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H-1 Series Electric Conductivity Meter

HE-200C

■ Overview

● The HE-200C is designed to measure the electric conductivity and temperature of an aqueous solution when used with an electric conductivity sensor (ESD, ESH, or FS series A cell constant may be selected from 0.01, 0.1, and 1.0 per centimeter. For the unit of electric conductivity, either the former units or the SI units may be chosen. The total dissolved solids (TDS) may be displayed in a conversion table by converting the measured electric conductivity. In this case, the HE-200C is used as a TDS conversion meter to display values in an unit of mg/L.

■ Measurement target

● Deionized water ● Boiler water

■ Measuring principle

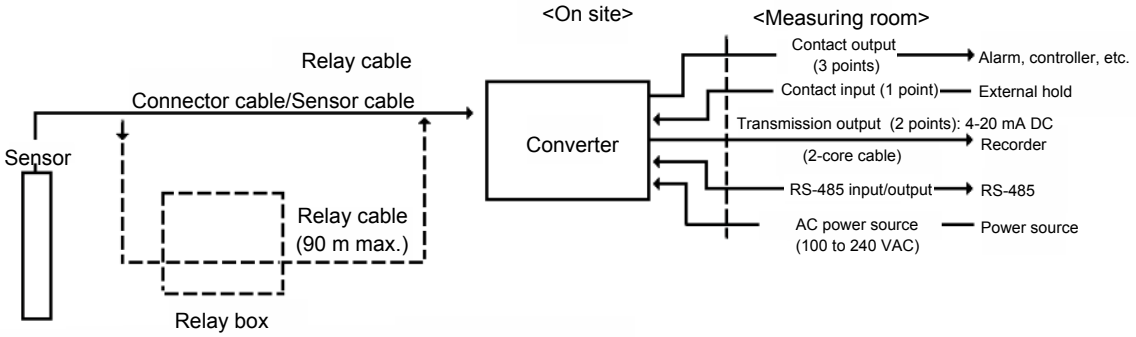
● AC bipolar
● The electric conductivity sensor is used to measure the resistance and temperature of the sample. The equation programmed in the HE-200C is used to calculate the electric conductivity from the above measured values.

■ Intended use

● Management of deionized water
● Monitoring and control of solutions in processes

■ System configuration diagram

Standard specification



* The relay box and the dedicated cable are used when the sensor cable length (10 m) is exceeded.

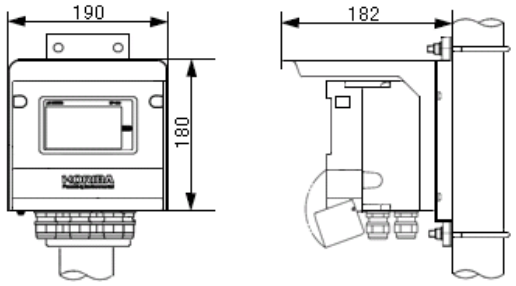
H-1 Series Electric Conductivity Meter

HE-200C 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

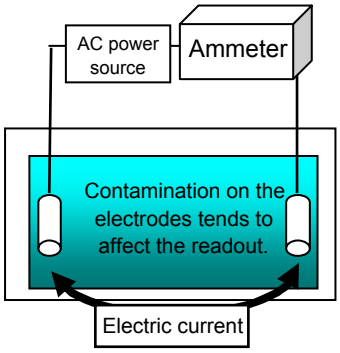
■ External Dimensions



Unit: mm

■ Instrument

The electric conductivity sensor is used to measure the resistance and temperature of the sample. The equation programmed in the HE-200C is used to calculate the electric conductivity from the above measured values.
The electric conductivity is subject to temperature compensation by the user-specified method. You may select one of three options: NaCl temperature compensation, compensation using the temperature coefficient for electric conductivity and any reference temperature, and no temperature compensation. The temperature compensation range is between ℃ and 100℃.



Basic principle
Electric current = Information in proportion to electric conductivity
(voltage is constant)
Features
Very accurate in the low-concentration range

■ Sensor

The sensors available for connection to the HE-200C are of the ESD, ESH, and FS series. The cell constant differs depending on the connectable sensors; select 0.01/cm, 0.1/cm, or 1.0/cm. The use of a new technique for temperature measurements has greatly improved the accuracy as a thermometer. The unique temperature circuit features its capability of minimizing the drift of the measured temperature value against changes in the ambient temperature. If the sensor is provided with temperature assay, the sensor's instrumental error for temperature can be corrected by entering the value for deviation of the resistance-temperature detector (RTD) at 0℃. Thus, the temperature measuring accuracy of within ±0.2℃ can be achieved without the user's temperature calibration. Normally, the deviation of the RTD's resistance value is not marked on a label. The capability of performing calibration by making a comparison with the reference thermometer is provided, allowing the user to achieve the necessary accuracy.

The temperature sensor (RTD) incorporated in the electric conductivity sensor has 1000Ω specified as the initial value at 0℃ and 1385Ω at 100℃. The electric conductivity sensor of the ESH series is used at 3850 ppm/℃. There is an additional capability available for correcting the resistance of the cable for the electric conductivity sensor by entering cable length of up to 50 m .
The cell constant is expressed by multiplying the order (0.01/cm, 0.1/cm, or 1.0/cm) by the correction coefficient. Enter both of them as cell-related information. Entering the correction coefficient allows you to correct the sensor's instrumental error for the cell constant.

■ Configurations

● Front

Cover
This cover is used for outdoor installation.

Display part
The measured value and other information are displayed here.

Screw cap
When the two screw caps are removed, the front case screws appear.

Front cover
When the cover is opened, 6 operation keys appear.

Conduit
Up to 6 electric wires of 7 to 12 mm diameter can be used.

Purge air inlet
Purge air is sent through this inlet to prevent internal corrosion. Normally no connection is required.

● With the front cover

Front case
Front case screw

When the four screws are removed, the front case can be opened.
Operation key section

● Display part

Status display

Measured value

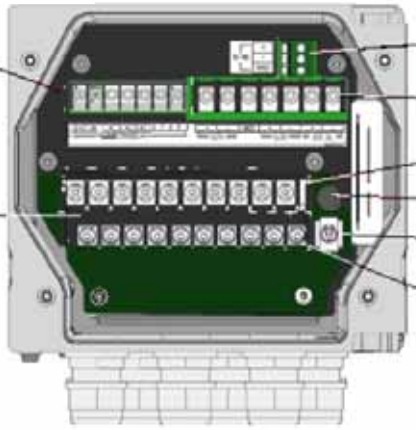
Status display

Indicator

Auxiliary display

● Operation key section

● Terminal block



Sensor connection terminal

RS-485 terminal

Transmission output terminal and contact input terminal

Power connection terminal

Fuse box

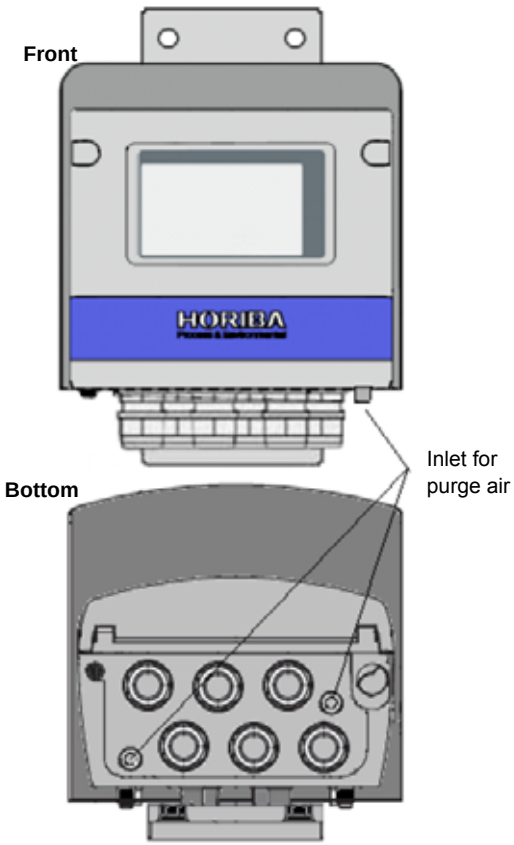
Contact output terminal

Power switch

Grounding terminal

■ Air purge

An inlet is provided for purge air which is used to prevent internal corrosion. When the HE-200C is used in an environment where corrosive gas is generated, instrumental error is always sent to prevent corrosive gas from entering the inside of the HE-200C.



■ TDS

TDS stands for total dissolved solid.
The electric conductivity of a solution is dependent on the amounts of salt, mineral substances, and dissolved gases. The electric conductivity is an index showing the total amount of all the substances in the solution. TDS indicates only the total dissolved solid out of that amount.
TDS can be accurately used to compare the states of substances each consisting of a single component, such as NaCl. However, when different kinds of solutions are compared with each other, an error becomes much large
The electric conductivity and TDS are expressed by the following equations:
When the electric conductivity is of International System of Units (mS/m):
: TDS(mg/L)＝L(mS/m)×K×10
When the electric conductivity is of the former unit (μS/cm):
: TDS(mg/L)＝L(μS/cm)×K
K = TDS conversion coefficient, L = electric conductivity value

■ Measuring the temperature

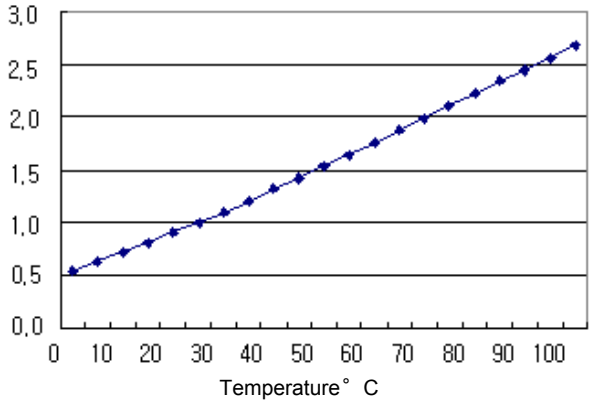
The RTD, an element to measure the temperature, uses a resistance-temperature detector which has resistance of 1000Ω at 0° C. This detector is characterized by increasing its resistance value as the temperature rises. Its resistance becomes 1385Ω (standard) at 100° C. Manufacturing variations at the resistance value at 0° C affect the temperature measuring accuracy.
In the algorithm for the HE-200C, which was not available in the past, variations in the temperature element are corrected. The resistance value of the temperature element at 0° C 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° C. 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° C is corrected by making an adjustment to the reference temperature.
In order to reset the temperature calibration, the input to RTD at 0° C and the offset for the temperature calibration are individually retained. A sensor for which the resistance value of RTD at 0° C was not assayed may be used without correction. At this time, however, the accuracy is ±0.5° C.
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° C is relative to a state (equilibrium state which is achieved when water and ice are agitated in atmosphere) rather than to thermometer.

■ Temperature compensation

Temperature compensation for electric conductivity
Method using the characteristics of NaCl
When the main component of salt included in the sample is sodium chlorine, 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° C and changes at the following rate. Find the ratio at an arbitrary temperature from this table and then obtain the electric conductivity at 25° C.
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 (℃)	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 (℃)	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° C relative to the electric conductivity at 25° C, 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° C 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° C. Yet temperature compensation is applicable at any temperature other than 25° C.
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
C(T): Electric conductivity of solution at T° C
α : Temperature coefficient (unit: /°C) for electric conductivity
T: Arbitrary temperature T° C
ST : Reference temperatureST° C

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

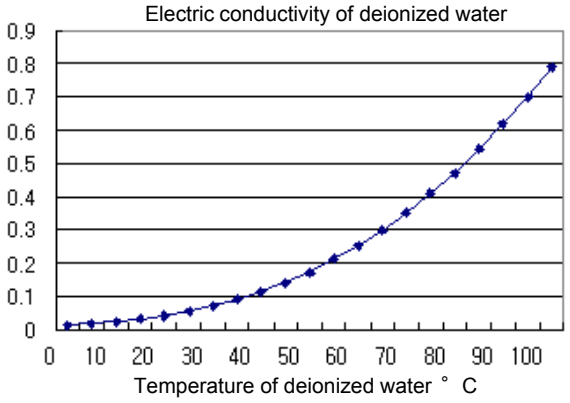
■ Characteristics of deionized

The electric conductivity of deionized water is measured as the sum of electric conductivity values resulting from dissociation of water molecules and impurity ions

$C_{(T)} = F_{(T)} + G_{(T)}$

$C_{(T)}$: Electric conductivity of solution at T° C
F(T) : Electric conductivity of solutionat T° C
G(T) : Electric conductivity due to impurity ions at T° C

Electric conductivity of deionized water
The electric conductivity of deionized water 007A results from the dissociation of water molecules. The dissociation of water molecules is greatly affected by temperature changes. The electric conductivity of deionized water is measured with continuous temperature functions which have been prepared from tables in ASTM D1125-91 and JIS K0130-1995.



Temp (℃)	Electric conductivity ratio for NaCl
0	0.012
5	0.017
10	0.023
15	0.031
20	0.042
25	0.055
30	0.071
35	0.090
40	0.114
45	0.141

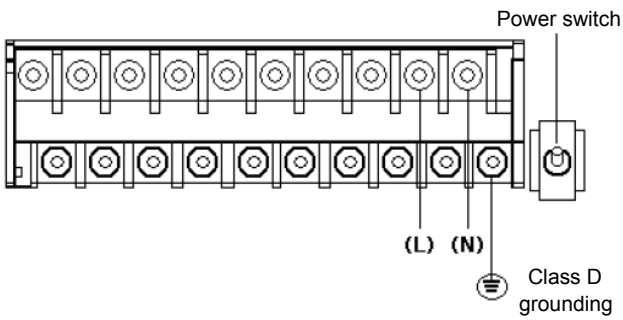
Temp (℃)	Electric conductivity ratio for NaCl
50	0.173
55	0.210
60	0.251
65	0.299
70	0.352
75	0.410
80	0.474
85	0.544
90	0.621
95	0.703
100	0.793

■ Power supply

The HE-200C has a power switch. For the HE-200C, 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 HP-200 so that the power can be turned ON/OFF. If lightning might strike, install an arrester on the output side of the HE-200C and on the side of receiving instruments.

Be sure to ground the grounding terminal (class D grounding). Separate this grounding from the grounding of electric devices such as a motor.

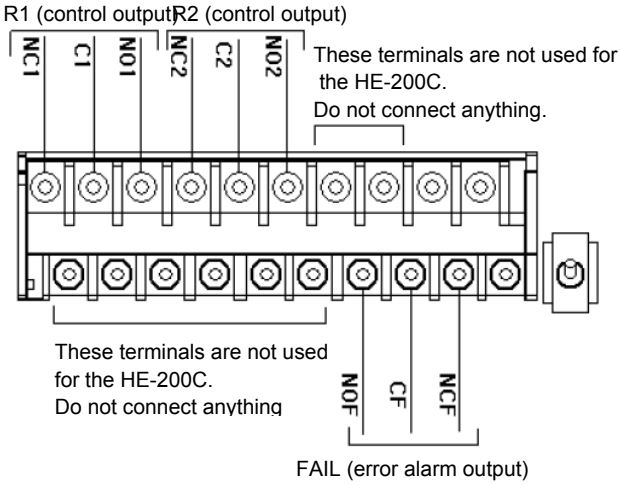


Electric power supplied	Voltage: 100 to 240 VAC
	Frequency: 50/60 Hz
Applicable power cable	0.75 to 5.5 mm2 (AWG18 to 10).

■ Output terminal

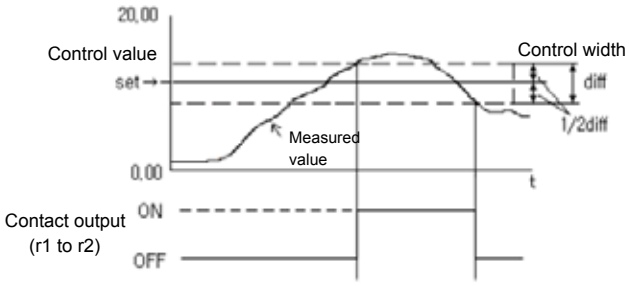
The HE-200C is provided with three contact outputs as standard.
The HE-200C has various contact outputs such as USP determination, transmission output hold, and error alarm as well as upper and lower alarm contact outputs.
Major specifications
・The contact capacity is 250 VAC, 3 A maximum or 30 VDC, 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-200C 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-200C is OFF, the C-NC contact for R1 to R4 is short-circuited. Therefore, be careful about the connection of load.

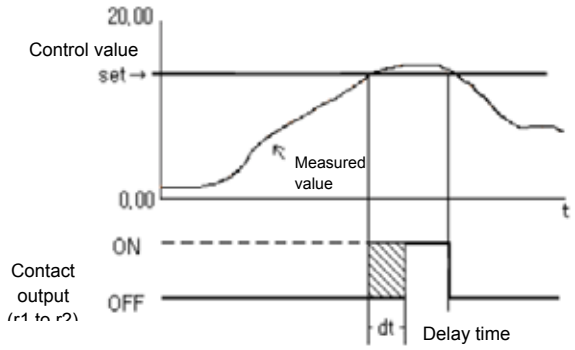


Contact point capacit	250 VAC, 3A max. or 30 VDC, 3 A maximum
Applicable power cable	0.75 to 5.5 mm2 (AWG18 to 10)
Kinds of alarms	CtrL control output, alarm output,Temperature alarm output, HOLD output,FAIL output and UPS acceptance limit output

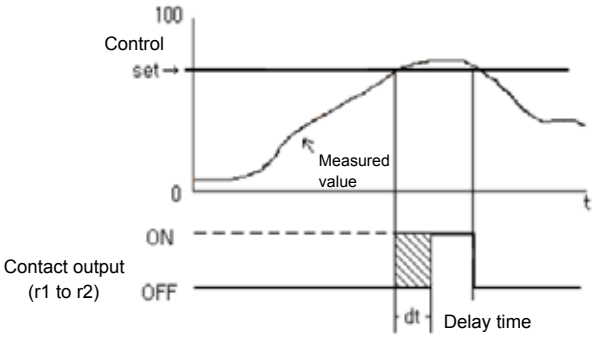
CtrL: Control output
The output turns ON when the measured value is larger than (control value + control width x 1/2). It turn OFF when the measured value is smaller than (control value - control width x 1/2).
These are the upper-limit actions. For the lower-limit actions, reverse them.)



"AL": 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.)

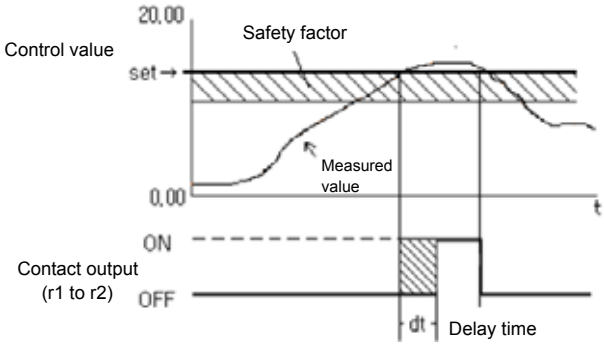


HoLd: Output during hold mode
When the measured value is held, this output is turned ON after the delay time. When the hold mode is canceled, the output is immediately turned OFF. The setting of output delay time (0 to 600 seconds) is also possible.

FAIL: FAIL output
This output is turned ON when over full-scale or system error occurs. It is also turned ON when theHE-200C malfunctions.

USP acceptance limit output

When the measured value is larger than the setting value, the output will turn ON to issue an alarm after the delay time. When the measured value becomes smaller than the setting, the output is immediately turned OFF to cancel the alarm.
These are the upper-limit actions. For the lower-limit actions, reverse them)
A safety factor (30% to 100%) for USP acceptance limit and delay time (0 to 600 seconds) may be specified.



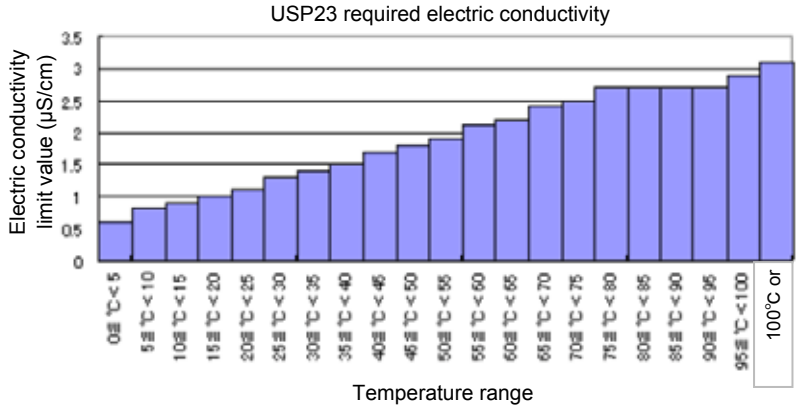
• • • • What is a USP acceptance limit? • • •

The USP acceptance limit is a limit value for electric conductivity without temperature compensation, which is specified for each temperature area between 0℃ and 100℃. It is used when the electric conductivity of water for pharmaceutical use is monitored.
USP23 (23rd edition of US Pharmacopeia) requires that water for pharmaceutical use is lower than the electric conductivity limit value.
The HE-200C internally has the assessment table for USP23 and automatically determines the electric conductivity limit for the value without temperature compensation, based on the measured temperature

Temperature range (℃)	Electric conductivity limit value (μS/cm)	Temperature range (℃)	Electric conductivity limit value (μS/cm)
0≤℃<5	0.6	50≤℃<55	1.9
5≤℃<10	0.8	55≤℃<60	2.1
10≤℃<15	0.9	60≤℃<65	2.2
15≤℃<20	1.0	65≤℃<70	2.4
20≤℃<25	1.1	70≤℃<75	2.5
25≤℃<30	1.3	75≤℃<80	2.7
30≤℃<35	1.4	80≤℃<85	2.7
35≤℃<40	1.5	85≤℃<90	2.7
40≤℃<45	1.7	90≤℃<95	2.7
45≤℃<50	1.8	95≤℃<100	2.9
		100℃ or more	3.1

Table: Requirements of temperature and electric conductivity -- stage 1

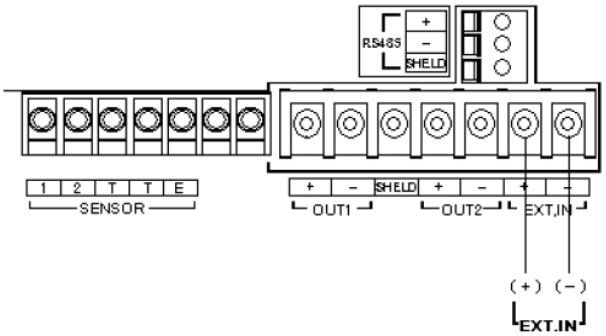
Example: The left table shows that the electric conductivity at 15℃ is 1.0 μS/cm. Once the safety factor is set to 50%, an alarm may be triggered when the electric conductivity is larger than 0.5 μS/cm at 15℃.



■ Contact input

The HE-200C is provided with contact input as standard.
The output value is held with an external signal.
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 arrestor on the output side of the HE-200C and on the side of receiving instruments.
The resistor for the contact input shall be 100 Ω maximum.



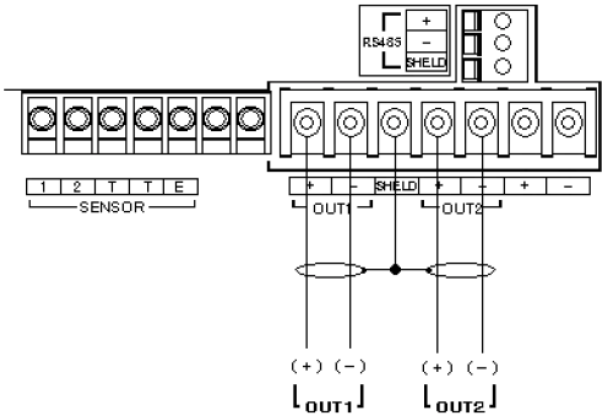
(Contact input)

Contact input resistance	100Ω/km max.
Applicable power cable	2mm2 (AWG14) MAX

■ Transmission output

The HE-200C is provided with two transmission outputs (4 to 20 mA DC).
Transmission output 1 outputs electric conductivity and transmission output 2 temperature.
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 HP-200 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 of electric conductivity is between 0 and 200 µS/cm:
The transmission output of 4 mA may be set to 50 µS/cm and that of 20 mA to 100 µS/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 50 µS/cm, the transmission output maintains the output value of 50 µS/cm.
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 arrestor on the output side of the HE-200C 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.

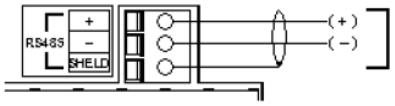


(Transmission output)

Maximum load resistance	900Ω
Applicable power cable	2mm2 (AWG14) MAX

■ RS-485

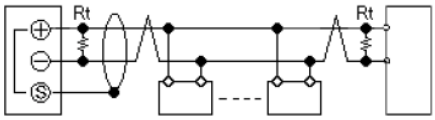
The HE-200C has an RS-485 communication terminal. To use this terminal, connect wiring.
- The applicable electric wire is of 0.14 to 2.5 mm2 (AWG26 to 14).
- For the communication output cable, use a twisted shielded pair.
- Up to 32 connections can be made including one for the host computer. Set the 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 output)

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

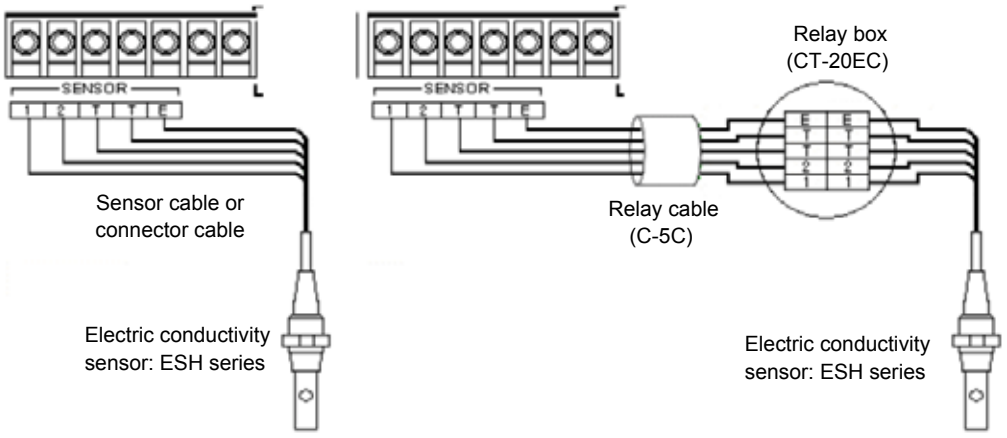
The sensor cable is highly insulated. In handling this cable, pay attention to the following points:
- Do not wet the terminals and terminal block for cables with water or the like or contaminate them with your hand or oil. Tl insulation will otherwise deteriorate.

The decreased insulation can cause instable readings. Maintain the electrode cable in a dry, clean state.
- For the purposes of maintenance and electrode checks and replacement, carry out wiring with a margin given to the electrode cable length.
- Carry out wiring for the sensor cable and the relay cable while ensuring that they are kept away from any induction- causing equipment such as a motor and its power cable.
- Be sure to use replay cable and relay box.

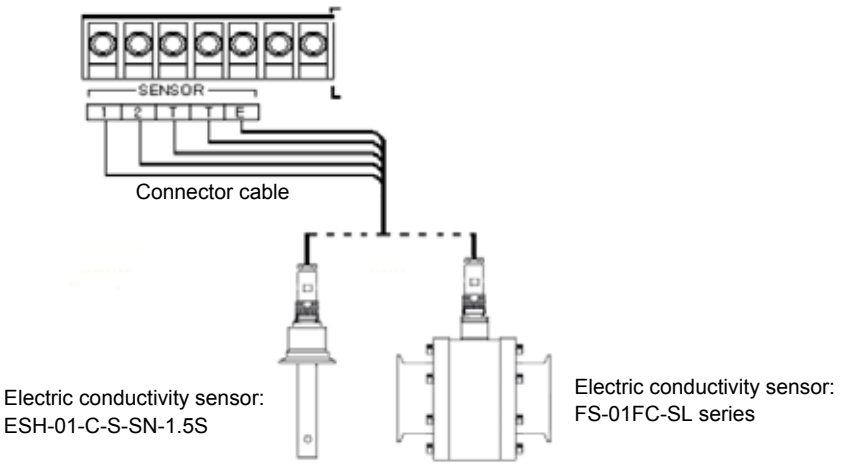
- For the sanitary sensor, avoid extension wherever practical. Specify a connector cable of the necessary length.

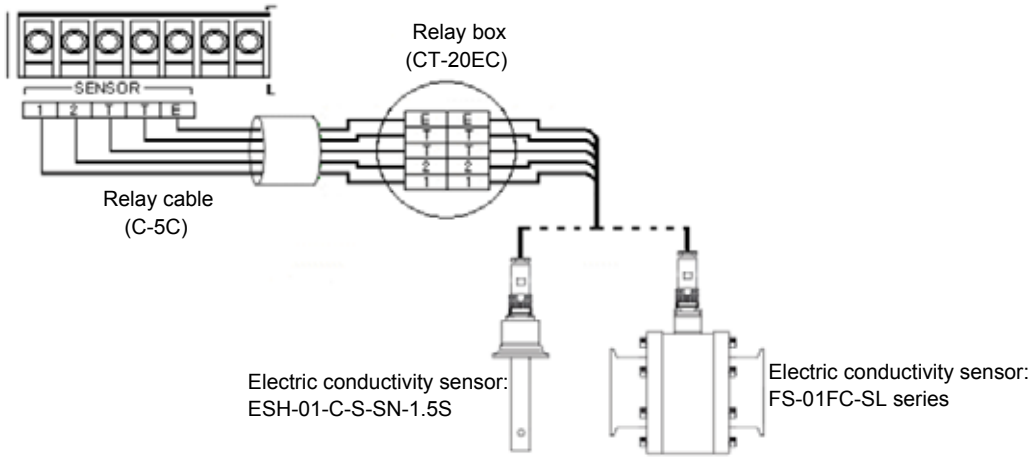
Electric conductivity Sensor	1. Conductivity sensor 1 terminals
	2. Conductivity sensor 2 terminals
	T, T:Temperature compensation sensor terminal
	E: Shielded terminal

Connecting the ordinary ESH series electric conductivity sensor



Connecting the FSH or FS sanitary electric conductivity sensor

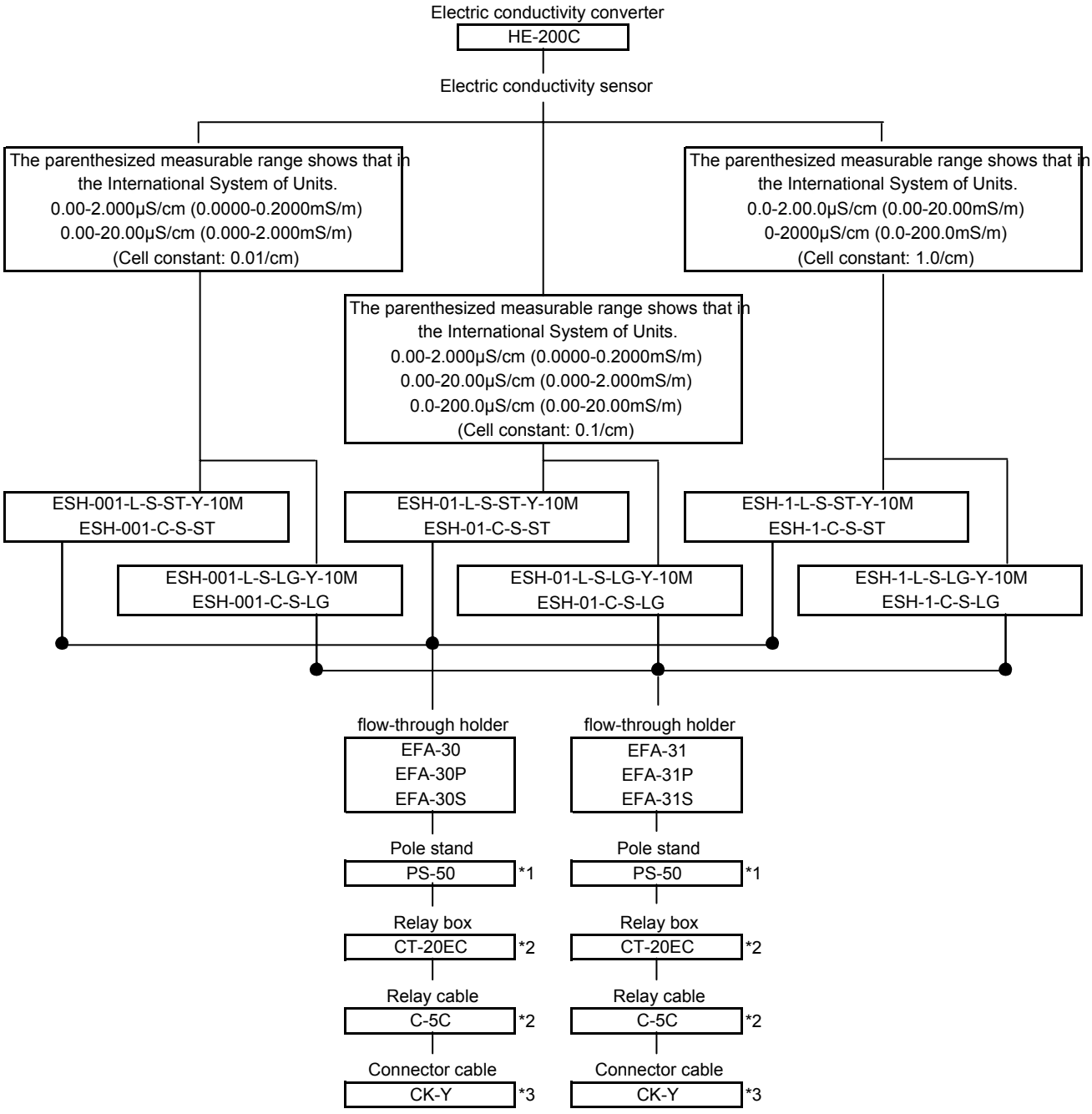




■ Combinations

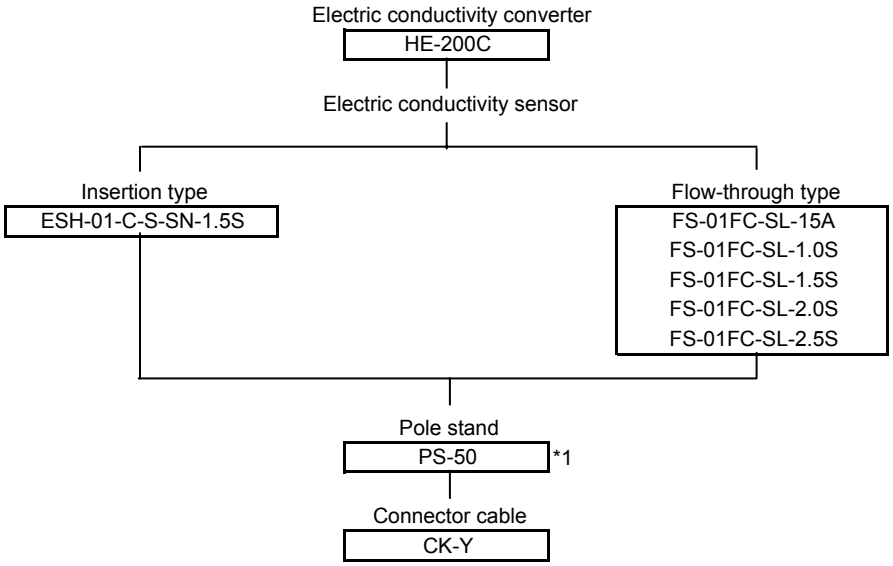
The following combinations are based on the specifications for converters electric conductivity sensors and holders.
For the detailed specifications, see the items of each product.

For ordinary electric conductivity sensor



*1: This pole stand is intended to mount the converter and the CT-25 (relay box).
*2: This is not required when the ESH-001-C-S-ST, ESH-01-C-S-ST, ESH-1-C-S-ST, ESH-001-C-S-LG, ESH-01-C-S-LG, or ESH-1-C-S-LG electric conductivity sensor is selected.
*3: This is not required when the ESH-001-L-S-ST, ESH-01-L-S-ST, ESH-1-L-S-ST, ESH-001-L-S-LG, ESH-01-L-S-LG, or ESH-1-L-S-LG electric conductivity sensor is selected.

For sanitary electric conductivity sensor



*1：This pole stand is intended to mount the converter.

■ Specification 1

Product Name	Electric conductivity converter for industrial use				
Model	HE-200C				
Combination sensor	Bipolar electric conductivity sensors with cell constants of 0.01/cm, 0.1/cm, and 1.0/cm (ESH, ESD, ESL, and FS series)				
Measurable range	Cell constant (/cm)		0.01	0.1	1
		Unit / Model	(ESH-001)	(ESH/FS-01)	(ESH-1)
	Electric conductivity	µS/cm	0.000-2.000 0.00-20.00	0.000-2.000 0.00-20.00 0.0-200.0 0.00-2000(*1)	0.0-200.0 0.00-2000
		mS/m	0.0000-0.2000 0.000-2.000	0.0000-0.2000 0.000-2.000 0.00-20.00 0.0-200.0(*1)	0.00-20.00 0.0-200.0
	TSD conversion (*2)	mg/L	0.00-2.00 0.0-20.0	0.00-~2.00 0.0-20.0 0-200	0-200 0-2000
	Temp	℃	0 to 100 (readout range: -10℃ to 160℃		
Display resolution	TDS conversion of electric conductivity		As shown in the above table		
	Temp		0.01℃		
Performance	Electric conductivity	Repeatability	Within ±0.5% of full-scale value (with equivalent input) Within ±5% of full-scale value in 200µS/cm and 200.0 mS/m ranges of the FS-01		
		Linearity	Within ±0.5% of full-scale value (with equivalent input) Within ±5% of full-scale value in 200µS/cm and 200.0 mS/m ranges of the FS-01		
	TSD conversion	Repeatability	Within ±1.5% of full-scale value (with equivalent input)		
		Linearity	Within ±1.5% of full-scale value (with equivalent input)		
	Temp	Repeatability	Within ±0.1℃(for equivalent input)		
		Linearity	Within ±0.5℃(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: May be freely specified within the measurable range		
		Output 2	Temperature: Freely specifiable within a range between -10℃ and 160℃		
	Error output		With burn-out capability (3.8 or 21 mA)		
	Hold capability		Select holding the previous value or an arbitrary value		
Output terminal	Number of output points		3 points		
	Output type		No-voltage contact output		
	Contact Form		Relay contact, SPDT (1c)		
	Contact point capacity		250 V AC 3 A, 30 V DC 3 A (resistance load)		
	Contact function	RI, R2	Select from upper limit alarm, lower limit alarm, USP assessment, and output holding.		
		FAIL	Error alarm (closed when normal; opened when an error occurs; opened when the power is turned OFF)		
	Description of alarm function	Description of output	Electric conductivity (or TDS conversion) and temperature		
		Description of settings	・Setting range: Within the measurable range ・Delay time: 0 to 600 seconds		
Contact input	Number of input points		1 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 holding transmission output		
Communication function	Method		RS-485		
	Signal type		Two-wire, input/output insulated type (not insulated from transmission output)		

■ Specification 2

Temperature compensation	Applicable temperature element			Platinum resistive element: 1 kΩ(0℃)	
	Compensation method			Select one of the following three options: Temperature characteristics of NaCl (reference temperature: 25℃ to 95℃) Input of arbitrary temperature coefficient (reference temperature: 0℃ to 95℃; temperature coefficient: ±3%/℃) No temperature compensation (For either NaCl or any arbitrary temperature coefficient, the temperature compensation for deionized water is automatically applied in the deionized water range.))	
	Temperature compensation range			0℃ to 100℃ (extensively calculated at less than 0℃ or more than 100℃)	
Calibration	Electric conductivity			By entering a correction coefficient (parameter) for the cell constant	
	TSD conversion			Conversion using an arbitrary coefficient (0.30 to 1.00)	
	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 temperature range	-20℃ to 55℃ (without freeze)				
Operating humidity range	Relative humidity: 5% to 90% (without condensation)				
Storage temperature	-25~65℃				
Power Source	Power supply voltage range			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 radiofrequency	IEC61000-4-6
				Voltage dip, short-time power outage, and voltage fluctuation	IEC610000-4-11
			Emission ClassA	Radiated disturbance	CISPR 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				

*1: Applicable to sanitary sensor (FS-01) only

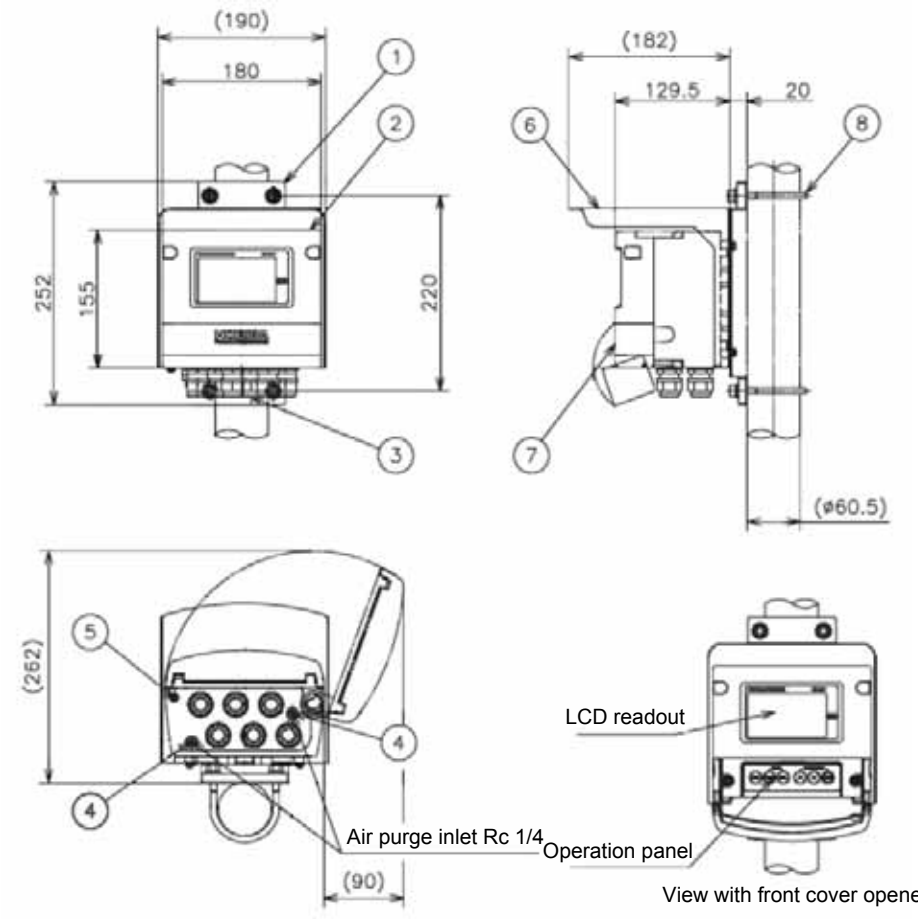
*2: Electric conductivity measurement and TSD conversion measurement cannot be selected at the same time.

*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.

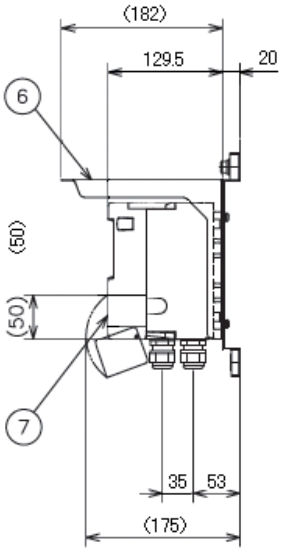
*4: For transmission output, contact input, and communication, an arrester (sparkover voltage: 400 V) is provided.
However, use the most suitable surge absorption element on the connected line considering the ambient environment, the equipment installation situation, and the externally connected equipment.

■ External dimensions (HE-200C Electric Conductivity Meter)

(pole-mounted)



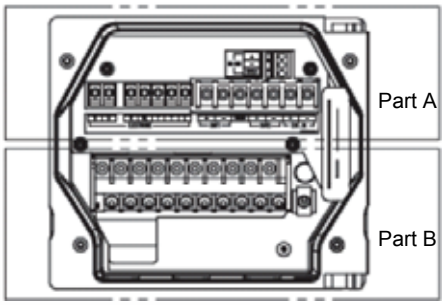
(wall-mounted)

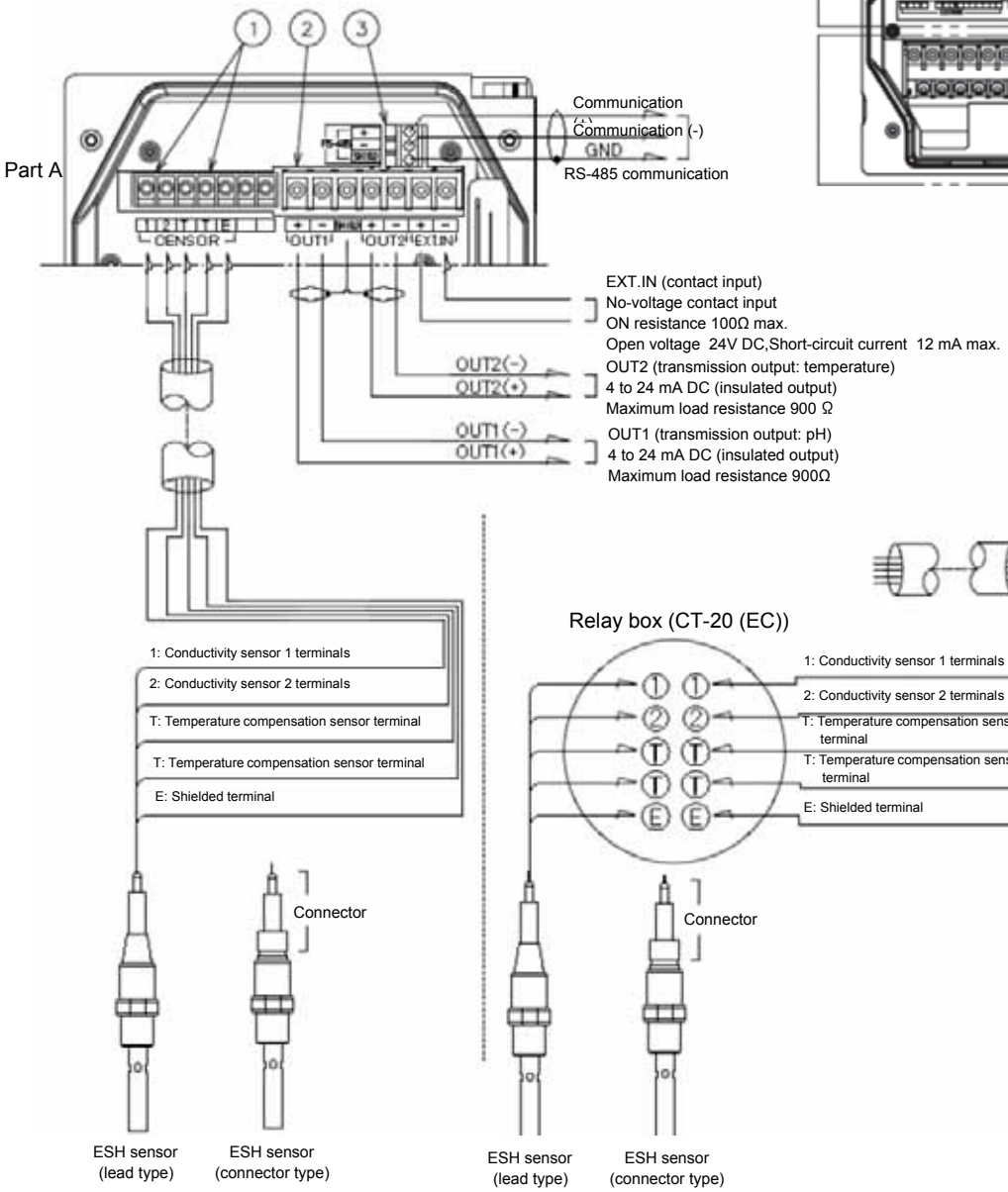


	PARTS	NOTES
(1)	Mounting plate	SUS304
(2)	Case	ADC12
(3)	Wiring hole	O.DΦ7~Φ12cable
(4)	Plug	SUS304
(5)	Earth	SUS304 M4
(6)	Cover	SUS304
(7)	Front cover	ADC12
(8)	U bolt	SUS304 50A MB

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

■ External connection diagram 1 (HE-200C)

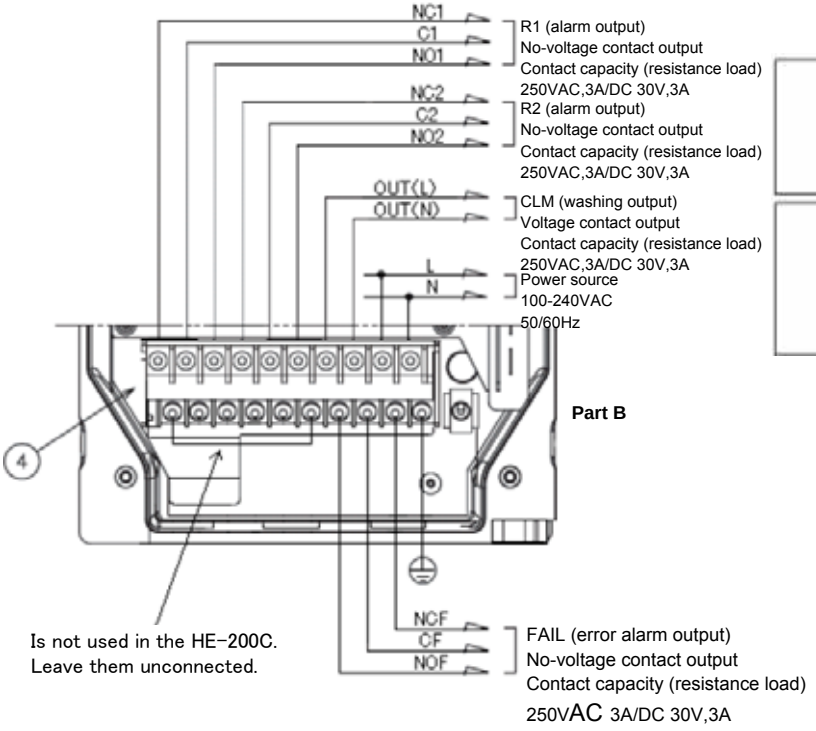


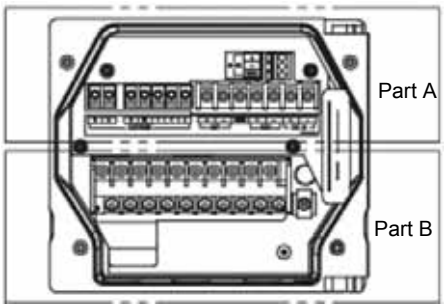


	Terminal screw	Applicable crimp-type terminal	Applicable electric wire	Screw tightening torque
①	M3	MAX6.5, MAX3.2, MAX5.2	1.25mm²/MAX (AWG16)	0.8N・m
②	M3.5	MAX6.2, MAX3.6, MAX7.2	2mm²/MAX (AWG14)	0.8~1.2N・m
③	M3		0.14~2.5mm² (AWG26~14) Single or stand wire	0.5~0.6N・m

Note
: The screws on the terminal block are designed as non-removable. To connect a cable to a terminal, loosen 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-200C)





	Terminal screw	Applicable crimp-type terminal	Applicable electric wire	Screw tightening torque
④	M4	MAX8 MAX4.7 MAX8.5	5.5mm²/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, loosen 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

ESH-01-L-S-ST
(lead type)

ESH-01-C-S-ST
(connector type)

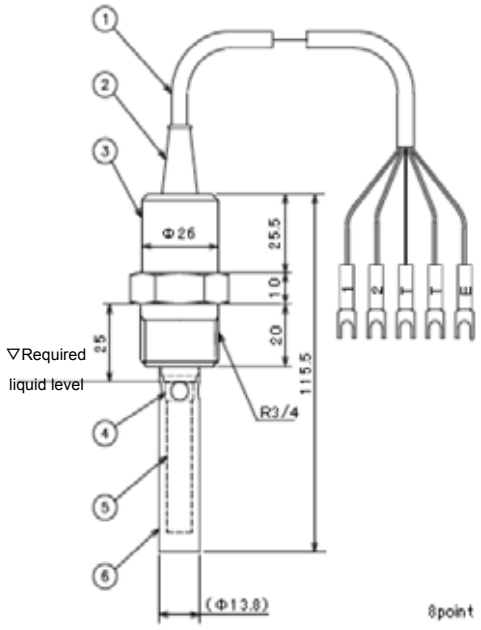
ESH-01-L-S-LG
(lead type)

ESH-01-C-S-LG
(connector type)

Model		ESH-001	ESH-01	ESH-1
Cell constant		Approx. 0.01/cm	Approx. 0. 1/cm	Approx. 1.0/cm
Wetted material	Pole	SUS316 stainless steel or titanium		
	Body	PVDF		
	Gasket	FKM		
Measuring liquid pressure		0-0.5MPa		
Measuring liquid temperature		0-100℃		
Cable length		Lead type: 10 m; spade terminal (standard); max. extension: 100 m *1		
		Connector type: 10 m (CK-Y10M), 20 m (CK-Y20M), or 30 m (CK-Y30M)		
Mounting		Screwed type flange size: R(PT) 3/4		
Combination holder		Distribution type holder: EFA-30, EFA-30P, EFA-30S (for short cells) EFA-31, EFA-31P, EFA-31S (for long cell)		

*1: For extension, use the relay cable (C-5C) and the relay box (CT-20EC).

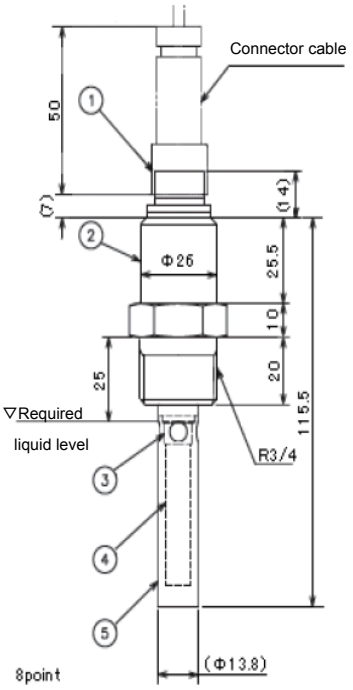
■ ESH-001-L-S-ST-Y-10M / ESH-01-L-S-ST-Y-10M



	PARTS	NOTES
(1)	Silicone	PVC
(2)	Cable	EPDM
(3)	Body	SUS316
(4)	Spacer	PVDF
(5)	Inner electrode	SUS316
(6)	Outer electrode	SUS316

Model	ESH-001-L-S-ST-Y-10M ESH-01-L-S-ST-Y-10M
Cell constant	Approx. 0.01/cm (ESH-001-L-S-ST-Y-10M) (marked on each product)
	Approx. 0. 1/cm(ESH-01-L-S-ST-Y-10M) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316
Cable length	10m

■ ESH-001-C-S-ST / ESH-01-C-S-ST

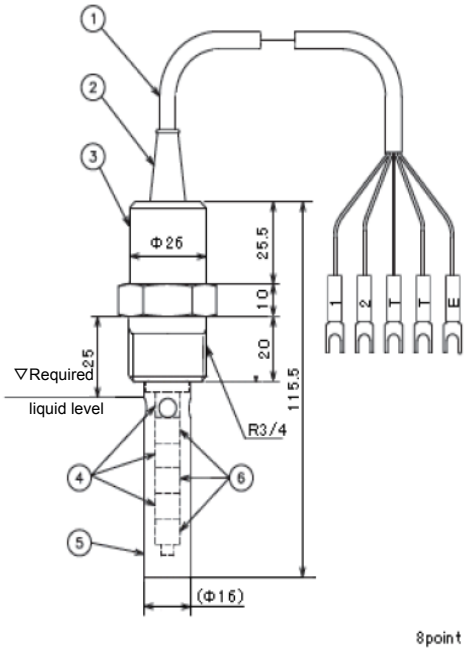


	PARTS	NOTES
(1)	Connector	BS
(2)	Body	SUS316
(3)	Spacer	PVDF
(4)	Inner electrode	SUS316
(5)	Outer electrode	SUS316

Specifications

Cell constant	Approx. 0.01/cm (ESH-001-C-S-ST) (marked on each product)
	Approx. 0. 1/cm (ESH-01-C-S-ST) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316 Seal: FKM

■ ESH-1-L-S-ST-Y-10M

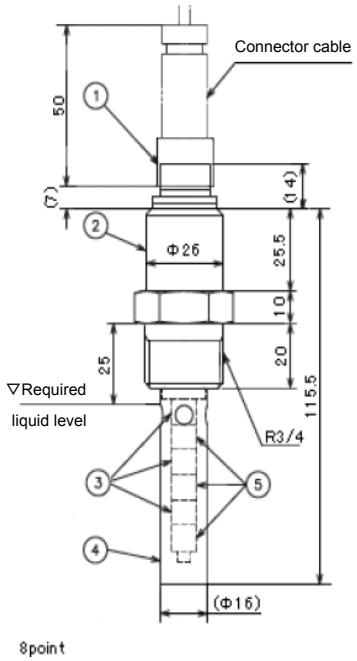


	PARTS	NOTES
(1)	Silicone	PVC
(2)	Cable	EPDM
(3)	Body	SUS316
(4)	Spacer	PVDF
(5)	Cover	PVDF
(6)	Electrode	SUS316

Specifications

Cell constant	Approx. 1/cm (ESH-1-L-S-ST-Y-10M) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316
Cable length	10m

■ ESH-1-C-S-ST

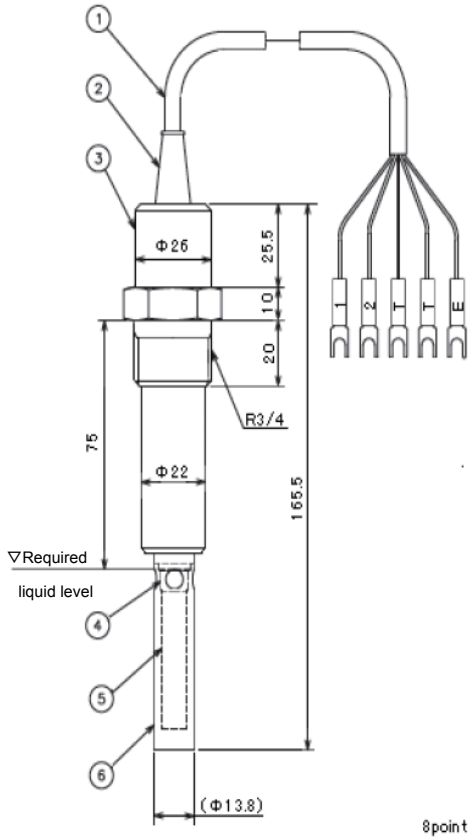


	PARTS	NOTES
(1)	Connector	BS
(2)	Body	SUS316
(3)	Spacer	PVDF
(4)	Cover	PVDF
(5)	Electrode	SUS316

Specifications

Cell constant	Approx. 1/cm (ESH-01-C-S-ST) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316 Seal: FKM

■ ESH-001-L-S-LG-Y-10M / ESH-01-L-S-LG-Y-10M

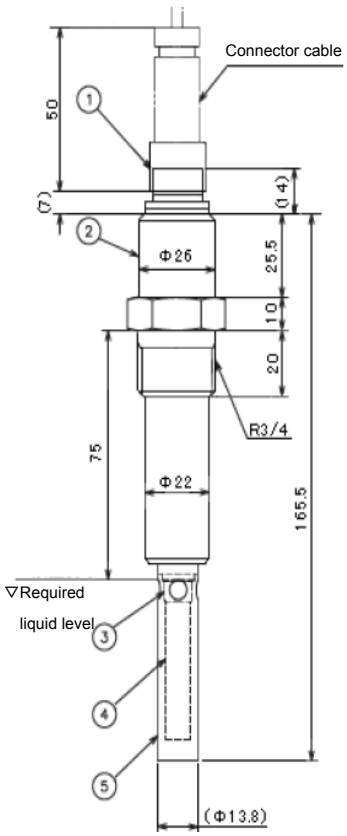


	PARTS	NOTES
(1)	Silicone	PVC
(2)	Cable	EPDM
(3)	Body	SUS316
(4)	Spacer	PVDF
(5)	Inner electrode	SUS316
(6)	Outer electrode	SUS316

Specifications

Cell constant	Approx. 0.01/cm (ESH-001-L-S-LG-Y-10M) (marked on each product) Approx. 0. 1/cm (ESH-01-L-S-LG-Y-10M) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316
Cable length	10m

■ ESH-001-C-S-LG /ESH-01-C-S-LG

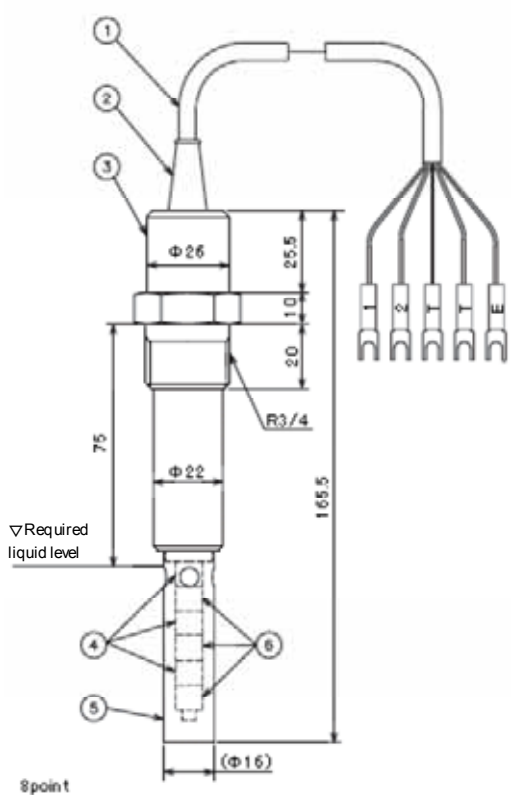


	PARTS	NOTES
(1)	Connector	BS
(2)	Body	SUS316
(3)	Spacer	PVDF
(4)	Inner electrode	SUS316
(5)	Outer electrode	SUS316

Specifications

Cell constant	Approx. 0.01/cm (ESH-001-C-S-LG) (marked on each product) Approx. 0. 1/cm (ESH-01-C-S-LG) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316 Seal: FKM

■ ESH-1-L-S-LG-Y-10M



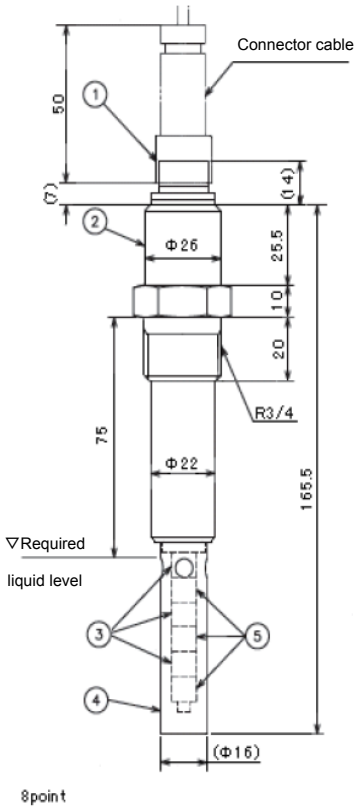
	PARTS	NOTES
(1)	Silicone	PVC
(2)	Cable	EPDM
(3)	Body	SUS316
(4)	Spacer	PVDF
(5)	Cover	PVDF
(6)	Electrode	SUS316

Specifications

Cell constant	Approx. 1/cm (ESH-1-L -S-LG-Y-10M) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316
Cable length	10m

8point

■ ESH-1-C-S-LG



	PARTS	NOTES
(1)	Connector	BS
(2)	Body	SUS316
(3)	Spacer	PVDF
(4)	Cover	PVDF
(5)	Electrode	SUS316

Specifications

Cell constant	Approx. 1/cm (ESH-1-C-S-LG) (marked on each product)
RTD	Pt1000Ω, 3850ppm/℃
Measured liquid conditions	Temperature: 0℃ to 100℃ Pressure: 0 MPa to 0.5 Mpa
Wetted material	Pole: SUS316 Spacer: PVDF Body: SUS316 Seal: FKM

■ Electric conductivity sensor (sanitary sensor) Specifications and External Dimensions

ESH-01-C-S-SN-1.5S

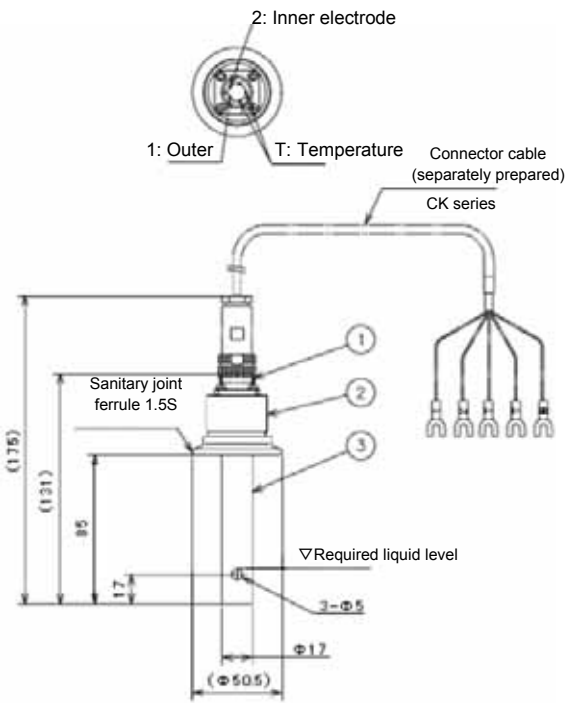
FS-01FC-SL series
15A, 1.0S, 1.5S, 2.0S, and 2.5S in the rightward order

Model		ESH-01-C-S-SN-1.5S
Flange size		IDF/ISO 1.5S ferrule
Cell constant		Approx. 0. 1/cm
Measurable range		0 to 200 μS/cm
Measurable temperature		0 to 100℃
Measuring liquid pressure		0 to 1 MPa
Operating ambient temperature		0 to 50℃
Operating ambient humidity		Max. 95% relative humidity
Temperature element		Pt 1000Ω (0℃) 3850ppm/℃
Structure		Equivalent to IP67
Wetted material	Pole	SUS 316L stainless steel (treatment: #400 buffed/electopolished)
	Insulated part for electrode	PEEK and FKM (materials conforming to announcement Nos. 20 and 85 by Ministry of Health and Welfare)
	Gasket	
Sterilization by steam		At 140℃ and 0.6 MPa within 60 minutes
Weight (kg)		Approx. 0.3
Silicone (connector type)		10m (CK-Y10M) 20m (CK-Y20M) 30m (CK-Y30M) applicable for 100 m max.

Model		FS-01FC-SL-15A	FS-01FC-SL-1.0S	FS-01FC-SL-1.5S	FS-01FC-SL-2.0S	FS-01FC-SL-2.5S
Flange size		ISO 15A ferrule	IDF/ISO 1S ferrule	IDF/ISO 1.5S ferrule	IDF/ISO 2S ferrule	IDF/ISO 2.5S ferrule
Cell constant		Approx. 0. 1/cm				
Measurable range		0 to 2000 μS/cm (conforming to specifications for electric conductivity converter)				
Measurable temperature		0℃ to 100℃ (conforming to specifications for electric conductivity converter)				
Measuring liquid pressure		0 to 1 MPa				
Operating ambient temperature		0 to 50℃				
Operating ambient humidity		Max. 95% relative humidity				
Temperature element		Pt 1000Ω (0℃) 3850ppm/℃				
Structure		Equivalent to IP67				
Wetted material	Pole	SUS 316L stainless steel (treatment: #400 buffed/electropolished)				
	Insulated part for electrode	PEEK and FKM (materials conforming to announcement Nos. 20 and 85 by Ministry of Health and Welfare)				
	Gasket					
Sterilization by steam		At 140℃ and 0.6 MPa within 60 minutes				
Weight (kg)		Approx. 1.0	Approx. 1.0	Approx. 1.3	Approx. 1.8	Approx. 2.5
Silicone		Connector type: 10 m (CK-Y10M), 20 m (CK-Y20M), or 30 m (CK-Y30M)				

■ ESH-01-C-S-SN-1.5S

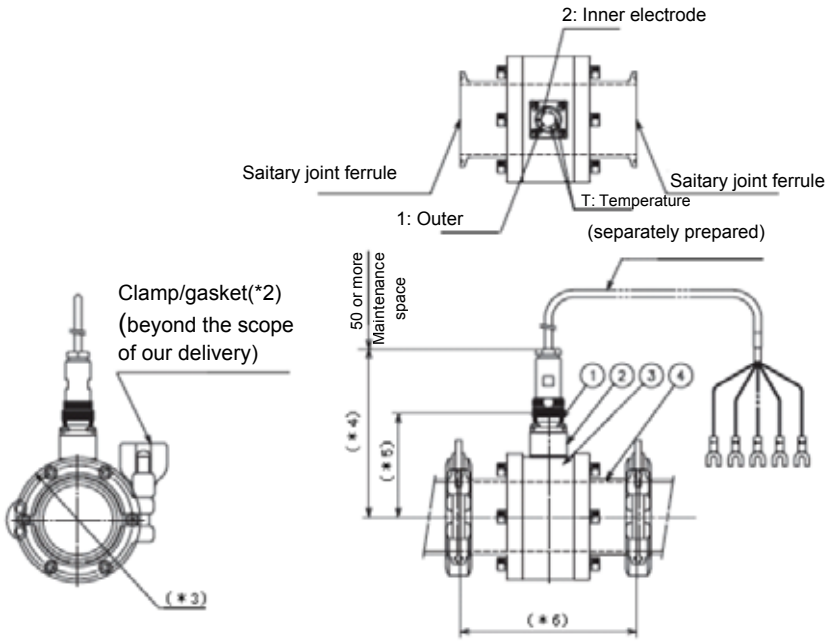
	PARTS	NOTES
(1)	Connector	1108-21810-5M
(2)	Mounting of connecto	PF (phenol resin)
(3)	Sensor body	SUS 316L stainless steel



Specifications

Measuring principle	AC 2-pole method
Flange size	IDF/ISO 2.5S ferrule
Cell constant	Approx. 0. 1/cm
Measurable range	0 to 200 μS/cm (conforming to specifications for converter)
Measurable temperature	0℃ to 100℃ (conforming to specifications for converter)
Measuring liquid pressure	0 to 1MPa
Operating ambient temperature	0 to 50℃
Operating ambient humidity	Max. 95% relative humidity
Temperature element	Pt 1000Ω（0℃） 3850ppm/℃
Structure	Equivalent to IP67
Mass	Approx. 1.0kg
RTD	Pt1000Ω, 3850ppm/℃
Sterilization by steam	At 140℃ and 0.6 MPa within 60 minutes
Wetted material (pole)	SUS 316L stainless steel (treatment: #400 buffed/electropolished)
Insulated part (gasket) for electrode	PEEK and FKM (materials conforming to announcement Nos. 20 and 85 by Ministry of Health and Welfare)
	PEEK and FKM (materials conforming to announcement Nos. 20 and 85 by Ministry of Health and Welfare)
Applicable cable	CK-Y10M, CK-Y20M, CK-Y30M applicable for 100 m max.

■ FS-01FC-SL series



The figure shows FS-01FC-SL-2.0S.

	PARTS	NOTES
(1)	Connector	1108-21810-5M
(2)	Mounting of connector	PF (phenol resin)
(3)	Case 15A	SUS304
(4)	Flange 15A	SUS 316L stainless steel

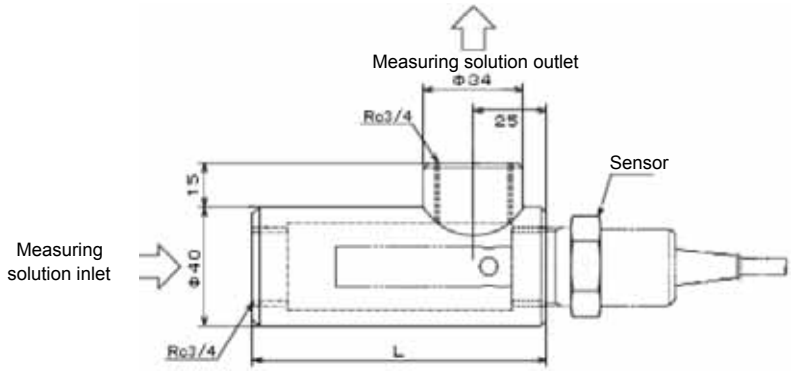
Common specifications

Measuring principle	AC 2-pole method
Cell constant	Approx. 0. 1/cm
Measurable range	0 to 2000 μS/cm (conforming to specifications for converter)
Measurable temperature	0℃ to 100℃ (conforming to specifications for converter)
Measuring liquid pressure	0 to 1MPa
Operating ambient temperature	0℃ to 50℃
Operating ambient humidity	Max. 95% relative humidity
Temperature element	Pt 1000Ω (0℃) 3850ppm/℃
Structure	Equivalent to IP67
Mass	Approx. 1.0kg
RTD	Pt1000Ω, 3850ppm/℃
Sterilization by steam	At 140℃ and 0.6 MPa within 60 minutes
Wetted material (pole)	SUS 316L stainless steel (treatment: #400 buffed/electropolished)
Insulated part (gasket) for electrod	PEEK and FKM (materials conforming to announcement Nos. 20 and 85 by Ministry of Health and Welfare)
Applicable cable	CK-Y10M, CK-Y20M, and CK-Y30M applicable for 100 m max.

Dimensions of each part

	FS-01FC-SL-**				
	15A	1.0S	1.5S	2.0S	2.5S
*3	Φ55	Φ65	Φ75	Φ85	Φ110
*4	99.5	103	108.5	114	126.5
*5	55.5	59	64.5	70	82.5
*6	120	120	120	120	140

■ Specifications and external dimensions of flow-through type holder for electric conductivity sensor

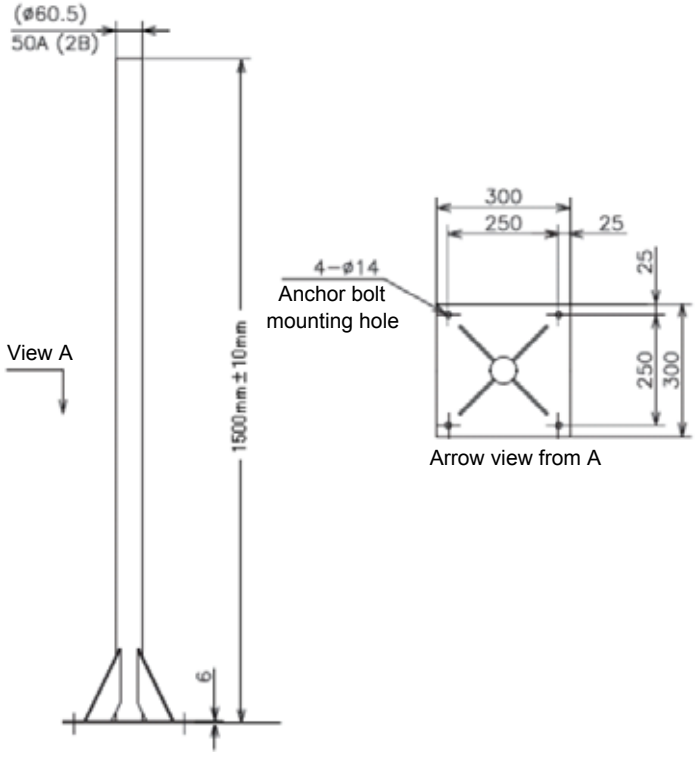


Model	EFA-30	EF-30P	EFA-30S	EFA-31	EF-31P	EFA-31S
Materials of Liquid Junction Section	PVC	PVDF	SUS316	PVC	PVDF	SUS316
Measuring liquid pressure	0-0.1MPa	0-0.1MPa	0-0.5MPa	0-0.1MPa	0-0.1MPa	0-0.5MPa
Measuring liquid temperature	0-50℃	0-100℃	0-100℃	0-50℃	0-100℃	0-100℃
Flow rate of liquid measured	0-10L/min					
Flange size of connection piping	Inlet: Rc3/4, outlet: Rc3/4					
Applicable sensor	EHS-***-*-ST series			EHS-***-*-LG series		

Dimensions of each p

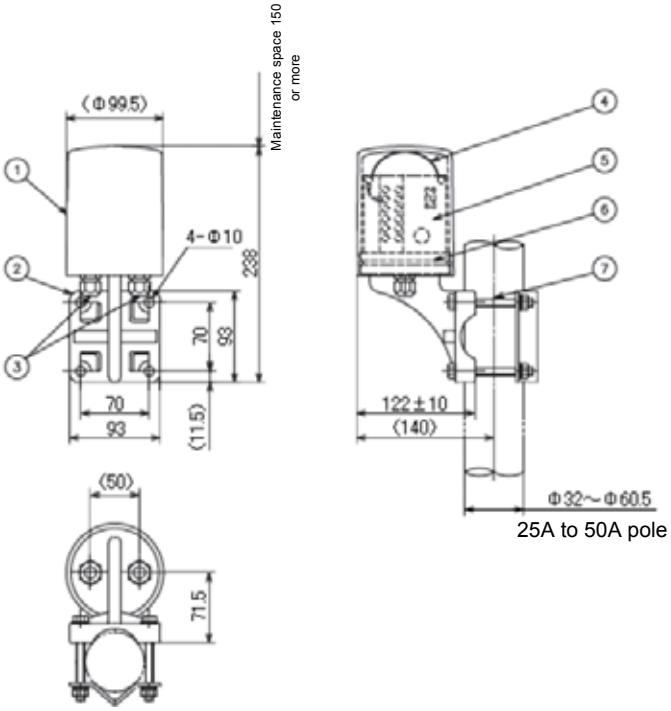
	EFA-30	EF-30P	EFA-30S	EFA-31	EF-31P	EFA-31S
L	100			150		

■ Pole stand (PS-50): specifications and external dimensions



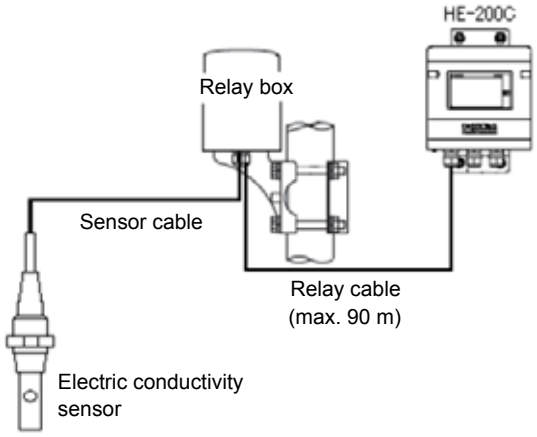
Model	PS-50
Materials	SUS304
Pipe diameter	50A

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

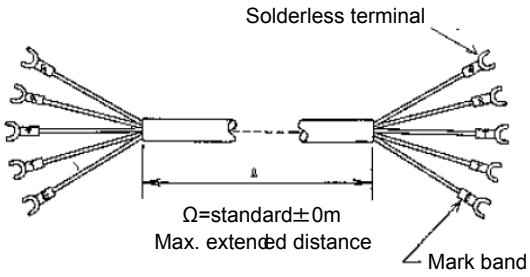


	PARTS	NOTES
(1)	Cover	ABS
(2)	Bracket	ABS
(3)	Wiring hole	
(4)	Spring	SUS304
(5)	Terminal board	ABS
(6)	O-ring	NBR
(7)	Bolt (provided)	SUS304 M8

- 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 dedicated cable. Do not use any general cable or splice the cable.
- The relay box is designed as rainproof.
- Terminals 3 and 4 are blank.



■ Specifications and external dimensions of relay cable (C-5C)



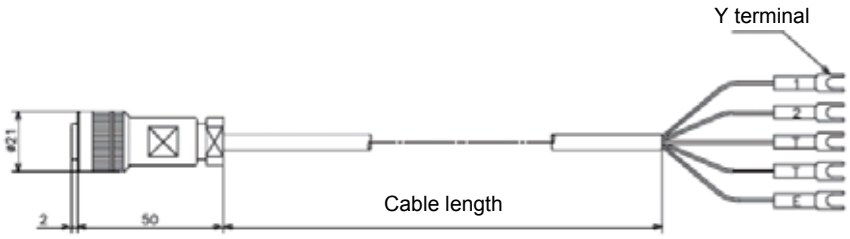
Characteristics
Conductor resistance :63.2Ω/hm max.
Withstand voltage :Shall withstand 1000 VAC for 1 minute.
Insulation resistance :10000MΩ/hm
Rated temperature :90℃
Capacitance :150 PP/m max.

- Use the relay cable when the cable is to be extended from the standard 10 m using ESH-001-L-S-ST-Y-10M, ESH-01-L-S-ST-Y-10M, or ESH-1-L-S-ST-Y-10M.
- For wiring, be sure to use the dedicated cable. Do not use the general cable or halfway splice the dedicated cable.
- Use the relay box when the cable is to be extended.
- The cable may be extended up to 90 m.

■ Specifications and external dimensions of connector cables (CK-Y series)

Model	Cable length	Shape of terminal
CK-Y10M	10m	Spade terminal
CK-Y20M	20m	Spade terminal
CK-Y30M	30m	Spade terminal

- Use the spade terminal when the ERF-001-C-T is used.
- For wiring, be sure to use the dedicated cable. Do not use the general cable or halfway splice the dedicated cable.



■ Installation (power source, transmission, etc.)

The description of the following installation (power source, transmission, etc.) assumes that the HE-200C is of the standard specification.

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

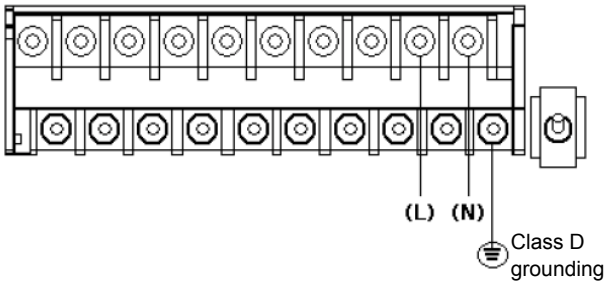
Power Source

- This ultrasonic cleaner has a 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 ±10%.

Provide the power switch in a place near the HP-200 so that the power can be turned ON/OFF. If lightning might strike, install an arrester on the output side of the HP-200 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 equipment such as a motor.

Electric power supplied	Voltage: 100 to 240 VAC
	Frequency: 50/60 Hz
Terminal screw	M4
Applicable power cable	0.75 to 5.5 mm2 (AWG18 to 10).

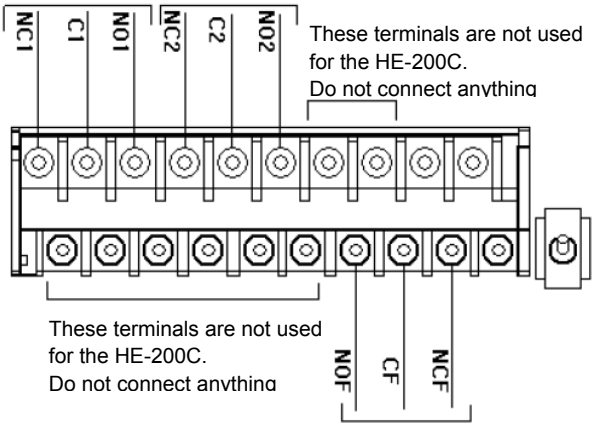


Output terminal

- 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 HP-200 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 HP-200 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 ma
Terminal screw	M4
Applicable power cable	0.75 to 5.5 mm2 (AWG18 to 10)

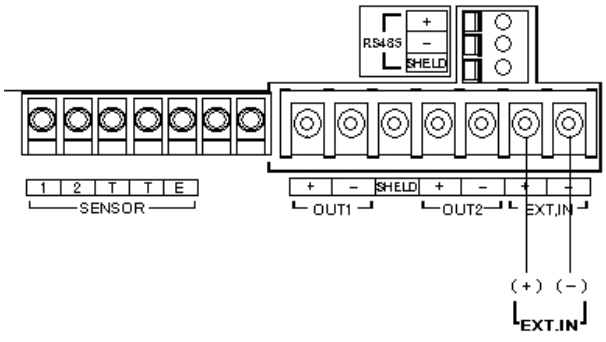
R1 (control output) R2 (control output)



Contact input

- Use a shielded cable.
- When lightning might strike, install an arrestor on the output side of the HP-200 and on the side of receiving instruments.

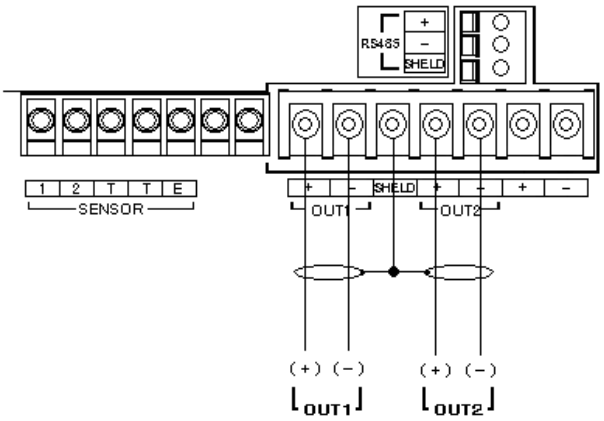
Contact input resistance	100Ω/km max.
Terminal screw	M3.5
Applicable power cable	0.75~5.5 mm2 (AWG18~10)



(Contact input)

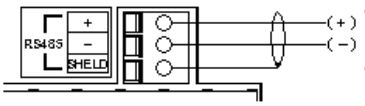
Transmission output
- For the transmission output cable, use a shielded cable.
- When lightning might strike, install an arrestor on the output side of the HP-200 and on the side of receiving instruments.
- The negative terminals OUT1 (-) and OUT2 (-) for transmission output are internally connected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

Maximum load resistance	900Ω
Terminal screw	M3.5
Applicable power cable	2mm2 （AWG14） MAX



Transmission output

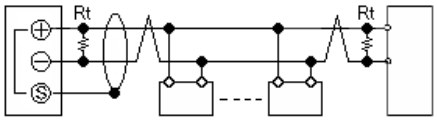
RS-485
For the communication output cable, use a twisted shielded pair.
- The communication cable length is 500 m maximum.
- Use a terminating resistor (Rt: 120Ω) for any device at which the RS-485 communication line is terminated.
- Up to 32 connections can be made including one for the host computer.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



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

Example of external connection for

This unit RS-485 (communication output)

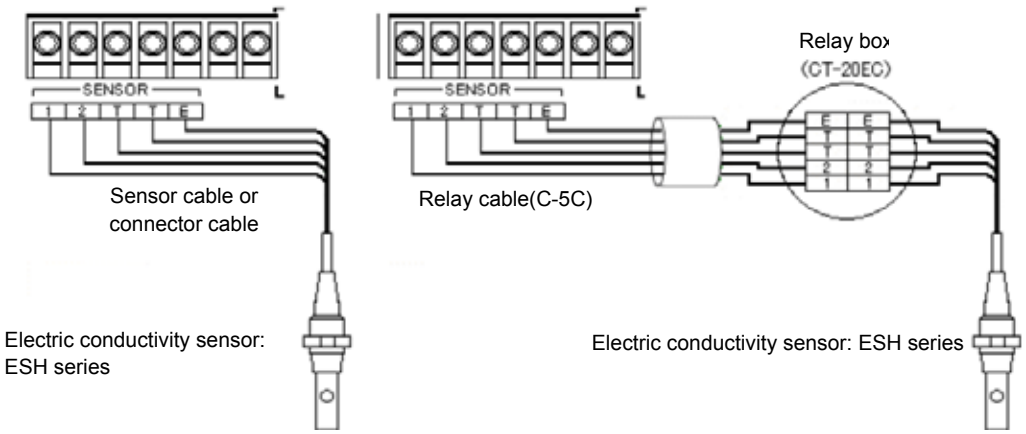


Sensor cable
The sensor cable is highly insulated. Exercise care in handling the sensor cable.
・Do not wet any cable terminal or the terminal block with water or the like; also do not soil it with dirt, oil, or the like. The insulation will otherwise deteriorate.
The decreased insulation can cause instable 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.

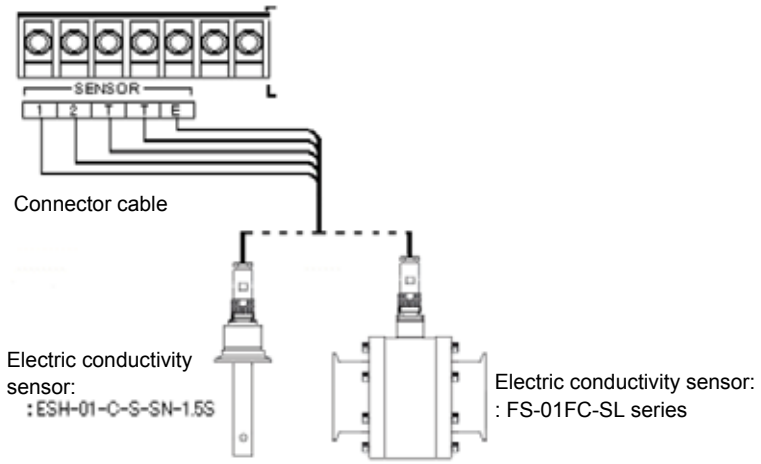
・For the sanitary sensor, avoid extension wherever practical. Specify a connector cable of the necessary length.

Electric conductivity Sensor	1. Conductivity sensor 1 terminals
	2. Conductivity sensor 2 terminals
	T, T:Temperature compensation sensor terminal
	E: Shielded terminal

Connecting the ordinary ESH series electric conductivity sensor



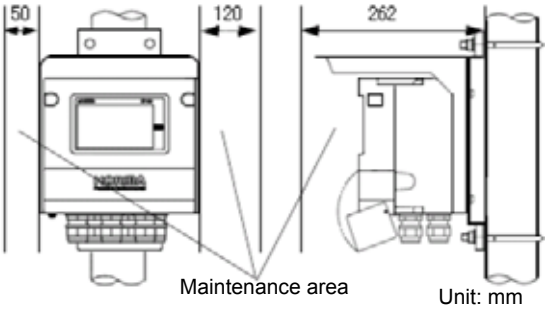
Connecting procedure for ESH and FS flow-through electric conductivity sensors



■ Installation (mounting)

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

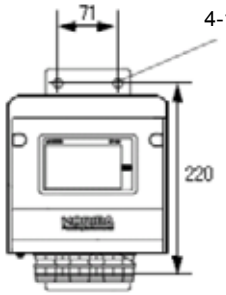
Body (for pole mounting)



Unit: mm

・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.

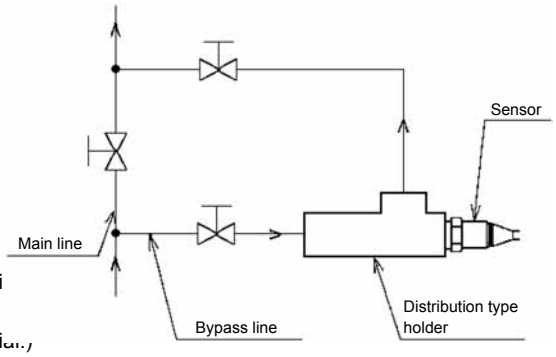
Body (to be wall-mounted)



Sensor plus flow-through holder

Precautions for sensor piping

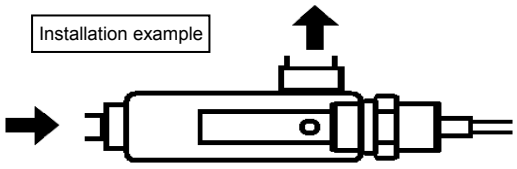
The sensor cannot be installed directly to the 20A piping. To install the sensor on the piping line, provide a bypass line from the main line and use the flow-through type holder. Carry out piping so that the liquid under measurement is sent upward from the lateral side of the flow-through holder (from the leading end of the electric conductivity sensor).



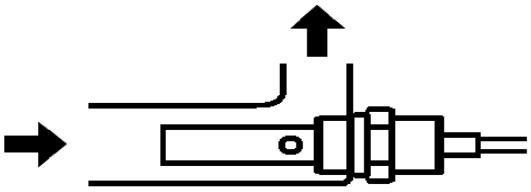
Installation conditions

Flow rate	0 to 0.5 MPa (max.)
	(The dedicated holder is dependent on the holder materi
Temp	0℃ to 100℃ (maximum)
	(The dedicated holder is dependent on the holder materia.)
Flow rate	10 L/min (maximum)
	(Increase the flow rate as much as possible within 10 L/min.)

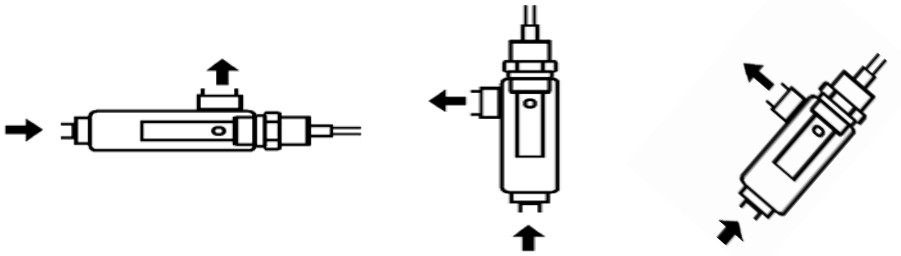
Installation example



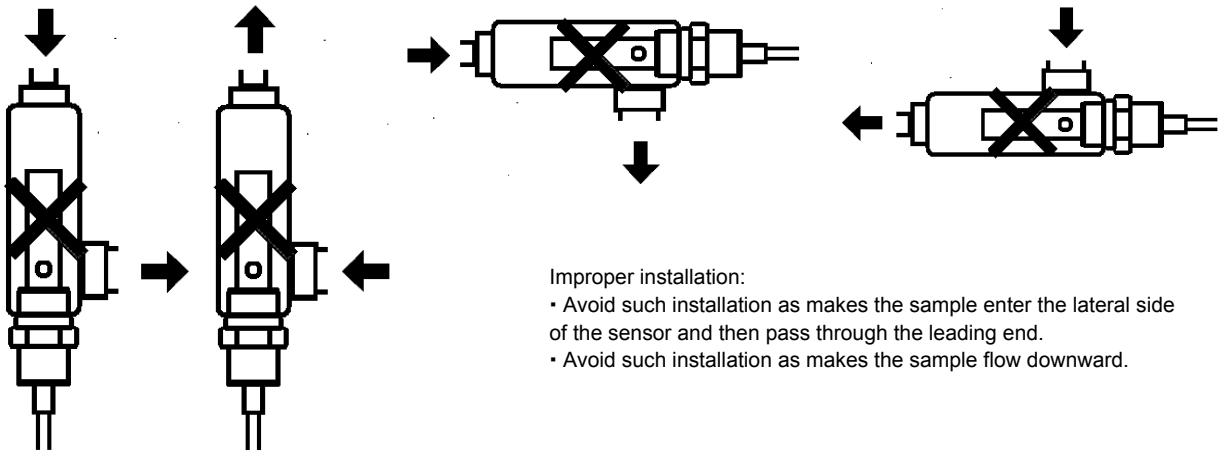
When the dedicated flow-through holder is used:



When the sensor is installed directly on piping or the like:



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.

Installation and cleaning of sensor

In measurements of electric conductivity of 1μS/cm minimum, 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.

Installing the sensor for proper measurements

The basic condition for proper measurements is that the entire surface of the sensor shall be exposed to the well agitated sample without bubbles. In principle, measurements are not affected by the pressure and the flow rate, but they are affected secondarily by the dissolution of carbon dioxide or the generation of bubbles. The dissolution of carbon dioxide greatly affects measurements in the deionized water range; the existence and adhesion of bubbles affect the measured values for electric conductivity and specific resistance. In order to prevent bubbles from being generated in the line, it is effective to make measurements while applying pressure. The generation of bubbles can be prevented by providing a flow rate control valve downstream of the sensor and maintaining the sensor in a pressurized state. If the valve located upstream of the sensor is closed, measurements may be affected as the pressure around the sensor may decrease, causing the dissolved gas to become bubbles. The increased water temperature or the addition of salt may also cause dissolved gas to become bubbles. Those bubbles may adhere to the sensor, affecting the measured values. Determine the orientation of the sensor holder so that more bubbles can be released

Installing the sensor for measurements of electric conductivity of deionized water

In principle, the electric conductivity is not affected by the flow rate. However, when the electric conductivity of a sample close to deionized water is measured, the dissolution of carbon dioxide in air may increase the value for electric conductivity (specific resistance may decrease). In particular, fluorine resin piping allows gas to easily pass it through. Therefore, the flow rate and pressure of the sample change the dissolved volume of carbon dioxide, affecting the measured values. For sampling, use piping of a clean material with low permeability to gases install the sensor as close as possible to the main, and then ensure an appropriate flow rate which is not too slow.

Sanitary electric conductivity sensor

Precautions for piping

• Install the sensor in a location where the sensor is not exposed to electromagnetic induction.
• Avoid installation in a location where the sensor is exposed to frequent vibrations or corrosive atmosphere.
• To conduct comparative checks or calibration with the actual sample during periodical checks or calibration, you need to install a valve for sampling.

Installation conditions

Flow rate 0 to 1.0 MPa (max.)

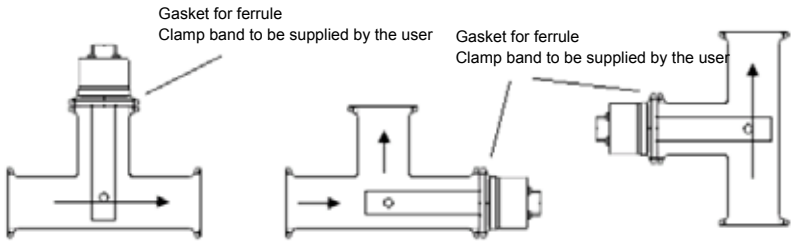
Temp 0℃ to 100℃ (maximum)

Flow rate

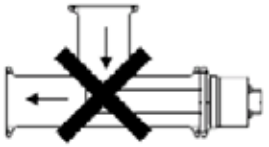
Installation conditions

・Send the liquid under measurement so that the sensor is filled with water without bubbles
・The sensor may be installed either horizontally or vertically. The connector may be positioned either upward or downward. (FS-01FC-SLseries)
・Support both sides so that the sensor is not stressed. (FS-01FC-SLseries)
・Install the sensor in a location where the sensor is not exposed to electromagnetic induction.
・Avoid installation in a location where the sensor is exposed to frequent vibrations or corrosive atmosphere.
・Install the piping so that the sensor can be removed safety from the piping during maintenance.
・To conduct comparative checks/calibration with verification standards using the actual sample during periodical check/calibration, be sure to install a sampling valve (ferrule size: 15A; 1.0S for ESH) just before or after the sensor.

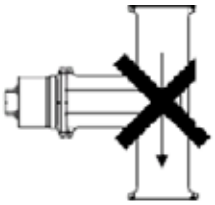
Installation example (inserted type)



The arrow mark indicates the flow of the sample.



The sample should not be sent downward and then laterally.

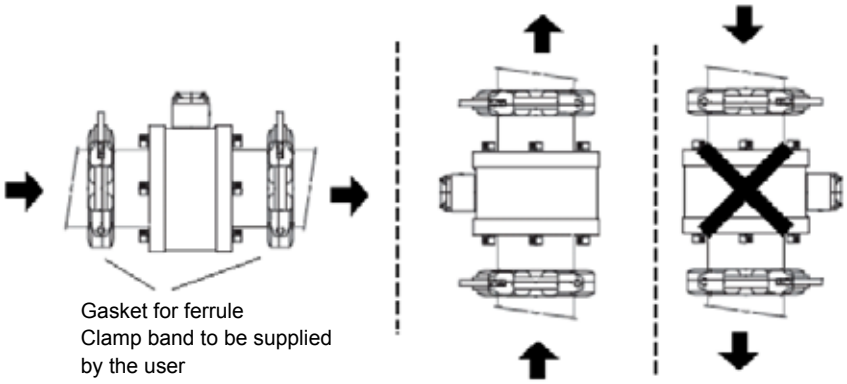


The sample should not be sent downward.

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.

Installation example (for the flow-through sensor)



Gasket for ferrule
Clamp band to be supplied by the user

Improper installation:
・Avoid such installation as makes the sample flow downward.

The arrow mark indicates the flow of the sample.

To compare the actual sample with the verification standard during checks/calibration, you need to install a sampling valve.
In installing the flow-through sensor, support the piping to ensure that the sensor is not stressed.