

***Minebea***

***Transmitter***  
***CSA-591***

# **Instruction Manual**



## **FOREWORD**

Thank you very much for your purchasing our Transmitter CSA-591.


This manual explains installation procedures and connecting method and also operating method for the Transmitter CSA-591. Make use of it properly after reading through the manual carefully.


Be sure to deliver the manual to the end user. Moreover, the end user should keep the manual at hand after reading it over.

# Marks and arrangements used in this manual


The following marks are attached to the explanation on the matters that indicate “Don’t do this.”, “Take care.” and “For reference”.

Be sure to read these items where these marks are attached.

	<b>Warning</b> Warning may cause injury or accident that may harm to the operator. Don’t do these things described here.
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	<b>Caution during operation and working.</b> Be sure to read the item to prevent malfunction.
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Mark during operation.

	Press the switch.
--	-------------------

# For safe operation

Be sure to read this instruction manual before use.

## 1. Installation place



Use the instrument where the temperature/humidity specifies with the range as follows :

Environmental temperature : 0 to 50

Environmental humidity : Less than 80 %R.H. (Non condensing)

(1) Location where installation is not allowed.



Warning

Don't locate the instrument on the places as follows :  
It may cause an unexpected faulty in the instrument.

- Don't locate the instrument in direct sunshine and/or high temperature area.
- Don't use the instrument in a high humid area.
- Don't install the instrument where there are vibrations and shocks.
- Don't use the instrument where there is excess of dusts and fine particles.
- Don't use the instrument where there are corrosive gas and salt and like that.
- Don't install the instrument where there is rapid change of temperature and humidity.
- Don't install the instrument near the devices that are magnetized or generate an electromagnetic field.
- Don't install the instrument where the instrument may be affected by radioactivity or radial rays.
- Avoid the location where chemical reaction may take place such as in a laboratory, or like that.

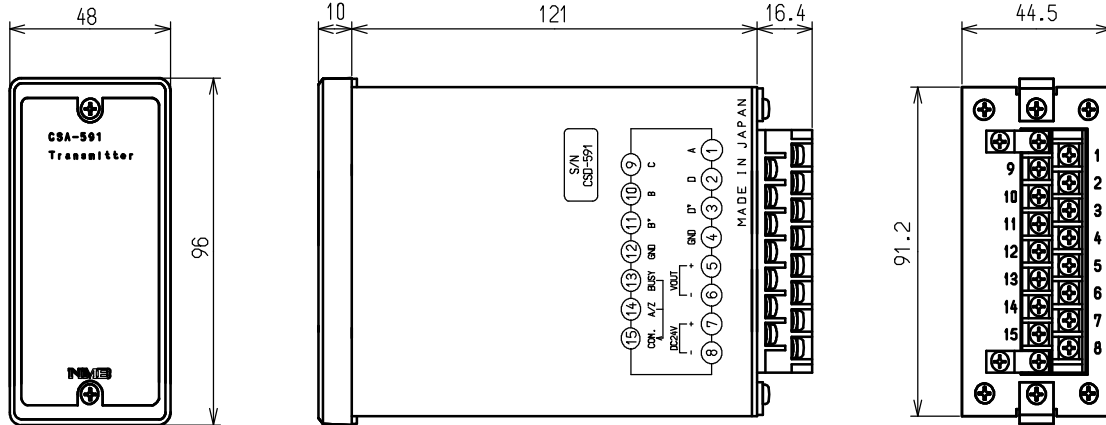
## (2) Installation



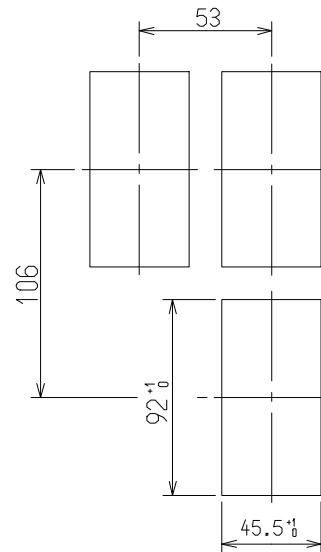
When installing the instrument, install as referring to the following figures and secure the space around the instrument.

Each dimensions of the instrument and required dimensions for the environmental spaces are as follows:

### Outline dimensions



### Panel cut size



Unit : mm

## 2. Power supply



Warning

Be sure to check that the power supply is off in connecting each cable. If the work is done while the power is on, there may have the case that electric shock to the operator or even may have damage to the instrument.



Warning

Before supplying the power, check that the indication of power supply voltage /specifications for the instrument and the power going to supply should be the same. If they are not equal, contact us.  
If you use the instrument without checking them, it may cause a damage in the instrument or electric shock to the operator.



Earth wire should be grounded securely.

When earth wire is not connected, it may cause a malfunction of the instrument or electric shock to the operator.

## 3. Application note



Warning

Before using a new instrument or exchanging the strain gage applied transducer for a new one, be sure to make calibration. If calibration will not be made, the correct measuring results may not be obtained nor which may cause malfunction in the instrument and there may exist damage in peripheral equipments.  
Besides, even though calibration has been made, there may occur the similar case when the results are not correct, so make calibration, again.



Warning

In case of using the instrument, check that the connections are executed properly. If not connected properly, the correct measuring result will not be obtained, nor it may cause malfunctions of the instrument, damage to the peripheral equipments or even more serious accidents.



Warning

When change of setting is made carelessly on the instrument during measurement, correct measured results may not be obtained and it may cause malfunction in the instrument and even have the possibility of damage in peripheral instruments.



Warning

Do not shock the instrument such as throwing something on it.  
If neglected, it may cause destruction of the parts and damage to the electrical circuits.

## History of revision

Date	Instruction manual No.	Details of revised point
Feb. 2006	DRW. NO.EN294-1141	First Version
Jan.2007	DRW. NO.EN294-1141-A	Due to ECN No.FN06-01050 - Correction - former name -> "tie bar gage"
Aug. 2007	DRW. NO.EN294-1141-B	Due to ECN No.FN07-02094 - Change - 4-3. Connection Extension cable "FA409-357"→"FA409-404"
Feb. 2010	DRW.No.EN294-1141-C	Due to ECN FN10-02026 - Change - Front cover's logo is changed.
Oct. 2010	DRW.No.EN294-1141-D	Due to ECN FN10-02140 - Change - Minebea logo is changed.
Feb. 2018	DRW.No.EN294-1141-E	Due to ECN FN17-02017 •Delete the company name in the cover page. •Delete the company name in the contents.
Mar. 2018	DRW.No.EN294-1141-F	Due to ECN FN18-02019 -Correction- INDEX P10 5-2 Calibration procedure ①CSA-591 calibration by the actual load → CSA-591 calibration procedure by the actual load ②CSA-591 (with automatically zero function) by the actual load.→CSA-591-99 (with automatically zero function calibration. procedure) by the actual load. 5-2-1. Calibration procedure by the actual load → CSA-591 Calibration procedure by the actual load P12 5-2-2 Electrical calibration by the actual load (CSA-591-99)→CSA-591-99 (with automatically zero function) calibration. procedure by the actual load. P13 Procedures -Correction drawing- P9 5-1. The front panel was removed. P12 The front panel was removed. P13 Procedures



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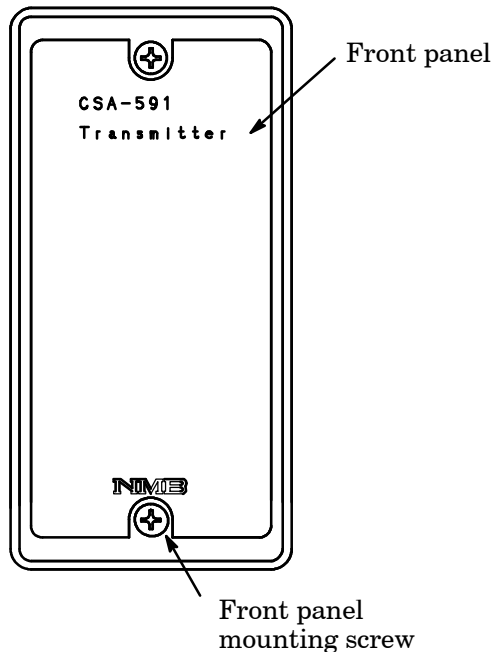


# 1. General

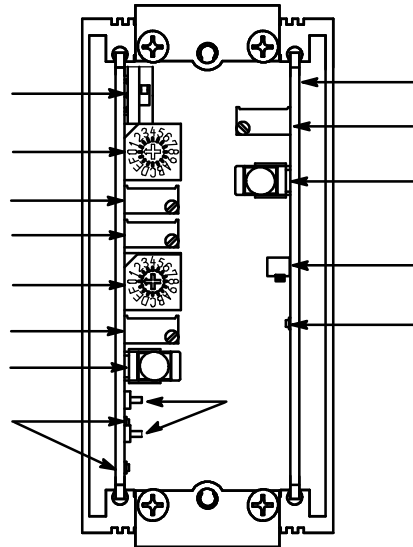
This instrument is a transmitter for the tie bar gage (350 ohm, 2 pieces one pair)

## 2. Name and function of each point

### 2-1. Front panel



The front panel was removed.



- ① “ZERO” adjustment polarity switch  
It is a polarity switch in executing zero adjustment.
- ② “ZERO” coarse adjustment rotary switch  
It is a rotary switch for zero coarse adjustment.
- ③ “ZERO” coarse adjustment trimmer  
It is a trimmer for zero coarse adjustment.
- ④ “ZERO” fine adjustment trimmer  
It is a trimmer for zero fine adjustment.
- ⑤ “GAIN” coarse adjustment rotary switch  
It is a rotary switch for sensitivity coarse adjustment.
- ⑥ “GAIN” fine adjustment trimmer  
It is a trimmer for sensitivity fine adjustment.
- ⑦ CAL switch  
CAL value is output when switch is turned on.
- ⑧ LED  
When both LED are turned off, the analog output is within some  $\pm 50\text{mV}$ .
- ⑨ Check pin of analog output  
The same voltage as V-OUT of the back terminal is output.

⑩ PC board for automatic zero as an option

When model CSA-591 is specified, PC board for automatically zero is not attached.

When model CSA-591-99 is specified as an option, it is attached.

⑪ Trimmer for adjusting automatic zero comparator

It is adjusted at the shipment from factory. Don't turn it.

⑫ Switch of ON for automatically zero

A/Z (Automatically zero) operates by turning ON.

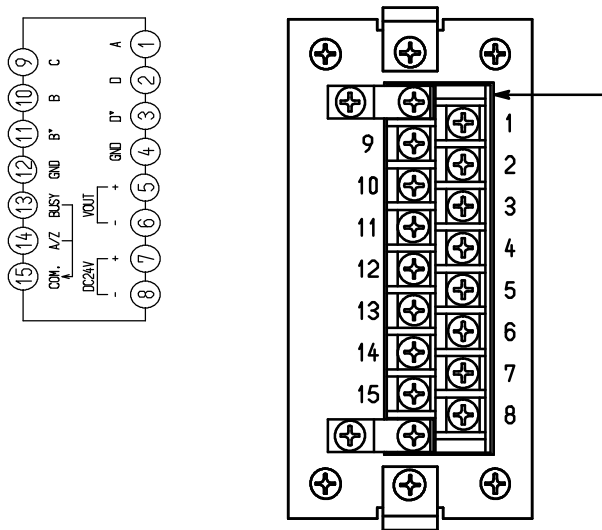
⑬ Switch of OFF for automatically zero

The voltage in which the voltage of PC board for automatically zero is subtracted by turning OFF is output. It is used when the initial zero is adjusted.

⑭ LED

It lights on while the automatically zero is working.

## 2-2. Rear panel



① Terminal block

It is a terminal block for gage, voltage output, power supply, A/Z, BUSY and COM.

### 3. Installation method

#### 3-1. Installation place



Use the instrument where the temperature/humidity specifies with the range as follows :

Environmental temperature : 0 to 50

environmental humidity : Less than 80 %R.H. (Non condensing)

#### 3-2. Location where installation is not allowed



Warning

Don't locate the instrument on the places as follows :

It may cause an unexpected faulty in the instrument.

- Don't locate the instrument in direct sunshine and/or high temperature area.
- Don't use the instrument in a high humid area.
- Don't install the instrument where there are vibrations and shocks.
- Don't use the instrument where there is excess of dusts and fine particles.
- Don't use the instrument where there are corrosive gas and salt and like that.
- Don't install the instrument where there is rapid change of temperature and humidity.
- Don't install the instrument near the devices that are magnetized or generate an electromagnetic field.
- Don't install the instrument where the instrument may be affected by radioactivity or radial rays.
- Avoid the location where chemical reaction may take place such as in a laboratory, or like that.

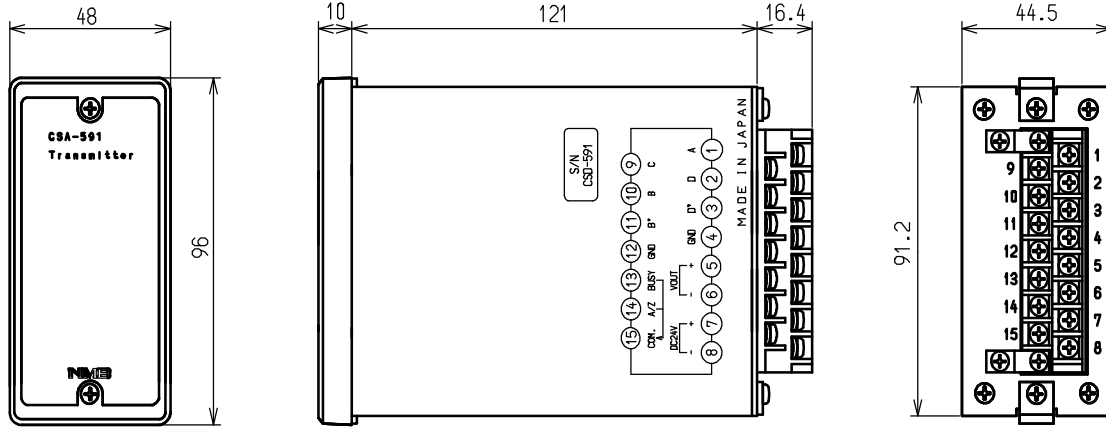
### 3-3. Installation



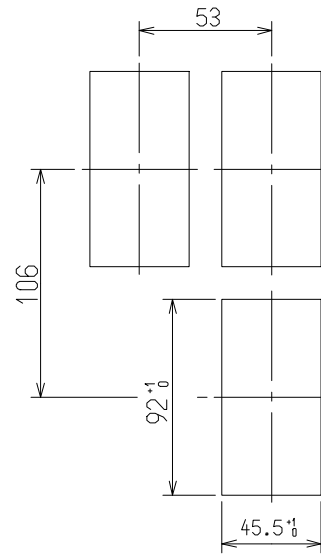
When installing the instrument, install as referring to the following figures and secure the space around the instrument.

Each dimensions of the instrument and required dimensions for the environmental spaces are as follows:

Outline dimensions



Panel cut size



Unit : mm

## 4. Connecting method

### 4-1. Layout of the terminal boards

The layout of each signal of the terminal block is shown in the following table. :

- Terminal block

	Terminal	Description	Application
1	A	Input 1 connecting terminal (RED)	Tie bar gage is connected.
2	D	Output 1-1 connecting terminal (BLU)	
3	D'	Output 1-2 connecting terminal (WHT)	
4	GND	Shield (Connected internally with terminal No.12 )	Shield of gage is connected. D class single grounding.
5	VOUT +	Voltage output terminal ( + )	Voltage output.
6	VOUT -	Voltage output terminal ( - )	
7	DC24 V +	Power supply input terminal ( + )	DC24 V is connected.
8	DC24 V -	Power supply input terminal ( - )	
9	C	Input 1 connecting terminal (RED)	Tie bar gage is connected.
10	B	Output 1-1 connecting terminal (BLU)	
11	B'	Output 1-2 connecting terminal (WHT)	
12	GND	Shield (Connected internally with terminal No.4)	Shield of gage is connected. D class single grounding.
13	BUSY	Output terminal for BUSY signal	Open collector output with approx.400 ms as an option
14	A/Z	Connecting terminal for external automatically zero	external automatically zero as an option
15	COM	Common terminal for BUSY/A/Z	



Terminal No. 4 for “GND” and terminal No.12 for “GND” are connected internally.  
Take the D class single ground for No.4 or No.12.

## 4-2. Note on connection



### Warning

In case of connection with the instrument, keep strictly to the following items. If neglected, it may cause an unexpected failure or a damage to the instrument.

- Be sure to set the power supply to OFF, when the connection is made.
- Since the terminal block at the front of the instrument is made of resin, take care not to drop it down or not to apply strong impact.
- The tightening torque of the screw on the terminal block is 0.8 N·m at the maximum.
- Crimp terminal that suits the terminal block of this unit is shown in the table below.

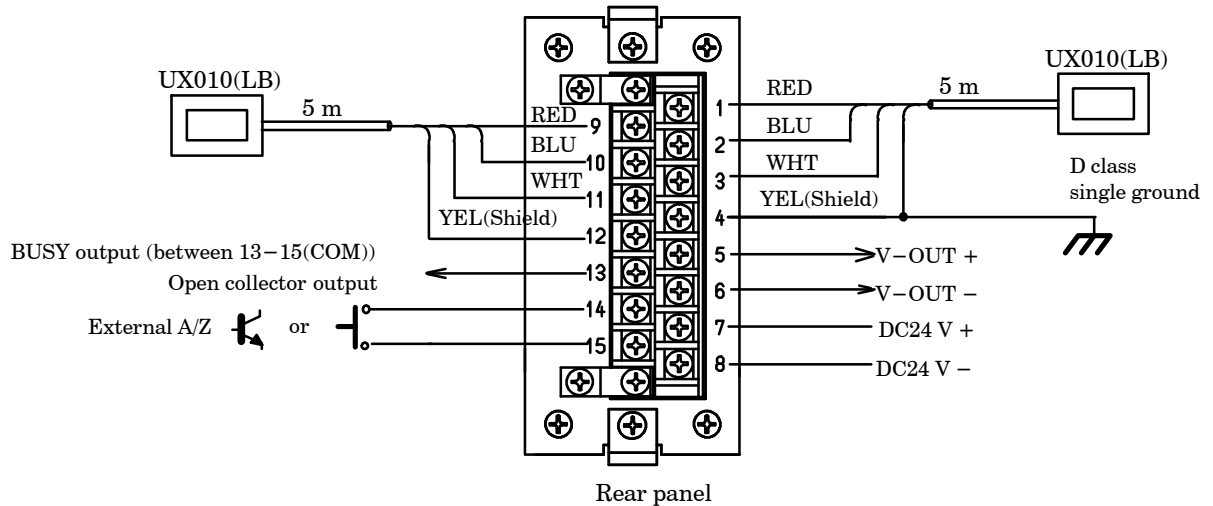
Width of Crimp terminal	Suitable crimp terminal
6.0 mm or less	1.25-3, or Y-type 1.25-3.5

- Connecting cable with the instrument should be away from the noise source such as power supply line and/or I/O line for control and so on as far as possible.
- All of the connections should be executed securely by referring to the Instruction manual for the instrument.



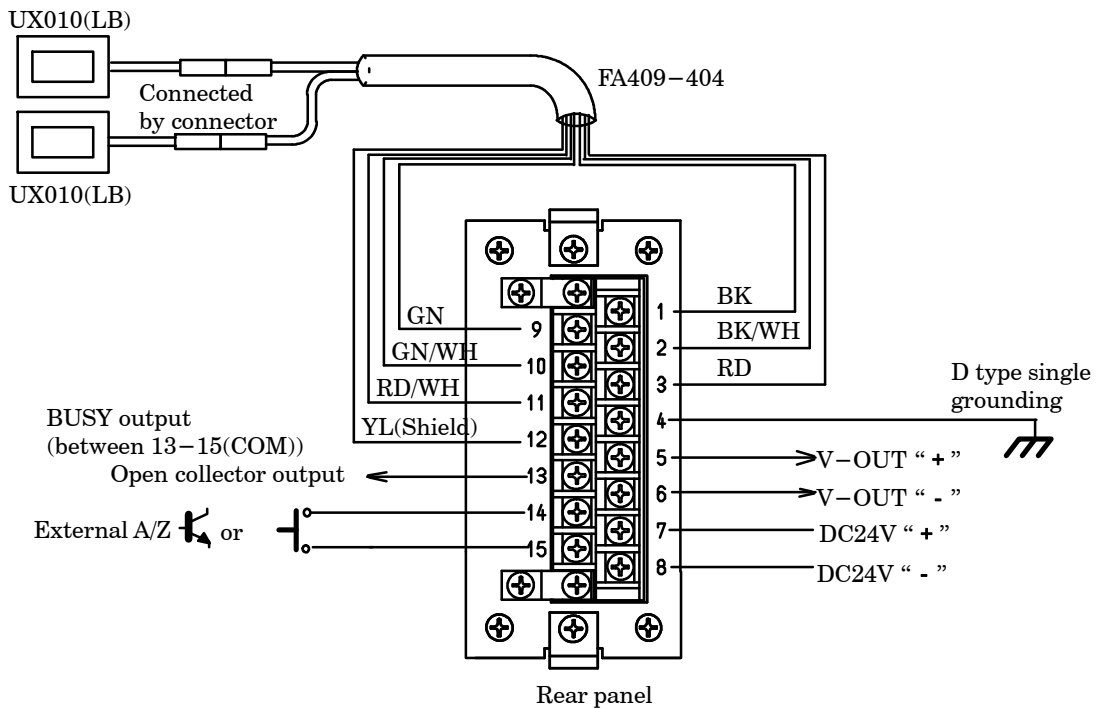
### 4-3. Connection

(1) When tie bar gage model UX010(LB)(LB) is used.



(Terminal No.4 and No.12 are shortened internally.)

(2) When tie bar gage model UX010(LB) with extension cable model FA409-404 is used.



Warning

Connection with external control input should be made securely according to the figures. If neglected, it may cause an unexpected failure and/or malfunction to the instrument.



For the connection with external control input/output, be sure to apply shielded cable, and shielded cable should be connected with the GND terminal (Terminal No.4 or No.12) If not connected, it may cause malfunction due to the effects from external noises and so on.

#### 4-3-1. Connection of power supply and ground

Please connect the power supply and the ground (GND) as shown in the figure.

Grounding should be the D class with single earth.

Power supply voltage                      DC24 V (DC18 V to DC36 V)

Power consumption                         Approx. 0.15 A (at DC24 V)



#### Warning

Connections with voltage outputs should be made securely according to the figures and also within specified load resistance. If neglected, it may cause an unexpected failure and/or malfunction to the instrument.



For the connections with voltage outputs, be sure to apply shielded cable, and the shielded cable should be connected with the F.G. terminal of the instrument. If not connected, it may cause malfunction due to the effects from external noises and so on.

## 5. Calibration procedure



### Warning

Before using the new instrument or after exchanging the tie bar gage, be sure to make calibration. If calibration is not made, the correct measured results may not be obtained, or it may cause malfunction to the instrument and it may damage the peripheral equipment. Moreover, even if the calibration has made already, there may occur the similar case as above when the result is not correct. So make precise calibration again.



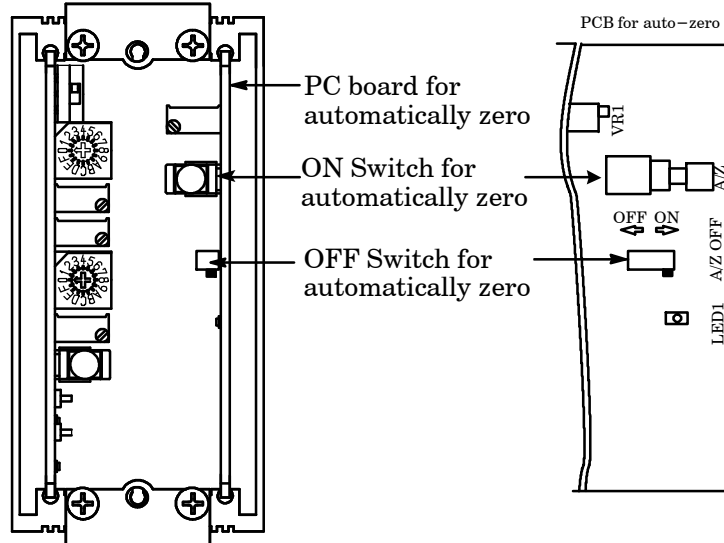
### Warning

When you connect the tester and digital volt meter, etc., please connect them correctly before turning on the power supply.

### 5-1. Preparation

- ① According to the “4. Connection method”, connect this unit and a tie bar gage correctly, and turn on the power.
- ② In case of CSA-591-99 (with automatically zero function), begin the adjustment after set the condition to turn off that function.

The front panel was removed.

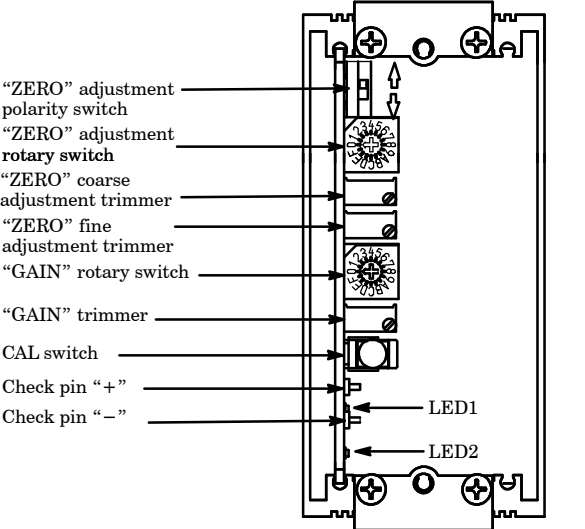
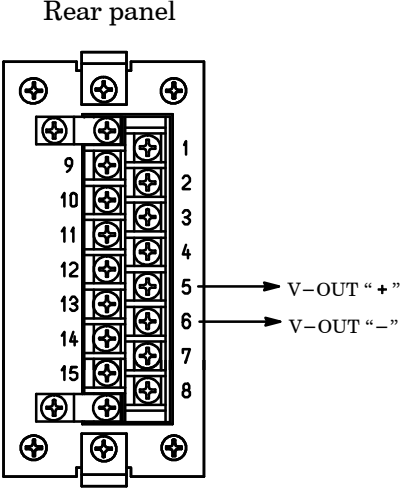



## 5-2. Calibration procedure

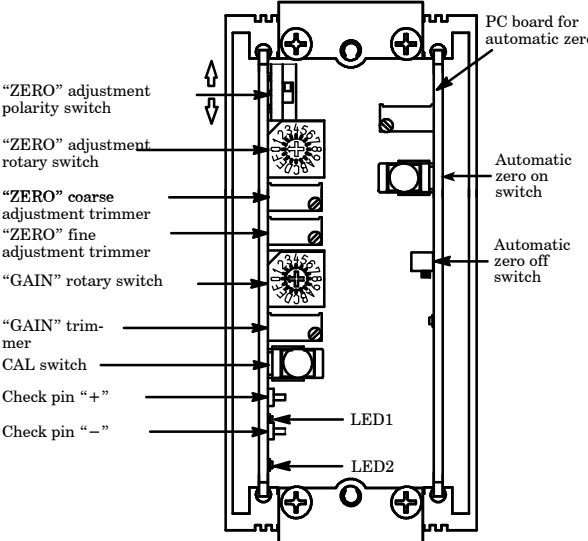
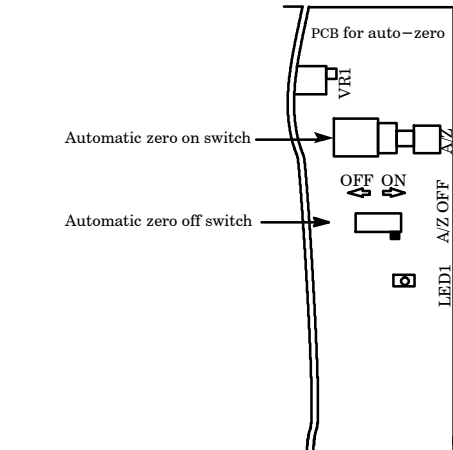

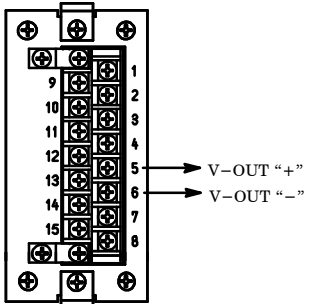
The explanation of actual load calibration procedures for this unit are two as follows:


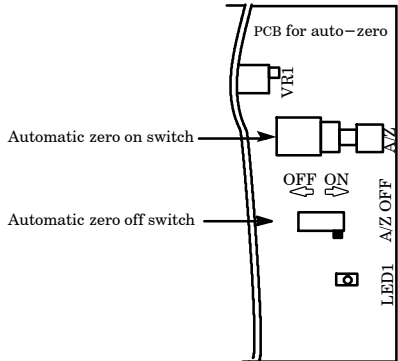
- ① CSA-591 calibration procedure by the actual load 5-2-1
- ② CSA-591-99 (with automatically zero function) calibration procedure by the actual load. 5-2-2.

### 5-2-1. CSA-591 Calibration procedure by the actual load.

	Procedures	
1	<p>Set the gage onto tie bar, etc.            Connect the digital volt meter, tester, etc., between “+” and “-” of the check pin, or between “+” and “-” of the voltage output at rear panel.            Set the gage to the condition of zero adjustment.            Set the rotary switch for zero adjustment to the position of zero.</p>	<p>The front panel was removed.</p> 
2	<p><b>Zero adjustment</b>            Confirm whether the output voltage can be adjustable to <math>\pm 0.2</math> V or less by turning coarse adjustment trimmer.</p> <ol style="list-style-type: none"> <li>① Adjustable              Adjust the output voltage to approx. <math>\pm 0.2</math> V or less by “ZERO” coarse adjustment trimmer, and then adjust the output voltage to 0.000 V by “ZERO” fine adjustment trimmer.</li> <li>② Not adjustable              Set the “ZERO” adjustment rotary switch at the position in which the output voltage becomes <math>\pm 10</math> V or less.              When the output voltage does not change, set the “ZERO” adjustment polarity switch to the position which the output voltage becomes <math>\pm 10</math> V or less. After that, set the output voltage to approx. <math>\pm 0.2</math> V or less by “ZERO” coarse adjustment trimmer, and adjust the output voltage to 0.000 V by “ZERO” fine adjustment trimmer.</li> </ol> <ul style="list-style-type: none"> <li>• When both LED1 and LED2 is turned off, the output voltage outputs approx. <math>\pm 50</math> mV or less.</li> <li>• When LED1 lights on, the output voltage is approx. <math>+50</math> mV or more. When LED2 lights on, the output voltage is approx. <math>-50</math> mV or more.</li> </ul>	
3	<p><b>Sensitivity adjustment</b></p> <ol style="list-style-type: none"> <li>① Take the rated load to the gage, and turn the “GAIN” rotary switch so that the output voltage may approach 10.00 V most.</li> <li>② Adjust the output voltage to 10.000 V by using the “GAIN” trimmer.</li> </ol> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> The sensitivity adjustment range is <math>\pm 10</math> V of output voltage at the input of <math>\pm 300</math> <math>\mu</math> ST to <math>\pm 2000</math> <math>\mu</math> ST.</p> </div>	

Procedures		
4	<p>Zero adjustment and Sensitivity adjustment</p> <p>① Remove the rated load which put on in step 3, and confirm the zero of output voltage. When zero shifts, adjust zero by executing step 2.</p> <p>② Put the rated load on the gage again, and confirm the sensitivity. When sensitivity shifts, adjust the sensitivity by executing step 3</p>	<p>The front panel was removed.</p>
5	<p>Confirm the CAL value</p> <p>When the transmitter is replaced, it is possible to adjust the sensibility of the replaced transmitter in almost the same state of the calibration when CAL switch is turned on and the output voltage is recorded.</p>	
6	<p>Complete the calibration</p>	<p>Rear panel</p>

	Procedures	
1	<p>Set the gage to the tie bar.                      Connect the tester, digital voltage meter, etc., between “+” and “-” of the check pin, or between V-OUT “+” and “-” of the voltage output in the rear panel.                      Set the automatic zero off switch to the OFF side.                      Set the gage to the condition for adjusting zero.                      Set the “ZERO” adjustment rotary switch to zero position.</p>	<p>The front panel was removed.</p>  <p>Labels in diagram: “ZERO” adjustment polarity switch, “ZERO” adjustment rotary switch, “ZERO” coarse adjustment trimmer, “ZERO” fine adjustment trimmer, “GAIN” rotary switch, “GAIN” trimmer, CAL switch, Check pin “+”, Check pin “-”, LED1, LED2, PC board for automatic zero, Automatic zero on switch, Automatic zero off switch.</p>
2	<p><b>ZERO adjustment</b>                      Confirm whether the output voltage can be adjustable to approx. <math>\pm 0.2</math> V or less by “ZERO” coarse adjustment trimmer.</p> <p>① Adjustable case                      Adjust the output voltage to approx. <math>\pm 0.2</math> V or less by “ZERO” coarse adjustment trimmer, and then adjust the output voltage to 0.000 V by “ZERO” fine adjustment trimmer.</p> <p>② Not adjustable case                      Set the “ZERO” adjustment rotary switch at the position in which the output voltage becomes <math>\pm 10</math> V or less.                      When the output voltage does not change, set the “ZERO” adjustment polarity switch to the position which the output voltage becomes <math>\pm 10</math> V or less. After that, set the output voltage to approx. <math>\pm 0.2</math> V or less by “ZERO” coarse adjustment trimmer, and adjust the output voltage to 0.000 V by “ZERO” fine adjustment trimmer.</p> <ul style="list-style-type: none"> <li>• When both LED1 and LED2 are turned off, the output voltage outputs approx. <math>\pm 50</math> mV or less.</li> <li>• When LED1 lights on, the output voltage is approx. <math>+50</math> mV or more. When LED2 lights on, the output voltage is approx. <math>-50</math> mV or more.</li> </ul>	 <p>Labels in diagram: PCB for auto-zero, VRI, Automatic zero on switch, OFF ON, Automatic zero off switch, LED1, LED2.</p>
3	<p><b>Sensitivity adjustment</b></p> <p>① Take the rated load to the gage, and turn the “GAIN” rotary switch so that the output voltage may approach 10.00 V most.</p> <p>② Adjust the output voltage to 10.000 V by using the “GAIN” trimmer.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> The sensitivity adjustment range is <math>\pm 10</math> V of output voltage at the input of <math>\pm 300 \mu</math> ST to <math>\pm 2\,000 \mu</math> ST.</p> </div>	<p>Rear panel</p>  <p>Labels in diagram: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, V-OUT “+”, V-OUT “-”.</p>
4	<p><b>Zero adjustment and Sensitivity adjustment</b></p> <p>① Remove the rated load which put on in step 3, and confirm the zero of output voltage. When zero shifts, adjust zero by executing step 2.</p> <p>② Put the rated load on the gage again and confirm the sensitivity. When sensitivity shifts, adjust the sensitivity by executing step 3.</p>	

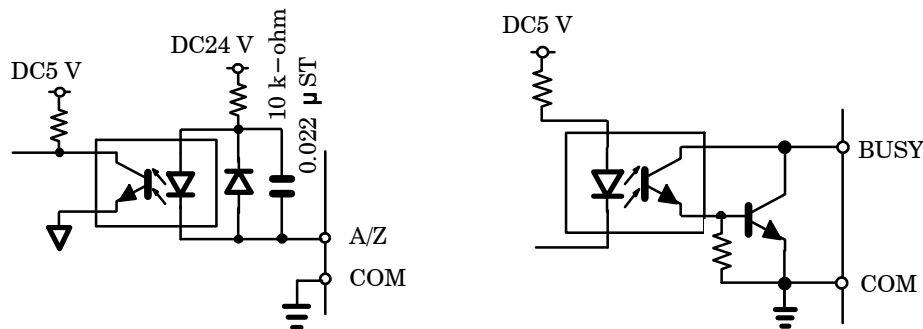
Procedures		
5	<p>Confirm the CAL value</p> <p>When the transmitter is replaced, it is possible to adjust the sensitivity of the replaced transmitter in almost the same state of the calibration when CAL switch is turned on and the output voltage is recorded.</p>	
6	<p>Set the automatic zero off switch to ON side.</p> <p>Turn on the automatic zero on switch (or external automatic zero).</p> <p>Calibration is completed.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  Any difference of automatic zero is changed depending on the input condition (noise etc.).         </div>	 <p>The diagram shows a PCB for auto-zero with the following components and labels:</p> <ul style="list-style-type: none"> <li><b>PCB for auto-zero</b>: The main board.</li> <li><b>VRL</b>: A component at the top.</li> <li><b>Automatic zero on switch</b>: A switch with 'OFF' and 'ON' positions, indicated by arrows.</li> <li><b>Automatic zero off switch</b>: A switch with 'OFF' and 'ON' positions, indicated by arrows.</li> <li><b>LED1 A/Z OFF</b>: An LED indicator.</li> </ul>

## 6. Options

### 6-1. Automatic zero (CSA591-P99)

- (1) Operational range of automatic zero: Approx.  $\pm 2\,000\ \mu\text{ST}$
- (2) Required time of automatic zero : Approx. 500 ms
- (3) Accuracy of automatic zero : within  $\pm 20\ \text{mV}$
- (4) Battery backup time : Approx. 10 years in the room temperature  
(Using lithium electric cell battery)
- (5) External input of automatic zero : 1 point
- (6) BUSY output : Output while the operation of automatic zero  
Open collector output  $V_{ce} = \text{DC}30\ \text{V}$   $I_c = 20\ \text{mA}$

#### 6-1-1. Equivalent circuit of input/output section



#### 6-1-2. Function

- (1) Automatic zero ON :  
Automatic zero function works when the connection between A/Z and COM is shorted for about 50 ms or more, and the voltage output becomes zero after about 500 ms. However, the difference of automatic zero is changed depending on the input condition (external noise etc.).



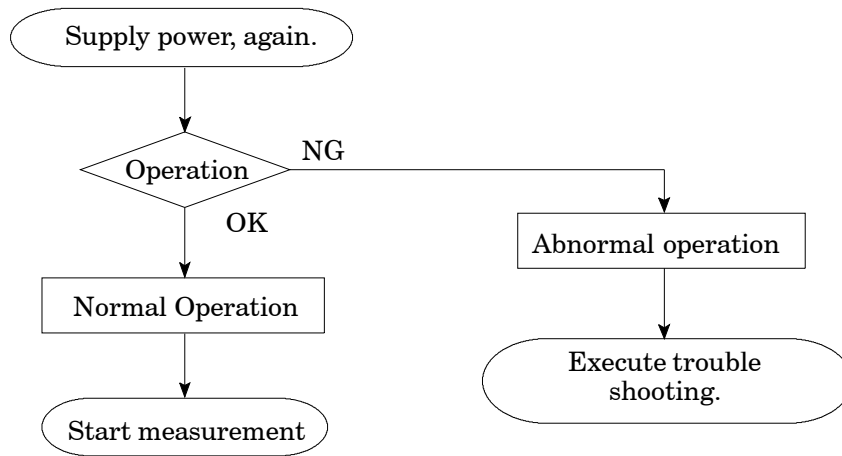
The operation of automatic zero ON is executed after the input signal is shorted for about 50 ms or more.

When the condition changes in the external control, please confirm the timing with the actual system, and also please meet the timing by the timer processing if necessary.

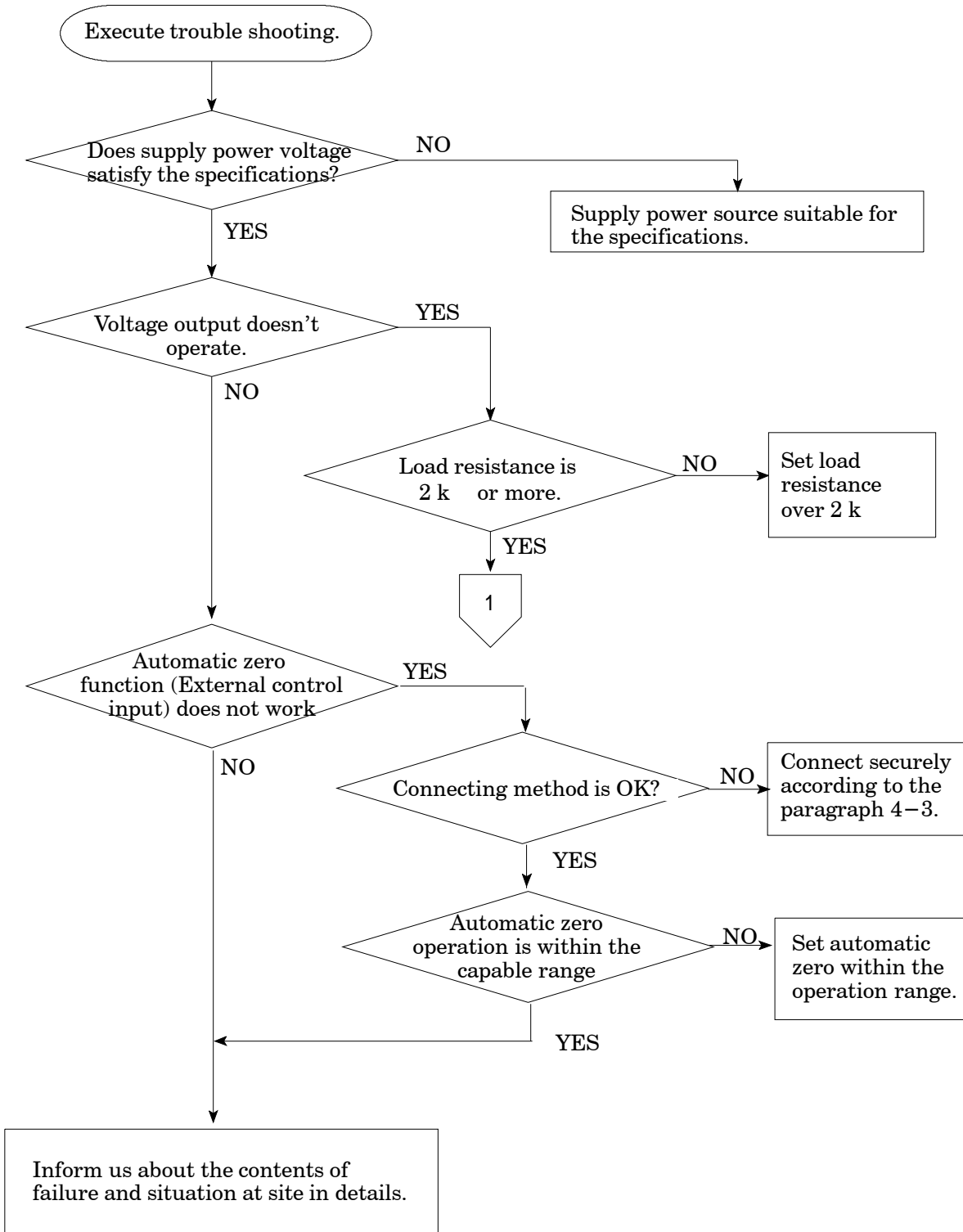


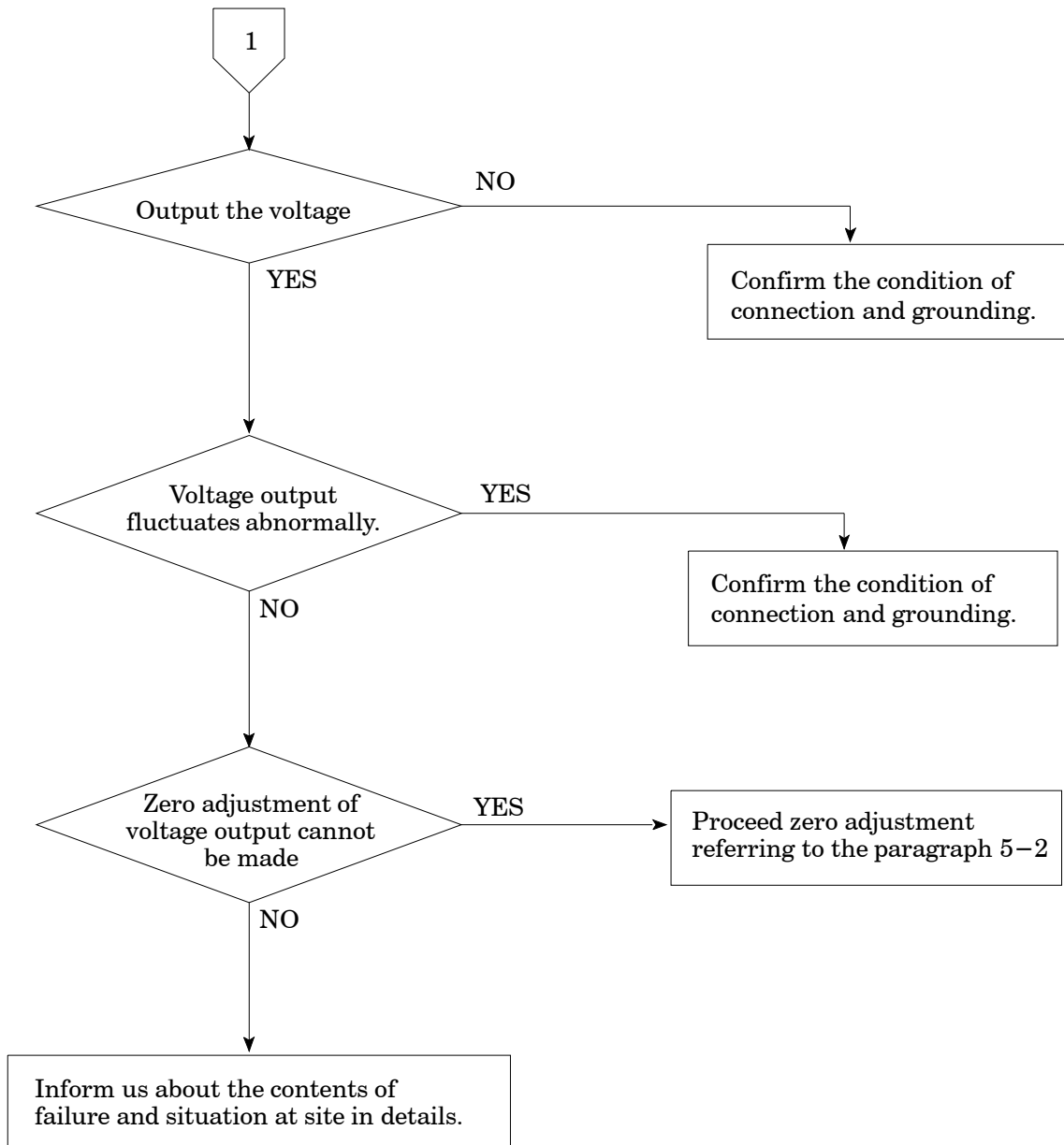
## 7. Trouble shooting

When abnormal point(s) is/are found during the operation of the instrument, check by the following procedures. However, when you can't find any applicable item nor solve the symptom of trouble even after you have taken some measures, contact us.



## 7-1. Execute trouble shooting





## 8. Specifications

### 8-1. Specifications

- Bridge power supply DC8 V  $\pm$  0.3 V within 30 mA
- Applicable transducers Tie bar gage (350 ohm type 2 pieces one pair) is connectable.
- Input range  $\pm$  300 micro-ST to  $\pm$  2 000 micro-ST
- Output voltage DC  $\pm$  10 V
- Output load resistance 2 k or more
- Zero adjustment range
  - Coarse adjustment Approx.  $\pm$  10 000 micro-ST adjustable by 16 steps of rotary switch
  - Fine adjustment Approx.  $\pm$  3 000 micro-ST adjustable by coarse/fine trimmer
- Sensitivity adjustment range
  - Coarse adjustment Adjustable by 16 steps of rotary switch
  - Fine adjustment Adjustable by trimmer
- Non-linearity 0.1 %F.S.
- Temperature coefficient
  - Zero point  $\pm$  10  $\mu$  V/ (Input conversion)
  - Sensitivity  $\pm$  0.05 %F.S./
- CALIB 300 micro-ST  $\pm$  15 micro-ST 1 point
- Frequency response range Approx. 100 Hz or approx. 30 Hz  
(Selectable by dip switch on PC board)

### 8-2. General specifications

- Operating temperature/humidity range
  - Temperature 0 to 50
  - Humidity Less than 80 %RH (Non condensing.)
- Power supply voltage DC24 V (DC18 V to DC36 V)
  - Current Approx. 0.15 A or less (at DC24 V)
- Outline dimensions W x H x D : 48 mm x 96 mm x 131 mm
- Weight Approx. 0.5 kg
- Terminals 236-110(WAG0) : CN1

### 8-3. Standard specification at the shipment

- Sensitivity 10 V output at the input of 300 micro-ST
- Frequency response range Approx. 100 Hz

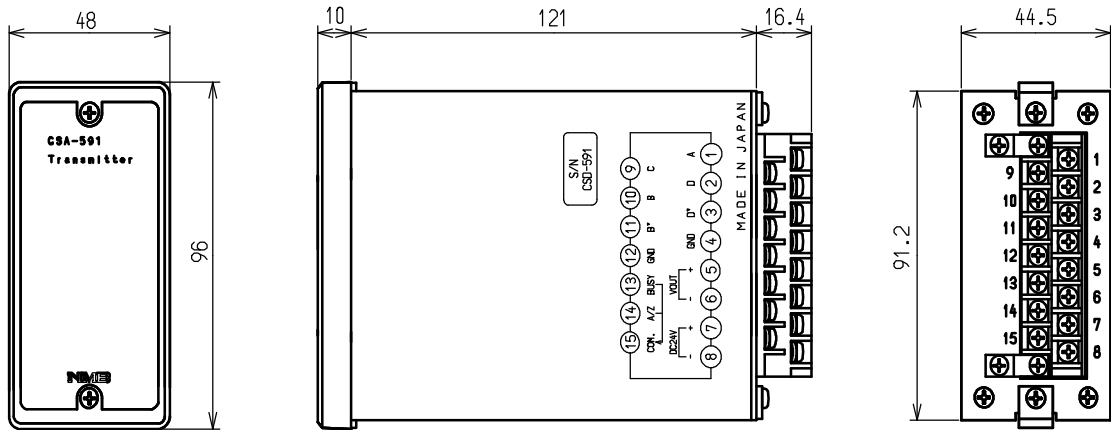
### 8-4. Accessories

- Instruction manual 1 piece
- Minus driver(small) 1 piece

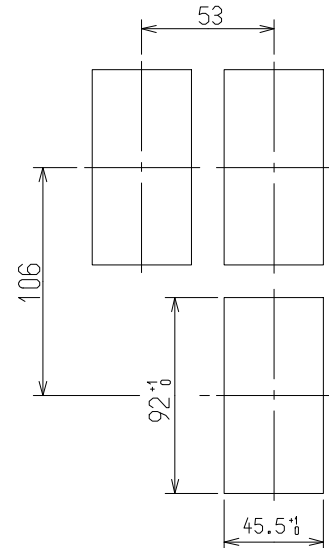
### 8-5. Option

- |                                  |   |
|----------------------------------|---|
| • Parts No.                      | CSA591-P99  |
| • Automatic zero range           | $\pm 2\,000\text{micro-ST}$   |
| • Automatic zero processing time | within approx. 500 ms   |
| • Accuracy of automatic zero     | within 20 mV/V  |
| • Battery backup time            | Approx. 10 years in the room temperature<br>(Lithium electric cell battery use) |
| • External automatic zero input  | 1point  |
| • BUSY output                    | 1 point output during the operation of automatic zero.<br>Open collector output |

### 8-6. Outline dimensions



Panel cut size



Unit : mm

## 9. Warranty

### 9–1. Warranty

- The instrument is covered by a warranty for a period of one year from the date of delivery.
- As for repairs and/or after service is required during the period of warranty, contact our sales office or sales agent from which you have purchased.

### 9–2. Repair

Before asking repairs, make checks once again that the connection, setting and adjustment for the instrument have finished properly by referring to 9. Trouble shooting.

Especially, make checks whether the connections of gages are disconnected or cut off.

After that, still there may be found some defects in the instrument, contact our sales office or sales agency from which you have purchased.



●The contents of this manual may subject to change without notice.

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