









# Technical Information

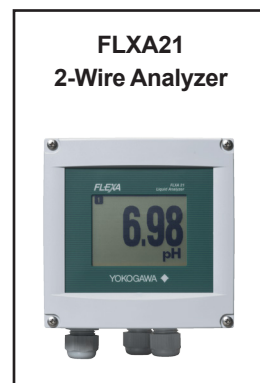
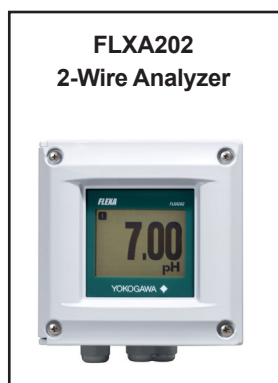
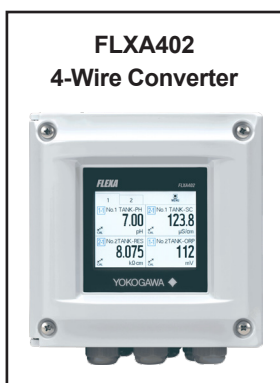
# pH/ORP Analyzer Selection Guide

TI 12B07A03-03E

## pH/ORP Sensors

<p><b>Model PH8EFP</b> KCl Filling type pH Sensor</p>  <p><b>PH4P/PH4PT/OR4P</b> Polymer Electrolyte pH (ORP) sensor</p> <p><b>PH4F/PH4FT</b> Hydrofluoric Acid-resistant pH sensor</p> <p><b>PH4C/PH4CT/OR4C</b> pH (ORP) sensor for Chemical Process</p> 	<p><b>Model PH8ERP</b> KCl Refillable type pH Sensor</p> 	<p><b>Model PH8EHP</b> pH Sensor for High Purity Water</p>  <p><b>FU20/FU20F</b> pH/ORP combination</p>  <p><b>PH10RP</b> KCl Replenish-free type</p> 	<p><b>Digital sensors</b> PH8EFP...-V PH8ERP...-V + SA11 PH8EHP...-V</p>  <p><b>FU20-VS + SA11</b></p> 
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## pH/ORP Converters



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## ■ pH Sensor Selection Guide and Compatible Instruments

Model Name	General Ryton pH Sensor			PH4 Sensor Series				
	PH8EFP PH8EFP.-V +SA11(*9)	PH8ERP PH8ERP.-V +SA11(*9)	PH8EHP PH8EHP.-V +SA11(*9)	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	
<b>Specifications</b>								
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 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)				
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	
<b>Applications</b>								
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	
<b>Converter/Analyzer Compatibility</b>								
FLXA402 4-Wire Converter	A	A	A	A	A	A	A	
FLXA202 2-Wire Analyzer	A (*9)	A (*9)	A (*9)	A	A	A	A	
FLXA21 2-Wire Analyzer	A (*9)	A (*9)	A (*9)	A	A	A	A	
<b>Holder Compatibility</b>								
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-Thorough 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 SENCOS sensor for FLXA202/FLXA21. FU20F can't be used for FLXA402.
- \*8: Only PH8HS and PH8HF can be used for FU20F. When using PH8HS or PH8HF, use adapter for installation.
- \*9: SA11 (SENCOS Smart Adapter) cannot be used for FLXA202/FLXA21.

Note • The table above is for reference purposes only. Consult YOKOGAWA for more detail information.

• See the following references for further information:

FLXA402 : GS 12A01F01-01EN, FLXA202: GS 12A01A03-01EN, FLXA21 : GS 12A01A02-01E  
pH/ORP sensors : GS 12B07B02-E, GS 12B10B00-01EN  
TI (not attached to products) 12B07A03-02E

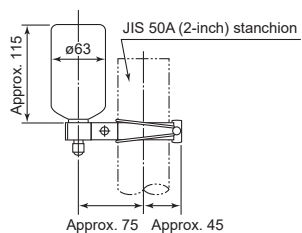
PH4 Sensor Series				Dedicated to PH100 Converter		Model Name
PH4C	PH4CT	FU20 FU20-VS +SA11 (*9)	FU20F (*7) (*8)	PH10FP	PH10RP	
For chemical process	For chemical process	pH/ORP combination		KCl refillable type	KCl replenish-free type	Product Name
<b>Specifications</b>						
0 to 14 pH	0 to 14 pH	2 to 12 pH	2 to 12 pH	0 to 14 pH	2 to 12 pH	Normal measuring range
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)		0 to 1 MPa		AP (max depth: 3 m)		Process pressure
≥100 μS/cm	≥100 μS/cm	≥50 μS/cm	≥50 μS/cm	≥50 μS/cm	≥50 μS/cm	Process conductivity
Not integrated (*3)	Pt1000	Pt1000	Pt1000	Pt1000	Pt1000	Integral temperature element
<b>Applications</b>						
A	A	L	L	N	N	General chemical process
A	A	N	N	N	N	Electrolyte (caustic soda solution)
N	N	N	N	N	N	High purity water (0.1-50 μS/cm)
A	A	N	N	N	N	Solution containing organic solvent
N	N	N	N	N	N	Solution containing fluorine
R	R	N	N	N	N	High alkaline process (≥10 pH)
N	N	N	N	N	N	Bioprocess with steam sterilization
A	A	R	R	L	L	Industrial wastewater, sewage
N	N	R	R	N	N	Human waste treatment
R	R	N	N	N	N	Plating process
L	L	R	R	A	A	Effluent
A	A	N	N	N	N	Flue gas desulfurization system (*6)
N	N	N	N	N	N	Water treatment
<b>Converter /Analyzer Compatibility</b>						
A	A	A	N (*7)	N	N	FLXA402 4-Wire Converter
A	A	A (*9)	A	N	N	FLXA202 2-Wire Analyzer
A	A	A (*9)	A	N	N	FLXA21 2-Wire Analyzer
<b>Holder Compatibility</b>						
N	N	N	N	N	N	PH8HG Guide Pipe
A	A	N	A (*8)	N	N	PH8HS Immersion Type Holder
N	N	N	N	N	N	PH8HSF Immersion Type Holder (Flameproof Version, available only in Japan)
A	A	N	A (*8)	N	N	PH8HF Flow-Thorough Type Holder
N	N	N	N	N	N	PH8HFF Flow-Thorough Type Holder (Flameproof Version, available only in Japan)
N	N	N	N	N	N	PH8HH Holder for High Purity Water
N	N	N	N	N	N	HH350G Suspension Type Holder
N	N	N	N	N	N	PB350G Angled Floating Ball Holder
N	N	N	N	N	N	PB360G Vertical Floating Ball Holder
N	N	N	N	R	R	PH10HG Guide Pipe
N	N	N	N	R	R	PH10HLD Immersion Type Holder

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

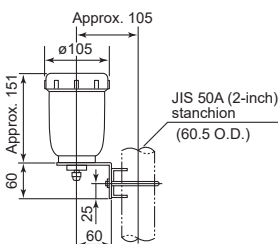
**KCl Reserve Tanks for KCl Filling Type pH/ORP Sensors and pH Sensor for High Purity Water**

Unit: mm

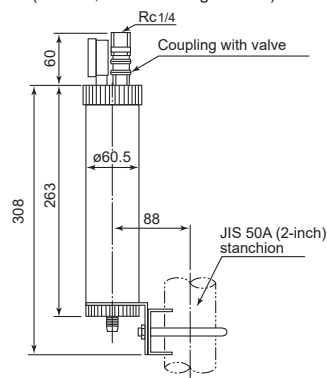
**General Purpose KCl Reserve Tank**  
(250 mL, with mounting bracket)



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



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



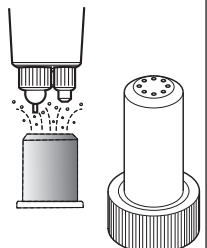
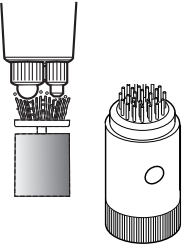
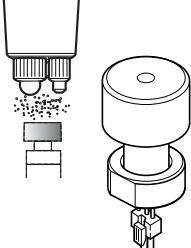
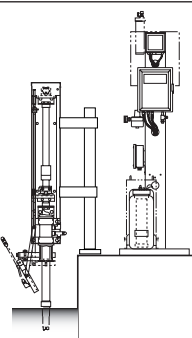
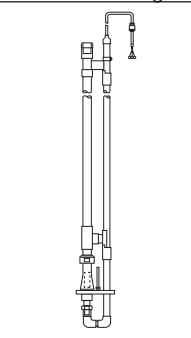
When medium pressure KCl reserve tank is not needed, large volume (500 mL) KCl reserve tank is recommended.

## pH Converter/Analyzer Selection Guide

	Model Name	FLXA402	FLXA202	FLXA21
	Product Name	4-Wire converter	2-wire analyzer	2-wire analyzer
Installation site	Indoors	R	A	A
	Outdoors (non-hazardous area)	R	R	R
	Outdoors (hazardous area)	A*	R	R
Application	For integration	A	/	/
	Small-scale instrumentation			
	General purpose Medium-scale instrumentation	R	A	A

Rating: R=Recommended, A=Applicable, N=Not applicable  
 \*: NI for FM only

## 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 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
Viscosity	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
	Suspension type (HH350G)	SUS	with		-5 to 80
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)	PP	with or without		-5 to 80
	Flow-through type (PH8HF)	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
			with jet cleaning	PP, SUS	0 to 100
	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
				PP, SUS	0 to 80
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
with (*1)	SUS, TN, HC	-5 to 80			

\*1: Brush cleaning is not available.

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)	KCI 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
		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
<b>Specifications</b>				
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)
<b>Applications</b>				
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
<b>Converter/Analyzer Compatibility</b>				
FLXA402 4-Wire Converter	A	A	A	A
FLXA202 2-Wire Analyzer	A	A	A	A
FLXA21 2-Wire Analyzer	A	A	A	A
<b>Holder Compatibility</b>				
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

Note • The table above is for reference purposes only. Consult YOKOGAWA for more detail information.

• See the following references for further information:

FLXA402 : GS 12A01F01-01EN, FLXA202: GS 12A01A03-01EN, FLXA21 : GS 12A01A02-01E

pH/ORP sensors : GS 12B07B02-E, GS 12B10B00-01EN

TI (not attached to products) 12B07A03-02E

## ■ ORP Converter/Analyzer Selection Guide

	Model Name	FLXA402	FLXA202	FLXA21
	Product Name	4-Wire converter	2-wire analyzer	2-wire analyzer
Installation site	Indoors	R	A	A
	Outdoors (non-hazardous area)	R	R	R
	Outdoors (hazardous area)	A*	R	R
Application	For integration	A		
	Small-scale instrumentation			
	General purpose Medium-scale instrumentation	R	A	A

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

\*: NI for FM only

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
<b>Specifications</b>				
-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
<b>Applications</b>				
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)
<b>Converter/Analyzer Compatibility</b>				
A	A	N	N	FLXA402 4-Wire Converter
A	A	N	N	FLXA202 2-Wire Analyzer
A	A	N	N	FLXA21 2-Wire Analyzer
<b>Holder Compatibility</b>				
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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# Revision Information

- Title : pH/ORP Analyzer Selection Guide
- Manual No. : TI 12B07A03-03E

**Feb. 2020/7th Edition**

Added FLXA402, SA11,  
Deleted PH450G

**Mar. 2018/6th Edition**

Revised overall.

**Aug. 2017/5th Edition**

Revised overall including changeover of sensor models.

**Jun. 2015/4rd Edition**

FU20F is added.

**Feb. 2015/3rd Edition**

PH400G, OR400G are deleted.

**Oct. 2011/2nd Edition**

PH100, OR100 are deleted.

**Jun. 2009/1st Edition**

Newly published