SHOWA

D01235221B

MODEL DS-2000

Digital transducer indicator corresponding to TEDS

Operation Manual

SHOWA

Introduction

Thank you for purchasing the DS-2000 Digital Indicator.
Please read this document in its entirety before using the product to get the best performance and ensure safe and proper operation.
In this manual, "this unit" or "DS-2000" is used when referring to the DS-2000.

ATTENTION

The unit display shown in this manual shows the English interface, but this unit is set to Japanese when sent from the factory. (See "9-7. Languages" to change to English.)

Features

- Five-digit digital display enables direct reading of physical quantities up to ±99999.
- Support for TEDS sensors makes calibration easy. Automatic calibration is also possible when a TEDS sensor is connected.
- An equivalent input function is included, making sensitivity adjustment without actual loads easy.
- Supports remote sense functions. Even using long cables measurement is possible without losing precision.
- Static strain measurement is possible. Identifying load cell defects and other problems through plastic deformity is easy.
- In addition to high and low limit comparison, this indicators also supports high high limit and low low limit comparison functions.
- Supports a variety of hold functions, including peak hold, bottom hold, peak to peak hold, peak and bottom hold, average hold and these holds with zone designations.
- DIN size supports incorporation with testing devices and manufacturing equipment, for example.
- D/A output according to designated values is a standard feature.
- Product is RoHS compliant

Disclaimers

Information is given about products in this manual only for the purpose of example and does not indicate any guarantees against infringements of third-party intellectual property rights and other rights related to them. SHOWA MEASURING INSTRUMENTS will bear no responsibility for infringements on third-party intellectual property rights or their occurrence because of the use of these products.

Included accessories

If anything is missing or damaged, contact us. (For contact information, see the last page.)

Micro driver (flat-blade)	1
Input and output connector plugs	
B2L 3.50/08/180F SN BK BX	1
B2L 3.50/16/180F SN BK BX	1
AC adapter (GPE012T)	1
Panel attachment fixtures (already attached to unit)	2
DIN rail attachment adapter	1
Power input terminal bank cover (pre-installed on unit)	1
Operation manual (this document)	1

Safety information

This document describes the safety instructions for the operation of the digital indicator. Before operating the product, read this document carefully to familiarize yourself with the unit.

⚠ **WARNING**	Follow the instructions below to avoid risk of serious personal injury and death.
Never use beyond the rated specifications as there is the danger of property damage, injury, fire or electrical shock.	
Never use in flammable gaseous environments including the following locations as there is the danger of explosion. ● Locations containing corrosive or flammable gases ● Locations near water, oil or subject to chemical splash	
If the product malfunctions (any smoke, odor or noise is present), stop operating the product immediately and unplug the power cord as there is the danger of fire or electrical shock.	
Never attempt to disassemble the product.	
Carefully check connections and wiring before applying power.	
Be sure to ground the product (with ground resistance of 100 Ω or less).	
To allow the operator to immediately shut off the power to the product, install a switch or circuit breaker that complies with both IEC60947-1 and IEC60947-3 requirements near the product. The switch or breaker installed must also indicate that it functions to shut off the power to the unit.	
Do not allow foreign objects such as metal fragments that result from cutting panels, wires or other materials to enter this unit.	
If the unit is dropped or subject to strong impacts, it could break. If this occurs, stop using it and contact the seller from which you purchased it.	
Overvoltage category: II Pollution degree: 2	
If the unit is used in a manner not specified by the manufacturer, the protection provided by the unit may be impaired.	

Safety information

⚠ CAUTION	Follow the instructions below to avoid risk of personal injury or property damage.

Disconnect the power cord when performing the following.

- When wiring or connecting cables to the terminal banks for connecting the DC power supply, load cells and external inputs and outputs
- Connecting the ground line

Wait for at least five seconds between turning the unit on and off.

Never touch the rear panel or connectors while the product is turned on.

- When connecting to a power supply, frame ground or signal input/output connector, be sure to wire them correctly after confirming the signal names and pin assignment numbers.
- Use shielded cables for signal input/output cables (load cell, external input/output).
- Conduct wiring in a place so that it will not be together or parallel with electrical wiring.

Avoid use in locations like the following.

- Near a power line
- Where a strong electric or magnetic field is present
- Where static electricity or noise, (for example, from a relay) is generated

Do not install in the following environments.

- Locations subject to temperatures exceeding the specified temperature and humidity ranges
- Locations with high salt or iron content
- Locations subject to direct vibration or shock
- Outdoor, or locations with an altitude of higher than 2000 m
- Locations subject to radiant heat from heat sources
- Locations exposed to dirt and dust
- Locations subject to severe temperature changes
- Locations where freezing or condensation might occur

Do not operate a damaged unit.

The unit is classified as an open-type (built-in) device and must be installed inside a control panel.

If the top cover and the panel are dirty, wipe them with a soft cloth lightly dampened with a solution of a neutral detergent and water. Then wipe them again with a slightly damp cloth. DO NOT use a chemically treated dust cloth, paint thinner, or other flammable solvents. Using any of them could damage the coating of the product.

If the product is used in a manner unintended by the manufacturer, the user's safety may be adversely affected.

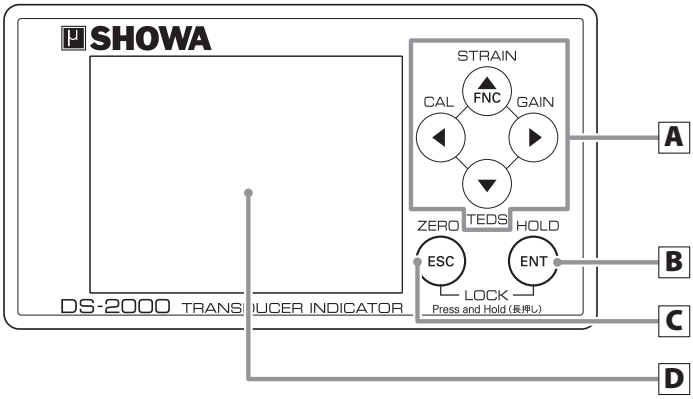
Always attach the DC power terminal bank cover when an electric current is present.

If subject to electromagnetic waves (from transceivers, mobile phones, amateur wireless transmissions, etc.), use metal pipes for the wiring or make other countermeasures using shielding.

Contents

Contents

1-1. Front panel



A Setting buttons

STRAIN

Press and hold to open static strain display.

CAL

Press and hold to conduct equivalent input calibration.

FNC

Press when an indicator value is shown to open the Function Menu.

Press when a setting screen is open to change the function number.

Press when changing a setting value to enable changing the symbol or decimal point.

GAIN

Press and hold to conduct actual load calibration.

TEDS

When a TEDS sensor is connected, press and hold to open the TEDS calibration screen.

▲▼

Select setting items and change setting values.

◀▶

Change the screen shown.

Press when a setting screen is open to select setting items and setting value digits.

B HOLD/ENT button

Press and hold to start operation of the hold function. Press and hold this button again to disable the hold function.

Press when changing a setting value to confirm the setting item or setting value and move to the next item.

C ZERO/ESC button

When Cal. Value Lock is OFF, press and hold to use the Zero Balancing function (page 40).

When Cal. Value Lock is ON, press this to forcibly set the indicator value to zero (Digital zero function).

When holding, this button clears the hold value.

Press when a setting screen is open to move up one level.

- Press and hold the ESC and ENT buttons simultaneously to enable or disable the key lock function.

D Display

This shows indicator and setting values.

If the sensor input is abnormal or the indicator value cannot be shown, one of the following overflow messages will be shown.

–LOAD: A/D converter minus over

LOAD: A/D converter plus over

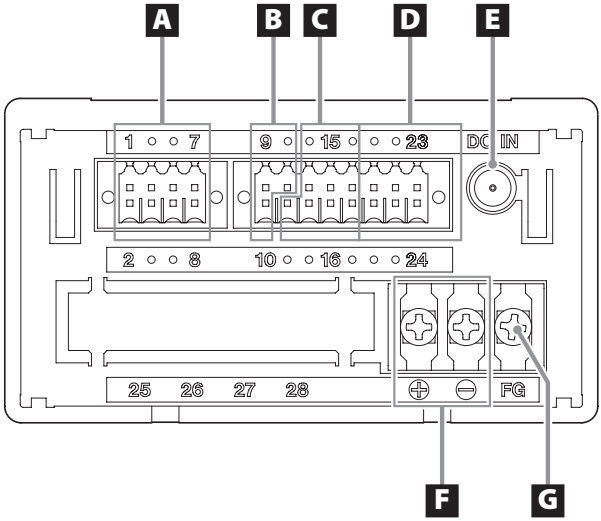
–FULL: display minus over (less than the minimum display value)

FULL: display plus over (greater than the maximum display value)

–OVER FULL: input is outside the maximum input range (negative value)

OVER FULL: input is outside the maximum input range

1-2. Rear panel



A **Sensor signal input terminals**

Terminal bank for connecting strain gauge transducers and TEDS sensors.

B **D/A output terminals**

C **Control signal input terminals**

D **Comparison output terminals**

Connect judgment outputs.

E **AC adapter jack**

Connect the included GPE012T AC adapter.

DC IN 12V

⚠ **Do not connect both an AC adapter and a power supply to the DC power supply input terminal.**

F **DC power supply input terminals**

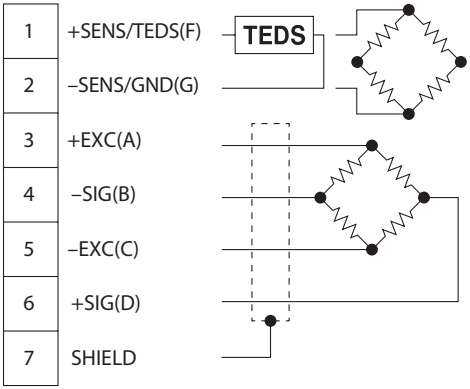
Connect a DC power supply. The voltage range is 12–24 V DC.

G **Frame grounding connector**

FG connector for DC power supply.

⚠ **Always be sure to connect the FG connector.**

1-3. Sensor signal input terminals



Terminal number	Signal name	Wire color
1	+SENS/TEDS (F)	Orange
2	–SENS/GND (G)	Green
3	+EXC (A)	Red
4	–SIG (B)	Black
5	–EXC (C)	Blue
6	+SIG (D)	White
7	SHIELD (E)	Yellow

- Terminals 1 and 2 are data terminals for use by both remote sense and TEDS sensors. Before connecting the sensor, set which type will be connected in advance using the Remote Sense/TEDS setting on the Calibration menu page. If "Remote Sense disabled/TEDS enabled" is selected, calibration will occur automatically if a sensor with TEDS built-in is connected.
- The wire colors are those that we use in the strain gauge transducers that we make.

1-4. D/A output connectors

These can output either voltage or current.
They cannot output both at the same time. Set voltage or current in System Settings → D/A Converter → D/A Output Mode (page 70).

Terminal number	Signal name	Explanation
9	V-OUT	D/A voltage output
10	I-OUT	D/A current output
11	COM	D/A output common terminal

- The D/A output is isolated from this unit's circuits.

1-5. Control signal input terminal

Terminal number	Signal name	Explanation
12	CLEAR	This turns on when a hold is cleared in any hold mode except sample hold. Set whether or not CLEAR Signals are active or inactive in Hold Function Setting → CLEAR Signal.
13	JUDGE	Judgment output using judgment output control signals only functions when this is ON. Set whether or not JUDGE signals are active or inactive in Comparison Setting → JUDGE Signal.
14	HOLD	Holds function using hold start signals when this is ON. Disable this by selecting OFF in Hold Function Setting → Hold Mode.
15	D/Z	Sets the indicator value digitally to 0. This is active when both System Settings → Lock → Cal. Value Lock and Condition Setting → Digital Zero → Enable Digital Zero are set to ON.
16	SEL1	If System Settings → Setting Memory is set to "by signal", the SEL1 and SEL2 terminals can be used to select the active Setting Memory. See "9-1. Setting Memory" on page 68.
17	SEL2	
18	COM	This is the control input signal common terminal.

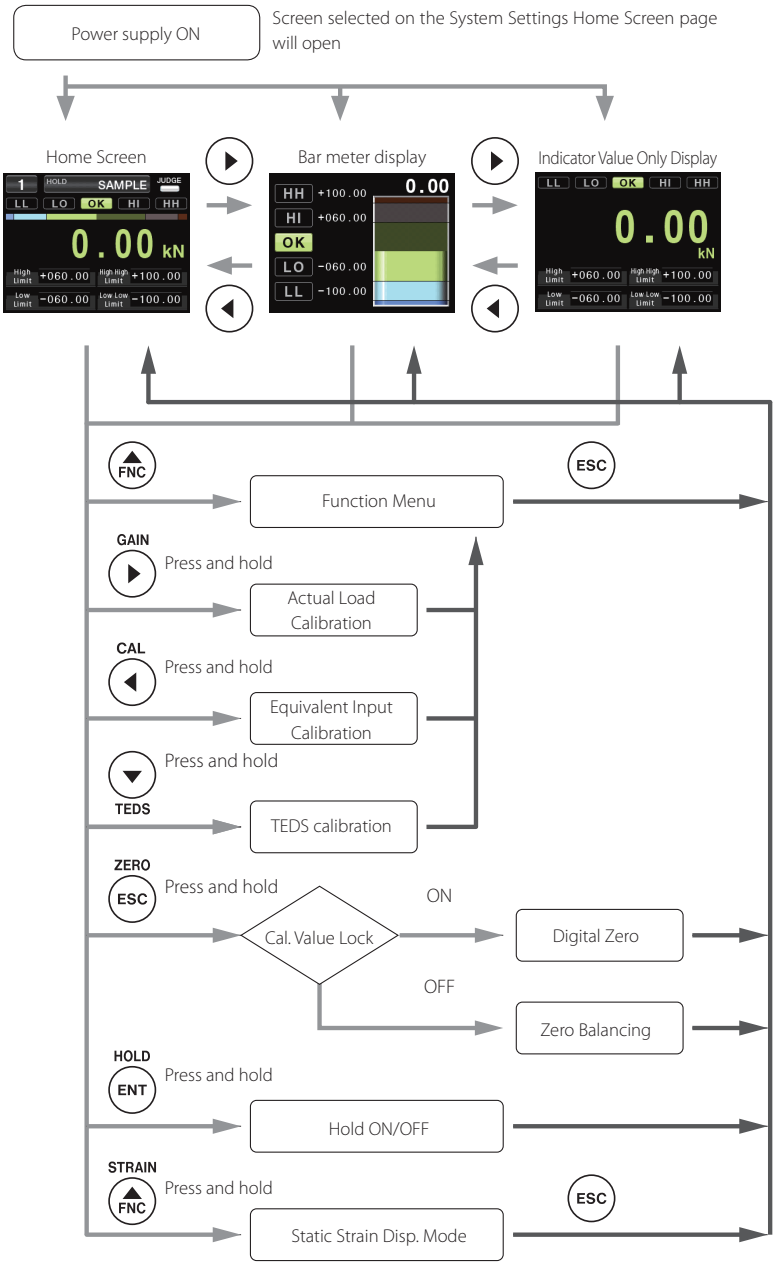
- The control input signal is isolated from the unit's circuits by a photocoupler.
- Signals are input to each terminal by shorting and opening with 18 COM.
  A current of about 20mA results from shorting.
  When using a transistor, select one with a resistance of at least 10 V and elements that allow the flow of at least 40 mA when on.
- You can confirm the status of the input signal on the screen shown in "6-6. Control Input Check" on page 45.

1-6. Comparison output connectors

Terminal number	Signal name	Explanation
19	LL	Low low limit judgment output
20	LO	Low limit judgment output
21	HH	High high limit judgment output
22	HI	High limit judgment output
23	OK	OK judgment output
24	COM	Comparison output common terminal

- The comparison output is isolated from the unit's circuits by a photocoupler.
  Open collector output (NPN, current sync)
  20mA/30V maximum collector current
- For the operation of each signal, see "7. Comparison Setting" on page 46.

1-7. Screen transition diagram



1-8. Home Screen

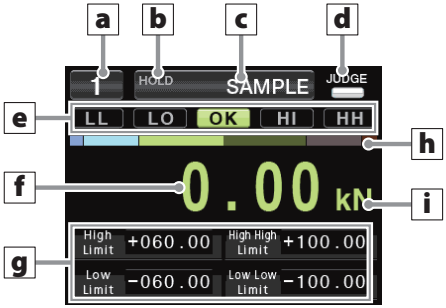
The screen selected on the System Settings Home Screen page will open when the unit is turned on.
Use the ◀ and ▶ buttons to change screen views.

NOTE

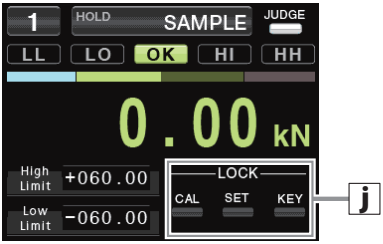
The Home Screen will open about 15 seconds after power is supplied to the unit.

1-8-1. Standard

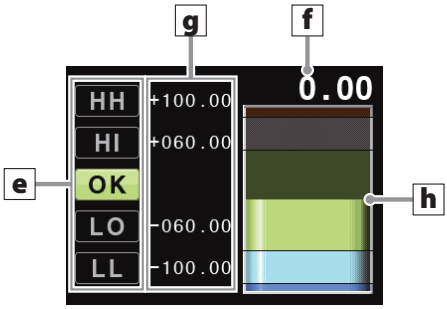
When high high limit and low low limit are enabled



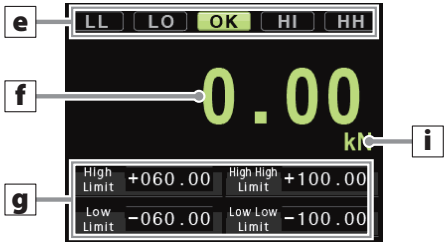
When high high limit and low low limit are disabled



1-8-2. Bar meter display



1-8-3. Large indicator value



a **Memory number**

The currently selected memory number is shown.

b **HOLD indicator**

When the hold function is active, a white indicator appears beneath the word HOLD. When the zone definition hold function is active, a gray indicator appears.

c **Hold function setting**

The currently selected hold mode is shown.

d **JUDGE indicator**

When judgment output is active, this indicator appears white.

When Judge Signal is enabled, this appears white if the JUDGE input terminal is ON and black if it is OFF. When Judge Signal is disabled, it is always white.

e **Judgment type**

HH/HI

These light to show judgment output operation for indicator values greater than the setting values for the high high and high limits.

OK

This lights to show OK judgment output operation when the indicator value is equal to or higher than the low limit and equal to or less than the high limit.

LL/LO

These show judgment output operation for indicator values lower than the setting values for the low low and low limits.

NOTE

Judgment output operation changes according to the Comp. Pattern, Comp. Output Pattern and Hysteresis settings.

The above example is of operation when the Comp. Pattern setting is LL/LO/OK/HI/HH, the Comp. Output Pattern is "Standard Output" and the Hysteresis setting is 0.

f **Indicator value**

g **High limit, low limit, high high limit and low low limit setting values**

Each setting value is shown.

If high high limit and low low limit are disabled, the LOCK settings are shown.

h **Bar meter**

This is an analog representation of the indicator value.

The highest value of the bar meter range is set with the Max. Disp. Value setting.

If the low low limit and low limit are zero or higher, the bar meter will show from zero to the maximum display value.

If the low low limit or low limit is less than zero, the bar meter will show zero as the center value and show a range from the maximum display value to negative that value.

NOTE

If the bar meter zero position is at the center, a white line will appear at the zero position.

i **Unit**

j **LOCK settings**

This shows the lock status.

CAL: Cal. Value Lock
SET: Setting Value Lock
KEY: Key lock

These do not appear when the high high limit and low low limit are enabled.

NOTE

There are two key lock types.

Press and hold ESC + ENT

This is indicated on the front panel.

This cannot be used to unlock when key lock has been set by pressing and holding ◀+▶.

Press and hold ◀+▶

This is not indicated on the front panel, so it can be used to prevent unlocking when not desired.

Press and hold ◀+▶ to unlock this key lock.

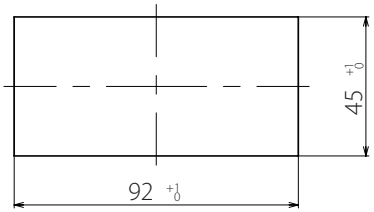
This can also be used to unlock when key lock has been set by pressing and holding ESC+ENT.

2. Installation

Follow these procedures to install the unit in a control panel.

2-1. Installing in a panel

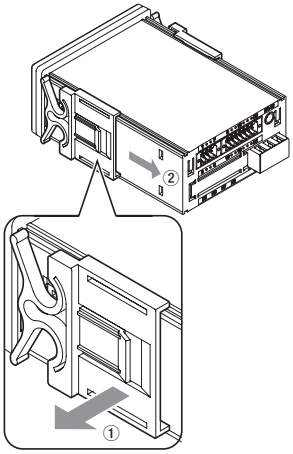
1 **Open a hole in the panel in accordance with this dimensional drawing of the panel installation opening.**



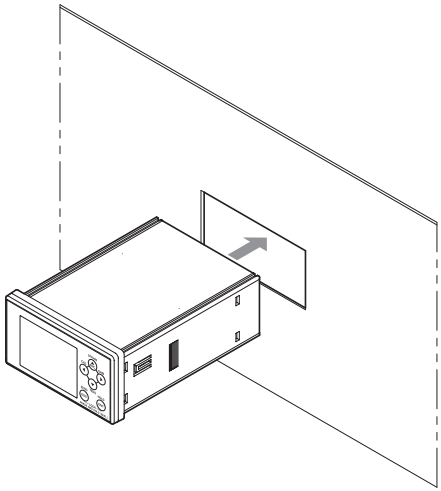
- The recommended panel thickness is 0.8–5 mm.

2 **Remove the left and right panel attachment fixtures.**

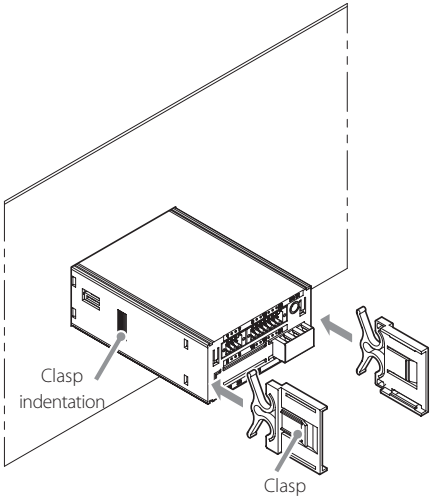
While pulling their movable clasps away from the unit, slide each one off the back of the unit.



3 **Insert the unit through the front of the panel.**



4 **Attach the left and right panel attachment fixtures that were removed in step 2 to the unit from behind and fix them in place.**



- When pushing the panel attachment fixtures to the panel, attach them horizontally and be sure that they are attached firmly without any give.
- In order to assure that the clasp indentations and the clasps on the panel attachment fixtures are securely connected during use, after attaching them, push the panel attachment fixture clasps toward the unit and confirm that they have latched.

- If the clasp indentations and the clasps on the panel attachment fixtures are not securely connected and left in this state, the clasps could become bent and cease to fit the indentations on the unit.

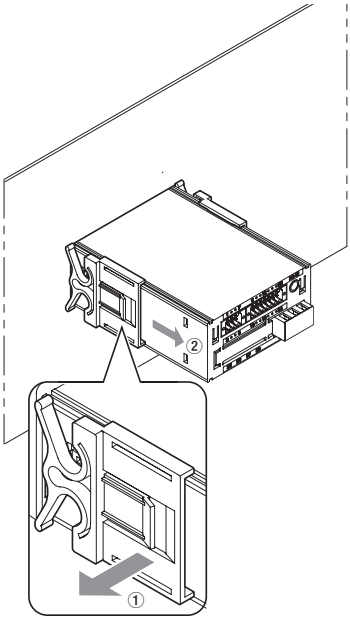
ATTENTION

- Do not install the unit in a location that is exposed to direct sunlight, temperatures outside a 0–40℃ range or humidity outside a 35–85% range or that is subject to condensation due to extreme temperature variation.
- Do not install in a location with dust or garbage or where electronic components would be exposed to harmful chemicals or corrosive gases, for example.
- When installing inside other equipment, be sure that heat dissipates to prevent the inside of the equipment from exceeding 40℃.
- Do not install in a location that is exposed to excessive vibrations or impacts.

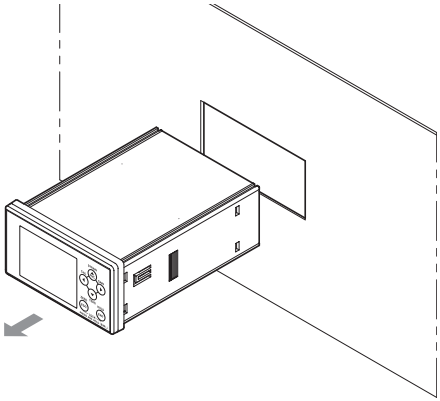
2-2. Removing from a panel

1 **Remove the left and right panel attachment fixtures.**

While pulling their movable clasps away from the unit, slide each one off the back of the unit.



2 **After removing the panel attachment fixtures, pull the unit out through the front of the panel.**



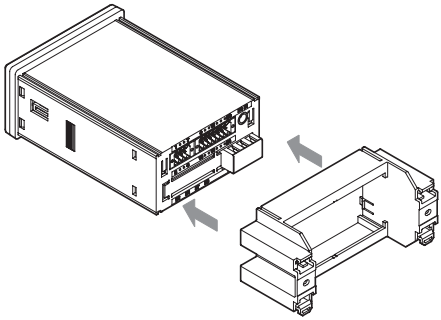
2-3. Attaching to a DIN rail

1 **Insert the rear of the unit into the DIN rail attachment adapter.**

You can insert either side up so that it is the orientation desired in step 2.

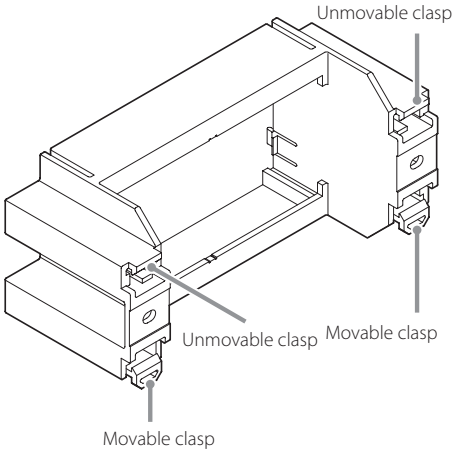
ATTENTION

Be sure that the attachment adapter is attached to the unit firmly without any give.



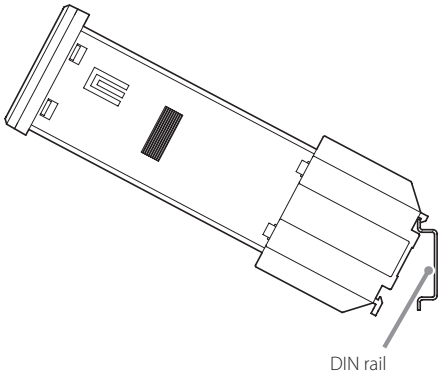
ATTENTION

When attaching the adapter to the DIN rail, first hook it to the unmovable clasps and push it in at an angle.

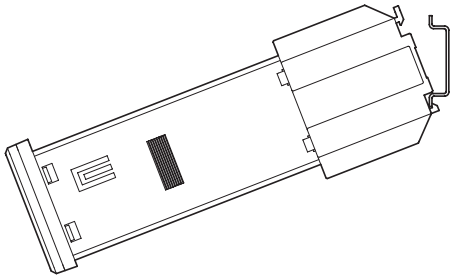


2 **Push the adapter on to the DIN rail at an angle and connect it.**

If the unmovable clasps face the top of the unit after step 1

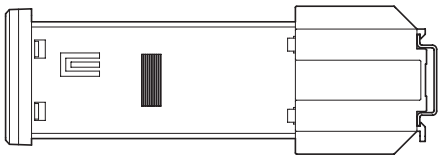


If the unmovable clasps face the bottom of the unit after step 1



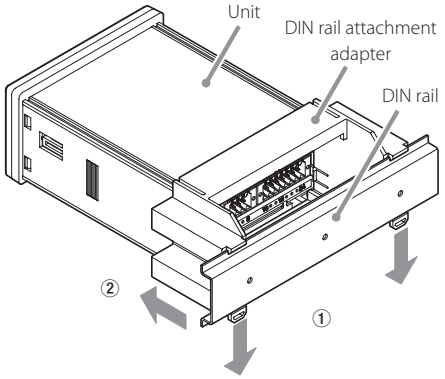
ATTENTION

Fix the adapter to the DIN rail firmly and confirm that there is no give.

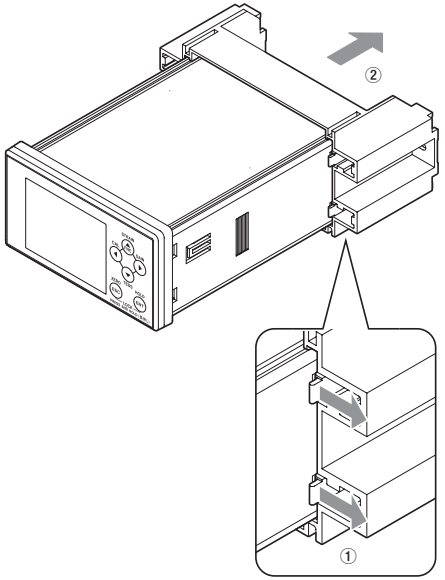


2-4. Removing from a DIN rail

1 **Open the movable clasps on the attachment adapter and pull the unit forward to remove it from a DIN rail.**



2 **Open the four clasps on the left and right sides that hold the attachment adapter and the unit together, and remove the attachment adapter from the back of the unit.**



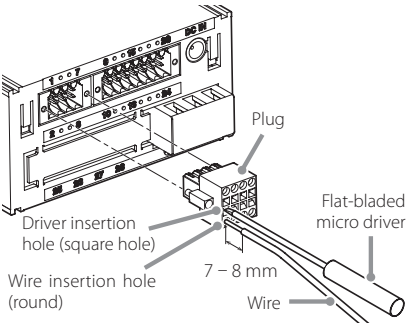
3-1. Connecting with the input and output terminal bank

The terminal bank is a 2-piece type.
Use the included micro driver or another tool to connect the included B2L 3.5/08/180F SN BK BX or B2L 3.5/16/180F SN BK BX.
When using a flat-blade driver other than the one included, make sure the blade is less than 2.5mm wide and 0.4mm thick.

CAUTION

Connect only the included B2L 3.5/08/180F SN BK BX and B2L 3.5/16/180F SN BK BX connectors to the input and output terminal bank. Do not use any other connector, because doing so could make it unsafe.

3-1-1. Sensor signal input connector



1 **Remove 7–8 mm of the covering from the wire being connected, and twist it so that the tip does not come apart.**

Suitable wiring is 0.13–1.0 mm2 (28–18 AWG).

2 **Insert the included flat-bladed micro driver into the square hole above or below the wire insertion hole in the orientation shown in the illustration.**

This will open the metal cover over the wire hole.

3 **Insert the wire into the hole so that the tip does not come apart.**

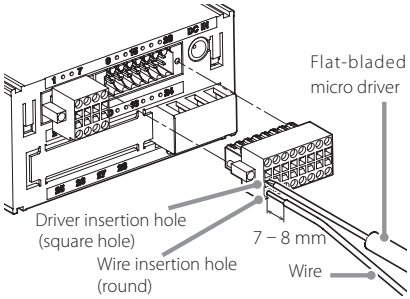
Continued on the next page ➡

4 **Remove the flat-bladed screwdriver.**

5 **Pull the wire gently to confirm that it is securely clamped into the hole.**

6 **After it has been connected to the sensor, insert the plug into the indicator and secure it with screws.**

3-1-2. Control signal input/output connector



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This will open the metal cover over the wire hole.

3 **Insert the wire into the hole so that the tip does not come apart.**

4 **Remove the flat-bladed screwdriver.**

5 **Pull the wire gently to confirm that it is securely clamped into the hole.**

6 **After it has been connected to the sensor, insert the plug into the indicator and secure it with screws.**

3-2. Connecting a strain gauge transducer

3-2-1. About the sensor terminals

Terminals 1 and 2 in the signal input and output terminal bank are data terminals for use by both remote sense and TEDS sensors.

Before connecting the sensor, set which type will be connected in advance using the Remote Sense/TEDS setting.

The default setting is "Remote Sense disabled/TEDS enabled".

For details, see "5-5. Remote Sense/TEDS".

ATTENTION

- When using a six-wire format (remote sense format), before connecting a sensor, always set "Remote Sense/TEDS" to "Remote Sense enabled/TEDS disabled".
- When using a TEDS sensor or a 4-wire format, set it to "Remote Sense disabled/TEDS enabled".
- Incorrect connections or settings could cause damage to sensors.

3-2-2. About the Remote Sense function

The six-wire format (remote sense format) is a superior connection method that compensates for reduced voltages due to cable length and voltage changes, for example, due to temperature changes.

In systems installed outdoors and other situations where temperature changes are expected, as well as in cases when general precision is desired, for example, we recommend using the six-wire format for remote sensing.

3-2-3. Notes about bridge voltage (applied voltage)

As a reference for setting the bridge voltage, consider that the output from the sensor will increase, and set the maximum voltage in a range that does not exceed the maximum excitation voltage on the sensor test result sheet.

If you a set a value that exceeds the sensor's maximum excitation voltage, the sensor could be damaged.

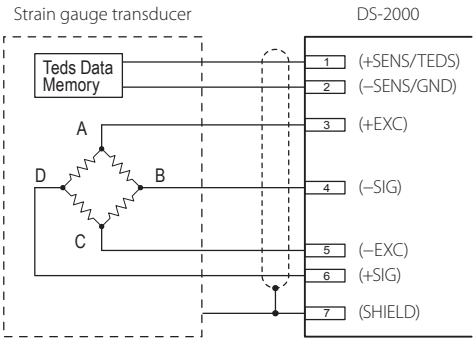
ATTENTION

- If the maximum excitation voltage is less than 10 V, set the bridge voltage to 2.5 before connecting.
- In TEDS calibration, when TEDS data is read, if the bridge voltage setting is greater than the maximum excitation voltage recorded in the TEDS memory, the bridge voltage will be changed to a value less than the maximum excitation voltage.

NOTE

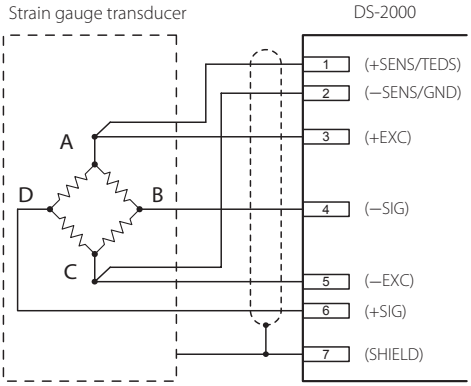
- The default value is 2.5 V.

Connecting a TEDS sensor or one with 4 wires



If not using the TEDS function, terminals 1 and 2 can be left open.

Connecting using 6 wires



Usable sensor characteristics

- Output between +SIG and –SIG: ±3.2 mV/V or less
- Voltage (current) between +EXC and –EXC: DC 10 V or DC 2.5 V ±10% (30 mA maximum current)

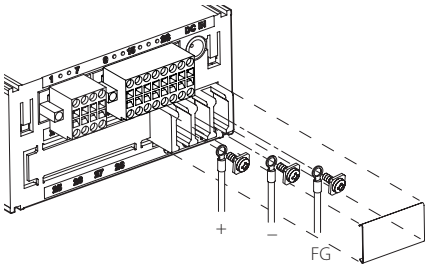
WARNING

Do not use this unit for measurements on mains circuits.

3-3. Connecting the power supply input terminal

3-3-1. DC power supply

The DC power supply input voltage should be 12–24 V.
Use a power supply cord that is 0.517–2.081 mm2 (20–14 AWG).
When connecting to the terminal bank, use a solderless terminal (M3, width of 6 mm or less).



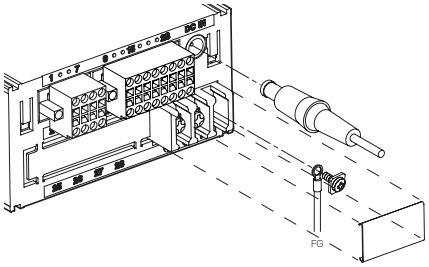
- When the input voltage is DC 12 V, a current of about 0.75 A flows.

ATTENTION

- If using the unit as a CE compliant product, the power cord must be no more than 3m long.
- Allow the unit to warm up for at least five minutes after supplying power to it.
- The recommended tightening torque for terminals is 0.5 N·m (5.1 kgf·cm).

⚠ **Always attach the cover to the power supply input terminal bank. Failure to do so could result in fire, electric shock or malfunction.**

3-3-2. AC power supply



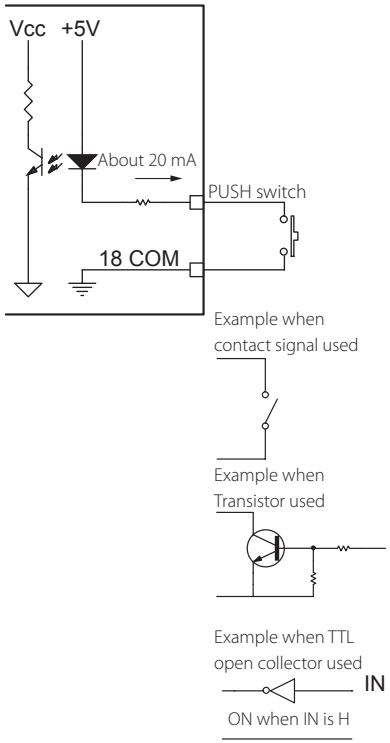
- When using AC 100 V, do not use any adapter besides the included one.
- When not using AC 100 V, use a DC power supply whenever possible. When using an AC power supply in the European region, however, use an adapter that meets EN standards. Specifications for EN standards compliant AC adapter
  Output: 12 V ±5%, 0.8 A or greater
  Output plug: 5.5mm outer diameter
  3.3 mm inner diameter
  Output polarity: center plus
- Insert completely until you hear it click into place before use.
- To prevent the connector from being pulled out and to protect the connector from unnecessary loads, before use fix the adapter cable separately so that it does not hang.
- Allow the unit to warm up for at least five minutes after supplying power to it.

⚠ **Always attach the cover to the power supply input terminal bank. Failure to do so could result in fire, electric shock or malfunction.**

3-4. Connecting control input terminals

Signals are input with the external input circuit when shorted or opened between any control input terminal and the COM terminal.
Shorts occur from both contact and non-contact (transistor, TTL open collector).

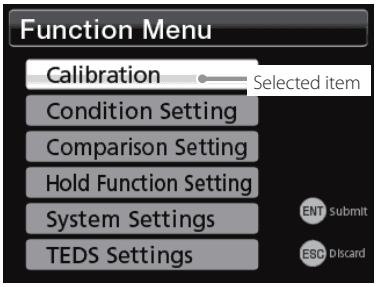
DS-2000



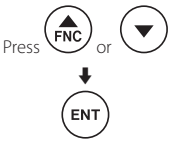
- When external contact is ON, about 20 mA flows. When using a transistor, for example, select one with a resistance of at least 10 V and elements that allow a flow of at least 40 mA when on.
- 18 COM is the common terminal for the 12 CLEAR, 13 JUDGE, 14 HOLD, 15 D/Z, 16 SEL1 and 17 SEL2 control input terminals.
- Do not apply voltage from an external source.

4-1. Basic operation

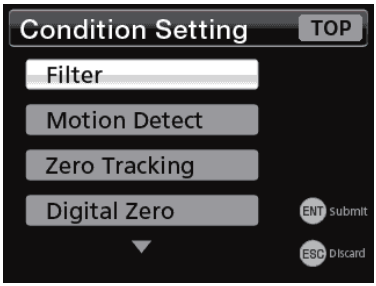
1 **Press the FNC button to open the Function Menu.**



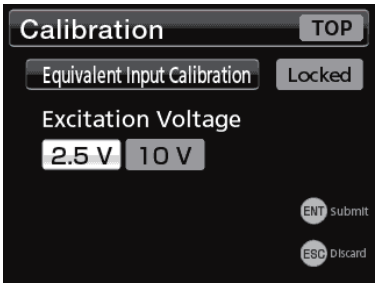
2 **Use the ▲ and ▼ buttons to select the setting item, and press the ENT button to open the setting screen.**



If there are too many selections to be shown on one screen, 5/b will be shown at the top/bottom of the list. Move to the 5 or b to open the next screen.



The following screen appears when you select Calibration → Equivalent Input Calibration.



3 **Changing a series of setting values.**

Depending on the menu item, setting screens might appear in a series. When you press the ENT button to confirm a setting value, the next setting screen will open. The setting screens for the lowest level of settings under Calibration, Condition Setting and Hold Function Setting in "4-9. Setting menu list" on page 25 open in series.

If you do not need to change a setting value, press the ENT button to move to the next setting screen.

For example, in the case of Equivalent Input Calibration, the following setting screens appear one after another.

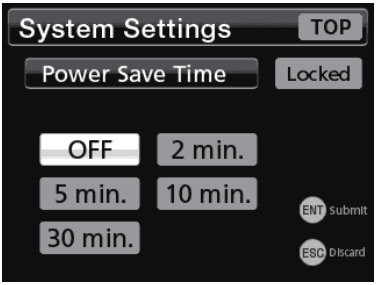
Excitation Voltage
Rated Output
Rated Capacity
Zero Balancing
D/A Output Mode
D/A Max. Voltage
Select EU
Cal. Value Lock

After settings are complete, the Function Menu opens.

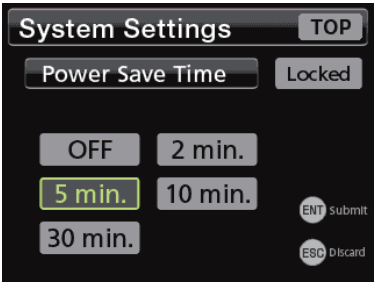
- Press the ESC button to return to the higher level screen.

4-2. Selecting setting values from options

The current value has a white background.
Other options have gray backgrounds.

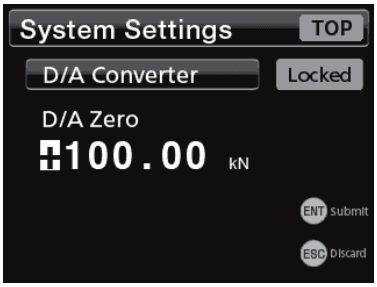


Use the g and t buttons to change the selected option, and press the ENT button. When there are multiple selections, pressing the t button when an option at the right end of a line is selected will select the option at the left end of the next line.
A confirmed item will be shown with a green border.

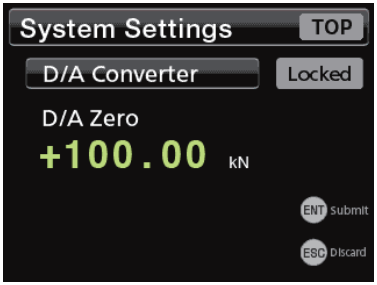


4-3. Inputting numerical setting values

The selected digit appears dark with a white background.



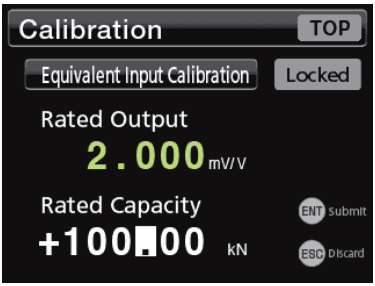
Use the ◀ and ▶ buttons to change the selection, and use the ▲ and ▼ buttons to change the value.
The symbol at the left edge can be switched between + and – by pressing either the ▲ or ▼ button.
When you press the ENT button to confirm, the characters turn green.



4-4. Changing the decimal point position

The decimal point position can only be changed for the Rated Capacity.

1 **Move the cursor to the decimal point and press the ▲ button to show "0".**



2 **Move the cursor to the digit where you want to show the decimal point, and press the ▲ or ▼ button until the decimal point is shown.**

Each time you press the ▲ or ▼ button, the display changes as follows.

If you press the ENT button when there are two decimal points, an error message appears. Remove one of the decimal points.

3 **Press the ENT button to confirm the selection.**

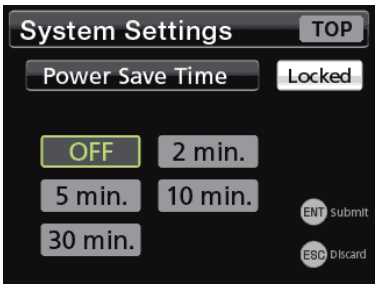
ATTENTION

When a TEDS sensor is connected, if the calibration value lock is not set to ON, the default value will be restored the next time the unit is turned on.

4-5. Lock

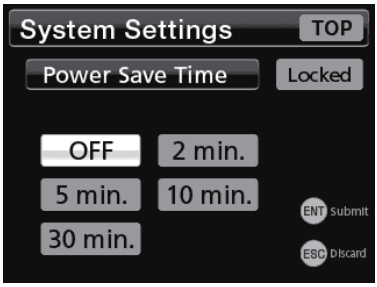
You can prohibit the changing of calibration and setting values.

When locked, "Locked" appears with a white background at the top right of the setting screen.



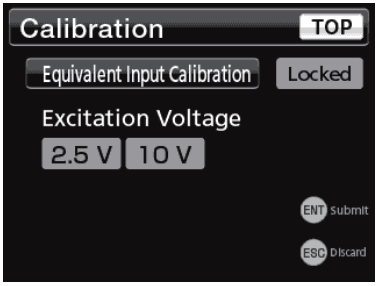
To change a setting value when locked, from the Function Menu, select System Settings → Lock, and disable locking for the calibration or setting values (page 32).

When not locked, "Locked" appears with a gray background at the top right of the setting screen.



See "4-10. Setting value list" on page 27 for information about lock settings.

4-6. Returning to the Home Screen



Use the ◀ and ▶ buttons to select TOP, and press the ENT button to return to the Home Screen.

4-7. Viewing the version

1 **Press the FNC button to open the Function Menu.**

2 **Press and hold ◀ and ▶.**
Press the ESC button to return to the Function Menu.

4-8. Initializing all settings

You can initialize all the settings of this unit to their factory default values.

- If you want to initialize all the settings except the calibration values in the selected setting value memory, follow the procedures in "9-8. Reset to the Factory Settings" on page 73.

ATTENTION

The following procedure will initialize all the settings in the setting value memory, including calibration values.

1 **Follow the procedures in the previous section to show the version.**

2 **Press the ENT button once. When "Initialize OK?" appears, press the ENT button again.**

- Press the ESC button to cancel.

4-9. Setting menu list

4-9-1. Function Menu

4-9-2. Calibration

4-9-3. Condition Setting

4-9-4. Comparison Setting

4-9-5. Hold Function Setting

4-9-6. System Settings

4-9-7. TEDS Settings

4-10. Setting value list

4-10-1. Calibration

Item	Settings	Format	Unit display	Default value	Setting range/options	Calibration value lock	Setting value lock	Setting value memory
Equivalent Input Calibration	Bridge Voltage	Options	V	2.5	2.5, 10	✓		
	Rated Output	Input	mV/V	2.000	0.300–3.200	✓		
	Rated Capacity	Input	Set unit	100.00	00000–99999	✓		
	Zero Balancing				Execute	✓		
	D/A Output Mode	Options		Voltage	Voltage, Current		✓	
	D/A Max. Voltage	Input	V	10V	1–10 (in 1V increments)		✓	
	Select EU	Options		N	N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none	✓		
	Cal. Value Lock	Options		OFF	OFF, ON			
Actual Load Calibration	Bridge Voltage	Options	V	2.5	2.5, 10	✓		
	Zero Balancing				Execute	✓		
	Rated Capacity	Input	Set unit	100.00	00000–99999	✓		
	D/A Output Mode	Options		Voltage	Voltage, Current		✓	
	D/A Max. Voltage	Input	V	10V	1–10 (in 1V increments)		✓	
	D/A Full Scale	Input	Set unit	100.00	–99999–99999		✓	
	Select EU	Options		N	N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none	✓		
	Max. Disp. Value	Input	Set unit	110.00	00000–99999	✓		
	Cal. Value Lock	Options		OFF	OFF, ON			
TEDS calibration	Rated Output	Display	mV/V		0.300–3.200	✓		
	Rated Capacity	Display	Automatic		00000 - 99999	✓		
	Zero Balancing		Set unit		Execute	✓		
	Select EU	Options		N	N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none	✓		
	Cal. Value Lock	Options		OFF	OFF, ON			
Remote Sense/TEDS		Options		Remote Sense disabled/ TEDS enabled	Remote Sense enabled/ TEDS disabled, Remote Sense disabled/ TEDS enabled	✓		
Select Min. Grid		Options		1	1, 2, 5, 10	✓		
Select Disp. Times		Options	Times	4	4, 6, 10, 20	✓		
Max. Disp. Value		Input	Set unit	110.00	00000 - 99999	✓		
Select EU		Options		N	N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none	✓		
Sensor input logic		Options		Standard	Starndard, Reversed	✓		

The above items will not be reset when the procedures in "9-8. Reset to the Factory Settings" on page 73 are conducted.

4-10-2. Condition Setting

Item	Settings	Format	Unit display	Default value	Setting range/ options/operation	Calibration value lock	Setting value lock	Setting value memory
Filter	Select LPF	Options	Hz	100	3, 10, 30, 100, 300, 1000, none		✓	✓
	Select Num. of Moving Avg.	Options		OFF	OFF, 16, 32, 64, 128, 256, 512, 1024, 2048		✓	✓
Motion Detect	Time	Input	Seconds	1.5	0.0–9.9		✓	✓
	Width	Input	Set unit	000.05	00000–00999		✓	✓
Zero Tracking	Time	Input	Seconds	0.0	0.0–9.9		✓	✓
	Width	Input	Set unit	000.00	00000–00999		✓	✓
Digital Zero Offset		Input	Set unit	000.00	–19999–19999		✓	
Digital Zero	Enable Digital Zero	Options		ON	ON, OFF		✓	
	Digital Zero Limit Value	Input	Set unit	999.99	00000–99999		✓	
	Clear Digital Zero	Options		Skip	Execute, Skip		✓	
Control Input Check	D/Z	Display			LOW, HIGH			
	HOLD	Display			LOW, HIGH			
	JUDGE	Display			LOW, HIGH			
	CLEAR	Display			LOW, HIGH			
	SEL1	Display			LOW, HIGH			
	SEL2	Display			LOW, HIGH			
Judge Output Check		Options			HH, HI, OK, LO, LL			
Static Strain Disp. Mode		Options		OFF	ON, OFF		✓	
Select Data Output		Options		Displayed output	Hold value is output in coordination with display, input is output as is		✓	✓

4-10-3. Comparison Setting

Item	Settings	Format	Unit display	Default value	Setting range/options	Calibration value lock	Setting value lock	Setting value memory
Comp. Value Setting	High high limit input (HH)	Input		999.99	–99999–99999		✓	✓
	High limit input (HI)	Input		100.00	–99999–99999			
	Low limit input (LO)	Input		50.00	–99999–99999			
	Low low limit input (LL)	Input		000.00	–99999–99999			
Comp. Pattern Setting		Options		LL/LO/OK/ HI/HH	OK/LL/LO/HI/HH, LL/OK/LO/HI/HH, LL/LO/OK/HI/HH, LL/LO/HI/OK/HH, LL/LO/HI/HH/OK		✓	✓
Comp. Mode Setting		Options		Compare Always	Compare Always, Compare During Stable, Compare Except Nearly Zero, Compare During Stable Except Nearly Zero, Compare During Held, Disable comparison		✓	✓
HH LL Limit Enable		Options		Disable	Disable, Enable		✓	✓
Hysteresis		Input	Set unit	000.00	00000–99999		✓	✓
Judge Signal		Options		Disable	Disable, Enable		✓	✓
Comp. Output Pattern		Options		Standard Output	Standard Output, Area Output		✓	✓
Nearly Zero		Input	Set unit	001.00	00000–09999		✓	✓
Bar meter zero position		Options		Automatic	Automatic, Left-edge fixed		✓	✓

4-10-4. Hold Function Setting

Item	Settings	Format	Unit display	Default value	Setting range/options	Calibration value lock	Setting value lock	Setting value memory
Hold Mode		Options		SAMPLE	OFF, SAMPLE, PEAK, BOTTOM, AVERAGE, PEAK to PEAK, PEAK and BOTTOM		✓	✓
Times of Average		Input	Times	1	1–999		✓	✓
Fast Sampling Mode		Options		OFF	OFF, ON		✓	✓
External Hold Mode		Options		Level	Level, Pulse		✓	✓
CLEAR Signal		Options		Enable	Enable, Disable		✓	✓
Zone Definition		Options		OFF	OFF, ON		✓	✓
Auto Zero		Options		OFF	OFF, ON		✓	✓

4-10-5. System Settings

Item	Settings	Format	Unit display	Default value	Setting range/options	Calibration value lock	Setting value lock	Setting value memory
Setting Memory		Options		by menu	by signal, by menu		✓	
		Options		Memory 1	Memory 1, Memory 2, Memory 3, Memory 4		✓	
D/A Converter	D/A Zero	Input	Set unit	000.00	–99999–99999		✓	
	D/A Full Scale	Input	Set unit	100.00	–99999–99999		✓	
	D/A Output Mode	Options		Voltage	Voltage, Current		✓	
	D/A Max. Voltage	Input	V	10V	1–10 (in 1V increments)		✓	
	D/A CAL TEST	Input	Based on D/A output	0V, 4mA	–10 V to +10 V (in 1V increments), 4 mA to 20 mA (in 1mA increments)			
Lock	Cal. Value Lock	Options		OFF	OFF, ON			
	Setting Value Lock	Options		OFF	OFF, ON			
Home Screen		Options		Standard	Standard, Bar meter, Large indicator value		✓	
Brightness		Options		Normal	OFF, Dark, Normal, Bright		✓	
Power Save Time		Options		OFF	OFF, 2 min., 5 min., 10 min., 30 min.		✓	
Languages		Options		Japanese	Japanese, English		✓	
Reset to the Factory Settings		Options		OFF	OFF, ON		✓	

4-10-6. TEDS Settings

Item	Settings	Format	Unit display	Default value	Setting range/options	Calibration value Lock	Setting value Lock	Setting value memory
TEDS Data Change	Accept Changing	Input		00000	00000–99999		✓	
	Calibration Date Input	Input	Year: Month: Date	-: -: -	Year/Month/Date		✓	
	Writing Cal. Data				Write		✓	
Restore TEDS Data	Accept Changing	Input		00000	00000–99999		✓	
	Writing Restore Data				Write		✓	
TEDS Data		Display	Rated capacity unit, mV/V, Ω, V, Year/ Month/ Date		Serial number, Rated capacity, Rated output, Bridge Element Impedance, Max. Exc. Level, Calibration Date			

Connecting the unit with a strain gauge transducer and setting how the indicator values will be shown is called "calibration". The following three calibration methods can be used with the unit.

1. Equivalent input calibration

This calibration method does not depend on actual loads. It only requires the input of the strain gauge transducer rated output (mV/V) and the rated capacity (value you want shown). Use this to calibrate easily when an actual load cannot be applied.

Examples:

Weight
100kN rated capacity, 2.001mV/V rated output

Pressure
10.00MPa rated capacity, 2.002mV/V rated output

Torque
15.00N·m rated capacity, 2.502mV/V rated output

In this manner, by recording values from test results tables, the gain can be determined automatically and shown.

2. Actual Load Calibration

This calibration method measures the values of actual loads on the strain gauge transducer.

By applying an actual load that is as close as possible to the maximum measured value, calibration with less error is possible.

3. TEDS calibration

This calibration method uses the strain gauge transducer rated output (mV/V) and rated capacity that are recorded in TEDS memory.

Note, however, that equipment with TEDS memory includes both 1kbit and 4kbit devices, but the unit only supports 4kbit.

Sensor check before calibrating

After connecting a sensor and providing power, calibration is not possible if the indicator value is unstable or an error appears. If this occurs, turn static strain mode ON (Condition Setting → Static Strain Disp. Mode) and check the indicator value. In this mode, the sensor output itself is shown as a strain amount unit (μST), so input between 0 and ±3.2 mV/V will be shown as a value from 0 to ±6400.

A strain gauge transducer should have written test results with contents such as the following.

Rated capacities: weight, pressure, etc. (unit: kN, MPa, etc.)
Rated output: voltage (unit: mV/V)
Nonlinearity: %R.O.
Hysteresis: %R.O.
Maximum excitation voltage: V (bridge voltage)
Input Terminal Resistance: Ω
Output Terminal Resistance: Ω
Zero balance: %R.O.

- The data necessary for equivalent input calibration are rated capacity and rated output.
- Some of this data is written to the internal memory of the TEDS sensor.

5-1. Procedures shared by all calibration methods

The three calibration methods are equivalent input calibration, actual load calibration and TEDS calibration. All the calibration methods have the same procedures before and after calibration.
An overview of the calibration procedures is shown below.

Disable Cal. Value Lock
System Settings → Lock → Cal. Value Lock (select OFF)

↓

Remote Sense/TEDS selection
Calibration → Remote Sense/TEDS
Terminals 1 and 2 are data terminals for use by both remote sense and TEDS sensors.
Before connecting the sensor, set which type will be connected in advance using the Remote Sense/TEDS setting on the Calibration menu page.

↓

Calibration
Calibration → Equivalent Input Calibration
or, Actual Load Calibration
or, TEDS calibration

↓

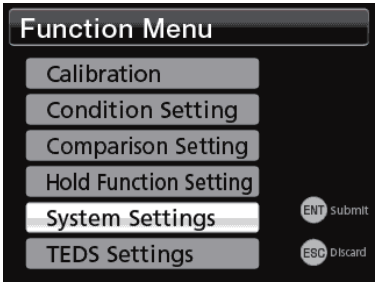
Cal. Value Lock setting

First, we will explain the procedures to be conducted before and after calibration. Then, we will explain the procedures for equivalent input calibration, actual load calibration and TEDS calibration.

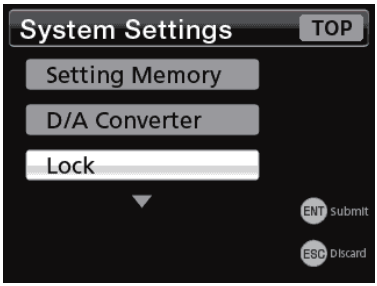
5-1-1. Locking and unlocking calibration values

Usually, the unit is used with Cal. Value Lock set to ON. Before calibration, Cal. Value Lock must be set to OFF. After calibration, set Cal. Value Lock to ON again.

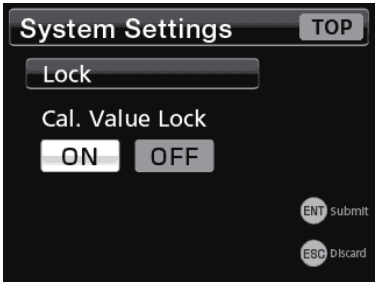
1 **Press the FNC button to open the Function Menu.**



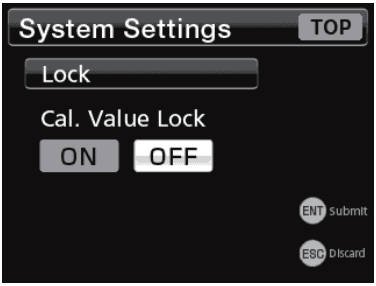
2 **Use the ▲ ▼ buttons to change the selection, and select in order System Settings → Lock.**



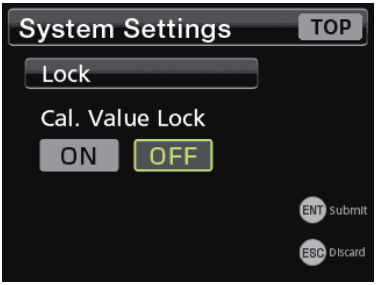
↓



3 **Use the ◀ ▶ buttons to select OFF or ON.**



4 **Press the ENT button to confirm the selection.**



5 **Press the ESC button to exit setting mode.**

ATTENTION

- The ZERO button function depends on the Cal. Value Lock setting.
  When Cal. Value Lock is ON, press the ZERO button to use the Digital Zero function. When Cal. Value Lock is OFF, press it to use the Zero Balancing function.
- In order to prevent accidental changes to the calibration value, set Cal. Value Lock to ON after calibration.

NOTE

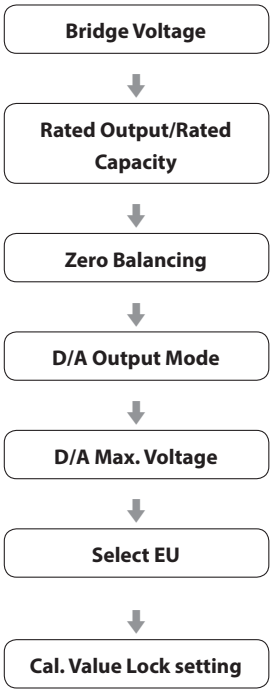
See "4-10. Setting value list" on page 27 for information about settings that cannot be changed when Cal. Value Lock is ON.

5-1-2. Remote Sense/TEDS

Terminals 1 and 2 are data terminals for use by both remote sense and TEDS sensors.
Before connecting a sensor, confirm the sensor specifications. Furthermore, when using a 6-wire format, set Remote Sense/TEDS to "Remote Sense enabled/TEDS disabled". When using a TEDS sensor or a 4-wire format, set it to "Remote Sense disabled/TEDS enabled".

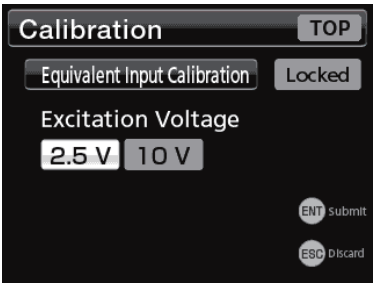
5-2. Equivalent input calibration

This method determines the calibration value by recording rated output and rated capacity values from a test results table. Use this to calibrate easily when an actual load cannot be applied.
An overview of the equivalent input calibration procedures is shown below.



- See "9-2. D/A Converter" on page 68 for information about D/A settings.

5-2-1. Bridge Voltage



Select the bridge voltage to supply to the strain gauge transducer.
Press the ENT button to change the bridge voltage.

- As a reference for setting the bridge voltage,consider that the output from the sensor will increase, and set the maximum voltage in a range that does not exceed the maximum excitation voltage on the sensor test result sheet.

ATTENTION

- If you a set a value that exceeds the sensor's maximum excitation voltage, the sensor could be damaged.

NOTE

- The default value is 2.5 V.
- In TEDS calibration, when TEDS data is read, if the bridge voltage setting is greater than the maximum excitation voltage recorded in the TEDS memory, the bridge voltage will be changed to a value less than the maximum excitation voltage.

5-2-2. Rated Output

Input range: 0.300–3.200 mV/V
Set the rated output of the strain gauge transducer being used.

5-2-3. Rated Capacity

Set the rated capacity of the strain gauge transducer being used.

NOTE

The decimal point position set here will be used as the indicator value decimal point position.

ATTENTION

When using a D/A option, set Rated Capacity to the D/A Full Scale value.

5-2-4. Zero Balancing

With no load on the sensor, press the ENT button.
During zero balancing, a pop-up appears to show that it is in progress. When zero balancing completes, the setting screen for the next procedure appears.

- If a calibration error appears, conduct countermeasures according to the error message.

5-2-5. D/A Output Mode

Options: Voltage, Current

5-2-6. D/A Max. Voltage

Range: ±1–±10 (1V increments)

NOTE

For information about D/A settings, see "9-2. D/A Converter" on page 68.

5-2-7. Select EU

Options: N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none
Select the unit that corresponds to the indicator value.

5-2-8. Cal. Value Lock

To prevent unintended changes to the calibration value, Cal. Value Lock should usually be set to ON.

5-3. Actual Load Calibration

Calibrate by applying an actual load to the sensor.

Bridge Voltage
↓
Zero Balancing
↓
Rated capacity (load calibration)
↓
D/A Output Mode
↓
D/A Max. Voltage
↓
D/A Full Scale
↓
Select EU
↓
Max. Disp. Value
↓
Cal. Value Lock setting

- See "9-2. D/A Converter" on page 68 for information about D/A settings.

5-3-1. Bridge Voltage

Options: 2.5V, 10V

Select the bridge voltage to supply to the strain gauge transducer.

Press the ENT button to change the bridge voltage.

- As a reference for setting the bridge voltage,consider that the output from the sensor will increase, and set the maximum voltage in a range that does not exceed the maximum excitation voltage on the sensor test result sheet.

ATTENTION

If you a set a value that exceeds the sensor's maximum excitation voltage, the sensor could be damaged.

NOTE

- The default value is 2.5 V.
- In TEDS calibration, when TEDS data is read, if the bridge voltage setting is greater than the maximum excitation voltage recorded in the TEDS memory, the bridge voltage will be changed to a value less than the maximum excitation voltage.

5-3-2. Zero Balancing

With no load on the sensor, press the ENT button.

During zero balancing, a pop-up appears to show that it is in progress. When zero balancing completes, the setting screen for the next procedure appears

- If a calibration error appears, conduct countermeasures according to the error message.

5-3-3. Rated capacity (load calibration)

Set the actual load value and conduct load calibration.

With an actual load applied to the sensor, press the ENT button.

After measuring the sensor output, confirm the rated capacity.

Continued on the next page ➡

- If a calibration error appears, conduct countermeasures according to the error message.

ATTENTION

The Rated Capacity is set to the D/A Full Scale value.

NOTE

- The decimal point position set here will be used as the indicator value decimal point position.
- For information about D/A settings, see "9-2. D/A Converter" on page 68.

5-3-4. D/A Output Mode

Options: Voltage, Current

5-3-5. D/A Max. Voltage

Range: ±1–±10 (1V increments)

5-3-6. D/A Full Scale

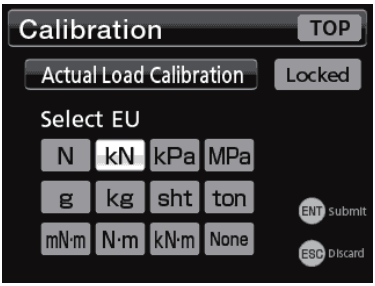
With the "9-2-1. D/A Zero" value as the reference, set the span for the indicator values output to D/A. When the "9-2-1. D/A Zero" setting value is added, the "9-2-4. D/A Max. Voltage" setting value voltage (20 mA when in electrical current mode) is output.

NOTE

For information about D/A settings, see "9-2. D/A Converter" on page 68.

5-3-7. Select EU

Select the unit that corresponds to the indicator value.



Options: N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none

5-3-8. Max. Disp. Value

Set the maximum displayed indicator value (page 38).

5-3-9. Cal. Value Lock

To prevent unintended changes to the calibration value, Cal. Value Lock should usually be set to ON.

5-4. TEDS calibration

A TEDS sensor has calibration information, including rated output and rated capacity, stored in its memory.
TEDS calibration reads this calibration information to automatically record calibration values.

- Press and hold the TEDS button to open the TEDS calibration screen without needing to select the Function Menu.

Rated Output/Rated Capacity display
↓
Zero Balancing
↓
Select EU
↓
Cal. Value Lock setting

5-4-1. Rated Output/Rated Capacity display

After reading the TEDS data, the Rated Output/Rated Capacity is shown.

Rated capacity digit shown during TEDS calibration

TEDS sensor Rated Capacity	unit	Indicator value
1	N, kN	01.000
2	N, kN	02.000
3	N, kN	03.000
4	N, kN	04.000
5	N, kN	005.00
10	N, kN	010.00
20	N, kN	020.00
30	N, kN	030.00
40	N, kN	040.00
50	N, kN	050.00
100	N, kN	0100.0
200	N, kN	0200.0
300	N, kN	0300.0
400	N, kN	0400.0
500	N, kN	0500.0

NOTE

- TEDS data is automatically read when the power supply is turned ON.
- The rated capacity decimal point position set here will be used as the indicator value decimal point position.
- D/A settings will become as follows.
  · D/A Output Mode: voltage
  · D/A Max. Voltage: 10 V
- The Max. Disp. Value is set as 110% of the Rated Capacity.

ATTENTION

The bridge voltage setting will be set to a value that is less than the Maximum Excitation Voltage stored in the TEDS memory.

5-4-2. Zero Balancing

With no load on the sensor, press the ENT button.
During zero balancing, a pop-up appears to show that it is in progress. When zero balancing completes, the setting screen for the next procedure appears.

- If a calibration error appears, conduct countermeasures according to the error message.

5-4-3. Select EU

Options: N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none
Select the unit that corresponds to the indicator value.

- If a sensor with TEDS built in is connected, the read unit will be set.

5-4-4. Cal. Value Lock

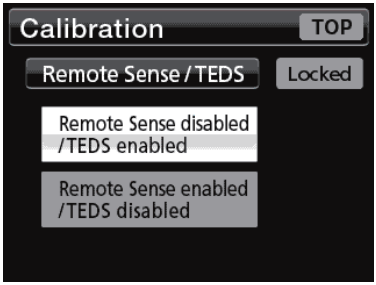
To prevent unintended changes to the calibration value, Cal. Value Lock should usually be set to ON.

ATTENTION

If Cal. Value Lock is ON, automatic calibration will not occur when the unit is turned on.

5-5. Remote Sense/TEDS

Terminals 1 and 2 in the signal input and output terminal bank are data terminals for use by both remote sense and TEDS sensors.
Before connecting the sensor, set which type will be connected in advance.



Options: Remote Sense enabled/TEDS disabled
Remote Sense disabled/TEDS enabled

ATTENTION

Incorrect connections or settings could cause damage to sensors.

5-6. Select Min. Grid

Set the minimum digital change of the indicator value.

Options: 1, 2, 5, 10

5-7. Select Disp. Times

Select the number of times that the indicator value is shown per second.

Options: 4, 6, 10, 20

5-8. Max. Disp. Value

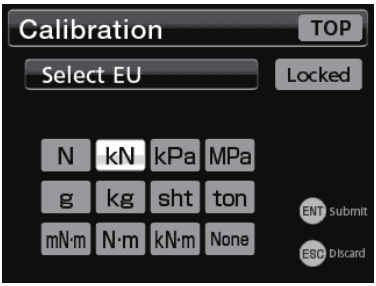
Set the maximum displayed indicator value.
The default value is set at 110% of the Rated Capacity.
If this value is exceeded, "±FULL: Plus Value Over (Over Max. Disp. Value)" appears in a pop-up message.

ATTENTION

The input value will be checked with a value converted to match the input signal. If the value converted to match the input exceeds 3.2 mmV/V, the setting value will be adjusted to be equivalent to 3.2 mmV/V. The default value will be checked in the same manner and adjusted if necessary.

5-9. Select EU

Select the indicator value unit.
Select the unit that corresponds to the indicator value.



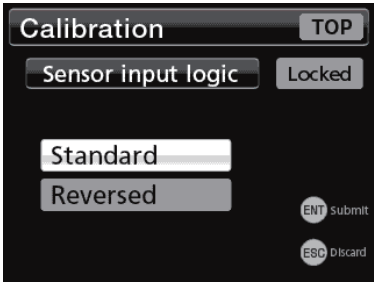
Options: N, kN, kPa, MPa, g, kg, sht, ton, mN·m, N·m, kN·m, none

NOTE

The display unit is shown next to the indicator value, but it has no effect on internal calculations.
For example, the calibration value will not change even if the display unit is changed from "N" to "kN".

5-10. Sensor input logic

The sensor input logic can be reversed artificially. Normally, "Standard" should be used.



NOTE

"Reversed" does not electrically reverse the input.

5-11. Zero Balancing

You can conduct Zero Balancing calibration even without resetting the calibration value.

1 **Set Cal. Value Lock to OFF.**

See "5-1-1. Locking and unlocking calibration values" on page 32.

2 **With no load on the sensor, press and hold the ZERO button.**

During zero balancing, a pop-up appears to show that it is in progress.

If a calibration error appears, conduct countermeasures according to the error message.

3 **Set Cal. Value Lock to ON.**

5-12. Digital Zero

The current indicator value becomes zero.
When Cal. Value Lock is set to ON, press and hold the ZERO button or set D/Z to ON for the control input terminals.

- The range for Digital Zero is the range set by Digital Zero Limit.
- Digital Zero is cleared by turning off the power supply or using Clear Digital Zero.

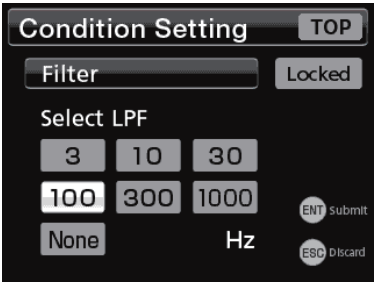
ATTENTION

- This only functions when Cal. Value Lock is ON and Enable Digital Zero is ON.
- When Cal. Value Lock is OFF, this function is replaced by Zero Balancing.

6-1. Filter

6-1-1. Select LPF

Set the low pass filter cutoff frequency (Hz).



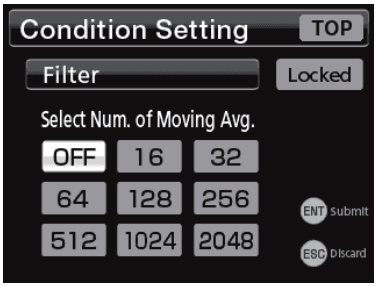
Options: 3, 10, 30, 100, 300, 1000, None

NOTE

When set to "None", the AD converter anti-aliasing function is enabled for sampling frequencies to the top of the range.

6-1-2. Select Num. of Moving Avg.

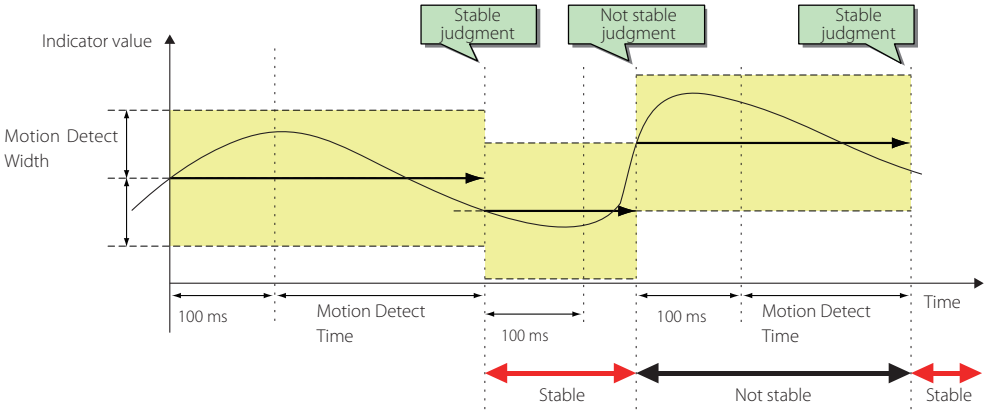
Set the moving average number for the measured data.



Options: OFF, 16, 32, 64, 128, 256, 512, 1024, 2048

6-2. Motion Detect

Set the parameters used to detect stability.
The indicator value is judged to be stable if a difference less than the set width occurs between the current indicator value and the indicator value 100 ms before, and this continues for the set time.
The Motion Detect function is closely related to the comparison mode. For details, see "7-3. Comp. Mode Setting".

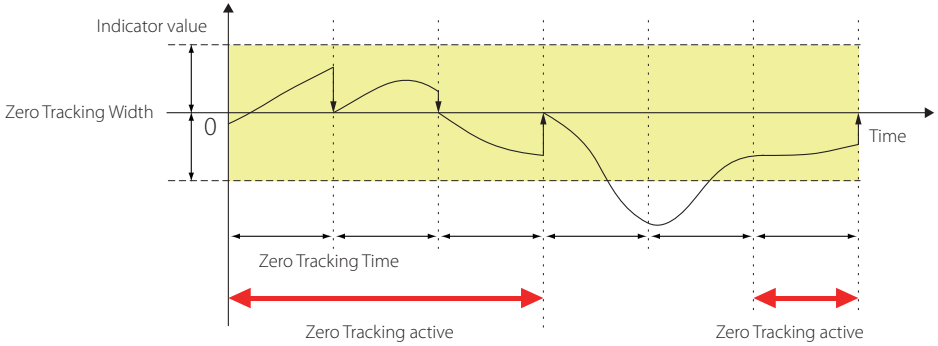


6-2-1. Time

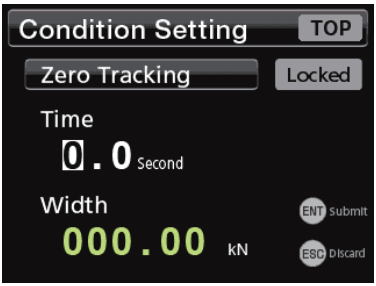
6-2-2. Width

6-3. Zero Tracking

This function automatically tracks drift and other gradual changes to the zero point.
With Zero Tracking, when the zero point moves no more than the set width, the indicator value is automatically adjusted to zero each set time interval.
This only functions when Cal. Value Lock is ON and Enable Digital Zero is ON.
Zero Tracking will not function if its Time is set to 0.0 seconds and its Width is set to 0.0.



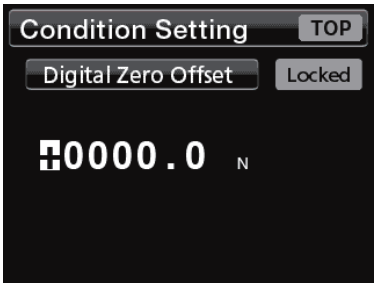
6-3-1. Time



6-3-2. Width

6-4. Digital Zero Offset

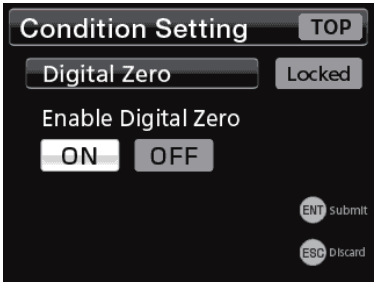
The set value is subtracted from the measured value (digital zero).



6-5. Digital Zero

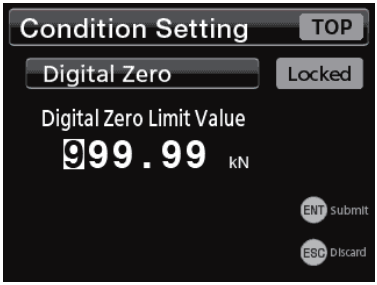
6-5-1. Enable Digital Zero

When Enable Digital Zero is set to OFF, the Digital Zero function will not be executed when you press and hold the ZERO button or set D/Z to ON for the control input terminals.



6-5-2. Digital Zero Limit Value

Set the range for Digital Zero capture. (The setting value unit is the same as for the indicator value.)



ATTENTION

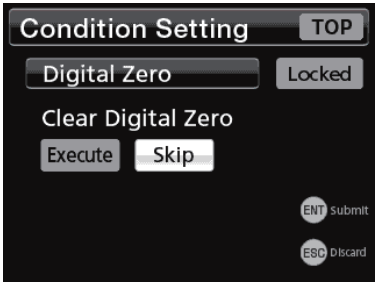
If the current sensor input value exceeds the Digital Zero Limit setting value, "Digital Zero Limit error" appears and the indicator value does not become zero.
Even when Enable Digital Zero is set to ON, if Cal. Value Lock is set to OFF, the zero function will not be executed even when the ZERO button is pressed and held or D/Z is set to ON for the control input terminal.

NOTE

If you execute the Clear Digital Zero function, the current sensor input value is shown with the Zero Balancing value as zero.

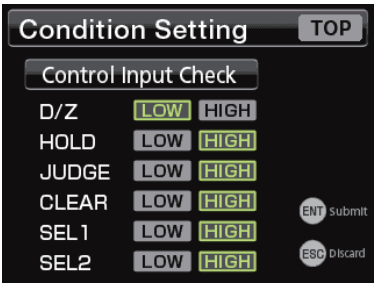
6-5-3. Clear Digital Zero

The display adjustment that has been made with Digital Zero is reverted so that the unadjusted value is shown again.
When Zero Balancing has been conducted, the value is shown as zero.



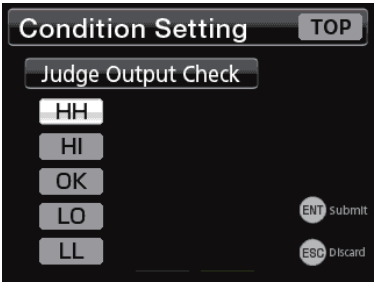
6-6. Control Input Check

Depending on the input signal, LOW (OFF) or HIGH (ON) is shown.



6-7. Judge Output Check

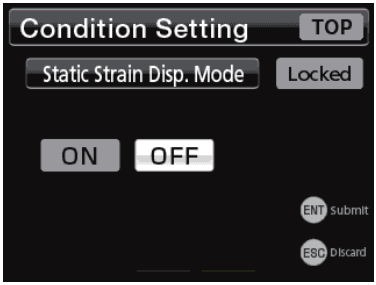
You can turn one judgment output option ON.
Use when conducting a judgment output wiring check.
Be aware that it will not operate as an indicator at this time.



Select HH, HI, OK, LO or LL to turn judgment output ON for that item.

6-8. Static Strain Disp. Mode

Set whether to show the input signal with the strain amount unit (μST).
Use when checking sensor output and unsteadiness in indicator values, including for sensors and cables, and when making adjustments for discrepancies.

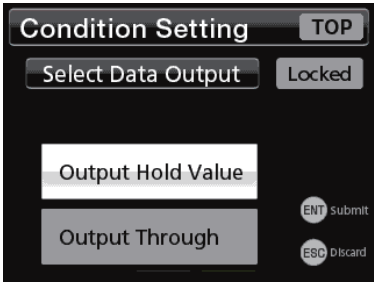


NOTE

- Press the ESC button to exit static strain mode.
- Static strain is shown using 1-gauge method with a gauge factor of 2.0.

6-9. Select Data Output

Select the data output from the D/A Converter.



Select Data Output has the following two options.
The hold value is output in coordination with the display.
The input is output as is.

7. Comparison Setting

7-1. Comp. Value Setting

Use this function to set the high limit, low limit, high high limit and low low limit values can compare them with indicator values, and turn judgment output ON for each one.

- When HH LL Limit Enable is set to Disable, the HH and LL values cannot be changed.

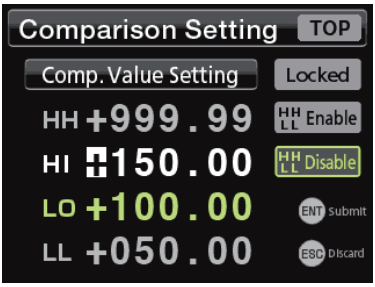
HH: high high limit value
HI: high limit value
LO: low limit value
LL: low low limit value

ATTENTION

Low low limit value < low limit value < high limit value < high high limit value
If the above condition is not met, "Error message" will appear and the setting value will not be confirmed. Input values that meet the above condition, and press the ENT button.

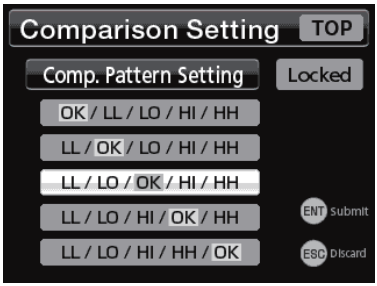
NOTE

You can enable or disable the HH and LL limits.
Use the ▲ and ▼ buttons to change the selection, and select either HH LL Enable or HH LL Disable at the right edge of the screen, and press the ENT button to confirm the setting.



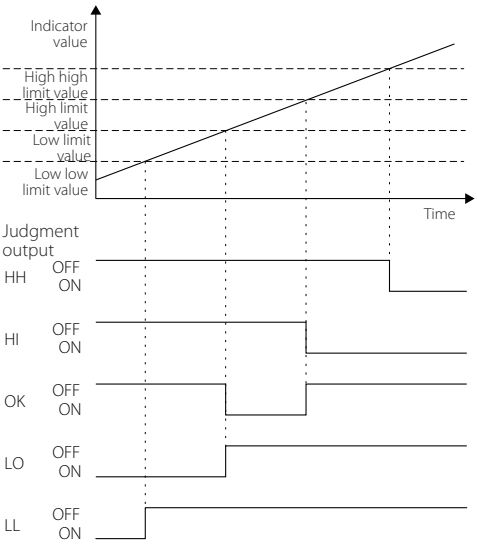
7-2. Comp. Pattern Setting

You can change the judgment output high limit and low limit assignments of HH, HI, LO and LL.

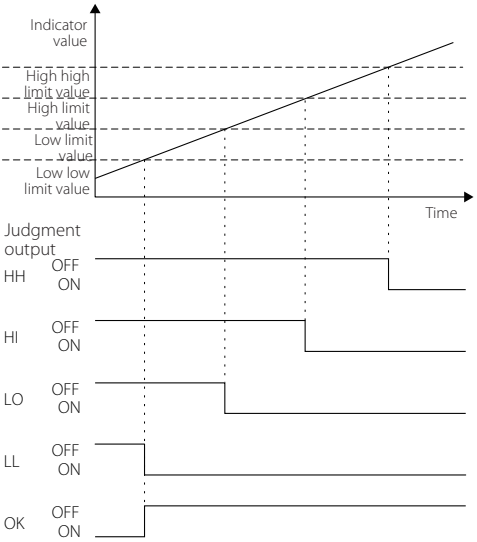


Options:
OK/LL/LO/HI/HH
LL/OK/LO/HI/HH
LL/LO/OK/HI/HH
LL/LO/HI/OK/HH
LL/LO/HI/HH/OK

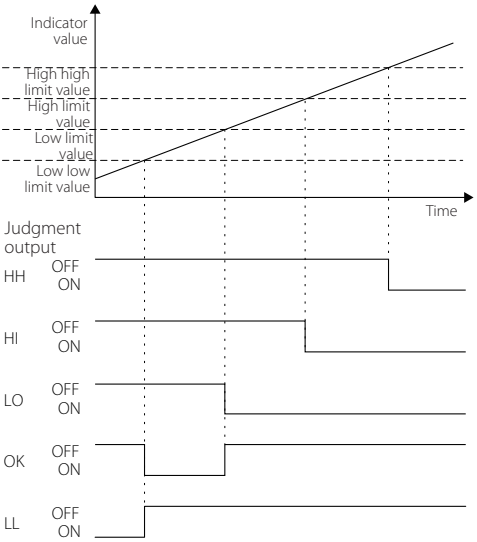
When set to LL/LO/OK/HI/HH, two are assigned to high limit and two are assigned to low limit (when Standard Comp. Output Pattern setting)



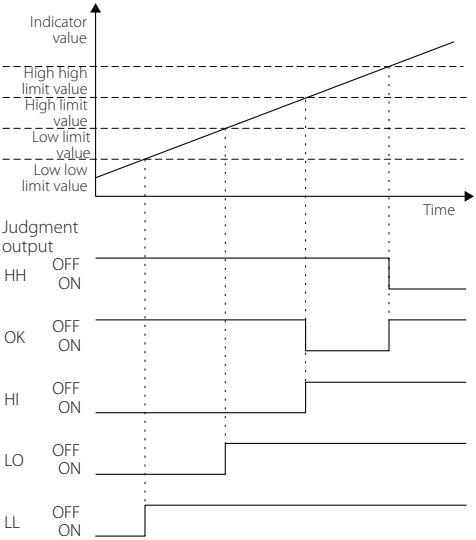
When set to OK/LL/LO/HI/HH, all are assigned to high limit (when Standard Comp. Output Pattern setting)



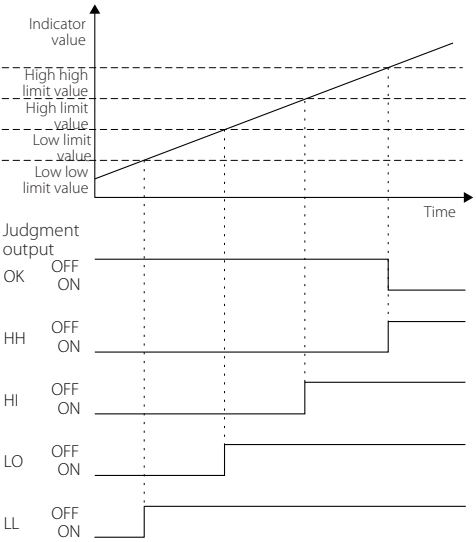
When set to LL/OK/LO/HI/HH, three are assigned to high limit and one is assigned to low limit (when Standard Comp. Output Pattern setting)



When set to LL/LO/HI/OK/HH, one is assigned to high limit and three are assigned to low limit (when Standard Comp. Output Pattern setting)

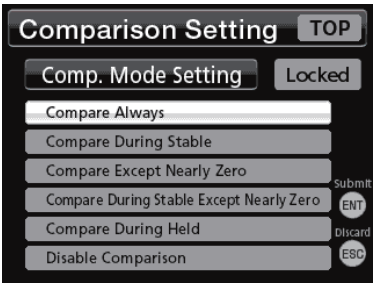


When set to LL/LO/HI/HH/OK, all are assigned to low limit (when Standard Comp. Output Pattern setting)



7-3. Comp. Mode Setting

Set the conditions for judging high limit, low limit, high high limit and low low limit.

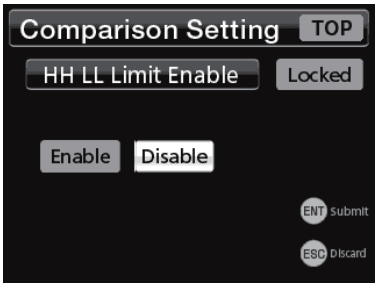


NOTE

Compare During Stable, Compare Except Nearly Zero and Compare During Stable Except Nearly Zero comparison modes are closely related to Motion Detect and Nearly Zero functions. See "6-2. Motion Detect" and "7-8. Nearly Zero" for details.

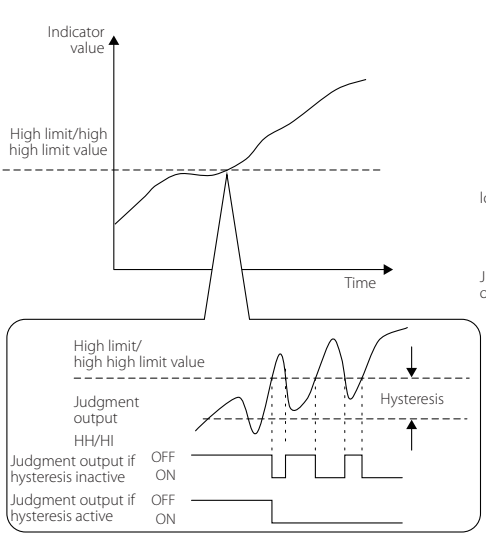
7-4. HH LL Limit Enable

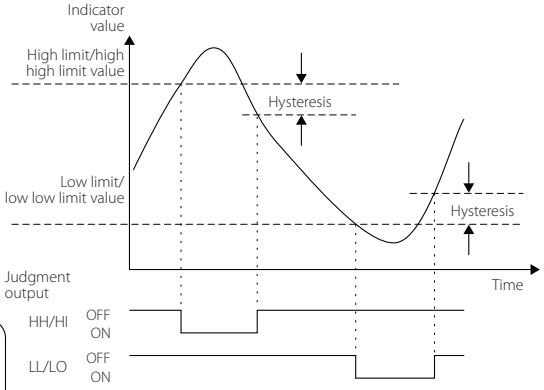
Set whether to enable or disable high high limit and low low limit judgment output.
When set to Disable, high high limit and low low limit judgments will stop being output.



7-5. Hysteresis

This function applies a width to switching from ON to OFF for high high limit, high limit, low limit and low low limit judgment output. If the indicator value fluctuates near a value, causing judgment output to chatter between ON and OFF, adjustment of the hysteresis value can prevent this chattering.
The operation of hysteresis changes as follows according to the Comp. Pattern Setting.
For limit boundary values that are greater than the OK position, it operates in the negative direction. For limit boundary values that are less than the OK position, it operates in the positive direction.
When the Comp. Pattern Setting is LL/LO/OK/HI/HH, hysteresis activates for the high high limit and high limit values when an indicator value decreases and for the low low limit and low limit values when an indicator value increases.





Judgment output conditions (when Comp. Output Pattern is set to Standard Output)

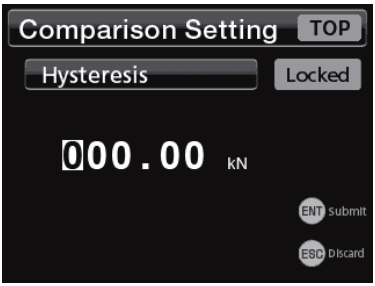
Judgment output	Status	Condition
HH	OFF → ON	High high limit value < indicator value
	ON → OFF	Indicator value ≤ (high high limit value – hysteresis setting value)
HI	OFF → ON	High limit value < indicator value
	ON → OFF	Indicator value ≤ (high limit value – hysteresis setting value)
LO	OFF → ON	Indicator value < low limit value
	ON → OFF	(Low limit value + hysteresis setting value) ≤ indicator value
LL	OFF → ON	Indicator value < low low limit value
	ON → OFF	(Low low limit value + hysteresis setting value) ≤ indicator value

ATTENTION

Set the hysteresis setting value so that it meets the following conditions.
High limit value < (high high limit value – hysteresis setting value)
Low limit value < (high limit value – hysteresis setting value)
Low low limit value < (low limit value – hysteresis setting value)

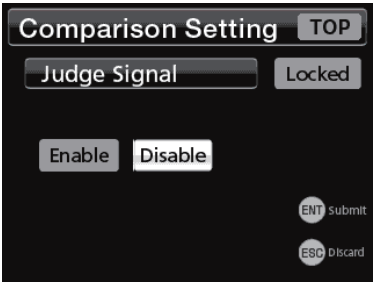
NOTE

- The same Hysteresis Width setting is used with high limit, low limit, high high limit and low low limit values.
- If set to "0", hysteresis will be disabled.



7-6. Judge Signal

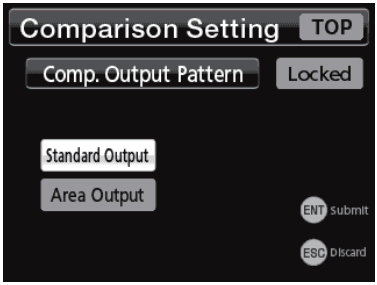
Enable/disable judgment output control signals.



Disable: judgment output always active
Enable: judgment output only when Judge Signal is ON

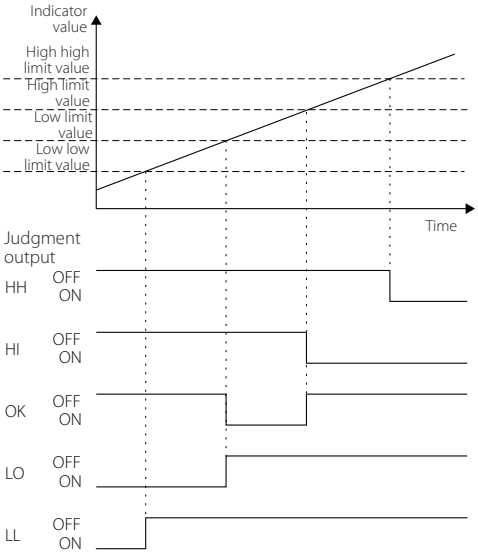
7-7. Comp. Output Pattern

The two types of judgment output operation are Standard Output and Area Output.



7-7-1. Standard Output

Judgment output operation is as follows.
(when Hysteresis is "0")
HH: high high limit value < indicator value
HI: high limit value < indicator value
LO: indicator value < low limit value
LL: indicator value < low low limit value

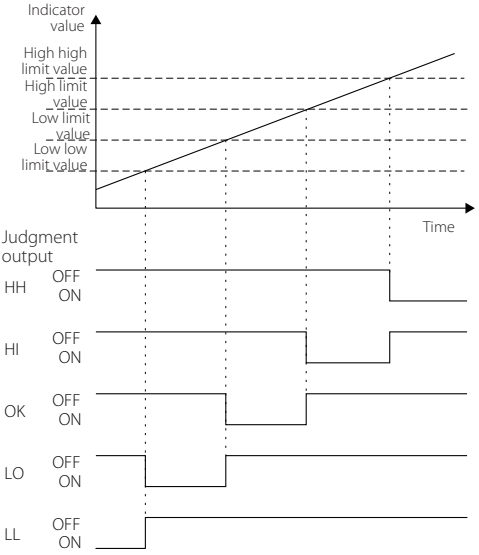


NOTE

Judgment output operation changes according to the Hysteresis setting. See "7-5. Hysteresis" on page 49.

7-7-2. Area Output

Judgment output operation is as follows.
(when Hysteresis is "0")
HH: high high limit value < indicator value
HI: high limit value < indicator value < high high limit value
LO: low low limit value < indicator value < low limit value
LL: indicator value < low low limit value



NOTE

Judgment output operation changes according to the Hysteresis setting. See "7-5. Hysteresis" on page 49.

7-8. Nearly Zero

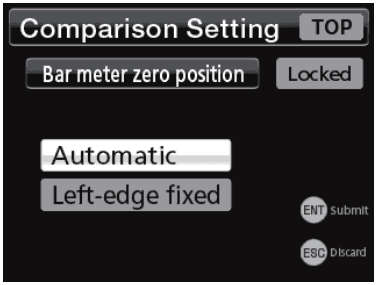
Set the range in which indicator values are evaluated as being nearly zero.

NOTE

The Nearly Zero judgment result is closely related to high limit, low limit, high high limit and low low limit judgment output. See "7-3. Comp. Mode Setting" on page 48 for details.

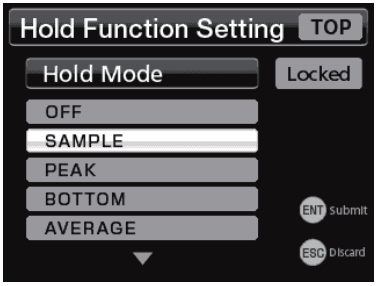
7-9. Bar meter zero position

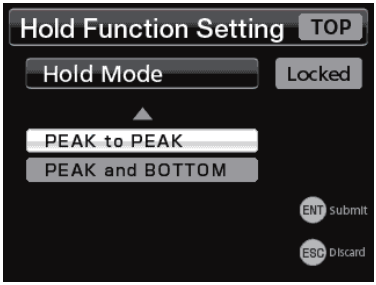
Set the zero position of the bar meter on the Home Screen.
When "Automatic" is selected, the left edge, the center or the right edge can be selected according to the comparison value set by the "Comp. Value Setting".
When "Left-edge fixed" is selected, the left edge will always be zero regardless of the "Comp. Value Setting".



8. Hold Function Setting

8-1. Hold Mode





Hold Mode has seven settings.

OFF
No hold

SAMPLE
Sample and hold

PEAK
Peak hold

BOTTOM
Bottom hold

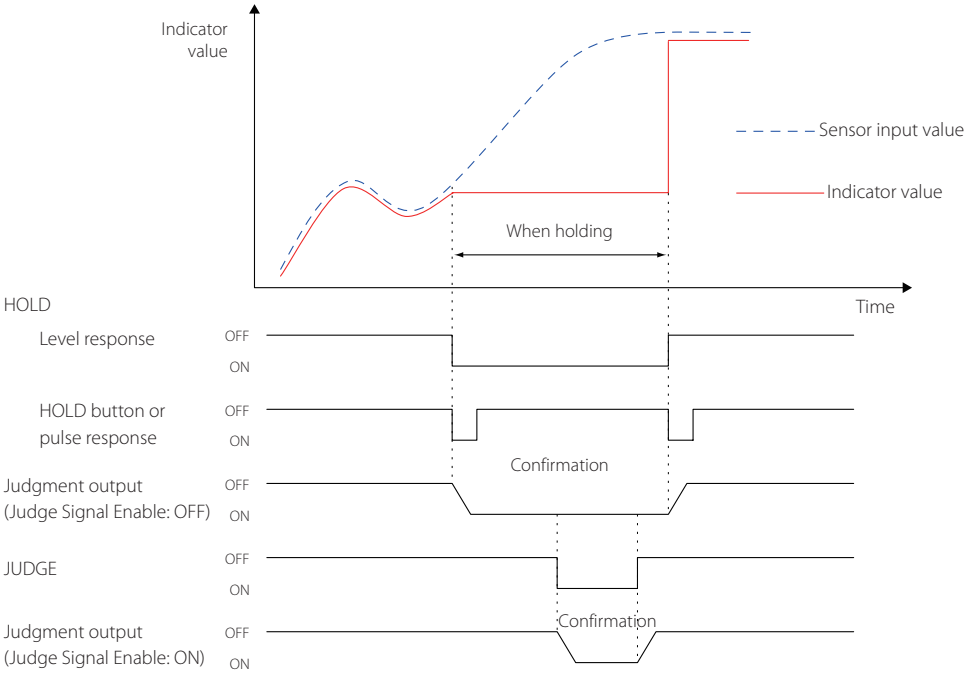
AVERAGE
Average hold

PEAK to PEAK
Peak to peak hold

PEAK and BOTTOM
Peak and bottom hold

8-1-1. Sample and hold

The HOLD button or a HOLD signal from a control input terminal can be used to hold the indicator value.
Press the HOLD button once to hold the indicator value, and press it again to stop holding the value.



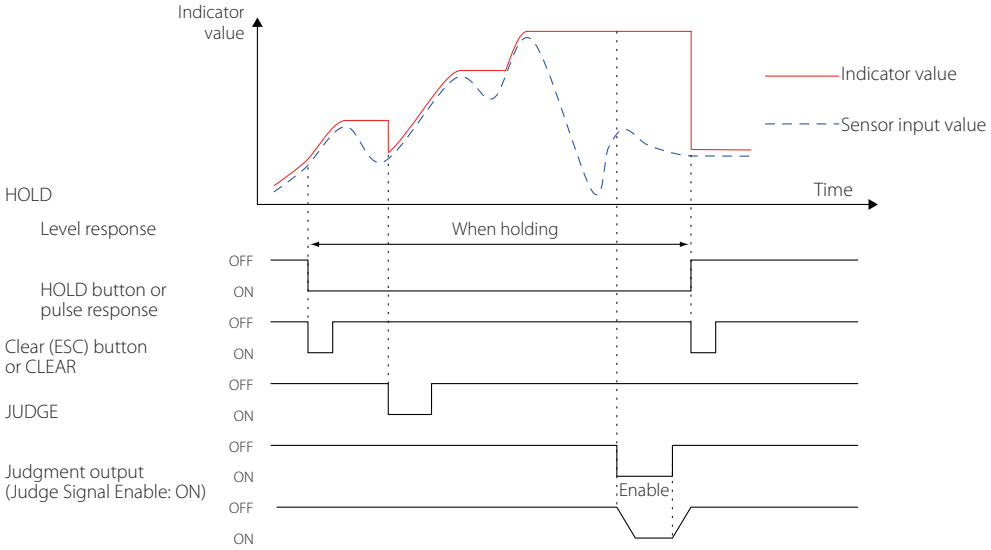
- Set the External Hold Mode to make the unit respond to level or pulse as a control input terminal HOLD signal.
- Judgment output conduct depends on the comparison mode. The above illustration shows operation when set to Compare During Held.
- Judgment output operation depends on the Judge Signal Enable setting.
  When set to Enable and the JUDGE signal is ON for the control input terminals, judgment output will occur in response to input signals.
  When set to Disable, judge is always active, and judgment output always occurs in response to an input signal.
- Zone Definition cannot be used with the sample and hold mode.
- When using the sample and hold mode, you cannot use the ESC button or a control input terminal CLEAR signal.

8-1-2. Peak hold

8-1-2-1. No zone definition

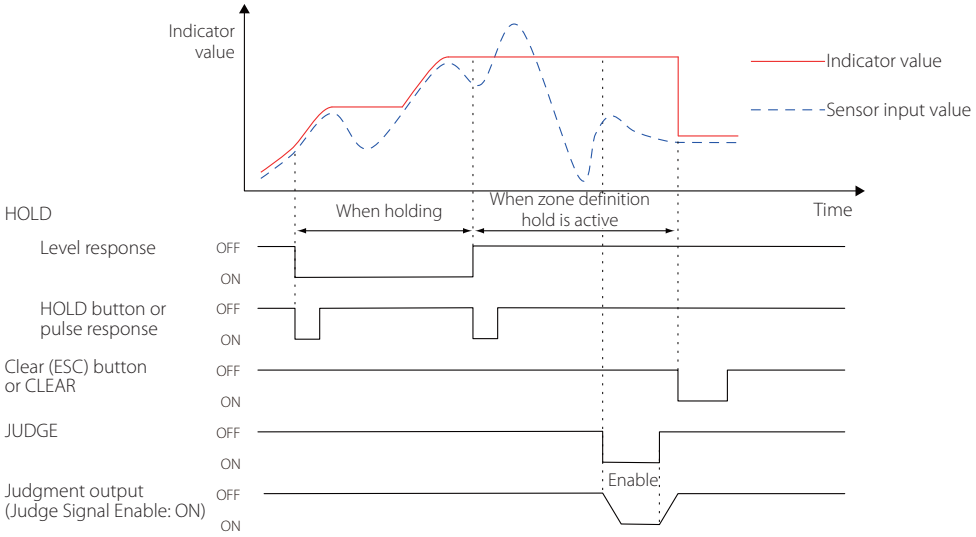
After pressing the HOLD button or while a control input terminal HOLD signal is ON, the maximum value (peak value) in the indicator value positive direction is held. When the HOLD button is pressed again or when the control input terminal HOLD signal is turned OFF, peak hold ends.

When holding, the peak value is also reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.



8-1-2-2. Zone definition used

The indicator value when the hold operation completes continues to be shown.
The display is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

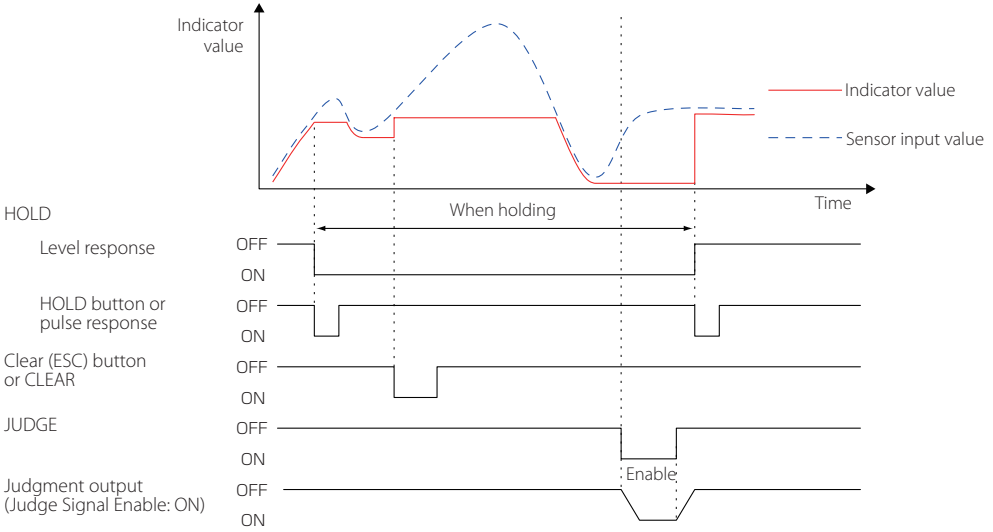


When holding, the peak value is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

8-1-3. Bottom hold

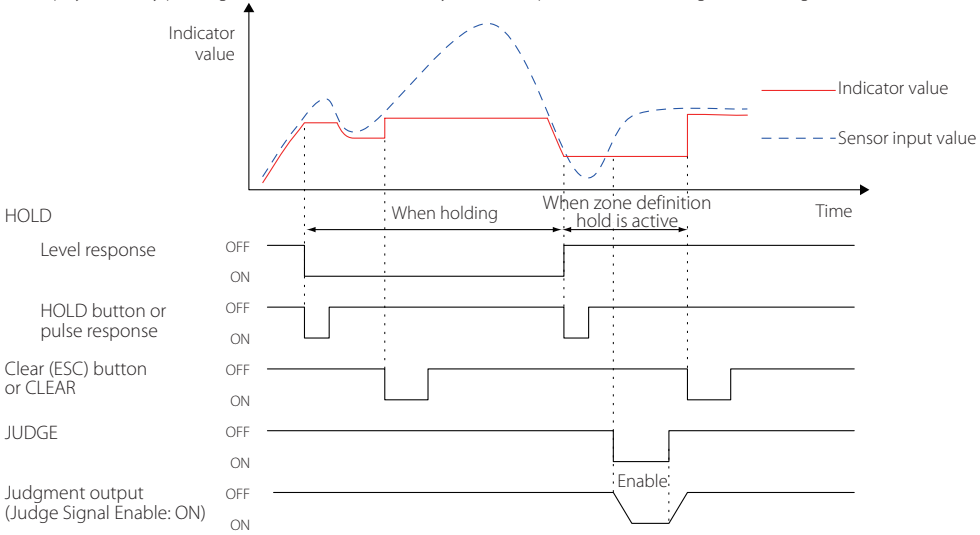
8-1-3-1. No zone definition

After pressing the HOLD button or while a control input terminal HOLD signal is ON, the lowest indicator value (bottom value) is held.
When the HOLD button is pressed again or when the control input terminal HOLD signal is turned OFF, bottom hold ends.
When holding, the bottom value is also reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.



8-1-3-2. Zone definition used

The indicator value when the hold operation completes continues to be shown.
The display is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

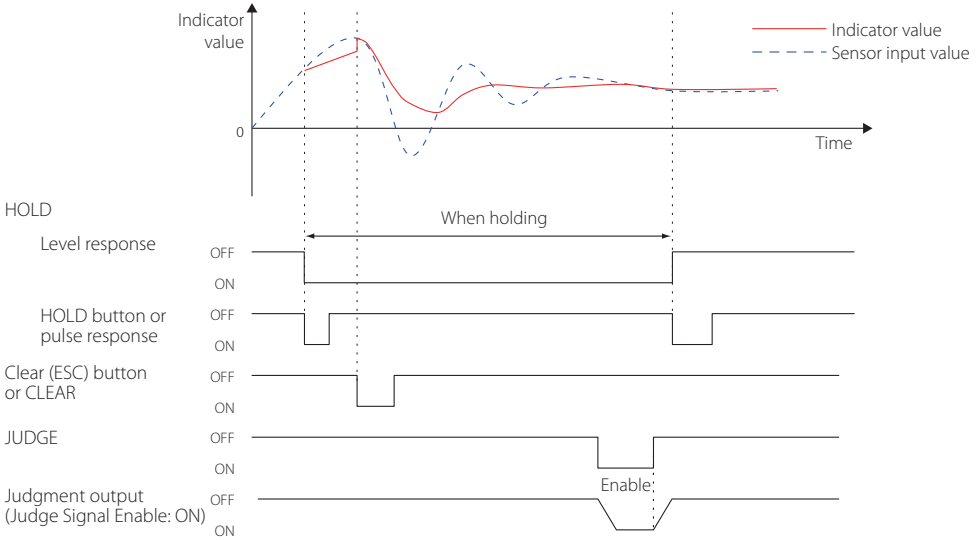


When holding, the bottom value is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

8-1-4. Average hold

8-1-4-1. No zone definition

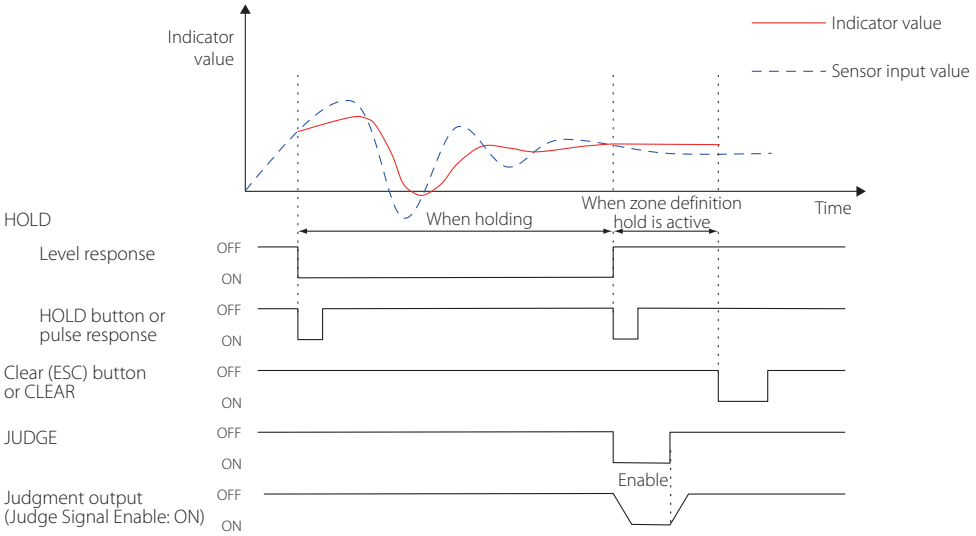
After pressing the HOLD button or while a control input terminal HOLD signal is ON, the average indicator value is held.
When the HOLD button is pressed again or when the control input terminal HOLD signal is turned OFF, average hold ends.
When holding, the average hold is also reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.



Even during the HOLD interval, if the maximum average calculation time is exceeded, average hold will end. If Zone Definition is set to ON, the average value is held at that point (page 66).

8-1-4-2. Zone definition used

The indicator value when the hold operation completes continues to be shown.
The display is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

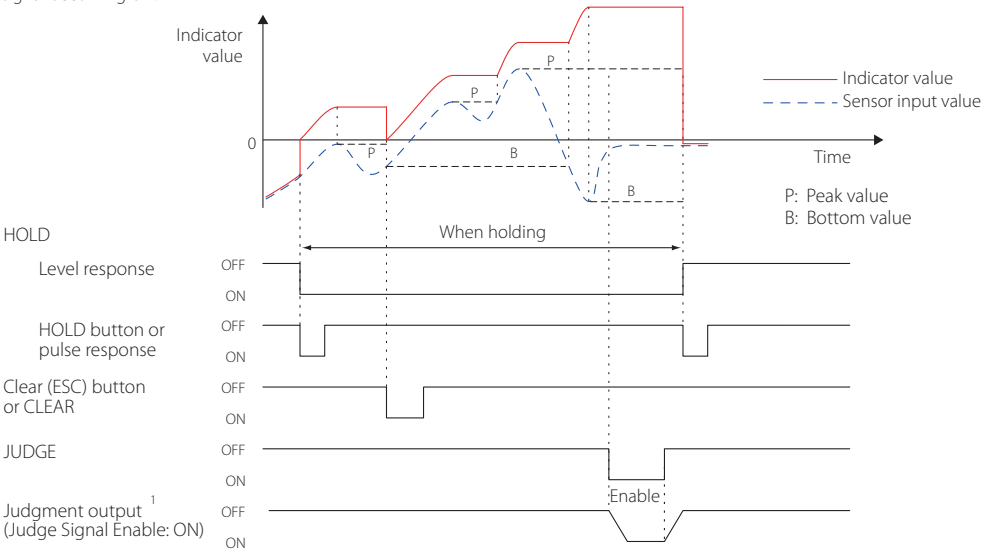


8-1-5. Peak to peak hold

8-1-5-1. No zone definition

After pressing the HOLD button or while a control input terminal HOLD signal is ON, the maximum (peak) and minimum (bottom) values are held each time sampled and the maximum difference between the peak and bottom values is displayed as the indicator value. When the HOLD button is pressed again or when the control input terminal HOLD signal is turned OFF, the peak to peak hold ends.

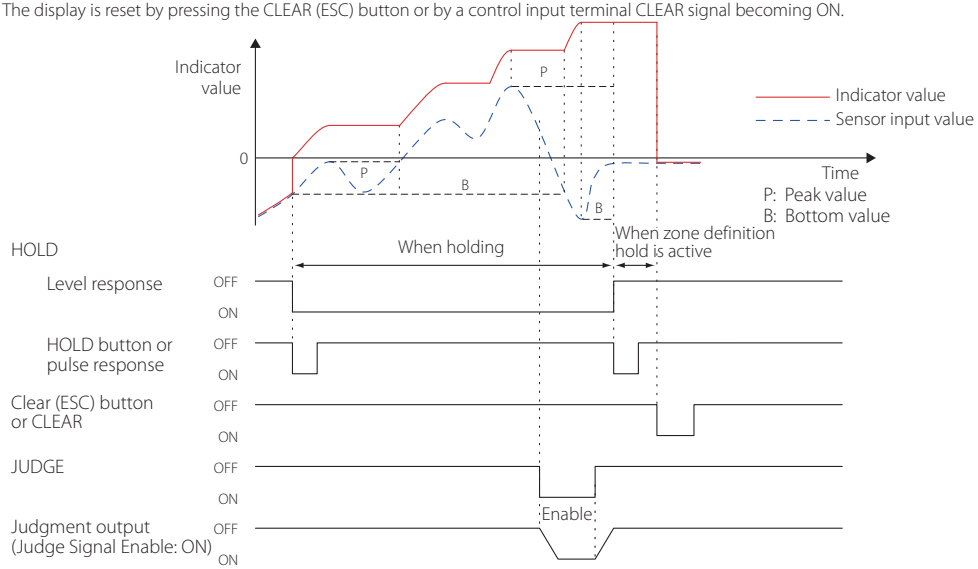
When holding, the peak to peak hold value is also reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.



[1] Judgment output is determined by the maximum difference between the peak and bottom values.

8-1-5-2. Zone definition used

The indicator value when the hold operation completes continues to be shown.
The display is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.



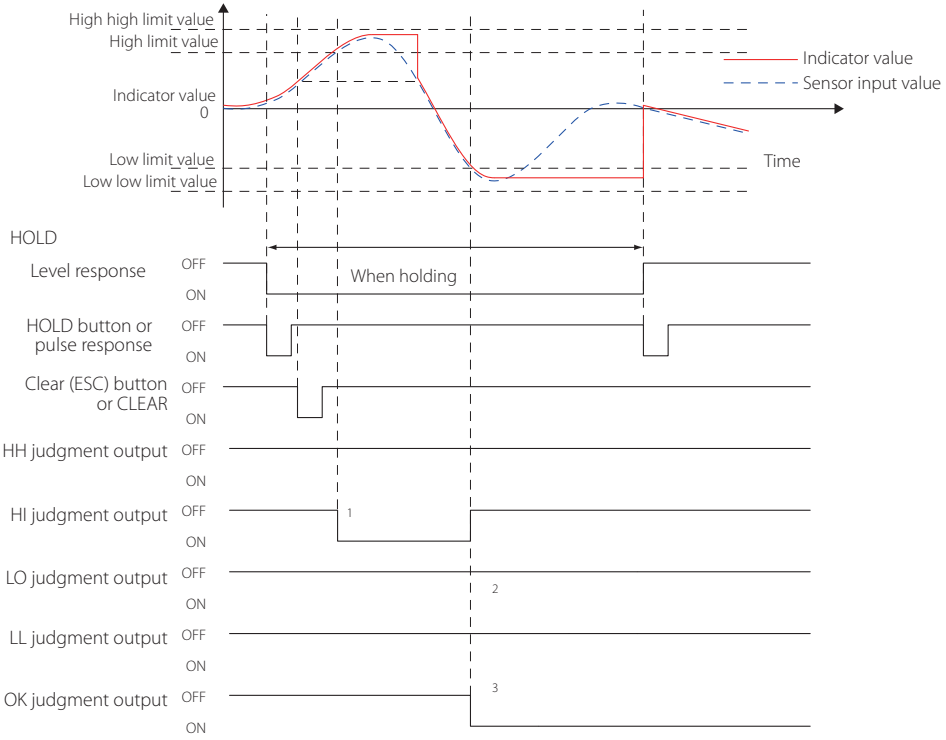
When holding, the peak to peak hold value is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

8-1-6. Peak and bottom hold

8-1-6-1. No zone definition

After pressing the HOLD button or while a control input terminal HOLD signal is ON, the maximum (peak) and minimum (bottom) values are held each time sampled and the peak or bottom value is held and displayed.
Whether the peak and bottom values are each within the comparison value range can be judged.
When the HOLD button is pressed again or when the control input terminal HOLD signal is turned OFF, the peak and bottom hold ends.
When holding, the peak and bottom values are also reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.

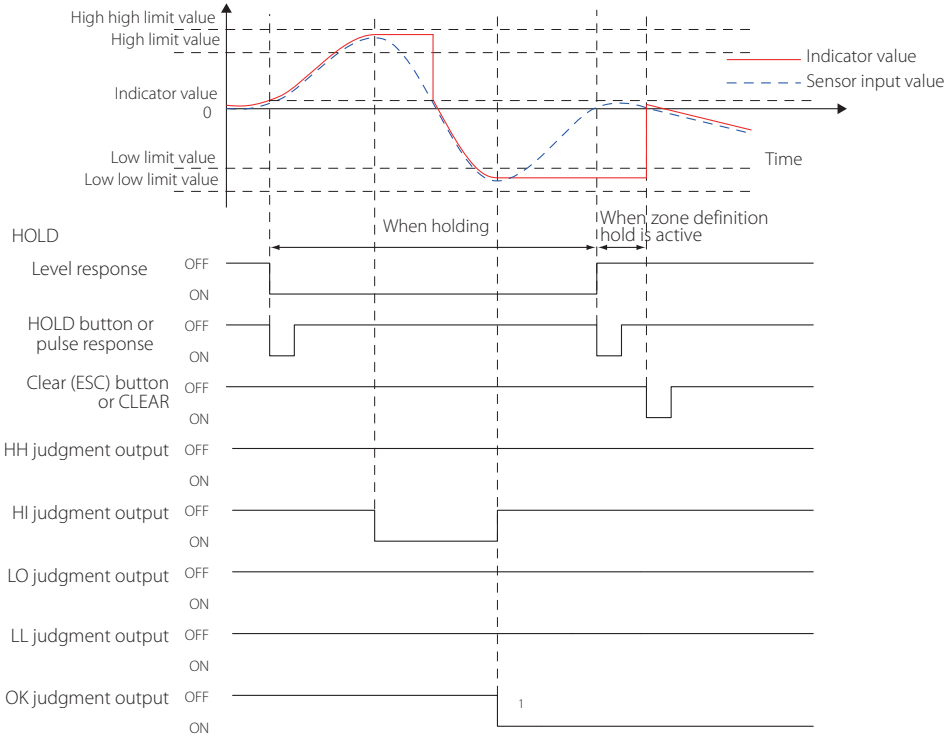
- When peak and bottom hold is active, LL/LO/OK/HI/HH will appear regardless of the Comp. Pattern Setting.



[1] If the peak value exceeds HI, the HI judgment output will become ON.
[2] If the bottom value becomes less than LO, the OK judgment output will become ON, so the LO judgment output will stay OFF.
[3] When the peak value becomes between HH and HI and the bottom value becomes between LO and LL, the OK judgment output will become ON.

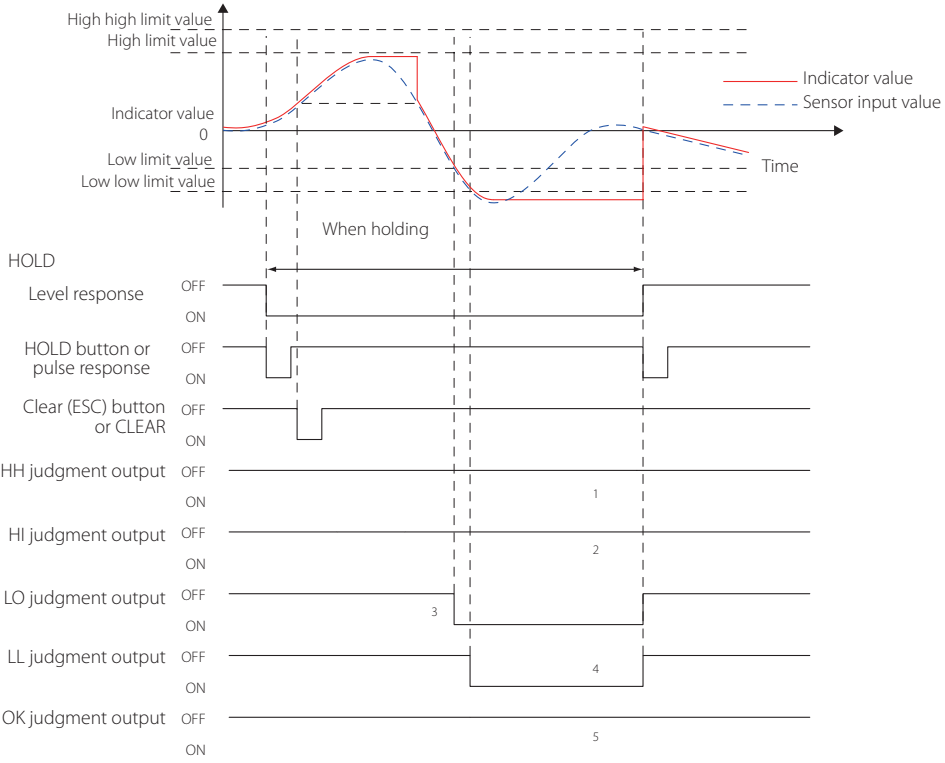
8-1-6-2. Zone definition used

The indicator value when the hold operation completes continues to be shown.
The display is reset by pressing the CLEAR (ESC) button or by a control input terminal CLEAR signal becoming ON.



[1] When the peak value becomes between HH and HI and the bottom value becomes between LO and LL, the OK judgment output will become ON.

8-1-6-3. Example when the judgment output does not become OK



[1] If the peak value does not exceed HH, HH judgment output stays OFF.

[2] If the peak value does not exceed HI, HI judgment output stays OFF.

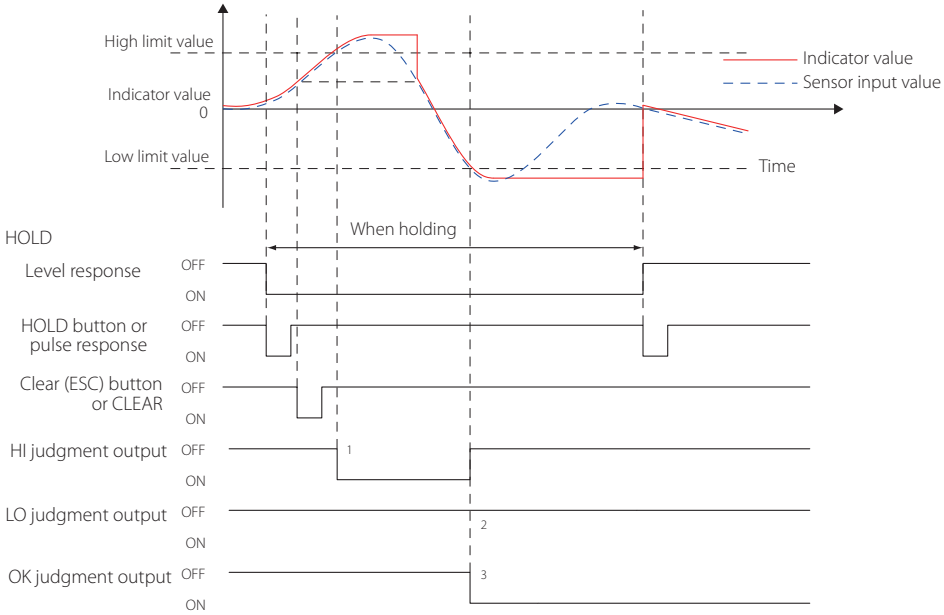
[3] If the bottom value becomes less than LO, the LO judgment output becomes ON.

[4] If the bottom value becomes less than LL, the LL judgment output becomes ON.

[5] In summary, the peak value does not exceed HI and the bottom value is less than LL, so the OK judgment output will not turn ON.

- If Zone Definition is active, judgment output will also be held, so you can search for the cause of the error.

8-1-6-4. Example when HH LL Limit is disabled



[1] If the peak value exceeds HI, the HI judgment output will become ON.

[2] If the bottom value becomes less than LO, the OK judgment output will become ON, so the LO judgment output will stay OFF.

[3] When the peak value exceeds HI and the bottom value becomes less than LO, the OK judgment output will become ON.

Since HH and LL are not enabled, it will be judged OK if the peak value exceeds HI and the bottom value becomes less than LO.

8-2. Times of Average

When using average hold, a maximum of 20000 samples can be used to calculate the average.
However, by setting Times of Average to 2 or more, you can increase the number of measurements used in each sample for the calculation.

Times of Average setting range: 1–999

Using Times of Average, first the unit averages measurements the set number of times for each sample and then averages the values of 20000 samples.

Maximum number of measurements averaged
= Times of Average × 20000 samples

NOTE

This unit can make 4000 measurements/second, so 20000 measurements take 5 seconds.

When Times of Average is set to a value of 2 or higher, the number of times that the average calculation refreshes decreases.

Times average calculation refreshes/second = 4000 measurements/second ÷ Times of Average

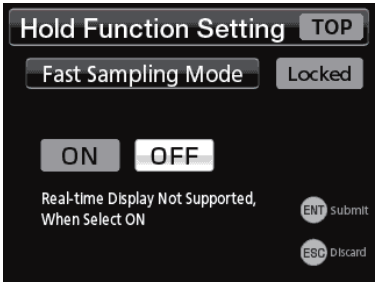
NOTE

- If Times of Average is set to 50, the refresh rate will be 80 times/second.
- If Times of Average is set to 100, the average of up to 500 seconds will be calculated.
- Using the Times of Average setting, you can set the time for which the average can be calculated, but if the maximum average calculation time is exceeded, average calculation will stop automatically. If Zone Definition is set to ON, the average value is held at that point.

8-3. Fast Sampling Mode

When set to ON, the A/D conversion speed while holding is increased 5x from 4000 times/second to 20000 times/second, allowing measurement with even less error.
The following hold modes are supported.

· PEAK hold
· BOTTOM hold
· PEAK to PEAK hold
· PEAK and BOTTOM hold



While a hold is being executed, the following screen appears and the hold value cannot be checked in real time.

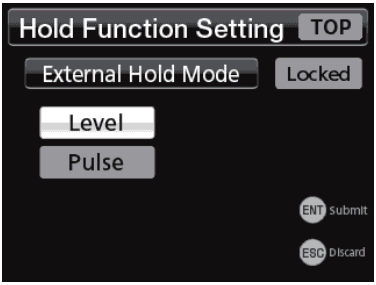
After holding stops, Zone Definition mode is activated automatically and the value will be held, so you can check the hold value.

ATTENTION

When high-speed sampling is on, measurement will start 10 ms after holding starts.

8-4. External Hold Mode

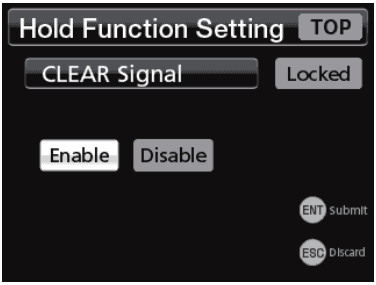
Select the control input terminal HOLD signal format.



The External Hold Mode has the following two types.
Level
Pulse

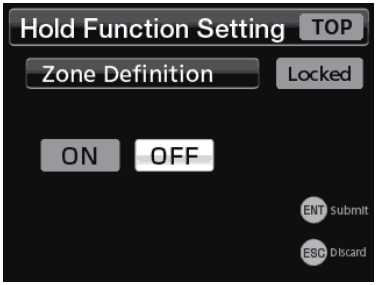
8-5. CLEAR Signal

Enable or disable control input terminal CLEAR signals and the CLEAR (ESC) button.



8-6. Zone Definition

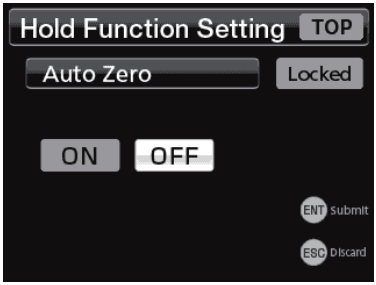
When set to ON, the indicator value will continue to be shown after the hold ends.
Pressing the CLEAR (ESC) button or a CLEAR Signal will clear the held value.



Options: ON, OFF

8-7. Auto Zero

Set whether or not to automatically execute a Digital Zero when a hold starts (ON/OFF).

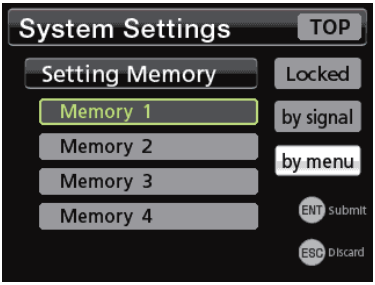


ON: automatically execute the Digital Zero function when a hold starts
OFF: do not automatically execute the Digital Zero function when a hold starts

9. System Settings

9-1. Setting Memory

You can set whether the memory is determined by an external signal or by manual input using this menu as well as select the memory used when set by menu.
You can save up to 4 memories with setting values and switch among them.



The setting currently in use is selected.
If "by menu" has been selected and confirmed, move the selection and press the ENT button to change the setting.

- There are no setting value saving or loading menu operations.
- The selected memory setting is changed directly.
- You cannot copy between setting memories.

When shipped from the factory, memory 1 to 4 are set at default values.
See the setting value list for the setting values that can be saved in memories 1 to 4.
When "by signal" is active, you can also select memories 1–4 using the SEL1 and SEL2 control input terminals. When this setting is active, you cannot select the memory from the setting menu.
To change the memory using the System Settings, select "by menu".

When "by signal" selected		SEL2	
		OFF	ON
SEL1	OFF	Memory 1	Memory 3
	ON	Memory 2	Memory 4

NOTE

The calibration value does not change.

ATTENTION

- When "by signal" is active, a signal to switch memories received 50 ms or less after another will be ignored.
- Even if "by signal" is selected, this setting will not change when a hold or zone definition hold is active.
- Turning the power OFF while writing setting values will not only cause the values to not be recorded, it might also corrupt the memory. Do not turn the unit off when a setting screen is open.

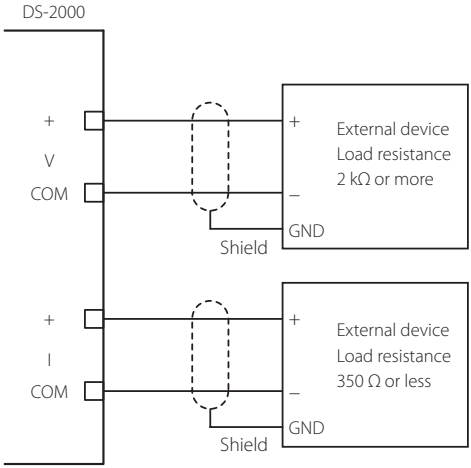
9-2. D/A Converter

The D/A Converter allows for analog output that corresponds to the unit indicator value.
The D/A output circuit is isolated from the main unit circuit.
The analog output range is either 0–±10V voltage output or 4–20mA current output. Set the maximum voltage output between ±1 V and ±10 V in 1V steps using the D/A Max. Voltage setting.
You can achieve analog output from zero (0V, 4mA) to full scale (±10V, 20mA) according to the digital values set using D/A Zero and D/A Full Scale settings.
The zero point and full scale cannot be changed separately for current output and voltage output.
The conversion speed is 4000 times/second.

The D/A conversion rate does not change even during high-speed sampling.

For voltage output, connect an external device with a load resistance of 2 kΩ or more to V-OUT and COM.
For current output, connect an external device with a load resistance, including cable wiring resistance, of 350 Ω or less to I-OUT and COM.

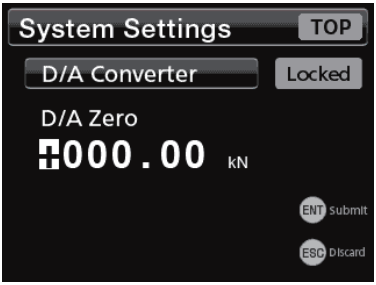
- Voltage output or current output can be used. They cannot both be output at the same time.



See "1-4. D/A output connectors" on page 9 for terminal numbers.

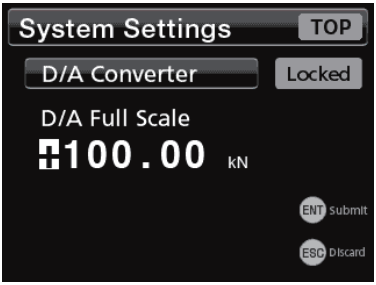
9-2-1. D/A Zero

Set the indicator value that you want to output for D/A Zero (0V voltage or 4mA current).



9-2-2. D/A Full Scale

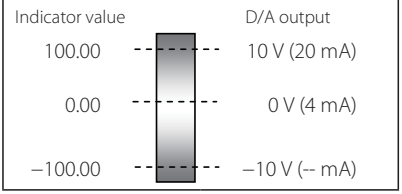
With the "9-2-1. D/A Zero" value as the reference, set the span for the indicator values output to D/A.
When the "9-2-1. D/A Zero" and "9-2-2. D/A Full Scale" setting values are added, the "9-2-4. D/A Max. Voltage" setting value voltage (20 mA when in electrical current mode) is output.



The following is an example of when "9-2-4. D/A Max. Voltage" is set to 10 V.

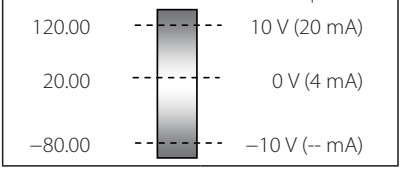
Setting example 1

D/A Zero	000.00
D/A Full Scale	100.00



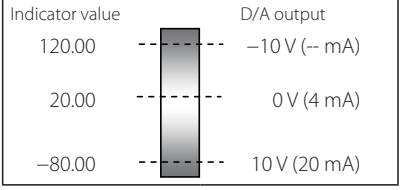
Setting example 2

D/A Zero	020.00
D/A Full Scale	100.00



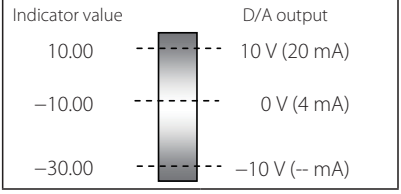
Setting example 3

D/A Zero	020.00
D/A Full Scale	-100.00



Setting example 4

D/A Zero	-010.00
D/A Full Scale	020.00

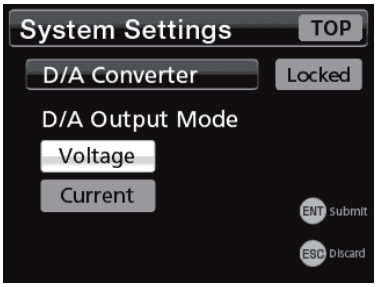


ATTENTION

If calibration is conducted, when the rated capacity is confirmed, the D/A Full Scale value will be set as its value.

9-2-3. D/A Output Mode

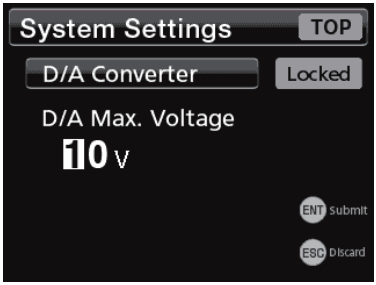
Select voltage or current



9-2-4. D/A Max. Voltage

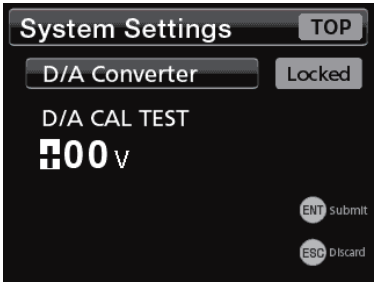
Set voltage (limiter)

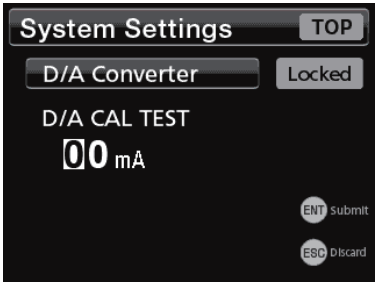
- The output has an over range of about 10% of the set value. The load also uses the same output voltage range. For example, when set to 5 V, the D/Z output voltage range will be about −5.5 V to +5.5 V, and +5 V will be output when the "9-2-1. D/A Zero" and "9-2-2. D/A Full Scale" setting values are added.



9-2-5. D/A CAL TEST

The output value for the method selected in D/A Output Mode can be changed.



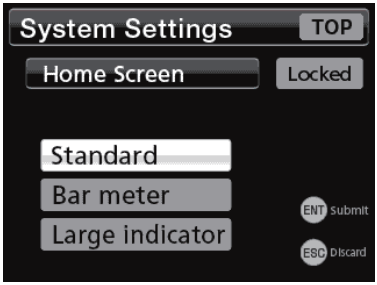


NOTE

When the D/A CAL TEST screen is open, the voltage and current values shown on the display are output from the D/A. The D/A output changes each time a setting is changed. If a value outside the D/A range (outside the range indicated in the specifications) is set, the setting value change will be ignored and the D/A output will not change. For example, when set to 5 V, if the setting is changed to 15 V, that value will be ignored and the D/A output will remain 5 V.

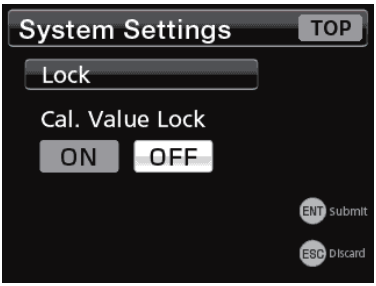
9-3. Home Screen

You can select the Home Screen that first appears when the unit is turned on and when it is reopened from a function menu.



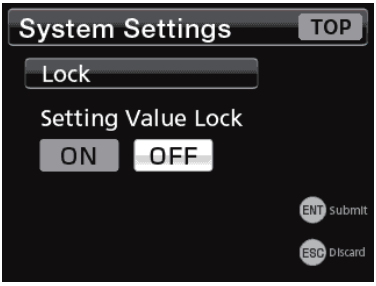
9-4. Lock

9-4-1. Cal. Value Lock



See "4-10. Setting value list" on page 27 for information about settings that cannot be changed when Cal. Value Lock is ON.

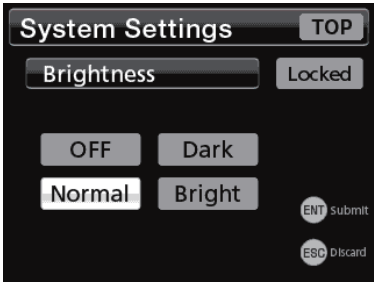
9-4-2. Setting Value Lock



See "4-10. Setting value list" on page 27 for information about settings that cannot be changed when Setting Value Lock is ON.

9-5. Brightness

Adjust the brightness of the LCD screen backlight.



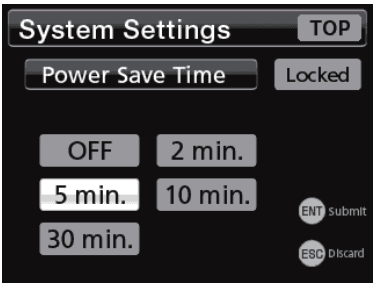
Select Bright, Normal, Dark or OFF.

NOTE

Even when set to OFF, the backlight will light at normal brightness for 5 seconds whenever you press a button.
Button operations are only enabled when the backlight is lit.

9-6. Power Save Time

Set the amount of time without any button operations until the backlight turns off.



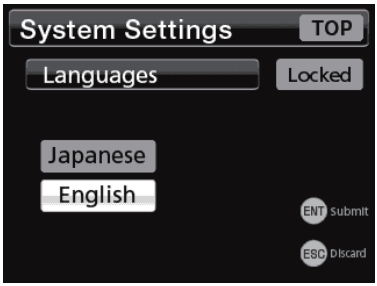
Select OFF, 2 min., 5 min.,10 min. or 30 min.

NOTE

The brightness at this time is according to the Brightness setting.
Button operations are only enabled when the backlight is lit.

9-7. Languages

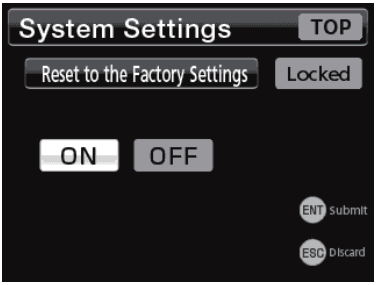
You can select the language used for display.
The options are Japanese and English.



9-8. Reset to the Factory Settings

You can restore settings to their default values (initialize them).

Select ON and press the ENT button.



After resetting to defaults completes, the Home Screen opens.

NOTE

Only the current Setting Memory is reset.
Items in "4-10-1. Calibration" on page 27 are not reset.

ATTENTION

Always turn the unit off once after executing the "Reset to the Factory Settings" command.

10. TEDS Settings

By connecting a sensor that supports IEEE1451.4 Transducer Electronic Data Sheets (TEDS) to the unit, the Rated Output stored in the sensor can be loaded and this can be applied to calibration of the indicator with this function.
In addition, the value calibrated by the unit itself can be loaded to the TEDS sensor or its original value can be restored.
This function supports functions with TEDS sensors as shown below.
Note, however that equipment with TEDS memory includes both 1kbit and 4kbit devices, but the unit only supports 4kbit.

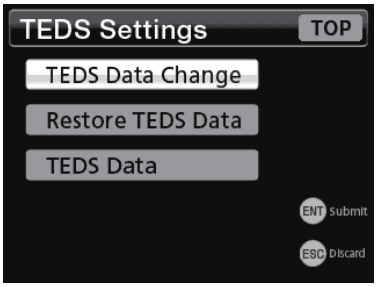
TEDS standard			
IEEE 1451.4 (V0.9)	IEEE1451.4 (V1.0)		
	Template ID		
	Bridge Sensors (33)	Strain Gauge (35)	Other
-	✓✓	✓	-

✓✓ TEDS calibration, TEDS data writing and TEDS data restoration supported
✓ TEDS calibration supported
- Not supported

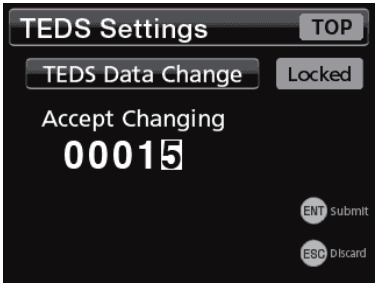
10-1. TEDS Data Change

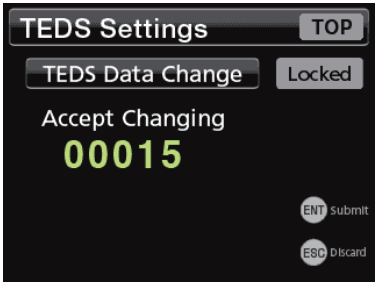
The current calibration values (rated output and rated capacity) and calibration date will be written to the TEDS memory.
The indicator unit will not be written.

1 **Press the FNC button to open the Function Menu, and select in order TEDS Settings → TEDS Data Change.**



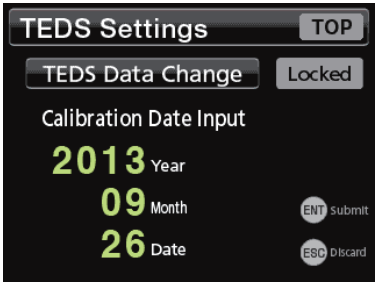
2 **Input 00015 and press the ENT button twice.**





NOTE
- This value must be input to prevent accidental data change.
- Press the ESC button to cancel and exit setting mode.

3 **Input the Calibration Date, and press the ENT button twice.**

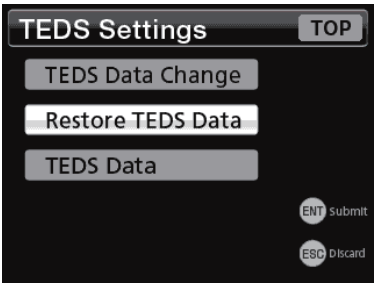


While the calibration value is being written, "Writing Cal. Data" appears.
After the calibration value has been written, TEDS Settings appears and is ready for button input.
Press the ESC button to exit setting mode.

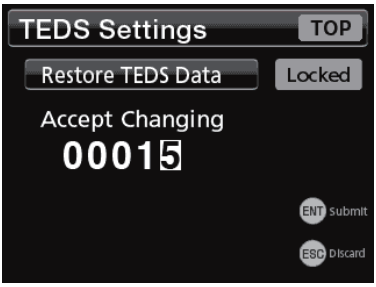
10-2. Restore TEDS Data

Use this to restore the factory default calibration value of a sensor to which data was written using the TEDS Data Change procedures above.

1 **Press the FNC button to open the Function Menu, and select in order TEDS Settings → Restore TEDS Data.**



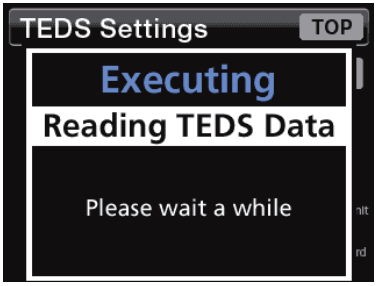
2 **Input "00015".**



NOTE

- This value must be input to prevent accidental data change.
- Press the ESC button to cancel and exit setting mode.

3 **Press the ENT button to restore the data from the TEDS memory. "Executing" appears while this occurs.**

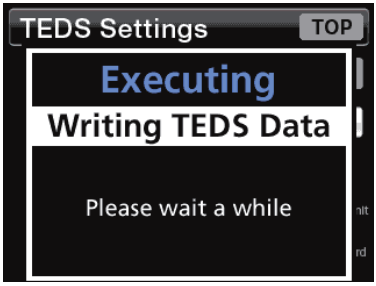


When writing the TEDS memory restoration data completes, the rated output (mV/V) and rated capacity are shown so you can check the values.

NOTE

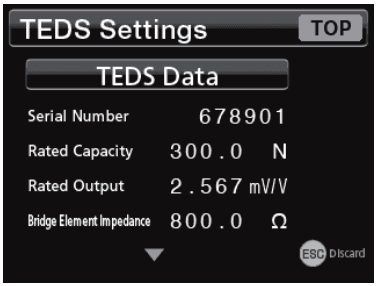
- Press the ESC button to cancel and exit setting mode.

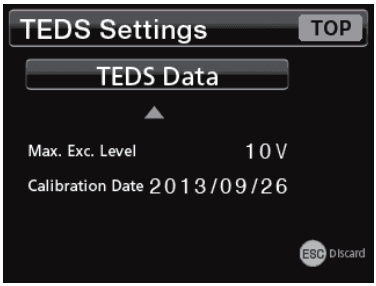
4 **Press the ENT button to write the data to the TEDS memory. "Writing TEDS Data" appears while this occurs.**



10-3. TEDS Data

Select TEDS Data to show the following items.
Serial number
Rated capacity unit
Rated capacity
Rated output
Bridge Element Impedance
Max. Exc. Level
Calibration Date





Press the ESC button to exit TEDS data display mode.

Message	Explanation
LOAD	ADC plus over
–LOAD	ADC minus over
FULL	Display plus over (greater than maximum display value)
–FULL	Display minus over (less than minimum display value)
OVER FULL	Input is exceeding maximum input range (3.2 mV/V)
–OVER FULL	Input is less than minimum input range (–3.2 mV/V)
ZERO OVER	Zero balancing range exceeds regulated values
ZERO ERROR	Zero-adjusting failed within specified time
OUTPUT CAL OVER	Sensor output exceeds calibration range
OUTPUT CAL SHORT	Sensor output does not achieve calibration range
MINUS INPUT	Sensor input is negative
TEDS READ ERROR	A valid TEDS sensor is not connected
TEDS LOADING ERROR	Even though TEDS has been disabled by the "Remote Sense/TEDS" setting, TEDS memory was accessed.
TEDS PW ERROR	Input password different from the one set
PARAMETER ERROR	Irregular setting value exists
R.O. SET OVER	Rated output exceeds the set range (greater than 3.2 mV/V)
R.O. SET SHORT	Rated output below the set range (less than 0.3 mV/V)
ZERO LIMIT OVER	Digital Zero Limit exceeded
ERROR	An error has occurred
DA OVER	DA output is outside output range
DA –OVER	DA output is outside output range
SYSTEM ERROR	A system error has occurred
INVALID OPERATION	Operation is invalid

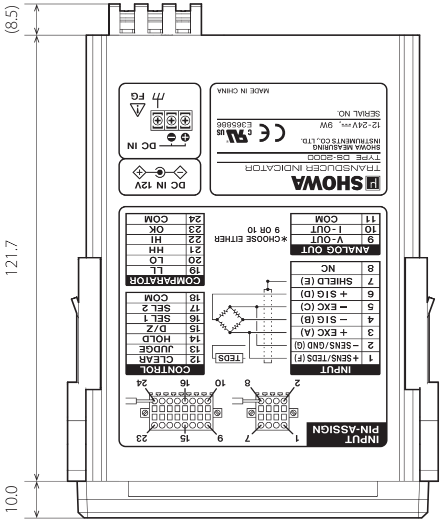
Fast Sampling Mode	Result will be shown after hold stops
Zero Balancing	Please wait a while
Executing Digital Zero	Please wait a while
Reading TEDS data	Please wait a while
Writing TEDS data	Please wait a while

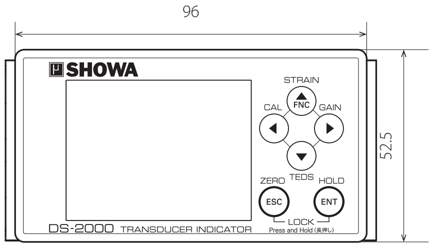
12. Specifications

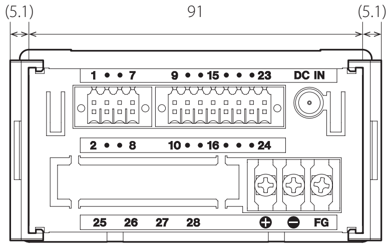
Bridge Voltage		10V DC, 2.5 V ±10% (30mA current maximum, remote sense can be used)
Signal input range		±3.2 mV/V
Equivalent input/TEDS	Calibration range	0.3 mV/V–3.2 mV/V
	Calibration precision	Within 0.1% F.S. (when using a 1m standard Φ8, 4-core shielded cable with 350Ω impedance, 10V BV and 0.5mV/V or greater setting)
Precision	Nonlinearity	Within 0.01% F.S. + 1 digit (when input is 1 mV/V or greater)
	Zero drift	Within 0.5 μV/°C (input conversion value)
	Gain drift	Within ±0.005% F.S./°C
A/D conversion rate		4000 times/second
Digital filter		Select 3 Hz (–6db/oct), 10, 30, 100, 300, 1000 Hz (–12 db/oct) or none
D/A output		Isolated output, 0±1 – ±10V voltage output in 1V steps or 4–20mA current output 4000 times/second
TEDS function		IEEE1451.4 class 2 mix mode interface
Display		320 x 240 color liquid crystal
Indicator value	Display range	–99999 – 99999
	Decimal point	Display position selectable
	Times displayed	Select 4, 6, 10 or 20 times/second
Displayed items	Calibration settings	Zero calibration/span calibration (TEDS calibration, actual load calibration, equivalent input calibration)
	Function settings	High limit, low limit, high high limit, low low limit, comparison mode, hysteresis, nearly zero, moving average, low pass filter, motion detect, zero tracking, static strain, digital zero, digital zero offset, zone definition, hold mode, key lock, minimum grid, display times, bridge voltage, digital zero limit, clear digital zero, comp. output pattern, comparison output control, select data output, D/A converter, remote sense
Hold functions		Sample hold, peak hold, bottom hold, peak to peak hold, peak and bottom hold, average hold, zone definition hold (peak, bottom, peak to peak, peak and bottom, average)
External input and output signals	Input	Hold, judge, clear, digital zero, setting memory selection 1, setting memory selection 2 (isolated from main unit circuits using a photocoupler)
	Output	HH, HI, OK, LO, LL open collector output (isolated from main unit circuits using a photocoupler)
Power supply	AC adapter power supply specifications	Ratings: DC12 V 9 W (AC adapter connector) Ratings: AC100–240 V, 50–60 Hz, 12 W (including the AC adapter that is provided with the unit)
	DC power supply specifications	Ratings: DC 12–24 V, 9 W
Operating temperature range		0°C – 40°C
Storage temperature range		–20°C – 60°C
Operating humidity range		85% RH or less (without condensation)
Applicable standards		CE marking EN61326 (class A), UL61010-1
External dimensions (W × H × D)		Approximately 96 mm × 53 mm × 132 mm (without protrusions)
Weight		About 300 g

- Specifications and appearance are subject to change without notice.
- Weight and dimensions are approximate.
- Illustrations in this owner's manual might differ slightly from production models.

DS-2000


(8.5)
121.7
10.0


96
52.5
SHOWA
STRAIN
CAL
FNC
GAIN
TEDS
ZERO
HOLD
ESC
ENT
LOCK
DS-2000 TRANSDUCER INDICATOR
Press and Hold (長押し)


(5.1)
91
(5.1)
1 • • 7
9 • • 15 • • • 23
DC IN
2 • • 8
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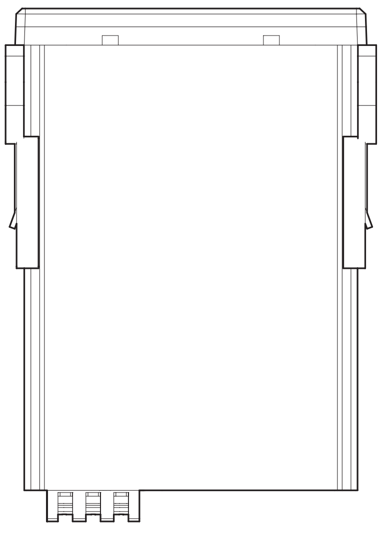
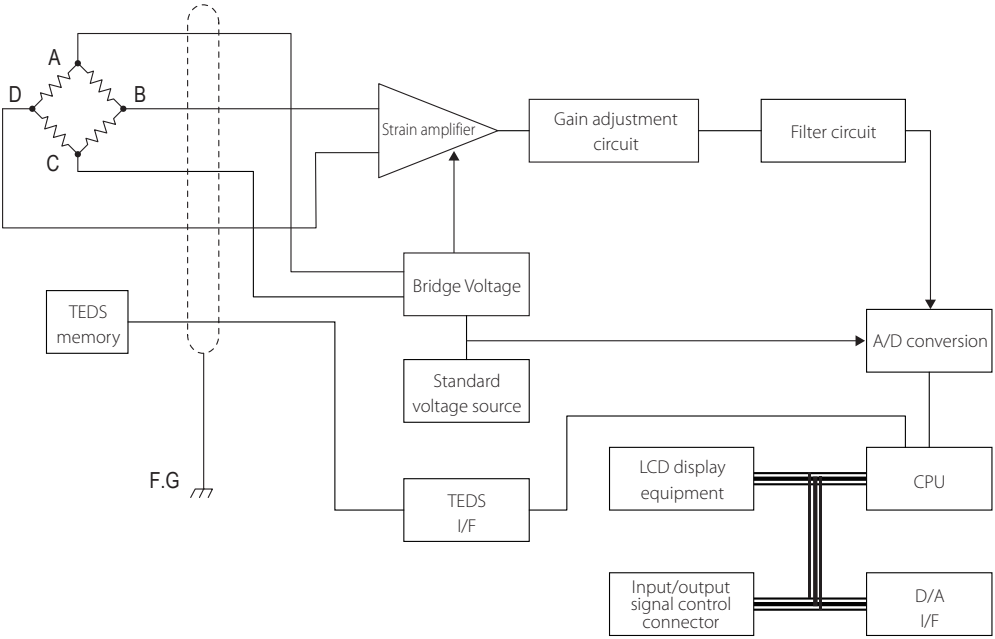


14. Block diagram



SHOWA

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