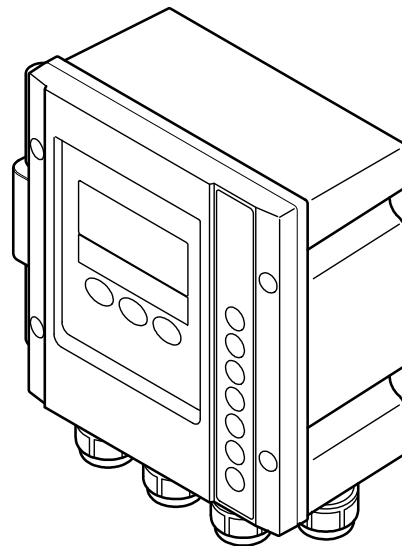


# ELECTRODELESS CONCENTRATION ANALYZER

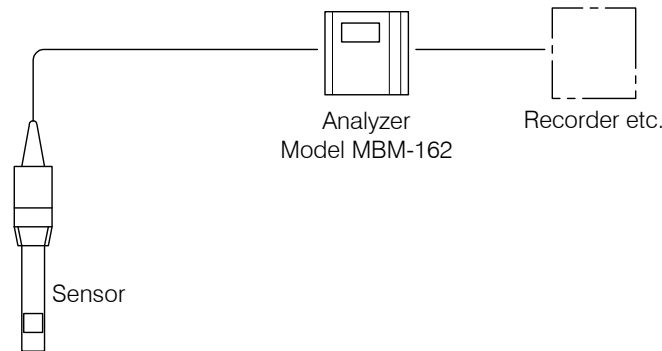
## MODEL MBM-162



- Please keep this instruction manual close at hand of the persons who are in charge of the operation of this product.
- Before operating this product, please read this instruction manual carefully for its correct handling.

# Introduction

- (a) Thank you for your purchase of our product. The Model: MBM-162 Electrodeless Concentration Analyzer (hereafter called the analyzer or the product) is an indicating analyzer in a measurement system that measures the electrical conductivity of a solution continuously and converts the measured value into concentration and displays/outputs it.



## Example of a Measurement System

- (b) If this product is equipped with an RS-232C connector (option), by using an application program (option), the following can be performed from the screen of a personal computer. For details, refer to the instruction manual of the application program.
- Include digital measured value data (concentration, temperature and conductivity) to the personal computer.
  - Change the concentration conversion data stored in the analyzer (using an optional dedicated software).
- (c) In this product, concentration conversion data (linear approximate expression) is pre-input according to the ordered specification. The concentration conversion data indicates the relationship between concentration, temperature and conductivity. For the standard specifications, the concentration conversion data is based on the International Critical Table (I.C.T) and DKK-TOA analysis data.
- (d) The entire concentration measuring range is 0.00 to 99.99% (it may be 0.000 to 4.000% depending on the setting). However, the concentration measuring range of each product depends on the preset concentration conversion data. In accordance with the preset concentration conversion data, one of the following conductivity measuring ranges is automatically selected.
- 0.000 to 2.100/ 0.00 to 7.00/ 0.00 to 21.00/ 0.0 to 70.0/ 0.0 to 210.0/ 0 to 700/ 0 to 2100mS/cm (at 25°C)
- The transmission output range can be set arbitrarily on the basis of the range of the concentration conversion data.
- (e) This product can be combined with a sensor whose reference cell constant (designed cell constant) is 9.00 or 2.60/cm (depending on the ordered specification). Sensors with other reference cell constants cannot be combined. The power supply is 90 to 264VAC, 50/60Hz and the transmission output is 4 to 20mADC, isolated from ground. For alarm output, 2 circuits are provided. For other specifications, refer to 6.1 “Standard Specifications”.
- (f) There is a possibility that the product indicates or outputs an erroneous measured value by the following causes. Prepare a backup system so that no damage occurs to the related facilities even in the case like these.

- Any problem of the product such as deterioration or damage of the detecting section or inappropriate insulation of cables.
- Improper setting of operating conditions or calibration operation.
- Electrical interference such as noise in the vicinity or improper grounding.
- Other unpredictable phenomena


(g) Since important items are described in “Safety Information,” read the contents carefully.

(h) The product should be handled by persons who have received proper training. In addition, for technical services such as repairs, ask a specialist to do who is qualified for the technical certification system in our company or a person who has technical skills equivalent to that certification system.

# Safety Information

---

## (1) Meaning of markings

Meaning of symbols such as the ones used in notations of warning in the instruction manual is described below. In addition, the alert symbol (: General caution symbol) used on a product label, etc. is meant to notify the existence of hazard/loss and it also means “Refer to the Instruction Manual.”

### **WARNING:**

Indicates the degree of hazard which can lead to death or serious injury if you fail to operate the product properly.

Serious injury means an injury such as loss of sight, burns (high temperature or low temperature), electric shock, bone fracture and poisoning, and the aftereffects of the injury remains or the injury requires hospitalization or long periods of outpatient treatment.


### **CAUTION:**

Indicates the degree of hazard/loss which can result in minor injury or property damage if you fail to operate the product properly.

Minor injury means an injury not requiring hospitalization or long periods of outpatient treatment. Property damage refers to damage that affects property around the product such as equipment and buildings (wide-ranging damage).

**[IMPORTANT]** : Indicates important matters such as to prevent damage to the product main body, prevent data destruction, prevent wasting time, and maintain performance.

**[NOTE]** : Indicates comments, reasons, background information, a case example and other items to help the reader understand the meaning.

 : Indicates reference items.

①, ②, ③ : Indicates item numbers such as the ones used in operations.

## (2) Safety compliance items

---

### **WARNING**

---

#### Hazardous Gasses

- Do not use the product in an area where explosive gas, flammable gas exists. Using the product in any of these areas can cause explosion or fire.

#### Electric Shock

- Do not touch the terminals in the analyzer while power is applied. Touching the terminals may cause electric shock.
  - The ground terminal must be grounded. If the terminal is not grounded and a problem occurs in the power supply system, electric shock may result.
-



### Disassembly and Modification

- Do not disassemble or modify the sections of the product that are not described in the instruction manual. The product can be damaged.

### Warning Label Lost

- If any warning label affixed to this product becomes too difficult to read or lost, please order a new one through your local sales agent or our sales office and affix it to its original position.

### Disposal

- In case you dispose of this product or any part of this product, handle it as industrial waste as specified by law.
- 

## (3) Notes on use of the instruction manual

Important items such as “Safety compliance items” are described in this manual. Handle the manual as follows:

- (a) The instruction manual is required not only at the start of operation but also required when maintenance is performed or in case a failure occurs. Please keep the manual at hand all the time so that the operator who actually operates the product can read the manual at any time.
- (b) If the manual is lost or too smeared to read, please order a new copy through your local sales agent or directly from our sales office.
- (c) Some of the diagrams used in the manual or on product labels may be modified with part of their shapes or displays omitted or they may be described in abstract form. In addition, numbers etc. shown on the screen example are just examples for such cases.
- (d) The contents of the manual may be changed without prior notice for reasons such as to improve performance.
- (e) Intellectual property right of the manual belongs to DKK-TOA. All or part of the manual must not be reproduced without permission.

# Product Warranty

## (1) Warranty Coverage

DKK-TOA Corporation (DKK-TOA) warrants its products against defective material or workmanship for the warranty period.

- (a) The warranty period is one year from the date of delivery to the original user. If the date of delivery cannot be specified, the warranty period is 24 months from the month following the date of manufacture shown on the product nameplate.
- (b) Specific written agreements with DKK-TOA, if any, shall take precedence over this warranty.
- (c) The limitation of warranty described herein may not apply where applicable laws do not allow such limitation.

## (2) Limited Warranty

This warranty does not cover the cases listed below.

- (a) Direct or indirect failure or damage caused by the use of the product for a purpose or in a manner not prescribed by the specifications or the instruction manual for the product.
- (b) Direct or indirect failure or damage caused by force majeure, including but not limited to an act of God, natural disaster such as earthquake, storm and flood damage, and lightning, fire, accident, abnormal voltage, salt damage, gas damage, labor unrest, acts of war (declared or undeclared), terrorism, .civil strife, or acts of any governmental jurisdiction.
- (c) Failure or damage caused by any repair or modification not authorized by DKK-TOA.
- (d) Failure or damage caused by the transport, moving, or dropping of the product after the purchase that is not attributable to DKK-TOA.
- (e) Electrodes and consumables (The warranty period for each part has priority when the period is shorter than that for the main unit of the product. If the customer requires any part after more than six months from the date of manufacture, consult DKK-TOA or its distributor.)
- (f) Failure or damage caused by the use of consumables, parts, or software not supplied by DKK-TOA.
- (g) Malfunctions or damage caused by the use of connecting equipment not supplied by DKK-TOA
- (h) Loss of data, settings, programs, or software stored on the product not attributable to DKK-TOA.
- (i) Any product other than DKK-TOA's, if specified by the purchaser or user, that incorporates, or is incorporated into or combined with DKK-TOA's products (\*1). In such cases, this warranty covers DKK-TOA's products only.
- (j) Any product not under proper maintenance in accordance with the instruction manual furnished by DKK-TOA.
- (k) Products without a nameplate (excluding products proved to have been delivered by DKK-TOA).

**EXCEPT AS EXPRESSLY SET FORTH IN THE PRECEDING SENTENCES, DKK-TOA MAKES NO WARRANTY OF ANY KIND WHATSOEVER WITH RESPECT TO ANY PRODUCT. DKK-TOA EXPRESSLY DISCLAIMS ANY WARRANTY IMPLIED BY LAW, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

**LIMITATION OF REMEDIES:** In the event that a defect is discovered within the warranty period, DKK-TOA or its authorized distributor will, at its option, repair or replace the defective product or its part, or will refund the purchase price of the product. **THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.**

**LIMITATION OF DAMAGES: IN NO EVENT SHALL DKK-TOA BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND FOR BREACH OF ANY WARRANTY, NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE.**

## (3) Others

- (a) Maintenance parts (\*2) for product will normally be supplied for five years (\*3) from the date manufacturing and sales are discontinued.
- (b) The cause of any malfunction or damage shall be determined by a DKK-TOA technician.
- (c) For repairs, contact a local distributor in your country or state.

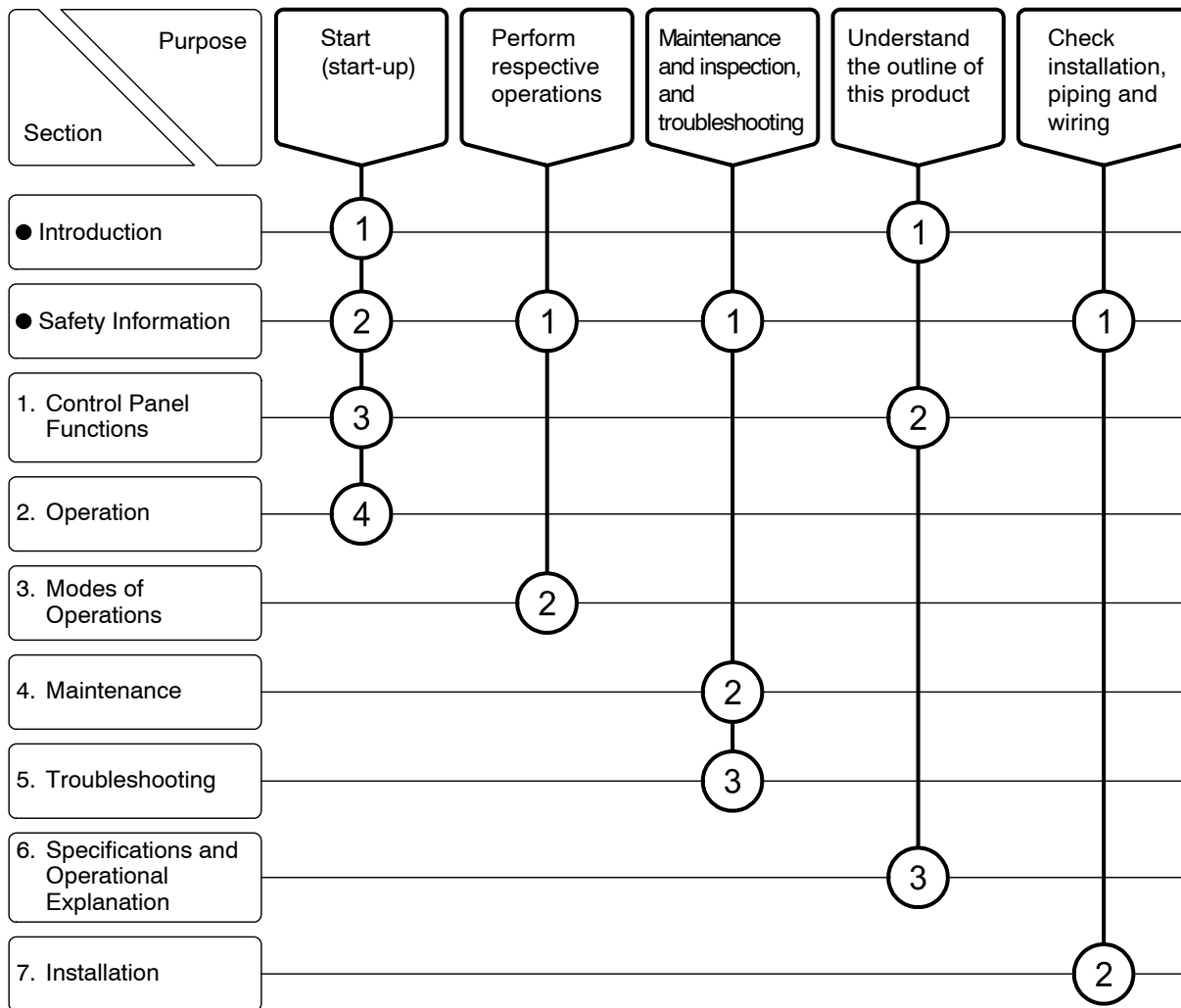
\*1: Warranties for products from other companies must be maintained by the user.

\*2: Maintenance parts refers to parts that are required to maintain operation of the product.

\*3: This five-year period is subject to availability of parts or their replacement.

# Reading Guide

Refer to the necessary sections of this instruction manual depending on your purposes such as understanding the outline of this product or starting the product as shown below. The numbers in circles indicate sections to be referred to in sequential order.



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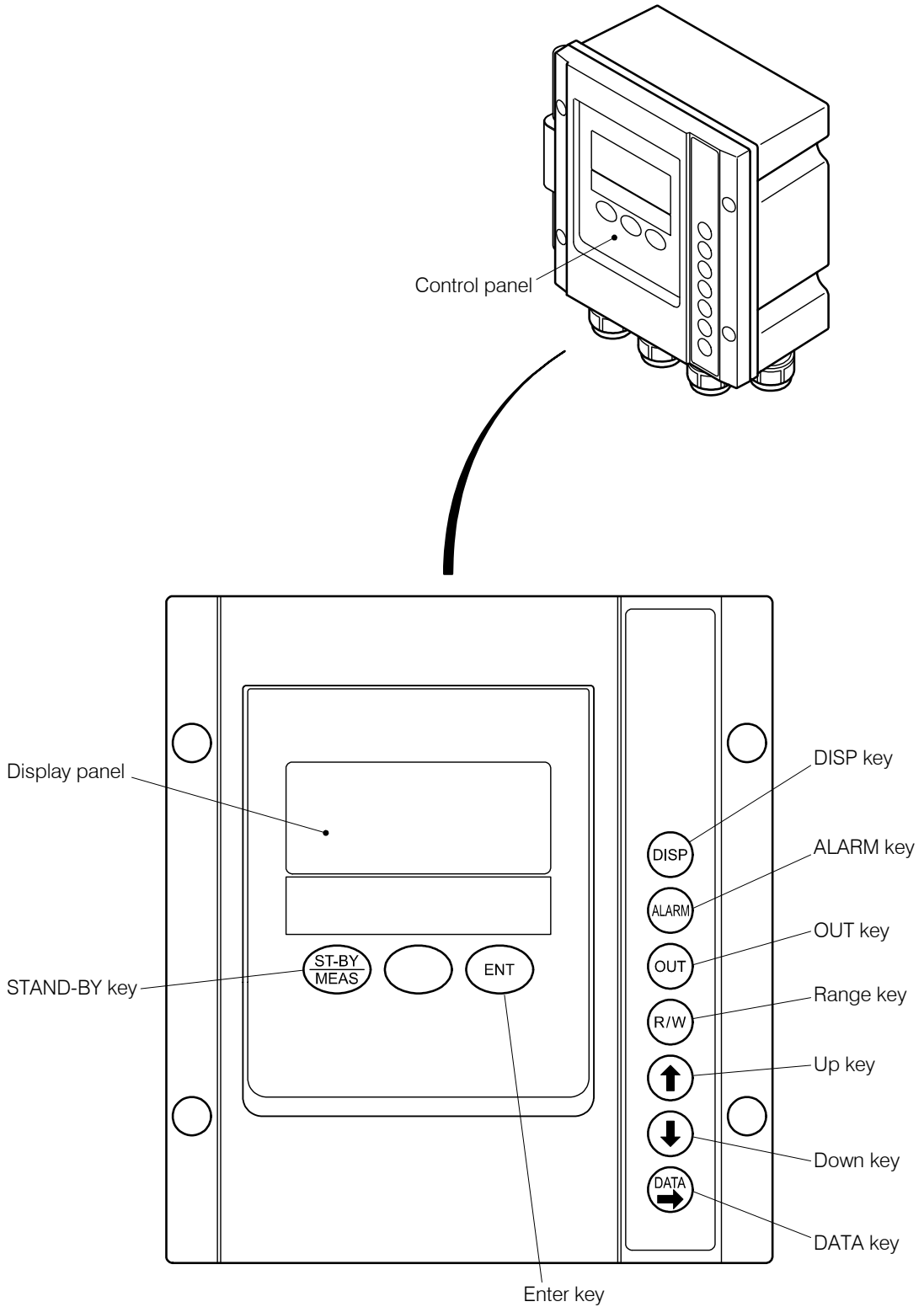
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# 1. Control Panel Functions

























## (1) Names of main components



**Names of Main Components**

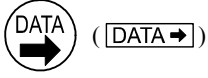
## (2) Functions of keys and indicators

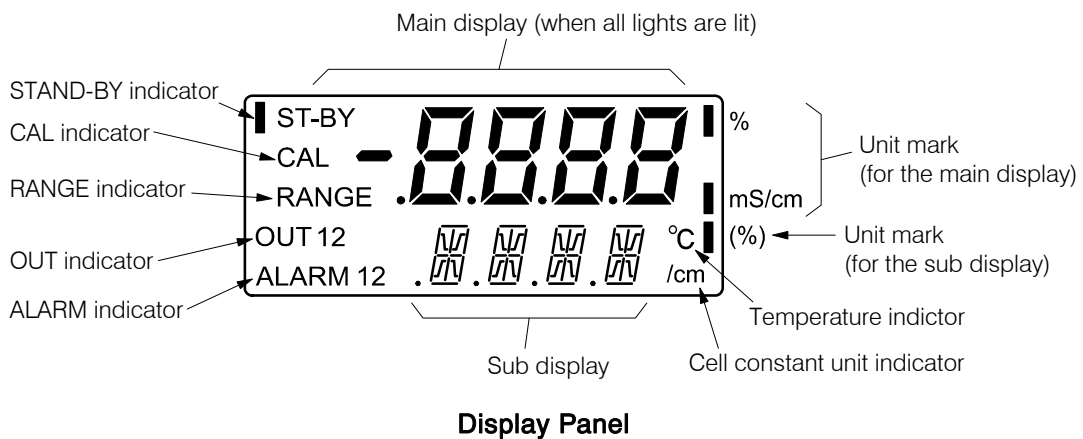
### Functions of Keys

Operation key (notation in the text)	Function
Stand-by key  (  )	<ul style="list-style-type: none"> <li>Pressing this key longer (3 seconds or more) in the measurement mode changes the screen to the “Setting Mode Concentration Measured Value” screen (the initial screen of the setting mode).</li> <li>Pressing this key longer (3 seconds or more) in the setting mode returns the screen to the “Concentration Measured Value” screen (the initial screen of the measurement mode).</li> </ul>
Enter key  (  )	<ul style="list-style-type: none"> <li>Pressing this key in the setting mode or in the transmission adjustment mode switches the screen. Confirms the entered number or symbol and, at the same time, switches the screen to the next screen.</li> <li>Pressing  and  together longer switches the key lock function on and off (valid and invalid). If the key lock function is valid, keys other than  and  are not accepted.</li> </ul>
DISP key  (  )	<ul style="list-style-type: none"> <li>Pressing this key in the measured value screen group enables the screens in this group to be switched.</li> <li>Pressing this key in the “Setting Mode Concentration Measured Value” screen longer, the “Concentration Compensation On/Off” screen, the initial screen of the compensation screen group, appears.</li> </ul>
Alarm key  (  )	<ul style="list-style-type: none"> <li>Pressing this key in the measured value screen group causes the screen to go to the alarm display screen group. If this key is pressed repeatedly, the screen switches to another one in the group and finally returns to the “Concentration Measured Value” screen.</li> <li>Pressing this key longer when “Setting Mode Concentration Measured Value” screen is displayed, “Alarm 1 On/Off” screen, the initial screen of the alarm screen group, appears.</li> </ul>
OUT key  (  )	<ul style="list-style-type: none"> <li>Pressing this key longer in the measurement mode causes the analyzer to enter the transmission adjustment mode. Pressing this key longer in the transmission adjustment mode returns the screen to the “Concentration Measured Value” screen.</li> <li>Pressing this key in the measured value screen group causes the screen to go to the transmission range, etc. display screen group. If this key is pressed repeatedly, the screen switches to another one in the group and finally returns to the “Concentration Measured Value” screen.</li> <li>Pressing this key longer when “Setting Mode Concentration Measured Value” screen is displayed, “Concentration Transmission Range 4mA Value” screen, the initial screen of the transmission range, etc. screen group, appears.</li> </ul>
Range key  (  )	<ul style="list-style-type: none"> <li>Pressing this key in the measured value screen group causes the screen to go to the proper cell constant, etc. display screen group. If this key is pressed repeatedly, the screens of this group open sequentially and finally the screen returns to the “Concentration Measured Value” screen.</li> <li>Pressing this key longer in the “Setting Mode Concentration Measured Value” screen brings up the “Proper Cell Constant (C.CON)” screen, the initial screen of the of the proper cell constant, etc. screen group.</li> </ul>
Up key  (  )	<ul style="list-style-type: none"> <li>Pressing this key in the setting mode or in the transmission adjustment mode increases the setting number or switches the setting symbol.</li> <li>Pressing  and  together longer switches the key lock function on and off (valid and invalid). If the key lock function is valid, keys other than  and  are not accepted.</li> </ul>
Down key  (  )	<ul style="list-style-type: none"> <li>Pressing this key in the setting mode or in the transmission adjustment mode decreases the setting number or switches the setting symbol.</li> </ul>

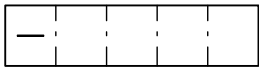
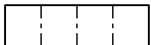
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Operation key (notation in the text)	Function
<p>DATA key</p> 	<ul style="list-style-type: none"> <li>Pressing this key in the measured value screen group causes the screen to go to the concentration conversion data, etc. display screen group. If this key is pressed repeatedly, the screen switches to another one in the group and finally returns to the “Concentration Measured Value” screen.</li> <li>Pressing this key longer in the “Setting Mode Concentration Measured Value” screen brings up the “Measurement Mode Auto Return (M.RET)” screen, the initial screen of the other screen group.</li> <li>Pressing this key in the setting mode or in the transmission adjustment mode moves the digit of the number for setting to the right.</li> </ul>

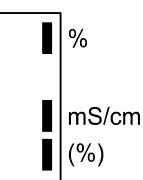



**Functions of indicators**

Functions of indicators	Function
<p>Main display</p> 	<ul style="list-style-type: none"> <li>Displays mainly the measured value in the measurement mode.</li> <li>Displays setting values, selection items, etc. in the setting mode and in the transmission adjustment mode.</li> </ul>
<p>Sub display</p> 	<ul style="list-style-type: none"> <li>Displays mainly the temperature in the measurement mode.</li> <li>Displays setting values, selection items, etc. in the setting mode and in the transmission adjustment mode.</li> </ul>
<p>STAND-BY indicator <b>ST-BY</b></p>	<ul style="list-style-type: none"> <li>When this indicator is lit, the mode is in the setting mode or in the transmission adjustment mode.</li> <li>When this indicator blinks, the analyzer is in the state to change settings.</li> </ul>
<p>CAL indicator <b>CAL</b></p>	<ul style="list-style-type: none"> <li>Indicates that the analyzer is in the transmission adjustment mode.</li> </ul>
<p>RANGE indicator <b>RANGE</b></p>	<ul style="list-style-type: none"> <li>Indicates that the main display shows the selected measuring range.</li> </ul>
<p>OUT indicator <b>OUT1</b> <b>OUT2</b></p>	<ul style="list-style-type: none"> <li>OUT1 indicates that the screen is related to the concentration transmission output.</li> <li>OUT2 indicates that the screen is related to the temperature transmission output.</li> </ul>

(To be continued)

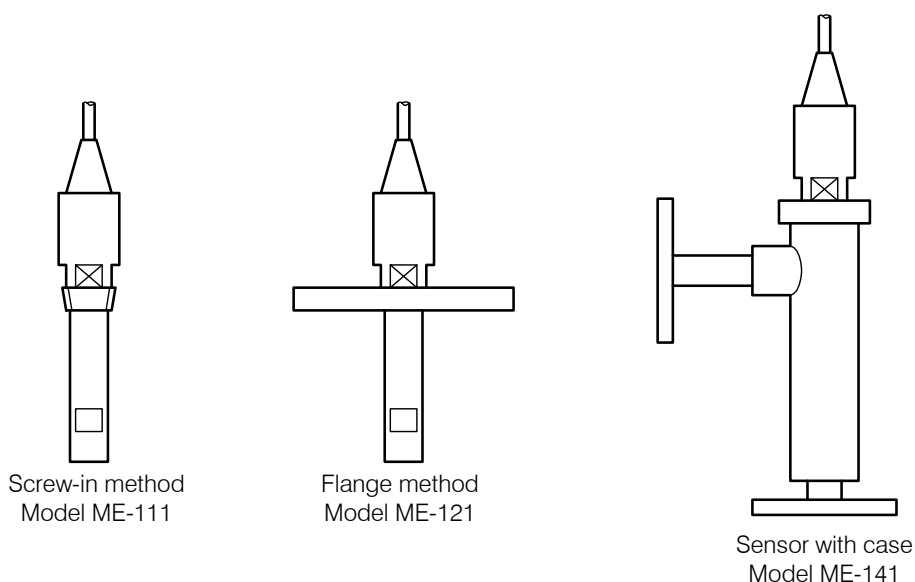
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Functions of indicators	Function
ALARM indicator <b>ALARM1</b> <b>ALARM 2</b>	<ul style="list-style-type: none"> <li>Indicates that the screen is related to the alarm output.</li> <li>ALARM1 indicates that Alarm 1 has occurred and ALARM2 indicates that Alarm 2 has occurred.</li> </ul>
Temperature indicator <b>°C</b>	<ul style="list-style-type: none"> <li>Indicates the unit for the value on the main display or sub display.</li> </ul>
Cell constant unit indicator <b>/cm</b>	<ul style="list-style-type: none"> <li>Indicates whether the unit for the value displayed is centimeter unit or meter unit cell constant.</li> </ul>
Unit mark 	<ul style="list-style-type: none"> <li>“%” or “mS/cm”. indicates the unit of the numeric value currently shown on the main display.</li> <li>“(%)” indicates the unit of the numeric value currently shown on the sub display.</li> </ul>
Key lock mark 	<ul style="list-style-type: none"> <li>Indicates that the key lock function is valid.</li> </ul>

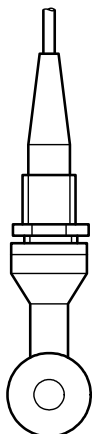
[NOTE] • For mode and screen group, refer to 3.1(1) “Mode switching.”  
 • For screen configuration and switching, refer to 3.1(2) “Operation screen map.”

### (3) Main sensors

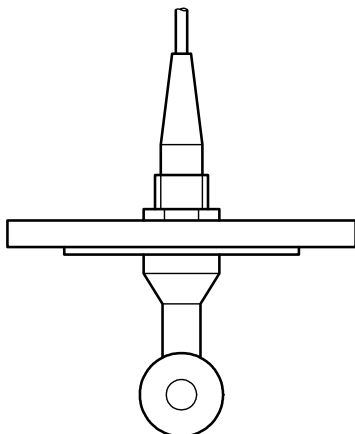
Sensor is selected according to the ordered specification. The shapes of main sensors are shown below. The reference cell constant is 9.00/cm or 2.6/cm.



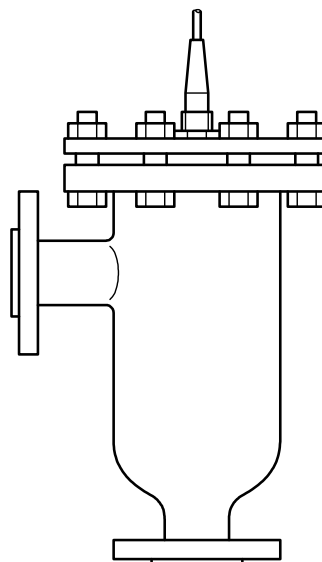
**ME-1□1 Series Sensors** (Reference cell constant: 9.00/cm)



Screw-in method  
Model ME-11T-1-O



Flange method  
Model ME-11T-1-D



Sensor with case  
Model ME-11T-1-H

**ME-11T Series Sensors** (Reference cell constant: 2.60/cm)

## 2. Operation

### 2.1 Operation Start Procedure

Operate the analyzer in the procedure below. The measuring system including the analyzer becomes ready to operate in normal operating conditions.

- ① **Check the installation.** ..... Check that the necessary installation work described in 7. “Installation” (mounting and wiring) is completed.
- ② **Install the sensor.** ..... Check that the sensor is mounted properly. (▷ Check the procedure in 7.2 “Sensor Mounting” and make sure that the liquid contacting section of the sensor is immersed in a sample solution.
- ③ **Turn on power supply.** ..... Make sure the power to be supplied to the analyzer is 90 to 264VAC and turn on power at the power source side and then open the door of the analyzer and turn on the power switch. Close the door in the same manner.

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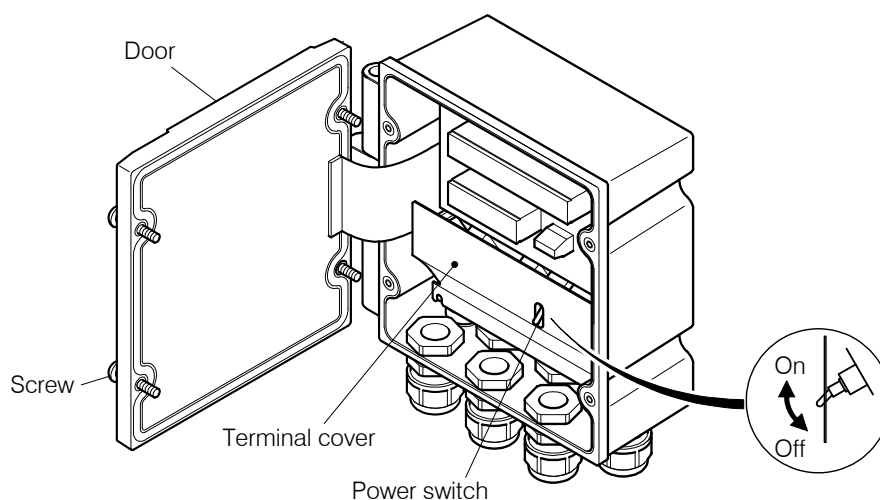
### ⚠ WARNING

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#### Electric Shock

- Do not touch the terminal plate in the analyzer while power is applied. Touching the terminal plate may cause electric shock.
- 

- [IMPORTANT]**
- Power voltage is 90 to 264VAC. Supplying voltage higher than this range may damage the analyzer.
  - Power switch is installed facing a little downward. When you turn on or off the switch, make sure that the switch is actually turned on or off.
- 

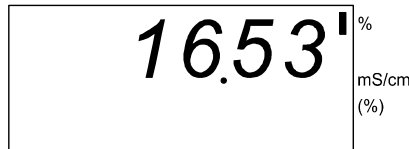


**Power Switch of the Analyzer**

- ④ **Check the display and indicators.** ..... Confirm that the “Concentration Measured Value” screen, the initial screen of the measurement mode, appears and the concentration measured value is shown on the main display. The standby indicator (ST-BY) is unlit.

[NOTE] ● If the concentration compensation and temperature shift is on (valid), the offset is shown on the sub display.

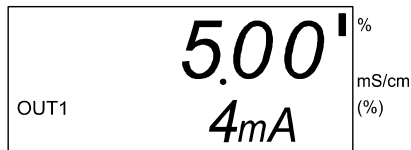




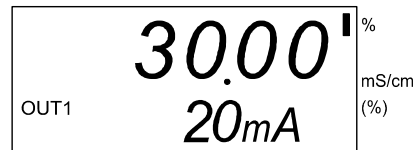
**Example of Concentration Measured Value Screen**

⑤ Go to the transmission output range, etc. display screen group. .... Press [OUT] while a screen of the measured value screen group is displayed.

- The “Concentration Transmission 4mA Value Display (4mA)” screen of the transmission range, etc. display screen group appears.



**Concentration Transmission 4mA Value Display Screen**



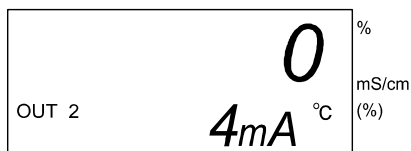
**Concentration Transmission 20mA Value Display Screen**

⑥ Check the concentration transmission output range.

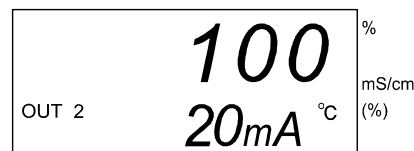
- Check the 4mA value. .... Check that the value on the main display of “Concentration Transmission 4mA Value Display (4mA)” screen shows the necessary concentration value (%) that corresponds to 4mA value.
- Check the 20mA value. .... Press [OUT] once and check that the value on the main display of “Concentration Transmission 20mA Value Display (20mA)” screen shows the necessary concentration value (%) that corresponds to 20mA value. Check that the transmission output range is appropriate for the conductivity of sample liquid for 20mA value as well as 4mA value.
  - Normally, the concentration transmission output range is set as factory setting value according to the ordered specification. However, this range can be changed.
    - ▷ 3.3(4) “Changing the concentration transmission output range”

⑦ Check the temperature transmission output range.

- Check the 4mA value. .... Press [OUT] once and check that the value on the main display of “Temperature Transmission 4mA Value (4mA) Display” screen shows the necessary temperature value that corresponds to 4mA value.



**Temperature Transmission 4mA Value display Screen**



**Temperature Transmission 20mA Value display Screen**

- Check the 20mA value. .... Press [OUT] once and check that the value on the main display of “Temperature Transmission 20mA Value (20mA) Display” screen shows the necessary temperature value that corresponds to 4mA value. Check that the transmission output range is appropriate for the temperature of sample liquid for 20mA value as well as 4mA value.

- The temperature transmission output range is set as factory setting value as shown in the table “Measurement Mode Check Screens and Factory Setting Values” in Step ⑨. However, this range can be changed. ▷ 3.3(5) “Changing the temperature transmission output range”

⑧ Return to “Concentration Measured Value” screen. .... Press **[OUT]**.

⑨ Check other setting values. .... Check other setting values shown in the table below and change them, if necessary. Among them, “Concentration Transmission 4mA Value display (4mA)” screen, “Concentration Transmission 20mA Value Display (20mA)” screen, “Temperature Transmission 4mA Value Display (4mA)” screen and “Temperature Transmission 20mA Value Display (20mA)” screen are already checked in Steps ⑥ and ⑦.





**Measurement Mode Check Screens and Factory Setting Values**

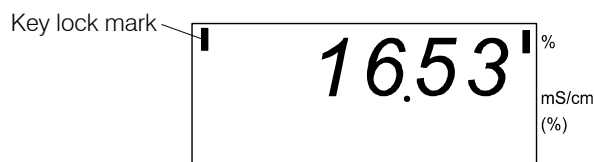
Check screen	Factory setting value	Reference item
[Alarm display screen group]		▷ 3.2(2) “Checking the alarm”
• Alarm 1 Set Point Display Screen	Invalid (OFF)	▷ 3.3(3) “Changing the alarm setting ”
• Alarm 2 Set Point Display Screen	Invalid (OFF)	
[Transmission output range, etc. display screen group]		▷ 3.2(3) “Checking the transmission output range and Hold setting”
• Concentration Transmission 4mA Value Display Screen	According to the ordered specification	▷ 3.3(4) “Changing the Concentration transmission output range”
• Concentration Transmission 20mA Value Display Screen	According to the ordered specification	3.3(5) “Changing the temperature transmission output range”
• Temperature Transmission 4mA Value Display Screen	0°C	3.3(6) “Changing the Hold setting”
• Temperature Transmission 20mA Value Display Screen	50°C	
• Hold Display Screen	Hold	
[ Proper cell constant, etc. display group ]		▷ 3.2(4) “Checking the proper cell constant”
• Proper Cell Constant Display Screen	Depends on the combined sensor.	▷ 3.3(7) “Changing the proper cell constant”
• Temperature Slope Display Screen		3.3(8) “Changing the temperature slope”
[Concentration conversion data, etc. display screen group ]		▷ 3.2(5) “Checking the concentration conversion data”
• Concentration Conversion X1T1 Display Screen to the Concentration Conversion X6T5 Display Screen	Depends on the ordered specification.	• If the product is equipped with an RS-232 connector (option), the concentration conversion data can be changed by an application program (option) for personal computer.
• Measurement Mode Auto Return Display Screen	Returns automatically (on)	▷ 3.3(9) “Changing the measurement mode auto return”

⑩ Check the indication in the measurement mode. .... While “Concentration Measured Value” screen is displayed, press **[DISP]** repeatedly until the desired screen appears.

- Concentration Measured Value Screen
- Concentration and Compensated Value Screen (automatically returns to “Concentration Measured Value” screen in about 20 seconds)
- Temperature Measured Value Screen

- Concentration and Temperature Measured Value Screen
- Compensation and Conductivity Screen

⑩ **Enable the key lock function** ..... It is recommended to enable the key lock function in advance to prevent the setting values from being changed by mistake during setting. Pressing  and  together longer (3 seconds or more) switches this function on and off (valid/invalid). When this function is valid, all keys other than the  and  keys will not be accepted. If this function is turned off, the key lock mark goes out and all keys will be accepted.



**Key Lock Mark Is Lit** (Key Lock Function: Valid)

Now, the measurement system has returned to normal measurement state.

## 2.2 Stopping the Operation

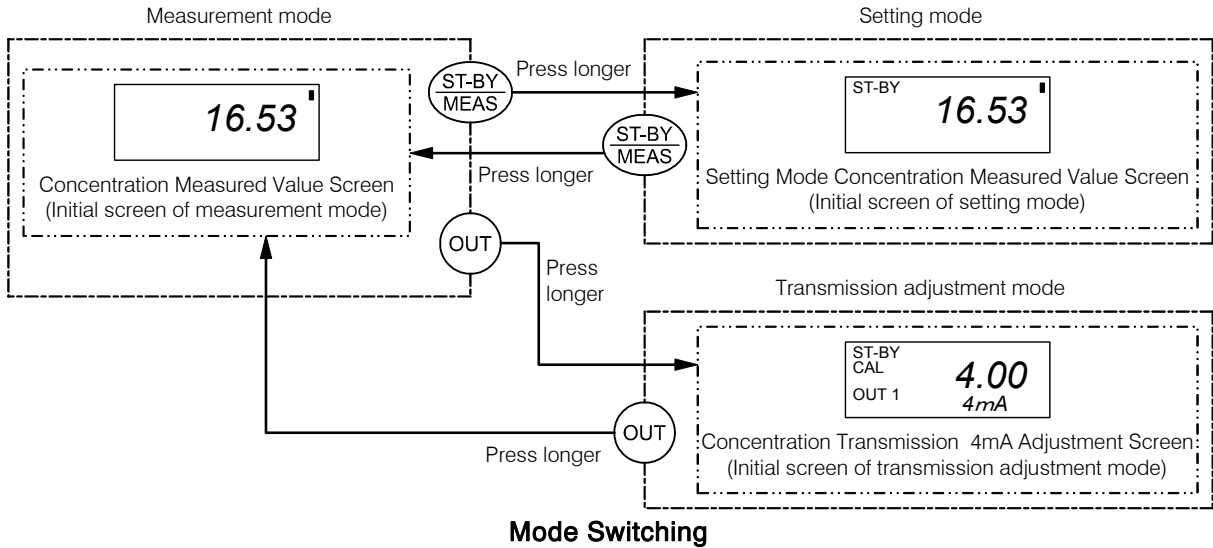
- To stop the operation, turn off the power switch of the analyzer and turn off the power source that supplies power to the analyzer.
- If it is sure that the sensor will not be damaged or no possibility of the electrode section gets dirty, it is not necessary to remove the sensor
- To restart the operation, refer to 2.1 “Operation Start Procedure.” To transfer the analyzer to other place, refer to 7, “Installation.”

# 3. Modes of Operations

## 3.1 Modes and Operation Screen Map

### (1) Mode Switching

(a) The screens to check or perform settings are separated into 3 modes as shown below.



(b) The mode that the current screen belongs to can be checked as shown below using the standby indicator (ST-BY)

**Indicators and the Current Mode**

	Standby indicator (ST-BY)	CAL indicator (CAL)
Measurement mode	Unlit	Unlit
Setting mode	Lit	Unlit
Transmission adjustment mode	Lit	Blinks

(c) As shown in the diagram “Mode Switching,” the mode can be changed by pressing **[ST-BY/MEAS]** longer (3 seconds or more) and pressing **[OUT]** longer (3 seconds or more).

(d) When the mode is changed, the initial screen of the changed mode appears.

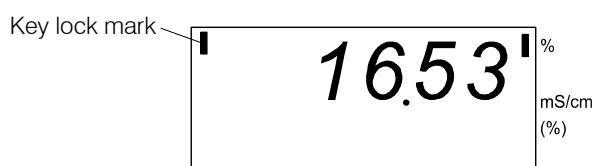
(e) When the analyzer goes to the setting mode, the conductivity transmission output (terminals 70 and 71) and the temperature transmission output (terminals 72 and 73) automatically change as follows:

- At the time of measurement mode ..... Outputs the current conductivity measured value.
- At the time of setting mode ..... Outputs depending on the type set by “Hold (S.OUT)” screen
- At the time of transmission adjustment mode ..... Outputs an arbitrarily current value set by the screen in this mode.

(f) When the analyzer is in the setting mode or in the transmission adjustment mode, alarm output signals will be reset.

- (g) If a specified key is pressed (such as **DISP**), that corresponds to each group in the measurement mode or in the setting mode, the screen goes to that group. ▷ 3.1(2) “Operation screen map”
- (h) Various measurement conditions such as measuring range are set using the screens of the setting mode. These are normally set individually as factory setting values according to the ordered specification. Unless otherwise necessary, do not operate the screens of the setting mode. If it is necessary to change the values, understand this function thoroughly before operating the screens.
- (i) This analyzer is equipped with the key lock function. Pressing **↑** and **ENT** together longer (3 seconds or more) switches the key lock function on and off (valid and invalid). When this function is valid, all keys other than the **↑** and **ENT** keys will not be accepted. If this function is turned off, the key lock mark goes out and all keys will be accepted.

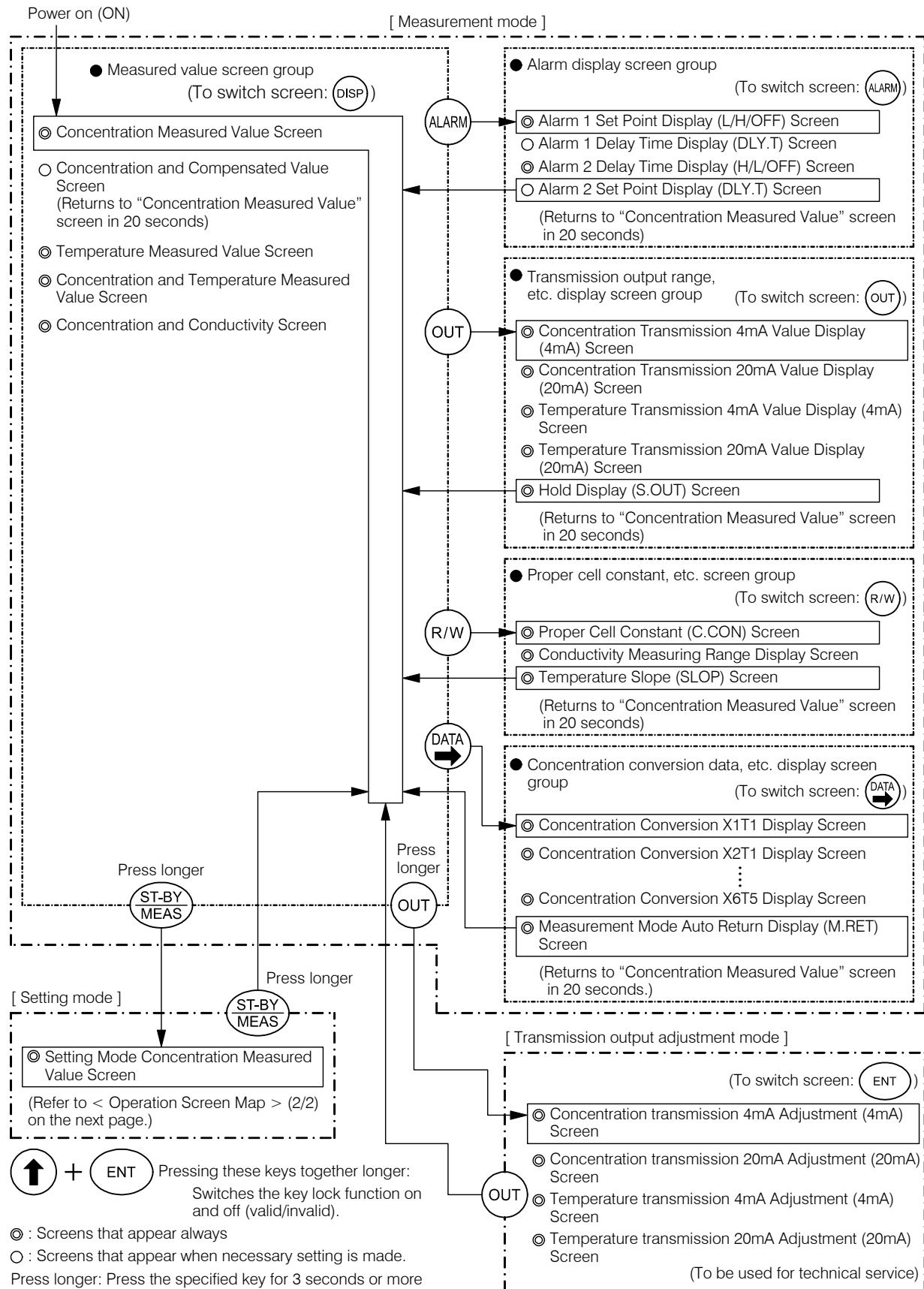
[NOTE] • Whenever the power switch is turned on, the key lock function is made invalid.



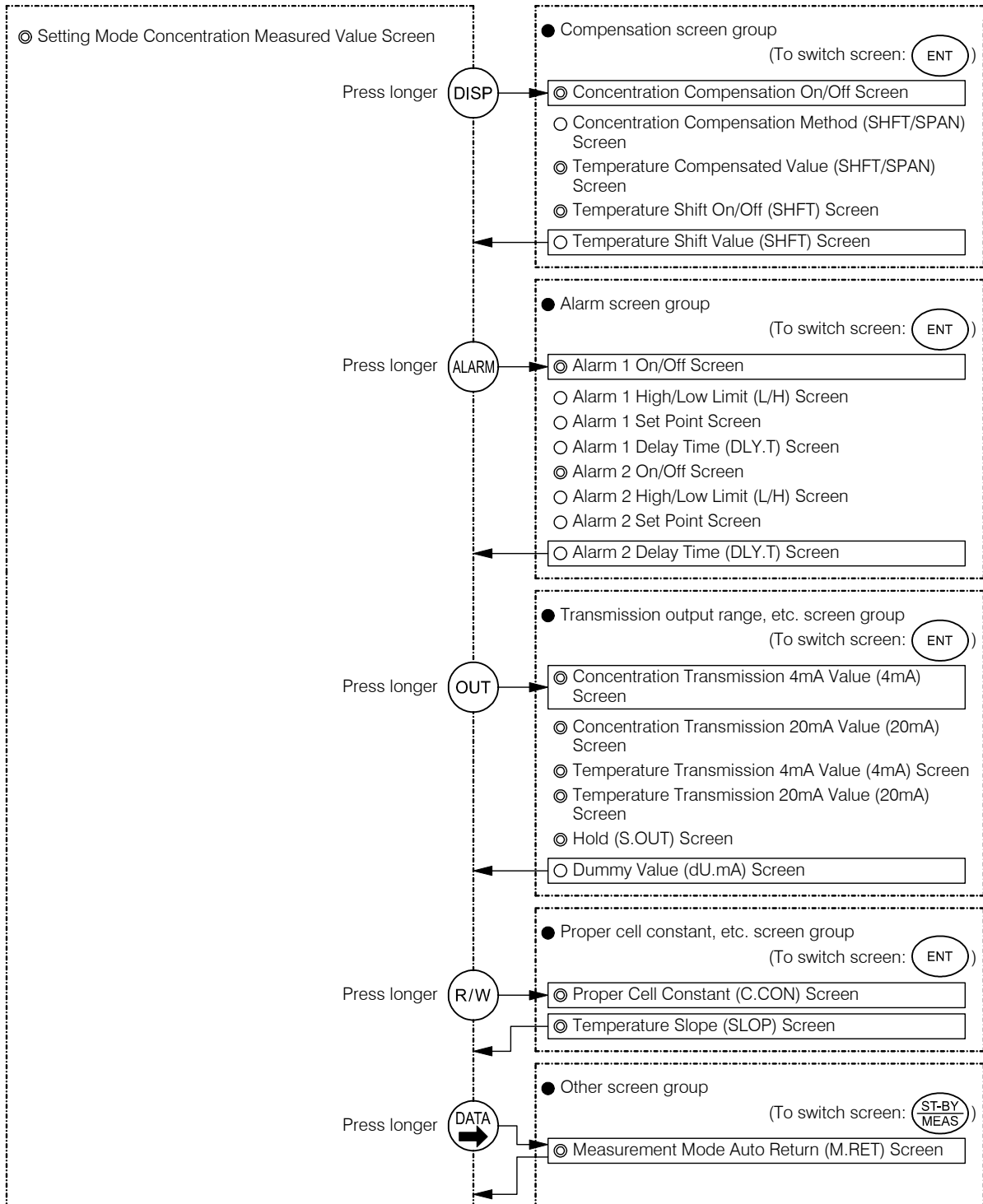
**Key Lock Mark Is Lit** (Key Lock Function: Valid)

- 
- 【IMPORTANT】** • Unless otherwise necessary, do not operate the screens of the setting mode. To prevent the setting values from being changed by mistake, the key lock function should be enabled (key lock mark: lit) in advance. If the setting values are changed by aimless operation, correct measurement cannot be obtained and it may not be possible to return to the measurement condition before the change.
-

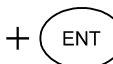
## (2) Operation screen map



Operation Screen Map (1/2)



Press longer: Returns to "Concentration Measured Value" screen in the measurement mode.



Pressing these keys together longer: Switches the key lock function on and off (valid/invalid).

◎ : Screens that appear always

○ : Screens that appear when necessary setting is made.

Press longer: Press the specified key for 3 seconds or more

**Operation Screen Map (2/2)**

### 3.2 Measurement Mode Operation

#### (1) Measured value screen selection

- (a) The screens shown in the table below are provided in the measured value screen group. The current concentration measured value or the temperature measured value can be checked. These screens are used in normal measurement state.
- (b) Each time **[DISP]** is pressed in the measurement mode, the screens change. Select the desired screen when needed.
- (c) The “Concentration and Compensation Value” screen returns automatically to “Concentration Measured Value” screen in 20 seconds after it is displayed.
- (d) When power is turned on, “Concentration Measured Value” screen, the initial screen of this group, appears. This screen appears when the screen returns from the display screen group of the measurement mode or this screen appears when the screen returns from the setting mode or from the transmission adjustment mode.
- (e) The concentration transmission output corresponds to the concentration measured value regardless of the screen displayed. The same is true with the temperature transmission output.

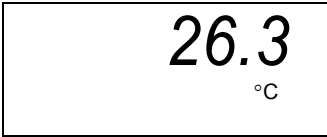
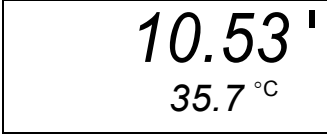
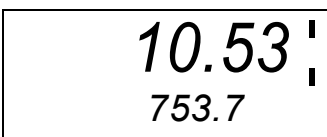
**Sequence and Contents of Measured Value Screen Group**

No.	Name	Screen example	Description
(To switch screen: <b>[DISP]</b> )			
①	<input checked="" type="radio"/> Concentration Measured Value Screen		<ul style="list-style-type: none"> <li>• Main display .... The current concentration measured value (%).</li> <li>• Sub display .... Not displayed. However, if the “Concentration Compensation On/Off” screen is on, the offset is shown.</li> <li>• Unit marks .... The unit (%) for the main display and the unit (mS/cm) for the sub display are shown.</li> </ul>
②	<input type="radio"/> Concentration and Compensation Value Screen (If the “Concentration Compensation On/Off Setting” (on/oFF) screen is “oFF”, this screen does not appear.)		<ul style="list-style-type: none"> <li>• Main display .... The current concentration measured value (%).</li> <li>• Sub display .... Either of the following is shown.                             <ul style="list-style-type: none"> <li>+ or - .... Indicates the offset (conductivity) for concentration compensation (mS/cm).</li> <li>× .... Indicates the compensation coefficient by span compensation. In this case, the unit mark “mS/cm” is unlit.</li> </ul> </li> <li>• Unit marks .... The unit (%) for the main display are shown.</li> <li>• Returns automatically to the “Concentration Measured Value” screen in 20 seconds after it is opened.</li> </ul>

(To be continued)



(Continued from previous page)

No.	Name	Screen example	Description
③	⊙ Temperature Measured Value Screen		<ul style="list-style-type: none"> <li>• Main display .... The current temperature measured value (°C).</li> <li>• Sub display .... Shift value is displayed when “on” is set to the “Temperature Shift On/Off (SHFT)” screen.</li> </ul>
④	⊙ Concentration / Temperature Measured Value Screen		<ul style="list-style-type: none"> <li>• Main display .... The current concentration measured value (%).</li> <li>• Sub display .... The temperature measured value (°C).</li> <li>• Unit marks .... The unit (%) for the main display are shown.</li> </ul>
⑤	⊙ Concentration / Conductivity Value Screen		<ul style="list-style-type: none"> <li>• Main display .... The current concentration measured value (%).</li> <li>• Sub display .... The current conductivity measured value of sample solution (mS/cm).</li> <li>• Unit marks .... The unit (%) for the main display are shown.</li> </ul>

⊙: Screens that appear always

○: Screens that appear when necessary setting is made.

## (2) Checking the alarm

- The screens shown in the table below are provided in the alarm display screen group. The setting contents related to the alarm function such as alarm On/Off can be checked.
- When **ALARM** is pressed in the measurement mode, the screen goes to this group. If the same key is pressed again, the screen changes to another one in the group. If the same key is pressed while the last screen is displayed, the screen exits this group and returns to the “Concentration Measured Value” screen.
- Any screen in this group returns automatically to the “Concentration Measured Value” screen in 20 seconds after it is displayed.
- The setting values of these screens can be changed by the screens of the alarm screen group in the setting mode. ➤ 3.3(3) “Changing the alarm setting”

**Sequence and Contents of Alarm Display Screen Group**

No.	Name	Screen example	Description
(To switch screen: <b>ALARM</b> )			
①	<p>⊙ Alarm 1 Set Point Display Screen</p>	<p>&lt; When Alarm is Off (invalid) &gt;</p>	<ul style="list-style-type: none"> <li>• Main display .... The set point (concentration value) of Alarm 1 high/low alarm value (%). Indicates that Alarm 1 is valid.</li> <li>• Sub display .... High or low alarm distinction. Or indicates that Alarm 1 function is invalid.</li> <li>OFF (Off) .... Alarm 1 is invalid. (factory setting)</li> <li>L (Low) .... Alarm 1 is low alarm.</li> <li>H (high) .... Alarm 1 is high alarm.</li> </ul>
②	<p>○ Alarm 1 Delay Time Display Screen Not displayed when “oFF” is set to “Alarm 1 Set Point Display” screen.</p>		<ul style="list-style-type: none"> <li>• Main display .... Alarm 1 delay time (second)</li> <li>• Sub display .... The following items are displayed alternately: DLY.T .... Indicates that the delay time is shown on the main display. SEC .... Indicates that the unit for the main display is “Second.”</li> </ul>
③	<p>⊙ Alarm 2 Set Point Display Screen</p>	<p>&lt; When Alarm is Off (invalid) &gt;</p>	<ul style="list-style-type: none"> <li>• The contents are the same with Alarm 1.</li> </ul>
④	<p>○ Alarm 2 Delay Time Display Screen Not displayed when “oFF” is set to “Alarm 2 Set Point Display” screen.</p>		<ul style="list-style-type: none"> <li>• The contents are the same with Alarm 1.</li> </ul>
Returns to “Concentration Measured Value” screen.			

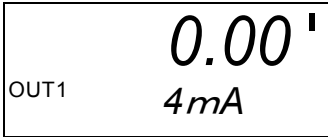

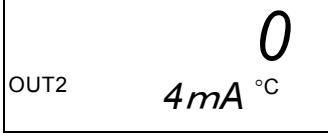
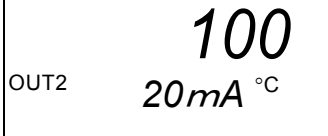
⊙: Screens that appear always

○: Screens that appear when necessary setting is made.

### (3) Checking the transmission output range and hold setting

- (a) The screens shown in the table below are provided in the transmission range, etc. display screen group. The concentration and the temperature transmission output range correspond to the 4 to 20mADC.
- (b) When **[OUT]** is pressed in the measurement mode, the screen goes to this group. If the same key is pressed again, the screen changes to another one in the group. If the same key is pressed while the last screen is displayed, the screen exits this group and returns to the “Concentration Measured Value” screen.
- (c) Any screen in this group returns automatically to the “Concentration Measured Value” screen in 20 seconds after it is displayed.
- (d) The setting values of these screens can be changed by the screens of the transmission range, etc. screen group in the setting mode. ▷ 3.3(4) “Changing the concentration transmission output range” to 3.3(6) “Changing the Hold setting”

#### Sequence and Contents of Transmission Range, etc. Display Screen Group

No.	Name	Screen example	Description
(To switch screen: <b>[OUT]</b> )			
①	◎ concentration Transmission 4mA Value Display Screen		<ul style="list-style-type: none"> <li>• Main display ... Concentration value that corresponds to the set transmission 4mA.</li> <li>• Corresponds to the concentration transmission output terminals 70 and 71.</li> </ul>
②	◎ concentration Transmission 20mA Value Display Screen		<ul style="list-style-type: none"> <li>• Main display ... Concentration value that corresponds to the set transmission 20mA.</li> <li>• Corresponds to the concentration transmission output terminals 70 and 71.</li> </ul>
③	◎ Temperature Transmission 4mA Value Display Screen		<ul style="list-style-type: none"> <li>• Main display ... Temperature value that corresponds to the set transmission 4mA.</li> <li>• Corresponds to the temperature transmission output terminals 72 and 73.</li> </ul>
④	◎ Temperature Transmission 20mA Value Display Screen		<ul style="list-style-type: none"> <li>• Main display ... Temperature value that corresponds to the set transmission 20mA.</li> <li>• Corresponds to the temperature transmission output terminals 72 and 73.</li> </ul>

(To be continued)

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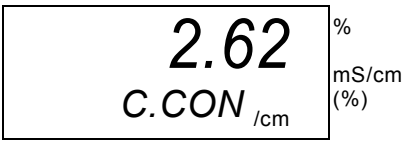
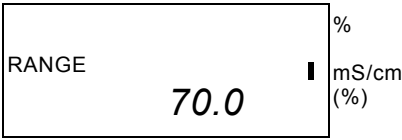

No.	Name	Screen example	Description
⑤	⊙ Hold Display Screen	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>OUT <span style="float: right;">%</span></p> <p style="text-align: center; font-size: 2em;"><i>HoLd</i></p> <p style="text-align: center;"><i>S.OUT</i></p> <p style="text-align: center;">&lt;When Hold is set&gt;</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>OUT <span style="float: right;">%</span></p> <p style="text-align: center; font-size: 2em;">12.0</p> <p style="text-align: center;"><i>du.mA</i></p> <p style="text-align: center;">&lt;When Dummy is set&gt;</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p>OUT <span style="float: right;">%</span></p> <p style="text-align: center; font-size: 2em;"><i>tH</i></p> <p style="text-align: center;"><i>S.OUT</i></p> <p style="text-align: center;">&lt;When Through is set&gt;</p> </div>	<ul style="list-style-type: none"> <li>• Main display .... The symbol indicating the “Hold” type set in the setting mode.</li> <li>HoLd (Hold) .... Outputs the transmission output immediately preceding the mode is changed to the setting mode (factory setting).</li> <li>du (Dummy value) .... Outputs an arbitrarily set transmission output value (mA). The set value is shown on the main display. du.mA is shown on the sub display.</li> <li>tH (Through) .... Outputs the current concentration measured value in the same way as in the measurement mode.</li> </ul> <p>Returns to “Concentration Measured Value” screen.</p>

⊙: Screens that appear always

#### (4) Checking the proper cell constant

- (a) The proper cell constant, etc. display screen group includes the following screens. In these screens, proper cell constant, conductivity measuring range and temperature slope can be checked.
- (b) When **[R/W]** is pressed in the measurement mode, the screen goes to this group. If the same key is pressed again, the screen changes to another one in the group. If the same key is pressed while the last screen is displayed, the screen exits this group and returns to the “Concentration Measured Value” screen.
- (c) Any screen in this group returns automatically to the “Concentration Measured Value” screen 20 seconds after it is displayed.
- (d) The setting values of these screens can be changed by the screens of the proper cell constant display, etc. screen group in the setting mode. ▷ 3.3(7) “Changing the proper cell constant”
- (e) The proper cell constant is a cell constant that each sensor has and is a value a little more or less the reference cell constant (designed cell constant). Normally if you enter the proper cell constant (described on the sensor) of the sensor combined to the analyzer, higher accuracy measurement can be obtained.
- (f) The conductivity measuring range is preset at factory according to the ordered specification. If the product is equipped with an RS-232C connector (option), by using an application program (option) for personal computer, the concentration conversion data can be changed to new one. This may result in the conductivity measuring range being changed.

### Sequence and Contents of Proper Cell Constant, etc. Display Screen Group

No.	Name	Screen example	Description
(To switch screen: <span style="border: 1px solid black; padding: 0 2px;">R/W</span> )			
①	⊙ Proper Cell Constant Display Screen		<ul style="list-style-type: none"> <li>• Main display .... Displays the set proper cell constant, a value of approx. 9.00/cm or 2.60/cm. Normally, the value described on the combined sensor is set.</li> <li>• Sub display .... Indicates that the main display shows the proper cell constant.</li> <li>• Sub unit indication .... Indicates the unit for the main display is /cm.</li> </ul>
②	⊙ Conductivity Measuring Range Display Screen		<ul style="list-style-type: none"> <li>• Sub display .... Maximum scale value (FS) (mS/cm) in the conductivity measuring range set at factory according to the ordered specification</li> <li>• Range display .... Indicates that the sub display shows a value within the conductivity measuring range.</li> </ul>
	⊙ Temperature Slope Display Screen		<ul style="list-style-type: none"> <li>• Main display .... Coefficient indicating the slope of the analytical curve for temperature measurement</li> </ul>
Returns to “Concentration Measured Value” screen.			

⊙: Screens that appear always

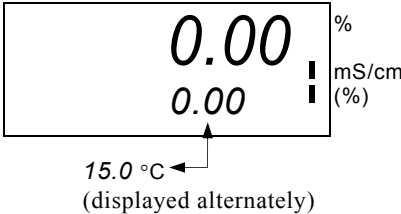
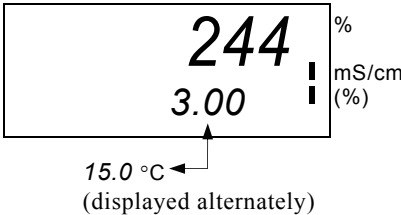
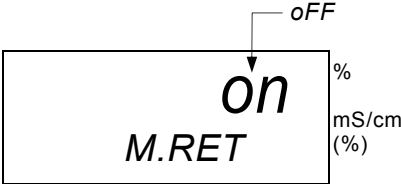
## (5) Checking the concentration conversion data

- (a) The concentration conversion data display screen group includes the screens listed in the table below. In these screens, the concentration conversion data and measurement mode auto return setting contents can be checked.
- (b) Pressing DATA → in the measurement mode causes the screen to go to this group. Pressing the same key again causes the screen to exit this group and return to the “Concentration Measured Value” screen.
- (c) Each screen in this group automatically returns to the “Concentration Measured Value” screen in 20 seconds after it is displayed.
- (d) The setting values in these screens are preset at factory according to the ordered specification and cannot be changed. However, if the product is equipped with an RS-232C connector (option), the concentration conversion data can be changed by using an application program (option) for personal computer.
- (e) The concentration conversion data is a list of conductivity (mS/cm) of a sample solution of concentration X (%) and temperature T (°C). Conductivity for up to 30 points (X1T1 to X6T5) (conductivity for up to 6 points of concentration (X1 to X6) and up to 5 points of temperature (T1 to T5)) is set. In this instruction manual, each data is referred to as the following symbol.

**Symbol Representing Each Conductivity of the Concentration Conversion Data**

		Concentration (%)					
		X1	X2	X3	X4	X5	X6
Temperature (°C)	T1	X1T1	X2T1	X3T1	X4T1	X5T1	X6T1
	T2	X1T2	X2T2	X3T2	X4T2	X5T2	X6T2
	T3	X1T3	X2T3	X3T3	X4T3	X5T3	X6T3
	T4	X1T4	X2T4	X3T4	X4T4	X5T4	X6T4
	T5	X1T5	X2T5	X3T5	X4T5	X5T5	X6T5

**Sequence and Description of Screens in the Concentration Conversion Data, etc. Display Screen Group**

No.	Name	Screen example	Description
(To switch screen: <b>DATA</b> →)			
①	◎ Concentration Conversion X1T1 Display Screen		<ul style="list-style-type: none"> <li>• Main display .... Conductivity value (mS/cm) at the point where the concentration conversion data is concentration X1 and temperature T1.</li> <li>• Sub display .... Displays concentration X1 (%) and temperature X1 (°C) alternately. The screen example is an example of displaying 0.00% and 15.0°C alternately.</li> </ul>
②	◎ Concentration Conversion X2T1 Display Screen		<ul style="list-style-type: none"> <li>• Main display .... Conductivity value (mS/cm) at the point where the concentration conversion data is concentration X2 and temperature T1.</li> <li>• Sub display .... Displays the concentration X2 (%) and temperature X1 (°C) alternately. The screen example is an example of displaying 3.00% and 15.0°C alternately.</li> </ul>
③	◎◎ Concentration Conversion X3T1 Display Screen to Concentration Conversion X6T5 Display Screen	(Screen omitted)	<ul style="list-style-type: none"> <li>• The same descriptions as in ① and ② apply to these screens. There are up to 30 such screens provided, including ① and ②.</li> <li>• Screens in which no concentration conversion data is set do not appear.</li> <li>• Pressing <b>ST-BY/MEAS</b> when concentration conversion data is displayed causes the screen to go to the next screen.</li> </ul>
④	◎ Measurement Mode Auto Return Display Screen		<ul style="list-style-type: none"> <li>• Main display .... Selection of the measurement mode auto return function on (On) .... Auto return is valid (factory setting) oFF (Off) .... Auto return is invalid.</li> </ul>

Returns to “Concentration Measured Value” screen.

◎: Screens that appear always

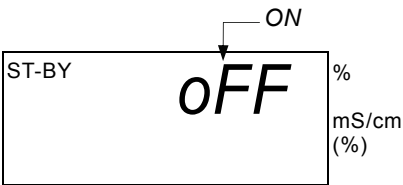
○: Screens that appear when necessary setting is made.

### 3.3 Setting Mode Operation

#### (1) Changing the concentration compensation

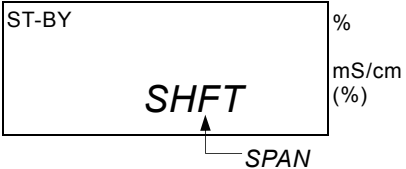
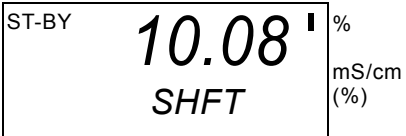
- (a) It is possible to change the current on/off setting of the concentration compensation function, the compensation method and the value after compensation. The concentration compensation function is set to “oFF” (do not perform compensation) at factory. Normally, this operation is not needed.
- (b) Concentration compensation is an operation that measures a solution of known compensation and changes the measured value on the screen to the value for the solution of known compensation by key operation. While this function is on, the measured value is compensated. If this function is turned off, the value before compensation is restored.
- (c) To perform this operation, it is necessary to prepare in advance a solution of known concentration that is kept constant (within a variance of 0.5°C for 5 minutes) within the temperature range of the concentration conversion data and immerse the sensor in it.
- (d) Either the concentration shift compensation (SHIFT) or concentration span compensation (SPAN) can be selected. Concentration shift compensation adds/subtracts an offset to/from the measured value and is suitable for compensation around the minimum value in the measuring range. On the other hand, concentration span compensation multiplies the measured value by the set compensation coefficient and is suitable for compensation around the maximum value.

#### Procedure for Changing the Concentration Compensation

Procedure and screen example	Operation
<p>① Select the “Setting Mode Concentration ..... Measured Value” screen.</p>	<p>Press <b>[ST-BY/MEAS]</b> longer in the measurement mode.</p> <ul style="list-style-type: none"> <li>• “ST-BY” lights.</li> </ul>
<p>② Prepare a solution of known concentration. ....</p>	<p>Immerse the sensor in the solution of known compensation that is kept constant (within a variance of 0.5°C for 5 minutes) within the temperature range of the concentration conversion data and wait until the concentration is stabilized.</p> <ul style="list-style-type: none"> <li>• If the concentration compensation function is turned off, this operation is not needed.</li> </ul>
<p>③ Select the “Concentration Compensation ..... On/Off” screen.</p> <div style="text-align: center; margin-top: 10px;">  </div> <p style="margin-top: 10px;">Concentration Compensation On/Off Screen</p>	<p>Press <b>[DISP]</b> longer.</p> <ul style="list-style-type: none"> <li>• The screen goes to the compensation screen group and this screen appears.</li> <li>• Main display .... The selected On/Off of the concentration compensation function on (On) .... The concentration compensation function is valid. oFF (Off) .... The concentration compensation function is invalid (factory setting).</li> </ul>
<p>④ Confirm the on/off selection of the ..... concentration compensation function.</p>	<p>Use <b>[↑]</b> or <b>[↓]</b> to show the desired choice and press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• If you select “on”, the screen goes to the next screen after confirmation.</li> <li>• If you select “oFF”, proceed to the operation in ⑦ after confirmation.</li> </ul>

(To be continued)

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Procedure and screen example	Operation
<p>⑤ Set a concentration compensation method. .... (If you select "oFF" in ④, this screen does not appear.)</p>  <p style="text-align: center;">Concentration Compensation Method Screen</p>	<p>Use <b>↑</b> or <b>↓</b> to display your desired choice on the sub display and press <b>ENT</b>.</p> <ul style="list-style-type: none"> <li>• SHFT (shift) ... Concentration shift compensation.</li> <li>• SPAN (span) ... Concentration span compensation.</li> <li>• After confirmation, the screen goes to the next screen.</li> </ul>
<p>⑥ Confirm the concentration compensation value. .... (If you select "oFF" in ④, this screen does not appear.)</p>  <p style="text-align: center;">Concentration Compensation Value Screen</p>	<p>Change the blinking number on the main display to the concentration after compensation and press <b>ENT</b>.</p> <ul style="list-style-type: none"> <li>• Main display ... The set measured value (%) after compensation To increase/decrease number: <b>↑</b> <b>↓</b></li> <li>• Sub display ... The selected concentration compensation method.</li> <li>• After confirmation, the screen goes to the next screen.</li> </ul>
<p>⑦ Return to the "Concentration Measured Value" screen.</p>	<p>Press <b>ST-BY/MEAS</b> longer.</p>

## (2) Changing the temperature shift

- (a) It is possible to change the on/off setting of the temperature shift function and the temperature measured value after shift. The temperature shift is set to "off" (do not shift) at factory. Normally, this operation is not needed.
- (b) Temperature shift is a method that obtains the temperature of a sample solution by using another method (by using a precision thermometer, etc.) and shifts the indicated value of the analyzer by keying in the temperature measured value in the screen. While this function is on, the analytical curve of the temperature measurement system is moved in parallel (SHIFT). If this function is turned off, the value before shift is restored.
- (c) When the temperature shift is on, not only the temperature measured value but also the conductivity measured value and concentration measured value are calculated with the shifted temperature.

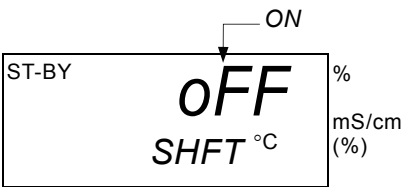
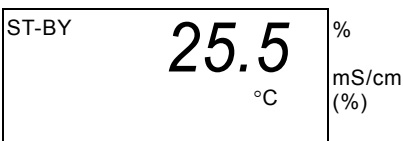
### Procedure for the Changing the Temperature Shift

Procedure and screen example	Operation
<p>① Select the "Setting Mode Concentration Measured Value" screen.</p>	<p>Press <b>ST-BY/MEAS</b> longer in the measurement mode.</p> <ul style="list-style-type: none"> <li>• "ST-BY" lights.</li> </ul>
<p>② Measure the temperature by another method.</p>	<p>Arrange so that the temperature of the solution in which the sensor is immersed can be measured by another method, and wait until the temperature is stabilized.</p> <ul style="list-style-type: none"> <li>• If the temperature shift function is turned off, this operation is not needed.</li> </ul>

(To be continued)



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Procedure and screen example	Operation
<p>③ Select the “Temperature Shift On/Off” screen. ....</p> <div style="text-align: center;">  </div> <p>Temperature Shift On/Off Screen</p>	<p>Press <b>[DISP]</b> longer to enter the compensation screen group.</p> <ul style="list-style-type: none"> <li>Pressing <b>[ENT]</b> repeatedly until the sub display shows “SHIFT” and the temperature indication becomes “°C” brings up this screen.</li> <li>Main display .... The selected On/Off of the temperature shift function.                      on (On).... The temperature shift is valid.                      oFF (Off) .... The temperature shift is invalid (factory setting).</li> </ul>
<p>④ Confirm the selection of the temperature shift.....</p>	<p>Use <b>[↑]</b> or <b>[↓]</b> to display your desired choice and press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>If you select “on”, the screen goes to the next screen after confirmation.</li> <li>If you select “oFF”, proceed to the operation in ⑥ after confirmation.</li> </ul>
<p>⑤ Set a temperature shift value. ....                      (If you select “oFF” in ④, this screen does not appear.)</p> <div style="text-align: center;">  </div> <p>Temperature Shift Value Screen</p>	<p>Change the blinking number on the main display to show the temperature measured value after shift measured by another method and press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>Main display .... The current temperature measured value after shift                      To increase/decrease number: <b>[↑]</b> <b>[↓]</b></li> <li>Unit indication .... °C</li> <li>After confirmation, the screen returns to the “Setting Mode Concentration Measured Value” screen.</li> </ul>
<p>⑥ Return to the “Concentration Measured Value” screen. ....</p>	<p>Press <b>[ST-BY/MEAS]</b> longer.</p>

### (3) Changing the alarm setting

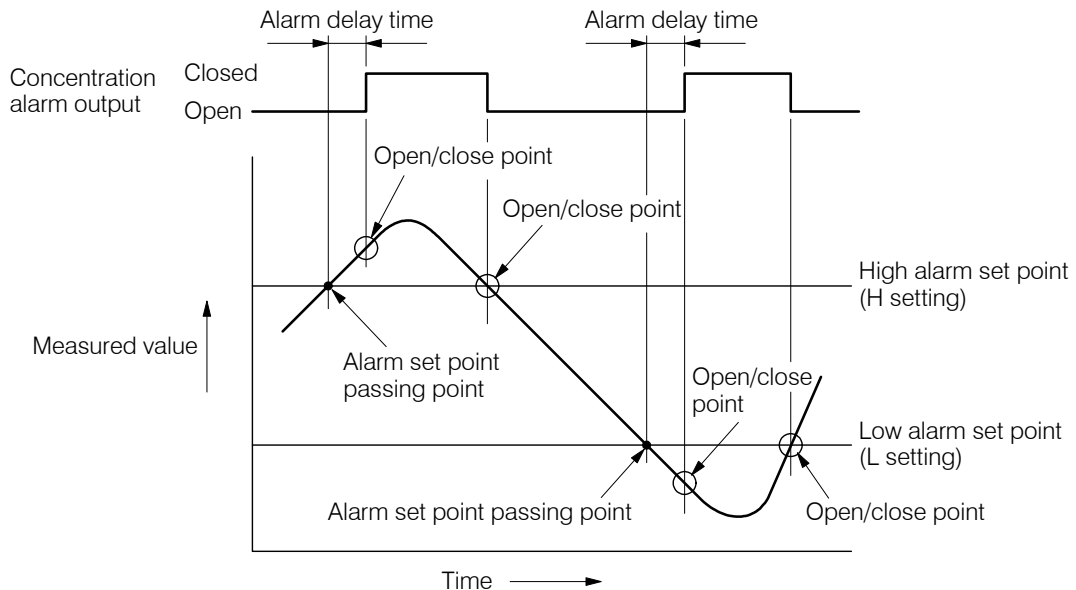
- (a) Alarm signals can be taken from the alarm output terminals. Selection of this function, whether to use high limit or low limit, set points and delay time setting can be changed. Factory setting is Off for this function (alarm function is invalid).
- (b) Each alarm conforms to the following alarm output terminals.

**Alarm Output Terminals**

Alarm output terminals	Alarm output 2-circuit type
Alarm 1 output terminals	“30, 31, 32” Transfer contact (One set of NO and NC contact)
Alarm 2 output terminals	“33, 34, 35” Transfer contact (One set of NO and NC contact)

- (c) If the alarm function is On (valid) and delay time is zero, the alarm circuit works as shown below. If the concentration measured value exceeds the set point, the corresponding open/close signal of the alarm output terminals changes and when the concentration measured value returns to a value within the set points, the signal returns to normal. If an alarm output condition occurs, the Alarm indicator (ALARM1, 2) blinks.

**【IMPORTANT】** • For 2 minutes after power is turned on, the alarm output does not turn on (close). If a delay time is set, time for this delay time will be added further.



**Alarm Delay Time and Alarm Output**

(d) This function is valid in normal measurement conditions and invalid in the following conditions.

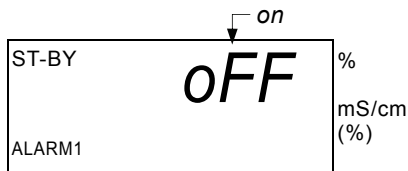
- A screen of the setting mode or the transmission adjustment mode is displayed.
- At the time of power failure or when power supply is turned off

(e) By setting a delay time (DLY.T) other than zero value, a contact signal, generated when the concentration measured value exceeds the alarm set point, can be delayed. If a delay time is set when an alarm action occurs repeatedly in a short time, hunting can be prevented. Obtain proper set points by increasing the delay time gradually.

(f) If “Transmission output range” or “Measuring range” is changed, check this alarm setting again.

**Procedure to Change the Alarm Setting**

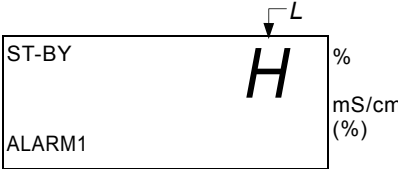
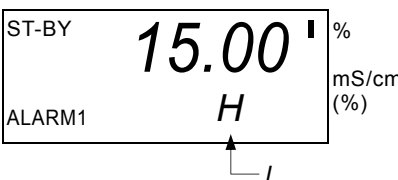
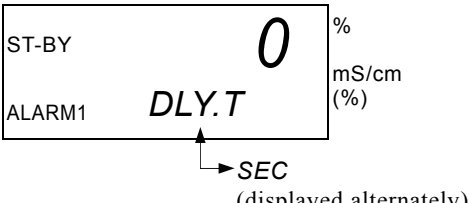
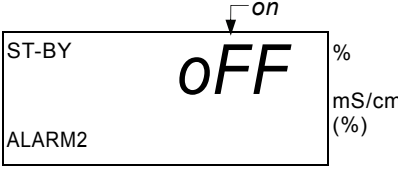
Procedure and screen example	Operation
① Select “Setting Mode Concentration Measured Value” screen.	Press <b>[ST-BY/MEAS]</b> longer in the measurement mode. • “ST-BY” lights.
② Select “Alarm 1 On/Off” screen.	Press <b>[ALARM]</b> longer. • Goes to the alarm screen group and this screen appears. Main display ... The selected Alarm 1 condition on (On) ... Alarm 1 is valid oFF (Off) ... Alarm 1 is invalid (factory setting)



Alarm 1 On/Off Screen

(To be continued)

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Procedure and screen example	Operation
<p>③ Confirm the selected Alarm 1 condition. ....</p>	<p>Press <b>↑</b> or <b>↓</b> to select either one necessary on the main display and then press <b>ENT</b>.</p> <ul style="list-style-type: none"> <li>• If “on” is selected, the screen goes to the next screen after confirmation.</li> <li>• If “oFF” is selected, the screen goes to Step ⑦ after confirmation.</li> </ul>
<p>④ Select High or Low for Alarm 1. ....</p>  <p>Alarm 1 High/Low Limit Screen</p>	<p>Press <b>↑</b> or <b>↓</b> to select either one necessary on the main display and then press <b>ENT</b>.</p> <ul style="list-style-type: none"> <li>• Main display .... The currently set Alarm 1 High/Low. L (Low) .... Alarm 1 is low limit H (high) .... Alarm 1 is high limit (factory setting)</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>
<p>⑤ Enter Alarm 1 set point value. ....</p>  <p>Alarm 1 Set Point Screen</p>	<p>Change the blinking number so that a new set point value of Alarm 1 appears on the main display and then press <b>ENT</b>.</p> <ul style="list-style-type: none"> <li>• Main display .... The currently set Alarm 1 set point value (concentration value) To increase/decrease number .... <b>↑</b> <b>↓</b> To move the digit .... <b>DATA</b>➔</li> <li>Setting range .... Depends on the current measuring range</li> <li>• Sub display .... High or Low selection for Alarm 1</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>
<p>⑥ Enter Alarm 1 delay time. ....</p>  <p>Alarm 1 Delay Time Screen</p>	<p>Change the blinking number so that a new delay time of Alarm 1 appears on the main display and then press <b>ENT</b>.</p> <ul style="list-style-type: none"> <li>• Main display .... The currently set Alarm 1 delay time (seconds) To increase/decrease number .... <b>↑</b> <b>↓</b> To move the digit .... <b>DATA</b>➔</li> <li>Setting range .... 0 to 99s (factory setting: 0s)</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>
<p>⑦ Set Alarm 2 settings. ....</p>  <p>Alarm 2 Delay Time Screen</p>	<p>Set Alarm 2 settings as shown below. Refer to Steps ③ to ⑥.</p> <ul style="list-style-type: none"> <li>• Alarm 2 selection .... “Alarm 2 On/Off” screen</li> <li>• Alarm 2 High/Low .... “Alarm 2 High/Low Limit” screen L (Low) .... Alarm 2 is low alarm. H (High) .... Alarm 2 is high alarm (factory setting)</li> <li>• Alarm 2 set point .... “Alarm 2 Set Point (H/L)” screen Setting range .... The currently set measuring range.</li> <li>• Alarm 2 delay time .... “Alarm 2 Delay Time (DLY.T)” screen</li> <li>• The screen returns to “Setting Mode Concentration Measured Value” screen after confirmation.</li> </ul>
<p>⑧ Return to “Concentration Measured Value” screen...</p>	<p>Press <b>ST-BY/MEAS</b> longer.</p>

### (4) Changing the concentration transmission output range

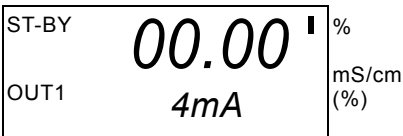
- (a) The transmission output range of concentration can be changed. Factory setting differs depending on the ordered specification. Normally this operation is not needed.
- (b) The transmission output range is from the conductivity value corresponding to the transmission 4mA to the concentration value corresponding to 20mA. This is different from the measuring range.
- (c) The setting of the transmission output range can be changed arbitrarily in a range of -30 to 130% of the concentration range set in the “concentration conversion data screen group”.

Example: The minimum concentration (X1) of the concentration conversion data: 8%, the maximum concentration (X6): 26%

The minimum value of the transmission output range that can be set =  $8 - (26 - 8) \times 0.3 = 2.6 (\%)$

The maximum value of the transmission output range that can be set =  $26 + (26 - 8) \times 0.3 = 31.4 (\%)$

#### Procedure to Change the Concentration Transmission output Range

Procedure and screen example	Operation
① Select “Setting Mode Concentration Measured Value” screen.	Press <b>[ST-BY/MEAS]</b> longer in the measurement mode. <ul style="list-style-type: none"> <li>• “ST-BY” lights.</li> </ul>
② Select “Concentration Transmission 4mA Value” screen.	Press <b>[OUT]</b> longer. <ul style="list-style-type: none"> <li>• Goes to the transmission range, etc. screen group and this screen appears.</li> <li>• Main display ... Concentration value (%) corresponding to 4mA of transmission.</li> </ul>
	
Concentration Transmission 4mA Value Screen	
③ Set the concentration value that corresponds to the transmission 4mA.	Change the blinking number so that the concentration value corresponding to 4mA of transmission appears on the main display and then press <b>[ENT]</b> . <ul style="list-style-type: none"> <li>• To increase/decrease number ... <b>[↑]</b> <b>[↓]</b></li> <li>To move the digit ... <b>[DATA →]</b></li> <li>Setting range ... According to the table previously shown.</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>

(To be continued)

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Procedure and screen example	Operation
<p>④ Set the concentration value that corresponds to the transmission 20mA.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ST-BY      30.00 %</p> <p>OUT1      20mA      mS/cm (%)</p> </div> <p>Concentration Transmission 20mA Value Screen</p>	<p>Change the blinking number so that the concentration value corresponding to 20mA of transmission appears on the main display and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• Main display .... Concentration value corresponding to 20mA of transmission.</li> <li>To increase/decrease number .... <b>[↑]</b> <b>[↓]</b></li> <li>To move the digit .... <b>[DATA↔]</b></li> <li>Setting range .... According to the table previously shown. The transmission output range must be within the measuring range and approx. 25% or more of the maximum scale value of the measuring range is needed.</li> <li>• The screen goes to the next screen after confirmation. If <b>[ENT]</b> is pressed repeatedly here, the screen returns to “Setting Mode Concentration Measured Value” screen.</li> </ul>
<p>⑤ Return to “Concentration Measured Value” screen...</p>	<p>Press <b>[ST-BY/MEAS]</b> longer.</p>

## (5) Changing the temperature transmission output range

- (a) The temperature transmission output range can be changed. This range corresponds to the temperature transmission output (4 to 20mADC). The display section indicates the temperature in the range of -5 to 120°C, regardless of the setting of the temperature transmission output range.
- (b) The setting range can be arbitrarily changed within the range of -5 to 120°C in the unit of 1°C with 10°C or more in width. If the temperature measured value goes out of the transmission output range, “OUT2” blinks and it disappears if the value returns to within the range.

### Procedure to Change the Temperature Transmission Output Range

Procedure and screen example	Operation
<p>① Select “Setting Mode Concentration Measured Value” screen.</p>	<p>Press <b>[ST-BY/MEAS]</b> longer in the measurement mode.</p> <ul style="list-style-type: none"> <li>• “ST-BY” lights.</li> </ul>
<p>② Select “Temperature Transmission 4mA Value” screen.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ST-BY      000 %</p> <p>OUT 2      4mA °C      mS/cm (%)</p> </div> <p>Temperature Transmission 4mA Value Screen</p>	<p>Press <b>[OUT]</b> longer then the screen goes to the transmission range, etc. screen group.</p> <ul style="list-style-type: none"> <li>• Press <b>[ENT]</b> repeatedly until “OUT 2”, appears as OUT indicator, “4mA” appears on the sub display and “°C” lights as temperature indicator to show this screen.</li> <li>• Main display .... Temperature value corresponding to 4mA of the transmission.</li> </ul>

(To be continued)

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Procedure and screen example	Operation
<p>③ Set the temperature value that corresponds to the transmission 4mA value.</p>	<p>Change the blinking number so that the temperature value corresponding to 4mA of the transmission appears on the main display and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• To increase/decrease number ... <b>[↑]</b> <b>[↓]</b></li> <li>To move the digit ... <b>[DATA→]</b></li> <li>Setting range ... -5 to 110°C (factory setting: 0)</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>
<p>④ Set the temperature value that corresponds to the transmission 20mA value.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ST-BY <span style="font-size: 2em; font-weight: bold;">50</span> %</p> <p>OUT 2 <span style="font-size: 1.5em; font-weight: bold;">20mA</span> °C <span style="font-size: 0.8em;">mS/cm (%)</span></p> </div> <p>Temperature Transmission 20mA Value Screen</p>	<p>Change the blinking number so that the temperature value corresponding to 20mA of the transmission appears on the main display and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• Main display ... Conductivity value corresponding to 20mA of the transmission.</li> <li>To increase/decrease number ... <b>[↑]</b> <b>[↓]</b></li> <li>To move the digit ... <b>[DATA→]</b></li> <li>Setting range ... 5 to 120°C (factory setting: 50)</li> <li>• The screen goes to the next screen after confirmation. If <b>[ENT]</b> is pressed repeatedly, the screen returns to “Setting Mode Concentration Measured Value” screen.</li> </ul>
<p>⑤ Return to “Concentration Measured Value” screen ...</p>	<p>Press <b>[ST-BY/MEAS]</b> longer.</p>

## (6) Changing the hold setting

- (a) The Hold type for concentration transmission output and temperature transmission output used when the mode is changed to the setting mode can be changed. This setting is used to prevent an abnormal transmission output value from disturbing the control system.
- (b) The Hold type can be selected from the types shown below:
- Preceding value hold (HoLd) ... Holds and outputs the proceeding transmission output value (factory setting)
  - Dummy value (du) ... Outputs an arbitrary set fixed transmission output value.
  - Through (tH) ... Outputs the measured value as usual even in the setting mode.
- (c) The Hold function is used only for the transmission output. The indicted value will not be fixed any time.

### Procedure to Change the Hold Setting

Procedure and screen example	Operation
<p>① Select “Setting Mode Concentration Measured Value” screen.</p>	<p>Press <b>[ST-BY/MEAS]</b> longer in the measurement mode.</p> <ul style="list-style-type: none"> <li>• “ST-BY” lights.</li> </ul>

(To be continued)

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Procedure and screen example	Operation
<p>② Select “Hold” screen. ....</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">dU tH</p> <p>ST-BY <span style="font-size: 2em; font-weight: bold;">HoLd</span> %</p> <p>OUT <span style="font-size: 1.5em; font-weight: bold;">S.OUT</span> mS/cm (%)</p> </div> <p style="text-align: center;">Hold Screen</p>	<p>Press <b>[OUT]</b> longer then the screen goes to the transmission range, etc. screen group.</p> <ul style="list-style-type: none"> <li>• Press <b>[ENT]</b> repeatedly until “OUT” appears as OUT indicator, “S.OUT” appears on the sub display to show this screen.</li> <li>• Main display .... The selected Hold type                      HoLd .... Holds the immediately preceding value (factory value)                      dU .... Dummy value                      tH .... Through</li> </ul>
<p>③ Confirm the selected Hold type. ....</p>	<p>Press <b>[↑]</b> or <b>[↓]</b> to select the desired item on the main display and then press <b>[ENT]</b>.</p> <p>If Dummy (dU) is selected, the screen goes to the next screen after confirmation.</p> <ul style="list-style-type: none"> <li>• If Hold (HoLd) or Through (tH) is selected, the screen goes to Step ⑤ after confirmation.</li> </ul>
<p>④ Enter Dummy value. ....                      (This screen is not displayed if “HoLd” or “tH” is selected.)</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>ST-BY <span style="font-size: 2em; font-weight: bold;">12.00</span> %</p> <p>OUT <span style="font-size: 1.5em; font-weight: bold;">du.mA</span> mS/cm (%)</p> </div> <p style="text-align: center;">Dummy Value screen</p>	<p>Change the blinking number so that the desired dummy value appears on the main display and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• Main display .... Dummy value (mA) to set                      To increase/decrease number .... <b>[↑]</b> <b>[↓]</b>                      To move the digit .... <b>[DATA→]</b>                      Setting range .... 4.00 to 20.00mA (factory setting: 12.00)</li> <li>• The screen goes to the next screen after confirmation. If <b>[ENT]</b> is pressed repeatedly, the screen returns to “Setting Mode Concentration”.</li> </ul>
<p>⑤ Return to “Concentration Measured Value” screen</p>	<p>Press <b>[ST-BY/MEAS]</b> longer.</p>

## (7) Changing the proper cell constant

- (a) The proper cell constant can be changed. It is necessary to change the proper cell constant when the sensor combined is replaced. Factory setting depends on the ordered specification. Normally, this operation is not needed.
- (b) This analyzer must be combined with a sensor whose reference cell constant (designed cell constant) is 9.00/cm or 2.60/cm. The proper cell constant is a value that each sensor has and is described on the plate or tag of the sensor. The proper cell constant is a numeric value that is slightly larger or smaller than the reference cell constant. Setting this value for the analyzer enables more accurate measurement.
- (c) It is necessary to install the sensor where no shielding (conductors or insulator) exists within 50mm in radius from the center of the sensor. If it is necessary to install the sensor in a location where a shielding object exists, refer to 7.2(3) “Adjustment of proper cell constant when shielding exists.”





(Continued from previous page)

Procedure and screen example	Operation
<p>② Go to the proper cell, etc. screen group. ....</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px 0;"> <p>ST-BY <span style="font-size: 2em; font-weight: bold;">02.64</span> %</p> <p style="text-align: center;">C.CON /cm</p> <p style="text-align: right; font-size: 0.8em;">mS/cm (%)</p> </div> <p>Proper Cell Constant Screen</p>	<p>Press <b>[R/W]</b> longer to go to the proper cell, etc. screen group.</p> <ul style="list-style-type: none"> <li>• Main display .... The set proper cell constant (/cm)</li> </ul>
<p>③ Select the “Temperature Slope” screen. ....</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px 0;"> <p>ST-BY <span style="font-size: 2em; font-weight: bold;">2.000</span> %</p> <p style="text-align: center;">SLOP °C</p> <p style="text-align: right; font-size: 0.8em;">mS/cm (%)</p> </div> <p>Temperature Slope Screen</p>	<p>Press <b>[ENT]</b> once.</p> <ul style="list-style-type: none"> <li>• The screen goes to the “Temperature Slope” screen.</li> <li>• Main display .... The set temperature slope value.</li> </ul>
<p>④ Set a temperature slope value. ....</p>	<p>Change the main display to show your desired temperature slope value and press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• To increase/decrease number: <b>[↑]</b> <b>[↓]</b></li> <li>• To move the digit: <b>[DATA →]</b></li> <li>• After confirmation, the screen returns to the “Setting Mode Measured Value” screen.</li> </ul>
<p>⑤ Return to the “Concentration Measured Value” screen. ....</p>	<p>Press <b>[ST-BY/MEAS]</b> longer.</p>
<p>⑥ Check the temperature measured value. ....</p>	<p>In the “Temperature Measured Value” screen, check the temperature after the temperature slope value is changed and repeat operations in ① to ⑤, if necessary.</p>

## (9) Changing the measurement mode auto return

- (a) When 2 hours passes after the mode is changed from the measurement mode to the setting mode, the mode automatically returns to the measurement mode. This function complements the analyzer so that the mode returns to the measurement mode without fail. This function can be turned on or off.
- (b) The screen returns to the “Concentration Measured Value” screen of the measured value screen group in the measurement mode.

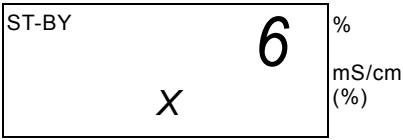
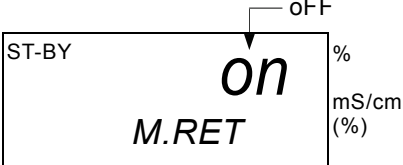
**[IMPORTANT]** • In the other screen group, do not operate other than the “Measurement Mode Auto Return” screen.

### Procedure to Change the Measurement Mode Auto Return

Procedure and screen example	Operation
<p>① Select “Setting Mode Concentration Measured Value” screen. ....</p>	<p>Press <b>[ST-BY/MEAS]</b> longer in the measurement mode.</p> <ul style="list-style-type: none"> <li>• “ST-BY” lights.</li> </ul>

(To be continued)

(Continued from previous page)

Procedure and screen example	Operation
<p>② Select the Other Screen Group Initial screen. ....</p>  <p>Other Screen Group Initial Screen</p>	<p>Press <b>[DATA →]</b> longer, then the screen goes to the other screen group.</p>
<p>③ Select “Measurement Mode Auto Return” .....</p> <p>④ Confirm the selection of auto return. ....</p>  <p>Measurement Mode Auto Return Screen</p>	<p>Press <b>[ST-BY/MEAS]</b> once, then “M.RET” appears on the sub display.</p> <p>Press <b>[↑]</b> or <b>[↓]</b> to show either of the required item on the main display and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• Main display ... Selection of measurement mode auto return.  on (On) ... Auto return is valid (factory setting).  oFF (Off) ... Auto return is invalid.</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>
<p>⑤ Return to “Concentration Measured Value” .....</p> <p>screen</p>	<p>Press <b>[ST-BY/MEAS]</b> longer.</p>

**[IMPORTANT]**

- To select the “Measurement Mode Auto Return” screen, be sure to press **[ST-BY/MEAS]**. If **[ENT]** is accidentally pressed to select the screen, the setting values of others screens in this group (concentration transmission range, temperature transmission range, alarm 1 set-point value and alarm 2 set-point value) will be initialized. However, if you press **[ST-BY/MEAS]** before the “Measurement Mode Auto Return” screen appears, the initialization of these values can be prevented.

### 3.4 Transmission adjustment Mode Operation

#### (1) Adjustment of concentration transmission output

(a) This function is mainly used for technical service. Do not operate this function unless otherwise required.

**【IMPORTANT】** • If these setting values are changed when not necessary, correct measured values become difficult to obtain. In this case, set the value back to the factory setting value.

(b) 4mADC and 20mADC values of the concentration transmission output can be adjusted. This adjustment can be used when adjustment function is not provided for a receiving device (recorder, etc.)

#### Procedure to Adjust the Concentration Transmission

Procedure and screen example	Operation									
<p>① Select “Concentration Transmission 4mA Adjustment” screen.</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;"> <table style="border-collapse: collapse; width: 100%;"> <tr> <td style="padding: 2px;">ST-BY</td> <td style="text-align: center; font-size: 24px; font-weight: bold;">4.00</td> <td style="padding: 2px;">%</td> </tr> <tr> <td style="padding: 2px;">CAL</td> <td></td> <td></td> </tr> <tr> <td style="padding: 2px;">OUT1</td> <td style="text-align: center; font-size: 24px; font-weight: bold;">4mA</td> <td style="padding: 2px;">mS/cm (%)</td> </tr> </table> </div> <p style="margin-top: 10px;">Concentration Transmission 4mA Adjustment Screen</p>	ST-BY	4.00	%	CAL			OUT1	4mA	mS/cm (%)	<p>Press <b>[OUT]</b> longer in the measurement mode.</p> <ul style="list-style-type: none"> <li>• “ST-BY” and “OUT1” light and “CAL” blinks.</li> <li>• The analyzer goes to the transmission adjustment mode and this screen appears.</li> <li>• Main display .... Approx. 4mA value after adjustment</li> </ul>
ST-BY	4.00	%								
CAL										
OUT1	4mA	mS/cm (%)								
<p>② Adjust the 4mA value.</p>	<p>Press <b>[↑]</b> or <b>[↓]</b> so that the indication of a receiving device becomes 4mA and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• To increase or decrease .... <b>[↑]</b> or <b>[↓]</b> (Approx. 0.005mA changes each time either or these keys is pressed)</li> <li>• Setting range .... 3.50 to 5.00mA (factory setting: 4.00)</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>									
<p>③ Adjust the 20mA value.</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;"> <table style="border-collapse: collapse; width: 100%;"> <tr> <td style="padding: 2px;">ST-BY</td> <td style="text-align: center; font-size: 24px; font-weight: bold;">20.00</td> <td style="padding: 2px;">%</td> </tr> <tr> <td style="padding: 2px;">CAL</td> <td></td> <td></td> </tr> <tr> <td style="padding: 2px;">OUT1</td> <td style="text-align: center; font-size: 24px; font-weight: bold;">20mA</td> <td style="padding: 2px;">mS/cm (%)</td> </tr> </table> </div> <p style="margin-top: 10px;">Concentration Transmission 20mA Adjustment Screen</p>	ST-BY	20.00	%	CAL			OUT1	20mA	mS/cm (%)	<p>Press <b>[↑]</b> or <b>[↓]</b> so that the indication of a receiving device becomes 20mA and then press <b>[ENT]</b>.</p> <ul style="list-style-type: none"> <li>• Main display .... Approx. 20mA value after adjustment.</li> <li>• To increase or decrease .... <b>[↑]</b> or <b>[↓]</b> (Approx. 0.005mA changes each time either or these keys is pressed)</li> <li>• Setting range .... 19.00 to 21.00mA (factory setting: 20.00)</li> <li>• “OUT 2” lights and “Temperature Transmission 4mA Adjustment (4mA)” screen appears. Furthermore, if <b>[ENT]</b> is pressed twice, the screen returns to “Concentration Transmission 4mA Adjustment” screen.</li> </ul>
ST-BY	20.00	%								
CAL										
OUT1	20mA	mS/cm (%)								
<p>④ Repeat the adjustment.</p>	<p>Repeat the procedures in Steps ② and ③ until the indicated values of 4mA and 20mA match.</p>									
<p>⑤ Return to “Concentration Measured Value” screen</p>	<p>Press <b>[OUT]</b> longer.</p>									

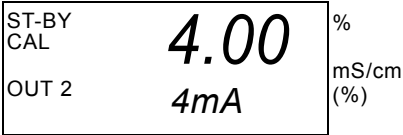
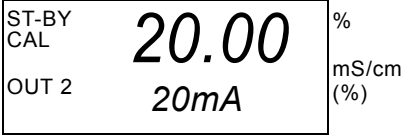
## (2) Adjustment of temperature transmission output

(a) This function is mainly used for technical service. Do not operate this function unless otherwise required.

**[IMPORTANT]** • If these setting values are changed when not necessary, correct measured values become difficult to obtain. In this case, set the value back to the factory setting value.

(b) 4mADC and 20mADC values of the temperature transmission output can be adjusted. This adjustment can be used when adjustment function is not provided for a receiving device (recorder, etc.)

### Procedure to Adjust the Temperature Transmission

Procedure and screen example	Operation
① Select the transmission adjustment mode. ....	Press <b>[OUT]</b> longer in the measurement mode. <ul style="list-style-type: none"> <li>• “ST-BY” and “OUT 2” light and “CAL” blinks.</li> </ul>
② Select “Temperature Transmission 4mA Adjustment” screen.	Press <b>[ENT]</b> (twice) until “OUT 2” lights and “4mA” appears on the sub display. <ul style="list-style-type: none"> <li>• Main display .... Approx. 4mA value after adjustment.</li> </ul>
	
Temperature Transmission 4mA Adjustment Screen	
③ Adjust the 4mA value. ....	Press <b>[↑]</b> or <b>[↓]</b> so that the indication of a receiving device becomes 4mA and then press <b>[ENT]</b> . <ul style="list-style-type: none"> <li>• To increase or decrease .... <b>[↑]</b> or <b>[↓]</b> (Approx. 0.005mA changes each time either or these keys is pressed)</li> <li>• Setting range .... 3.50 to 5.00mA (factory setting: 4.00)</li> <li>• The screen goes to the next screen after confirmation.</li> </ul>
④ Adjust the 20mA value. ....	Press <b>[↑]</b> or <b>[↓]</b> so that the indication of a receiving device becomes 20mA and then press <b>[ENT]</b> . <ul style="list-style-type: none"> <li>• Main display .... Approx. 20mA value after adjustment.</li> <li>• To increase or decrease .... <b>[↑]</b> or <b>[↓]</b> (Approx. 0.005mA changes each time either or these keys is pressed)</li> <li>• Setting range .... 19.00 to 21.00mA (factory setting: 20.00)</li> <li>• “OUT 1” lights and “Concentration Transmission 4mA Adjustment (4mA)” screen appears. Furthermore, if <b>[ENT]</b> is pressed twice, the screen returns to “Temperature Transmission 4mA Adjustment” screen.</li> </ul>
	
Temperature Transmission 20mA Adjustment Screen	
⑤ Repeat the adjustment. ....	Repeat the procedures in Steps ③ and ④ until the indicated values of 4mA and 20mA match.
⑥ Return to “Concentration Measured Value” screen.	Press <b>[OUT]</b> longer.

# 4. Maintenance

## 4.1 Maintenance List

(a) To operate the product correctly at all times and maintain its specified performance, it is necessary for you to thoroughly understand its function and perform maintenance periodically.

**[IMPORTANT]** • Operating the product without performing maintenance periodically can result in a failure.

(b) For technical services such as repairs, please call a sales representative in your area or directly contact our company. A specialist who is qualified for the technical certification system in our company or a person who has technical skills equivalent to that certification system must perform technical services.

(c) The “Maintenance cycle” described in the following table is based on the standard installation condition (condition that satisfies the items in 7.1(1) “Installation location”). Depending on the condition, the maintenance cycle may differ. Modify the maintenance cycle based on the operating condition carried out more than several months.

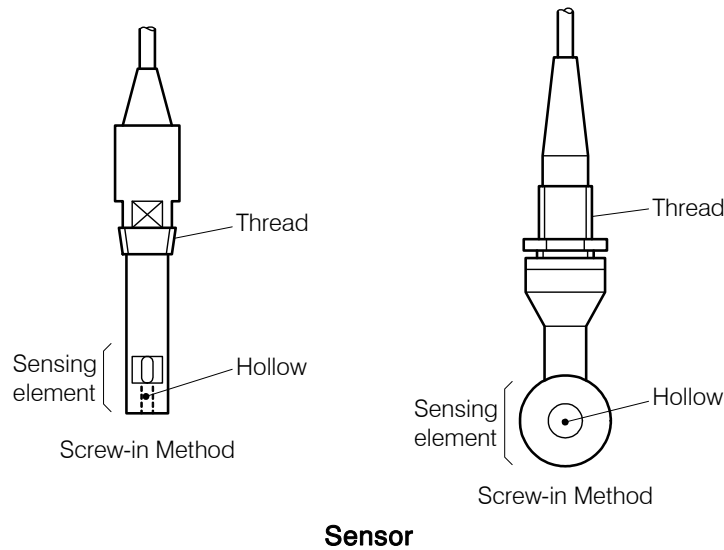
**Standard Maintenance List**

No.	Subject	Contents	Start	Maintenance Cycle						Execution method, etc.
				1 week	1 month	3 months	6 months	1 to 2 years	When needed	
1	Sensor	(1) Wash	In the case of city water with up to several hundred $\mu\text{S}/\text{cm}$ , etc.			○				▷ 4.2 “Washing the Sensor”
					○					
		(2) Inspection of temperature element					○		▷ 4.3 “Inspection of Temperature Element”	
2	Measurement system	Adjustment using a solution of known conductivity							○	▷ 4.4 “Adjustment Using a Solution of Known Concentration”

**[NOTE]** • Generally, it is not necessary for an electrodeless concentration analyzer to prepare spare parts.

## 4.2 Washing the Sensor

(a) The electrode section of the sensor is used to measure concentration. If the electrode section gets dirty, correct measurement cannot be made. Remove the dirt especially from the hollow section.



(b) Select appropriate cleaning agent to wash the sensor depending on the condition of sample solution.

### Washing the Sensor

Condition of sample solution	Cleaning agent	Washing method
<ul style="list-style-type: none"> <li>When dirt is not much, such as general process, boiler, etc.</li> </ul>	Alcohol	Wipe off dirt from the electrode section using gauze, etc. soaked with ethyl alcohol.
	Neutral detergent	Wash the sensor with neutral detergent, etc. and rinse it off thoroughly with city water, etc.
<ul style="list-style-type: none"> <li>When dirt is tough, such as process waste water with plenty of rust.</li> </ul>	Cleanser	Applying cleanser to a cloth and polish the electrode section lightly with that cloth and rinse it off thoroughly with city water, etc.
	Other agents	Soak the electrode section in a cleaning agent suitable for the components of dirt such as a low concentration hydrochloric acid solution and then rinse it off thoroughly with city water, etc.

### **WARNING**

#### Toxic Substances

- For chemical substances to be used, ask the manufacturer from which you bought the product to send the Material Safety Data Sheet (MSDS) on the product and handle it safely according to the explanation.

(c) When concentration of about the same value is measured, if the measured value obtained after the wash is higher than the value obtained before, it indicates that the measured value had been affected very much by dirt. Therefore, shorten the wash interval. On the contrary, if the measured value obtained after the wash is about the same as before, it indicates that the measured value is almost not affected by dirt. Therefore, you can make the wash interval longer.

- (d) Take necessary measures to prevent sample solution from leaking out when you remove the sensor. In the case of a flange type sensor, remove the flange section first instead of thread section. This can prevent liquid leak from the thread section.
- (e) When you assemble a screw-in type sensor after the wash, remove the old sealing material (such as tape) from the thread section and then wind new sealing material.

- 
- 【IMPORTANT】**
- To reassemble a screw-in type sensor, use new sealing material to the thread section. This is used to prevent liquid leak.
  - When you assemble a sensor, make sure that the thread of the sensor mates correctly.
- 

## 4.3 Inspection of Temperature Element

A temperature element is built in the electrode section of the sensor and used to automatically compensate for a change in concentration of sample solution due to temperature.

- ① **Turn off the power source.** ..... Turn off the power source that supplies power to the analyzer.

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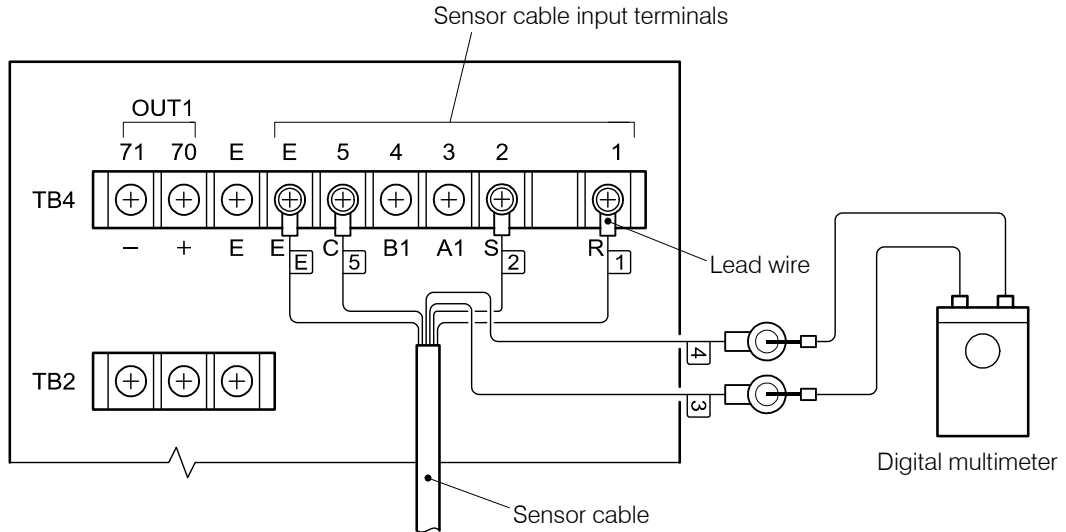
### **WARNING**

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#### Electric Shock

- Do not touch the terminals in the analyzer while power is applied. Touching the terminals may cause electric shock.
- 

- ② **Remove the lead wires of temperature element.** ..... Remove the wires 3 and 4 of the sensor cable lead wires from the analyzer terminal plate.



**Inspection of Temperature Element**

③ **Measure the resistance value.** ..... Measure the resistance value between the lead wires 3 and 4 of the sensor cable using a digital multimeter, etc. and write down its value.

**[IMPORTANT]** • Measure the temperature element in a short time. This is to prevent measurement current from causing self-heat and changing its resistance value.

④ **Check the temperature.** ..... Check the temperature of sample solution using a bar thermometer, etc.

⑤ **Compare the resistance value.** ..... Obtain the guideline resistance value of the temperature element corresponding to the temperature of sample solution measured in Step ④ and compare the value with the resistance value written down in Step ③ and check that there is no extremely large error.

**Guideline Resistance Value of Temperature Compensation Element**

Temperature [°C]	Guideline resistance value [kΩ]	Temperature [°C]	Guideline resistance value [kΩ]
10	60.0	60	7.4
20	37.5	70	5.2
25	30.0	80	3.7
30	24.1	90	2.7
40	15.9	100	2.0
50	10.7		

If an extreme large error exists, there is a possibility of broken wires or short-circuits. It is necessary to replace the sensor. Contact DKK-TOA.

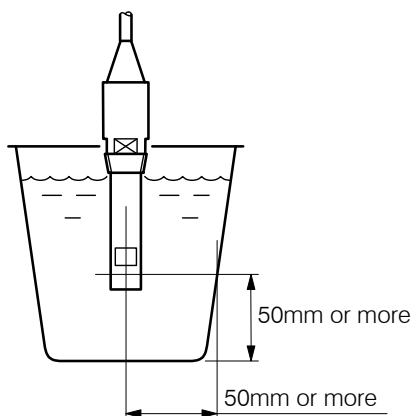
⑥ **Reinstallation** ..... Connect the sensor cable in the same way as before and turn on power to the analyzer.



## 4.4 Adjustment Using a Solution of Known Concentration

The indication of the analyzer can be checked and, if necessary, the indicated value can be adjusted using a solution of known concentration.

- ① **Wash the sensor.** ..... Take out the sensor and wash it thoroughly. This is needed because if the sensor is dirty, an error occurs. ▷ 4.2 “Washing the Sensor”
- ② **Confirm that the conductivity is zero.** ..... Place the sensor in the air and confirm that the conductivity shown on the sub display of the “Concentration and Conductivity” screen is approx. 0.
- ③ **Immerse the sensor in the solution.** ..... Immerse the sensor in a solution of known concentration (or the reference solution) and waits until the indication is stabilized.
  - If the sensor is provided with a case, fill the case with a solution of known concentration to immerse the sensor. This is needed not to change the condition such as the distance between the electrode section and the perimeter.
  - If the sensor is not provided with a case, isolate the electrode section of the sensor from the inner wall and the bottom of the vessel by 50mm or more.



### Isolating Electrode Section from Inner Wall and Bottom of the Vessel by 50mm or more

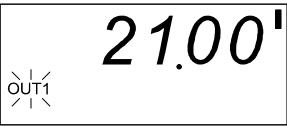
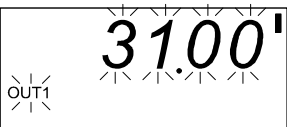
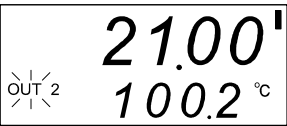
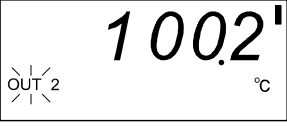
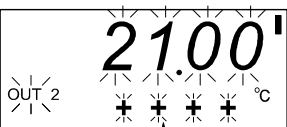
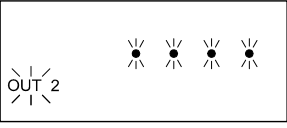
- ④ **Check the concentration indication.** ..... Check the difference between the indicated value in the “Concentration Measured Value” screen and the concentration of the solution of known concentration.
  - If the difference is within the range of the specified “temperature compensation accuracy” adjustment is not required. In this case, proceed to ⑥.
- ⑤ **Adjust the concentration indication.** ..... Set “on” in the “Concentration Compensation On/Off” screen in the setting mode and perform concentration shift compensation or concentration span compensation. ▷ 3.3(1) “Changing the concentration compensation”
- ⑥ **Rinse off the sensor.** ..... Rinse off the sensor with clean water, etc.
- ⑦ **Reinstall the sensor.** ..... Replace the sealing tape of the thread section with new one and install the sensor in the same way as before.

# 5. Troubleshooting

## 5.1 Error Messages

The displayed conditions shown in the following table are error messages. Take necessary corrective action.

**Error Messages and Corrective Action**

No.	Display	Message name and contents	Corrective action, etc.
1		[Concentration went out of the transmission output range ] (Transmission output scale out) • Concentration value went out of the range of the set transmission output.	• Change the transmission output range of Concentration. ▷ 3.3(4) “Changing the concentration transmission output range”
2		[Concentration went out of the measuring range ] (indication scale out) • The concentration value went out of the set measured range.	• Remove the abnormal sample solution. ▷ 5.2(2) “Concentration value is off the scale”
3	 <p>When “concentration Measured Value” screen is selected</p>  <p>When “Temperature Measured Value” screen is selected</p>	[ Temperature went out of the transmission output range ] • Liquid temperature went out of the range of the set transmission output.	• Change the transmission output range of temperature. ▷ 3.3(5) “Changing the temperature transmission output range”
4	 <p>When “Concentration Measured Value” screen is selected</p>  <p>When “Temperature Measured Value” screen is selected</p>	[ Temperature is off the scale ] • Liquid temperature went out of the range of -5 to 120°C. • Temperature compensation element or sensor cable is short-circuited or their wires are broken.	• Connect the sensor cable correctly. • Replace the sensor.

(To be continued)

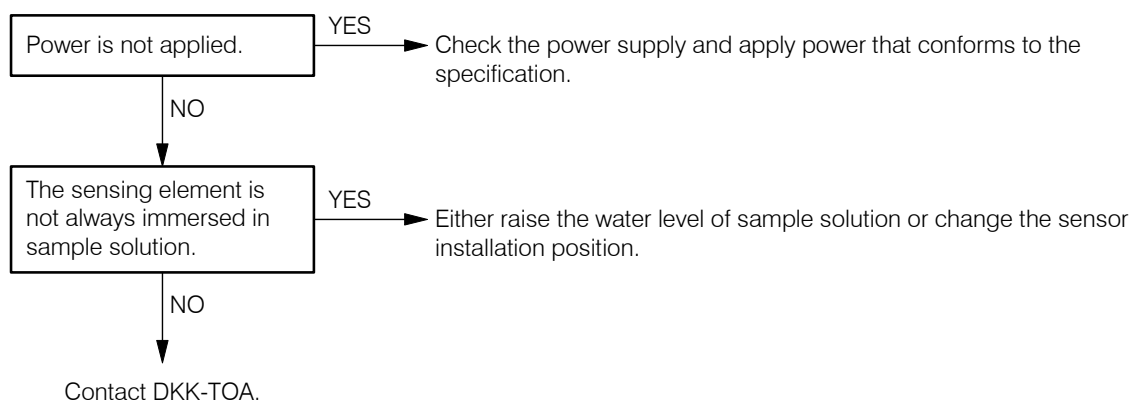
(Continued from previous page)

No.	Display	Message name and contents	Corrective action, etc.
5	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p style="font-size: 24pt; margin: 0;"><b>E-20</b></p> <p style="font-size: 18pt; margin: 0;"><b>ROM</b></p> </div> <small>% mS/cm (%)</small>	<p>[ Memory element error ]</p> <ul style="list-style-type: none"> <li>• After power is turned on, the set data could not be called and judged that it was an error.</li> <li>• Transmission output is off the scale.</li> </ul>	<ul style="list-style-type: none"> <li>• Turn power off and on again. If it does not return to normal, contact DKK-TOA.</li> </ul>
6	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p style="font-size: 24pt; margin: 0;"><b>E-21</b></p> <p style="font-size: 18pt; margin: 0;"><b>DATA</b></p> </div> <small>% mS/cm (%)</small>	<p>[ Setting data error ]</p> <ul style="list-style-type: none"> <li>• After power is turned on, the set data was checked and judged that it was an error.</li> </ul>	<ul style="list-style-type: none"> <li>• Turn power off and on again, and if it does not return to normal, contact DKK-TOA.</li> </ul>

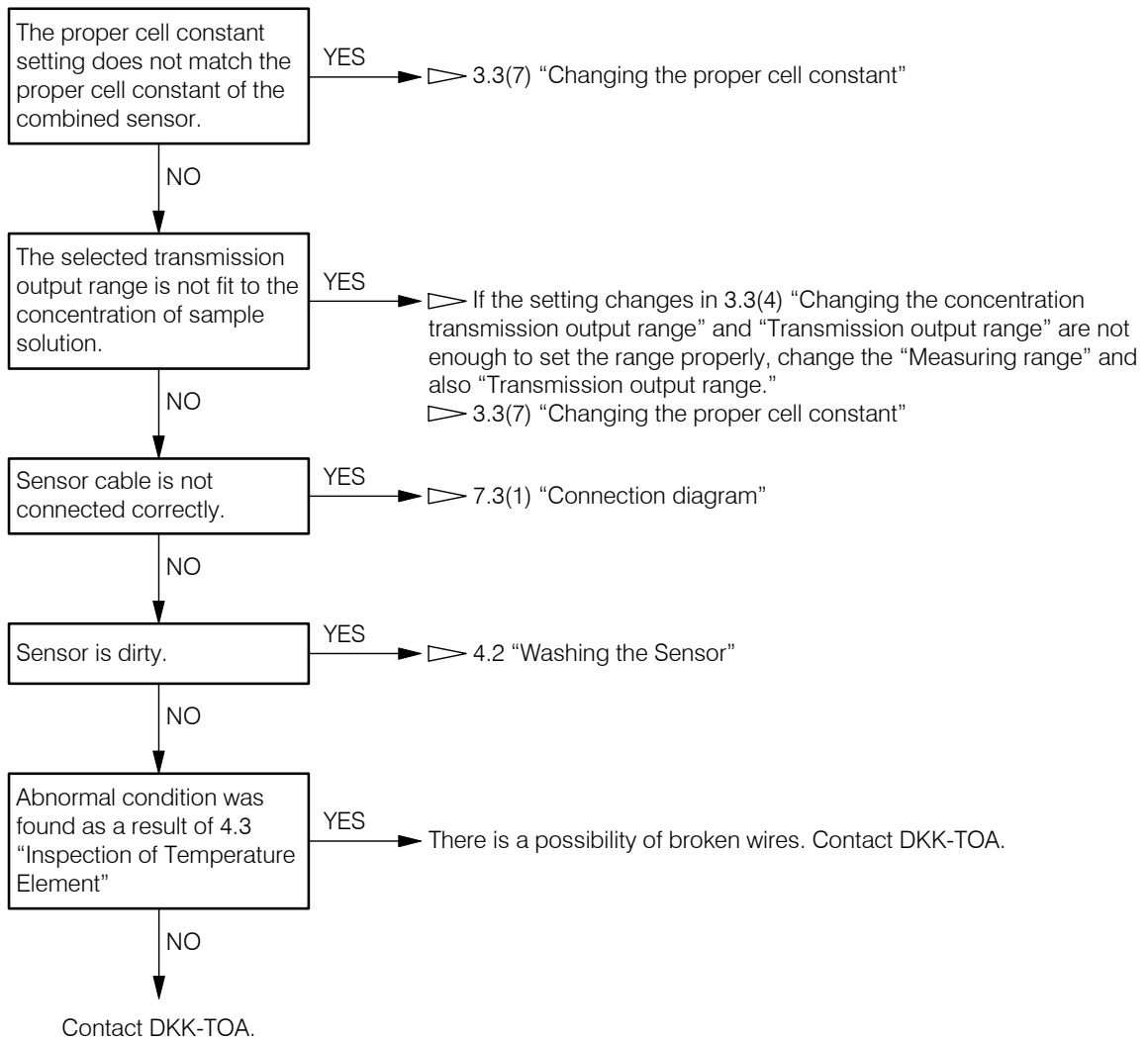
## 5.2 Troubleshooting

“Indication” here means the indicated values such as the indication of the analyzer, indication of a recorder and indication of a digital multimeter.

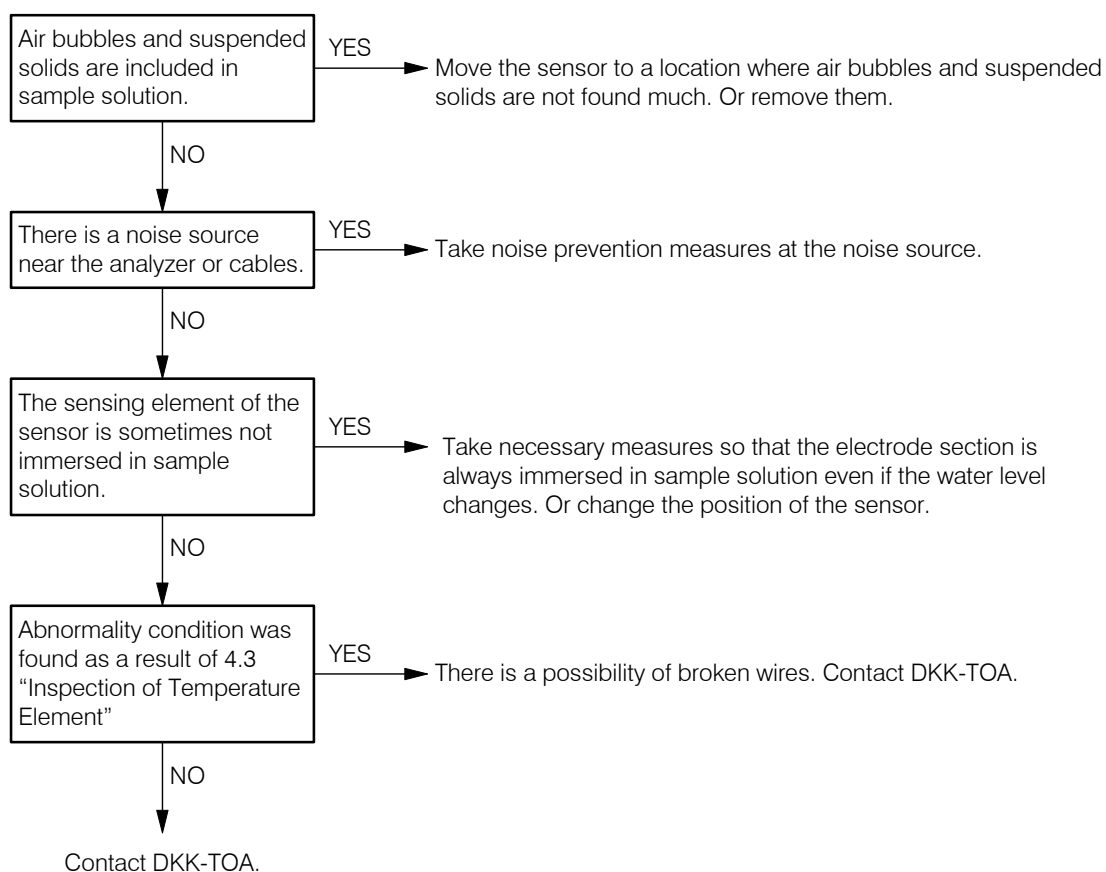
### (1) No indication or indication does not change



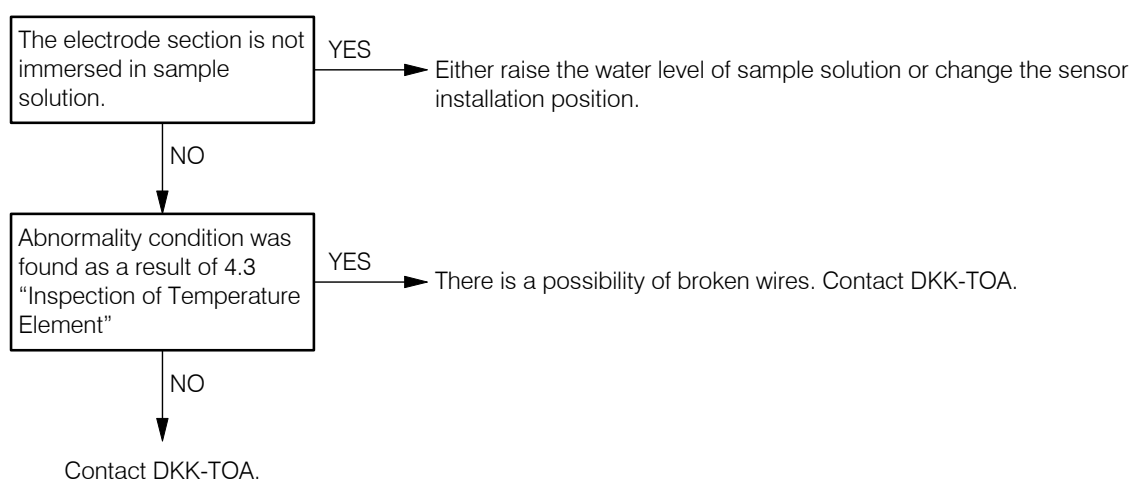
**(2) Concentration value is off the scale**



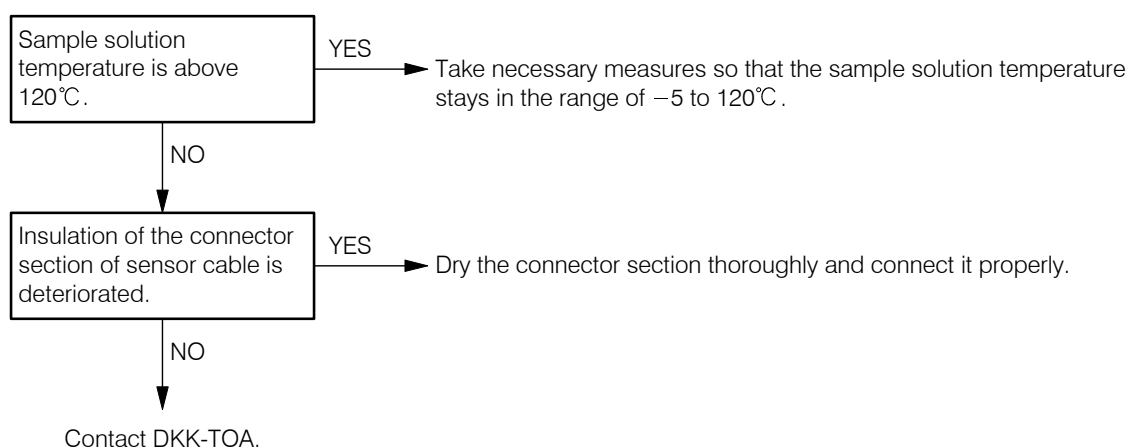
### (3) Fluctuation of conductivity value



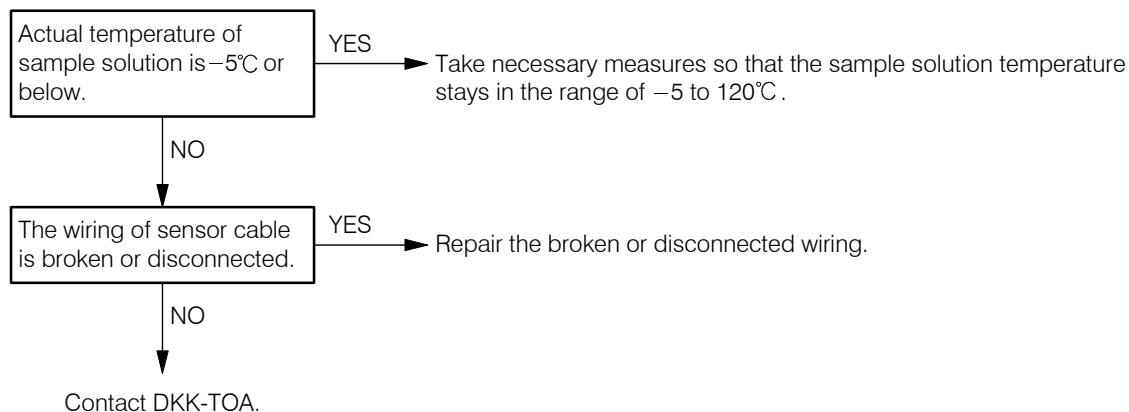
### (4) A large deviation of concentration measured value



**(5) Temperature measured value is off the scale**



**(6) Temperature measured value is below the minimum indication value**



## 5.3 Checking the Analyzer Operation with Equivalent Input

- (a) Using an equivalent resistance, the entire measurement system including the sensor can be checked whether it is working correctly or not. If the measured value is improper even if the system is working correctly, it is probable that there is other cause for the problem other than the measurement system. This operation requires a 6-decade resistance box, digital multimeter, etc.
- (b) In this operation, the lead wires of the 6-decade resistance box are wound to the hollow section of the sensor to give a simulation signal (equivalent resistance value) to the analyzer and a simulation resistance instead of a resistance value of the temperature element is connected to the terminals 3 and 4 of the analyzer to create the condition of sample solution under stable temperature and check that the concentration indicated value and the transmission output value are appropriate.
- (c) The inspection record is made under the condition of factory setting values. If the product is equipped with an RS-232 connector (option) and the concentration conversion data is drastically changed by the application program (option), then the numeric values in the inspection record differs and this operation check cannot be performed.

### ① Preparation

- Digital multimeter (internal resistance of 10Ω or less)..... 1 unit
- 6-decade resistance box A..... 1 unit
- 6-decade resistance box B (or a fixed resistor) ..... 1 unit (piece)
- Inspection record (attached to the product)..... 1



### Electric Shock

- Do not touch the terminals in the analyzer while power is applied. Touching the terminals may cause electric shock.
- 

- ② **Write down the proper cell constant and the transmission output range.** ..... Open the screens shown below in the measurement mode and write down the setting values.

- “Proper Cell Constant Display (C.CON)” screen
- “Concentration Transmission Range 4mA Value Display (4mA)” screen
- “Concentration Transmission Range 20mA Value Display (20mA)” screen
- “Temperature Transmission Range 4mA Value Display (4mA)” screen
- “Temperature Transmission Range 20mA Value Display (20mA)” screen

Here, if the transmission output range does not match the values described in the inspection record, adjust the range. ▷ 3.3(4) “Changing the concentration transmission output range”, 3.3(5) “Changing the temperature transmission output range”, 3.3(7) “Changing the proper cell constant”

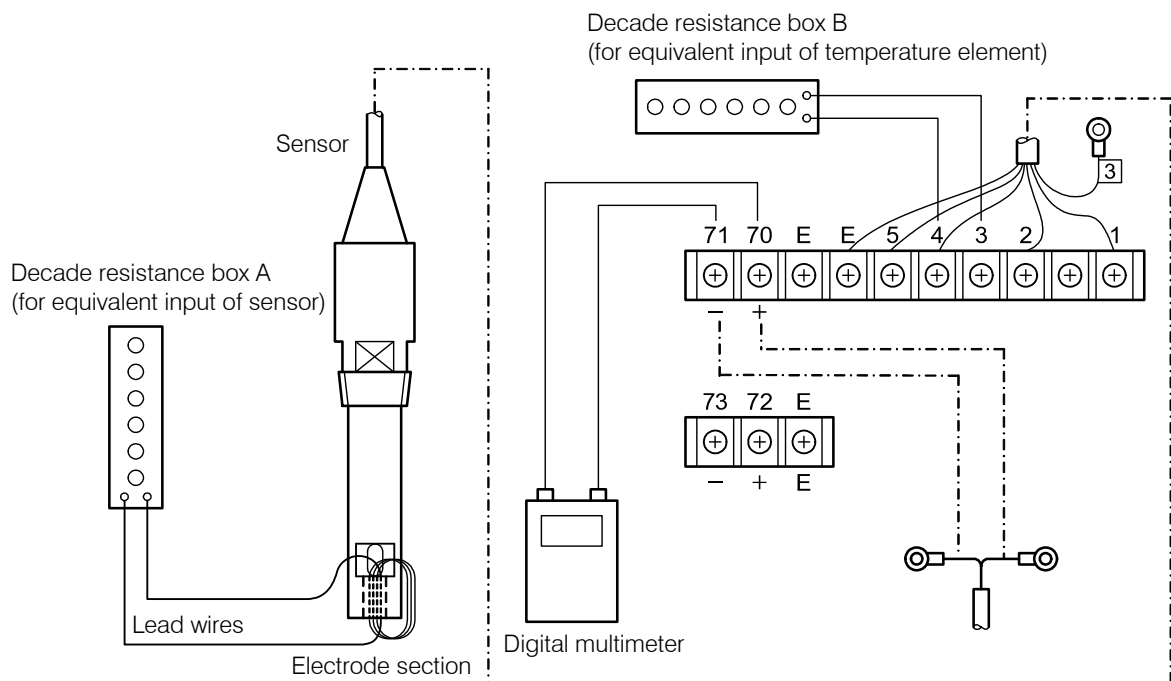
- ③ **Set “oFF” to the concentration compensation and temperature shift settings.** ..... ▷ 3.3(1) “Changing the concentration compensation”, 3.3(2) “Changing the temperature shift”

- ④ **Turn off power and remove the lead wires.** ..... Turn off the power source that supplies power to the analyzer and remove the wire of the sensor cable connected to the terminal 3 of the terminal plate and also remove the wires of another cable connected to the terminals 70 (+) and 71 (-).

- ⑤ **Remove the sensor.** ..... Take necessary measures to prevent sample solution from leaking out and remove the sensor.

⑥ **Connect the prepared devices.** ..... Connect the following devices to the terminals of each as shown below. “N” as in “(N) turns” in the column of “Equivalent resistance value” means the number of turns of lead wires to the electrode section. Wind the lead wires of a 6-decade resistance box N times to the hollow section of the electrode section. If nothing is described, use “1 turn” (the lead wire is put through the tip end of the sensor without being wound up).

- Electrode section hollow section ..... 6-decade resistance box A (equivalent input for sensor)
- Between the terminals 3 and 4 ..... 6-decade resistance box B (equivalent input for temperature element)
- Between the terminals 70 (+) and 71 (-) .... Digital multimeter



**Connecting the Devices for Operation Check**

⑦ **Set the reference cell constant to “Proper Cell Constant” screen.** ..... Turn on the power source that supplies power to the analyzer and enter the reference cell constant (designed cell constant, which is the “Cell constant” described in the inspection record) to “Proper Cell Constant (C.CON)” screen in the setting mode. ▷ 3.3(7) “Changing the proper cell constant”

- When the constant is near 9.00/cm ..... Set 9.00/cm
- When the constant is near 2.60/cm ..... Set 2.60/cm

⑧ **Select “Concentration Measured Value” screen.** ..... If the analyzer is in the setting mode (“ST-BY” is lit), press **[ST-BY/MEAS]** longer. If the analyzer is in the measurement mode (“ST-BY” is unlit), press **[DISP]** several times to select “Concentration Measured Value” screen.

⑨ **Enter an equivalent resistance value of temperature element.** ..... Check the “Thermistor resistance value” (with reference temperature) in the inspection record and set that resistance value to the 6-decade resistance box B.

⑩ **Enter an equivalent resistance value of 4mA.** ..... Check the “Equivalent resistance value (Ω)” corresponding to 4mA of “Transmission output value” in the inspection record and set that resistance value to the 6-decade resistance box A.



- ⑪ **Check the indication of 4mA and transmission output.** ..... Check that the value (mS/cm at 25°C) corresponding to 4mA appears on the “Concentration Measured Value” screen and “4mA” is indicated on the multimeter.
- ⑫ **Enter an equivalent resistance value of 20mA.** ..... Check the “Equivalent resistance value (Ω)” corresponding to 20mA of “Transmission output value” in the inspection record and set that resistance value to the 6-decade resistance box A.

[NOTE] • The equivalence resistance value of “Inspection record” is calculated as follows:

$$\text{Equivalent resistance } (\Omega) = \frac{\text{Reference cell constant } (/cm)}{\text{Conductivity } (mS/cm)} \times 10^3 \times (\text{Number of turns})^2$$

Example: Reference cell constant: 9.00/cm (same with 9.00cm<sup>-1</sup>)  
 Conductivity for 20mA value: 876mS/cm  
 Number of turns: 4 turn

$$\text{Equivalent resistance value } (\Omega) = \frac{9.00}{876} \times 10^3 \times (4)^2 = 164.4 (\Omega)$$

- ⑬ **Check the indication of 20mA and transmission output.** ..... Check that the value corresponding to 20mA in the inspection record appears on the “Concentration Measured Value” screen and “20mA” is indicated on the digital multimeter.
- If a large error occurs, the analyzer, sensor cable or sensor is probably not working correctly. refer to 5.2 “Troubleshooting.”
- ⑭ **Restore the proper cell constant and the transmission output range.** ..... Put these value back to the ones written down in Step ②. ▷ 3.3(4) “Changing the Concentration transmission output range”, 3.3(5) “Changing the temperature transmission output range”, 3.3(7) “Changing the proper cell constant”
- ⑮ **Restore concentration compensation and the temperature shift.** ..... Restore the setting if “on” was changed to “oFF” in Step ③. ▷ 3.3(1) “Changing the concentration compensation”, 3.3(2) “Changing the temperature shift”
- ⑯ **Remove the devices.** ..... Turn off the power source and disconnect the digital multimeter, 6-decade resistance box, etc. and connect the sensor cable to the terminal 3 and another cable to the terminals 70 (+) and 71 (-).
- ⑰ **Reinstall the sensor.** ..... Reinstall the sensor in the same way as before.

---

**[IMPORTANT]** • To reassemble a screw-in type sensor, use new sealing material to the thread section. This is used to prevent liquid leak.

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- ⑱ **Turn on power.** ..... Turn on power to the analyzer.

## 5.4 Measures against Noise

### (1) Error symptom due to noise

If a strong noise source exists near this analyzer, the following symptoms may occur.

This analyzer has an effective anti-noise characteristic for  $\pm 1500\text{Vp-p}$  (peak-to-peak voltage) but if a peripheral device exists that generates strong noise exceeding this level, any of the following symptoms occurs.

- (a) Alarm operating point changes.
- (b) Indication flickers erroneously.
- (c) Indication stays unmoved.

### (2) Noise source

If an error symptom caused by noise occurs, check that any of the following devices is not found in the vicinity and take necessary actions.  $\triangleright$  5.4(3) “Protective measures using a surge absorber”

These inductive control devices generate pulsed surge voltages of 4000V or more when some of the circuits used there turn on and off. These may be the source of noise.

- (a) Electromagnetic switch
- (b) Solenoid valve
- (c) Pump
- (d) Motor

### (3) Protective measures using a surge absorber

If there is a device that is considered as a noise source described above, install a surge absorber as follows:

- (a) Use a CR filter type surge absorber. The life of a semiconductor absorber such as a varistor is relatively short.
- (b) Use a surge absorber with its rating exceeding the drive voltage of the target device.
- (c) DKK-TOA sells the following type of a surge absorber.  
Spark killer 2S1201 (part code No. 112Z009)
- (d) Install a surge absorber between the drive terminals nearest to the noise generating source.

#### ●Repair contact

If a repair is required, please contact your sales representative or directly our sales office, or our service department. In this case, let us know the following information:

- Model name (MODEL)
- Serial number (SER. No.)
- Manufacturing date (DATE)

## 6. Specifications and Operational Explanation

### 6.1 Standard Specifications

#### (1) Analyzer specifications

Product name	: Electrodeless Concentration Analyzer
Model name	: MBM-162
Measurement object	: Converts the conductivity of a solution into concentration.
Measurement method	: Linear approximation concentration calculation by electromagnetic-induction-type conductivity measurement
Unit	: %, mS/cm
Reference cell constant	: 9.00/cm or 2.60/cm, sensors of other cell constants cannot be combined with this analyzer.
Entire Measuring range	: (1) Concentration ..... 0.000 to 4.000% or 0.00 to 99.99% (2) Conductivity ..... 0 to 2100mS/cm. One of the following is selected according to the ordered specification. 0.000 to 2.100, 0.00 to 7.00, 0.00 to 21.00 0.0 to 70.0, 0.0 to 210.0, 0 to 700, 0 to 2100mS/cm (3) Temperature ..... -5 to 120°C (depending on the heat resistance of the sensor) (Minimum indication 0.1°C)
Measurement range	: Depending on the ordered specification (depending on the concentration calculation data)
Temperature compensation	: (1) Temperature compensation method ..... Linear approximation microcomputer calculation method (2) Temperature compensation resistance ..... 30kΩ (at 25°C), thermistor (3) Temperature compensation range ..... Depending on the ordered specification (depending on the concentration calculation data) (4) Temperature compensation coefficient ..... Depending on the ordered specification (depending on the concentration calculation data)
Indication	: 4-digit LCD (with sub display and unit indicator)
Transmission output	: Analog signal, supports the concentration measured value and temperature measure value.  <ul style="list-style-type: none"> <li>• Type ..... Input/output and ground isolated type</li> <li>• Signal type ..... 4 to 20mADC</li> <li>• Load resistance ..... 650Ω</li> <li>• Ripple ..... Peak value 0.3%FS</li> </ul>
Adjustment function	: (1) Calibration <ul style="list-style-type: none"> <li>① Cell constant ..... -10 to 50% with respect to the reference value, variable with key operation</li> </ul>

	② Concentration	..... -10 to 50% of the measured value, variable with key operation
	③ Temperature	..... $\pm 5^{\circ}\text{C}$ of the measured value, variable with key operation
	④ Transmission output	..... 4mA value and 20mA value can be adjusted with key operation
	(2) Measurement/maintenance switching	..... At the time of maintenance, the output mode of Hold, Dummy and Through can be set with operation.
Alarm function	: (1) Target	..... Concentration
	(2) Alarm contacts	..... 2 point transfer contacts (H or L can be arbitrarily set)
	(3) Contact capacity	..... 250VAC, 3A (resistive load) or 30VDC, 3A (resistive load)
Temperature compensation accuracy	: Concentration	..... Within $\pm 3.0\%$ FS (with equivalent resistance input. Depends on the concentration calculation data.)
Repeatability	: (1) Concentration	..... Within $\pm 0.5\%$ FS (with equivalent resistance input. Depends on the concentration calculation data.)
	(2) Conductivity	..... Within $\pm 0.2\%$ FS (with equivalent resistance input)
	(3) Temperature	..... Within $\pm 0.1^{\circ}\text{C}$ (with equivalent resistance input)
Stability	: (1) Concentration	..... Within $\pm 0.2\%$ FS/24h (with conductivity and equivalent resistance input)
Linearity (Changes depending on the type of condensation)	: (1) Concentration (Indication)	..... Within $\pm 3.0\%$ FS/24h (with equivalent resistance input)
	(2) Conductivity (Indication)	..... Within $\pm 0.5\%$ FS (with equivalent resistance input)
	(3) Temperature (Indication)	..... Within $\pm 0.3^{\circ}\text{C}$ (with equivalent resistance input)
Response time	: (1) Concentration	..... Within 0 to 90%FS, 50 seconds (with equivalent resistance input)
Power supply	: 90 to 264VAC, 50/60Hz	
Power consumption	: 10VA	
Ambient temperate and humidity	: -20 to 55 $^{\circ}\text{C}$ , 95%RH or less (no condensation)	
Structure	: Outdoor installation, dustproof, jet flow resistant (IP65 or equivalent)	
Material	: (1) Main body	..... Aluminum die-cast
	(2) Display section and key operation section	..... Polyesters resin
Surface color	: (1) Main body	..... Metallic silver
	(2) Display section and key operation section	..... Munsell N1.5

Mass	: Approx. 2kg
Wiring	: Terminal connection (Size: M3)
Dimensions and mounting	: 181(W) × 180(H) × 95(D) (excluding waterproof glands) 50A pipe mounting
Option (when requested)	: (1) Power-off signal …… Outputs an NC contact when power supply is stopped  (2) Sensor ME-1□1 Series (Reference cell constant: 9.00/cm) (Cable length: 5m standard) ME-11T Series (Reference cell constant: 2.60/cm) (Cable length: 5m standard), etc.  (3) Wall mounting fixture  (4) Connector box …… Model FC-4  (5) Sensor cable …… Model EC-16 dedicated cable (up to 10m is possible, needed when connector box is used)

## (2) Specifications of main sensors

The specifications of the sensor differ depending on the ordered specification. Check the actual specifications using delivery specifications, etc. The following specifications are just examples.

### (a) Model ME-111 sensor specifications

Product name and model name	: Electrodeless concentration sensor Model ME-111
Reference cell constant	: 9.00/cm
Temperature element	: Thermistor
Conditions of sample solution	: Temperature …… 0 to 100°C (Liquid contacting material: PFA, PVDF) 0 to 65°C (Liquid contacting material: Heat resistant PVC)  Pressure …… 0.5MPa or less (Liquid contacting material: PFA, PVDF) 0.3MPa or less (Liquid contacting material: Heat resistant PVC)  Flow rate …… 2m/s or less
Ambient temperature	: -10 to 60°C
Mounting	: R3/4 screw-in method
Sensor cable	: 5m
Mass	: Approx. 0.5kg

**(b) Model ME-11T sensor specifications**

Product name and model name	: Electrodeless concentration sensor Model ME-11T-1-0 (when used independently as a detector)
Measurement object	: Electric concentration of general water, acid, alkali, salt solution, etc.
Measurement method	: Electric concentration measurement using electromagnetic induction.
Reference cell constant	: 2.60/cm
Sample solution temperature	: -5 to 150°C
Sample solution pressure	: Maximum 2.0MPa (1.0MPa when sample temperature is 150°C)
Sample solution flow rate	: 5m/s or less
Ambient temperature	: - 10 to 60°C
Response of built-in temperature element	: 4 to 10 minutes for 90% response (depends on the flow rate condition)
Liquid contacting material	: PTFE, PFA
Mounting	: G3/4 screw-in method
Sensor cable	: 5m
Mass	: Approx. 0.5kg

**(c) Model ME-61 sensor (Model ME-61TTH) specifications**

Reference cell constant	: 2.60/cm (vertical-hole type)
Liquid contacting material	: PFA
Temperature element	: External thermistor
Condition of sample solution:	Temperature: 0 to 120°C
Mounting	: Equipped with a case
Connection flange	: 25A JIS 10K RF equivalent

**(d) Model ME-62 sensor (Model ME-62TTH) specifications**

Reference cell constant	: 2.60/cm (horizontal-hole type)
Liquid contacting material	: PFA
Temperature element	: External thermistor
Condition of sample solution:	Temperature: 0 to 120°C
Mounting	: Equipped with a case
Connection flange	: 25A JIS 10K RF equivalent

**(e) Model ME-63 sensor (Model ME-63EGH) specifications**

Reference cell constant	: 2.60/cm (slanted-hole type)
Liquid contacting material	: PVC, glass
Temperature element	: External thermistor
Condition of sample solution:	Temperature: 0 to 60°C
Mounting	: Equipped with a case
Connection flange	: 25A JIS 10K FF

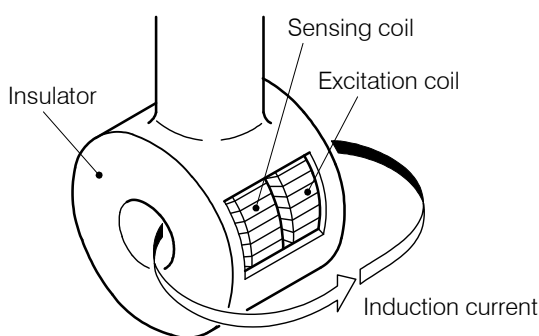
**(f) Model ME-73 sensor (Model ME-73E) specifications**

Reference cell constant	: 2.60/cm (slanted-hole type)
Liquid contacting material	: PVC, glass
Temperature element	: Built-in thermistor
Condition of sample solution:	Temperature: 0 to 60°C
Mounting	: Without a case
Connection flange	: 100A JIS 10K FF

## 6.2 Principle of Operation

### (1) Principle of sensor

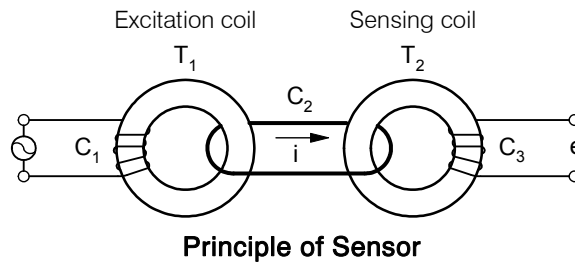
The sensor is structured with two transformers placed one on top of another in a insulator case and this structure is immersed in a sample solution to measure the concentration (conductivity) of the sample using electromagnetic induction.



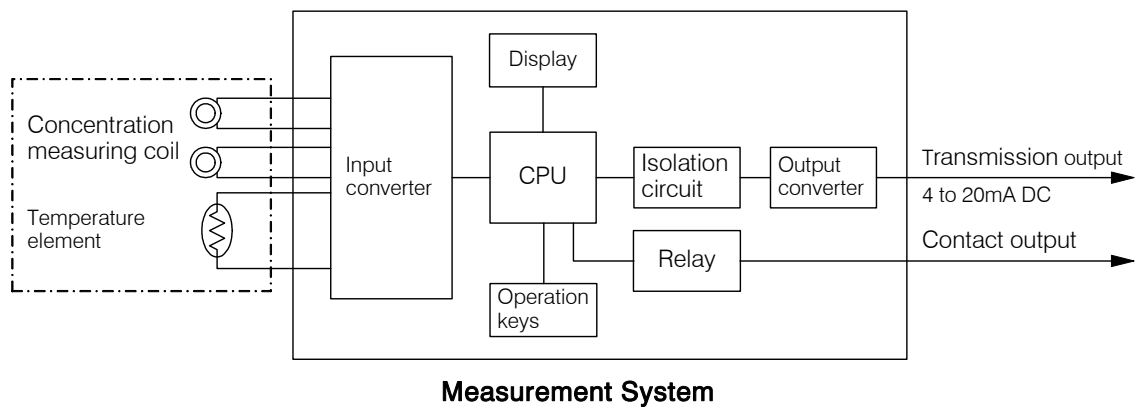
**Structure of Sensor**

If  $T_1$  and  $T_2$  coils are placed as transformers in a sample solution as shown in the diagram “Principle of Sensor,” the sample solution, in equivalent circuit, forms a 1-turn circuit intercrossing  $T_1$  and  $T_2$ . If an AC current is made to flow in the primary circuit  $C_1$ , an induced current  $i$  flows in  $C_2$ , which is proportional to the concentration of the solution. On the other hand, in the secondary coil  $C_3$  of the transformer  $T_2$  with primary coil  $C_2$ , a voltage  $e$  is generated, which is proportional to the current that

flows in  $C_2$ . Therefore, this voltage conforms to the concentration of the solution and by measuring the voltage  $e$ , the concentration of the sample solution can be obtained.



**(2) Analyzer operation**



The concentration analyzer calculates, including temperature compensation, as follows. The input transmitter receives a signal from the concentration sensor consisting of an excitation coil and a detection coil, and a signal from a temperature element and the transmitter converts these signals. The CPU (central processing unit) reads these signals and calculates and indicates the concentration value at conversion temperature (normally 25°C) on the display. At the same time, the output from the CPU goes through an isolation circuit and enters the output transmitter and the output transmitter sends out a 4 to 20mA transmission signal.

In addition, if the measured value exceeds the alarm point, the CPU drives a relay to send a contact signal.



## 7. RS-232C Communication Function (Option)

### (1) Outline and specifications

(a) When the analyzer is equipped with RS-232C communication function (option), the following can be performed by connecting the analyzer and a PC with a communication cable.

- Importing the digital measured value data (concentration, temperature and conductivity) to PC

(b) Communication specifications are as follows:

- Standard: JIS X5103 compliance
- Transmission method: Asynchronous, half-duplex operation
- Baud rate: 9600 bps
- Character framing: Data length..... 8 bits  
Parity check ..... Non-parity  
Stop bit ..... 1 bit
- Connection method: 3-pin terminal block (communication cable is required)

### (2) Terminal arrangement and communication cable

(a) The terminal arrangement for RS-232C communication is shown in the table below.

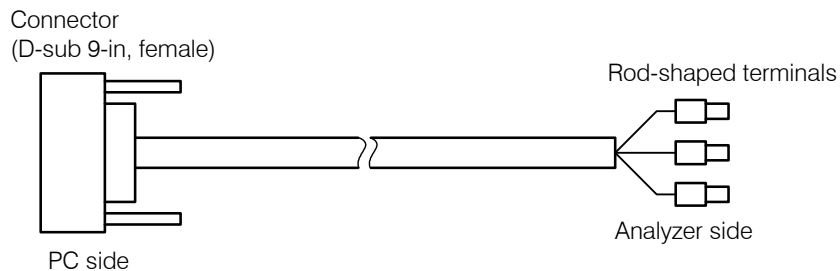
**Terminal Arrangement and Signal Names**

Terminal No.	Signal symbol	Signal name	Direction
1	RD (RXD)	Receive Data	Input
2	SD (TXD)	Send Data	Output
3	SG	Signal Ground	—

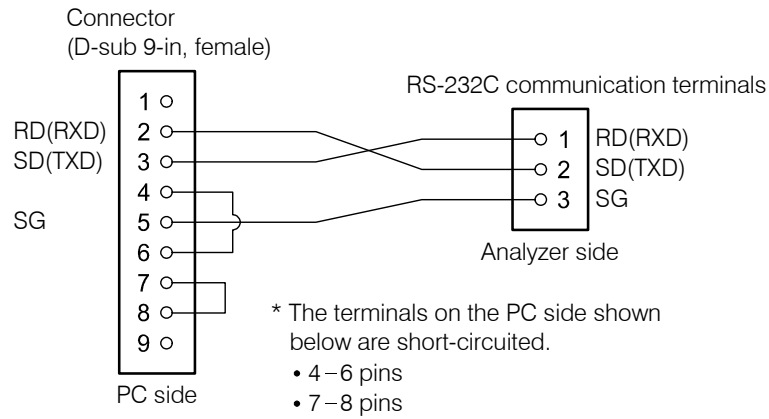
(b) To connect with a PC, be sure to prepare a communication cable (standard 1.5m) made by DKK-TOA.

(c) Make the length of the cable within 10m.

**【IMPORTANT】** • If the length of the cable exceeds 10m, the application software may not work properly.

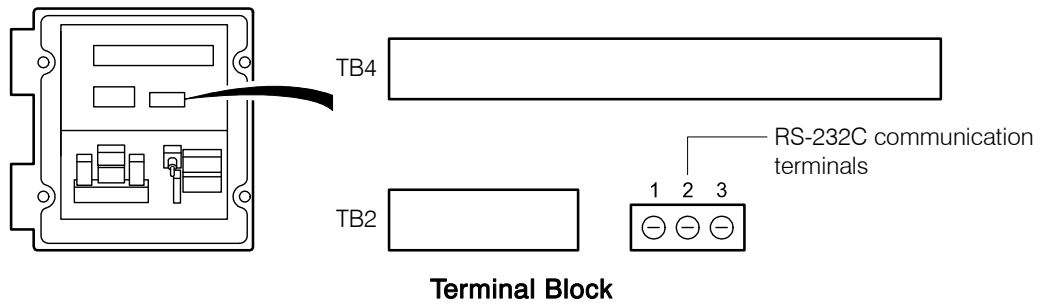


**Appearance of Communication Cable**



**Configuration of Communication Cable**

**(3) Wiring**



(a) Before you connect a communication cable, be sure to turn off the power source to the analyzer and turn off the power of PC. After connecting the cable, turn on the power source and turn on the PC. The purpose of this procedure is to prevent electric shock by touching the terminals and erroneous operations of application software.

(b) Please maintain the communication cable apart from the power cable and alarm cable.

---

**【IMPORTANT】** • If the communication cable is installed together with a power cable or alarm cable, a communication error may occur caused by noise.

---

(c) The ground terminal must be grounded. This is also to prevent noise.

**(4) Command format**

**(a) PC command**

The command format for PC to request the analyzer to send the measurement data is shown below.



**Command Format from PC**

**(b) Analyzer response**

(i) Responding to a request from PC, the analyzer sends data in the format below.

I	,	0	3	.	2	9	,	0	3	5	.	8	,	1	3	.	8	5	CR	LF
ID code		Concentration data				Temperature data				Conductivity data				End data						

**Command Format from Analyzer**

(ii) Concentration data consists of 4-digit data shown in an example below.

(Example) Concentration    1.731%: 1.731  
                                       3.29%: 03.29  
                                       99.99%: 99.99

(iii) Temperature data consists of 4-digit data shown in an example below.

(Example) Temperature        -1.6°C: -01.6  
                                       35.8°C: 035.8  
                                       102.9°C: 102.9

(iv) Conductivity data consists of 4-digit data shown in an example below.

(Example) Conductivity        0.497 mS/cm: .497  
                                       13.85 mS/cm: 13.85  
                                       115.6 mS/cm: 115.6  
                                       1234 mS/cm: 1234

## 8. Installation

### 8.1 Analyzer Mounting

#### (1) Installation location

Install the analyzer in a location which conforms to the specifications and satisfies the following conditions.

- (a) A location where the lead wires of the sensor, etc. can reach.
- (b) A location where installation and maintenance work can be performed easily.
- (c) A location where not exposed to direct sunshine and where temperature does not change quickly and temperature change does not occur locally.
- (d) A location where no equipment is nearby that generates electric noise. ▷ 5.4 “Measures against Noise”
- (e) A location where sea water or chemicals are not sprayed.
- (f) A location without vibration.
- (g) A location without corrosive gasses.
- (h) A location where drops of water are not sprinkled.

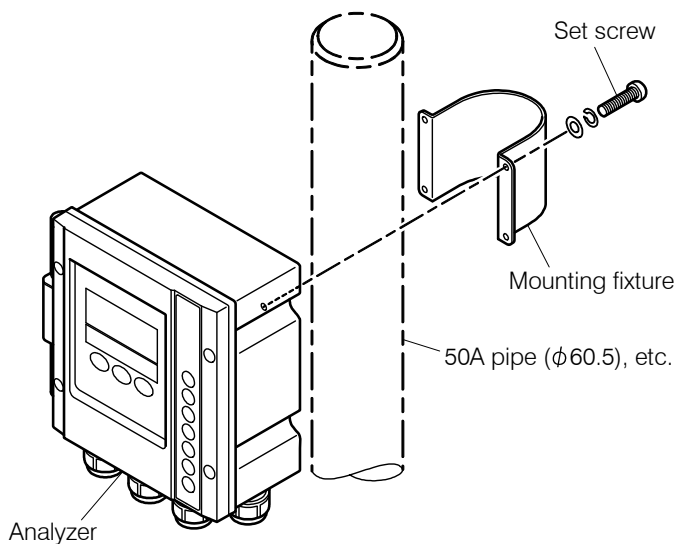


#### Hazardous Gasses

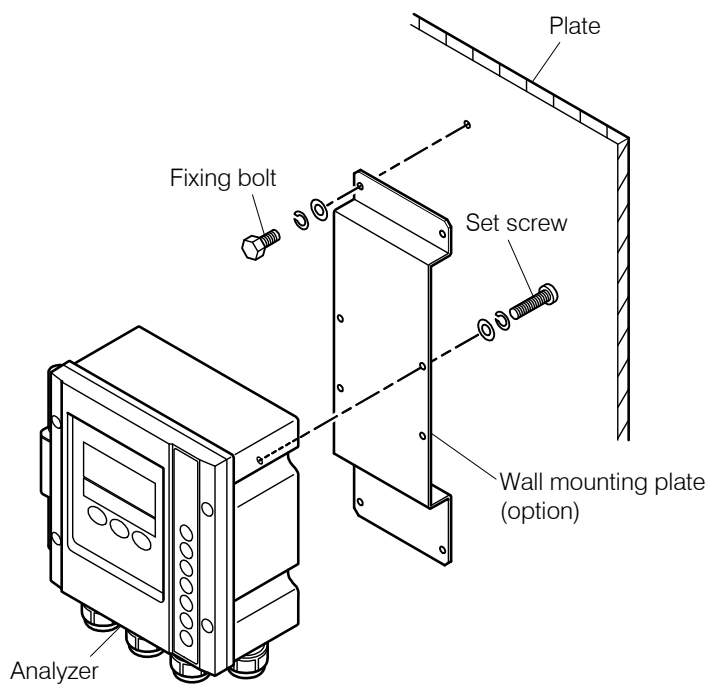
- Do not use the product in an area where explosive gas, flammable gas exists. Using the product in any of these areas can cause explosion or fire.
- 

#### (2) Examples of analyzer installation

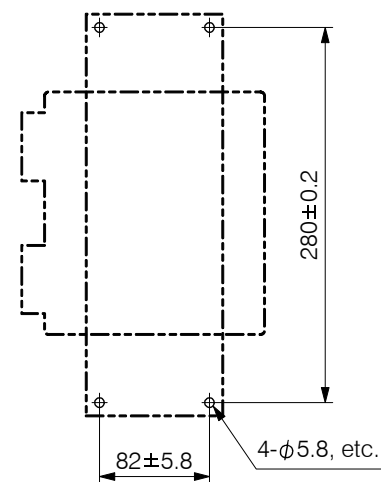
- (a) Loosen the fixing screws and install a mounting fixture from the rear of 50A pipe (outer diameter 60.5mm), etc. and tighten the fixing screws. To mount the analyzer to the wall, use an optional wall mounting plate.
- (b) If the installation height is 1.3 to 1.5m from the floor, readout or calibration work can easily be done.
- (c) Provide clearance space of 30cm or more between the analyzer rear side and the surrounding object. Maintenance work can be performed easily.
- (d) Mount the analyzer so that the top surface of the analyzer becomes level.
- (e) For installation of the sensor, refer to the instruction manual attached to the sensor.



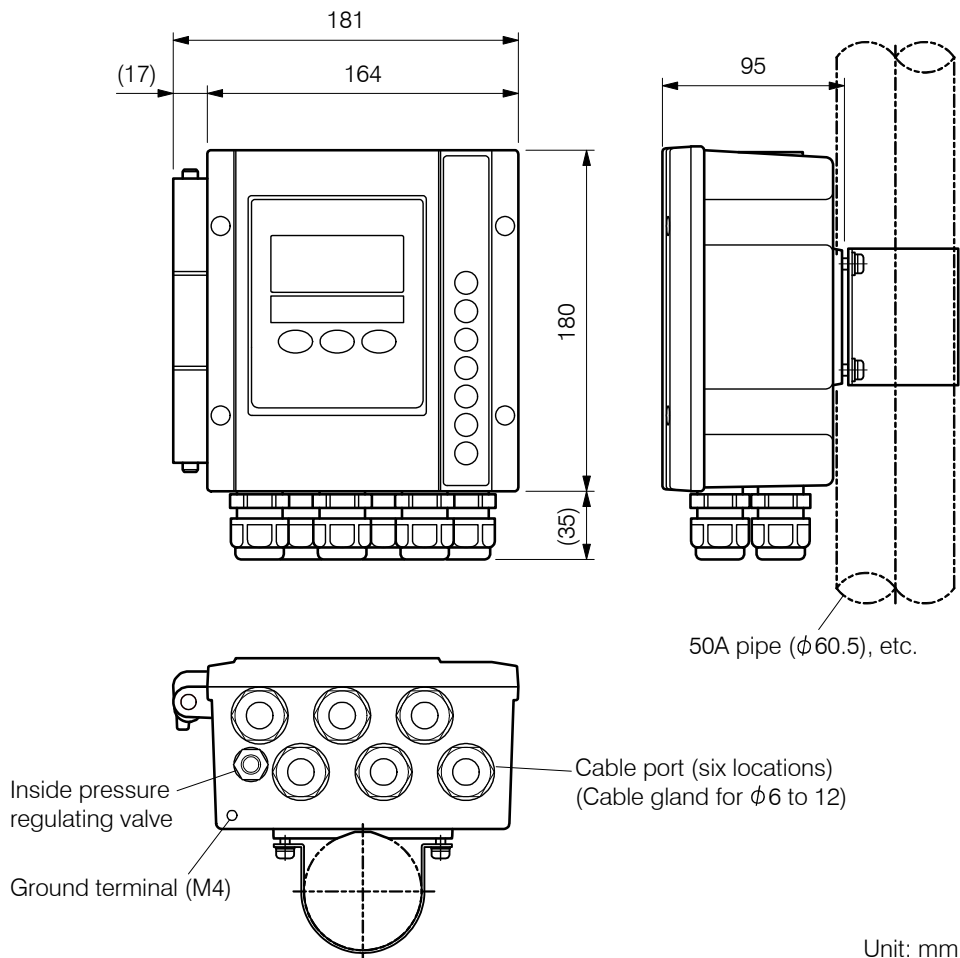
**Pipe Mounting Method**



**Wall Mounting Method**



**Hole Positions of Wall Mounting Plate**



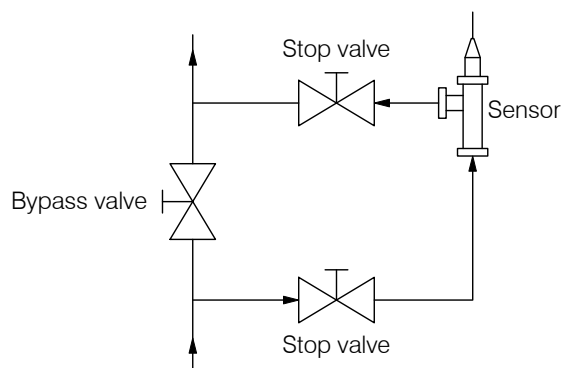
**Dimensions**

## 8.2 Sensor Mounting

### (1) Key points of sensor mounting

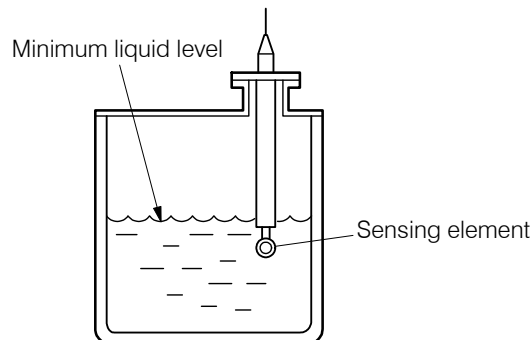
Install the transmitter in a location which conforms to the specifications and satisfies the following conditions.

- (a) A location where installation and maintenance work can be performed easily.
- (b) A location where not exposed to direct sunshine and where temperature does not change quickly and temperature change does not occur locally.
- (c) A location where no equipment is nearby that generates electric noise
- (d) A location where sea water or chemicals are not sprayed.
- (e) A location without vibration
- (f) A location without corrosive gasses
- (g) A location where the temperature of the sample is maintained within the operating temperature range of the electrode regardless of whether the sensor is in operation or not.
- (h) If the sensor is provided with a case, use the specified types of bolts and packing.
- (i) When you install the sensor to a pipeline, provide a bypass line and stop valves so that the sensor can be removed.



**Installation to a Pipeline**

- (j) Even if the liquid level varies, the sensor must always be immersed in sample solution.



**Tip End of Sensor and Minimum Liquid Level**

- (k) If a noise current flows through the sample solution or piping, an error may occur. Therefore, sample solution must be grounded in some way.

- (l) If air bubbles or suspended solids exist in sample solution, this causes fluctuation of the indication or a measurement error. Either remove air bubbles and suspended solids or move the sensor to other location.
- (m) For a sensor provided with a case, maintain the flow rate near the sensor within the specification limits. Even if the indication is not affected by flow rate, if the flow rate is large, air bubbles tend to occur and if it is small, the indication becomes slow.
- (n) Do not allow solids to flow into sample solution, which may scratch or damage the tip end of the sensor.

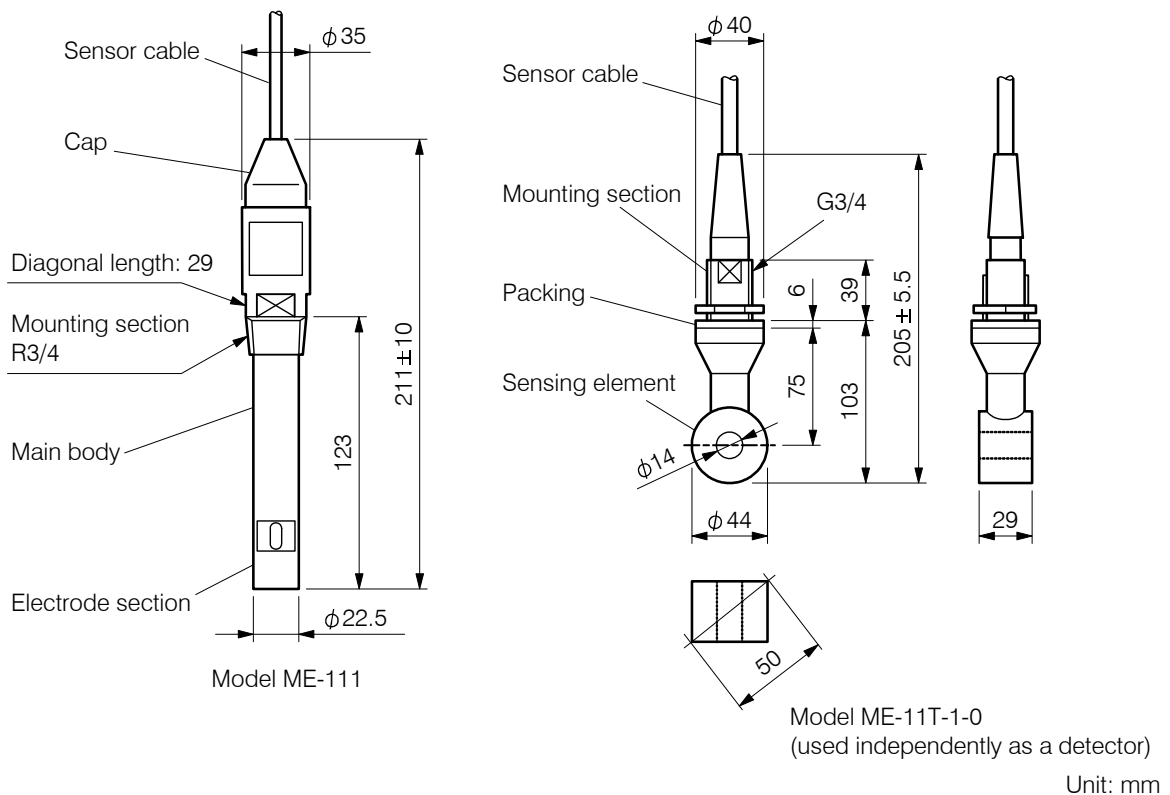
**⚠ WARNING**

**Hazardous Gasses**

- Do not use the product in an area where explosive gas, flammable gas exists. Using the product in any of these areas can cause explosion or fire.

**(2) Examples of sensor installation**

- (a) For this analyzer, combine a sensor with a reference cell constant of 9.00/cm or 2.60/cm. Even if the analyzer is combined with a sensor of other reference cell constants, the analyzer does not work correctly.
- (b) For the type of sensor, screw-in type, flange type and a sensor with a case are provided and liquid contacting materials differ. Mount the sensor referring to the delivery specification, etc.



**Dimensions Examples of Screw-in Type Sensors**

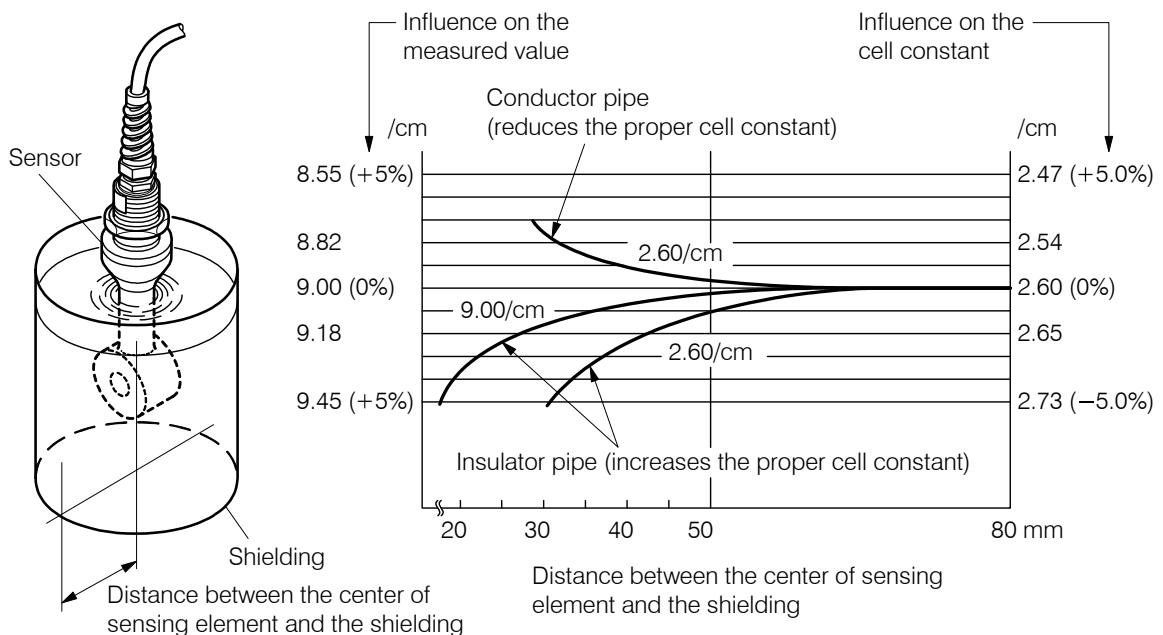


- 【IMPORTANT】**
- Do not apply strong shock to the extent the sensor deforms or gets scratched.
  - Be careful that the sensor cable will not be twisted when you screw in the sensor. The sensor cable is directly connected and it cannot be removed from the sensor.

- (c) If the mounting section is made of resin, the opposite side must also be made of resin. If it is made of metal, select the opposite side which is made of metal. This is needed to prevent liquid leak.
- (d) For the thread of the mounting section, wind sealing material and mount the sensor correctly so that the thread of the sensor mates correctly.

### (3) Adjustment of proper cell constant when shielding exists

- (a) If the distance between the center of the electrode section and a shielding object (conductor or insulator) is 50mm (inner diameter  $\phi$ 100mm) or less, the direction of induction current changes and the measurement value will be affected. The effect is shown in the diagram below. However, if a sensor with reference cell constant of 9.00/cm is installed in a conductor pipe (metal), almost no effect occurs. This is not described in the diagram.
- (b) If it is necessary to install the sensor where a shielding object exists, the effect can be almost corrected by adjusting the setting value of the proper cell constant soon after the operation started. However, if the sensor is provided with a case when it is shipped from the factory, the proper cell constant described on the sensor is the one adjusted in the combined condition and thus it is not necessary to adjust the setting value again.



**Effect of Sensor Cell Constant by Shielding Object**

- (c) Adjust the proper cell constant as shown below after the operation starts.

(Example) Sensor reference cell constant: 2.60/cm  
 Type of shielding: Conductor pipe (metal)  
 Distance between the center and the shielding: 50mm (inner diameter  $\phi$ 100mm)

- ① **Check the cell constant affected by shielding.** ..... Read the cell constant (approx. 2.59/cm) when the distance between the center of the electrode section and the shielding is 50mm referring to the diagram “Effect of Sensor Cell Constant by Shielding Object.”
- ② **Adjust the proper cell constant.** ..... Open the “Proper Cell Constant Setting (C.CON)” screen in the setting mode and set the cell constant affected by shielding. ▷ 3.3(7) “Changing the proper cell constant”

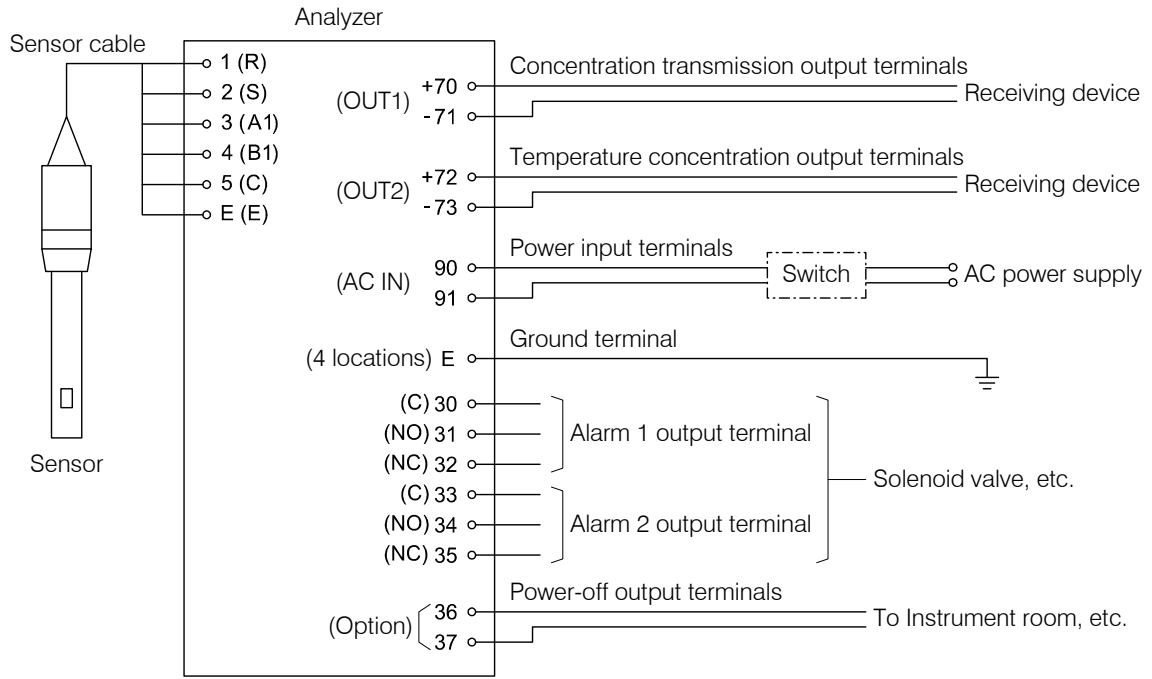
## 8.3 Wire Connection

### (1) Connection diagram



#### Electric Shock

- Do not touch the terminals in the analyzer while power is applied. Touching the terminals may cause electric shock.
-

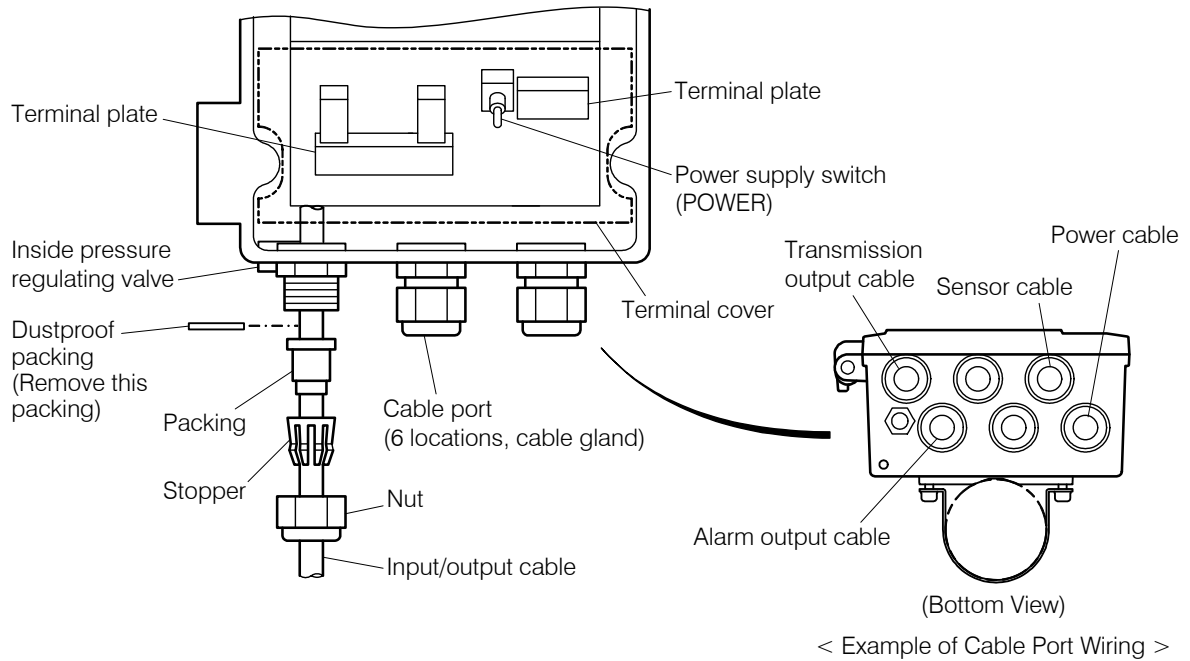


**Example of Connection Diagram**

## (2) Cable ports

Install each cable to the inside of the analyzer by putting it through a cable gland (for  $\phi 6-12$ ) of cable ports at the bottom of the analyzer.

- 
- 【IMPORTANT】**
- Use a cable with outer diameter fit for the size of the cable gland. If it is not fit, airtight condition in the analyzer cannot be maintained and humidity inside the analyzer increases and this causes deterioration of insulation.
  - To maintain airtight condition, tighten all of the nuts when wiring is completed. In addition, do not remove the dustproof packing from the ports not used.
-

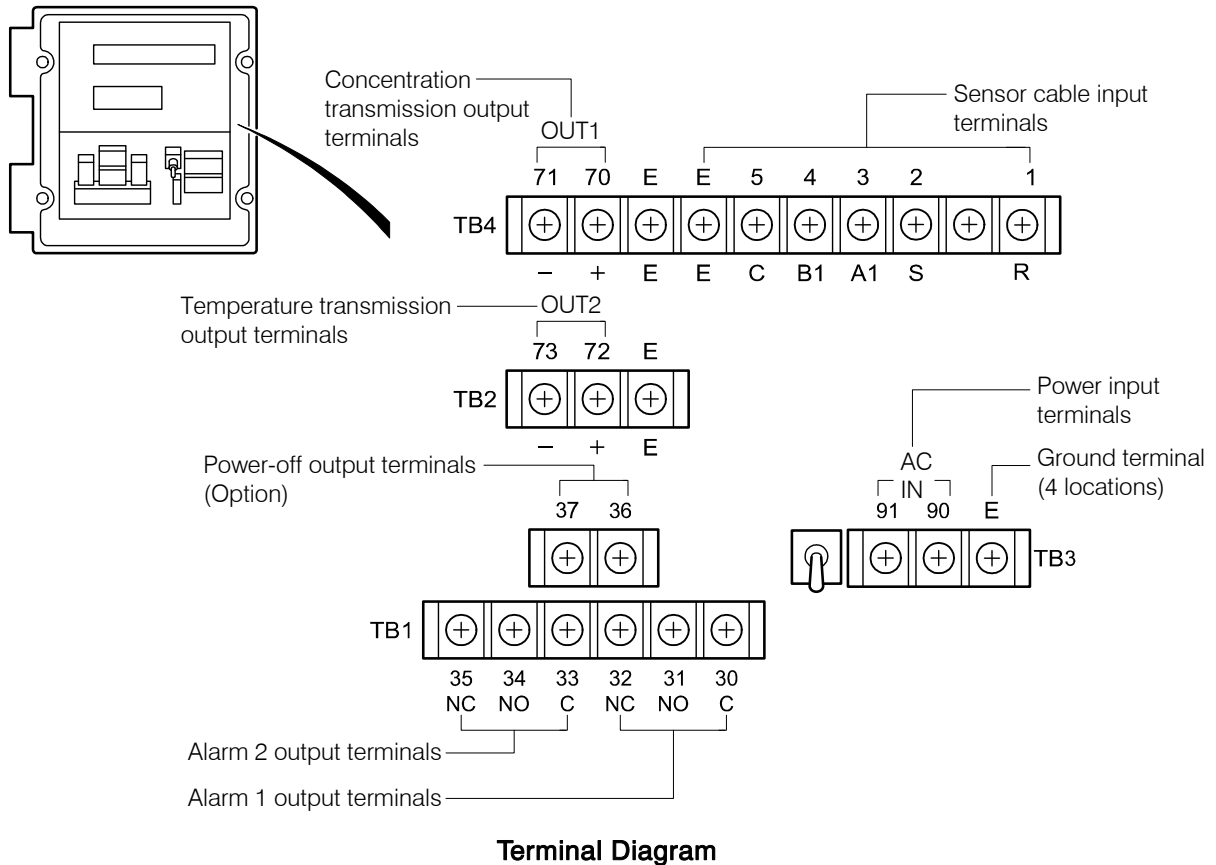


**Cable Ports**

**(3) External input/output terminals**

Check that the power supply to the analyzer is off, open the terminal door of the analyzer and remove the terminal cover and then connect wires to each terminal. When wiring is completed, install the terminal cover in the same was as before.

- 
- 【IMPORTANT】**
- Do not connect power supply terminals or alarm output terminals 1 and 2 to other terminals. The analyzer may be damaged.
  - For reasons of safety, do not turn on power to the analyzer here. Turn on power in accordance with 2.1 “Operation Start Procedure.”
-



#### (4) Sensor cable input terminals

(a) Each lead wire of sensor cable is indicated by terminal number (wire mark). Connect each wire to the terminal plate of the analyzer referring to this number.

- [NOTE] • Description of terminal numbers
- 1(R), 5 (C): Sensing coil
  - 2 (S), 4 (B1): Excitation coil
  - 3 (A1), 4 (B1): Temperature compensation
  - E (E): Shield

**[IMPORTANT]** • If the terminals of the sensor cable are touched by dirty hand or contaminants such as water drops or oil stick to the terminals, the indication of the analyzer may become unstable. Maintain the terminals always in dry and clean condition. In case contaminants are stuck to the terminals, wipe off with reagent alcohol, etc. and dry the terminals thoroughly.

- Since the sensor cable cannot be extended by splicing cables together, be sure to use one cable.

(b) Do not shorten the sensor cable. If it is cut in half, terminal treatment is needed again. If it is necessary to cut the cable in half, ask a technical service company to do it for you. This is because the work is relatively complex, such as preparation of crimping terminals and insulation tubes is required. At that time, ask the company to do in the same way as the actual terminal treatment of the delivered sensor cable. In addition, if the cable length is changed, readjustment of the analyzer may become necessary.

- 
- 【IMPORTANT】** • For terminal treatment of the sensor cable, ask a technical service company to do it. If terminal treatment fails, measurement cannot be performed correctly.
- 

## (5) Concentration transmission output terminals

- (a) The transmission output of the concentration measured value corresponding to the measuring range can be taken from the terminals 70(+) and 71(-) of the terminal plate. Use a 2-core shielded cable to connect between these terminals and a receiving device (such as a recorder).
- (b) The specifications of the transmission output are shown below (isolated type from ground):
- Current transmitter: 4 to 20mADC (load resistance 650Ω max.)
- Terminals: Terminal 71 (-) is shared with the temperature transmission output terminal 73(-).  
(These terminals are connected inside.)

## (6) Temperature transmission output terminals

- (a) The transmission output of the sample solution temperature can be taken from the terminals 72(+) and 73(-) of the terminal plate. Use a 2-core shielded cable to connect between these terminals and a receiving device (such as a recorder).
- (b) The specifications of the transmission output are shown below (isolated type from ground):
- Current transmitter: 4 to 20mADC (load resistance 650Ω max.)
- Terminals: Terminal 73 (-) is shared with the conductivity transmission output terminal 71(-).  
(These terminals are connected inside.)

## (7) Power input terminals

- (a) Power supply of this analyzer is 90 to 264VAC. Connect a 2-core cable to the terminals 90 and 91 of the terminal plate.

- 
- 【IMPORTANT】** • Do not apply voltage higher than 264VAC. The analyzer may be damaged.
- Do not connect power supply to terminals other than 90 and 91 erroneously. The analyzer may be damaged.
  - For safety reasons, apply power to the analyzer in accordance with 2.1 “Operation Start Procedure.”
- 

- (b) Provide a switch, etc. so that power supply can be turned off at the power source side.

## (8) Ground terminal

- (a) The ground terminal (E) of the terminal plate must be grounded using D type grounding method (ground resistance 100Ω max.). Avoid sharing the ground with power equipment to prevent noise.
- (b) If the analyzer cannot be grounded near the installation site, it is possible to ground at the power supply side. Use a 3-core instrumentation type shielded cable for power cable and connect the core wire for ground to the ground terminal “E” of the terminal plate.

**! WARNING**

**Electric Shock**

- The ground terminal must be grounded. If the terminal is not grounded and a problem occurs in the power supply system, electric shock may result.

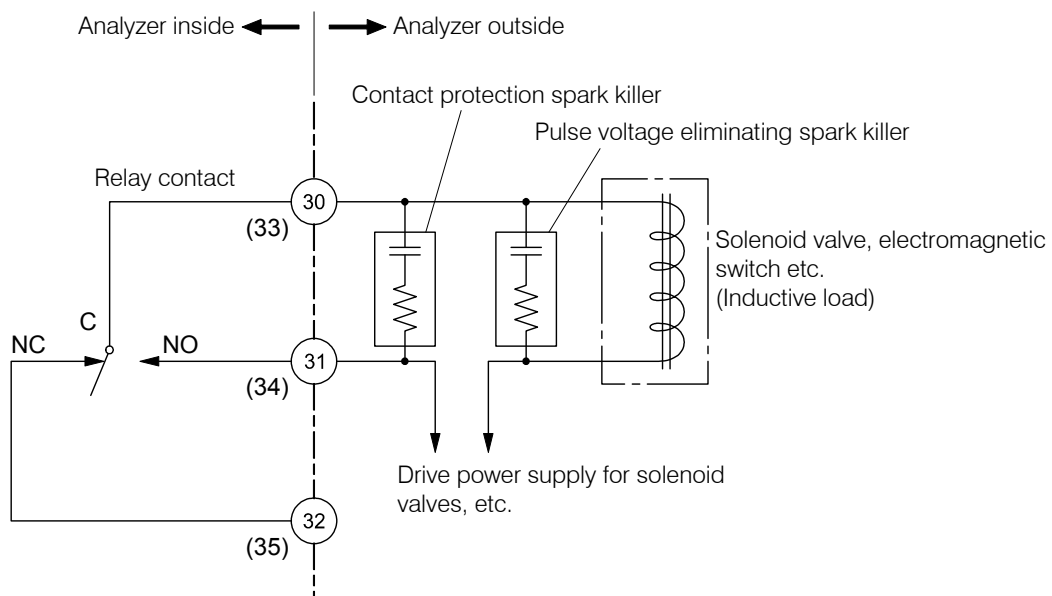
**(9) Alarm output terminals**

- (a) 2-circuit transfer contacts can be taken as alarm output terminals. Connect these terminals to a solenoid valve, etc. as conductivity alarm output.

**Alarm Output Terminals**

	Alarm output 2-circuit type
Alarm 1 output terminals	“30, 31, 32” Transfer contact (One set of NO and NC contact)
Alarm 2 output terminals	“33, 34, 35” Transfer contact (One set of NO and NC contact)

- (b) Provide a contact protecting spark killer and a pulse voltage eliminating spark killer near the solenoid valve.



**Example of Protection against Noise for Alarm Circuits**

- (c) If the indicated value exceeds the alarm set point, the contact signal of the corresponding alarm output terminal changes and the conductivity measured value returns to within the set points, the contact signal returns to its original state. The contact capacity is 250VAC, 3A or 30VDC, 3A (resistive load). To open/close the current exceeding this capacity limit, provide a power relay, etc. and use the alarm output signal to turn on/off its amplifier circuit.
- (d) The settings for alarm on/off, set points, high/low distinction, etc. can be changed with key operation.

**(10) Power-off output terminals** (option)

For the analyzer equipped with power-off output function (option), if power supply to the analyzer stops, the signal of the power-off output terminals (36 and 37) changes to “Closed” condition. When the power supply returns to normal, the signal automatically returns to “Open” condition. The contact capacity is 250VAC, 3A or 30VDC, 3A (resistive load).

## Revision History

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