HORIBA
Process & Environmental

Beyond Water with You

Panel mount type water quality measuring instruments

48/96
Series

HORIBA Advanced Techno

6.86

25

MEAS   CAL   MNT

ENT

pH METER   HP-480

Panel mount type water quality measuring instruments

48/96 series

Full line-up of panel mount type water quality meters in which the original sensing technologies of HORIBA Advanced Techno are concentrated.

These products have stability, reliability and maintainability and achieve excellent performance with advanced functions.

The new, more compact 48/96 series offers greater space-savings and, by featuring a lineup of lead-free pH/ORP eletcrodes and adopting the use of lead-free solder for products that are friendly to both humans and our global natural environment, this is sure to be the standard for next-generation devices.

Excellent Functionality, Operability and Stability

Well-developed status indicator icons
Icons indicate the status of the meter.
The easy-to-read display prevents faulty operation.

Setting with the front-panel keys
The elimination of internal switches enables settings and the change of operations to be accomplished with the front-panel keys.

Seeking "User-friendliness"
Secure operability is implemented by adopting the simple menu system and the emboss sheet.

Addition of security function
By setting a password, all the key operations are locked to perform operations and measurements securely.

Utilization of lead-free solder
Lead-free solder is used for mounting chips on the PCB according to the RoHS directive.

Series Line up

pH meter	**HP-480**
pH meter (4-point alarm and time sharing proportional control)	**HP-960FTP**
pH meter (Time sharing proportional control)	**HP-480TP**
pH meter (Pulse proportional control)	**HP-480PL**
ORP meter	**HO-480**
Conductivity meter (High concentration type)	**HE-480H**
Conductivity meter (Low concentration type)	**HE-480C**
2-Channel conductivity meter (Low concentration type)	**HE-960CW**
Conductivity meter (Wide range type)	**HE-960HI**
Resistivity meter	**HE-480R**
2-Channel Resistivity Meter	**HE-960RW**
Residual chlorine meter (Galvanic cell method)	**HR-480**
Residual chlorine meter (Polarography method)	**HR-480P**
Dissolved oxygen meter	**HD-480**

■ Part names

pH METER   HP-480

▶ **Status indicator icons**
- **HOLD** Lights up when the transmission output is held
- ⚠ Lights up when the meter is out of order
- **?** Lights up when a measurement abnormality occurs
- **R1** Turn on when contact "a" is ON
- **R2** Turn on when contact "a" is ON

▶ **Measured value display**
Normally indicates the measured value.

▶ **Auxiliary value display**
Indicates the set value, an error message the temperature, etc.

▶ **Mode indicator Icons**
- ◠ Measurement mode (MEAS)
- ▤ Calibration mode (CAL)
- ⑂ Maintenance mode (MNT)

MEAS — Use this key to start a measurement.
No matter what condition the device is in, this key works preferentially.
This key also serves as the cancel key for the calibration mode and the maintenance mode.

CAL — Use this key to execute the standard solution calibration or the temperature calibration. With 1-touch pH calibration, "good" is displayed when calibration is completed properly and the [ENT] key is pressed.

MNT — Use this key to specify or change various functions. Every operation can be done on the front panel.

⌃ ⌄ — Use this key to move the set value up and down and scroll the menus.

ENT — Use this key to register the setting.

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48/96series

Panel mount type
water quality measuring instruments

pH meter

HP-480

- pH meter of standard type
- One-touch calibration
- Automatically determines conditions of the electrode
- Supports five types of temperature compensation elements
- Enables environmentally-friendly measurements in combination with a lead-free pH electrode

> Common specifications
> Power supply: AC100 to 240V±10% 10 VA (max.)

Model	HP-480
Measurement range	pH 0 to 14: Resolution 0.01 pH Temperature 0 to 100: Resolution 1°C (display selectable)
Reproducibility	±0.05 pH (equivalent input)
Transmission output	4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control), alarm, and maintenance.

Calibration function	• Two-point automatic calibration or manual calibration
	    Two-point automatic calibration: automatically determines whether the electric potential is stable or not.
	    Types of standard solution: pH 2, 4, 9 and 10 (JIS)
	    Combination of standard solution: pH 7 and one of the others
	    Manual calibration: Freely selectable, but the difference should be over 2 pH.
	• Temperature calibration (one point)

Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous

Self-diagnosis function	• Calibration failure
	    Asymmetry potential error, sensitivity error, response speed error and standard solution error
	• Electrode self-check
	    Temperature sensor short-circuit and temperature sensor disconnection
	• Outside the measuring range
	    Converter error

Temperature compensation	Select between 500Ω, 6.8 kΩ, 1 kΩ, 10 kΩ, 350Ω and no compensation
Conforming standard	CE marking FCC regulations

4-point alarm
time sharing proportional control

HP-960FTP

- High-end type equipped with a four-point alarm and time sharing proportional control
- Allows interlocking with a washer through the external input
- Supports five types of temperature compensation elements
- Enables environmentally-friendly measurements in combination with lead-free pH electrode

Model	HP-960FTP
Measurement range	pH 0 to 14: Resolution 0.01 pH Temperature 0 to 100: Resolution 1°C (display selectable)
Reproducibility	±0.05 pH (equivalent input)
Transmission output	4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 4 (R1, R2, R3, and R4) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control, time sharing proportional control), alarm, and maintenance.
Contact input	No. of contacts: 1 (external input for holding) Contact shape: Open collector no-voltage contact a
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous

Control actions	• ON/OFF control
	• Time sharing proportional control
	    Upper and lower limit setting range: 0.00 to 14.00 pH
	    Proportional band: 0.01 to 4.00 pH
	    Cycle: 5 to 300 seconds
	    Control output shift function: Amount of shift 0 to 50% of the cycle
	    Automatic cycle change function: When the deviation enters the range of (flexible zone), the cycle is automatically prolonged according to the deviation.
	    Flexible zone: 1 to 100% of the proportional band
	    Maximum cycle extension time: 0 to 300 seconds
	    Maximum control amount: 50 to 100% (operates independently of the proportional band)

Temperature compensation	Select between 500Ω, 6.8 kΩ, 1 kΩ, 10 kΩ, 350Ω and no compensation
Conforming standard	CE marking FCC regulations

pH/ORP meter

Electrode

	Type	Product name	Useable temperature range	Useable pressure range	Combined holder
PH	Dome type pH electrode	6108-50B ToupH Pb Free	-10 to 100°C	0 to 0.6 MPa	CH-101, CF-251 CF-301, CF-401
	Sleeve type pH electrode	6109-50B ToupH Pb Free	-10 to 80°C	0 to 0.03 MPa	CH-101 CF-251
	Plastic composite pH electrode (for Hydrofluoric acid containing sample)	6151-50B ToupH Pb Free	-10 to 60°C	0 to 0.2 MPa	CH-101 CF-251 CF-301
	Plastic composite pH electrode (for Highly alkalic sample)	6152-50B Pb Free			
	Dome type pH electrode (gel)	6108G-50B ToupH Pb Free	-10 to 100°C	0 to 0.6 MPa	Specialized pressurized holder
	pH electrode (Tip replaceable)	6174-50B	-10 to 100°C	0 to 0.03 MPa	HIBP, HIBS CF-501
	pH electrode HF (Tip replaceable)	6171-50B ToupH Pb Free	-10 to 60°C	0 to 0.03 MPa	
	pH electrode Alkaline (Tip replaceable)	6172-50B Pb Free			
	pH electrode Oil (Tip replaceable)	6173-50B ToupH Pb Free			
ORP	General use (Pt)	6805-50B ToupH Pb Free	0 to 80°C	0 to 0.03 MPa	CH-101 CF-251 CF-301
	General use (Au)	6815-50B ToupH Pb Free			
	Tip repraceable (Pt)	6870-60B	0 to 105°C	0 to 0.03 MPa	HIBP HIBS CF-501

6108-50B 6151-50B 6171-50B ダミー ORP electrode (Pt) 6805-50B

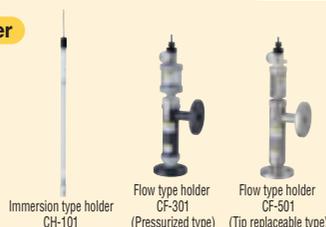Note that the pH electrodes and ORP electrodes are HORIBA, Ltd. products.

ToupH (Tough electrode) Impact-resistant, splinterless glass electrode

Pb Free Lead free glass is used in both the sensitive glass areas and main body.

Contact your sales representative when electrodes are to be used with any of the samples below.

- With strongly oxidizing solutions such as aqua regia, chromic acid, hypochlorous acid, perchloric acid
- When corrosive gases (ammonia, chlorine, hydrogen sulfide) are involved.

Holder

	Application	Product name	Main materials	Measurement solution conditions*			Interface
				Temperature	Pressure	Flow rate	
Immersion type	General use type	CH-101	PP	-5 to 80°C	Atmospheric pressure	2 m/sec or less (flow velocity)	—
	Tip replaceable type	HIBP	PP	-10 to 80°C			
Flow type	General use type	CF-251	PP	-5 to 80°C	Atmospheric pressure	0.3 to 10 L/min	JIS 10K 25A FF flange (Input port/ output port)
	General use internal solution tank mounted type	CF-251-T	PP	-5 to 80°C			
	General use pressurized type	CF-301	PP	-5 to 80°C	0.3 MPa		
	Tip replaceable type	CF-501	PP	-5 to 80°C	Atmospheric pressure		

Immersion type holder CH-101

Flow type holder CF-301 (Pressurized type)

Flow type holder CF-501 (Tip replaceable type)

* Usage conditions vary according to the combination of electrodes. Refer to the specifications document of each product for details.

pH meter

ORP meter

Time sharing proportional control
HP-480TP

- pH meter equipped with the time sharing proportional control function
- Achieves the neutralization optimum for Flexible zone
- Supports five types of temperature compensation elements
- Enables environmentally-friendly measurements in combination with lead-free pH electrode

Model	HP-480TP
Measurement range	pH 0 to 14: Resolution 0.01 pH Temperature 0 to 100: Resolution 1°C (display selectable)
Reproducibility	±0.05 pH (equivalent input)
Transmission output	4 to 20 mA DC; Isolated I/O type, Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control, time sharing proportional control), alarm, and maintenance.
Control actions	• ON/OFF control • Time sharing proportional control 　Upper and lower limit setting range: 0.00 to 14.00 pH 　Proportional band: 0.01 to 4.00 pH 　Cycle: 5 to 300 seconds 　Control output shift function: Amount of shift 0 to 50% of the cycle 　Automatic cycle change function: When the deviation enters the range of (flexible zone), the cycle is automatically prolonged according to the deviation. 　Flexible zone: 1 to 100% of the proportional band 　Maximum cycle extension time: 0 to 300 seconds 　Maximum control amount: 50 to 100% (operates independently of the proportional band)
Calibration function	Automatic 2-point calibration or manual calibration Temperature calibration (1 point)
Conforming standard	CE marking FCC regulations

Pulse proportional control
HP-480PL

- pH meter equipped with the pulse proportional control function
- Drives the pulse pump directly
- Supports five types of temperature compensation elements
- Enables environmentally-friendly measurements in combination with lead-free pH electrode

Model	HP-480PL
Measurement range	pH 0 to 14: Resolution 0.01 pH Temperature 0 to 100: Resolution 1°C (display selectable)
Reproducibility	±0.05 pH (equivalent input)
Transmission output	4 to 20 mA DC; Isolated I/O type, Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPST (1a) Contact rating: 240 V AC 0.3 A, 100 V DC 0.3 A (resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control, pulse proportional control), alarm, and maintenance.
Control actions	• ON/OFF control • Pulse proportional control 　Upper and lower limit setting range: 0.00 to 14.00 pH 　Maximum output pulse number: Can be set to any value in a range of 1 to 360 SPM 　Proportional band: 0.01 to 4.00 pH 　Control output shift function: 0 to 50%
Calibration function	• Two-point automatic calibration or manual calibration 　Two-point automatic calibration: automatically determines whether the electric potential is stable or not. 　Types of standard solution: pH 2, 4, 9 and 10 (JIS) 　Combination of standard solution: pH 7 and one of the others 　Manual calibration: Freely selectable, but the difference should be over 2 pH. • Temperature calibration (one point)
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous
Temperature compensation	Select between 500Ω, 6.8 kΩ, 1 kΩ, 10 kΩ, 350Ω and no compensation
Conforming standard	CE marking FCC regulations

HO-480

- Measures oxidation-reduction potential
- Enables environmentally-friendly measurements in combination with lead-free ORP electrode

Model	HO-480
Measurement range	±2000 mV: Resolution 1 mV
Reproducibility	Within ±5 mV (equivalent input)
Linearity	Within ±5 mV (equivalent input)
Transmission output	4 to 20 mA DC; Isolated I/O type, Maximum load resistance 900Ω
Transmission output range	Free range
Calibration function	Sensitivity compensation Adjustment: ±200 mV Span variable range: 50.0 to 150.0%
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control), alarm, and maintenance.
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous
Self-diagnosis function	• Outside of the measuring range • Converter error
Conforming standard	CE marking FCC regulations

Cleaning device

Ultrasonic cleaning device Immersion type **UCH-10**

Water/Air jet cleaning device Immersion type **JCH-10**

Brush cleaning device Immersion type **BCH-10**

Ultrasonic cleaning device Flow type **UCF-30**

Water/Air jet cleaning device Flow type **JCF-30**

Sensor cable

ORP sensor extension cable
- **C-5A** (pH)
- **C-2A** (ORP)

Used to connect transmitter and relay box.

Product name	C-5A	C-2A
Outer diameter	Ø10	Ø6
Max. extendable distance	50 m	50 m

Mount fitting
- **BA-1A** (ABS)
- **BA-1S** (SUS)

Attachment/detachment can be performed in one step using the specialized mount fitting. Standard solution calibration and maintenance are also straightforward. The fitting is available in two types of material: either ABS resin or stainless steel (SUS304).

Relay box

- **CT-25pH** (S/SE terminal attached)
- **CT-20pH** (S/SE terminal attached)

If the distance between the electrode holder and analyzer or transmitter main unit is longer than the electrode cable, use the relay box as a cable repeater. Connect the relay box and analyzer or transmitter main unit using a specialized extension cable.

Calibration standard solution
- **pH7 standard solution** (500 ml)
- **pH4 standard solution** (500 ml)
- **pH9 standard solution** (500 ml)
- **Reference electrode internal solution** (250 ml)
- **ORP standard powder** (10 packs)

Other powders are also available in addition to solutions.

[Loose flange]

This is an adapter for attaching the CH-101 series immersion type holder to the flange.

Product name	Material	Interface
FK-1	PP	JIS10K 50A
FK-1P	PVC	
FK-1S	SUS	

Conductivity meter

High concentration type
HE-480H

- Allows for measurement in a wide range up to 500 mS/cm
- Equipped with the seawater salt content and NaCl salt content conversion function
- Supports a variety of temperature compensation
- Automatically determines condition of the sensor

Low concentration type
HE-480C

- Optimum for continuous measurement of pure water and boiler water
- Implements high-precision temperature compensation
- Automatically determines condition of the sensor
- Supports a variety of temperature compensation

Model	HE-480H			
Measurement method	4-electrode method			
Sensor input	1-channel (cell constant: 1.0/cm)			
Temperature sensor	Resistance thermometer: 1000Ω/0°C			
Measurement range	Conductivity (mS/cm)	0.00 to 20.00	0.0 to 200.0	0.0 to 500.0
	(S/m)	0.000 to 2.000	0.00 to 20.00	0.00 to 50.00
	* Measurement in the 200.0 mS/cm and 20.00 S/m ranges is possible up to a custom temperature coefficient setting of ±3.5%/°C at a standard temperature of 25°C. * Measurement in the 500.0 mS/cm and 50.00 S/m ranges is possible without temperature compensation.			
	Seawater salinity conversion value: 0.00 to 4.00%			
	NaCl salinity conversion value: 0.0 to 20.0%			
	Temperature: 0 to 100°C (The displayed decimal place is selectable among 0, 1, and 2.)			
Reproducibility	Within ±0.5% of the full scale (±1.0% for salinity conversion and the 500 mS/cm range)			
Transmission output	No. of outputs: 1; 4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω			
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control), alarm, and maintenance			
Calibration function	Conductivity: Based on the specified compensation coefficient for the cell constant (parameter input) Temperature: Calibrated by comparing with the reference thermometer			
Temperature compensation	• Temperature characteristics of NaCl • Based on the reference temperature and user-defined temperature coefficient (Reference temperature: 5-95°C, Temperature coefficient: ±5%/°C) • No temperature compensation			
Compatible sensors	FES series conductivity sensor (cell constant: 1.0/cm) (The measurement range differs depending on the sensor model)			
Conforming standards	CE marking, FCC regulations			

Model	HE-480C			
Measurement method	2-electrode method			
Sensor input	1-channel (cell constant: 0.01/cm, 0.1/cm, 1.0/cm)			
Temperature sensor	Resistance thermometer: 1000Ω/0°C			
Measurement range	Cell constant (/cm)	0.01	0.1	1.0
	Conductivity (μS/cm)	2.000/20.00	20.00/200.0	200.0/2000
	(mS/m)	0.2000/2.000	2.000/20.00	20.00/200.0
	TDS conversion (mg/L)	2.00/20.0	20.0/200	200/2000
	Temperature: 0 to 100°C (The displayed decimal place is selectable among 0, 1, and 2.)			
Reproducibility	Within ±0.5% of the full scale (TDS: within ±1.5% of the full scale)			
Transmission output	No. of outputs: 1; 4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω			
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control), USP determination, Error alarm, and Maintenance			
Calibration function	Conductivity: Based on the specified compensation coefficient for the cell constant (parameter input) Temperature: Calibrated by comparing with the reference thermometer TDS: Conversion using a user-defined coefficient value (0.30 to 1.00)			
Temperature compensation	• Based on the temperature characteristics of ultra-pure water (reference temperature: 25°C) • Based on the reference temperature and user-defined temperature coefficient (reference temperature 5-95°C, temperature coefficient ±5%/°C) • Based on the temperature characteristics of NaCl • No temperature compensation			
Compatible sensors	ESH and FS-series conductivity sensor; cell constant: 0.01/cm, 0.1/cm, or 1.0/cm			
Conforming standards	CE marking, FCC regulations			

Conductivity meter   High concentration type

Sensor
■ Specifications

Model		FES-125F	FES-126F
Cell constant		Approx. 1.0/cm	
Wetted material	Electrode	Titanium	Titanium
	Body	PVC	PPS
	Packing	FKM	FKM
Temperature of fluid being measured		0-50°C	0-120°C*1
Pressure of fluid being measured		0-0.5 MPa	0-0.5 MPa
Cable length		10 m (standard) Use the CT-20EC relay box for further extension. Maximum extension length: 70 m	
Installation		1. Submersible type 2. Threaded type ●Use the thread adapter EA-20.	1. Submersible type 2. Threaded type ●Use the thread adapter EA-40.
Holder to be combined		Flow type holder: EF-20, EF-20P, EF-20S	

*1. Submersible types can only be used between 0 and 50°C

Conductivity sensor
FES-126F

Flow type holder
EF-20

Flow type holder

Model	EF-20	EF-20P	EF-20S
Wetted material	PVC	PVDF	SUS316
Temperature of fluid being measured	0 to 50°C	0 to 100°C	0 to 100°C
Pressure of fluid being measured	0 to 0.1 MPa	0 to 0.1 MPa	0 to 0.5 MPa
Flow rate of fluid being measured	0 to 10 L/min		
Connecting pipe diameter	Inlet: Rc (PT) 1/2, Outlet: Rc (PT) 1/2		

Low concentration type

Threaded sensor
■ Threaded sensor code chart

Model	Cell constant	Connection	Wetted material	Cell length	Terminal type	Cable length	Specifications
ESH							Resistivity sensor (2-electrode method)
	-1						Cell constant 1.0/cm
	-01						Cell constant 0.1/cm
	-001						Cell constant 0.01/cm
		-L					Cable-attached type
		-C					Connector type
			-S				SUS-316 (operating temperature range: 0 to 100°C)
			-T				Titanium (operating temperature range: 0 to 80°C)
				-ST			Short cell
				-LG			Long cell
					-Y		Y terminal (standard)
					-O		Round terminal (option)
					N/A		When the connector type sensor is selected
						-10	10 m (standard)
						-XX	Designated cable length (option)*1
						N/A	When the connector type sensor is selected*2

*1. Limit cable extensions to a max. 50 m. (Relay boxes cannot be used.)
*2. A connector cable (CK-10M/20M/30M, etc.) is separately required for connector type sensors.

Sensor

Short cell
(connector type)

Flow type holder
■ Flow type holder code chart

Model	Cell length	Material	Specifications
EFA			Flow type holder
	-30		For short cell sensors
	-31		For long cell sensors
		N/A	PVC (temperature: 0 to 50°C; pressure: 0 to 0.1 MPa)
		P	PVDF (temperature: 0 to 100°C; pressure: 0 to 0.1 MPa)
		S	SUS-316 (temperature: 0 to 100°C; pressure: 0 to 0.5 MPa)

EFA-30

2-Channel
HE-960CW

- 2-channel simultaneous measurement
- High-quality conductivity meter appropriate for monitoring purified water quality
- Buit-in USP<645> determination function
- Established traceability system
- Built-in RS-485 communications output

Wide range type
HE-960HI

- Measures the full range up to 500 mS/cm
- Equipped with the chemical concentration conversion function
- Offers 3 independent user-defined transmission outputs
- Built-in RS-485 communications output

Model	HE-960CW			
Measurement method	2-electrode method			
Sensor input	2-channel (cell constant: 0.01/cm, 0.1/cm, 1.0/cm)			
Temperature sensor	Resistance thermometer: 1000Ω/0°C			
Measurement range	Cell constant (/cm)	0.01	0.1	1.0
	Conductivity (µS/cm)	2.000/20.00	20.00/200.0	200.0/2000
	(mS/m)	0.2000/2.000	2.000/20.00	20.00/200.0
	TDS conversion (mg/L)	2.00/20.0	20.0/200	200/2000
	Temperature: 0 to 100°C (The displayed decimal place is selectable among 0, 1, and 2.)			
Reproducibility	Within ±0.5% of the full scale (TDS: within ±1.5% of the full scale)			
Transmission output	No. of outputs: 2; 4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω			
Contact output	No. of outputs: 4 (R1, R2, R3, and R4) 　Contact type: Relay contacts R1 to R3: SPST (1a); R4: SPDT (1c) 　Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load) 　Contact function: Select between upper/lower limit operation (ON/OFF control), 　USP determination, Error alarm, and Maintenance 　(R1 and R2, and R3 and R4 are for common use, respectively)			
Communication function	RS-485 I/O			
Calibration function	Conductivity: Based on the specified compensation coefficient for the cell constant (parameter input)			
	Temperature: Calibrated by comparing with the reference thermometer			
	TDS: Conversion using a user-defined coefficient value (0.30 to 1.00)			
Temperature compensation	• Based on the temperature characteristics of ultra-pure water (reference temperature: 25°C) • Based on the reference temperature and user-defined temperature coefficient 　(reference temperature 5 to 95°C, temperature coefficient ±5%/°C) • Based on the temperature characteristics of NaCl • No temperature compensation			
Compatible sensors	ESH and FS-series conductivity sensor; cell constant: 0.01/cm, 0.1/cm, or 1.0/cm			
Conforming standards	CE marking, FCC regulations			

Model	HE-960HI
Measurement method	4-electrode method
Sensor input	1-channel (cell constant: 0.1/cm)
Temperature sensor	Resistance thermometer: 1000Ω/0°C
Measurement range	Conductivity: 0 to 200 mS/cm (Conductivity measurement range prior to temperature compensation: 0 to 500 mS/cm)
	Temperature: 0 to 100°C
Concentration conversion	NaOH: 0 to 5%, HNO₃: 0 to 5%, H₃PO₄: 0 to 5% (using internal program)
	Custom 1: 0 to 100%, Custom 2: 0 to 100% (user-customizable conversion formula)
Reproducibility	Within ±0.5% of the full scale (500 mS/cm range: within ±1.0% of the full scale)
Transmission output	No. of outputs: 3; 4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of alarm outputs: 4 points (R1, R2, R3, and R4) 　Contact type: Relay contacts R1 to R3: SPST (1a); R4: SPDT (1c) 　Contact rating: 240 V AC, 30 V DC 3 A (Resistance load) 　Contact function: upper/lower limit operation (ON/OFF control) No. of alarm outputs: 1 point (RF) 　Contact type: Relay contacts R1 to R3: SPST 　Contact rating: 24 V DC 1 A (Resistance load) 　Contact function: Upper/Lower limit operation (ON/OFF control) 　Contact operation: At error or power OFF: open; Normal: closed
Communications output	RS-485 I/O
Calibration function	Conductivity: Based on the specified compensation coefficient for the cell constant (parameter input)
	Temperature: Calibrated by comparing with the reference thermometer
Temperature compensation	• NaCl temperature characteristics (reference temperature: 25°C) • Custom temperature compensation coefficient input 　(reference temperature: 25°C, temperature coefficient: 0-5%/°C)
Compatible sensors	FES-310/FES-210 series; cell constant: 0.1/cm
Conforming standards	CE marking, FCC regulations

Sanitary type (low concentration)

Flow-through sensor

FS-01FC series

■ Flow-through sensor specifications

Model	FS-01FC series
Cell constant	0.1/cm
Pressure range	0 to 1 MPa
Protective structure	IP67 equivalent
Wetted material	SUS316L, PTFE, FKM
Sterilization conditions	140°C/0.6 MPa within 60 minutes
Connection aperture	15A, 1.0S, 1.5S, 2.0S, 2.5S (IDF/ISO ferrule)

Sanitary type (high concentration)

Flow-through sensor

FES-310 series

■ Flow-through sensor specifications

Model	FES-310 series
Cell constant	0.1/cm
Pressure range	0 to 1 MPa
Protective structure	IP67 equivalent
Wetted material	SUS316L, PTFE, FKM
Sterilization conditions	140°C/0.6 MPa within 60 minutes
Connection aperture	1.5S, 2.0S, 2.5S, 3.0S, 4.0S, 4.5S (IDF/ISO ferrule)

Ferrule clamp sensor

■ Insertion type sensor specifications

Model	ESH-01-C-S-SN-1.5S
Cell constant	0.1/cm
Pressure range	0 to 1 MPa
Protective structure	IP67 equivalent
Wetted material	SUS316L, PEEK, FKM
Sterilization conditions	140°C/0.6 MPa within 60 minutes
Connection aperture	1.5S (IDF/ISO ferrule)

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

Connector cable

The extension cable is required for the connector type.

CK-10M/20M/30M

Ferrule clamp sensor

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

■ Insertion type sensor specifications

Model	FES-210 series
Cell constant	0.1/cm
Pressure range	0 to 1 MPa
Protective structure	IP67 equivalent
Wetted material	SUS316L, PPS, FKM
Sterilization conditions	140°C/0.6 MPa within 60 minutes
Connection aperture	1.5S, 2.0S (IDF/ISO ferrule)

Resistivity meter

HE-480R

- Measure ultra-pure water at a high degree of accuracy
- Implements advanced temperature compensation
- Allows for setting of the reference temperature to any value
- Established traceablity system

2-Channel
HE-960RW

- High-quality resistivity meter
- Employs highly accurate, high-stability temperature measurement circuits
- Responds to minute changes in the measurement water temperature
- 2-channel simultaneous measurement
- Established traceability system
- Built-in RS-485 communications output

Model	HE-480R
Measurement method	Electrode type (2-electrode method)
Sensor input	1-channel (cell constant: 0.01/cm)
Temperature sensor	Resistance thermometer 1000Ω/0°C
Measurement range	Resistivity MΩ·cm 0 to 0.200, 0 to 2.00, 0 to 20.0, 0 to 100.0*
	kΩ·m 0 to 2.00, 0 to 20.0, 0 to 200.0, 0 to 1000*
	(*: Measurable without temperature compensation)
	Temperature: 0 to 100°C (The displayed decimal place is selectable among 0, 1, and 2.)
Reproducibility	Within ±0.5% of the full scale (equivalent input)
Linearity	Within ±0.5% of the full scale (equivalent input)
Transmission output	No. of outputs: 1; 4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 2 (R1 and R2)
	Contact type: Relay contact SPDT (1c)
	Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load)
	Contact function: Select between upper/lower limit operation
	(ON/OFF control), alarm, and maintenance
Calibration function	Conductivity: Based on the specified compensation coefficient for the cell constant (parameter input)
	Temperature: Calibrated by comparing with the reference thermometer
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous
Temperature compensation	• Based on the temperature characteristics of ultra-pure water (reference temperature: 25°C)
	• Based on the reference temperature and user-defined temperature coefficient
	(reference temperature 5 to 95°C, temperature coefficient ±5%/°C)
	• No temperature compensation
Compatible sensors	ERF-series resistivity sensor; cell constant: 0.01/cm
Conforming standards	CE marking, FCC regulations

Model	HE-960RW
Measurement method	Electrode type (2-electrode method)
Sensor input	2-channel (cell constant: 0.01/cm)
Temperature sensor	Resistance thermometer 1000Ω/0°C
Measurement range	Resistivity MΩ·cm 0 to 0.200, 0 to 2.00, 0 to 20.0, 0 to 100.0*
	kΩ·m 0 to 2.00, 0 to 20.0, 0 to 200.0, 0 to 1000*
	(*: Measurable without temperature compensation)
	Temperature: 0 to 100°C (The displayed decimal place is selectable among 0, 1, and 2.)
Reproducibility	Within ±0.1% of the full scale (equivalent input)
Linearity	Within ±0.5% of the full scale (equivalent input)
Transmission output	No. of outputs: 2; 4 to 20 mA DC; Isolated I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 4 (R1, R2, R3, and R4)
	Contact type: Relay contacts R1 to R3: SPST (1a); R4: SPDT (1c)
	Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load)
	Contact function: Select between upper/lower limit operation (ON/OFF control), alarm, and maintenance
	(R1 and R2, and R3 and R4 are for common use, respectively)
Communication function	RS-485 I/O
Calibration function	Conductivity: Based on the specified compensation coefficient for the cell constant (parameter input)
	Temperature: Calibrated by comparing with the reference thermometer
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous
Temperature compensation	• Based on the temperature characteristics of ultra-pure water (reference temperature: 25°C)
	• Based on the reference temperature and user-defined temperature coefficient
	(reference temperature 5 to 95°C, temperature coefficient ±5%/°C)
	• No temperature compensation
Compatible sensors	ERF-series resistivity sensor; cell constant: 0.01/cm
Conforming standards	CE marking, FCC regulations

Resistivity meter

Sensor

ERF sensor

(Connector type)

ERF sensor

(Cable-attached type)

Connector cable

This cable is for connecting a connector type sensor to the indication converter.

CK-10M/20M/30M

Flow type holder

EFA-30 **EFA-30P** **EFA-30S**

■ Resistivity sensor code chart

Model	Cell constant	Connection	Wetted material	Temperature testing	Terminal type	Cable length	Specifications
ERF							Resistivity sensor
	-001						Cell constant 0.01/cm
		-L					Cable-attached type
		-C					Connector type
			-T				Titanium (operating temperature range: 0-80°C)
				-N			No temperature testing
				-R			With 0°C temperature testing
				-S			With pair calibration*1
					-Y		Y terminal (standard)
					-O		Round terminal (option)
					N/A		When the connector type sensor is selected
						-10	10 m (standard)
						-XX	Designated cable length (option) *2
						N/A	When the connector type sensor is selected*3

*1. The sensor and converter are calibrated together before shipping.

Calibration accuracy (HE-960RW+ERF-001 sensor)

Resistivity	Within ±0.01 MΩ·cm	Against reference device/At same temperature
Temperature	Within ±0.02°C	

*2. Limit cable extensions to a max. 50 m. (Relay boxes cannot be used.)
*3. A connector cable (CK-10M/20M/30M, etc.) is separately required for connector type sensors.

■ Flow type holder code chart

Model	Cell	Material	Specifications
EFA			Flow type holder
	-30		For short cell sensors
		N/A	PVC (temperature: 0 to 50°C; pressure: 0 to 0.1 MPa)
		P	PVDF (temperature: 0 to 100°C; pressure: 0 to 0.1 MPa)
		S	SUS-316 (temperature: 0 to 100°C; pressure: 0 to 0.5 MPa)

The connector cable (sold separately) is required when a connector type sensor is selected.
Use a maximum 50 m extension.
A relay box must not be used.

Residual chlorine meter

HR-480

- Optimum for control of free residual chlorine in drinking water or pool
- Allows for span calibration for low-concentration fluid being measured
- Adopts the galvanic method with no drive
- Automatically determines condition of the sensor

HR-480P

- Optimum for a waterworks and water reuse systems, etc.
- Chip replacement type cathode electrode reduces maintenance costs.
- The combined use of bead and electrochemical cleaning enables stable measurement over the long term.

Model	HR-480
Measurement target	Free residual chlorine
Measurement method	Galvanic cell method
Measurement range	Residual chlorine : 0 to 2 mg/L : Resolution 0.01 mg/L (The number of decimals displayed can be selected between 1 and 2)
Reproducibility	Within ±0.05 mg/L (equivalent input)
Linearity	Within ±0.05 mg/L (equivalent input)
Transmission output	4 to 20 mA DC; Insulation I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 2 (R1 and R2) Contact type: Relay contact SPDT (1c) Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load) Contact function: Select between upper/lower limit operation (ON/OFF control), alarm, and maintenance
Calibration function	• Zero calibration (Equipped with zero calibration skipping) • Span calibration (Calibration comparing to the DPD tester)
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous
Self-check function	• Calibration failure (zero failure and gain error) • Measurement out-of-range error • Converter abnormality
Compatible sensors	RS-1
Conforming standards	CE marking, FCC regulations

Model	HR-480P
Measuring method	Polarography
Measuring range	Residual Chlorine: 0 mg/L to 3 mg/L Resolution: 0.01 mg/L Temperature: 0 to 50°C Resolution: 0.1°C
Repeatability	Residual Chlorine:Within ±0.05 mg/L or less Temperature: Within ±0.5°C(for equivalent input)
Linearity	Residual Chlorine:Within ±0.05 mg/L or less Temperature: Within ±0.5°C(for equivalent input)
Transmission output	Two points 4 to 20 mA DC Input/output insulation type Maximum load resistance 900Ω
Contact output	Three points No-voltage contact output Relay contact, SPST Contact capability R1, R2: Selectable from upper limit alarm, lower limit alarm, ON/OFF control, currently holding transmission output, and cleaning output. (The contact is closed during alarm operation, opened normally and white the power is down.) Error alarm : (Closed in the normal state, opened in the failure state or white the power is down.)
Contact input	One points Contact type: No-voltage a contact for open collector
Temperature compensation range	0 to 50°C
Applicable temperature element	Platinum resistor: 1 kΩ (0°C) (The temperature sensor is built into the electrochemical electrode.)
Cleaning capability	Electrochemical Cleaning between Cathode and Electrochemical cleaning electrode
Calibration method	Zero calibration (Zero liquid calibration) SPAN calibration(Compare to measurement value of DPD method, Including zero electric calibration)
Self-diagnosis function	Calibration error, Temperature sensor diagnostic error, Meter error
Compatible sensor	RA-10 (Overflow type). RA-20 (Inline type)
Conforring standard	CE marking, FCC rules

Residual chlorine meter

Sensor

■ Specifications

Model	RS-1
Condition of fluid being measured	Temperature: 0 to 40°C (Temperature change within ±5°C) Flow rate: 0.5 to 1.0 L/min. pH: 6 to 8 (must be constant)
Wetted material	PVC
Pole material	Cathode: P1 Anode: Ag/AgCl
Maximum extension length	50 m (from sensor to meter) Note that the sensor standard cable length is 5 m. Use the relay box for further extension.

RS-1

Sampling rack

■ Specifications

Model	SS-2/SS-3
Flow rate of fluid being measured	0.5 to 1.0 L/min
Pressure of fluid being measured	Inlet: 0.3 MPa or less Outlet: Open to the atmosphere
Wetted material	PVC
Connecting pipe diameter	Inlet: PVC13A socket Outlet: PVC20A pipe
Installation	Wall-mounting (Indoor installation)
Weight	Approx. 4.5 kg

Model	Sensor that can be integrated
SS-2	Residual chlorine, pH, ORP and temperature
SS-3	Residual chlorine, pH, ORP, conductivity and temperature

SS-2

Residual chlorine meter

Sensor

RA-10 (Overflow type)   **RA-20** (Inline type)

■ Specifications

Model		RA-10	RA-20
		Overflow type	Inline type
Measuring method		Polarography	
Sample condition	Temperature	0°C to 45°C (without freeze)	
	Flow rate	1.3L/min to 2.0L/min	0.6L/min to 1.0L/min (Constant*²)
	Pressure	Within 0.5MPa	
	pH	5.8pH to 8.6pH (Constant)	
	Electrical conductivity	More than 10mS/m	
Wetted part material		PVC, PPO, EPDM	
Electrode material		Au, AgCl, C	
Bead material		SiO2	
Filter material		Nylon	
Pipe arrangement	Sample inlet	PREFAB JOINT TS16A (ASHAHI)	
	Sample outlet	PREFAB JOINT TS16A (ASHAHI)	
Cleaning method		Physical polishing by glass bead , Electrochemical Cleaning	
Cable length		Standard: 2m, Maximum extension: 40m	

Dissolved oxygen meter

HD-480

- Supports a wide range of dissolved oxygen measurement for boiler water, rivers and aeration
- Adopts disposable sensors
- Selectable from the atmosphere calibration and the saturated solution calibration
- Automatically determines condition of the sensor
- Salt concentration calibration function

Model	HD-480
Measurement method	Galvanic cell method
Measurement range	Dissolved oxygen : 0 to 20 mg/L : Resolution 0.01 mg/L
	Degree of saturation : 0 to 200% : Resolution 1%
	Temperature : 0 to 40°C : Resolution 0.1°C
Reproducibility	Within ±0.5% of the full scale (equivalent input)
Linearity	Within ±0.5% of the full scale (equivalent input)
Transmission output	4 to 20 mA DC; Insulation I/O type; Maximum load resistance 900Ω
Transmission output range	Free range
Contact output	No. of outputs: 2 (R1 and R2)
	Contact type: Relay contact SPDT (1c)
	Contact rating: 240 V AC 3 A, 30 V DC 3 A (Resistance load)
	Contact function: Select between upper/lower limit operation (ON/OFF control), alarm, maintenance, and temperature upper/lower limit
Calibration function	• Atmosphere calibration and saturated solution calibration
	• Salt content compensation (0.0 to 5.0%)
	• Temperature calibration (2 points)
Hold function	Select between Previous Hold, Arbitrary Hold, and Continuous
Self-check function	• Calibration failure (zero failure and gain error)
	• Sensor check (Short and breaking of temperature sensor)
	• Measurement out-of-range error
	• Converter abnormality
Temperature compensation range	0 to 40°C
Compatible sensors	Probe: DP-100
	Sensor: 5400, 5405
Conforming standards	CE marking, FCC regulations

Dissolved oxygen meter

Probe

■ Specifications

Model	DP-100
Structure	Immersion type
Temperature of fluid being measured	0 to 40°C
Wetted material	PVC, titanium, CR
Sensor to be combined	5400, 5405

DP-100

✛ **Submersible type probe**
Use this probe by immersing directly in the fluid being measured. No special installation work is required. The immersion type and flow type holders are available depending on the application.

Sensor

■ Specifications

Model	5400	5405
Structure	Disposal type to be replaced as a cartridge	
Combination with a cleaner	OK	OK
Film thickness	25 µm	50 µm
Responsiveness (under the same measurement conditions)	90% response within 120 seconds	90% response within 120 seconds
Conditions of fluid being measured	Temperature: 0 to 40°C Pressure: 0 to 0.1 MPa (DO measurement is possible to a maximum depth of 10 m) Flow velocity: 25 cm/sec. or higher	
Film material	PTFE	
Probe to be combined	DP-100	

✛ **Disposable type sensor**
Eliminates the need for Membrane replacement work that has been required for conventional sensors when reclaiming electrodes, so that anyone can replace them easily. In addition, the disposable type sensors achieve high quality and reduced cost.
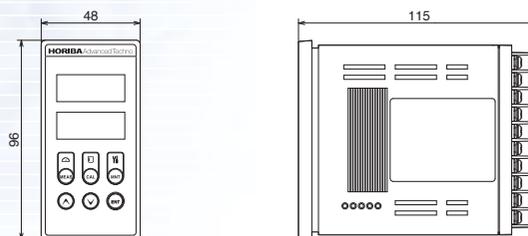
5400

Cleaning device
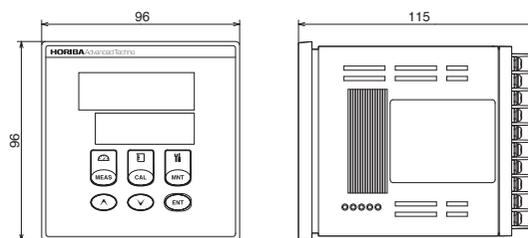
Flow type water/air jet cleaning device
JDF-30

Immersion type water/air jet cleaning device
JDH-10

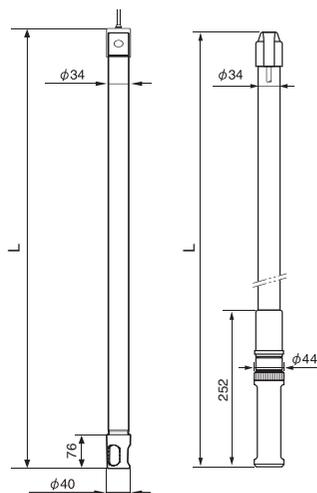## External dimensions

■ Indication converter 48 series

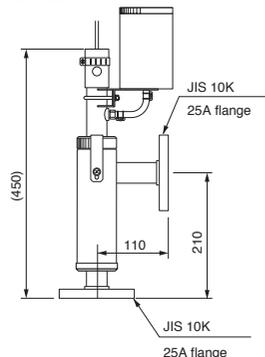### ■ Indication converter 96 series
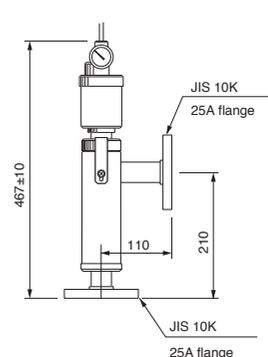

■ Immersion type holder

CH-101/101P   **HIBP**

Mode	Dimension L	Nominal length	Material
CH-10-0.3-PP	300 mm	0.3 m	PP
CH-10-0.5-PP	500 mm	0.5 m	PP
CH-10-1.0-PP	990 mm	1.0 m	PP
CH-10-1.5-PP	1490 mm	1.5 m	PP
CH-10-2.0-PP	1990 mm	2.0 m	PP
CH-10-2.5-PP	2500 mm	2.5 m	PP

CF-25T   **CF-30**

JIS 10K 25A flange
JIS 10K 25A flange

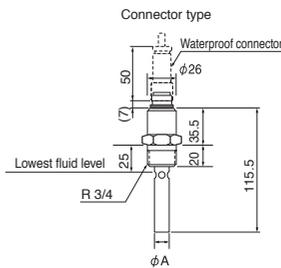## ■ Conductivity sensor (high concentration type) FES-125F/FES-126F

With thread adaptor

Cable length 10 m

ϕ24

ϕ28

Lowest fluid level

98

161.5

(193)

ϕ20

Cable length 10 m

ϕ36

R(PT)3/4

Lowest fluid level

98

126.5

(193)

ϕ20

■ Flow type holder EFA-20

Measurement fluid outlet
Rc 1/2

ϕ34

35

Measurement
fluid inlet
Rc 1/2

ϕ60

50

220

Sensor attachment
Rc 3/4
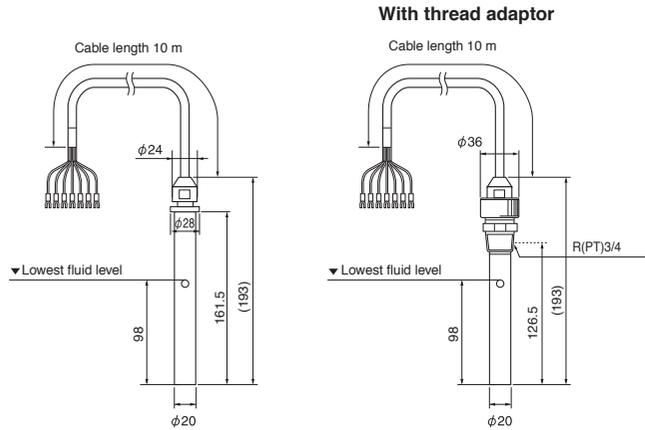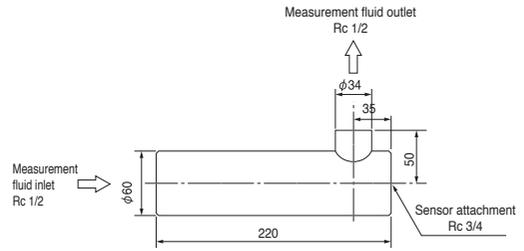
## ■ Conductivity sensor (low concentration type) ESH-1/01/001 series

● **Short cell**

Lead type

ϕ26

35.5

Lowest fluid level

25

20

R 3/4

115.5

ϕA

Connector type

Waterproof connector

ϕ26

50

(7)

35.5

Lowest fluid level

25

20

R 3/4

115.5

ϕA

● **Long cell**

Lead type

ϕ26

35.5

20

75

R 3/4

ϕ22

165.5

Lowest fluid level

ϕA

Connector type

Waterproof connector

ϕ26

50

(7)

35.5

20

75

R 3/4

ϕ22

165.5

Lowest fluid level

ϕA
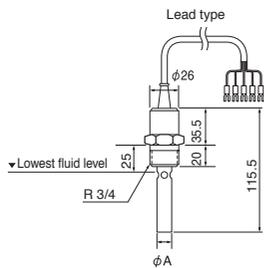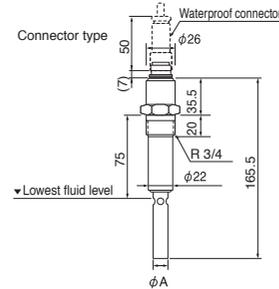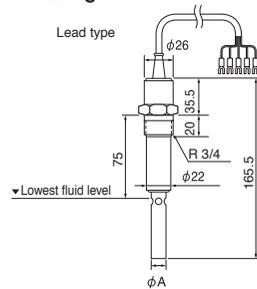
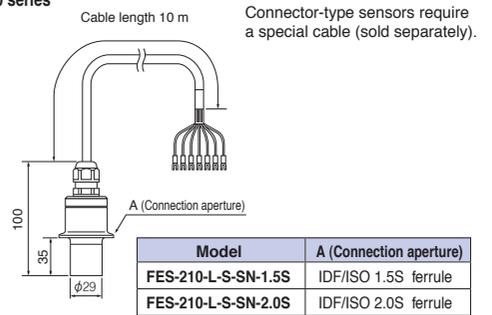| Model	ϕA
ESH-1	16
ESH-01	13.8
ESH-001	13.8

■ Sanitary conductivity sensor (high concentration type) FES-310 series
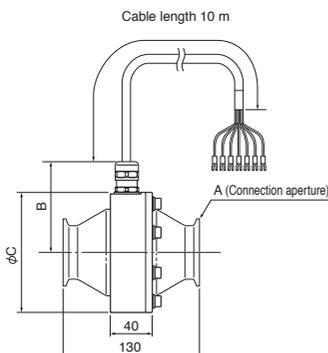
Cable length 10 m

Connector-type sensors require
a special cable (sold separately).

B

ϕC

A (Connection aperture)

40

130

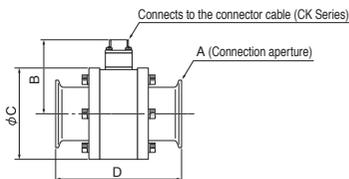| Model	A (Connection aperture)	B	ϕC
FES-310-L-S-SN-1.5S	IDF/ISO 1.5S ferrule	80.5	104
FES-310-L-S-SN-2.0S	IDF/ISO 2S ferrule	86	114
FES-310-L-S-SN-2.5S	IDF/ISO 2.5S ferrule	98	138
FES-310-L-S-SN-3.0S	IDF/ISO 3.0S ferrule	109	159
FES-310-L-S-SN-4.0S	IDF/ISO 4.0S ferrule	119.5	180
FES-310-L-S-SN-4.5S	IDF/ISO 4.5S ferrule	123.5	188

■ Sanitary conductivity sensor (high concentration type)
FES-210 series

Cable length 10 m

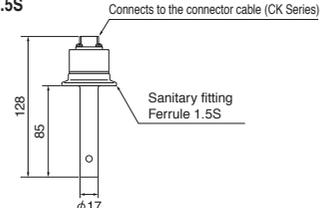Connector-type sensors require
a special cable (sold separately).

100

35

A (Connection aperture)

ϕ29

Model	A (Connection aperture)
FES-210-L-S-SN-1.5S	IDF/ISO 1.5S ferrule
FES-210-L-S-SN-2.0S	IDF/ISO 2.0S ferrule

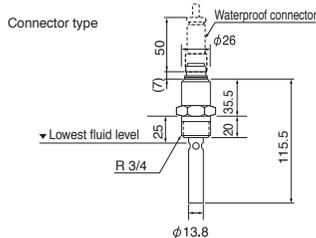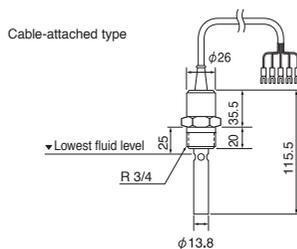## ■ Sanitary conductivity sensor (low concentration type) FS-01FC series

Connects to the connector cable (CK Series)

A (Connection aperture)

B

ϕC

D

Model	A (Connection aperture)	B	ϕC	D
FS-01FC-SL-15A	15A ferrule	53.5	55	120
FS-01FC-SL-1.0	IDF/ISO 1S ferrule	59	65	120
FS-01FC-SL-1.5	IDF/ISO 1.5S ferrule	64.5	75	120
FS-01FC-SL-2.0	IDF/ISO 2S ferrule	70	85	120
FS-01FC-SL-2.5	IDF/ISO 2.5S ferrule	82.5	110	140

■ Sanitary conductivity sensor (low concentration type)
ESH-01-C-S-SN-1.5S

Connects to the connector cable (CK Series)

128

85

Sanitary fitting
Ferrule 1.5S

ϕ17

■ Resistivity sensor ERF-001 series

Cable-attached type

ϕ26

35.5

Lowest fluid level

25

20

R 3/4

115.5

ϕ13.8

Connector type

Waterproof connector

ϕ26

50

(7)

35.5

Lowest fluid level

25

20

R 3/4

115.5

ϕ13.8

■ Flow type holder EFA-30/31

Model	L
EFA-30	100
EFA-31	150

Measurement fluid outlet
Rc 3/4

ϕ34

25

Measurement
fluid inlet
Rc 3/4

ϕ40

35

Sensor attachment
Rc 3/4

L

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