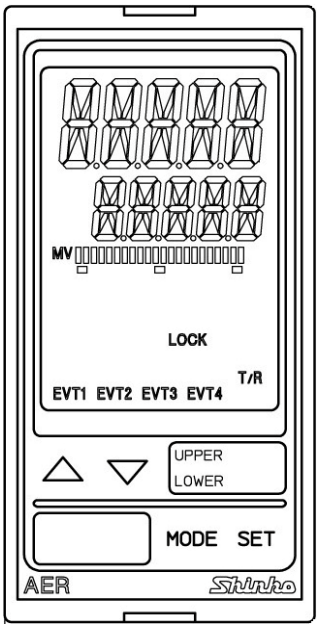
Digital Indicating Resistivity Meter

AER-102-SE

Instruction Manual



Shinko

Preface

Thank you for purchasing our AER-102-SE, Digital Indicating Resistivity Meter.

This manual contains instructions for the mounting, functions, operations and notes when operating the AER-102-SE. To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.

To prevent accidents arising from the misuse of this instrument, please ensure the operator receives this manual.

Characters Used in This Manual

Indication	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Number, ℃/℉	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Indication	A	b	c	d	E	F	G	H	I	J	K	L	M
Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Indication	N	o	P	Q	R	S	T	U	V	W	X	Y	Z
Alphabet	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

⚠ Caution

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow all of the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- The contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed within a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos Co., Ltd. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

Safety Precautions (Be sure to read these precautions before using our products.)

The safety precautions are classified into 2 categories: “Warning” and “Caution”.
Depending on the circumstances, procedures indicated by ⚠ Caution may cause serious results, so be sure to follow the directions for usage.

⚠ Warning Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.

⚠ Caution Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.

⚠ Warning

- To prevent an electric shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

SAFETY PRECAUTIONS

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after purpose-of-use consultation with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protective equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

Caution with respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

1. Installation Precautions

⚠ Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category Ⅱ, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50 ℃ (32 to 122 ℉) that does not change rapidly, and no icing
- An ambient non-condensing humidity of 35 to 85 %RH
- No large capacity electromagnetic switches or cables through which large current is flowing.
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit
- If the AER-102-SE is mounted through the face of a control panel, the ambient temperature of the unit - not the ambient temperature of the control panel - must be kept to under 50 ℃. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.

Note: Do not install this instrument on or near flammable material even though the case of this instrument is made of flame-resistant resin.

2. Wiring Precautions

⚠ Caution

- Do not leave wire remnants in the instrument, as they could cause a fire or a malfunction.
- Use a solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the AER-102-SE.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw may be damaged.
- This instrument does not have a built-in power switch, circuit breaker or fuse. It is necessary to install them near the instrument. (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- For a 24 V AC/DC power source, do not confuse polarity when using direct current (DC).
- Be sure to connect the ground terminal to earth for safety (D-class grounding). Keep the grounding of this unit separate from other electrical devices, such as motors.
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.
- Use the 2-electrode resistivity sensor in accordance with the sensor input specifications of the AER-102-SE.
- Keep the input wires and power line separate.

3. Operation and Maintenance Precautions

⚠ Caution

- Do not touch live terminals. This may cause an electric shock or problems in operation.
- Turn the power supply to the instrument OFF when retightening the terminal or cleaning.
  Working on or touching the terminal with the power switched ON may result in severe injury or death due to electric shock.
- Use a soft, dry cloth when cleaning the instrument.
  (Alcohol based substances may tarnish or deface the unit.)
- As the display section is vulnerable, do not strike or scratch it with a hard object or put pressure on it.

Contents

1. Model

1.1 Model

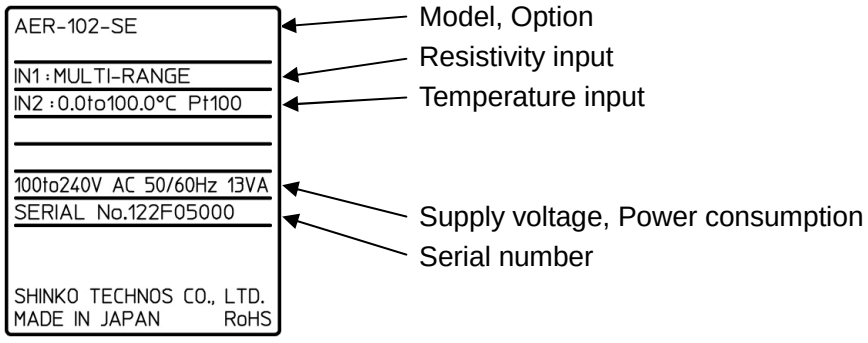
AER-10	2-	SE		,□□□	
Input Points	2				2 points
Input		SE			2-electrode resistivity sensor (Temperature element Pt100)
Supply Voltage					100 to 240 V AC (standard)
			1		24 V AC/DC (*)
Option				C5	Serial communication RS-485
				EVT3	EVT3, EVT4 output (Contact output 3, 4)

(*) Supply voltage 100 to 240 V AC is standard.

When ordering 24 V AC/DC, enter “1” after the input code.

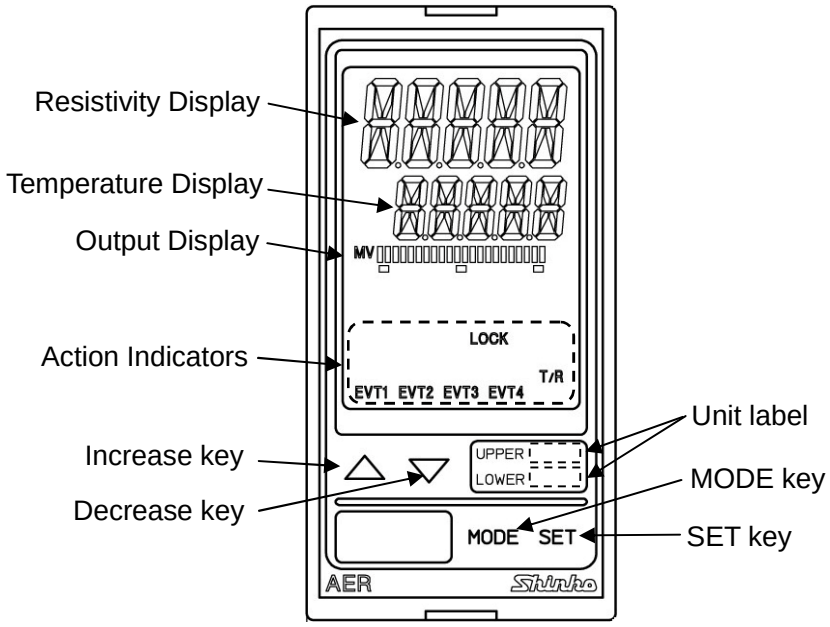
1.2 How to Read the Model Label

The model label is attached to the left side of the case.



(Fig. 1.2-1)

2. Names and Functions of Sections



(Fig. 2-1)

Displays

Resistivity Display: Resistivity or characters in setting mode are indicated in red/green/orange.
Indications differ depending on the selections in [Backlight selection (p.44)] and [Resistivity color (p.44)].

Temperature Display: Temperature or values in setting mode are indicated in green.
Indications differ depending on the selections in [Backlight selection (p.44)].

Output Display: Backlight green
The bar graph is lit corresponding to the transmission output.
Indications differ depending on the selections in [Bar graph indication (p.45)]

Action Indicators: Backlight orange

EVT1: Lit when EVT1 output (Contact output 1) is ON.
EVT2: Lit when EVT2 output (Contact output 2) is ON.
EVT3: Lit when EVT3 output (Contact output 3) (EVT3 option) is ON.
EVT4: Lit when EVT4 output (Contact output 4) (EVT3 option) is ON.
T/R: Lit during Serial communication (C5 option) TX output (transmitting).
LOCK: Lit when Lock 1, 2 or 3 is selected.

Unit label

Upper: Attach the user's unit of Resistivity display from the included unit labels if necessary.
Lower: Attach the user's unit of Temperature display from the included unit labels if necessary.

Keys

△ **Increase key:** Increases the numeric value.
▽ **Decrease key:** Decreases the numeric value.
MODE **MODE key:** Selects a group.
SET **SET key:** Switches the setting modes, and registers the set value.

3. Mounting to the Control Panel

3.1 Site Selection

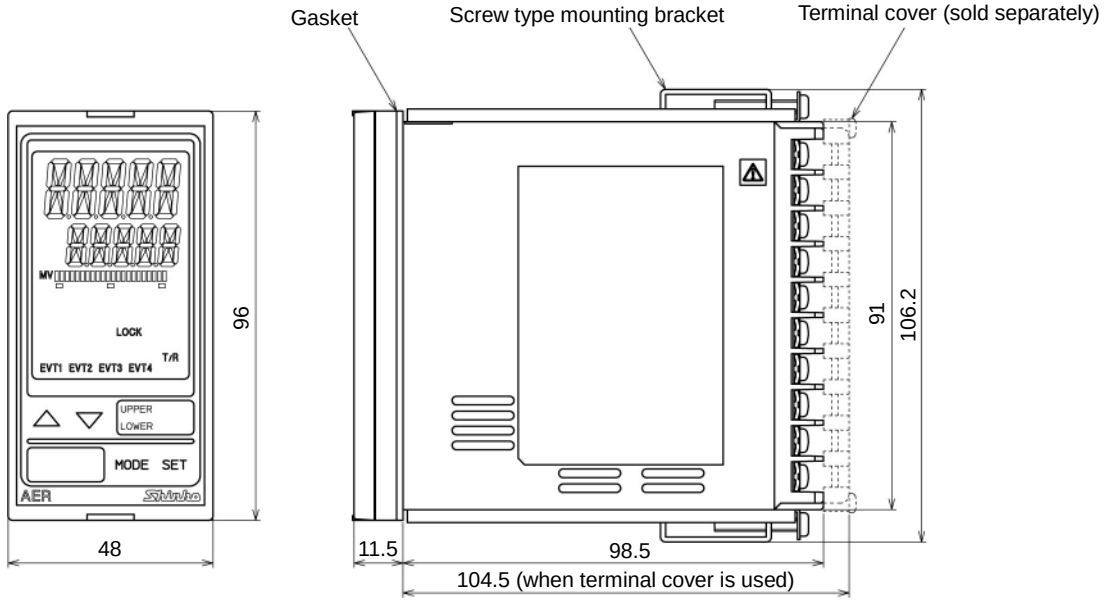
> **⚠ Caution**
>
> Use within the following temperature and humidity ranges:
> Temperature: 0 to 50 ℃(32 to 122 ℉) (No icing)
> Humidity: 35 to 85 %RH (Non-condensing)
> If AER-102-SE is mounted through the face of a control panel, the ambient temperature of the unit - not the ambient temperature of the control panel - must be kept to under 50 ℃, otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.

This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category Ⅱ, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change rapidly
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing.
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit.

3.2 External Dimensions (Scale: mm)

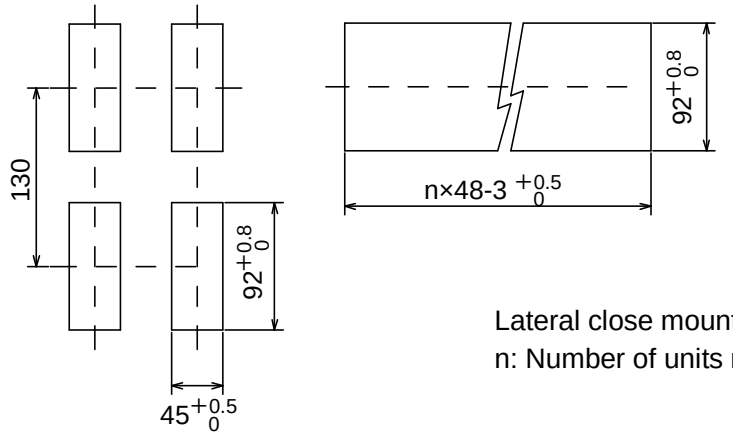


(Fig. 3.2-1)

3.3 Panel Cutout (Scale: mm)

⚠ Caution

If lateral close mounting is used for the unit, IP66 specification (Drip-proof/Dust-proof) may be compromised, and all warranties will be invalidated.



Lateral close mounting
n: Number of units mounted

(Fig. 3.3-1)

3.4 Mounting and Removal

⚠ Caution

As the case is made of resin, do not use excessive force while screwing in the mounting bracket, or the case or mounting brackets could be damaged. The tightening torque should be 0.12 N•m.

How to mount the unit

Mount the unit vertically to the flat, rigid panel to ensure it adheres to the Drip-proof/Dust-proof specification (IP66).

Mountable panel thickness: 1 to 8 mm

(1) Insert the unit from the front side of the panel.

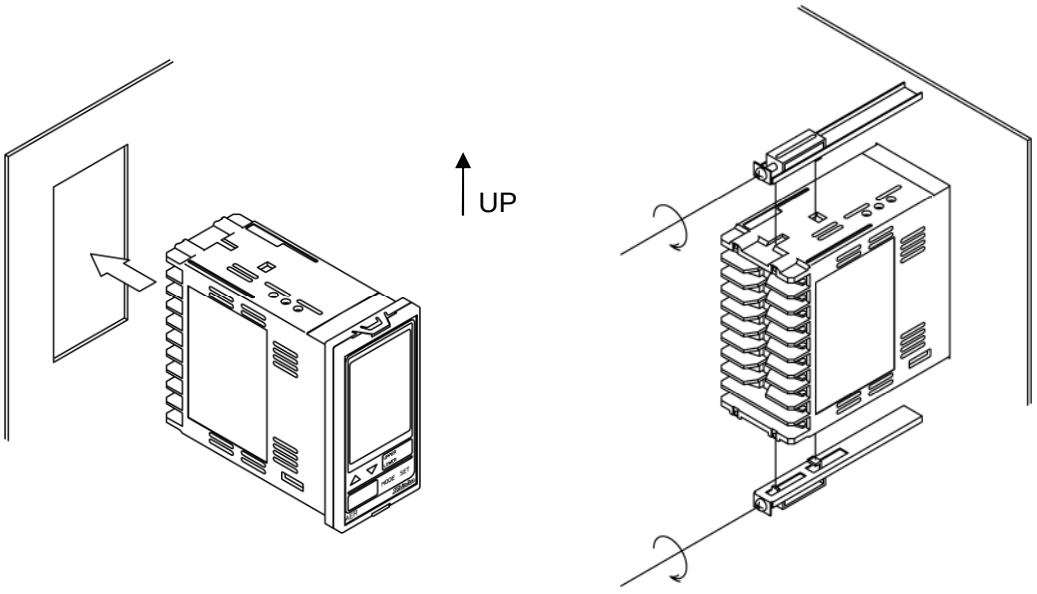
(2) Attach the mounting brackets by the holes at the top and bottom of the case, and secure the unit in place with the screws.

How to remove the unit

(1) Turn the power to the unit OFF, and disconnect all wires before removing the unit.

(2) Loosen the screws of the mounting brackets, and remove the mounting brackets.

(3) Pull the unit out from the front of the panel.



(Fig. 3.4-1)

4. Wiring

⚠ Warning

Turn the power supply to the instrument off before wiring or checking. Working on or touching the terminal with the power switched on may result in severe injury or death due to electric shock.

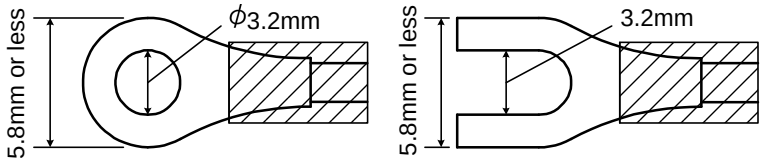
⚠ Caution

- Do not leave wire remnants in the instrument, as they could cause a fire or a malfunction.
- Use a solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the AER-102-SE.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw may be damaged.
- This instrument does not have a built-in power switch, circuit breaker or fuse. It is necessary to install them near the instrument. (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- For a 24 V AC/DC power source, do not confuse polarity when using direct current (DC).
- Be sure to connect the ground terminal to earth for safety (D-class grounding). Keep the grounding of this unit separate from other electrical devices, such as motors.
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.
- Use the 2-electrode resistivity sensor in accordance with the sensor input specifications of this unit.
- Keep the input wires and power line separate.

4.1 Lead Wire Solderless Terminal

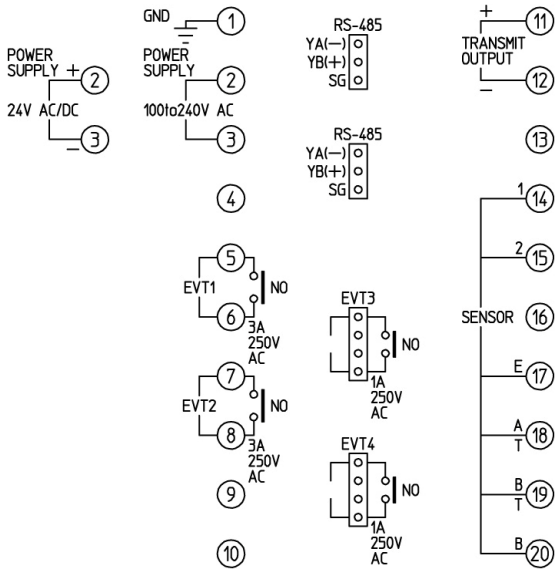
Use a solderless terminal with an insulation sleeve in which an M3 screw fits as follows. The tightening torque should be 0.63 N•m.

Solderless Terminal	Manufacturer	Model	Tightening Torque
Y-type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25Y-3	0.63 N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Ring-type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	



(Fig. 4.1-1)

4.2 Terminal Arrangement



(Fig. 4.2-1)

GND: Ground

POWER SUPPLY: 100 to 240 V AC or 24 V AC/DC (when 1 is added after the model)
For 24 V DC, ensure polarity is correct.

EVT1: EVT1 output (Contact output 1)

EVT2: EVT2 output (Contact output 2)

TRANSMIT OUTPUT: Transmission output

1, 2: Resistivity sensor terminals 1, 2

E: Resistivity sensor shielded wire terminal

A, B: Temperature compensation sensor terminals,
Temperature element Pt100 (2-wire)

A, B, B: Temperature compensation sensor terminals,
Temperature element Pt100 (3-wire)

RS-485: Serial communication RS-485 (C5 option)
2 connectors are wired internally.
Use the included wire harnesses C5 and C0.

EVT3: EVT3 output (Contact output 3) (EVT3 option)
Use the included wire harness HB.

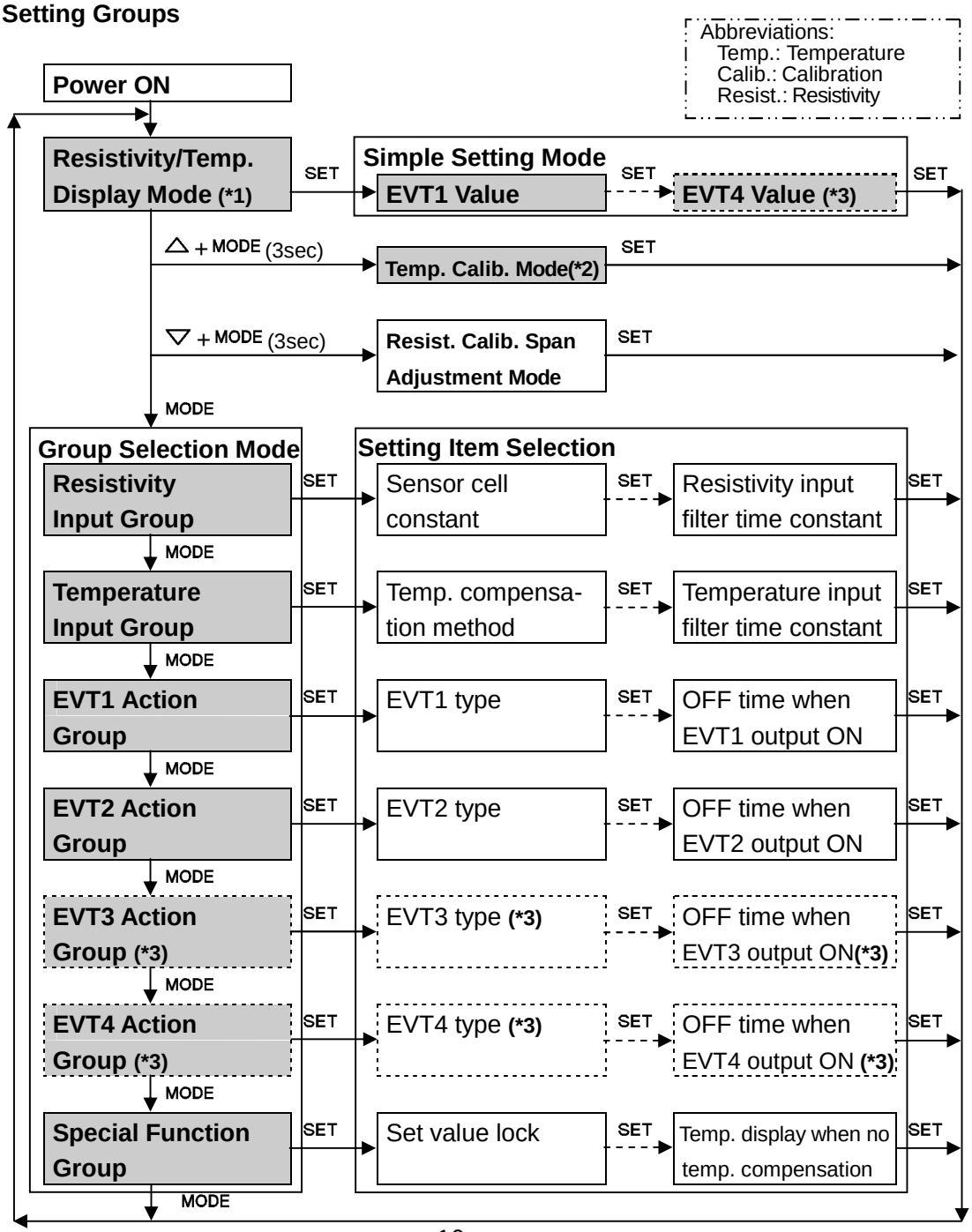
EVT4: EVT4 output (Contact output 4) (EVT3 option)
Use the included wire harness HB.

5. Outline of Key Operation and Setting Groups

5.1 Outline of Key Operation

There are 2 setting modes: Simple Setting mode, and Group Selection mode in which setting items are divided into groups.
To enter Simple Setting mode, press the SET key in Resistivity/Temp. Display mode.
To enter Group Selection mode, press the MODE key in Resistivity/Temp. Display mode.
Select a group with the MODE key, and press the SET key. The unit enters each setting item.
To set each setting item, use the △ or ▽, and register the set value with the SET key.

5.2 Setting Groups



[Resistivity/Temperature Display mode, Temperature Calibration mode]

(*1) In Resistivity/Temperature Display mode, the item selected in [Backlight selection (p.44)] in the Special Function group is indicated, and measurement starts.

(*2) If oFF (No temperature compensation) is selected in [Temperature compensation method (p.24)] in the Temperature Input group, the unit does not move to the Temperature Calibration mode.

(*3) Setting groups and items with dotted lines are indicated only when the EVT3 option is ordered.

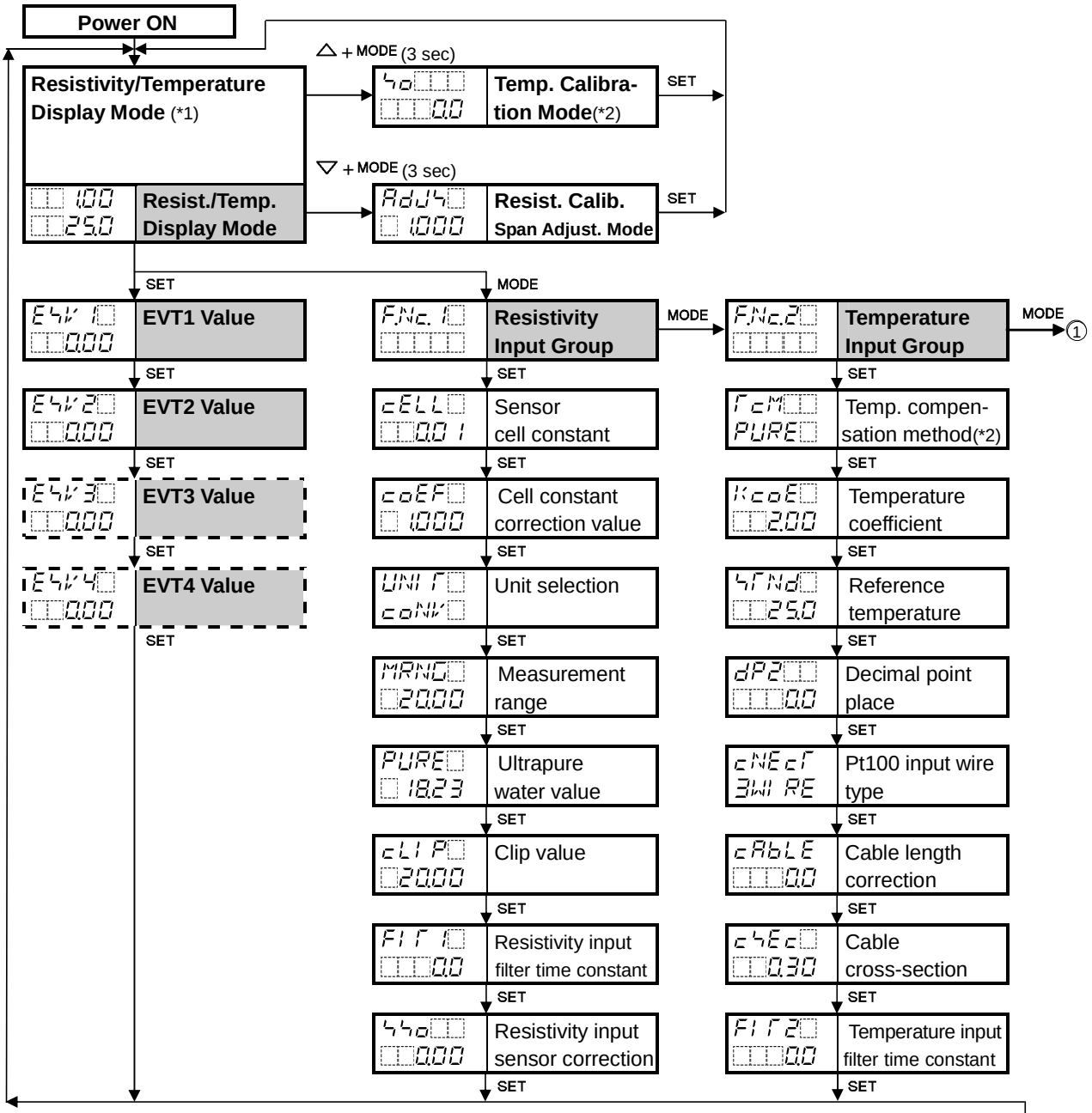
[Key Operation]

- △ + MODE (3 sec): Press and hold the △ key and MODE key (in that order) together for 3 seconds. The unit will proceed to the Temperature Calibration mode.
- ▽ + MODE (3 sec): Press and hold the ▽ key and MODE key (in that order) together for 3 seconds. The unit will proceed to the Resistivity Calibration Zero Adjustment mode.
- MODE, SET: Press the MODE or SET key. The unit will proceed to the next setting item indicated by an arrow.
- SET ----▶: Press the SET key until the desired setting mode appears.

• To revert to Resistivity/Temperature Display mode, press and hold the MODE key for 3 seconds while in any mode.

6. Key Operation Flowchart

Abbreviations:
Temp.: Temperature Calib.: Calibration
Resist.: Resistivity Adjust.: Adjustment



[Resistivity/Temperature Display mode, Temperature Calibration mode]

(*1) Measurement start, indicating the item selected in [Backlight selection (p.44)] in the Special Function group.

(*2) If oFF (No temperature compensation) is selected in [Temperature compensation method (p.24)] in the Temperature Input group, the unit does not move to the Temperature Calibration mode.

[Setting groups and items with dotted lines]

Setting groups and items with dotted lines are indicated only when the options are ordered.

[About Setting Items]

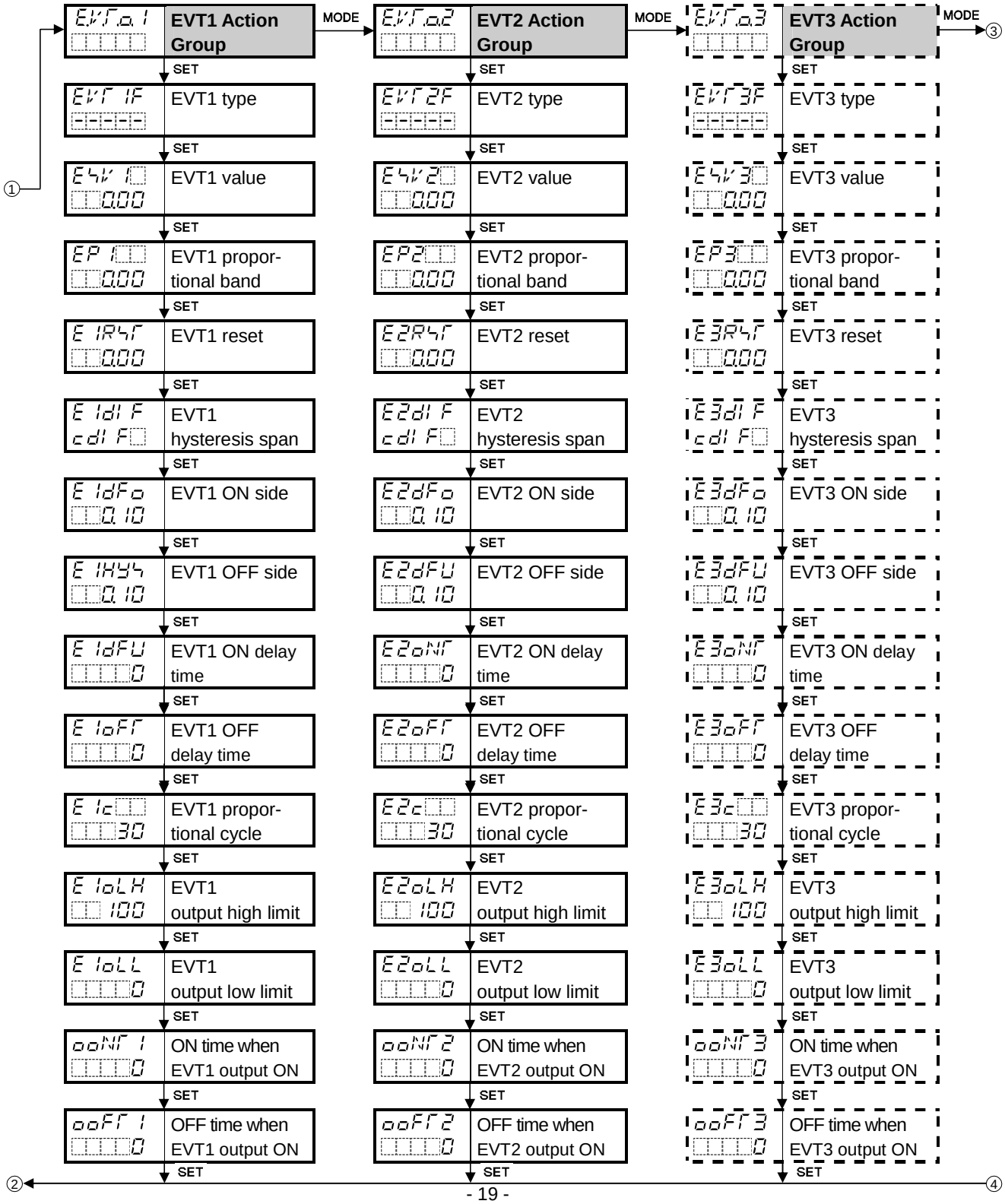
EVT1 Value

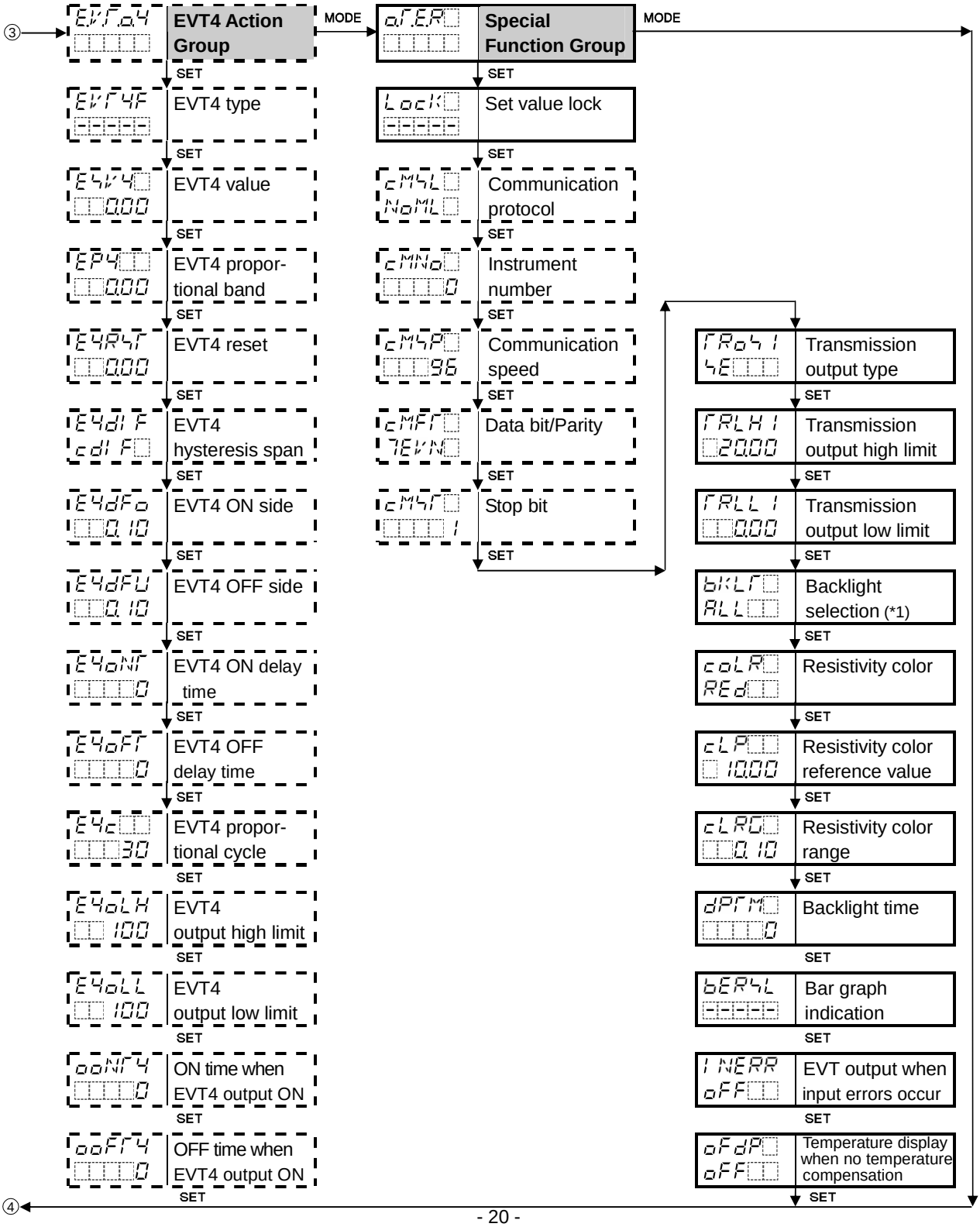
- Upper left: Resistivity Display: Indicates the setting item characters.
- Lower left: Temperature Display: Indicates the factory default.
- Right side: Indicates the setting item.

[About Key Operation]

Abbreviations: Temp.: Temperature, Calib.: Calibration

- △ + MODE (3 sec): Press and hold the △ and MODE keys (in that order) together for 3 sec. The unit enters the Temp. Calib. mode.
- ▽ + MODE (3 sec): Press and hold the ▽ and MODE keys (in that order) together for 3 sec. The unit enters the Resistivity Calibration Span Adjustment mode.
- MODE, SET: Press the MODE or the SET. The unit will enter the next setting mode.
- To revert to Resistivity/Temperature Display mode, press and hold the MODE key for 3 sec while in any mode.




③
EVT.04
EVT4 Action Group
MODE
oTER
Special Function Group
MODE
SET
EVT4F
EVT4 type
Lock
Set value lock
E4V4
EVT4 value
cMSL
NoML
Communication protocol
EP4
EVT4 proportional band
cMNo
Instrument number
E4RST
EVT4 reset
cMSP
96
Communication speed
E4dIF
cdIF
EVT4 hysteresis span
cMFT
7EVN
Data bit/Parity
E4dFo
EVT4 ON side
cMST
1
Stop bit
E4dFU
EVT4 OFF side
E4oNT
EVT4 ON delay time
E4oFT
EVT4 OFF delay time
E4c
30
EVT4 proportional cycle
E4oLH
100
EVT4 output high limit
E4oLL
EVT4 output low limit
ooNT4
ON time when EVT4 output ON
ooFT4
OFF time when EVT4 output ON
TRo1
4E
Transmission output type
TRLH1
20.00
Transmission output high limit
TRLL1
Transmission output low limit
bKLT
ALL
Backlight selection (*1)
coLR
REd
Resistivity color
cLP
10.00
Resistivity color reference value
cLRG
Resistivity color range
dPTM
Backlight time
bER4L
Bar graph indication
INERR
oFF
EVT output when input errors occur
oFdP
oFF
Temperature display when no temperature compensation
SET
④

7. Setup

Setup should be done before using this instrument, to select Resistivity input, Temperature input, EVT1, EVT2, EVT3 (EVT3 option) and EVT4 (EVT3 option) types, Communication (C5 option), Transmission output type, and Indication settings (Backlight selection, Resistivity color, etc.), according to the users' conditions.

Setup can be conducted in the Resistivity Input group, Temperature Input group, EVT1, EVT2, EVT3, EVT4 Action groups and Special Function group.

If the users' specification is the same as the factory default of the AER-102-SE, or if setup has already been completed, it is not necessary to set up the instrument. Proceed to Chapter "8. Calibration (p.46)".

7.1 Turn the Power Supply to the AER-102-SE ON.

For approx. 4 seconds after the power is switched ON, the following characters are indicated in the Resistivity display and Temperature display.

Display	Character	Unit
Resistivity display	conU	Resistivity (MΩ•cm)
	kU	Resistivity (kΩ•m)
Display	**Character**	**Pt100 Input Wire Type**
Temperature display	Pt 2	2-wire type
	Pt 3	3-wire type

During this time, all outputs are in OFF status, and action indicators go off.
After that, measurement starts, indicating the item selected in [Backlight selection (p.44)].
This status is called Resistivity/Temperature Display mode.

7.2 Resistivity Input Group

To enter the Resistivity Input group, follow the procedures below.

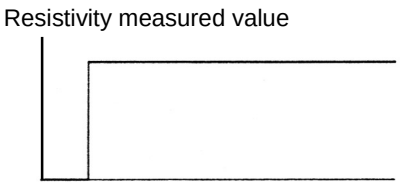
① F.Nc. 1 Press the MODE key once in Resistivity/Temperature Display mode.

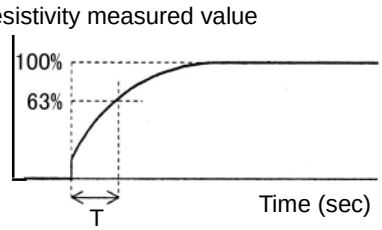
② cELL Press the SET key once.

The unit proceeds to the Resistivity Input group, and "Sensor cell constant" is indicated.

Character	Name, Function, Setting Range	Factory Default
cELL 0.01	**Sensor cell constant** • Selects sensor cell constant. • 0.01/cm fixed.	0.01/cm
coEF 1.000	**Cell constant correction value** • Sets sensor cell constant correction value. coEF and resistivity value are displayed alternately. • Setting range: 0.001 to 5.000	1.000
UNIT coNV	**Unit selection** • Selects the resistivity unit. If resistivity unit is changed, Resistivity span adjustment value and Cell constant correction value will be cleared. Set the Cell constant correction value again, and calibrate Resistivity span adjustment value again. • coNV : Resistivity (MΩ•cm) SI : Resistivity (kΩ•m)	Resistivity (MΩ•cm)
MRNG 20.00	**Measurement range** • Selects resistivity measurement range. If measurement range is changed, Resistivity span adjustment value and Cell constant correction value will be cleared. Set the Cell constant correction value again, and calibrate Resistivity span adjustment value again. • Selection items differ depending on the Unit selection.	20.00 MΩ•cm

Unit	Selection Item	Measurement Range
Resistivity (MΩ•cm)	0.200	0.000 to 0.200 MΩ•cm
	2.00	0.00 to 2.00 MΩ•cm
	20.00	0.00 to 20.00 MΩ•cm
	100.0	0.0 to 100.0 MΩ•cm
Resistivity (kΩ•m)	2.00	0.00 to 2.00 kΩ•m
	20.0	0.0 to 20.0 kΩ•m
	200.0	0.0 to 200.0 kΩ•m
	1000	0 to 1000 kΩ•m

<table>
<tr><th>Character</th><th>Name, Function, Setting Range</th><th>Factory Default</th></tr>
<tr><td>PURE
18.23</td><td>Ultrapure Water Value
• Selects ultrapure water value.
• Selection items differ depending on the Unit selection.
<table>
<tr><th>Unit</th><th>Selection Item</th><th>Ultrapure Water Value</th></tr>
<tr><td rowspan="3">Resistivity (MΩ•cm)</td><td>18.18</td><td>18.18</td></tr>
<tr><td>18.23</td><td>18.23</td></tr>
<tr><td>18.24</td><td>18.24</td></tr>
<tr><td rowspan="3">Resistivity (kΩ•m)</td><td>181.8</td><td>181.8</td></tr>
<tr><td>182.3</td><td>182.3</td></tr>
<tr><td>182.4</td><td>182.4</td></tr>
</table></td><td>18.23</td></tr>
<tr><td>CLIP
20.00</td><td>Clip value
• Sets the clip value (resistivity to be fixed temporarily).
If resistivity measured value is larger than clip value and smaller than measurement range high limit value, the resistivity indication and transmission output will be fixed to the clip value.
If resistivity measured value exceeds measurement range high limit value (outside the measurement range), the clip value will be voided, and measurement range high limit value will flash.
• Setting range: 0 to Measurement span</td><td>20.00 MΩ•cm</td></tr>
<tr><td>FIT
0.0</td><td>Resistivity input filter time constant
• Sets filter time constant for resistivity input.
(Fig. 7.2-1) shows resistivity measured value before filter process is set. If the filter time constant “T” is set, the resistivity measured value changes as shown in (Fig. 7.2-2) so that resistivity measured value after finishing filter process can reach 63% (of the desired value) after T seconds have passed.
If the filter time constant is set too large, it affects EVT action due to the delay of response.
(e.g.) If the LSD (least significant digit) of the resistivity measured value prior to filter process is fluctuating, it can be suppressed by using the filter time constant.
 

(Fig. 7.2-1)
 

(Fig. 7.2-2)
• Setting range: 0.0 to 10.0 sec</td><td>0.0 sec</td></tr>
</table>

Character	Name, Function, Setting Range	Factory Default
rRo 0.00	**Resistivity input sensor correction** • Sets resistivity input sensor correction value. This corrects the input value from the resistivity sensor. When a sensor cannot be set at the exact location where measurement is desired, resistivity measured by the sensor may deviate from the resistivity in the measured location. In this case, desired resistivity can be obtained by adding a sensor correction value. However, it is effective within the measurement range regardless of the sensor correction value. Resistivity after sensor correction= Current resistivity + (Sensor correction value) • Setting range: ±10 % of measurement range. (*)	0.00

(*) The unit and decimal point place follow the measurement range.

7.3 Temperature Input Group

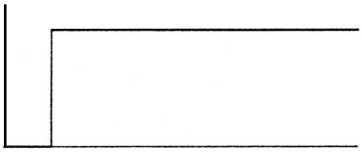
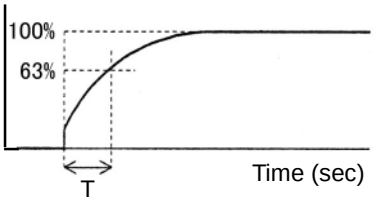
To enter the Temperature Input group, follow the procedures below.

① F.Nc.2 Press the MODE key twice in Resistivity/Temperature Display mode.

② TcM Press the SET key.

The unit enters the Temperature Input group, and "Temperature compensation method" will appear.

Character	Name, Function, Setting Range	Factory Default
TcM PURE	**Temperature compensation method** • Selects Temperature compensation computation method. • PURE: Temperature compensation is conducted using temperature characteristics of pure (deionized) water. PUST: Temperature compensation is conducted using temperature characteristics of pure (deionized) water and impure substance. TcoE: Temperature compensation is conducted using temperature coefficient (%/℃) and randomly selected reference temperature. oFF: No temperature compensation	Temperature characteristics of pure (deionized) water
KcoE 2.00	**Temperature coefficient** • Sets Temperature coefficient. If Temperature coefficient is set to 2.00 %/℃, this value can be used for most aqueous solutions. If Temperature coefficient of an aqueous solution is known, set the value. If Temperature coefficient is set to 0.00 %/℃, resistivity without temperature compensation will be indicated. • Not available when PURE and oFF is selected in [Temperature compensation method]. • Setting range: -5.00 to 5.00 %/℃	2.00 %/℃
STNd 25.0	**Reference temperature** • Sets the reference temperature for temperature compensation. • Setting range: 5.0 to 95.0 ℃	25.0 ℃

Character	Name, Function, Setting Range	Factory Default
dP2 0.0	**Decimal point place** • Selects decimal point place to be indicated in the Temperature display. • 0 : No decimal point 0.0 : 1 digit after decimal point	1 digit after decimal point
cNEcT 3WI RE	**Pt100 input wire type** • Selects the input wire type of Pt100. • 2WI RE: 2-wire type 3WI RE: 3-wire type	3-wire type
cAbLE 0.0	**Cable length correction** • Sets the cable length correction value. • Available only when 2WI RE (2-wire type) is selected in [Pt100 input wire type]. • Setting range: 0.0 to 100.0 m	0.0 m
cSEc 0.30	**Cable cross-section** • Sets the cable cross-section area. • Available only when 2WI RE (2-wire type) is selected in [Pt100 input wire type]. • Setting range: 0.10 to 2.00 mm^2	0.30 mm^2
FIT2 0.0	**Temperature input filter time constant** • Sets filter time constant for temperature input. (Fig. 7.3-1) shows temperature measured value before filter process is set. If the filter time constant "T" is set, the temperature measured value changes as shown in (Fig. 7.3-2) so that temperature measured value after finishing filter process can reach 63% (of the desired value) after T seconds have passed. If the filter time constant is set too large, it affects EVT action due to the delay of response. (e.g.) If the LSD (least significant digit) of the temperature measured value prior to filter process is fluctuating, it can be suppressed by using the filter time constant. Temperature measured value  (Fig. 7.3-1) Temperature measured value  (Fig. 7.3-2) • Setting range: 0.0 to 10.0 sec	0.0 sec

7.4 EVT1 Action Group

To enter the EVT1 Action group, follow the procedures below.

① E.VT□.1 Press the MODE key 3 times in Resistivity/Temperature Display mode.

② EVT 1F Press the SET key.

The unit proceeds to the EVT1 Action group, and "EVT1 type" is indicated.

Character	Name, Function, Setting Range	Factory Default
EVT 1F ----- **EVT1 type**		No action

• Selects an EVT1 output (Contact output 1) type. (Fig.7.4-1, p.29)

Note: If EVT1 type is changed, EVT1 value defaults to 0.00 or 0.0.

• If oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)], EVT1 action will be disabled even if Temperature input low limit or Temperature input high limit is selected.

• ----- : No action
- %E_L□ : Resistivity input low limit
- %E_H□ : Resistivity input high limit
- TEMPL : Temperature input low limit
- TEMPH : Temperature input high limit
- ERoUT : Error output [When the error type is "Error" (Table 7.4-1), the output is turned ON.]
- FAIL□ : Fail output [When the error type is "Fail" (Table 7.4-1), the output is turned ON.]

• **Error output, Fail output**

(Table 7.4-1)

Error Type	Error Contents	Description
Fail	Temperature sensor burnout	Temperature sensor lead wire is burnt out.
Fail	Temperature sensor short-circuited	Temperature sensor lead wire is short-circuited.
Error	Outside temperature compensation range	Measured temperature has exceeded 110.0 ℃.
Error	Outside temperature compensation range	Measured temperature is less than 0.0 ℃.

Character	Name, Function, Setting Range	Factory Default
E%V 1□ □□0.00	**EVT1 value**	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃

• Sets EVT1 value. (Fig. 7.4-1, p.29)

If ----- (No action), ERoUT (Error output) or FAIL□ (Fail output) is selected in [EVT1 type], this setting item and all following items will not appear.

• Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1)

Temperature input: 0.0 to 100.0 ℃ (*2)

(*1) The unit and decimal point place follow the measurement range.

(*2) The decimal point place does not follow the selection. It is fixed.

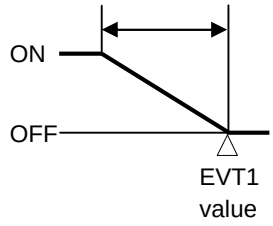
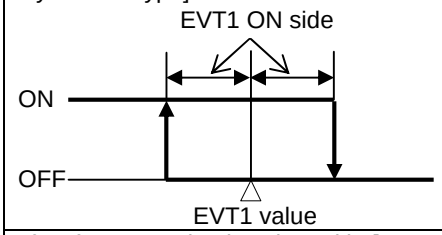
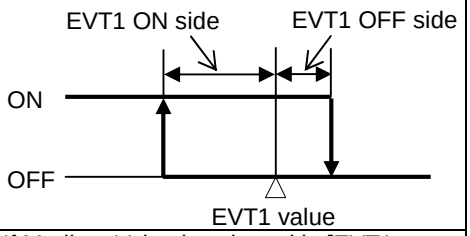
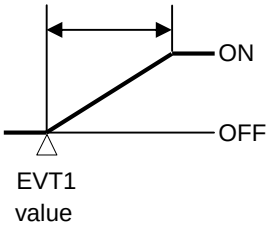
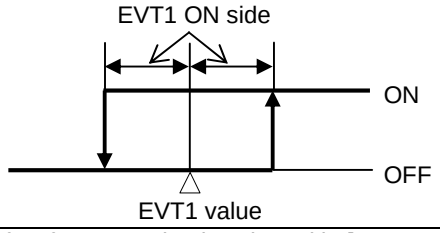
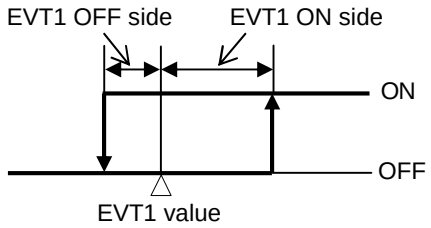
Character	Name, Function, Setting Range	Factory Default
EP 1 □□ □□0.00	**EVT1 proportional band**	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
	• Sets EVT1 proportional band. (Fig. 7.4-1, p.29) ON/OFF control action when set to 0.00 or 0.0. • Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	
E IRSt □□0.00	**EVT1 reset**	Resistivity input: 0.00 Temperature input: 0.0 ℃
	• Sets EVT1 reset value. • Not available for the ON/OFF control action. • Setting range: Resistivity input: ±Measurement span (*1) Temperature input: ±100.0 ℃ (*2)	
E Idl F cdl F□	**EVT1 hysteresis type**	Medium Value
	• Selects EVT1 output hysteresis type (Medium or Reference Value). (Fig. 7.4-1, p.29) • Not available for the P control action. • cdl F□: Medium Value Sets the same value for both ON and OFF sides in relation to EVT1 value. Only ON side needs to be set. Sdl F□: Reference Value Sets individual values for ON and OFF sides in relation to EVT1 value. Both ON and OFF sides need to be set individually.	
E IdFo □□0.10	**EVT1 ON side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT1 ON side. (Fig. 7.4-1, p.29) If cdl F□ (Medium Value) is selected in [EVT1 hysteresis type], the span of ON/OFF side will be the same value. • Not available for the P control action. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	
E IdFU □□0.10	**EVT1 OFF side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT1 OFF side. (Fig. 7.4-1, p.29) • Not available for the P control action, or if cdl F□ (Medium Value) is selected in [EVT1 hysteresis type]. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	

(*1) The unit and decimal point place follow the measurement range.

(*2) The decimal point place does not follow the selection. It is fixed.

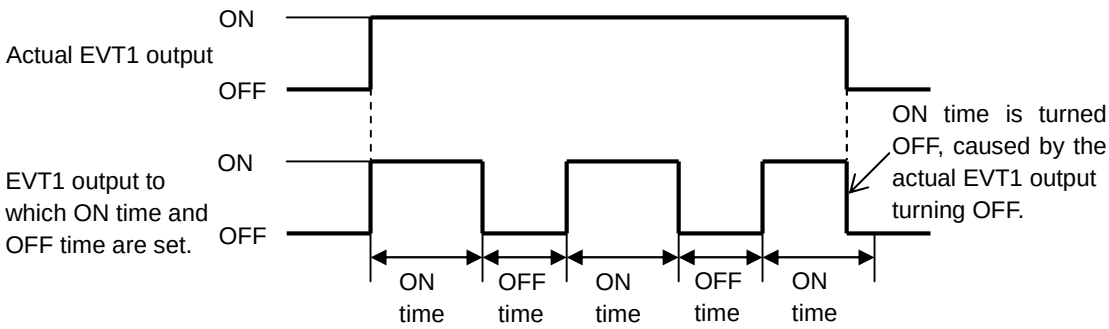
Character	Name, Function, Setting Range	Factory Default
E ioNT 0	**EVT1 ON delay time** • Sets EVT1 action delay time. The EVT1 output does not turn ON after the input value exceeds the EVT1 value until the time set in [EVT1 ON delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E ioFT 0	**EVT1 OFF delay time** • Sets EVT1 action delay time. The EVT1 output does not turn OFF after the input value exceeds the EVT1 value until the time set in [EVT1 OFF delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E ic 30	**EVT1 proportional cycle** • Sets EVT1 proportional cycle. • Not available for the ON/OFF control action. • Setting range: 1 to 300 seconds	30 sec
E ioLH 100	**EVT1 output high limit** • Sets EVT1 output high limit value. • Not available for the ON/OFF control action. • Setting range: EVT1 output low limit to 100 %	100 %
E ioLL 0	**EVT1 output low limit** • Sets EVT1 output low limit value. • Not available for the ON/OFF control action. • Setting range: 0 % to EVT1 output high limit	0 %
ooNT 1 0	**ON Time when EVT1 output ON** • Sets ON time when EVT1 output is ON. If ON time and OFF time are set, EVT1 output can be turned ON/OFF in a configured cycle when EVT1 output is ON. (Fig. 7.4-2, p.29) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec
ooFT 1 0	**OFF Time when EVT1 output ON** • Sets OFF time when EVT1 output is ON. If ON time and OFF time are set, EVT1 output can be turned ON/OFF in a configured cycle when EVT1 output is ON. (Fig. 7.4-2, p.29) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec

EVT1 Action

EVT1 Type	P Control Action	ON/OFF Control Action
Resistivity input low limit, Temperature input low limit	EVT1 proportional band 	If Medium Value is selected in [EVT1 hysteresis type]:  If Reference Value is selected in [EVT1 hysteresis type]: 
Resistivity input high limit, Temperature input high limit	EVT1 proportional band 	If Medium Value is selected in [EVT1 hysteresis type]:  If Reference Value is selected in [EVT1 hysteresis type]: 

(Fig. 7.4-1)

Timing chart when EVT1 output ON time and OFF time are set.



(Fig. 7.4-2)

7.5 EVT2 Action Group

To enter the EVT2 Action group, follow the procedures below.

① E.V.T.o.2 Press the MODE key 4 times in Resistivity/Temperature Display mode.

② EVT2F Press the SET key.

The unit proceeds to the EVT2 Action group, and “EVT2 type” is indicated.

Character	Name, Function, Setting Range	Factory Default
EVT2F -----	**EVT2 type** • Selects an EVT2 output (contact type 2). (Fig. 7.5-1, p.33) **Note: If EVT2 type is changed, EVT2 value defaults to 0.00 or 0.0.** • If oFF (No temperature compensation) is selected in [Temperature compensation method (p.24)], EVT2 action will be disabled even if Temperature input low limit or Temperature input high limit is selected. • ----- : No action SE_L : Resistivity input low limit SE_H : Resistivity input high limit TEMPL : Temperature input low limit TEMPH : Temperature input high limit ERoUT : Error output [When the error type is “Error” (Table 7.5-1), the output is turned ON.] FAIL : Fail output [When the error type is “Fail” (Table 7.5-1), the output is turned ON.] • **Error output, Fail output**	No action

(Table 7.5-1)

Error Type	Error Contents	Description
Fail	Temperature sensor burnout	Temperature sensor lead wire is burnt out.
Fail	Temperature sensor short-circuited	Temperature sensor lead wire is short-circuited.
Error	Outside temperature compensation range	Measured temperature has exceeded 110.0 ℃.
Error	Outside temperature compensation range	Measured temperature is less than 0.0 ℃.

Character	Name, Function, Setting Range	Factory Default
ESV2 0.00	**EVT2 value** • Sets EVT2 value. (Fig. 7.5-1, p.33) If ----- (No action), ERoUT (Error output) or FAIL (Fail output) is selected in [EVT2 type], this setting item and all following items will not appear. • Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃

(*1) The unit and decimal point place follow the measurement range.

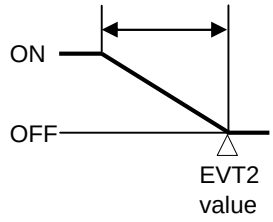
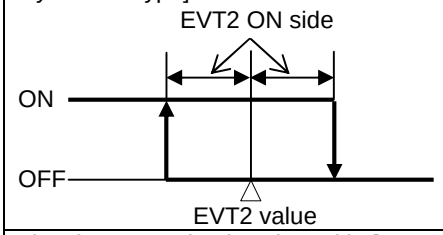
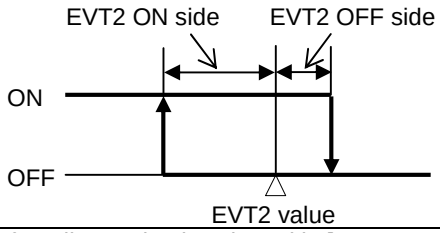
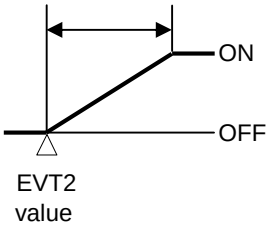
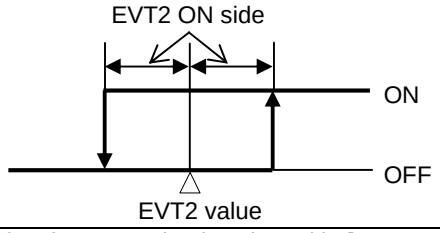
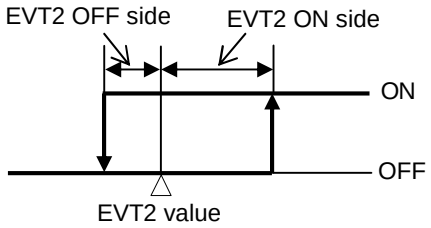
(*2) The decimal point place does not follow the selection. It is fixed.

Character	Name, Function, Setting Range	Factory Default
EP2□□ □□0.00	**EVT2 proportional band**	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
	• Sets EVT2 proportional band. (Fig. 7.5-1, p.33) ON/OFF control action when set to 0.00 or 0.0. • Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	
E2rSt □□0.00	**EVT2 reset**	Resistivity input: 0.00 Temperature input: 0.0 ℃
	• Sets EVT2 reset value. • Not available for the ON/OFF control action. • Setting range: Resistivity input: ±Measurement span (*1) Temperature input: ±100.0 ℃ (*2)	
E2dI F cdI F□	**EVT2 hysteresis type**	Medium Value
	• Selects EVT2 output hysteresis type (Medium or Reference Value). (Fig. 7.5-1, p.33) • Not available for the P control action. • cdI F□: Medium Value Sets the same value for both ON and OFF sides in relation to EVT2 value. Only ON side needs to be set. rdI F□: Reference Value Sets individual values for ON and OFF sides in relation to EVT2 value. Both ON and OFF sides need to be set individually.	
E2dFo □□0.10	**EVT2 ON side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT2 ON side. (Fig. 7.5-1, p.33) If cdI F□ (Medium Value) is selected in [EVT2 hysteresis type], the span of ON/OFF side will be the same value. • Not available for the P control action. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	
E2dFU □□0.10	**EVT2 OFF side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT2 OFF side. (Fig. 7.5-1, p.33) • Not available for the P control action, or if cdI F□ (Medium Value) is selected in [EVT2 hysteresis type]. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	

(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.

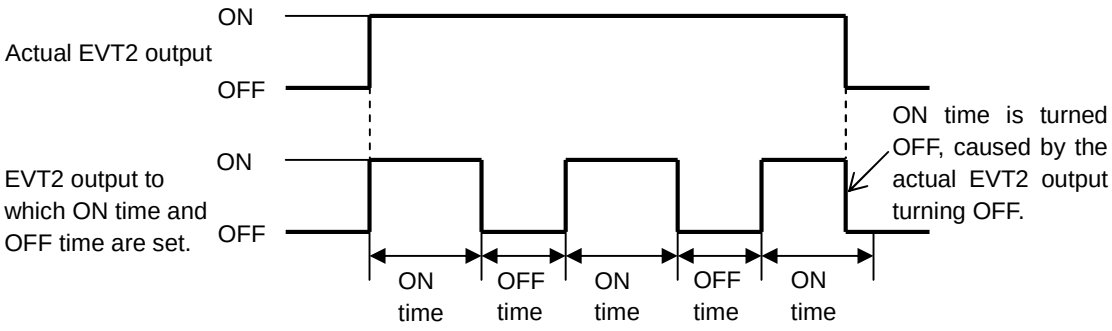
Character	Name, Function, Setting Range	Factory Default
E2oNr □□□0	**EVT2 ON delay time** • Sets EVT2 action delay time. The EVT2 output does not turn ON after the input value exceeds the EVT2 value until the time set in [EVT2 ON delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E2oFr □□□0	**EVT2 OFF delay time** • Sets EVT2 action delay time. The EVT2 output does not turn OFF after the input value exceeds the EVT2 value until the time set in [EVT2 OFF delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E2c□□ □□30	**EVT2 proportional cycle** • Sets EVT2 proportional cycle. • Not available for the ON/OFF control action. • Setting range: 1 to 300 seconds	30 sec
E2oLH □□ 100	**EVT2 output high limit** • Sets EVT2 output high limit value. • Not available for the ON/OFF control action. • Setting range: EVT2 output low limit to 100 %	100 %
E2oLL □□□0	**EVT2 output low limit** • Sets EVT2 output low limit value. • Not available for the ON/OFF control action. • Setting range: 0 % to EVT2 output high limit	0 %
ooNr2 □□□0	**ON Time when EVT2 output ON** • Sets ON time when EVT2 output is ON. If ON time and OFF time are set, EVT2 output can be turned ON/OFF in a configured cycle when EVT2 output is ON. (Fig. 7.5-2, p.33) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec
ooFr2 □□□0	**OFF Time when EVT2 output ON** • Sets OFF time when EVT2 output is ON. If ON time and OFF time are set, EVT2 output can be turned ON/OFF in a configured cycle when EVT2 output is ON. (Fig. 7.5-2, p.33) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec

EVT2 Action

EVT2 Type	P Control Action	ON/OFF Control Action
Resistivity input low limit, Temperature input low limit	EVT2 proportional band 	If Medium Value is selected in [EVT2 hysteresis type]:  If Reference Value is selected in [EVT2 hysteresis type]: 
Resistivity input high limit, Temperature input high limit	EVT2 proportional band 	If Medium Value is selected in [EVT2 hysteresis type]:  If Reference Value is selected in [EVT2 hysteresis type]: 

(Fig. 7.5-1)

Timing chart when EVT2 output ON time and OFF time are set.



(Fig. 7.5-2)

7.6 EVT3 Action Group

EVT3 Action group is available only when EVT3, EVT4 Output (EVT3 option) is ordered.

To enter the EVT3 Action group, follow the procedures below.

① E.VT.a3 Press the MODE key 5 times in Resistivity/Temperature Display mode.

② EVT 3F Press the SET key.

The unit proceeds to the EVT3 Action group, and "EVT3 type" is indicated.

Character	Name, Function, Setting Range	Factory Default
EVT 3F -----	**EVT3 type**	No action

• Selects an EVT3 output (Contact output 3) type. (Fig. 7.6-1, p.37)
Note: If EVT3 type is changed, EVT3 value defaults to 0.00 or 0.0.

• If oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)], EVT3 action will be disabled even if Temperature input low limit or Temperature input high limit is selected.

• ----- : No action
RE_L□ : Resistivity input low limit
RE_H□ : Resistivity input high limit
TEMPL : Temperature input low limit
TEMPH : Temperature input high limit
ERoUT : Error output [When the error type is "Error" (Table 7.6-1), the output is turned ON.]
FAIL□ : Fail output [When the error type is "Fail" (Table 7.6-1), the output is turned ON.]

• Error output, Fail output
(Table 7.6-1)

Error Type	Error Contents	Description
Fail	Temperature sensor burnout	Temperature sensor lead wire is burnt out.
Fail	Temperature sensor short-circuited	Temperature sensor lead wire is short-circuited.
Error	Outside temperature compensation range	Measured temperature has exceeded 110.0 ℃.
Error	Outside temperature compensation range	Measured temperature is less than 0.0 ℃.

Character	Name, Function, Setting Range	Factory Default
EV3□ □□0.00	**EVT3 value**	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃

• Sets EVT3 value. (Fig. 7.6-1, p.37)
If ----- (No action), ERoUT (Error output) or FAIL□ (Fail output) is selected in [EVT3 type], this setting item and all following items will not appear.

• Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1)
Temperature input: 0.0 to 100.0 ℃ (*2)

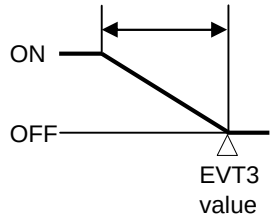
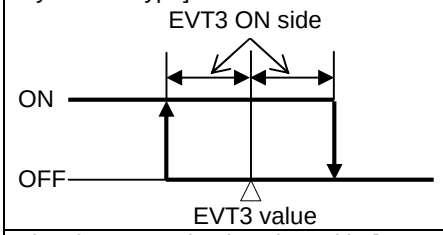
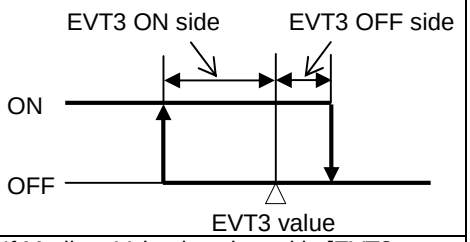
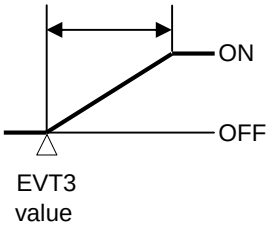
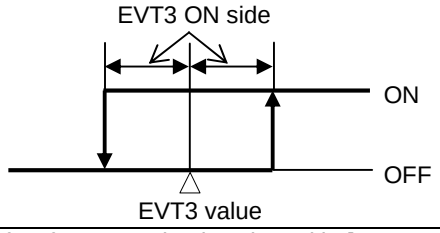
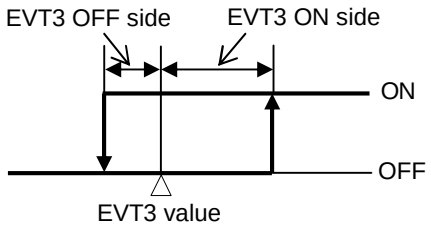
(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.

Character	Name, Function, Setting Range	Factory Default
EP3□□ □□0.00	**EVT3 proportional band**	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
	• Sets EVT3 proportional band. (Fig. 7.6-1, p.37) ON/OFF control action when set to 0.00 or 0.0. • Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	
E3rSt □□0.00	**EVT3 reset**	Resistivity input: 0.00 Temperature input: 0.0 ℃
	• Sets EVT3 reset value. • Not available for the ON/OFF control action. • Setting range: Resistivity input: ±Measurement span (*1) Temperature input: ±100.0 ℃ (*2)	
E3dI F cdI F□	**EVT3 hysteresis type**	Medium Value
	• Selects EVT3 output hysteresis type (Medium or Reference Value). (Fig. 7.6-1, p.37) • Not available for the P control action. • cdI F□: Medium Value Sets the same value for both ON and OFF sides in relation to EVT3 value. Only ON side needs to be set. hdI F□: Reference Value Sets individual values for ON and OFF sides in relation to EVT3 value. Both ON and OFF sides need to be set individually.	
E3dFo □□0.10	**EVT3 ON side**	Resistivity input: 0.10 Temperature input: 1.0℃
	• Sets the span of EVT3 ON side. (Fig. 7.6-1, p.37) If cdI F□ (Medium Value) is selected in [EVT3 hysteresis type], the span of ON/OFF side will be the same value. • Not available for the P control action. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	
E3dFU □□0.10	**EVT3 OFF side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT3 OFF side. (Fig. 7.6-1, p.37) • Not available for the P control action, or if cdI F□ (Medium Value) is selected in [EVT3 hysteresis type]. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	

(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.

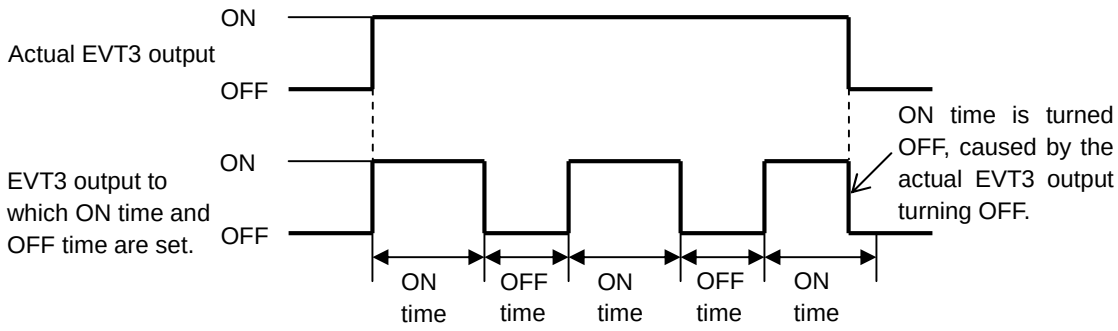
Character	Name, Function, Setting Range	Factory Default
E3oNr □□□0	**EVT3 ON delay time** • Sets EVT3 action delay time. The EVT3 output does not turn ON after the input value exceeds the EVT3 value until the time set in [EVT3 ON delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E3oFr □□□0	**EVT3 OFF delay time** • Sets EVT3 action delay time. The EVT3 output does not turn OFF after the input value exceeds the EVT3 value until the time set in [EVT3 OFF delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E3c□□ □□30	**EVT3 proportional cycle** • Sets EVT3 proportional cycle. • Not available for the ON/OFF control action. • Setting range: 1 to 300 seconds	30 sec
E3oLH □□ 100	**EVT3 output high limit** • Sets EVT3 output high limit value. • Not available for the ON/OFF control action. • Setting range: EVT3 output low limit to 100 %	100 %
E3oLL □□□0	**EVT3 output low limit** • Sets EVT3 output low limit value. • Not available for the ON/OFF control action. • Setting range: 0 % to EVT3 output high limit	0 %
ooN3 □□□0	**ON Time when EVT3 output ON** • Sets ON time when EVT3 output is ON. If ON time and OFF time are set, EVT3 output can be turned ON/OFF in a configured cycle when EVT3 output is ON. (Fig. 7.6-2, p.37) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec
ooF3 □□□0	**OFF Time when EVT3 output ON** • Sets OFF time when EVT3 output is ON. If ON time and OFF time are set, EVT3 output can be turned ON/OFF in a configured cycle when EVT3 output is ON. (Fig. 7.6-2, p.37) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec

EVT3 Action

EVT3 Type	P Control Action	ON/OFF Control Action
Resistivity input low limit, Temperature input low limit	EVT3 proportional band 	If Medium Value is selected in [EVT3 hysteresis type]:  If Reference Value is selected in [EVT3 hysteresis type]: 
Resistivity input high limit, Temperature input high limit	EVT3 proportional band 	If Medium Value is selected in [EVT3 hysteresis type]:  If Reference Value is selected in [EVT3 hysteresis type]: 

(Fig. 7.6-1)

Timing chart when EVT3 output ON time and OFF time are set.



(Fig. 7.6-2)

7.7 EVT4 Action Group

EVT4 Action group is available only when EVT3, EVT4 Output (EVT3 option) is ordered.

To enter the EVT4 Action group, follow the procedures below.

① EVT.a4 Press the MODE key 6 times in Resistivity/Temperature Display mode.

② EVT4F Press the SET key.

The unit proceeds to the EVT4 Action group, and "EVT4 type" is indicated.

Character	Name, Function, Setting Range	Factory Default
EVT4F ----- EVT4 value □□0.00	**EVT4 type** • Selects an EVT4 type. (Fig. 7.7-1, p.41) **Note: If EVT4 type is changed, EVT4 value defaults to 0.00 or 0.0.** • If oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)], EVT4 action will be disabled even if Temperature input low limit or Temperature input high limit is selected. • -----: No action rE_L□ : Resistivity input low limit rE_H□ : Resistivity input high limit TEMPL : Temperature input low limit TEMPH : Temperature input high limit ERoUT : Error output [When the error type is "Error" (Table 7.7-1), the output is turned ON.] FAIL□ : Fail output [When the error type is "Fail" (Table 7.7-1), the output is turned ON.] • **Error output, Fail output (Table 7.7-1)**	No action
	EVT4 value • Sets EVT4 value. (Fig. 7.7-1, p.41) If ----- (No action), ERoUT (Error output) or FAIL□ (Fail output) is selected in [EVT4 type], this setting item and all following items will not appear. • Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃

Error Type	Error Contents	Description
Fail	Temperature sensor burnout	Temperature sensor lead wire is burnt out.
Fail	Temperature sensor short-circuited	Temperature sensor lead wire is short-circuited.
Error	Outside temperature compensation range	Measured temperature has exceeded 110.0 ℃.
Error	Outside temperature compensation range	Measured temperature is less than 0.0 ℃.

(*1) The unit and decimal point place follow the measurement range.

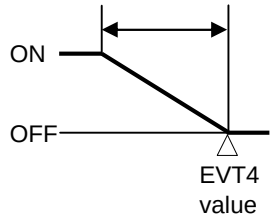
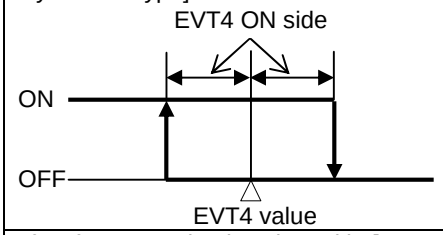
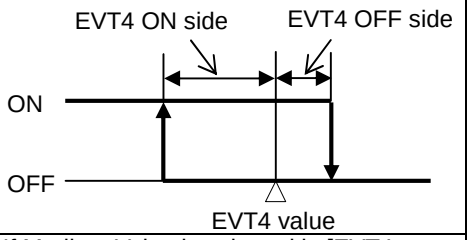
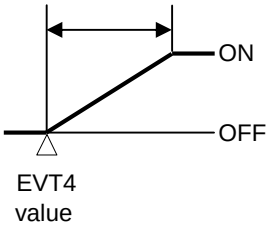
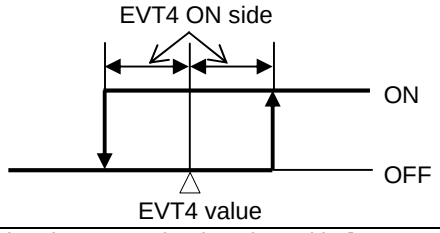
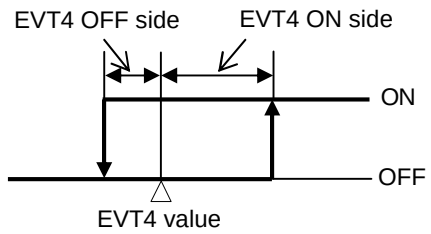
(*2) The decimal point place does not follow the selection. It is fixed.

Character	Name, Function, Setting Range	Factory Default
EP4□□ □□0.00	**EVT4 proportional band**	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
	• Sets EVT4 proportional band. (Fig. 7.7-1, p.41) ON/OFF control action when set to 0.00 or 0.0. • Setting range: Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	
E4rSt □□0.00	**EVT4 reset**	Resistivity input: 0.00 Temperature input: 0.0 ℃
	• Sets EVT4 reset value. • Not available for the ON/OFF control action. • Setting range: Resistivity input: ±Measurement span (*1) Temperature input: ±100.0 ℃ (*2)	
E4dIF cdIF□	**EVT4 hysteresis type**	Medium Value
	• Selects EVT4 output hysteresis type (Medium or Reference Value). (Fig. 7.7-1, p.41) • Not available for the P control action. • cdIF□: Medium Value Sets the same value for both ON and OFF sides in relation to EVT4 value. Only ON side needs to be set. rdIF□: Reference Value Sets individual values for ON and OFF sides in relation to EVT4 value.	
E4dFo □□0.10	**EVT4 ON side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT4 ON side. (Fig. 7.7-1, p.41) If cdIF□ (Medium Value) is selected in [EVT4 hysteresis type], the span of ON/OFF side will be the same value. • Not available for the P control action. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0℃ (*2)	
E4dFU □□0.10	**EVT4 OFF side**	Resistivity input: 0.10 Temperature input: 1.0 ℃
	• Sets the span of EVT4 OFF side. (Fig. 7.7-1, p.41) • Not available for the P control action, or if cdIF□ (Medium Value) is selected in [EVT4 hysteresis type]. • Setting range: Resistivity input: 0 to 20 % of Measurement range high limit (*1) Temperature input: 0.0 to 10.0 ℃ (*2)	

(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.

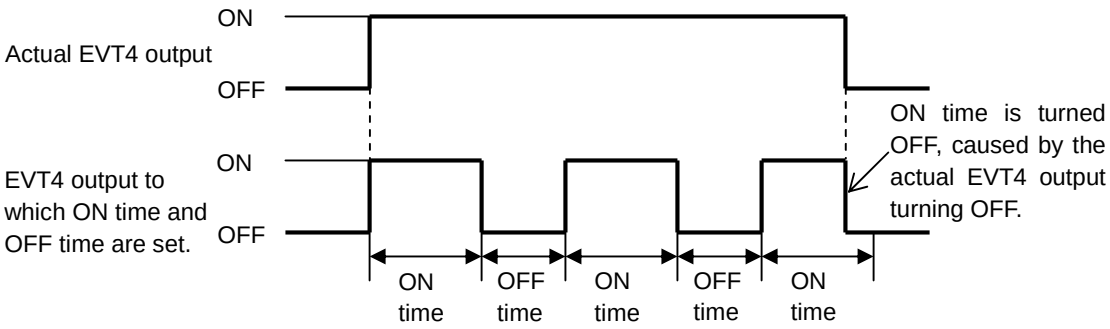
Character	Name, Function, Setting Range	Factory Default
E4oNT □□□0	**EVT4 ON delay time** • Sets EVT4 action delay time. The EVT4 output does not turn ON after the input value exceeds the EVT4 value until the time set in [EVT4 ON delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E4oFT □□□0	**EVT4 OFF delay time** • Sets EVT4 action delay time. The EVT4 output does not turn OFF after the input value exceeds the EVT4 value until the time set in [EVT4 OFF delay time] elapses. • Not available for the P control action. • Setting range: 0 to 10000 seconds	0 sec
E4c□□ □□30	**EVT4 proportional cycle** • Sets EVT4 proportional cycle. • Not available for the ON/OFF control action. • Setting range: 1 to 300 seconds	30 sec
E4oLH □□ 100	**EVT4 output high limit** • Sets EVT4 output high limit value. • Not available for the ON/OFF control action. • Setting range: EVT4 output low limit to 100 %	100 %
E4oLL □□□0	**EVT4 output low limit** • Sets EVT4 output low limit value. • Not available for the ON/OFF control action. • Setting range: 0 % to EVT4 output high limit	0 %
ooNT4 □□□0	**ON Time when EVT4 output ON** • Sets ON time when EVT4 output is ON. If ON time and OFF time are set, EVT4 output can be turned ON/OFF in a configured cycle when EVT4 output is ON. (Fig. 7.7-2, p.41) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec
ooFT4 □□□0	**OFF Time when EVT4 output ON** • Sets OFF time when EVT4 output is ON. If ON time and OFF time are set, EVT4 output can be turned ON/OFF in a configured cycle when EVT4 output is ON. (Fig. 7.7-2, p.41) • Not available for P control action • Setting range: 0 to 10000 seconds	0 sec

EVT4 Action

EVT4 Type	P Control Action	ON/OFF Control Action
Resistivity input low limit, Temperature input low limit	EVT4 proportional band 	If Medium Value is selected in [EVT4 hysteresis type]:  If Reference Value is selected in [EVT4 hysteresis type]: 
Resistivity input high limit, Temperature input high limit	EVT4 proportional band 	If Medium Value is selected in [EVT4 hysteresis type]:  If Reference Value is selected in [EVT4 hysteresis type]: 

(Fig. 7.7-1)

Timing chart when EVT4 output ON time and OFF time are set.



(Fig. 7.7-2)

7.8 Special Function Group

To enter the Special Function group, follow the procedures below.

① aTER Press the MODE key 5 times in Resistivity/Temperature Display mode. If EVT3, EVT4 output (EVT3 option) is ordered, press the MODE key 7 times in Resistivity/Temperature Display mode.

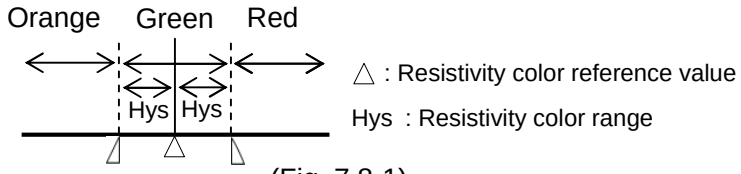
② LocK Press the SET key.

The unit enters the Special Function group, and the “Set value lock” will appear.

Character	Name, Function, Setting Range	Factory Default
LocK -----	**Set value lock** • Locks the set values to prevent setting errors. • ----- (Unlock): All set values can be changed. Lock 1 (Lock 1) : None of the set values can be changed. Lock2 (Lock 2) : Only EVT1, EVT2, EVT3, EVT4 values can be changed. Lock3 (Lock 3) : All set values - except Unit selection, Measurement range, Resistivity calibration value, Temperature calibration value and - can be temporarily changed. However, they revert to their previous value after the power is turned off because they are not saved in the non-volatile IC memory. Do not change setting items (EVT1, EVT2, EVT3, EVT4 types). If they are changed, they will affect other setting items. Be sure to select Lock 3 when changing the set value frequently via communication function. (If the value set by the communication function is the same as the value before the setting, the value will not be written in the non-volatile IC memory.)	Unlock
cMtL NoML	**Communication protocol** • Selects communication protocol. • Available when the Serial communication (C5) option is ordered. • NoML : Shinko protocol ModA : Modbus ASCII mode ModR : Modbus RTU mode	Shinko protocol
cMNo 0	**Instrument number** • Sets the instrument number of this unit. (The instrument numbers should be set one by one when multiple instruments are connected, otherwise communication is impossible.) • Available when the Serial communication (C5) option is ordered. • Setting range: 0 to 95	0

Character	Name, Function, Setting Range	Factory Default
cMSP □□96	**Communication speed** • Selects a communication speed equal to that of the host computer. • Available when the Serial communication (C5) option is ordered. • □□96 : 9600 bps □□192 : 19200 bps □□384 : 38400 bps	9600 bps
cMFT 7EVN	**Data bit/Parity** • Selects data bit and parity. • Available when the Serial communication (C5) option is ordered. • 8NoN : 8 bits/No parity 7NoN : 7 bits/No parity 8EVN : 8 bits/Even 7EVN : 7 bits/Even 8odd : 8 bits/Odd 7odd : 7 bits/Odd	7 bits/Even
cMST □□□1	**Stop bit** • Selects the stop bit. • Available when the Serial communication (C5) option is ordered. • □□□1 : Stop bit 1 □□□2 : Stop bit 2	Stop bit 1
TRoH1 %E□□□	**Transmission output type** • Selects the transmission output type. • If oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)], and if TEMP□ (Temperature transmission) is selected, the transmission output value will differ depending on the selection in [Temperature display when no temperature compensation (p.45)] as follows. If oFF□□ (Unlit) or %Td□□ (Reference temperature) is selected, the value set in [Reference temperature (p.24)] will be outputted. If PV□□□ (Measured value) is selected, the measured value will be outputted. • %E□□□: Resistivity transmission TEMP□: Temperature transmission	Resistivity transmission
TRLH1 □20.00	**Transmission output high limit** • Sets the Transmission output high limit value. (This value correponds to 20 mA DC output.) If Transmission output high limit and low limit are set to the same value, 4mA DC will be fixed as a transmission output. • Setting range: Resistivity transmission: Transmission output low limit to Measurement range high limit (*1) Temperature transmission: Transmission output low limit to 100.0℃(*2)	Resistivity transmission: Measurement range high limit Temperature transmission: 100.0 ℃

(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.

Character	Name, Function, Setting Range	Factory Default
TRLL 1 □□0.00	**Transmission output low limit**	Resistivity transmission: Measurement range low limit Temperature transmission: 0.0 ℃
	• Sets the Transmission output low limit value. (This value correponds to 4 mA DC output.) If Transmission output high limit and low limit are set to the same value, 4 mA DC will be fixed as a transmission output. • Setting range: Resistivity transmission: Measurement range low limit to Transmission output high limit (*1) Temperature transmission: 0.0 ℃ to Transmission output high limit (*2)	
bKLT□ ALL□□	**Backlight selection**	All are backlit
	• Selects the display to backlight. • ALL□□ : All are backlit. SE□□□ : Resistivity display TEMP□ : Temperature display Rc□□□ : Action indicators SETMP : Resistivity display + Temperature display SERc□ : Resistivity display + Action indicators TMPRc : Temperature display + Action indicators	
coLR□ REd□□	**Resistivity color**	Red
	• Selects a color for the Resistivity display. • GRN□□ : Green REd□□ : Red oRG□□ : Orange SEGR□ : Resistivity color changes continuously (Fig. 7.8-1). The Resistivity display color changes according to [Resistivity color reference value] and [Resistivity color range] settings. • When resistivity is lower than [Resistivity color reference value] – [Resistivity color range]: Orange • When resistivity is within [Resistivity color reference value] ± [Resistivity color range]: Green • When resistivity is higher than [Resistivity color reference value] + [Resistivity color range]: Red  (Fig. 7.8-1)	
cLP□□ □ 10.00	**Resistivity color reference value**	10.00
	• Sets a reference value for resistivity color to be green when SEGR□ (Resistivity color changes continuously) is selected in [Resistivity color]. • Setting range: 0 to Measurement range high limit (*1)	

(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.

Character	Name, Function, Setting Range	Factory Default
cLRG □□0.10	**Resistivity color range** • Sets a range for Resistivity color to be green when YEGR□ (Resistivity color changes continuously) is selected in [Resistivity color]. • Setting range: 0.10 to Measurement range high limit (*)	0.10
dPTM□ □□□□0	**Backlight time** • Sets time to backlight from no operation status until backlight is switched off. When set to 0, the backlight remains ON. Backlight relights by pressing any key while backlight is OFF. • Setting range: 0 to 99 minutes	0 minutes
bERhL -----	**Bar graph indication** • Selects bar graph indication. • -----: No indication TRoT 1: Transmission output Segments will light in accordance with the output. Scale is -5 to 105 %. Segments will light from left to right in accordance with the output. When output is 50 %  -5 % 50 % 105 % Lit increasingly to the right in accordance with the output. (Fig. 7.8-2)	No indication
I NERR oFF□□	**EVT output when input errors occur** • If input errors occur, such as resistivity sensor is disconnected or short-circuited, EVT output Enabled/Disabled can be selected. If "Enabled" is selected, EVT output will be maintained when input errors occur. If "Disabled" is selected, EVT output will be turned OFF when input errors occur. • oFF□□: Disabled oN□□□: Enabled	Disabled
oFdP□ oFF□□	**Temperature display when no temperature compensation** • Selects an item to be indicated in the Temperature display when oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)]. • Available if oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)]. • oFF□□: Unlit rFd□□: Reference temperature Temperature set in [Reference temperature (p.24)] will be indicated. PV□□□: Measured value	Unlit

(*) The unit and decimal point place follow the measurement range.

8. Calibration

The Resistivity Calibration mode and Temperature Calibration mode are described below.

8.1 Resistivity Calibration Span Adjustment Mode

Cell constant sometimes varies due to deterioration of 2-electrode resistivity sensor.
To correct this cell constant, calibration is required.
Adjust correction value so that resistivity measured value matches the reference resistivity meter.

The following outlines the procedure for **Resistivity calibration span adjustment**.

① Press and hold the ▽ key and MODE key (in that order) together for 3 seconds in Resistivity/Temperature Display mode.
The unit enters [Resistivity calibration span adjustment mode], and indicates as follows.

- Resistivity display: AdJ4 and resistivity are indicated alternately.
- Temperature display: Resistivity span adjustment value is indicated.

② Set the Resistivity span adjustment value with the △ or ▽ key while checking the reference resistivity meter.
Resistivity span adjustment value: 0.700 to 1.300

③ Press the SET key.
The resistivity span adjustment value will be registered, and the unit reverts to the Resistivity/Temperature Display mode.

8.2 Temperature Calibration Mode

To calibrate a temperature, set a temperature calibration value.
If oFF (No temperature compensation) is selected in [Temperature Compensation Method (p.24)], Temperature Calibration mode is not available.

When a sensor cannot be set at the exact location where measurement is desired, the resulting measured temperature may deviate from the temperature in the desired location. In such a case, the desired temperature can be set for the desired location by setting a temperature calibration value. However, it is effective within the input rated range regardless of the temperature calibration value.
Temperature after calibration = Current temperature + (Temperature calibration value)
(e.g.) When current temperature is 23.5 ℃,
If temperature calibration value is set to 1.5 ℃: 23.5 + (1.5) = 25.0 ℃
If temperature calibration value is set to -1.5 ℃: 23.5 + (-1.5) = 22.0 ℃

The following outlines the procedure for **Temperature calibration**.

① Press and hold the △ key and MODE key (in that order) together for 3 seconds in Resistivity/Temperature Display mode.
The unit will proceed to the Temperature Calibration mode, and indicates as follows.
• Resistivity display: tc and temperature are indicated alternately.
• Temperature display: Temperature calibration value is indicated.

② Set a temperature calibration value with the △ or ▽ key while checking the temperature.
Setting range: -10.0 to 10.0 ℃

③ Press the SET key.
Temperature calibration is complete, and the unit reverts to the Resistivity/ Temperature Display mode.

9. Measurement

9.1 Starting Measurement

After mounting to the control panel, wiring, setup and calibration are complete, turn the power to the instrument ON.

For approx. 4 seconds after the power is switched ON, the following characters are indicated in the Resistivity display and Temperature display.

Display	Character	Unit
Resistivity display	coNV	Resistivity (MΩ•cm)
	kI	Resistivity (kΩ•m)
Display	**Character**	**Pt100 Input Wire Type**
Temperature display	Pr2	2-wire type
	Pr3	3-wire type

During this time, all outputs are in OFF status, and action indicators go off.

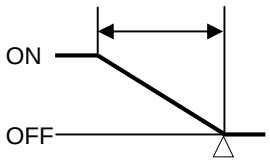
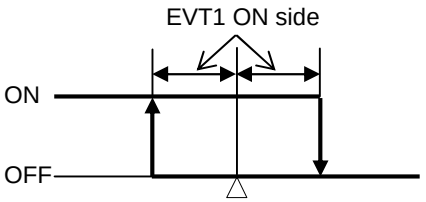
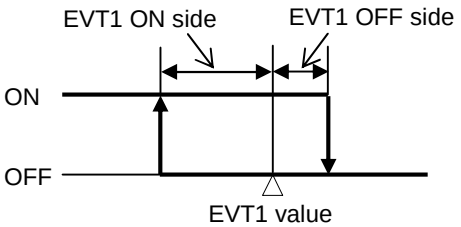
After that, measurement starts, indicating the item selected in [Backlight Selection (p.44)].

9.2 EVT1 to EVT4 Outputs

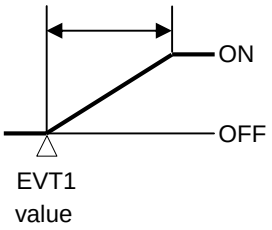
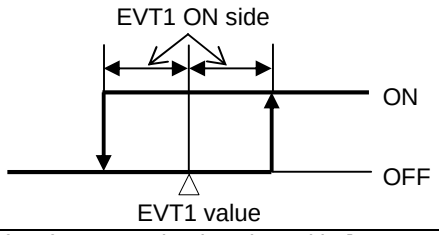
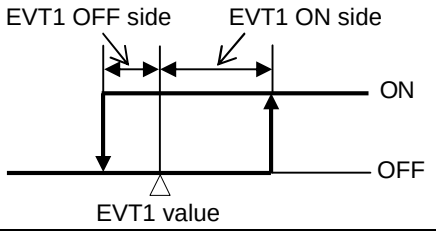
If rE_L (Resistivity input low limit), rE_H (Resistivity input high limit), TEMPL (Temperature input low limit) or TEMPH (Temperature input high limit) is selected in [EVT1 type (p.26)], the following action is activated. (Fig. 9.2-1), (Fig. 9.2-2, p.49)

The same applies to EVT2, EVT3 and EVT4.

- **EVT1 Action**

EVT1 Type	P Control Action	ON/OFF Control Action
Resistivity input low limit, Temperature input low limit	EVT1 proportional band  	If Medium Value is selected in [EVT1 hysteresis type]:  If Reference Value is selected in [EVT1 hysteresis type]: 

(Fig. 9.2-1)

<table>
<tr><th>EVT1 Type</th><th>P Control Action</th><th>ON/OFF Control Action</th></tr>
<tr><td rowspan="2">Resistivity input high limit,
Temperature input high limit</td><td rowspan="2">EVT1 proportional band
 
</td><td>If Medium Value is selected in [EVT1 hysteresis type]:
 
</td></tr>
<tr><td>If Reference Value is selected in [EVT1 hysteresis type]:
 
</td></tr>
</table>

(Fig. 9.2-2)

• P Control Action

Within the proportional band, the manipulated variable is outputted in proportion to the deviation between the EVT1 value and measured value.

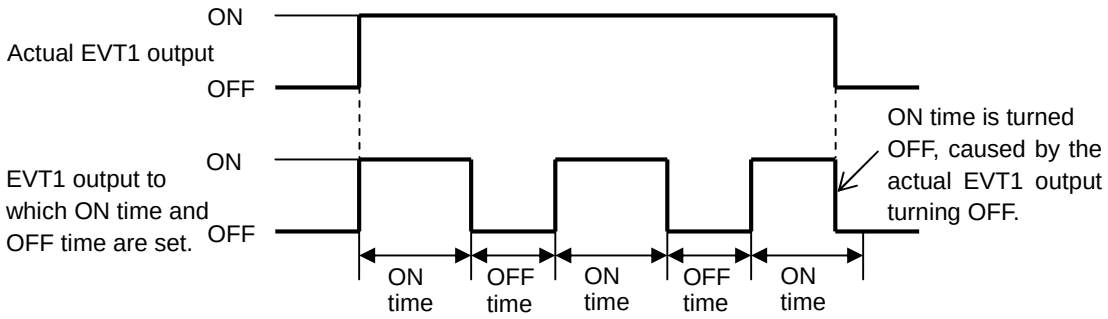
EVT1 Action	Description
Resistivity input low limit, Temperature input low limit	If measured value is lower than [EVT1 value – EVT1 proportional band], EVT1 output is turned ON. If measured value enters within the proportional band, EVT1 output is turned ON/OFF in EVT1 proportional cycles. If measured value exceeds the EVT1 value, EVT1 output is turned OFF.
Resistivity input high limit, Temperature input high limit	If measured value is higher than [EVT1 value + EVT1 proportional band], EVT1 output is turned ON. If measured value enters within the proportional band, EVT1 output is turned ON/OFF in EVT1 proportional cycles. If measured value drops below the EVT1 value, EVT1 output is turned OFF.

• ON/OFF Control Action

EVT1 Action	Description
Resistivity input low limit, Temperature input low limit	If measured value is lower than EVT1 value, EVT1 output is turned ON. If measured value exceeds the EVT1 value, EVT1 output is turned OFF.
Resistivity input high limit, Temperature input high limit	If measured value is higher than EVT1 value, EVT1 output is turned ON. If measured value drops below the EVT1 value, EVT1 output is turned OFF.

If ON time and OFF time are set in [ON time/OFF time when EVT1 output ON (p.28)], EVT1 output can be turned ON/OFF in a configured cycle when EVT1 output is ON.

Timing chart when EVT1 output ON time and OFF time are set.



(Fig. 9.2-3)

EVT output status can be read by the status flag (EVT1, EVT2, EVT3, EVT4 output bit) in Serial communication (C5 option).

EVT output status when errors occur differs depending on the selection in [EVT output when input errors occur (p.45)].

- If oFF (Disabled) is selected, EVT output will be turned OFF when input errors occur.
- If oN (Enabled) is selected, EVT output will be maintained when input errors occur.

9.3 Error Output

If ERoUT (Error output) is selected in [EVT1 type (p.26)], and when the error type is "Error" in (Table 9.5-1), the EVT1 output is turned ON.

The same applies to EVT2, EVT3 and EVT4.

9.4 Fail Output

If FAIL (Fail output) is selected in [EVT1 type (p.26)], and when the error type is "Fail" in (Table 9.5-1), the EVT1 output is turned ON.

The same applies to EVT2, EVT3 and EVT4.

9.5 Error Code during Measurement

For temperature sensor error or outside temperature compensation range during measurement, their corresponding error codes flash in the Temperature display as shown below in (Table 9.5-1).

(Table 9.5-1)

Error Code	Error Type	Error Contents	Description
ERR01	Fail	Temperature sensor burnout	Temperature sensor lead wire is burnt out.
ERR02	Fail	Temperature sensor short-circuited	Temperature sensor lead wire is short-circuited.
ERR03	Error	Outside temperature compensation range	Measured temperature has exceeded 110.0 ℃.
ERR04	Error	Outside temperature compensation range	Measured temperature is less than 0.0 ℃.

9.6 Setting EVT1 to EVT4 Values

EVT1 to EVT4 values are set in Simple Setting mode.

These setting items are the same as those in EVT1 to EVT4 Action groups.

To enter the Simple Setting mode, follow the procedures below.

① EVT 1 Press the SET key in Resistivity/Temperature Display mode.
"EVT1 value" will be indicated.

② Sets each item using the △ or ▽ key, and register the value with the SET key.

Character	Name, Function, Setting Range	Factory Default
EVT 1 0.00	**EVT1 value** • Sets EVT1 value. • If ----- (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT1 type (p.26)], this item and the following item will not appear. • Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
EVT 2 0.00	**EVT2 value** • Sets EVT2 value. • If ----- (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT2 type (p.30)], this item and the following item will not appear. • Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
EVT 3 0.00	**EVT3 value** • Sets EVT3 value. • If ----- (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT3 type (p.34)], this item and the following item will not appear. • Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃
EVT 4 0.00	**EVT4 value** • Sets EVT4 value. • If ----- (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT4 type (p.38)], this item and the following item will not appear. • Resistivity input: Measurement range low limit to Measurement range high limit (*1) Temperature input: 0.0 to 100.0 ℃ (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃

(*1) The unit and decimal point place follow the measurement range.

(*2) The decimal point place does not follow the selection. It is fixed.

③ Press the SET key. The unit reverts to the Resistivity/Temperature Display mode.

10. Specifications

10.1 Standard specifications

Rating

Rated Scale

Input		Measurement Range	Resolution
Resistivity	Cell constant 0.01/cm	0.000 to 0.200 MΩ•cm	0.001 MΩ•cm
		0.00 to 2.00 MΩ•cm	0.01 MΩ•cm
		0.00 to 20.00 MΩ•cm	0.01 MΩ•cm
		0.0 to 100.0 MΩ•cm	0.1 MΩ•cm
		0.00 to 2.00 kΩ•m	0.01 kΩ•m
		0.0 to 20.0 kΩ•m	0.1 kΩ•m
		0.0 to 200.0 kΩ•m	0.1 kΩ•m
		0 to 1000 kΩ•m	1 kΩ•m
Temp.	Pt100	0.0 to 100.0 ℃	0.1 ℃

(Abbreviation: Temp.: Temperature)

Input

2-electrode resistivity sensor (Temperature element Pt100)

Supply Voltage

Model	AER-102-SE	AER-102-SE 1
Supply voltage	100 to 240 V AC 50/60 Hz	24 V AC/DC 50/60 Hz
Allowable voltage fluctuation range	85 to 264 V AC	20 to 28 V AC/DC

General Structure

External Dimensions	48 x 96 x 98.5 mm (W x H x D)
Mounting	Flush (Applicable panel thickness: 1 to 8 mm)
Case	Material: Flame-resistant resin, Color: Black
Front Panel	Membrane sheet
Indication Structure	Display

Resistivity display	11-segment LCD display 5-digit Backlight: Red/Green/Orange Character size: 14.0 x 5.4 mm (H x W)
Temperature display	11-segment LCD display 5-digit Backlight: Green Character size: 10.0 x 4.6 mm (H x W)
Output display	22-segment LCD display Bar graph Backlight: Green

<table>
<tr><td>Indication Structure</td><td>Action indicators: Backlight: Orange<table>
<tr><td>EVT1</td><td>EVT1 output (Contact output 1) ON: Lit</td></tr>
<tr><td>EVT2</td><td>EVT2 output (Contact output 2) ON: Lit</td></tr>
<tr><td>EVT3</td><td>EVT3 output (Contact output 3) ON: Lit</td></tr>
<tr><td>EVT4</td><td>EVT4 output (Contact output 4) ON: Lit</td></tr>
<tr><td>T/R</td><td>Serial comm. TX output (transmitting): Lit</td></tr>
<tr><td>LOCK</td><td>Set Value Lock 1, 2, 3 selected: Lit</td></tr>
</table></td></tr>
<tr><td>Setting Structure</td><td>Input system using membrane sheet key</td></tr>
</table>

Indication Performance

Repeatability (at equivalent input)	Resistivity: ±0.5 % of measurement span
Linearity (at equivalent input)	Resistivity: ±0.5 % of measurement span
Indication Accuracy	Temperature: ±1 ℃
Input Sampling Period	250 ms (2 inputs)

Standard Functions

Resistivity Calibration Span Adjustment	For Resistivity calibration span adjustment, adjust so that resistivity measured value matches the reference resistivity meter.
Temperature Calibration	When a sensor cannot be set at the exact location where measurement is desired, the resulting measured temperature may deviate from the temperature in the desired location. In such a case, the desired temperature can be set for the desired location by setting a temperature calibration value. However, it is effective within the input rated range regardless of the temperature calibration value.

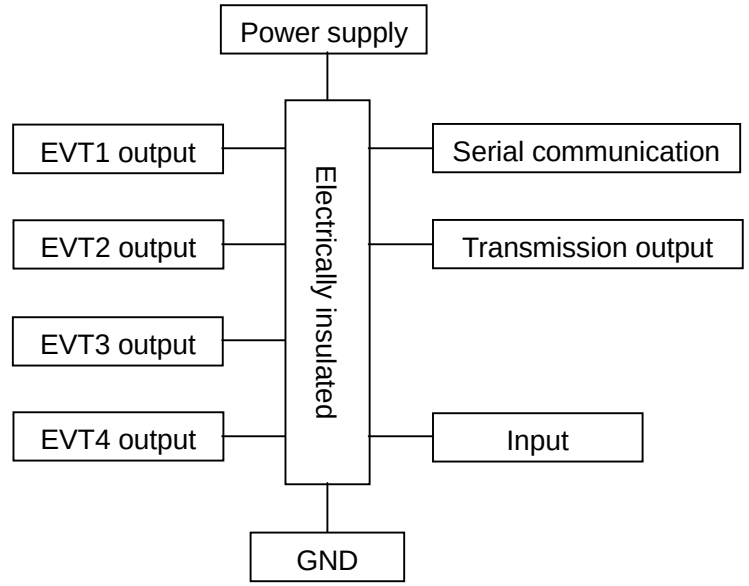
<table>
<tr><td colspan="2">EVT Output</td><td></td></tr>
<tr><td></td><td>Setting Accuracy</td><td>The same as the indication accuracy</td></tr>
<tr><td></td><td>Output Action</td><td>P control action: When setting the proportional band to any value except 0.00 or 0.0.
ON/OFF control action: When setting the proportional band to 0.00 or 0.0.
<table>
<tr><td>Proportional band</td><td><table><tr><td>Resistivity input</td><td>Measurement range low limit to Measurement range high limit (*1)</td></tr><tr><td>Temperature input</td><td>0.0 to 100.0 ℃ (*2)</td></tr></table></td></tr>
<tr><td>Proportional cycle</td><td>1 to 300 sec</td></tr>
<tr><td>ON/OFF hysteresis</td><td><table><tr><td>Resistivity input</td><td>0 to 20 % of Measurement range high limit (*1)</td></tr><tr><td>Temperature input</td><td>0.1 to 10.0 ℃ (*2)</td></tr></table></td></tr>
<tr><td>Output high, low limit</td><td>0 to 100 %</td></tr>
</table>
(*1) The unit and decimal point place follow the measurement range.
(*2) The decimal point place does not follow the selection. It is fixed.</td></tr>
<tr><td></td><td>Type</td><td>Selectable by the keypad from the following.
See EVT1 Action. (Fig. 9.2-1, p.48), (Fig. 9.2-2, p.49)
• No alarm
• Resistivity input low limit
• Resistivity input high limit
• Temperature input low limit
• Temperature input high limit
• Error output
• Fail output</td></tr>
<tr><td></td><td>Output</td><td>Relay contact 1a
<table>
<tr><td>Control capacity</td><td>3 A 250 V AC (resistive load)
1 A 250 V AC (inductive load, cosϕ=0.4)</td></tr>
<tr><td>Electrical life</td><td>100,000 cycles</td></tr>
</table></td></tr>
<tr><td></td><td>EVT ON Delay Time</td><td>0 to 10000 sec</td></tr>
<tr><td></td><td>EVT OFF Delay Time</td><td>0 to 10000 sec</td></tr>
<tr><td></td><td>ON Time/OFF Time when EVT Output ON</td><td>If ON time and OFF time are set, the output can be turned ON/OFF in a configured cycle when EVT output is ON.
See (Fig. 9.2-3, p.50).</td></tr>
</table>

Transmission Output Function

Transmission Output	Converting resistivity or temperature to analog signal every input sampling periods (every 250 ms), outputs the value in current. If oFF□□ (No temperature compensation) is selected in [Temperature compensation method (p.24)], and if TEMP□ (Temperature transmission) is selected in [Transmission output type (p.43)], the transmission output value will differ depending on the selection in [Temperature display when no temperature compensation (p.45)]. • If oFF□□ (unlit) or SrEd□□ (Reference temperature) is selected, the value set in [Reference temperature (p.24)] will be outputted. • If PV□□□ (measured value) is selected, the measured value will be outputted. If Transmission output high limit and low limit are set to the same value, transmission output low limit value (4 mA DC fixed) will be outputted.

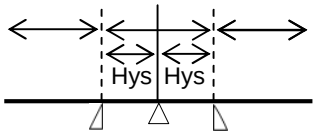
Resolution	1/12000
Current	4 to 20 mA DC (Load resistance: Max. 500 Ω)
Output accuracy	Within ±0.3 % of Transmission output span

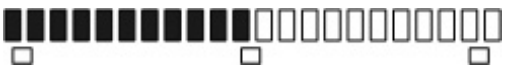
Insulation, Dielectric Strength

Circuit Insulation Configuration	
Insulation Resistance	10 MΩ or more, at 500 V DC
Dielectric Strength	Power terminal - ground (GND): 1.5 kV AC for 1 minute Input terminal - ground (GND): 1.5 kV AC for 1 minute Input terminal - power terminal: 1.5 kV AC for 1 minute

Attached Functions

<table>
<tr><td>Set Value Lock</td><td>Lock 1: None of the set values can be changed.
Lock 2: Only EVT1, EVT2, EVT3, EVT4 values can be changed.
Lock 3: All set values, except Unit selection, Measurement range, Resistivity calibration value and Temperature calibration value, can be temporarily changed. However, they revert to their previous value after the power is turned off because they are not saved in the non-volatile IC memory.</td></tr>
<tr><td>Resistivity Input Sensor Correction</td><td>This corrects the input value from the resistivity sensor. When resistivity measured by the sensor may deviate from the resistivity in the measured location, desired resistivity can be obtained by adding a sensor correction value.
However, it is effective within the measurement range regardless of the sensor correction value.</td></tr>
<tr><td>Temperature Display when No Temperature Compensation</td><td>If oFF (No temperature compensation) is selected in [Temperature compensation method (p.24)], the item to be indicated in the Temperature display can be selected.</td></tr>
<tr><td>Cable Length Correction</td><td>If 2WI RE (2-wire type) is selected in [Pt100 input wire type (p.25)], and if sensor cable is too long, temperature measurement error will occur due to cable resistance. This can be corrected by setting the cable length correction value and cable cross-section area.</td></tr>
<tr><td>Larger than Clip Value, Smaller than Measure-ment Range High Limit</td><td>When Resistivity measured value is larger than the clip value or smaller than the measurement range high limit, the following is displayed.
<table>
<tr><th>Resistivity Display</th><th>Temperature Display</th></tr>
<tr><td>Clip value (*)</td><td>Measured temperature</td></tr>
</table>
(*) Transmission output is fixed to the Clip value.</td></tr>
<tr><td>Outside Measurement Range</td><td>• When Resistivity measured value is outside the measurement range:
<table>
<tr><th>Resistivity Display</th><th>Temperature Display</th></tr>
<tr><td>Resistivity high limit is flashing.</td><td>Measured temperature</td></tr>
</table>
• When temperature measured value is outside the measurement range, the following will be indicated.
<table>
<tr><th>Resistivity Display</th><th>Temperature Display</th></tr>
<tr><td>Measured resistivity</td><td>Exceeding 110.0 ℃: ERR03</td></tr>
<tr><td>Measured resistivity</td><td>Less than 0.0 ℃: ERR04</td></tr>
</table></td></tr>
<tr><td>Power Failure Countermeasure</td><td>The setting data is backed up in the non-volatile IC memory.</td></tr>
<tr><td>Self-diagnosis</td><td>The CPU is monitored by a watchdog timer, and if an abnormal status is found on the CPU, the AER-102-SE is switched to warm-up status.</td></tr>
<tr><td>Warm-up Indication</td><td>For approx. 4 seconds after the power is switched ON, the characters below are indicated in the Resistivity Display and Temperature Display.
<table>
<tr><th>Display</th><th>Character</th><th>Unit</th></tr>
<tr><td rowspan="2">Resistivity display</td><td>conU</td><td>Resistivity (MΩ•cm)</td></tr>
<tr><td>kΩ</td><td>Resistivity (kΩ•m)</td></tr>
<tr><th>Display</th><th>Character</th><th>Pt100 Input Wire Type</th></tr>
<tr><td rowspan="2">Temperature display</td><td>Pt 2</td><td>2-wire type</td></tr>
<tr><td>Pt 3</td><td>3-wire type</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>Resistivity Color Selection</td><td>Selects Resistivity display color.
<table>
<tr><th>Selection Item in [Resistivity Color (p.45)]</th><th>Resistivity Display Color</th></tr>
<tr><td>GRN</td><td>Green</td></tr>
<tr><td>REd</td><td>Red</td></tr>
<tr><td>oRG</td><td>Orange</td></tr>
<tr><td>VEGA</td><td>Resistivity color changes continuously.</td></tr>
</table>
Resistivity color changes continuously:
Resistivity display color changes according to [Resistivity color reference value (p.44)] and [Resistivity color range (p.45)] settings.
• When Resistivity is lower than [Resistivity color reference value] – [Resistivity color range]: Orange
• When Resistivity is within [Resistivity color reference value] ± [Resistivity color range]: Green
• When Resistivity is higher than [Resistivity color reference value] + [Resistivity color range]: Red
Orange Green Red


△: Resistivity color reference value
Hys : Resistivity color range</td></tr>
<tr><td>Bar Graph Indication</td><td>When rRnG 1 (Transmission output) is selected in [Bar graph indication (p.45)], segments light in accordance with the output.
Scale is -5 to 105 %. Segments light increasingly to the right in accordance with the output.
(e.g.) When output is 50 %

-5 % 50 % 105 %
Light increasingly to the right in accordance with the output.</td></tr>
</table>

Other

Power Consumption	Approx. 13 VA
Ambient Temperature	0 to 50 ℃
Ambient Humidity	35 to 85 %RH (Non-condensing)
Weight	Approx. 280 g
Accessories	Unit label: 1 sheet Mounting bracket: 1 set Instruction manual: 1 copy When Serial communication (C5 option) is ordered: Wire harness C5 (0.2 m): 1 length Wire harness C0 (3 m): 1 length When EVT3, EVT4 Output (Contact output 3, 4) (EVT3 option) is ordered: Wire harness HB (3 m): 2 lengths

10.2 Optional Specifications

Serial Communication (Option code: C5)

<table>
<tr><td>Serial Communication</td><td>The following operations can be carried out from an external computer.
(1) Reading and setting of various set values
(2) Reading of the resistivity and temperature status
(3) Function change</td></tr>
<tr><td>Cable Length</td><td>1.2 km (Max), Cable resistance value: Within 50 Ω
(Terminators are not necessary, but if used, use 120 Ω or more on one side.)</td></tr>
<tr><td>Communication Line</td><td>EIA RS-485</td></tr>
<tr><td>Communication Method</td><td>Half-duplex communication</td></tr>
<tr><td>Communication Speed</td><td>9600, 19200, 38400 bps (Selectable by keypad)</td></tr>
<tr><td>Synchronization Method</td><td>Start-stop synchronization</td></tr>
<tr><td>Code Form</td><td>ASCII, Binary</td></tr>
<tr><td>Communication Protocol</td><td>Shinko protocol, Modbus ASCII, Modbus RTU
(Selectable by keypad)</td></tr>
<tr><td>Data Bit/Parity</td><td>8-bits/No parity, 7-bits/No parity, 8-bits/Even, 7-bits/Even, 8-bits/Odd, 7-bits/Odd (Selectable by keypad)</td></tr>
<tr><td>Stop Bit</td><td>1, 2 (Selectable by keypad)</td></tr>
<tr><td>Error Correction</td><td>Command request repeat system</td></tr>
<tr><td>Error Detection</td><td>Parity check, Checksum (Shinko protocol),
LRC (Modbus protocol ASCII),
CRC-16 (Modbus protocol RTU)</td></tr>
<tr><td>Data Format</td><td>
<table>
<tr><th>Communication Protocol</th><th>Shinko Protocol</th><th>Modbus ASCII</th><th>Modbus RTU</th></tr>
<tr><td>Start bit</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Data bit</td><td>7</td><td>7 or 8</td><td>8</td></tr>
<tr><td>Parity</td><td>Yes
(Even)</td><td>Yes
(Even, Odd)
No parity</td><td>Yes
(Even, Odd)
No parity</td></tr>
<tr><td>Stop bit</td><td>1</td><td>1 or 2</td><td>1 or 2</td></tr>
</table>
</td></tr>
</table>

EVT3, EVT4 Output (Contact output 3, 4) (Option code: EVT3)

EVT3, EVT4 Output (Contact output 3, 4)	The same as EVT output (p.54)

11. Troubleshooting

If any malfunction occurs, refer to the following items after checking that power is being supplied to the AER-102-SE.

11.1 Indication

Problem	Possible Cause and Solution
The Resistivity/ Temperature displays are unlit.	• The time set in [Backlight time (p.45)] has passed. If any key is pressed while displays are unlit, it will re-light. Set the backlight time to a suitable time-frame.
Indication of the Resistivity/Temperature Display is unstable or irregular.	• Resistivity calibration and Temperature calibration may not have finished. Perform Resistivity calibration and Temperature calibration again. • Temperature compensation method selection might not be correct. Select a correct Temperature compensation method. • Specification of Resistivity sensor may not be suitable. Replace the sensor with a suitable one. • There may be equipment that interferes with or makes noise near the AER-102-SE. Keep AER-102-SE clear of any potentially disruptive equipment.
The Temperature Display is unlit.	• oFF (Unlit) is selected in [Temperature display when no temperature compensation (p.45)]. Select Std (Reference temperature) or Pv (Measured value).
[ERR01] is flashing in the Temperature Display.	• This occurs when the temperature sensor lead wire is burnt out. Replace the resistivity sensor.
[ERR02] is flashing in the Temperature Display.	• This occurs when the temperature sensor lead wire is short-circuited. Replace the resistivity sensor.
[ERR03] is flashing in the Temperature Display.	• This occurs when measured temperature exceeds 110.0 ℃. Check the environment of measurement location.
[ERR04] is flashing in the Temperature Display.	• This occurs when measured temperature is less than 0.0 ℃. Check the environment of measurement location.
[ERR 1□] is indicating in the Resistivity Display.	• Internal memory is defective. Contact our agency or us.

11.2 Key Operation

Problem	Possible Cause and Solution
• Unable to set values. • The values do not change by △, ▽ keys.	• Lock 1 (Lock 1) or Lock2 (Lock 2) is selected in [Set value lock (p.42)]. (The LOCK indicator is lit when Lock 1 or 2 is selected.) Select -----(Unlock).

12. Character Tables

The following shows our character tables. Use data column for your reference.

12.1 Setting Group List

Character	Setting Group	Reference Section
FNc.1	Resistivity Input group	Section 12.5 (p.62)
FNc.2	Temperature Input group	Section 12.6 (p.63)
EVT.a.1	EVT1 Action group	Section 12.7 (pp.64, 65)
EVT.a.2	EVT2 Action group	Section 12.8 (pp.65, 66)
EVT.a.3	EVT3 Action group	Section 12.9 (pp.66, 67)
EVT.a.4	EVT4 Action group	Section 12.10 (pp.68, 69)
aT.ER	Special Function group	Section 12.11 (pp. 69 to 71)

12.2 Temperature Calibration Mode

Character	Name, Setting Range	Factory Default	Data
toCAL(*)	**Temperature calibration** -10.0 to 10.0 ℃	0.0 ℃	

(*) toCAL and measured value are lit alternately.

12.3 Resistivity Calibration Mode

Character	Name, Setting Range	Factory Default	Data
AdJ4(*)	**Span adjustment** 0.700 to 1.300	1.000	

(*) AdJ4 and measured value are lit alternately.

12.4 Simple Setting Mode

Character	Name, Setting Range	Factory Default	Data
EV1	**EVT1 value** (*1)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
	Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)		
EV2	**EVT2 value** (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
	Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)		
EV3	**EVT3 value** (*3)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
	Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)		
EV4	**EVT4 value** (*4)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
	Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)		

(*1) Not available if ------ (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT1 type].
(*2) Not available if ------ (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT2 type].
(*3) Not available if ------ (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT3 type].
Available only when EVT3, EVT4 Output (EVT3 option) is ordered.
(*4) Not available if ------ (No action), EROUT (Error output) or FAIL (Fail output) is selected in [EVT4 type].
Available only when EVT3, EVT4 Output (EVT3 option) is ordered.
(*5) The unit and decimal point place follow the measurement range.
(*6) The decimal point place does not follow the selection. It is fixed.

12.5 Resistivity Input Group

Character	Name, Setting Range	Factory Default	Data
cELL	**Sensor cell constant**	0.01/cm	
coEF	**Cell constant correction value** 0.001 to 5.000	1.000	
UNIT	**Unit selection** conK : Resistivity (MΩ•cm) kI : Resistivity (kΩ•m)	Resistivity (MΩ•cm)	
MRNG	**Measurement range** See (Table 12.5-1).	20.00 MΩ•cm	
PURE	**Ultrapure water** (*1) See (Table 12.5-2).	18.23	
cLIP	**Clip value** 0 to Measurement range span	20.00 MΩ•cm	
FIT	**Resistivity input filter time constant** 0.0 to 10.0 sec	0.0 sec	
SSo	**Resistivity input sensor correction** ±10 % of measurement range (*)	0.00	

(*) The unit and decimal point place follow the measurement range.

(Table 12.5-1)

Unit	Selection Item	Measurement Range
Resistivity (MΩ•cm)	0.200	0.000 to 0.200 MΩ•cm
	2.00	0.00 to 2.00 MΩ•cm
	20.00	0.00 to 20.00 MΩ•cm
	100.0	0.0 to 100.0 MΩ•cm
Resistivity (kΩ•m)	2.00	0.00 to 2.00 kΩ•m
	20.0	0.0 to 20.0 kΩ•m
	200.0	0.0 to 200.0 kΩ•m
	1000	0 to 1000 kΩ•m

(Table 12.5-2)

Unit	Selection Item	Ultrapure Water
Resistivity (MΩ•cm)	18.18	18.18
	18.23	18.23
	18.24	18.24
Resistivity (kΩ•m)	181.8	181.8
	182.3	182.3
	182.4	182.4

12.6 Temperature Input Group

Character	Name, Setting Range	Factory Default	Data
TcM	**Temperature compensation method** • Selects Temperature compensation computation method. • PURE: Temperature compensation is conducted using temperature characteristics of pure (deionized) water. PUSt: Temperature compensation is conducted using temperature characteristics of pure (deionized) water and impure substance. TcoE: Temperature compensation is conducted using temperature coefficient (%/℃) and randomly selected reference temperature. oFF: No temperature compensation	Temperature characteristics of pure (deionized) water	
KcoE	**Temperature coefficient** (*1) -5.00 to 5.00 %/℃	2.00 %/℃	
StNd	**Reference temperature** 5.0 to 95.0 ℃	25.0 ℃	
dP2	**Decimal point place** 0 : No decimal point 0.0 : 1 digit after decimal point	1 digit after decimal point	
cNEcT	**Pt100 input wire type** 2WIRE : 2-wire type 3WIRE : 3-wire type	3-wire type	
cAbLE	**Cable length correction** (*2) 0.0 to 100.0 m	0.0 m	
cSEc	**Cable cross-section** (*2) 0.10 to 2.00 mm^2	0.30 mm^2	
FIT2	**Temperature input filter time constant** 0.0 to 10.0 sec	0.0 sec	

(*1) Not available if PURE [Temperature characteristics of pure (deionized) water] or oFF (No temperature compensation) is selected in [Temperature compensation method].

(*2) Not available if 3WIRE (3-wire type) is selected in [Pt100 input wire type].

12.7 EVT1 Action Group

Character	Name, Setting Range	Factory Default	Data
EVT 1F	**EVT1 type** ----- : No action SE_L : Resistivity input low limit SE_H : Resistivity input high limit TEMPL : Temperature input low limit TEMPH : Temperature input high limit ERROR : Error output FAIL : Fail output	No action	
EVT 1	**EVT1 value** (*1) Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
EP 1	**EVT1 proportional band** (*2) Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
E 1RST	**EVT1 reset** (*3) Resistivity input: ±Measurement span (*5) Temperature input: ±100.0 ℃ (*6)	Resistivity input: 0.00 Temperature input: 0.0℃	
E 1dl F	**EVT1 hysteresis type** (*4) cdl F: Medium Value Sdl F: Reference Value	Medium Value	
E 1dFo	**EVT1 ON side** (*4) Resistivity input: 0 to 20 % of Measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)	Resistivity input: 0.10 Temperature input: 1.0 ℃	
E 1dFU	**EVT1 OFF side** (*4), (*7) Resistivity input: 0 to 20 % of Measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)	Resistivity input: 0.10 Temperature input: 1.0 ℃	
E 1oNT	**EVT1 ON delay time** (*4) 0 to 10000 sec	0 sec	
E 1oFT	**EVT1 OFF delay time** (*4) 0 to 10000 sec	0 sec	
E 1c	**EVT1 proportional cycle** (*3) 1 to 300 sec	30 sec	
E 1oLH	**EVT1 output high limit** (*3) EVT1 output low limit to 100 %	100 %	
E 1oLL	**EVT1 output low limit** (*3) 0 % to EVT1 output high limit	0 %	

Character	Name, Setting Range	Factory Default	Data
oonT 1	**ON time when EVT1 output ON** (*4) 0 to 10000 sec	0 sec	
ooFT 1	**OFF time when EVT1 output ON** (*4) 0 to 10000 sec	0 sec	

(*1) If ---- (No action), Error (Error output) or FAIL (Fail output) is selected in [EVT1 type], this item and all following items will not appear.
(*2) ON/OFF control action when set to 0.00 or 0.0.
(*3) Not available for ON/OFF control action.
(*4) Not available for P control action.
(*5) The unit and decimal point place follow the measurement range.
(*6) The decimal point place does not follow the selection. It is fixed.
(*7) Not available if cdiF (Medium Value) is selected in [EVT1 hysteresis type].

12.8 EVT2 Action Group

Character	Name, Setting Range	Factory Default	Data
EVT2F	**EVT2 type** ----: No action rE_L: Resistivity input low limit rE_H: Resistivity input high limit TEMPL: Temperature input low limit TEMPH: Temperature input high limit Error: Error output FAIL: Fail output	No action	
E2V2	**EVT2 value** (*1) Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
E2P2	**EVT2 proportional band** (*2) Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
E2RST	**EVT2 reset** (*3) Resistivity input: ±Measurement span (*5) Temperature input : ±100.0 ℃ (*6)	Resistivity input: 0.00 Temperature input: 0.0 ℃	
E2diF	**EVT2 hysteresis type** (*4) cdiF: Medium Value rdiF: Reference Value	Medium Value	
E2dFo	**EVT2 ON side** (*4) Resistivity input: 0 to 20 % of measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)	Resistivity input: 0.10 Temperature input: 1.0 ℃	

Character	Name, Setting Range	Factory Default	Data
E2dFU	**EVT2 OFF side**(*4) (*7)	Resistivity input: 0.10 Temperature input: 1.0 ℃	
	Resistivity input: 0 to 20 % of measurement range high limit (*5) Temperature input: 0.0 to 10.0 ℃ (*5)		
E2oNT	**EVT2 ON delay time** (*4)	0 sec	
	0 to 10000 sec		
E2oFT	**EVT2 OFF delay time** (*4)	0 sec	
	0 to 10000 sec		
E2c□□	**EVT2 proportional cycle** (*3)	30 sec	
	1 to 300 sec		
E2oLH	**EVT2 output high limit** (*3)	100 %	
	EVT2 output low limit to 100 %		
E2oLL	**EVT2 output low limit** (*3)	0 %	
	0 % to EVT2 output high limit		
ooNT2	**ON time when EVT2 output ON** (*4)	0 sec	
	0 to 10000 sec		
ooFT2	**OFF time when EVT2 output ON** (*4)	0 sec	
	0 to 10000 sec		

(*1) If -------- (No action), ERoUT (Error output) or FAIL□ (Fail output) is selected in [EVT2 type], this item and all following items will not appear.
(*2) ON/OFF control action when set to 0.00 or 0.0.
(*3) Not available for ON/OFF control action.
(*4) Not available for P control action.
(*5) The unit and decimal point place follow the measurement range.
(*6) The decimal point place does not follow the selection. It is fixed.
(*7) Not available if cdl F□ (Medium Value) is selected in [EVT2 hysteresis type].

12.9 EVT3 Action Group

Character	Name, Setting Range	Factory Default	Data
EVT3F	**EVT3 type**	No action	
	-------- : No action RE_L□ : Resistivity input low limit RE_H□ : Resistivity input high limit TEMPL : Temperature input low limit TEMPH : Temperature input high limit ERoUT : Error output FAIL□ : Fail output		
EV3□	**EVT3 value** (*1)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
	Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)		

Character	Name, Setting Range	Factory Default	Data
EP3□	**EVT3 proportional band** (*2)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
	Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)		
E3RST	**EVT3 reset** (*3)	Resistivity input: 0.00 Temperature input: 0.0 ℃	
	Resistivity input: ±Measurement span (*5) Temperature input : ±100.0 ℃ (*6)		
E3dIF	**EVT3 hysteresis** type (*4)	Medium Value	
	cdIF□: Medium Value rdIF□: Reference Value		
E3dFo	**EVT3 ON side** (*4)	Resistivity input: 0.10 Temperature input: 1.0 ℃	
	Resistivity input: 0 to 20 % of measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)		
E3dFU	**EVT3 OFF side** (*4) (*7)	Resistivity input: 0.10 Temperature input: 1.0 ℃	
	Resistivity input: 0 to 20 % of measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)		
E3oNT	**EVT3 ON delay time** (*4)	0 sec	
	0 to 10000 sec		
E3oFT	**EVT3 OFF delay time** (*4)	0 sec	
	0 to 10000 sec		
E3c□□	**EVT3 proportional cycle** (*3)	30 sec	
	1 to 300 sec		
E3oLH	**EVT3 output high limit** (*3)	100 %	
	EVT3 output low limit to 100 %		
E3oLL	**EVT3 output low limit** (*3)	0 %	
	0 % to EVT3 output high limit		
ooNT3	**ON time when EVT3 output ON** (*4)	0 sec	
	0 to 10000 sec		
ooFT3	**OFF time when EVT3 output ON** (*4)	0 sec	
	0 to 10000 sec		

This setting group is available only when EVT3, EVT4 output (EVT3 option) is ordered.

(*1) If ----- (No action), ERoUT (Error output) or FAIL□ (Fail output) is selected in [EVT3 type], this item and all following items will not appear.

(*2) ON/OFF control action when set to 0.00 or 0.0.

(*3) Not available for ON/OFF control action.

(*4) Not available for P control action.

(*5) The unit and decimal point place follow the measurement range.

(*6) The decimal point place does not follow the selection. It is fixed.

(*7) Not available if cdIF□ (Medium Value) is selected in [EVT3 hysteresis type].

12.10 EVT4 Action Group

Character	Name, Setting Range	Factory Default	Data
EVT4F	**EVT4 type** ----- : No action rE_L : Resistivity input low limit rE_H : Resistivity input high limit tEMPL : Temperature input low limit tEMPH : Temperature input high limit ERoUT : Error output FAIL : Fail output	No action	
EVV4	**EVT4 value** (*1) Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
EP4	**EVT4 proportional band** (*2) Resistivity input: Measurement range low limit to Measurement range high limit (*5) Temperature input: 0.0 to 100.0 ℃ (*6)	Resistivity input: Measurement range low limit Temperature input: 0.0 ℃	
E4RST	**EVT4 reset** (*3) Resistivity input: ±Measurement span (*5) Temperature input : ±100.0 ℃ (*6)	Resistivity input: 0.00 Temperature input: 0.0 ℃	
E4dIF	**EVT4 hysteresis type** (*4) cdIF: Medium Value sdIF: Reference Value	Medium Value	
E4dFo	**EVT4 ON side** (*4) Resistivity input: 0 to 20 % of measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)	Resistivity input: 0.10 Temperature input: 1.0 ℃	
E4dFU	**EVT4 OFF side** (*4) (*7) Resistivity input: 0 to 20 % of measurement range high limit (*5) Temperature input : 0.0 to 10.0 ℃ (*6)	Resistivity input: 0.10 Temperature input: 1.0℃	
E4oNT	**EVT4 ON delay time** (*4) 0 to 10000 sec	0 sec	
E4oFT	**EVT4 OFF delay time** (*4) 0 to 10000 sec	0 sec	
E4c	**EVT4 proportional cycle** (*3) 1 to 300 sec	30 sec	
E4oLH	**EVT4 output high limit** (*3) EVT4 output low limit to 100 %	100 %	
E4oLL	**EVT4 output low limit** (*3) 0 % to EVT4 output high limit	0 %	

Character	Name, Setting Range	Factory Default	Data
oonT4	**ON time when EVT4 output ON** (*4) 0 to 10000 sec	0 sec	
ooFT4	**OFF time when EVT4 output ON** (*4) 0 to 10000 sec	0 sec	

This setting group is available only when EVT3, EVT4 output (EVT3 option) is ordered.
(*1) If ------ (No action), Error (Error output) or FAIL (Fail output) is selected in [EVT4 type], this item and all following items will not appear.
(*2) ON/OFF control action when set to 0.00 or 0.0.
(*3) Not available for ON/OFF control action.
(*4) Not available for P control action.
(*5) The unit and decimal point place follow the measurement range.
(*6) The decimal point place does not follow the selection. It is fixed.
(*7) Not available if cdiF (Medium Value) is selected in [EVT4 hysteresis type].

12.11 Special Function Group

Character	Name, Setting Range	Factory Default	Data
LocK	**Set value lock** ------ : Unlock Lock1 : Lock 1 Lock2 : Lock 2 Lock3 : Lock 3	Unlock	
cMtL	**Communication protocol** (*1) NoML : Shinko protocol ModA : Modbus ASCII mode ModR : Modbus RTU mode	Shinko protocol	
cMNo	**Instrument number** (*1) 0 to 95	0	
cMtP	**Communication speed** (*1) 96 : 9600 bps 192 : 19200 bps 384 : 38400 bps	9600 bps	
cMFT	**Data bit/Parity** (*1) 8NoN : 8 bits/No parity 7NoN : 7 bits/No parity 8EvN : 8 bits/Even 7EvN : 7 bits/Even 8odd : 8 bits/Odd 7odd : 7 bits/Odd	7 bits/Even	
cMtT	**Stop bit** (*1) 1 : Stop bit 1 2 : Stop bit 2	Stop bit 1	

Character	Name, Setting Range	Factory Default	Data
rRn1	**Transmission output type**	Resistivity transmission	
	SE□□□ : Resistivity transmission TEMP□ : Temperature transmission		
rRLH1	**Transmission output high limit**	Resistivity transmission: Measurement range high limit Temperature transmission: 100.0 ℃	
	Resistivity transmission: Transmission output low limit to Measurement range high limit (*2) Temperature transmission: Transmission output low limit to 100.0 ℃ (*3)		
rRLL1	**Transmission output low limit**	Resistivity transmission: Measurement range low limit Temperature transmission: 0.0 ℃	
	Resistivity transmission: Measurement range low limit to Transmission output high limit (*2) Temperature transmission: 0.0 ℃ to Transmission output high limit (*3)		
bKLT□	**Backlight selection**	All are backlit.	
	ALL□□ : All are backlit. SE□□□ : Resistivity display TEMP□ : Temperature display Ac□□□ : Action indicators SETMP : Resistivity display + Temperature display SEAc□ : Resistivity display + Action indicators TMPAc : Temperature display + Action indicators		
coLR□	**Resistivity color**	Red	
	GRN□□ : Green REd□□ : Red oRG□□ : Orange SEGR□ : Resistivity color changes continuously.		
cLP□□	**Resistivity color reference value**	10.00	
	0 to Measurement range high limit (*2)		
cLRG□	**Resistivity color range**	0.10	
	0.10 to Measurement range high limit (*2)		
dPTM□	**Backlight time**	0 minutes	
	0 to 99 minutes		
bERSL	**Bar graph indication**	No indication	
	-----□ : No indication rRoT 1 : Transmission output		
INERR	**EVT output when input errors occur**	Disabled	
	oFF□□ : Disabled oN□□□ : Enabled		

Character	Name, Setting Range	Factory Default	Data
oFdP□	**Temperature display when no temperature compensation** (*4) oFF□□ : Unlit Std□□ : Reference temperature Pv□□□ : Measured value	Unlit	

(*1) Available only when Serial communication (C5 option) is ordered.
(*2) The unit and decimal point place follow the measurement range.
(*3) The decimal point place does not follow the selection. It is fixed.
(*4) Available only when oFF□□ (No temperature compensation) is selected in [Temperature compensation method].

12.12 Error Code List

If the following errors occur, corresponding error codes willl be flashing in the Temperature display.

Error Code	Error Type	Error Contents	Description	Occur-rence
ERR01	Fail	Temperature sensor burnout	Temperature sensor lead wire is burnt out.	When measuring or calibrating
ERR02	Fail	Temperature sensor short-circuited	Temperature sensor lead wire is short-circuited.	
ERR03	Error	Outside temperature compensation range	Measured temperature has exceeded 110.0 ℃.	
ERR04	Error	Outside temperature compensation range	Measured temperature is less than 0.0 ℃.	

***** Inquiries *****

For any inquiries about this unit, please contact our agency or the vendor where you purchased the unit after checking the following.

[Example]

- Model ---------- AER-102-SE
- Serial number ---------- No. 122F05000

In addition to the above, please let us know the details of the malfunction, or discrepancy, and the operating conditions.

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