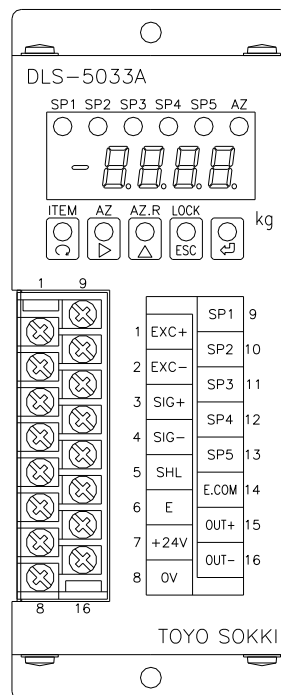




LEVEL MONITOR

MODEL DLS-5033A

Operation Manual



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§ 1. Summary

DLS-5033A is a Level Monitor equipped with Auto-Zero (AZ), preset Tare function, five comparators and various functions, which is designed specifically for a strain gauge type transducer and is most suitable for monitoring or controlling a system of using a platform scale, a crane or an elevator.

Setting values of each function can easily be changed by a button switch operation.

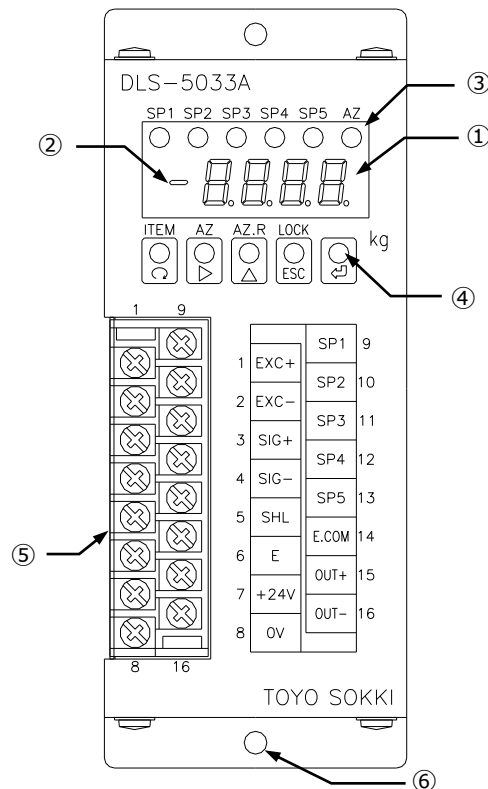
Furthermore, analog output which corresponds to the measured value or serial communication interface to connect TOYO's peripheral equipment is optionally available.

Power supplied voltage of this unit is DC24V.

The content of this operational manual applies to program version [P.2.00] and later. Program version is confirmed in Test Mode.

§ 2. Appearance and Each name

Appearance of this unit



- | | |
|--|--|
| <p>① Measured value Indicator</p> <p>② Polarity Indicator / Guide Indicator</p> <p>③ Status LED</p> <p>④ Push Buttons</p> <p>⑤ Terminal Block</p> <p>⑥ Fixing Hole</p> | <p>Indicate the measured value in Measuring Mode
Indicate a setting candidate or value in Function Mode</p> <p>Indicate minus polarity of the measured value in Measuring Mode
Indicate a setting item in Function Mode</p> <p>Indicate status of 5 comparators (SP1 to 5) and Auto Zero (AZ)</p> <p>5 push buttons enable to set various functions</p> <p>7.62mm pitch crimp terminal for Load Cell, optional output, comparator output and power line</p> <p>Fix this unit with M4 screw</p> |
|--|--|

§ 3. Operation

3 – 1) Operation Mode and role of each button

There are three operation modes as follows.






- Measuring Mode The measured value is displayed on the measured value indicator.
- Function Mode Set items and values of various functions.
 There are 3 classifications of function.
 - Comparator

c	S	E	t
---	---	---	---
 - Function

F	U	n	c
---	---	---	---
 - Calibration


c	A	L
---	---	---
- Test Mode Check operation of this unit.

This unit has 5 push buttons and role of them are as follows.

Push button	Measuring Mode	Function Mode
 (ITEM)	Push 3 times to enter Function Mode	Select item of each classification of function in order
 (AZ/NEXT)	Push for 1 second to operate Auto Zero	Select classification of function. Select a candidate or the digit of setting value.
 (AZ.R/UP)	Push for 1 second to cancel Auto Zero	Select an item of each classification of function in reverse order. Increase the value of the selected digit.
 (LOCK/ESCAPE)	Push for 2 seconds to lock / unlock push buttons	Cancel while setting. Leave Function Mode.
 (ENTER)	-	Memorize the setting



Tips on operation

When setting a candidate or value in Function Mode, the indication (7-segment LED) is blinking. Unless pushing  button, no modification of setting is made.

Comparators are operated normally even in Function Mode.

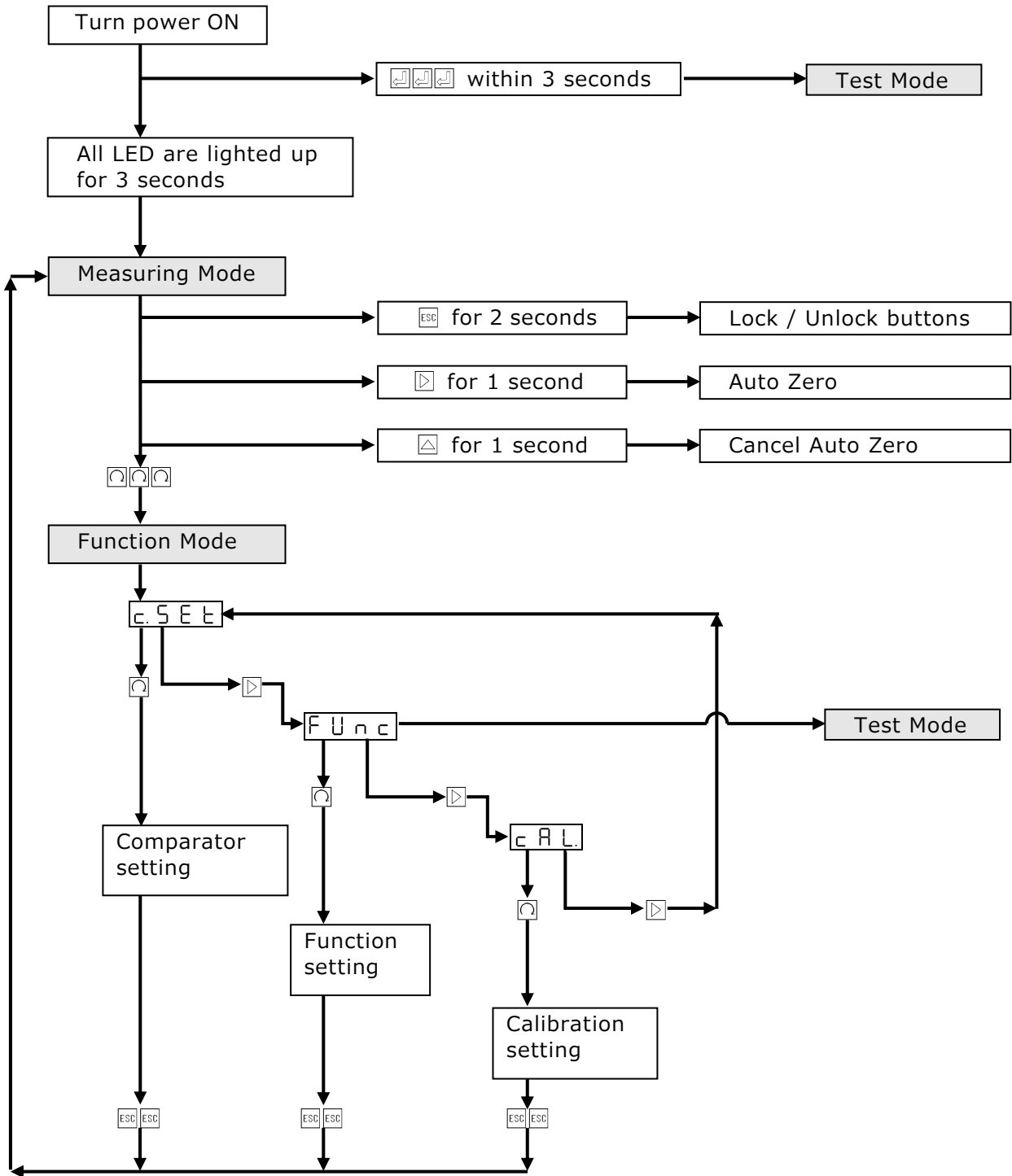
Push  button several times to leave Function Mode.

3 – 2) Basic operation

Each Mode is linked together as the following flow chart.

Each button character '◀▶▲ESC▶' in this chart means to push a corresponding button.

'▶▶▶' means to push ▶ button 3 times, 'ESC ESC' means to push ESC button 2 times.



3 – 3) Measuring Mode

The measured value is displayed on the measured value indicator.

Auto Zero and Reset Auto Zero operation.

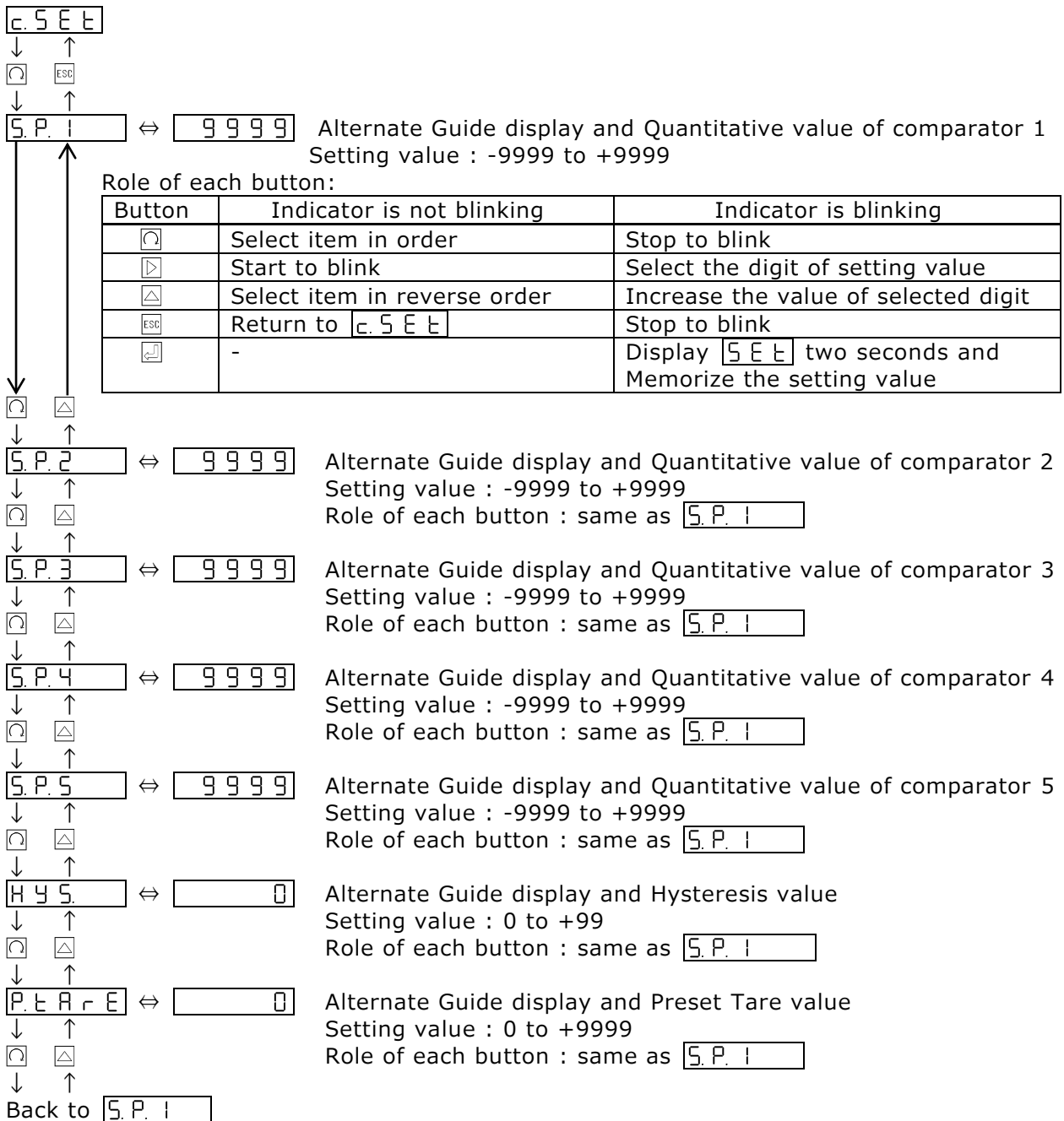
- Push [AZ] button for 1 second to perform Auto Zero.
- Push [AZ.R] button for 1 second to reset Auto Zero.

Lock / Unlock buttons operation.

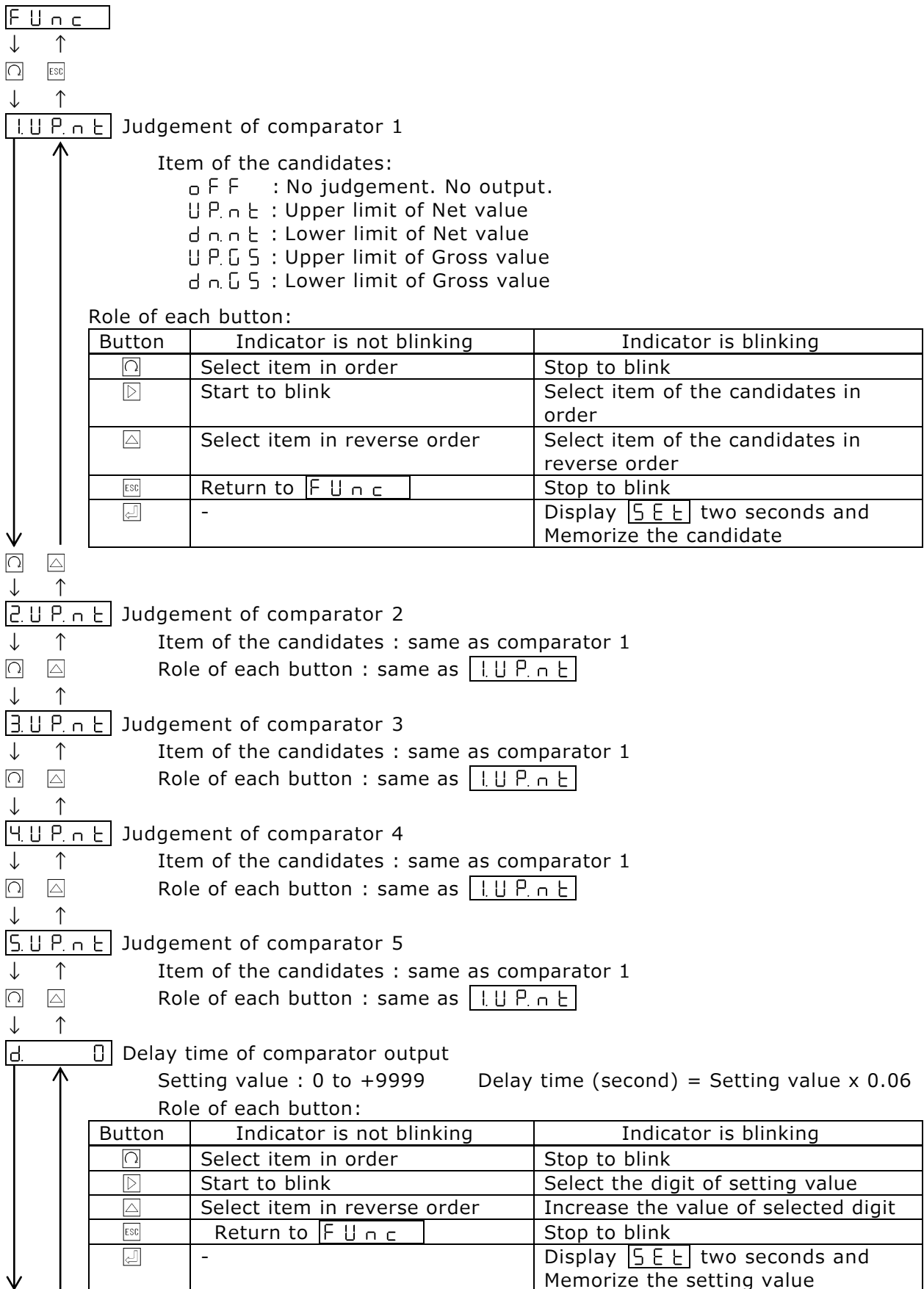
- Push [ESC] button for 2 seconds to lock / unlock buttons.
- When pressing any button other than [ESC], display and ignore the input.

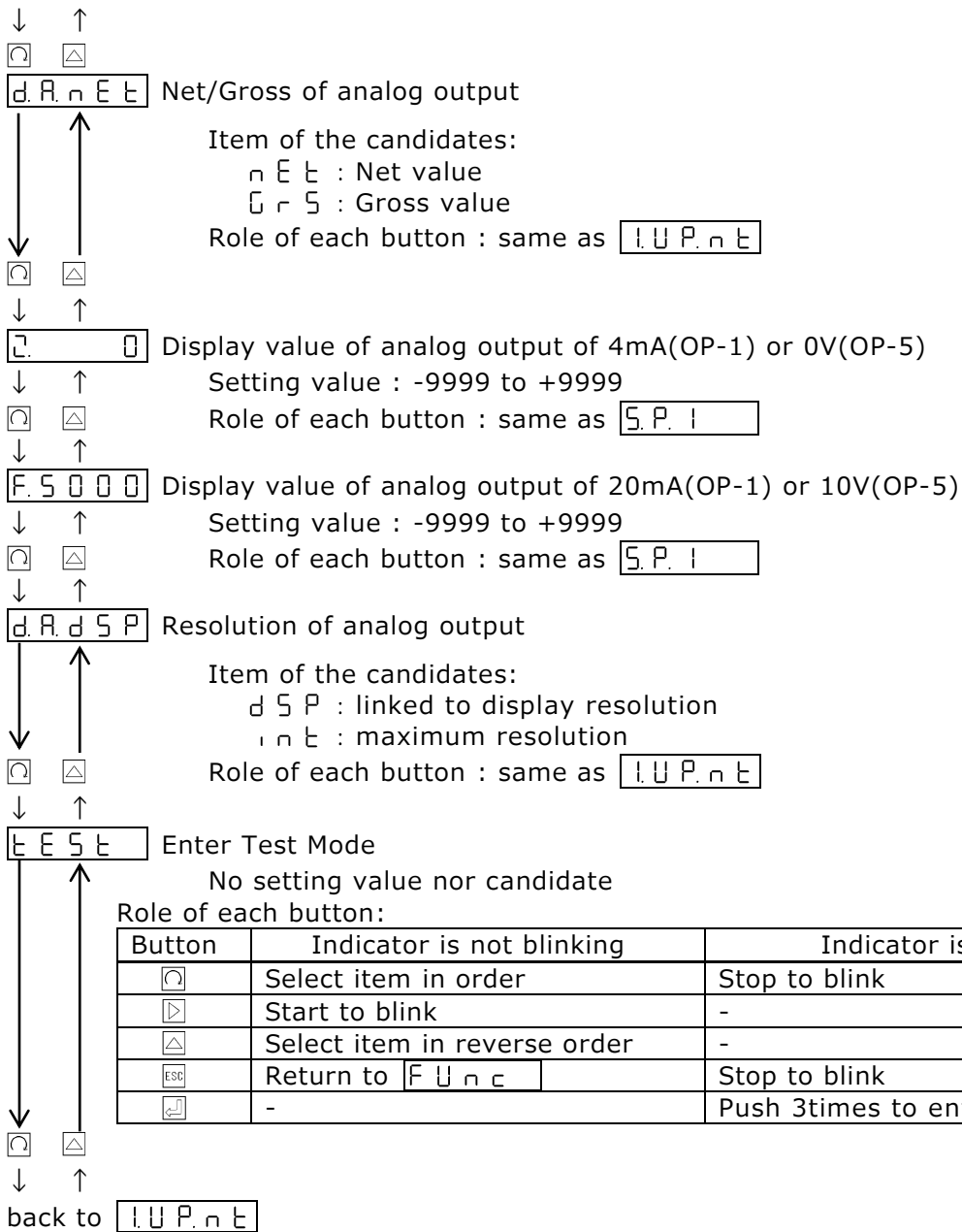
3 – 4) Function Mode

1) Comparator setting



2) Function setting

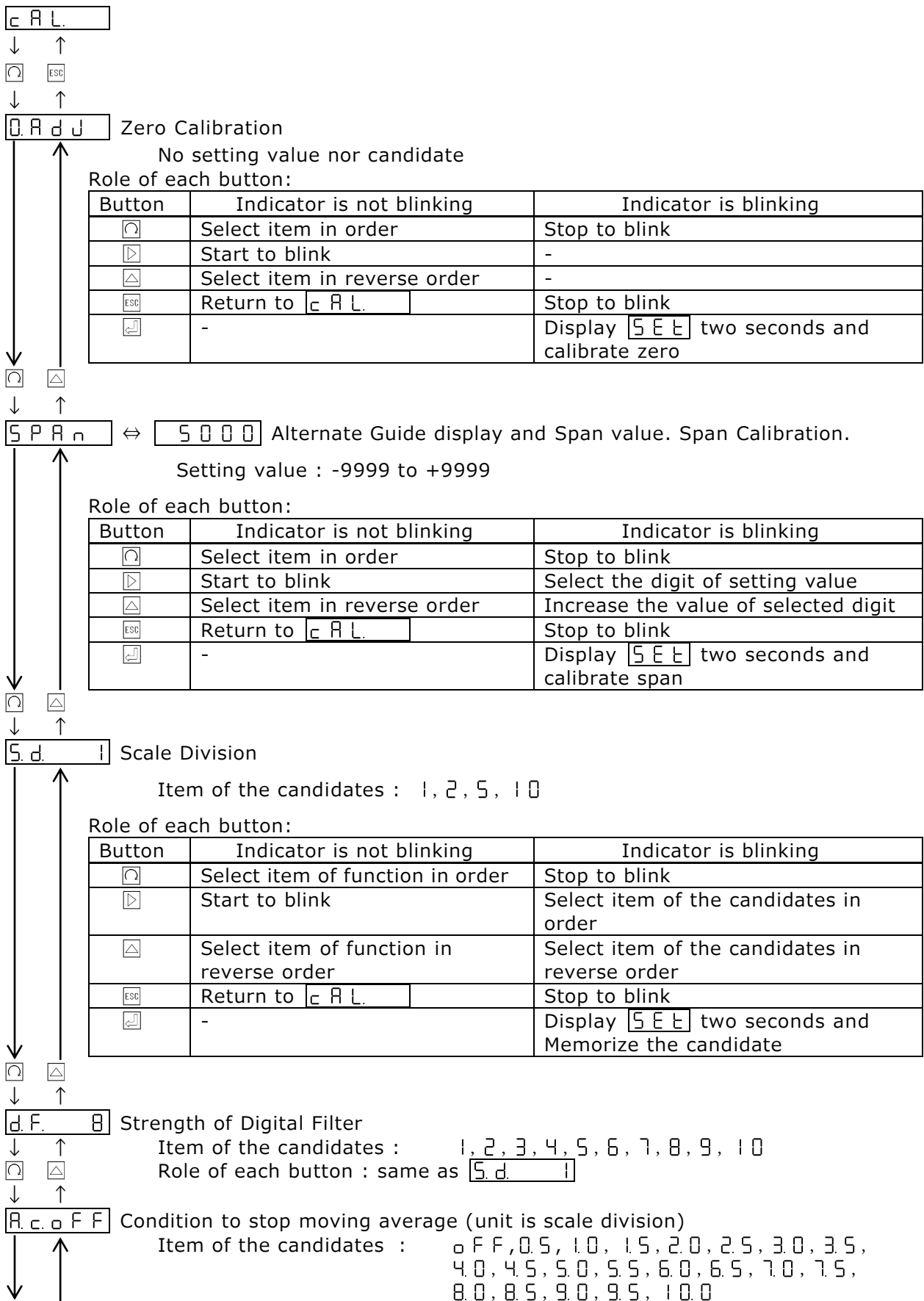


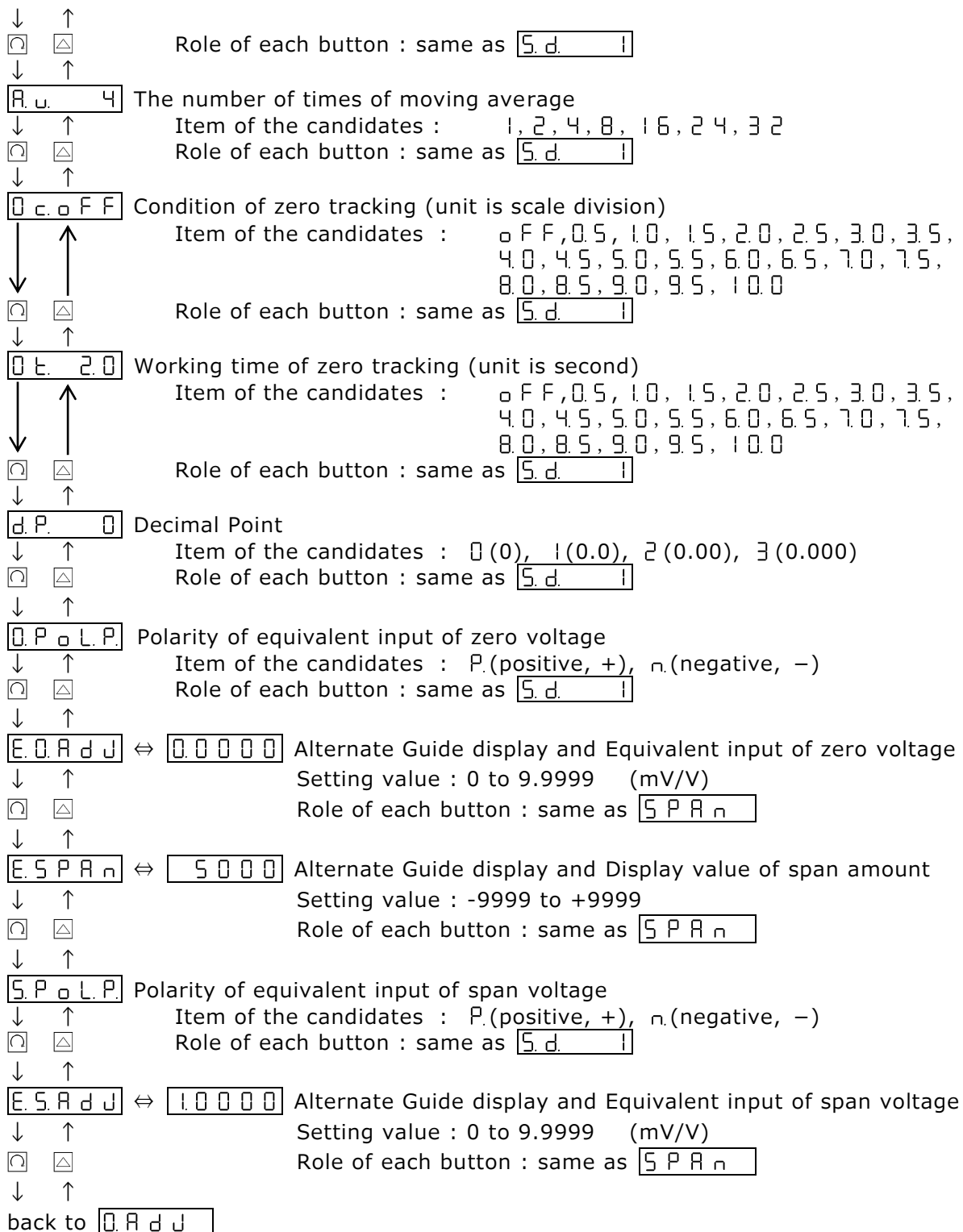


※ **□.□□□□** and **d.R.dS P** is displayed only when OP-1(4 to 20mA) or OP-5(0 to 10V) is installed

※When setting a numerical value, the left end digit serves as a guide character also as a polarity. It is impossible to set a ‘-’ polarity if the numeric value is ‘0000’. In that case, set a numeric value first.

3) Calibration setting





※When setting a numerical value, the left end digit serves as a guide character also as a polarity. It is impossible to set a ‘-’ polarity if the numeric value is ‘0000’. In that case, set a numeric value first.

3 – 5) Test Mode

5 0 3 3 8 Display model name for 3 seconds

P. 2.0 0 Display program version

Role of each button:

Button	Role
	Proceed to the next item
	Push 3 times to leave Test Mode
	-
	-
	-



d. Check indicator (7-segment LED)

Role of each button:

Button	Role
	Proceed to the next item
	Turn ON each segment in order
	Turn ON each segment in reverse order
	Turn OFF all the segment
	Turn OFF all the segment



E. 0 Check push buttons

Role of each button:

Button	Role
	Display 1 while pushed
	Display 2 while pushed
	Display 3 while pushed
	Display 4 while pushed
	Display 5 while pushed
-	Display 0 while no button pushed



5 P. Check the output of comparators

0 0 0 0 0

Role of each button:

Button	Role
	Display 1 / 0 , [SP1]LED ON/OFF, OUTPUT1 ON/OFF
	Display 2 / 0 , [SP2]LED ON/OFF, OUTPUT2 ON/OFF
	Display 3 / 0 , [SP3]LED ON/OFF, OUTPUT3 ON/OFF
	Display 4 / 0 , [SP4]LED ON/OFF, OUTPUT4 ON/OFF
	Display 5 / 0 , [SP5]LED ON/OFF, OUTPUT5 ON/OFF



4. 0 or 0. 0 Fine adjustment of analog output of 4mA or 0V

Role of each button:

Button	Role
	Proceed to the next item
	Increase analog output. Fast forward when pushing button longer.
	Decrease analog output. Fast rewind when pushing button longer.



	Cancel the setting. Return to previous value.
	Display 5 E E two seconds and memorize the setting value.

↓
 ↓
2 0 . 0 or **1 0 . 0** Fine adjustment of analog output of 20mA or 10V

Role of each button:

Button	Role
	Proceed to the next item
	Increase analog output. Fast forward when pushing button longer.
	Decrease analog output. Fast rewind when pushing button longer.
	Cancel the setting. Return to previous value.
	Display 5 E E two seconds and memorize the setting value.

↓
 ↓
d a . 4 . 0 or **d a . 0 . 0** Check analog output by 11 steps

Role of each button:

Button	Role
	Proceed to the next item
	Increase analog output 11 steps, from 4 to 20mA or from 0 to 10V
	Decrease analog output 11 steps, from 20 to 4mA or from 10 to 0V
	Cancel the setting. Return to previous value.
	Display 5 E E two seconds and memorize the setting value.

↓
 ↓
5 E
0 0 0 0 0 Check input voltage from Load Cell (mV/V). **5 E** is abbreviation of Strain.
 Turn [SP1,2,3,4,5]LED ON when the value is minus.

Role of each button:

Button	Role
	Proceed to the next item
	Set the value to zero. [AZ]LED is turned ON
	Cancel zero and restore the previous value. [AZ]LED is turned OFF
	-
	-

↓
 ↓
0 R d J Correction of zero of the measured value

Role of each button:


Button	Role
	Proceed to the next item
	Move zero toward minus (Increase the measured value). Fast forward when pushing the button longer.
	Move zero toward plus (Decrease the measured value). Fast rewind when pushing the button longer.
	Cancel the setting. Return to 0 R d J
	Display 5 E E two seconds and memorize the setting value.


↓
 ↓
 Back to **P. 2 0 0**

※ **4 . 0**, **0 . 0**, **2 0 . 0**, **1 0 . 0**, **d a . 4 . 0**, **d a . 0 . 0** is displayed only when OP-1(4 to 20mA) or OP-5(0 to 10V) is installed

§ 4. Function

4 – 1) Auto Zero

Pushing  button for 1 second in Measuring Mode, memorize the measured value at this moment and set the measured value to zero. Afterwards display the increased or decreased value from that moment as the Net value. (Subtract the memorized value from the Gross value). Unlike zero calibration, AZ can be operated within all the range of the measured value. [AZ]LED is turned ON when AZ is operated.

After pushing  button for 1 second in Measuring Mode, cancel AZ function and return to the Gross value. [AZ]LED is turned OFF.


4 – 2) Preset Tare subtraction


After setting a preset tare value, always display the measured value which is subtracted the tare value. It is useful for a container which has a known weight beforehand.

A preset tare value becomes zero after zero calibration or span calibration has been done.

4 – 3) Zero Tracking

After fulfilling a condition of being a zero drift, set the Gross value to zero automatically.

Condition of zero tracking : OFF, 0.5 to 10.0 scale division (0.5 step)

Working time of zero tracking : 0.1 second, 0.5 to 5.0 second (0.5 step)

Zero tracking can be operated in the same range of zero calibration.

※Caution of using zero tracking

When loading the materials or ingredients into a large tank or scale, if the measured value varies slowly within the range of preset condition of zero tracking, the measured value keeps to indicate zero. In that case, please set the condition of zero tracking to 'OFF'.

4 – 4) Scale division

Scale division is a notch of displaying value and selected from 1, 2, 5, 10. Preset span amount is not changed even if modifying a scale division.

Error occurs when resolution of span amount is not achieved with a preset scale division at the time of span calibration. After span calibration has been done, please confirm a scale division in Function Mode.

A quantitative value of comparator is set regardless of a scale division. But a comparator works against the measured value which has a notch of a scale division.

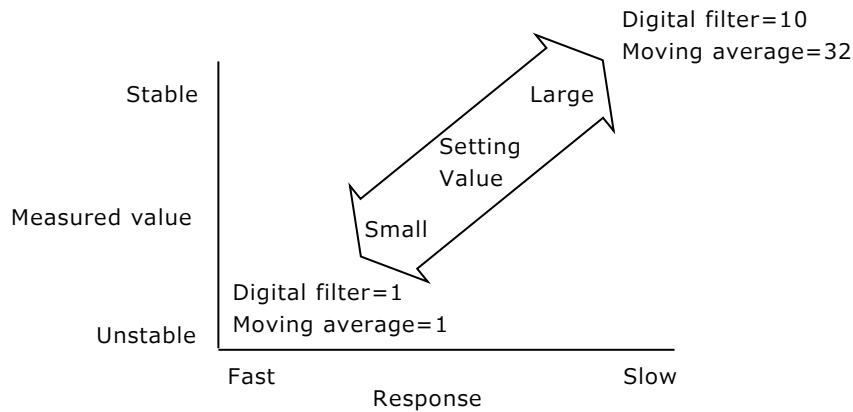
4 – 5) Digital filter and Moving average

These functions make the measured value be stable when an external vibration is applied to Load Cell or a sensor. It is more stable when the value of Digital filter or Moving average is larger.

Strength of Digital filter  : 1 to 10, 1 step

Number of times of Moving average  : 1(OFF), 2, 4, 8, 16, 24, 32

When the value of Digital filter or Moving average is larger, response of indicating the measured value is slower. Choose an appropriate value according to the nature of a signal input from Load Cell or a sensor.



If the measured value is stable but need the fast response, there is one method of using a condition of stop moving average [R.C]. If the measured value exceeds the preset value of [R.C], stop moving average and make the response fast temporarily, and back to moving average once the measured value decreases to be within the preset value of [R.C].

Condition to stop moving average [R.C]: OFF, 0.5 to 10.0 scale division(0.5 step)

When selected 'OFF', it is kept on moving average.

4 – 6) Scaling of analog output (available when analog output OP-1,5 installed)

This is a function of scaling analog output 4 to 20mA or 0 to 10V against the preset value set at [L] or [E], regardless of zero or span of the indication value. Analog output corresponds to Net value or Gross value selected at [d.R].

4 – 7) Button Lock

This function prevents wrong operation by means of disabling button input.

- ① Push [ESC] button for 2 seconds in Measuring Mode to lock the buttons
To unlock the buttons, Push [ESC] button for 2 seconds in the button locked status
- ② Indicate [L O C.] for 2 seconds when any button except [ESC] is pushed and ignore the input.

4 – 8) Calibration Lock

This function prevents modification of calibrated span value from wrong operation by means of disabling span calibration.

- ① Keep pushing [ESC] button while turning ON power or push [ESC] button 3 times immediately after power ON to enter a mode of calibration lock [C R L].
- ② Push [▶] or [▲] button to alternate to indicate a candidate as follows
C R L : Unlock calibration. Enable span calibration.
L O C. : Lock calibration. Disable span calibration.
- ③ Push [↵] button to memorize the selected candidate.

Indicate [L O C.] when trying span calibration in calibration locked status and calibrated span value is not modified.

In case this unit is assembled in a system and can't be powered OFF, once enter Test Mode and push [▶] button 3 times while displaying program version, occurred a forced reset and activated as power ON. Push [ESC] button 3 times immediately and to enter a mode of calibration lock [C R L].

4 – 9) Comparator output

Compare the measured value with the preset quantitative value of Set Point (SP) and output the judgement. Also Hysteresis value can be set.

Each [SP]LED is turned ON while respective comparator output is ON, that is, Open Collector output between each SP terminal and COM-E terminal is ON.

Output will be delayed when a delay parameter is set. After a preset delay time, comparator output of SP will be turned ON. [SP]LED will be blinked during the delay time.

- 1). Setting value Quantitative value –9999 to +9999
 Hysteresis value 0 to 99 (common to SP1 to SP5)
 Delay time 0 to 9999 (common to SP1 to SP5)
 Delayed time = setting value X 0.06 second (approximately)

2). Judgement

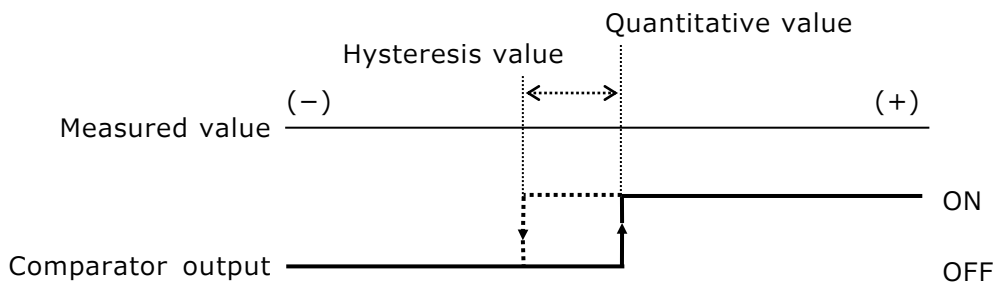
To control charging and discharging, upper limit or lower limit can be selected from the following five candidates.

- F F : No judgement
- U P. n t : Upper limit of Net value (at the time of shipment of SP1 to SP5)
- d n. n t : Lower limit of Net value
- U P. G S : Upper limit of Gross value
- d n. G S : Lower limit of Gross value

3). Timing of each judgement

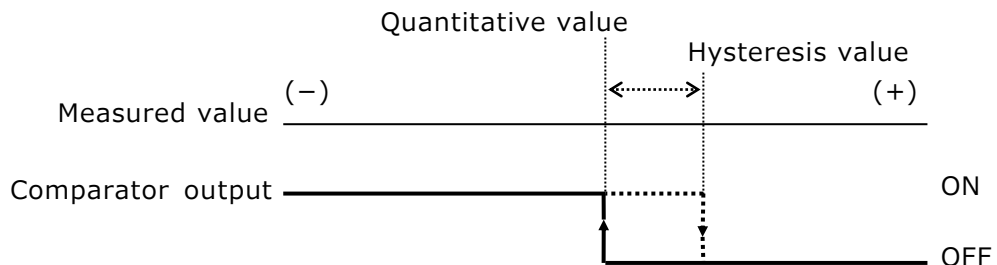
a) Upper limit to control charging

- Comparator ON : Measured value \geq Quantitative value
- Comparator OFF : Measured value $<$ Quantitative value – Hysteresis value



b) Lower limit to control discharging

- Comparator ON : Measured value \leq Quantitative value
- Comparator OFF : Measured value $>$ Quantitative value + Hysteresis value



§ 5. Option (at the factory)

5 – 1) Analog output / current output [OP-1] / voltage output [OP-5]

This analog output option can output Net value or Gross value with zero scaling and full scaling. Also can output minus value when discharging load. Zero scaling and full scaling can be operated no relation with the calibrated value.

Resolution of analog output follows resolution of displayed value when selected **d S P.** at **d.R.** in Function Mode.

Resolution of analog output is maximum resolution (1/10,000) when selected **i n t.** at **d.R.** in Function Mode.

Analog output is unipolar but can output minus of 5% of full scale also can output additional 5% beyond full scale.

Analog output is isolated from the inner circuit.

1). Adjustment and setting

① Fine adjustment of zero and full scale of analog output.

Zero (4mA or 0V) and full scale (20mA or 10V) of analog output has been adjusted at our factory. But they are re-adjusted in Test Mode. Please refer to section 8, Test Mode.

② Select Net/Gross in Function Mode

<input type="checkbox"/> d.R. n E t.	Output Net value
<input type="checkbox"/> d.R. G r S.	Output Gross value

③ Set scaling of zero and full scale in Function Mode

<input type="checkbox"/> 0.	Display value of analog output of 4mA or 0V
<input type="checkbox"/> F.	Display value of analog output of 20mA or 10V

④ Select resolution of analog output

<input type="checkbox"/> d.R. d S P.	Linked with resolution of displayed value
<input type="checkbox"/> d.R. i n t.	Maximum resolution, 1/10,000

2). Check analog output

Analog output can be checked 4mA to 20mA or 0V to 10V, 11 steps at **d a.** in Test Mode. Linearity of analog output is easily confirmed.

5 – 2) Current Loop / serial output [OP-4]

This option is a serial interface dedicated for a TOYO's peripheral equipment. If TOYO's CV-3010(serial to BCD converter) is connected to this interface, the measured value of this unit can be output as parallel BCD signal. Also an external indicator or a printer of TOYO can be connected to this interface.

This interface is isolated from an inner circuit and connected to an external equipment through 4 to 20mA current loop, thus less effected from noise and a cable can be extended up to 100m. There is no function setting of this interface. Use a two wire cable and connect from output of this unit to input of external equipment. Two wires can be connected whichever as there is no polarity of them.

There is no use of a shielded cable in short distance, but wire apart from a power line or a drive motor line with noise.

§ 6. Calibration

As for calibration method, there are two kinds of calibration as [Equivalent Input Calibration] which input the equivalent output voltage of the Load Cell by a button switch and as [Actual Load Calibration] which use a reference weight as an actual load. Calibration can be done by either method but it will be operated by last performed calibration value. We recommend to calibrate by actual load as much as possible.


If you purchase this unit and TOYO'S Load Cell as a combination, calibration has might been done.

Preset tare subtraction value and Auto Zero value become 0 (cleared) after calibration.






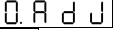

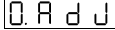



6 – 1) Necessary setting before calibration

Unlock buttons and unlock calibration if they are locked. Refer to 4-7) and 4-8)









6 – 2) Actual Load Calibration



The followings show the methods from Measuring Mode. If pushing  button several times, return to Measuring Mode without modifying anything.

1). Unload an object and calibrate zero

- ① Push  button 3 times and  is displayed.
- ② Push  button twice and  is displayed.
- ③ Push  button once and  is displayed.
- ④ Push  button and  is blinking.
- ⑤ Push  button and calibrate zero point. Display  for 2 seconds after calibrated successfully and proceed to span calibration.
If it is out of the range of zero calibration,  is displayed.

2). Put an object which has known weight, such as a reference weight, on Load Cell and calibrate a span amount






- ①  and  is displayed alternatively.  is a span value which calibrated at the last time.
- ② Push  button and select the digit. Push  button and select the number to set the known weight of object.
- ③ Push  button and calibrate a span amount. Display  for 2 seconds after calibrated successfully and proceed to setting scale division.
If it is out of range of span calibration,  is displayed.

If wanting to cancel the calibration process, push  button while the setting value is blinking. Thus, stop blinking. Push  button again and return to Measuring Mode without changing the calibration value.

3). Unload an object from Load Cell

4). Set a scale division

Scale division (notch) is selected from 1, 2, 5, 10. Calibrated span value is not modified even after changing a scale division.


- ①  means that scale division is 1.
- ② Push  button and select the candidate value from 1, 2, 5, 10. Push  button to memorize the value. If not modifying, push  or  button.

5). Do same procedure to set digital filter, zero tracking and decimal point.






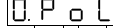






- 6). After the settings have been done, push  button several times and return to Measuring Mode.

7). Confirm the measured value is zero. If it is not, repeat the same procedure from 1).

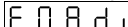







6 – 3) Equivalent Input Calibration

The followings show the methods from Measuring Mode. If pushing  button several times, return to Measuring Mode without modifying anything.

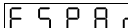













1). Set a polarity of zero equivalent input

- ① Push  button 3 times and  is displayed.
- ② Push  button twice and  is displayed.
- ③ Push  button 10 times and  is displayed. The last set polarity is displayed.
- ④ Push  button to start to blink . Push  button and select a polarity (positive) or (negative).
- ⑤ Push  button to memorize a polarity. Proceed to the next.

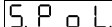






2). Zero equivalent input Calibration

- ①  and  is displayed alternatively.  is zero equivalent value which calibrated at the last time.
- ② Push  button to start to blink the left end digit.
- ③ Push  button again and select the digit. Push  button and select the number to set the output voltage (mV/V) from Load Cell or a sensor without load.
- ④ Push  button to calibrate zero point. Display  for 2 seconds after calibrated successfully and proceed to the next.

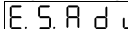









3). Set a display value of span equivalent input Calibration

- ①  and  is displayed alternatively.  is a display value which calibrated at the last time.
- ② Push  button to start to blink the left end digit.
- ③ Push  button again and select the digit. Push  button and select the number to set a display value of span equivalent input.
If setting a minus value, push  button and select the left end. Pushing  button appears  (minus) /  (plus) alternatively to select. Once the numeric value is selected zero,  (minus) will be disappeared and  (plus) is set.
- ④ Push  button to memorize a display value. Display  for 2 seconds and proceed to the next.

4). Set a polarity of span equivalent input

- ①  is displayed. The last set polarity is displayed.
- ② Push  button to start to blink . Push  button and select a polarity (positive) or (negative).
- ③ Push  button to memorize a polarity. Proceed to the next.

5). Span equivalent input Calibration

- ①  and  is displayed alternatively.  is span equivalent value which calibrated at the last time.
- ② Push  button to start to blink the left end digit.
- ③ Push  button again and select the digit. Push  button and select the number to set the span output voltage (mV/V) from Load Cell or a sensor.
- ④ Push  button to calibrate a span amount. Display  for 2 seconds after calibrated successfully and return to the top of  menu.
If it is out of the range of span calibration,  is displayed.

- 6). Push  button to return to Measuring Mode

§ 7. Trouble shooting

If this unit is malfunctioning, please contact us if the problem cannot be solved by the following measures. At this time, please inform us of the model name, product serial number, the malfunction symptoms and usage as much as possible. The model name of Load Cell or sensor connected to this unit should be also informed.

7 – 1) Basic check point

- 1). Check the power supplied voltage. This unit is powered by DC24V
- 2). Check the wires connected correctly and firmly at the terminals of this unit

7 – 2) Cautions when calibrating

- 1). Error occurs when calibrating zero point

To perform zero point calibration, Load Cell output with no load should be in the range of $-2.8 \sim +2.8 \text{ mV/V}$. Please call us if the output with no load is out of range of $\pm 2.8 \text{ mV/V}$, when using Load Cell whose rated output is more than 3 mV/V .

- 2). Fluctuation of indication is large

The input sensitivity of this unit is $0.5 \mu\text{V}/\text{digit}$ and indication resolution is $1/9,999$ at 1.0 mV/V input. Indication resolution is $1/5,000$ at 0.5 mV/V input. If the resolution is more than this, fluctuation of indication becomes larger. In this case, please increase a scale division at **[5.d]** in Function Mode until not to be noticeable of fluctuation. Also digital filter can ease fluctuation when the strength of it is higher.

- 3). Error occurs when calibrating a span amount or displayed value is not correct as set in span calibration.

This unit cannot measure in a system that the sum of initial tare value and measured value exceed 3.3 mV/V . Please contact us when the rated output of Load Cell or a sensor is more than 3.3 mV/V .

7 – 3) Countermeasures when an abnormal notice is indicated

- 1). In case of measured value blinking when it is not over load status.

It is considered that a cable of Load Cell is disconnected or Load Cell has been failed. Please confirm input signal (mV/V) from Load Cell in Test Mode.

7 – 4) Judgment whether this unit has malfunction

- 1). Check the excitation voltage of Load Cell

Checking the excitation voltage between terminal No.1 (EXC+) and No.2 (EXC-) is stable at $5\text{V} \pm 0.25\text{V}$. If it is not stable, a power supply circuit for Load Cell inside this unit may be defective.

- 2). Short the output voltage of Load Cell (making an electric short between terminal No.3 (SIG+) and No.4 (SIG-)). In other words, the input voltage to this unit is made zero.

Check input voltage (mV/V) in Test Mode. Please confirm whether it is stable at about 0.0000 mV/V . If it is not stable, this unit should have malfunction. If it is stable, please check Load Cell and a cable of it.

- 3). Digital I/O check

Check external input and output in Test Mode.

7 – 5) Check Load Cell

Since Load Cell is composed of a bridge circuit, it is possible to make a rough judgement by measuring the input / output resistance and insulation resistance.

* Please be sure to turn power OFF of this unit before checking Load Cell.

1). Failure judgement method by Load Cell resistance value.

- ① Remove all Load Cell cables.
- ② Measure the bridge resistance of Load Cell with a tester and check if there is any abnormality in the input / output resistance.

2). Failure judgement method based on Load Cell insulation resistance

- ① Remove all Load Cell cables.
- ② Measure the insulation resistance between shield and each cable of Load Cell at voltage within 50V.
- ③ If the insulation resistance is 1000M Ω or more, Load Cell is mostly good.

§ 8. Test Mode

Test Mode can help to determine whether this unit has malfunction when a measuring system occurs problem.

The response of output and indication of display is different during Test Mode. Please take measures to connected external equipment to keep it from abnormality.

8 – 1) Basic Operation

To enter Test Mode, select **EEEE** in Function Mode and push **▶** button to let the indication blink and push **□** button 3 times. Also enter Test Mode by pushing **□** button 3 times within 3 seconds right after power ON. To leave Test Mode, turn power OFF or push **▶** button 3 times during Program Version Display.

The test item will proceed to the next by pushing **◀** button. The next to the bottom end of the item is the top of it.

8 – 2) Each Test

1). Program Version display

Program Version : **P**

Displays software version of this unit.

Display : **2.00** shows Ver. 2.00

If pushing **▶** button 3 times in this mode, return to Measuring Mode.

2). LED test

LED : **d**

① Pushing **▶** button, all the LEDs are turned OFF. Nothing is lighted up

② Pushing **▶** button successively, each segment of 7-segment LEDs and status LEDs of SP1 to SP5, AZ will be lighted up in turn.

③ Each time pushing **▶** button, each digit of all segments of the LED will be lighted up in turns in the following sequence.

(10^4 digit → 10^3 digit → 10^2 digit → 10^1 digit → 10^0 digit)

④ Pushing **▶** button, all the LEDs are turned ON.

⑤ Pushing **▲** button, the LEDs are turned ON/OFF in reverse order, as ④ → ①.

⑥ Pushing **ESC** button, all the LEDs are turned OFF. Nothing is lighted up.

⑦ Pushing **□** button, all the LEDs are turned ON.

3). Button test

KEY : **□**

Display the allocated number of the button

◀ button 1 (If pushing twice, it moves to the next item)

▶ button 2

▲ button 3

ESC button 4

□ button 5

4). Comparator output test

Set Point : **S.P**

Output the allocated number of comparator by pushing the button as follows.

◀ button 1 0 0 0 0 and [SP1]LED is ON

▶ button 0 2 0 0 0 and [SP2]LED is ON

▲ button 0 0 3 0 0 and [SP3]LED is ON

ESC button 0 0 0 4 0 and [SP4]LED is ON

□ button 0 0 0 0 5 and [SP5]LED is ON

Push **◀** button 3 times successively, it moves to the next item.

5). Zero adjustment of analog output (when OP-1, OP-5 installed)

4mA : **4** or 0V : **0**

Push **▶** button to increase the analog output. Push **▲** button to decrease the analog output. Increment / decrement goes faster when pushing **▶/▲** button longer. The setting range is ±999. Push **□** button to memorize the setting value.

- 6). Span adjustment of analog output (when OP-1, OP-5 installed) 20mA : 2 0 or 10V : 1 0
 Push ▶ button to increase the analog output. Push ◀ button to decrease the analog output. Increment / decrement goes faster when pushing ▶/◀ button longer. The setting range is ±999. Push ☑ button to memorize the setting value.
- 7). Check analog output (when OP-1, OP-5 installed) d o
 Push ▶ button to increase the analog output. Push ◀ button to decrease the analog output. The indicated value of the right end is milli-Ampere in OP-1 or Voltage in OP-5. Increment / decrement goes 11 steps, from 4mA to 20mA / from 0V to 10V.
 Push ESC button to output the minimum, 4mA / 0V.
 Push ☑ button to output the maximum, 20mA / 10V.
- 8). Check input voltage from Load Cell or a sensor mV/V : 5 0
 Display input voltage from Load Cell or a sensor (mV/V). The value is blinked when the input voltage is out of the range. When the input voltage is minus, light up LEDs of [SP1] to [SP5].
 Push ▶ button to set the value to be zero and [AZ]LED is turned ON
 Push ◀ button to reset the zero and restore the previous value. [AZ]LED is turned OFF
- 9). Correction of zero of the measured value 0 Adjust : 0 . R d J
 Zero of the measured value is adjusted even when an object is loaded.
 Push ▶/◀ button to display the measured value. Push ▶/◀ button again to start to blink the value.
 Push ▶ button to increase the measured value, which move zero point toward minus.
 Push ◀ button to decrease the measured value, which move zero point toward plus.
 This function helps to modify the known amount of the deviation of zero.
 Push ☑ button to memorize the zero correction value.

§ 9. Installation and Connection method

9 – 1) Installation environment

- 1). The operating temperature range of this unit is $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$.
Consider installing in a place not exposed to the direct sunlight.
- 2). This unit is operated with power supplied voltage DC24V.
Note that connecting to a different voltage may cause failure or damage.
- 3). Please fix this unit with M4 screw using holes 2- $\Phi 4.5$ of the base bracket

9 – 2) Terminal connection

Wiring to this unit is done with 7.62mm pitch 16pin terminal block.

No.	Connection signal	
1	EXC+	Excitation voltage to Load Cell (+)
2	EXC-	Excitation voltage to Load Cell (-)
3	SIG+	Input signal from Load Cell (+)
4	SIG-	Input signal from Load Cell (-)
5	SHL	Shield line of Load Cell cable
6	E	Grounding
7	+24V	DC20 to 27V
8	0V	DC0V
9	SP1	Comparator 1 output (Collector)
10	SP2	Comparator 2 output (Collector)
11	SP3	Comparator 3 output (Collector)
12	SP4	Comparator 4 output (Collector)
13	SP5	Comparator 5 output (Collector)
14	COM-E	Common Emitter
15	OUT+	Output signal + side (Option)
16	OUT-	Output signal - side (Option)

Applicable crimp terminal: Crimp terminal for M3 up to 6mm width

1). Connection of Load Cell or a sensor

Use a 4-core cable and wire apart from a power line or a drive motor line with noise.

2). Connection of comparator output

Open collector output, negative logic.
Rated output is DC30V 30mA (resistive load).

3). Grounding

Connect to ground resistance $\leq 100\Omega$.

4). Connection of optional output

No polarity when current loop [OP-4] is installed.
Do not connect a wire when option is not installed.

§ 1 0. Specifications

1 0 – 1) Analog to Digital converter part

- | | |
|--------------------------------|---|
| 1). Input sensitivity | 0.5 μ V/digit or more
Resolution 1/9,999 maximum when 1.0mV/V input
Resolution 1/5,000 maximum when 0.5mV/V input |
| 2). Non-linearity | $\pm 0.03\%$ FS ± 1 count |
| 3). Temperature characteristic | Zero : $\pm 0.005\%$ FS/ $^{\circ}$ C (at 1.0mV/V input)
Sensitivity : $\pm 0.005\%$ Reading/ $^{\circ}$ C |
| 4). Frequency characteristic | approx. 1Hz (-3dB) (at $\frac{d.F.}{R.U.}=8$) |
| 5). Power for transducer | DC5V $\pm 5\%$, 60mA (able to connect 4 transducers of 350 Ω) |

1 0 – 2) Display part

- | | |
|----------------------------|---|
| 1). Display device | |
| ① Measured value display | LED 7-segment, Red, 4digits, character height 8mm |
| ② Status display | LED, Red, 6pcs |
| 2). Measured value display | |
| ① Maximum reading | $\pm 9 9 9 9$ (Zero suppress reading) |
| ② Decimal point | 0, 0.0, 0.00, 0.000 |
| ③ Over indication | All digit blink
when the input voltage exceeds the range of ± 3.3 mV/V or
the measured value exceeds ± 9999 |
| ④ Unit | kg
Other unit is pasted by a unit seal as,
g, t, N, kN, N·m, kN·m, kPa, MPa, mm, % |
| ⑤ Renew period | 60 msec. (16.7 times / second) |
| 3). Status display | |
| | AZ (Auto Zero)
SP1, SP2, SP3, SP4, SP5 (Comparator 1 to 5) |

1 0 – 3) Zero and Sensitivity calibration

- | | |
|---|--|
| 1). Zero calibration | adjustable by input signal -2.8 to 2.8mV/V |
| 2). Sensitivity calibration | adjustable by span amount -3.0 to 3.0mV/V |
| 3). Zero equivalent input calibration | adjustable -2.8 to 2.8mV/V by button |
| 4). Sensitivity equivalent input calibration | adjustable -3.0 to 3.0mV/V by button |
| 5). Display value of sensitivity equivalent input | adjustable -9999 to 9999 by button |
| 6). Accuracy of equivalent input calibration | $\pm 0.2\%$ FS (at 1.0mV/V input) |
- ※ The sum of initial Tare value (zero point input signal) and maximum measured value (span amount) should not exceed ± 3.3 mV/V.

1 0 – 4) I/O part

- 1). Operation button 5 buttons. (ITEM, NEXT, UP, ESC, ENTRY)
- 2). Comparator output
 - ① Output signal 5 output, Open Collector, negative logic.
Common Emitter to SP1 to SP5.
Insulated by photo coupler, NPN transistor.
Emitter-Collector is ON when comparator output is ON.
Saturated voltage of Emitter-Collector is 1.2V or less
(Equivalent to TOSHIBA TLP127)
 - ② Rated output DC30V, 30mA (resistive load)
- 3). Serial data output (Option: OP-4)
 - Current Loop output Interface to connect TOYO peripheral equipment
- 4). Analog output (Option: OP-1, OP-5)
 - ① Output signal D/A signal linked with displayed value, isolated output.
4 to 20mA (resistive load 510Ω or less) ···· OP-1
0 to 10V (resistive load 5kΩ or more) ····· OP-5
able to output additional 5% of FS against both min. and max.
output.
 - ② Resolution Linked with display resolution
(maximum 1/10,000 is set at in Function Mode)
 - ③ Non-linearity ±0.1%FS (against displayed value)
 - ④ Temperature characteristic ±0.02%FS/°C (both zero and sensitivity)

1 0 – 5) Function

Refer to section 4 for details of each function.

- 1). Auto Zero
- 2). Preset Tare subtraction
- 3). Zero Tracking
- 4). Scale division
- 5). Digital filter and Moving average
- 6). Scaling of analog output
- 7). Button lock
- 8). Calibration lock
- 9). Comparator output
- 10). Serial data output

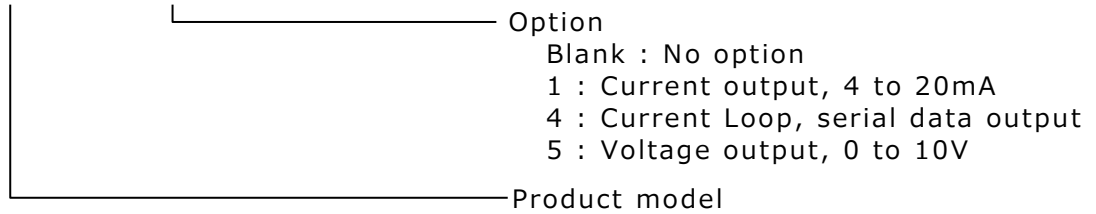
1 0 – 6) General

- 1). Countermeasure of power failure Data are memorized to a non-volatile memory
- 2). Power supplied voltage DC20 to 27V
Isolated from an inner circuit by a DC-DC converter.
- 3). Current consumption 0.5A typ.
- 4). Operating Temp. & Humidity -10~+40°C, 20~85% R.H. without condensation
- 5). Mounting method Wall mount type
Fix with M4 screw using holes 2-Φ4.5
- 6). Mass approx. 1kg

§ 1 1 . List of Models and Accessories

1 1 - 1) Model

D L S - 5 0 3 3 A - 1



Power supplied voltage is DC24V.

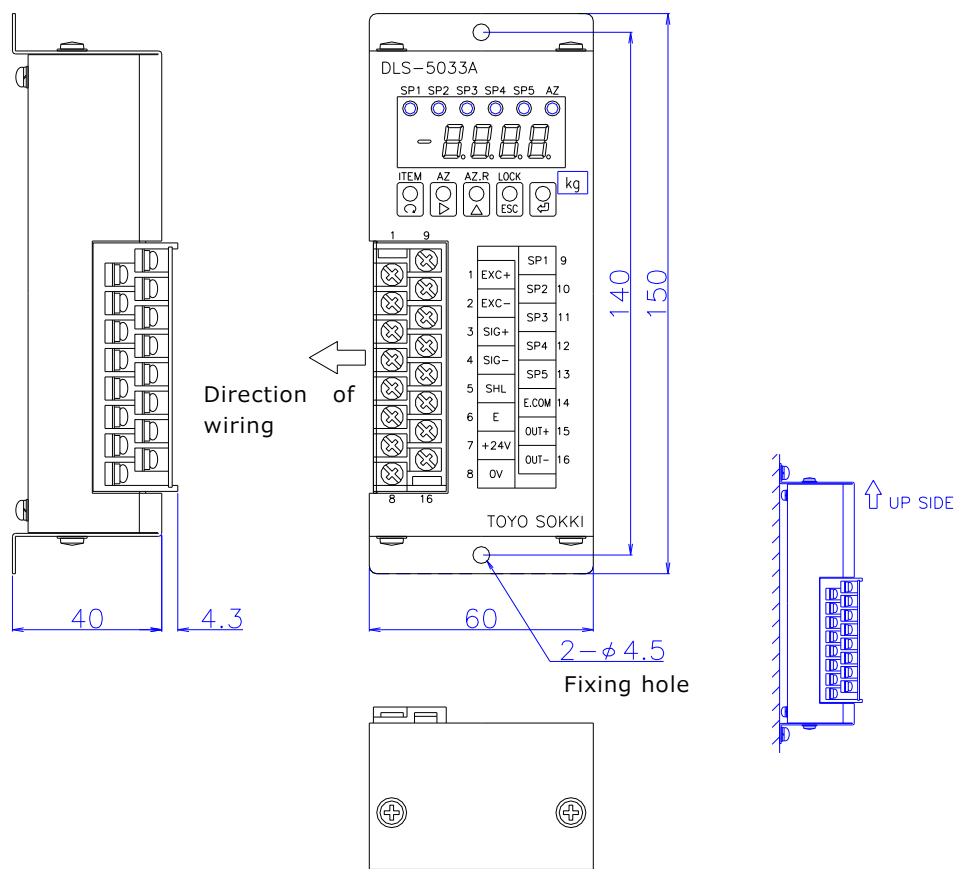
Note that connecting to a different voltage may cause failure or damage.

Check the power supply voltage carefully before connecting to this unit.

1 1 - 2) Accessories

Unit seal	1 pc
Operation Manual	1 copy

§ 1 2 . Dimensional Drawing



§ 1 3. Table of functions

Mode	Button /Indication	Content	Remark
Measuring Mode		Move to Function Mode	Push 3 times
		Auto Zero(AZ)	Push for 1 second
		Reset Auto Zero(AZ.R)	Push for 1 second
		Lock/Unlock buttons	Push for 2 seconds
Function Mode Comparator setting c. 5 E t	S. P. 1	Quantitative value of comparator 1	Set a numeric value -9999 to +9999
	S. P. 2	Quantitative value of comparator 2	
	S. P. 3	Quantitative value of comparator 3	
	S. P. 4	Quantitative value of comparator 4	
	S. P. 5	Quantitative value of comparator 5	
	H Y S.	Hysteresis value	Set a numeric value 0 to +99
	P. t A r t	Preset Tare value	Set a numeric value 0 to +9999
Function Mode Function setting F U n c.	1.	Judgement of comparator 1	Select a candidate o F F : No judgement U P. n t : Upper limit of Net d n. n t : Lower limit of Net U P. G S : Upper limit of Gross d n. G S : Lower limit of Gross
	2.	Judgement of comparator 2	
	3.	Judgement of comparator 3	
	4.	Judgement of comparator 4	
	5.	Judgement of comparator 5	
	d.	Delay time of comparator output	Delay time (second) = setting value×0.06
	d. A.	Net/Gross of analog output	Select a candidate n E t : Net value G r S : Gross value
	2.	Zero scale of analog output	Set a numeric value -9999 to +9999 Set a display value to output 4mA or 0V
	F.	Full scale of analog output	Set a numeric value -9999 to +9999 Set a display value to output 20mA or 10V
	d. A.	Resolution of analog output	Select a candidate d S P : Linked with display i n t : Maximum resolution
	t E S t	Move to Test Mode	Blink by , Enter Test Mode by 3 times
Function Mode Calibration setting c A L.	0. A d J	Zero Calibration	Blink by , Calibrate by
	S P A n	Span Calibration	Set a numeric value -9999 to +9999
	S. d.	Scale division	Select a candidate (1,2,5,10)
	d. F.	Strength of digital filter	Select a candidate (1~10)

	R. c.	Condition to stop moving average	Select a candidate (oFF, 0.5 to 10.0) Unit: scale division
	R. u.	The number of times of moving average	Select a candidate (1,2,4,8,16,24,32)
	0 c.	Condition of zero tracking	Select a candidate (oFF, 0.5~10.0) Unit: scale division
	0 t.	Working time of zero tracking	Select a candidate (0.1, 0.5~5.0) Unit: second
	d. P.	Decimal point	Select a candidate (0,1,2,3)
	0. P o L.	Polarity of equivalent input of zero voltage of a sensor	Select a candidate P.: positive n.: negative
	E. 0. R d J	Equivalent input of zero voltage of a sensor	Set a numeric value 0 to 9.9999 Unit: mV/V
	E. S P R n	Display value of span amount	Set a numeric value -9999 to +9999
	S. P o L.	Polarity of equivalent input of span voltage of a sensor	Select a candidate P.: positive n.: negative
	E. S. R d J	Equivalent input of span voltage of a sensor	Set a numeric value 0 to 9.9999 Unit: mV/V
Function Mode		Select item in order	
Indicator is not blinking		Select item in reverse order	
		Start to blink	
		Return to top of Function Mode	
Function Mode	or	Stop to blink	
Indicator is blinking		Select a candidate or a digit	
		Select a candidate or change the value of selected digit	
		Memorize the setting and proceed to the next item	Display for two seconds
Test Mode	S 0 3 3 R	Display model name	Display for 3 seconds
t E S t	P.	Display program version	Push 3 times and return to Measuring Mode
	d.	Check LEDs	Turn ON/OFF by pushing / button
	t.	Check buttons	:1, :2, :3, :4, :5 :Procced to the next
	S. P.	Check the output of comparators	:SP1, :SP2, :SP3, :SP4, :SP5 :Procced to the next
	0. or 4.	Adjustment of analog output of zero	:Increment :Decrement :Memorize
	1 0. or 2 0.	Adjustment of analog output of span	
	d o.	Check analog output	:Increment :Decrement 11 steps
	S t.	Check input voltage from Load Cell (mV/V)	:Set to zero :Restore the value
	0. R d J	Correction of zero of the measured value	Push / once, the measured value is appeared. :Increment :Decrement :Memorize