

General Specifications

Model FF20/FS20
Flow Fittings for pH/ORP
(Redox) measuring loops

pH/ORP

For liquid analysis, the sensors are usually mounted in either a flow or an immersion fitting. Therefore Yokogawa has invested considerable design and development time in producing a full range of fittings with particular emphasis on designs that reduce installation and maintenance time and consequently save operation costs.

A high degree of standardisation makes it possible to mount electrodes with DIN dimensions directly into a fitting. For most other types a mounting kit (accessory) is available. A wide choice of construction materials gives the user the optimal solution for any process considering chemical resistance, pressure and temperature specifications. The program includes fittings and subassemblies for mounting of a variety of electrodes and/or a cleaning system.

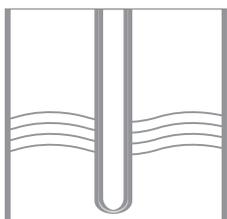
Features

Wide choice of construction materials.

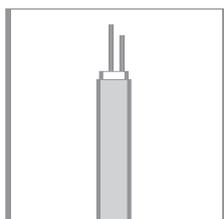
- High degree of standardisation reduces spare holding requirements.
- Direct mounting of sensors with DIN dimensions.
- Liquid earth pin for stable measurements.
- High pressure and temperature specifications.
- Chemical cleaning system as an option for 2-, 3- and 4-hole fitting.
- Brush cleaning system as an option for 4-hole fitting only.
- Electrolytically polished stainless steel fittings for optimal corrosion resistance.



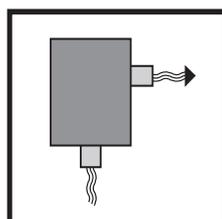
System Configuration



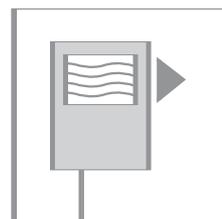
Sensors



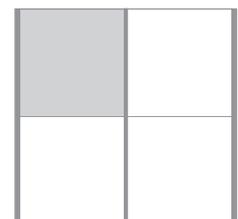
Cables



Fittings



Transmitters



Accessories

A. Flow Fittings

From a practical plant aspect, the optimal mounting place of a sensor is in a by-pass behind a sample valve. For these applications the complete flow fittings are the optimal solution. They are provided with a ring to hold a calibration dish for easy cleaning and maintenance.

Features

- Easy calibration and maintenance using the calibration dish.
- Changeable liquid outlet position (right or left).
- Wall mounting bracket.

B. Subassemblies

The subassemblies are the optimal solution for mounting sensors directly in a piping system. They can be easily adapted to the process piping by welding or cementing. The subassemblies of stainless steel meet the requirements of DIN 11850 and DIN 11851 for mounting in sanitary constructions.

Features

- Suitable for mounting in a T-piece or directly in the piping system by cementing or welding.

General Specifications

Materials

- Wetted parts
 - A. Body (refer to model code): Polypropylene (PP)
Stainless steel AISI 316 (SS)
Polyvinylchloride (PVC)
Polyvinylidene fluoride (PVDF)
 - B. O-rings : Silicone rubber/Viton
 - C. Liquid earth sensor : Titanium (in plastic design)
(not in 1-hole subassy) : Stainless steel AISI 316 (in SS design)
- Mounting brackets : Stainless steel AISI 316 (for SS design)
Polyvinylchloride (for plastic design)
- Electrode mounting sets : Rytan R 4
- Holder for calibration dish : Stainless steel AISI 316
- Calibration dish : polyethylene
- Retaining nut for electrode holder : Stainless steel AISI 304

Volume measuring vessel

- 2-hole fitting : 130 ml
- 3-hole fitting : 130 ml
- 4-hole fitting : 250 ml

Process connections for fittings

- 2-, 3- and 4-hole fitting : 1/2" NPT or flange LAP-joint (DIN or ANSI) see model code

Nominal pipe size for mounting subassemblies

- 1-hole : DN20
- 2-hole : DN50
- 3-hole : DN50
- 4-hole : DN80

Weight*

: See tabel 1



Functional Specifications

Temperature

- min. : -10°C
- max. : depending on material and application (see figure 1)

Flow rate (fittings)

- : 0.1 to 10 l/min (depending on application)

Pressure

- : see figure 1

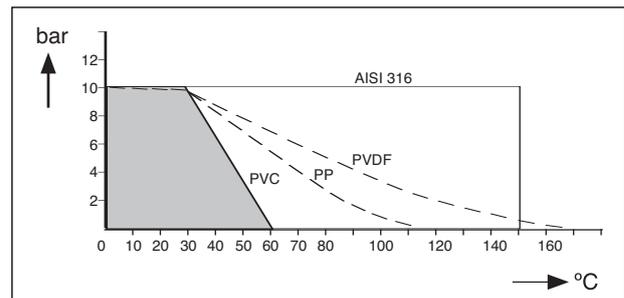


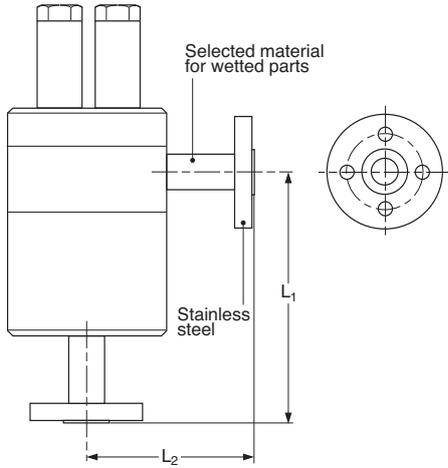
Fig. 1. Pressure/temperature class

Table 1

Fitting \ Material	PP	SS	PVC	PVDF
1-hole subassembly		0.2 kg	0.1 kg	
2-hole subassembly	0.5 kg	1.2 kg	0.5 kg	0.7 kg
3-hole subassembly	0.5 kg	1.2 kg	0.5 kg	0.7 kg
4-hole subassembly		3 kg	1.4 kg	
2-hole flowfitting	1.1 kg	2.2 kg		1.5 kg
3-hole flowfitting	1.1 kg	2.2 kg		1.5 kg
4-hole flowfitting	1.4 kg	6.5 kg		1.8 kg

* The accessories are not included

Flange adapters (NPT^{1/2"} male lap joint)

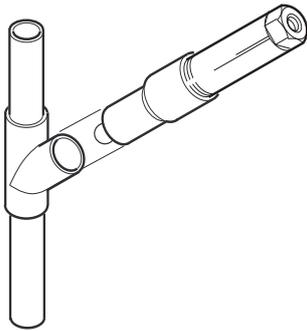


Dimensions

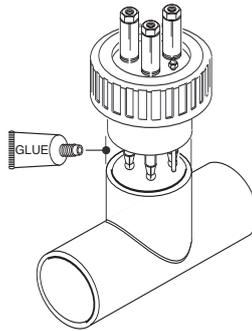
TYPE	FP1-FF1-FS1		FP2-FF2-FS2		FP3-FF3-FS3		FP4-FF4-FS4	
	L ₁	L ₂						
FF20-S22	143	137	153	147	5.6	5.4	6.0	5.8
FF20-P22	180	133	169	122	7.1	5.2	6.6	4.8
FF20-F22	180	133	169	122	7.1	5.2	6.6	4.8
FF20-S33	143	137	153	147	5.6	5.4	6.0	5.8
FF20-P33	180	133	169	122	7.1	5.2	6.6	4.8
FF20-F33	180	133	169	122	7.1	5.2	6.6	4.8
FF20-S43	156	133	166	143	6.1	5.2	6.5	5.6
FF20-P43	183	153	172	142	7.2	6.0	6.8	5.6
FF20-F43	183	153	172	142	7.2	6.0	6.8	5.6

Application examples subassemblies

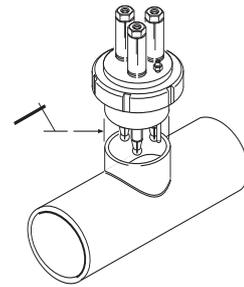
SS/PVC



PVC



SS

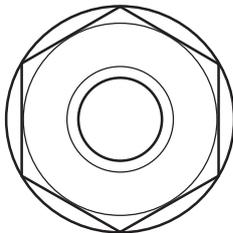


Dimensions

(Unit: mm)

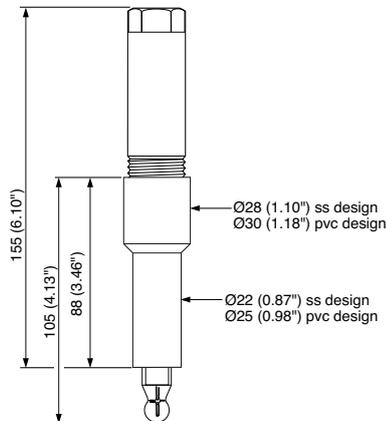
Configurations

1-Hole



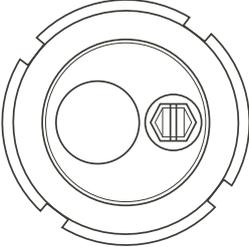
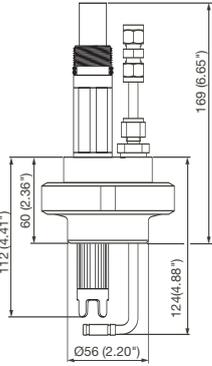
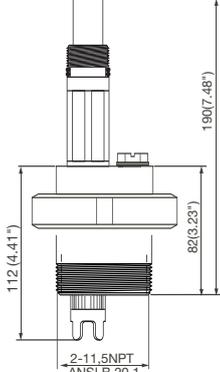
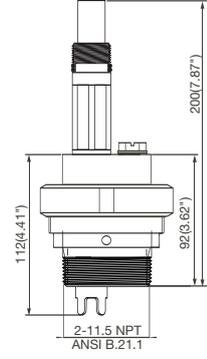
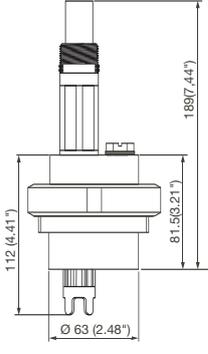
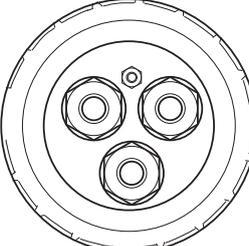
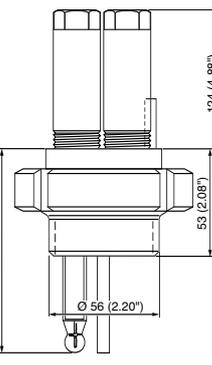
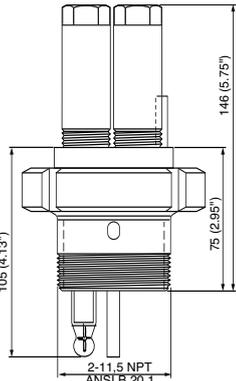
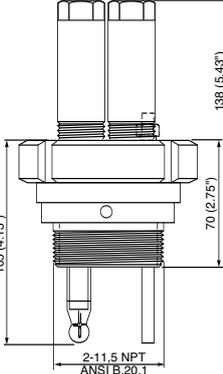
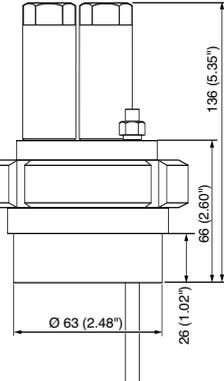
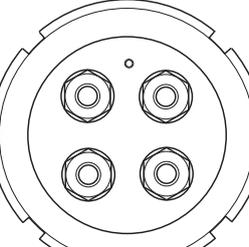
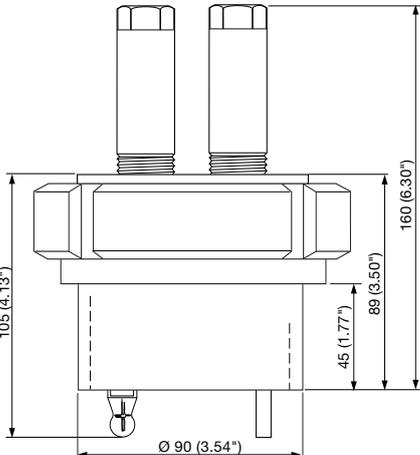
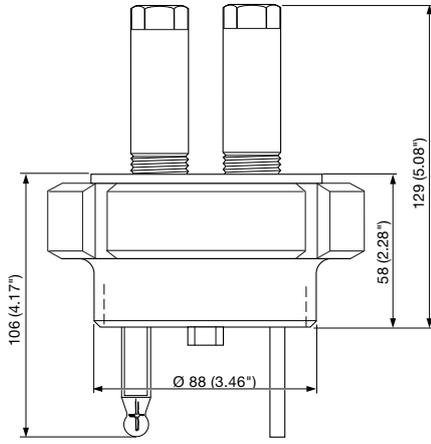
Subassemblies

SS/PVC



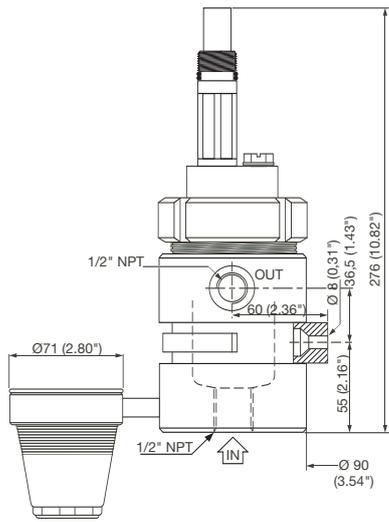
FS20-S12-WE
FS20-V12-WE

Dimensions (Unit: mm)

Configurations	Subassemblies			
<p>2-Hole</p> 	<p>SS</p>  <p>FS20-S22-WE</p>	<p>SS</p>  <p>FS20-S22-TP</p>	<p>PP/PVDF</p>  <p>FS20-P22-TP FS20-F22-TP</p>	<p>PP/PVC/PVDF</p>  <p>FS20-P22-WE FS20-V22-WE FS20-F22-WE</p>
<p>3-Hole</p> 	<p>SS</p>  <p>FS20-S32-WE</p>	<p>SS</p>  <p>FS20-S32-TP</p>	<p>PP/PVDF</p>  <p>FS20-P32-TP FS20-F32-TP</p>	<p>PP/PVC/PVDF</p>  <p>FS20-P32-WE FS20-V32-WE FS20-F32-WE</p>
<p>4-Hole</p> 	<p>PVC</p>  <p>FS20-V43-WE</p>		<p>SS</p>  <p>FS20-S43-WE</p>	

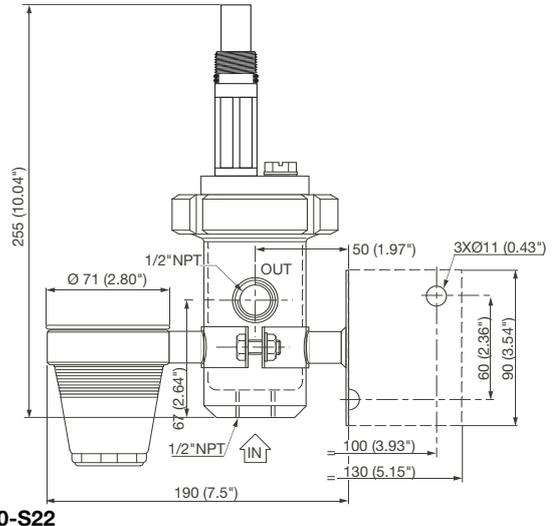
Flow Fittings

PP/PVDF



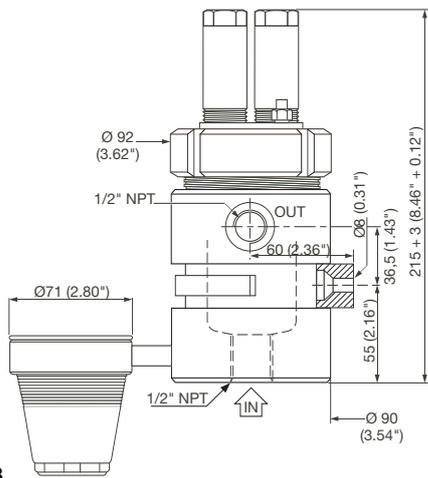
FF20-P22
FF20-F22

SS



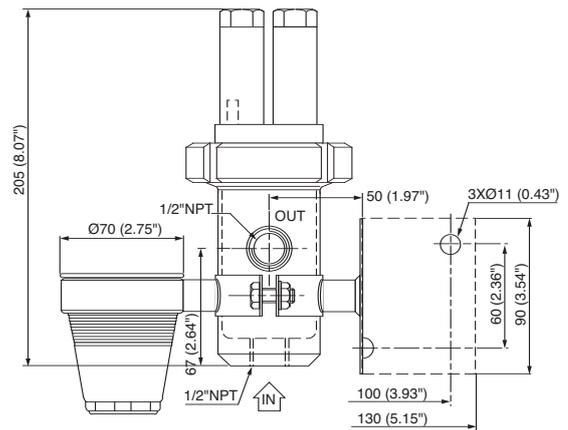
FF20-S22

PP/PVDF



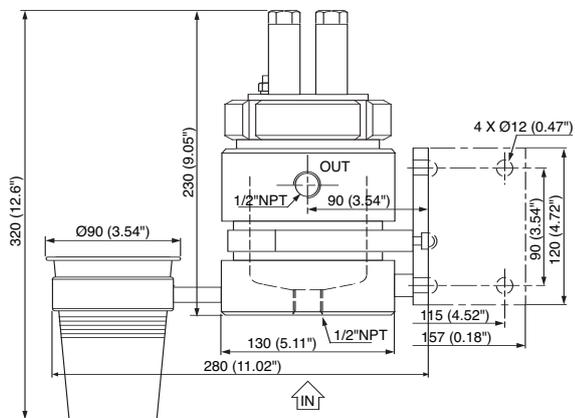
FF20-P33
FF20-F33

SS



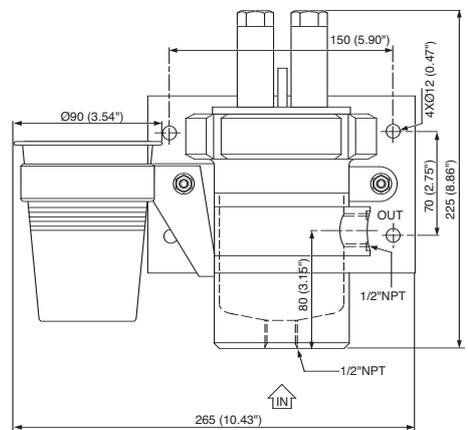
FF20-S33

PP/PVDF



FF20-P43
FF20-F43

SS



Distance wall-outlet: 85 (3.35")

FF20-S43

Model and Suffix Codes

Model	Suffix Code	Option Code	Description
FF20			Flow fitting
Material	-P -S -F		Polypropylene (PP) Stainless steel AISI 316 (SS) Polyvinylidene fluoride (PVDF)
Number of holes	22 33 43		For PH20 3 electrode mounting holes 4 electrode mounting holes
		*B	Style code B
Options		/HCN2 /HCN3 /HCN4	FF20- .22 FF20- .33 FF20- .43
-Cleaning system			
Options		/B /R	For mounting Bellomatic reference electrodes For mounting (top) refillable electrodes with long glass shaft.
-Mounting kit			
-Flange adapters (NPT 1/2" male lap joint)		/FP1 /FP2 /FP3 /FP4 /FF1 /FF2 /FF3 /FF4 /FS1 /FS2 /FS3 /FS4	DN15-PN10 PP DN25-PN10 PP 1/2" 150 lbs PP 1" 150 lbs PP DN15-PN10 PVDF DN25-PN10 PVDF 1/2" 150 lbs PVDF 1" 150 lbs PVDF DN15-PN10 SS 316 DN25-PN10 SS 316 1/2" 150 lbs SS 316 1" 150 lbs SS 316
-KCl-reservoir		/K	Electrolyte tubing (2.5 m) is included.
-Salt bridge		/S	For liquid which cannot stand contamination with KCl.
-Certificate		/M	Material certificate 3.1 according to EN 10204 for wetted metal parts only

Model	Suffix Code	Option Code	Description
FS20			Subassembly (Flow fitting)
Material	-V -P -S -F		Polyvinylchloride (PVC) Polypropylene (PP) Stainless steel AISI 316 (SS) Polyvinylidene fluoride (PVDF)
Number of holes	12 22 32 43		1 electrode mounting holes (only V,S) For PH20 3 electrode mounting holes 4 electrode mounting holes (only V,S)
Mounting		-WE -TP	Welding end: Type, S12, S22,S32, S43 Glue for PVC: Type V12, V22, V32, V43 Heat welding: Type F22, F32, P22, P32 Tapered pipe thread (2"NPT acc. ANSI B.20.1). (for 2 and 3 holes version, and not in case of type V22 and V32)
Options		/HCN2 /HCN3 /HCN4	FS20- .22 FS20- .32 FS20- .43
-Cleaningsystem			
Options		/B /R	For mounting Bellomatic reference electrodes and combined electrodes. For mounting (top) refillable electrodes with long glass shaft.
-Mounting kit			
-KCl-reservoir		/K	Electrolyte tubing (2.5 m) is included.
-Salt bridge		/S	For liquid which cannot stand contamination with KCl.
-Certificate		/M	Material certificate 3.1 according to EN 10204 for wetted metal parts only

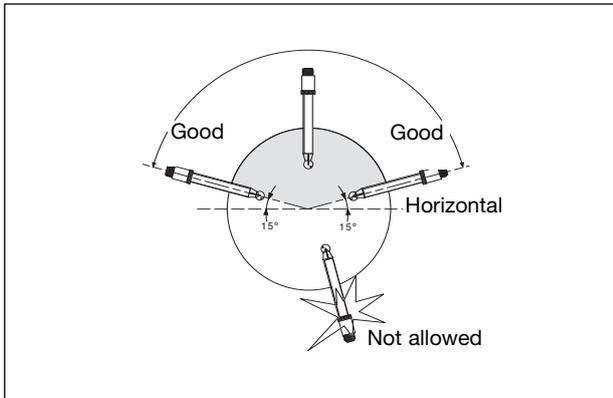


Fig. 2. Mounting positions of electrodes

Notes:

1. Mounting position of electrodes
2. For mounting or replacing the electrodes some space (ca. 20 cm) must be available at the top of the fitting.

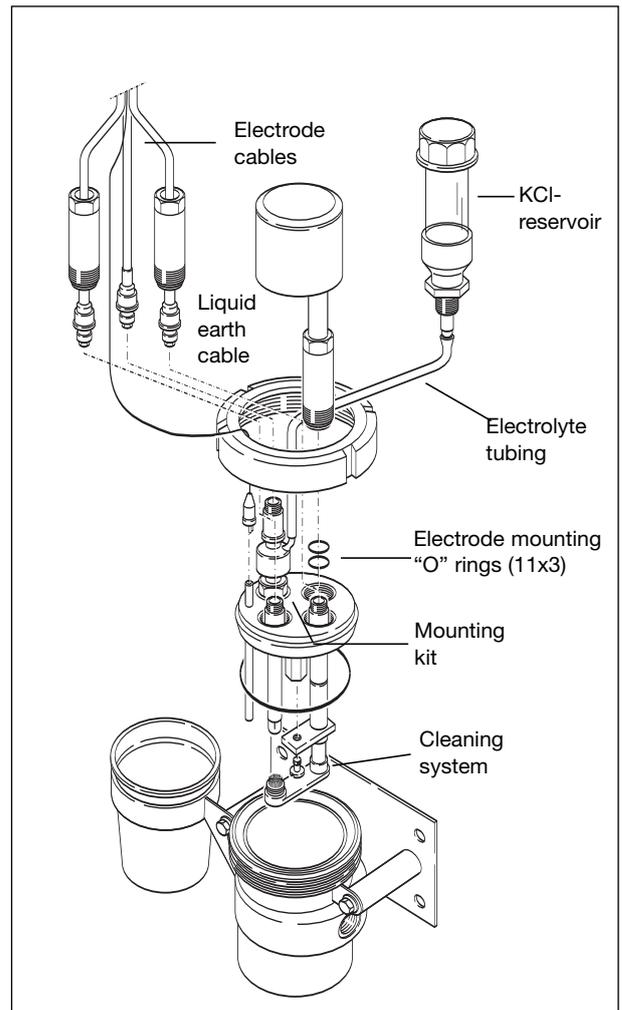


Fig. 3. Assembled flow fitting (example)

Selection Criteria

Chemical		Concentration and pH		Material			
		W/V (%)	pH (25°C)	PVC	PVDF	PP	SS 316
Inorganic acid	Sulfuric acid	0.5	1.0	O	O	O	X
		0.05	2.0	O	O	O	X
	Hydrochloric acid	0.4	1.0	O	O	O	X
		0.04	2.0	O	O	O	X
	Nitric acid	0.6	1.0	O	O	O	O
		0.06	2.0	O	O	O	O
	Phosphoric acid	1.0	1.5	O	O	O	O
	Boric acid	0.6	5.0	*	O	O	*
Organic acid	Carbonic acid	0.6	3.6	O	O	O	*
	Chromic acid	1.2	0.8	O	O	O	O
	Sulfurous acid	0.8	1.4	O	O	O	*
	Acetic acid	0.6	2.8	*	O	O	*
	Formic acid	0.5	2.3	*	O	O	O
	Oxalic acid	0.9	1.0	*	O	*	*
	Lactic acid	0.9	2.4	*	X	O	O
	Phenol acid	0.9	5.4	*	O	*	O
Alkali	Monochloroacetic acid	0.9	1.8	X	O	O	O
	Calcium hydroxide	0.2	12.4	O	O	O	O
	Potassium hydroxide	0.5	12.7	O	O	O	*
	Sodium hydroxide	0.4	12.9	O	O	O	O
Acid salt	Ammonium hydroxide	0.5	10.4	O	O	O	O
	Ammonium chloride	5		O	O	O	X
	Aluminous water	5		O	O	O	*
	Zinc chloride	5		O	O	O	X
	Iron (III) chloride	5		O	O	O	X
	Iron (III) nitrate	5	1.3	O	O	O	O
Basic salt	Sodium sulfite	5		O	O	O	*
	Sodium carbonate	5	11.8	O	O	O	O
	Sodium phosphate	5		O	O	O	*
Neutral salt	Potassium chloride	5		O	O	O	X
	Sodium sulfate	5		O	O	O	*
	Calcium chloride	5		O	O	O	X
	Sodium nitrate	5	8.2	O	O	O	*
	Aluminium chloride	5		O	O	O	X
Oxidizing agent	Hydrogen peroxide	1		O	O	O	*
	Sodium hypochlorite solution	1	12.5	O	O	*	X
	Chlorinated lime	1		*	O	O	*
	Potassium dichromate	5	4.5	O	O	O	*
Organic solvent	Alcohol	10		O	O	O	O
	Organic solvent or oil (excluding alcohol)			*	O	*	O
	Chlorinated solvent			X	O	X	*

O = can be used
 * = shortens useful life
 X = cannot be used

Note:

- pH in table was calculated with dissociated constant (related to measurement)
- When any of the two conditions listed below are applicable, please consult our sales department.
 - Strong, oxidizing solutions such as aqua regia, chromic acid, hypochloric acid, perchloric acid, etc.
 - The organic solvent is contained in the order of a few percent.

Accessories

Part no.	Description
K1500FU	KCl reservoir PVC for F*20
SB20	Salt bridge
K1500BX	Grommet for watertight cable input in PG 16 gland (3 electrodes cables and liquid earth cable)
K1500BY	Mounting kit for (top) refillable electrodes
K1547PA	Complete hastelloy cleaning system /HCN2 and /HCN3
K1547PB	Complete hastelloy cleaning system /HCN4
K1521AD	Flange adapter /FS3
K1521AE	Flange adapter /FF3
K1521AF	Flange adapter /FP3
K1521AG	Flange adapter /FS4
K1521AH	Flange adapter /FF4
K1521AJ	Flange adapter /FP4
K1521AK	Flange adapter /FS1
K1521AL	Flange adapter /FF1
K1521AM	Flange adapter /FP1
K1521AN	Flange adapter /FS2
K1521AP	Flange adapter /FF2
K1521AQ	Flange adapter /FP2

Consumable Parts

Part no.	Description
6C231	Buffer powder pH 1.68 (at 25°C)
6C232	Buffer powder pH 4.01 (at 25°C)
6C234	Buffer powder pH 6.98 (at 25°C)
6C237	Buffer powder pH 6.87 (at 25°C)
6C236	Buffer powder pH 9.18 (at 25°C)
K1500GF	250 ml. KCl-solution (1 M)
K1520VA	250 ml. KCl-solution (3.3 M)
K1500GG	250 ml. KCl-solution (1 M), thickened
K1520VN	250 ml. KCl-solution (3.3 M), thickened

Cables

Part no.	Description
K1500FV	Liquid earth cable (10 m)
K1500DU	Liquid earth cable (25 m)
WU20-PC02	COAX-cable (2 m) for single electrode
WU20-PC05	COAX-cable (5.5 m) for single electrode
WU20-PC10	COAX-cable (10 m) for single electrode
WU20-PC15	COAX-cable (15 m) for single electrode
WU20-PC20	COAX-cable (20 m) for single electrode
WU20-PC25	COAX-cable (25 m) for single electrode
WU20-LT02	TRIAX-cable (2 m) for combined electrode
WU20-LT05	TRIAX-cable (5.5 m) for combined electrode
WU20-LT10	TRIAX-cable (10 m) for combined electrode
WU20-LT15	TRIAX-cable (15 m) for combined electrode
WU20-LT20	TRIAX-cable (20 m) for combined electrode
WU20-LT25	TRIAX-cable (25 m) for combined electrode

Spare parts FS20

Part no.	Description
K1500BV	O-rings EPDM 11x3 (6 Pcs.)
K1500BW	Flow tube for SB20-VC
K1500BY	Option /R for F*20.. (82850747)
K1500DU	Liquid earth cable 25m
K1500DW	Set of 12 cable nuts for WU20
K1500DX	5 m tubing for SB20
K1500DZ	Nut SS, FF/S20-3* + ISC40FF/S
K1500EK	O-rings viton 6.07x1.78 (5x2)
K1500ER	O-ring set Viton FF20-S22
K1500FU	KCl reservoir PVC for F*20
K1500FV	Liquid earth cable 10m
K1500GA	5 m tube for KCl reservoir
K1500GN	O-ring set FF/FS20 3-hole SS
K1500GP	O-ring set FF/FS20 3-hole P/F
K1500GR	O-rings silicon 11x3 8pcs
K1500GT	O-ring set silicon. FF20-.4.
K1500GZ	Earthpin assy for F*20 non-S
K1500HD	O-rings silicon 11x3 50pcs
K1511DP	O-rings viton 21.9x2.62 (5x2)
K1520CD	Spare 3-hole holder PVC
K1520CE	Spare 3-hole holder PP
K1520CF	Spare 3-hole holder PVDF
K1530UL	Tubing for FD30/JC, 10 meter
K1547PF	Nozzle and mounting HCN2/3/F
K1547PG	Nozzle and mounting HCN4
K1547PH	10 m Nylon Tube and mounting
K1547PP	Spare Part EPDM spraying valves

Spare parts FF20

Part no.	Description
K1500AN	Hauling parts kit for FD20-SS
K1500AP	Hauling parts kit for FD20-plastic
K1500BV	O-rings EPDM 11x3 (6 Pcs.)
K1500BW	Flow tube for SB20-VC
K1500BY	Option /R for F*20.. (82850747)
K1500BZ	O-rings Viton 11x3 (6Pcs)51250
K1500DW	Set of 12 cable nuts for WU20
K1500DX	5 m tubing for SB20
K1500DZ	Nut SS, FF/S20-3* + ISC40FF/S
K1500EK	O-rings viton 6.07x1.78 (5x2)
K1500EL	Mounting set for FF20-S22/33
K1500EQ	O-ring set EPDM FF20-S22
K1500ER	O-ring set Viton FF20-S22
K1500ES	O-ring set EPDM FF20P&F33
K1500ET	O-ring set Viton FF20P&F33
K1500EU	O-ring set EPDM FF20-S33
K1500EV	O-ring set Viton FF20-S33
K1500EW	O-ring set EPDM FF20P&F43
K1500EX	O-ring set Viton FF20P&F43
K1500EY	O-ring set EPDM FF20-S43
K1500EZ	O-ring set Viton FF20-S43
K1500FK	O-ring set Viton FF20P&F22
K1500FL	O-ring set standard FF20P&F22
K1500FM	O-ring set FF20-S22
K1500GA	5 m tube for KCl reservoir
K1500GN	O-ring set FF/FS20 3-hole SS
K1500GP	O-ring set FF/FS20 3-hole P/F
K1500GR	O-rings silicon 11x3 8pcs
K1500GT	O-ring set silicon. FF20-.4.
K1500GZ	Earthpin assy for F*20 non-S
K1500HA	Calibr. dish for FF20-*33 (50)
K1500HB	Calibr. dish for FF20-*43 (50)
K1500HD	O-rings silicon 11x3 50pcs
K1500ZA	Nut PVDF for old FF20-F33
K1500ZB	Nut PP for old FF20-P33
K1511DP	O-rings viton 21.9x2.62 (5x2)
K1520CE	Spare 3-hole holder PP
K1520CF	Spare 3-hole holder PVDF
K1530UL	Tubing for FD30/JC, 10 meter
K1547PF	Nozzle and mounting HCN2/3/F
K1547PG	Nozzle and mounting HCN4
K1547PH	10 m Nylon Tube and mounting
K1547PP	Spare Part EPDM spraying valves

YOKOGAWA HEADQUARTERS

9-32, Nakacho 2-chome,
Musashinoshi
Tokyo 180
Japan
Tel. (81)-422-52-5535
Fax (81)-422-55-1202
www.yokogawa.com

YOKOGAWA EUROPE B.V.

Databankweg 20
3821 AL AMERSFOORT
The Netherlands
Tel. +31-33-4641 611
Fax +31-33-4641 610
www.yokogawa.com/eu

YOKOGAWA CORPORATION OF AMERICA

2 Dart Road
Newnan GA 30265
United States
Tel. (1)-770-253-7000
Fax (1)-770-251-2088
www.yokogawa.com/us

YOKOGAWA ELECTRIC ASIA Pte. Ltd.

5 Bedok South Road
Singapore 469270
Singapore
Tel. (65)-241-9933
Fax (65)-241-2606
www.yokogawa.com/sg

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