Technical Information

pH/ORP Analyzer Selection Guide

TI 12B07A03-03E

■ pH/ORP Sensors

Model PH8EFP
KCl Filling type pH Sensor

Model PH8ERP
KCl Refillable type pH Sensor

Model PH8EHP
pH Sensor for High Purity Water

PH4P/PH4PT/OR4P
Polymer Electrolyte pH (ORP) sensor

PH4F/PH4FT
Hydrofluoric Acid-resistant pH sensor

PH4C/PH4CT/OR4C
pH (ORP) sensor for Chemical Process

FU20/FU20F
pH/ORP combination

PH10RP
KCl Replenish-free type

Model PH450G
pH/ORP Converter

2-Wire Analyzer
FLXA21

2-Wire Analyzer
FLXA202

YOKOGAWA
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pH Sensor Selection Guide and Compatible Instruments

	General Ryton pH Sensor			PH4 Sensor Series				
Model Name	**PH8EFP**	**PH8ERP**	**PH8EHP**	**PH4P**	**PH4PT**	**PH4F**	**PH4FT**	
Product Name	KCl filling type	KCl refillable type	For high purity water	Solid electrolyte type	Solid electrolyte type	Hydrofluoric acid resistant	Hydrofluoric acid resistant	
Specifications								
Normal measuring range	0 to 14 pH	2 to 12 pH	2 to 12 pH	2 to 14 pH	2 to 14 pH	2 to 11 pH	2 to 11 pH	
Process temperature	-5 to 105 °C (*1)	-5 to 80 °C (*1)	0 to 50 °C	0 to 110 °C (*1)	0 to 110 °C (*1)	0 to 80°C (*1)	0 to 80°C (*1)	
Process pressure	AP to 10 kPa (*2)	AP to 50 kPa (*2)	AP	AP to 1.6 MPa (sol temp 25°C) AP to 600 kPa (sol temp 100°C) (*2)		Same as PH4P/ PH4PT (*2)	Same as PH4P/PH4PT (*2)	
Process conductivity	≥50 µS/cm	≥50 µS/cm	≥0.1 µS/cm	≥5 µS/cm	≥5 µS/cm	≥5 µS/cm	≥5 µS/cm	
Integral temperature element	Pt1000	Pt1000	Pt1000	Not integrated (*3)	Pt1000	Not integrated (*3)	Pt1000	
Applications								
General chemical process	A (*4)	N	N	L	L	A	A	
Electrolyte (caustic soda solution)	N	N	N	N	N	N	N	
High purity water (0.1-50 µS/cm)	N	N	R	N	N	N	N	
Solution containing organic solvent	N	N	N	L	L	N	N	
Solution containing fluorine	N	N	N	N	N	R	R	
High alkaline process (≥10 pH)	R (*4)	N	N	A	A	N	N	
Bioprocess with steam sterilization	N	N	N	N	N	N	N	
Industrial wastewater, sewage	R (*5)	N	N	A	A	N	N	
Human waste treatment	L (*5)	N	N	L	L	N	N	
Plating process	A	N	N	L	L	N	N	
Effluent	R	A	N	A	A	L	L	
Flue gas desulfurization system (*6)	A	N	N	R	R	N	N	
Water treatment	R	R	N	A	A	N	N	
Converter/Analyzer Compatibility								
PH450G pH/ORP Converter	A	A	A	A	A	A	A	
FLXA21 2-Wire Analyzer	A	A	A	A	A	A	A	
FLXA202 2-Wire Analyzer	A	A	A	A	A	A	A	
Holder Compatibility								
PH8HG Guide Pipe	A	A	N	N	N	N	N	
PH8HS Immersion Type Holder	A	A	N	A	A	A	A	
PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)	A	A	N	N	N	N	N	
PH8HF Flow-Thorough Type Holder	A	A	N	A	A	A	A	
PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)	A	A	N	N	N	N	N	
PH8HH Holder for High Purity Water	N	N	R	N	N	N	N	
HH350G Suspension Type Holder	A	A	N	N	N	N	N	
PB350G Angled Floating Ball Holder	A	A	N	N	N	N	N	
PB360G Vertical Floating Ball Holder	A	A	N	N	N	N	N	
PH10HG Guide Pipe	N	N	N	N	N	N	N	
PH10HLD Immersion Type Holder	N	N	N	N	N	N	N	

Rating: R=Recommended, A=Acceptable, L=Limited, N=Not applicable
AP = Atmospheric Pressure

*1: When using in conjunction with holder, see Appendix 1 on page 5.
*2: When using in conjunction with holder, see Appendix 2 on page 5.
*3: For automatic temperature compensation, select PH4PT/ PH4FT/PH4CT, or use adapter with SA405 temperature sensor.
*4: For high alkaline solutions, specify appropriate optional glass electrode.
*5: Specify optional Teflon junction.
*6: When using in flue gas desulfurization system, use Chemical Cleaning pH Measuring System (PH8HS3+PH8SM3).
*7: Model FU20F is a dedicated SENCOM®sensor for FLXA202/FLXA21. FU20F can't be used to PH450G.
*8: Only PH8HS and PH8HF can be used for FU20F. When using PH8HS or PH8HF, use adapter for installation.

Note • The table above is for reference purposes only. Consult YOKOGAWA for more detail information.
• Refer to the following references for further information: FLXA202: GS 12A01A03-01EN or TI (not attached to products) 12B07A03-02E

	PH4 Sensor Series			Dedicated to PH100 Converter		
	PH4C	**PH4CT**	**FU20/FU20F (*7) (*8)**	**PH10FP**	**PH10RP**	**Model Name**
	For chemical process	For chemical process	pH/ORP combination	KCl refillable type	KCl replenish-free type	**Product Name**
						Specifications
	0 to 14 pH	0 to 14 pH	2 to 12 pH	0 to 14 pH	2 to 12 pH	Normal measuring range
	0 to 100 °C (*1)	0 to 100°C (*1)	-10 to 105°C (sensor body)	0 to 70°C	0 to 60°C	Process temperature
	AP to 250 kPa (*2)	AP to 250 kPa (*2)	0 to 1 MPa	AP (max depth: 3 m)	AP (max depth: 3 m)	Process pressure
	≥100 µS/cm	≥100 µS/cm	≥50 µS/cm	≥50 µS/cm	≥50 µS/cm	Process conductivity
	Not integrated (*3)	Pt1000	Pt1000	Pt1000	Pt1000	Integral temperature element
						Applications
	A	A	L	N	X	General chemical process
	A	A	X	N	X	Electrolyte (caustic soda solution)
	X	X	X	N	X	High purity water (0.1-50 µS/cm)
	A	A	X	N	X	Solution containing organic solvent
	X	X	X	N	X	Solution containing fluorine
	R	R	X	N	X	High alkaline process (≥10 pH)
	X	X	X	N	X	Bioprocess with steam sterilization
	A	A	R	L	L	Industrial wastewater, sewage
	X	X	R	N	X	Human waste treatment
	R	R	X	N	N	Plating process
	L	L	R	A	A	Effluent
	A	A	N	N	N	Flue gas desulfurization system (*6)
	N	N	N	N	N	Water treatment
						Converter /Analyzer Compatibility
	A	A	A (*7)	N	N	PH450G pH/ORP Converter
	A	A	A	N	N	FLXA21 2-Wire Analyzer
	A	A	A (*7)	N	N	FLXA202 2-Wire Analyzer
						Holder Compatibility
	N	N	N	N	N	PH8HG Guide Pipe
	A	A	N (*8)	N	N	PH8HS Immersion Type Holder
	N	N	N	N	N	PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)
	A	A	N (*8)	N	N	PH8HF Flow-Thorough Type Holder
	N	N	N	N	N	PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)
	N	N	N	N	N	PH8HH Holder for High Purity Water
	N	N	N	N	N	HH350G Suspension Type Holder
	N	N	N	N	N	PB350G Angled Floating Ball Holder
	N	N	N	N	N	PB360G Vertical Floating Ball Holder
	N	N	N	R	R	PH10HG Guide Pipe
	N	N	N	R	R	PH10HLD Immersion Type Holder

Rating: R=Recommended, A=Acceptable, L=Limited, N=Not applicable
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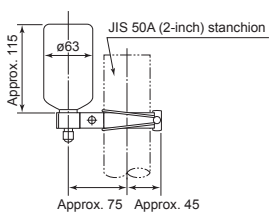
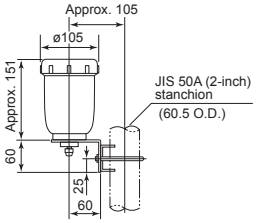
KCl Reserve Tanks for KCl Filling Type pH/ORP Sensors and pH Sensor for High Purity Water

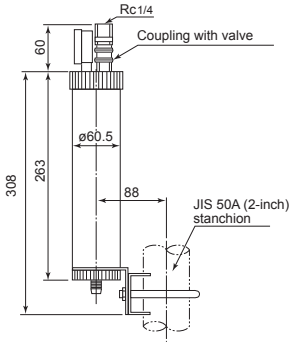
General Purpose KCl Reserve Tank
(250 mL, with mounting bracket)



Large Volume KCl Reserve Tank
(500 mL, with mounting bracket)



Medium Pressure KCl Reserve Tank
(250 mL, with mounting bracket)



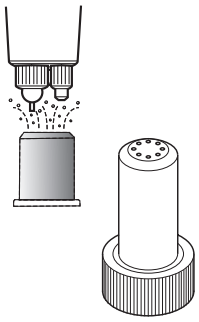
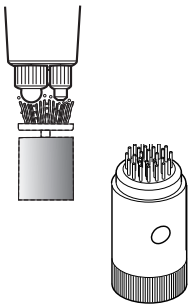
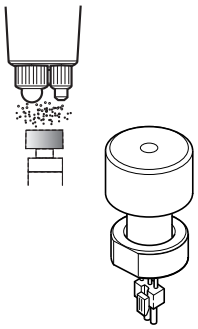
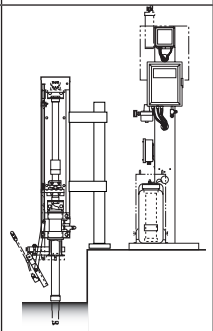
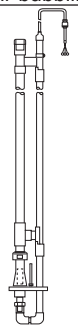
When medium pressure KCl reserve tank is not needed, large volume (500 mL) KCl reserve tank is recommended.

pH Converter/Analyzer Selection Guide

	Model Name	PH450G	FLXA21	FLXA202
	Product Name	pH/ORP converter	2-wire analyzer	2-wire analyzer
Installation site	Indoors	A	A	A
	Outdoors (non-hazardous area)	A	A	A
	Outdoors (hazardous area)	N	R	R
Application	For integration Small-scale instrumentation	A		
	General purpose Medium-scale instrumentation	R	A	A
	Remotely located instrument panel room		R	R

Rating: R=Recommended, A=Applicable, N=Not applicable

Automatic Cleaning Systems for pH Sensors

	Jet (water/air)	Brush	Ultrasonic	Chemical	Ultrasonic + air bubbling
Cleaning system					
	Deposits on the electrode are removed by a water or air jet (intermittent cleaning)	Deposits on the electrode are removed by brush revolving hydraulically or pneumatically (intermittent cleaning).	Deposits are prevented by cavitation by ultrasonic vibration (continuous cleaning).	Sensor is lifted from process solution at specified intervals and washed with chemicals (plus air bubbling) in cleaning chamber.	Deposits that are difficult to remove by ultrasonic cleaning, are removed by air bubbling (continuous blowing).
	Effective against suspended matter, etc.	Effective against absorption deposits, etc.	Effective against crystalline scale.	Field proven in flue gas desulfurization systems.	Effective in pulping waste liquor.
Compatible holder	PH8HF PH8HS	PH8HF PH8HS	PH8HF/PH8HFF PH8HS/PH8HSF	PH8HS3 (automatic chemical cleaning system)	Custom-designed
Compatible sensor	PH8EFP, PH8ERP FU20F PH4P/PH4PT PH4F/PH4FT, PH4C/PH4CT	PH8EFP, PH8ERP	PH8EFP FU20F	PH8EFP PH4P/PH4PT	PH8EFP

Effectiveness of Cleaning Contaminations by System

Contamination	Process involved	Cleaning System				
		Jet (water/air)	Brush	Ultrasonic	Chemical	Ultrasonic + air bubbling
Crystalline scale	Sugar, fertilizer, soda, glass	F	F	F	G	G
Suspended matter, fiber	Ceramic, pulp and paper, textile, metal, water treatment, iron & steel wastewater, dairy	F	F	F	F	F
Viscidity	Flour milling, food processing	F	F	P	G	G
Algae, microorganism	River, seawater, industrial wastewater	G	F	F	G	F
Absorption deposit	Metal processing/treating, wastewater treatment (coagulation sedimentation)	P	G	P	G	F

Rating: G=Good, F=Fair, P=Poor
This information should only be used as a reference.

Appendix 1 Process Temperature Range

Sensor	Holder Type (Model Name)	Holder Material	Cleaning System	Adapter Material	Process Temp (°C)
PH8EFP OR8EFG	Guide pipe (PH8HG)	PVC	without	Adapter is not used	–5 to 50
		PP	without		–5 to 80
	Immersion type (PH8HS)	PP, SUS	without		–5 to 100
			with		–5 to 80
	Flow-through type (PH8HF)	PP	with or without		–5 to 80
		SUS	without		–5 to 105
			with		–5 to 80
	Suspension type (HH350G)	SUS	with or without		–5 to 80
	Floating ball type (PB350G, PB360G)	PP, SUS	with or without		–5 to 50
PH8ERP OR8ERG	Guide pipe (PH8HG)	PVC	without	Adapter is not used	–5 to 50
		PP	without		–5 to 80
	Immersion type (PH8HS) Flow-through type (PH8HF)	PP	with or without		–5 to 80
		SUS	with or without		–5 to 80
	Suspension type (HH350G)	SUS	with or without		–5 to 80
	Floating ball type (PB350G, PB360G)	PP, SUS	without		–5 to 50
PH8EHP	For high purity water (PH8HH)	Acrylic	without	Adapter is not used	0 to 50
PH4P PH4PT PH4C PH4CT PH4F PH4FT OR4C OR4P	Immersion type (PH8HS)	PP, SUS	without	PVC	0 to 50
				PP, SUS	0 to 100
			with jet cleaning	PVC	0 to 50
				PP, SUS	0 to 80
	Flow-through type (PH8HF)	PP	with jet cleaning or without	PVC	0 to 50
				PP, SUS	0 to 80
		SUS	without	PVC	0 to 50
				PP	0 to 80
				SUS	0 to 100
			with jet cleaning	PP, SUS	0 to 80
				PVC	0 to 50
FU20F	Immersion type (PH8HS)	PP, SUS	without	SUS, TN, HC	–5 to 100
			with (*1)	SUS, TN, HC	–5 to 80
	Flow-through type (PH8HF)	PP	with or without (*1)	SUS, TN, HC	–5 to 80
		SUS	without	SUS, TN, HC	–5 to 105
			with (*1)	SUS, TN, HC	–5 to 80

*1: Brush cleaning is not availavle.
PVC = Rigid Polyvinyl Chloride, PP = Polypropylene, SUS = SUS316, TN = Titanium, HC = Hastelloy C
Note: SUS holder and SUS adapter should be used in process solution with 3 pH or greater.

Appendix 2 Process Pressure Range

Sensor	Holder Type (Model Name)	KCl Reserve Tank	Process Pressure
PH8EFP OR8EFG	Immersion type (PH8HS)	General purpose type, large volume type	AP (max depth: 3 m)
	Guide pipe (PH8HG) Suspension type (HH350G) Floating ball type (PB350G, PB360G)	General purpose type, large volume type	AP (max depth: 3 m)
	Flow-through type (PH8HF)	General purpose type, large volume type	AP to 10 kPa
		Medium pressure type	AP to 500 kPa
PH8ERP OR8ERG	Immersion type (PH8HS)	NA	AP (max depth: 3 m)
	Guide pipe (PH8HG) Suspension type (HH350G) Floating ball type (PB350G, PB360G)	NA	AP (max depth: 3 m)
	Flow-through type (PH8HF)	NA	AP to 50 kPa
PH8EHP	For high purity water (PH8HH)	General purpose type, large volume type	AP (outlet is vented to atmosphere)
PH4P, PH4PT PH4F, PH4FT OR4P	Immersion type (PH8HS)	NA	AP (max depth: 3 m)
	Flow-through type (PH8HF)	NA	AP to 500 kPa
PH4C, PH4CT OR4C	Immersion type (PH8HS)	NA	AP (max depth: 3 m)
	Flow-through type (PH8HF)	NA	AP to 250 kPa
FU20F	Immersion type (PH8HS)	NA	AP (max depth: 3 m)
	Flow-through type (PH8HF)	NA	AP to 500 kPa

NA=Not applicable
AP = Atmospheric Pressure

■ ORP Sensor Selection Guide and Compatible Instruments

	General Ryton ORP Sensor				
Model Name	**OR8EFG-PT**	**OR8EFG-AU**	**OR8ERG-PT**	**OR8ERG-AU**	
Product Name	KCl filling type	KCl filling type	KCl refillable type	KCl refillable type	
Specifications					
Measuring range	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV	
Indicator electrode	Platinum ring	Gold	Platinum ring	Gold	
Process temperature	-5 to 105 °C (*1)	-5 to 105 °C (*1)	-5 to 80 °C (*1)	-5 to 80 °C (*1)	
Process pressure	AP to 10 kPa (*2)	AP to 10 kPa (*2)	AP to 50 kPa (*2)	AP to 50 kPa (*2)	
Applications					
General chemical process	A	N	A	N	
Wastewater (cyanide) treatment	N	A	N	A	
Wastewater (chromate) treatment	N	A	N	A	
Solution containing organic solvent	N	N	N	N	
Sewage	N	N	N	N	
Human waste treatment	N	N	N	N	
Plating process	A	N	A	N	
Electrolyte (caustic soda solution)	N	N	N	N	
Converter/Analyzer Compatibility					
PH450G pH/ORP Converter	A	A	A	A	
FLXA21 2-Wire Analyzer	A	A	A	A	
FLXA202 2-Wire Analyzer	A	A	A	A	
Holder Compatibility					
PH8HG Guide Pipe	A	A	A	A	
PH8HS Immersion Type Holder	A	A	A	A	
PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)	A	A	A	A	
PH8HF Flow-Thorough Type Holder	A	A	A	A	
PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)	A	A	A	A	
PH8HH Holder for High Purity Water	N	N	N	N	
HH350G Suspension Type Holder	A	A	A	A	
PB350G Angled Floating Ball Holder	A	A	A	A	
PB360G Vertical Floating Ball Holder	A	A	A	A	
PH10HG Guide Pipe	N	N	N	N	
PH10HLD Immersion Type Holder	N	N	N	N	

Rating: R=Recommended, A=Acceptable, L=Limited, N=Not applicable
AP = Atmospheric Pressure
*1: When using in conjunction with holder, see Appendix 1 on page 5
*2: When using in conjunction with holder, see Appendix 2 on page 5

■ ORP Converter/Analyzer Selection Guide

	Model Name	**PH450G**	**FLXA21**	**FLXA202**
	Product Name	pH/ORP converter	2-wire Analyzer	2-wire Analyzer
Installation site	Indoors	L	L	L
	Outdoors (non-hazardous area)	L	L	L
	Outdoors (hazardous area)	N	R	R
Application	For integration Small-scale instrumentation	L		
	General purpose Medium-scale instrumentation	R	L	L
	Remotely located instrument panel room		R	R

Rating: R=Recommended,L= Limited, N=Not applicable.

	OR4 Sensor Series		Dedicated to ORP100 Converter		
	OR4P	**OR4C**	**OR10FP**	**OR10RP**	**Model Name**
	Polymer Electrolyte	For chemical process	KCl refillable type	KCl replenish-free type	**Product Name**
					Specifications
	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV	Measuring range
	Platinum wire	Platinum ring	Platinum	Platinum	Indicator electrode
	0 to 110 °C (*1)	0 to 100 °C (*1)	0 to 70 °C	0 to 60 °C	Process temperature
	AP to 1.6 MPa (sol temp 25 °C) AP to 600 kPa (sol temp 100 °C) (*2)	AP to 250 kPa (*2)	AP (max depth: 3 m)	AP (max depth: 3 m)	Process pressure
					Applications
	L	A	A	A	General chemical process
	N	N	N	N	Wastewater (cyanide) treatment
	N	N	N	N	Wastewater (chromate) treatment
	L	A	N	N	Solution containing organic solvent
	A	N	N	N	Sewage
	A	N	N	N	Human waste treatment
	N	A	A	A	Plating process
	N	A	N	N	Electrolyte(caustic soda solution)
					Converter/Analyzer Compatibility
	A	A	N	N	PH450G pH/ORP Converter
	A	A	N	N	FLXA21 2-Wire Analyzer
	A	A	N	N	FLXA202 2-Wire Analyzer
					Holder Compatibility
	N	N	N	N	PH8HG Guide Pipe
	A	A	N	N	PH8HS Immersion Type Holder
	N	N	N	N	PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)
	A	A	N	N	PH8HF Flow-Thorough Type Holder
	N	N	N	N	PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)
	N	N	N	N	PH8HH Holder for High Purity Water
	N	N	N	N	HH350G Suspension Type Holder
	N	N	N	N	PB350G Angled Floating Ball Holder
	N	N	N	N	PB360G Vertical Floating Ball Holder
	N	N	R	R	PH10HG Guide Pipe
	N	N	R	R	PH10HLD Immersion Type Holder

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