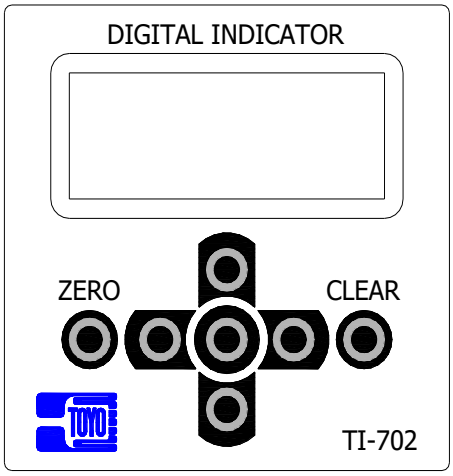
SMALL DIGITAL INDICATOR

MODEL　T I – 7 0 2

OPERATION MANUAL



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MA4-00285-R1(2021/2)

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※This operation manual conforms to program version 1.00 and later.

This document is translated from MA4-00281-R0 (Japanese)

§ 1. Summary

This small digital indicator has a signal input channel from a distortion gauge type transducer and is suitable for controlling platform scale or hopper, etc.
This indicator has various functions such as Tare subtraction, Comparator output, Hold, and Zero tracking, etc. They are easily operated by key buttons.
There are two contact output and three external input to control the connected equipment.
Also this unit is equipped with analog output of 4 to 20mA current output, ±5V voltage output and 0 to 10V voltage output as standard and can be selected one of them at Function Mode by key operation.
Power supplied voltage is DC24V.

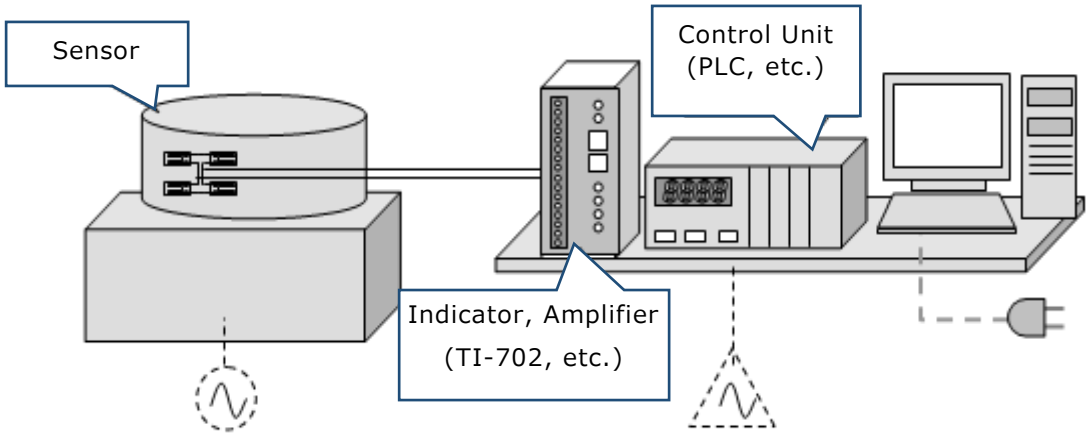
§2. Installation and the connection method of the unit

2 – 1) Installation environment of this unit

1) Operation temperature range of this unit is −10 to +40℃.
   Please install this unit in a place not exposed to direct sunlight and condensation.
2) The power supply is DC24V.
   Recommend to use a constant-voltage transformer if power supply is not stable.
3) This unit is designed to fix by a panel-mount. Please make use of the attached metal fittings to fix it on.
4) Please confirm the cable specification before wiring this unit.
5) A shield line of each cable should be grounded to either one of this unit or each connected equipment.

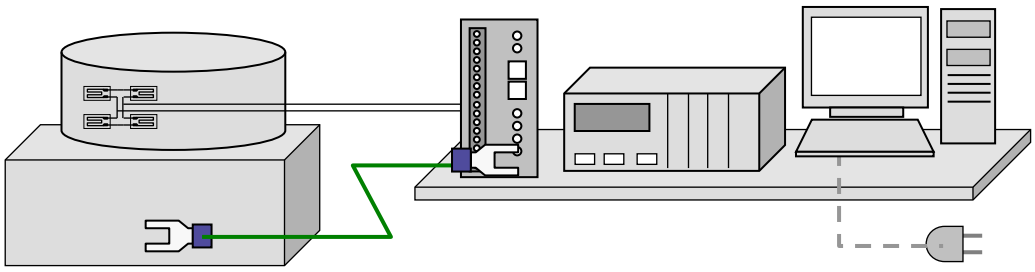
2 – 2) To obtain stable measurement

When a sensor of strain gauge (i.e., Load Cell, Pressure gauge) is amplified by an amplifier or is connected to an indicator, the value may fluctuate or may not be stable.



(Fig. 1)

This is because of difference of an electric potential between a sensor part and an amplifier / indicator part. It is induced from electric potential of commercial power (AC100V/AC200V).



(Fig. 2)

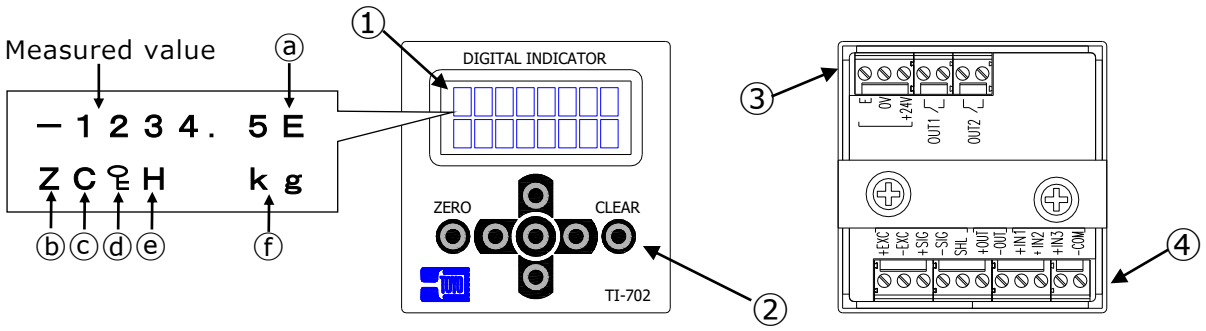
The most effective way to improve stability is to use a cable to connect an Earth terminal of an amplifier / indicator to a case or chassis of sensor, like Fig 2.

If it is difficult to find an Earth terminal of sensor side, loose a bolt of metal case of sensor and connect the cable. Please make the electric potential be same as possible.

In case that a sensor and amplifier / indicator have installed apart separately, stability improves when an Earth terminal of indicator / amplifier and a metal case of sensor connect to the nearest earth of each. But if they are apart far from each other, it may not bring a good result due to different electric potential of the earth. However, in such a case, stability improves if connecting a cable as Fig 2.

§3. Appearance and name of each part

Appearance of the unit



① LCD with back light
In Measuring Mode, the measured value is at upper side and the status of operation is at lower side. In Function Mode, guide of function and setting value/candidate are displayed. Back light will be turned OFF after no key operation is made for a period of time, which is set in Function Mode. It turns ON again when any key is pushed.

Place	Status	Content
ⓐ	E	Blinking when abnormal analog output
ⓑ	Z	Tare subtraction is in operation
	G	Indicate Gross value
	G	Indicate Gross value while Tare subtraction is in operation
ⓒ	C	Calibration Locked
ⓓ	⚿	Key Locked
ⓔ	H	Hold is in operation / Blinking while pausing Hold
ⓕ	(unit)	Unit which is selected at [Unit] in Function Mode

② Key switches

Key	Measuring Mode	Function Mode
ZERO	Perform Tare subtraction by pushing for 1 second	–
CLEAR	Cancel Tare subtraction by pushing for 1 second	Cancel the setting or Leave Function Mode
▲/(Pause)	Start/Stop data update while Peak/Bottom Hold is in operation	Increase the value of the selected digit Select a candidate upward
▼/(Hold)	Start/Stop Hold operation	Decrease the value of the selected digit Select a candidate downward
◀	–	Select the digit toward left
▶	–	Select the digit toward right
ENT	Enter Function Mode by pushing for 1 second	Memorize the setting

③ Terminals for power line and rely contact output

④ Terminals for Load Cell (sensor) and external input

§4. Function & Operation

4 – 1) Measuring Mode

1) LCD back light

Back light will be turned OFF after a period of time of no key operation. It turns ON again when any key is pushed during LCD back light OFF. Time period to turn back light ON is selected at [LCDlight] in Function Mode.

⚠ Deteriorate LCD faster when keeping back light ON.

2) Over Load

This is a function of alert for over-loading of Load Cell. The measured value is blinking to inform that it exceeds the rated capacity of Load Cell set at [Capacity] in Function Mode. Tare subtraction cannot be done during over-loaded.

3) Zero point correction (Zero point correction of Gross value)

External command input can correct and clear zero point of Gross value, which is set at [IN☐Sel/GrossZr] or [IN☐Sel/GZeroClr] in Function Mode. (☐ is 1～3)
The value of zero point correction is memorized in a non-volatile memory and cannot be disappeared even after powered OFF.
Zero correction cannot be done during over-loaded.

4) Tare Subtraction

When pushing ZERO key for 1 second, perform Tare subtraction and [Z] is indicated on LCD.
Cancel Tare subtraction when pushing CLEAR key for 1 second.
Value of Tare subtraction is memorized in a non-volatile memory and cannot be disappeared even after powered OFF.
Tare subtraction cannot be done during over-loaded.
External command input can set or cancel of Tare subtraction after selecting [IN☐Sel / ZERO] or [IN☐Sel / CLEAR] in Function Mode. (☐ is 1～3)

5) Preset Tare Subtraction

This function is used for an object that have a known container weight (Tare value) beforehand.
Select [Tare Sel / Pre-Tare] in Function Mode and set Tare value at [Pre-Tare] in Function Mode.
Setting range is −99999 to +99999.
When the value other than 0 is set, Tare value is subtracted from the measured value and keep it subtracted afterward.
※ Please choose one either Preset Tare Subtraction or Net Calculation

6) Net Calculation

This function is used for an object that have a known content amount (Net value) beforehand.
Select [Tare Sel / Pre-NET] in Function Mode and set a content amount at [Pre-Tare] in Function Mode. Setting range is −99999 to +99999.
Content amount appears on LCD when ZERO key is pushed for 1 second at Measuring Mode.
※ Please choose one either Preset Tare Subtraction or Net Calculation

7) Gross / Net value to display

[G] is indicated on LCD and display Gross value while external command input assigned at [IN ☐ Sel / Gross] of Function Mode is in electrical short state. Display Net value while it is in electrical open state. (☐ is 1～3)
Black and white reversed [G] will be indicated while Tare subtraction is in operation.

8) Hold

Select a candidate at [Hold] in Function Mode as follows

[Sample] : Fix displayed value to the number when start Hold operation
[Peak] : Indicate maximum displayed value during Hold operation
[Bottom] : Indicate minimum displayed value during Hold operation

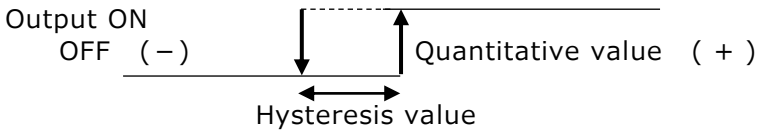
Press ▼ key to start / stop Hold operation and [H] is indicated on LCD during Hold operation.
Press ▲ key to pause the update data during Peak/Bottom Hold operation and [H] blinks ON and OFF. This pause function helps to confirm the value temporarily before the display value updated higher or lower.
External command input can operate Hold. Select [IN□Sel / Hold] or [IN□Sel / Ps Hold] in Function Mode and operate Hold or pause Hold during external command input is in electrical short state. Stop Hold operation during it is in electrical open state. (□ is 1～3)

9) Comparator output

Two comparators output upper / lower limit judgement. Comparator judgement condition is set at [Cmp□ Sel] in Function Mode. (□ is 1 or 2)

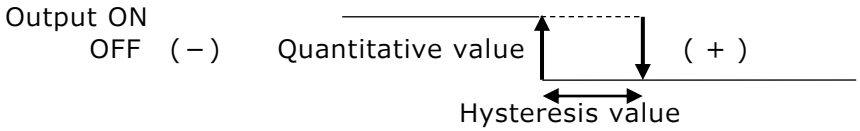
a) Comparator Upper Limit judgement

Output ON : Measured value ≧ Quantitative value
Output OFF : Measured value < (Quantitative value − Hysteresis value)



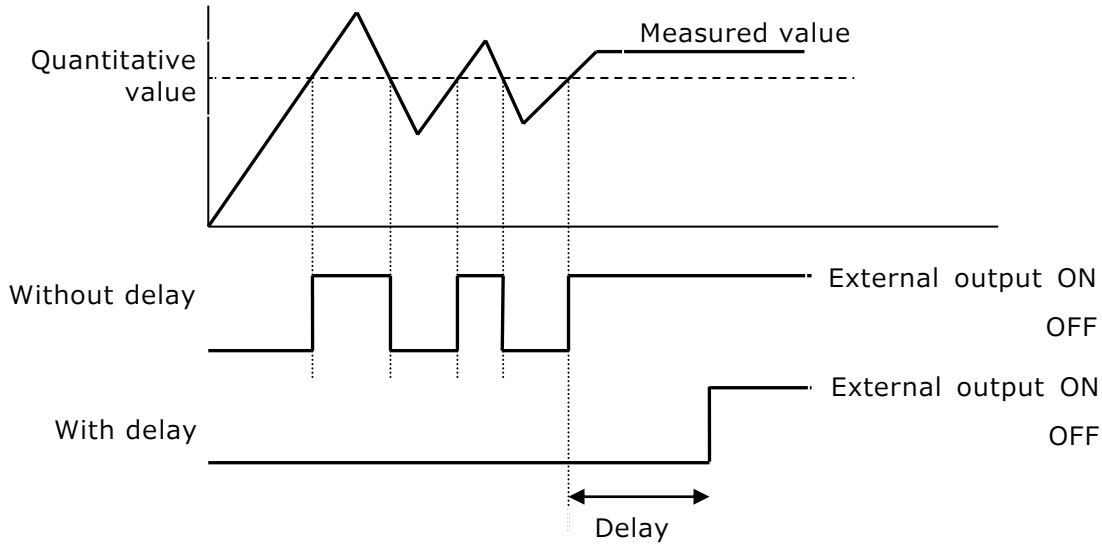
b) Comparator Lower Limit judgement

Output ON : Measured value ≦ Quantitative value
Output OFF : Measured value > (Quantitative value + Hysteresis value)



c) Delay time

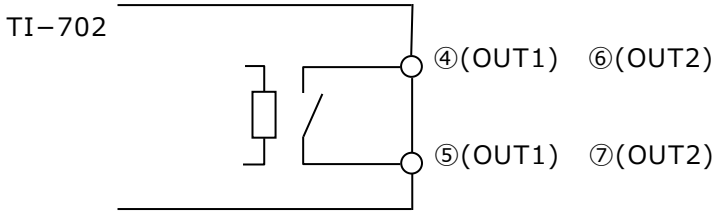
External output can be delayed after comparator judge upper / lower limit.
Set [Dly□] in Function Mode. (□ is 1 or 2)
Delay Time = Set value x approx. 0.01sec. i.e.) 100 (set value) x 0.01sec. ≒ 1.0sec.



d) Abnormal Detection

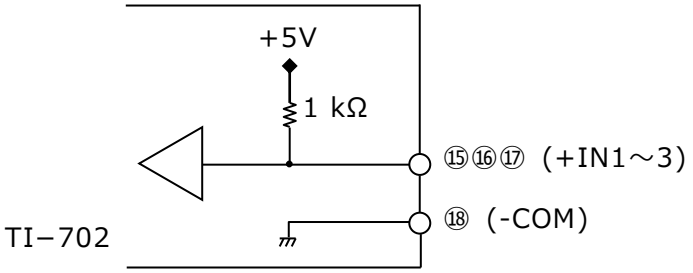
Alert the operating conditions of this unit.
It turns ON when operating normally and turns OFF in case of abnormal condition such as power supply failure or over loading.

e) Relay Output Circuit Diagram



10) External input

Three external command input are equipped.
Operation allocated each input is selected at [IN□ Sel] of Function Mode. (□ is 1～3)



(External command input circuit)

11) Key Lock

This function is to prevent wrong operation.
Set key Lock / Unlock in [Key Lock] of Function Mode.
[🔒] is indicated on LCD during key locked.
Displays [Lock] when pushing any key except ENT key in key locked status but accepts external command input.

12) Cal Lock

This function prevents to change the span calibrated value from wrong operation.
Span calibration is prohibited in Cal Lock status but zero calibration can be implemented.
[C] is indicated on LCD during Cal Lock.
Set calibration locked / unlock in [Cal Lock] of Function Mode.

4 – 2) Function Mode

Various functions are implemented in Function Mode.
Push ENT key for 1 second to enter Function Mode.
Please refer to section 7) Function Mode.

4 – 3) Test Mode

This is a function to confirm the operation of this unit. The response of indication and external input / output signal in Test Mode is different from Measuring Mode. Please take measures for connected external equipment to keep it from abnormality.
To enter Test Mode, push ENT key while turning power ON or push ◀/▶ key let [ON] blink and push ENT key 3 times at [Test] in the Function Mode.

§5. Adjustment of Analog Output

After A/D converts the input signal from Load Cell to digital data, D/A converts it to analog output again. By a scaling function, it can link a display value to 4mA,−5V, 0V of minimum analog output, and can link a display value to 20mA, 5V, 10V of maximum analog output. In addition, it can fine-tune at 4mA, 20mA, 0V, ±5V, +10V in order to regulate level error against input of instruments connected to this unit.
By using Test Mode, it can output 11 steps between 4∼20mA, −5∼0∼+5V or 0∼10V.

5 – 1) Method of adjusting current output 4∼20mA

	Guide display	Content	Operation
1	AoutType	Select output type	Proceed to [AoutType] in Function Mode.
2	4—20mA		Select [4—20mA] by using ◀ ▶ key.
3			Memorize by pushing ENT key.
4	Aout ZS	Scale to 4mA output	Proceed to [Aout ZS] in Function Mode.
5	0		Set display value to link 4mA output by using ◀ ▶ ▲ ▼ key.
6			Memorize by pushing ENT key
7	Aout FS	Scale to 20mA output	Proceed to [Aout FS] in Function Mode
8	10000		Set display value to link 20mA output by using ◀ ▶ ▲ ▼ key.
9			Memorize by pushing ENT key.
10	Aout Sel	Select output data type	Proceed to [Aout Sel] in Function Mode.
11	Net		Select data type by using ◀ ▶ key.
12			Memorize by pushing ENT key.
Fine adjustment of current output			
13	AoutZAdj	Fine adjustment of 4mA output	Proceed to [AoutZAdj] in Function Mode.
14	0		Fine tune by using ◀ ▶ key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
15			Memorize by pushing ENT key.
16	AoutFAdj	Fine adjustment of 20mA output	Proceed to [AoutFAdj] in Function Mode.
17	0		Fine tune by using ◀ ▶key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
18			Memorize by pushing ENT key.

5 – 2) Method of adjusting voltage output 0～±5V

	Guide display	Content	Operation
1	AoutType	Select output type	Proceed to [AoutType] in Function Mode.
2	±5V		Select [±5V] by using ◀ ▶ key.
3			Memorize by pushing ENT key.
4	Aout ZS	Scale to 0V output	Proceed to [Aout ZS] in Function Mode.
5	0		Set display value to link 0V output by using ◀ ▶ ▲ ▼ key.
6			Memorize by pushing ENT key.
7	Aout FS	Scale to +5V output	Proceed to [Aout FS] in Function Mode.
8	10000		Set display value to link +5V output by using ◀ ▶ ▲ ▼ key.
9			Memorize by pushing ENT key.
10	Aout–FS	Scale to −5V output	Proceed to [Aout—FS] in Function Mode.
11	−10000		Set display value to link −5V output by using ◀ ▶ ▲ ▼ key.
12			Memorize by pushing ENT key.
13	Aout Sel	Select output data type	Proceed to [Aout Sel] in Function Mode.
14	Net		Select data type by using ◀ ▶ key.
15			Memorize by pushing ENT key.
Fine adjustment of voltage output			
16	AoutZAdj	Fine adjustment of 4mA output	Proceed to [AoutZAdj] in Function Mode.
17	0		Fine tune by using ◀ ▶ key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
18			Memorize by pushing ENT key.
19	AoutFAdj	Fine adjustment of +5V output	Proceed to [AoutFAdj] in Function Mode.
20	0		Fine tune by using ◀ ▶ key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
21			Memorize by pushing ENT key.
22	Aout–Adj	Fine adjustment of −5V output	Proceed to [Aout—Adj] in Function Mode.
23	0		Fine tune by using ◀ ▶ key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
24			Memorize by pushing ENT key.

5 – 3) Method of adjusting voltage output 0～10V

	Guide display	Content	Operation
1	AoutType	Select output type	Proceed to [AoutType] in Function Mode.
2	0—10V		Select [0—10V] using ◀ ▶ key.
3			Memorize by pushing ENT key.
4	Aout ZS	Scale to 0V output	Proceed to [Aout ZS] in Function Mode.
5	0		Set display value to link 0V output by using ◀ ▶ ▲ ▼ key.
6			Memorize by pushing ENT key.
7	Aout FS	Scale to 10V output	Proceed to [Aout FS] in Function Mode.
8	10000		Set display value to link 10V output by using ◀ ▶ ▲ ▼ key.
9			Memorize by pushing ENT key.
10	Aout Sel	Select output data type	Proceed to [Aout Sel] in Function Mode.
11	Net		Select data type by using ◀ ▶ key.
12			Memorize by pushing ENT key.
Fine adjustment of voltage output			
13	AoutZAdj	Fine adjustment of 0V output	Proceed to [AoutZAdj] in Function Mode
14	0		Fine tune by using ◀ ▶ key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
15			Memorize by pushing ENT key
16	AoutFAdj	Fine adjustment of 10V output	Proceed to [AoutFAdj] in Function Mode
17	0		Fine tune by using ◀ ▶ key. Tuning will be fast-forward or fast-rewind when the key pressed longer.
18			Memorize by pushing ENT key

§6. Calibration

As for the calibration method, there are two kinds of calibration, as [Equivalent Input Calibration] which input the equivalent output voltage of Load Cell by key operation, 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 the last calibration. Recommend to calibrate by an actual load as much as possible.

6 – 1) Cancel Calibration Lock

There is a calibration lock function to keep the calibrated value secure from wrong operation. [C] is indicated on LCD during calibration locked. But zero point calibration can be done. Please cancel a calibration locked status prior to operate calibration.
Select [Unlock] at [Cal Lock] in Function Mode.

6 – 2) Actual Load Calibration

	Guide display	Content	Operation
1	Cal Lock Unlock	Cancel calibration lock	Cancel calibration lock if locked.
2	Capacity 99999	Rated capacity of Load Cell	Set numeric value by using ◀ ▶ ▲ ▼ key. Set 99999 if not needed.
3			Memorize by pushing ENT key.
4	Min.Div 1	Minimum scale	Select minimum scale by using ◀ ▶ key.
5			Memorize by pushing ENT key.
6	D.Point 0	Decimal point position	Select decimal point position by using ◀ ▶key.
7			Memorize by pushing ENT key.
8	CAL Zero 0	Zero calibration	Put nothing on the Load Cell.
9			Let [0] blink by pressing ▶ key.
10			Memorize by pushing ENT key.
11	CAL Span 10000	Span calibration	Put a reference weight on Load Cell. ※A weight should be as heavy as possible within the feasible range of Load Cell.
12			Set a weight value by using ◀ ▶ ▲ ▼ key.
13			Memorize by pushing ENT key.

6 – 3) Equivalent Input Calibration (Not available EXC=2.5V)

	Guide display	Content	Operation
1	Cal Lock Unlock	Cancel calibration lock	Cancel calibration lock if locked.
2	Capacity 99999	Rated capacity of Load Cell	Set numeric value by using ◀ ▶ ▲ ▼ key. Set 99999 if not needed.
3			Memorize by pushing ENT key.
4	Min.Div 1	Minimum scale	Select minimum scale by using ◀ ▶ key.
5			Memorize by pushing ENT key.
6	D.Point 0	Decimal point position	Select decimal point position by using ◀ ▶key.
7			Memorize by pushing ENT key.
8	E.Zr.Adj 0.0000	Equivalent value of zero point of Load Cell	Set zero point value (mV/V) of Load Cell by using ◀ ▶ ▲ ▼ key.
9			Memorize by pushing ENT key.
10	E.Span 10000	Display value of span amount	Set span display value of Load Cell by using ◀ ▶ ▲ ▼ key.
11			Memorize by pushing ENT key.
12	E.Sp.Adj 1.0000	Equivalent value of span of Load Cell	Set span output value (mV/V) of Load Cell by using ◀ ▶ ▲ ▼ key.
13			Memorize by pushing ENT key.

§7. Function Mode

7 – 1) How to operate

① Enter Function Mode by pushing ENT key for 1 second.
② Select an item by using ▲ or ▼ key.
③ Select the digit or candidate by using ◀ or ▶ key.
④ When setting a numerical value, increase /decrease the value by using ▲ or ▼ key.
⑤ To complete the setting, memorize by pushing ENT key.
⑥ To cancel the setting or leave Function Mode, push CLEAR key.
⑦ Back to Measuring Mode automatically without key operation for 3 minutes.

7 – 2) Function Table

	Guide display	Content	Setting value / candidate	Operation
1	Pre-Tare	Numerical value of Pre-Tare/Pre-Net	0 to ±99999	Set numeric value (0 at the time of shipment)
2	Tare Sel	Select Pre-Tare/Pre-Net operation	Pre-Tare	Preset Tare Subtraction (at the time of shipment)
			Pre-Net	NET Calculation
3	Set P1	Quantitative value of comparator 1	0 to ±99999	Set numeric value (99999 at the time of shipment)
4	Set P2	Quantitative value of comparator 2	0 to ±99999	Set numeric value (99999 at the time of shipment)
5	Dly1	Delay output of comparator 1	0 to 999	Set numeric value (0 at the time of shipment)
6	Dly2	Delay output of comparator 2	0 to 999	Set numeric value (0 at the time of shipment)
7	Hys1	Hysteresis of comparator 1	0 to 99999	Set numeric value (0 at the time of shipment)
8	Hys2	Hysteresis of comparator 2	0 to 99999	Set numeric value (0 at the time of shipment)
9	Cmp1 Sel	Select judgement of comparator 1	OFF	No judgement. No output.
			Up-Net	Upper limit of Net value (at the time of shipment)
			Dn-Net	Lower limit of Net value
			Up-Gross	Upper limit of Gross value
			Dn-Gross	Lower limit of Gross value
			Up-Disp	Upper limit of Display value
			Dn-Disp	Lower limit of Display value
			Warning	ON during normal operation
10	Cmp2 Sel	Select judgement of comparator 2	OFF	No judgement. No output.
			Up-Net	Upper limit of Net value (at the time of shipment)
			Dn-Net	Lower limit of Net value
			Up-Gross	Upper limit of Gross value
			Dn-Gross	Lower limit of Gross value
			Up-Disp	Upper limit of Display value
			Dn-Disp	Lower limit of Display value
			Warning	ON during normal operation
11	Relay1	Select operation of relay 1	Make	ON when relay is excited (at the time of shipment)
			Break	OFF when relay is excited
12	Relay2	Select operation of relay 2	Make	ON when relay is excited (at the time of shipment)
			Break	OFF when relay is excited
13	IN1 Sel	Select operation of external command	Non	No operation
			ZERO	Tare subtraction

		input 1		(at the time of shipment)
			CLEAR	Clear Tare subtraction
			Gross Zr	Zero correction of Gross value
			GZeroClr	Clear zero correction of Gross value
			Gross	Display Gross value (at low level)
			Hold	Hold operation (at low level)
			Ps Hold	Pause Hold operation (at low level)
14	IN2 Sel	Select operation of external command input 2	Non	No operation
			ZERO	Tare subtraction
			CLEAR	Clear Tare subtraction (at the time of shipment)
			Gross Zr	Zero correction of Gross value
			GZeroClr	Clear zero correction of Gross value
			Gross	Display Gross value (at low level)
			Hold	Hold operation (at low level)
			Ps Hold	Pause Hold operation (at low level)
15	IN3 Sel	Select operation of external command input 3	Non	No operation
			ZERO	Tare subtraction
			CLEAR	Clear Tare subtraction
			Gross Zr	Zero correction of Gross value (at the time of shipment)
			GZeroClr	Clear zero correction of Gross value
			Gross	Display Gross value (at low level)
			Hold	Hold operation (at low level)
			Ps Hold	Pause Hold operation (at low level)
16	AoutType	Select analog output type	Non	No analog output (at the time of shipment)
			4-20mA	Current output 4～20mA
			±5V	Voltage output 0～±5V
			0-10V	Voltage output 0～10V
17	Aout ZS	Scale to output 4mA or 0V	0～±99999	Set display value to link 4mA or 0V. Set numeric value (0 at the time of shipment)
18	Aout FS	Scale to output 20mA, +5V or 10V	0～±99999	Set display value to link 20mA, +5V or 10V. Set numeric value (10000 at the time of shipment)
19	Aout-FS	Scale to output −5V	0～±99999	Set display value to link −5V. Set numeric value (-10000 at the time of shipment)
20	Aout Sel	Analog output data type	Net	Net value (at the time of shipment)
			Gross	Gross value
			Disp	Display value (link to Hold operation)
21	AoutZAdj	Fine adjustment of 4mA or 0V output	0 ～±999	Select numeric value (0 at the time of shipment)
22	AoutFAdj	Fine adjustment of 20mA, +5V or 10V output	0 ～±999	Select numeric value (0 at the time of shipment)
23	Aout−Adj	Fine adjustment of −5V output	0 ～±999	Select numeric value (0 at the time of shipment)
24	Hold	Hold operation	OFF	No Hold operation (at the time of shipment)
			Sample	Sampling Hold operation
			Peak	Peak Hold operation
			Bottom	Bottom Hold operation
25	LCDlight	Time period to turn on LCD backlight	1min.	Turn on 1 minute (at the time of shipment)
			30min.	Turn on 30 minutes
			60min.	Turn on 60 minutes

			Always	Turn on all the time
26	Disp Cyc	Renew period of displaying	5	5 times per second
			10	10 times per second (at the time of shipment)
			20	20 times per second
27	Strain M	Display input voltage from Load Cell	OFF	Measuring Mode (at the time of shipment)
			ON	Display input voltage (mV/V)
28	DF cond	Condition of moving average	OFF	Normal moving average (at the time of shipment)
			5	Moving average range of ±5 scale
			10	ditto ±10 scale
			20	ditto ±20 scale
			50	ditto ±50 scale
			100	ditto ±100 scale
			500	ditto ±500 scale
29	D.Filter	Number of times of moving average	1	1 time (No average)
			5	5 times
			10	10 times
			20	20 times (at the time of shipment)
			50	50 times
			100	100 times
			200	200 times
			300	300 times
30	ZT cond	Condition of zero tracking	OFF	Zero tracking ineffective (at the time of shipment)
			1	Within ±1 scale
			2	Within ±2 scale
			3	Within ±3 scale
			4	Within ±4 scale
			5	Within ±5 scale
			10	Within ±10 scale
31	ZT time	Working time of zero tracking	0.1	0.1 second
			0.5	0.5 second
			1.0	1.0 second (at the time of shipment)
			2.0	2.0 seconds
			3.0	3.0 seconds
32	Capacity	Rated capacity of Load Cell	0 to 99999	Set numeric value (99999 at the time of shipment)
33	Min.Div	Minimum scale	1	Minimum scale 1 (at the time of shipment)
			2	Minimum scale 2
			5	Minimum scale 5
			10	Minimum scale 10
			20	Minimum scale 20
			50	Minimum scale 50
			100	Minimum scale 100
34	D.Point	Decimal point position	0	No decimal point (at the time of shipment)
			0.0	1 digit after decimal point
			0.00	2 digit after decimal point
			0.000	3 digit after decimal point
			0.0000	4 digit after decimal point
35	Unit	Unit to display	(blank)	Do not display unit
			g	Gram
			kg	Kilogram (at the time of shipment)
			t	Ton
			N	Newton

			kN	Kilo newton
			N・m	Newton meter
			kN・m	Kilo newton meter
			Pa	Pascal
			kPa	Kilo pascal
			MPa	Mega pascal
			gf	Gram force
			kgf	Kilogram force
			tf	Ton force
			mm	Millimeter
			%	Percentage
			mV/V	Millivolt per volt
			$\mu\varepsilon$	Micro strain
36	Cal Zero	Zero actual load calibration	0	Fixed value '0'
37	Cal Span	Span actual load calibration	±1 to ±99999	Set numeric value (10000 at the time of shipment)
38	E.Zr.Adj	Equivalent Zero output of Load Cell	0 to ±2.8000	Set numeric value (mV/V) (0.0000 at the time of shipment)
39	E.Span	Display value of span amount	±1 to ±99999	Set numeric value (10000 at the time of shipment)
40	E.Sp.Adj	Equivalent Span output of Load Cell	±0.0001 to ±3.0000	Set numeric value (mV/V) (1.0000 at the time of shipment)
41	Cal Lock	Calibration Lock / Unlock	Unlock	Span calibration enabled (at the time of shipment)
			Lock	Span calibration disabled
42	Key Lock	Key Lock / Unlock	Unlock	Key unlocked (at the time of shipment)
			Lock	Key locked
43	Test	Shift to Test Mode	OFF	Do not shift to Test Mode (at the time of shipment)
			ON	Push ▶ key to let [ON] blink and push ENT key 3 times

§8. Test Mode

※The response of external I/O signal and indication of display is different during Test Mode. Please take measures to connected external equipment to keep it from abnormality. Test Mode confirms conditions of this unit by manual operation.

8 – 1) Operation method

1) To enter Test Mode, push [ENT] key while turning power ON or push [◀] [▶] key to let [ON] blink and push [ENT] key 3 times at [Test] in Function Mode.

2) To leave Test Mode, turn power OFF or push [▶] key 3 times while displaying Model Name or Program Version in Test Mode.

3) Push [▲] key to proceed to the next item. Push [▼] key to return to the previous item.

8 – 2) Test item

	Guide display	Item	Description
1	TEST	Test Mode	Proceed to [2 Model Name] after 2 seconds
2	TI-702 R2	Model Name	Push [▶] key 3 times to leave Test Mode [▲] to the next item, [▼] to the previous item
3	P-x.xx	Program Version	Push [▶] key 3 times to leave Test Mode [▲] to the next item, [▼] to the previous item
4	S/N xxxxx	Serial Number	[▲] to the next item, [▼] to the previous item
5	▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮	Check LCD	Graphic pattern varies every second Turn LCD back light ON / OFF by [ZERO] key [▲] to the next item, [▼] to the previous item
6	Key 0	Check keys	[▲]=1, [ZERO]=2, [◀]=3, [ENT]=4, [▶]=5, [CLEAR]=6, [▼]=7 [▲] to the next item, [▼] to the previous item
7	Cmp Out 00	Check comparator output	00 : No output 01 : Comparator1 output ON / OFF by [▶] key 20 : Comparator2 output ON / OFF by [◀] key [▲] to the next item, [▼] to the previous item
8	Ext In 000	Check external command input	000 : No external command input 001 : External command input 1 is ON 020 : External command input 2 is ON 300 : External command input 3 is ON [▲] to the next item, [▼] to the previous item
9	I out 4.0mA	Check current output	Output 11 steps by using [◀] [▶] key [ZERO] : 4mA, [CLEAR] : 20mA [▲] to the next item, [▼] to the previous item
	±5V out 0.0V	Check voltage output when ±5V selected	Output 11 steps by using [◀] [▶] key [ZERO] : −5V, [ENT] : 0V, [CLEAR] : 5V [▲] to the next item, [▼] to the previous item
	10V out 0.0V	Check voltage output when 0−10V selected	Output 11 steps by using [◀] [▶] key [ZERO] : 0V, [CLEAR] : 10V [▲] to the next item, [▼] to the previous item
10	mV/V x.xxxx	Check input voltage from Load Cell	[ZERO] : Zero, [CLEAR] : Clear zero [▲] to the next item, [▼] to the previous item

§9. Troubleshooting

If this unit does not work properly, please take the following measures. If the trouble still cannot be solved, then please contact our company.
At query, please inform us the model name, product serial number, and conditions of this unit as detailed as possible. The model name of Load Cell or a sensor connected to this unit should be also informed.

9 – 1) Basic check point

1) Please check if using a correct power supply. This unit is supplied voltage DC+24V.
2) Please check that wires are connected to the terminal properly and firmly.

9 – 2) Precautions at the time of calibration.

1) Error occurs at the time of zero calibration.

・In case of exceeding the range of zero calibration.
To perform zero point calibration, Load Cell output with no load should be in the range of −2.8～+2.8mV/V. Please contact us if it is out of the range of ±2.8mV/V, when using Load Cell whose rated output is more than 3.3mV/V.

2) Error occurs at the time of span calibration, or display value is not correct as set in span calibration.

・In case of a sensor output being higher.
This unit cannot measure in a system that the sum of initial Tare value and measured value exceed 3.3mV/V. Please contact us when the rating output of the sensor is more than 3.3mV/V.

・In case of input level of span calibration being lower.
This unit cannot perform span calibration when variation amount of output of Load Cell is lower than value set as span at [Cal Span] in Function Mode. Increase minimum scale at [Min.Div] in Function Mode to make resolution rougher or use an appropriate Load Cell.

3) Fluctuation of indication

・In case of span amount against resolution being not enough.
The input sensitivity of this unit is 0.25μV/digit and indication resolution is 1/20,000 at 1.0mV/V input. If the resolution is more than this, fluctuation of indication becomes bigger. In this case, please increase minimum scale until not to be noticeable of fluctuation.

9 – 3) Countermeasure when abnormal display is indicated

1) In case of [A/D over] blinking

It is considered to be disconnected a part or whole of Load Cell cable. Refer the section 9-5) Checking Sensor (Load Cell).

2) In case of the measured value blinking when not over-loaded. These two causes are considered
   ① Disconnection of sensor cable
   ② Sensor failure
Please check input signal (mV/V) from a sensor in Test Mode.

9 – 4) Judgement whether this unit has malfunction

1) Please confirm whether the sensor excitation voltage is correct.

Disconnect Load Cell cable from this unit and check the voltage by a tester between #8(+EXC) and #9(-EXC) of the terminal is stable at 5V±0.5V (EXC=5V). If it is not stable, this unit should have malfunction.

2) Make electrical short between #10(+SIG) and #11(-SIG) of the terminal (make input voltage 0mV/V). Check input voltage in Test Mode. Please confirm whether it is stable at

around 0.0000 mV/V. If it is not stable, this unit should have malfunction. If it is stable, please check Load Cell side.

3) Digital I/O check
Please perform I/O check in Test Mode.

9 – 5) Checking Sensor (Load Cell)
Good or bad rough judgement can be done by measuring input/output resistance and insulation resistance because Load Cell is structured by a bridge circuit.
(Please make sure to power OFF this unit first and disconnect Load Cell before checking resistance)

1) Fault judging method by resistance of Load Cell.
Check bridge resistance of Load Cell by a tester, and confirm whether input/output resistance are correct.

2) Fault judging method by insulation resistance of Load Cell.
Measure insulation resistance between shield line and other with voltage less than 50V. If the insulation resistance has more than 1000MΩ, insulation of Load Cell is no problem.

§10. Specifications

10－1) A/D convert part

1) Input signal range		-3.3 to +3.3 mV/V
2) Non linearity		±0.02%FS±1count
3) Temp. Characteristic	zero	±0.0025%FS/℃ typ. at 1.0mV/V input, EXC=5V (Double the value at EXC=2.5V)
	sensitivity	±0.0025%Reading/℃ typ.
4) Frequency response		approx. 2Hz(-3dB) at D.Filter=20
5) Sampling speed		approx. 100 times/sec. (10ms)
6) Power for transducer		DC5V±5%, 60mA (able to connect 4 sensors of 350Ω) (DC2.5V±5% as option at the time of shipment)

10－2) Zero point and Sensitivity part

1) Adjustment range	zero	adjustable within the range of ±2.8mV/V input
	sensitivity	adjustable within the range of ±3.0mV/V input ※ Sum of initial Tare level (zero point input value) and maximum measured level (span amount) must not exceed ±3.3mV/V.
2) Minimum input sensitivity		0.25μV/digit (display resolution 1/20,000 at 1.0mV/V input, EXC=5V)
3) Calibration method		Actual load method or Equivalent input method

10－3) Display part

1) Display device	LCD 5X7 dot, 8 lettersX2 rows, letter height 5mm with green back light
2) Measured value display	±99999 (zero suppressed)
3) Minimum scale	1, 2, 5, 10, 20, 50, 100
4) Decimal point	0 (Nil), 0.0, 0.00, 0.000, 0.0000
5) Over load	Blinking when the measured value exceeds the capacity ([A/D over] is displayed when input is out of range of A/D)
6) Unit display	(None), g, kg, t, N, kN, N･m, kN･m, Pa, kPa, MPa, gf, kgf, tf, mm, %, mV/V, με
7) Status indication	E:Abnormal analog output, Z:Tare subtraction, G:Gross C:Calibration Lock, 🔒:Key Lock, H:Hold operation
8) Display update	10, 5 or 20 times/sec. (100ms, 200ms or 50ms)

10－4) I/O part

1) Operation switch

7 key switches

ZERO	: Tare subtraction
CLEAR	: Clear Tare subtraction / Cancel Setting
▲	: UP / LCD back light ON/OFF / Pause Hold
▼ / (Hold)	: Down / Hold
◀	: Left
▶	: Right
ENT	: Enter Function Mode / Memorize

2) External command input (3 point)

① Operation	7 commands can be allocated in Function Mode
② Input Signal	Contact input without voltage or Open collector input (Ic = 10mA, Voltage endurance more than 20V)

3) External output (2 point)

① Operation	7 judgements can be allocated in Function Mode
② Output signal	Relay contact, 'a' contact point (BREAK at powered OFF)
③ Rated output	DC24V, 1A (resistance load)

10－5）Analog output

1) Output signal

① 4～20mA	Current output	resistance load ≦ 510Ω	output range 2～24 mA
② ±5V	Voltage output	resistance load ≧ 5kΩ	output range −6～+6 V
③ 0～10V	Voltage output	resistance load ≧ 5kΩ	output range −2～+12 V

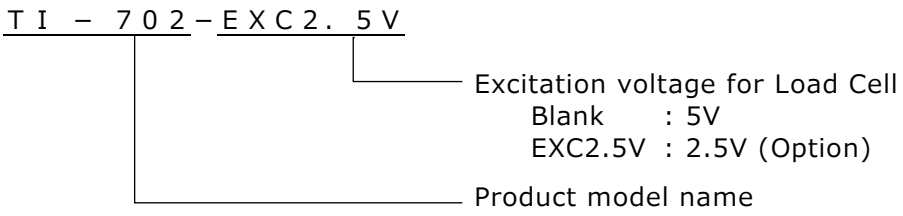
2) Non linearity	0.1%FS (for display level)
3) Temp. characteristic	Zero point, Sensitivity = ±0.01%FS/℃ typ. (for display level)
4) Resolution	Interlocking with display resolution (maximum 1/20,000)
5) Update period	Synchronized with sampling (10ms)

10－6）General

1) Countermeasure of power failure	Setting data are memorized to a non-volatile memory
2) Power supplied voltage	DC24V±10%, approx.100mA Isolated from inner circuit by DC/DC converter
3) Range of temp. & humidity	−10～+40℃, 85% R.H. or less (no condensation)
4) Mounting method	Panel mount type or DIN rail (option)
5) Mass	approx. 150g

§11. List of Models and Accessories

11 – 1) Model



※Option is available at the manufacturer before shipment. (Option at the time of shipment)

11 – 2) Attached accessory

1) Operation manual	1 copy

11 – 3) Accessory sold separately

1) TI-702-DIN-KIT	35mm DIN rail mount kit
2) TI-702-AC-KIT	AC adapter kit

§12. Terminal Layout

1) 3.5mm pitch, screw terminal, upper side

No.	Connection Signal	
1	E	Earth (Grounding)
2	0	Power line, DC 0V
3	+24V	Power line, DC +24V
4	OUT1	Comparator output 1, 'a' contact
5		
6	OUT2	Comparator output 2, 'a' contact
7		

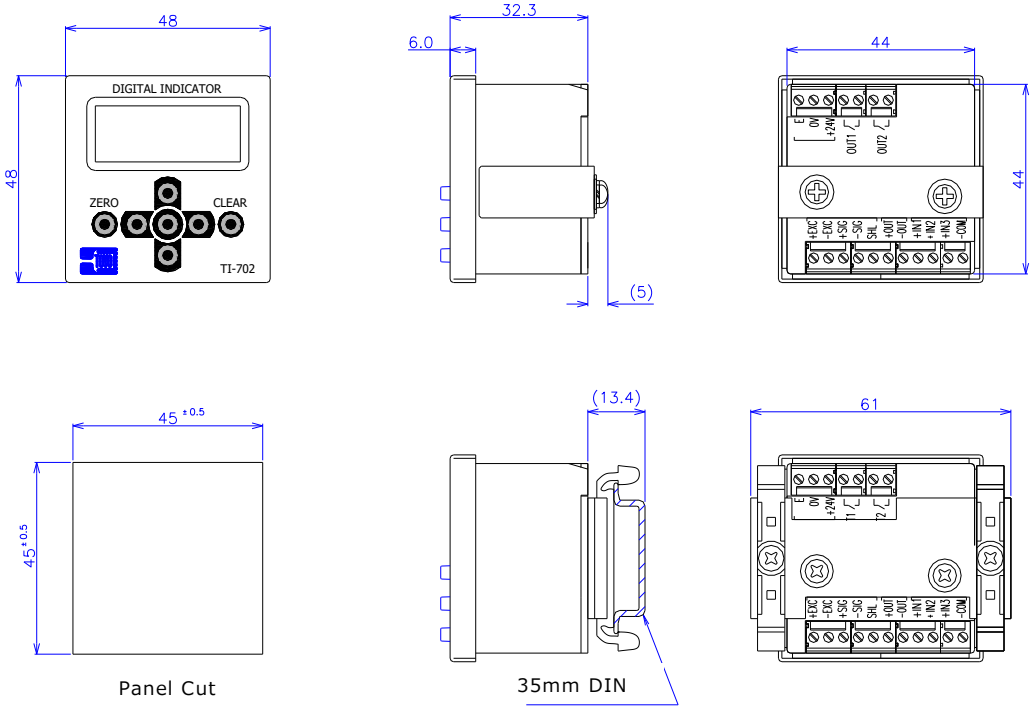
2) 3.5mm pitch, screw terminal, lower side

No.	Connection Signal	
8	+EXC	Excitation voltage to Load Cell (+)
9	−EXC	Excitation voltage to Load Cell (−)
10	+SIG	Input signal from Load Cell (+)
11	−SIG	Input signal from Load Cell (−)
12	SHL	Shield line of Load Cell cable
13	+OUT	Analog output (+)
14	−OUT	Analog output (−)
15	+IN1	External input 1
16	+IN2	External input 2
17	+IN3	External input 3
18	−COM	Common ground of external input

Applicable wire specification:
Single wire =Φ0.4～1.2mm (AWG26～16)
Strand wire = 0.2～0.75mm^2 (AWG24～20), wire OD ≧Φ0.18mm
Standard peeled wire length = 5～7mm

Load Cell cable should be wired apart from a power line or a motor drive line with noise to prevent malfunction.
The cable wiring color varies depending on the manufacturer or a model. Refer to the Test Report attached to Load Cell, check the signal name and color, and connect correctly and firmly.
Earth terminal (E) should be connected to the ground resistance ≦100Ω.

§13. Dimensional drawing



§14. Function Block Diagram