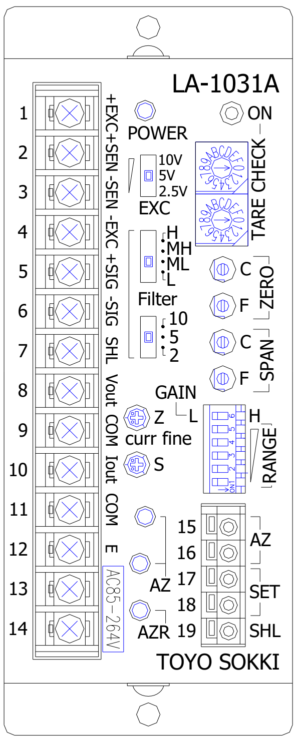
LOAD CELL AMPLIFIER

MODEL　ＬＡ－１０３１Ａ

OPERATION MANUAL



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MA4-00294-R0 (2020/9)

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This document is translated from MA4-00280-R1 (Japanese)

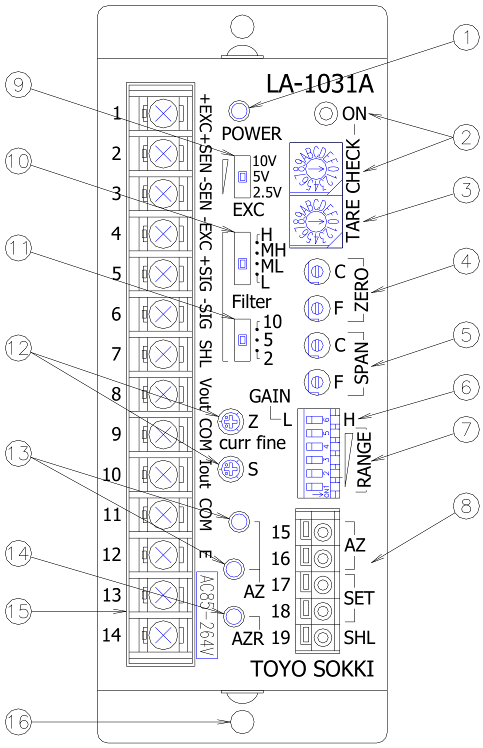
MA4-00294-R0

§1. Summary

This unit is a low drift instrumentation amplifier which amplifies signal from a strain gauge transducer and outputs voltage signal 0～±5V and current signal 4～20mA.
This unit has analog Auto Zero function which set output signal to zero by a button switch or external command input.
Applied voltage to Load Cell or a sensor is selected from 10V, 5V, 2.5V by a slide switch.
Frequency characteristic is selected by two slide switches.
Also this unit has a remote sensing function to reduce measurement error caused by a sensor cable.
The power supplied voltage is AC85～264V as standard or DC20～27V as option, which specified as option at the time of order.
DC/DC converter in this unit isolates power supplied voltage from current / voltage output signal.

§2. Appearance and Each name

Appearance of this unit



① POWER (LED)	LED for indicating power ON
② CHECK (CAL SW)	Pseudo signal generation switch, 16 position rotary switch
③ TARE	For Tare subtraction, 16 position rotary switch
④ ZERO(C,F)	Zero adjustment trimmer (Coarse / Fine:15 rotation)
⑤ SPAN(C,F)	Span adjustment trimmer (Coarse / Fine:15 rotation)
⑥ GAIN MODE	Low/High (input signal≧0.6mV/V: Low, 0.6mV/V: High)
⑦ RANGE	Amplification range adjusted by a DIP switch (5 steps setting)
⑧ TERMINAL (5mm pitch)	External command input of AZ and answer back signal of SET
⑨ EXCITATION VOLTAGE	Select excitation voltage by a slide switch (10V, 5V, 2.5V)
⑩ FILTER 1st	Select the range of cut off frequency by a slide switch (L:1Hz, ML:10Hz, MH:100Hz, H:1kHz)
⑪ FILTER 2nd	Select a multiple of cut off frequency (x2, x5, x10) by a slide switch
⑫ FINE-TUNE of CURRENT OUTPUT (Z,S)	Fine adjustment trimmer for Zero and Span of current output
⑬ AUTO ZERO	Button switch and status LED of Auto Zero
⑭ AUTO ZERO RESET	Button switch of canceling Auto Zero
⑮ TERMINAL(7.62mm pitch)	14pin terminal for Load Cell, Analog output and Power line
⑯ MOUNTING HOLE	Fixing hole 2 -Φ4.5mm

§3. Operation

This unit outputs voltage signal and current signal simultaneously. Voltage output is bipolar and can be output up to ±5V. (Max. ±10V depending on the intensity of input signal from a sensor)
Current output 4～20mA is available only when voltage output is set to 0～5V. Combination other than 4～20mA / 0～5V is impossible.

3－1） Excitation select switch (slide switch 10V, 5V, 2.5V)

This switch enable to change an applied voltage to Load Cell or a sensor.
Before calibrating this unit, check the specification of Load Cell and apply an appropriate excitation voltage to Load Cell. Changing excitation voltage can correct sensitivity of this unit automatically, but there is an error to consider.

When changing excitation voltage from 10V to 5V or 2.5V, amplification of this unit can be corrected 2times, 4times respectively. An error of sensitivity against the previous value is up to 2% when changing excitation voltage. After calibration of this unit has done, changing excitation voltage, calibration value of zero and span will be modified slightly. So recommend to calibrate again.

3－2） TARE (initial Tare setting, 16 position rotary switch)

This switch can be used to cancel an unbalanced voltage equivalent to Tare amount when Tare amount is too large to achieve zero adjustment. The setting is 16 positions from 0 to F and can be set at about 0.15mV/V step. (0 to 2.25mV/V) The larger the setting value, the larger Tare cancellation amount.

When adjusting the output to 0V or 4mA (with Tare load applied), set a coarse [ZERO] trimmer at the center position beforehand and turn a [TARE] rotary switch to set the output value to the closest of 0V or 4mA.

If a weight of Tare load is known in advance, equivalent output level of Load Cell weighing Tare load can be calculated using the following formula to determine the code of TARE rotary switch.

$$\text{Equivalent LC output of Tare (mV/V)} = \frac{\text{Tare load weight}}{\text{Load Cell rated capacity}} \times \text{Load Cell rated output (mV/V)}$$

Code and Tare amount by [TARE] rotary switch

Code	Tare amount	Code	Tare amount	Code	Tare amount	Code	Tare amount
0	0 mV/V	4	0.6 mV/V	8	1.2 mV/V	C	1.8 mV/V
1	0.15 mV/V	5	0.75 mV/V	9	1.35 mV/V	D	1.95 mV/V
2	0.3 mV/V	6	0.9 mV/V	A	1.5 mV/V	E	2.1 mV/V
3	0.45 mV/V	7	1.05 mV/V	B	1.65 mV/V	F	2.25 mV/V

3－3） ZERO (Zero point adjustment trimmer)

This is a zero adjustment trimmer to set the output voltage to 0V or 4mA when there is unbalance voltage of Load Cell or voltage of Tare load. There are a coarse adjustment trimmer and a fine adjustment trimmer.
Adjustment range of zero trimmer is approximately ±0.2mV/V.
If zero adjustment cannot be achieved within this range, use a [TARE] rotary switch.

3－4） GAIN MODE, RANGE (Amplification range DIP switch)

Set the amplification range of a [SPAN] adjustment trimmer according with the output voltage of Load Cell or sensor.

Amplification range is adjustable in 10 steps by combining [GAIN MODE (H/L)] and [RANGE (1～5)] DIP switch. Set only one bit of the [RANGE(1～5)] DIP switch. Amplification will be larger as a range number becomes larger. Appropriate setting of [GAIN MODE] and [RANGE] is determined by the following formula. Please refer the table below.

※When span amount of output of Load Cell is 0.6 to 3.3mV/V, set GAIN MODE=L.
When it is 0.15 to 0.6 mV/V, set GAIN MODE=H.
※If output voltage is set to 10V, [GAIN MODE] should be set to H.

$$\text{LC output of maximum load (mV/V)} = \frac{\text{Maximum load}}{\text{Load Cell rated capacity}} \times \text{Load Cell rated output (mV/V)}$$

$$\text{Required amplification} = \frac{\text{Desired output voltage at maximum load (mV)}}{\text{Load Cell output of maximum load (mV/V) x EXC (V)}}$$

※EXC is applied voltage to Load Cell = 10V, 5V or 2.5V

GAIN MODE	RANGE (1～5)	Amplification			Necessary LC output amount (mV/V)	
		EXC=10V	EXC=5V	EXC=2.5V	for 5V,20mA output	for 10V output
L	1	149～ 236	298～ 472	596～ 944	3.36～2.12	―――
	2	209～ 330	418～ 660	836～ 1320	2.39～1.52	―――
	3	299～ 472	598～ 944	119～ 1888	1.67～1.06	―――
	4	418～ 661	836～1322	1672～ 2644	1.20～0.76	―――
	5	598～ 944	1196～1888	2392～ 3776	0.84～0.53	―――
H	1	598～ 944	1196～1888	2392～ 3776	0.84～0.53	3.36～2.12
	2	837～1316	1674～2632	3348～ 5264	0.60～0.38	2.39～1.52
	3	1195～1879	2390～3758	4780～ 7516	0.42～0.27	1.67～1.06
	4	1673～2631	3346～5262	6692～10524	0.30～0.19	1.20～0.76
	5	2390～3759	4780～7518	9560～15036	0.21～0.13	0.84～0.53

Numeric values in above table are typical value. They have an error up to 1% because of resistance tolerance in a circuit.

If this unit is shipped combined with a weighing scale which is adjusted together, no need to change GAIN MODE nor RANGE.
If this unit is shipped alone, GAIN MODE=L and RANGE=4 are set as for reference sensitivity, 1mV/V input and 5V output, at the time of shipment.

!CAUTION

Reference sensitivity of this unit is specified as 1mV/V input and EXC=10V. If input signal is small, amplify it larger by setting GAIN MODE and RANGE higher, but it leads to side effects. First, it worsens temperature characteristic of zero point of output. Second, it worsens fluctuation of output signal. Noise level of amplifier of this unit is 0.5mVp-p of 5V output. If amplifying larger, noise level is also amplified, it leads to fluctuate the output obviously.

Filter setting also affects fluctuation of the output signal. Noise level of the output signal is larger about 4 times at 100Hz and about 10 times at 7kHz compared to 2Hz. But it depends on the connected equipment for measuring the output signal of this unit.

3－5） SPAN (SPAN adjustment trimmer)

This is a span adjustment trimmer for amplifying incoming signal. There are a coarse adjustment trimmer and a fine adjustment trimmer.
Rotate a trimmer clockwise (CW) to increase amplification, counterclockwise (CCW) to decrease it. Rotate a coarse adjustment trimmer fully counterclockwise (CCW) can reduce the output to about 70% of the maximum.
If adjustment cannot be completed within this range, change the [GAIN MODE (L/H)] and [RANGE(1～5)] DIP switch setting.

3－6） CHECK (Pseudo input signal setting rotary switch)
(Pseudo input signal generating push switch)

By pressing a [CHECK] button switch, a pseudo input signal can be generated and added to the input signal. A pseudo input signal is generated only while the push switch is pressed. The pseudo input signal can be set at about 0.15mV/V step by 16 position rotary switch. After calibration of the scale is completed, with no load (output is 0V or 4mA), pressing a [CHECK] push switch (keep pressing) and turn a [CHECK] rotary switch to set the output to be 75% or more of measured value of the maximum load. By making a note of the rotary switch setting position and output value, it can be used as a secondary calibration value.
Even if the span trimmer is touched after calibration, the span amount can be re-calibrated based on this secondary calibration value.

3－7） FILTER (Cut off frequency of analog filter)

Two slide switches determine the cut off frequency of analog filter to response incoming signal.

First slide switch (L,ML,MH,H)

H	Response quickly (cut off frequency is higher)	Tend to fluctuate output
MH	⇕	
ML		
L	Response slowly (cut off frequency is lower)	Tend to be stable output

Second slide switch (x2, x5, x10) is used for a multiple of cut off frequency.

Cut off frequency (−3dB, analog filter) combined with two slide switches as below.

Cut off frequency				
	L	ML	MH	H
x2	2Hz	20Hz	200Hz	2kHz
x5	5Hz	50Hz	500Hz	4.5kHz
x10	10Hz	100Hz	1kHz	7kHz

3－8） Remote sensing function

When using a longer Load Cell or sensor cable, resistance of the cable is not negligible and its resistance vary if environment temperature vary. Fluctuation of resistance will cause fluctuation of voltage drop and fluctuation of applied voltage to a sensor and result in measurement error.
Remote sensing function helps to decrease a measurement error. This function requires a sensor cable of 6core wire. If 4core wire cable is used, set two attached metal plates as they are at the time of shipment. If 6core wire cable from Load Cell with remote sensing is used, remove two metal plates from terminal and make a remote sensing function effective.

!CAUTION

In case of not using a remote sensing function, make it sure to set two attached metal plates to make electrical short between +SEN and +EXC terminal also between -SEN and -EXC terminal. Otherwise a remote sensing circuit in this unit does not work correctly and will abnormal voltage is applied to a sensor and might damage a sensor of Load Cell or this unit.

§4. Calibration

Calibrate the output level to 0V with no load on Load Cell, and calibrate the output level to the desired voltage with maximum load on Load Cell. Current output 4～20mA is available when voltage output is adjusted to 0～5V. Calibration operation is based on "actual load calibration" using a known weight such as a reference weight.

4－1） Necessary setting prior to calibrate

1). Select appropriate excitation voltage from 10V, 5V or 2.5V according to the specification of applied voltage of Load Cell.
(Make sure to select before calibration, otherwise measurement error occurs and re-calibration will be needed)

2). Select appropriate filter setting (L,ML,MH,H ,x2, x5, x10)
Cut off frequency is selected from 2Hz to 7kHz, 12 frequencies.

3). Amplifier gain setting (GAIN MODE, RANGE setting)
Set the amplification range for the desired output level. Calculate Load Cell output of maximum load and select the corresponding GAIN MODE(H/L) and RANGE (1～5).
For a calculation method of Load Cell output of maximum load, refer to section 3-4).

4). Make sure to [AZ] LED is turned OFF
Push [AZR] button for 3 seconds to cancel auto zero if turned ON.

4－2） Calibration method with actual load

1). Put nothing on Load Cell (only the initial Tare load is applied)
2). Turn a [TARE] rotary switch to the position where the output is closest to 0V or 4mA.
3). Turn a [ZERO] trimmer (Coarse, Fine) to adjust the output to 0V or 4mA.
4). Put a known weight such as a reference weight on Load Cell and turn a [SPAN] trimmer (Coarse, Fine) to adjust to the desired output voltage or current.
5). Remove a known weight such as reference weight from Load Cell.
6). Confirm that the output is 0V or 4mA. If not, repeat from step 3) above.

!CAUTION

Current output 4～20mA is available when voltage output is adjusted to 0～5V. When using voltage output and current output simultaneously, calibration of voltage output has priory and should have been done first. After calibration, if there is an error of 4mA or 20mA of current output, use a fine adjustment trimmer 'curr fine(Z,S)' for zero and span of current output, please refer to 5-3).
When only using current output, calibrate current output directly using of ZERO and SPAN adjustment trimmer.

If calibration operation cannot be done properly, refer to section §5 Troubleshooting and take measures.

§5. Troubleshooting

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 a sensor connected to this unit should be also informed.

5－1） Basic check point

1). Check whether the power supplied voltage (AC85 to 264V or DC20 to 27V) is normal and stable
2). Check whether the terminals are connected correctly and firmly

5－2） What to do if the desired calibration is not achieved

1). Zero adjustment cannot be done.

Zero adjustment range is ±0.2mV/V
If the output is more than 0V even if a [ZERO] trimmer is turned fully counterclockwise (CCW), increase a [TARE] rotary switch setting.
If the output is less than 0V even if a [ZERO] trimmer is tuned fully clockwise (CW), decrease a [TARE] rotary switch setting.

2). When span adjustment, the desired output voltage cannot be set.

If the output goes below the desired value even if a [SPAN] trimmer is turned fully clockwise (CW), change a [GAIN MODE] and [RANGE] DIP switch and increase the amplification by one step.
If the output exceeds the desired value even if a [SPAN] trimmer is turned fully counterclockwise (CCW), change a [GAIN MODE] and [RANGE] DIP switch and decrease the amplification by one step.
10 steps can be set according to the [GAIN MODE] and [RANGE] DIP switch setting. If the desired output is not obtained even if all the DIP switch setting, check whether Load Cell output satisfies the sensitivity adjustment range of this unit.
Choose only one step of the setting of [RANGE(1～5)]

3). Output voltage is out of range of ±10V or output current is out of range of 4～20mA even though it is not overloaded.
① When a part of Load Cell cable is disconnected. (Ref: Section 5-5)
② A [TARE] rotary switch setting is inappropriate. (Ref: Section 3-2)
③ A [GAIN MODE] or [RANGE] DIP switch setting is inappropriate. (Ref: Section 3-4)
④ When Load Cell becomes defective. (Ref: 5-5)

5－3） Fine tuning of zero and span of current output

Current output 4～20mA is available when voltage output is set to 0～5V. A fine adjustment trimmer 'curr fine(Z,S)' is adjusted at the factory. If re-tuning of current output is necessary when outputting voltage and current simultaneously and connected equipment has an error for measuring voltage and current, take measures as follows. But combination other than 0～5V/4～20mA is impossible.

There are two adjustment trimmers on the front panel.
curr fine (Z) : Zero adjustment trimmer of current output (1 rotation)
Adjust this trimmer to 4mA when output voltage is 0V
curr fine (S) : Span adjustment trimmer of current output (1 rotation)
Adjust this trimmer to 20mA when output voltage is 5V

Current output is adjusted properly at the shipment in our factory. It is not necessary to re-adjust it. But when current output is not appropriate even if re-adjusting has been done, please contact us.

5 – 4） Judgement if this unit is malfunction

1). Check the excitation voltage of Load Cell

Checking the excitation voltage between terminal No.1 (+EXC) and No.4 (−EXC) is stable at 10V, 5V, 2.5V, tolerance ±5% respectively. If it is not stable, a power supply circuit inside this unit may be defective.
If excitation voltage exceeds 10V, such as 12V, check the connection of remote sensing wire. If 4 core cable is used from Load Cell, it should make electrical short between +SEN and +EXC terminal also between −SEN and −EXC terminal. Otherwise excess voltage is applied to Load Cell.

2). Short the output voltage of Load Cell (making an electric short between terminal No.5 (+SIG) and No.6 (−SIG)). In other words, the input voltage to this unit is made zero.

At this time, set a [TARE] rotary switch to ‘0’ once. In this state, the voltage which adjusted by a [ZERO] trimmer is output, so the output does not become 0V, but it can be checked whether the output is stable.
If it is not stable, an amplification circuit in this unit may be defective. If it is stable, check Load Cell side.
Please restore the setting of a [TARE] rotary switch to the previous position after checking.

5 – 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 a voltage within 50V.
In addition, the insulation resistance between a metal case of Load Cell and each cable other than shield is also measured at a voltage within 50V.
③ If the insulation resistance is 1000MΩ or more, Load Cell is mostly good.

5 – 6） Output doesn’t become zero even if AZ switch is pushed

1). Output won’t be changed and [AZ] LED is blinking

When output voltage exceeds ±2.0V before pushing a [AZ] button or inputting [AZ] command, ignore Auto Zero and blink [AZ] LED as an error. However this unit is operated normally as before.
When ignoring [AZ] command, no answer back [SET] is transmitted, it is able to judge an error at the external controller side.
Blinking [AZ] LED will be stopped after pushing a [AZR] button or operating Auto Zero successfully within the range of output ±2.0V.

2). Output won't be 0V or 4mA completely

Circuit of Auto Zero have been adjusted in the factory, there is no need to re-adjust it after shipment. If re-adjustment is needed because the connected equipment has an error for measuring voltage and current, take following measures to adjust. If output doesn't become zero even if after adjustment has done, please contact us.

If residual voltage or current is large after AZ operation, take measures as follows.
① Put nothing on Load Cell (only the initial Tare load is applied) and check zero output. Operate zero calibration if needed.
② Turn power OFF once.
③ Turn power ON while [AZ] button is pushed. Enter zero adjustment mode of AZ. Starts to blink [AZ] LED.
④ Push [AZ] button to increase the output and push [AZR] button to decrease the output. Set output to 0V or 4mA using the two buttons.
⑤ Turn power OFF and turn ON again without pushing any button.

After above adjustment has been done, put nothing on Load Cell and push [AZ] button. Check the output voltage is within ±2mV or the output current is within 4mA±6.4μA while [AZ] LED is turned ON.

Next, put a load on Load Cell and set the output larger within the range of Auto Zero. (i.e. 2.0V). Push [AZ] button and check the output become 0V or 4mA.
If residual voltage or current is large compared the one when operating AZ with no load, proceed to the following measures.

① Push [AZR] button and cancel Auto Zero. Put a load on Load Cell and set output voltage to 1.5V to 2.0V or set current output to 8.8mA to 10.4mA. Turn power OFF once.
It is possible to use [CHCEK] button and [CHCEK] rotary switch instead of putting a load on Load Cell. But in this case, keep pushing [CHCEK] button.
② Turn power ON while [AZR] button is pushed. Enter span adjustment mode of AZ. Starts to blink [AZ] LED. But blinks faster than zero adjustment mode of AZ.
③ If output doesn't become 0V or 4mA, push [AZ] button to increase the output and push [AZR] button to decrease the output. Set output 0V or 4mA using the two buttons.
Use [CHCEK] switch as substitution of a load, keep pushing [CHCEK] button.
④ Turn power OFF and turn ON again without pushing any button.

After above adjustment has been done, put/remove a load on Load Cell and push [AZ] button. Check the output voltage is within ±2mV or the output current is within 4mA±6.4μA while [AZ] LED is turned ON.

§6. Installation and connection method

6－1） Installation environment, etc.

1) The operating temperature range of this unit is 0 ℃ to 40℃.
   Consider installing in a place not exposed to the direct sunlight.
2) This unit is operated with power supplied voltage AC85V to 264V as standard, or DC20V to 27V as option.
   Note that connecting to a different voltage may cause failure or damage.
3) Please fix this unit with M4 screw using hole 2-Φ4.5 of the base bracket.

6－2） Terminal connection

Wiring to this unit is done with 7.62mm pitch 14pin terminal block. The shield line of each cable shall be grounded by either this unit or each connected instrument, so that there is no ground loop.

1). Load Cell, Analog output and Power line connection

7.62mm pitch terminal block

No.	Connection signal			
1	+EXC	Excitation voltage to Load Cell (+)		
2	+SEN	Remote sense input (+)		
3	－SEN	Remote sense input (－)		
4	－EXC	Excitation voltage to Load Cell (－)		
5	+SIG	Input signal from Load Cell (+)		
6	－SIG	Input signal from Load Cell (－)		
7	SHL	Shield line of Load Cell cable		
8	Vout	Voltage output signal (＋)		
9	COM	Voltage output signal (－)		
10	Iout	Current output signal (＋)		
11	COM	Current output signal (－)		
12	E	Grounding		
13	AC	AC85V to 264V (standard)	+24V	DC20V to 27V (option)
14	AC		0V	DC0V (option)

COM(#9, #11) are common.
The shield line of the output signal should be grounded on the receiving device side.

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

2). Control I/O connection

5mm pitch screw-less terminal block

No.	Connection signal	
15	AZ	Auto Zero command (contact input)
16		
17	SET-C	Answer back output (Corrector)
18	SET-E	Answer back output (Emitter)
19	SHL	Shield line of I/O control cable

Applicable wire range
  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: 11mm

3). Precautions for connection

① Terminal of +EXC and +SEN /−EXC and −SEN is connected by two metal plates at the time of shipment. If using a 4-core Load Cell cable and not using remote sensing function, make it sure to two attached metal plates are connected as they are at the time of shipment. If using a 6-core Load Cell cable, remove two metal plates from terminal and make remote sensing function effective.

② Remote sensing of this unit is effective when a resistance of Load Cell cable less than 10Ω (20Ω, cable length to and from). General AWG24 wire of 100m length has a resistance about 9Ω. Use a Load Cell cable as thick as possible.

③ Ground the shield line of each cable on either this unit or the connected instrument. If connected instrument doesn't have a terminal of shield, make a use of terminal #12(E) of this unit.

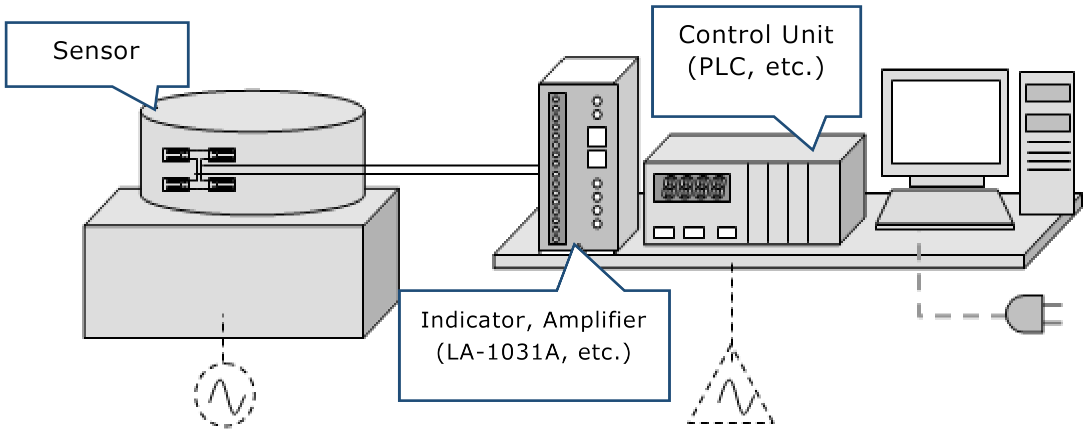
④ Since cable wiring color of Load Cell (a sensor) differs depending on the manufacturer, check the wiring color with Test Report attached to Load Cell.

⑤ In general Load Cell, shield line of Load Cell cable is not connected to a metal case of the Load Cell. If the ground potential of this unit is different from the potential of Load Cell metal case, it is easy to be affected by inductive noise.
Therefore, make sure that Load Cell mounting base is at the same potential as metal case of this unit by a grounding cable.

⑥ Regarding of length of analog output cable, it depends on surrounding electromagnetic circumstances, voltage output cable length should be shorter than 5m.

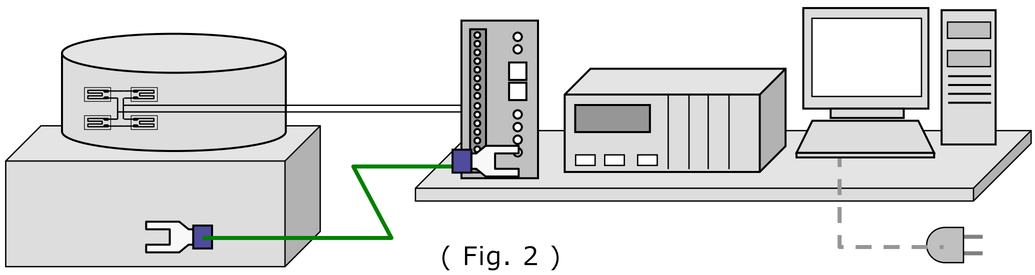
6－3） To obtain stable measurement

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 electricity rounding of general commercial power supply (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 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 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.

§7. List of Models and Accessories

7－1） Model

LA－1031A－DC

Power supplied voltage
Blank : AC85 to 264V
DC : DC20 to 27V (Option)

Product model name

7－2） Accessories

Metal plate for shorting	2 pcs (attached to the terminal)
Operation Manual	1 copy

§8. Specifications

8 – 1) Power supply part for Load Cell

1). Excitation Voltage	DC10V, 5V, 2.5V±5% (selective at a switch on rear panel)
2). Number of Connectable sensors	4 sets of 350Ω type Load Cell
3). Correction of voltage drop	Remote sensing function Resistance of Load Cell cable (to and from) should be less than 20Ω (equivalent to AWG24 wire x 100m)

8 – 2) Amplifire part and I/O part

1). Input range	±3.3mV/V (sum of tare amount and span amount)
2). Initial tare elimination	0 to 2.25mV/V (0.15mV/V step by 16 position rotary switch)
3). Zero adjustment	Range approx. ±0.2mV/V Multi-turn trimmer adjustment (Coarse, Fine adjustment: 15 rotations each)
4). Auto Zero	Range ±2.0V When output is within the above range after zero adjustment and initial tare elimination, set output to 0V if operating Auto Zero function. [AZ] button or external [AZ] command enables Auto Zero. [AZR] button cancels Auto Zero.
5). Sensitivity adjustment	Amplification variable range: x3333 to x151 (EXC=10V) Span amount 0.15 to 3.3mV/V can output 4～20mA or 0～5V (If span amount is 0.6mV/V or more, 0 to 10V can be output) Standard sensitivity: Output 0～5V or 4～20mA when EXC=10V, 0～1mV/V input
Gain More	H (0.15 to 0.6mV/V) / L (0.6 to 3.3mV/V) (DIP switch)
Range	5 steps (DIP switch)
Span	Multi-turn trimmer adjustment (Coarse, Fine adjustment: 15 rotations each)
6). Voltage output	0 to ±5V (Load resistance 2kΩ or more) Bipolar output For spans amount 0.6mV/V or more, output of 0 to ±10V is possible.
7). Current output	4 to 20mA (Load resistance 510Ω or less) (corresponding to voltage output 0 to 5V)
8). Simultaneous output	Output voltage and current simultaneously. Because zero and span trimmer are common for both output, there is 0.2% error of conversion of voltage to current. (two trimmers on front panel are reserved to fine tune zero and span of current output)
9). Non linearity	±0.05%FS (±0.1%FS when EXC=2.5V)
10). Filter Characteristic	Selective from 2Hz to 7kHz, 12 frequencies Low pass filter, −12dB/oct. Range switch : L, ML, MH, H Multiple switch : x2, x5, x10

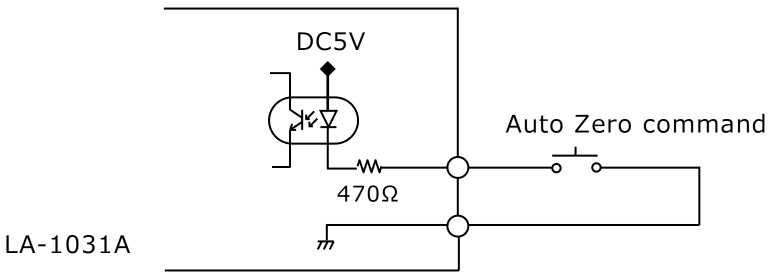
11). Temperature coefficient

Zero	±0.005% FS/℃ typ. (at standard sensitivity) (twice the above at EXC=5V, 4 times at EXC=2.5V)
Sensitivity	±0.005% FS/℃ typ. (±0.01% FS/℃ typ. at EXC=2.5V)

12). Check function — A pseudo input signal can be generated by pushing [CHECK] button. It is added to the input signal.
Can be set up to about 2.25mV/V about 0.15mV/V step.
(Temperature coefficient: 25ppm/℃ maximum)

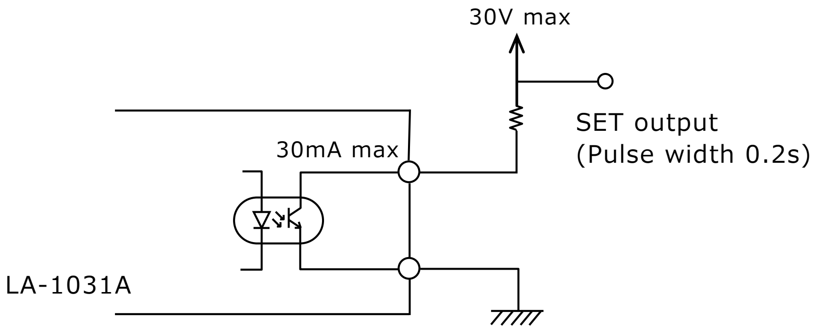
13). Switches — Two button switches
[AZ] operates Auto Zero
[AZR] cancels Auto Zero

14). External input — One bit (AZ)
One shot Make contact (Pulse width 0.2 second)



Equivalent input circuit

15). Control output — One bit (SET)
Open Collector output, negative logic, one bit one common
Isolated by photo coupler, NPN transistor
Collector – Emitter: ON when Make
Rated output: DC30V, 30mA (resistance load)
Saturation voltage between Collector and Emitter: 1.2V or less
Photo coupler, TLP-127, TOSHIBA or the equivalent.



Equivalent output circuit

8 – 3) Analog Auto Zero function

1). Auto Zero — Pushing [AZ] button for 3 seconds or external [AZ] input (0.2s one shot Make pulse) let output voltage within ±2.0V set to 0V. Output increase and decrease amount from that point.
Output should be stable for 0.5second before AZ operation.
[AZ] LED is turned ON while AZ operation
Pushing [AZR] button for 3 seconds cancel Auto Zero

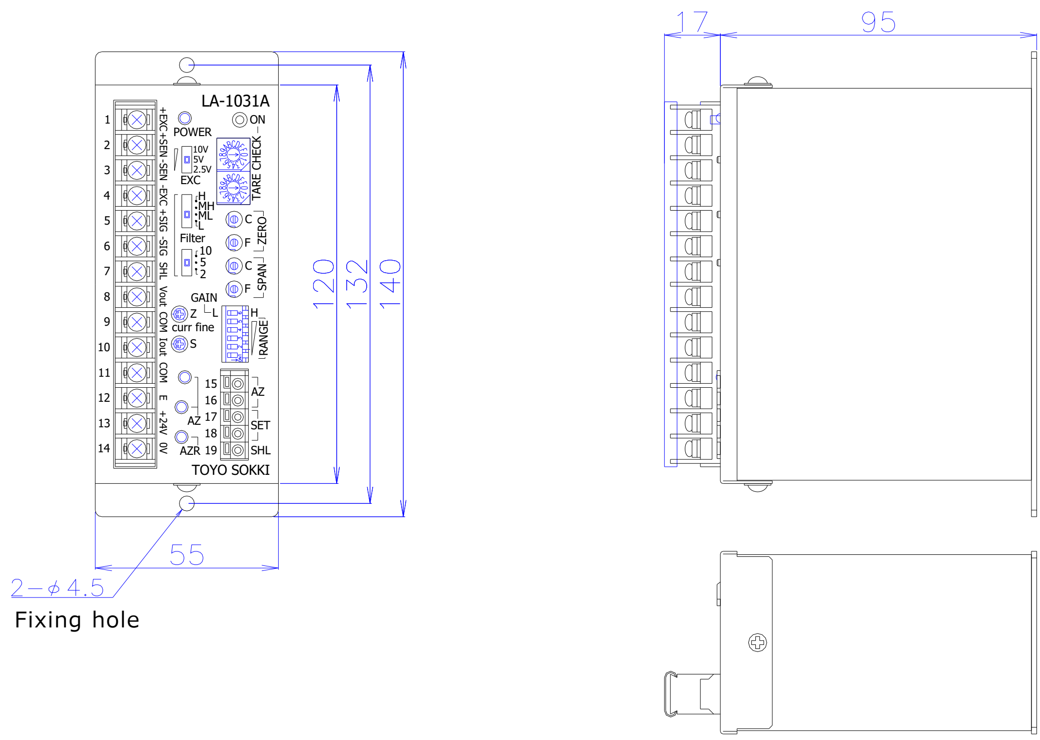
Time length to set AZ	less than 0.2 second
Resolution of AZ	less than 500μV or 1.6μA
Elimination accuracy	less than ±2mV or 6.4μA (maximum residual voltage or current after AZ operation)
Out of range operating AZ	If output is out of range of ±2.0V, ignore AZ, [AZ] LED starts to blink and keep it until the next successful AZ operation or pushing [AZR] button for 3 seconds.
Retain of AZ	Data of AZ is memorized in a non-volatile memory (FeRAM), AZ is kept operating even if this unit is turned power OFF/ON

2). Answer back (SET) — After input of AZ command, procedure done properly, output [SET] signal for 0.2 second as answer back. (Open Collector signal)
If it is out of operating range of AZ, ignore AZ, doesn't output [SET] signal. [AZ] LED starts to blink as an error indication.

8－4） General

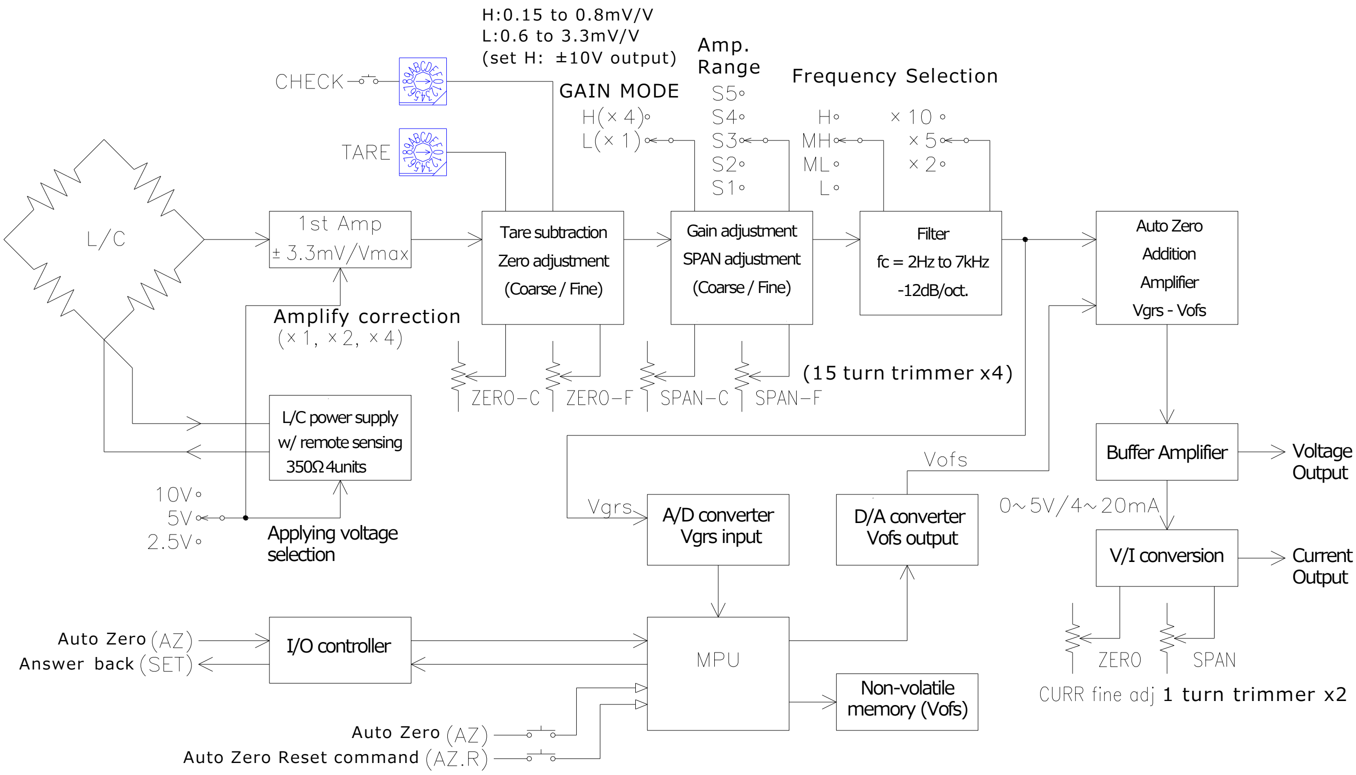
1). Power stability	±0.02% FS (Power supplied voltage fluctuation within±10%)
2). Power supplied voltage	AC85 to 264V, 50/60Hz as standard DC20 to 27V as option
3). Current consumption	0.6A typ.(AC100V), 0.4A typ.(AC200V), 0.5A typ.(DC24V)
4). Operating Temp./Humidity	0～＋40℃、20～85% R.H. without condensation
5). Store Temp./Humidity	−20～＋60℃、20～85% R.H. without condensation
6). Mass	approx. 0.7kg
7). Mounting method	Wall mount method Fix with M4 screw using 2-Φ4.5 of the base bracket

§9. Dimensional Drawing



Fixing hole

§10. Functional block diagram



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§11. Timing chart of Auto Zero (AZ) operation