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OMRON

K3HB-S Linear Sensor Indicator

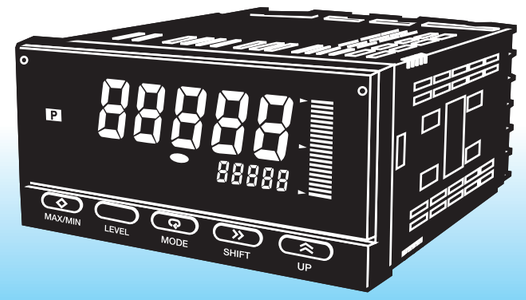
User's Manual Cat. No. N110-E1-01

OMRON

Linear Sensor Indicator

K3HB-S

User's Manual



Cat. No. N110-E1-01

Preface

This manual describes the application methods for the K3HB.

Please read this manual before attempting to use the K3HB to ensure that you are using the K3HB correctly.

Keep this manual in a safe location so that it is available for reference when required.

General Application Precautions

Before using the product under any of the following conditions or in any of the following environments, consult your OMRON representative to make sure that the ratings and performance characteristics of the product are sufficient and be sure to provide redundant safety mechanisms.

(1) Conditions or environments not described in this manual

(2) Nuclear control systems, railroad systems, vehicles, aviation systems, combustion systems, medical equipment, amusement machines, and safety equipment

(3) Other systems, machines, and equipment that may have a serious influence on lives and property

Precautions for Safe Use

● Definition of Safety Notices and Information

The following notation is used in this manual to provide precautions required to ensure safe usage of the K3HB.

The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

● Symbols

	Indicates a CAUTION or WARNING with the specific contents indicated in the triangle and described in text. The example at the left is for a precaution for electric shock.
	Indicates a prohibition with the specific contents indicated behind the circle and slash and described in text. The example at the left is for prohibiting disassembling.
	Indicates a CAUTION or WARNING with the specific contents indicated in the triangle and described in text. The example at the left is for a general precaution.
	Indicates a mandatory action with the specific contents indicated in the circle and described in text. The example at the left is for a general mandatory action that is not classified otherwise.

● Precautions

⚠ CAUTION	
Do not touch the terminals while power is being supplied. Doing so may result in electric shock.	
Do not disassemble the product or touch internal parts while power is being supplied. Doing so may result in electric shock, fire, or malfunction.	
Perform correct setting of the product according to the application. Failure to do so may cause unexpected operation, resulting in injury or damage to the installation.	
Ensure safety in the event of product failure by taking safety measures, such as installing a separate monitoring system. Product failure may prevent operation of comparative outputs and result in a serious accident unless appropriate safety measures are taken.	
Do not allow pieces of metal or wire clippings to enter the product. Doing so may result in electric shock, fire, or malfunction.	
Do not use the product in locations where flammable or explosive gases are present.	
Do not use the equipment for measurements within measurement categories II,III and IV. Doing so may result in injury or damage to the installation. (according to IEC61010-1)	

General Precautions

● Observe the following precautions to ensure safety.

(1) Be sure to confirm the name and polarity for each terminal before performing wiring. Incorrect wiring may result in burning of or other damage to internal components.

(2) Use a power supply within the specified voltage range.
Use the product within the rated load.

(3) Tighten the screws on the terminal block securely.
The recommended tightening torque is 0.43 to 0.58 N·m.
Loose screws may result in product failure or malfunction.

(4) Do not connect anything to unused terminals.

(5) Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON.

(6) Output turns OFF when the mode is changed or settings are initialized. Take this into consideration when setting up the control system.

(7) Install an external switch or circuit breaker and label them clearly so that the operator can quickly turn OFF the power.

Precautions for Correct Use

● General Precautions

(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) Provide sufficient space around the product for heat dissipation.

(3) Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON.

(4) Allow the product to operate without load for at least 15 minutes after the power is turned ON.

(5) To prevent static electricity, do not touch the slits or the terminals while the power is turned ON.

(6) Do not place heavy loads on the product that would cause it to deform or deteriorate.

● Mounting and Wiring

(1) Mount to a panel between 1-mm and 8-mm thick.

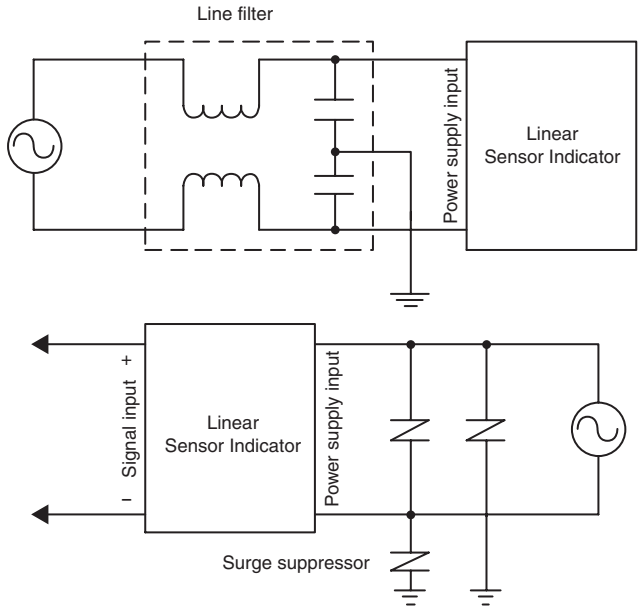
(2) Install the product horizontally.

(3) Use crimp terminals appropriate for the screw size (M3).

● Noise Countermeasures

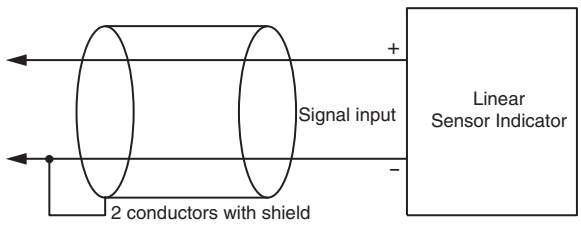
Do not install the product near devices generating strong high-frequency waves or surges, such as high-frequency welding and sewing machines.

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



(2) 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>



(3) When using a noise filter, check the voltage and current and install it as close to the product as possible.

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

● Extending Product Life

(1) 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.
The service life of internal components depends on the ambient temperature. The higher the temperature is, the shorter the service life will be. Therefore, the product's service life can be extended by keeping the product interior at a low temperature.

(2) Use and store the product within the specified temperature and humidity ranges.
If several Linear Sensor Indicators are mounted side-by-side or arranged in a vertical line, the heat dissipation will cause the internal temperature of the Linear Sensor Indicators to rise, shortening the service life. In this case, cool the Linear Sensor Indicators using a fan or some other method.

(3) 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.

(4) Do not use thinner to clean the product. Use commercially available alcohol.

● Revision History

The revision code of this manual is given at the end of the catalog number at the bottom left of the back cover.

Cat. No.	**N110-E1-01**

Revision code	Date	Pages and changes
A	March 2003	Original production

About this Manual

Manual Structure

Preface

Provides precautionary information, a manual revision history, an overview of the manual contents, information on using this manual, and other general information.

Section 1 Outline

Provides an overview and describes the features of the product.

Section 2 Preparations

Describes the mounting and wiring required before using the product.

Section 3 Basic Application Methods

Shows typical applications for the product. Also shows wiring and parameter settings which enables the user to understand how to use the product from practical examples.

Section 4 Initialization

Describes the initialization process when using this product.

Section 5 Functions and Operations

Describes the functions and settings methods for more effective use of functions, displays, outputs, and settings for each application.

Section 6 User Calibration

Describes the methods for user calibration.

Section 7 Troubleshooting

Describes how to check and possible countermeasures for errors.

Appendices

Provides specifications and settings lists.

● Settings data notation

The letters of the alphabet in settings data are displayed as shown below.

												
A	B	C	D	E	F	G	H	I	J	K	L	M

												
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Contents

Section 1 Outline

1.1 Main Functions and Features of the K3HB-S

Measurement

Input calculation

Two measurement values can be added, subtracted, or the ratio calculated. In addition, any constant can be set and measurement values can be added to or subtracted from a constant.
→ P.5-9

Timing hold

Using external timing signal inputs, synchronous measurements can be made and maximum values, minimum values, and the difference between maximum and minimum values can be measured.
→ P.5-16

Timing delay

Delays starting or ending a for a set time from the rising or falling edge of the measurement signal.
ON and OFF timing can be set independently.
→ P.5-25

Filter

Average processing

Average processing of input signals with extreme changes or noise smooths out the display and makes control stable.
→ P.5-30

High-pass filter

Removes slight changes from input signals and detects only extreme changes.
→ P.5-33

Input compensation

Forced-zero

Forces the present value to 0. Effective to set a reference value from which to perform measurements.
→ P.5-53

Tare zero

Shifts the current value measured with a forced zero to 0 again.
Effective, for example, when two compounds are measured separately.
→ P.5-54

Zero-trimming

Compensates for gradual changes in input signals from, for example, sensor temperature drift, based on OK data (PASS data) at measurement.
→ P.5-57

Zero-limit

Changes the display value to 0 for input values less than the set value.
Effective when drift and displacement of values near zero need to be eliminated.
→ P.5-28

Step value

The step for changing the value of the rightmost digit of the measurement value can be set.
→ P.5-63

Key operations

Teaching

During scaling, the input value during measurement can be set, as is, as the scaling input value.
→ P.5-12
(Setting Scaling)

Key protection

Limits key-operated level and parameter changes to prevent inadvertent key operations and malfunctions.
→ P.5-80

Outputs

Comparative output pattern

The comparative output pattern can be selected as standard output, zone output, and level output.
→ P.5-36

Hysteresis

Prevents comparative output chattering when the measurement value fluctuates slightly near the set value.
→ P.5-38

Output refresh stop

Holds the output status when comparative results outputs other than PASS turn ON.
→ P.5-44

PASS output change

Comparative results other than PASS and error signals can be output from the PASS output terminal.
→ P.5-49

Output OFF delay

Connects the comparative output OFF timing for a set interval. Comparative output ON times can be held when comparative results change quickly.
→ P.5-47

Shot output

Produces a constant comparative output ON time.
→ P.5-41

Output de-energization

Reverses the output logic of comparative outputs for comparative results.
→ P.5-51

Startup compensation timer

Constant-time measurements can be stopped by an external signal input.
→ P.5-21

Output test

Output operation can be confirmed without actual input signals, by setting test measurement values using the keys.
→ P.5-71

Display

Display value selection

The current display value can be selected from the present value, the maximum value, and the minimum value.
→ P.5-62

Display color selection

The PV display color can be set to either green or red. The present value color can be switched according to the status of comparative outputs.
→ P.5-65

Display refresh period

When inputs change quickly, the display refresh period can be delayed to reduce flickering and make the display easier to read.
→ P.5-60

Position meter

Displays the current measurement value as a position in relation to the scaling width on a meter with 20 sections.
→ P.5-67

Scaling

Can convert the input signal to any display value.
→ P.5-12

Comparative set value display

The comparative set value can be set to not display during operation.
→ P.5-64

Other

Max/Min hold

Holds the maximum and minimum measurement values.
→ P.5-46

Bank selection

Eight comparative set value banks can be selected using the keys on the front of the Unit or by external inputs. Groups of comparative set values can be set and can be selected as groups.
→ P.5-72

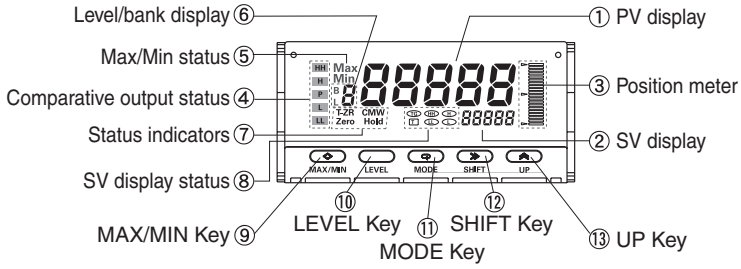
Bank copy

Any bank setting can be copied to all banks.
→ P.5-77

User calibration

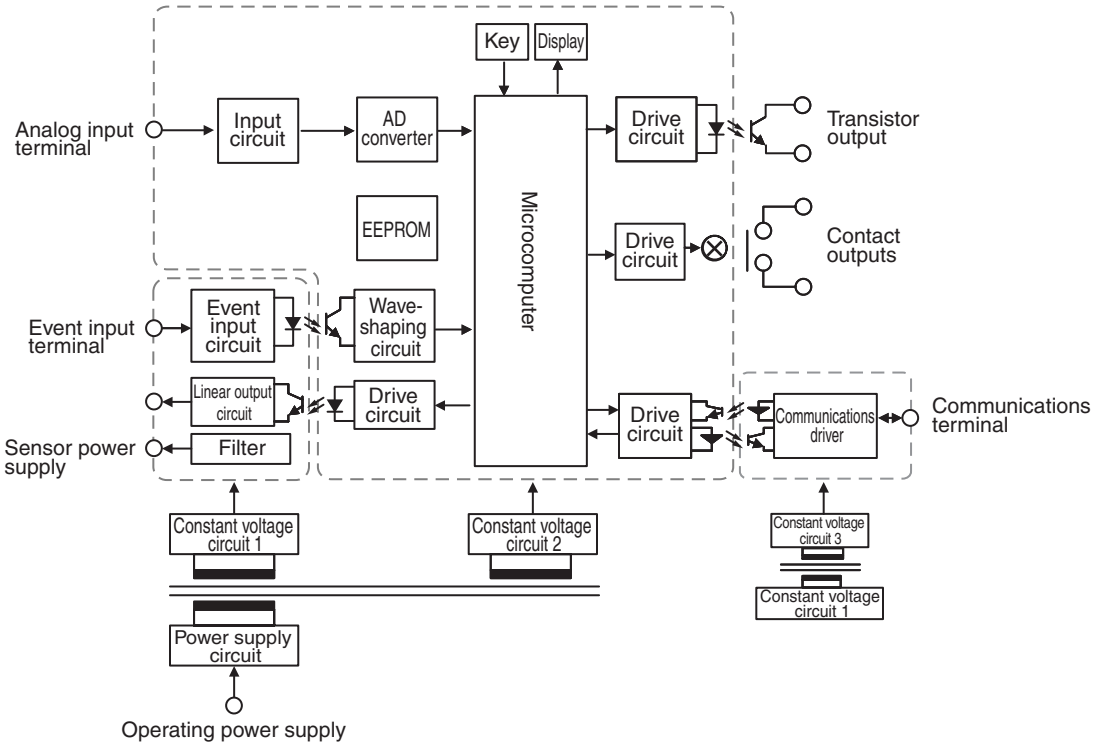
The user can calibrate the K3HB-S.
→ P.6-1

1.2 Component Names and Functions



No.	Name	Function
①	PV display	Displays PVs, maximum values, minimum values, parameter names, and error names.
②	SV display	Displays SVs and monitor values.
③	Position meter	Displays the position of the PV with respect to a desired scale.
④	Comparative output status indicators	Display the status of comparative outputs.
⑤	Max/Min status indicator	Turns ON when the maximum value or minimum value is displayed in the RUN level.
⑥	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.
⑦	Status indicators	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. Hold: Turns ON/OFF when hold input turns ON/OFF.
⑧	SV display status indicators	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.
⑨	MAX/MIN key	Used to switch the display between the PV, maximum value, and minimum value and to reset the maximum and minimum values.
⑩	LEVEL key	Used to switch level.
⑪	MODE key	Used to switch the parameters displayed.
⑫	SHIFT key	Used to change parameter settings. When changing a set value, this key is used to move along the digits.
⑬	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.

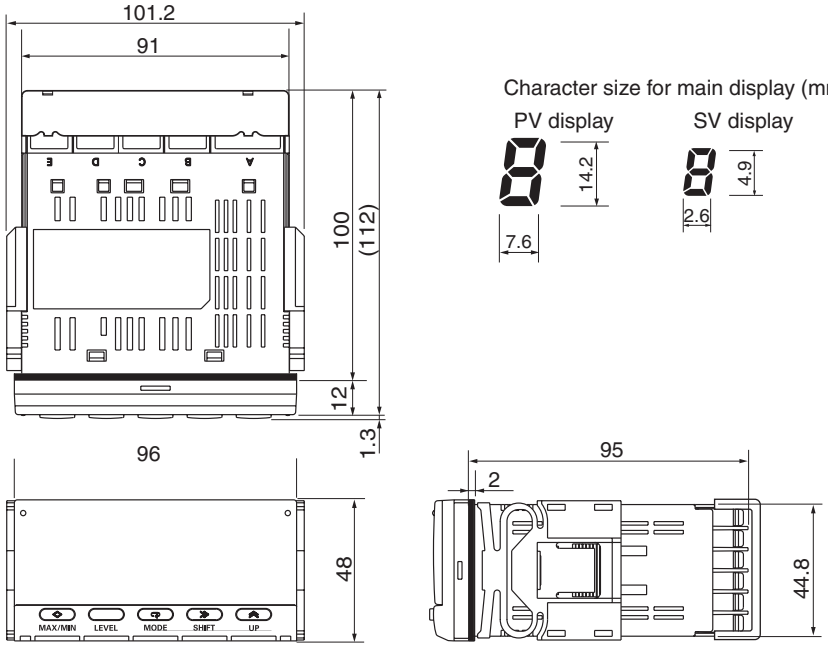
1.3 Internal Block Diagram



Section 2 Preparations

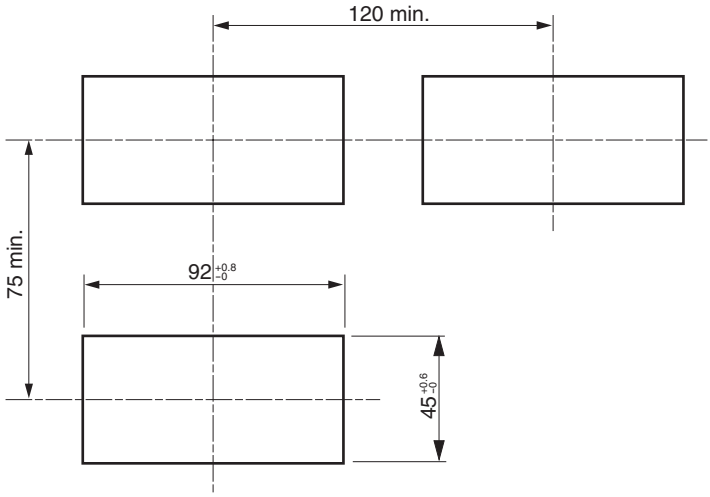
2.1 Mounting

■ External Dimensions



Character size for main display (mm)

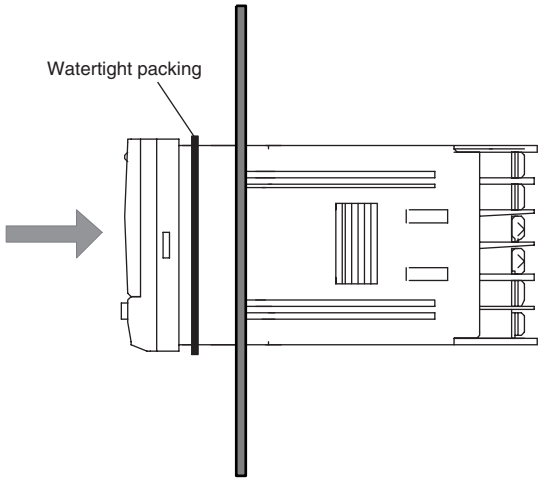
■ Panel Cutout Dimensions



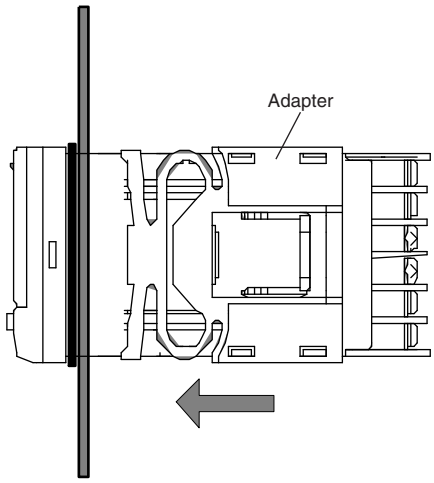
■ Mounting method

(1) Insert the K3HB into the mounting cutout in the panel.

(2) Insert watertight packing around the Unit to make the mounting watertight.

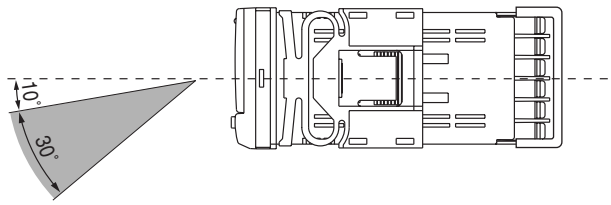


(3) Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.

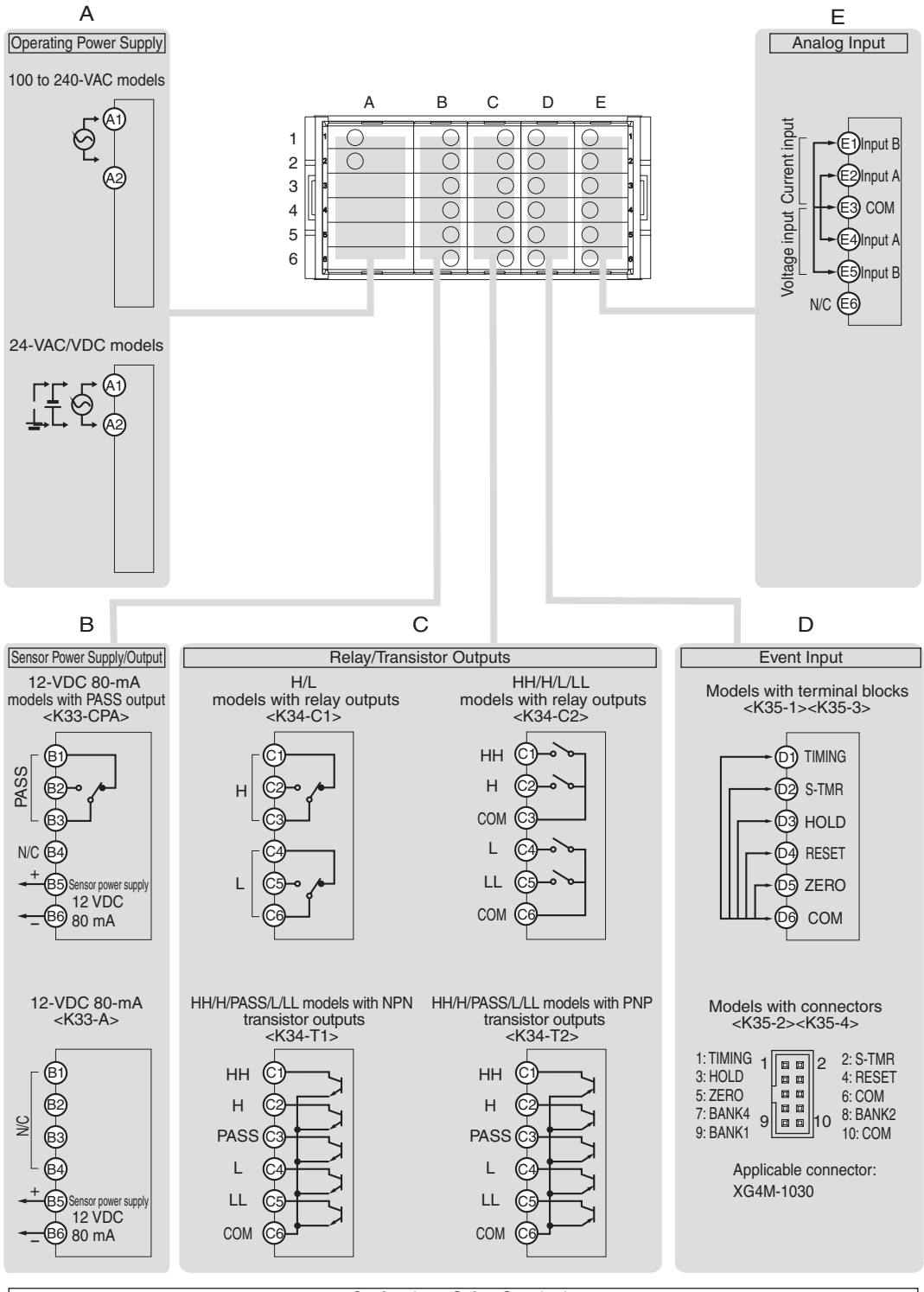


■ LCD Field of Vision

The H3HB-S is designed to have the best visibility at the angles shown in the following diagram.



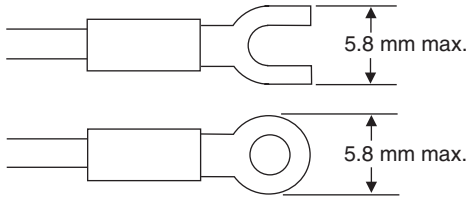
2.2 Using I/O



Conformity to Safety Standards
The device uses reinforced insulation between the power supply, the inputs/transistor outputs, and the relay outputs, however, basic insulation is used between the inputs and the transistor outputs.

■ Wiring

Use the crimp terminals suitable for M3 screws shown below.



● Power supply

Supply power to terminal numbers A1 and A2. The power supply specifications are outlined below.

100 to 240 VAC, 50/60 Hz, 18 VA max. (at max. load)

24 VAC/VDC, 50/60 Hz, 12 VA max./7 W max. (at max. load.)

(No polarity)

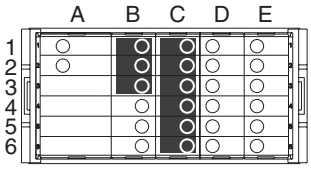
When the power is turned ON, a power supply capacity greater than the rated power supply is required. When multiple Units are being used, make sure that the operating power supply has sufficient capacity.

Complying with UL/CSA Standards

Use an SELV power supply with overcurrent protection for the DC power supply. An SELV power supply has double or reinforced insulation between the input and output, an output voltage of 30 V rms and 42.4 V peak, and is 60 VDC or less.

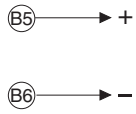
Recommended Power Supply: S8VS-06024□ (from OMRON)

● Sensor power supply

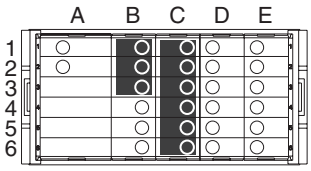


The sensor power can be supplied from terminals B5 and B6. The power supply specifications are outlined below.

12 VDC 80 mA



● Comparative outputs



Comparative outputs are output to terminals B1 to B3 and C1 to C6.

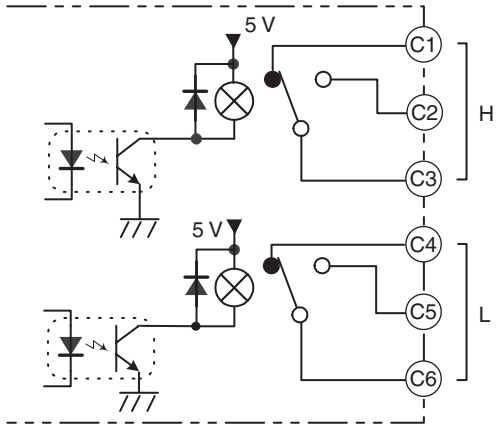
Connect loads within specifications.

The electrical life expectancy of the relays is 100,000 operations.

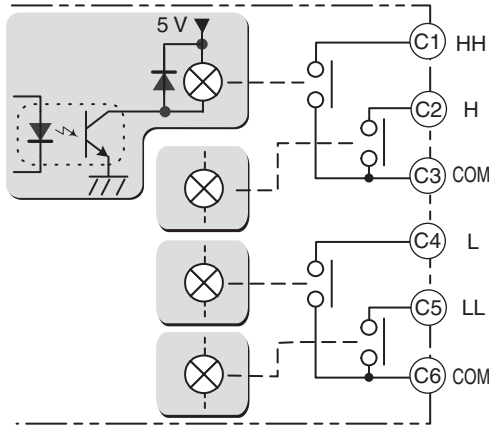
Circuit Diagrams

<Contact outputs>

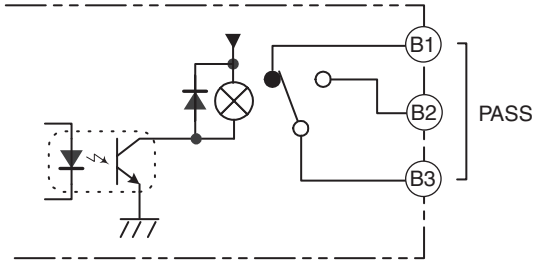
<C1> H and L output model



<C2> HH, H, L, and LL output model

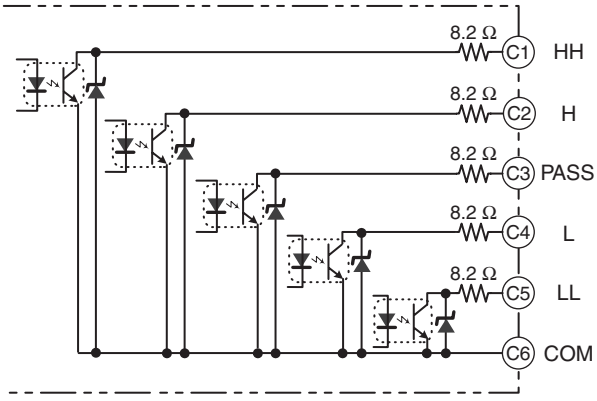


<CPA> PASS output model

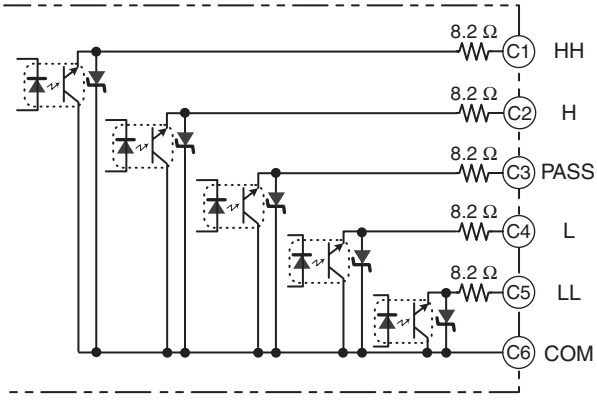


<Transistor outputs>

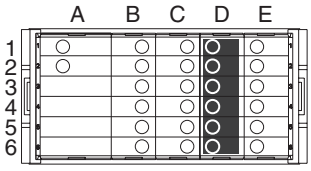
<T1> NPN output model



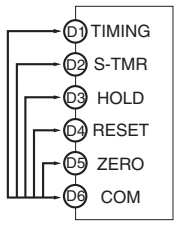
<T2> PNP output model



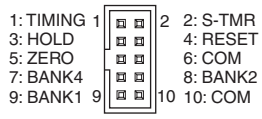
● Event inputs



Input control signals. The configuration is shown below.



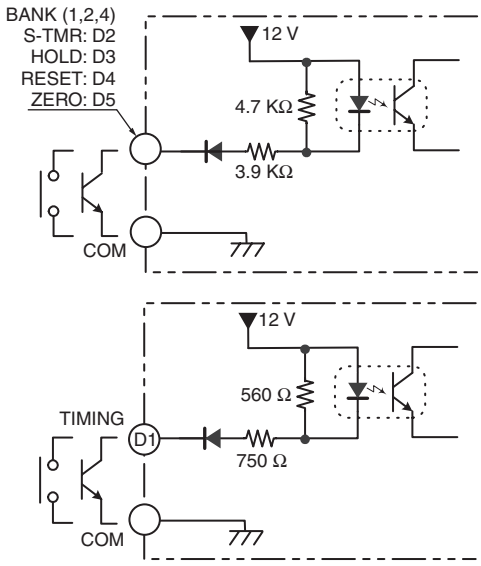
Models with terminal blocks
<1><3>



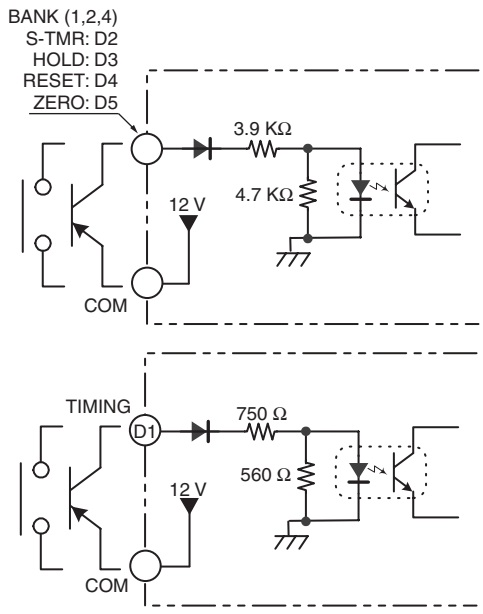
Models with connectors
<2><4>

Circuit Diagrams

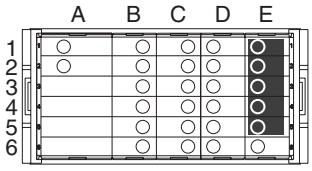
<1><2> NPN input model



<3><4> PNP input model



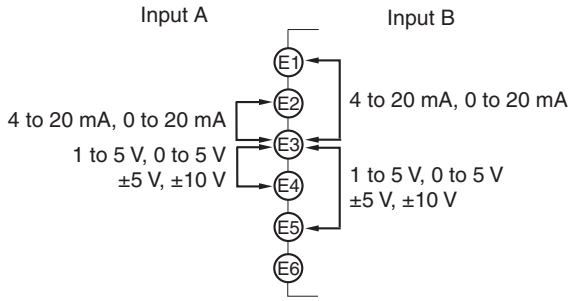
● Analog inputs



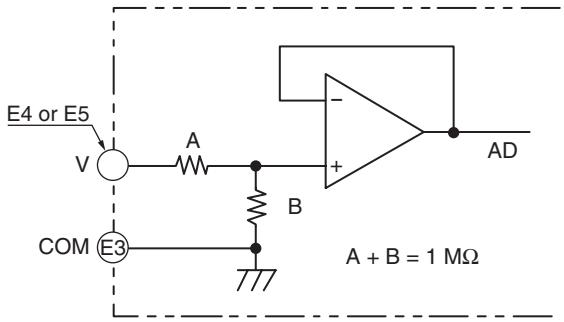
Input the signal to be measured. The inputs that can be measured by each model are outlined below.

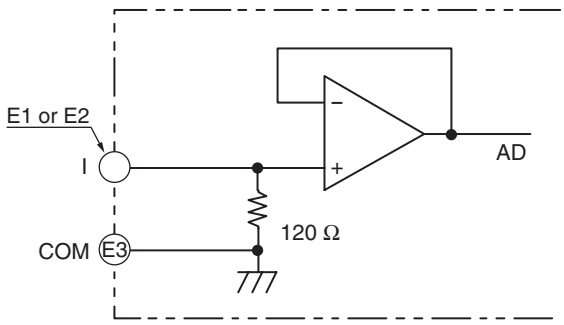
Voltage/current inputs

Connect the input device to the terminals shown below depending on the input type. Make sure that the maximum rating is not exceeded, even momentarily.



Circuit Diagrams





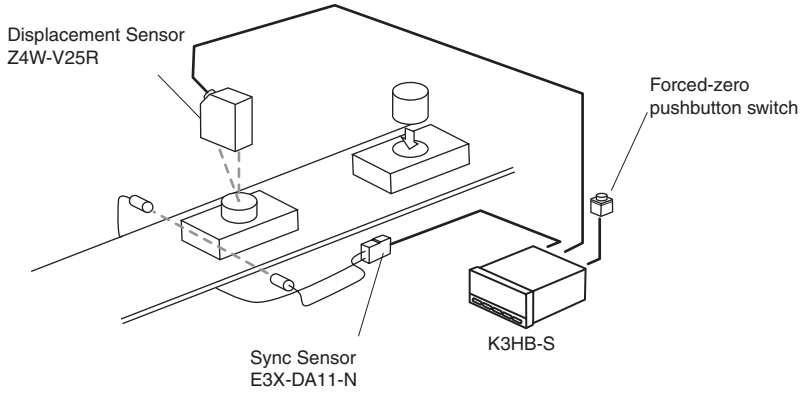
Section 3 Basic Application Methods

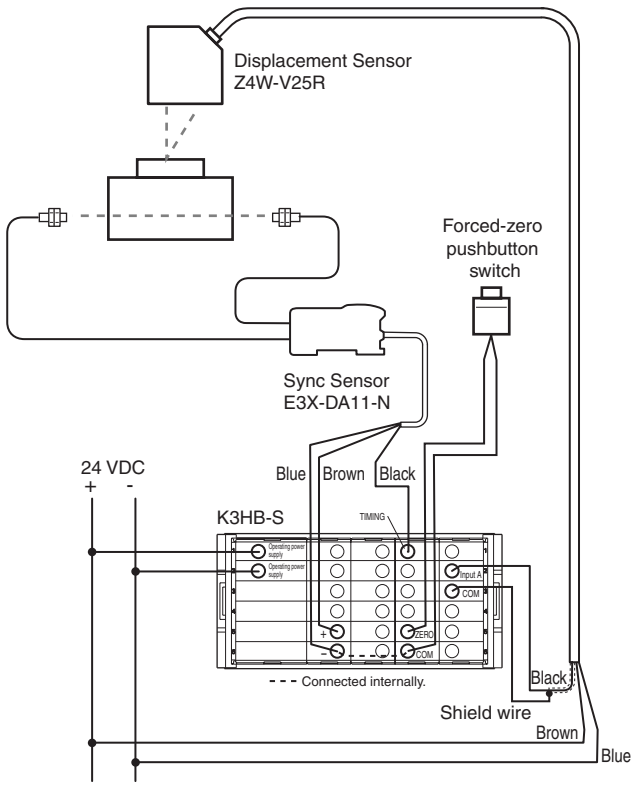
3.1 Product height measurement and OK/NG judgement

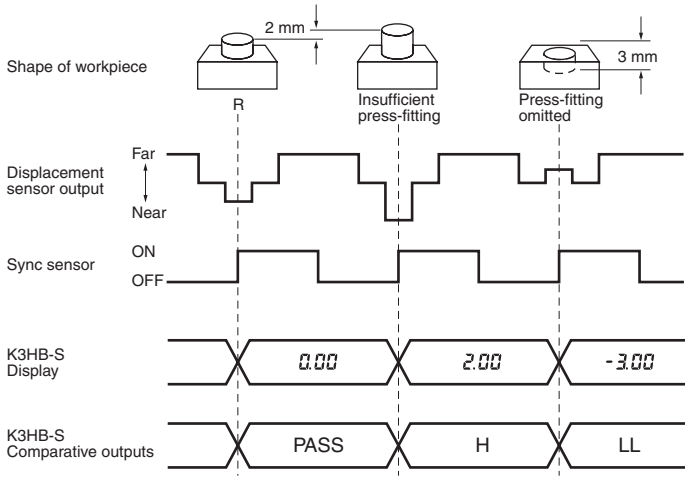
Advantages of Using the K3HB-S

- The sampling hold function can be used to use sensors synchronously and display and hold product heights.
- The forced-zero function can be used for one-touch zero adjustment.
- The position meter can be used to display how far the measurement value is displaced (deviation) from the center.
- The dimensions of molded parts or for detecting caps that are not tight on PET bottles can be checked.

● Checking Dimensions after Press-fitting







■ K3HB-S Setting Details

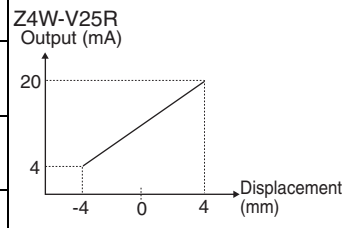
RUN level

Parameter	Characters	Set value	Remarks
Comparative set value HH	✻	3.00	Example of monitoring in two stages, at the ±2 mm and ±3 mm from the reference.
Comparative set value H	✻	2.00	
Comparative set value L	✻	-2.00	
Comparative set value LL	✻	-3.00	

✻ Check on the status display.

Initial setting level (L 0)

Parameter	Characters	Set value	Remarks
Calculation	CAL	0	A
Input type A	In-tA	4-20	
Scaling input value A1	InP.A1	4.000	
Scaling display value A1	dSP.A1	-4.00	
Scaling input value A2	InP.A2	20.000	
Scaling display value A2	dSP.A2	4.00	
Decimal point position	dP	ooo.oo	



Input adjustment level (L 1)

Parameter	Characters	Set value	Remarks
Timing hold	tHG-H	S-H	Sampling hold

Display adjustment level (L2)

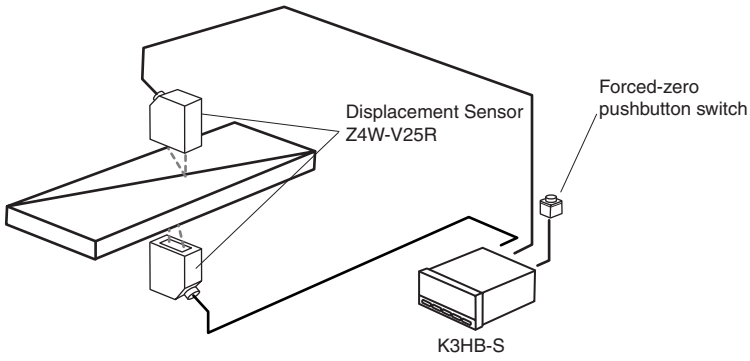
Parameter	Characters	Set value	Remarks
Display value selection	dISP	Pv	Present value
Position meter type	POS-t	dEv	Deviation display
Position meter upper limit	POS-H	4.00	Full-scale ±4 mm
Position meter lower limit	POS-L	-4.00	

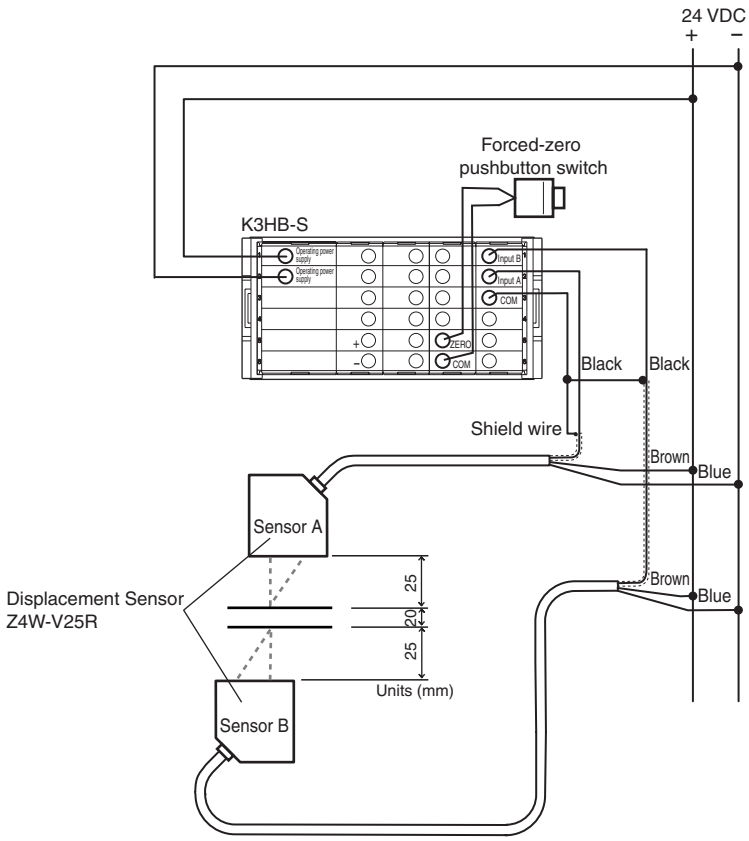
* Only the parameters required for settings are displayed in the initial setting, input adjustment, and display adjustment levels.

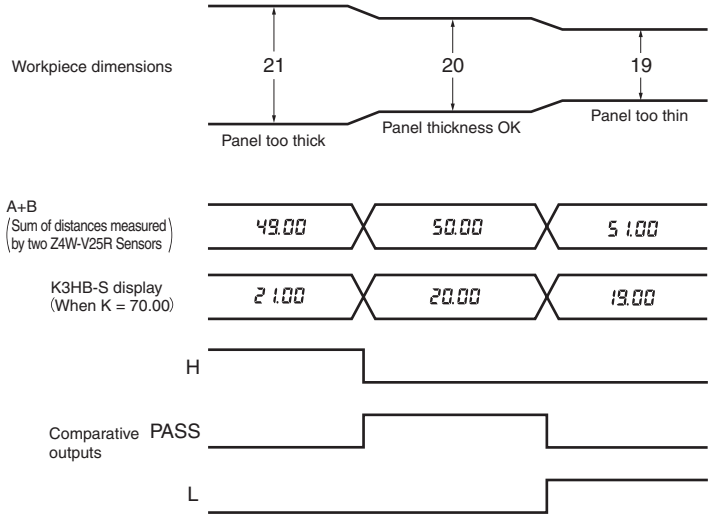
3.2 Panel thickness inspection

Advantages of Using the K3HB-S

- Calculation mode K-(A+B) can be used to convert panel thickness to actual size and measure it from the outputs of two displacement sensors.
- The forced-zero function can be used for one-touch deviation measurement from a reference panel thickness.







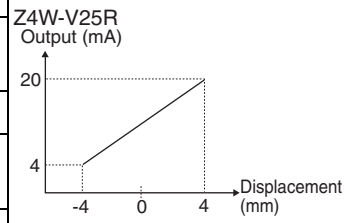
■ K3HB-S Settings Details

RUN level

Parameter	Characters	Set value	Remarks
Comparative set value H	✻	20.50	Monitoring a difference of ±0.5 mm for a reference panel thickness of 20 mm
Comparative set value L	✻	19.50	

✻ Check on the status display.

Initial setting level (L 0)

Parameter	Characters	Set value	Remarks
Calculation	CAL	5	K-(A+B)
Input type A	In-tA	4-20	
Scaling input value A1	InP.A1	4.000	
Scaling display value A1	dSP.A1	21.00	
Scaling input value A2	InP.A2	20.000	
Scaling display value A2	dSP.A2	29.00	
Input type B	In-tb	4-20	
Scaling input value B1	InP.b1	4.000	
Scaling display value B1	dSP.b1	21.00	
Scaling input value B2	InP.b2	20.000	
Scaling display value B2	dSP.b2	29.00	
Constant K	K	7000	Reference panel thickness 20 mm + sensor displacement 25 mm × 2
Decimal point position	dP	000.00	

Input adjustment level (L 1)

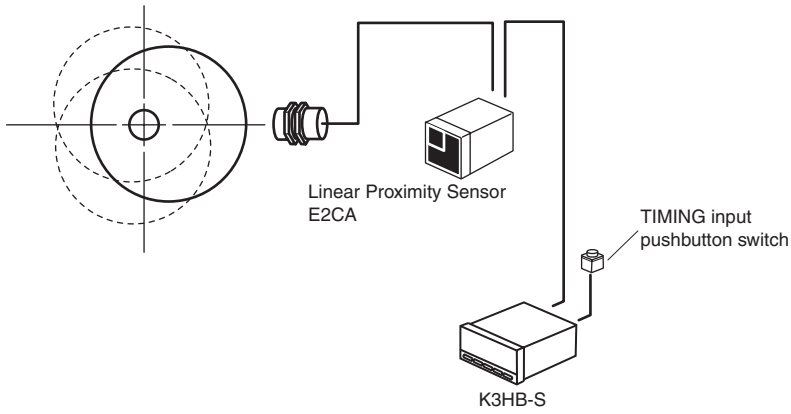
Parameter	Characters	Set value	Remarks
Timing hold	tHG-H	nonAL	Normal

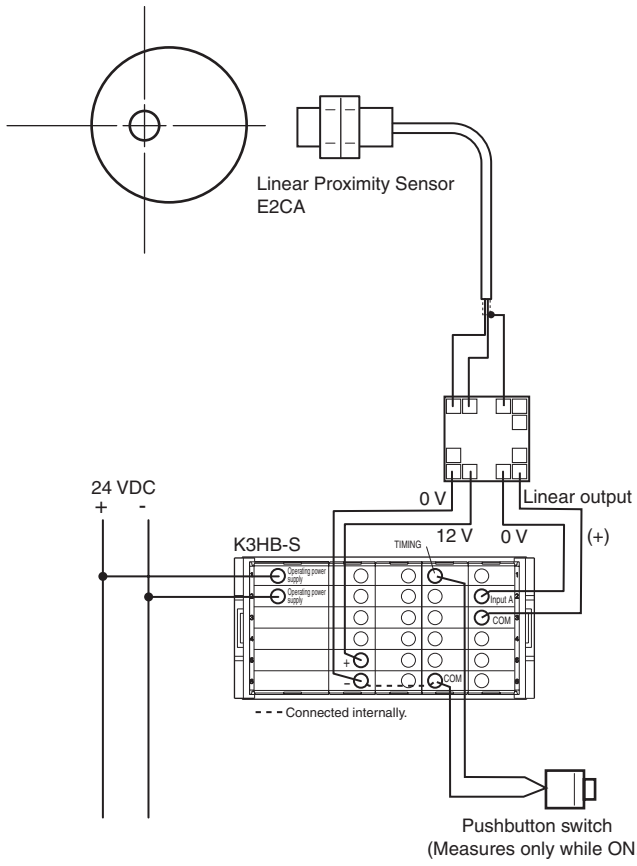
* Only the parameters required for settings are displayed in the initial setting and input adjustment levels.

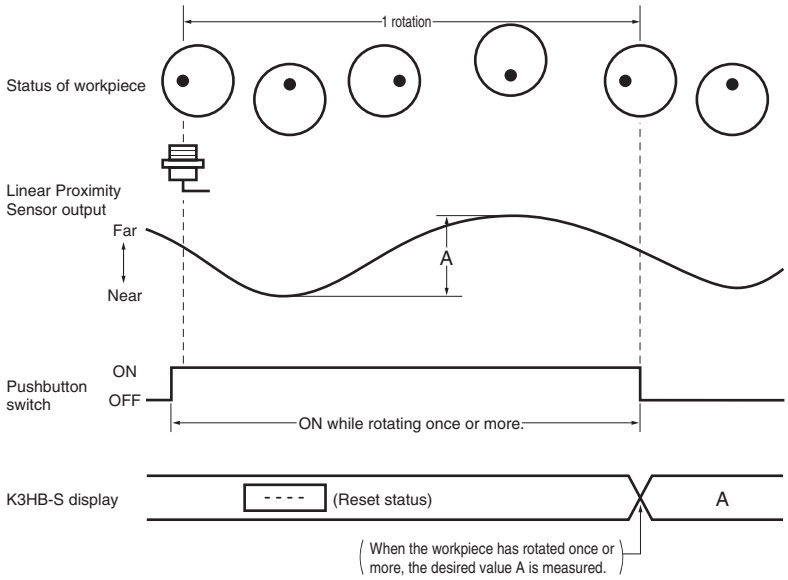
3.3 Measurement of Disk Eccentricity

Advantages of Using the K3HB-S

- The peak-to-peak hold function can be used for simple eccentricity measurement by measuring the difference between the maximum and minimum values for linear sensor signals that change continuously.
- Measurements are taken the timing input (the pushbutton switch in the following diagram) is ON and the last result is held when it is OFF.
- Applications such as measuring shaft eccentricity are possible. (Similar applications are possible for non-metallic objects using an ultrasonic displacement sensor.)

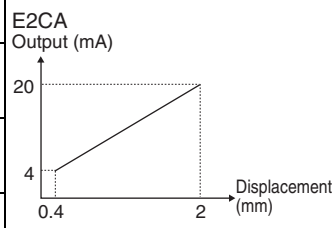






■ K3HB-S Setting Details

Initial setting level (L 0)

Parameter	Characters	Set value	Remarks
Calculation	CAL	0	A
Input type A	In-tA	4-20	
Scaling input value A1	InP.A1	4.000	
Scaling display value A1	dSP.A1	0.40	
Scaling input value A2	InP.A2	20.000	
Scaling display value A2	dSP.A2	2.00	
Decimal point position	dP	ooo.oo	

Input adjustment level (L 1)

Parameter	Characters	Set value	Remarks
Timing hold	tmG-H	P-P	Peak-to-peak hold

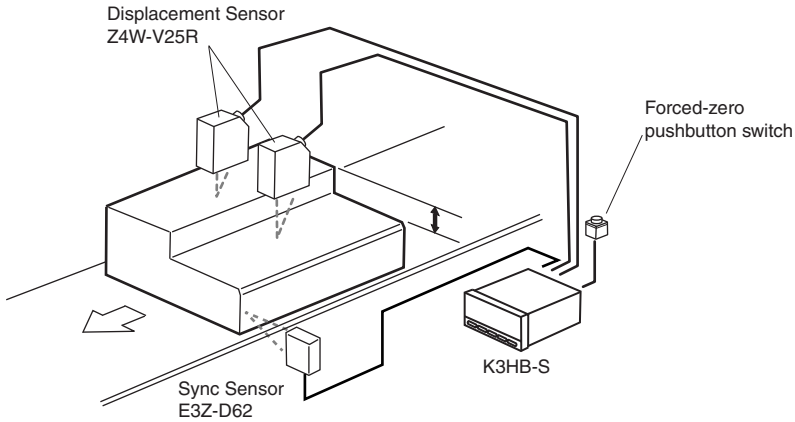
* Only the parameters required for settings are displayed in the initial setting and input adjustment levels.

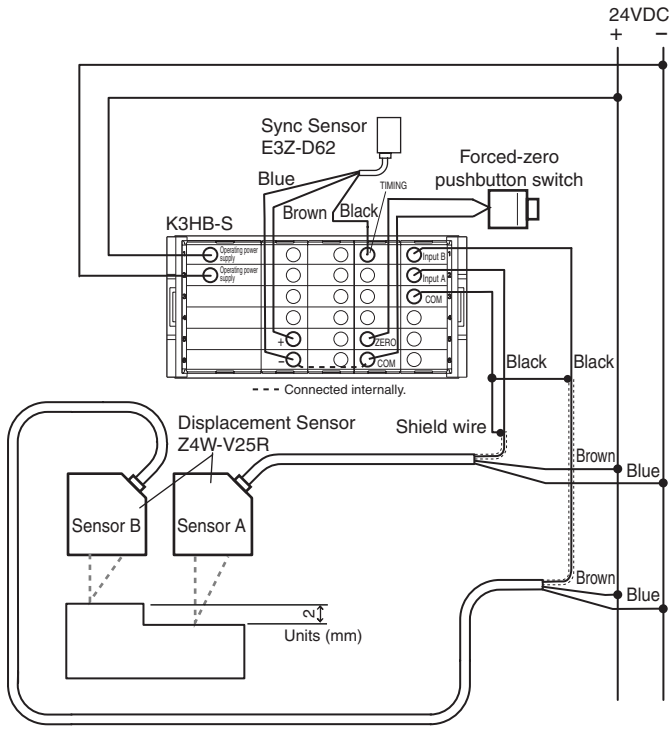
3.4 Step inspection

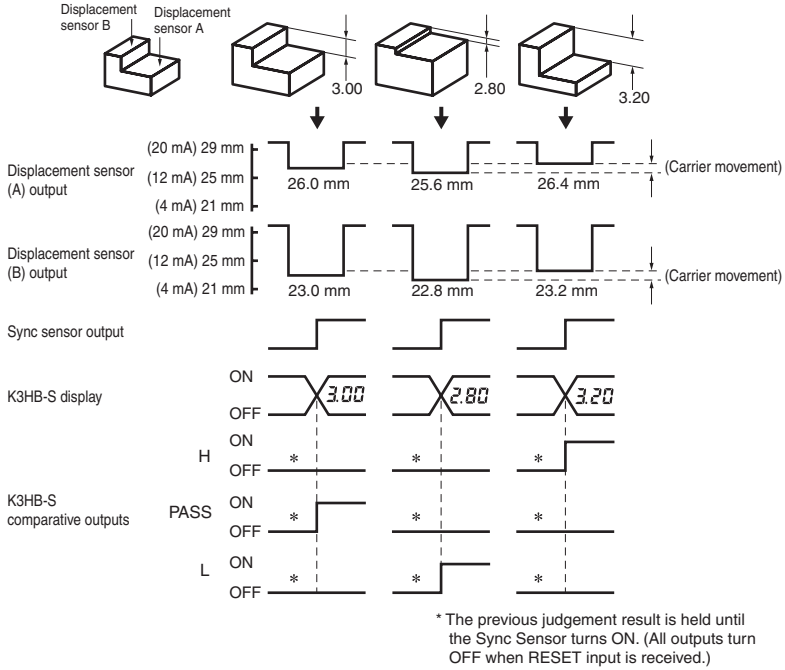
Advantages of Using the K3HB-S

- Calculation mode A-B can be used to measure steps using two displacement sensors.
- The forced-zero function can be used to easily adjust the reference step dimension to the actual object.
- The effects of carrier line movement can be eliminated using a normal dimensions check to measure the dimensions between the workpiece surface and the carrier line surface.

● Checking Molded Parts Dimensions







* The previous judgement result is held until the Sync Sensor turns ON. (All outputs turn OFF when RESET input is received.)

■ K3HB-S Setting Details

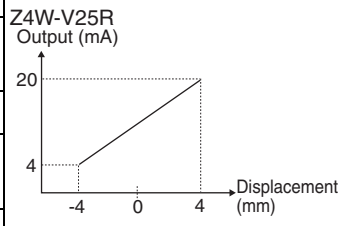
RUN level

Parameter	Characters	Set value	Remarks
Comparative set value H	✻	2.50	Monitoring a difference of ±0.5 mm for a reference step of 2 mm
Comparative set value L	✻	1.50	

✻ Check on the status display.

Initial setting level (L 0)

Parameter	Characters	Set value	Remarks
Calculation	CAL	4	A-B
Input type A	In-tA	4-20	
Scaling input value A1	InP.A1	4.000	
Scaling display value A1	dSP.A1	21.00	
Scaling input value A2	InP.A2	20.000	
Scaling display value A2	dSP.A2	29.00	
Input type B	In-tb	4-20	
Scaling input value B1	InP.b1	4.000	
Scaling display value B1	dSP.b1	21.00	
Scaling input value B2	InP.b2	20.000	
Scaling display value B2	dSP.b2	29.00	
Decimal point position	dP	000.00	



Input adjustment level (L 1)

Parameter	Characters	Set value	Remarks
Timing hold	tHO-H	S-H	Sampling hold

* Only the parameters required for settings are displayed in the initial setting and input adjustment levels.

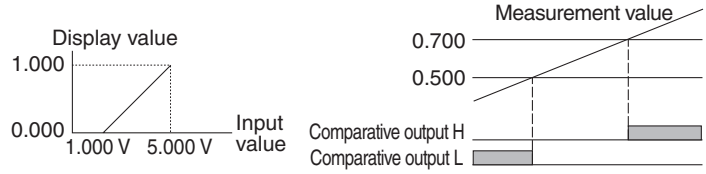
Section 4 Initialization

4.1 Initialization example

Initialization when using the K3HB-S is explained in the following example.

<Settings example>
1- to 5-V input is scaled to 0.000 to 1.000 and displayed.

- Comparative output H is output when the measurement value reaches 0.700 or higher.
- Comparative output L is output when the measurement value falls to 0.500 or lower.



Initialization Flow

To change the setting in steps B, C, D, E, F, or G, press the [SHIFT] Key once to enable the setting to be changed. Then use the [UP] Key to change the set value.
Press the [MODE] Key to clear the set value. The next parameter will be displayed and the setting will be registered.

A Check the wiring and turn the power ON. (Connect the sensor to input A.)

- The input type is factory-set to 4 to 20-mA input. When the power is turned ON, the display may flash "RErr" (outside the input range). This simply indicates, however, that the input is outside the range 4 to 20 mA and does not indicate a product failure.

B Set "Calculation" to 0.

1. Move to the initial setting level by pressing the [LEVEL] Key for at least 3 s with the present value displayed (RUN level).

● CAUTION ●
Perform steps C, D, and E in the order given here to make input type, scaling value, and decimal point position settings.
Performing the steps in any other order may result in unexpected operation (due to automatic set value initialization).
For example, If the scaling value is set and then the input type selected, the scaling value is automatically initialized.

2. Set the calculation "CAL" to "0"(initial value) and press the [MODE] Key.

C Set "Input type A" to 1 to 5 V.

1. Set the parameter "In-tA" to "1-5" and press the [MODE] Key.

D Set the scaling value.

1. Set the scaling input value A1 "InP.A1" to "1.000" (initial value) and press the [MODE] Key.
2. Set the scaling display value A1 "dSP.A1" to "0" and press the [MODE] Key.
3. Set the scaling input value A2 "InP.A2" to "5.000" (initial value) and press the [MODE] Key.
4. Set the scaling display value A2 "dSP.A2" to "1000" and press the [MODE] Key.

E Set the decimal point position.

1. Set the parameter "dP" to "oo.ooo" (initial value) and press the [MODE] Key.

F Set comparison set value H to 0.700 and set comparison set value L to 0.500.

1. Return to the RUN level by pressing the [LEVEL] key for at least 1 s. (Start operation.)
2. Press the [MODE] key repeatedly until the status display shows (H), and then set the value to "0.700".
3. Press the [MODE] key until the status display shows (L), and then set the value to "0.500".

G Start actual operation.

1. Press the [MODE] key repeatedly to display the measurement values and start actual operation.

Clearing Settings

If you become confused while setting the parameters and cannot continue, all settings can be cleared so that you can start over.

Refer to "5.34 Initializing all settings" (P.5-78) for information on clearing all settings.

* Refer to Section 5 Functions and Operations for details on making parameter settings.

Section 5 Functions and Operations

Knowledge Required for Setting Parameters

■ About Levels

Levels are groups of parameters.

Levels for the K3HB-S are classified as follows:

Important

Depending on the level, measurements may continue to be executed or stop. Check the measurement operation.

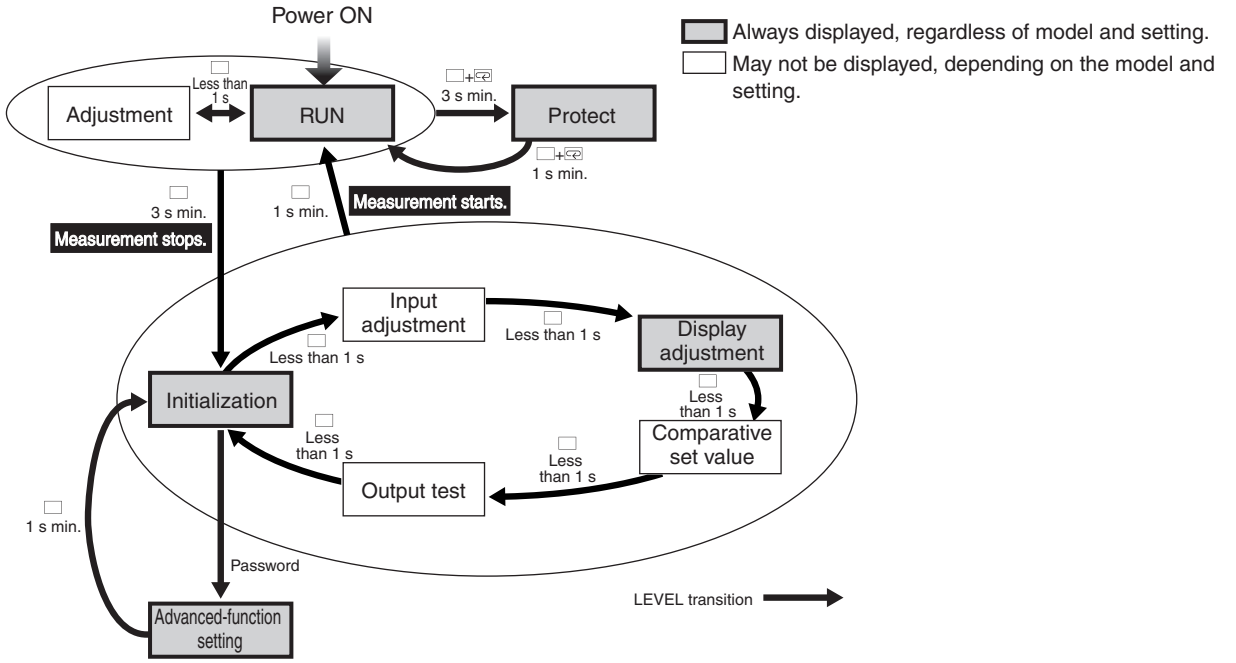
Level	Function	Measurement operation
Protect	Makes settings to prevent inadvertent key operations. Movement between levels and changes to settings may be prohibited, depending on the protect settings.	Measurement
RUN	This is the normal operation mode where inputs are read and comparative judgements are made. In RUN level, the present value can be displayed, comparative set values checked, and forced-zero executed or cleared. The K3HB-S is in RUN mode immediately after the power is turned ON.	
Adjustment	Switches banks.	
Initialization	Initializes settings such as input type, scaling, and comparative output patterns.	Stop
Input adjustment	Adjusts inputs.	
Display adjustment	Adjusts comparative set value display/ no display, display refresh periods, display color, and position meters.	
Comparative set value	Makes comparative set value bank settings.	
Output test	Sets a test measurement value and performs an output test.	
Advanced-function settings	Used for advanced customization.	

To change a parameter, move to the level where that parameter is found. The current level is shown on the bank/level display when moving between levels.

Level/bank display	Level
LP	Protect level
Not lit	RUN level *
LA	Adjustment level
LD	Initial setting level
L 1	Input adjustment level
L2	Display adjustment level
L4	Comparative set value level
LE	Output test level
LF	Advanced-function setting level

* B 1 and B7 are displayed when banks are used.

■ Moving Between Levels



To protect level

Press the □[LEVEL] and ⇆[MODE] Keys in RUN level for at least 1 s and the PV display will start to flash. Press the same keys for at least 2 s to move to protect level.
Press the □[LEVEL] and ⇆[MODE] Keys for at least 1 s to return to RUN level.

To adjustment level

Press the □[LEVEL] Key in RUN level once (less than 1 s). The level will change to adjustment level when the key is released.
Use the same operation to return from adjustment level to RUN level.

To initial setting level

Press the □[LEVEL] Key in RUN or adjustment level for at least 1 s and the PV display will start to flash. Press the □[LEVEL] Key for at least 2 s to move to the initial setting level.
Press the □[LEVEL] Key for at least 1 s to return to the RUN level from the initial setting level.

Input adjustment level
Display adjustment level
Comparative set value level
Output test level

First, move to initial setting level. Press the □[LEVEL] Key in initial setting level (less than 1 s) each time to move to the next level.
Moving to the next level from the output test level returns you to the initial setting level.

Advanced-function setting level

A special operation is required to move to the advanced-function setting level.
Use the following procedure.

Procedure

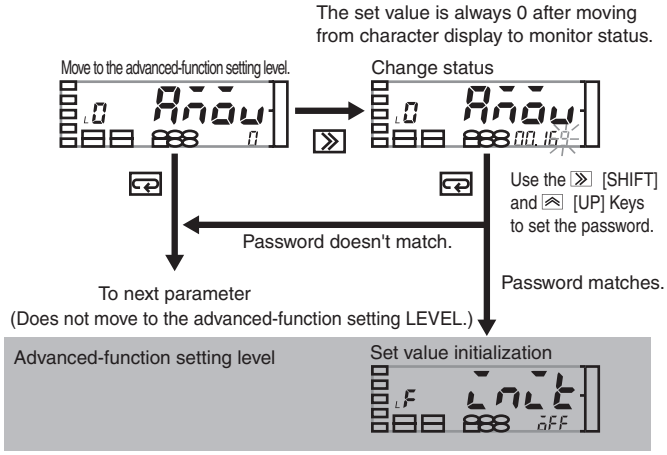
A Move to the initial setting level, press the [MODE] Key several times to display the "Ano4" (move to advanced-function setting level) parameter.

B Press the [SHIFT] Key to enable the password to be entered.

C Use the [SHIFT] and [UP] Keys to set the password.
The password is "-0169" (-0169).

D Press the [MODE] Key and write the password.

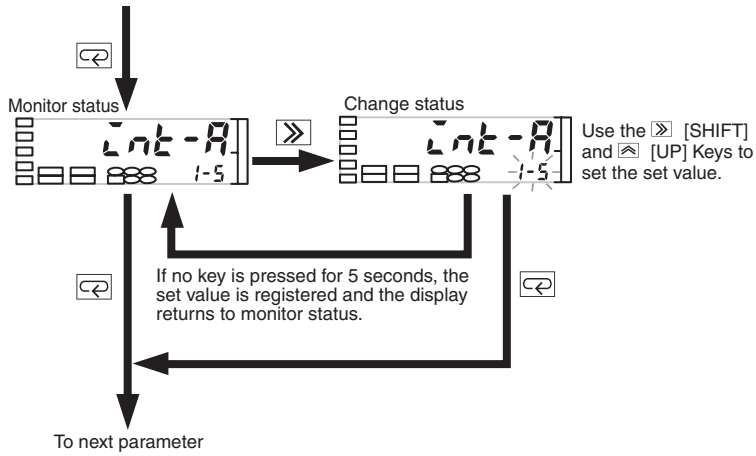
- The advanced-function setting level will be entered if the password is correct.
- If the password is incorrect, the next parameter is displayed and the Unit stays on the initial setting level.



■ Monitoring and Changing Set Values

Values set to each parameter are called "set values".
Set values can be numerals or characters.

When the SV display is lit, it is called the "monitor status". When the SV display is flashing, it is called the "change status".



Use the following procedure to change set values.

Procedure

A The parameter to be changed is displayed.

- At this stage, set values are displayed but cannot be changed.

B Press the [SHIFT] Key once to enable the setting to be changed.

- The place that can be changed starts to flash.

C Use the [SHIFT] and [UP] Keys to change the setting.

D Press the [MODE] Key to switch to the next parameter.

- The changed set value is stored in the internal memory.
- If no key is pressed at step C for 5 s*, the set value is registered and the display automatically returns to monitor status.

* If the display is on RUN level or adjustment level, the time before the return to monitor status differs depending on the setting for "Automatic display return time". If the "automatic display return time" setting is less than 5 s, for example, 3 s, then if there are no key operations in change status for 3 s, the changed set value is registered and the display automatically returns to the display when the power was turned ON.

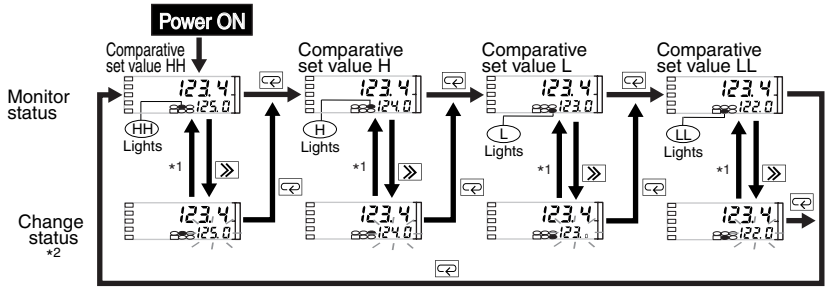
■ Confirming and Changing Comparative Set Values

Comparative set values are confirmed and changed in RUN level.
(The Unit keeps operating even while comparative set values are being confirmed and changed.)

The comparative set values from HH to LL are displayed each time the [MODE] Key is pressed in the operation status immediately after the power is turned ON. The SV display status (HH) (H) (L) (LL) is lit for the displayed comparative set value.

Some comparative set values may not be displayed, depending on the relay/transistor output specifications and settings.

Refer to the parameter setting procedures for information on how to change comparative set values.



*1 If no key is pressed for 5 seconds, the set value is registered and the display returns to monitor status.
*2 Use the [SHIFT] and [UP] Keys to set the set value.

Displayed comparative set value

	Displayed comparative set value			
Relay/transistor output specifications	**HH**	**H**	**L**	**LL**
H/L Models with Relay Outputs <C1>		○	○	
HH/H/L/LL Models with Relay Outputs <C2>	○	○	○	○
HH/H/PASS/L/LL Models with transistor output <T1><T2>	○	○	○	○
None *				

* For Sensor Power Supply/Output models with a PASS output, the displayed comparative set value changes depending on the allocation setting of the PASS output.

	Displayed comparative set value			
PASS (PASS output change)	**HH**	**H**	**L**	**LL**
LL				○
L			○	
PASS				
H		○		
HH	○			
Err.				

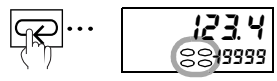
Remarks

Allocating other outputs to PASS output → P.5-49

* When Su. dSP (comparative set value display) is set to OFF, comparative set values are not displayed during operation but are displayed with key operations.

Parameter Setting Procedure

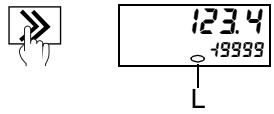
A Press the [MODE] Key several times to display the comparative set value to be changed.



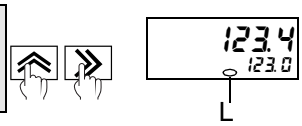
One of the values between HH and LL will flash, according to the displayed comparative set value.

B Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

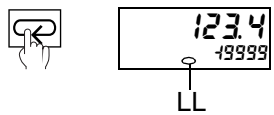


C Use the [SHIFT] Key and [UP] Key to change the comparative set value.



D Press the [MODE] Key to switch to the next parameter.

- The comparative set value set in C will be registered.



5.1 Setting Calculations

Initial setting level

The K3HB-S can add, subtract, and display two types of analog inputs, input A and input B.

Explanation of Functions	Calculation and constant K

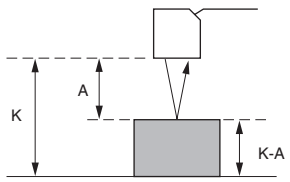
■ A

- Select to use only input A.

■ B

- Select to use only input B.

■ K-A

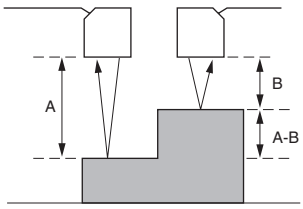


- Select to subtract input A from a constant.
- K can be set to any value.
- This function is useful for applications such as measuring the height of a workpiece.

■ A+B

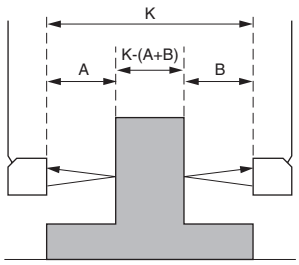
- Select to add input A and B values.

■ A-B



- Select to subtract input B from input A.
- This function is useful for applications such as measuring steps in workpieces.

■ K-(A+B)



- Select to subtract input A and B values from a constant.
- K can be set to any value.
- This function is useful for applications such as measuring the thickness of a workpiece.

■ B/A × 10000

• Select to display the ratio between input A and input B.

■ (B/A-1) × 10000

• Select to display the error ratio for input B and input A.

Set using the following parameter.

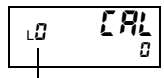
(CAL)

Parameter	Set value	Meaning of set value
Calculation CAL	0	A
	1	B
	2	K-A
	3	A+B
	4	A-B
	5	K-(A+B)
	6	B/A × 10000
	7	(B/A-1) × 10000

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

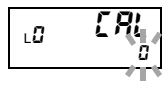

3 s min.



Displays "L0".

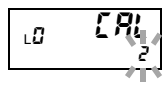
• "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [SHIFT] Key to make the SV display flash.

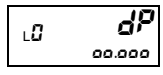


• The setting can be changed when the SV starts to flash.

C Use the [UP] Key to change the set value.



D Press the [MODE] Key to switch to the next PV display.



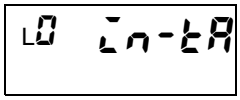
• The set value is registered.

Remarks

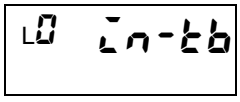
Setting constant K. → P.5-14

5.2 Setting Input Types

Initial setting level



(IN-TA)



(IN-TB)

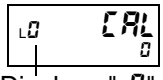
Set the input types at the next parameter to match the connected input devices. Set input type A to match the device connected to input A and set input type B to match the device connected to input B.

Parameter	Set value	Meaning of set value
Input type A In-tA or Input type B In-tb	0-20	0 to 20 mA
	4-20	4 to 20 mA
	0-5	0 to 5 V
	1-5	1 to 5 V
	5	±5 V
	10	±10 V

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

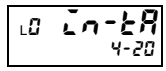
3 s min.



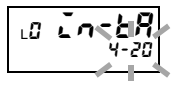
Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B If the PV display is not "In-tA" or "In-tb", press the [MODE] Key to display the desired parameter.

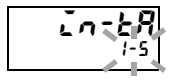


C Press the [SHIFT] Key to make the SV display flash.

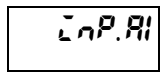


- The setting can be changed when the SV display starts to flash.

D Use the [UP] Key to change the set value.



E Press the [MODE] Key to switch to the next parameter.



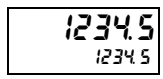
- The set value is registered.

* The display may differ.

Important *

F Press the [LEVEL] Key for at least 1 s to return to the RUN level.

1 s min.



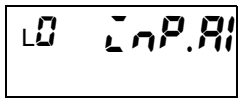
* If input type A is changed, scaling input values A1 and A2 and scaling display values A1 and A2 are initialized. The same applies for input type B.

5.3 Setting Scaling Values

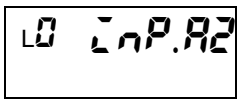
Initial setting level

Set scaling to convert and display input values as any value. Inputs A and B are set separately.

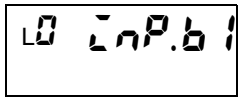
One point *



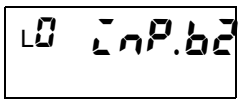
(INP.A1)



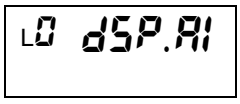
(INP.A2)



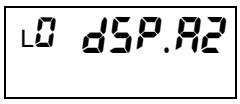
(INP.B1)



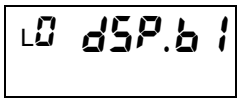
(INP.B2)



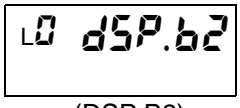
(DSP.A1)



(DSP.A2)

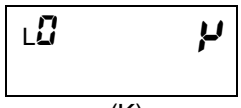


(DSP.B1)



(DSP.B2)

(DP)



(K)

Functions and Operations

<Setting parameter for input A>

Parameter	Set value	Meaning of set value
Scaling input value A1 InP.A1	-19999 to 99999 *	Input value corresponding to dSP.A1
Scaling display value A1 dSP.A1	-19999 to 99999	Display value corresponding to InP.A1
Scaling input value A2 InP.A2	-19999 to 99999 *	Input value corresponding to dSP.A2
Scaling display value A2 dSP.A2	-19999 to 99999	Display value corresponding to InP.A2

<Setting parameter for input B>

Parameter	Set value	Meaning of set value
Scaling input value B1 InP.b1	-19999 to 99999 *	Input value corresponding to dSP.b1
Scaling display value B1 dSP.b1	-19999 to 99999	Display value corresponding to InP.b1
Scaling input value B2 InP.b2	-19999 to 99999 *	Input value corresponding to dSP.b2
Scaling display value B2 dSP.b2	-19999 to 99999	Display value corresponding to InP.b2

The decimal point position for scaling input values depends on the input type.

Input type	Set value
0.000 to 20.000 mA	0.000 to 20.000
4.000 to 20.000 mA	4.000 to 20.000
0.000 to 5.000 V	0.000 to 5.000
1.000 to 5.000 V	1.000 to 5.000
±5.000 V	-5.000 to 5.000
±10.000 V	-10.000 to 10.000

* Use the teaching function to use actual inputs to set scaling input values "InP.A1", "InP.A2", "InP.b1", and "InP.b2".
Refer to Teaching (P.5-15) for details.

The decimal point for scaling display values depends on the decimal point position [dP] setting.

Parameter	Set value	Meaning of set value
Decimal point position dP	0000	No decimal point
	000.0	One digit below the decimal point is displayed.
	00.00	Two digits below the decimal point are displayed.
	0.000	Three digits below the decimal point are displayed.
	.0000	Four digits below the decimal point are displayed.

Set constant K [P] when setting the calculation [CAL] to K-A[2] or K-(A+B)[5]

Parameter	Set value	Meaning of set value
Constant K P	-1999 to 9999	-19999 to 99999

The decimal point will be at the decimal point position.

Explanation of Functions	Scaling

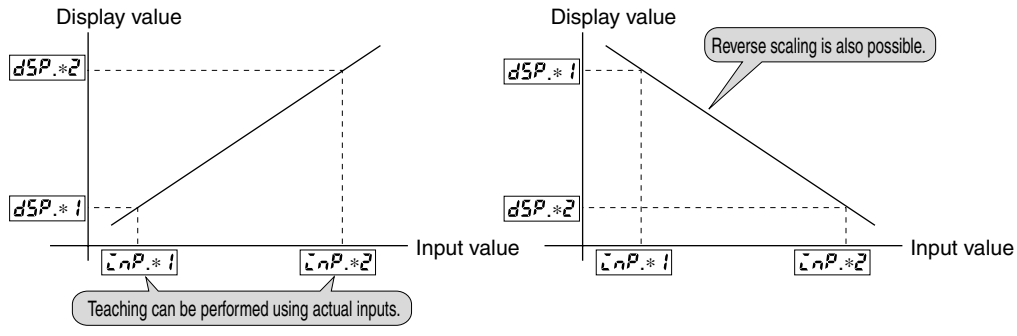
Scaling is a function that applies sampled input values to a conversion formula that is set beforehand to convert each input value to a measurement value.

The input value can be converted to Units used by the system.

The scaling conversion formula for voltage/current input is shown below.

$$dsp = \frac{DSP2 - DSP1}{INP2 - INP1} inp + \frac{INP1 \cdot DSP2 - INP2 \cdot DSP1}{INP2 - INP1}$$

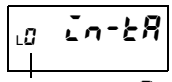
Here,
INP1: The input value for measurement value DSP1
DSP1: The measurement value for input value INP1
INP2: The input value for measurement value DSP2
DSP2: The measurement value for input value INP2
inp: Input value for each sampling
dsp: Corresponding measurement value



Scaling

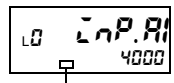
Parameter Setting Procedure (Scaling Settings for Input A)

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.



- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to switch the PV display to "InP.A1".

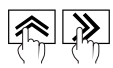


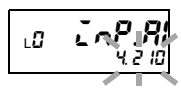
- Teaching is possible for scaling input value A1. "T" is lit to indicate that teaching is possible.
- Refer to P.5-15 for the teaching method.

C Press the [SHIFT] Key to make the SV display flash.

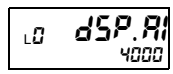
- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to change the set value.

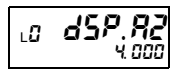




E Press the [MODE] Key to switch the PV display to "dSP.A1".



F Repeat steps C to E and set "dSP.A1", "InP.A2", and "dSP.A2".



* The display may be different.

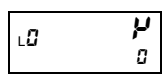
Use the same procedure to set the "InP.b1", "dSP.b1", "InP.b2", and "dSP.b2" parameters for scaling input B.

Constant K

Use steps G to I to set constant K, if required.

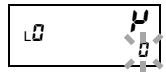
Proceed to step J if constant K is not included in the calculation and does not, therefore, need to be set.

G Press the [MODE] Key several times to switch the PV display to "P".

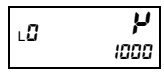


- The set value is registered.

H Press the [SHIFT] Key to make the SV display flash.

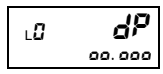


I Use the [UP] and [SHIFT] Keys to change the set value.



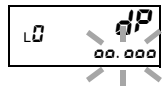
Decimal point position

J Press the [MODE] Key to switch the PV display to the next parameter "dP".

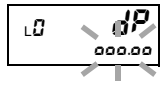


K Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV starts to flash.



L Use the [UP] Key to change the set value.



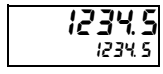
M Press the [MODE] Key to switch to the next parameter.

- The set value is registered.

* The display may be different.

N Press the [LEVEL] Key for at least 1 s to return to the RUN level.

1 s min.



Teaching

Use the teaching function to use real inputs to set scaling input values "SnP.A1", "SnP.A2", "SnP.b1", and "SnP.b2".

Parameter Setting Procedure

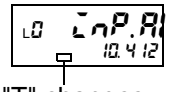
After performing step B, press the [UP] Key.

- Teaching is enabled and "T" is lit.
- The setting changes to match the actual input.

"T" is lit.

Press the [UP] Key again.

- The input value is registered as the set value and the monitor mode is entered.
- Press the [MODE] Key when in teaching mode to cancel teaching and switch to the next parameter.



"T" changes from flashing to being lit.

* Even if a sensor error occurs during teaching or the [UP] Key is pressed when no measurement has been made, the input value is not registered.

5.4 Setting Measurement Operations

Input adjustment level

L1 tmG-H

(TMG-H)

The K3HB-S has 5 measurement modes, which are set using the following parameter.

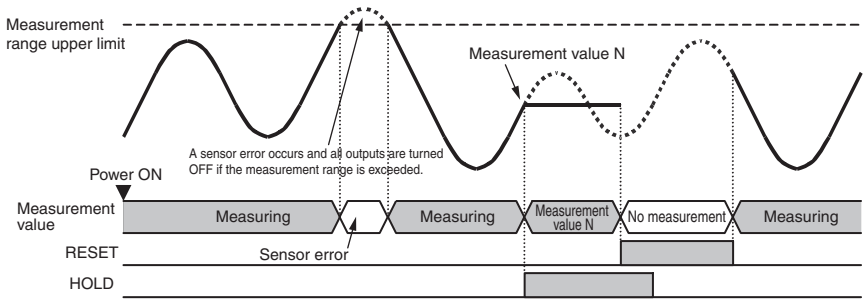
Parameter	Set value	Meaning of set value
Timing hold tmG-H	norml	Normal
	S-H	Sampling hold
	P-H	Peak hold
	b-H	Bottom hold
	P-P	Peak-to-peak hold

Normal

- Continuously performs measurement and always outputs based on comparative results.
- TIMING inputs are ignored.

Important *

- When the measurement value exceeds the measurement range, a sensor error will occur and all outputs will turn OFF.
- The measurement value immediately prior to a HOLD input is held during the HOLD input. Measurements are not performed during RESET input.
- If RESET and HOLD inputs are competing, the RESET input will take priority.



The PV display will show "-----" in no measurement status.

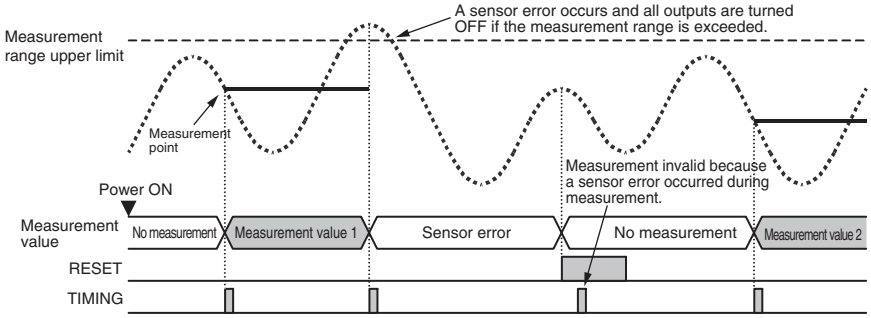
Remarks

Selecting operations for input errors. → P.5-23

Sampling hold

Important *

- Holds the measurement at the rising edge of the TIMING signal.
- When the measurement value exceeds the measurement range, a sensor error will occur and all outputs will turn OFF.
- Measurements are not performed during RESET input and TIMING inputs are disabled.



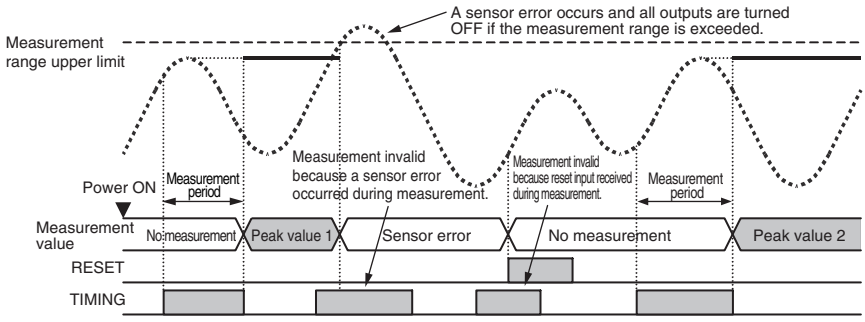
The PV display will show "-----" in no measurement status.

Peak hold

- The maximum value is held while measurement is being performed (while the TIMING input is ON) and when the measurement has been completed (when the TIMING input turns OFF) the measurement value is refreshed using the largest held value.

Important *

- When the measurement value exceeds the measurement range during measurement, a sensor error will occur, a sensor error will immediately show on the display, and all outputs will turn OFF. Also, the measurement at that time will be invalid.
- Measurements are not performed and TIMING inputs are disabled during RESET input.



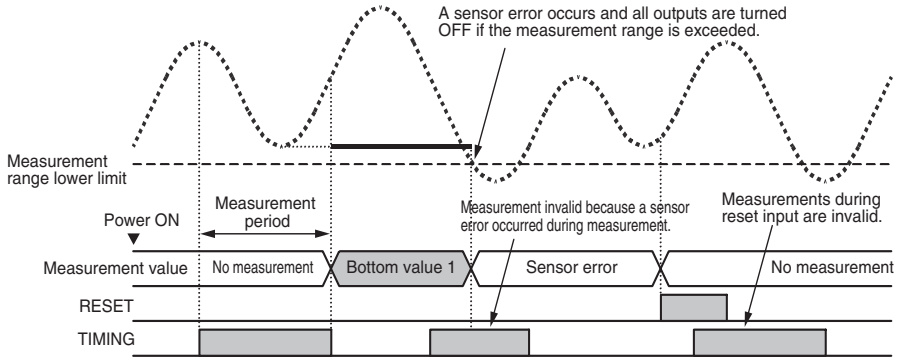
The PV display will show "-----" in no measurement status.

Bottom hold

- The minimum value is held while measurement is being performed (while the TIMING input is ON) and when the measurement has been completed (when the TIMING input turns OFF) the measurement value is refreshed using the smallest held value.

Important *

- When the measurement value exceeds the measurement range during measurement, a sensor error will occur, a sensor error will immediately show on the display, and all outputs will turn OFF. Also, the measurement at that time will be invalid.
- Measurements are not performed during RESET input and TIMING inputs are disabled.



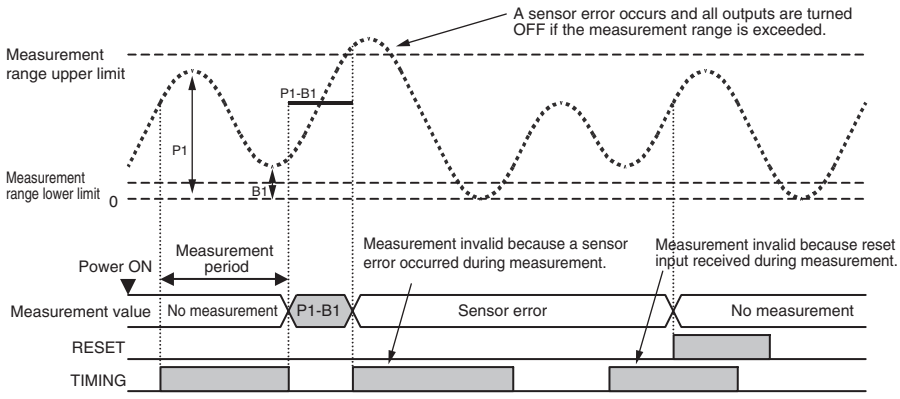
The PV display will show "- - - - -" in no measurement status.

Peak-to-peak hold

- The maximum and minimum values are held while measurement is being performed (while the TIMING input is ON). When the measurement has been completed (when the TIMING input turns OFF), the measurement value is refreshed using the maximum value minus the minimum value (i.e., the peak-to-peak value).

Important *

- When the maximum or minimum value exceeds the measurement range during measurement, a sensor error will occur, a sensor error will immediately show on the display, and all outputs will turn OFF. Also, the measurement at that time will be invalid.
- Measurements are not performed and TIMING inputs are disabled during RESET input.



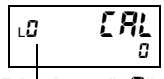
The PV display will show "- - - - -" in no measurement status.

* If input error enabled (S.Err) is set to OFF, the measurement value will be displayed as the upper or lower limit of the display range if it exceeds the measurement range, and a sensor error will occur. If this happens, the comparative result will not be based on the real measurement value. The display flashes when TIMING is set to OFF in peak hold, bottom hold, and peak-to-peak hold, and the comparative output is based on the display value.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

3 s min.

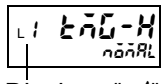


Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [LEVEL] Key again (less than 1 s) to move to the input adjustment level and display "tAG-H".

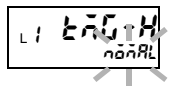
1 s max.



Displays "L 1".

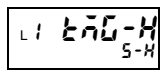
- "L 1" is displayed on the level/bank display to indicate the input adjustment level.

C Press the [SHIFT] Key to make the SV display flash.

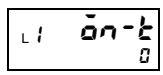


- The setting can be changed when the SV display starts to flash.

D Use the [UP] Key to change the set value.



E Press the [MODE] Key to switch to the next parameter.

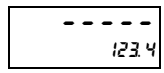


- The set value is registered.

* The display may differ.

F Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.

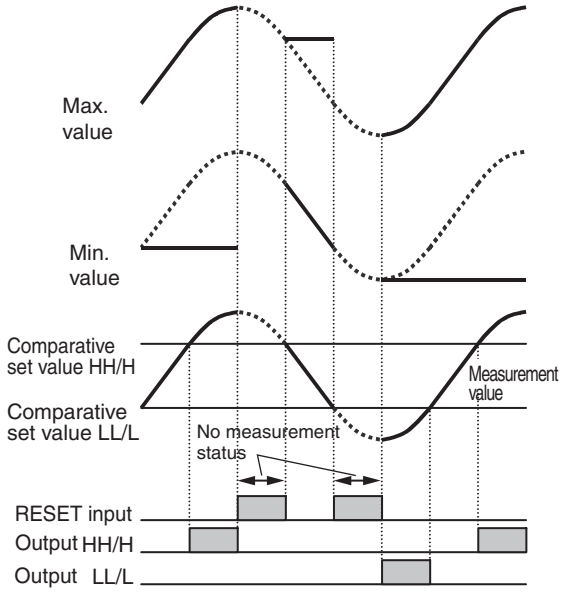


Remarks

Adjusting timing inputs → P.5-25

5.5 Resetting Measurements

When the RESET input turns ON or the ◇[MAX/MIN] Key is pressed for at least 1 s, the maximum value, minimum value, and outputs are cleared. Measurement is not performed during RESET input.



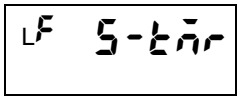
- The display during RESET input is "- - - - -" and all outputs are OFF.
- HOLD and TIMING are disabled during RESET input.
- Forced-zero is not accepted during HOLD input.

Remarks

Not performing measurements for set intervals. → P.5-21

5.6 Not Performing Measurements for Set Intervals

Advanced-function setting level



(S-TMR)

With this function measurement is not performed until a set time has passed after the S-TMR input turns ON. (The function starts at the rising edge of the S-TMR input and the PV display is "------" while no measurement has been performed.)

The time is set using the next parameter.
If the power is turned ON while the S-TMR input is ON, it functions as a startup compensation timer. Measurement will not start until the time set for S-tmr passes after the power is turned ON.

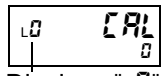
This function can be used for applications such as when the K3HB-S and a rotating body are turned ON at the same time and the rotating body is to be in standby mode until the correct rotation speed has been reached.

Parameter	Set value	Meaning of set value
Startup compensation timer S-tmr	0.0	Startup compensation timer disabled
	0.1 to 99.9	0.1 to 99.9 s

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

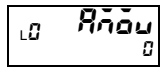

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Anou".

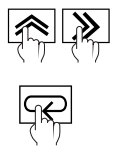


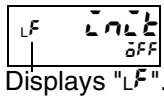
- This parameter is not displayed for the initial status due to setting level protect. Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

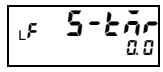




Displays "LF".

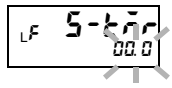
- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to change the PV display to "S-tmr".

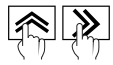


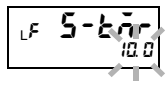
F Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.



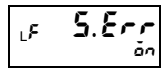
G Use the [UP] and [SHIFT] Keys to change the set value.





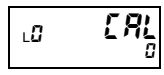
H Press the [MODE] Key to switch to the next parameter.

- The set value is registered.



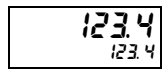
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.

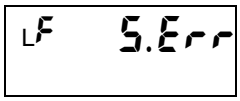


Remarks

Resetting measurements → P.5-20

5.7 Selecting Operations for Input Errors

Advanced-function setting level



(S.ERR)

The display and operation when the input is outside the input range can be selected by setting the next parameter.
(Refer to Input Characteristics in the appendices for information on input ranges.)

Parameter	Set value	Meaning of set value
Input error enabled S.Err	oFF	Input error disabled
	on	Input error enabled

Each operation is outlined below.

●Input error disabled

Display	Output
The display is fixed at the measurement value that corresponds to the upper or lower limit of the input range and flashes.	Outputs the corresponding value from the fixed measurement table.

●Input error enabled

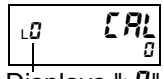
Display	Output
Error display flashes *	All outputs turned OFF.

* When an error occurs for input A or inputs A and B, the display will show "AErr". When an error occurs for input B, the display will show "bErr".

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

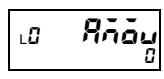

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano4".

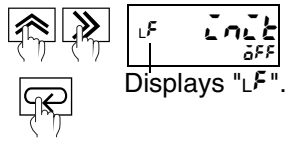


- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

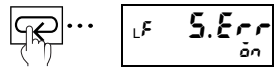
- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

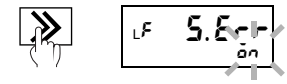


- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to switch the PV display to "S.Err".

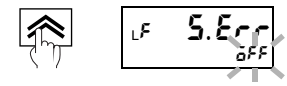


F Press the [SHIFT] Key to make the SV display flash.

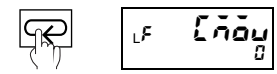


- The setting can be changed when the SV display starts to flash.

G Use the [UP] Key to change the SV display to "on".



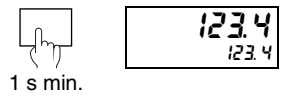
H Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

J Press the [LEVEL] Key for at least 1 s to return to RUN level.



Remarks

Setting inputs types → P.5-11

5.8 Adjusting Timing Inputs

Input adjustment level

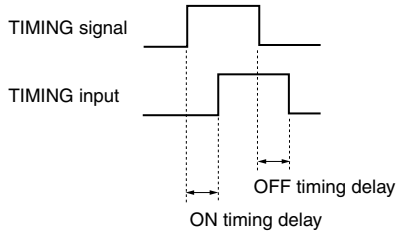
L1 ON-T

(ON-T)

L1 OFF-T

(OFF-T)

TIMING inputs can be delayed by adjusting the ON timing delay and OFF timing delay.



Parameter	Set value	Meaning of set value
ON timing delay ON-T	0 to 4999	0 to 4,999 ms
OFF timing delay OFF-T	0 to 4999	0 to 4,999 ms

The timing hold settings for ON-T (ON timing delay) and OFF-T (OFF timing delay) are enabled for the following conditions.

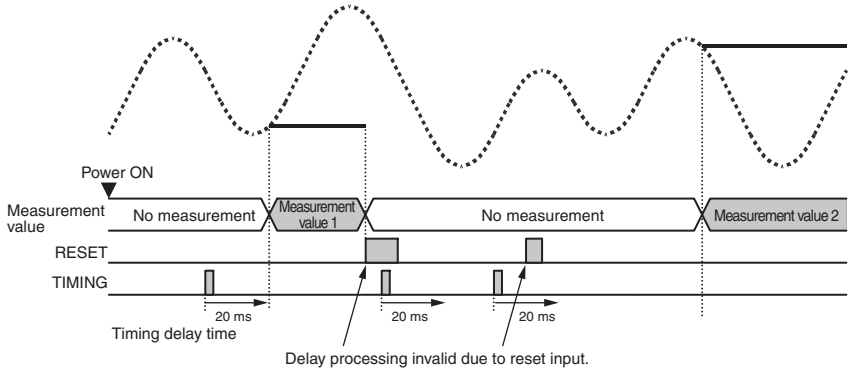
Timing hold set value	THLD-M	ON timing delay ON-T	OFF timing delay OFF-T
Normal	NORMAL	—	—
Sampling hold	S-H	●	—
Peak hold	P-H	●	●
Bottom hold	b-H	●	●
Peak-to-peak hold	P-P	●	●

●: Setting possible —: Setting not possible

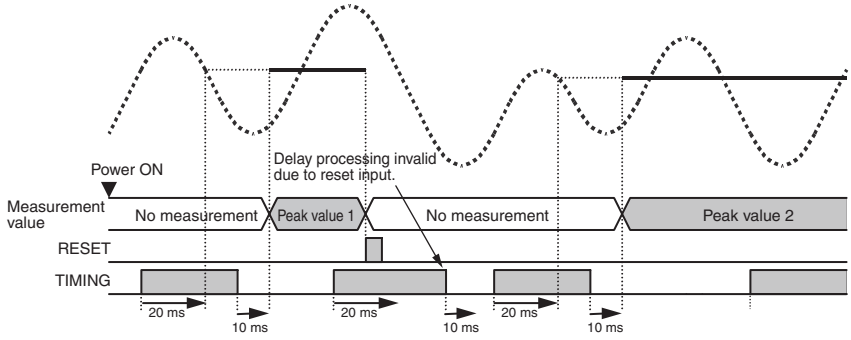
Explanation of Functions	ON timing delay, OFF timing delay

The following example shows settings for an ON timing delay of 20 ms and an OFF timing delay of 10 ms.

● Timing hold set value set to sampling hold



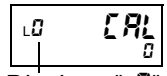
● **Timing hold set value set to peak hold**



Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

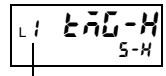

3 s min.


Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

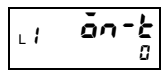
B Press the [LEVEL] Key again (less than 1 s) to move to the input adjustment level.


1 s max.

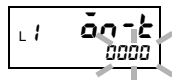

Displays "L 1".

- "L 1" is displayed on the level/bank display to indicate the input adjustment level.

C Press the [MODE] Key several times to switch the PV display to "on-t".

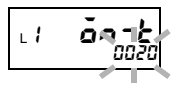


D Press the [SHIFT] Key to make the SV display flash.



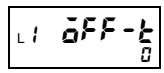
- The setting can be changed when the SV display starts to flash.

E Use the [UP] and [SHIFT] Keys to change the ON timing delay time.



- Units: ms

F Press the [MODE] Key to switch the PV display to the next parameter "oFF-t".



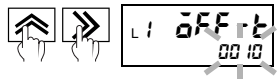
- The parameter "on-t" is registered.

G Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

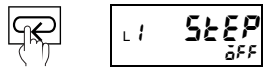
H Use the [UP] and [SHIFT] Keys to change the timing delay.

- Units: ms

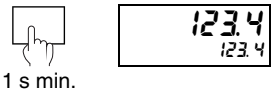


I Press the [MODE] Key to switch to the next parameter.

- The set value is registered.



J Press the [LEVEL] Key for at least 1 s to return to RUN level.



5.9 Eliminating Drift Near "0"

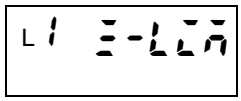
Input adjustment level

"Zero limit" is the function that makes measurement values "0" for inputs lower than a set value.

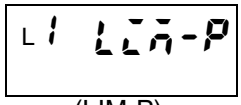
Explanation of Functions	Zero-limit

If the input value is less than the set value, the measurement value becomes "0". This function is effective when display drift and displacement near "0" is to be eliminated.

- This function can be used only when the timing hold parameter is set to normal [nohRL].



(Z-LIM)



(LIM-P)

Set the following parameter for zero-limit.

The zero-limit value can be set only when zero-limit is ON.

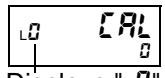
Parameter	Set value	Meaning of set value
Zero-limit Z-LIM	on/oFF	on: Enabled off: Disabled
Zero-limit value LIM-P	0 to 99	0 to 99 *

* The decimal point depends on the "decimal point position" setting.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.


3 s min.

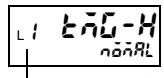


Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [LEVEL] Key again once (less than 1 s) to move to the input adjustment level.

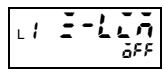

Less than 1 s



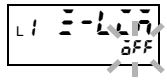
Displays "L1".

- "L1" is displayed on the level/bank display.

C Press the [MODE] Key several times to switch the PV display to "Z-LIM".

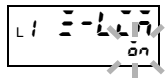


D Press the [SHIFT] Key to make the SV display flash.



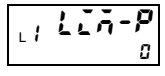
- The setting can be changed when the SV display starts to flash.

E Use the [UP] Key to change the set value to "on".



- Change the set value to "oFF" to disable the setting.
- The setting is completed at step F.

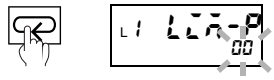
F Press the [MODE] Key to switch to the next parameter "LIM-P".



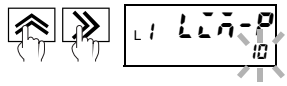
- The set value is registered.

G Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.



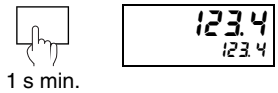
H Use the [UP] and [SHIFT] Key to change the zero-limit value.



I Press the [MODE] Key to switch to the next parameter.

- The set value is registered.

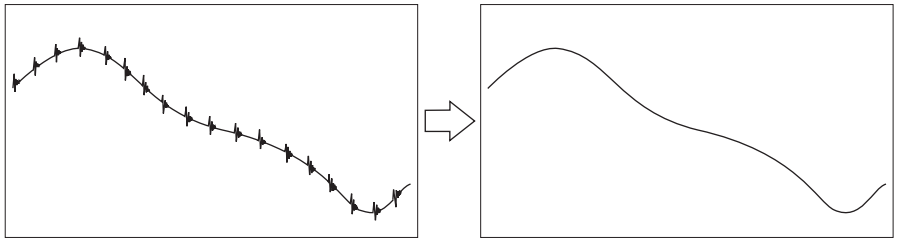
J Press the [LEVEL] Key for at least 1 s to return to RUN level.



5.10 Averaging Inputs

Input adjustment level

Averaging is a function that makes display and output smooth for input values with dramatic fluctuations, such as spike noise.



Explanation of Functions	Average processing

There are two types of averaging: "simple" and "moving". Select one type.

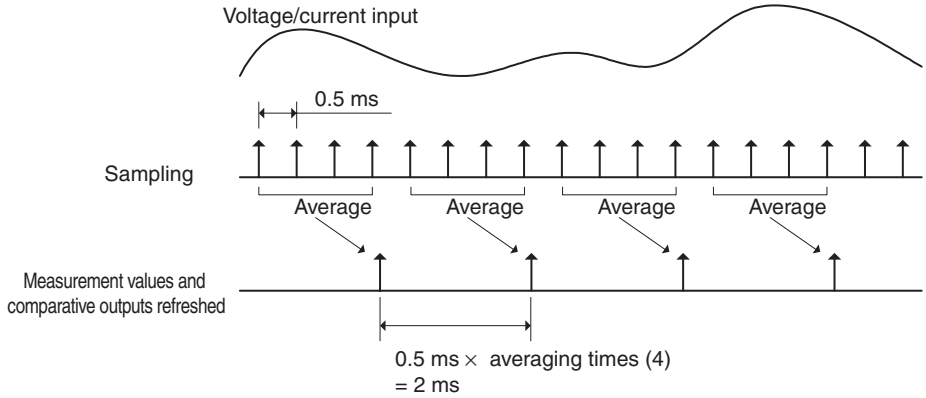
The number of samples ("averaging times") can also be specified for the input values to be averaged.

Simple average is used when the display refresh period is to be lengthened.

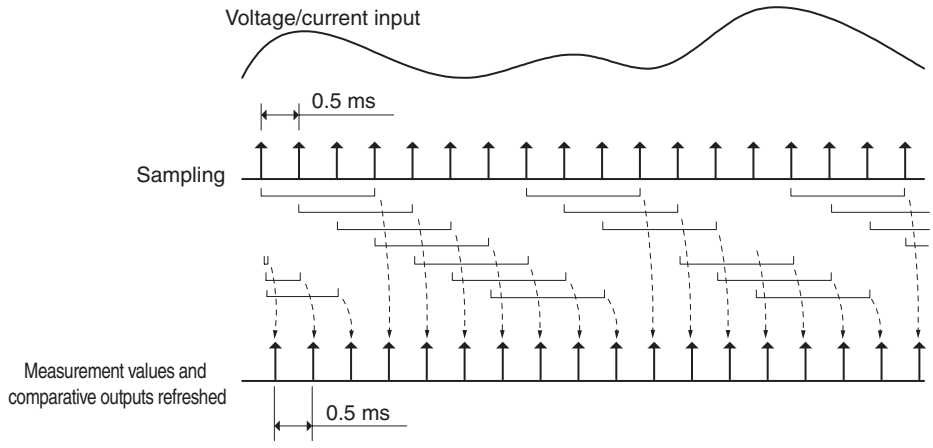
Moving average is used to remove periodic noise superimposed on input signals.

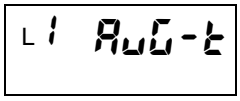
The relationship between the data refresh periods for both simple and moving averages when the averaging times is set to 4 is shown below.

● Simple average



● Moving average





(AVG-T)

(AVG-N)

Averaging is set using the following parameters.

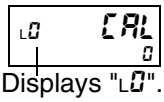
Parameter	Set value	Meaning of set value
Average type AVG-T	SMPL	Simple average
	MOVE	Moving average
Averaging times AVG-N	1	1
	2	2
	4	4
	8	8
	16	16
	32	32
	64	64
	128	128
	256	256
	512	512
	1024	1024

* To not use averaging, set the average type "AVG-T" to SMPL and the averaging times "AVG-N" to 1.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

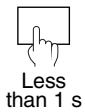

3 s min.

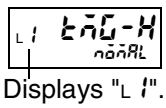


Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [LEVEL] Key once (less than 1 s) to move to the input adjustment level.

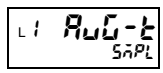

Less than 1 s



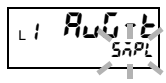
Displays "L 1".

- "L 1" is displayed on the level/bank display to indicate the input adjustment level.

C Press the [MODE] Key several times to switch the PV display to "AVG-T".

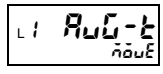


D Press the [SHIFT] Key to make the SV display flash.

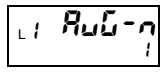


- The setting can be changed when the SV display starts to flash.

E Use the [UP] Key to change the average type setting.



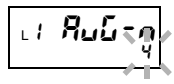
F Press the [MODE] Key to change to the next parameter "AVG-N".



- The average type setting is registered.

G Press the [SHIFT] Key to make the SV display flash.

H Use the [UP] Key to change the averaging times setting.

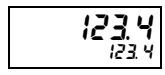


I Press the [MODE] Key to switch to the next parameter.

- The averaging times setting is registered.

J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



Remarks

Changing display refresh periods → P.5-60

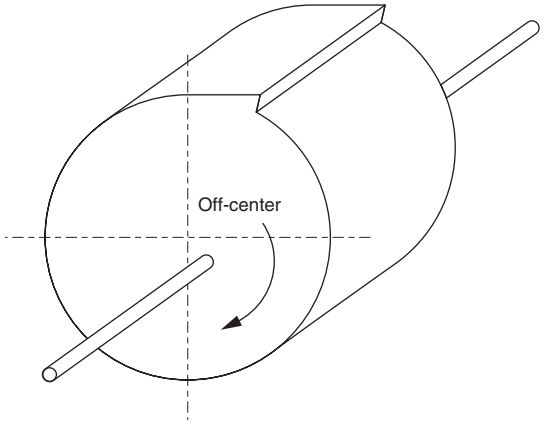
5.11 Detecting Sudden Input Changes

Advanced-function setting level

"High-pass filter" is a function that detects only sudden changes to input signals.

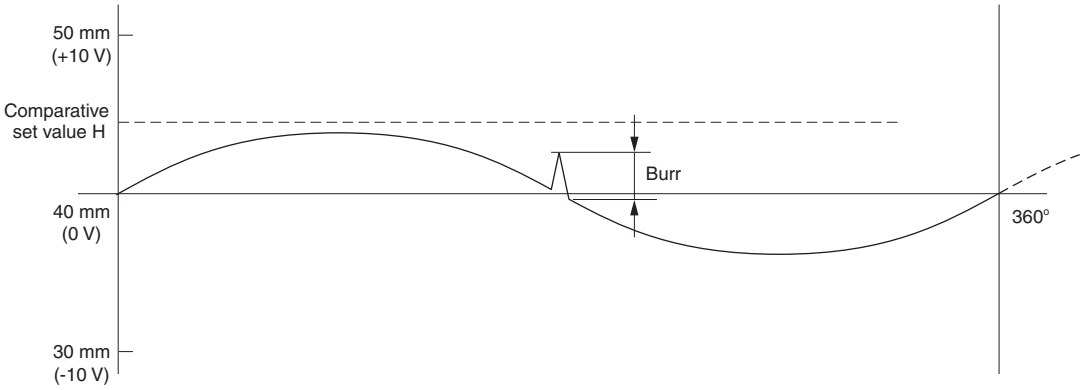
Explanation of Functions	High-pass filter

Use the high-pass filter to not detect gentle changes and only detect sudden changes.

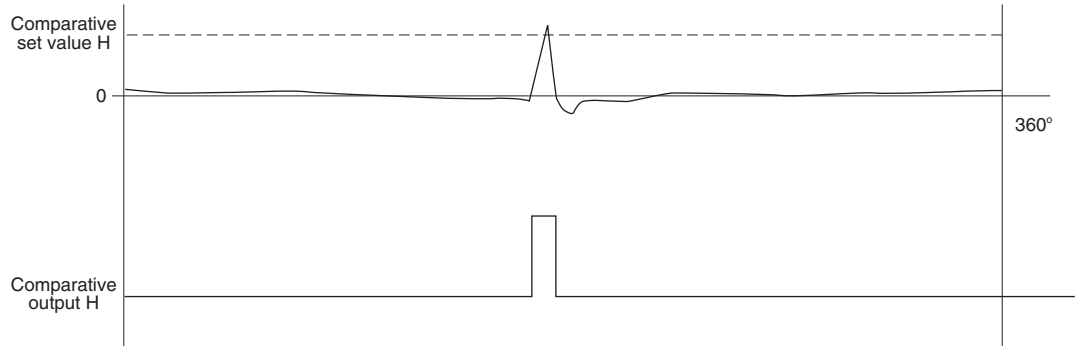


As shown in the above diagram, when rotating a cylindrical object and measuring the distance from the object using a laser displacement meter, it cannot be judged if the increase in measurement values when the rotating axis is eccentric is due to the eccentricity or to a burr.

● Measurements without using high-pass filter



● Measurements using high-pass filter



The high-pass filter makes the measurement value the difference between the present input value and the average of all previous input values.

Number of measurements	Input value	Display value	Comparative set value for next input
1	V_1	$V_1-V_1=0$	$C_1=V_1$
2	V_2	V_2-C_1	$C_2=\frac{1}{2}(C_1+V_2)=\frac{1}{2}(V_1+V_2)$
3	V_3	V_3-C_2	$C_3=\frac{1}{2}(C_2+V_3)=\frac{1}{2}(V_1+V_2)+\frac{1}{2}V_3$
4	V_4	V_4-C_3	$C_4=\frac{1}{2}(C_3+V_4)=\frac{1}{2}(V_1+V_2)+\frac{1}{2}V_3+\frac{1}{2}V_4$
. . .	. . .	. . .	. . .
n	V_n	V_n-C_{n-1}	$Cn=\frac{1}{2^{n-1}}(V_1+V_2)+\frac{1}{2^{n-1}}V_3+\cdots+\frac{1}{2}V_n$

(Vn indicates the input value and Cn indicates the comparative set value used for the next input.)

(HP-F)

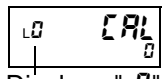
High-pass filter is set using the following parameter.

Parameter	Set value	Meaning of set value
High-pass filter HP-F	OFF	High-pass filter disabled
	On	High-pass filter enabled

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

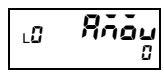

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano0".

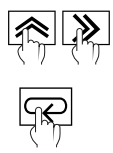


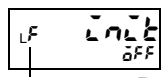
- This parameter is not displayed for the initial status due to setting level protect. Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

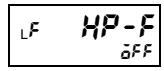




Displays "LF".

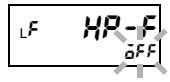
- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key to change the PV display to "HP-F".

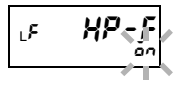


F Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

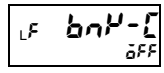


G Use the [UP] Key to change the set value.



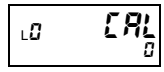
H Press the [MODE] Key to switch to the next parameter.

- The set value is registered.



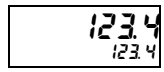
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



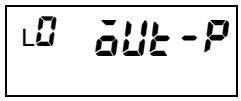
Remarks

Compensating forced-zero references → P.5-57

Delaying output OFF timing → P.5-44

Holding already output comparative outputs → P.5-47

5.12 Changing Comparative Output Patterns Initial setting level

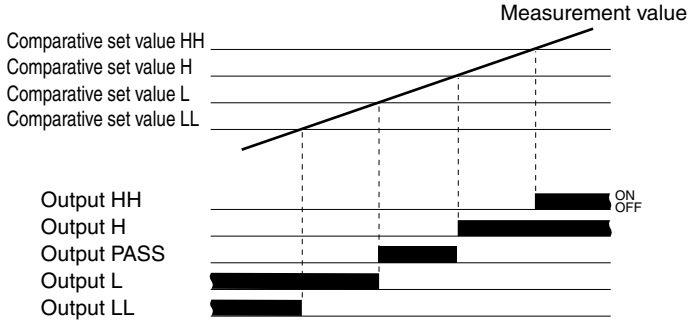


(OUT-P)

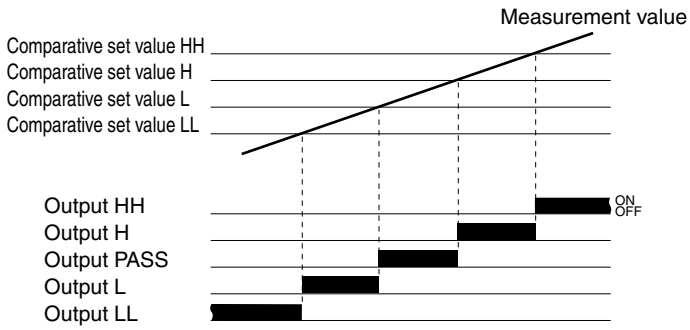
Compares the measurement value and comparative set value and outputs the comparative result. The output pattern is set using the following parameter.

Parameter	Set value	Meaning of set value
Comparative output pattern oUt-P	nonAL	Standard output
	Zone	Zone output
	LEvEL	Level output

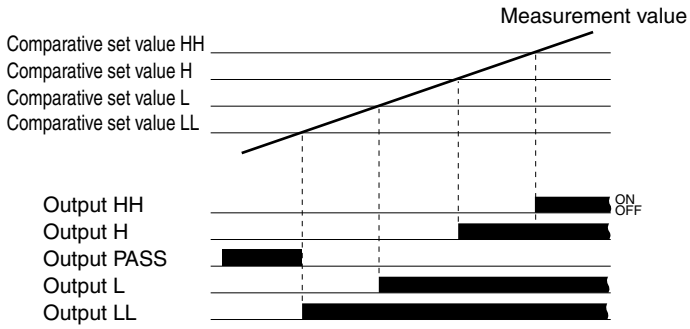
● **Standard output**



● **Zone output**



● **Level output**

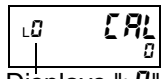


* PASS output turns ON when any HH, H, L, or LL outputs turn OFF.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.


3 s min.


Displays "L0".

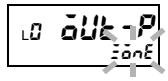
- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "oUt-P".

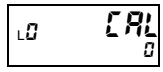
C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed and the SV display starts to flash.

D Use the [UP] Key to change the set value.



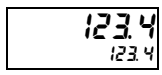
E Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

F Press the [LEVEL] Key for at least 1 s to return to RUN level.


1 s min.



Remarks

Preventing output chattering → P.5-38

Delaying output OFF timing → P.5-44

Outputting at set intervals → P.5-41

Reversing output logic → P.5-51

Holding already output comparative outputs → P.5-47

Performing output tests → P.5-71

Allocating other outputs to PASS output → P.5-49

5.13 Preventing Output Chattering

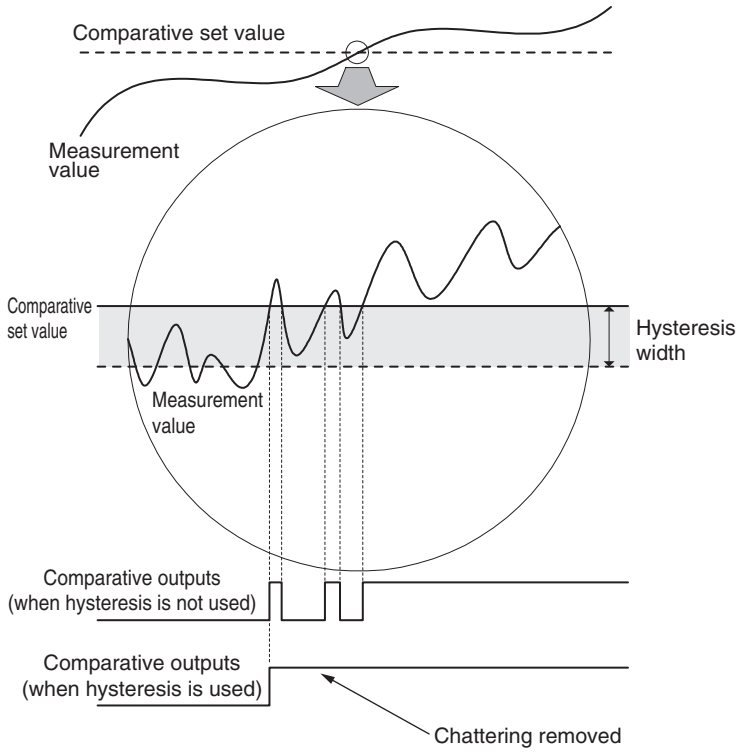
Advanced-function setting level

Comparative output chattering results from drift in measurement value near the comparative set value. Chattering can be prevented by adjusting the hysteresis value.

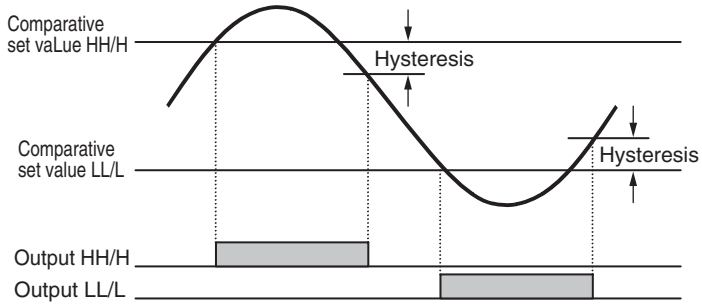
Explanation of Functions	Hysteresis

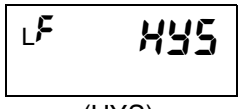
Hysteresis is a range between the value for which a comparative output turns ON and the value for which the comparative output turns OFF. When the comparative output turns ON, it only turns OFF after the change in measurement values is greater than the set hystresis.

The hysteresis can be used to prevent comparative output chattering resulting from measurement value drift near the comparative set value.



Hysteresis works in direction of decreasing measurement values for comparative set values HH and H and works in the increasing measurement value direction for comparative set values LL and L.





(HYS)

Hysteresis is set using the following parameter.

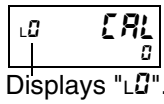
Parameter	Set value	Meaning of set value
Hysteresis HYS	0 to 9999	0 to 9,999 *

* The decimal point depends on the "decimal point position" setting.

Parameter Setting Procedure

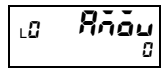
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.


3 s min.


Displays "LO".

- "LO" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano".

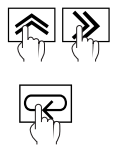


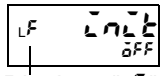
- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

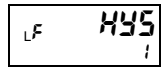
D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.



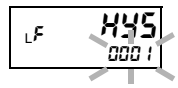

Displays "LF".

- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to change the PV display to "HYS".

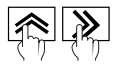


F Press the [SHIFT] Key to make the SV display flash.

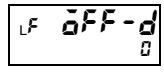


- The setting can be changed when the SV display starts to flash.

G Use the [UP] and [SHIFT] Keys to change the set value.



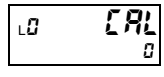
H Press the [MODE] Key to switch to the next parameter.



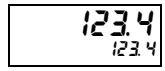
- The set value is registered.

I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.


1 s min.

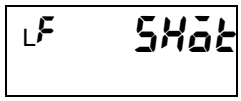


J Press the [LEVEL] Key for at least 1 s to return to RUN level.



5.14 Outputting at Set Intervals

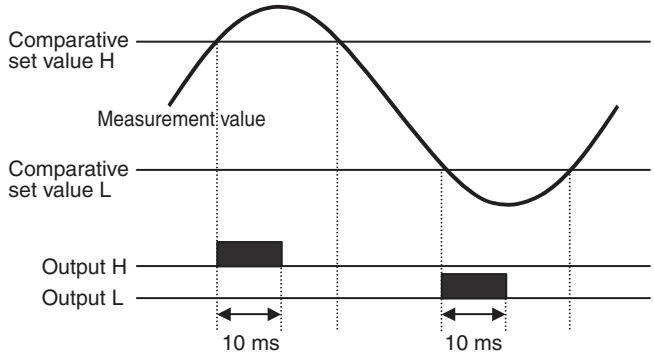
Advanced-function setting level



(SHOT)

Shot output is the function that turns OFF a comparative output after a set interval after it turns ON.
The following diagram shows the operation when timing hold is set to normal and shot output is set to 10 ms.

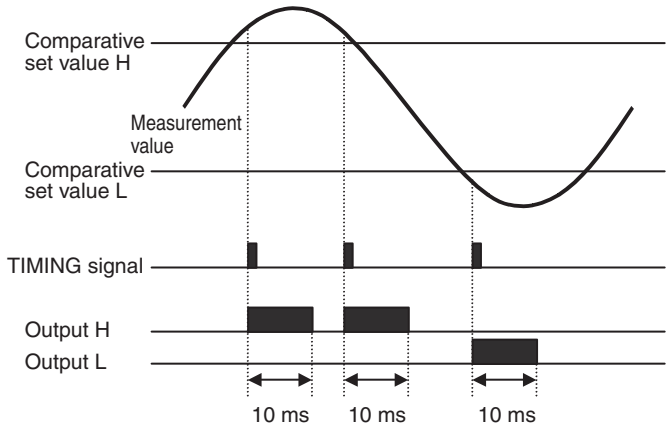
● Timing hold set to normal



● Timing hold not set to normal

Outputs at the measurement refresh timing if the comparative result is ON. (Even if the comparative result is the same as the previous time, the output is made again at the refresh timing.)
This function can be used to count the number of errors and for similar applications because an output is made at each refresh timing.

Example: Sampling hold



The shot output time is set using the following parameter.

Parameter	Set value	Meaning of set value
Shot output SHōt	0 to 1999	0 to 1,999 ms

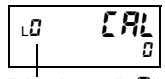
The shot output time is an internal calculation time. The following times are added to the set time to give the actual output time.

- For relay outputs: 11 ms max. (channel 1 OFF → ON)
- For transistor outputs: 1 ms max. (channel 1 OFF → ON)

Parameter Setting Procedure

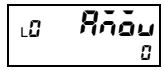
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.


3 s min.



- "LO" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ahd".

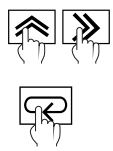


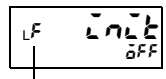
- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

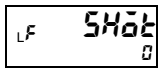
D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.





- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to change the PV display to "SHot".



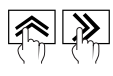
F Press the [SHIFT] Key to make the SV display flash.

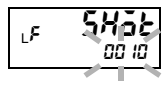
- The setting can be changed when the SV display starts to flash.

Important

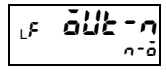
Set shot output (SHot) to "0" to use OFF delay (oFF-d). If set to anything else, oFF-d (OFF delay) will be disabled.

G Use the [UP] and [SHIFT] Keys to change the set value.





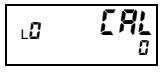
H Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

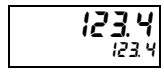
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.


1 s min.



J Press the □[LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



Remarks

Delaying output OFF timing → P.5-44

5.15 Delaying Output OFF Timing

Advanced-function setting level

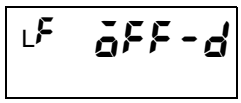
Output OFF delay is the function that delays the OFF timing for comparative results.

Shot output (5HōŁ) is given priority over OFF delay (ōFF-d). OFF delay will be disabled if shot output is set to anything other than "0", regardless of the OFF delay setting.

Explanation of Functions	Output OFF delay

If the measurement value changes and the comparative result that had been ON until now turns OFF, the comparative output is held for the time set for the output OFF delay parameter.

The comparative output ON time may be shortened if measurement values change quickly. When comparative output signals are read by external devices, short signals may not be received properly.
In such situations, the output OFF delay can be used to output comparative output signal values for a set duration or greater.



(OFF-D)

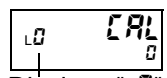
Output OFF delay is set using the following parameter.

Parameter	Set value	Meaning of set value
Output OFF delay ōFF-d	0 to 1999	0 to 1,999 ms

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

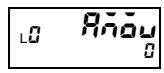

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "RāōU".

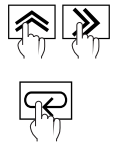


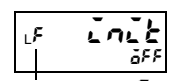
- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

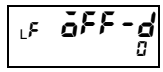




Displays "LF".

- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

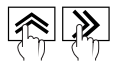
E Press the [MODE] Key several times to change the PV display to "oFF-d".



F Press the [SHIFT] Key to make the SV display flash.

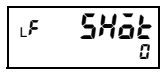
- The setting can be changed when the SV display starts to flash.

G Use the [UP] and [SHIFT] Keys to change the set value.



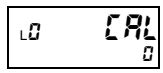
H Press the [MODE] Key to switch to the next parameter.

- The set value is registered.



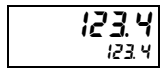
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



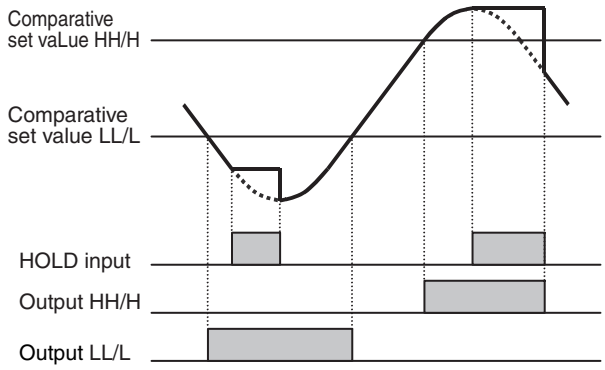
Remarks

Outputting at set intervals → P.5-41

Holding already output comparative outputs → P.5-47

5.16 Holding measurement status

Measurement values, maximum values, minimum values, and output status can be held while the HOLD input is ON.



- The measurement value when HOLD input turns ON is held.
- When HOLD input turns OFF, the measurement value at that time is restored.
- During HOLD inputs, signals other than RESET input and bank number selection using bank selection are not accepted.
- If HOLD input turns ON in no measurement status, a sensor error has occurred, or there is an overflow, the status at that time is held.
- Forced-zero is not accepted during HOLD input.

5.17 Holding Already Output Comparative Outputs

Advanced-function setting level

LF o-StP

(O-STP)

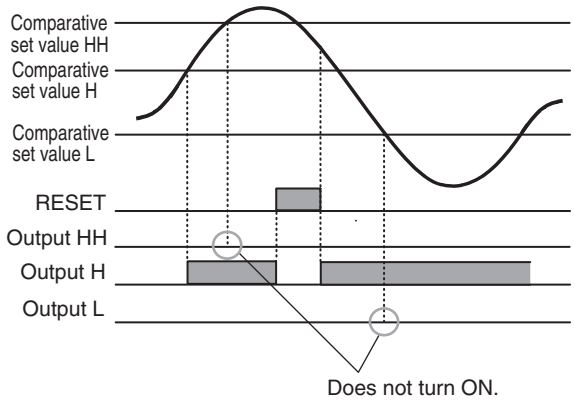
Output refresh stop is the function that holds output comparative outputs. While comparative outputs are being held, the comparative output status and display color are also held but measurement continues.

If output refresh stop "o-StP" is ON and a comparative output has been output, that output is held and subsequent different comparative outputs and sensor errors are not output.

The reset operation clears output refresh stop.

• Reset operation → P.5-20

● Comparative output example when output refresh stop is ON

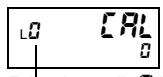


Parameter	Set value	Meaning of set value
Output refresh stop o-StP	on	Enabled
	oFF	Disabled

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

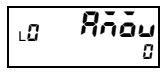

3 s min.



Displays "L0".

• "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano".

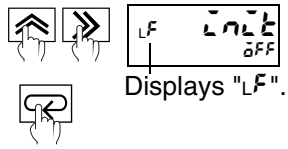


• This parameter is not displayed for the initial status due to setting level protect. Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

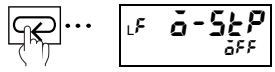
• The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

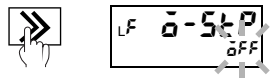


- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to change the PV display to "o-SEP".

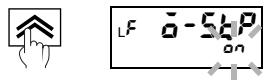


F Press the [SHIFT] Key to make the SV display flash.

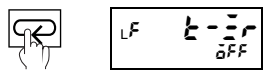


- The setting can be changed when the SV display starts to flash.

G Use the [UP] Key to change the set value.

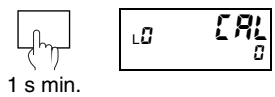


H Press the [MODE] Key to switch to the next parameter.

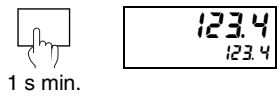


- The set value is registered.

I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

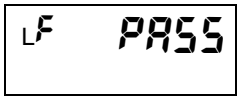


J Press the [LEVEL] Key for at least 1 s to return to RUN level.



5.18 Allocating Other Outputs to PASS Output

Advanced-function setting level



(PASS)

In the default settings, PASS signals are output from the PASS output terminal. The "PASS output change" parameter can be set to output comparative output status details other than PASS or errors from the PASS output terminal. (Enabled when there is a PASS output terminal.)

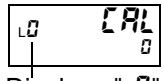
Parameter	Set value	Meaning of set value
PASS output change PASS	LL	LL
	L	L
	PASS	PASS
	H	H
	HH	HH
	Err	Input error *

* To allocate input errors to the PASS output, set the "input error enable" parameter to ON. If the "input error enable" parameter is left set to OFF, no error occurs even if there is an input error and the allocated output is not output.

• Turning ON the "input error enable" parameter → P.5-23

Parameter Setting Procedure

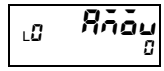
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.



Displays "L0".

• "L0" is displared on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Adju".

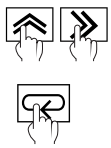


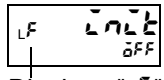
• This parameter is not displayed for the initial status due to setting level protect. Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

• The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

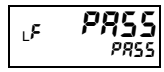




Displays "LF".

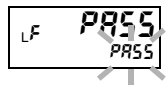
• "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key to change the PV display to "PASS".

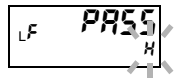


F Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

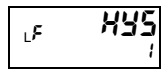


G Use the [UP] Key to change the set value.



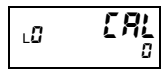
H Press the [MODE] Key to switch to the next parameter.

- The set value is registered.



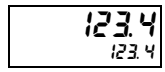
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



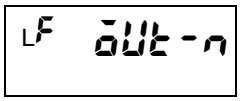
J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



5.19 Reversing Output Logic

Advanced-function setting level



(OUT-N)

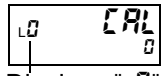
The comparative output logic for comparative results is set using the following parameter.
However, only the actual output is reversed. The operation logic for the comparative output status is not reversed.

Parameter	Set value	Operation		
		Comparative result	Comparative output status	Comparative output
Output de-energization oUt-n	n-o	ON	ON	ON
		OFF	OFF	OFF
	n-C	ON	ON	OFF
		OFF	OFF	ON

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

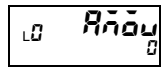

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Anou".

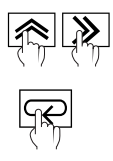


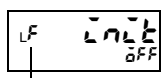
- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

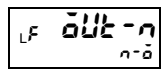




Displays "LF".

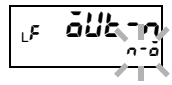
- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to change the PV display to "oUt-n".

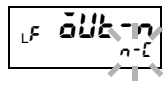


F Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

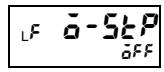


G Use the [UP] Key to change the set value.



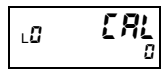
H Press the [MODE] Key to switch to the next parameter.

- The set value is registered.



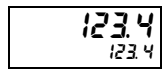
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



5.20 Setting the present measurement value to a reference value of "0"

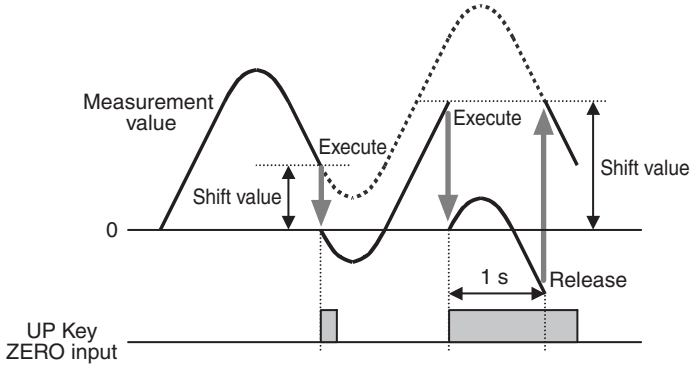
Forced-zero is the function that forces the present measurement value to "0".

Explanation of Functions	Forced-zero

This function can be used for applications such as making comparative judgements where the tare or container weight is canceled and only the weight of the contents are used for measurement.

When forced-zero is cleared, the display returns to the actual measurement value.

The changes to measurement values when forced-zero is executed or cleared during measurement are shown below.



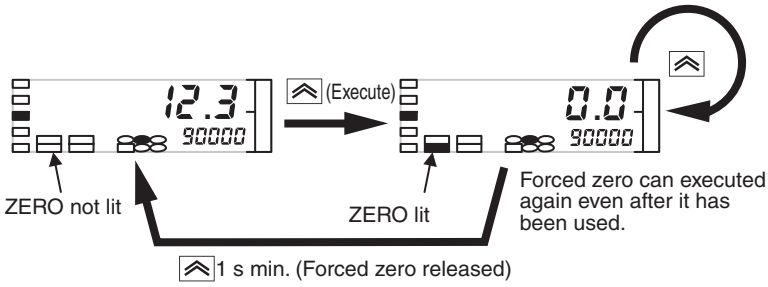
- Maximum and minimum values are not initialized even if forced-zero is executed.
- When the display range has been exceeded or a sensor error occurs, forced-zero cannot be executed while no measurement is being performed. (Forced-zero can be cleared but not during RESET input.)
- The forced-zero and forced-zero clear operations are stored in the internal non-volatile memory of the K3HB-S, so the status is held even if the power supply is turned ON again.

There are two methods for executing and clearing forced-zero: using key operations and using ZERO inputs.

● Using key operations

<Executing forced-zero>Press the [UP] Key for less than 1 s while the present value is displayed to execute forced-zero.

<Clearing forced-zero> Press the [UP] Key for at least 1 s to clear forced-zero.



● Using ZERO inputs

<Executing forced-zero>Forced-zero is executed on the rising edge of the ZERO input ON signal (when ZERO input is ON for 1 s max.).

<Clearing forced-zero> Forced-zero is cleared when ZERO input is ON for 1 s min.

Remarks

Setting the present measurement value to "0" again using the forced-zero reference → P.5-54
(Tare zero)

Prohibiting key-operated forced-zero → P.5-80
(Key protect)

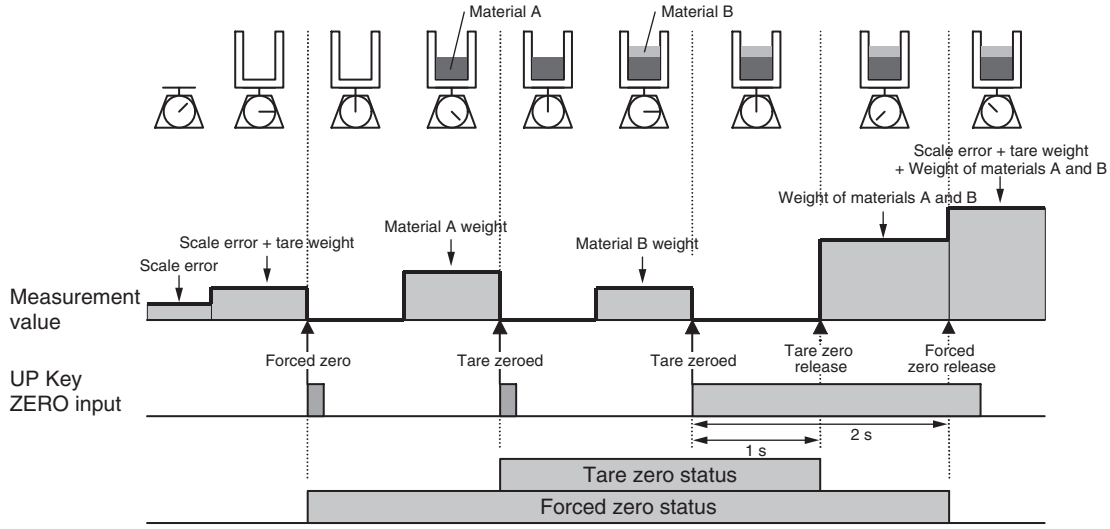
5.21 Setting the present measurement value to "0" again using the forced-zero reference

Advanced-function setting level

The tare zero function shifts the present measurement value to "0" again using the forced-zero reference.

Explanation of Functions	Tare zero

This function is enabled when each of two different types of compound are to be weighed, as shown in the following example.



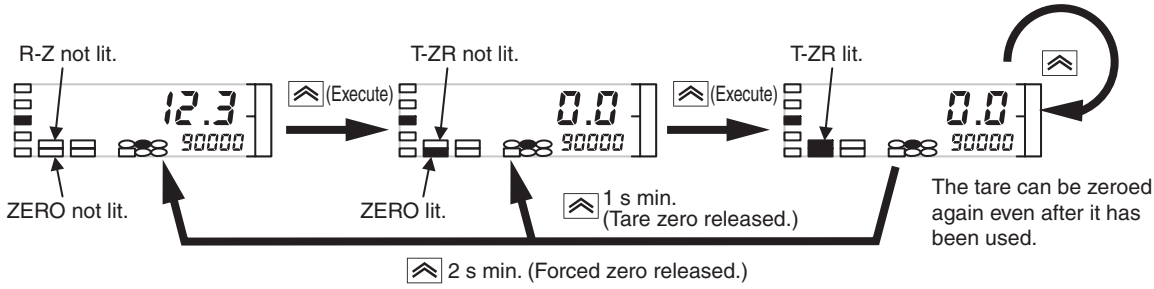
- Information about whether tare zero is being executed or cleared and shift values after tare zero is executed are not stored in memory when the power is turned OFF. (If the power is turned OFF during tare zero, the Unit will be in forced-zero status when the power is turned ON again.)
- Forced-zero cannot be executed when the display range has been exceeded or a sensor error occurs, or while no measurement is being performed. (Forced-zero can be cleared but not during RESET input.)

There are two methods for executing and clearing tare zero: using key operations and using ZERO inputs.

●Using key operations

<Executing tare zero>Press the [UP] Key while forced-zero is being executed and the present value is displayed to execute tare zero.

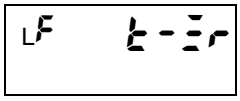
<Clearing tare zero> Press the [UP] Key for 1 s to clear tare zero. (Press it again for 1 s to clear forced-zero.)



●Using ZERO inputs

<Executing tare zero>Tare zero is executed on the rising edge of the ZERO input ON signal during forced-zero execution.

<Clearing tare zero> If the ZERO input is ON for 1 s, tare zero is cleared. (Forced-zero is cleared if the ZERO input is ON for a further 1 s.)



(T-ZR)

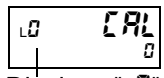
Tare zero is set using the following parameter.

Parameter	Set value	Meaning of set value
Tare zero t-Zr	on	Tare zero enabled
	oFF	Tare zero disabled

Parameter Setting Procedure

A Press the □[LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

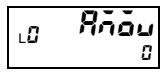

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano0".

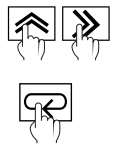


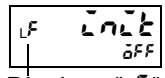
- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

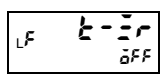




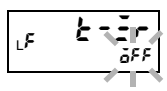
Displays "LF".

- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to switch the PV display to "t-Zr".

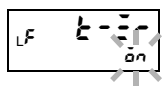


F Press the [SHIFT] Key to make the SV display flash.



- The setting can be changed when the SV display starts to flash.

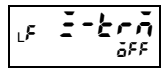
G Use the [UP] Key to change the set value to "on".



- Change the set value to "oFF" to turn OFF tare zero.

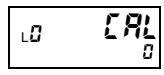
H Press the [MODE] Key to switch to the next parameter.

• The set value is registered.



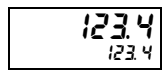
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



J Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



Remarks

Setting the present measurement value to a reference value of "0" (forced-zero) → P.5-53

5.22 Compensating Forced-zero References

Advanced-function setting level

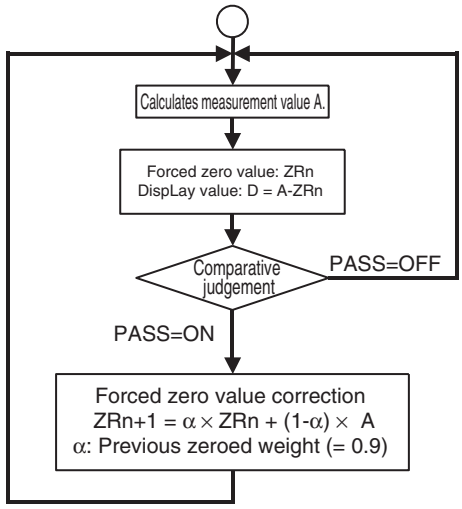
Zero-trimming is the function that compensates the forced-zero shift value based on the measurement value for an OK object (PASS data) while forced-zero is being executed.

This function can be used if the timing hold setting is sampling hold, peak hold, or bottom hold.

Explanation of Functions	Zero-trimming

Zero-trimming can be used if the timing hold parameter is set to sampling hold, peak hold, or bottom hold.

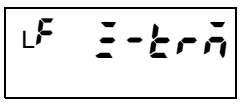
The zero-trimming algorithm is shown below.



[Application example] Absorbing temperature drift for linear sensors

The reference device is measured using the linear sensor and forced-zero is executed first thing in the morning, when the room temperature is low. While workpieces are subsequently being measured, the room temperature gradually increases and the measurement values gradually change due to the temperature characteristics of the linear sensor.

These kinds of gradual changes can be compensated for by using the zero-trimming function.



(Z-TRM)

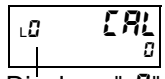
Zero-trimming is set using the following parameter.

Parameter	Set value	Meaning of set value
Zero-trimming Z-trn	on	Zero-trimming ON
	oFF	Zero-trimming OFF

Parameter Setting Procedure

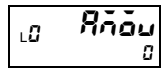
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.


3 s min.


Displays "LO".

- "LO" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano0".

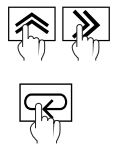


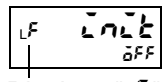
- This parameter is not displayed for the initial status due to setting level protect. Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

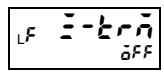
D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.



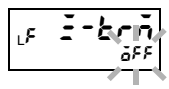

Displays "LF".

- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to switch the PV display to "I-trn".

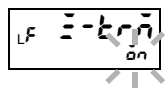


F Press the [SHIFT] Key to make the SV display flash.



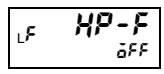
- The setting can be changed when the SV display starts to flash.

G Use the [UP] Key to change the set value to "on".



- Change the set value to "oFF" to turn OFF zero-trimming.

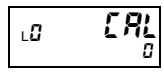
H Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

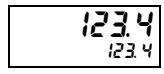
I Press the [LEVEL] Key for at least 1 s to return to the initial setting level.


1 s min.



J Press the □[LEVEL] Key for at least 1 s to return to RUN level.

1 s min.

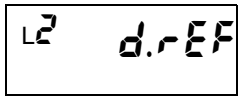


Remarks

Setting the present measurement value to a reference value of "0" (forced-zero) → P.5-53

5.23 Changing Display Refresh Periods

Display adjustment level



(D.REF)

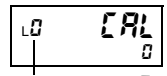
When measurement values change rapidly and the display changes with the measurement values, flickering often occurs and the display becomes difficult to read. The flickering can be suppressed and the display made easier to read in such situations by delaying the display refresh period. The display refresh period is set using the following parameter.

Parameter	Set value	Meaning of set value
Display refresh period d.rEF	oFF	Every 50 ms
	0.5	Every 0.5 ms
	1	Every 1 s
	2	Every 2 s
	4	Every 4 s

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

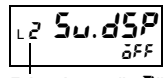
3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

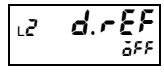
B Press the [LEVEL] Key several times to move to the display adjustment level.



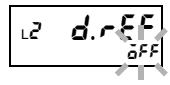
Displays "L2".

- "L2" is displayed on the level/bank display.

C Press the [MODE] Key to change the PV display to "d.rEF".

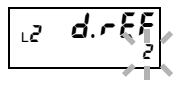


D Press the [SHIFT] Key to make the SV display flash.

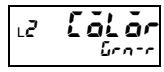


- The setting can be changed when the SV display starts to flash.

E Use the [UP] Key to change the set value.



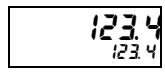
F Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

G Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



Remarks

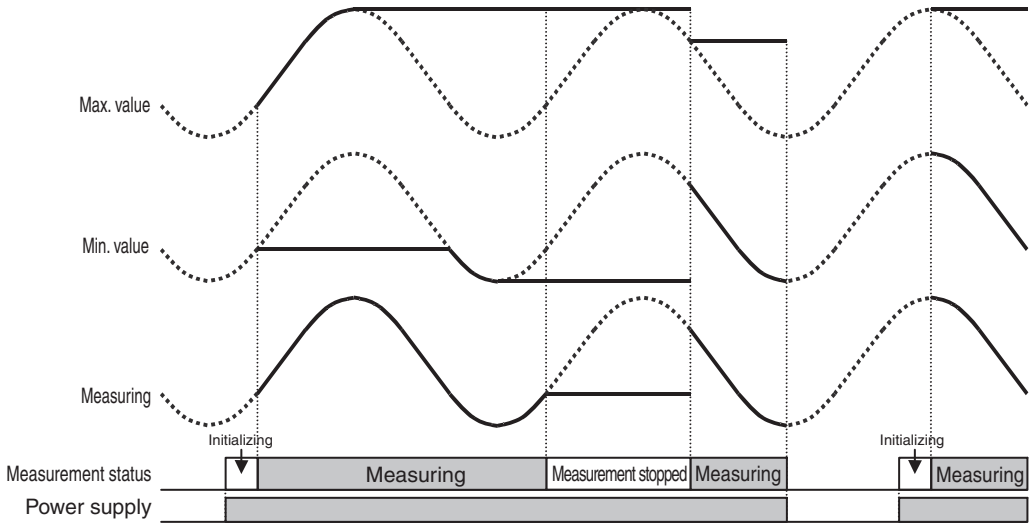
Averaging inputs → P.5-30

Detecting sudden input changes→ P.5-33

5.24 Holding maximum and minimum values

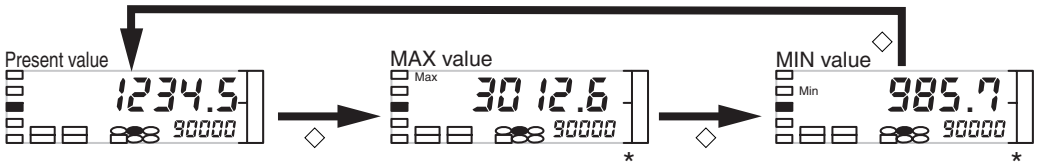
The maximum and minimum values during measurement can be held.

- The maximum and minimum values are reset when the power is turned OFF, RESET inputs are received, the ◇ [MAX/MIN] Key is pressed for 1 s, S-TMR inputs are received, and when returning to RUN level from levels other than adjustment and protect levels.
- Maximum and minimum values are not refreshed when forced-zero and tare zero are executed or cleared.



● Switching maximum and minimum value displays

Each time the ◇ [MAX/MIN] Key is pressed in RUN level, the PV display switches as follows: present value → maximum value → minimum value → present value.



* If input error enable (S.Err) is ON and a sensor error occurs, R.Err or b.Err is held by the maximum and minimum values.
The error details can be checked using the maximum and minimum value displays. R.Err and b.Err are cleared by a RESET input or by pressing the ◇ [MAX/MIN] Key for 1 s min.

● Resetting maximum and minimum values

Press the ◇ [MAX/MIN] Key for 1 s min. in RUN level to reset the maximum and minimum values.

Remarks Changing normal display values to maximum and minimum values → P.5-62

5.25 Changing Normal Display Values to Maximum and Minimum Values

Display adjustment level

(DISP)

The PV display value after the power has been turned ON, immediately after moving to RUN level, or immediately after automatic display return in RUN or adjustment levels can be set to either "present value", "maximum value", or "minimum value".

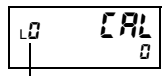
"Display value selection" is set using the following parameter.

Parameter	Set value	Meaning of set value
Display value selection dISP	Pv	Present value
	MAv	Max. value
	MIn	Min. value

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

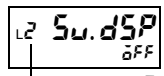

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

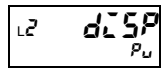
B Press the [LEVEL] Key several times to move to the display adjustment level.



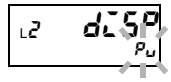
Displays "L2".

- "L2" is displayed on the level/bank display to indicate the display adjustment level.

C Press the [MODE] Key to change the PV display to "dISP".

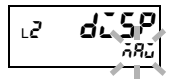


D Press the [SHIFT] Key to make the SV display flash.

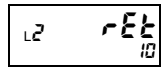


- The setting can be changed when the SV display starts to flash.

E Use the [UP] Key to change the set value.



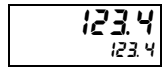
F Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

G Press the [LEVEL] Key for at least 1 s to return to RUN level.


1 s min.



Remarks

Displaying/not displaying comparative set values → P.5-64

Using position meters → P.5-67

Changing automatic display return time → P.5-60

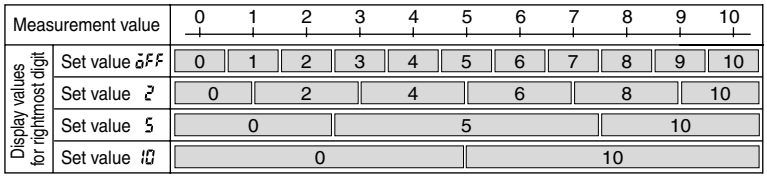
5.26 Setting the Step for Changing the Rightmost Digit

Input adjustment level

L1 STEP
(STEP)

The step for changing the rightmost digit on the display is set using the following parameter.

Parameter	Set value	Meaning of set value
Step value STEP	OFF	Refer to the diagram below.
	2	
	5	
	10	



Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

- "L0" is displayed on the level/bank display to indicate the initial setting level.

3 s min.

L0 CAL 0
Displays "L0".

B Press the [LEVEL] Key once (less than 1 s) to move to the input adjustment level.

- "L 1" is displayed on the level/bank display to indicate the input adjustment level.

Less than 1 s

L1 tAG-H NORAL
Displays "L 1".

C Press the [MODE] Key several times to change the PV display to "STEP".

L1 STEP OFF

D Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed and the SV display starts to flash.

L1 STEP OFF

E Use the [UP] Key to change the set value.

L1 STEP 2

F Press the [MODE] Key to switch to the next parameter.

- The set value is registered.

L1 AUG-T SAPL

G Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.

123.4
123.4

5.27 Displaying/Not Displaying Comparative Set Values

Display adjustment level

L2 Su.dSP

(SV.DSP)

Comparative set values can be displayed or not displayed on the SV display during operation.

This is set using the following parameter.

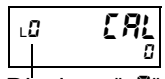
Parameter	Set value	Meaning of set value
Comparative set value display Su.dSP	oFF	Comparative set value not displayed.
	on	Comparative set value displayed.

If "comparative set value display" is set to OFF, the comparative set value display will turn OFF (not be lit) after 10 s in RUN level. The comparative set value is displayed again when any key is pressed.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

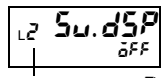

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

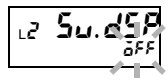
B Press the [LEVEL] Key several times to move to the display adjustment level.



Displays "L2".

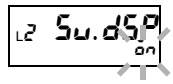
- "L2" is displayed on the level/bank display to indicate the display adjustment level.

C Press the [SHIFT] Key to make the SV display flash.

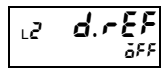


- The setting can be changed when the SV display starts to flash.

D Use the [UP] Key to change the set value.



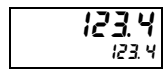
E Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

F Press the [LEVEL] Key for at least 1 s to return to RUN level.


1 s min.



5.28 Changing Display Colors

Display adjustment level

L2 COLOR

(COLOR)

The PV display color can be switched when the comparative result changes from PASS to HH, H, L, or LL, or when an input error occurs during operation in RUN, adjustment, or protect levels.

This function is called "display color selection" and the color switching pattern is set using the following parameter.

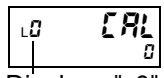
Parameter	Set value	Status *	PV display color
Display color selection COLOR	Grn-r	OFF	Green
		ON	Red
	Grn	OFF	Green
		ON	
	rEd-G	OFF	Red
		ON	Green
	rEd	OFF	Red
		ON	

* Comparative output HH, H, L, or LL or input error status

OFF: All comparative outputs HH, H, L, and LL are OFF and no input errors.
ON: HH, H, L, or LL comparative output turns ON or input error occurs.

Parameter Setting Procedure

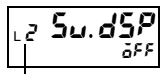
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

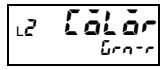
B Press the [LEVEL] Key several times to move to the display adjustment level.



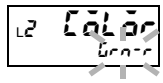
Displays "L2".

- "L2" is displayed on the level/bank display to indicate the display adjustment level.

C Press the [MODE] Key to change the PV display to "COLOR".

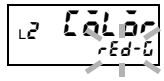


D Press the [SHIFT] Key to make the SV display flash.

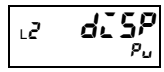


- The setting can be changed when the SV display starts to flash.

E Use the [UP] Key to change the set value.



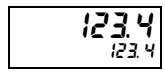
F Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

G Press the [LEVEL] Key for at least 1 s to return to RUN level.

1 s min.



Remarks

Performing output tests → P.5-71

5.29 Using Position Meters

Display adjustment level

L2 POS-T
(POS-T)

L2 POS-H
(POS-H)

L2 POS-L
(POS-L)

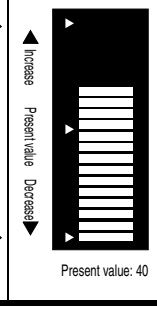
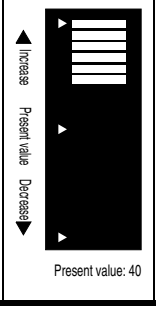
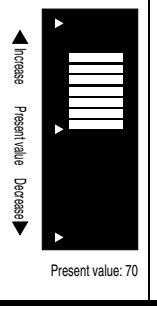
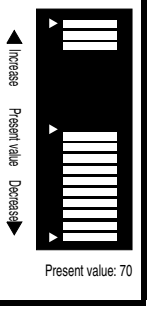
The meters on the right side of the front panel with 20 sections is called the "position meter" and shows the position of the displayed value (present value, maximum, or minimum) in relation to any values set using position meter upper and lower limits.
The position meter upper and lower limits can be set to any values.

The position meter display pattern is set using the following parameter.

Parameter	Set value	Meaning of set value
Position meter type POS-T	OFF	Position meter not displayed
	InC	Incremental
	InC-r	Incremental (reversed)
	dEv	Deviation *2
	dEv-r	Deviation (reversed)
Position meter upper limit POS-H	-19999 to 99999	-19999 to 99999 (*1)
Position meter lower limit POS-L	-19999 to 99999	-19999 to 99999 (*1)

*1. The decimal point depends on the "decimal point position" parameter setting.

*2. The amount that the displayed value differs from the mid-point between the position meter upper and lower limits (the deviation) is displayed.

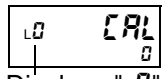
Position meter type	Incremental	Incremental (reversed)	Deviation	Deviation (reversed)
Position meter upper limit ▷ Position meter lower limit ▷				

* If the position meter lower limit set value is smaller than the position meter upper limit set value, the top and bottom of the above displays will be reversed.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

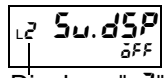

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

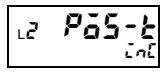
B Press the [LEVEL] Key several times to move to the display adjustment level.



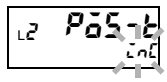
Displays "L2".

- "L2" is displayed on the level/bank display to indicate the display adjustment level.

C Press the [MODE] Key several times to change the PV display to "PoS-t".

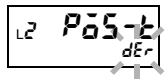


D Press the [SHIFT] Key to make the SV display flash.

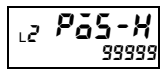


- The setting can be changed when the SV display starts to flash.

E Use the [UP] Key to change the position meter type setting.

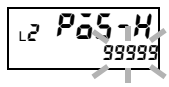


F Press the [MODE] Key to switch to the next parameter "PoS-H".



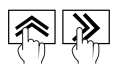
- The parameter for position meter type is registered.

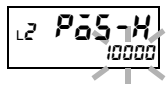
G Press the [SHIFT] Key to make the SV display flash.



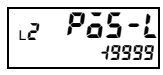
- The setting can be changed when the SV display starts to flash.

H Use the [UP] and [SHIFT] Keys to change the position meter upper limit setting.



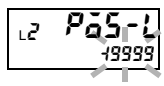


I Press the [MODE] Key to switch to the next parameter "PoS-L".



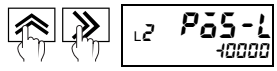
- The parameter for the position meter upper limit is registered.

J Press the [SHIFT] Key to make the SV display flash.



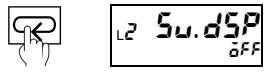
- The setting can be changed when the SV display starts to flash.

K Use the [UP] and [SHIFT] Keys to change the position meter lower limit setting.

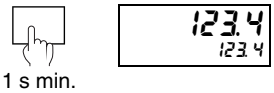


L Press the [MODE] Key to switch to the next parameter.

- The parameter for the position meter lower limit is registered.



M Press the [LEVEL] Key for at least 1 s to return to RUN level.



1 s min.

5.30 Forcing Automatic Return to Normal Display

Display adjustment level

(RET)

If no key operations are made after switching the display in RUN or adjustment levels, the display will automatically return to the display after the power is turned ON. The time until automatic display return can be set and the automatic display return can be disabled.

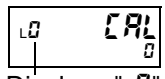
Automatic display return settings are made using the following parameter.

Parameter	Set value	Meaning of set value
Automatic display return rEt	0 to 99	0 to 99 s Automatic display return will not occur if set to 0.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

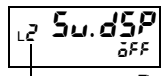

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

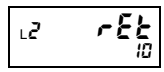
B Press the [LEVEL] Key several times to move to the display adjustment level.



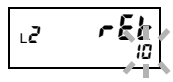
Displays "L2".

- "L2" is displayed on the level/bank display to indicate the display adjustment level.

C Press the [MODE] Key several times to change the PV display to "rEt".

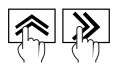


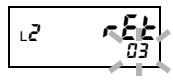
D Press the [SHIFT] Key to make the SV display flash.



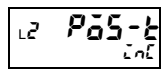
- The setting can be changed when the SV display starts to flash.

E Use the [UP] and [SHIFT] Keys to change the set value.





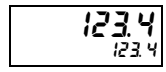
F Press the [MODE] Key to switch to the next parameter.



- The set value is registered.

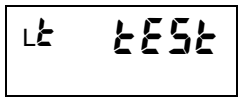
G Press the [LEVEL] Key for at least 1 s to return to RUN level.


1 s min.



5.31 Performing Output Tests

Output test level



(TEST)

The output test function is used to set a test measurement value using the keys and to check the comparative output against the set comparative set value.

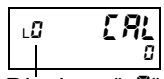
The test measurement value is set using the following parameter.

Parameter	Set value	Meaning of set value
Test input	oFF	Output test disabled
	-19999 to 99999	-19999 to 99999

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

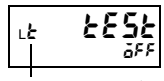

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

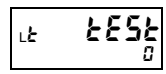
B Press the [LEVEL] Key several times to move to the output test level "tESt".



Displays "LE".

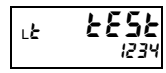
- "LE" is displayed on the level/bank display to indicate the output test level.

C Press the [SHIFT] Key.



- The test input will be 0 after moving to output test status.

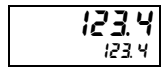
D Use the [UP] and [SHIFT] Keys to change the set value.



- Use the [UP] Key to increase the set value.
- Use the [SHIFT] Key to decrease the set value.
- Continue pressing the key to quickly increase or decrease the set value.

E Once the output test has finished, press the [LEVEL] Key for at least 1 s to return to RUN level.


1 s min.



5.32 Using Comparative Set Value Banks

Advanced-function setting level/Comparative set value level

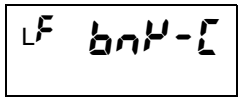
The K3HB-S has 8 areas (banks) where groups of comparative set values are set beforehand. Comparative set values can be changed easily by switching these banks.
This function is called "bank selection".

Explanation of Functions	Bank selection

Comparative set values HH, H, L, and LL are set in groups to banks. Comparative set values can be set to all 8 banks, numbered 0 to 7. Banks can be selected using front panel keys or an input.

* If the bank copy function is used, the comparative set values set to one bank can be copied to all banks.

■ 1. Specifying the bank selection method



(BNK-C)

Before banks can be selected, the bank selection method must be specified. (The bank selection function is enabled when the selection method is specified. The individual bank settings cannot be made until bank selection is enabled.)

The bank selection method is set using the following parameter.

Parameter	Set value	Meaning of set value
Bank selection bnK-C	oFF	Bank selection disabled
	KEY	Bank selection using the keys (*1)
	Eu	Bank selection using event input (*2)

*1. Banks cannot be selected using event inputs.

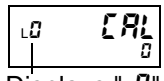
*2. Banks cannot be selected using key operations.
Event inputs can be used only for models with connectors.
The relationship between event input (BANK1, BANK2, and BANK4) ON/OFF status and the bank number is shown below.

Bank No.	External terminal		
	BANK1	BANK2	BANK4
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

Parameter Setting Procedure

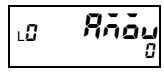
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.


3 s min.


Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Anou".

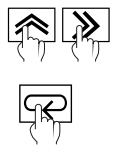


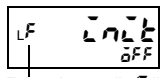
- This parameter is not displayed for the initial status due to setting level protect.
  Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

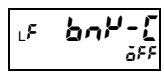
D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.



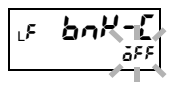

Displays "LF".

- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [MODE] Key several times to change the PV display to "bnK-C".

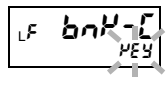


F Press the [SHIFT] Key to make the SV display flash.

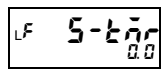


- The setting can be changed when the SV display starts to flash.

G Use the [UP] Key to change the set value.

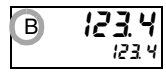


H Press the [MODE] Key to switch to the next parameter.



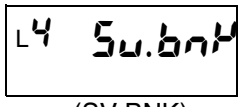
- The set value is registered.

One point *

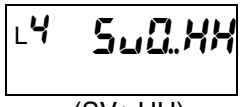
I Press the □[LEVEL] Key for at least 1 s to return to RUN level.	 1 s min.  "B" is lit to indicate that the bank is enabled.

* If the bank selection is not set to OFF, the comparative set values set in RUN level HH, H, L, and LL are registered to the HH, H, L, and LL of bank 0.

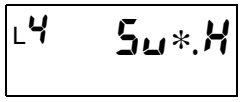
■ 2. Setting the comparative set values for each bank



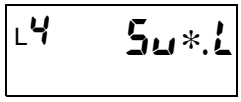
(SV.BNK)



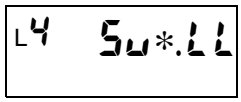
(SV∗.HH)



(SV∗.H)

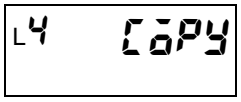


(SV∗.L)



(SV∗.LL)

∗0 to 7



(COPY)

Once the bank selection method has been specified, set the comparative set values for each bank.

Comparative set values are set using the following parameter.

Parameter	Set value	Meaning of set value
Comparative set value ∗HH Su∗.HH	-19999 to 99999	-19999 to 99999
Comparative set value ∗H Su∗.H	-19999 to 99999	-19999 to 99999
Comparative set value ∗L Su∗.L	-19999 to 99999	-19999 to 99999
Comparative set value ∗LL Su∗.LL	-19999 to 99999	-19999 to 99999

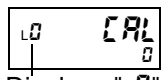
∗0 to 7

The decimal point depends on the "decimal point position" parameter settings.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

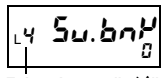

3 s min.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

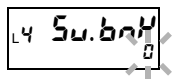
B Press the [LEVEL] Key several times to move to the comparative set value level.



Displays "L4".

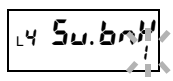
- "L4" is displayed on the level/bank display to indicate the comparative set value level.

C Press the [SHIFT] Key to make the SV display flash.

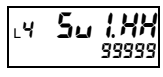


- The setting can be changed when the SV display starts to flash.

D Use the [UP] Key to select the bank to be set.

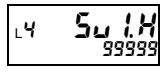


E Press the [MODE] Key.

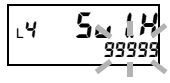


- The bank selected in step D can be set.

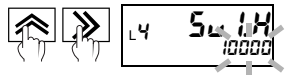
F Press the [MODE] Key several times to select the comparative set value to be changed.



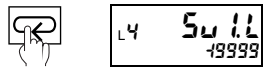
G Press the [SHIFT] Key to make the SV display flash.



H Use the [UP] and [SHIFT] Keys to change the set value.



I Press the [MODE] Key to switch to the next parameter.



- The parameter changed in step H is registered.

Repeat steps F to I to change other comparative set values in the same bank.

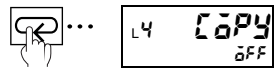
The settings for all comparative set values in the bank have been completed.

Proceed to step J to copy the contents of this bank to all banks.

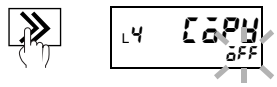
Proceed to step D to set comparative set values for other banks.

Proceed to step N when bank comparative set value settings have been completed.

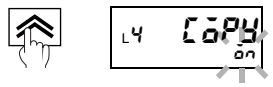
J Press the [MODE] Key several times to change the PV display to "COPY".



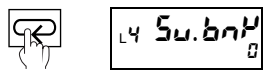
K Press the [SHIFT] Key to make the SV display flash.



L Use the [UP] Key to change the set value.



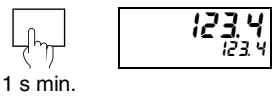
M Press the [MODE] Key to switch to the next parameter "Su.bnK".



Proceed to step D to correct copied bank parameters.

Proceed to step N if bank comparative set value settings have been completed.

N Press the [LEVEL] Key for at least 1 s to return to RUN level.

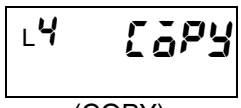


1 s min.

Remarks

Copying bank comparative set values → P.5-77

5.33 Copying bank comparative set values



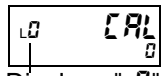
(COPY)

The bank copy function is used to specify a bank between 0 and 7 and copy the group of comparative set values in that bank to all banks.

Parameter Setting Procedure

A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.

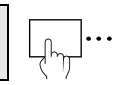

3 s min.

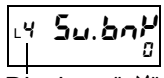


Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [LEVEL] Key several times to move to the comparative set value level.

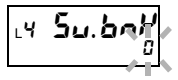




Displays "L4".

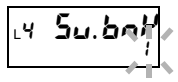
- "L4" is displayed on the level/bank display to indicate the comparative set value level.

C Press the [SHIFT] Key to make the SV display flash.

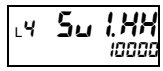


- The setting can be changed when the SV display starts to flash.

D Use the [UP] Key to select the bank to be copied from.

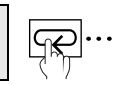


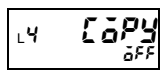
E Press the [MODE] Key to switch to the next parameter.



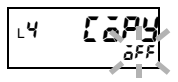
- Change the comparative set values HH, H, L, and LL as required.

F Press the [MODE] Key several times to change the PV display to "COPY".



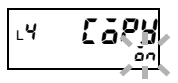


G Press the [SHIFT] Key to make the SV display flash.

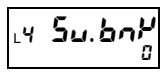


- The setting can be changed when the SV display starts to flash.

H Use the [UP] Key to change the SV display to "on".



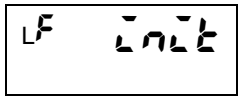
I Press the [MODE] Key to switch to the next parameter.



- The comparative set value from the copy source bank selected in step D will be copied to all banks.

5.34 Initializing all settings

Important *

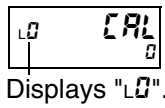


(INIT)

Initialization can be used to start settings over again from the default settings. Refer to Parameter List in the Appendices for information on default set values.

Parameter Setting Procedure

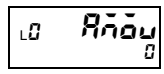
A Press the [LEVEL] Key for at least 3 s in RUN level to move to the initial setting level.



Displays "L0".

- "L0" is displayed on the level/bank display to indicate the initial setting level.

B Press the [MODE] Key several times to change the PV display to "Ano0".

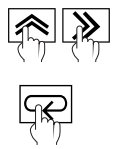


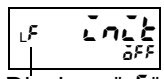
- This parameter is not displayed for the initial status due to setting level protect. Refer to "Limiting Key Operations" (P.5-80) for information on removing setting level protect.

C Press the [SHIFT] Key to make the SV display flash.

- The setting can be changed when the SV display starts to flash.

D Use the [UP] and [SHIFT] Keys to set the password "-0169". Press the [MODE] Key to move to the advanced-function setting level.

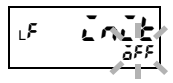




Displays "LF".

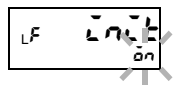
- "LF" is displayed on the level/bank display to indicate the advanced-function setting level.

E Press the [SHIFT] Key to make the SV display flash.

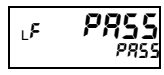


- The setting can be changed when the SV display starts to flash.

F Use the [UP] Key to change the SV display to "on".



G Press the [MODE] Key to switch to the next parameter and execute initialization.

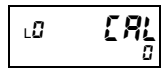


- The set value is registered.

* If this operation is performed, all parameters return to the initial settings and current settings are lost. It is recommended that before performing this operation, the Parameter List at the end of this manual or some other method is used to record the current set values.

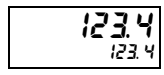
H Press the □[LEVEL] Key for at least 1 s to return to the initial setting level.

1 s min.



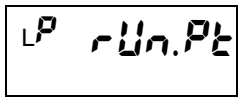
I Press the □[LEVEL] Key for at least 1 s to return to RUN level.

1 s min.

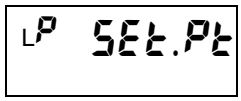


5.35 Limiting Key Operations

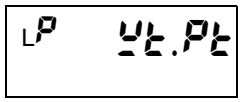
Protect level



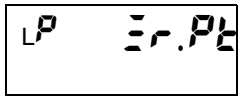
(RUN.PT)



(SET.PT)



(WT.PT)



(ZR.PT)

The "key protect" function limits level and parameter changes using key operations. There are 4 kinds of key protection. The parameters, settings, and details of each kind of protection are outlined below.
○ : Enabled, × : Prohibited

● **RUN/adjustment protect**
(Limits key operations in RUN level and movement to adjustment level.)

Parameter	Set value	Restriction details		
		RUN level		Move to the adjustment level
		Present value display	Comparative set value change	
RUN/adjustment protect rUn.Pt	0	○	○	○
	1	○	○	×
	2	○	×	×

● **Setting level protect (Limits moving to other levels.)**

Parameter	Set value	Restriction details	
		Move to initialization, input adjustment, display adjustment, comparative set values, and output test levels	Move to the advanced-function setting level
Setting level protect SEt.Pt	0	○	○
	1	○	×
	2	×	×

● **Setting change protect (Disables changing settings with key operations.)**

Parameter	Set value	Restriction details
Setting change protect Wt.Pt	oFF	Setting change using key operations: Enabled
	on	Setting change using key operations: Prohibited

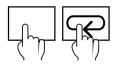
* All protect level parameters and movement to advanced-function setting level and calibration level can be changed.

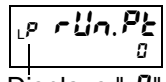
● **Forced-zero protect**
(Limits key-operated execution and clearing of forced-zero and tare zero.)

Parameter	Set value	Restriction details
Zero protect Zr.Pt	oFF	Forced-zero using key operations and tare zero execution/clear: Enabled
	on	Forced-zero using key operations and tare zero execution/clear: Prohibited

Parameter Setting Procedure

A Press the [LEVEL] and [MODE] Keys together for at least 3 s in RUN level to move to the protect level.

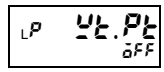




Displays "LP".

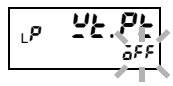
• "LP" is displayed on the level/bank display to indicate protect level.

B Press the [MODE] Key several times to display the desired protection.

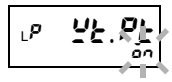


* The display shows setting change protect as an example.

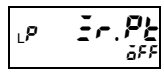
C Press the [SHIFT] Key to make the SV display flash.



D Use the [UP] Key to change the SV display.

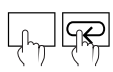


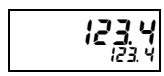
E Press the [MODE] Key to switch to the next parameter.



• The set value is registered.

F Press the [LEVEL] and [MODE] Keys together for at least 1 s to return to RUN level.





Section 6 User calibration

6.1 About user calibration

The K3HB-S is calibrated correctly at shipment, so there is normally no need for the user to calibrate it.

The K3HB-S has a function to calibrate analog inputs that can be used for user calibration.
OMRON, however, does not accept any responsibility for the results of user calibration using this function.

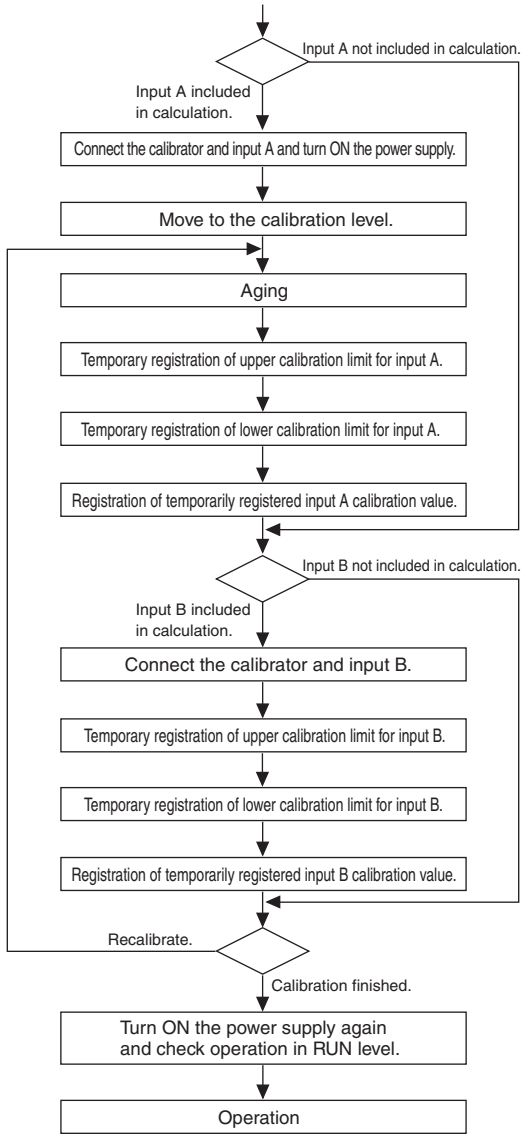
Each time data is calibrated, earlier calibration data is overwritten. Be careful, therefore, because default data is lost when the K3HB-S is calibrated by the user.

Prepare measuring instruments and equipment for calibration separately. Refer to each manual for the instruments and equipment for information on handling the instruments and equipment.

Calibration flowchart

User calibration is performed according to the following flowchart.

User calibration is performed for input A if "A" is included in the calculation and input B if "B" is included in the calculation.
Calibration is performed on both inputs A and B if both "A" and "B" are included in the calculation.



The input type that can be calibrated according to this flowchart is the type selected under "input type A" or "input type B".
To calibrate other input types, switch the setting for "input type A" or "input type B" in the initial setting level to the target input type and then perform calibration according to the flowchart outlined above.

6.2 User calibration operation

■ Connecting to the Calibrator

Connect the Calibrator (standard voltage generator or standard current generator) to the input terminal for the input type to be calibrated.

Use a Calibrator with enough precision for the accuracy of the K3HB-S.

■ Key operation procedure

Perform the operation according to the following procedure.

Moving to calibration level

Parameter Setting Procedure

A Move to the advanced-function setting level, press the [MODE] Key several times and display the parameter to move to the calibration level.

- The parameter character is "Cmov".

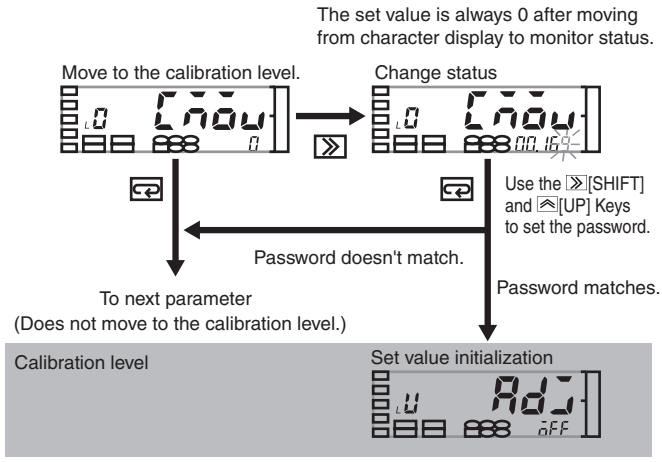
B Press the [SHIFT] Key to make the SV display flash.

- The parameter can be changed when the SV display starts to flash.

C Use the [UP] and [SHIFT] Keys to set the password. The password is "1201"(1201).

D Press the [MODE] Key to write the password.

- If the password is correct, the Unit moves to the calibration level.
- If the password is incorrect, the Unit remains in the advanced-function setting level and the next parameter is displayed.

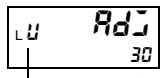


Operation in calibration level

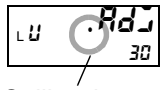
Parameter Operation Procedure

A Use the procedure outlined above to move to the calibration level.

- The aging timer is displayed.
- The aging timer is a 30-minute countdown timer that counts until 0 is reached.
- A calibration record mark will be displayed if a user calibration history exists.

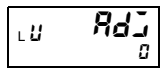


Displays "LU".



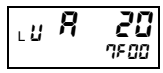
Calibration record mark

B Perform aging until the aging timer reaches 0. (If the calibrator needs more than 30 minutes of aging, extend the aging until the conditions are met.)

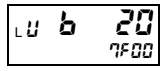


- If the [MODE] Key is pressed while the aging timer is counting down, the display skips to the calibration upper limit parameter display.

C Press the [MODE] Key to display the parameter for the calibration upper limit.



- The parameter for the present input type is displayed. Refer to the table on the next page for the relationship between input type and parameters.
- The display will be as shown below if "A" is not included in the calculation and the calibration will be for input "B".



D The calibrator applies a reference signal that corresponds to the calibration upper limit.

- Refer to the table on the next page for required reference signal values.

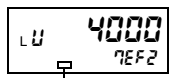
E Press the [UP] Key.

- The reference signal is read and "T" starts flashing.

"T" is flashing.

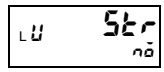
F Press the [UP] Key again to temporarily register the calibration upper limit.

- If the [MODE] Key is pressed instead of the [UP] Key, the upper limit is not registered and the display changes to the calibration lower limit parameter.



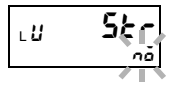
"T" is lit.

G Repeat steps D to F to temporarily register the calibration lower limit.



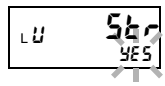
- When temporary registration has been completed, the parameter for registration "StR" is displayed.

H Press the [SHIFT] Key to make the SV display flash.



- The setting can be changed when the SV display starts to flash.

I Use the [UP] Key to change the set value to "YES".



J Press the [MODE] Key.

- The calibration value is "registered".
- When there are two inputs, input B is calibrated next. Connect the reference device to input B and repeat steps D to J.

K Turn ON the power again and check the operation.

● **Input type and parameter/reference signal**

Input	Input type	Calibration upper limit		Calibration lower limit	
		Parameters	Reference signal	Parameters	Reference signal
A	0 to 20 mA, 4 to 20 mA	A 20	20.00 mA	A 4	4.00 mA
	0 to 5 V, 1 to 5 V	A 5	5.000 V	A 1	1.000 V
	±5 V	A 5	5.000 V	A -5	-5.000 V
	±10 V	A 10	10.000 V	A -10	-10.000 V
B	0 to 20 mA, 4 to 20 mA	b 20	20.00 mA	b 4	4.00 mA
	0 to 5 V, 1 to 5 V	b 5	5.000 V	b 1	1.000 V
	±5 V	b 5	5.000 V	b -5	-5.000 V
	±10 V	b 10	10.000 V	b -10	-10.000 V

Section 7 Troubleshooting

7.1 Error displays

PV display	SV display	Description of error	Countermeasure
Unit	Err	An unexpected Unit was detected.	The mounting position depends on the Unit model. Check the Unit's model number and mount it in the correct position.
Unit	CHG	Displayed the first time the power is turned ON after mounting a new Unit or changing the position of a Unit.	Press the □[LEVEL] key for at least 3 s to register the new Unit configuration.
dISP *1	Err	Display error	Repair is necessary. Consult your OMRON representative.
SYS	Err	Internal memory error	Repair is necessary. Consult your OMRON representative.
EEP	Err	Error in non-volatile memory	Press the □[LEVEL] key in this state for at least 3 s to return to the factory settings. If the problem still persists, repair is necessary. Contact the point of purchase or your OMRON representative.
R.Err or b.Err *2	Normal operation	In the K3HB-S factory settings, the input type is set to 4 to 20 mA. When the power is turned ON for the first after the Unit is purchased, the input is 0 mA if nothing is connected to the current input terminal, so this error will be displayed.	In the initial setting level, set the input type and other settings to suit the application.
		Input error	Quickly return the voltage/current input to within the possible measurement range. The possible measurement ranges for each input type are shown below. 0 to 20 MA range:-2 to 22 mA 4 to 20 MA range: 2 to 22 mA 0 to 5 V range: -0.5 to 5.5 V 1 to 5 V range: 0.5 to 5.5 V ±5 V range: -5.5 to 5.5 V ±10 V range: -11 to 11 V
Flashing on 99999 or -19999	Normal operation	The input value is out of range or the measurement value after scaling is either greater than 99,999 or less than -19,999.	Quickly return the input to within the displayable range.
			The scaling value may be inappropriate. Review the scaling value in the initial setting level.

*1. The parameters already set are returned to the factory settings.
If the problem still persists after performing initialization, repair is necessary.

*2. If there is an error in input A only, or if there is an error in both inputs A and B, "R.Err" is displayed, and if there is an error in input B only, "b.Err" is displayed.

7.2 Countermeasures

Symptoms	Inspection details	Countermeasure
Forced-zero is not executed when the [UP] Key is pressed.	Is forced-zero protect enabled?	Enable forced-zero protect in the protect level.
The display remains on "- - - - -" after the power is turned ON.	Is the "startup compensation timer" parameter set value too long?	Change this parameter setting to an appropriate value. The K3HB-S can have startup compensation for up to 99.9 s.
	Is the HOLD input still ON?	Turn OFF the HOLD input. If the HOLD input remains ON and the power is turned ON, the display remains on "- - - - -" while the HOLD input remains ON.
The comparative output does not turn OFF even if the measurement value returns to the normal range.	Is the "hysteresis" parameter setting too large?	Change the setting for this parameter to an appropriate value.
Cannot move to the advanced functions.	Is the operation protected?	Refer to Moving between Levels: Moving to Advanced-function Setting Level in Section 5 Knowledge Required for Setting Parameters for information on how to clear protection. → P.5-2

Appendices

Specifications

■ Ratings

Power supply voltage		100 to 240 VAC (50/60 Hz) 24 VAC (50/60 Hz)/VDC
Allowable power supply voltage range		85% to 110% of the rated power supply voltage
Power consumption		100 to 240 VAC: 18 VA max., 24 VAC/VDC: 11 VA/7W max.
Input range (measurement range)		DC voltage/current (0 to 20 mA, 4 to 20 mA, 0 to 5 V, 1 to 5 V, ±5 V, ±10 V) 2 channels
Input impedance		Current range: 120 Ω max., Voltage range: 1 MΩ min.
Absolute maximum rated input		±31 mA (4 to 20 mA, 0 to 20 mA) ±10 V (1 to 5 V, 0 to 5 V, ±5 V) ±14.5 V (±10 V)
External power supply		12 VDC ± 10% 80 mA (only for models with external power supply)
Control input	Timing input Startup compensation timer input Hold input Reset input Forced-zero input	NPN open collector or no-voltage contact signal
	Bank input	NPN open collector or no-voltage contact signal (only for models with bank input)
A/D conversion method		Sequential comparison system
Output ratings		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.
Display method		• Negative LCD (backlit LCD) display • 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green)
Other functions		Scaling function, 2-input calculation function, measurement operation selection, averaging, high pass filter, 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		2 fixtures, unit stickers, operation manual

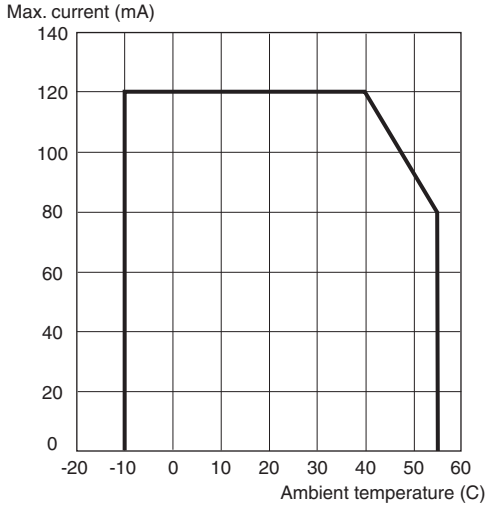
■ Characteristics

Sampling period	One input: 0.5 ms; Two inputs: 1 ms	
Accuracy	One input: ±0.1% FS ±1 digit max. (at 23 ± 5 °C) Two inputs: ±0.2% FS ±1 digit max. (at 23 ± 5 °C)	
Display range	-19999 to 99999	
Comparative output response time (transistor output)	For one input: OFF → ON 1 ms and ON → OFF 1.5 ms For two inputs: OFF → ON 2 ms and ON → OFF 2.5 ms	
Insulation resistance	20 MΩmin. (at 500 VDC)	
Dielectric strength	Between external terminals and case 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 to 10 sweeps of 5 min each in X, Y, and Z directions	
Shock resistance	150m/s^2 (100m/s^2 for relay outputs) 3 times each in 3 axes, 6 directions	
Weight	Approx. 300 g (Linear Sensor Indicator only)	
Enclosure rating	Front panel: Conforms to NEMA 4X (equivalent to IP66), Rear case: IP20, Terminals: IP00 + finger protection (VDE 0106/100)	
Memory protection	EEPROM (non-volatile memory) Number of rewrites: 100,000 times	
Installation environment	Overvoltage category II, pollution degree 2 (as per IEC61010-1)	
Applicable standards	UL3121-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/overvoltage category II (Evaluated by TUV Product Service.) EN61326: 1997, A1: 1998, A2: 2001	
EMC	(EMI)	EN61326+A1 Industrial applications
	Terminal interference wave voltage	CISPR 11 Group 1, Class A: CISPR16-1/-2
	Electromagnetic interference wave	CISPR 11 Group 1, Class A: CISPR16-1/-2
	(EMS)	EN61326+A1 Industrial applications
	Electrostatic discharge (ESD)	EN61000-4-2 : 4 kV (contact) : 8 kV (in air)
	Radiating radio-frequency electromagnetic field	EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)
	Burst	EN61000-4-4 : 2 kV (power line) : 1 kV (I/O signal line)
	Surge	EN61000-4-5 : 1 kV with line (power line) : 2 kV with ground (power line)
	Radio-frequency electric interference	EN61000-4-6: 3 V (0.15 to 80 MHz)
	Momentary power interruptions from voltage dips	EN61000-4-11: 0.5 cycle, 0°, 180°, 100% (rated voltage)

■ Input characteristics

Input type	Setting range	Specified range	Accuracy
0-20	0 to 20 mA	-2 to 22 mA	For 1 input: ±0.1% FS ± 1 digit max. (for 23±5°C) For 2 inputs: ±0.2% FS ± 1 digit max. (for 23±5°C)
4-20	4 to 20 mA	2 to 22 mA	
0-5	0 to 5 V	-0.5 to 5.5 V	
1-5	1 to 5 V	0.5 to 5.5 V	
5	-5 to 5 V	-5.5 to 5.5 V	
10	-10 to 10 V	-11 to 11 V	

■ Power supply derating curve for sensor (reference value)



* The value for standard mounting. Be careful because the derating curve differs depending on the mounting.

Available Models

■ Base Units

Model	Supply voltage	Part number	Applicable sensor power supply/ output boards	Applicable relay/ transistor outputs boards	Applicable event input boards
	100 to 240 VAC	K3HB-SSD 100-240VAC	K33-CPA K33-A	K34-C1 K34-C2	K35-1 K35-2
	24 VAC/ VDC	K3HB-SSD 24VAC/VDC		K34-T1 K34-T2	K35-3 K35-4

■ Applicable Optional Board

Type	Configuration	Board Model
Sensor Power Supply/ Output	12-VDC 80-mA model with PASS-output (PASS:SPDT)	**K33-CPA**
	12-VDC 80-mA model	**K33-A**
Relay/Transistor Output	H/L models with relay outputs (H,L:SPDT)	**K34-C1**
	HH/H/L/LL models with relay outputs (HH,H,L,LL:SPST-NO)	**K34-C2**
	5 comparative transistor outputs (NPN open collector)	**K34-T1**
	5 comparative transistor outputs (PNP open collector)	**K34-T2**
Event Input	Models with terminal blocks (NPN open collector)	**K35-1**
	Models with terminal blocks (PNP open collector)	**K35-2**
	Models with connectors (NPN open collector)	**K35-3**
	Models with connectors (PNP open collector)	**K35-4**

Model Number Structure

Base Units and Optional Boards can be ordered individually or as sets.

Base Units

K3HB-S□□
①⑤

1.Input Sensors Codes

SD : DC voltage/current input

5.Supply Voltage

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

Optional Borards

- Sensor Power Supply/Output Boards
  K33-□
  ②
- Relay/Transistor Outputs Boards
  K34-□
  ③
- Event Input Boards
  K35-□
  ④

Base Units with Optional Boards

K3HB-S□-□□□□
① ②③④⑤

2.Sensor Power Supply/Output Type Codes

CPA : 12-VDC 80-mA modele with PASS-output (PASS:SPDT)
A : 12-VDC 80-mA modele

3.Relay/Transistor Output Type Codes

C1 : H/L models with relay outputs (H,L:SPDT)
C2 : HH/H/L/LL models with relay outputs (HH,H,L,LL:SPST-NO)
T1 : 5 comparative transistor outputs (NPN open collector)
T2 : 5 comparative transistor outputs (PNP open collector)

4.Event Input Type Codes

1 : Models with terminal blocks (NPN open collector)
2 : Models with terminal blocks (PNP open collector)
3 : Models with connectors (NPN open collector)
4 : Models with connectors (PNP open collector)

Model Numbers

K3HB-SSD-□□□ □

① ② ③ ④ ⑤ ⑥

Basic model

Code	Series
K3HB	Linear Sensor Indicator K3HB Series

Input specifications

Code	Input specifications
SSD	Linear sensor input

Auxiliary output and external power supply specifications

Code	Auxiliary output and external power supply specifications
CPA	Relay, SPDT, 1 point, PASS, 12 VDC 80 mA
A	None, 12 VDC 80 mA

Relay/transistor output specifications

Code	Pulse output specifications
None	None
C1	Relay, SPDT 2 points: H/L
C2	Relay, SPST-NO 4 points: HH/H/L/LL
T1	NPN open collector 5 points: HH/H/PASS/L/LL
T2	PNP open collector 5 points: HH/H/PASS/L/LL

Control input specifications

Code	Control input specifications
None	None
1	NPN open collector 5 points (M3 terminal block)
2	NPN open collector 8 points (10-pin MIL connector)
3	PNP open collector 5 points (M3 terminal block)
4	PNP open collector 8 points (10-pin MIL connector)

Power supply specifications

Code	Power supply voltage
100 to 240 VAC	100 to 240 VAC
24 VAC/VDC	24 VAC/VDC

Parameter list

Enter the set value before using.

Level	Parameter name	Display	Setting range	Initial value	Unit	Set value
Protect LP	RUN/adjustment protect	rUnPt	0 to 2	0		
	Setting level protect	SEtPt	0 to 2	1		
	Setting change protect	CtPt	oFF, on	oFF		
	Forced-zero protect	ZrPt	oFF, on	oFF		
Run	Measurement value	-	-19999 to 99999	—		
	Measurement value/ comparative set value HH	-	-19999 to 99999	99999		
	Measurement value/ comparative set value H	-	-19999 to 99999	99999		
	Measurement value/ comparative set value L	-	-19999 to 99999	-19999		
	Measurement value/ comparative set value LL	-	-19999 to 99999	-19999		
Adjustment LA	Bank	bAnK	0 to 7	0		
Initial setting L0	Calculation	CAL	0, 1, 2, 3, 4, 5, 6, 7	0		
	Input type A	InP-tA	0-20, 4-20, 0-5, 1-5, 5, 10	4-20		
	Scaling input value A1	InP.A1	-19999 to 99999	4.000		
	Scaling display value A1	dSP.A1	-19999 to 99999	4000		
	Scaling input value A2	InP.A2	-19999 to 99999	20.000		
	Scaling display value A2	dSP.A2	-19999 to 99999	20000		
	Input type B	InP-tb	0-20, 4-20, 0-5, 1-5, 5, 10	4-20		
	Scaling input value B1	InP.b1	-19999 to 99999	4.000		
	Scaling display value B1	dSP.b1	-19999 to 99999	4000		
	Scaling input value B2	InP.b2	-19999 to 99999	20.000		
	Scaling display value B2	dSP.b2	-19999 to 99999	20000		
	Constant K	K	-19999 to 99999	0		
	Decimal point position	dP	oooooo, oooo.o, ooo.oo, oo.ooo, o.oooo	oo.ooo		
	Comparative output pattern	oUt-P	noRmAL, ZonE, LEvEL	noRmAL		
	Move to the advanced-function setting level	AdvU	-19999 to 99999	0		

Level	Parameter name	Display	Setting range	Initial value	Unit	Set value
Input adjustment L1	Timing hold	tHLd-H	noHAL, S-H, P-H, b-H, P-P	noHAL		
	ON timing delay	on-t	0 to 9999	0	ms	
	OFF timing delay	oFF-t	0 to 9999	0	ms	
	Zero-limit	Z-LIM	oFF, on	oFF		
	Zero limit value	LIM-P	0 to 99	0		
	Step value	StEP	oFF, 2, 5, 10	oFF		
	Average type	AuG-t	SMPL, mouE	SMPL		
	Averaging times	AuG-n	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024	1		
Display adjustment L2	Comparative set value display	Su.dSP	oFF, on	oFF		
	Display refresh period	d.rEF	oFF, 0.5, 1, 2, 4	oFF	s	
	Display color selection	CoLor	Grn-r, Grn, rEd-G, rEd	Grn-r		
	Display value selection	dISP	Pu, mAu, mIn	Pu		
	Automatic display return	rEt	0 to 99	10	s	
	Position meter type	PoS-t	oFF, InC, InC-r, dEu, dEu-r	InC		
	Position meter upper limit	PoS-H	-19999 to 99999	99999		
	Position meter lower limit	PoS-L	-19999 to 99999	-19999		

Level	Parameter name	Display	Setting range	Initial value	Unit	Set value
Comparative set value display L4	Comparative set value bank	SuBnP	0 to 7	0		
	Comparative set value 0HH	Su0HH	-19999 to 99999	99999		
	Comparative set value 0H	Su0H	-19999 to 99999	99999		
	Comparative set value 0L	Su0L	-19999 to 99999	-19999		
	Comparative set value 0LL	Su0LL	-19999 to 99999	-19999		
	Comparative set value 1HH	Su 1HH	-19999 to 99999	99999		
	Comparative set value 1H	Su 1H	-19999 to 99999	99999		
	Comparative set value 1L	Su 1L	-19999 to 99999	-19999		
	Comparative set value 1LL	Su 1LL	-19999 to 99999	-19999		
	Comparative set value 2HH	Su2HH	-19999 to 99999	99999		
	Comparative set value 2H	Su2H	-19999 to 99999	99999		
	Comparative set value 2L	Su2L	-19999 to 99999	-19999		
	Comparative set value 2LL	Su2LL	-19999 to 99999	-19999		
	Comparative set value 3HH	Su3HH	-19999 to 99999	99999		
	Comparative set value 3H	Su3H	-19999 to 99999	99999		
	Comparative set value 3L	Su3L	-19999 to 99999	-19999		
	Comparative set value 3LL	Su3LL	-19999 to 99999	-19999		
	Comparative set value 4HH	Su4HH	-19999 to 99999	99999		
	Comparative set value 4H	Su4H	-19999 to 99999	99999		
	Comparative set value 4L	Su4L	-19999 to 99999	-19999		
	Comparative set value 4LL	Su4LL	-19999 to 99999	-19999		
	Comparative set value 5HH	Su5HH	-19999 to 99999	99999		
	Comparative set value 5H	Su5H	-19999 to 99999	99999		
	Comparative set value 5L	Su5L	-19999 to 99999	-19999		
	Comparative set value 5LL	Su5LL	-19999 to 99999	-19999		
	Comparative set value 6HH	Su6HH	-19999 to 99999	99999		
	Comparative set value 6H	Su6H	-19999 to 99999	99999		
	Comparative set value 6L	Su6L	-19999 to 99999	-19999		
	Comparative set value 6LL	Su6LL	-19999 to 99999	-19999		
	Comparative set value 7HH	Su7HH	-19999 to 99999	99999		
	Comparative set value 7H	Su7H	-19999 to 99999	99999		
	Comparative set value 7L	Su7L	-19999 to 99999	-19999		
	Comparative set value 7LL	Su7LL	-19999 to 99999	-19999		
	Bank copy	CoPY	oFF, on	oFF		
Output test Lt	Test input	tESt	oFF, -19o999 to 99999	oFF		

Level	Parameter name	Display	Setting range	Initial value	Unit	Set value
Advanced-function settings LF	Set value initialization	INIT	OFF, On	OFF		
	PASS output change	PASS	LL, L, PASS, H, HH, Err	PASS		
	Hysteresis	HYS	0 to 9999	1		
	Output OFF delay	OFF-d	0 to 1999	0	ms	
	Shot output	SHOT	0 to 1999	0	ms	
	Output de-energization	OUT-n	n-O, n-C	n-O *1		
	Output refresh stop	O-STP	OFF, On	OFF		
	Tare zero	T-ZR	OFF, On	OFF		
	Zero trimming	Z-TRM	OFF, On	OFF		
	High-pass filter	HP-F	OFF, On	OFF		
	Bank selection	BNK-C	OFF, KEY, Eu	OFF		
	Startup compensation timer	S-TMR	0.0 to 99.9	0.0		
	Input error enabled	S.Err	OFF, On	On		
	Move to the calibration level.	CMOU	-19999 to 99999	0		

*1 Depends on the model.

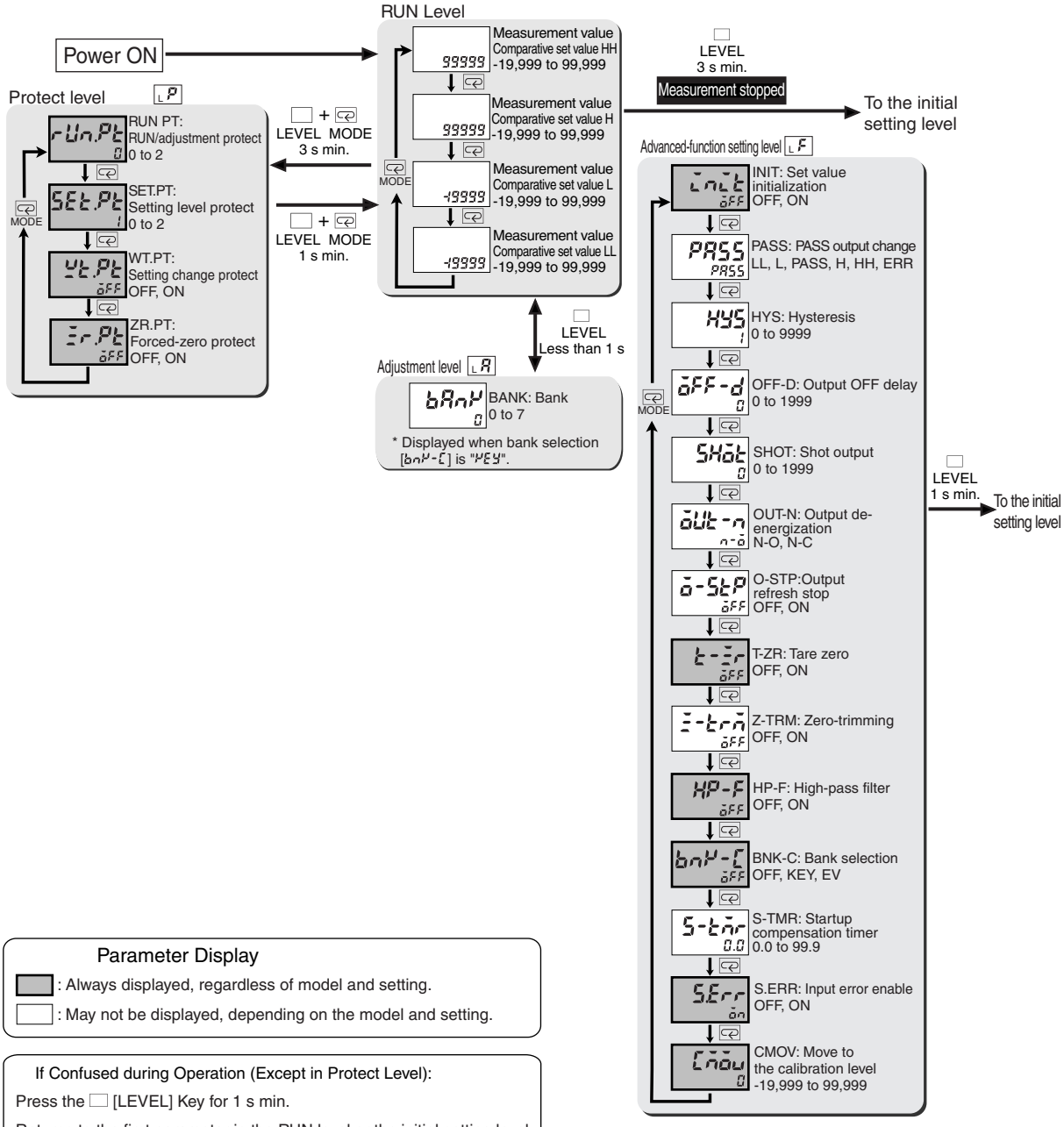
Parameter display conditions

Level	Parameter name	Display	Unit					Setting Conditions
			Input	Output				
			<1 to 4>	<C1>	<C2>	<T1 to 2>	<CPA>	
Protect	RUN/adjustment protect	rUn.Pt						
	Setting level protect	SEt.Pt						
	Setting change protect	Pt.Pt						
	Forced-zero protect	Zr.Pt						
RUN	Measurement value	-					▲	PASS output change = PASS or ERR
	Measurement value/comparative set value HH	-			●	●	▲	When the Output Unit is only <CPA>, change in PASS output = HH.
	Measurement value/comparative set value H	-		●	●	●	▲	When the Output Unit is only <CPA>, change in PASS output = H.
	Measurement value/comparative set value L	-		●	●	●	▲	When the Output Unit is only <CPA>, change in PASS output = L.
	Measurement value/comparative set value LL	-			●	●	▲	When the Output Unit is only <CPA>, change in PASS output = LL.
Adjustment	Bank	bAnK		●	●	●	▲	Bank selection = KEY When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
Initialization	Calculation	CAL						
	Input type A	in-tA						Calculation ≠ B
	Scaling input value A1	inP.A1						Calculation ≠ B
	Scaling display value A1	dSP.A1						Calculation ≠ B
	Scaling input value A2	inP.A2						Calculation ≠ B
	Scaling display value A2	dSP.A2						Calculation ≠ B
	Input type B	in-tb						Calculation ≠ A or K-A
	Scaling input value B1	inP.b1						Calculation ≠ A or K-A
	Scaling display value B1	dSP.b1						Calculation ≠ A or K-A
	Scaling input value B2	inP.b2						Calculation ≠ A or K-A
	Scaling display value B2	dSP.b2						Calculation ≠ A or K-A
	Constant K	K						Calculation = K-A or K-(A+B)
	Decimal point position	dP		●	●	●	▲	
	Comparative output pattern	oUt-P						When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
	Move to the advanced-function setting level.	AdvN	●					When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
Input adjustment	Timing hold	tiG-H	▲					
	ON timing delay	on-t	▲					Timing hold ≠ NormaL
	OFF timing delay	oFF-t						Timing hold ≠ Normal or sampling
	Zero-limit	Z-LiM						<1 to 4> do not exist or Timing hold = Normal
	Zero-limit value	LiM-P						Zero limit = ON
	Step value	StEP						
	Average type	AvG-t						
	Averaging times	AvG-n		●	●	●	●	
Display adjustment	Comparative set value display	Su.dSP						When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
	Display refresh period	d.rEF						
	Display color selection	CoLor						
	Display value selection	diSP						
	Automatic display return	rEt						
	Position meter type	PoS-t				∗1		
	Position meter upper limit	PoS-H						Position meter type ≠ OFF
	Position meter lower limit	PoS-L		●	●	●	●	Position meter type ≠ OFF
Comparative set value	Comparative set value bank	Su.bnK			▲	▲	▲	When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
	Comparative set value ∗ HH (∗:0 to 7)	Su ∗HH		▲	▲	▲	▲	∗ is the value between 0 and 7 set on the comparative set value bank. When the Output Unit is only <CPA>, change in PASS output = HH.
	Comparative set value ∗ H (∗:0 to 7)	Su ∗H		▲	▲	▲	▲	∗ is the value between 0 and 7 set on the comparative set value bank. When the Output Unit is only <CPA>, change in PASS output = H.
	Comparative set value ∗ L (∗:0 to 7)	Su ∗L			▲	▲	▲	∗ is the value between 0 and 7 set on the comparative set value bank. When the Output Unit is only <CPA>, change in PASS output = L.
	Comparative set value ∗ LL (∗:0 to 7)	Su ∗LL		●	●	●	▲	∗ is the value between 0 and 7 set on the comparative set value bank. When the Output Unit is only <CPA>, change in PASS output = LL.
	Bank copy	CoPY						When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
Output test	Test input	tESt						
Advanced-function setting	Set value initialization	inIt				●	●	
	PASS output change	PASS		●	●	●	▲	
	Hysteresis	HYS		●	●	●	●	When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
	Output OFF delay	oFF-d		●	●	●	●	
	Shot output	SHot		●	●	●	●	
	Output de-energization	oUt-n		●	●	●	●	
	Output refresh stop	o-StP						
	Tare zero	t-Zr						
	Zero-trimming	Z-trM						Timing hold = sampling, peak, or bottom
	High-pass filter	HP-F						
	Bank selection	bnK-C						When the Output Unit is <CPA>, change in PASS output ≠ PASS or ERR.
	Startup compensation timer	S-tiM						
	Input error enable	S.Err						
	Move to the calibration level.	CAbr						

<1 to 4> Event Input
<C1> Relay Output (H/L)
<C2> Relay Output (HH/H/L/LL)
<T1 to 2> Transistor Output
<CPA> PASS Output

Items marked may not be displayed due to Unit configuration or settings. Others are always displayed.
● Displayed if the Unit is connected.
▲ Displayed if the Unit is connected and the setting conditions are met.

About parameters



Parameter Display

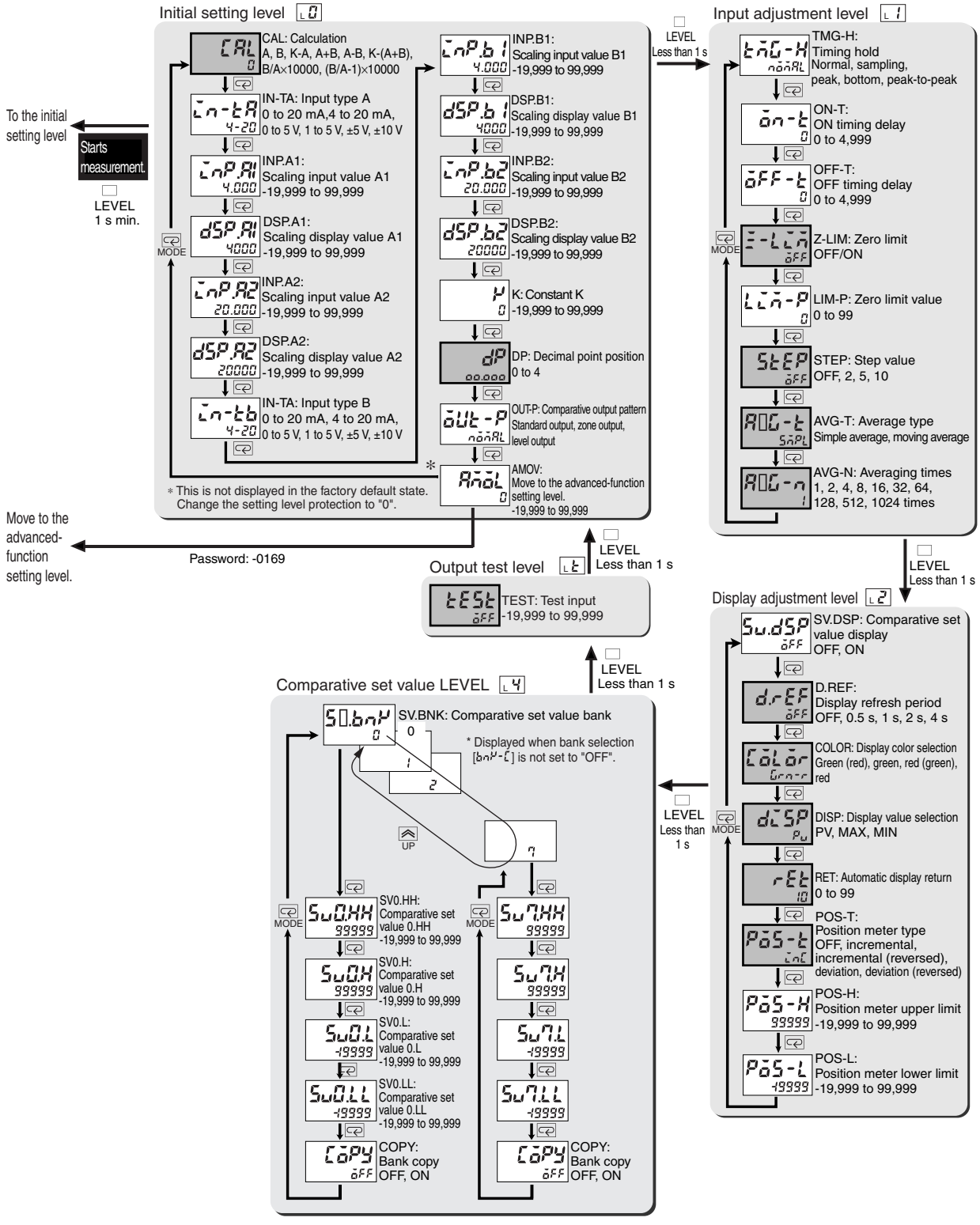
: Always displayed, regardless of model and setting.

: May not be displayed, depending on the model and setting.

If Confused during Operation (Except in Protect Level):

Press the [LEVEL] Key for 1 s min.

Returns to the first parameter in the RUN level or the initial setting level.


Initial setting level
CAL: Calculation
A, B, K-A, A+B, A-B, K-(A+B), B/A×10000, (B/A-1)×10000
IN-TA: Input type A
0 to 20 mA,4 to 20 mA, 0 to 5 V, 1 to 5 V, ±5 V, ±10 V
INP.A1: Scaling input value A1 -19,999 to 99,999
DSP.A1: Scaling display value A1 -19,999 to 99,999
INP.A2: Scaling input value A2 -19,999 to 99,999
DSP.A2: Scaling display value A2 -19,999 to 99,999
IN-TA: Input type B
0 to 20 mA, 4 to 20 mA, 0 to 5 V, 1 to 5 V, ±5 V, ±10 V
INP.B1: Scaling input value B1 -19,999 to 99,999
DSP.B1: Scaling display value B1 -19,999 to 99,999
INP.B2: Scaling input value B2 -19,999 to 99,999
DSP.B2: Scaling display value B2 -19,999 to 99,999
K: Constant K -19,999 to 99,999
DP: Decimal point position 0 to 4
OUT-P: Comparative output pattern Standard output, zone output, level output
AMOV: Move to the advanced-function setting level. -19,999 to 99,999
* This is not displayed in the factory default state. Change the setting level protection to "0".
To the initial setting level
Starts measurement.
LEVEL 1 s min.
MODE
Move to the advanced-function setting level.
Password: -0169
LEVEL Less than 1 s
Input adjustment level
TMG-H: Timing hold Normal, sampling, peak, bottom, peak-to-peak
ON-T: ON timing delay 0 to 4,999
OFF-T: OFF timing delay 0 to 4,999
Z-LIM: Zero limit OFF/ON
LIM-P: Zero limit value 0 to 99
STEP: Step value OFF, 2, 5, 10
AVG-T: Average type Simple average, moving average
AVG-N: Averaging times 1, 2, 4, 8, 16, 32, 64, 128, 512, 1024 times
Output test level
TEST: Test input -19,999 to 99,999
Display adjustment level
SV.DSP: Comparative set value display OFF, ON
D.REF: Display refresh period OFF, 0.5 s, 1 s, 2 s, 4 s
COLOR: Display color selection Green (red), green, red (green), red
DISP: Display value selection PV, MAX, MIN
RET: Automatic display return 0 to 99
POS-T: Position meter type OFF, incremental, incremental (reversed), deviation, deviation (reversed)
POS-H: Position meter upper limit -19,999 to 99,999
POS-L: Position meter lower limit -19,999 to 99,999
Comparative set value LEVEL
SV.BNK: Comparative set value bank
* Displayed when bank selection [bnK-L] is not set to "OFF".
UP
SV0.HH: Comparative set value 0.HH -19,999 to 99,999
SV0.H: Comparative set value 0.H -19,999 to 99,999
SV0.L: Comparative set value 0.L -19,999 to 99,999
SV0.LL: Comparative set value 0.LL -19,999 to 99,999
COPY: Bank copy OFF, ON

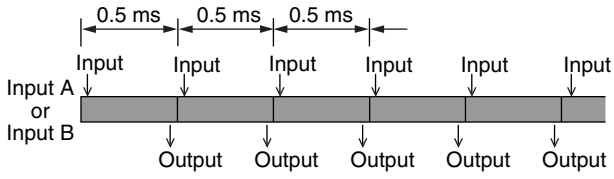
Sampling and comparative output response times

The K3HB-S sampling and comparative output response times differ depending on the calculations, timing hold type, and, for simple averaging, the averaging times. Refer to the following description for details.

■ Output refresh period

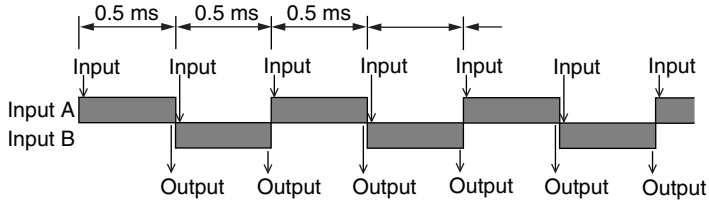
The K3HB-S repeats input reads, calculation, and judgement output processing. The output refresh period differs depending on whether there are one or two inputs, as outlined below.

● **One input**



Input read	Every 0.5 ms
Output refresh	Every 0.5 ms

● **Two inputs**

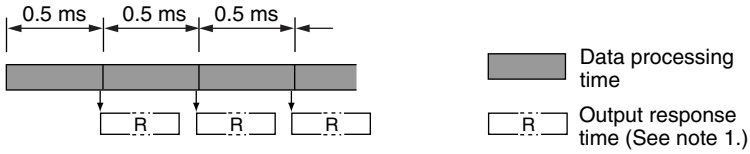


Input read	Input A: every 1 ms
	Input B: every 1 ms
Output refresh	Every 0.5 ms

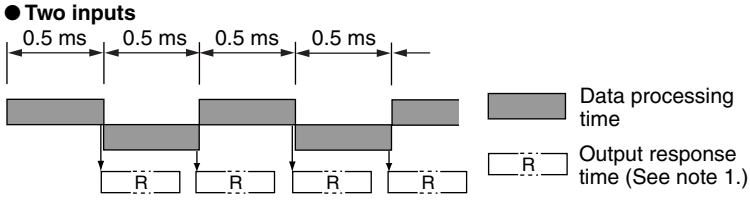
■ Output response time

The comparative output response time is the sum of the data processing time and the output (relay or transistor) response time.

● **One input**



● **Two inputs**



(Note 1.)

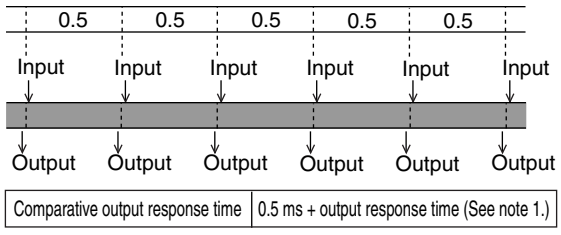
For transistor outputs
For one input: OFF → ON 1 ms and ON → OFF 1.5 ms
For two inputs: OFF → ON 2 ms and ON → OFF 2.5 ms

For relay outputs
The relay operation time of 10 ms is added to the transistor output response times.

■ Operation timing examples

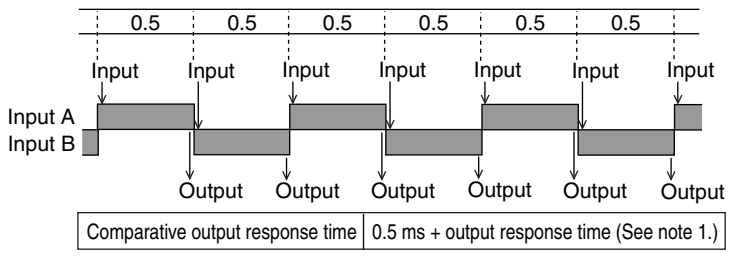
Example 1
The Unit operates as shown in the diagram to the right for the settings shown in the table below.

Calculation	A
Timing hold mode	Normal
Averaging times (n)	Once



Example 2
The Unit operates as shown in the diagram to the right for the settings shown in the table below.

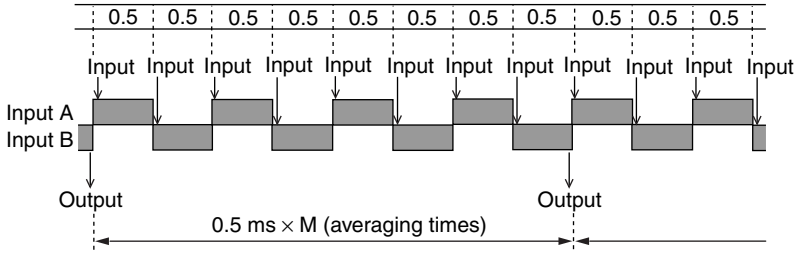
Calculation	A+B
Timing hold mode	Normal
Averaging times (n)	Once



* The output every 0.5 ms is the comparative output corresponding to the input change for either input A or input B. The input change for both inputs is reflected in the comparative outputs every 1 ms.

Example 3
The Unit operates as shown in the diagram to the right for the settings shown in the table below.

Calculation	A+B
Timing hold mode	Normal
Averaging times (n)	8 times simple averaging

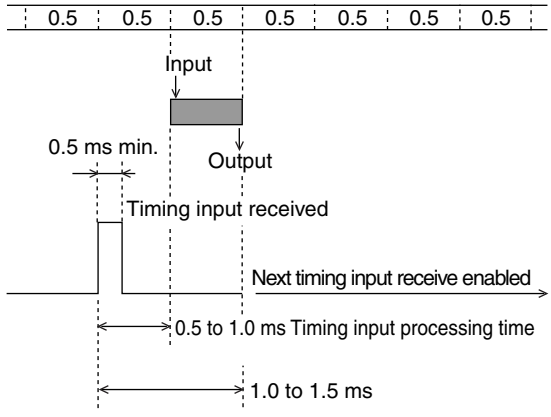


For simple averaging
If the number of averaging times is 8, the comparative output that corresponds to the average for 8 read inputs (4 input A's and 4 input B's) is output.

Comparative output response time	4 ms + output response time (See note 1.) = 0.5 ms × M (averaging times) + output response time (See note 1.)

Example 4
The Unit operates as shown in the diagram to the right for the settings shown in the table below.

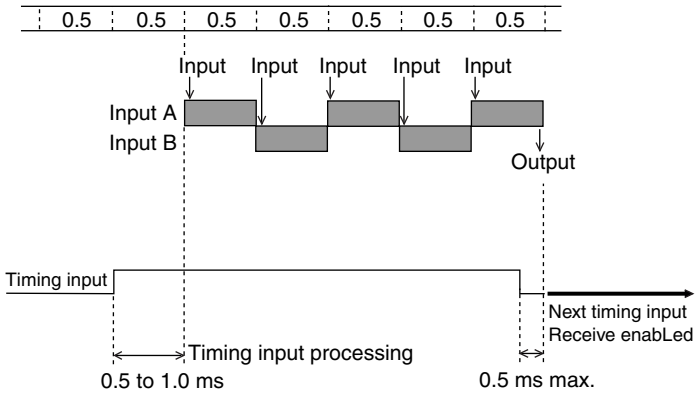
Calculation	A
Timing hold mode	Sampling hold
Averaging times (n)	Once



Comparative output response time	1.0 to 1.5 ms + output response time (See note 1.)

Example 5
The Unit operates as shown in the diagram to the right for the settings shown in the table below.

Calculation	A+B
Timing hold mode	Peak hold
Averaging times (n)	Once

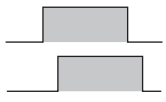
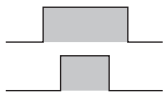
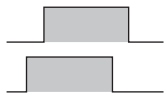
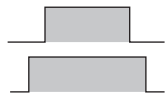


Comparative output response time	0.5 ms max. + output response time (See note 1.)

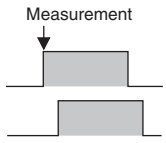
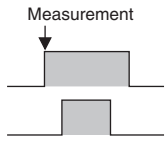
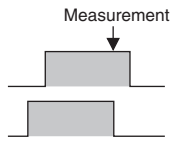
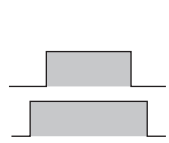
■ Relationship between timing signals and reset or hold signals

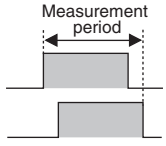
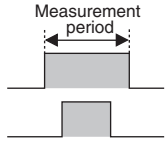
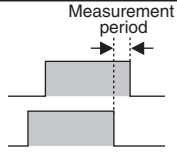
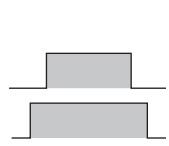
The following tables show whether or not measurement is performed for each signals timing input, when timing hold is not set to normal.

● Timing signal and reset signal

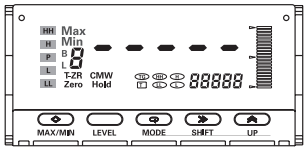
TIMING RESET				
Sampling	Measured → Not measured	Measured → Not measured	Measurement not possible	Measurement not possible
Other	Measurement cancelled	Measurement cancelled	Measurement cancelled	Measurement cancelled

● Timing signal and hold signal

TIMING HOLD				
Sampling	Measurement	Measurement	Measurement	Measurement not possible

TIMING HOLD				
Other	Measurement	Measurement	Measurement	Measurement not possible

No Measurement Status



· PV display "-----"
· All outputs OFF

When no measurement value has been determined, a "no measurement" status exists. The PV display for no measurement is "-----" and all outputs are OFF.

A no measurement status occurs in the following circumstances.

- Immediately after turning ON the power.
- Immediately after returning to RUN level from any level other than protect and adjustment levels.
- When the reset signal is ON.
- When the ◇[MAX/MIN] Key is pressed for 1 s min.
- While the startup compensation timer is operating.

* If the hold signal turns ON when no measurement has been made, the no measurement status is held.

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