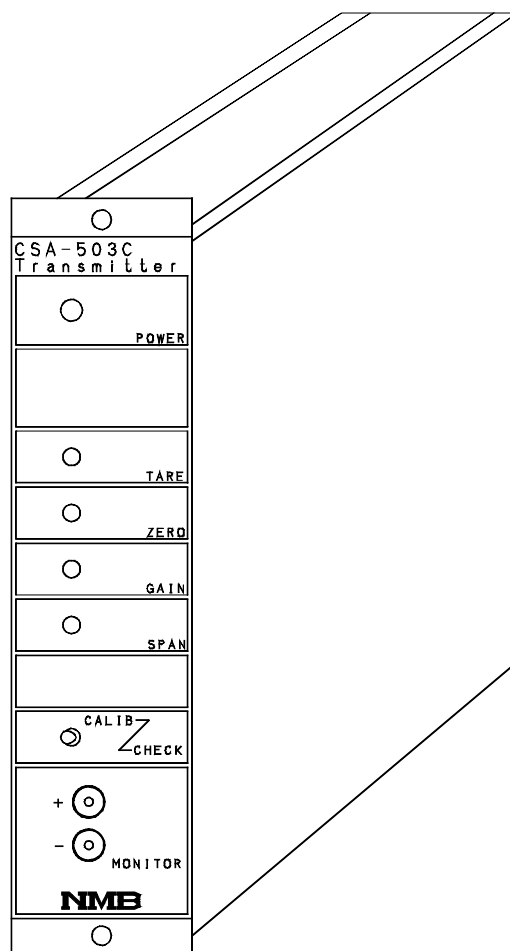


Minebea

MINEBEA CO., LTD.

Instruction manual

TRANSMITTER CSA-503C



Note: Please read this Instruction Manual carefully before use.

Be sure to follow the items that require attention described in the Manual.

Keep the Manual at hand so that you can pick it up read it as soon as necessity requires.

EN294-1041I

FORWARD

Thank you very much for your purchasing Minebea Transmitter CSA-503C. This manual explains installation procedures and connecting method and operating method for Transmitter CSA-503C. Use properly after reading through the manual carefully.

This manual is intended for technical experts to read. Be sure to deliver the manual to the end user. Moreover, the end user should keep the manual at hand after reading over it.

- **The contents of the manual may subject to change without notice.**
- **The instrument is covered by a warranty for a period of one (1) year from the date of delivery.**

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.



Warning

- Warning that may cause injury or accident that may harm to the operator. Don't do these things described here.



- Caution during operating and working.

Be sure to read the item to prevent malfunction.

For safe operation

Be sure to read this manual before use.

1. Installation place



- Use the instrument where the temperature/humidity specifies within the range as follows.

Environmental temperature: $-10\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$

Environmental humidity : 20 % to less than 80 % R.H.
(Non-condensing.)

(1) Places where installation is not allowed.



Warning

- Do not locate the instrument on the places such as follows:
It causes unexpected faulty in the instrument.

- Don't use the instrument in a high humid area.
- Don't locate the instrument in direct and/or high temperature area.
- Don't install the instrument where there is high mechanical vibration.
- Do not use the instrument where there are excess of dusts and fine particles.
- Do not install the instrument where there is rapid change of temperature and humidity.
- Do not install the instrument near the devices that become magnetized or generate an electromagnetic field.
- Avoid the location where chemical reaction may cause such as in a laboratory or like that.

(2)Installing the instrument



- When installing the instrument, secure the space around the instrument.



- Warning** ●In order to prevent from damage to the instrument and electric shock to the operator, be sure to check the following point.

- Be sure to check that power supply is off when installing/removing the power supply cable or connecting cable.

2.Power supply



- Warning** ●It's very dangerous for you to operate electric instrument, so take care of yourself not to be injured.

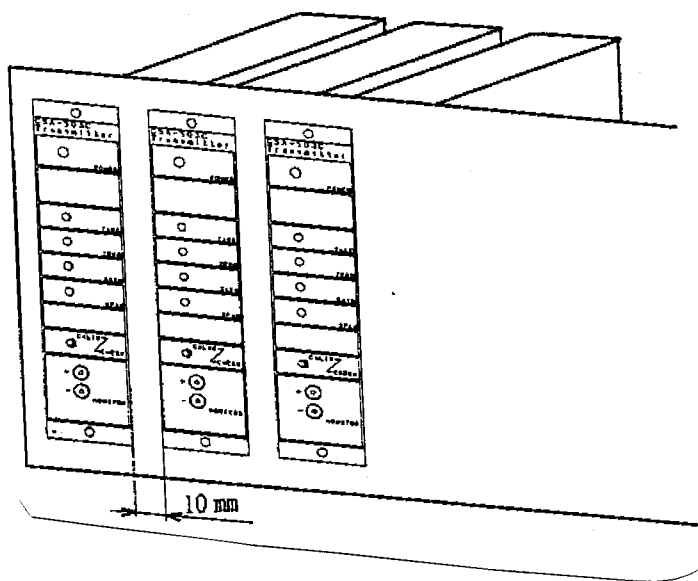
- Permissible range for power supply voltage is from 90 VAC to 110 VAC. (50/60 Hz)
(Standard voltage is 100 VAC.)
- Be sure to check the indication for power supply voltage for the instrument.
If you find unclear points, please contact with Minebea.

(2)Installing the instrument



- When installing the instrument, secure the space around the instrument.

- When using with the control panel or like that, we recommend you to prepare an electric fan to prevent from temperature rise.
- When using the instruments with multi-channels, we also recommend to install each instrument with some spaces as 10 mm between them.



- Warning** ● In order to prevent from damage to the instrument and electric shock to the operator, be sure to check the following point.

- Be sure to check that power supply is off when installing/removing the power supply cable or interface cable.

2.Power supply



- Warning** ● It's very dangerous for you to operate electric instrument, so take care of yourself not to be injured.

- Permissible range for power supply voltage is from 90VAC to 110VAC.(50/60 Hz)
(Standard voltage is 100VAC.)
- Be sure to check the indication for power supply voltage for the instrument.
If you find unclear points, please contact with Minebea.

Record of Revision

Date	Instruction NO,	Revised reasons(content)	Remarks
NOV, 1992	DRW.NO. 11294-1041	FIRST VERSION	
FEB, 1996	DRW.NO. 11294-1041A	Due to classifications of documents for ISO.	
NOV, 1997	DRW.NO. 11294-1041B	According to the documents of FN97-2102.	
MAY, 1999	DRW.NO. EN294-1041C	Due to the documents of FN99-2056.: "Recycled papers"	
SEPT, 2001	DRW.NO. EN294-1041D	ECN No. FN01-02134 -Change- : Operating temperature range "0°C to 50°C" → "-10°C to 50°C"	
DEC, 2003	DRW.NO. EN294-1041E	ECN No. FN03-02176 -Addition- :6-5 "When the condition changes by the external control, check the timing at the time of change with the instrument (amplifier) thoroughly and also adjust the timing by the timer process as necessity requires". -Change- :8. Option Battery back-up time : Changed to "Approx. 5 years".	
JUN, 2005	DRW.NO. EN294-1041F	ECN No. FN05-02035 -Addition- :3-1 "At the warning column in the wiring section, as there is a case that standard wiring color is different, please confirm the inspection data sheet of the load cell being used." is added.	
MAR, 2006	DRW.NO. EN294-1041G	ECN No. FN01-02188A -Addition- : In the case of multi-channel, we recommend using with some spaces between the instruments not to raise temperature around. ECN No. FN06-02031 -Correction- In the chapter 9.Outline dimensions, hole work indication has changed at Panel cut dimensions.	

*** CONTENTS ***

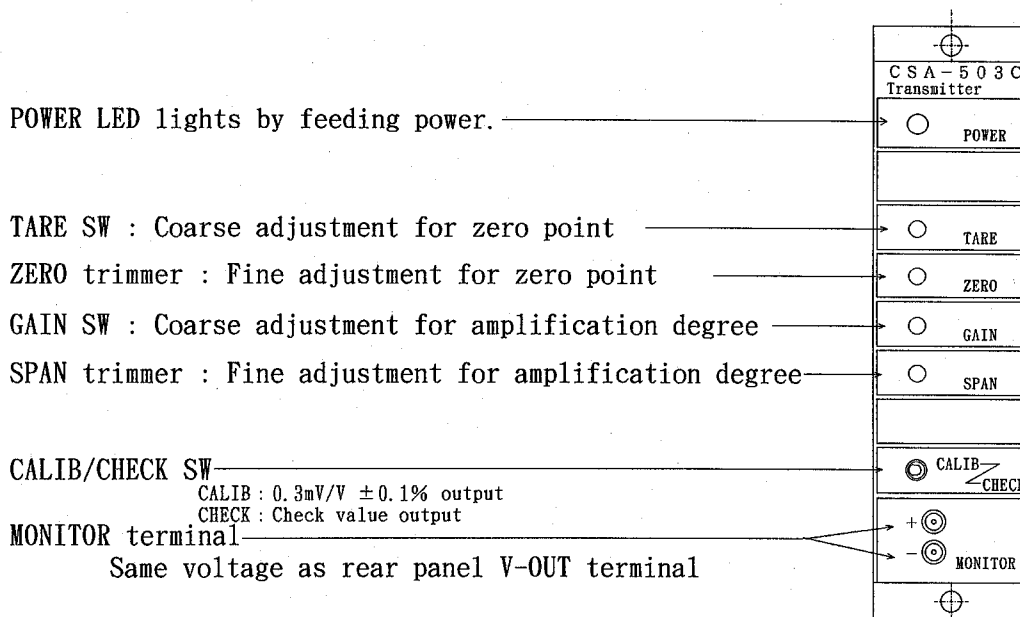
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1. General

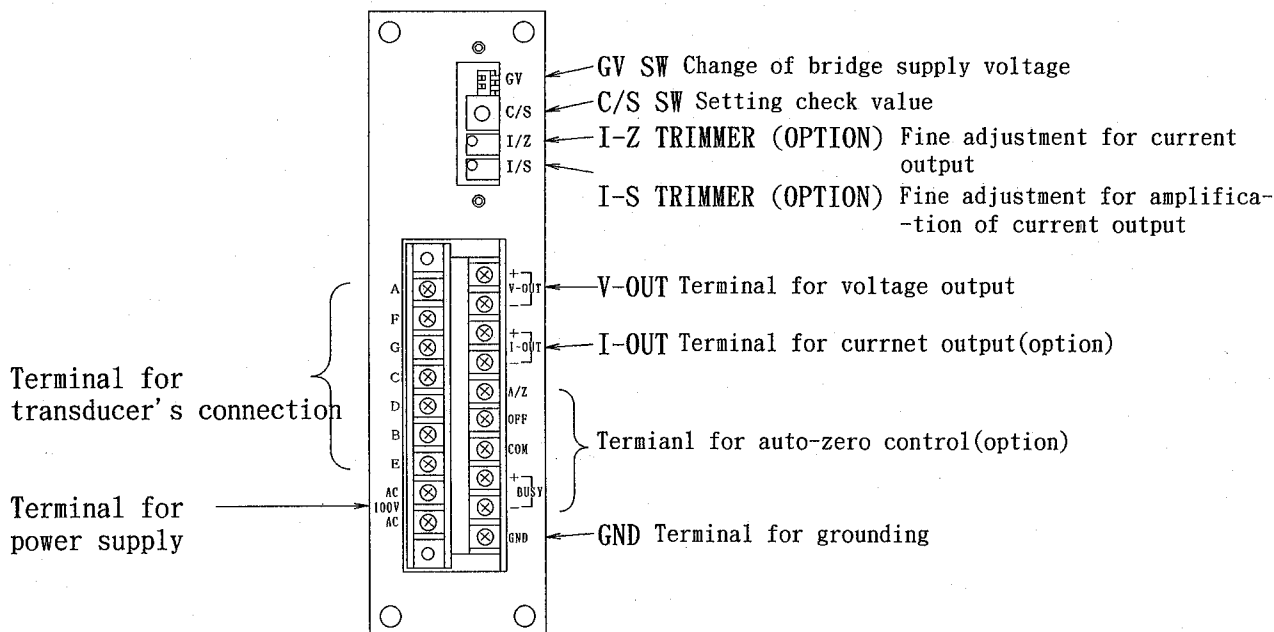
CSA-503C is a transmitter for the application of strain gage applied transducer. Analog output can be obtained corresponding to load, pressure, torque and so on.

2. Each name and its function

2-1 Front panel

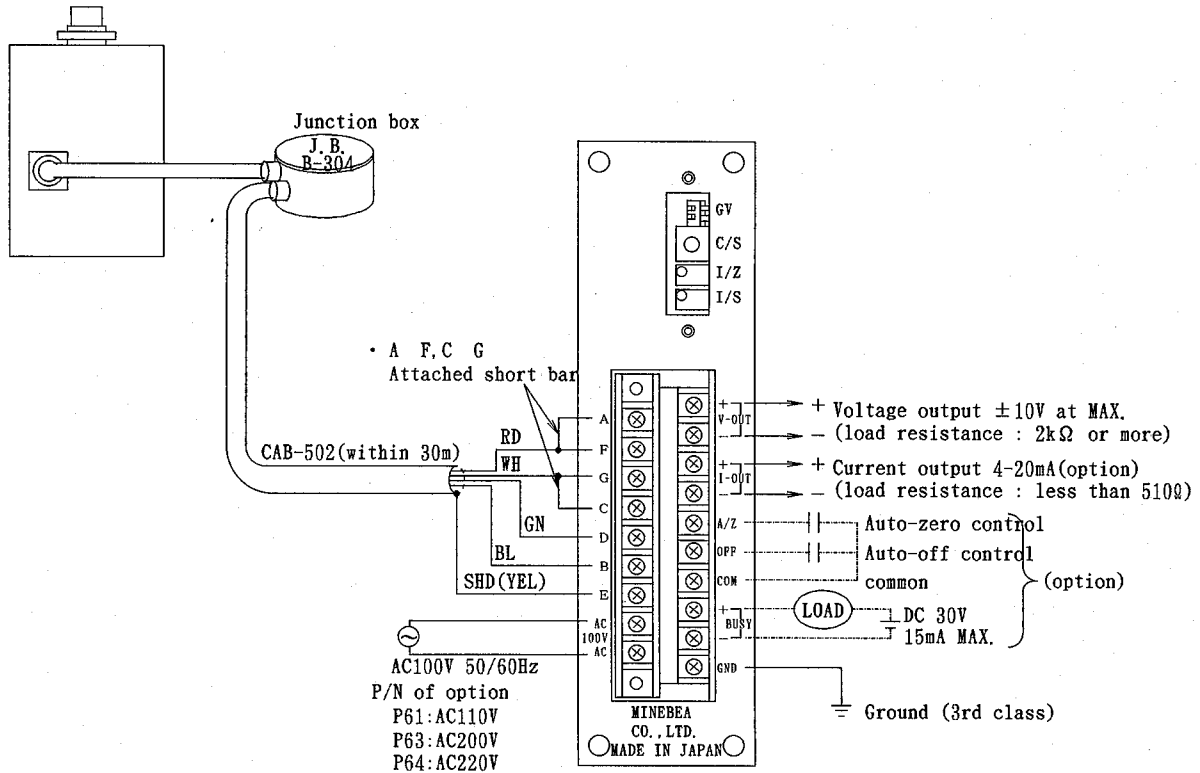


2-2 Rear panel



3. Connections

- 3-1 Connections with 1 pce of transducer and CAB-502 (4 core Minebea's standard cable) and CSA-503C (the instrument)



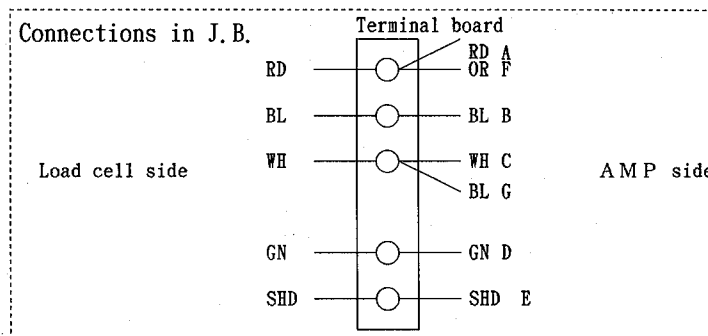
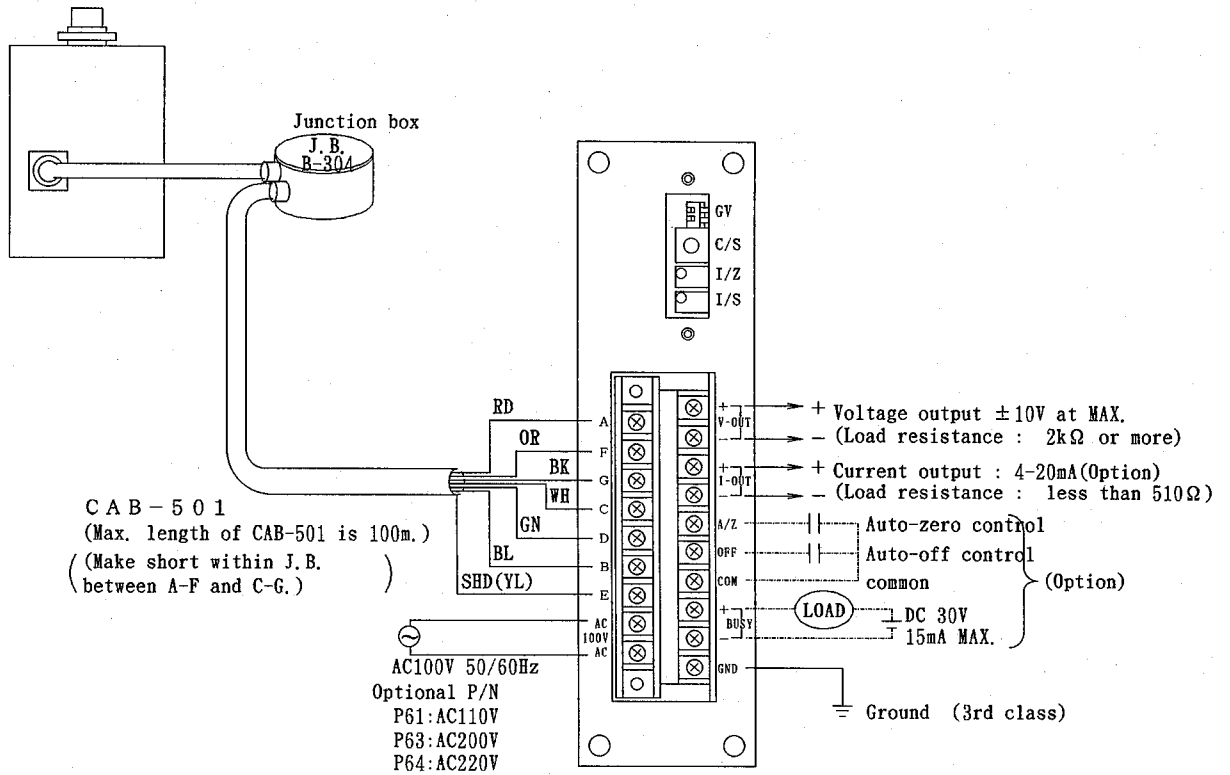
* When Minebea's CAB-502 (4 core cable) is used for extension cable, remote sensing function in bridge power supply doesn't work, in due course CAL 0.3mV/V ±0.1% shall become out of specification because voltage drop shall not be compensated.

* Above figure shows the wirings for output of ⊕ voltage with Compression load applied.

When output of ⊕ is required with tension load applied, exchange the connections B for D.

* As there is a case that standard wiring color is different, please confirm the Inspection data sheet of the load cell being used.

3-2 Connection with 1 pce of transducer & CAB-501(6 core Minebea's STD cable)& CSA-503C



- * Above figure shows the wirings for output of \oplus voltage with compression load applied. When output of \oplus voltage is required with tension load applied, exchange the connections B for D.
- * When zener barrier (Intrinsically safe explosion-proofed) is used, change of bridge supply voltage is required corresponding to the Nos. of addition of transducers. Refer to 5-1 Various kinds of changing method, as for changing procedures.

3-3 A list of colors for No. of terminal board, signal and Minebea's cable

No. of terminal board	Signal	Minebea's cable color	Remarks
A	Bridge power supply +	red	EXC +
B	Amplifier input	blue	SIG -
C	Bridge power supply -	white	EXC -
D	Amplifier input +	green	SIG +
E	Shield	yellow	SHD -
F	Sensing +	orange	SEN +
G	Sensing -	black	SEN -

3-4 AC100V, earth

Feed safe power supply of 100VAC.

(Avoid using with power line together, and supply power source for exclusive use of instrumentation.)

Grounding should be applied with 3rd class and make connection with single earth.

3-5 Note for connections

1) Connections with extension cable for transducer

☆ As for cable, use Minebea's standard CAB-501 (6 core cable) and CAB-502 (4 core cable).

☆ Since the signal of load cell is minute voltage, wirings should be separated from power supply and I/O line for control.

☆ For conduit wirings, make use of conduit wirings for exclusive use.

* When CAB-502 or Zener barrier is used, CALIB $0.3\text{mV/V} \pm 0.1\%$ shall become out of specification.

2) V-OUT, I-OUT connection

☆ Make use of 2 core shield cable.

☆ When wiring, be separated from power supply line, I/O line for control.

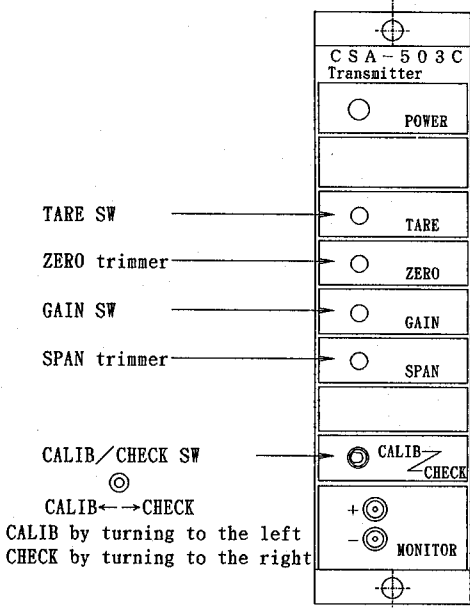
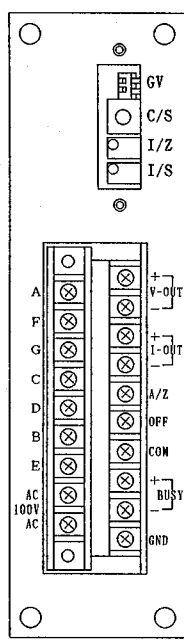
4. Adjustment procedures (Electrical calibration, actual load calibration)

Supply power after making confirmation that the transducer and power supply is properly connected. In case of application with auto-zero (P/N P99), make calibration with the condition of short-circuit between OFF and COM located on the rear panel previously.

4-1 Electrical calibration

Make the condition with initial load (tare weight) applied on the transducer.

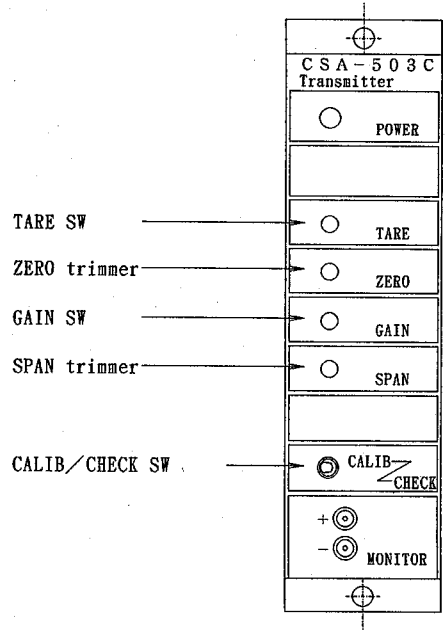
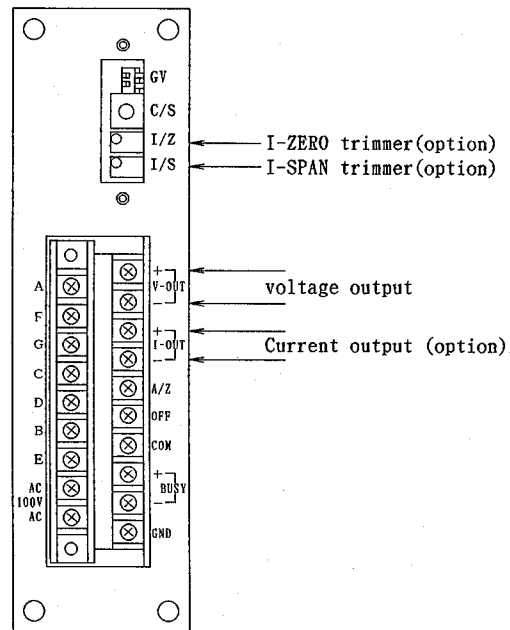
(Specification of CALIB 0.3mV/V ± 0.1% shall not applied when Minebea's CAB-502 (4 core cable) and Zener barrier are used.)

No.	Adjustment procedures	Remarks
1	<p>Initial load (tare weight) cancellation</p> <p>Turn the TARE SW to make voltage output show 0.000V or current output (option) show 4mA the nearest.</p>	
2	<p>Zero point adjustment</p> <p>By turning ZERO trimmer, adjust so that the voltage output becomes 0.000V or current output (option) becomes 4.000mA. In case of application of voltage output and current output (option) together, adjust voltage output previously by using the above procedure, then apply adjustment of current output (option) by using I-ZERO trimmer on rear panel.</p>	 <p>TARE SW</p> <p>ZERO trimmer</p> <p>GAIN SW</p> <p>SPAN trimmer</p> <p>CALIB/CHECK SW</p> <p>CALIB ← → CHECK</p> <p>CALIB by turning to the left</p> <p>CHECK by turning to the right</p> <p>CSA-503C Transmitter</p> <p>POWER</p> <p>TARE</p> <p>ZERO</p> <p>GAIN</p> <p>SPAN</p> <p>CALIB</p> <p>CHECK</p> <p>MONITOR</p> <p>CALIB/CHECK SW shall return to the position where it was when your finger is released from the SW. So it is required to keep pressing the Sw during ON operation of the SW.</p>
3	<p>SPAN adjustment</p> <p>Make the CALIB/CHECK SW to CALIB position. Output value of calibrated portion of 0.3mV/V±0.1% can be obtained. After making calculation on output value in case of load is applied on transducer, in the next, set voltage value or current output value (option) by using GAIN SW or SPAN trimmer.</p> <p>EX) C3P1-1tf 3mV/V (1 set)</p> <p>In case of voltage output of 10.000V, with compression load of 0.2 t applied.</p> $* 3\text{mV/V} \times \frac{0.2\text{t}}{1\text{t}} = 0.6\text{mV/V}$ $\frac{0.3\text{mV/V}}{0.6\text{mV/V}} \times 10.000 = 5.000\text{V}$	 <p>I-ZERO trimmer (Option)</p> <p>I-SPAN trimmer (Option)</p> <p>Voltage output</p> <p>Current output (Option)</p> <p>GV</p> <p>C/S</p> <p>I/Z</p> <p>I/S</p> <p>A</p> <p>F</p> <p>G</p> <p>C</p> <p>D</p> <p>B</p> <p>E</p> <p>AC 100V</p> <p>V-OUT</p> <p>I-OUT</p> <p>A/Z</p> <p>OFF</p> <p>COM</p> <p>BUSY</p> <p>GND</p>

No.	Adjustment procedures	Remarks
	<p>Make adjustment so that voltage output becomes 5.000V to the nearest and adjust 5.000V by SPAN trimmer.</p> <p>EX) C3P1-1tf 3mV/V (1 set)</p> <p>In case of current output of 20.000mA (option), with compression load of 0.2 ton.</p> $* 3\text{mV/V} \times \frac{0.2\text{t}}{1\text{t}} = 0.6\text{mV/V}$ $\frac{0.3\text{mV/V}}{0.6\text{mV/V}} \times 16.000 + 4 = 12.000\text{mA}$ <p>Turn the GAIN SW adequately so that the current output (option) becomes the nearest to 12.000mA, and adjust to 12.000mA by using SPAN trimmer.</p> <p>(Refer to Appendix I, as for 4 points of addition.)</p> <p>In case of application of voltage output and current output (option) together, adjust voltage output previously by using the above procedure, then apply adjustment of current output (option) by using I-ZERO trimmer on rear panel.</p> <p>Since variable range of I-SPAN trimmer is effective when voltage output is 10V, GAIN adjustment of current output shall be required, when necessary current value can't be obtained.</p> <p>Refer to 5-2, Response frequency, TARE polarity, current output GAIN.</p>	<p>NOTE)</p> <p>During SPAN adjustment, apply re-adjustment by changing bridge power voltage (Refer to 5-1.) when voltage value or current value doesn't decrease.</p>
4	<p>Zero point adjustment</p> <p>Release your finger from the CALIB/CHECK SW, then rotate ZERO trimmer so that voltage output becomes 0.000V or current output (option) becomes 4.000mA.</p>	
5	<p>Confirmation</p> <p>Make confirmation/adjustment on No. 3~ No. 4, again.</p>	
6	<p>Calibration has completed.</p>	

4-2 Actual load calibration

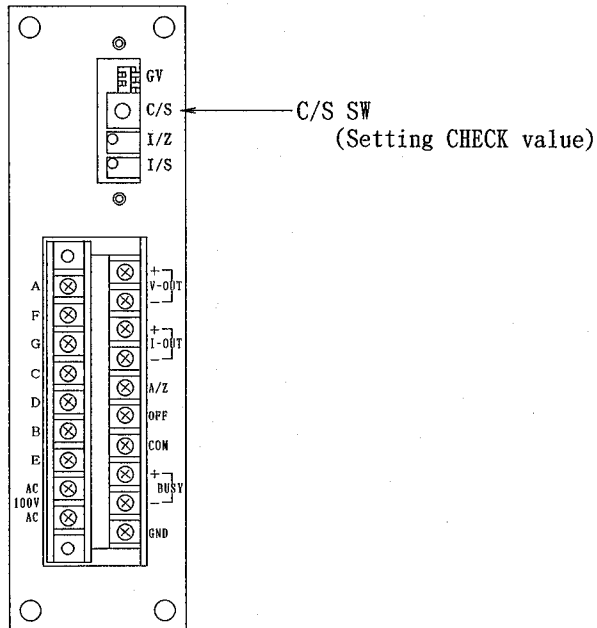
Before performing actual load calibration, more precise load calibration can be secured, if electrical calibration described in 4-1 Electrical calibration has completed. Make the condition that initial load (tare weight) is applied on the transducer.

No.	Adjustment procedures	Remarks
1	<p>Initial load (tare weight) cancellation</p> <p>Rotate the TARE SW so that voltage output becomes 0V or current output (option) becomes the nearest value of 4mA.</p>	
2	<p>Zero point adjustment</p> <p>Rotate the ZERO trimmer so that voltage output becomes 0.000V or current output (option) becomes 4.000mA.</p> <p>When voltage output and current output (option) is used together, adjust voltage output following the above procedures at first, then make adjustment on current output (option) by rear panel I-ZERO trimmer.</p>	
3	<p>SPAN adjustment</p> <p>Apply standard load such as weight or so on the transducer (tank, etc.). (Make use of max. weight as possible.)</p> <p>Apply fine adjustment by SPAN trimmer so that the required voltage output or current output value (option) can be obtained by using the GAIN SW.</p> <p>When voltage output and current output (option) is used together, adjust voltage output following the above described procedure, then make adjustment on current output (option) by using rear panel I-SPAN trimmer.</p> <p>Since variable range of I-SPAN trimmer is effective when voltage output is 10V, GAIN adjustment of current output shall be required when necessary current value can't be obtained. Refer to 5-2, as for adjustment.</p>	

No.	Adjustment procedures	Remarks
4	Zero point adjustment Remove the load described in No. 3 and make confirmation that voltage output becomes 0.000V or current output value shows 4.00mA.	NOTE) During SPAN adjustment, voltage value or current value doesn't decrease, make adjustment again by changing bridge power supply voltage (Refer to 5-1 Bridge power supply voltage.)
5	Confirmation Make re-confirmation on No. 3~No. 4.	
6	Calibration has completed.	

※ After completion of actual load calibration

Press the CALIB/CHECK SW to CHECK position, then rotate the rear panel C/S SW so that voltage output value or current output value becomes 80% of F.S. at that time, and write down the output value.



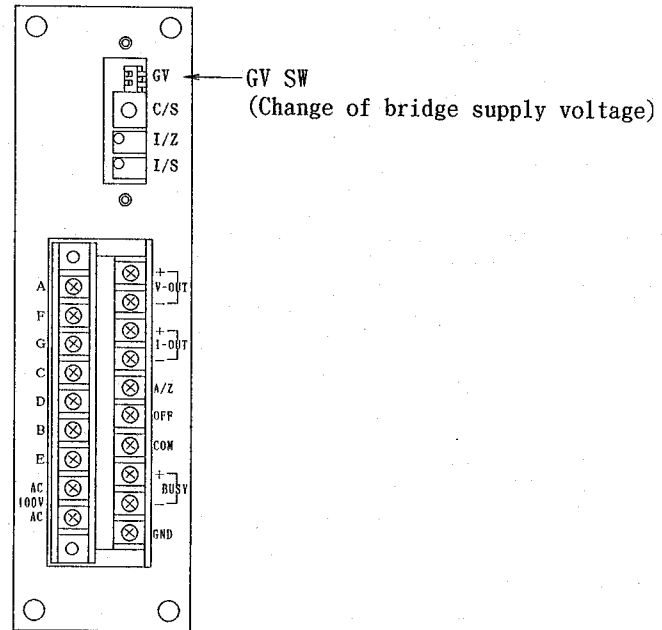
5. Various kinds of changing method

5-1 Bridge power supply voltage

Bridge excitation voltage can be changed by the setting of rear panel GV SW.

- ① Specification of excitation voltage is lower for the transducer to connect.
- ② Make use of zener barrier with 6 core shield cable.

Change of excitation voltage shall be required if above cases are applied.

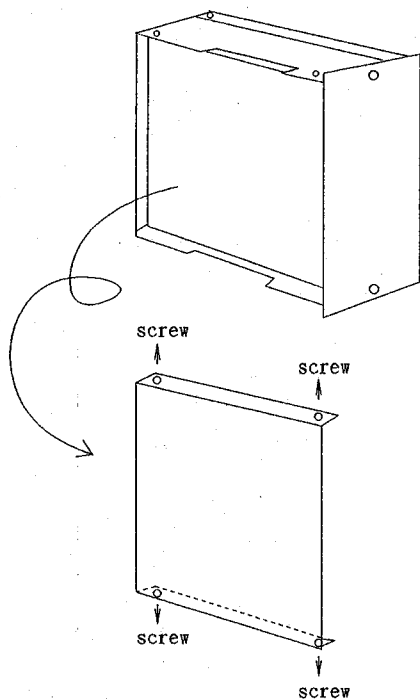


Standard setting

Bridge excitation voltage		10 V	10 V	5 V	2.5 V
GV SW rear panel	1	OFF	OFF	ON	ON
	2	OFF	ON	OFF	ON
6 core shield cable with zener barrier used		impossible	impossible	1 point	More than 2 points of addition

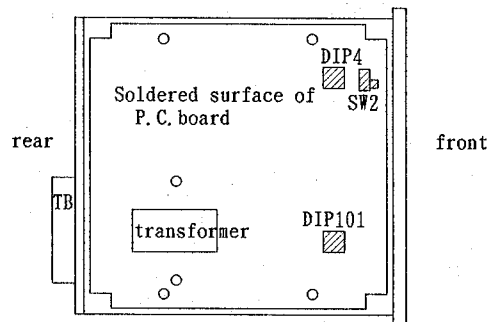
5-2 Response frequency, TARE polarity, Current output GAIN

By removing the chassis cover (fixed by 4 pcs of M2.6x5 flat head screw), at the left side facing the front panel, soldered surface of P.C. board will be appeared.



DIP4 : Response frequency

SW2 : TARE polarity



DIP101 : current output GAIN

5-2-1 Response frequency

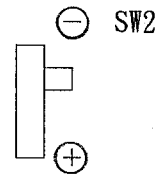
Response frequency		1 0 0 H z	1 0 0 H z	1 0 H z	1 H z
D I P 4 (soldered surface)	1	ON	ON	OFF	OFF
	2	ON	OFF	ON	OFF

5-2 T A R E polarity

Polarity change of TARE compensation value shall be required, when two directions are opposite, that is, one is the direction of initial load application such as tare weight, and the other is the direction of load due to increase of load, or when zero balance of transducer is deviated to ⊖ side excessively.

Standard setting

T A R E polarity	minus	plus
SW 2 (soldered)	-	+



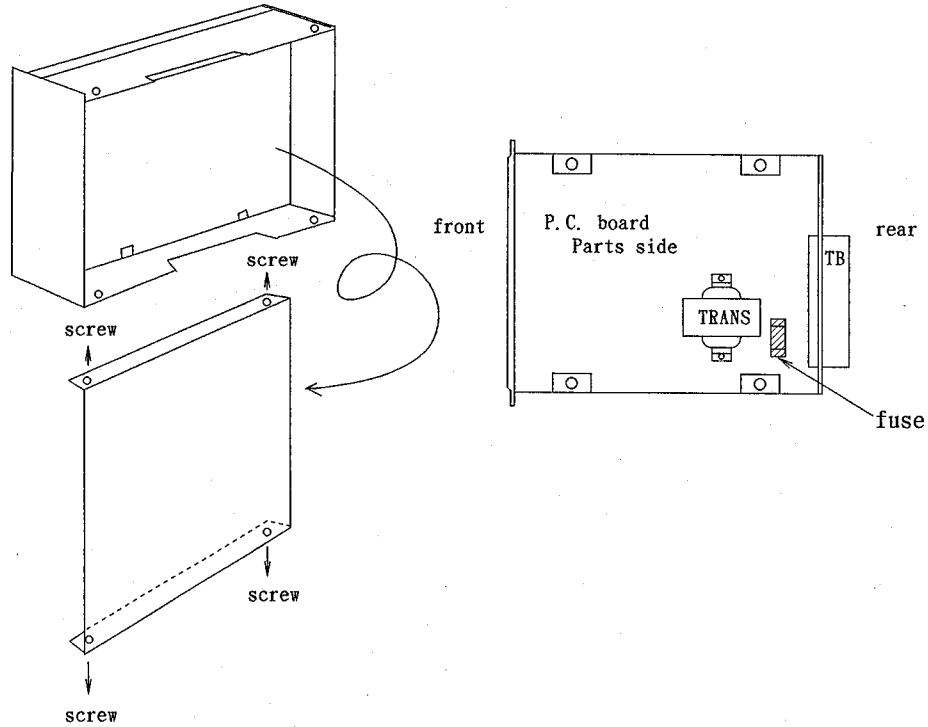
5-3 Current output G A I N

Set current output value of 20mA when voltage output is except 10V.

During calibration, set 20mA the nearest by turning DIP 101 when required voltage is output. In the next, set 20.000mA by turning I-S trimmer on the rear panel.

5-3 Exchange of fuse

By removing the chassis cover (Fixed by 4 pcs of flat head screws M2.6×5), soldered surface of parts of P.C. board shall be appeared.



As for fuse, prepare midget type (5.2× \varnothing 20) 0.5A.

NOTE) If the exchanged new fuse breaks after feeding power again, please contact with Minebea's sales office or sales agency.

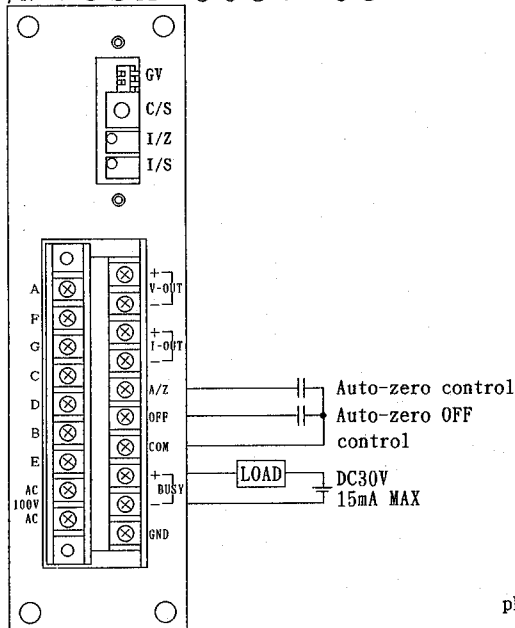
6. Auto-zero (Option P99)

6-1 General

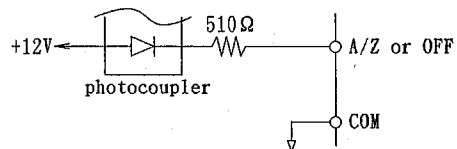
Functions can be installed which makes voltage output of 0V automatically and also makes current output (option) of 4mA through external command.

(P/N : CSA-503C-99 or CSA-503C-07-99)

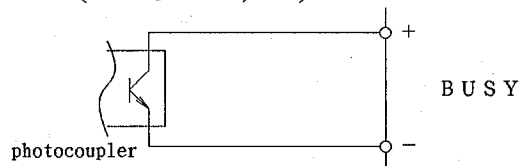
6-2 Wirings



* Equivalent circuit of input section (A/Z, OFF, COM)



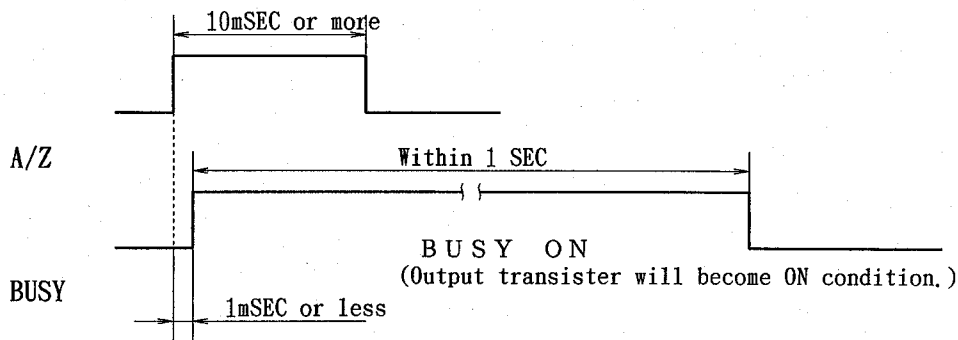
* Equivalent circuit of output section (BUSY +/−)



6-3 Function

- ① A/Z (AUTO-ZERO) : Shorting (10mSEC or more) between A/Z and COM makes output of 0V or 4mA automatically.
- ② OFF (AUTO-ZERO OFF) : During shorting between OFF and COM, cancelled value by the function of ①A/Z (AUTO-ZERO) is added to output value obtained before shorting. If the short is released, the instrument shall return to the condition as it was.
- ③ BUSY : BUSY shows that auto-zero function is executed. While the signal is output, don't fluctuate the load applied on the transducer.

6-4 Timing chart



6-5 Adjustment

When calibration is applied as shown in the section of 4. Adjustment procedures, be sure to make calibration with the condition of short between OFF and COM. After completing adjustment, release the condition of short, then apply A/Z input once finally



When the condition changes by the external control, check the timing at the time of change with the instrument (amplifier) thoroughly and also adjust the timing by the timer process as necessity requires.

7. Specifications

Bridge power supply	: DC10V \pm 3% Within 120mA (DC2.5V, 5V Can be variable.) Remote sensing applied.
Applicable transducers	: Up to 4 pcs of strain gage applied transducers (350 Ω) can be connected.
Input range	: 0.3~3mV/V
Output	: \pm 10V (At the input of 0.3mV/V, bridge power supply : DC10V)
Output load resistance	: 2k Ω at Min.
Zero point adjustment range	: \pm 2.4mV/V Coarse adjustment : Rotary SW Fine adjustment : Zero adjustment trimmer
Non-linearity	: 0.01% F.S.
Effect due to temp. variation	
Zero point	: Within \pm 0.45 μ V/ $^{\circ}$ C (Input conversion)
Sensitivity	: Within \pm 0.005%F.S./ $^{\circ}$ C
C A L I B	: 0.3mV/V \pm 0.1% 1 point (Suitable extension cable is Minebea's Standard CAB-501 6 cores 100m cable.) (When Zener barrier is used, above specification shall not be applied.)
C H E C K	: 1 point
Frequency response range	: 10Hz (1Hz or 100Hz can be variable.)
Operating temp./humidity	: Temperature : -10~50 $^{\circ}$ C range : Humidity : 20~80% (Excludes frozen.)
Power supply	: AC100V \pm 10% 50/60Hz Approx. 10VA
Insulation • Resist to pressure	: DC500V, 100M Ω or more, AC1500V 1 min. between AC and GND (chassis)
Outline dimensions	: 176(H) \times 42(W) \times 166(D) mm (Excludes protruding parts.)
Weight	: Approx. 1.5kg

(OPTION)

※ Current output

P/N name	CSA-503C-P07
Output	4~20mA (Isolation)
Load resistance	510Ω or less
Non-linearity	0.02% F.S.
Effect due to temp. variation	Zero point : 0.004%F.S./°C Sensitivity : 0.005%F.S./°C

※ Auto-zero

P/N name	CSA-503C-P99
Operating range of auto-zero	Within ±10V
Required time of auto-zero	Within 1 sec.
Accuracy of auto-zero	Within ±5mV
Non-linearity	0.01% F.S.
Effect due to temp. variation	Zero point : 0.005%F.S./°C Sensitivity : 0.005%F.S./°C
Battery back-up	Approx. 5 years (Lithium battery is used.)

※ Supply voltage

P/N name	CSA-503C-P61	AC110V
	CSA-503C-P63	AC200V
	CSA-503C-P64	AC220V

* STANDARD SPECIFICATIONS *

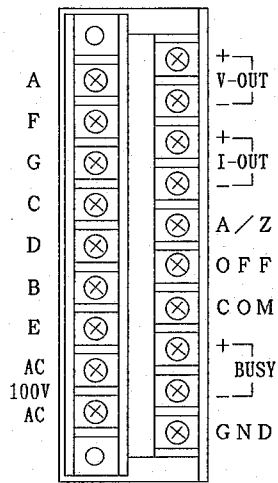
Bridge power supply	DC10V±3%
SPAN	10V output at input of 0.3mV/V (4~20mA with P07 is applied.)
Frequency response range	10 Hz

8. Accessories

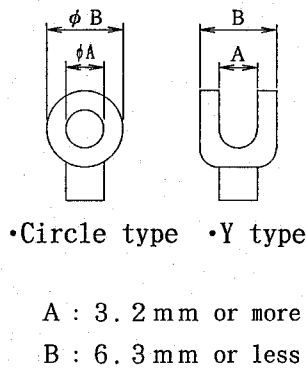
Instruction manual	1 pce
A-F, C-G shortbar	2 pcs
Small minus driver	1 pce
Midget fuse 0.5A	1 pce

9. Outline dimensions

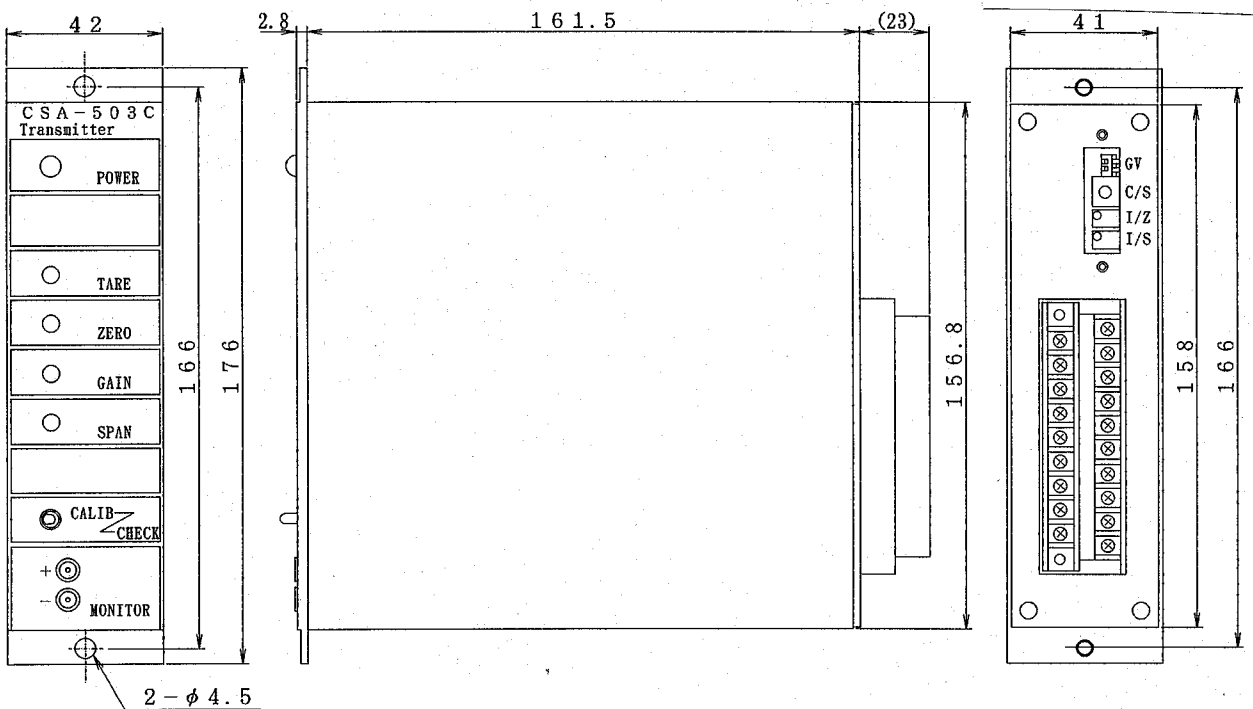
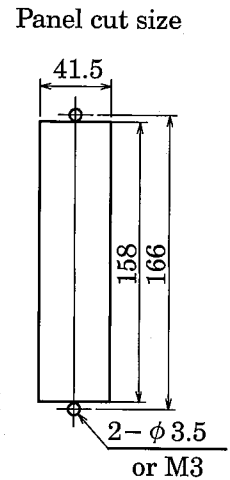
◆ REAR PANEL



◆ SUITABLE ATTACHED TERMINAL



PANEL CUT DIMENSIONS



10. Warranty/repair

10-1 Warranty

The instrument is covered by a warranty for a period of one (1) year from the date of delivery.

As for repairs of after-service is required during the period of warranty, please contact with Minebea's sales office of KI-NMB or sales agency from which you purchased.

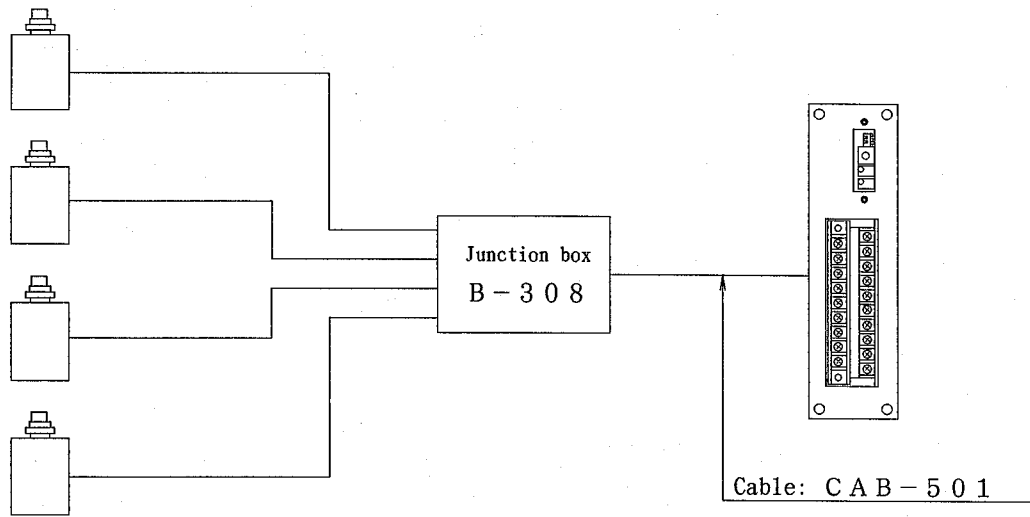
10-2 Repair

Before asking repairs, please make checks once again whether the connections, setting and adjustment for the instrument have finished by customer precisely. Moreover, make special checks on the connections of transducers which might be disconnected or cut off.

After that, still there may be found some effects in the instrument, please contact with Minebea's sales agency from which you purchased.

APPENDIX I

Sample of calculation for four (4) pcs of transducer addition



1. Example of application

Tare weight	500 kg (Cancellation by TARE)
Measuring weight	200 kg
Output	Output of 0.000~10.000 V when 0~200 kg load is applied on four (4) pcs of transducers.
Load cell	C3P1-300K (4 pcs) 3mV/V output

2. Calculation example

Output of 4 pcs of transducers with 200 kg of measuring weight is as follows:

$$\frac{200}{300 \times 4} \times 3 \text{ mV/V} = 0.5 \text{ mV/V} \rightarrow 0 \sim 10 \text{ V}$$

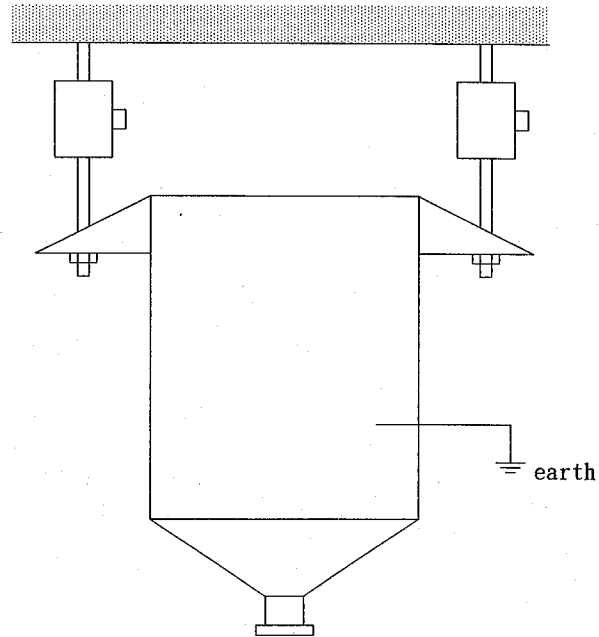
Voltage output value in case of calibration input of 0.3mV/V is as follows:

$$\frac{0.3}{0.5} \times 10.000 = 6.000 \text{ V}$$

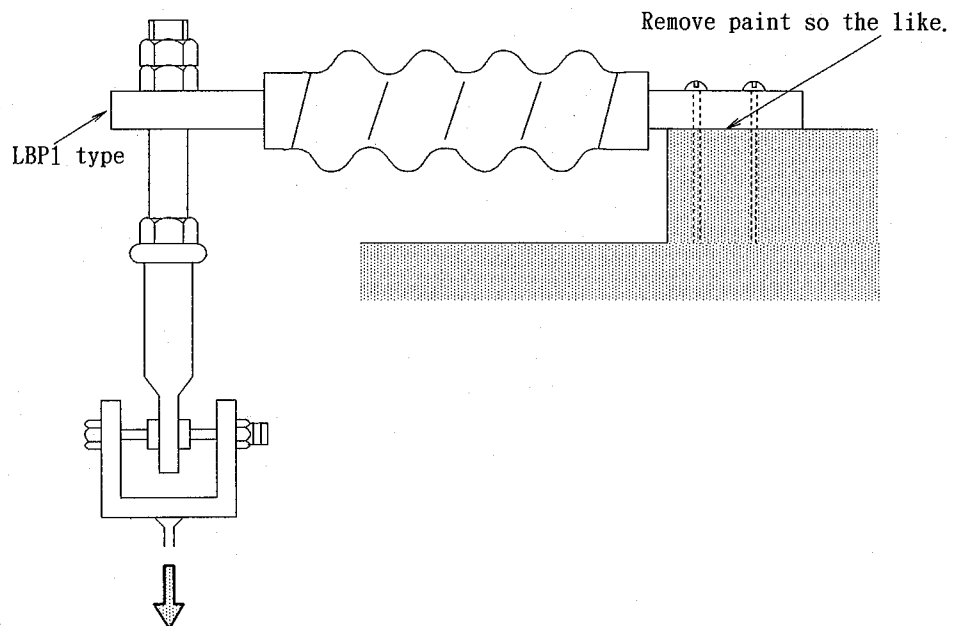
APPENDIX II

Note for setting transducers

When measuring materials of pellets, plastics, and so on which may charge with electricity, make checks on the earth with hopper, tank and transducer.



Before installing the transducer, remove painting or the like from the installation surface.



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

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