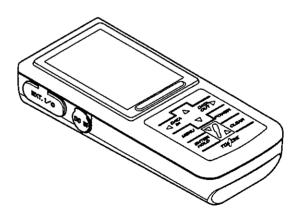


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HAND HELD CONDUCTIVITY METER

MODEL CM-31P-W



- 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 the Model CM-31P / CM-31P-W Hand Held Conductivity Meter (hereinafter called the instrument or the product). The instrument has a waterproof construction suitable for on-site measurements and a clock function and data memory function indispensable in data management. Power consumption has also been reduced to 1/10 compared with the existing products.
- (b)An AC adapter, external printer, analog output cable, and RS-232C connection cable can be connected to the instrument main body as optional devices. The data of measured value and calibration value can be printed by the printing function of an external printer.
- (c) Since important items are described in "Safety Information", read the contents carefully. In addition, this instruction manual and the "instruction manual" supplied with the electric conductivity cell will be needed in case of trouble or if users have questions in the future. After reading this manual, store it in a convenient place.

Model: CM-31P/CM-31P-W Safety Information

Safety Information

(1) Meaning of markings

The signal terminology and symbols related to warnings in the instruction manual are defined below. The alert symbol mark (A: General caution mark) indicates the possibility of hazard or damage and also means "Refer to the instruction manual."



/N 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 injury or property damage if you fail to operate the product properly.

Injury means an injury not requiring hospitalization or long periods of outpatient treatment and refers to burns or electric shock. Property damage refers to widespread damage to the home, household goods and livestock, pets, equipment, materials, etc. (damage to other than the product itself).

[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

MARNING

Explosion, fire, and electric shock

- Do not use the product in an area where explosive gas or flammable gas exists.
- Do not place the product in a fire or burn it. Doing so may cause an explosion or fire inside the product.
- Always verify that the power is off before connecting or disconnecting the electrode plug, AC adapter cover, or input/output cover. Water or reagent entering the product may short the circuits and cause electric shock or fire.

Tumbling

 When working at the measurement point, take tumbling prevention measures such as a safety belt, etc. In addition, to prevent injury, wear a helmet, life jacket, safety boots, etc.

CAUTION

Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

Mixing in

 Do not drop the instrument body into the measurement tank. Doing so may cause trouble.

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.

Caution Label Lost

 If any caution 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.

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 two years from the date of delivery to the original user.
- (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 WARANTY 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) Product parts for maintenance (*2) 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.

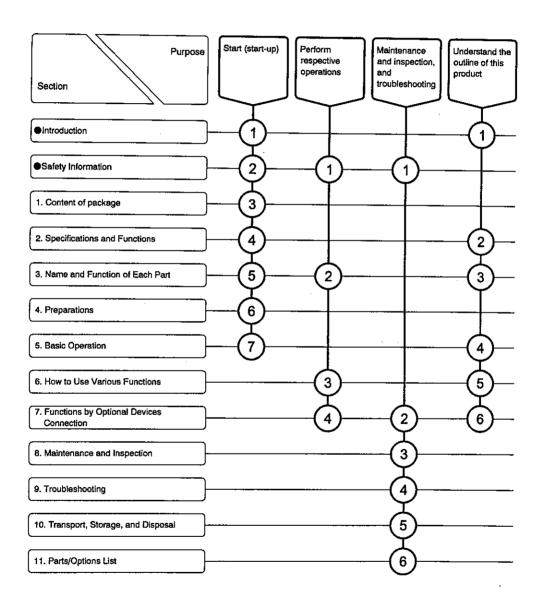


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1. Content of Package

Model CM-31P accessories list

Classification	Description	Model	Quantity	Appearance
Main body	Hand held conductivity meter	CM-31P	1	
Accessories	Electric conductivity cell (memory built-in type) *1	CT-27112B	1	
	Hand strap	0TZ00006	1	
	AA size dry battery *2 (sample supply)	_	2	
	Instruction manual	_	i	\Diamond

Model CM-31P-W accessories list

Classification	Description	Model	Quantity	Арреагапсе
Main body	Hand held conductivity meter	CM-31P	1	
Accessories	Electric conductivity cell (memory built-in type) *I	CT-27111D	Ī	
	Flow cell *1	CEF-22A	1	
	Hand strap	0TZ00006	1	
	AA size dry battery *2 (sample supply)		2	S
	Instruction manual	-	1	\Diamond

(NOTE) *1: This accessory is not supplied if only main body is ordered.

*2: Attached dry batteries are supplied as sample. Since the battery life may be extremely short, replace it with an AA size alkali dry cell battery or AA size rechargeable Nickel hydride battery available on the open market.

2. Specifications and Functions

(1) Specifications

Product name			Hand held conductivity meter	
Model			CM-31P	
Measuring method			Alternating current 2 electrodes method	
Display			Digital Electric conductivity / Electric resistivity / NaCl (Electric resistivity conversion) Simultaneous display of temperature and time (month/day, hour/minute)	
Temperature compensating range		ge	ATC (Automatic temperature compensation): 0.0 to 100.0°C MTC (Manual temperature compensation): 0.0 to 100.0°C	
	Electric conductivity	Range	CT-27112B (250m ⁻¹) 0.1 mS/m to 10S/m CT-27111D (1m ⁻¹) 5μS/m to 20mS/m CT-57101B (100m ⁻¹) 0.1 mS/m to 10S/m CT-57101C (10m ⁻¹) 5μS/m to 1S/m CT-57101A (1000m ⁻¹) 1mS/m to 100S/m	
		Resolution	Essential figure: 4 digits	
Measuring range	Electric resistivity	Range	CT-27112B (250m ⁻¹) 0.1Ω•m to 10kΩ•m CT-27111D (1m ⁻¹) 50Ω•m to 200kΩ•m CT-57101B (100m ⁻¹) 0.1Ω•m to 10kΩ•m CT-57101C (10m ⁻¹) 1Ω•m to 200kΩ•m CT-57101A (1000m ⁻¹) 0.01Ω•m to 1kΩ•m	
	1	Resolution	Essential figure: 4 digits	
	NaCl	Range	0.00 to 4.00%	
		Resolution	0.01%	
	Temperature	Range	0.0 to 100.0°C (by electric conductivity cell)	
		Resolution	0.1 °C	
	Electric conductivity / Electric resistivity		Next table "Cell type name and display range list	
Display range	e NaCl		0.0 to 4.04%	
	Temperature		-5.0 to 110.0°C	
Repeatability	Electric conductivity / Electric resistivity / NaCl		±0.5% (F.S.)	
(Main body)	Temperature		±0.2°C	
Temperature coefficient			0 to 9.99%/ °C (freely settable)	
			Pure water temperature compensation: 2%/ °C double temperature compensation	
Water Proof			IP67 *1	
Printing function *2			Interface is standard equipment, printer is optional	
RS-232C interf	face *2		Standard equipped	
Analog output			Standard equipped	

(To be continued)

(Continued from previous page)

Power supply	AA size alkali dry cell battery (2), AA size rechargeable nickel hydride battery (2) or AC adapter (optional) *3	
Main body dimensions	Approx. 35 (Height) × 68 (Width) × 173 (Depth) mm	
Main body weight	Approx. 280g	
Performance guarantee temperature range	0 to 45°C *4	

^{*1:} Invalid when no electric conductivity cell is connected or external input/output (optional) is used.

Cell type name and display range list

Cell type name	CT-27111D	CT-57101C	CT-57101B CT-27112B	CT-57101A
Electric	0.0 to 200.0μS/m	0.0 to 200.0μS/m	-	_
conductivity display	0.000 to 2.000mS/m	0.000 to 2.000mS/m	0.000 to 2.000mS/m	_
range	0.00 to 20.00mS/m	0.00 to 20.00mS/m	0.00 to 20.00mS/m	0.00 to 20.00mS/m
	0.0 to 200.0mS/m	0.0 to 200.0mS/m	0.0 to 200.0mS/m	0.0 to 200.0mS/m
	-	0.000 to 2.000S/m	0.000 to 2.000S/m	0.000 to 2.000S/m
		_	0.00 to 20.00S/m	0.00 to 20.00S/m
		_		0.0 to 200.0S/m
Electric resistivity		0.500 to 2.000Ω•m	0.050 to 2.000Ω•m	0.005 to 2.000Ω•m
display	5.00 to 20.00Ω•m	0.50 to 20.00Ω•m	0.05 to 20.00Ω•m	0.00 to 20.00Ω•m
range	5.0 to 200.0Ω•m	0.5 to 200.0Ω•m	0.0 to 200.0Ω•m	0.0 to 200.0Ω•m
	0.000 to 2.000kΩ•m	0.000 to 2.000kΩ•m	0.000 to 2.000kΩ•m	0.000 to 2.000kΩ•m
	0.00 to 20.00 kΩ•m	0.00 to 20.00 kΩ•m	0.00 to 20.00 kΩ•m	0.00 to 20.00 kΩ•m
	0.0 to 200.0 kΩ•m	0.0 to 200.0 kΩ•m	0.0 to 200.0 kΩ•m	0.0 to 200.0 kΩ•m
	0.000 to 2.000MΩ•m	0.000 to 2.000MΩ•m	0.000 to 2.000MΩ•m	_
	0.00 to 20.00MΩ•m	_	_	

^{*2:} Can not be used simultaneously

^{*3:} AC adapter is the 100VAC specifications. Therefore, transformer is always required. Please contact DKK-TOA or your sales representative.

^{*4: 0} to 40°C when optional AC adapter and external printer used.

Model: CM-31P/CM-31P-W

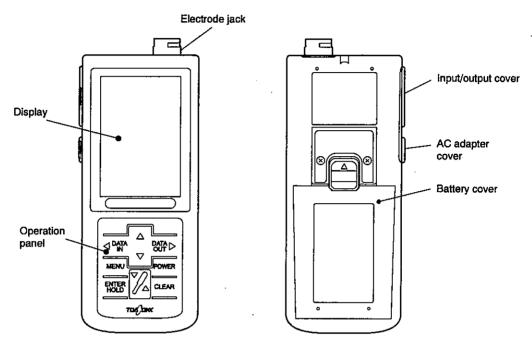
(2) Functions

Clock function	Built-in		
Data storage	1000 data (measured time, measured value, temperature)		
Interval time function	Short interval (1 sec to 99 mins 59 secs) data memory *1		
	Long interval (2 mins to 99 hrs 59 mins) data memory		
Automatically reading of	Enable only when used sensor with built-in memory		
cell constant	Automatically reading the cell constant of individual electric conductivity cell		
Calibration record	The latest calibration data		
	When combined with the built-in memory type, 10 calibration data, including the newest, can be stored at the electric conductivity cell side.		
Auto power off	On/Off setting is possible.		
	ON: Power is turned off when key operation is not performed for 10 mins/20 mins/30 mins/60 mins.		
Temperature calibration function	1 point calibration		
Auto hold function	Provided		
Printing function	When external printer is connected:		
	1. Printing of measured value		
	Manual printing		
	Printing using auto hold function		
	Printing using interval time function		
	Printing of stored data		
	2. Printing of calibration data/record		
RS-232C interface	Standard equipped (Interactive)		
Analog output	Standard equipped		

^{*1} When an external printer is connected, the minimum interval becomes 5 seconds.

3. Name and Function of Each Part

(1) Main body and operation panel



Names of main body

Types and functions of operation panel keys

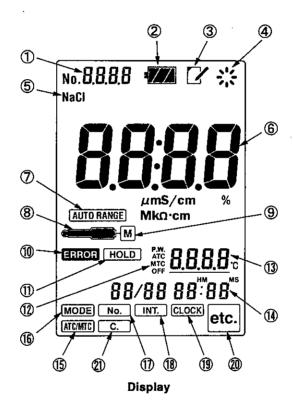
Type of key (Notation in text)	Function
Power switch (POWER)	 When pressed for 2 seconds or more, the power is turned on and off (ON/OFF).
	When pressed for less than 2 seconds, the display returns directly to the Measurement screen from any other screen.
Cell key ()	 If pressed for less than 2 seconds, switches to the manual range. If pressed for 2seconds or more, switches to the auto range.
Menu key (MENU)	Switches to the Menu screen.
Up key, down key (↑, ↓)	Switch value change (increase/decrease) and function selection.
Enter/hold key	Enters values and executes the auto hold function.
(ENTER/HOLD)	Switches to the next screen.
Clear key (CLEAR)	Clears the calibration value, etc.
	• Returns to the previous screen.

(To be continued)

(Continued from previous page)

Type of key (Notation in text)	Function
Data in/left arrow key (←/DATA IN)	Saves the measured value. Selects the MODE, C, ATC/MTC, No, INT. Clock, or etc. mark at the
Data out/right arrow key	Menu screen. • Displays the saved measured value.
(DATA OUT/→)	Selects the MODE, C, ATC/MTC, No, INT. Clock, or etc. mark at the Menu screen.

(2) Display

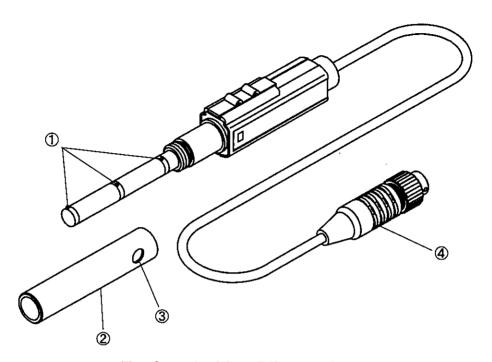


Names and functions of display

No.	Names (Notation in text)	Functions
1	Data number display	Displays the data number.
2	Battery mark	Displays the remaining battery capacity (4-step display).
3	Memory mark	Lights when memory data is displayed.
4	Operation display mark	Displays the operation state.
5	NaCl conversion mark	Lights when NaCl is measured.
6	Main display	Displays the electric conductivity, electric resistivity, or NaCl measured value.
7	AUTO RANGE mark	Lights when Auto Range is set.
8	Cell mark	Lights when an electric conductivity cell is connected.
	(Blinks during stability check execution.
9	M mark	Lights when the body is combined with the sensor with built-in memory.
10	Error mark	Blinks when an error occurs.
	(ERROR)	
10	Hold mark	Lights when the measured value is being held (hold standby state).
	(HOLD)	Blinks during auto hold execution.
12	Temperature compensation mark	Displays the temperature compensation method (ATC/MTC/P.W./OFF), (ATC: Automatic temperature compensation, MTC: Manual
	(ATC P.W.) MTC OFF	temperature compensation, P.W.: Pure water temperature compensation, OFF: No temperature compensation)
(1)	Temperature display	Displays the temperature measured value.
		After temperature calibration execution, displays an underline.
10	Date/time display	Displays the current date/time (Month/day Hour : minute)
(1)	ATC/MTC mark	Lights when the temperature compensation method (ATC, MTC) is set.
	(ATC/MTC)	,
16	MODE mark ((MODE))	 Lights when each mode of electric conductivity, electric resistivity, or NaCl conversion vale is switched.
17)	No. mark	Lights when the data number is set.
~	(No.)	
(18)	INT. mark	Lights when the interval function/time is set or the interval is
9	((INT.))	executed.
	(<u></u> ,	Blinks in the interval standby state.
(19)	CLOCK mark	• Lights when clock adjustment is set.
	(CLOCK)	
20	etc. mark	Lights at each setting such as auto power off reset.
	(etc.)	-
@	C. mark	Blinks when the cell constant of electric conductivity cell is checked
	(C.)	or set.

(3) Electric conductivity cell (CT-27112B)

Electric conductivity cell for general supplied with the Model CM-31P.



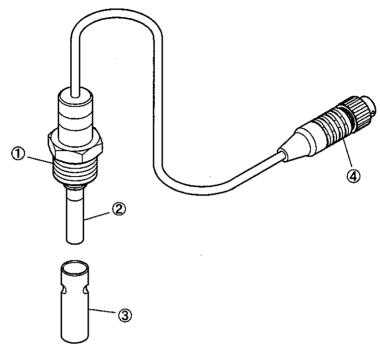
Electric conductivity cell (CT-27112B)

Names and contents of electric conductivity cell (CT-27112B)

No.	Names	Contents
1	Electrode	-
2	Outer tube	 Installed at the electric conductivity cell section during measurement.
3	Air bubbles vent	-
4	Cell plug	Plug for connecting the electric conductivity cell to the main body.

(4) Electric conductivity cell (CT-27111D)

Electric conductivity cell for pure water supplied with the Model CM-31P-W.



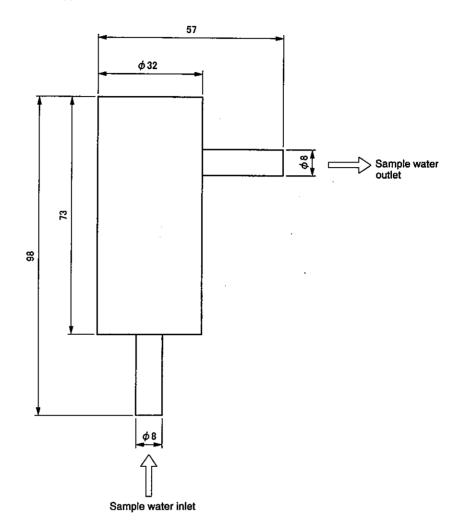
Electric conductivity cell (CT-27111D)

Names and contents of electric conductivity cell (CT-27111D)

No.	Names	Contents
①	Flow cell mounting section	-
2	Electrode	-
3	Electrode • Outer tube	Mount to the electrode during measurement.
4	Cell plug	_

(5) Flow cell (CEF-22A)

Flow cell supplied with the Model CM-31P-W.



Flow cell (CEF-22A)

Names and contents of flow ceil (CEF-22A)

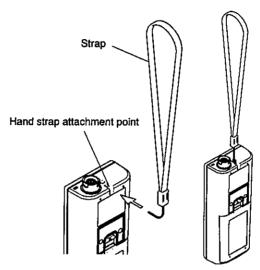
Names	Material
Flow cell (CEF-22A)	PP (polypropylene)
Option Flow cell (CEF-23A)	sus

Model: CM-31P/CM-31P-W 4.1 Attaching the hand strap

4. Preparations

4.1 Attaching the hand strap

Attach the hand strap as shown in the below figure. (The attachment method is the same as that of the hand strap of a mobile telephone.)

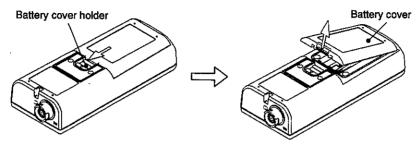


Attaching the hand strap

Model: CM-31P/CM-31P-W 4.2 Loading the batteries

4.2 Loading the batteries

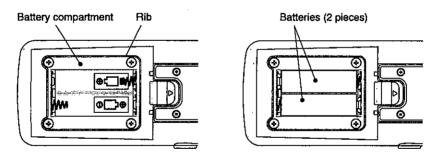
① Remove the battery cover ······ After sliding the battery cover holder in the arrow direction with your finger, remove the battery cover while pulling both ends of the battery cover with your fingers.



Removing the battery cover

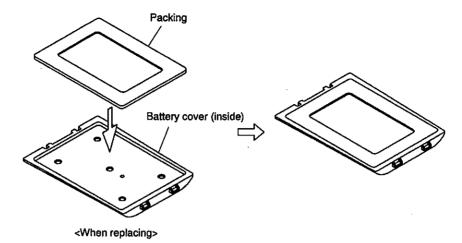
- 2 Load the batteries After checking the battery loading direction of the battery compartment, load AA size alkali dry cell batteries (2 pieces) or AA size rechargeable nickel hydride batteries (2 pieces).
 - •When alkali dry cell batteries are used, the battery drive time is about 600 hours. (The drive time may be different depending on the battery capacity, usage environment, etc.)
 - See 8.3 "Battery replacement period" for the battery replacement period.

[IMPORTANT] • When loading the batteries, be sure that the "+" and "-" polarities are correct.



Loading the batteries

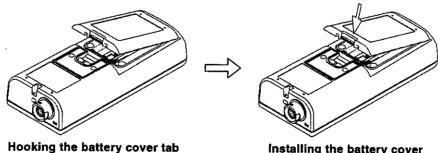
3 Check the packing Verify that the packing is properly installed to the battery cover (inside).



Checking the packing

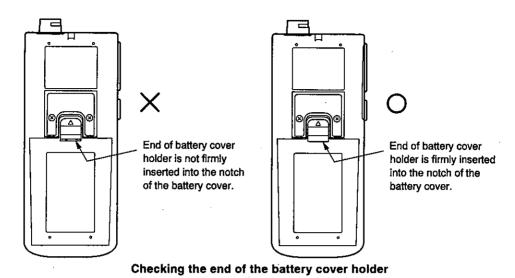
- [IMPORTANT] When installing the battery cover, confirm that the packing and the rib (part which seals the packing) are not scratched, deteriorated or dusty.
 - If the packing is scratched, cracked, or otherwise deteriorated, always replace it with new packing. (> 11 "Parts/Options list") In addition, if the packing and rib are dusty, clean up them. In each case, the waterproofing function cannot be guaranteed if used as is.
 - . When replacing the packing, refer to the figure shown above and confirm that the packing is installed properly. If the packing is separated from the battery cover, re-install it properly.

@Install the battery cover Hook the tab of the battery cover to the body and install the cover to the body by pushing it in the arrow direction. At this time, confirm that the end of the battery cover holder is firmly inserted into the notch of the battery cover. If it is not firmly inserted, push the battery cover against the instrument body.



Installing the battery cover

Model: CM-31P/CM-31P-W



Electric conductivity cell connection

N WARNING

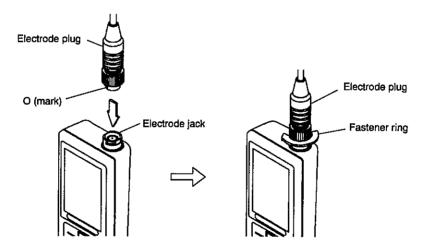
Fire and electric shock

 Always verify that the power is off before connecting or disconnecting the electric conductivity cell plug. AC adapter cover, or input/output cover. Water or reagent entering the product may short the circuits and cause electric shock or fire.

⚠ CAUTION

Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.
- ①Confirm that the power is off Confirm that the instrument power is off.
- Insert the electrode plug Hold the electrode plug so that the "O" mark at the end of the plug is facing the front of the instrument and insert the plug straight into the electrode jack.



3 Fasten the electrode plug Fasten the electrode plug by turning the fastener ring only. At this time, do not turn the plug body.

[IMPORTANT] • If the plug body is turned or moved back and forth when removing and installing the electrode plug, the pins and connector may be damaged. Pull it straight out or push it straight in.

4.4 Electric conductivity cell check

Model: CM-31P/CM-31P-W

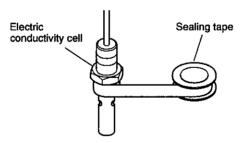
There are no special electric conductivity cell preparations before calibration and measurement. However, check if the surface of the electrode is dirty (metal section) or that the outer tube is not loose.

8.2 "Electric conductivity cell maintenance"

4.5 Flow cell installation

When using an electric conductivity cell for pure water (CT-27111D) with the Model CM-31P-W, before installing the flow cell, check if the surface of the conductivity cell is dirty or the outer tube is not loose. Then install the flow cell as shown in the following figure.

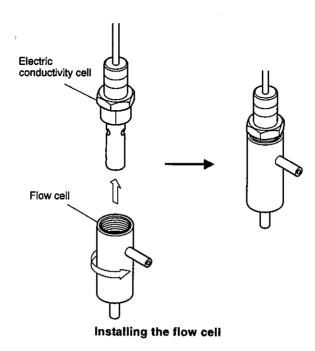
①Wrap with sealing tape ····· Wrap the threaded part of the electric conductivity cell with sealing tape.



Wrapping threaded part with sealing tape

②Install the flow cell Install the flow cell to the electric conductivity cell as shown in the following figure.

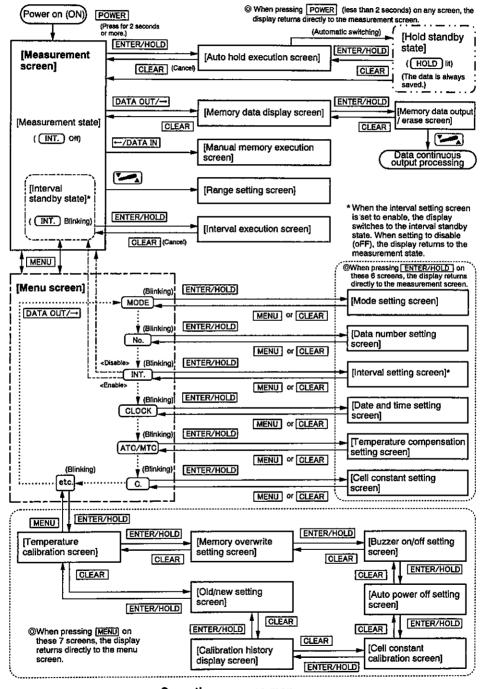
Model: CM-31P/ CM-31P-W 4.5 Flow cell installation



②Perform the piping ······ Perform the sample water inlet/outlet piping.

5. Basic Operation

5.1 Operation screens map



Operation screens map

Model: CM-31P/CM-31P-W 5.2 Turning on the power

5.2 Turning on the power

Press POWER for 2 seconds or more (until you hear a beep).

• The instrument power is turned on, the measurement screen is displayed and the instrument enters the measurement state (INT.) off)



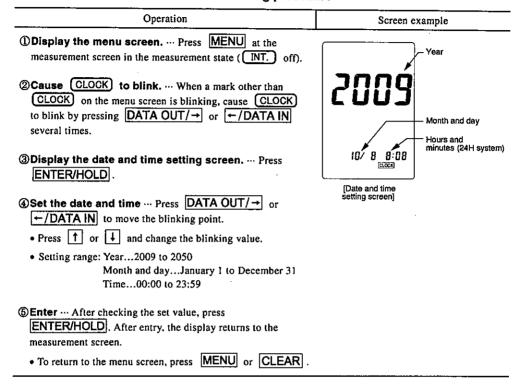
(Electric conductivity mode)

Power on screen (example)

5.3 Time setting

Set the current time in accordance with the following procedure.

Time setting procedure



5.4 Electric conductivity measurement

- (a) Since the electric conductivity cell combined with this meter is the built-in memory type, when connected to the meter the cell constant is automatically read.
- (b) In normal measurement, set temperature compensation to ATC (Automatic Temperature Compensation) and the temperature coefficient to 2.00%/ °C. 6.6 "Temperature compensation and temperature coefficient setting" (However, when using for the first time, these changes are unnecessary because they become these values as the initial value.)
- (c) When using an electric conductivity cell for pure water (CT-27111D) with the Model CM-31P-W, in normal measurement set to automatic temperature compensation for pure water (ATC P.W.). 6.6 "Temperature compensation and temperature coefficient setting"

(1) Measurement in beaker work

- ①Set to electric conductivity mode Check that the units are set to the electric conductivity mode (S/m lit) at the measurement screen in the measurement state (INT.) off).
 - If not in the electric conductivity mode, set to this mode. (6.1 "Mode switching setting")



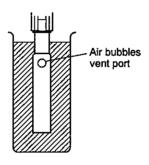
Measurement screen of electric conductivity mode

② Clean the cell Clean the electric conductivity cell with pure water and wipe off the water drops with tissue paper, etc.



Cleaning the tip of the electric conductivity cell

3 immerse the cell into the sample After pouring the sample into a beaker, immerse the cell up to the air bubbles vent port of the cell outer tube and move it up and down 2 or 3 times.



Immersing the cell into the sample

(4) Check the measured value When the displayed value stabilizes at the measurement screen in the measurement state (INT.) off), read the display.

[IMPORTANT] • During measurement, set the instrument at a stable location or hold it securely with your hands so that it will not move. If the instrument is moved during measurement, the measured value may become unstable.



(2) Immersion measurement

For waterproof type, measurement can be made by immersing directly at the measurement point.

WARNING

Tumbling

 When working at the measurement point, take tumbling prevention measures such as a safety belt, etc. In addition, to prevent injury, wear a helmet, life jacket, safety boots, etc.

CAUTION

Mixing in

- Do not drop the instrument body into the measurement tank. Doing so may cause trouble.
- ①Set to electric conductivity mode ····· Check that the units are set to the electric conductivity mode (S/m lit) at the measurement screen in the measurement state (INT.) off).
 - If not in the electric conductivity mode, set to this mode. (6.1 "Mode switching setting")



Measurement screen of electric conductivity mode

Clean the cell ····· Clean the electric conductivity cell with pure water and wipe off the water drops with tissue paper, etc.



Cleaning the tip of the electric conductivity cell

- 3 Immerse the cell into the sample Immerse the cell into the sample at the measurement point.
- **The Check the measured value** When the displayed value stabilizes at the measurement screen in the measurement state (INT.) off), read the display.
- During measurement, set the instrument at a stable location or hold it securely with your hands so that it will not move.

 If the instrument is moved during measurement, the measured value may become unstable.



⑤Clean the cell Clean amply the electric conductivity cell and the immersed part such as the cable with pure water and wipe off the water drops with tissue paper, etc.

(3) Pure water measurement

Pure water can be measured by using a conductivity cell for pure water.

- [IMPORTANT] Check that the flow cell mounting part of the electric conductivity cell is not loose and that piping parts of the flow cell, etc. are connected properly.
 - Check that the piping from the sample water outlet of flow cell is supplied to the drain.
 - In pure water measurement, set temperature compensation to automatic temperature compensation for pure water "ATC P.W." (pure water use). 6.6 "Temperature compensation and temperature coefficient setting"
 - In normal measurement, set to "ATC P.W.".
- 1) Set to electric conductivity mode Check that the units are set to the electric conductivity mode (S/m lit) at the measurement screen in the measurement state (INT.) off).
 - If not in the electric conductivity mode, set to this mode. (6.1 "Mode switching setting")
- @Flow sample water to the flow cell After checking the piping, flow sample water to the flow cell.

- [IMPORTANT] At this time, be sure that bubbles are not generated. A sudden temperature rise or excessive flow causes generation of bubbles. (Optimum flow rate range: 1 to 10L/min)
- 3 Check the measured value When the displayed value stabilizes at the measurement screen in the measurement state (INT.) off), read the display.

[IMPORTANT] • During measurement, set the instrument at a stable location or hold it securely with your hands so that it will not move. If the instrument is moved during measurement, the measured value may become unstable.



Stop the sample flow After reading the measured value, stop the sample water flow.

5.5 Electric resistivity measurement

Model: CM-31P/CM-31P-W

- (a) Since the electric conductivity cell combined with this meter is the built-in memory type, when connected to the meter the cell constant is automatically read.
- (b) In normal measurement, set temperature compensation to ATC (Automatic Temperature Compensation) and the temperature coefficient to 2.00%/°C. 6.6 "Temperature compensation and temperature coefficient setting" (However, when using for the first time, these changes are unnecessary because they become these values as the initial value.)
- (c) When using an electric conductivity cell for pure water (CT-27111D) with the Model CM-31P-W, in normal measurement set to automatic temperature compensation for pure water (ATC P.W.). 6.6 "Temperature compensation and temperature coefficient setting"
- (d)Perform electrical resistivity measurement by referring to "5.4 Electric conductivity measurement". Before making any measurements, set the units to the electrical resistivity mode (Ω •m lit). (\bigcirc 6.1 "Mode switching setting")

5.6 NaCl conversion value measurement

- (a) Since the electric conductivity cell combined with this meter is the built-in memory type, when connected to the meter the cell constant is automatically read.
- (b) In normal measurement, set temperature compensation to ATC (Automatic Temperature Compensation) and the temperature coefficient to 2.00%/ °C. 6.6 "Temperature compensation and temperature coefficient setting" (However, when using for the first time, these changes are unnecessary because they become these values as the initial value.)
- (c) When using an electric conductivity cell for pure water (CT-27111D) with the Model CM-31P-W, in normal measurement set to automatic temperature compensation for pure water (ATC P.W.). 6.6 "Temperature compensation and temperature coefficient setting"
- (d)Perform NaCl conversion value measurement by referring to "5.4 Electric conductivity measurement". Before making any measurements, set the units to the NaCl conversion value mode (% lit). (> 6.1 "Mode switching setting")

Model: CM-31P/ CM-31P-W 5.7 Ending measurement

5.7 Ending measurement

(1) Cell for general

- **Turn off the power** Press **POWER** for 2 seconds or more (until you hear a beep). The instrument power is turned off (OFF).
- Clean the tip of the electric conductivity cell Clean the tip of the electric conductivity cell with pure water and wipe off the water drops with tissue paper, etc.



Cleaning the tip of electric conductivity cell

3)Store the cell For the cell for general, after cleaning, store it in dry condition.

(2) Cell for pure water

- **Turn off the power** Press POWER for 2 seconds or more (until you hear a beep). The instrument power is turned off (OFF).
- 2Store the cell Store the cell with the flow cell filled with the sample water.
 - When 200μS/m or more sample was measured, flow pure water to the flow cell, clean the cell as
 described in "②, ③" of 5.7(1) "Cell for General" and then store the cell.
 - When the instrument will not be used for a long time (2 weeks or more), remove the flow cell from the electric conductivity cell, clean the cell as described in "②, ③" of 5.7(1) "Cell for General" and then store the cell.

6. How to Use Various Functions

6.1 Mode switching setting

The instrument can be switched to the electric conductivity mode (S/m), electric resistivity mode $(\Omega \cdot m)$ or NaCl conversion value mode (%), depending on the measurement unit.

Mode switching procedure

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT. off).	
②Cause MODE to blink When a mark other than MODE on the menu screen is blinking, cause MODE to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the mode setting screen. ··· Press ENTER/HOLD.	NaCi
(4) Select the mode. ··· Press ↑ or ↓ and switch blinking of the S/m, Ω•m, or NaCl mark.	-\$/./-
 Setting range: S/mElectric conductivity mode Ω•mElectric resistivity mode 	ά·m·
NaClNaCl conversion value mode	
(5) Return to the original screen After confirming that the display mark of the mode you want to switch is blinking, press ENTER/HOLD. After entry, the display returns to the original measurement screen.	[Mode setting screen]
To return to the menu screen, press MENU or CLEAR.	

Auto hold function 6.2

- (a) The auto hold function automatically judges that measurement is stable and holds the measured value and switches to the hold standby state. At this time the measured value is automatically stored.
- (b) Depending on the sample to be measured, it may not be possible to use this function.

(1) Memory execution by auto hold

The measured value is automatically stored by using the auto hold function to measure the electric conductivity, electric resistivity or NaCl conversion value.

Memory execution procedure by auto hold

Operation Screen example

- (i) Prepare the electric conductivity cell. ... Confirm that the electric conductivity cell is properly immersed in the sample.
- 2 Switch to the measurement state. ... Confirm that the measurement screen is being displayed in the measurement state ([INT.]off).
 - If the power is off (OFF), press POWER for 2 seconds or more and the measurement screen will be displayed.

③Start stability check. · · · Press ENTER/HOLD.

- HOLD blinks and the auto hold execution screen appears.
- When you want to stop the stability check, press |CLEAR| while HOLD is blinking. At this time, the display returns to the original measurement screen without saving the measured value.
- **4** End of stability check ... When the measured value is stabilized, a buzzer sounds and (HOLD) lights.
 - The measured value is held and the instrument automatically switches to the hold standby state.
 - · At this time, the measured value is automatically stored and the data number is incremented by 1.

[IMPORTANT] • When HOLD does not light even after several minutes or more have elapsed, since the measured value is unstable, cancel the hold standby state by pressing CLEAR and inspect the electric conductivity cell and instrument.

> [NOTE] • Stability check standard: ±5 digits /10 seconds



[Auto hold execution screen]

Operation	Screen example
(5) When repeating When you want to measure another sample by auto hold function, press ENTER/HOLD.	
(BReturn to the original screen Press CLEAR in the hold standby state (HOLD) lit).	
 The hold standby state is canceled and the display returns to the original measurement screen. 	

6.3 Data memory function

- (a) With the data memory function, the data number to store up to 1000 measured values can be set. In addition, the stored data can be individually recalled.
- (b)Before the start of measurement, set the data number of the measured value storage destination.
- (c) When the stored data exceeded No. 1000, whether or not the data is to be overwritten must be set.

 6.9 "Memory overwrite on/off setting"

(1) Data number setting

Use the data memory function to set the start data number of the measured value storage destination.

[NOTE] • Data number signifies the cell number for storing data.

Data number setting procedure

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT.) off).	
②Cause No. to blink When a mark other than No. on the menu screen is blinking, cause No. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the data number setting screen. ··· Press ENTER/HOLD.	No. 0 0 0 1
 ◆Set the data number The value of the 1st digit of the data number blinks. Set the start data number of storage destination. • Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. • Change the blinking value by pressing ↑ or ↓. 	
• Setting range: 1 to 1000 (Factory setting: 1)	Ma.
(5) Return to the original screen Check the set value, and press ENTER/HOLD. After entry, the display returns to the original measurement screen. • To return to the menu screen, press MENU or CLEAR.	[Data number setting screen]

(2) Memory execution by manual key

Each time the \(\frac{-/DATA \text{IN}}{\text{DATA IN}}\) key is pressed, the current measured value of the electric conductivity, electric resistivity, or NaCl conversion value can be stored.

Memory execution procedure by manual key

Operation

Screen example

- Prepare the electric conductivity cell. ... Confirm that the electric conductivity cell is properly immersed in the sample.
- Select the mode. ... Set the instrument to the electric conductivity mode (S/m), electric resistivity mode (Ω•m) or NaCl conversion value mode (%). (6.1 "Mode switching setting")
- ③ Switch to the measurement state. ... Confirm that the measurement screen is being displayed in the measurement state (INT. off).
 - If the power is off (OFF), press POWER for 2 seconds or more and the measurement screen will be displayed.
- Wait for the measured value to stabilize. ... Confirm that the displayed measured value is stable.

⑤Store the data. ··· Press ←/DATA IN.

- The current measured value is stored and the data number display is incremented by 1.
- After storage processing, the measurement state continues.



(Electric conductivity mode) [Measurement screen]



(Electric resistivity mode)



(NaCl conversion value mode) [Measurement screen]

(3) Memory data recall

- (a) With the data memory function the stored measured value of each data number can be recalled and displayed on the screen.
- (b) The stored data can also be erased.

Memory data recall procedure

Operation

Screen example

Display the memory data display screen. ... Press

DATA OUT/-> at the measurement screen in the measurement state (INT. off).

Recall the data number. ... The value of the 1st digit of the data number blinks. Set the data number you want to recall.

Move the blinking digit by pressing DATA OUT/-> or

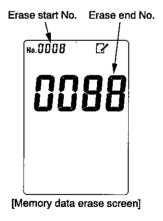
-/DATA IN.

Change the blinking value by pressing 1 or 1.

Memory data display screen

- 3 Check the memory data. ... The measured value, temperature, data and time corresponding to the data number recalled at step 2 are displayed.
- - When the displayed data is erased, the entire display except the current data number is cleared.
 - When not erasing, go directly to step 6.
- **Erasing arbitrary memory data.** ... Switch from the memory data display screen to the memory data erase screen by pressing ENTER/HOLD.
 - Refer to step ② and set the erase start No. and erase end No.
 and press CLEAR for 2 seconds or more.

® Return to the original screen. --- Press CLEAR .



Model: CM-31P/CM-31P-W 6.4 Interval function

6.4 Interval function

When the interval function is enabled, the instrument enters the interval standby state and memory using interval can be executed. The measured value is automatically stored at each set time.

(NOTE) • In the interval standby state (INT.) blinking), memory execution using auto hold. memory execution by manual key, or pH calibration cannot be performed.

(1) Interval function and time settings

- (a) The interval function can be enabled and disabled. When enabled, there are 2 kinds of interval functions; short interval function and long interval function according to the length of the set time.
 - The short interval function stores the measured value in real-time while displaying the measurement screen. (Setting range: 1 second to 99minutes 59 seconds). However, the buzzer is turned OFF for settings of 4 seconds or less.
 - The long interval function automatically turns off the screen about 2 seconds after data storage to conserve power during the interval period. One minute before the set time, the screen is automatically turned on (displayed) and the measured value is stored in real-time. (Setting range: 2 minutes to 99 hours 59 minutes)

- [IMPORTANT] When the long interval function is enabled, the screen is automatically turned off in accordance with the above, but it is not an abnormality.
 - . During automatic off, the screen can be turned on (displayed) by pressing POWER for 2 seconds or more. When POWER is pressed again for 2 seconds or more, the screen is turned off, but the interval operation is continued.
- (b) When this function is enabled, set the interval time.

Interval function and time setting procedure

Operation	Screen example
①Display the menu screen Press MENU at the measurement screen in the measurement state (INT.) off).	off
②Cause INT. to blink When a mark other than INT. on the menu screen is blinking, cause INT. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	int.
③Display the interval setting screen. ··· Press ENTER/HOLD.	INT.
Select the interval function.	OFF [Interval setting screen]
 Setting range: oFF (disable) (Factory setting: OFF) Shrt (enable, short interval) Long (enable, long interval) 	

(To be continued)

Operation

Screen example

(5) Set the interval time. ... When the interval function was enabled at step ④, change the blinking number and set the interval time by pressing DATA OUT/→ or ←/DATA IN.

Setting range: Short interval --- 1 second to 99 minutes 59 seconds

(Factory setting: 5 seconds)

Long interval ··· 2 minutes to 99 hours 59

minutes

(Factory setting: 10 minutes)

® Return to the original screen. ... Confirm the set value and press ENTER/HOLD. After entry, the display returns to the measurement screen in the interval standby state (INT.) blinking).

• To return to the menu screen, press MENU or CLEAR .



Short interval



Long interval [Interval setting screen]

(2) Memory execution by interval

By enabling the interval function, the measurement of the electric conductivity, electric resistivity or NaCl conversion value is performed at the set interval time and the measured data is automatically stored.

(a) Interval memory start

Interval memory start procedure

Operation	Screen example
①Prepare the electric conductivity cell. ··· Confirm tha	t
the electric conductivity cell is properly immersed in the	
sample.	

(To be continued)

Operation

- ②Set the mode. ... Set the instrument to the electric conductivity mode (S/m), electric resistivity mode (Ω •m) or NaCl conversion value mode (%).(\longrightarrow 6.1 "Mode switching setting")
- **3** Switch to the interval standby state. ... Perform steps ① to ⑤ of 6.4(1) "Interval function and time settings".
 - Confirm that the measurement screen is displayed in the interval standby state (INT.) blinking).

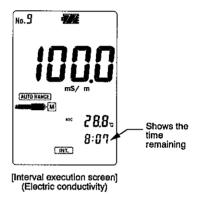


Screen example

[interval standby screen]

(Switch to the interval execution screen. ••• Press **ENTER/HOLD** .

- INT. lights, the time remaining up to automatic memory is displayed, and the interval function starts. The measured value at start is stored.
- When to r is pressed, the remaining time and normal clock display at the time display section are switched.
- Second Memory execution by interval ... The measured value is automatically stored and the data number is incremented by I at each set time interval.
- **®Repeat** ··· Memory execution at the set time interval is repeated as long as interval memory is not stopped or canceled.
- When you want to stop or clear memory execution ...
 Perform 6.4(2)(b) "Interval memory stop" or 6.4(2)(c)
 "Interval function cancel".



(b) Interval memory stop

Interval memory stop procedure

Operation Screen example Ostop interval execution. ... Press CLEAR during interval memory execution. The display returns to the measurement screen in the interval standby state (INT.) blinking) and memory execution stops. At this time, the interval remaining time is reset and returns to the set time.

(c) Interval function cancel

The short interval function is also canceled by turning off the power by pressing POWER for 2 seconds or more besides the operations shown in the table below.

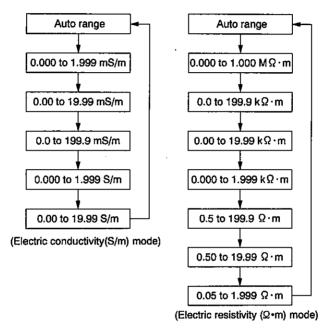
Interval function cancel procedure

Operation	Screen example
① Display the menu screen Confirm that the measurement screen is displayed in the interval standby state (INT. blinking) and press MENU.	
②Cause INT. to blink When a mark other than INT. on the menu screen is blinking, cause INT. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the interval setting screen. ··· Press ENTER/HOLD.	
④Turn off the interval function. Set the interval function to disable (oFF) by pressing ↑ or ↓.	oFF
 Setting range: oFF (disable) (Factory setting: OFF) 	
Shrt (enable, short interval)	!ab
Long (enable, long interval)	
(5) Return to the original screen Confirm the set value and press ENTER/HOLD. After entry, the display returns to the measurement screen in the measurement state (INT.)	
off).	INT.
• To return to the menu screen, press MENU or CLEAR.	OFF
	[Interval setting screen]
	

6.5 Range switching setting

(a) There are two range switching settings, Auto Range and Manual Range. In addition, the measured range differs depending on whether the in the electrical conductivity (S/m) mode or the electrical resistivity ($\Omega \cdot m$) mode.

- (b) When in the Auto Range, if the measured value exceeds the upper limit of the current measurement range, the unit will automatically switch to the next higher range. Conversely, if the measured value is below the lower limit of the measurement range, the unit will automatically switch to the next lower range.
- (c) Each time is pressed, the measurement range is changed in the order shown below.



Measurement range switching order

(d) When switching from Auto Range to Manual Range, press [...].



(e) When switching from Manual Range to Auto Range, press for 2 seconds or more. In addition, when measurement range switching is cycled once by pressing [several times at Manual Range, the unit switches to Auto Range.

[IMPORTANT] • The range cannot be changed for the NaCl conversion mode. Please set the ranges in advance for the electrical conductivity mode and the electrical resistivity mode.

Measurement range switching procedure

Operation

Screen example

- Switch to the measurement state. ... Confirm that the measurement screen is being displayed in the measurement state (INT.) off).
 - If the power is off (OFF), press POWER for 2 seconds or more and the measurement screen will be displayed.
- ②Select the mode. ... Set the instrument to the electric conductivity mode (S/m), or electric resistivity mode (Ω•m).
 (6.1 "Mode switching setting")
- ③ Check the measurement range. ... Check AUTO RANGE lighting status.
 - Auto Range: AUTO RANGE lights
 - Manual Range: AUTO RANGE goes off
- When switching from Auto Range to Manual Range ...

 Press Quest off.
- (5) When switching from Manual Range to Auto Range ...

 Press AUTO RANGE lights.
 - Alternatively, press several times until range switching at Manual Range cycles once.
- Select the measurement range in Manual range.
 Check the measurement range in current Manual Range by decimal point position or unit display on main display.
 - Select the suitable measurement range by pressing

Table "Measurement range switching order"



(Auto range)



(Manual range)
[Measurement screen]

6.6 Temperature compensation and temperature coefficient setting

- (a) Set to manual temperature compensation (MTC) to conduct measurements when performing measurements by using a constant temperature oven or other device with a sample at a constant temperature or when performing measures as an emergency procedure while there is a problem with the temperature sensor.
- (b)Set the manual temperature compensation (MTC) temperature by entering the sample temperature measured with a thermometer, etc. In addition, make the same setting when measuring a pure water range sample.
- (c) When performing compensation (25°C conversion), the temperature coefficient can be set by automatic temperature compensation (ATC). Then, temperature and temperature coefficient can be set at the same time by manual temperature compensation (MTC). As shown in the following table, there are 5 types of setting screens depending on the measurement application.

Temperature compensation type and setting screen

Measurement application	Setting item and contents	Setting screen name	Display Mark (lit)
For normal measurement	· Automatic temperature compensation (ATC)	[Automatic temperature compensation setting screen]	ATC
	Temperature coefficient		
	·Manual temperature compensation (MTC)	[Manual temperature compensation setting screen]	мтс
	·Temperature / Temperature coefficient		
For pure water measurement	· Automatic temperature compensation (ATC)	[Automatic temperature compensation setting screen (for pure water)]	P.W., ATC
	Manual temperature compensation (MTC) Temperature	[Manual temperature compensation setting screen (for pure water)]	P.W., MTC
For precise measurement	·No temperature compensation	[Temperature compensation off setting screen]	ATC, OFF

(d) For samples consisting of multiple compounds, set to no temperature compensation or set the temperature coefficient to "0%/°C" and measure the electrical conductivity at each temperature using a constant temperature oven or other device to find the sample temperature characteristics (temperature coefficient) to conduct rigorous measurement. However, for general measurement, set to "2%/°C" (factory setting: 2%/°C).

Temperature compensation and temperature coefficient setting procedure

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT. off).	

(To be continued)

Operation Screen example

② Cause ATC/MTC to blink. ... When a mark other than

ATC/MTC on the menu screen is blinking, cause

ATC/MTC to blink by pressing DATA OUT/--> or

--/DATA IN several times.

- 3 Display the temperature compensation setting screen. ... Press ENTER/HOLD.
- - Setting range: [Automatic temperature compensation setting screen]
 [Manual temperature compensation setting screen]

[Automatic temperature compensation setting screen (for pure water)]

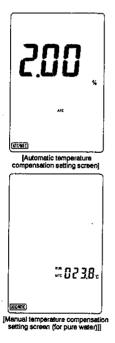
[Manual temperature compensation setting screen (for pure water)]

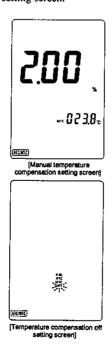
[Temperature compensation off setting screen]

Confirm the set value and press DATA OUT/→. Go to one
of the steps ⑤ to ⑨ by the selected setting screen.



[Temperature compensation setting screen]







(To be continued)

Operation	Screen example
When selecting [Automatic temperature	
compensation setting screen] ··· ATC lights. Enter the	
temperature coefficient (blinking) on the main display.	
 Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. 	•
 Change the blinking value by pressing or . 	
• Setting range: 0.00 to 9.99% (Factory setting: 2.00%)	
♦ After setting, go to [®] .	
When selecting [Manual temperature compensation	
setting screen] ··· MTC lights. Enter the temperature coefficient (blinking) on the main display.	
 Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. 	
• Change the blinking value by pressing 1 or 1.	
• Setting range: 0.00 to 9.99%	
After setting temperature coefficient, enter the temperature (blinking) on the temperature display in the same way above.	
• Setting range: 0.0 to 100.0°C	•
• After setting, go to .	
OWhen selecting [Automatic temperature compensation setting screen (for pure water)] ··· ATC and P.W. blink.	
• After checking, go to 10.	
When selecting [Manual temperature compensation	
setting screen (for pure water)] MTC and P.W. blink.	
Enter the temperature coefficient (blinking) on the temperature display.	
 Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. 	
• Change the blinking value by pressing 1 or 1.	
• Setting range: 0.0 to 100.0°C	
• After setting, go to .	
When selecting [Temperature compensation off setting screen] ··· OFF blinks.	
• After setting, go to .	
Return to the original screen Confirm the set value	
and press ENTER/HOLD. After entry, the display returns to the original measurement screen.	
• To return to the menu screen, press MENU or CLEAR.	

Model: CM-31P/CM-31P-W 6.7 Cell constant setting

6.7 Cell constant setting

(a) For cells with built-in memory, the cell constant, which is the intrinsic value of the cell, is measured at the factory and this value is stored by the cell. There is normally no need, therefore, to set the cell constant when measuring.

(b) For cells without built-in memory, the cell constant cannot be stored by the cell. Set the cell constant in the instrument main body according to the following procedure.

Cell constant setting calibration

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT. off).	
②Cause C. to blink When a mark other than C. on the menu screen is blinking, cause C. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the cell constant setting screen. ··· Press ENTER/HOLD.	
(Change the decimal point position (When Cal-memo is not provided) Move the decimal point to press	25 0.8
⑤Set the cell constant. The current set value is displayed.	
 Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. 	
 Change the blinking value by pressing	[Cell constant setting screen]
• Setting range: 0.500 to 5.000, 5.00 to 50.00, 50.0 to 500.0 500 to 5000	
6When returning to the factory set value ··· To return the cell constant to factory set value, press CLEAR for 2 seconds or more on the cell constant setting screen.	
 Return to the original screen After checking the set value, press for 2 seconds or more. After entry, the display returns to the original measurement screen. To return to the menu screen, press CLEAR or MENU. 	

6.8 Temperature calibration function

- (a) When performing precise measurement, temperature calibration (1-point calibration) can be performed by matching the temperature measured with another standard thermometer to compensate for the temperature error of the electric conductivity cell.
- (b) This function does not have to be used in normal measurements.

(1) Temperature calibration execution

Execution and cancel procedure for temperature calibration

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT. off).	
②Cause etc. to blink When a mark other than etc. on the menu screen is blinking, cause etc. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the temperature calibration screen. ··· Press ENTER/HOLD once.	OFF
♦ Select temperature calibration on/off. ··· Select ON/OFF by pressing ↑ or ↓.	
• Setting range: ONTemperature calibration execution mode (Factory setting: OFF)	**************************************
OFFTemperature calibration cancellation mode	548°
 The current calibration temperature is displayed on the main display. 	etc.
• When OFF was selected, go to step (6).	(Temperature calibration cancellation mode)
⑤Set the calibration temperature When ON was	an
selected at step $\textcircled{4}$, set the calibration temperature (standard temperature).	025.0
 Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. 	UL J.U
 Change the blinking value by pressing or . 	
 Setting range: 0.0 to 100.0°C 	E 70°
(However, within current temperature ±5.0°C)	etc.
(Factory setting: 25.0°C)	(Temperature calibration
® Perform (or cancel) temperature calibration,	execution mode)
Press .	[Temperature calibration screen]
 When ON is displayed, temperature calibration is performed. 	
 When OFF is displayed, temperature calibration is canceled. 	•

(To be continued)

Operation	Screen example
Return to the original screen After the end of	
temperature calibration, press (less than 2 seconds).	
The display returns to the original measurement screen.	
When performing the temperature calibration, underline is	
displayed at the temperature value on the temperature	
display.	

6.9 Memory overwrite on/off setting

- (a) When the measured value data No. exceeds 1000 can be set, whether or not the data No. is returned to 1 and the data is overwritten can be set.
- (b) When set to overwrite (ON), the old data is erased. Conversely, when set to do not overwrite (OFF), when storage exceeding data No. 1000 was attempted, "Error 02" is displayed.

Memory overwrite on/off setting procedure

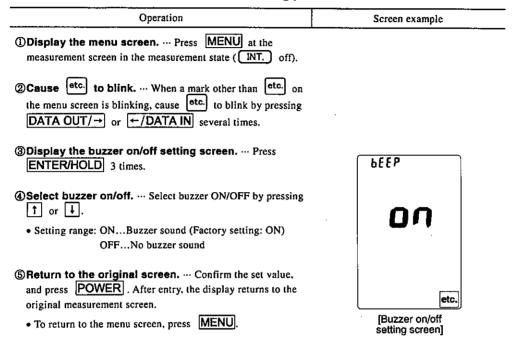
Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT. off).	
②Cause etc. to blink When a mark other than etc. on the menu screen is blinking, cause etc. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the memory overwrite on/off setting screen Press ENTER/HOLD twice.	Loop Z
 ◆Select memory overwrite on/off. ··· Select ON/OFF by pressing ↑ or ↓. • Setting range: ONOverwrite (Factory setting: ON) OFFDo not overwrite 	חם
 Return to the original screen Confirm the set value, and press POWER. After entry, the display returns to the original measurement screen. To return to the menu screen, press MENU. 	[Memory overwrite on/off setting screen]

Model: CM-31P/CM-31P-W 6.10 Buzzer on/off setting

6.10 Buzzer on/off setting

The operating sound, operation end sound, and other sounds can be turned on and off.

Buzzer on/off setting procedure



6.11 Auto power off setting

- (a) The auto power off function automatically turns off the power when a key operation was not performed within the set time (10/20/30/60 minutes).
- (b) This function is disabled during memory execution by interval at the interval execution screen.
- (c) This function is also disabled when an AC adapter, RS-232C connection cable, analog output cable, or external printer connection cable was connected.

Auto power off setting procedure

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT.) off).	
②Cause etc. to blink When a mark other than etc. on the menu screen is blinking, cause etc. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the auto power off setting screen. ··· Press ENTER/HOLD 4 times.	Roff
◆Select auto power off, etc. ··· Select an auto power off state by pressing ↑ or .	oFF
• Setting range: OFF (disabled), 10, 20, 30, 60 minutes (Factory setting: 30 minutes)	
Return to the original screen. Confirm the set value, and press POWER. After entry, the display returns to the	etc.
original measurement screen. To return to the menu screen, press MENU.	[Auto power off setting screen]

Model: CM-31P/CM-31P-W 6.12 Cell constant calibration

6.12 Cell constant calibration

- (a) Since the surface of the cell gets dirty by measurement and cell constant may be changed, check the cell constant and perform the calibration for cell constant periodically.
- (b) The cell constant calibration is used when connecting to a cell with built-in memory in which is stored the cell constant (factory set value). This cannot be used when the cell does not have built-in memory.

[IMPORTANT] • When calibrating the cell constant, use a constant temperature oven or similar device and always make sure the solution temperature is 25°C.

(1) Potassium Chloride Calibration Solution Adjustment

(a) Types of calibration solution

(a) As shown in the table below, the calibration solution type differs depending on the electrical conductivity cell model (cell constant) with which this product is combined. Prepare the corresponding calibration solution and calibrate the cell constant.

Cell Constant (Electrical Conductivity Cell Model Name)	Types of Calibration Solution
10000m ⁻¹	A (74.246g/L)
1000m ⁻¹ (CT-27112B(Standard), CT-57101A)	B (7.437g/L)
100m ⁻¹ (CT-57101B)	C (0.744g/L)
10m ⁻¹ (CT-57101C)	D (10 times diluted solution of Standard Solution C)

(b) We offer separately "solution B for electric conductivity cell check" (0BI00002). Immerse the cell in the check solution and check if the electrical conductivity cell is normal.

[IMPORTANT] • This "solution B for electric conductivity cell check" can be used only for the check. This solution cannot be used for the calibration of cell constant.

(b) Preparation method of calibration solution

When calibrating the cell constant, the calibration solution of Potassium Chloride must be prepared accurately. Preparation methods of each calibration solution are described as follows:

- (1) Arrange the reagents and tools. Arrange the following reagents and tools for preparation.
 - Water: Chemical analysis water A2, A3 or A4 as prescribed by JIS K 0557
 - · Potassium chloride: Potassium chloride (for electric conductivity measurement) prescribed by JIS K8121, powdered by an agate mortar, heated at 500 °C for 4 hours and naturally cooled down in a desiccator
 - Volumetric Flask: Volumetric flask as prescribed by JIS R 3505
 - Volumetric Pipette: Volumetric pipette as prescribed by JIS R 3505

Adjust the calibration solution. The adjustment methods for calibration solutions A through D are given below. In addition, refer to the following table for the post-adjustment calibration solution electrical conductivity (theoretical values).

Potassium Chloride Calibration Solution Theoretical Electrical Conductivity

Calibration	Electrical conductivity
solution	(mS/m) 25°C
A	11134
В	1286
С	140.9
D	14.69

- Calibration solution A: Weigh 74.246 g of potassium chloride, dissolve it into water (20°C). displace it into the 1000 mL volumetric flask and fill the flask with water up to the mark.
- Calibration solution B Weigh 7.437 g of potassium chloride, dissolve it into water (20 °C), displace it into the 1000 mL volumetric flask and fill the flask with water up to the mark.
- Calibration solution C: Weigh 0.744 g of potassium chloride, dissolve it into water (20°C), displace it into the 1000 mL volumetric flask and fill the flask with water up to the mark.
- Calibration solution D: Take 100 mL of standard solution C with the volumetric pipette, displace it into the 1000 mL volumetric flask and fill the flask with water up to the mark.

- [IMPORTANT] Store calibration solutions A, B, and C sealed in polyethylene or hard glass bottles. However, the electrical conductivity of these solutions could change if they are stored for a long period of time, so avoid not using them for a long time.
 - The conductivity of Solution D could change even if only stored for a short time, so prepare it each time it is used.

(2) Cell Constant Calibration Procedure

When finished calibrating the cell constant, the calibrated value is overwritten on the cell constant in the memory of cells with built-in memory. Thereafter, this overwritten cell constant is read.

Cell constant calibration procedure

Operation	Screen example
①Adjust the calibration solution temperature Place a	
beaker containing potassium chloride calibration solution in	
constant temperature oven that can keep at 25 ± 0.1°C and	
wait until the temperature of the solution reaches the same	
temperature as the constant temperature oven.	

(To be continued)

Operation

Screen example

- ②Immerse the cell in the calibration solution. ... Immerse the electrical conductivity cell in the calibration solution at step ①.
 - Use a stirrer, etc., and take the measurement while stirring the calibration solution.
- ③ Display the menu screen. ··· Press MENU at the measurement screen in the measurement state (INT.) off).
- (Cause etc.) to blink. ... When a mark other than etc. on the menu screen is blinking, cause etc. to blink by pressing DATA OUT/→ or ←/DATA IN several times.
- **⑤Display the cell constant calibration screen.** ··· Press **ENTER/HOLD** 5 times.
- © Check the measurement value. ... The electrical conductivity measurement value is shown in the display in real time (In this measurement value, temperature compensation is not performed and the measurement value is presupposed to be 25°C.)
- Set the calibration solution electrical conductivity value. — Refer to "6.12(1) (b) Table "Potassium Chloride Calibration Solution Theoretical Electrical Conductivity" and set the electrical conductivity corresponding to the calibration solution being used.
 - Move the blinking digit by pressing DATA OUT/→ or
 ←/DATA IN.
 - Change the blinking value by pressing
 or

 linking value by pressing
 linking value by
 linking va
 - Setting range: 0 to 2000, 0.0 to 200.0, 0.00 to 20.00,

0.000 to 2.000

(Factory setting: Depends on the cell used)



[Cell constant calibration screen]



(Set the electric conductivity value of calibration solution)

(To be continued)

Operation

- Screen example
- When returning to the factory set value To return the cell constant to the factory set value, press CLEAR for 2 seconds or more. (Factory setting: Depends on the cell used)
 - •When it is not necessary, go to step @ without change.
- - A buzzer will sound and the post-calibration constant will be displayed.
- Return to the original screen. Confirm the cell constant, and press POWER (less than 2 seconds). The display returns to the original measurement screen.
 - To return to the menu screen, press MENU.



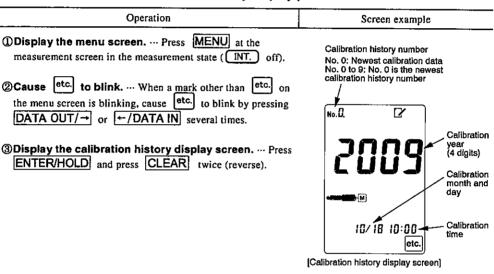
(Cell constant calibration ends)

6.13 Calibration history function

- (a) The calibration history function is effective only when the instrument is combined with the electric conductivity cell with built-in memory. When performing the calibration for cell constant, up to 10 calibration data can be stored in the electric conductivity cell itself.
- (b) With this function the calibration history of the electric conductivity cell can be checked by instrument key operation. This is an effective means of suitably managing the instrument.
- (c) History No. 0 is the newest calibration data and history No. 9 is the oldest data. When cell constant calibration exceeding 10 data was performed, the calibration data is entered in history No. 0. The calibration history data is sequentially moved down to the next history No. and the calibration data of the oldest history No. 9 is erased.

(1) Calibration history display

Calibration history display procedure



- (4) Check the newest calibration data. ... The newest calibration date and time are displayed. (Newest calibration data initial screen)
 - Each time DATA OUT/→ or ←/DATA IN is pressed. calibration date and time -> cell constant is displayed.
 - Switch the calibration history number by pressing | † | or
- 5 Return to the original screen. ... After checking the displayed data, press | POWER | (less than 2 seconds). The display returns to the original measurement screen.
 - To return to the menu screen, press | MENU|



(2) Calibration history printing

Refer to 7.2(1) "Printing of calibration history" for the printing contents.

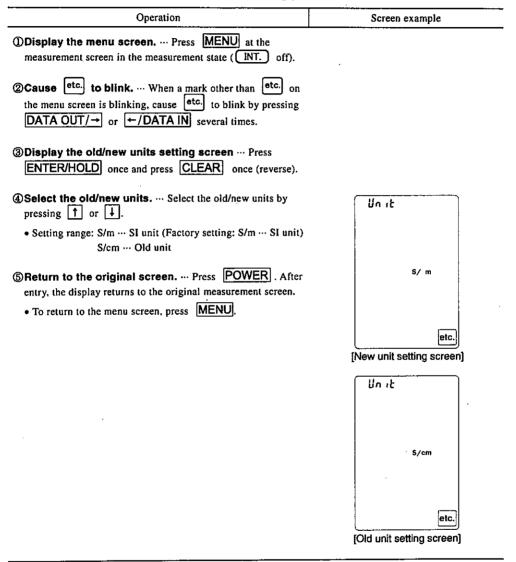
Calibration history printing procedure

Operation	Screen example
① Display the menu screen Press MENU at the measurement screen in the measurement state (INT. off).	
②Cause etc. to blink When a mark other than etc. on the menu screen is blinking, cause etc. to blink by pressing DATA OUT/→ or ←/DATA IN several times.	
③ Display the calibration history display screen ··· Press ENTER/HOLD and press CLEAR twice (reverse).	No.Q.
Select the calibration history data you want to print. Switch the calibration history number and display the data you want to print by pressing ↑ or ↓.	2009
⑤ Print ··· Press . The data displayed at step ④ is printed to an external printer (option).	10/18 10:00
 Return to the original screen After checking the printed data, press POWER (less than 2 seconds). The display returns to the original measurement screen. To return to the menu screen, press MENU. 	etc.

6.14 Old/new units setting

New unit (S/m) and old unit (S/cm) display for electric conductivity can be switched.

Old/new units setting procedure



7, **Functions by Optional Devices Connection**

7.1 Connection of optional devices

(a) AC adapter, external printer, analog output cable, and RS-232C connection cable can be connected as optional devices.

(b) Refer to the following for their connection method and functions.

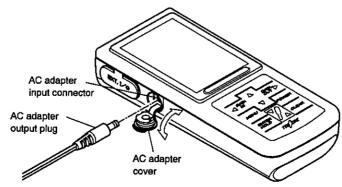
/N CAUTION

Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

(1) Connection of AC adapter

- [IMPORTANT] Always use our optional AC adapter. Never use an AC adapter other than
 - AC adapter is the 100VAC specifications. Therefore, transformer is always required. Please contact DKK-TOA or your sales representative.
- ①Confirm that the power is off Confirm that the instrument power is off.
- @Connect the output plug Remove the AC adapter cover of the instrument and connect the AC adapter (option) dedicated output plug to the AC adapter input connector.
- 3 Connect the AC adapter to an AC receptacle Connect the power side plug of the AC adapter (option) to an AC receptacle.
- **Turn on the power switch** Turn on the instrument power switch. The measurement screen in the measurement state (INT.) off) is displayed.

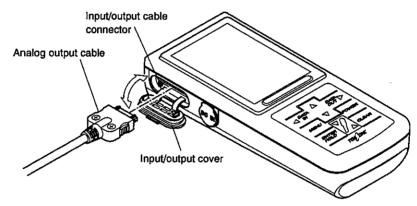


Connection of AC adapter

(2) Connection of analog output cable

(IMPORTANT) • Always use our optional analog output cable. Never use an analog output cable other than ours.

- (1) Confirm that the power is off Confirm that the instrument power is off.
- ② Connect the analog output cable Remove the instrument input/output cover and connect the connector of the analog output cable (option) to the input/output cable connector.
- **3** Connect a recorder, etc. Connect the arrow type pins (9) at the other end of the analog output cable (option) to the analog output terminal of a recorder, etc.
- Turn on the power switch Turn on the instrument power switch. The measurement screen in the measurement state (INT.) off) is displayed.



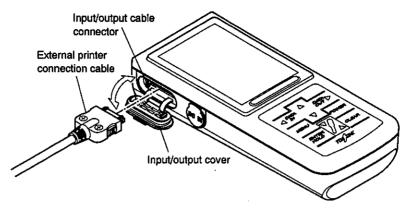
Connection of analog output cable

(3) Connection of external printer connection cable

The measurement results and calibration results can be printed on plain paper by connecting an external printer (option) to the instrument.

[IMPORTANT] • Always use our external printer connection cable. Never use an external printer connection cable other than ours

- (1) Confirm that the power is off Confirm that the instrument power is off.
- Connect the external printer connection cable Remove the instrument input/output cover and connect the connector of the external printer connection cable (option) to the input/output cable connector.
- ③ Connection to external printer and preparation Refer to the instruction manual supplied with the external printer and connect the connector (D-sub 25 pins) at the other end of the external printer connection cable to a printer. In addition, load the printer paper or make preparations up to operation start.
- **Turn on the power switch** Turn on the instrument power switch. The measurement screen in the measurement state (INT.) off) is displayed.



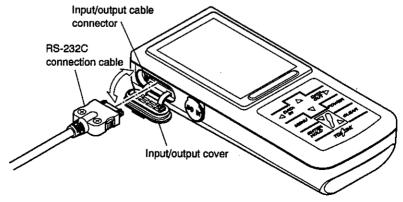
Connection of external printer connection cable

(4) Connection of RS-232C connection cable

- (a) The measured value and calibration value data can be fetched to a PC by connecting the RS-232C connection cable (option) to the instrument.
- (b) We offer GP-LOG-EN data collection software (option) for fetching the measured value data to a PC in CSV format. The data stored by this software can be used to create tables and graphs by using commercial spreadsheet software. (Please contact us for details.)

[IMPORTANT] • Always use our RS-232C connection cable. Never use an RS-232C connection cable other than ours.

- (1) Confirm that the power is off Confirm that the instrument power is off.
- Connect the RS-232C connection cable Remove the instrument input/output cover and connect the connector of the RS-232C connection cable (option) to the input/output cable connector.
- 3 Connect to the PC ····· Connect the connector (D-sub 9 pins) at the other end of the RS-232C connection cable (option) to the PC.
- Turn on the power switch Turn on the instrument power switch. The measurement screen in the measurement state (INT.) off) is displayed.

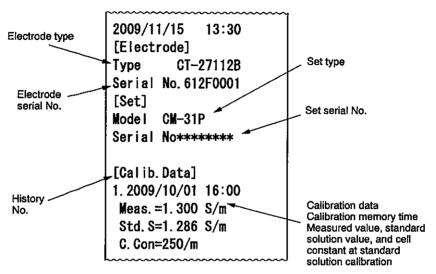


Connection of RS-232C connection cable

7.2 Printing function by external printer

When an external printer (option) was connected, the calibration history and measured value data can be printed as described below.

(1) Printing of calibration history



Printing of calibration history data

Calibration history data can be printed by means of the calibration history function. 6.13(2) "Calibration history printing"

(2) Printing of measured value

(a) Printing by auto hold function

When measurement was performed by auto hold function, the measured value can be printed simultaneously with hold. 6.2(1) "Memory execution by auto hold"

(b) Printing by interval function

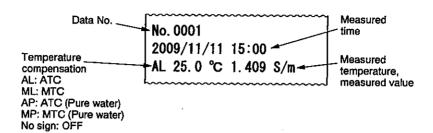
When measurement was performed by interval function, the measured value is automatically printed at each set interval time. \bigcirc 6.4(2) "Memory execution by interval"

(NOTE) • When connecting to the external printer, minimum interval is 5 seconds.

 When less than 5 seconds is set in short interval function, the value is printed at the minimum interval of 5 seconds.

(c) Manual printing by data memory function

The current measured value is printed by data memory function by pressing \(\frac{\rightarrow}{\text{DATA IN}} \) at the measurement screen. \(\frac{\rightarrow}{\text{6.3(2)}} \) "Memory execution by manual key"



Measured value printing example

(d) Printing of memory data by data memory function

The value measured at the site can be printed later as stored data.

6.3(3) "Memory data recall"

(i) Printing of individual memory data

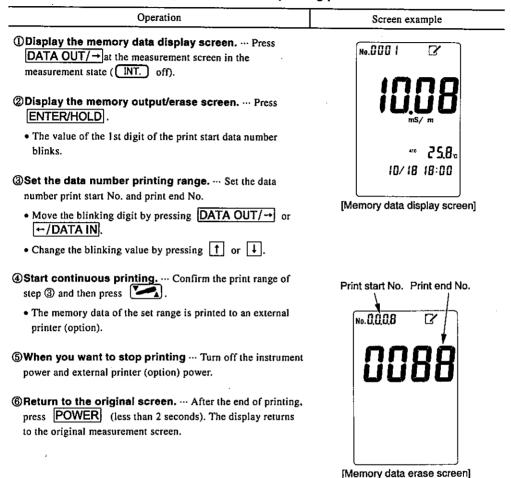
Individual memory data printing procedure

Operation Screen example Display the memory data display screen. ... Press No.0001 7 DATA OUT/→ at the measurement screen in the measurement state (INT. off). @Recall the data number. ... The value of the 1st digit of the data number blinks. Set the data number you want to recall. Move the blinking digit by pressing DATA OUT/→ or ←/DATA IN. 258. • Change the blinking value by pressing 1 or 1. 10/18 18:00 3 Check the memory data. ... The measured value, temperature, date, and time corresponding to the data number [Memory data display screen] recalled at step 2 are displayed. ④ Print the memory data. ··· Press
. The memory data displayed on the screen is printed to an external printer (option). ⑤Return to the original screen. ... Press CLEAR . The display returns to the original measurement screen.

(ii) Memory data continuous printing

Memory data can be continuously printed by specifying the data number range,

Memory data continuous printing procedure



7.3 RS-232C communication function

When the RS-232C input/output cable is connected, the auto power off function is disabled.

[NOTE] • Our RC-232C input/output cable is uninsulated type.

(1) RS-232C communication format

[Communication conditions] Fixed

• Transmission method: Half duplex communication

• Transmission speed : 19200bps

• Character

: 8 bits

• Stop

: 1 bit

Parity

: None

Flow control

: None

[General rules]

- The end code shall be CRLF.
- The delimiter shall be a comma.
- All numbers shall be "0" embedded format and "-" shall be embedded in all fields for measured value overrun.

[Message format]

■ Measurement data request

PC → Instrument

D CRLF

①

①: Request code D fixed

Ibyte

- Instrument → PC
 - * Automatically sent even at data memory and auto hold execution.

D, 0, 4, 1.000, 1, 0025.0, 0 CRLF

023 4 5 6

①: Request code D fixed

1byte

2: Measurement items

1 byte 0: Electric conductivity 1: Electric resistivity

2: Concentration

3: Temperature compensation

1byte 0:OFF 1:MTC (Line) 3:MTC (Pure water)

4: ATC (Line) 6: ATC (Pure water)

4: Measured value

5byte Effective digit: 4 digits

(5): Unit

1byte

 $0:\mu S/(c)m = 1:mS/(c)m = 2:S/(c)m = 3:\Omega \cdot (c)m$

 $4:k\Omega \cdot (c)m$ $5:M\Omega \cdot (c)m$ 6:%

6: Temperature

6byte

7: Old and new units

1byte 0: SI unit 1: Old unit

■ Memory data request0

PC → Instrument

DM, xxxx[, xxxx] CRLF

① ② 3 can be omitted

1: Request code DM fixed

2byte

2: Start data number

1 to 1000 4byte

3: End data number

4byte 1 to 1000

Instrument → PC

DM, xxxx, 00, A, 2009/03/20, 12:34, 0, 4, 1.000, 1, 0025.00 0, CRLF

0 2 3 4

6 78 9 10

1: Request code DM fixed

2byte

2: Data number

4byte 1 to 1000

3: Fixed code 00

2byte

4: Fixed code A

1 byte

(5): Measurement year, month, day

10byte

6: Measurement time

5byte

(7): Measurement items

1 byte 0: Electric conductivity 1: Electric resistivity

2: Concentration

8: Temperature compensation

lbyte

0:OFF 1:MTC (Line) 3:MTC (Pure water)

4: ATC (Line) 6: ATC (Pure water)

(9): Measured value

Effective digit: 4 digits 5byte

(10): Unit

1 byte

 $0:\mu S/(c)m = 1:mS/(c)m = 2:S/(c)m = 3:\Omega \cdot (c)m$

4:kΩ•(c)m 5:MΩ•(c)m 6:%

11: Temperature

6byte

(2): Old and new units

1byte 0:SI unit 1: Old unit

*The current set unit is returned.

Cell constant request

PC → Instrument

QJ CRLF

①: Request code QJ

2byte

Instrument → PC

QJ, 250.1 CRLF

2

1: Request code QJ

2byte

2: Cell constant

5byte *Only SI unit is returned.

■ Instrument information request

• PC → Instrument

Qxx CRLF

1

①: Request code

3byte

Q05: Data number

Q11: Set name

Q12: Set No.

Q21: Electric conductivity cell name

Q22: Electric conductivity cell serial No.

Instrument → PC

[Q05 reply]

Q05, xxxx CRLF

① ②

①: Request code

3byte

2: Data number

4byte

[Q11 reply]

Q11, CM-31P CRLF

① ②

①: Request code

3byte

2: Set name

10byte (left-justified, vacant places are filled with spaces)

[Q12 reply]

Q12, 1234567890 CRLF

(I)

①: Request code

3byte

2: Set serial

10byte (left-justified, vacant places are filled with spaces)

[Q21 reply]

Q21, CT-27112B CRLF

D (2

①: Request code

3byte

2: Electric conductivity cell name

10byte (left-justified, vacant places are filled with spaces)

[Q22 reply]

Q22, 1234567890 CRLF

① ②

1: Request code

3byte

2: Electric conductivity cell serial No.

10byte (left-justified, vacant places are filled with spaces)

4byte 1 to 1000

1 byte

1 byte

2: Set value

4byte

3: Reply status

2byte OK: Normal NG: Cannot be set

■ Date and time setting

• PC → Instrument

RT, 20090320, 1234 CRLF

1: Setting code RT

2byte

2: Year, month, day

8byte

3: Hours, minutes

4byte

Instrument → PC

RT, 20090320, 1234, xx CRLF

1byte

2: Year, month, day

8byte

③: Hour, minute

①: Setting code

4byte

4: Reply status

2byte

OK: Normal NG: Cannot be set

Others

If a code not in a message was sent, the reply is sent by adding ",ER" to the end of the message.

(2) Data collection software

- (a) We offer data collection software (GP-LOG-EN) for fetching the measured data in CSV format when the instrument is connected to a PC as an option.
- (b) The data stored by this software can be used to create tables and graphs using commercial spreadsheet software.

[IMPORTANT] • The data collection software (G-LOG2) cannot be used with this instrument.

⁽c) Please contact us for the detailed contents.

Connection to a recorder 7.4

CAUTION

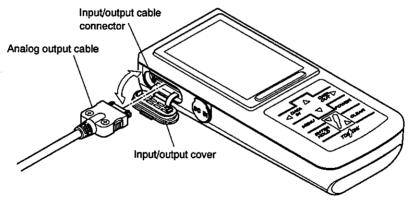
Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

[IMPORTANT] • Always use our optional analog output cable. Never use an analog output cable other than ours.

(1) Connection of analog output cable

- (1) Confirm that the power is off Confirm that the instrument power is off.
- @Connect the output plug Remove the instrument input/output cover and connect the analog output connector to the input/output cable connector.



Connection of analog output cable

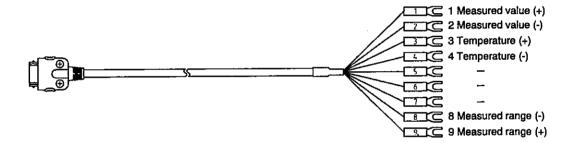
- 3 Connect a recorder, etc. Connect the arrow type pins (9 pins) at the other end of the analog output cable to the analog output terminal board of a recorder, etc.
- **Turn on the power switch** Turn on the instrument power switch. The measurement screen in the measurement state (INT.) off) is displayed.

(2) Analog output specifications

Output items	Measured value (Electric conductivity/Electric resistivity/NaCl conversion value) Temperature Measurement range		
Output DC voltage	Measured value : Full scale iV		
	• Temperature : 0 to 100°C→ 0 to 1V		
	Measurement range : 100mV/range		
Connection cable	Our specified analog output cable		

^{*} Analog output is uninsulated.

(3) Analog output cable terminals wiring



Analog output cable pin Nos. and output contents

Pin No.	Output contents			
1	Measured value (+)			
2	Measured value (-)			
3	Temperature (+)			
4	Temperature (-)			
5				
6	-			
7				
8	Measurement range (-)			
9	Measurement range (+)			

[IMPORTANT] • Pins 5 to 7 are not used, but insulate them with insulation tape, etc. so that they will not short with other pins.

Maintenance and Inspection 8.

8.1 Main body maintenance

When cleaning the instrument, wipe it with a soft cloth, tissue paper, or other soft material. In addition, when the instrument is very dirty, dip gauze, etc. into a dilute neutral detergent solution and always wring out the gauze and wipe the instrument body in the state in which the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are properly installed.

⚠ WARNING

Fire and electric shock

Always verify that the power is off before connecting or disconnecting the electrode plug, AC adapter cover, or input/output cover. Water or reagent entering the product may short the circuits and cause electric shock or fire.

M CAUTION

Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

- [IMPORTANT] When cleaning this instrument, never use paint thinner or other organic solvent. The wiped part may be discolored.
 - · When installing the battery cover, confirm that the packing and the rib (part which seals the packing) are not scratched or otherwise deteriorated or dirty. 4.2 "Loading the batteries"
 - If the packing is scratched or cracked, always replace it with new packing. (11. "Parts/Options List") In addition, when the packing and rib are dirty, clean them. In any case, if used as is, the waterproof function cannot be guaranteed.
 - When replacing the packing, confirm that the packing is properly installed by referring to ③ of 4.2 "Loading the batteries". If the packing is outside the battery cover, reinstall it properly.
 - If the AC adapter cover or the O-ring of input/output cover is scratched, cracked, or otherwise degraded, always replace it with a new part. (11. "Parts/Options List") In addition, when the O-ring is dirty, clean it. In any case, if used as is, the waterproofing function cannot be guaranteed.
 - When replacing the O-ring, check that it is installed properly so that it is not twisted.

Electric conductivity cell maintenance

∕ CAUTION

Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

[IMPORTANT] • Never clean the electric conductivity cell with cleanser or other abrasive. The surface of the electric conductivity cell will be scratched and its performance will drop.

(1) Daily maintenance

- (1) Clean with pure water Remove the outer tube from electric conductivity cell and clean the electrode (metal part) and outer tube thoroughly with pure water.
- Wipe off the waterdrop After cleaning, lightly wipe off the electrode (metal part) and outer tube with tissue paper, etc. Install the outer tube to the original position.

(2) Maintenance when the cell is dirty

When the electric conductivity cell is dirty, the measurement error becomes larger. Clean the cell as described below.

- (1) Clean with pure water Remove the outer tube from electric conductivity cell and clean the electrode (metal part) and outer tube thoroughly with pure water.
- Wipe off with neutral detergent After wiping off the tip of cell with sponge, etc. dipped in a neutral detergent, wash it thoroughly with pure water.
- 3 Wipe off the waterdrop After cleaning, lightly wipe off the electrode (metal part) and outer tube with tissue paper, etc. Install the outer tube to the original position.

8.3 Battery replacement period

- (a) When the battery mark display becomes as shown in No. 4 of the table below, replace the batteries with new or recharged batteries. 4.2 "Loading the batteries"
- (b) Since this remaining capacity display differs somewhat for AA size alkali batteries and AA size rechargeable nickel hydride batteries, it is only a guideline.
- (c) Since the clock stops at battery replacement, perform time adjustment. 5.3 "Time setting"

Battery mark display and meaning

No.	Battery mark display state	Meaning
1.	=	Battery can be amply used.
2.	=	Somewhat depleted battery can be amply used.
3.		Battery is fairly well depleted. The replacement period is near.
4.	•	Replacement is necessary.

9. Troubleshooting

9.1 Safety precautions when an abnormality occurred

If an abnormality should occur, remove the batteries.

In addition, when an AC adapter (option) is used, disconnect it from the AC receptacle.

WARNING

Fire and electric shock

 Always verify that the power is off before connecting or disconnecting the electrode plug, AC adapter cover, or input/output cover. Water or reagent entering the product may short the circuits and cause electric shock or fire.

↑ CAUTION

Waterproofing

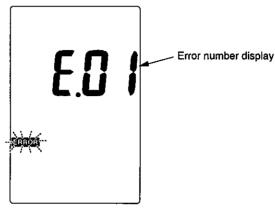
- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

Model: CM-31P/CM-31P-W 9.2 Error display

9.2 Error display

(a) This instrument has an error display function to alert the operator that an operation mistake or trouble has occurred.

When an error is generated, the **ERROR** mark blinks, an error number is displayed at the main display, and an "error display screen" is displayed.



Error display screen

- (b) When an error number is displayed at the main display, refer to the error display list below and take appropriate action.
- (c) When you want to clear the error number display, press any key at the error display screen. The display returns to the measurement screen.

Error display list

Error No.	Description	Cause	Countermeasures	
01	Electrode type error	Unsuitable electrode other than electric conductivity cell was connected.	Connect an electric conductivity cell usable with this instrument.	
02	Memory FULL alarm	An attempt was made to store data when the memory overwrite on/off setting was in the OFF state.	• Set the memory overwrite on/off setting to ON. 6.9 "Memory overwrite on/off setting"	
09	Temperature calibration error	• ±5°C or more relative to the temperature set value.	Check the temperature set value.	
38	38 Cell constant calibration error	The cell is not properly immersed in the calibration solution.	◆ Correctly immerse the cell into the calibration solution.	
		• There are air bubbles in the outer tube.	Remove the bubbles by moving the cell up and down 2 or 3 times.	
	İ	The cell is degraded or wrong.	Replace the calibration solution.	
		The electrode is dirty.	• Clean the cell. > 8.2 "Electric conductivity cell maintenance"	
		The cell is degraded or damaged.	Replace the standard solution.	
		The electrode is degraded or damaged.	Replace the cell.	

9.3 Other troubles and countermeasures

- (a) For the trouble contents, causes, and countermeasures of other than error number display, refer to the following table "Other troubles and countermeasures".
- (b) When the instrument does not recover even when these countermeasures are taken or when requesting repair, please confirm the set/electric conductivity cell name, model No., and the serial No. on the back of the instrument and contact your dealer or us.

Other troubles and countermeasures

Trouble contents	Cause	Countermeasures	
Nothing is displayed even though the power is turned on.	Batteries are not loaded. Batteries are dead.	• Replace the batteries. 4.2 "Loading the batteries", 8.3 "Battery replacement period"	
is turned on.	AC adapter (option) is not connected.	Correctly connect the AC adapter (option).	
Display does not	The hold function is on.	Turn off the hold function.	
change.	The cell is not connected properly.	Connect the cell properly. 4.3 "Electric conductivity cell connection"	
	The cell is degraded or damaged.	Replace the cell. 4.3 "Electric conductivity cell connection", 4.4 "Electric conductivity cell check"	
Indication is unstable. Response is slow.	There are air bubbles in the electrode (metal part).	Remove the bubbles by moving the cell up and down 2 or 3 times.	
	• The cell is dirty.	Clean the cell.	
	• The cell is degraded or damaged.	Replace the cell.	
	• The cell is not immersed properly into the calibration solution or sample.	Correctly immerse the cell into the calibration solution. 5.4 "Electric conductivity measurement", 5.5 "Electric resistivity measurement", 5.6 "NaCl conversion value measurement"	
	There is sediment or other SS component in the sample.	With such a sample, the value may become unstable or the response may become slow.	
Measured value blinks.	Sample is a value outside the measuring range.	Samples outside the measuring range cannot be measured.	
	• The cell is not connected properly.	Connect the cell properly. 4.3 "Electric conductivity cell connection"	
	The cell is degraded or damaged.	Replace the cell.	
	The cell is not immersed properly into the calibration solution or sample.	Correctly immerse the cell into the calibration solution. 5.4 "Electric conductivity measurement", 5.5 "Electric resistivity measurement", 5.6 "NaCl conversion value measurement"	

9.4 How to reset the system

- (a) If the instrument fails to operate properly or an error is generated at the display, it may be possible to return to normal operation by resetting the system.
- (b) There are 2 system reset methods. In either case, before resetting the system, turn off the instrument power by pressing POWER.

(1) Returning all data and parameters to their factory setting

After confirming that the instrument power is off, press POWER while pressing CLEAR and

(2) Returning data other than the clock data and measured data to their factory setting

After confirming that the instrument power is off, press POWER while pressing ENTER/HOLD.

10. Transport, Storage, and Disposal

10.1 Transport

- [IMPORTANT] Always pack the instrument in its container box. Also, do not drop or overturn the box and do not place heavy objects atop the box. Doing so will cause instrument trouble.
 - . When shipping, always use the specified packing material. Note that the use of other than the specified packing material will invalidate the warrantv.
 - When moving the instrument, always turn off the power. When an AC adapter (option) is used, disconnect the AC adapter from the AC receptacle.

↑ CAUTION

Waterproofing

- The construction of the product becomes waterproof (IP67) only when the electric conductivity cell, battery cover, AC adapter cover, and input/output cover are installed properly.
- Do not touch the instrument with wet hands or wash it with water when the electric conductivity cell has been removed or the battery cover, AC adapter cover, or input/output cover are opened. Besides, do not install or store the product where water or reagent may enter it.

Model: CM-31P/ CM-31P-W : 10.2 Storage

10.2 Storage

WARNING

Explosion, fire, and electric shock

- Do not use the product in an area where explosive gas or flammable gas exists.
- Do not place the product in a fire or burn it. Doing so may cause an explosion or fire inside the product.
- Always verify that the power is off before connecting or disconnecting the electrode plug, AC adapter cover, or input/output cover. Water or reagent entering the product may short the circuits and cause electric shock or fire.

The installation or storage site conditions are as follows:

- Within the range of the specified temperature (0 to 45°C) and humidity (20 to 90%) (However, no condensation)
- · No corrosive gases.
- · No condensation.
- · Away from direct sunlight.
- · No vibration.
- · Little dust and dirt.
- · Not directly exposed to the wind from air conditioning equipment.
- · Away from stoves and other heating equipment.
- · Stable, safe place.

Model: CM-31P/CM-31P-W 10.3 Disposal

10.3 Disposal

When disposing of the instrument or reagent, process it based on local regulations. For details, consult your local authorities.

CAUTION

Disposal

 In case you dispose of this product or any part of this product, handle it as industrial waste as specified by law. Model: CM-31P/ CM-31P-W 11. Parts/Options List

11. Parts/Options List

When purchasing parts, optional parts, etc., order them from the dealer from whom you bought the instrument. At this time, please specify the part name, type, and quantity.

Parts list (standard accessories)

Name	Туре	Sales units	Remarks
Hand strap	0TZ00006	1	
Battery Not handled by us.			Please purchase AA size alkali batteries or AA size rechargeable nickel hydride batteries in the marketplace.
Instruction manual	CM-31P	1	

Electric conductivity cell/standard solution list

Name	Туре	Sales units	Remarks
Electric conductivity cell for P Series	CT-27112B	1	General use/toss-in measurement (lead length 1m)
			Waterproof
Electric conductivity cell for P Series	CT-27112B (5)	1	General use/toss-in measurement (lead length 5m)
			Waterproof
Electric conductivity cell for P Series	CT-27112B (11)	1	General use/toss-in measurement (lead length 11m)
		-	Waterproof
Electric conductivity cell for general	CT-57101B	1	Immersing measurement (lead length 1m)
Electric conductivity cell for low electric conductivity	CT-57101C	1	Immersing measurement (lead length 1m)
Electric conductivity cell for high electric conductivity	CT-57101A	1	Immersing measurement (lead length 1m)
Solution B for electric conductivity cell check	0BI00002	1	250mL× 2

Options list

Name	Туре	Sales units	Remarks
AC adapter	134G022	1	100VAC 50/60Hz
			AC adapter is the 100VAC specifications. Therefore, transformer is always required. Please contact DKK-TOA or your sales representative.
Electrode stand	6948810K	1 set	When using in a laboratory
			Stand, stopper, and support rod
Electrode holder	01B00001	1	
Electrode attachment (DP)	0IB00007	1	

(To be continued)

(Continued from previous page)

Anchor	01C00001	1	Retainer for preventing the cell from floating when making measurements by immersing the cell.
			Use 5m or longer lead wire.
φ1 SUS rope (12m)	01Z00002	1	Auxiliary rope when an anchor is used.
Stick holder	01B00009		Safe measurements can be made in a comfortable position when the measurement point is not close, when the height difference is large, etc.
Electric conductivity checker	EC-1G	1	Checker for instrument inspection
Temperature checker plug	TC-1G	1	Checker for instrument inspection
External printer	EPS-P30	1	w/connection cable
External printer paper	P000119	l pack (20 rolls)	Non-thermal paper
Ink ribbon for external printer	0RD00001	1	1 sold
Connection cable for external printer	118N061	1	* When you already have an external printer (EPS-G/EPS-R), it can be used by providing only this cable.
RS-232C connection cable	118N062	1	For PC connection, cable length 2m
Analog output cable	118N063	1	Cable length 1.5m
Data acquisition software	GP-LOG-EN	1	Data is saved to a PC in CSV format.
Soft case	SC-10P	1	
Carrying case	0DA00001	1	
Battery cover packing	71535500	1	Packing for battery cover
O-ring S10	115A867	1	For AC adapter cover
O-ring S20	115A868	1	For input/output cover

Electric conductivity cell for pure water / Flow cell list

Name	Туре	Sales units	Remarks
Electric conductivity cell for P Series	CT-27111D	1	Pure water measurement (lead length 1m)
Flow cell	CEF-22A	1 1	Waterproof, built-in memory. Material: PP
Flow cell	CEF-23A	1	Material: SUS

Model: CM-31P/CM-31P-W 11. Parts/Options List

Revision History

Instruction Manual No.	New Version in English	
CM3-LB15211E	_	(DSL Sato/SD Nakamura)

•B5 size

DSL(NC)





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This instruction manuals use the paper called "3.9 paper" which made by the domestic timber grown in Japanese forest, to conform to Kyoto Protocol. DKK-TOA supports "KIZUKAI (care environment by using domestic timber more) campaign" promoted by the Forestry Agency, and is contributing GREENSTYLE to Increase the amount of CO2 absorption by a domestic forest.



PRINTED WITH Printed using VOC (volatile SOYINK organic compound)-free ink.