

# General Specifications

Models FF20, FS20 and FD20  
Flow, Subassembly and Immersion Fittings  
for pH/ORP (Redox) measuring loops

GS 12B06K01-01EN-P

## ■ Overview

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.

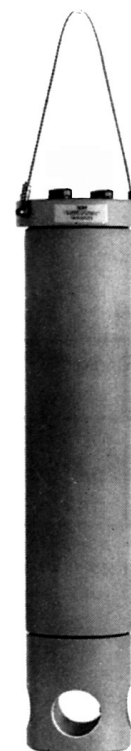
## ■ Features

### Flow fittings:

- 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.

### Immersion fittings:

- Designed for either pH or ORP measurements in tanks open vessels and drains.
- “Hoisting cable” for easy maintenance.
- Pre-selected immersion length.
- Wide choice of construction materials.
- Flange mounting.
- High degree of standardisation reduces spare holding requirements.
- Liquid earth pin for stable measurements.
- Chemical or brush cleaning systems as an option.



## ■ 1. General Specifications

### 1.1 General Specifications FF20/FS20

#### 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

: Ryton 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)

: max. 6 m/s

Pressure

: see Addendum 3

## 1.2 General specifications FD20

### 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

C. Liquid earth sensor

: Titanium (PP and PVDF design)

(not in 1-hole fitting)

Stainless steel AISI 316 (SS design)

- Electrode mounting sets

: Ryton R 4

- "Hoisting eye"

: Stainless steel cable (twisted)

Weight\*

: See table 2

Mounting

: by means of the "hoisting eye" or flange mounting

### Functional Specifications

Temperature

- min.

: -10°C

- max.

: depending on material and application  
(see figure 2)

Immersion length (in dm)

: between 0.5 and 2.0 m

Pressure

: see Addendum 3

**Table 1:** Weight per fitting/material for FF20/FS20

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		3.0 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

**Table 2:** Weight per fitting/material for FD20

Fitting / Material	PVC	PP	SS	PVDF
1-hole fitting	0,4 kg			
3-hole fitting		2 kg	5,3 kg	2,5 kg
4-hole fitting		4,5 kg	6,4 kg	5,5 kg

## ■ 2. Dimensions (units in mm)

### 2.1 Dimensions - flow fittings units mm (inch)

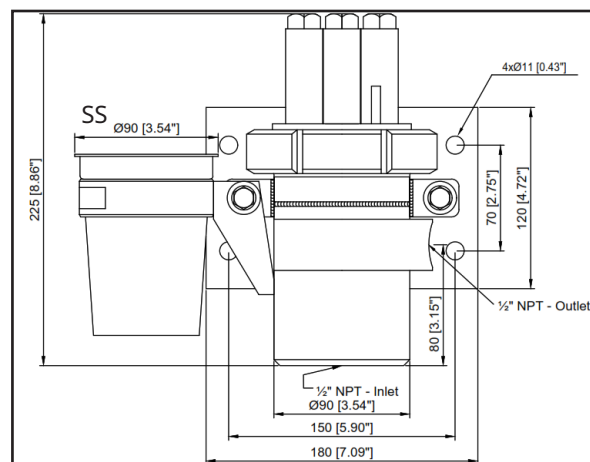
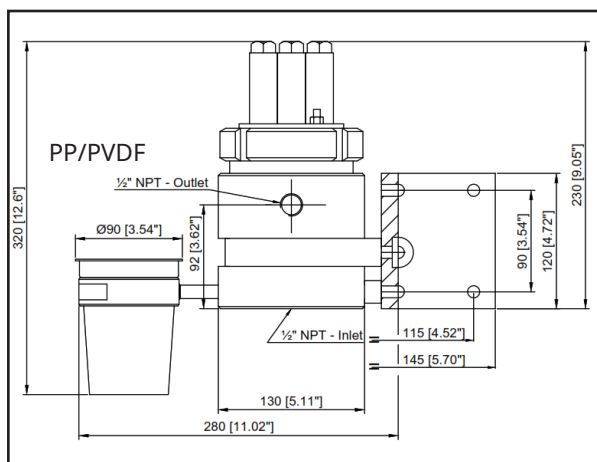
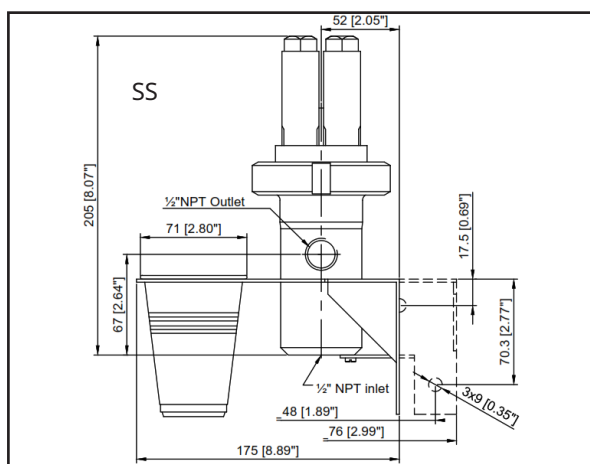
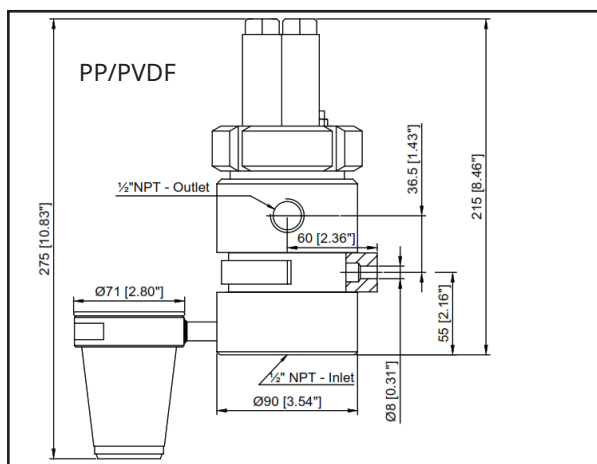
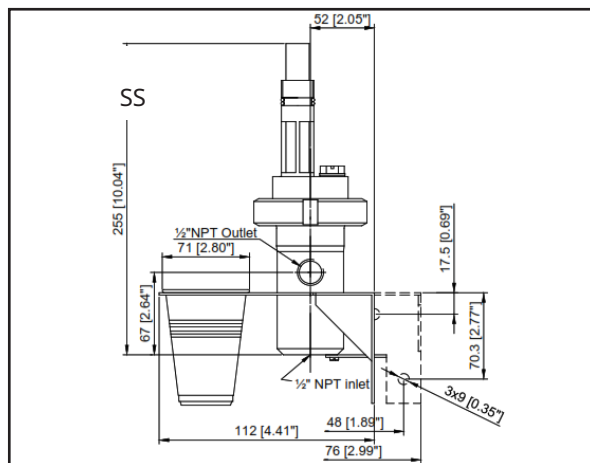
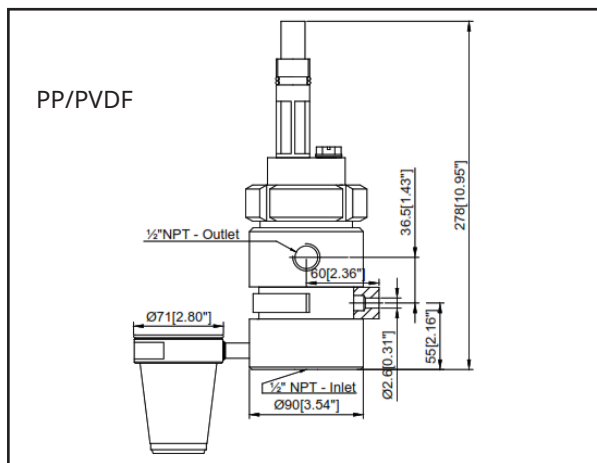
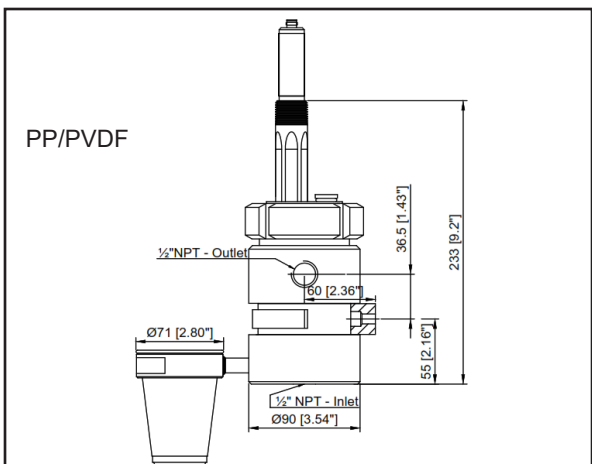
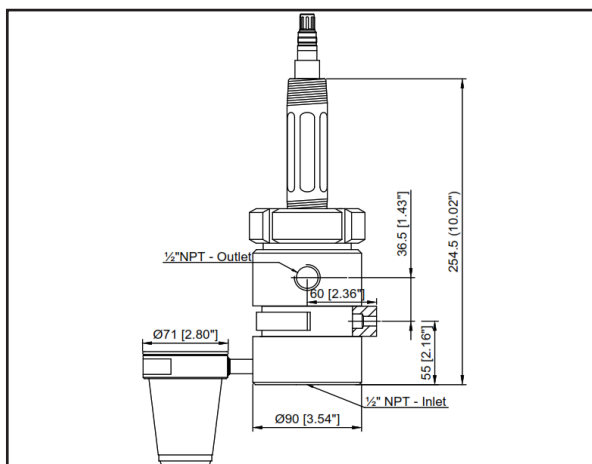


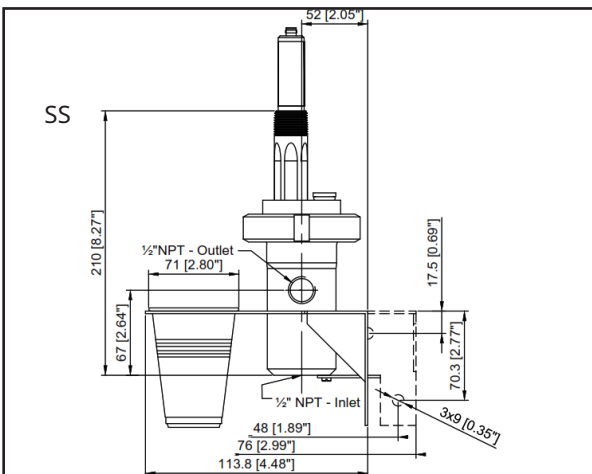
Figure 1: Flow fitting dimensions



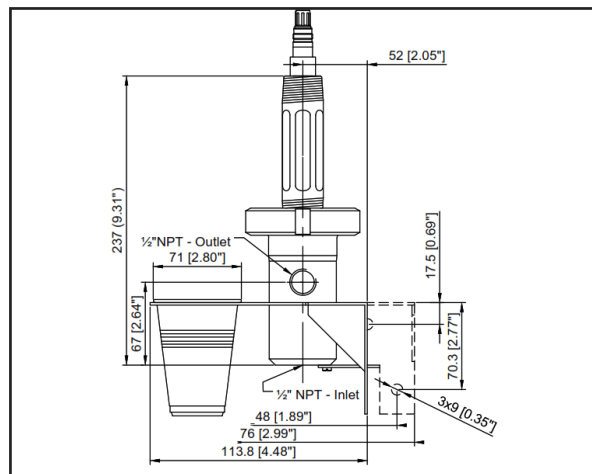
FF20-P3B / FF20-F3B



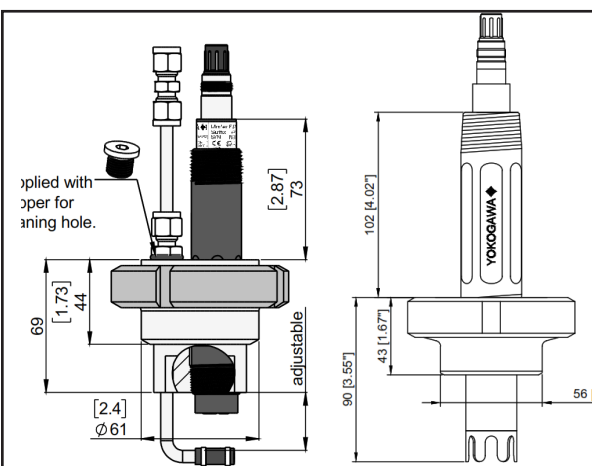
FF20-P3C / FF20-F3C



FF20-S3B

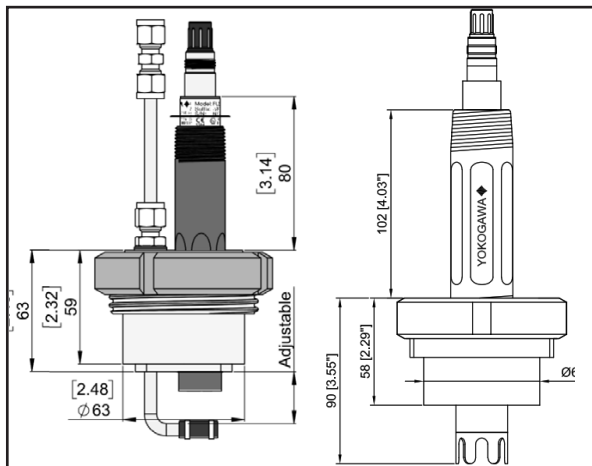


FF20-S3C



FS20-S3B-WE & /HCN2

FS20-S3C-WE



FS20-P3B-WE/HCN2  
FS20-F3B-WE/HCN2

FS20-P3C-WE  
FS20-F3C-WE

Figure 2: Flow fitting dimensions

2.2 Dimensions - subassemblies units mm (inch)

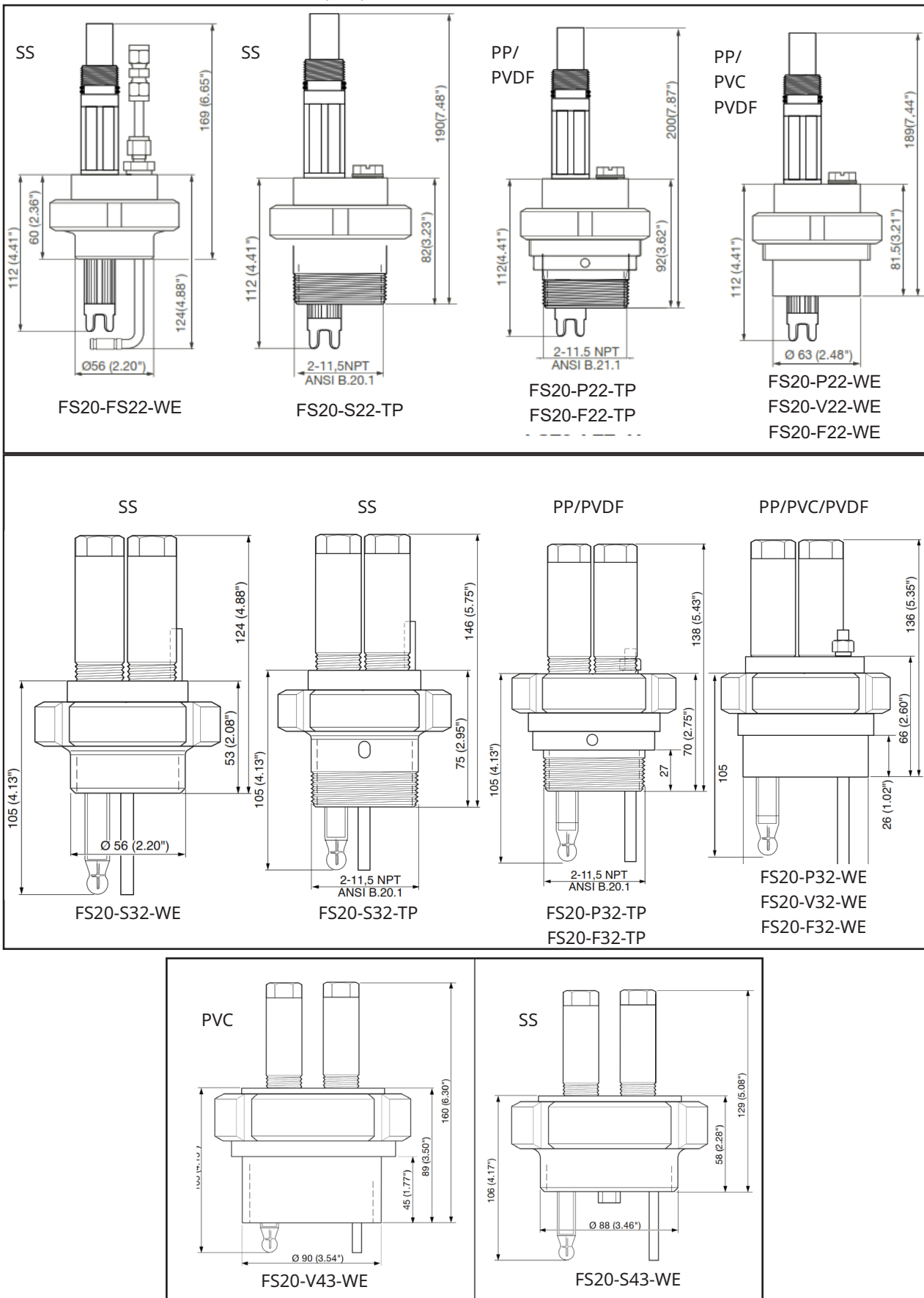


Figure 3: Flow subassembly dimensions

### 2.3. Flange adapters (NPT1/2" male lap joint) for FF20/FS20 models

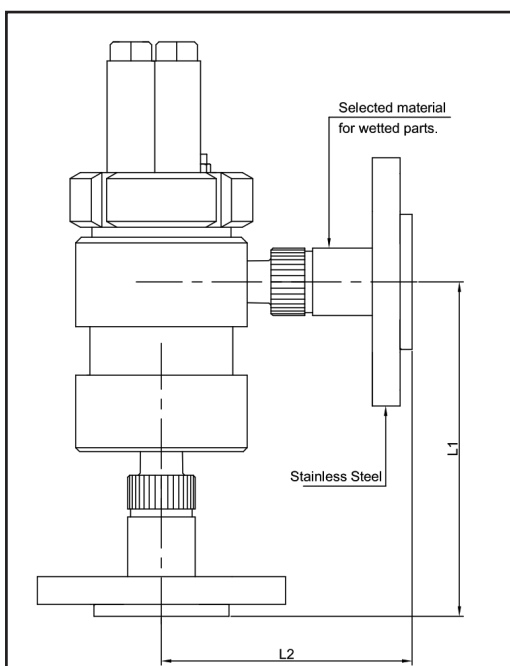


Figure 4: Flange adapters distance

Table 3: Fitting flange installation distance

TYPE	FP1-FF1-FS1				FP2-FF2-FS2				FP3-FF3-FS3				FP4-FF4-FS4			
	L1		L2		L1		L2		L1		L2		L1		L2	
	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
FF20-S22 / S3*	143	5.63	137	5.39	153	6.02	147	5.79	142.2	5.60	137	5.39	152.4	6.00	147.0	5.8
FF20-P22 / P3* FF20-F22 / F3	180	7.09	133	5.24	169	6.65	122	4.80	180.3	7.10	133	5.24	167.6	6.60	122.0	4.8
FF20-S43	156	6.14	133	5.24	166	6.54	143	5.63	154.9	6.10	133	5.24	165.1	6.50	143.0	5.6
FF20-P43 FF20-F43	183	7.20	153	6.02	172	6.77	142	5.59	182.9	7.20	153.0	6.02	172.7	6.80	142.0	5.6

## 2.4. Dimensions Immersion Fittings

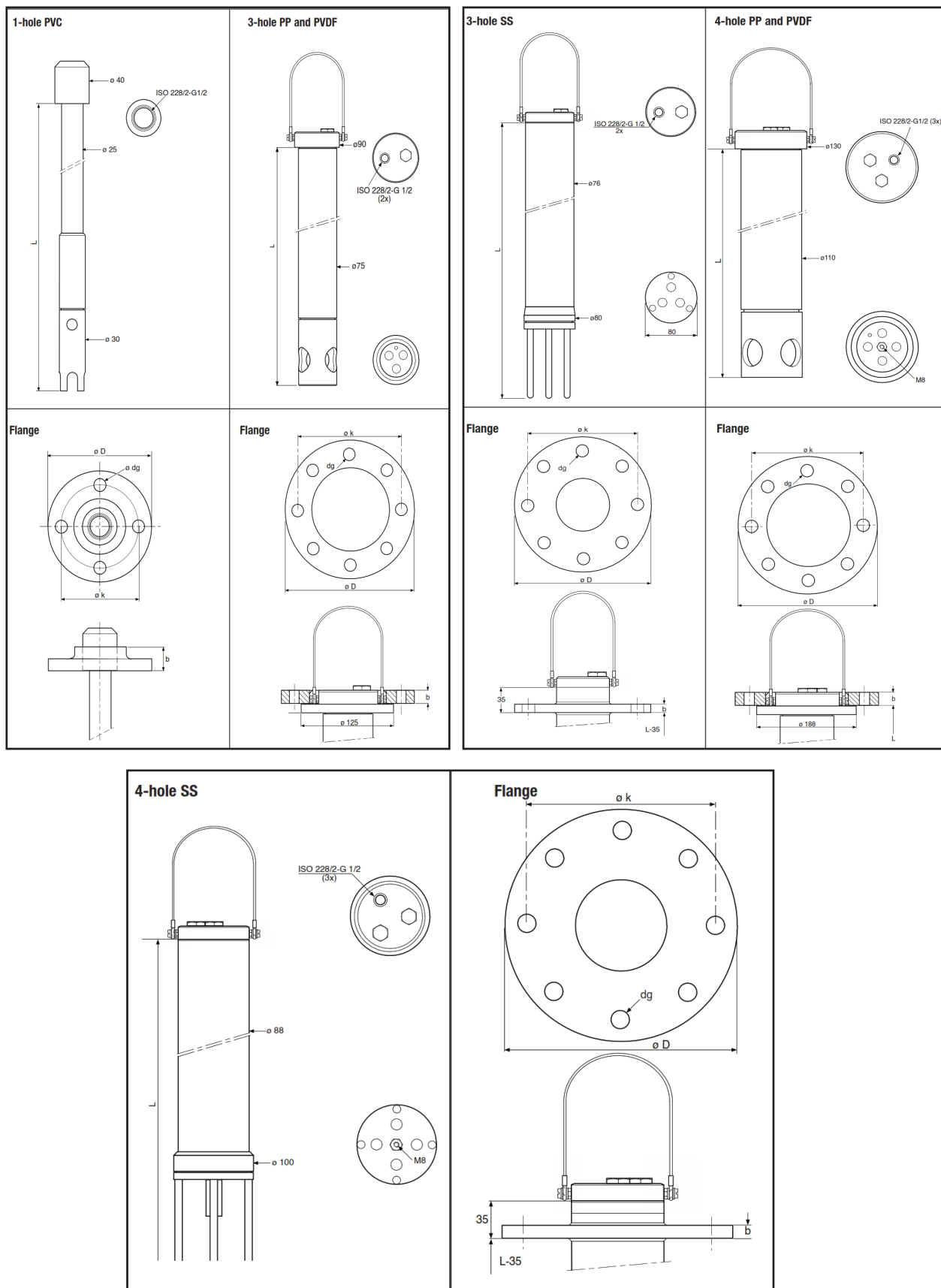


Figure 5: External dimensions for immersion fittings



**Table 4: FD20 dimensions - Unit in mm**

	L	D	k	dg	b
FD20-V18-.-NF	5-20dm				
FD20-V18-.-F1	5-20dm	120	90	14	26
FD20-V18-.-S1	5-20dm	120	90	16	26
FD20-P37-.-NF	5-20dm				
FD20-F37-.-NF	5-20dm				
FD20-P37-.-F2	5-20dm	200	160	18	20
FD20-F37-.-F3	5-20dm	200	160	18	20
FD20-P37-.-S2	5-20dm	190	152,4	20	18
FD20-F37-.-S3	5-20dm	190	152,4	20	18
FD20-S37-.-NF	5-20dm				
FD20-S37-.-F4	5-20dm	200	160	18	20
FD20-S37-.-S4	5-20dm	228,6	190,5	19	23,8
FD20-P47-.-NF	5-20dm				
FD20-F47-.-NF	5-20dm				
FD20-P47-.-F5	5-20dm	250	210	18	24±2
FD20-F47-.-F6	5-20dm	250	210	18	24±2
FD20-S47-.-NF	5-20dm				
FD20-S47-.-F7	5-20dm	220	180	18	20
FD20-S47-.-S7	5-20dm	228,6	190,5	19	23,8

### ■ 3. Model and suffix codes

**Table 5: Model and suffix codes for FS20 subassemblies**

Model	Suffix Code	Option code	Description
FS20			Subassembly (Flow fitting)
Material	-V		Polyvinylchloride (PVC)
	-P		Polypropylene (PP)
	-S		Stainless steel AISI 316 (SS)
	-F		Polyvinylidene fluoride (PVDF)
Number of holes	12		1 electrode mounting holes (only V, S)
	22		For PH20, 2 mounting holes
	32		3 electrode mounting holes
	3B		For FU20, 2 mounting holes (only P, S, F)
	3C		For FU24, 1 mounting hole (only P, S, F)
Mounting			4 electrode mounting holes (only V, S)
		-WE	Welding end: type, S12, S22,S32, S3B, S3C, S43 Glue for PVC: type V12, V22, V32, V43 Heat welding: type F22, F32, F3B, F3C, P22, P32, P3B, P3C
		-TP	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)
Cleaning system		/HCN2	FS20- .22 / FS20- .3B
		/HCN3	FS20- .32
		/HCN4	FS20- .43
Mounting kit		/B	For mounting Bellomatic reference electrodes.
		/R	For mounting (top) refillable electrodes with long glass shaft.
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-10-204 (DIN 50-049) (on SS wetted parts).

Table 6: Model and suffix codes for FF20 flow fitting

Model	Suffix Code	Option code	Description
FF20			Flow fitting
Material	-P		Polypropylene (PP)
	-S		Stainless steel AISI 316 (SS)
	-F		Polyvinylidene fluoride (PVDF)
Number of holes	22		For PH20, 2 mounting holes
	33		3 electrode mounting holes
	3B		For FU20, 2 mounting holes
	3C		For FU24, 1 mounting hole
	43		4 electrode mounting holes
	*B		Style code B
Cleaning system		/HCN2	Cleaning only for FF20-.22 / FF20-.3B / FF20-.4B
		/HCN3	Cleaning only for FF20-.33
		/HCN4	Cleaning only for FF20-.43
Mounting kit		/B	For mounting Bellomatic reference electrodes.
		/R	For mounting (top) refillable electrodes with long glass shaft.
Flange adapters (NPT ½" male lap joint).		/FP1	DN15-PN10 PP
		/FP2	DN25-PN10 PP
		/FP3	½" 150 lbs PP
		/FP4	1" 150 lbs PP
		/FF1	DN15-PN10 PVDF
		/FF2	DN25-PN10 PVDF
		/FF3	½" 150 lbs PVDF
		/FF4	1" 150 lbs PVDF
		/FS1	DN15-PN10 SS 316
		/FS2	DN25-PN10 SS 316
		/FS3	½" 150 lbs SS 316
		/FS4	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-10-024 (DIN 50-049), on SS wetted parts. Not for P3B, P4B, F3B and F4B without /HCN*.

**Table 7: Model and suffix codes for FD20 immersion fitting**

Model code	Suffix code	Option code	Description
FD20F37			Immersion fitting, PVDF, 3 electrode mounting holes
FD20F47			Immersion fitting, PVDF, 4 electrode mounting holes
FD20P37			Immersion fitting, PP, 3 electrode mounting holes
FD20P47			Immersion fitting, PP, 4 electrode mounting holes
FD20S37			Immersion fitting, SS, 3 electrode mounting holes
FD20S47			Immersion fitting, SS, 4 electrode mounting holes
FD20V18 <sup>1</sup>			Immersion fitting, PVC, 1 electrode mounting holes
Immersion length <sup>2</sup>	-NN		Between 5 and 20 (dm) example 06=0.6 m.
Flange <sup>3</sup>	-NF -F1 -F2 -F3 -F4 -F5 -F6 -F7 -S1 -S2 -S3 -S4 -S7		No flange Flange DN32 for 1 hole fitting Flange DN80 for 3 hole fitting PP Flange DN80 for 3 hole fitting PVDF Flange DN80 for 3 hole fitting SS Flange DN125 for 4 hole fitting PP Flange DN125 for 4 hole fitting PVDF Flange DN100 for 4 hole fitting SS Flange ANSI 1 1/4" 150Lbs for 1 hole fitting PVC Flange ANSI 3" 150Lbs for 3 hole fitting PP Flange ANSI 3" 150Lbs for 3 hole fitting PVDF Flange ANSI 4" 150Lbs for 3 hole fitting SS Flange ANSI 4" 150Lbs for 4 hole fitting SS
		*A	Style A
Cleaning system		/HCN3 /HCN4	Chemical cleaning for FD20- .37 Chemical cleaning for FD20- .47
Protection hose installation kit		/PH5 /PH10	For 5,5 m cable For 10 m cable
Mounting kit		/R /B	For mounting (top) refillable electrodes with al long glass shaft For mounting Bellomatic reference (SR20-AC32) and combined electrodes
KCL reservoir <sup>4</sup>		/K	Electrode tubing is included (2,5 m) (only in combination with /R)
Salt bridge		/S	For liquid which cannot stand contamination with KCL
Certificate		/M	3.1 according EN-10-204 (DIN 50049 3.1) for wetted metal parts

**Model and Suffix codes notes for FD20**

1. PVC is available in a 1-hole design only.
2. The immersion length of stainless steel fittings with a flange will be shortened by 35 mm (refer to dimensional drawings).
3. Configuration of hole (see dimensional drawings). Working pressure not more than 3 bar. For higher pressure ratings please contact your local Sales Department of Yokogawa.
4. In combination with /R option only.

**Additional Remarks:**

- a. Options are supplied with the fitting.
- b. The available length of the electrode cables between fitting and converter or connection box is cable length minus immersion length (L).
- c. It is possible to order the fittings assembled (complete with cables, cleaning system, options, etc.). Please contact your local Yokogawa sales organisation for more information.

## ■ 4. Spare parts and accessories

Table 8: Spare parts for FF20 and FS20

Spare part No		Description	FF20	FS20	
K1500FV	Cable accessories	LIQUID EARTH CABLE 10M	x	x	
K1500DU		LIQUID EARTH CABLE 25M	x	x	
K1500DW		Set of 12 cable nuts for WU20	x	x	
K1500GZ		Earthpin assy for F*20 non-S	x	x	
K1500BW	Tubing and accessories	Flow tube for SB20-VC	x	x	
K1500DX		5 m tubing for SB20	x	x	
K1500GA		5 m tube for KCl reservoir	x	x	
K1530UL		Tubing for FD30/JC, 10 metre	x	x	
K1547PH		10 m PVDF Tube and mounting	x	x	
K1500BY	Options	Option /R for F*20.. (82850747)	x	x	
K1520CD	Holders	Spare 3-hole holder PVC		x	
K1521JA		Holder for FU24(F) in FF20-S3* (SS)	x	x	
K1521JB		Holder for FU24(F) in FF20-F3* (PVDF)	x	x	
K1521JC		Holder for FU24(F) in FF20-P3* (PP)	x	x	
K1521JD		Holder for FU20(F) in FF20-S3* (SS)	x	x	
K1521JE		Holder for FU20(F) in FF20-F3* (PVDF)	x	x	
K1521JF		Holder for FU20(F) in FF20-P3* (PP)	x	x	
K1520CE		Spare 3-hole holder PP	x	x	
K1520CF		Spare 3-hole holder PVDF	x	x	
K1500FU		KCl reservoir PVC for F*20	x	x	
K1500HA		Calibr. dish for FF20-*33 (50pcs)	x		
K1500HB		Calibr. dish for FF20-*43 (50pcs)	x		
FP20-R12		Adapters	Mounting set PPS	x	x
FP20-S12			Mounting set SS	x	x
K1500DV	Adapter M25x1.5 - PG13.5 PVDF (82890155)		x	x	
K1520JN	Adapter M25x1.5 - PG13.5 PVC		x	x	
K1520JP	Adapter M25x1.5 - PG13.5 SS		x	x	
K1500DZ	Nut SS, FF/S20-3* + ISC40FF/S		x	x	
K1521AD	Flange adapter /FS3		x		
K1521AE	Flange adapter /FF3		x		
K1521AF	Flange adapter /FP3		x		
K1521AG	Flange adapter /FS4		x		
K1521AH	Flange adapter /FF4		x		
K1521AJ	Flange adapter /FP4		x		
K1521AK	Flange adapter /FS1		x		
K1521AL	Flange adapter /FF1		x		
K1521AM	Flange adapter /FP1		x		
K1521AN	Flange adapter /FS2		x		
K1521AP	Flange adapter /FF2		x		
K1521AQ	Flange adapter /FP2		x		

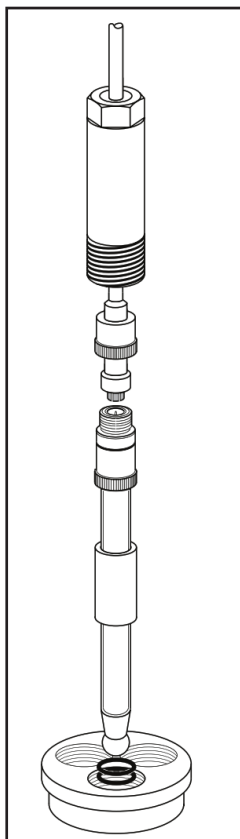
Table 8 (continue): Spare parts for FF20 and FS20

Spare part No		Description	FF20	FS20
K1547PA	Cleaning units and accessories	Hast. cleaning unit HCN2/3	x	x
K1547PB		Hast. cleaning unit HCN4	x	x
K1547PF		Nozzle and mounting HCN2/3/F	x	x
K1547PG		Nozzle and mounting HCN4	x	x
K1547PP		Spare Part EPDM spraying valves	x	x
K1520FA		Ferrule set PEEK/PTFE	x	
K1500BV	O-Ring	O-rings EPDM 11x3 (6 Pcs.)	x	x
K1500BZ		O-rings Viton 11x3 (6Pcs)	x	
K1500DD		O-RING FFKM 53.34X5.33 (1PC)	x	x
K1500EK		O-rings viton 6.07x1.78 (5x2)	x	x
K1500EQ		O-ring set EPDM FF20-S22	x	
K1500ER		O-ring set Viton FF20-S22	x	x
K1500ES		O-ring set EPDM FF20-P&F33/3B	x	
K1500ET		O-ring set Viton FF20-P&F33/3B	x	x
K1500EU		O-ring set EPDM FF20-S33/S3B	x	
K1500EV		O-ring set Viton FF20-S33/S3B	x	
K1500EW		O-ring set EPDM FF20-P&F43/4B	x	
K1500EX		O-ring set Viton FF20-P&F43/4B	x	
K1500EY		O-ring set EPDM FF20-S43/S4B	x	
K1500EZ		O-ring set Viton FF20-S43/S4B	x	
K1500FK		O-ring set Viton FF20P&F22	x	
K1500FL		O-ring set standard FF20P&F22	x	
K1500FM		O-ring set FF20-S22	x	
K1500GN		O-ring set silicon FF/FS20 3-hole/3B SS	x	x
K1500GP		O-ring set std FF/FS20 3-hole/3B P/F	x	x
K1500GR		O-rings silicon 10.77x2.62 8pcs	x	x
K1500GT		O-ring set silicon. FF20-.4.	x	x
K1500HD		O-rings silicon 10.77X2.62 50pcs	x	x
K1511DP		O-rings viton 21.9x2.62 (5x2) PH20	x	x

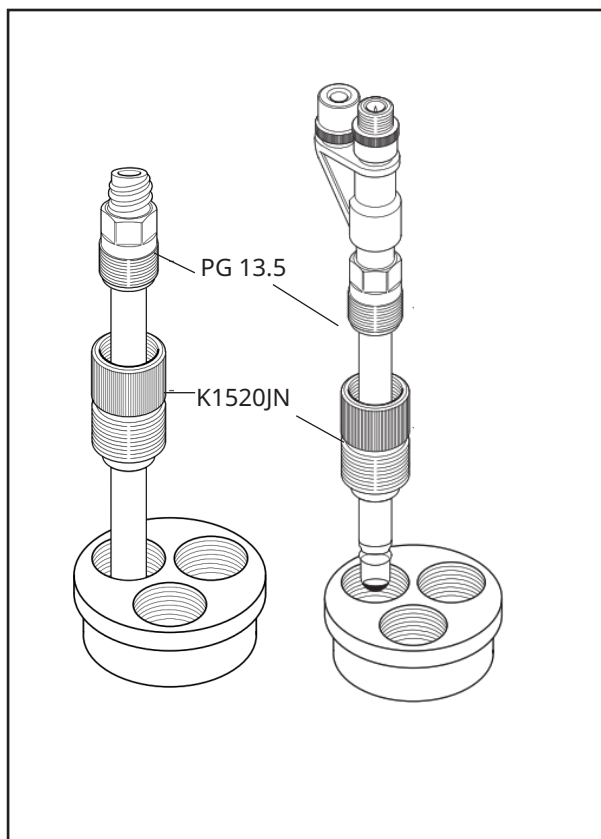
Table 9: Spare parts for FD20

Spare part No.		Description	FD20F37	FD20F47	FD20P37	FD20P47	FD20S37	FD20S47	FD20V18
K1500AW	Cable accessories	Flexible conduit, 5 meter	x	x	x	x	x	x	x
K1500AX		Flexible conduit, 10 meter	x	x	x	x	x	x	x
K1500AY		Connection parts for conduit	x	x	x	x	x	x	x
K1500FV		LlQUID EARTH CABLE 10M	x	x	x	x	x	x	
K1500DU		LlQUID EARTH CABLE 25M	x	x	x	x	x	x	
K1500GZ		Earthpin assy for F*20 non-S	x	x	x	x			
K1500DW		Set of 12 cable nuts for WU20	x	x	x	x	x	x	
K1500BW	Tubing and accessories	Flow tube for SB20-VC	x	x	x	x	x	x	
K1500DX		5 m tubing for SB20	x	x	x	x	x	x	
K1530UL		Tubing for FD30/JC, 10 metre	x		x				
K1547PH		10 m PVDF Tube and mounting	x		x		x		
K1500BY	Options	Option /R for F*20.. (82850747)	x	x	x	x	x	x	
K1500CJ		Option /PH5 (82890165)	x	x	x	x	x	x	x
K1500CK		Option /PH10 (82890160)	x	x	x	x	x	x	x
K1500EM	Holders	/PH25 for immersion holders	x	x	x	x	x	x	x
K1520AV		Bottom holder for FD20F37	x						
FP20-R12	Adapters	Mounting set PPS	x	x	x	x	x	x	
FP20-S12		Mounting set SS	x	x	x	x	x	x	
FP20-S13		Mounting set SR20-AC32	x	x	x	x	x	x	
K1500DV		Adapter M25x1.5 - PG13.5 PVDF (82890155)	x	x	x	x	x	x	
K1520JN		Adapter M25x1.5 - PG13.5 PVC	x	x	x	x	x	x	
K1520JP		Adapter M25x1.5 - PG13.5 SS	x	x	x	x	x	x	
K1547PA	Cleaning units and accessories	Hast. cleaning unit HCN2/3	x		x		x		
K1547PB		Hast. cleaning unit HCN4		x		x		x	
K1547PF		Nozzle and mounting HCN2/3/F	x		x		x		
K1547PP		Spare Part EPDM spraying valves	x		x		x		
K1520FA		Ferrule set PEEK/PTFE	x	x	x	x	x	x	
K1500FA	O-Ring	O-ring set EPDM FD20P&F37	x		x				
K1500FB		O-ring set Viton FD20P&F37	x		x				
K1500GR		O-rings silicon 10.77x2.62 8pcs	x	x	x	x	x	x	x
K1500GU		O-ring set FD20P&F37	x		x				
K1500HD		O-rings silicon 10.77X2.62 50pcs	x	x	x	x	x	x	x
K1500FF		O-ring set Viton FD20P&F47		x		x			
K1500GV		O-ring set FD20P&F47		x		x			
K1500FC		O-ring set EPDM FD20-S37					x		
K1500FD		O-ring set Viton FD20-S37					x		
K1500GW		O-ring set FD20S37					x		
K1500FG		O-ring set EPDM FD20-S47						x	
K1500FH		O-ring set Viton FD20-S47						x	
K1500GT		O-ring set silicon. FF20-.4.						x	
K1500GX		O-ring set FD20S47						x	

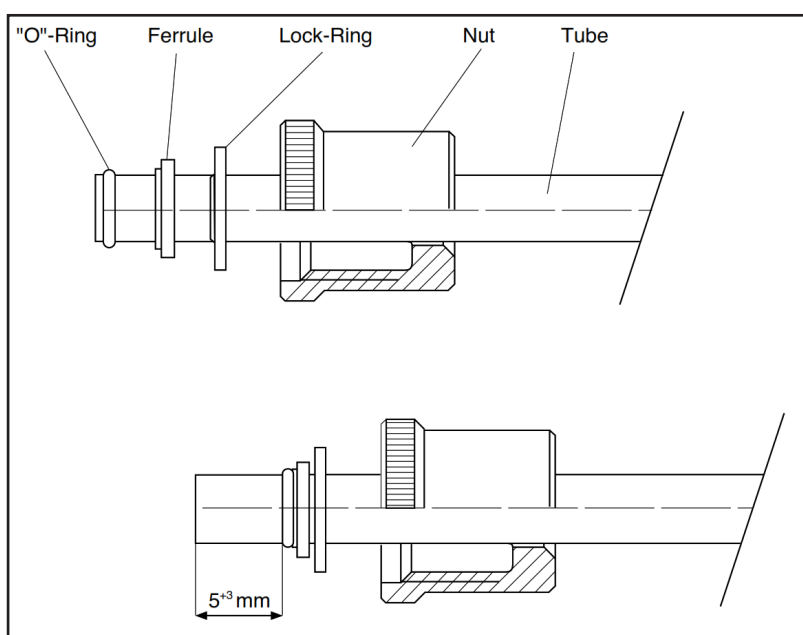
## ■ Addendum 1: Typical Installations



**Figure 6:** Standard mounting with mounting set FP20-R12, FP20-S12



**Figure 7:** Mounting PG13.5 in Yokogawa fitting using the adapter K1520JN (PVC-C) or K1500DV (PVDF)



**Figure 8:** Mounting the tube connection for the SC21C-AGC55

## ■ Addendum 2: Chemical compatibility

Table 10: Chemical compatibility chart

Chemical		Concentration and pH		Material			
		W/V (%)	pH	PVC	PVDF	PP	SS316
	Sulfuric acid	0.5	1.0	O	O	O	X
		0.05	2.0	O	O	O	X
Inorganic acid	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	*
	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	*	
Organic acid	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
	Monochloroacetic acid	0.9	1.8	X	O	O	O
Alkali	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
	Ammonium hydroxide	0.5	10.4	O	O	O	O
Acid salt	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:**

1. pH in table was calculated with dissociated constant (related to measurement)
2. 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.



## ■ Addendum 3: Operating range

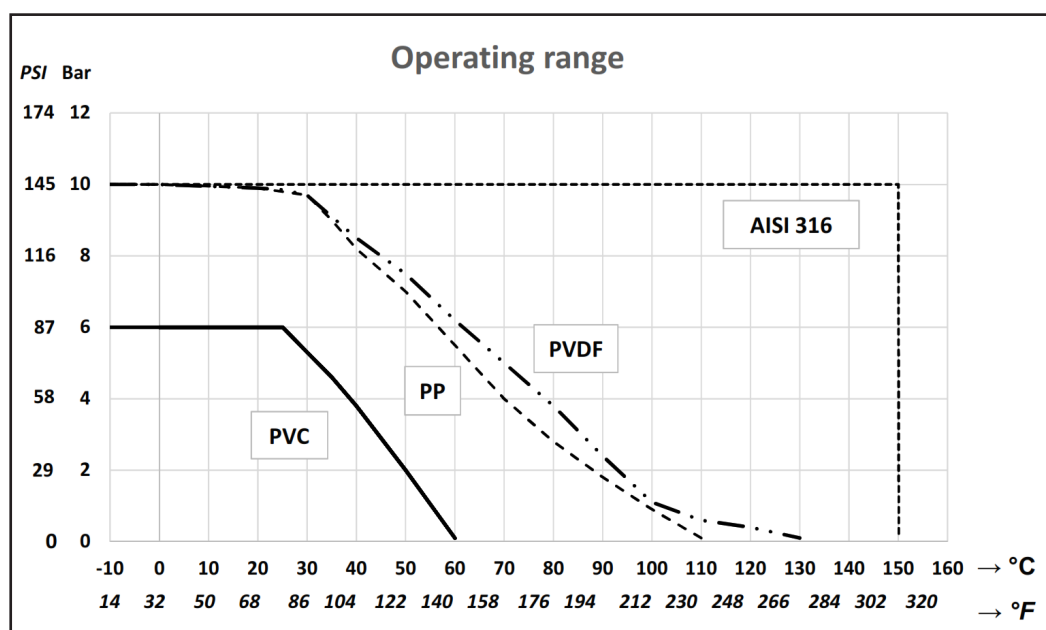


Figure 9 Pressure/temperature operating range

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