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

Model FU20
pH, Redox and Temperature Sensor

Model PH10RP
KCl Replenish-free type pH Sensor

Model HA405/HA406 *1
Solid Electrolyte pH Sensor

Model DPA405/DPA406 *1
pH Sensor for Chemical Processes

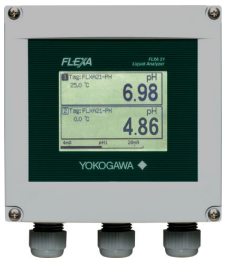
Model HF405 *1
Hydrofluoric Acid-resistive pH Sensor

Model PH450G
pH/ORP Converter

Model PH400G *1
pH Converter

Order acceptance was discontinued. Please refer to PH450G.

Model FLXA21
Modular Two-wire Liquid Analyzer



Model PH202G, S, SJ *2
pH/ORP Transmitter

Model OR400G *1
ORP Converter

Order acceptance was discontinued. Please refer to PH450G.

(*1) These products are available only in China, Korea, Taiwan and Russia.
(*2) This product (PH202SJ) is available only in Japan.

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■ pH Sensor Selection Guide and Compatible Instruments

	General Ryton pH Sensor			Specialty pH Sensor			
Model Name	**PH8EFP**	**PH8ERP**	**PH8EHP**	**HA405** *8	**HA406** *8	**DPA405** *8	
Product Name	KCl filling type	KCl refillable type	For high purity water	Solid electrolyte type	Solid electrolyte type	For chemical process	
Specifications							
Normal measuring range	0 to 14 pH	2 to 12 pH	2 to 12 pH	2 to 12 pH	2 to 12 pH	0 to 14 pH	
Process temperature	-5 to 105 °C*1	-5 to 80 °C*1	0 to 50 °C	0 to 110 °C*1	0 to 100 °C*1	0 to 100 °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		AP to 250 kPa*2	
Process conductivity	≥50 µS/cm	≥50 µS/cm		≥50 µS/cm	≥50 µS/cm	≥50 µS/cm	
Integral temperature element	Pt1000	Pt1000	Pt1000	Not integrated*3	Pt1000	Not integrated*3	
Applications							
General chemical process	B*4	X	X	C	C	B	
Chemical process containing Cl_2, H_2	X	X	X	X	X	B	
High purity water (0.1-50 µS/cm)	X	X	A	X	X	X	
Solution containing organic compounds	B	X	X	A	A	C	
Organic solvent rich solution	X	X	X	X	X	B	
Solution containing fluorine	X	X	X	X	X	X	
High alkaline process (≥10 pH)	A*4	X	X	B	B	A	
Bioprocess with steam sterilization	X	X	X	X	X	X	
Industrial wastewater, sewage	A*5	X	X	B	B	B	
Human waste treatment	C*5	X	X	C	C	X	
Plating process	B	X	X	C	C	A	
Effluent	A	B	X	B	B	C	
Flue gas desulfurization system*6	B	X	X	A	A	X	
Converter/Transmitter Compatibility							
PH450G 4-Wire pH/ORP Converter	B	B	B	B	B	B	
PH400G 4-Wire pH Converter	B	B	B	B	B	B	
FLXA21/PH202G 2-Wire pH/ORP Transmitter	B	B	B	B	B	B	
PH202SJ 2-Wire pH/ORP Transmitter	B	B	B	B	B	B	
PH202S 2-Wire pH/ORP Transmitter	B	B	B	B	B	B	
Holder Compatibility							
PH8HG Guide Pipe	B	B	X	X	X	X	
PH8HS Immersion Type Holder	B	B	X	B	B	B	
PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)	B	B	X	X	X	X	
PH8HF Flow-Thorough Type Holder	B	B	X	B	B	B	
PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)	B	B	X	X	X	X	
PH8HH Holder for High Purity Water	X	X	A	X	X	X	
HH350G Suspension Type Holder	B	B	X	X	X	X	
PB350G Angled Floating Ball Holder	B	B	X	X	X	X	
PB360G Vertical Floating Ball Holder	B	B	X	X	X	X	
PH10HG Guide Pipe	X	X	X	X	X	X	
PH10HLD Immersion Type Holder	X	X	X	X	X	X	

Rating: A=Recommended, B=Applicable, C=Acceptable, X=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, 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: Maximum hydrofluoric acid concentration is limited by pH.
*8: These products are available only in China, Korea, Taiwan and Russia.

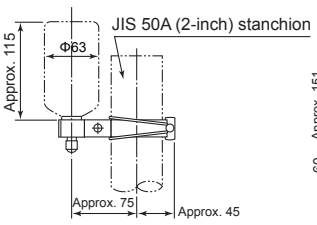
Specialty pH Sensor			Dedicated to PH100 Converter		
DPA406 [*8]	**HF405** [*8]	**FU20**	**PH10FP**	**PH10RP**	**Model Name**
For chemical process	Hydrofluoric acid resistant	pH/ORP combination	KCl refillable type	KCl replenish-free type	**Product Name**
					Specifications
0 to 14 pH	2 to 11 pH	2 to 12 pH	0 to 14 pH	2 to 12 pH	Normal measuring range
0 to 100 °C[*1]	0 to 80 °C[*1]	-10 to 105 °C (sensor body)	0 to 70 °C	0 to 60 °C	Process temperature
AP to 250 kPa[*2]	Same as HA405[*2]	0 to 1 MPa	AP (max depth: 3 m)	AP (max depth: 3 m)	Process pressure
≥50 µS/cm	≥50 µS/cm	≥50 µS/cm	≥50 µS/cm	≥50 µS/cm	Process conductivity
Pt1000	Not integrated[*3]	Pt1000	Pt1000	Pt1000	Integral temperature element
					Applications
B	B	C	X	X	General chemical process
B	X	X	X	X	Chemical process containing Cl_2, H_2
X	X	X	X	X	High purity water (0.1-50 µS/cm)
C	B	X	X	X	Solution containing organic compounds
B	X	X	X	X	Organic solvent rich solution
X	A[*7]	X	X	X	Solution containing fluorine
A	X	X	X	X	High alkaline process (≥10 pH)
X	X	X	X	X	Bioprocess with steam sterilization
B	X	A	C	C	Industrial wastewater, sewage
X	X	A	X	X	Human waste treatment
A	X	X	X	X	Plating process
C	C	A	B	B	Effluent
X	X	X	X	X	Flue gas desulfurization system[*6]
					Converter/Transmitter Compatibility
B	B	B	X	X	PH450G 4-Wire pH/ORP Converter
B	B	B	X	X	PH400G 4-Wire pH Converter
B	B	B	X	X	FLXA21/PH202G 2-Wire pH/ORP Transmitter
B	B	B	X	X	PH202SJ 2-Wire pH/ORP Transmitter
B	B	B	X	X	PH202S 2-Wire pH/ORP Transmitter
					Holder Compatibility
X	X	X	X	X	PH8HG Guide Pipe
B	C	X	X	X	PH8HS Immersion Type Holder
X	X	X	X	X	PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)
B	B	X	X	X	PH8HF Flow-Thorough Type Holder
X	X	X	X	X	PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)
X	X	X	X	X	PH8HH Holder for High Purity Water
X	X	X	X	X	HH350G Suspension Type Holder
X	X	X	X	X	PB350G Angled Floating Ball Holder
X	X	X	X	X	PB360G Vertical Floating Ball Holder
X	X	X	A	A	PH10HG Guide Pipe
X	X	X	A	A	PH10HLD Immersion Type Holder

Rating: A=Recommended, B=Applicable, C=Acceptable, X=Not applicable
AP = Atmospheric Pressure

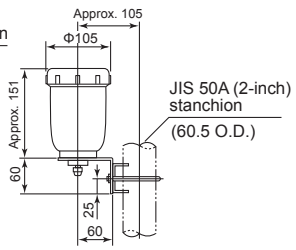
Unit: mm

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)

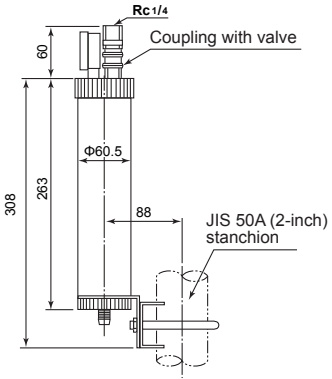


Large Volume KCl Reserve Tank
(500 mL, with mounting bracket)



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

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



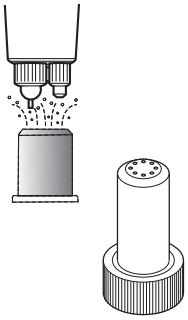
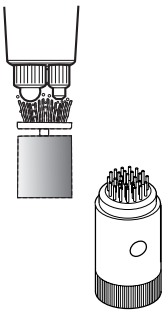
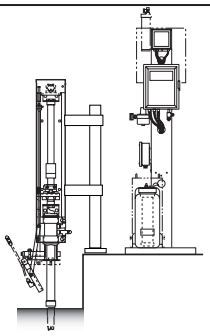
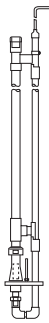
■ pH Converter/Transmitter Selection Guide

	Model Name	PH450G	PH400G	FLXA21/PH202G	PH202SJ*1	PH202S
	Product Name	4-wire pH/ORP converter	4-wire pH converter	2-wire pH/ORP transmitter	2-wire pH/ORP transmitter	2-wire pH/ORP transmitter
Installation site	Indoors	B	B	B	B	B
	Outdoors (non-hazardous area)	B	B	B	B	B
	Outdoors (hazardous area)	X	X	X	A	A
Application	For integration Small-scale instrumentation	B	B			
	General purpose Medium-scale instrumentation	A	A	B	B	B
	Remotely located instrument panel room			A	A	A

Rating: A=Recommended, B=Applicable, X=Not applicable

*1 This product is TIIS Intrinsically Safe type transmitter and available only in Japan.

■ 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) Effective against suspended matter, etc.	Deposits on the electrode are removed by brush revolving hydraulically or pneumatically (intermittent cleaning). Effective against absorption deposits, etc.	Deposits are prevented by cavitation by ultrasonic vibration (continuous cleaning). Effective against crystalline scale.	Sensor is lifted from process solution at specified intervals and washed with chemicals (plus air bubbling) in cleaning chamber. Field proven in flue gas desulfurization systems.	Deposits that are difficult to remove by ultrasonic cleaning, are removed by air bubbling (continuous blowing). 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 HA405/HA406 DPA405/DPA406 HF405	PH8EFP, PH8ERP	PH8EFP, PH8ERP	PH8EFP HA405/HA406	PH8EFP, PH8ERP

■ Effect 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	B	B	B	A	A
Suspended matter, fiber	Ceramic, pulp and paper, textile, metal, water treatment, iron & steel wastewater, dairy	B	B	B	B	B
Viscidity	Flour milling, food processing	B	B	C	A	A
Algae, microorganism	River, seawater, industrial wastewater	A	B	B	A	B
Absorption deposit	Metal processing/treating, wastewater treatment (coagulation sedimentation)	C	A	C	A	B

Rating: A=Good, B=Fair, C=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
HA405 HA406 DPA405 DPA406 HF405 HA485 DPA485	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

PVC = Rigid Polyvinyl Chloride, PP = Polypropylene, SUS = Stainless Steel

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)
HA405, HA406 HF405, HA485	Immersion type (PH8HS)	NA	AP (max depth: 3 m)
	Flow-through type (PH8HF)	NA	AP to 500 kPa
DPA405, DPA406 DPA485	Immersion type (PH8HS)	NA	AP (max depth: 3 m)
	Flow-through type (PH8HF)	NA	AP to 250 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	Gold	Platinum	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	
Process pH	No limit	No limit	No limit	No limit	
Applications					
General chemical process	B	X	B	X	
Wastewater (cyanide) treatment	X	B	X	B	
Wastewater (chromate) treatment	X	B	X	B	
Organic solvent rich solution	X	X	X	X	
Sewage	X	X	X	X	
Human waste treatment	X	X	X	X	
Plating process	B	X	B	X	
Electrolyte (caustic solution)	X	X	X	X	
Converter/Transmitter Compatibility					
PH450G 4-Wire pH/ORP Converter	B	B	B	B	
OR400G 4-Wire ORP Converter	B	B	B	B	
FLXA21/PH202G 2-Wire pH/ORP Transmitter	B	B	B	B	
PH202SJ 2-Wire pH/ORP Transmitter	B	B	B	B	
PH202S 2-Wire pH/ORP Transmitter	B	B	B	B	
Holder Compatibility					
PH8HG Guide Pipe	B	B	B	B	
PH8HS Immersion Type Holder	B	B	B	B	
PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)	B	B	B	B	
PH8HF Flow-Thorough Type Holder	B	B	B	B	
PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)	B	B	B	B	
PH8HH Holder for High Purity Water	X	X	X	X	
HH350G Suspension Type Holder	B	B	B	B	
PB350G Angled Floating Ball Holder	B	B	B	B	
PB360G Vertical Floating Ball Holder	B	B	B	B	
PH10HG Guide Pipe	X	X	X	X	
PH10HLD Immersion Type Holder	X	X	X	X	

Rating: A=Recommended, B=Applicable, C=Acceptable, X=Not applicable

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*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: These products are available only in China, Korea, Taiwan and Russia.

■ ORP Converter/Transmitter Selection Guide

	Model Name	**PH450G**	**OR400G**	**FLXA21/PH202G**	**PH202SJ*1**	**PH202S**
	Product Name	4-wire pH/ORP converter	4-wire ORP converter	2-wire pH/ORP transmitter	2-wire pH/ORP transmitter	2-wire pH/ORP transmitter
Installation site	Indoors	B	B	B	B	B
	Outdoors (non-hazardous area)	B	B	B	B	B
	Outdoors (hazardous area)	X	X	X	A	A
Application	For integration Small-scale instrumentation	B	B			
	General purpose Medium-scale instrumentation	A	A	B	B	B
	Remotely located instrument panel room			A	A	A

Rating: A=Recommended, B=Applicable, X=Not applicable

*1 This product is TIIS Intrinsically Safe type transmitter and available only in Japan.

Specialty ORP Sensor		Dedicated to ORP100 Converter		
HA485 *3	DPA485 *3	OR10FP	OR10RP	Model Name
Solid electrolyte type	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	Platinum	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
2 to 14 pH	No limit	No limit	No limit	Process pH
				Applications
B	B	B	B	General chemical process
X	X	X	X	Wastewater (cyanide) treatment
X	X	X	X	Wastewater (chromate) treatment
X	B	X	X	Organic solvent rich solution
B	X	X	X	Sewage
B	X	X	X	Human waste treatment
X	B	B	B	Plating process
X	B	X	X	Electrolyte (caustic solution)
				Converter/Transmitter Compatibility
B	B	X	X	PH450G 4-Wire pH/ORP Converter
B	B	X	X	OR400G 4-Wire ORP Converter
B	B	X	X	FLXA21/PH202G 2-Wire pH/ORP Transmitter
B	B	X	X	PH202SJ 2-Wire pH/ORP Transmitter
B	B	X	X	PH202S 2-Wire pH/ORP Transmitter
				Holder Compatibility
X	X	X	X	PH8HG Guide Pipe
B	B	X	X	PH8HS Immersion Type Holder
X	X	X	X	PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)
B	B	X	X	PH8HF Flow-Thorough Type Holder
X	X	X	X	PH8HFF Flow-Through Type Holder (Flameproof Version, available only in Japan)
X	X	X	X	PH8HH Holder for High Purity Water
X	X	X	X	HH350G Suspension Type Holder
X	X	X	X	PB350G Angled Floating Ball Holder
X	X	X	X	PB360G Vertical Floating Ball Holder
X	X	A	A	PH10HG Guide Pipe
X	X	A	A	PH10HLD Immersion Type Holder

Rating: A=Recommended, B=Applicable, C=Acceptable, X=Not applicable

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*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: These products are available only in China, Korea, Taiwan and Russia.

Revision Information

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- Manual No. : TI 12B07A03-03E

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PH100, OR100 are deleted (termination of products).

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