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H-1 Series Electric Conductivity Meter

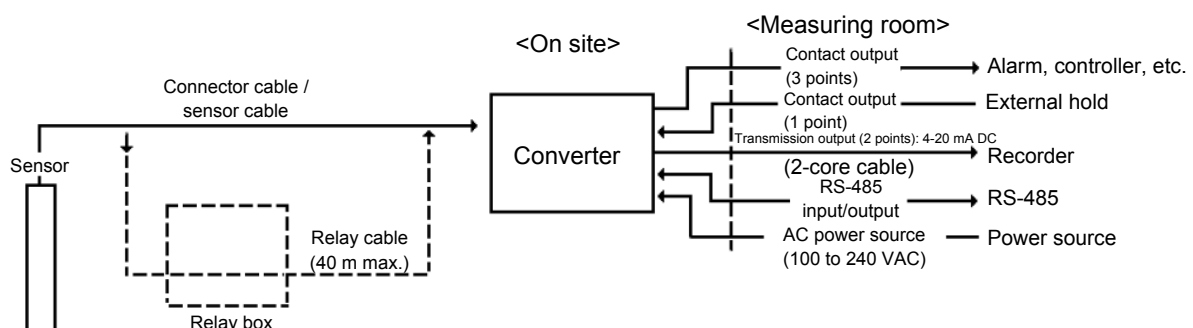
HE-200H



Measuring principle

- AC 4-pole type
- The HE-200H uses a dual information calculation type (current/voltage) circuit and software to measure electric conductivity with a 4-pole sensor. For a sample which changes from a high concentration to a low concentration, its electric conductivity can be monitored effectively.

System configuration diagram



* The relay box and dedicated cable are used when 10m of sensor cable is not sufficient.

Overview

- The HE-200H is designed to measure the electric conductivity and temperature of an aqueous solution when used with the electric conductivity sensor (FES-12X, FES-2XX, c FES-310 series). It may also be used to adjust the concentration for CIP or the like and to monitor rinse, and as a concentration meter for a process. The measured value readout (upper part) displays electric conductivity and converted concentration and the auxiliary readout (lower part) displays temperature. The HE-200H is provided with an RS-485 port, which allows you to find the measured value and to view or modify the setting value.

Measurement target

- Chemical solution ● Seawater
(No samples which would corrode the sensor can be measured.)

Intended use

- Controlling the concentrations of chemical solutions
- Monitoring and control of solutions in processes

Standard specification

H-1 Series Electric Conductivity Meter

HE-200H Readout Converter

■ Features

- Outdoor installation type (drip-proof construction equivalent to IP65)
- Selectable simultaneous display of temperature
- All settings available with front keys
- Improved maintenance feature (self-diagnostic capability)
- Selectable transmission output range
- Backup of stored data
- Easy-to-read display (150% larger than former display)
- Improved operability of keys by using an emboss sheet

■ Instrument

The HE-200H uses a newly designed dual information calculation type (current/voltage) circuit and software to measure electric conductivity of up to 500 mS/cm maximum (1000 mS/cm for the FES-12X series) with a 4-pole sensor. When 500 mS/cm is exceeded, the resolution becomes low and the accuracy decreases. Although the performance warranty is not applicable, electric conductivity of up to 2000 mS/cm may be displayed. The resolution becomes 1 μ S/cm at around 1 mS/cm and 1 mS/cm at around 500 mS/cm. The resolution is characterized by gradually changing depending on electric conductivity. For readout, one of the fixed ranges of 2.000, 20.00, 200.0, and 2,000 mS/cm or the auto range may be selected. In the low-concentration range, measurements can be performed at the minimum resolution of 1 μ S/cm. This allows you to monitor changes in a sample which changes from a high concentration to a low concentration while maintaining the effective electric conductivity resolution.

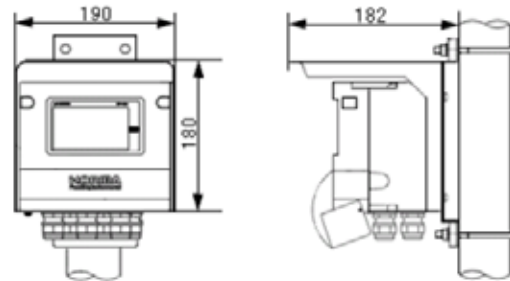
To comply with the electric conductivity meter used for reference, fine-tune the current electric conductivity in the calibration mode. The HE-200H uses hardware and software which enable temperature measurements between -30 and 160 and performs temperature compensation as specified by the user. A temperature compensation option may be selected from NaCl, arbitrary value, and no compensation. The temperature compensation range is between 0 $^{\circ}$ C and 100 .

■ Sensor

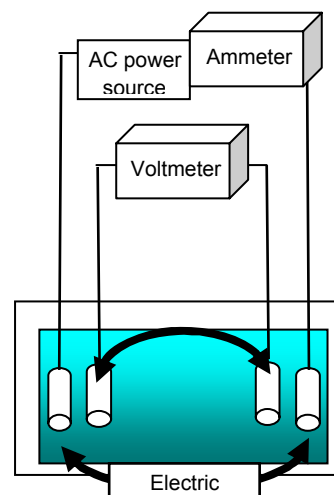
The sensors available for connection to the HE-200H are the FES-12X series (the cell constant is about 1.0/cm), the FES-2XX series (the cell constant is about 0.1/cm), and the flow-through type FES-310 series (the cell constant is about 0.1/cm).

The use of a new technique for temperature measurements has greatly improved the accuracy as a thermometer. The original temperature circuit has the advantage of minimizing the drift of the measured temperature value against changes in the ambient temperature. The thermometer has accuracy of +/-0.5 with a cable of 10 m. To extend the cable, enter the overall cable length for cable collection. If even higher accuracy is required, comply with the reference thermometer in the calibration mode. To correct the cable resistance, cable length of 50 m maximum may be entered.

■ External Dimensions



Unit: mm



Basic principle

Current \div Voltage = Information in proportion to electric conductivity

Features

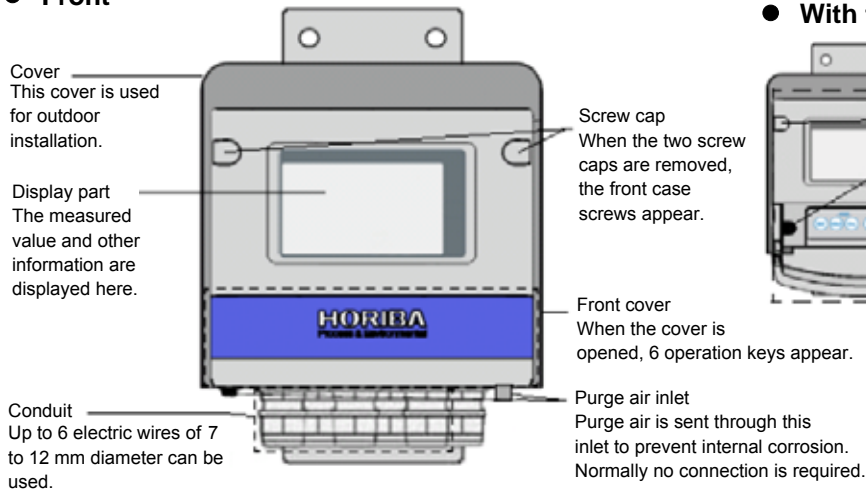
- Higher resolution can be achieved in a low-concentration range.
- Linearity is maintained up to a high-concentration range.
- Measurements are less affected by contamination and air.

The cell constant is expressed by multiplying the order (0.1/cm or 1.0/cm) by the correction coefficient (X.XXX). Enter both of them as cell-related information. Entering the correction coefficient allows you to correct the instrumental error in the cell constant of the sensor.

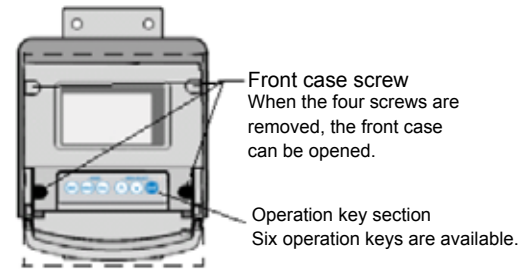
The measurable solutions are subject to the condition that they do not chemically react with the stainless steel electrode. Avoid using any chemical solution which corrodes stainless steel because it creates problems with the performance and life of the HE-200H.

■ Configurations

● Front



● With the front cover opened



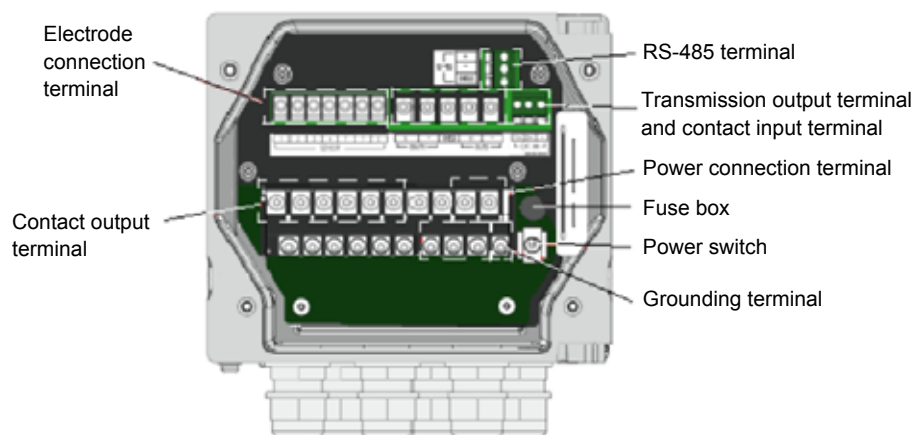
● Display part



● Operation key section

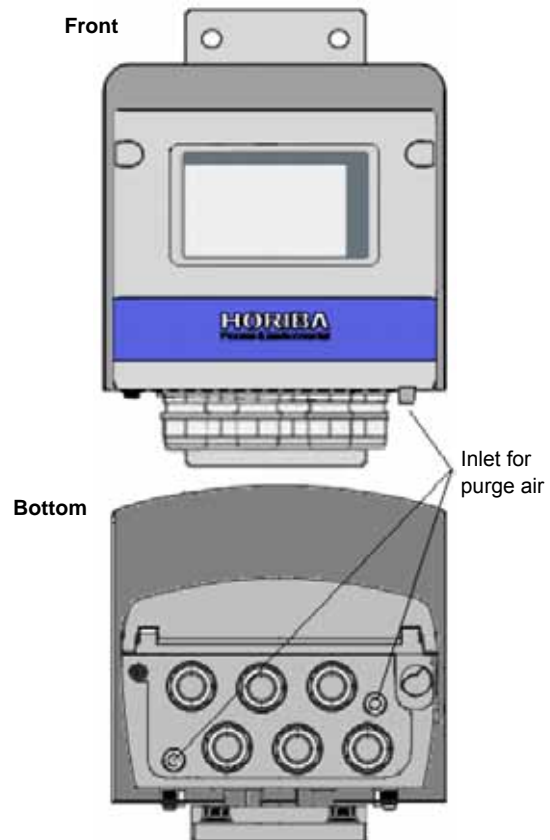


● Terminal block



■ Air purge

An inlet is provided for purge air which is used to prevent internal corrosion. To use the HE-200H in an environment where corrosive gas is generated, prevent corrosive gas from entering the inside by constantly sending instrument air.



■ Concentration conversion

The HE-200H has a capability of converting the measured electric conductivity into a concentration. For seawater salt of 4% maximum, NaCl salt of 20% maximum, and aqueous solutions of nitric acid, phosphoric acid, and sodium hydroxide of 5% maximum, software including the dedicated temperature compensation program is provided to convert electric conductivity into a concentration.

For any chemical solution other than the standard, four types of concentration conversion are made available by entering the relationship (concentration conversion coefficient) between the concentration and electric conductivity of the chemical solution and the temperature characteristics (temperature compensation coefficient).

In finding the concentration of a chemical solution, the relationship between electric conductivity and concentration is required.

Enter the concentration and electric conductivity data of any analyzed sample on commercially available spreadsheet software to calculate a third-order approximate function. After validating the approximate equation, enter the coefficient and index of the approximate function as parameters to the HE-200H.

Concentration conversion coefficient

In finding the concentration of a chemical solution, the relationship between electric conductivity and concentration is required.

Enter the concentration and electric conductivity data of any analyzed sample on commercially available spreadsheet software to calculate a third-order approximate function. After validating the approximate equation, enter the coefficient and index of the approximate function as parameters to the HE-200H.

Temperature compensation coefficient

In calculating the electric conductivity required for concentration conversion, the temperature characteristic data on the chemical solution is required.

The temperature characteristic means a ratio showing how much electric conductivity changes relative to that at 25 C as the temperature of the chemical solution increases \uparrow C. Enter the analyzed temperature characteristic data to commercially available spreadsheet software to let the software calculate a three-order approximate function. After validating the approximate equation, enter the coefficient and index of the approximate function as parameters to the HE-200H.

■ Measuring the temperature

The RTD, an element to measure the temperature, uses a resistance-temperature detector which has resistance of 1000Ω at 0 ° C. This detector is characterized by increasing its resistance value as the temperature rises. Its resistance becomes 1385Ω (standard) at 100 . Manufacturing variations at the resistance value at 0 affect the temperature measuring accuracy.

In the algorithm for the HE-200H, which was not available in the past, variations in the temperature element are corrected. The resistance value of the temperature element at 0 is assayed and then entered to correct the resistance values at all temperatures. For any RTD with a different temperature coefficient, the resistance values at all temperatures are corrected by entering that coefficient.

The use of this new algorithm for temperature measurements has achieved temperature accuracy of ± 0.2 . Furthermore, the temperature calibration mode has been made available so that the temperature can be calibrated by making a comparison with a thermometer having even higher accuracy. In the temperature calibration mode, the resistance value at 0 is corrected by making an adjustment to the reference temperature.

In order to reset the temperature calibration, the input to RTD at 0 and the offset for the temperature calibration are individually retained.

A sensor for which the resistance value of RTD at 0 was not assayed may be used without correction. At this time, however, the accuracy is ± 0.5 .

As the cable becomes longer, the measured resistance value increases. However, a calculation is performed to cancel the resistance of electric wire by entering the cable length.

An assay at 0 is relative to a state (equilibrium state which is achieved when water and ice are agitated in atmosphere) rather than to a thermometer.

■ Temperature compensation calculation

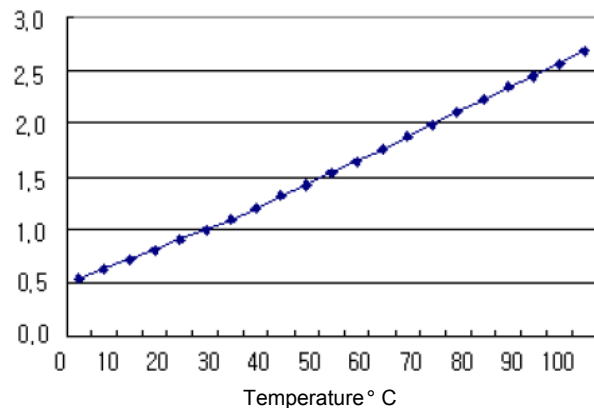
Temperature compensation for electric conductivity

Method using the characteristics of NaCl

When the main component of salt included in the sample is sodium chloride, select the temperature compensation method using the characteristics of NaCl. The electric conductivity of an aqueous solution of sodium chloride is relative to the electric conductivity at 25 and changes at the following rate. Find the ratio at an arbitrary temperature from this table and then obtain the electric conductivity at 25 .

This table shows the results of our test.

In the deionized water range, the temperature compensation for deionized water is automatically applied.



Electric conductivity ratio of sodium chloride assuming that the electric conductivity at 25 ° C is 1.

Temp (°C)	NaCl Electric conductivity ratio	Coefficient
0	0.542	1.845
5	0.626	1.597
10	0.715	1.399
15	0.806	1.240
20	0.902	1.109
25	1.000	1.000
30	1.101	0.908
35	1.205	0.830
40	1.312	0.762
45	1.420	0.704

Temp (°C)	NaCl Electric conductivity ratio	Coefficient
50	1.531	0.653
55	1.643	0.609
60	1.757	0.569
65	1.872	0.534
70	1.987	0.503
75	2.103	0.476
80	2.219	0.451
85	2.335	0.428
90	2.450	0.408
95	2.564	0.390
100	2.677	0.374

Temperature coefficient

The temperature coefficient may be changed.

The electric conductivity of an aqueous solution changes depending on the temperature. In general, when the temperature of the solution rises by 1 relative to the electric conductivity at 25 , the electric conductivity increases by about 2%.

The temperature coefficient differs depending on the kind and concentration of the solution, falling in a range between 0.5 and 2.5. The temperature compensation calculation assuming the electric conductivity at 25 is carried out by entering a temperature coefficient. Entering 2% for the temperature coefficient is applicable for almost all aqueous solutions. If the temperature coefficient for the solution is known, enter that value.

If the temperature coefficient is set to zero, the raw electric conductivity without temperature compensation is obtained.

The reference temperature for temperature compensation is generally 25 . Yet temperature compensation is applicable at any temperature other than 25 . Assume that the reference temperature is ST when the electric conductivity at T° is known.

$$C(ST) = C(T) / (1 + 0.01 \times \alpha \times (T - ST))$$

C(ST): Electric conductivity (reference) of solution at ST

C(T) : Electric conductivity of solution at T

α : Temperature coefficient (unit: .) for electric conductivity

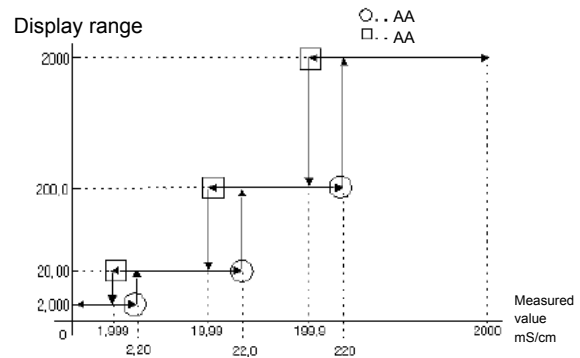
T : Arbitrary temperature T

ST : Reference temperature ST

The electric conductivity C (ST) at the reference temperature is found by this equation.

Measurable range

This graph shows how the readout range changes when the measurable range is set to Auto. This example assumes a unit of Conv (mS/cm). The available readout ranges to display the measured value are 2.000, 20.00, 200.0, and 2000. As the measured value increase, the readout range changes at its 110%. As the measured value decreases, the readout range changes at its 100%.



Power supply

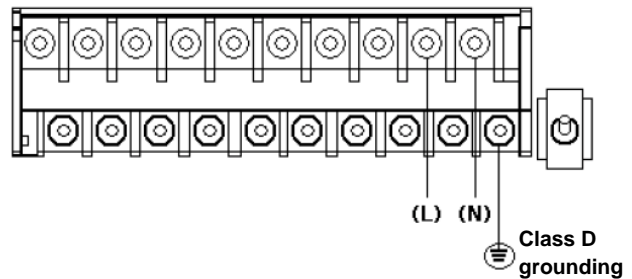
The HE-200H has a power switch. For the HE-200H, use a free power source for rated voltage of 100 to 240 VAC. If the ultrasonic cleaner is operated at non-rated voltage, it may malfunction. Check the power supply voltage. Carefully check that the power supply voltage fluctuations fall within a range of 10%.

Major specifications

- The terminal screw for the contact output is of M4.
- The applicable electric wire is of 0.75 to 5.5 mm² (AWG18 to 10).

Provide the power switch in a place near the HE-200 so that the power can be turned ON/OFF. If lightning might strike, install an arrester on the output side of the HE-200H and on the side of receiving instruments.

Be sure to ground the grounding terminal (class D grounding). Separate this grounding from any other grounding for electric



Electric power supplied	Voltage: 100 to 240 VAC
	Frequency: 50/60 Hz
Applicable power cable	0.75 to 5.5 mm ² (AWG18 to 10).

Output terminal

The HE-200H is provided with three contact outputs as standard. The HE-200H has various contact outputs such as USP determination, transmission output hold, and error alarm as well as upper and lower alarm contact outputs.

Major specifications

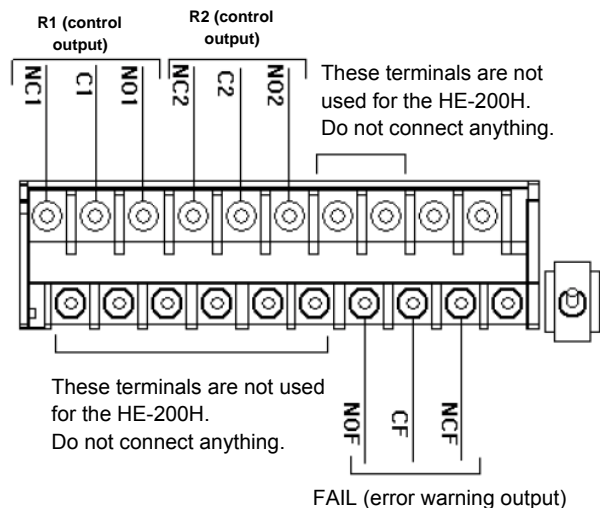
- The contact capacity is 250 VAC, 3 A maximum or 30 VDC, 3 A maximum for resistance load.
- The terminal screw for the contact output is of M4.
- The applicable electric wire is of 0.75 to 5.5 mm² (AWG18 to 10).

If noise is detected from the load, use a varistor or a noise killer. For the FAIL output only, NO and NC are reversed. When the HE-200H is normal (not in failure), the CF-NOF contact is open and the CF-NCF contact is short-circuited. When the power is OFF, the C-NOF contact is short-circuited.

The blank terminals are internally connect to each other. Do not connect anything.

To connect any load exceeding the contact capacity or any induction load (e.g., a motor or a pump), be sure to use a power relay exceeding the load rating.

When the HE-200H is OFF, the C-NC contact for R1 to R4 is short-circuited. Therefore, be careful about the connection of load.



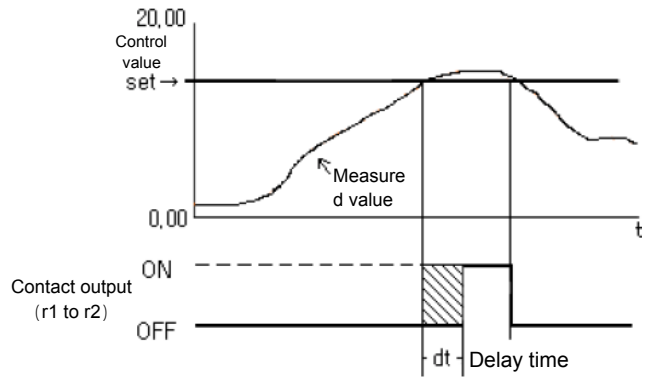
Contact point capacity	250 VAC, 3A max. or 30 VDC, 3 A maximum
Applicable power cable	0.75 to 5.5 mm ² (AWG18 to 10)
Kinds of alarms	Alarm output and temperature alarm output HOLD output and FAIL output

Cond, SEA, nACL, etc.: Alarm output

When the measured value becomes larger than the setting, the alarm output is turned ON to trigger the alarm after the delay time. When the measured value becomes smaller than the setting, the output is immediately turned OFF to cancel the alarm.

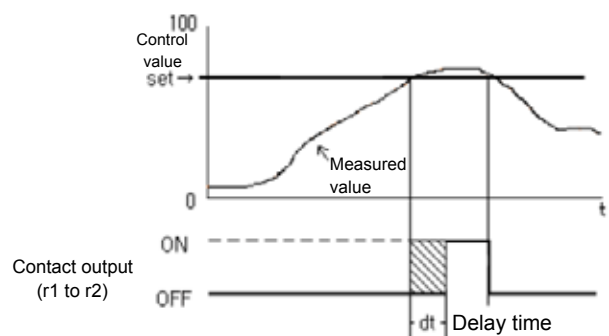
The setting of output delay time (0 to 600 seconds) is also possible.

These are the upper-limit actions. For the lower-limit actions, reverse them.)

**"t": Temperature alarm output**

When the temperature value is higher than the setting, this output is turned ON to trigger the alarm after the delay time. When the temperature value becomes lower than the setting, the output is immediately turned OFF to cancel the alarm. The setting of output delay time (0 to 600 seconds) is also possible.

(These are the upper-limit actions. For the lower-limit actions, reverse them.)

**HoLd: Output during hold mode**

When the measured value is held, this output is turned ON after the delay time. When the hold mode is canceled, the output is immediately turned OFF. The setting of output delay time (0 to 600 seconds) is also possible.

FAIL: FAIL output

This output is turned ON when over full-scale or system error occurs. It is also turned ON when the HE-200H malfunctions.

■ Contact input

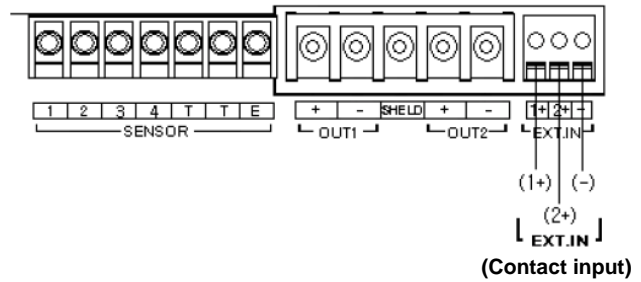
Two points for contact input are provided as standard. The previously specified transmission output item may be changed from transmission output 1. The transmission output value is held.

For transmission output 1, a maximum of 4 items may be selected from 11 items. This output may be changed with external contact input (combination of contact inputs).

Major specifications

- The terminal screws for the contact input is of M3.5.
- The applicable electric wire is of 2 mm² (AWG14) maximum.

For the transmission output cable, use a shielded cable. When lightning might strike, install an arrester on the output side of the HE-200H and on the side of receiving instruments. The resistor for the contact input shall be 100 Ω maximum.



Contact input resistance	100Ω/km max.
Applicable power cable	2mm ² (AWG14)MAX

Action of transmission output 1

For transmission output 1, an item is selected from a maximum of 4 items for component output.

When "Setting for action of external input terminal 2" is set to Cur, the component to be output through transmission output 1 may be selected from the previously specified 4 component items (1A, 1b, 1C, and 1d) using 2 external contact inputs EXTIN1 and EXTIN2.

When "Setting for action of external input terminal 2" is set to HoLd, the component to be output may be selected from the previously specified 2 component items (1A and 1b) using 2 external contact inputs EXTIN1 and EXTIN2.

EXTIN2 may be used as the HOLD signal in accordance with "Setting for transmission output HOLD."

EXTIN 1	EXTIN 2	Action
0	0	The component selected with 1A is output.
1	0	The component selected with 1b is output.
0	1	The component selected with 1c is output.
1	1	The component selected with 1d is output.

0: open, 1: short

EXTIN 1	EXTIN 2	Action
0	0	The component selected with 1A is output.
	1	All transmission output Hold
1	0	The component selected with 1b is output.
	1	All transmission output Hold

0: open, 1: short

Transmission output

The HE-200H is provided with two transmission outputs (4 to 20 mA DC).

Electric conductivity or the converted value is output through transmission output 1 and temperature through transmission output 2. For both outputs, the full-scale range of transmission output may be set freely within the full-scale setting for measured value. The setting of burn-out (transmission output: 3.8 or 21 mA) is also possible. The HE-200H allows you to select whether the output value is temporarily held at the directly previous value or the preset value when the transmission output is to be held with an external signal

Example: Arbitrary setting of transmission output

When the measurable range for electric conductivity is 0 to 200 mS/cm:

The transmission output of 4 mA may be set to 50 mS/cm and that of 20 mA to 100 mS/cm.

Example: Transmission output hold

When the held value is set to the directly previous value:

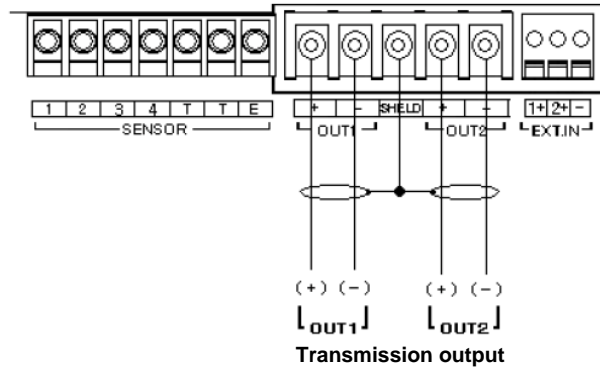
If an external signal is received when the measured value is read out as 50 mS/cm, the transmission output maintains the output value of 50 mS/cm.

For transmission output 1, a maximum of 4 items may be selected from 11 items. This output may be changed with external contact input (combination of contact inputs).

Major specifications

- The terminal screws for the contact input is of M3.5.
- The applicable electric wire is of 2 mm² (AWG14) maximum.

For the transmission output cable, use a shielded cable. When lightning might strike, install an arrester on the output side of the HE-200H and on the side of receiving instruments. The negative terminals OUT1 (-) and OUT2 (-) for transmission output are internally connected and have the same electric potential.



Maximum load resistance	900Ω
Applicable power cable	2mm ² (AWG14) MAX

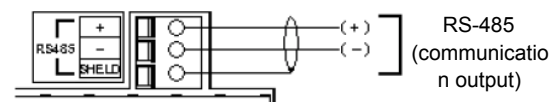
Output item for transmission output 1

Electric conductivity value, seawater salt concentration, NaCl salt concentration, nitric acid concentration, sodium hydroxide concentration, phosphoric acid concentration, and 4 arbitrary component concentrations, i.e. a total of 11 items. Among these items, a maximum of 4 items may be selected for component output. Combinations with external contact inputs are used to selectively display each item and concentration.

RS-485

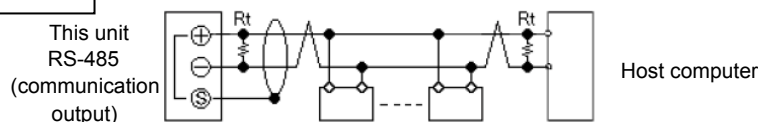
The HE-200H has an RS-485 communication terminal. To use this terminal, connect wiring.

- The applicable electric wire is of 0.14 to 2.5 mm² (AWG26 to 14).
- For the communication output cable, use a twisted shielded pair.
- Up to 32 connections can be made including one for the host computer. Set the address.
- The communication cable length is 500 m maximum.
- Use a terminating resistor (Rt: 120Ω) for any device at which the RS-485 communication line is terminated.



RS-485 communication conditions	Baud rate	19200 bps
	Character length	8 bit
	Parity	non
	Stop bit	1 bit

Example of external connection for communication

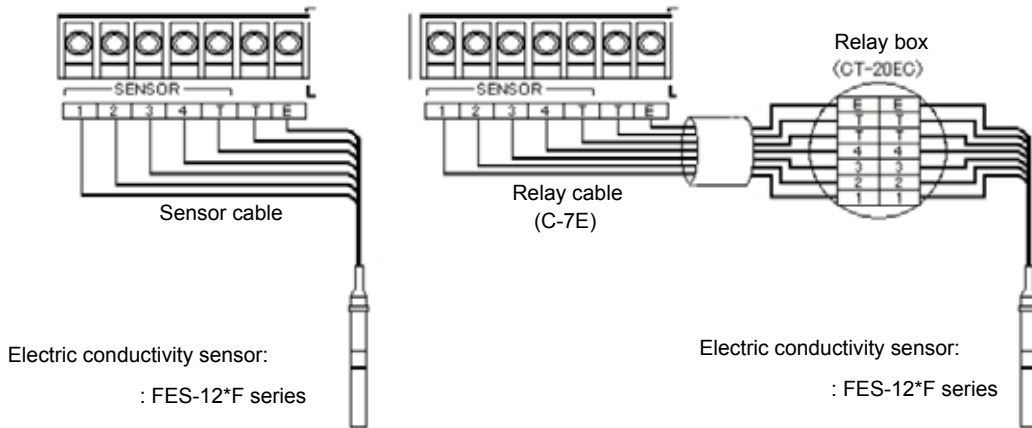


■ Sensor

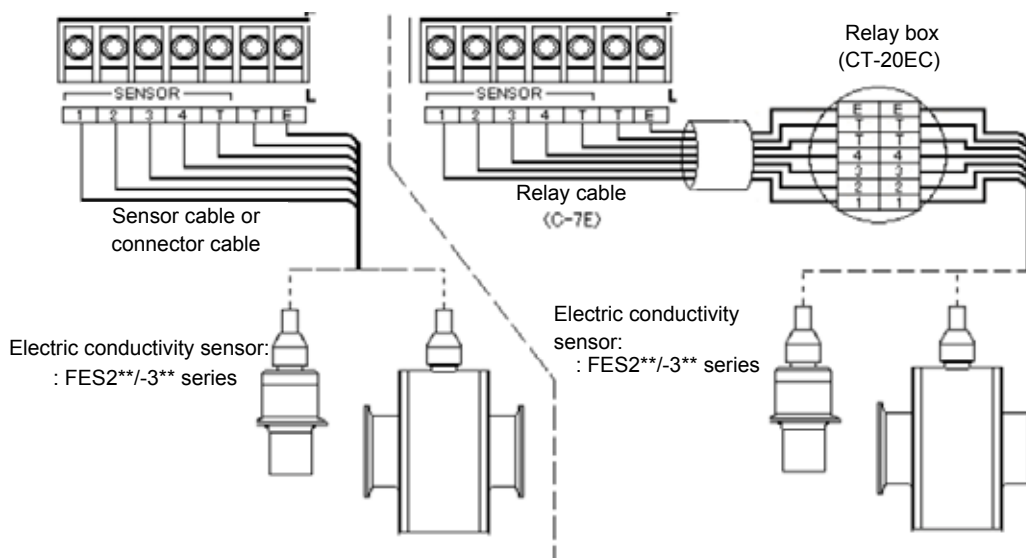
- The sensor cable is highly insulated. Exercise care in handling the sensor cable.
- Do not wet any cable terminal or the terminal block with water or the like; also do not soil it with dirt, oil, or the like. The insulation will otherwise deteriorate. The decreased insulation can cause instable readings.
- In wiring the sensor, give a margin to the sensor cable length for the purposes of calibration with standard solutions and of the checks and replacement of the sensor.
- Keep the wiring of the sensor cable and the relay cable away from electromagnetic induction devices such as a motor and their power cables.
- Be sure to use relay cable and relay box.
- For the sanitary sensor, avoid extension wherever practical. Specify a connector cable of the necessary length.

Electric conductivity Sensor	1: Conductivity sensor 1 terminal
	2: Conductivity sensor 2 terminal
	3: Conductivity sensor 3 terminal
	4: Conductivity sensor 4 terminal
	T, T: Temperature compensation sensor terminal
	E: Shielded terminal

Connection method for ordinary electric conductivity sensor of FES series



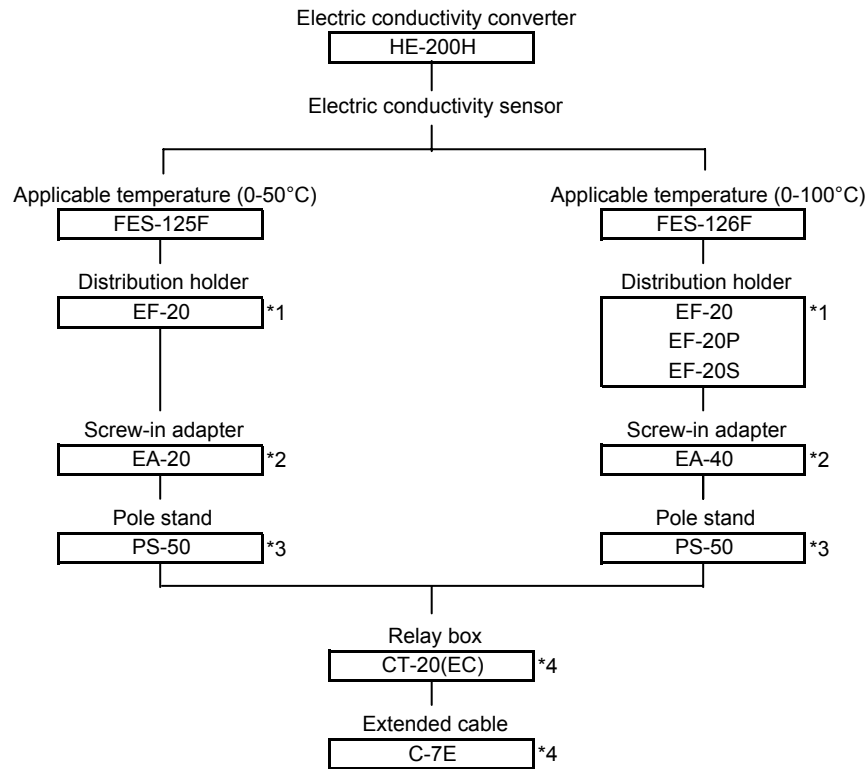
Connection method for sanitary electric conductivity sensor of ESH or FS series



■ Combinations

The following combinations are based on the specifications for converters electric conductivity sensors and holders.
For the detailed specifications, see the items of each product.

For ordinary electric conductivity sensor



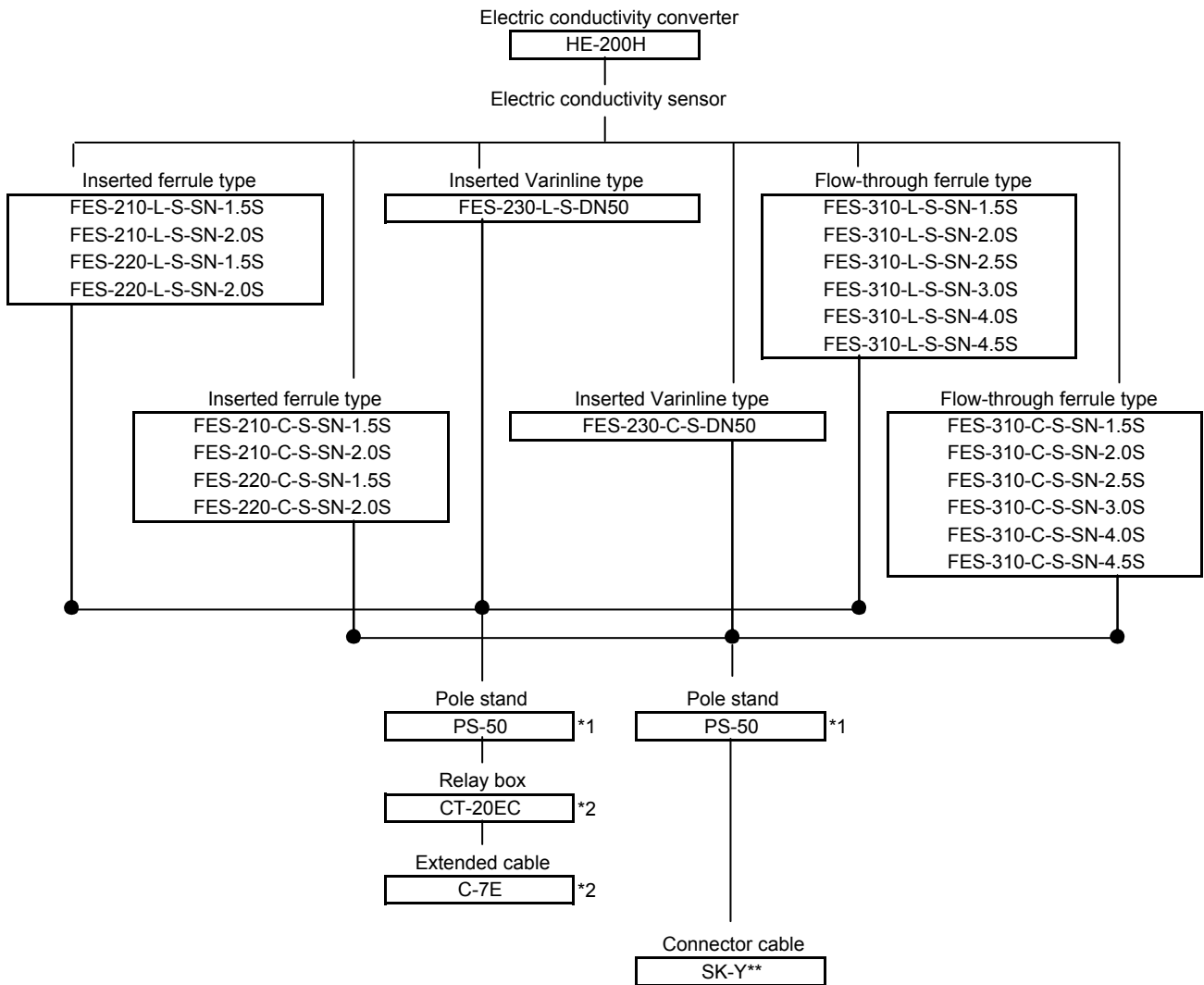
*1: Not required when the electric conductivity sensor is used as the throw-in type.

*2: Required when a flow-through holder is used or when the electric conductivity is fixed by screwing it into a flange or the like.

*3: Pole stand used to mount the converter and the CT-20 (EC) relay box.

*4: Required when the sensor cable is extended from 10 m.

For sanitary electric conductivity sensor



*1: Pole stand used to mount the converter and the CT-20 (EC) relay box.

*2: Required when the sensor cable is extended from 10 m.

* Varivent is a registered trade mark of GEA Process Engineering.

5月17日

<p>■ Specification 1</p>

Product Name	Electric conductivity converter for industrial use				
Model	HE-200H				
Combination sensor	4-pole electric conductivity sensor; cell constants: 0.1/cm and 1.0/cm (FES-12, FES-2XX, and FES-310 series)				
Measurable range	Electric conductivity	Cell constant (/cm)	0.1	1	
		model	FES-2XX series FES-310 seires	FES-125 seires FES-126 seires	
		Measurable range	0.000-2.000mS/cm	○	○
			0.00-20.00mS/cm	○	○
			0.00-20.00mS/cm	○	○
			0.00-2000mS/cm	△(*2)	△(*2)
			AUTO(*1)	○	○
			Practical-use range (*2)	0-500	0-1000
			Readout range	0-2200	
			0.000-0.2000S/m	○	○
			0.00-2.000S/m	○	○
			0.00-20.00S/m	○	○
		0.00-200.0S/m	△(*2)	△(*2)	
		AUTO(*1)	○	○	
Practical-use range (*2)	0-50.0	0-100.0			
Readout range	0-220.0				
	(*1) The range (decimal point position) changes automatically. (*2) Values may be measured as electric conductivity without temperature compensation.				
Temp		0.00-100.00 (readout range: -30°C to 160°C)			
Salt conversion function	Seawater	%	0.00-4.00		
	NaCl	%	0.0-20.0		
Concentration conversion function	NaOH	%	0.00-5.00		
	HNO3	%	0.00-5.00		
	H3PO4	%	0.00-5.00		
	Arbitrary 1 to 4	%	0.00-100.00		
Display resolution	Electric conductivity and conversion	As shown in the above table			
	Temp	0.01°C			
Performance	Electric conductivity	Repeatability (mS/cm)	Cell constant (/cm)	0.1	1.0
			0.00-20.00	Within ±0.5% of full-scale value	Within ±0.5% of full-scale value
			20.0-200.0	Within ±1.0% of full-scale value	Within ±0.5% of full-scale value
		200-1000	-	Within ±1.0% of full-scale value	
		Linearity (mS/cm)	Cell constant (/cm)	0.1	1.0
			0.00-20.00	Within ±0.5% of full-scale value	Within ±0.5% of full-scale value
	20.0-200.0		Within ±1.0% of full-scale value	Within ±0.5% of full-scale value	
	200-1000	-	Within ±1.0% of full-scale value		
	Temp	Repeatability	Within ±0.1°C(for equivalent input)		
		Linearity	Within ±0.5°C(for equivalent input)		
Transmission output	Number of output points		2 (the negative terminals for transmission outputs are internally connected to each other and have the same electric potential.		
	Output type		4 to 20 mA DC, input/output insulation type		
	Load resistance		900Ω max.		
	Repeatability		Within ±0.02 mA (output only)		
	Linearity		Within ±0.08 mA (output only)		
	Output range	Output 1	Electric conductivity (or calculated value): Arbitrarily selectable within the measurable range		
		Output 2	Temperature: Freely specifiable within a range between -30 and 160		
	Error output		With burn-out capability (3.8 or 21 mA)		
Hold capability		Selectable from hold function, previous value held, and arbitrary value held.			

*1: The range (decimal point position) changes automatically.

*2: Values may be measured as electric conductivity without temperature compensation.

<p>■ Specification 2</p>

Output terminal	Number of output points		3 points
	Output type		No-voltage contact output
	Contact Form		Relay contact, SPDT (1c)
	Contact point capacity		250VAC 3A, 30VDC 3A
	Contact function	RI, R2	Selectable from upper limit alarm, lower limit alarm, and transmission output hold. (closed when alarm is ON; normally open; open when power is OFF)
		FAIL	Error alarm (closed when normal; opened when an error occurs; opened when
Description of alarm function	Description of output	Electric conductivity (or converted value) and temperature	
	Description of settings	• Setting range: Within the measurable range	
		• Delay time: 0 to 600 seconds	
Contact input	Number of input points		2 points
	Contact Form		Open collector, no-voltage a-contact
	Conditions		ON resistance: 100Ω max. Open voltage: 24 VDC Short-circuit current: 12 mA DC
	Contact function		External input for transmission output range selection and transmission output hold Selectable from "transmission 4 ranges selection" and "transmission 2 ranges selection plus hold." The readout changes automatically in conjunction with the selected transmission
Communication function	Method		RS-485
	Signal type		Two-wire, input/output insulated type (not insulated from transmission output)
Temperature compensation	Applicable temperature element		Platinum resistive element: 1 kΩ (0°C)
	Compensation method		• Select one of the following three options: Temperature characteristics of NaCl (reference temperature: 5 to 95°C) • Input of arbitrary temperature coefficient (reference temperature: 5 to 95 ; temperature coefficient: ±3%/°C) • No temperature compensation
	Temperature compensation range		0°C to 100°C (extensively calculated at less than 0°C or more than 100°C)
Calibration	Electric conductivity		By entering a correction coefficient (parameter) for the cell constant
	Temp		One-point calibration using comparison with reference thermometer
Self-diagnostics	Electrode diagnostic error		Temperature sensor short-circuit error, temperature sensor electrical discontinuity error and temperature calibration range error
	Converter error		CPU error, ADC error, and memory error
Operating	-20 to 55 (without freeze)		
Operating humidity	Relative humidity: 5% to 90% (without condensation)		
Storage temperature	-25 to 65		

<p>■ Specification 3</p>

Power Source	Rated voltage		100-240VAC 50/60Hz		
	Power Consumption		15VA(max)		
	Others		With built-in time lag fuse (250 V, 1 A) With built-in power switch for maintenance		
Applicable standards	CE marking		EMCDirective(2004/108/EC) EN61326-1:2006 Low Voltage Directive (2006/95/EC) EN61010-1: 2001		
	EMC	Immunity Industrial location	Electrostatic discharge		IEC61000-4-2
			Radiated radiofrequency electromagnetic field		IEC61000-4-3
			Electric fast transient/burst		IEC61000-4-4
			Surge		IEC61000-4-5(*3)
			Conducted interference induced by		IEC61000-4-6
			Voltage dip, short-time power outage, and voltage fluctuation		IEC610000-4-11
	Emission ClassA	Radiated disturbance		CICPR 11 CLASSA	
		Noise terminal voltage		CISPR 11 CLASSA	
	Low voltage		Contamination level 2		
FCC Rules		Part 15 CLASS A			
Structure	Installation		Outdoor installation type		
	Installation method		50 A pole or wall mounting		
	Protection Class		IP65		
	Case material		Aluminum alloy (coated with epoxy modified melamine resin)		
	Mounting bracket material		SUS304		
	Hood material		SUS304 stainless steel (coated with epoxy modified melamine resin)		
	Readout window material		Polycarbonate		
	Readout element		Reflection type monochrome LCD		
External dimensions	180 (W) x 155 (H) x 115 (D) (excluding the mounting bracket)				
Mass	Body: Approx. 3.5 kg; hood and mounting bracket: Approx. 1 kg				

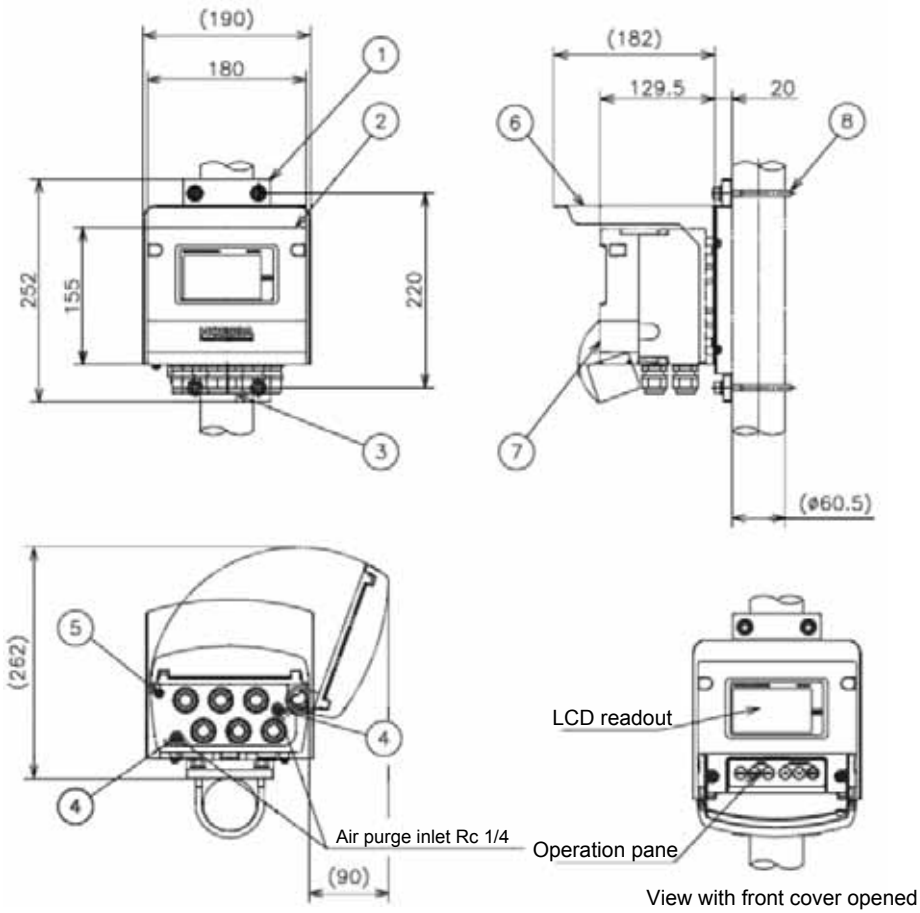
*3: When the sensor cable, the transmission cable, or the contact input cable is extended to 30 m or more, the surge test is not applied under the EMC directive for CE marking.

*4: For transmission output, contact input, and communication, an arrester (sparkover voltage: 400 V) is provided.

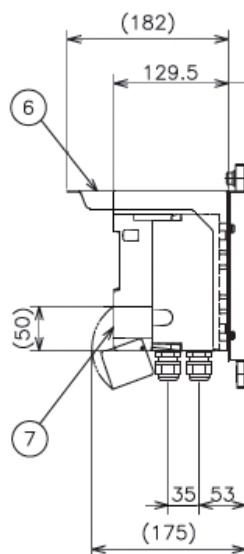
However, use the most suitable surge absorption element on the connected line considering the ambient environment, the equipment installation situation, and the externally connected equipment.

External dimensions (electric resistance meter: HE-200H)

(pole-mounted)



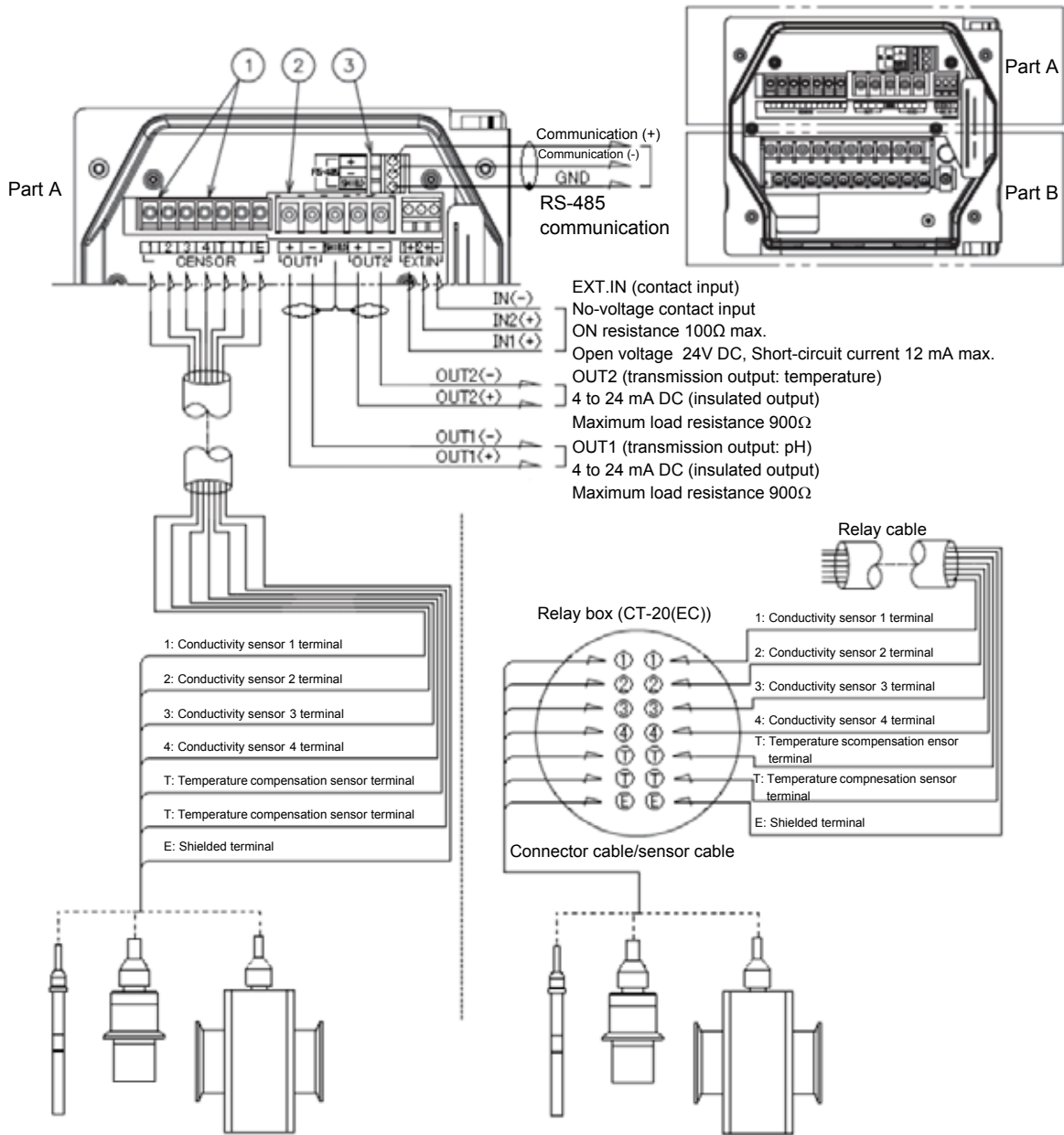
(wall-mounted)



	PARTS	NOTES
(1)	Mounting plate	SUS304
(2)	Case	ADC12
(3)	Wiring hole	O.DΦ7 to Φ12cable
(4)	Plug	SUS304
(5)	Earth	SUS304 M4
(6)	Cover	SUS304
(7)	Front cover	ADC12
(8)	U bolt	SUS304 50A M8

Coated with epoxy modified melamine resin
(Munsell 10PB/7/1)
Approx. 4.1 kg
IP65(IEC60529, JIS C0920)

External connection diagram 1 (HE-200H)

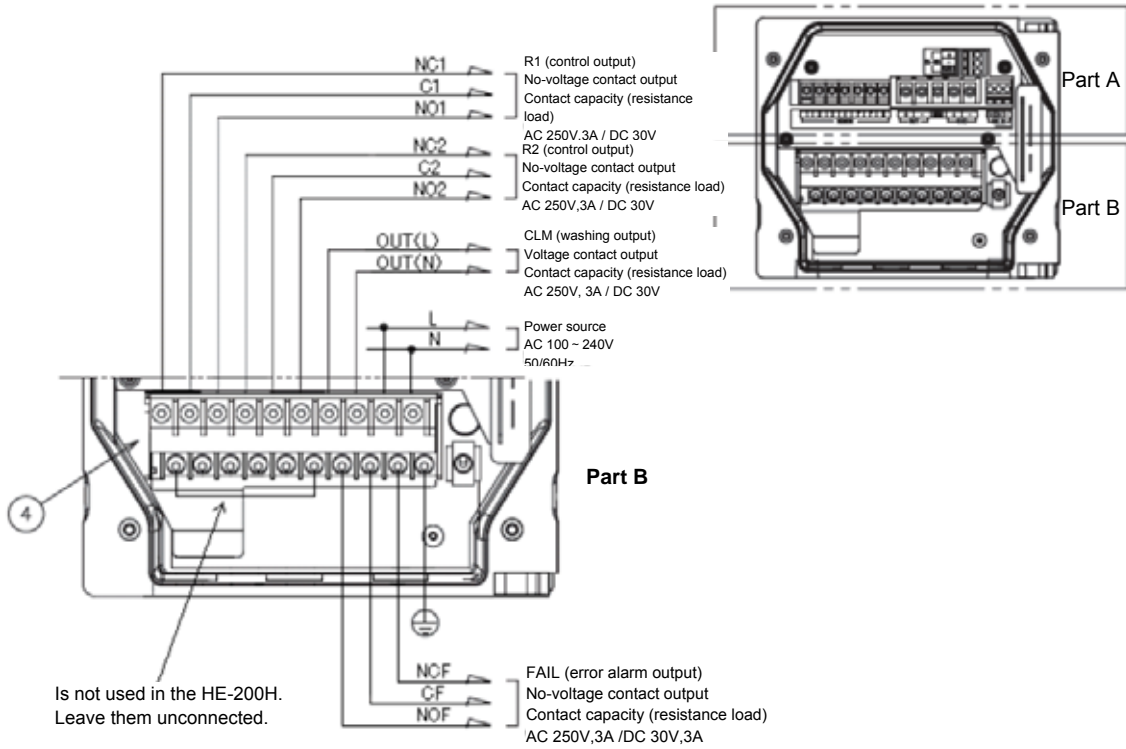


Terminal screw	Applicable crimp-type terminal	Applicable electric wire	Screw tightening torque
① M3	MAX6.5, MAX3.2 	1.25mm ² /MAX (AWG16)	0.8N·m
② M3.5	MAX6.2, MAX3.6 	2mm ² /MAX (AWG14)	0.8~1.2N·m
③ M3		0.14~2.5mm ² (AWG26~14) Single or stand wire	0.5~0.6N·m

Note

- :The screws on the terminal block are designed as non-removable. To connect a cable to a terminal turn the screw until it is floated.
- :The negative terminals OUT1(-) and OUT2(1) are internally connected and have the same electric potential.
- :Do not use any blank terminal.

External connection diagram 2 (HE-200H)



Terminal screw	Applicable crimp-type terminal	Applicable electric wire	Screw tightening torque
④ M4	MAX8, MAX4.7, MAX8.5	5.5mm ² /MAX (AWG10)	1.2~1.8N·m

Note

- :The screws on the terminal block are designed as non-removable. To connect a cable to a terminal turn the screw until it is floated.
- :The negative terminals OUT1(-) and OUT2(1) are internally connected and have the same electric potential.
- :Do not use any blank terminal.

Specifications and shapes of electric conductivity sensor



FES-125F
(lead type)

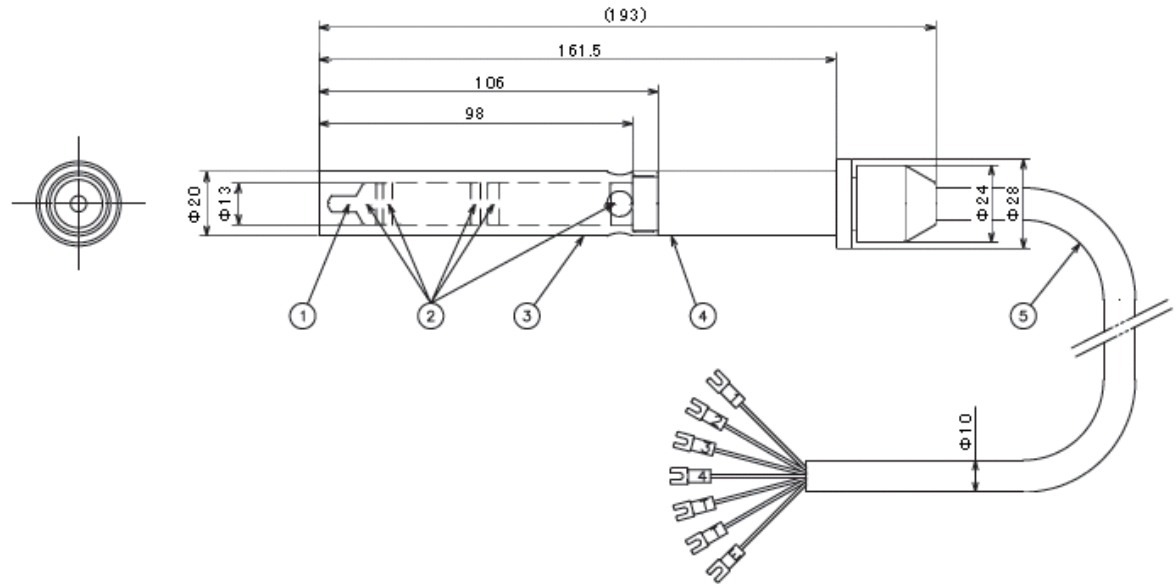


FES-126F
(lead type)
With screw-in adapter (EA-40)

Model	FES-125F	FES-126F
Cell constant	Approx. 1.0/cm	
Wetted material	Pole	Titanium
	Body	PVC PSS
	Gasket	FKM
Measuring liquid pressure	0-1.0MPa	
Measuring liquid temperature	0-50°C	0-120°C
Cable length	Lead type: 10 m; spade terminal (standard); max. extension: 50m *1	
Optional	Flow-through holder	Screwed type flange size: R(PT) 3/4
	Screw-in adapter	EA-20 (for FES-125F) EA-40 (for FES-126F)

*1: For extension, use the relay cable (C-7C) and the relay box (CT-20EC).

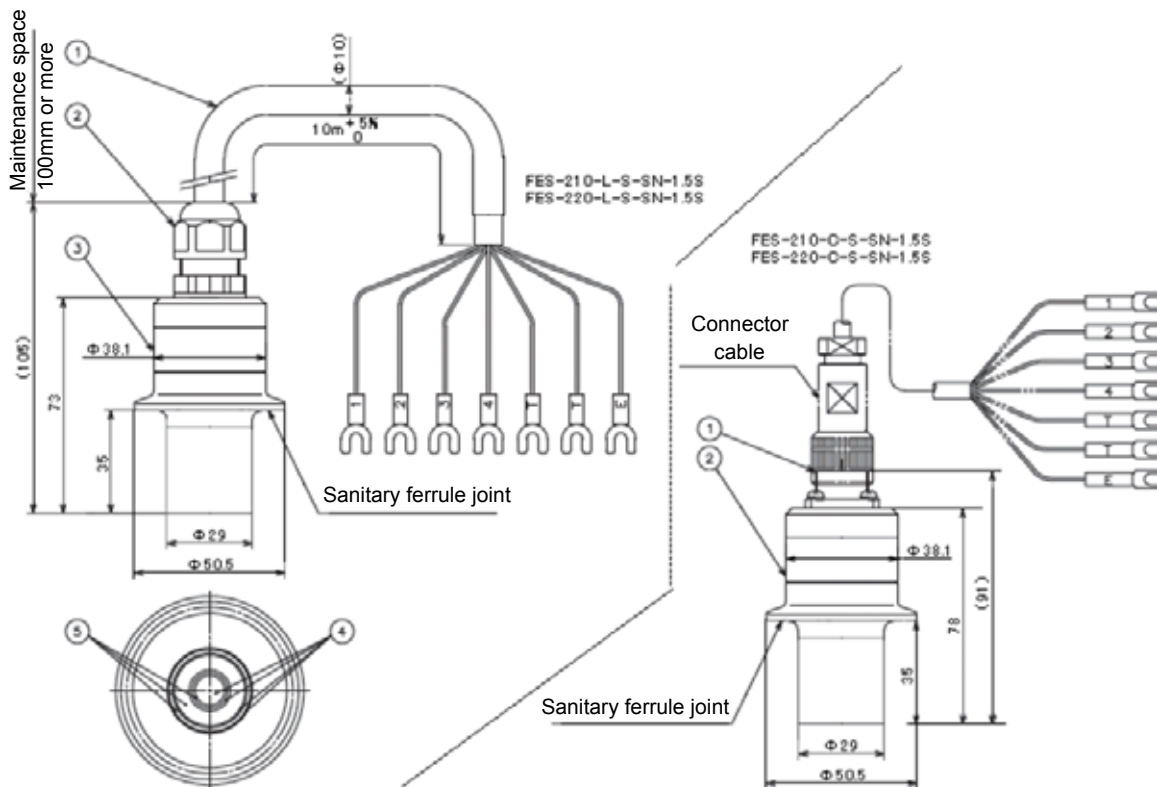
FES-125F/FES-126F



	PARTS	NOTES
(1)	Temperature sensor	Pt1000 Ω
(2)	Electrode	T340
(3)	Sensor cover	PVC(FES-125F)
		PSS(FES-126F)
(4)	Sensor body	PVC(FES-125F)
		PSS(FES-126F)
(5)	Silicone	S-PVC

Specifications	
Cell constant	Approx. 1.0
RTD	Pt1000 Ω , 3850ppm/ $^{\circ}$ C
Measured liquid conditions	Temperature: 0-50 (FES-125F)
	Temperature: 0-100 (FES-126F)
	Pressure: 0 MPa to 1.0 MPa
Wetted material	Pole: Titan
	Spacer: FKM
	Body:PVC(FES-125F)
	Body:PSS(FES-126F)
Cable length	10m

FES-210-L-S-SN-1.5S/FES-210-C-S-SN-1.5S
FES-220-L-S-SN-1.5S/FES-220-C-S-SN-1.5S



FES-210-L-S-SN-1.5S
FES-220-L-S-SN-1.5S

PARTS	NOTES
(1) Silicone	Flexible PVC
(2) Cable gland	Nylon 66
(3) Body	PPS(FES-210) SUS36L(FES-220)
(4) Electrode	SUS 316L stainless steel
(5) Insulator	PPS

FES-210-C-S-SN-1.5S
FES-220-C-S-SN-1.5S

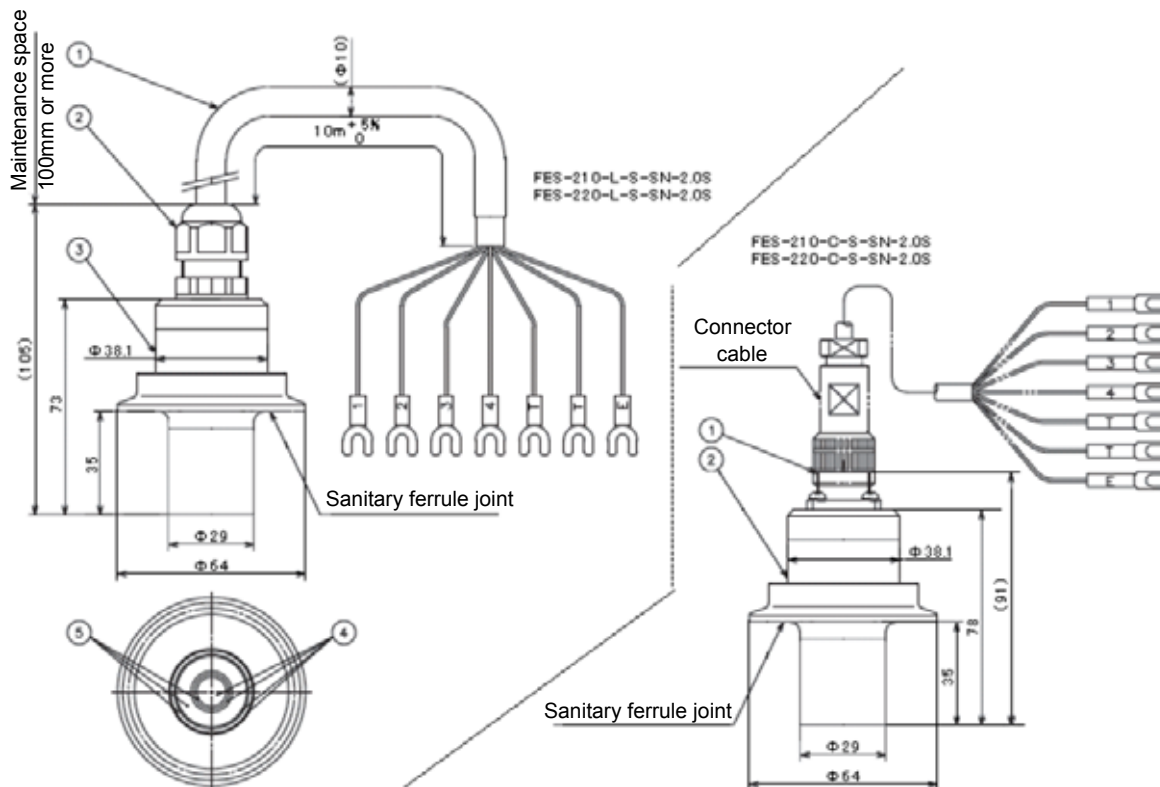
PARTS	NOTES
(1) Connector	Plated with Ni.
(2) Body	PPS(FES-210) SUS36L(FES-220)
(4) Electrode	SUS 316L stainless
(5) Insulator	PPS

Specifications

Measuring principle	AC 4-pole method
Cell constant	Approx. 0.1/cm
RTD	Pt1000Ω, 3850ppm/°C
Measurable range	0 to 500 mS/cm (conforming to the specifications for electric conductivity converter)
Measured liquid conditions	Temperature: 0-110°C (The resin ferrule deforms if 150°C is exceeded.) For steam sterilization, a clamp for high pressure is required.) Pressure: 0-1 MPa Operating temperature: 0-50°C Operating humidity: 95%R or less Construction: Equivalent to IP65 Weight: Approx. 2 kg (FES-210-L-S-SN-1.5S/FES-220-L-S-SN-1.5S) including a cable Approx. 0.2 kg (FES-210-C-S-SN-1.5S/FES-220-C-S-SN-1.5S)
Sterilization conditions	Temperature: 140°C max. Pressure: 0.6 MPa Time: Within 60 minutes
Wetted material	Electrode: SUS 316L stainless steel (treatment: #400 buffed) Insulated part of electrode: PPS O-ring: FKM

FES-210-L-S-SN-2.0S/FES-210-C-S-SN-2.0S

FES-220-L-S-SN-2.0S/FES-220-C-S-SN-2.0S



FES-210-L-S-SN-2.0S

FES-220-L-S-SN-2.0S

PARTS	NOTES
(1) Silicone	Flexible PVC
(2) Cable gland	Nylon 66
(3) Body	PPS(FES-210) SUS36L(FES-220)
(4) Electrode	SUS 316L stainless steel
(5) Insulator	PPS

FES-210-C-S-SN-2.0S

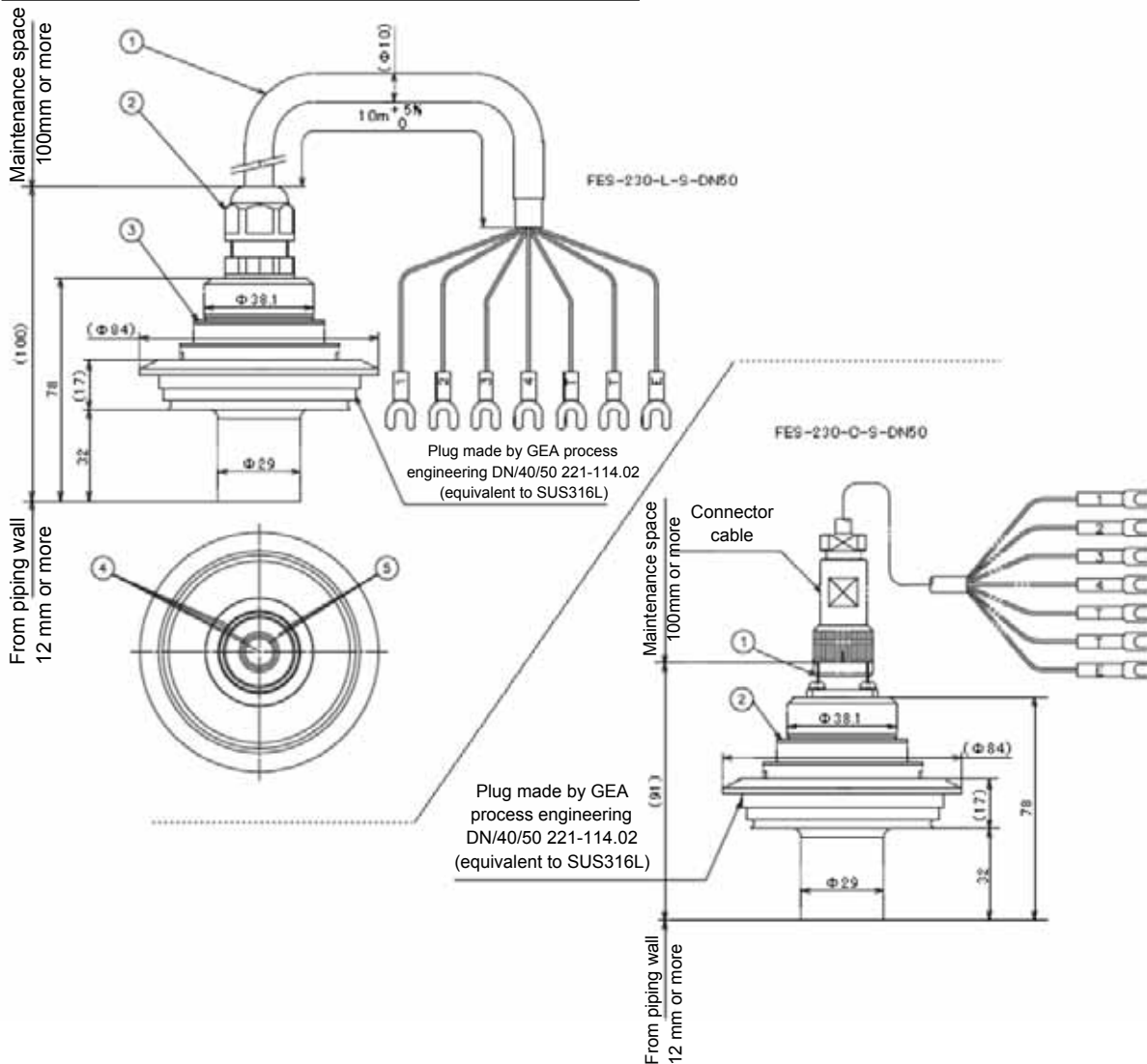
FES-220-C-S-SN-2.0S

PARTS	NOTES
(1) Connector	Plated with Ni.
(2) Body	PPS(FES-210) SUS36L(FES-220)
(4) Electrode	SUS 316L stainless steel
(5) Insulator	PPS

Specifications

Measuring principle	AC 4-pole method
Cell constant	Approx. 0.1/cm
RTD	Pt1000Ω, 3850ppm/°C
Measurable range	0 to 500 mS/cm (conforming to the specifications for electric conductivity converter)
Measured liquid conditions	Temperature: 0-110°C (The resin ferrule deforms if 150°C is exceeded.) For steam sterilization, a clamp for high pressure is required.) Pressure: 0-1 MPa Operating temperature: 0-50°C Operating humidity: 95%R or less Construction: Equivalent to IP65 Weight: Approx. 250 (FES-210-L-S-SN-2.0S/FES-220-L-S-SN-2.0S) including a cable Approx. 0.2 kg (FES-210-C-S-SN-2.0S) Approx. 0.5 kg (FES-220-C-S-SN-2.0S)
Sterilization conditions	Temperature: 140°C max. Pressure: 0.6 MPa Time: Within 60 minutes
Wetted material	Electrode: SUS 316L stainless steel (treatment: #400 buffed) Insulated part of electrode: PPS O-ring: FKM

FES-230-L-S-DN50/FES-230-C-S-DN50



* Varivent is a registered trade mark of GEA Process Engineering.

FES-230-L-S-DN-50

PARTS	NOTES
(1) Silicone	Plated with Ni, FKM
(2) Conduit	Nylon 66
(3) Presser	SUS316
(4) Electrode	SUS 316L sta
(5) Insulator	PPS

FES-230-C-S-DN-50

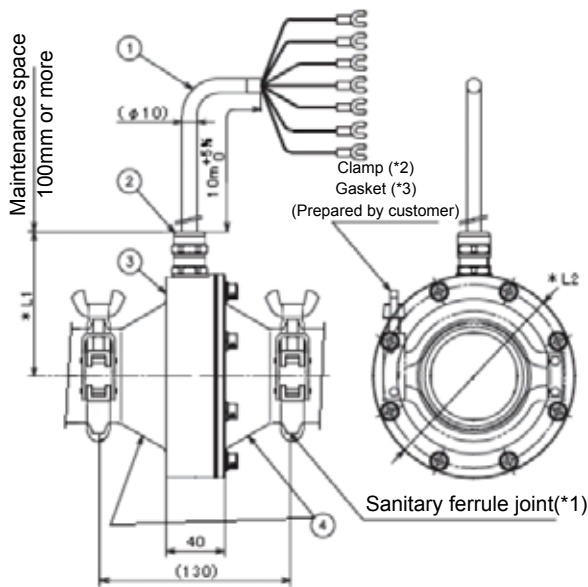
PARTS	NOTES
(1) Connector	Brass (plated with Ni), FKM
(2) Presser	SUS316
(4) Electrode	SUS 316L sta
(5) Insulator	PPS

Specifications

Measuring principle	AC 4-pole method
Cell constant	Approx. 0.1/cm
RTD	Pt1000Ω, 3850ppm/°C
Measurable range	0 to 500 mS/cm (conforming to the specifications for electric conductivity converter)
Measured liquid conditions	Temperature: 0-110°C
	Pressure: 0-1 MPa
	Operating temperature: 0-50°C
	Operating humidity: 95%R or less
Construction:	Equivalent to IP67

Weight	Approx. 2.6 kg (FES-230-L-S-DN-50) including a cable
	Approx. 0.65 kg (FES-230-C-S-DN-50)
Sterilization conditions	Temperature: 140 max.
	Pressure: 0.6 MPa
	Time: Within 60 minutes
Wetted material	Electrode: SUS 316L stainless steel (treatment: #400 buffed)
	Insulated part of electrode: PPS
	O-ring: FKM

■ FES-310-L-S-SN series



FES-310-L-S-SN-1.5S/FES-310-L-S-SN-2.0S
 FES-310-L-S-SN-2.5S/FES-310-L-S-SN-3.0S
 FES-310-L-S-SN-4.0S/FES-310-L-S-SN-4.5S

PARTS	NOTES
(1) Silicone	Flexible PVC
(2) Cable gland	Brass (plated with Ni),
(3) Sensor body	SUS 316L stainless steel
(4) Flange	SUS 316L stainless steel

Dimensions

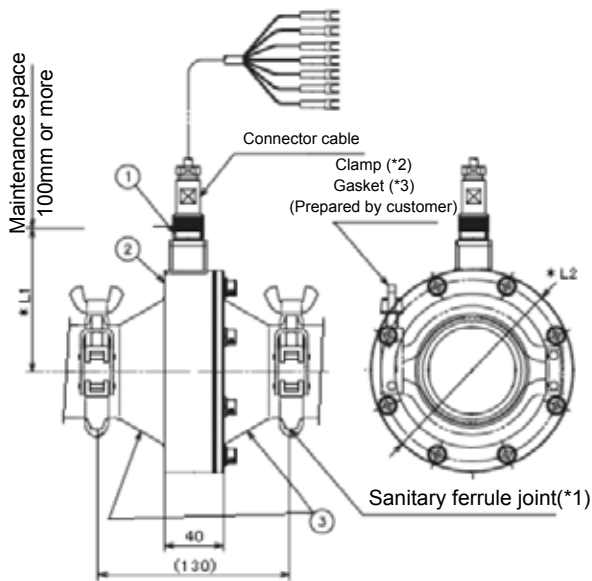
Electric conductivity sensor	*L1	*L2(φ)	*1	*2	*3
FES-310-L-S-SN-1.5S	80.5	104	For 1.5.0S		
FES-310-L-S-SN-2.0S	86	114	For 2.0.0S		
FES-310-L-S-SN-2.5S	98	138	For 2.5.0S		
FES-310-L-S-SN-3.0S	109	159	For 3.0.0S		
FES-310-L-S-SN-4.0S	119.5	180	For 4.0.0S		
FES-310-L-S-SN-4.5S	123.5	188	For 4.5.0S		

Specifications

Measuring principle	AC 4-pole method	
Cell constant	Approx. 0.25/cm	FES-310-L-S-SN-1.5S
	Approx. 0.15/cm	FES-310-L-S-SN-2.0S
		FES-310-L-S-SN-2.5S
		FES-310-L-S-SN-3.0S
		FES-310-L-S-SN-4.0S
	FES-310-L-S-SN-4.5S	
RTD	Pt1000Ω,3850ppm/°C	
Measurable range	0 to 500 mS/cm (conforming to the specifications for electric conductivity converter)	
Measured liquid conditions	Temperature: 0-110°C	
	Pressure: 0-1 MPa	
	Operating temperature: 0-55C	
	Operating humidity: 95%R or less	
Construction	Equivalent to IP67	

Weight	Approx. 2 kg (excluding a cable) : FES-310-L-S-SN-1.5S
	Approx. 2.5kg (excluding a cable) : FES-310-L-S-SN-2.0S
	Approx. 3.5kg (excluding a cable) : FES-310-L-S-SN-2.5S
	Approx. 5 kg (excluding a cable) : FES-310-L-S-SN-3.0S
	Approx. 6kg (excluding a cable) : FES-310-L-S-SN-4.0S
	Approx. 8kg (excluding a cable) : FES-310-L-S-SN-4.5S
Sterilization conditions	Temperature: 140°C max.
	Pressure: 0.6 MPa
	Time: Within 60 minutes
Wetted material	Electrode: SUS 316L stainless steel (treatment: #400 buffed)
	Insulated part of electrode: PPS
	O-ring: FKM
	Flange: SUS316L stainless steel (treatment: #400 buffed)

■ FES-310-C-S-SN series



FES-310-C-S-SN-1.5S/FES-310-CS-SN-2.0S
 FES-310-C-S-SN-2.5S/FES-310-CS-SN-3.0S
 FES-310-C-S-SN-4.0S/FES-310-C-S-SN-4.5S

	PARTS	NOTES
(1)	Connector	Brass (plated with Ni), EPDM
(2)	Sensor body	SUS 316L stainless steel
(3)	Flange	SUS 316L stainless steel

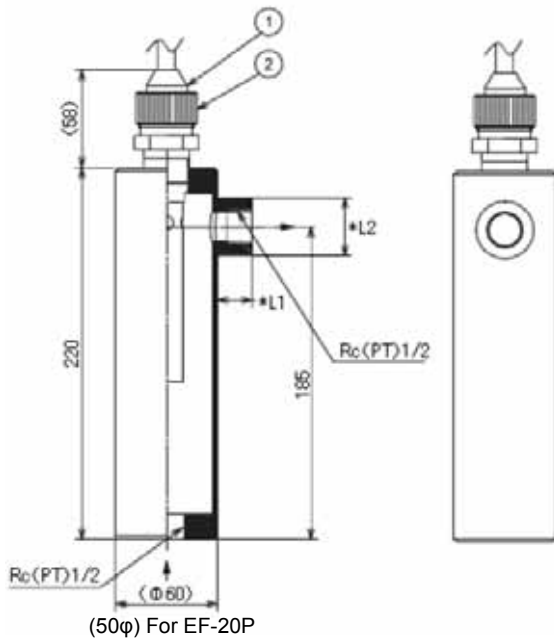
Electric conductivity sensor	*L1	*L2(φ)	*1	*2	*3
FES-310-C-S-SN-1.5S	80.5	104	For 1.5.0S		
FES-310-C-S-SN-2.0S	86	114	For 2.0.0S		
FES-310-C-S-SN-2.5S	98	138	For 2.5.0S		
FES-310-C-S-SN-3.0S	109	159	For 3.0.0S		
FES-310-C-S-SN-4.0S	119.5	180	For 4.0S		
FES-310-C-S-SN-4.5S	123.5	188	For 4.5.0S		

Specifications

Measuring principle	AC 4-pole method	
Cell constant	Approx. 0.25/cm	FES-310-C-S-SN-1.5S
	Approx. 0.15/cm	FES-310-C-S-SN-2.0S
		FES-310-C-S-SN-2.5S
		FES-310-C-S-SN-3.0S
		FES-310-C-S-SN-4.0S
	FES-310-C-S-SN-4.5S	
RTD	Pt1000Ω,3850ppm/°C	
Measurable range	0 to 500 mS/cm (conforming to the specifications for electric conductivity converter)	
Measured liquid conditions	Temperature: 0-110°C	
	Pressure: 0-1 MPa	
	Operating temperature: 0-55°C	
	Operating humidity: 95%R or less	
Construction	Equivalent to IP67	

Weight	Approx. 2 kg (excluding a cable) : FES-310-C-S-SN-1.5S
	Approx. 2.5kg (excluding a cable) : FES-310-C-S-SN-2.0S
	Approx. 3.5kg (excluding a cable) : FES-310-C-S-SN-2.5S
	Approx. 5 kg (excluding a cable) : FES-310-C-S-SN-3.0S
	Approx. 6kg (excluding a cable) : FES-310-C-S-SN-4.0S
	Approx. 8kg (excluding a cable) : FES-310-C-S-SN-4.5S
Sterilization conditions	Temperature: 140°C max.
	Pressure: 0.6 MPa
	Time: Within 60 minutes
Wetted material	Electrode: SUS 316L stainless steel (treatment: #400 buffed)
	Insulated part of electrode: PPS
	O-ring: FKM
	Flange: SUS316L stainless steel (treatment: #400 buffed)

Holder for electric conductivity sensor: Specifications and External Dimensions



	PARTS	NOTES
(1)	Electric conductivity sensor	FES-125F or FES-126F
(2)	Screw-in adapter	EA-20 or EA-40
(3)	Distribution holder	

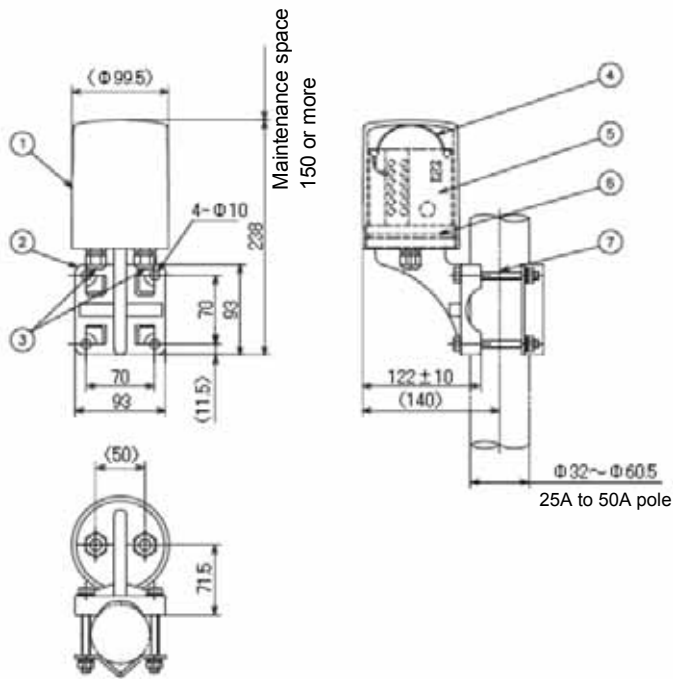
	*L1	*L2
EF-20	20	Φ34
EF-20P	25	Φ35
EF-20S	20	Φ34

Model	EF-20	EF-20P	EF-20S
Materials of Liquid Junction Section	PVC	PVDF	SUS316
Measuring liquid pressure	0-0.1MPs	0-0.1MPs	0-0.5MPs
Measuring liquid temperature	0-50°C	0-100°C	0-100°C
Flow rate of liquid measured	0-10L/min		
Flange size of connection piping	Inlet: Rc (PT) 3/4, outlet: Rc (PT) 3/4		

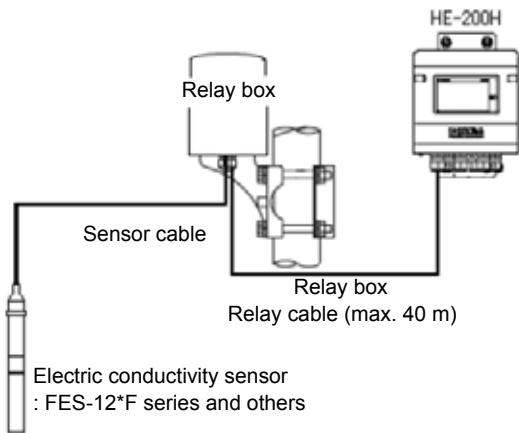
Installation conditions

Flow rate	0 to 1.0 MPa (max.) (The dedicated holder is dependent on the holder material.)
Temp	0-50°C (maximum) (when FES-125F is used) 0-100°C (maximum) (when FES-126F is used) (The dedicated holder is dependent on the holder material.)
Flow rate	10 L/min (maximum) (Maximize the flow rate within 10 L/min)

Specifications and external dimensions of relay box (CT-20EC)



	PARTS	NOTES
1	Cover	ABS
2	Bracket	ABS
3	Wiring hole	
4	Spring	SUS304WPA
5	Terminal board	ABS
6	O-ring	NBR
7	Bolt (provided)	SUS304 M8



- Be sure to use the relay box when the distance between the sensor and the converter is longer than the sensor cable length.
- For wiring, be sure to use the relay cable. Do not use the general cable or halfway splice the dedicated cable.
- The relay box is designed as rainproof.

■ Specifications and shape of C-7E relay cable

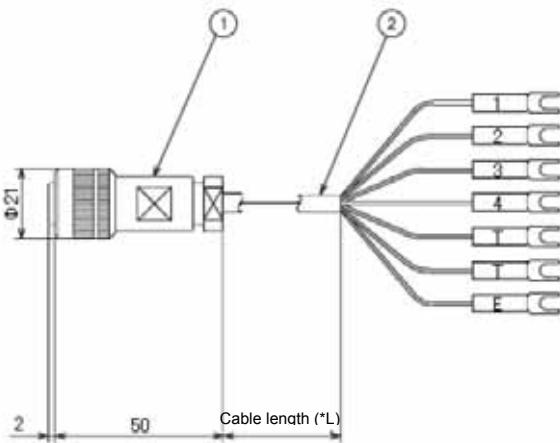


Characteristics

Conductor resistance	63.2Ω/km max.
Withstand voltage	Shall withstand 1000 VAC for 1 minute.
Rated temperature	90°C
Capacitance	150 PF/m max.

- Use this cable when the standard cable is extended to more than 10 m using FES-125F/FES-126F.
- For wiring, be sure to use the dedicated cable. Do not use any general cable or splice the cable.
- To extend the cable, use the relay box.

■ Specifications and shape of SK series connector cable



	PARTS	NOTES
(1)	Connector	1108-12A10-7F(Φ10.5)
(2)	Silicone	Flexible PVC

Model	Cable length (*L)	Shape of terminal
SK-10M	10m	Spade terminal
SK-20M	20m	Spade terminal
SK-30M	30m	Spade terminal
SK-40M	40m	Spade terminal
SK-50M	50m	Spade terminal

FES-210-C-S-SN-1.5S/FES-210-C-S-SN-2.0S
 FES-220-C-S-SN-1.5S/FES-220-C-S-SN-2.0S
 FES-230-C-S-DN50
 FES-310-C-S-SN-1.5S/FES-310-C-S-SN-2.0S
 FES-310-C-S-SN-2.5S/FES-310-C-S-SN-3.0S
 FES-310-C-S-SN-4.0S/FES-310-C-S-SN-4.5S

Use this cable when XXX is used.

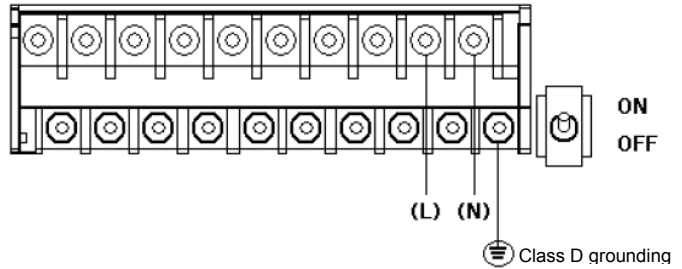
- For wiring, be sure to use the dedicated cable. Do not use any general cable or splice the cable.

■ Precautions for installation (power source and transmission)

Carry out installation and execution of work while paying attention to the following points:

Power Source

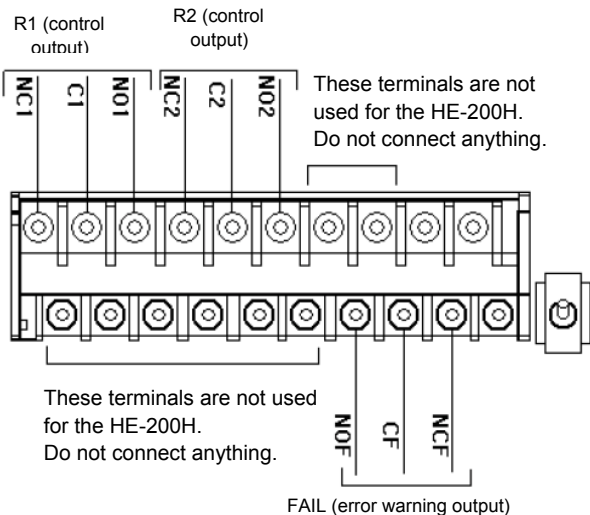
- The HE-200H has the power switch.
- Operation outside the rated range can cause a fault. Therefore, check the power supply voltage.
- Carefully check that the power supply voltage fluctuations fall within a range of $\pm 10\%$.
- Provide the power switch in a place near the HE-200H strike, install an arrester on the output side of the HE-200H
- Be sure to ground the grounding terminal (class D grounding).
- Separate this grounding from any other grounding for electric equipment such as a motor.



Electric power supplied	Voltage: 100 to 240 VAC Frequency: 50/60 Hz
Terminal screw	M4
Applicable power	0.75 to 5.5 mm ² (AWG18 to 10).

Output terminal

- If noise is detected from the load, use a varistor or a noise killer.
- For the FAIL output only, NO and NC are reversed. When the HE-200H is normal (not in failure), the CF-NOF contact is open and the CF-NCF contact is short-circuited. When the power is OFF, the C-NOF contact is short-circuited.
- The blank terminals are internally connect to each other. Do not connect anything.
- To connect any load exceeding the contact capacity or any induction load (e.g., a motor or a pump), be sure to use a power relay exceeding the load rating.
- When the HE-200H is OFF, the C-NC contact for R1 to R4 is short-circuited. Therefore, be careful about the connection of load

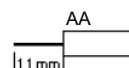
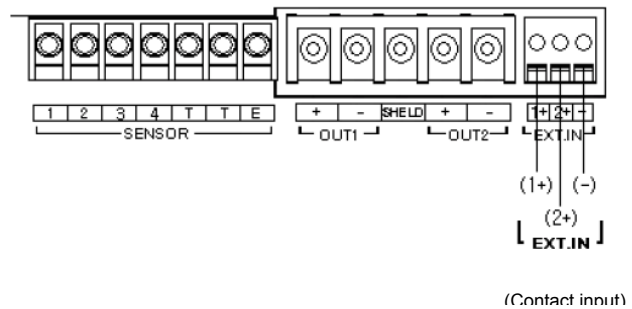


Contact point capacity	250 VAC, 3A max. or 30 VDC, 3 A maximum
Terminal screw	M4
Applicable power cable	0.75 to 5.5 mm ² (AWG18 to 10)

Contact input

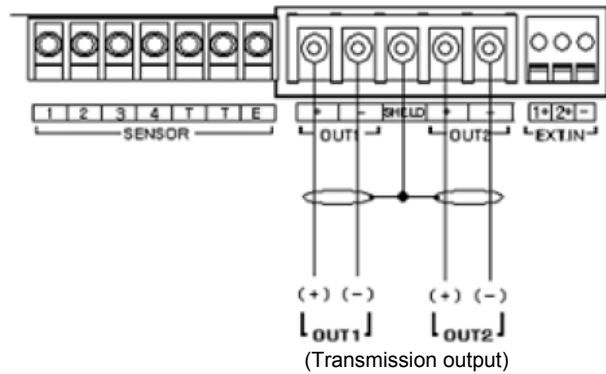
- For the cable, use a shielded cable.
- When lightning might strike, install an arrester on the output side of the HE-200H and on the side of receiving instruments.
- For cable termination, strip the covering at the leading end by 11 mm and then connect the exposed cable to the terminal.

Contact input resistance	100Ω/km max.
Terminal screw	M3.5
Applicable power cable	0.75 to 5.5 mm ² (AWG18 to 10)



Transmission output

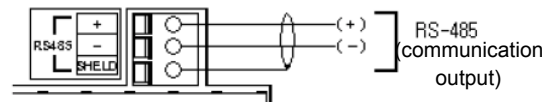
- For the transmission output cable, use a shielded cable.
- When lightning might strike, install an arrestor on the output side of the HE-200H and on the side of receiving instruments.
- The negative terminals OUT1 (-) and OUT2 (-) for transmission output are internally connected and have the same electric potential.



Maximum load resistance	900Ω
Terminal screw	M3.5
Applicable power cable	2mm ² (AWG14) MAX

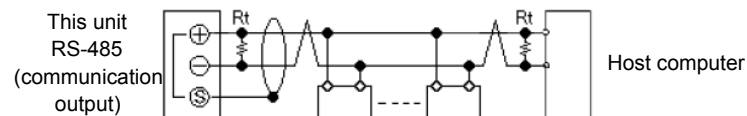
RS-485

- For the communication output cable, use a twisted shielded pair.
- The communication cable length is 500 m maximum.
- Use a terminating resistor (Rt: 120Ω) for any device at which the RS-485 communication line is terminated.
- Up to 32 connections can be made including one for the host computer. Set the address.



RS-485 communication conditions	Baud rate	19200
	Character length	8 bit
	Parity	non
	Stop bit	1 bit

Example of external connection for communication



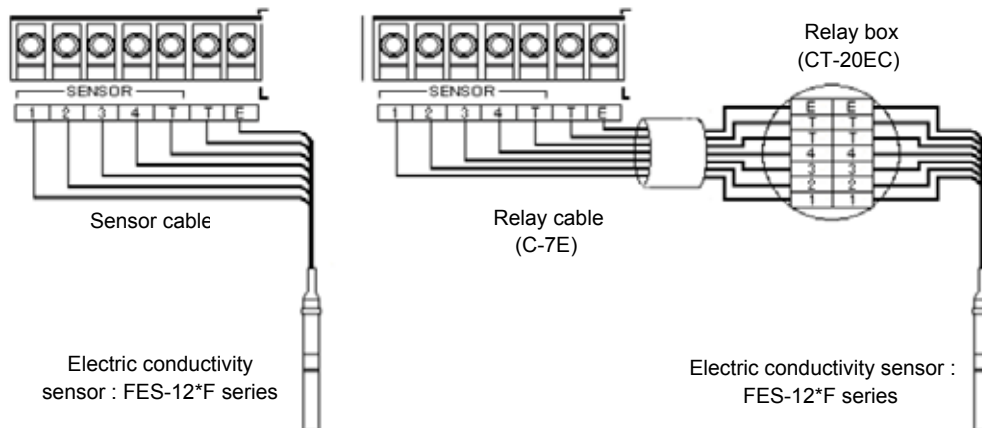
Sensor cable

The sensor cable is highly insulated. Exercise care in handling the sensor cable.

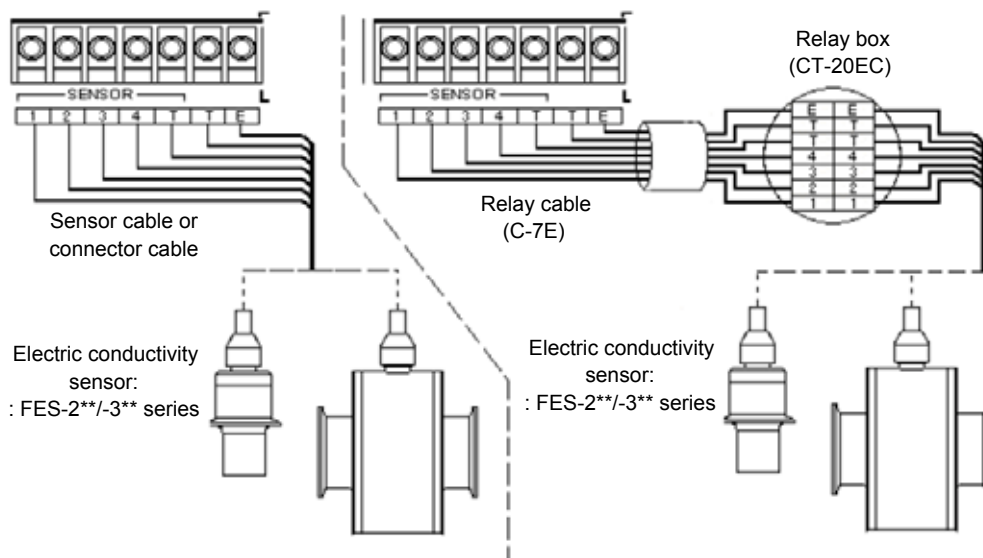
- Do not wet any cable terminal or the terminal block with water or the like; also do not soil it with dirt, oil, or the like. The insulation will otherwise deteriorate. The decreased insulation can cause instable readings. Maintain the electrode cable in a dry, clean state. If the electrode cable should be soiled, wipe it off with alcohol or the like and then well dry it.
- In wiring the sensor, give a margin to the sensor cable length for the purposes of calibration with standard solutions and of the checks and replacement of the sensor.
- Keep the wiring of the sensor cable and the relay cable away from electromagnetic induction devices such as a motor and their power cables.
- Be sure to use replay cable and relay box.
- For the sanitary sensor, avoid extension wherever practical. Specify a connector cable of the necessary length.

Electric conductivity Sensor	1: Conductivity sensor 1 terminal
	2: Conductivity sensor 2 terminal
	3: Conductivity sensor 3 terminal
	4: Conductivity sensor 4 terminal
	T, T: Temperature compensation sensor terminal
	E: Shielded terminal

Connecting an ordinary electric conductivity sensor of the FES series



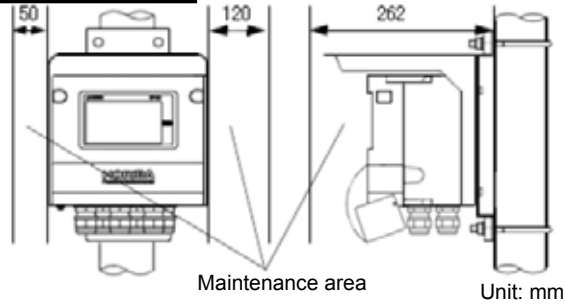
Connecting a sanitary electric conductivity sensor of the FES series



■ Installation (mounting)

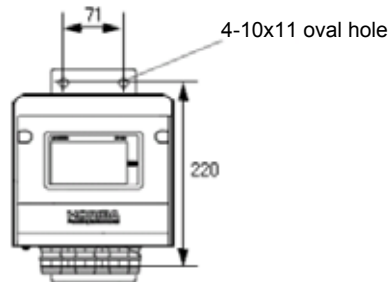
The description of the following installation (mounting) assumes that the HE-200H is of the standard specification.
For the HE-200H, the optionally available cleaner may be installed.
The installation of the HE-20H with the cleaner will be described in the section for the cleaner.

Body (for pole mounting)



- The body may be mounted on the pole or the wall.
- For pole mounting, use a 50A pole.
- In either case, mount the body considering maintenance space.

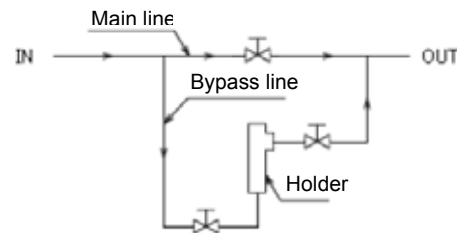
Body (to be wall-mounted)



Sensor plus flow-through holder

Precautions for sensor piping

To install the sensor on the piping line, provide a bypass line from the main line and use the flow-through type holder. Carry out piping so that the liquid under measurement is sent upward from the lateral side of the flow-through holder (from the leading end of the electric conductivity sensor).



Provide the holder in the bypass line.

Installation conditions

- Send the liquid under measurement so that the sensor is filled with water without bubbles
- The sensor may be installed either horizontally or vertically.
- Ensure that this sensor is not stressed.
- Install the sensor in a location where the sensor is not exposed to electromagnetic induction.
- Avoid installation in a location with frequent vibrations or corrosive atmosphere.
- Lay out the piping so that the sensor can be safely removed from the piping during maintenance.
- To perform comparative checks/calibration with the actual sample during periodical checks/calibration, provide a sampling valve just before or after the sensor.

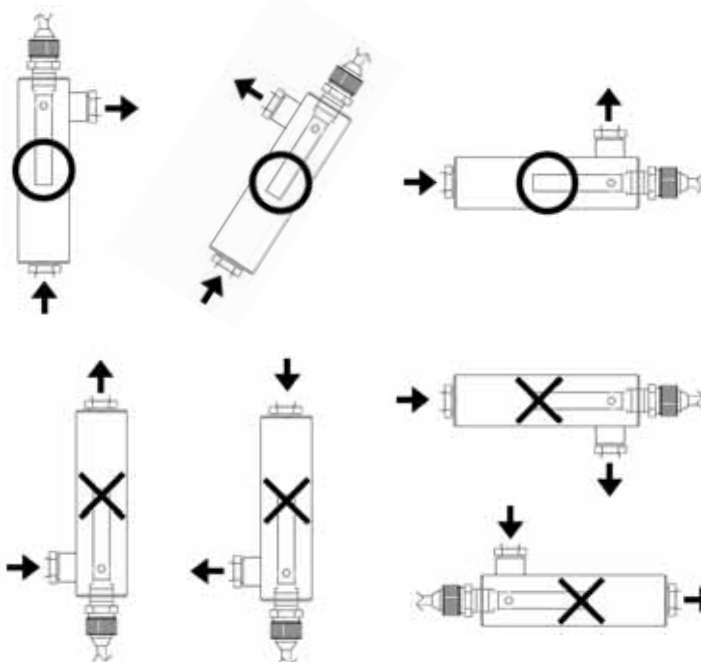
Cleaning

An error may result from generation of bubbles and contamination of the electrodes. If the sensor is contaminated, install the sensor in a removable state so that it can be periodically cleaned. In installing the sensor on the tank, take care to ensure that no sediment deposits on the sensor and that a readout error occurs from the stagnant sample. In cleaning the sensor, the use of alcohol, neutral detergent, or sodium hydroxide (about 3%) is effective for oily contaminant and the use of nitric acid for inorganic contaminant.

Installation conditions

Flow rate	0 to 1.0 MPa (max.) (The dedicated holder is dependent on the holder material.)
Temp	0-50°C (maximum) (when FES-125F is used) 0-20°C (maximum) (when FES-12fF is used) (The dedicated holder is dependent on the holder material.)
Flow rate	10 L/min (maximum) (Maximize the flow rate within 10 L/min)

Installation example



Proper installation: Ensure that the sample enters the leading end of the sensor and then passes through the lateral side.

Improper installation:

- Avoid such installation as makes the sample enter the lateral side of the sensor and then pass through the leading end.
- Avoid such installation as makes the sample flow downward.

Precautions for sensor piping (sanitary sensor)

- Send the solution under measurement so that the sensor is filled out without bubbles.
- The sensor may be installed either horizontally or vertically. The connector may be positioned either upward or downward.
- Support both sides of piping to prevent the sensor from being stressed.
- Install the sensor in a location where the sensor is not exposed to electromagnetic induction.
- Avoid installation in a location with frequent vibrations or corrosive atmosphere.
- Lay out the piping so that the sensor can be safely removed from the piping during maintenance.
- To perform comparative checks/calibration with the actual sample during periodical checks/calibration, provide a sampling valve just before or after the sensor.

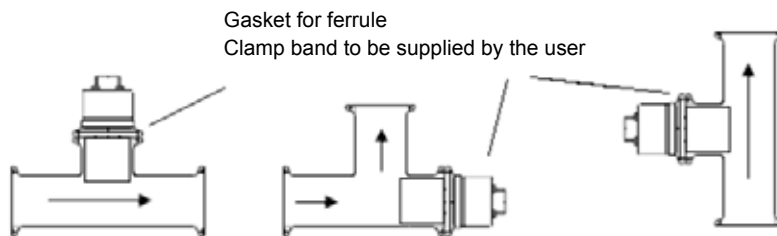
Cleaning

An error may result from generation of bubbles and contamination of the electrodes. If the sensor is contaminated, install the sensor in a removable state so that it can be periodically cleaned. In installing the sensor on the tank, take care to ensure that no sediment deposits on the sensor and that a readout error occurs from the stagnant sample. In cleaning the sensor, the use of alcohol, neutral detergent, or sodium hydroxide (about 3%) is effective for oily contaminant and the use of nitric acid for inorganic contaminant.

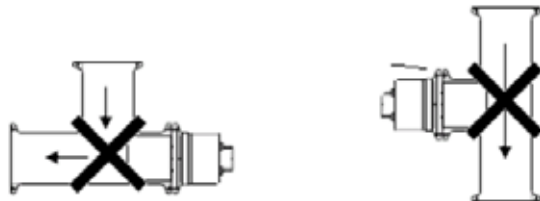
Installation conditions

Flow rate	0 to 1.0 MPa (max.)
Temp	0°C to 100°C (maximum)

Installation example



The arrow mark indicates the flow of the sample.



The sample should not be sent downward and then laterally.

The sample should not be sent downward.

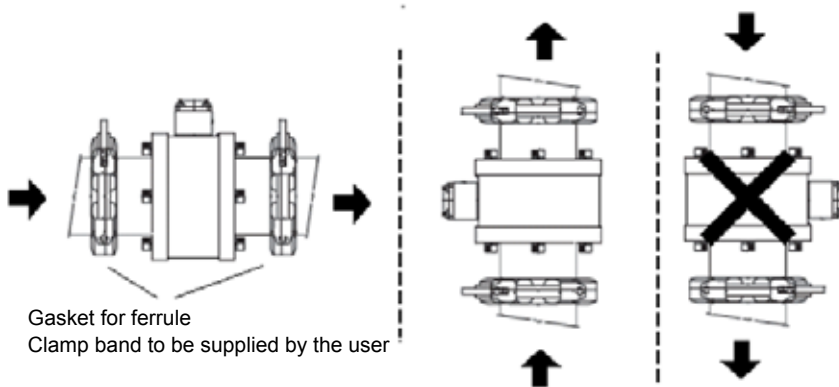
Proper installation

- Be sure to install the sensor so that it is filled with water.
- Support the piping so that the sensor is not stressed.
- To compare the actual sample with the verification standard during checks/calibration, you need to install a sampling valve.

Improper installation:

- Avoid such installation as causes the sample to flow downward or downward from the lateral side of the sensor.

Installation example (for the flow-through sensor)



The arrow mark indicates the flow of the sample.

Proper installation

- Be sure to install the sensor so that it is filled with water.
- You need to support the piping so that the sensor is not stressed.
- To compare the actual sample with the verification standard during checks/calibration, you need to install a sampling valve.

Improper installation:

- Avoid such installation as causes the sample to flow downward or downward from the lateral side of the sensor.