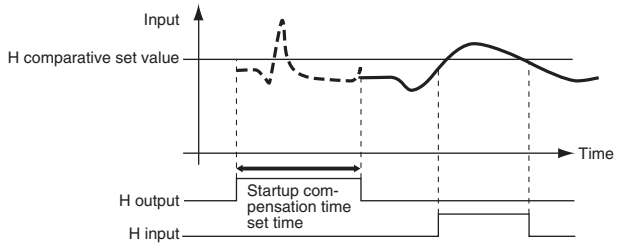
Example: Comparative Output Pattern (Standard Output)



Startup Compensation Timer

X V H S

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

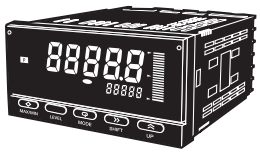


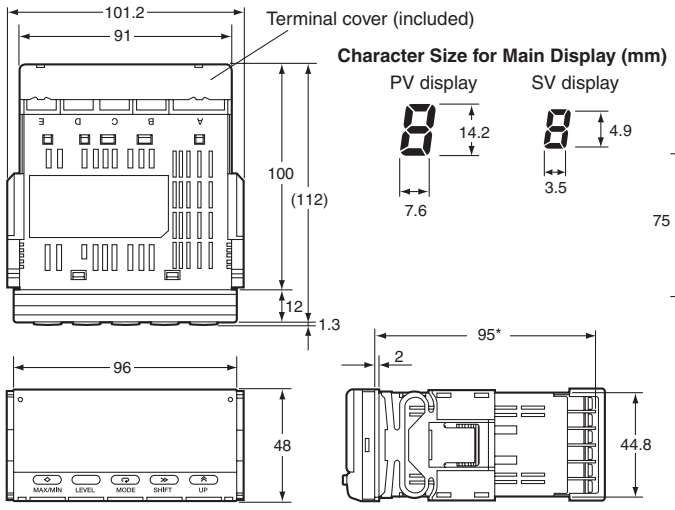
PASS Output Change

X V H S

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

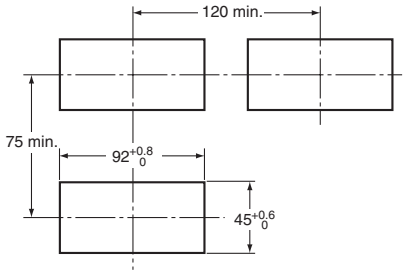
■ Dimensions





Character Size for Main Display (mm)

Panel Cutout Dimensions



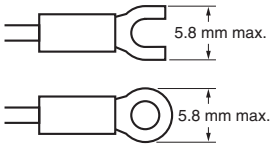
*DeviceNet models: 97 mm
Terminal: M3, Terminal Cover: Accessory

■ 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.

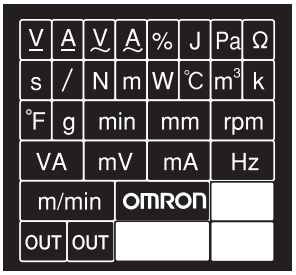
Wiring

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



Unit Stickers

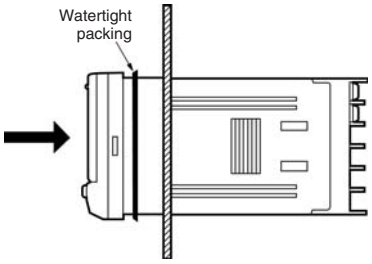
- Select the appropriate units from the unit sticker sheets provided and attach the sticker to the Indicator.



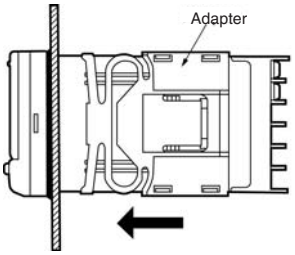
Note: When using for meters, such as weighing meters, use the units specified by regulations on weights and measures.

■ 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.

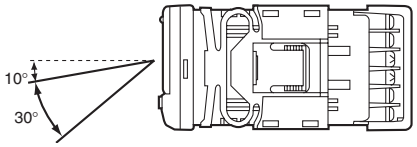


3. Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.



■ 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.

■ Precautions

⚠ WARNING

Do not touch the terminals while power is being supplied. Doing so may possibly result in electric shock. Make sure that the terminal cover is installed before using the product.

Always provide protective circuits in the network. Without protective circuits, malfunctions may possibly result in accidents that cause serious injury or significant property damage.

Provide double or triple safety measures in external control circuits, such as emergency stop circuits, interlock circuits, or limit circuits, to ensure safety in the system if an abnormality occurs due to malfunction of the product or another external factor affecting the product's operation.

⚠ CAUTION

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in minor electric shock, fire, or malfunction.

Do not use the product in locations where flammable or explosive gases are present. Doing so may occasionally result in explosion, causing minor or moderate injury, or property damage.

Do not attempt to disassemble, repair, or modify the product. Doing so may occasionally result in minor or moderate injury due to electric shock.

Do not use the equipment for measurements within Measurement Categories III and IV for K3HB-X and II, III, and IV for K3HB-S, K3HB-V, and K3HB-H (according to IEC61010-1). Doing so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment. Use the equipment for measurements only within the Measurement Category for which the product is designed.

Perform correct setting of the product according to the application. Failure to do so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.

Ensure safety in the event of product failure by taking safety measures, such as installing a separate monitoring system. Product failure may occasionally prevent operation of comparative outputs, resulting in damage to the connected facilities and equipment.

Tighten the screws on the terminal block and the connector locking screws securely using a tightening torque within the following ranges. Loose screws may occasionally cause fire, resulting in minor or moderate injury, or damage to the equipment.

Terminal block screws: 0.43 to 0.58 N·m

Connector locking screws:0.18 to 0.22 N·m

Make sure that the product will not be adversely affected if the DeviceNet cycle time is lengthened as a result of changing the program with online editing. Extending the cycle time may cause unexpected operation, occasionally resulting in minor or moderate injury, or damage to the equipment.

Before transferring programs to other nodes or changing I/O memory of other nodes, check the nodes to confirm safety. Changing the program or I/O memory of other nodes may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.

Precautions for Safe Use

1. Do not use the product in the following locations.
- Locations subject to direct radiant heat from heating equipment
- Locations where the product may come into contact with water or oil
- Locations subject to direct sunlight
- Locations where dust or corrosive gases (in particular, sulfuric or ammonia gas) are present
- Locations subject to extreme temperature changes
- Locations where icing or condensation may occur
- Locations subject to excessive shocks or vibration

2. Do not use the product in locations subject to temperatures or humidity levels outside the specified ranges or in locations prone to condensation. If the product is installed in a panel, ensure that the temperature around the product (not the temperature around the panel) does not go outside the specified range.
3. Provide sufficient space around the product for heat dissipation.
4. Use and store the product within the specified temperature and humidity ranges. If several products are mounted side-by-side or arranged in a vertical line, the heat dissipation will cause the internal temperature of the products to rise, shortening the service life. If necessary, cool the products using a fan or other cooling method.
5. The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may result in contact welding or burning.
6. Install the product horizontally.
7. Mount to a panel between 1 and 8-mm thick.
8. Use the specified size of crimp terminals (M3, width: 5.8 mm max.) for wiring. To connect bare wires, use AWG22 (cross section: 0.326 mm^2) to AWG14 (cross section: 2.081 mm^2) to wire the power supply terminals and AWG28 (cross section: 0.081 mm^2) to AWG16 (cross section: 1.309 mm^2) for other terminals. (Length of exposed wire: 6 to 8 mm)
9. In order to prevent inductive noise, wire the lines connected to the product separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using shield lines.
10. Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON.
11. Allow the product to operate without load for at least 15 minutes after the power is turned ON.
12. Do not install the product near devices generating strong high-frequency waves or surges. When using a noise filter, check the voltage and current and install it as close to the product as possible.
13. Do not use thinner to clean the product. Use commercially available alcohol.
14. Be sure to confirm the name and polarity for each terminal before wiring the terminal block and connectors.
15. Use the product within the noted supply voltage and rated load.
16. Do not connect anything to unused terminals.
17. Output turns OFF when the mode is changed or settings are initialized. Take this into consideration when setting up the control system.
18. Install an external switch or circuit breaker that complies with applicable IEC60947-1 and IEC60947-3 requirements and label them clearly so that the operator can quickly turn OFF the power.
19. Use the specified cables for the communications lines and stay within the specified DeviceNet communications distances. Refer to the User's Manual (Cat. No. N129) for details on communications distance specifications and cables.
20. Do not pull the DeviceNet communications cables with excessive force or bend them past their natural bending radius.

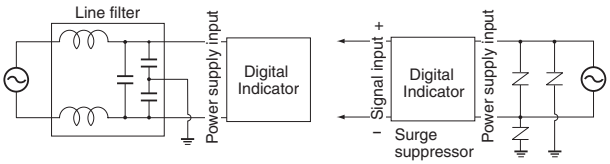
21. Do not connect or remove connectors while the DeviceNet power is being supplied. Doing so will cause product failure or malfunction.

22. Use cables with a heat resistance of 70ºC min.

■ Noise Countermeasures

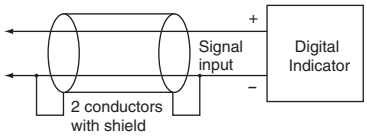
1. Do not install the product near devices generating strong high-frequency waves or surges, such as high-frequency welding and sewing machines.

2. Mount a surge suppressor or noise filter to peripheral devices generating noise, in particular, motors, transformers, solenoids, and magnet coils.



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

Example of Countermeasures for Inductive Noise on Input Lines



4. If a noise filter is used for the power supply, check the voltage and current, and install the noise filter as close to the product as possible.

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

Warranty and Limitations of Liability

■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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

Cat. No. N131-E1-04 In the interest of product improvement, specifications are subject to change without notice.