

Process pH/ORP Analysis Systems

K48

HORIBA



HORIBA, Ltd.

Bulletin: HRE-1413D

A SAMPLER OF SAMPLERS

The HORIBA K-8 process pH (ORP) analysis system features a systematic combination of functional component units which offers the versatility needed to meet a wide range of applications. Select the system which best suits your particular needs.

SENSOR ASSEMBLY

SENSORS

ED series
EL series
Glass stem series



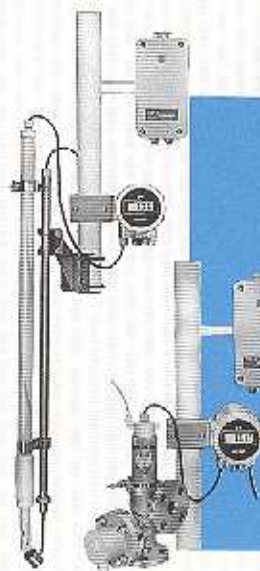
SENSOR HOLDERS

Submersible
Flow-type



SENSOR CLEANERS

Ultrasonic
Water-jet
Brushing
Chemical



One of HORIBA's outstanding three-in-one combination sensors is found to suit your needs. Next, add a sensor holder, designed for ease of installation and maintenance. To further minimize maintenance and down time add an optional cleaner.

ELECTRONICS

**2-WIRE
TRANSMITTER**
Analog/Digital



**AC-OPERATED
TRANSMITTER**
Analog/Digital

AC Power Line

Output (other instruments)

POWER UNIT

Rack-type
Wall-mount
Weather-proof



AC Power Line

Output
(other instruments)

The next step is to select one of HORIBA's transmitters which features an internally isolated input circuit, an integral indicator, and also offers a digital readout or an analog data display. Select a 2-wire transmitter plus one of HORIBA's three types of power units, or an AC-operated version for a conventional on-site power supply.

Versatile, Simple, Reliable, Accurate

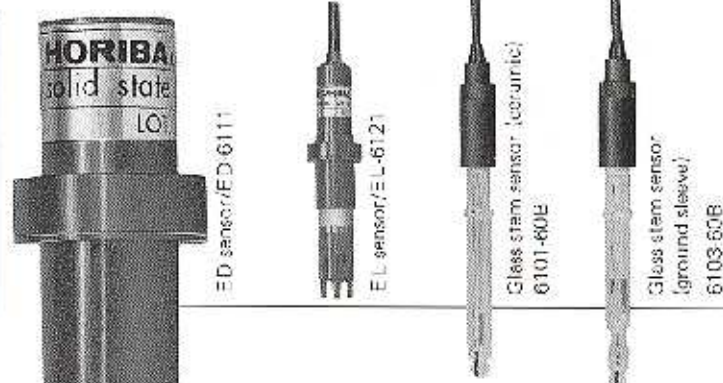
- A Sensor for All Samples
Versatile HORIBA three-in-one sensors
- User Friendly, Trouble Free
Submersible & flow-type sensor holders
- Trust your Transmitter
2-wire & AC-operated versions with fully isolated output
Digital or analog display
- The Power Behind the System
HORIBA power units offer a perfect match
but any 24~30V DC power supply acceptable
- A Quartet of Cleaner Systems
Four series to maintain high sensor accuracy

The HORIBA < K-8 > system comprises functional, modular components to meet all situations. This catalog will help you use our system code to order the < K-8 > system you have selected to suit your specific requirements. Select the component units in the following order; sensor (page 5), sensor holder (page 6 ~ 7), transmitter (page 8), power unit (page 9), optional sensor cleaner (page 10 ~ 11) and optional accessories (page 15). Then, use these unit codes to build a final system code with which to order your system.

Each < K-8 > system is composed of a sensor assembly, which tests the sample pH or ORP, and a transmitter, which converts the sensor output into an electrical signal. The 2-wire transmitter plus power unit offers the simplest wiring and greatest convenience for system instrumentation. The AC-operated version can be connected directly to an AC power line. This makes the basic < K-8 > system; sensor assembly + transmitter + power unit. The basic < K-8 > system code is formed from the three unit codes:

(sensor holder + transmitter + power unit)
 H00000 T00000 P00000

SENSOR



A Sensor for All Samples

HORIBA's three-in-one combination sensors, the result of more than three decades of pH/ORP measurement is comprised of a glass electrode, reference electrode and temperature compensator in one reliable and easy to maintain body.

Three types of sensor – the ED series, the EL series and the glass stem series – cover all sample conditions.

The ED sensor is recommended for samples with electrolytic conductivity at adequate level and relatively gentle sample-flow. The EL sensor can be used for samples of 200 $\mu\text{S}/\text{cm}$ and the glass stem sensors for 50 $\mu\text{S}/\text{cm}$. For faster flow, select an EL or a glass stem sensor. All offer either pH or ORP measurement.

ED Sensor

The ED sensor is equipped with a quick-disconnect cable connector and functional, unbreakable PPS (polyphenylene sulfide) body. Thanks to the special structure, there is no need to refill the integral reference electrode during the long life of the plug-in pH or ORP probe.



Easy replacement of the probe

EL Sensor

The EL sensor has the basic characteristics of the ED sensor plus an integrated cable. This offers an optional double junction for greater stability of the liquid junction potential.

Glass Stem Sensor

The glass stem sensor features outstanding chemical and thermal-resistance. A double junction reference electrode offers the maximum stability of the electrode potential. The application range has been further extended by two kinds of liquid junctions. Choose ground sleeve or ceramics.

Please contact us for applications related to the fermentation process.

ED Sensor

Model*	Specifications				Code	
	pH/ORP	Temp.	Connector	Body	No.	Holder code
ED-6111	pH	-10 ~ 80°C	Quick-disconnect	PPS	1	Submersible: H I - 100000
ED-6821	ORP (Pt)				2	Flow-type: H F - 710000

EL Sensor

Model*	Specifications				Code	
	pH/ORP	Temp.	Lead	Body	No.	Holder code
EL-6121	pH	-10 ~ 80°C	6 m	PPS	1	Submersible: H I - 210000
EL-6822	ORP (Pt)				2	Flow-type: H F - 810000

Glass Stem Sensor

Model*	Specifications				Code	
	pH/ORP	Temp.	Liquid junction	Lead	No.	Holder code
6101-60B	pH	-10 ~ 80°C	Ceramic	6 m	1	Submersible: H I - 300000 Flow-type: H F - 900000
6102-30B		0 ~ 110°C		3 m	2	
6102-60B			Ground sleeve		6 m	
6103-60B		4				
6801-60B	ORP (Pt)	-10 ~ 80°C	Ceramic	6 m	7	

* Use model number for ordering sensor only. Holder codes include sensor.

■ Next step... Sensor Holder

SENSOR HOLDER

Submersible

User Friendly, Trouble Free

The submersible sensor holder can be used in any application where a direct insertion assembly is required, such as open tanks, rivers, lakes and reservoirs. Select a holder to suit the sensor you have chosen and the nature of the sample, in pipe lengths of 0.5, 1, 1.5 or 2 meters. In some cases, your holder will double as the KC&L reservoir; in some, a separate reservoir is included in the holder code. All holders snap easily in and out of the bracket that is specified in the holder code. To make maintenance even simpler add an optional cleaner — ultrasonic, water-jet, brushing or chemical.

We recommend the following combinations of sensor and sensor holder:

- ED : HI-1 □□□□□□
- EL : HI-2 □□□□□□
- Glass stem : HI-3 □□□□□□



■ Sensor Holder Submersible-type

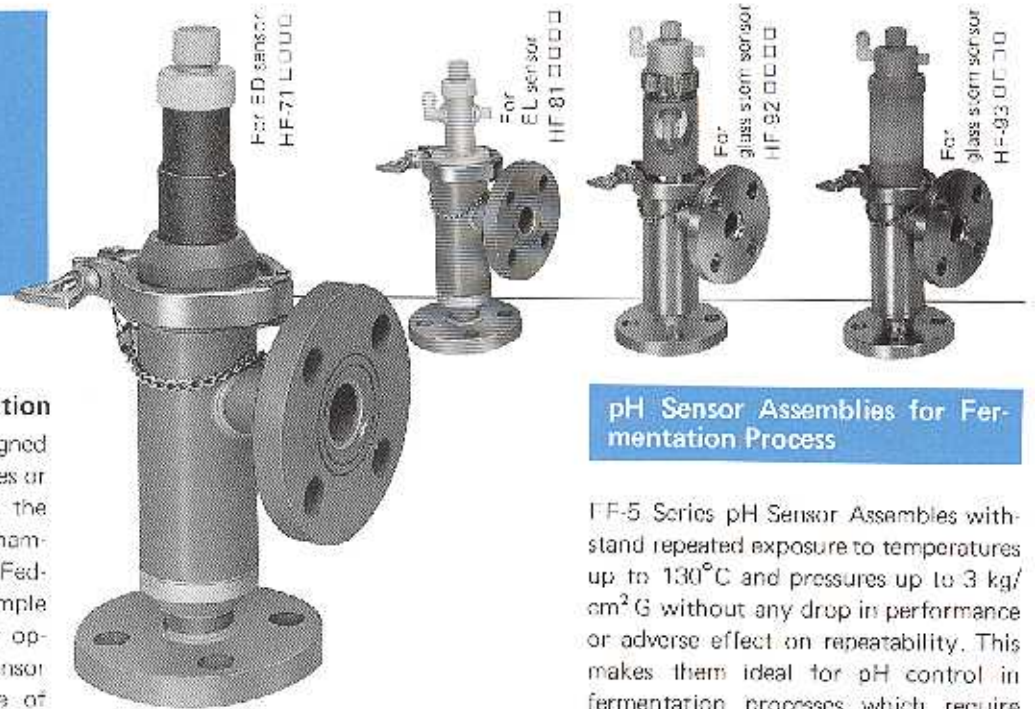
		Sensor type	Material	Holder length	Sensor code	Cleaner	Bracket	Specifications	Remarks
H	I	-	1	1				For ED sensor, P.P.*	Free length of sensor cable: 8 m less length of holder
H	I	-	1	2				For ED sensor, S.S.**	
H	I	-	2	1				For EL sensor, P.P.	Holder doubles as KC&L reservoir Free length of sensor cable: 8m less length of holder
H	I	-	3	1				For glass stem sensor, P.P.	
H	I	-	3	2				For glass stem sensor, S.S.	Includes KC&L reservoir Free length of sensor cable: Length of sensor cable used less length of holder
			1					0.5 m	
			2					1.0 m	
			3					1.5 m	
			4					2.0 m	
			0					Without sensor	
								With sensor	⇒ Cite sensor no. selected on page 5
					0			Without cleaner	
					1			With cleaner	⇒ Select optional sensor cleaner code from page 10 ~ 11
					0			Without bracket	
					1			With bracket	For bracket only, order MB-10 (without cleaner) or MB-15 (with cleaner)

* P.P. : polypropylene
** S.S. : stainless steel

H I - □ □ □ □ □ □ □ □ □ □ Next step ... Transmitter

SENSOR HOLDER

Flow-type



Simple Servicing, Perfect Protection

The flow-type sensor holder is designed for measuring the sample in pipelines or tank outlets. The upper part of the sensor holder fits onto the lower chamber with IDF (International Dairy Federation) clamps, making for simple removal and excellent sealing. An optional ultrasonic or water-jet sensor cleaner is available for this type of sensor holder. The addition of the optional KC& reservoir to an EL sensor holder creates a double junction. With a glass stem sensor this becomes a semi-double junction (unique HORIBA technology).

Recommended combinations:

ED	:	HF-7	□□□□□□
EL	:	HF-8	□□□□□□
Glass stem	:	HF-9	□□□□□□

pH Sensor Assemblies for Fermentation Process

FF-5 Series pH Sensor Assemblies withstand repeated exposure to temperatures up to 130°C and pressures up to 3 kg/cm²G without any drop in performance or adverse effect on repeatability. This makes them ideal for pH control in fermentation processes which require pressurized steam sterilization. For pressurization, either provide a constant external supply of clean air, sterilized if necessary, or



enclose clean air at a set pressure. To read pH values from an FF-5 sensor, connect the sensor cable directly or via a JB-30 junction box and W-5B extension cable to a K-8 Series pH transmitter / indicator.

* The HF-8 Pura Water pH Sensor Assembly is available for pure water applications.

■ Sensor Holder Flow-type

Sensor type		Material		Sensor code		Chamber		Flange		Specifications	Remarks	
H	F	-	7	1						For ED sensor, P.P.*	Free length of sensor cable: 5 m	
H	F	-	8	1						For EL sensor, P.P.	⇒ Order also RR-22 optional KC& reservoir	Free length of sensor cable: 6 m
H	F	-	9	2						For glass stem sensor, S.S.**		Free length of sensor cable: Length of sensor cable used
H	F	-	9	3						For glass stem sensor, PVC		
					0					Without sensor		
										With sensor	⇒ Cite sensor no. selected on page 5	
						2	1			S.S. 316, -10 ~ 110°C, without cleaner		
						3	1			PVC, -10 ~ 60°C, without cleaner		
						2	2			S.S. 316, -10 ~ 110°C, with cleaner		
						3	2			PVC, -10 ~ 60°C, with cleaner	⇒ Select optional sensor cleaner code from page 10 ~ 11	
								1		JIS 10K 25A FF		
								X		ANSI flange	Available	



■ Next step ... Transmitter

* P.P.: Polypropylene
** S.S.: stainless steel

TRANSMITTER



Digital readout/ TD-2 □□□□



Analog display/ TA-1 □□□□

Trust Your Transmitter

The transmitter converts the pH values obtained by the sensor into 4 ~ 20 mA current for data presentation on an integral indicator and at the signal output. The electrode circuit, internally isolated, in no way limits the power unit or any instruments which may be connected. The transmitter is housed in a weather-proof enclosure with all the controls at the bottom, allowing the system to be calibrated without removing the cover.

There are two versions. The 2-wire transmitter is powered by a 24 ~ 30 V DC current obtainable from either one of the HORIBA power units listed on the facing page or from a suitable commercially available model. This enables the transmitter to be located up to 2

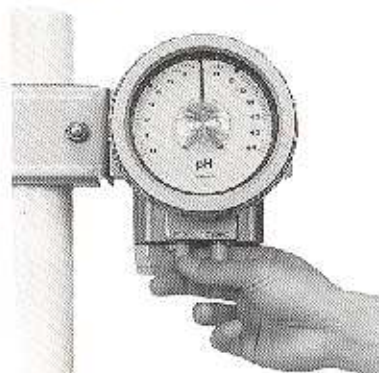
kilometers away from the power unit and connected by a single 2-wire cable. The AC-operated version can be run off of an AC power source to be supplied at the site of installation.

Two types of data displays are available for each version, the TD-2 □□□□ series 3½ digit liquid crystal readout with 1/100 pH reading resolution, and the TA-1 □□□□ series analog indicator with 200 mm scale.

Optional transmitter hood FD-10 offers greater protection for a field installation.

To extend the cable between the sensor assembly and the transmitter, use HORIBA junction box JB-30 and extension cable W-5B. (Maximum distance: 100 m)

For transmitter to power unit cable extension, use HORIBA cable WS. (Maximum distance: approx. 2 km)



Easy-to-reach calibration controls are positioned on the underside of the transmitter

Transmitter		Display	Range	Power	Air purge	Specifications
T	A	-	1			Analog display
T	D	-	2			Digital readout
						> Cite range no. selected from the range code table
				1		24 V DC, 4 ~ 20 mA output, 2 wire transmitter
				2		100 V AC, 4 ~ 20 mA output, AC-operated version
				3		115 V AC, 4 ~ 20 mA output, AC-operated version
				4		220 V AC, 4 ~ 20 mA output, AC-operated version
					0	Without air purge
					1	With air purge

Range Code Table

1	1	pH 0 ~ 14
1	2	pH 0 ~ 10
1	3	pH 2 ~ 12
1	4	pH 4 ~ 14
1	5	pH 0 ~ 8
1	6	pH 3 ~ 11
1	7	pH 6 ~ 14
1	8	pH 4 ~ 10
2	1	ORP ±700 mV
2	2	ORP 0 ~ 1000 mV

POWER UNIT

Power Behind the System

If you choose a 2-wire transmitter, make sure you choose a power unit, too.

The HORIBA K-8 system offers three different models of power units – the rack-type **PR-30** □□□, the wall-mount **PW-40** □□□ and the weather-proof model **PF-11** □□□. Both the rack-type and wall-mount models take up to four 2-wire transmitters, and hence four pH and/or ORP analysis systems (sensor assembly + transmitter), can run from a single power unit. The weather-proof model, designed for field installation, is fitted with HI/LO alarm contacts: up to 5A of 115 V AC current will activate optional devices used in the pH/ORP control system loop. For ON/OFF control and where an alarm is required,



Rack-type/PR-30 □□□



Weather-proof/PF-11 □□□



Wall-mount/PW-40 □□□

select this model.*

The addition of an external zener barrier to your power unit together with a special transmitter will convert it into an intrinsic-safety, explosion-proof analyzer. Contact your dealer for details.

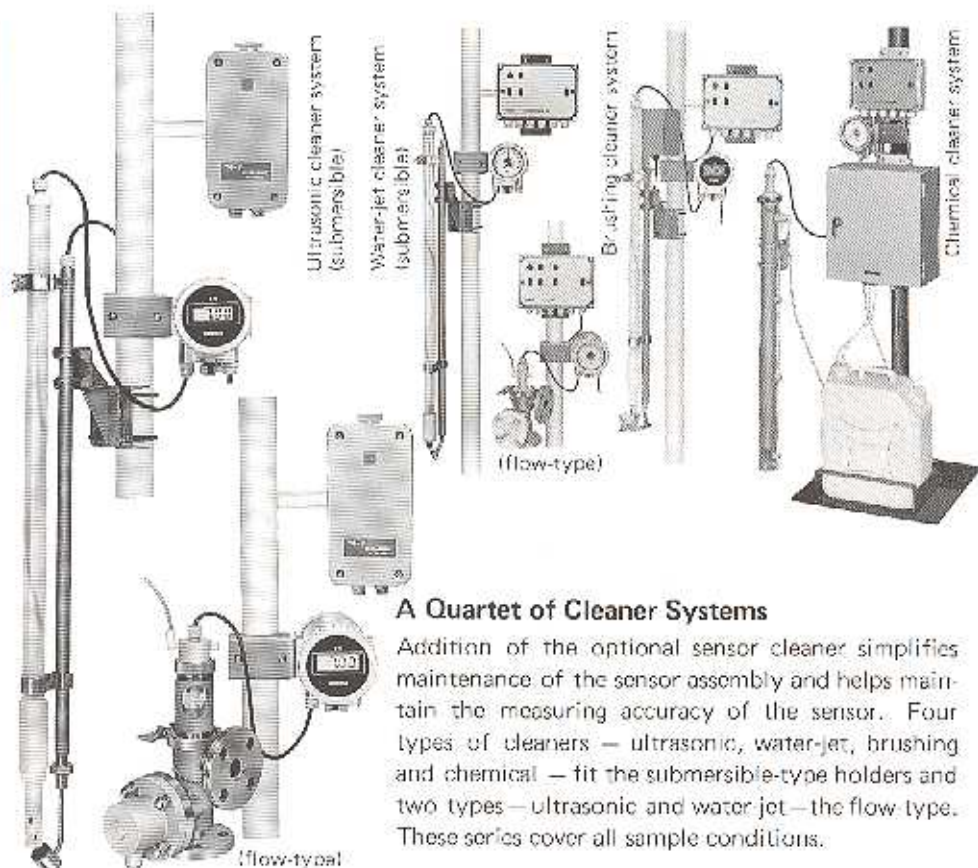
* The K-8 system can also be operated from any commercially available 24 ~ 30 V DC power supply.

Power Unit

Power Unit				Scale	Nos. of circuit	Output	Power	Specifications	Remarks
P	F	-	1	1				Weather-proof, pH 0 ~ 14 scale	With HI/LO alarm contacts
P	R	-	3	0				Rack-type, free scale	
P	W	-	4	0				Wall-mount, free scale	
					1			1 transmitter	
					2			4 transmitters	Not available for weather-proof type
						1		4 ~ 20 mA DC	
						2		0 ~ 16 mA DC	
							1	100 V AC	
							2	115 V AC	
							3	220 V AC	

SENSOR CLEANER

Option



A Quartet of Cleaner Systems

Addition of the optional sensor cleaner simplifies maintenance of the sensor assembly and helps maintain the measuring accuracy of the sensor. Four types of cleaners — ultrasonic, water-jet, brushing and chemical — fit the submersible-type holders and two types — ultrasonic and water jet — the flow-type. These series cover all sample conditions.

Ultrasonic

The ultrasonic sensor cleaner is designed to automatically descale the sensor and reduce further scaling by continuous direction of ultrasonic waves toward the sensor surface. Specify the appropriate ultrasonic cleaner and oscillator unit.

Water-jet

The water-jet cleaner sprays pressurized water ($2 \sim 6 \text{ kg/cm}^2$) onto the sensor surface to remove the deposits. If fitted with the control unit, the intervals between and duration of each measurement cycle leave in can be set at will to suit the kind of solution being measured or scale conditions.

Brushing

Repeated brushing removes slime or other material from the sensor surface. This method is particularly effective for sample solutions containing a low degree of slime, such as organics, cellulose and algae, and permits stable, continuous pH measurement. Use with the cleaner control unit for fully automated operation.

Chemical

The chemical cleaning method dissolves material adhering to the sensor surface. The predominant chemical used is hydrochloric acid, but other chemicals may be used if the composition of the deposit warrants it. Use with the cleaner control unit.

	Application	Ultrasonic	Water-jet	Brushing	Chemical
Slime Microorganism	Food, Paper, Pulp, Aquatic weed	X	○	○	△
	Bacteria (activated sludge) Whitewash	△	○	○	△
Oil	Tar, Heavy oil	X	X	X	△
	Light oil	○	△	△	○
	Fatty acid, Amine	X	○	X	○
Suspension	Sediment	○	X	X	○
	Metallic fines	△	X	X	○
	Clay, Lime	△	○	X	○
Scale	Flocculating deposit, Neutralized effluent, CaCO_3	△	△	△	△

○ : Recommend

△ : Applicable

X : Not applicable

Ultrasonic Cleaner
Submersible

		Material Holder length	Explosion-proof	Specifications
U	E	-	1 1	For submersible holder, S.S.
			1	1.0 m
			2	1.5 m
			3	2.0 m
			0	Non-explosion-proof
			2	Explosion-proof *1

U E - 1 1 ➔ Next step ... Oscillator

Water-Jet Cleaner
Submersible

		Material Holder length	Specifications	
J	E	-	3 1	For submersible-type, S.S.
			1	1.0 m
			2	1.5 m
			3	2.0 m
			1	-

J E - 3 1 ➔ Next step ... Water supply unit and cleaner control unit

Ultrasonic Cleaner
Flow type

		Vibrator Body	Explosion-proof	Specifications
U	E	-	2 1	For flow type, vibrator; S.S.
			0	Aluminum (for explosion-proof*1)
			1	S.S. (for S.S. chamber)
			2	PVC (for PVC chamber)
			1	Non-explosion-proof
			2	Explosion-proof *1

U E - 2 1 ➔ Next step ... Oscillator

Water-Jet Cleaner
Flow type

		Material	Specifications	
J	E	-	4	For flow type
			1	S.S. (sample contact: S.S.-316)
			2	PVC (sample contact: S.S.-316+PVC)
			0 1	-

J E - 4 ➔ Next step ... Water supply unit and cleaner control unit

Ultrasonic Oscillator

		Explosion-proof	Power	Specifications
U	O	-	1	Non-explosion-proof
U	O	-	2	Explosion-proof *1
			1	100 V AC
			2	115 V AC
			3	220 V AC
			0 0	-

U O - ➔ Next step ... Water supply unit and cleaner control unit

Water Supply Unit
For water-jet cleaner

		Specifications		
J	W	-	1	Solenoid valve
J	W	-	2	Solenoid valve + voltmeter
J	W	-	3	Solenoid valve + voltmeter + flowmeter
			1 0 1	100 V AC

J W - ➔ Next step ... Water supply unit and cleaner control unit

*1: Explosion-proof versions subject to confirmation.

Brushing Cleaner
Submersible

		Holder length	Specifications	
B	R	-	5 1	For submersible holder
			1	1.0 m
			2	1.5 m
			1	100 V AC

B R - 5 1 ➔ Next step ... Cleaner control unit

Cleaner Control Unit
For water-jet & brushing

		Output Power	Specifications	
C	P	-	3	For water-jet or brushing cleaner
			1	4 ~ 20 mA DC
			2	0 ~ 16 mA DC
			1	100 V AC *2

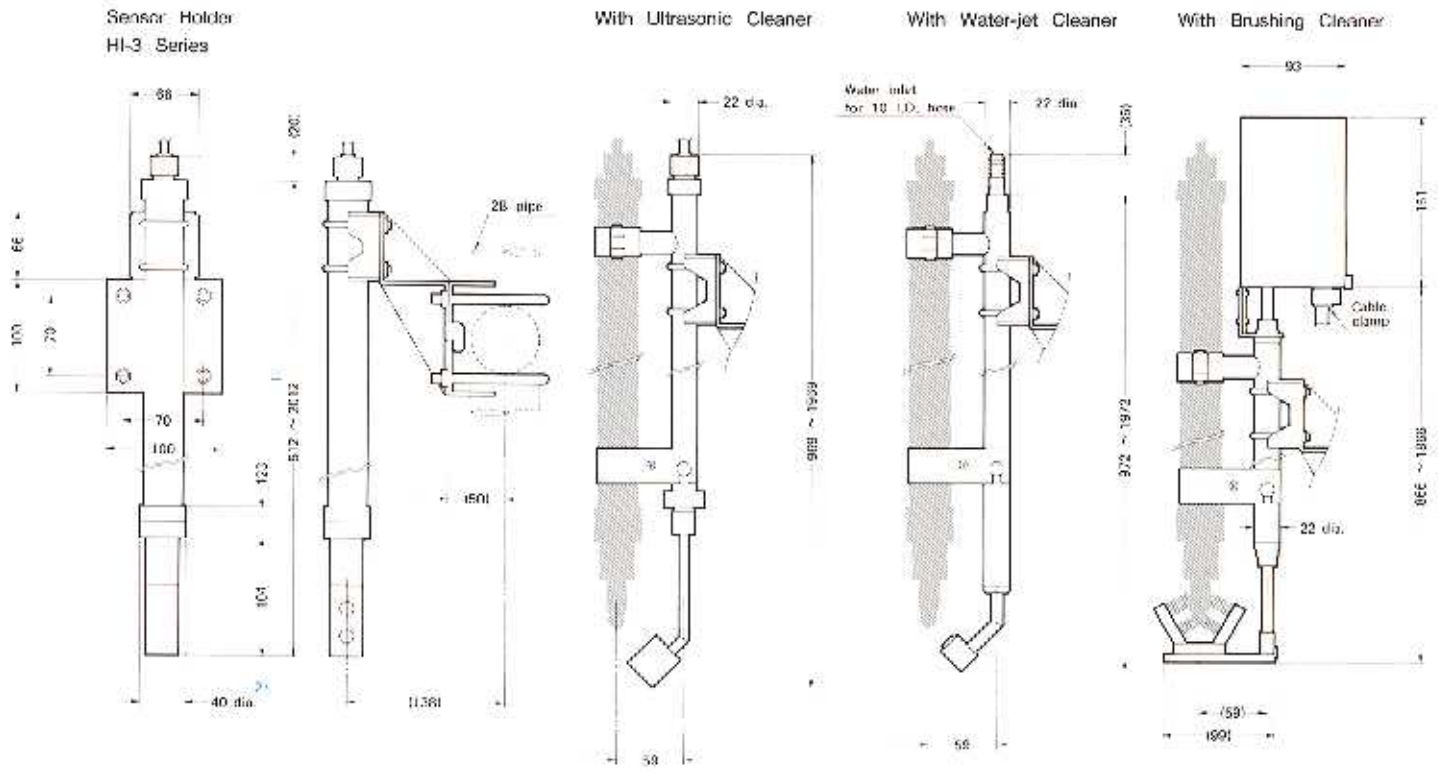
C P - 3 ➔ Check ... Power unit

(CS-201 is also available for sequential control only.)

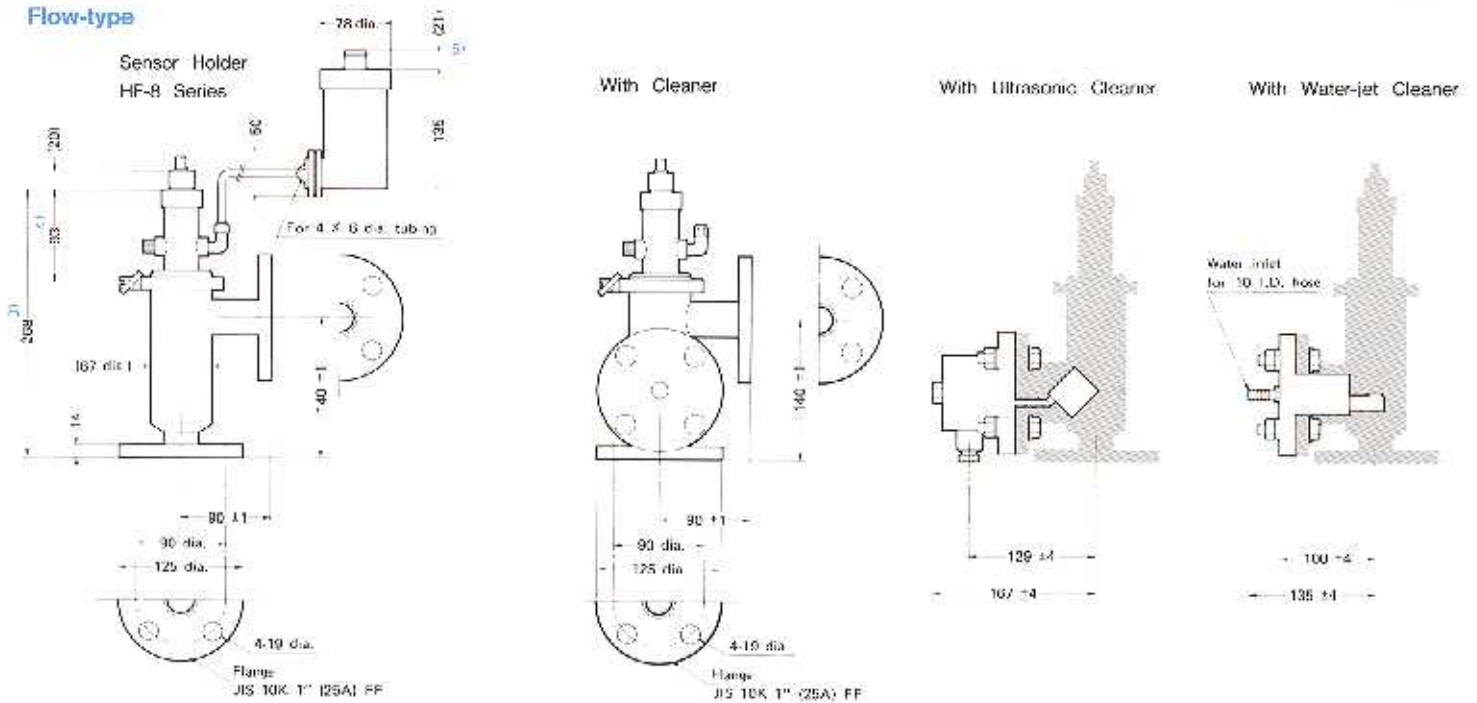
*2: When a voltage other than standard voltage is specified, a step-down transformer will be provided.

DIMENSIONAL OUTLINES

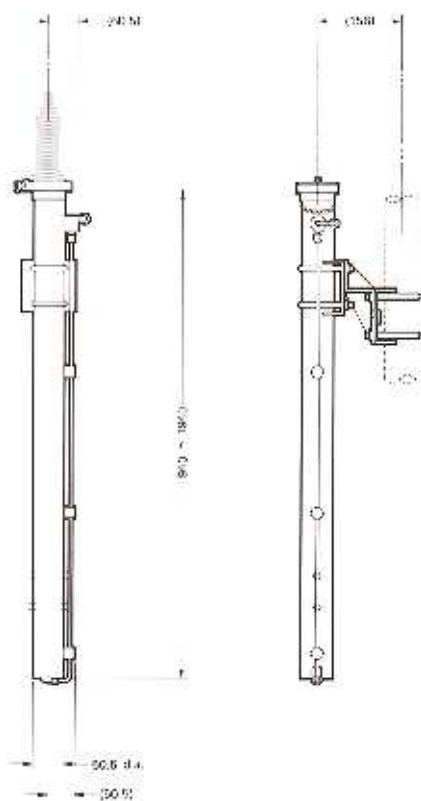
Submersible



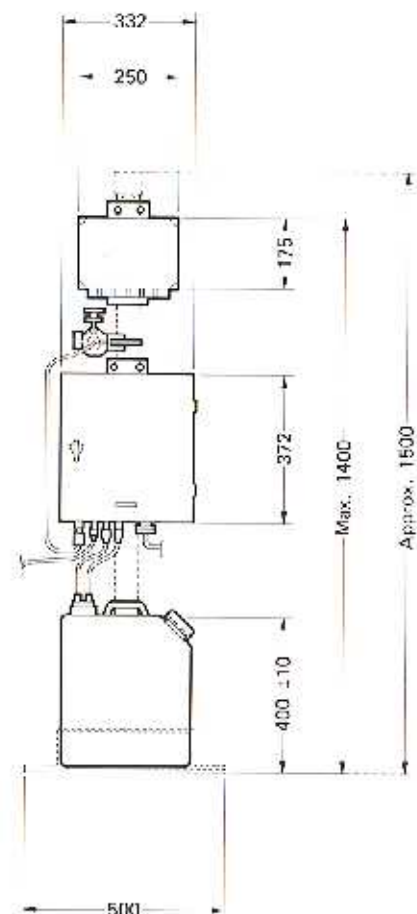
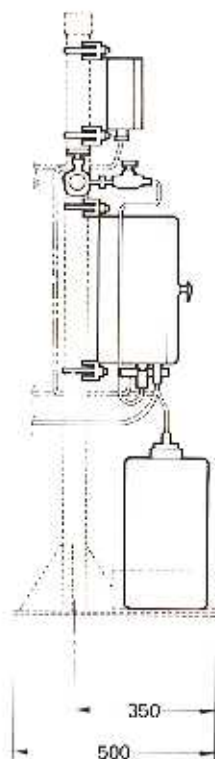
Flow-type



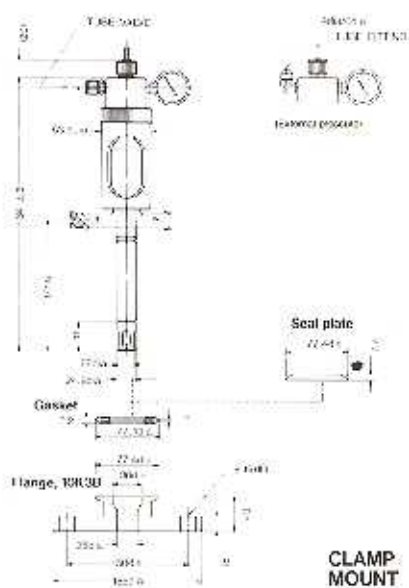
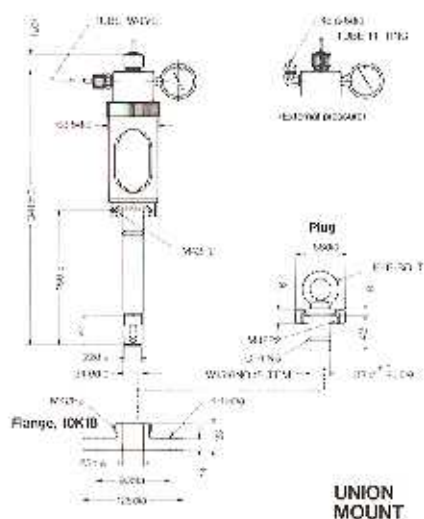
With Chemical Cleaner



Feeder Unit for Chemical Cleaner



pH Sensor Assemblies for Fermentation Process



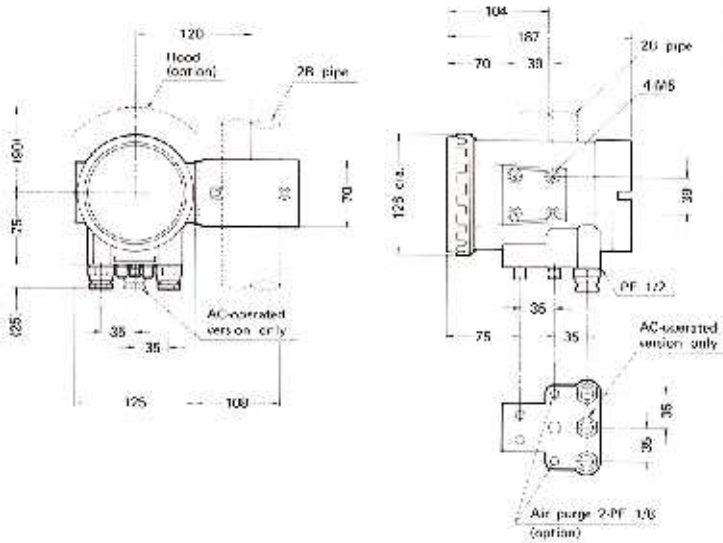
Note:

- ① 520~2029 for HI-1 Series,
497~1997 for HI-2 Series
- ② 44 for HI-1/HI-2 Series
- ③ 279 for HF-7 Series,
330 for HF-9 Series
- ④ 104 for HF-7 Series,
155 for HF-9 Series
- ⑤ KCI Reservoir HR-22 (option)
Available only for HF-8/HF-9 Series

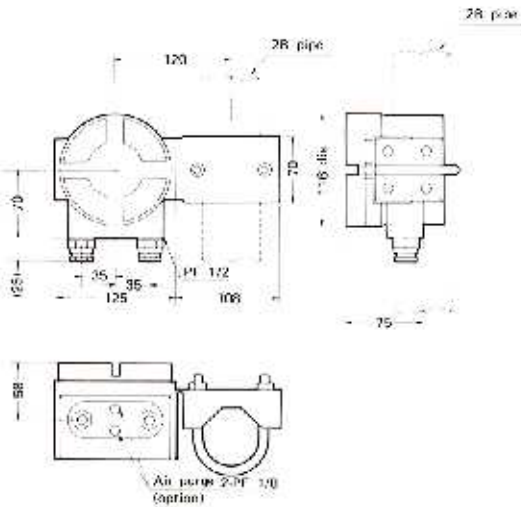
Remarks:
All dimensions are shown in millimeters.

Transmitter

TA-1/TD-2 Series

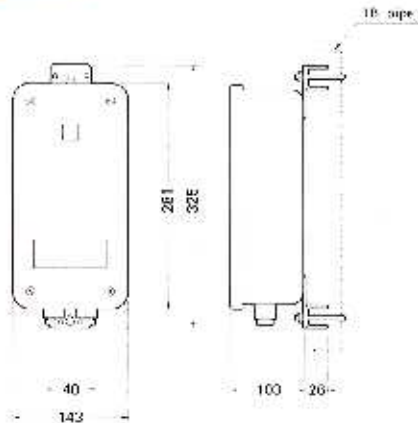


Junction Box



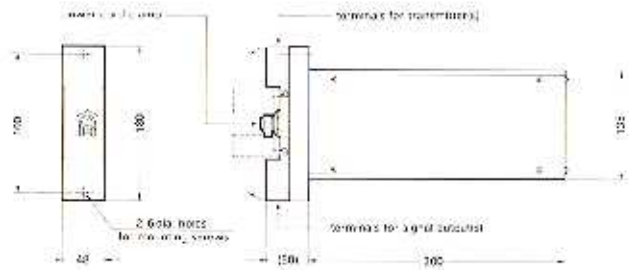
Ultrasonic Oscillator

UO-1 Series

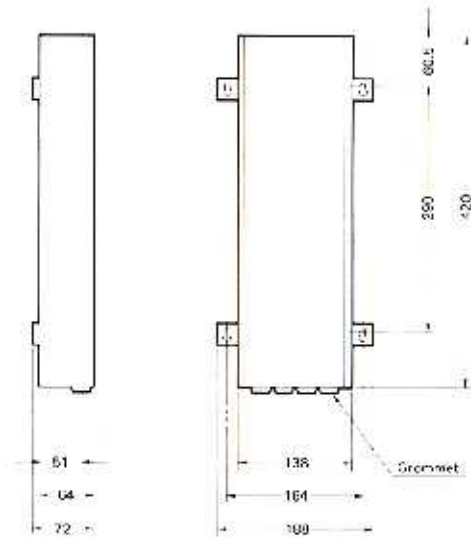


Power Unit

Rack-type PR-3 Series

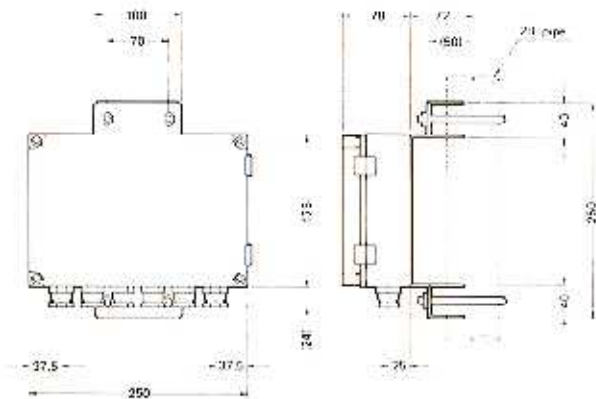


Wall-mount PW-4 Series



Weather-proof PF-1 Series

Cleaner Control Unit CS-2/CP-3 Series



GENERAL SPECIFICATIONS

Range:

[pH] 0 ~ 14, 0 ~ 10, 2 ~ 12,
4 ~ 14, 0 ~ 8, 3 ~ 11,
6 ~ 14 or 4 ~ 10 pH

[ORP] 0 ~ ±700 or 0 ~ 1000 mV

Accuracy:

[pH] ±0.1 pH, analog
±0.05 pH, digital

[ORP] ±10 mV, analog
±5 mV, digital

Data Display:

[Analog] 200 mm scale, wide angle
meter graduated in
0.2 pH or 20 mV

[Digital] 3½ digit, LCD
character height: 17.5 mm

Output:

4 ~ 20 mA DC

Isolated from electrode circuit

Total load resistance: 600 Ω at max.

Cable Extension:

Output signal; approx. 2000 m at max.

Sensor cable; 100 m at max.*

* Use cable junction box JB 30
and HORIBA W-5B cable.

Sample Conditions:

Temperature: -10 ~ 110°C**

** Select the sensor and the
sensor holder.

Pressure: 0 ~ 0.3 kg/cm²G

Flow rate/velocity:

[Flow-type] 1 ~ 15 l/min.

[Submersible] Less than 2 m/sec.

Ambient Temperature:

-10 ~ 50°C

Sample Contacting Material:

[Submersible holder]

Polypropylene or stainless steel 316

[Flow-type holder]

PVC, polypropylene and/or
stainless steel 316

Cable Connection:

For sensor cable:

PF 1/2 or JIS A11 equivalent

For output signal and power supply:

PF 1/2 or JIS A13 equivalent

Temperature Compensation:

Automatic compensation by integral
resistor in the sensor

Transmitter:

a) 2-wire transmitter, or

b) AC-operated version

Weather-proof enclosure of
polypropylene oxide (PPO), mountable
on 2B pipe

Complete with an analog meter or
digital readout

Power:

[2-wire transmitter]

24 V DC, approx. 0.5 VA

obtained by HORIBA power unit
described below, or

commercially available power
supply of 24 ~ 30 V DC.

[AC-operated version]

100(85 ~ 115), 115(95 ~ 135) or
220(190 ~ 260) V AC as specified,
50/60 Hz

Power Unit:

Available in rack type, wall mount,
or weather proof unit

Output: 24 V DC, 4 ~ 20 or
0 ~ 16 mA DC

Power: 100(85 ~ 115), 115(95 ~ 135)
or 220(190 ~ 260) V AC as
specified, 50/60 Hz

Calibration Service Stand

Code	Description
SD-10	A bracket that holds the upper part of flow-type sensor assembly when removed from the chamber for buffer check. Attachable to the chamber with a U-shaped bolt. Stainless steel 304

Calibration/Service Parts Kit

Code	Contents
AS-10	One each 150-4, 150-7 and 150-9, two 500 ml beakers, and one thermometer
AS-11	One each 150-4, 150-7, and 150-9, two 500 ml beakers, two bottles KCl solution (500 ml each), and one thermometer
AS-20	One each 160-22 and 160-51, two 500 ml beakers, and one thermometer
AS-21	One each 160-22 and 160-51, two 500 ml beakers, two bottles KCl solution (500 ml each), and one thermometer

Powders for pH Standards

Code	Description
150-4	10 packs pH 4 buffer powder
150-7	10 packs pH 7 buffer powder
150-9	10 packs pH 9 buffer powder

1 pack makes 500 ml of buffer solution.

Powders for ORP Test Solutions

Code	Description
160-22	10 packs mixture of pH 4 buffer powder and quinhydrone.
160-51	10 packs mixture of pH 7 buffer powder and quinhydrone.

1 pack makes 500 ml of test solution.

pH (ORP) Probe for ED and EL Sensor

Model	Specifications
7111	pH, normal temp.
7311	ORP (Pt)
7711	ORP (Au)

These model numbers are for ordering pH probe only.

OPTIONAL ACCESSORIES

Special Cables

Model	Description
W-5B	For pH sensor relay (0.3 mm ² , 4-core sealed), O.D. 10.2 mm
W-2A	For ultrasonic power transmission (0.36 mm ² , 2-core sealed), O.D. 6.8 mm
WS	For signal transmission (2 mm ² , 2-core sealed), O.D. 9.4 mm
WI	For ultrasonic power transmission (low capacity type) (1 mm ² , 2-core sealed), O.D. 10.0 mm