General Specifications

Model PH20, FU20 and FU24
analog 4 in 1 pH sensor

A family of the wide body sensor is available for application in a wide variety of processes. The sensors share the same valuable features:

• Long life saturated Ag/AgCl reference system.
• PTFE reference diaphragm to prevent fouling and reduce measurement error.
• Double junction combined with ion-trap to prolong the life of the reference probe, even in chemically unfavorable environments.
• Integral Pt1000 element for accurate temperature measurements.
• Platinum ORP/LE electrode for accurate simultaneous pH- and ORP measurements.
• Polymerized electrolyte to extend the sensors life time.
• Versatile in-line, immersion or off-line installation.

For general purpose applications: FU20
The FU20 combination sensor shows how Yokogawa applies the motto "Simply the Best" to sensor technology. The wide body sensors (26 mm diameter) hold four separate measuring elements in one unbreakable and chemical resistant PPS 40GF body. Installation is simple with the integrated industrial 3/4" tapered thread. Temperature fluctuations are compensated to extend the sensor life. The FU20 is targeted at those applications where simplicity will result in accurate and reliable pH- or redox measurements. This means that in 90% of the known applications, this sensor will be an excellent choice.
In general purpose applications running at constant pressure and temperature the FU20 sensor has proven it use for years. In the standard configuration the wide body sensors hold four separate measuring elements in one unbreakable body made of PPS 40GF. This sensor offers a cost effective and rigid solution to the users. In strong acidic applications and in In cases where the chemical compatibility of PPS does not address the process needs, the FTD version made in a PVDF body offers the required solution. The additional chemical compatibility offered by the PVDF version addresses the needs in several applications.

For more difficult applications: FU24
The FU24 is also made with a chemical resistant PPS 40GF body. It is particularly useful in harsh applications with fluctuating pressure and/or temperature. Process fluid may be moving in and out of the sensor under influence of frequent pressure and/ or temperature fluctuations. This results in fast desalting and dilution of the reference electrolyte. This on its turn will change the reference voltage and cause a drifting pH measurement.

By using the successful Yokogawa Bellow system integrated in the FU24 electrode, a strong pressure compensation mechanism is created. The build-in bellow ensures immediate interior pressure equalization to the outside pressure, making the sensor virtually insensitive to external pressure variations.

A slight overpressure caused by the bellow tension, prevents fluid ingress and maintains a positive ion flow out of the sensor. This feature is of particular interest in pure water applications.

Both FU20 and FU24 are available with VP connector. This makes installation a lot easier. All sensors are delivered with a Quality Certificate.

In addition to our analogue sensors Yokogawa delivers a platform consisting of so called SMART sensors in combinaton with the SENCOM SMART adapter SA11. In the SENCOM platform digital functionality allows:
• Perform off-line calibration reducing process impact.
• Enable easier asset management
• Enable easier statistical process control
• Easier monitoring of extreme conditions during use.

For additional information about SENCOM and its benefits request you to check the applicable GS-document number GS 12A06S01-01Z1. This document is available from our website and through our regional offices.

YOKOGAWA ◆

General Specifications FU20

Measuring elements   : pH glass electrode
: Silver Chloride reference
: Solid Platinum electrode
: Pt1000 temperature sensor

Construction materials
Wetted parts
Sensor body   : NPT, FSM: PPS GF40: FTD :
PVDF- (GF25+TZ24)
Earthing pin   : Solid Platinum
Measuring sensor   : G-glass
LE glass tube   : AR-glass
O-ring   : Viton-FTS and FSM,FTD and NPT
Reference junction   : Porous PTFE

Functional specifications (at 25°C)
Isothermal point   : pH 7
Reference system   : Ag/AgCl with saturated KCl
Glass impedance
- Dome shape   : nominal 200MΩ
- Flat Surface   : nominal 700MΩ
Junction resistance   : 1 to 15 kΩ
Temperature element   : Pt1000 to IEC 751
Asymmetry potential   : 8 ± 15 mV
Linearity PH (Slope)   : > 96 % (of theoretical value)

Dynamic specifications (at 25°C)
Response time pH step (7 to 4)
: < 15 sec for 90%
Response time temp step (10°C)
- Dome shape   : < 1 min for 90%
- Flat Surface   : < 4 min for 90%
Stabilization time (0.02 pH unit/10 s)
: < 2 minutes

Operating range
pH   : 0 to 14
ORP   : -1500 to 1500 mV
rH   : 0 to 100
Temperature
- Dome shape   : -10°C to 105°C (14°F to 221°F)
- Flat surface   : 15°C to 105°C (59°F to 221°F)
Pressure   : 0 to 10 bar (0 to 142 PSIG)
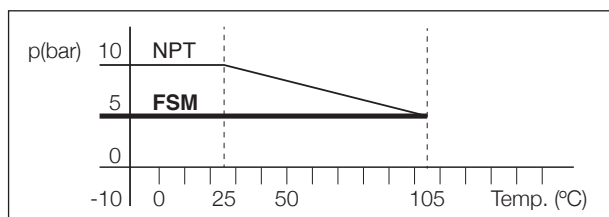
Conductivity   : > 50 µS/cm

Note: The pH operating range at room temperature is 0-14pH,
but at high temperatures the lifetime will be seriously
shortened outside 2-12 pH range.

Note: For detailed information about SENCOM sensors refer to
current edition of GS12B03J04.

GS 12B06J03-E-E

General specifications FU24

Measuring elements   : pH glass electrode
: Silver/Silver Chloride reference
: Solid Platinum electrode
: Pt1000 temperature sensor

Construction materials
  Wetted materials:
  Body   : PPS 40GF

  Measuring Sensor   : G-Glass
  Earth Pin   : Solid platinum
  Reference Junction   : Porous PTFE
  O-ring   : Viton

Functional specifications
Isothermal point   : pH 7
Glass impedance
- Dome shape   : nominal 200 MΩ
- Flat Surface   : nominal 700 MΩ
Reference system   : Double junction,
Ag/AgCl with saturated KCl,
including Ag^+ ion trap
Junction resistance   : 1 to 15 kΩ
Temperature element   : Pt1000 to IEC 751
Asymmetry potential   : 8 ±15 mV
Linearity PH (Slope)   : > 96 % (of theoretical value)

Note: The temperature sensor included in the FU24 is intended
to provide indication and cell compensation. The
construction has not been tested to the pressure vessel
standards required for plant temperature control.

Dynamic specifications
Response time pH step (7 to 4)
: < 15 sec for 90%
Response time temp step (10°C)
- Dome shape   : < 1 min for 90%
- Flat Surface   : < 4 min for 90%
Stabilization time (0.02 pH unit/10 s)
: < 2 minutes

Operating range
pH   : 0 to 14
Temperature   NPT   : -10 - 105 °C (14 - 221 °F)
              FSM   : 15 - 105 °C (59 - 212 °F)
Pressure   : 0 to 10 bar (0 to 145 PSIG)
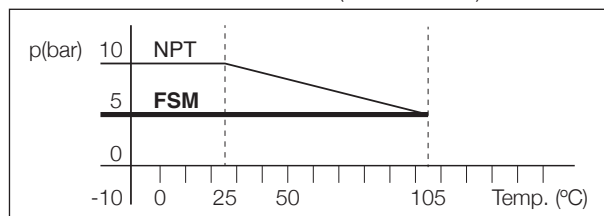
Storage temp.   : -15 to 50 °C (5 to 122 °F)

Note: The FU24 is suitable for pure water applications.

Note: Specifications should not be considered in isolation.
For example the pH range can be 2-12pH, where the
measurement is at elevated temperatures. For advice
about specific applications please contact your local sales
office.

Note: For detailed information about SENCOM sensors refer to
current edition of GS12B03J04.

General Specifications PH20
(to be discontinued)

Measuring elements	: pH glass electrode and Silver /Silver chloride reference system.
	: Platinum electrode and Pt1000 temperature sensor.

Construction materials

Body	: PVDF
Earthing pin	: Solid platinum/glass
O-ring	: Viton
Reference junction	: Porous PTFE
Cable	: Coaxial with 4 extra leads
Sheet material	: Thermoplastic rubber
Measuring Sensor	: G-Glass

Operating range

pH	: 0 to 14
ORP	: -1500 to 1500 mV
rH	: 0 to 100
Temperature	
- Dome shape	: -10°C to 105°C (14°F to 105°F)
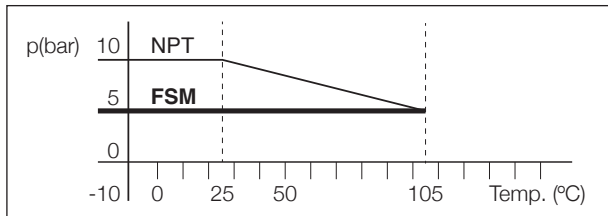
- Flat surface	: 15°C to 105°C (59°F to 221°F)
Conductivity	: > 50 µS/cm

Note: The pH operating range at room temperature is 0-14pH, but at high temperatures the lifetime will be seriously shortened outside 2-12 pH range.

Functional specifications (at 25°C)

Isothermal point	: pH 7
Reference system	: Ag/AgCl with saturated KCl
Glass impedance	: 200 MΩ (nominal), G-glass
Junction resistance	: 1 to 10 kΩ
Temperature element	: Pt1000 to IEC 751
Asymmetry potential	: 8 ± 15 mV
Linearity PH (Slope)	: > 96 % (of theoretical value)

Dynamic specifications (at 25°C)

Response time pH step (7 to 4)	
	: < 15 sec for 90%
Response time temp. step (10°C)	
	: < 1 min for 90 %
Stabilisation time (0.02 pH/10 s)	
	: < 2 minute

Operating range

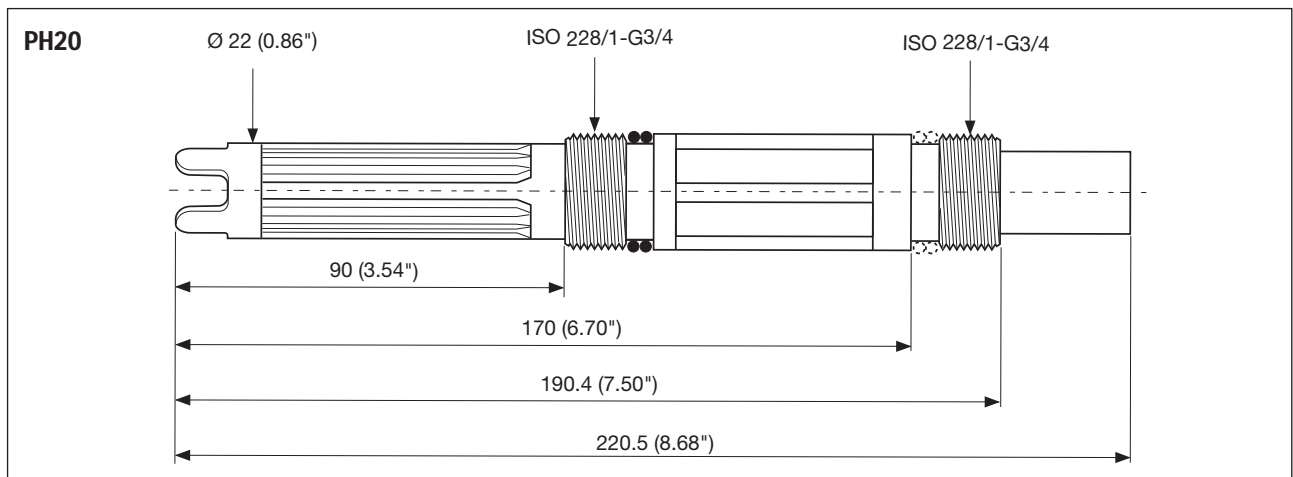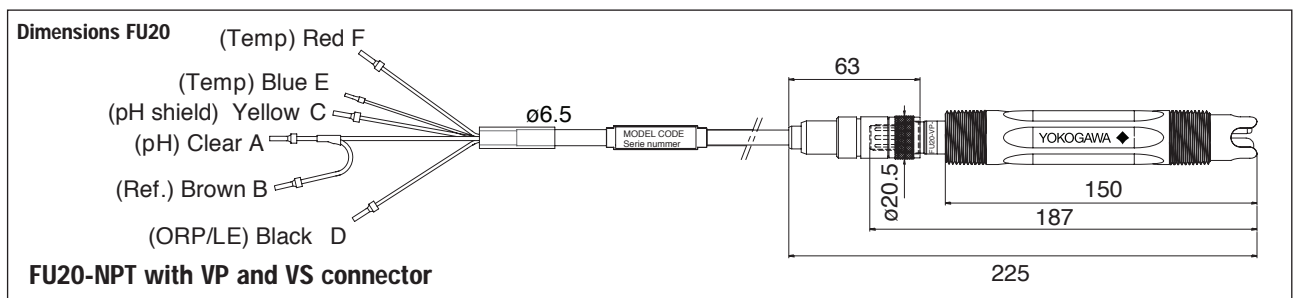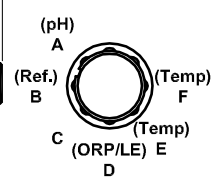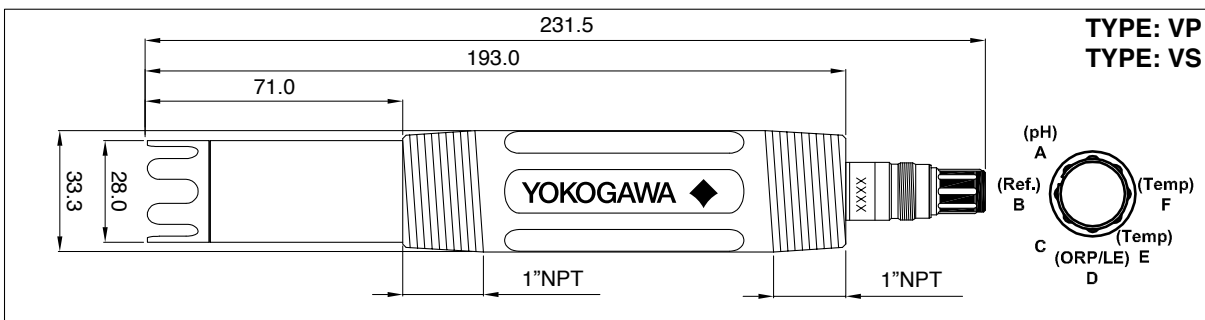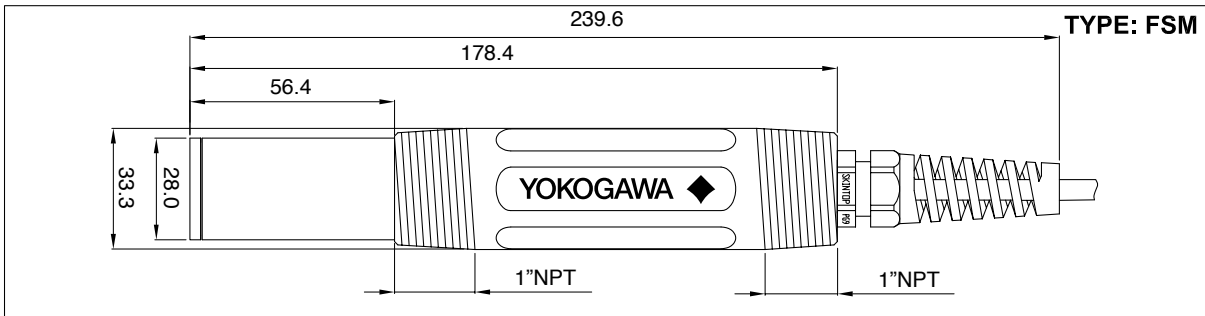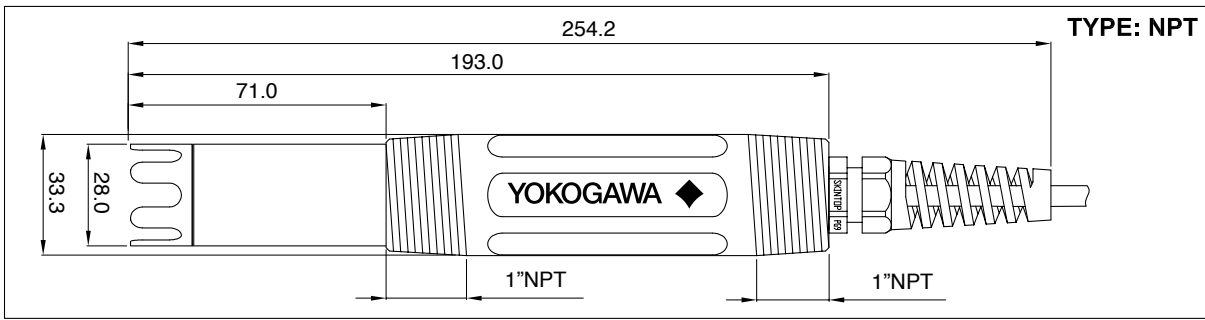|	
pH	: 0 - 14*
Temperature	: -10 to 105ºC (14 to 221 °F)
Pressure	: 0 to 10 bar (0 to 142 PSIG)
Conductivity	: > 50 µS/cm
Storage temperature	: -10 to 50ºC (-22 to 122 °F)
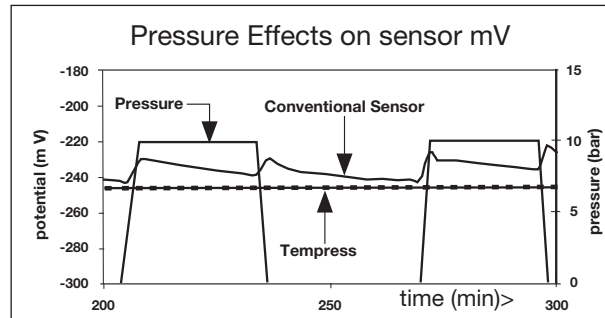
The erratic trend of the standard sensor shows the progressive contamination of its reference junction. The graph indicates between 0.1 to 0.4 pH error with the conventional sensor while the readings from the PH20 are extremely stable.
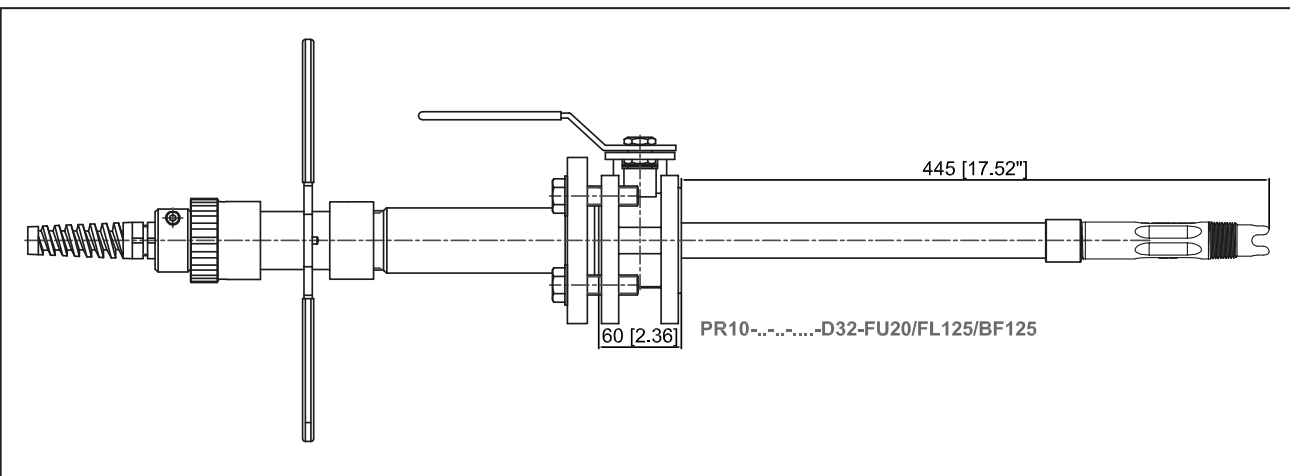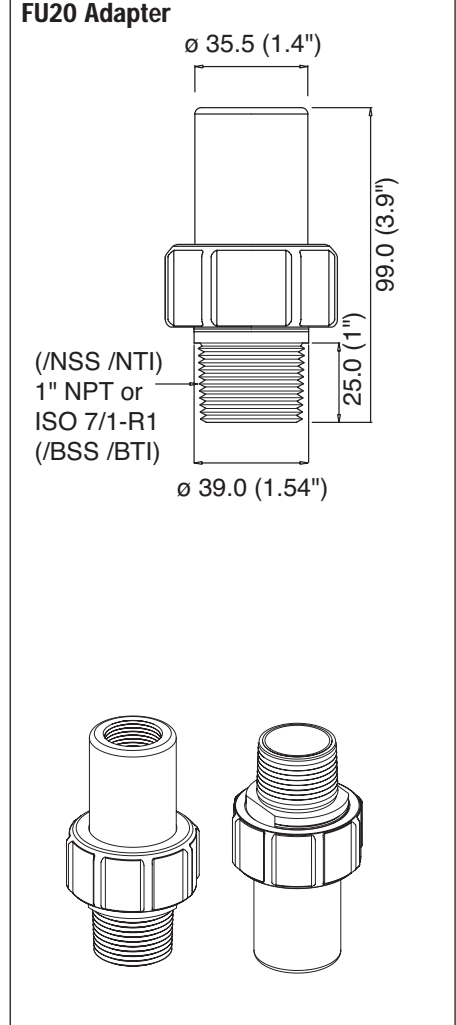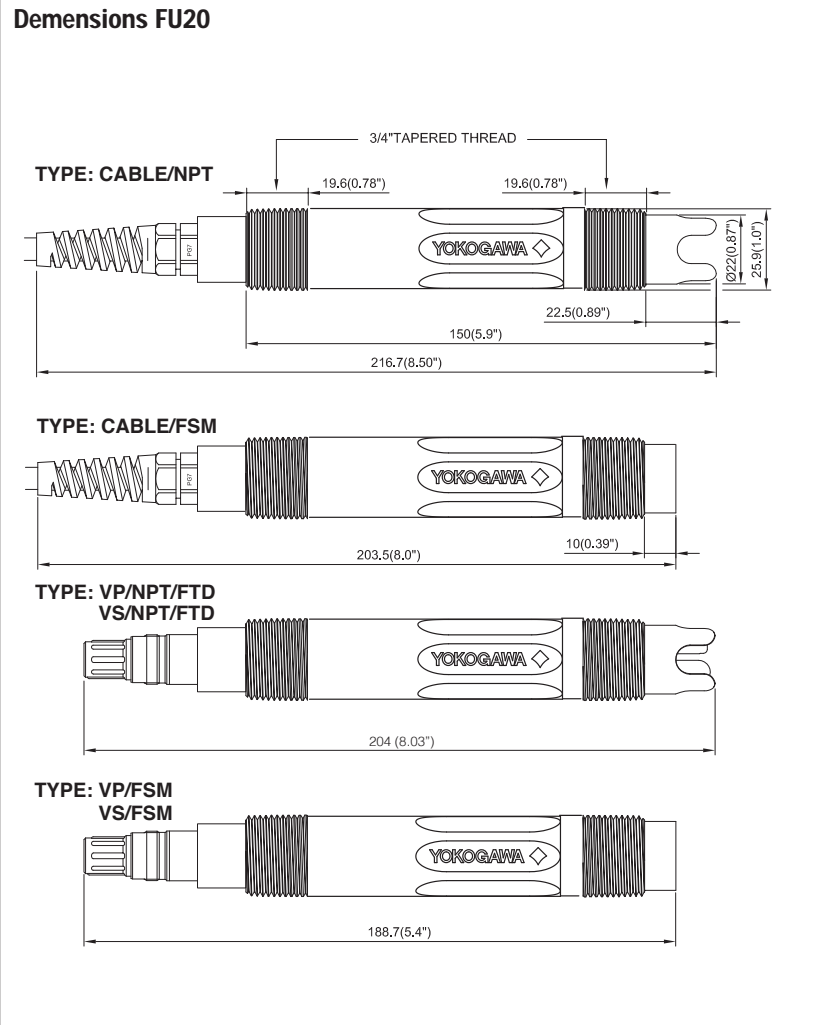
Tablenaam

FU20-03 FU20-05 FU20-10 FU20-20	FU20-VP FU20-VS		FU24-05 FU24-10	FU24-VP FU24-VS	PH20
Integrated	WU10-V-S-02 WU10-V-S-05 WU10-V-S-10 WU10-V-S-15 WU10-V-S-20		Integrated	WU10-V-S-02 WU10-V-S-05 WU10-V-S-10 WU10-V-S-15 WU10-V-S-20	Integrated
Flow Immersion Sub-assembly	: FF40+option/FPS or K1523DD : FD40+option/FPS or K1523DD : FS40+option/FPS or K1523DD	Flow Sub assembly	FF20 + K1521JA FS20 + K1521JA	Flow : FF20-*22 Immersion : FD40+option/SF4 or K1547QF Subassembly : FS20-*22	
Option HCNF or K1547PJ					Option /HCN2 or K1547PA when using FF20 or FS20 Option /HCNF or K1547PJ when no fitting is used
1"NPT SS /NSS or K1547PK 1"NPT Ti /NTI or K1547PM 1"BSP SS /BSS or K1547PL 1"BSP Ti /BTI or K1547PN					3/4"NPT SS /SN3 or K1547QA 3/4"R SS /SR3 or K1547QB 1"NPT PVDF / FN4 or K1547PC 1"R PVDF / FR4 or K547PD

Dimensions FU24

TYPE: NPT

254.2
193.0
71.0
33.3
28.0
1"NPT
1"NPT

TYPE: FSM

239.6
178.4
56.4
33.3
28.0
1"NPT
1"NPT

TYPE: VP
TYPE: VS

231.5
193.0
71.0
33.3
28.0
1"NPT
1"NPT

XXXX

(pH) A
(Ref.) B
C
(ORP/LE) D
(Temp) E
(Temp) F

Dimensions FU20

(Temp) Red F
(Temp) Blue E
(pH shield) Yellow C
(pH) Clear A
(Ref.) Brown B
(ORP/LE) Black D

ø6.5
MODEL CODE
Serie nummer
63
ø20.5
YOKOGAWA
150
187
225

FU20-NPT with VP and VS connector

PH20

Ø 22 (0.86")
ISO 228/1-G3/4
ISO 228/1-G3/4
90 (3.54")
170 (6.70")
190.4 (7.50")
220.5 (8.68")

Unit: mm

Dimensions

Demensions FU20

TYPE: CABLE/NPT

3/4"TAPERED THREAD

19.6(0.78") 19.6(0.78")

Ø22(0.87")
25.9(1.0")

22.5(0.89")

150(5.9")

216.7(8.50")

YOKOGAWA

TYPE: CABLE/FSM

203.5(8.0")

10(0.39")

YOKOGAWA

TYPE: VP/NPT/FTD
VS/NPT/FTD

204 (8.03")

YOKOGAWA

TYPE: VP/FSM
VS/FSM

188.7(5.4")

YOKOGAWA

FU20 Adapter

ø 35.5 (1.4")

99.0 (3.9")

(/NSS /NTI)
1" NPT or
ISO 7/1-R1
(/BSS /BTI)

25.0 (1")

ø 39.0 (1.54")

445 [17.52"]

60 [2.36]   PR10-..-..-....-D32-FU20/FL125/BF125

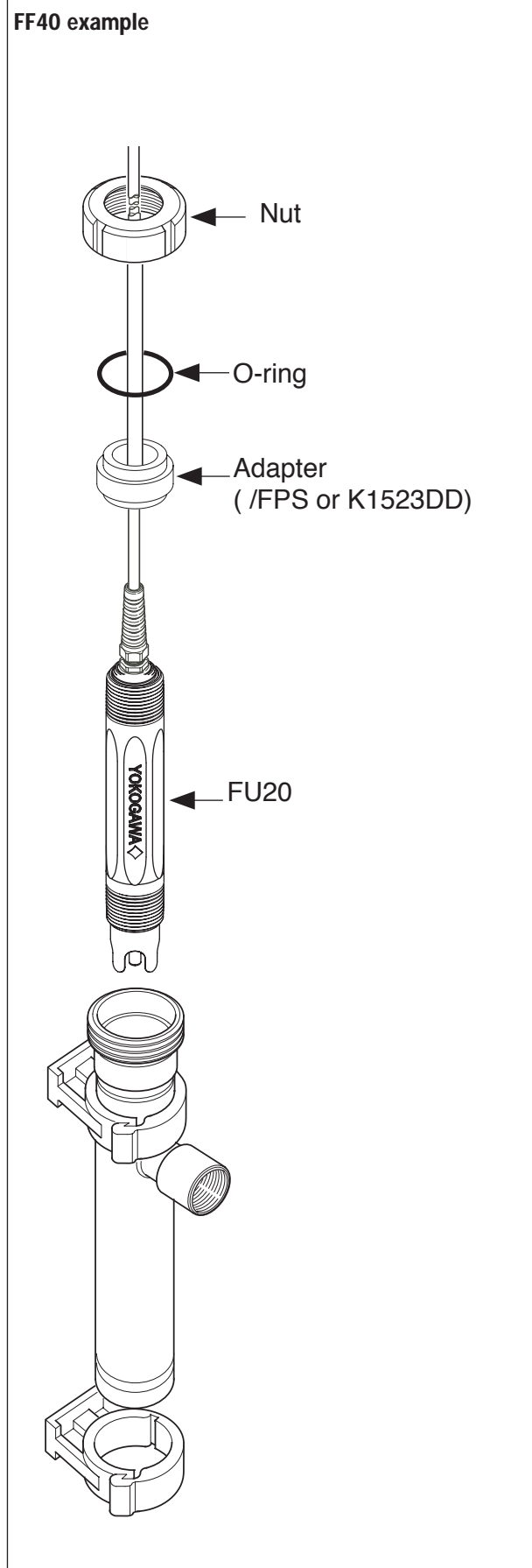**Installation example for FU20 in PR10 retractable fitting**

Unit: mm (inches)

GS 12B06J03-E-E

Installation examples using the FU20 adapter range

FD40 also for FF40 and FS40

Fitting

Adapter
(/FPS or K1523DD)

O-ring

FU20

O-ring

FF40 example

Nut

O-ring

Adapter
(/FPS or K1523DD)

FU20

Ø 30.0 (1.18")

22 mm

35.0 (1.38")

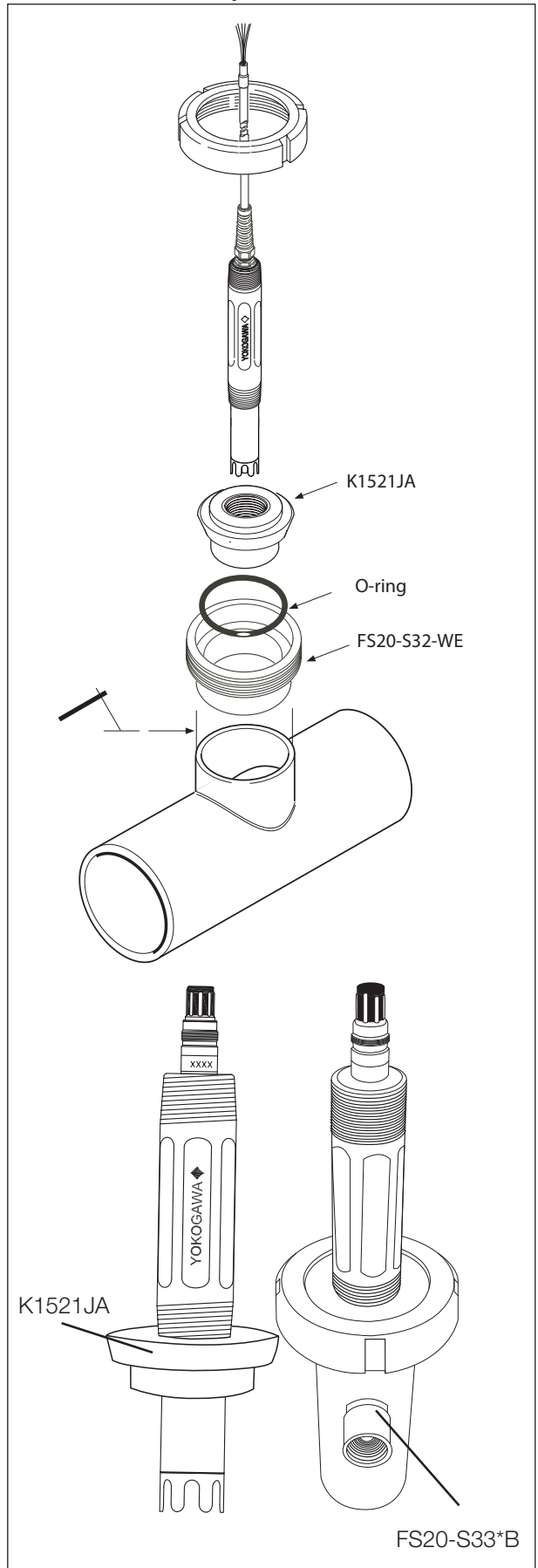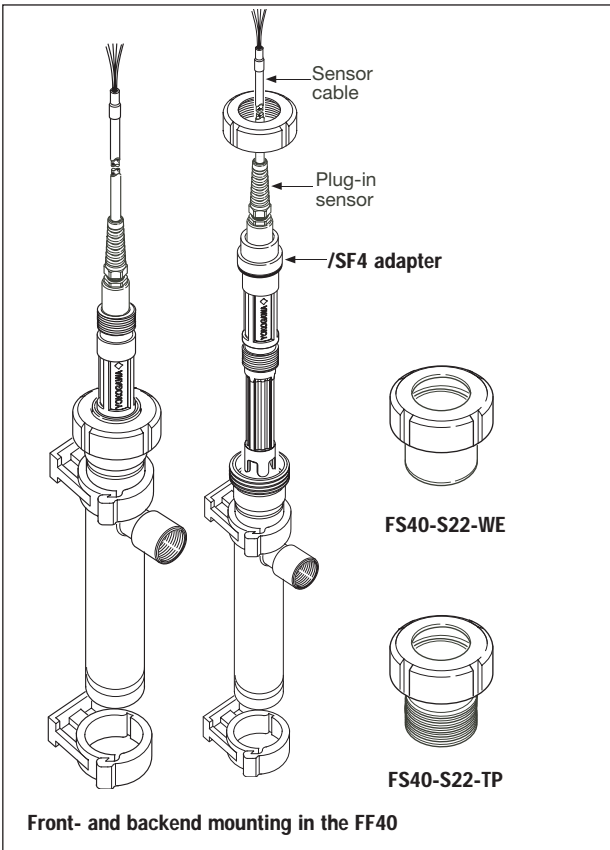5.0 (0.2")

10.0 (0.4")

Ø 30.0 (1.18")

Ø 36.0 (1.42")
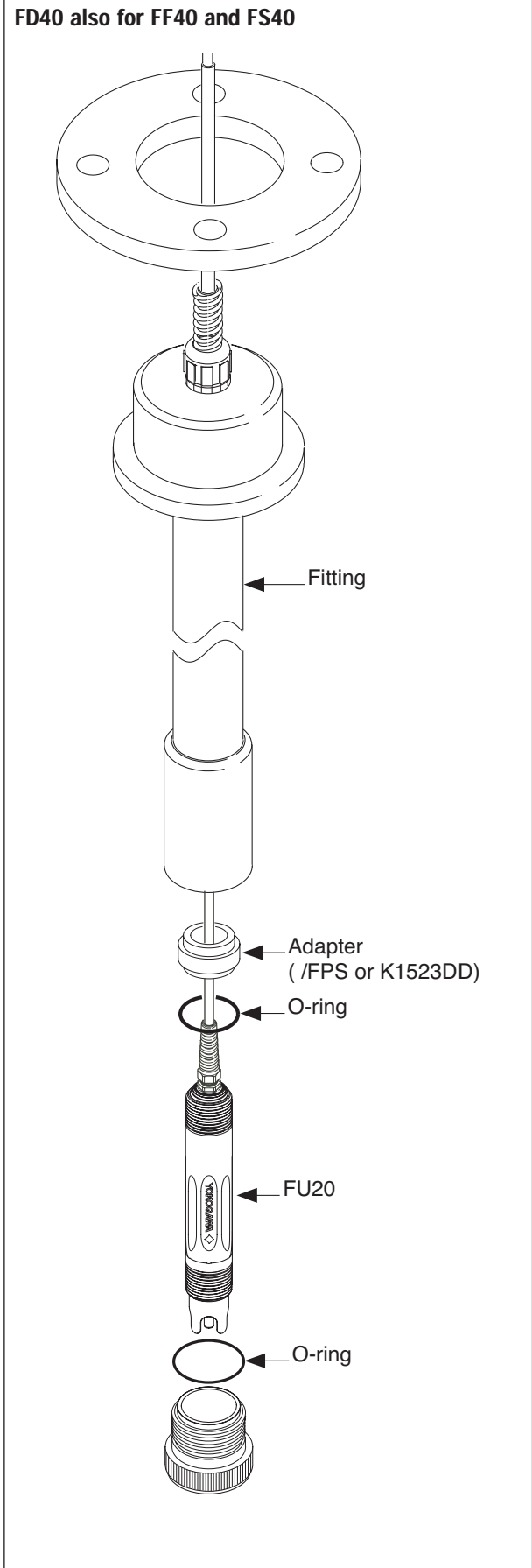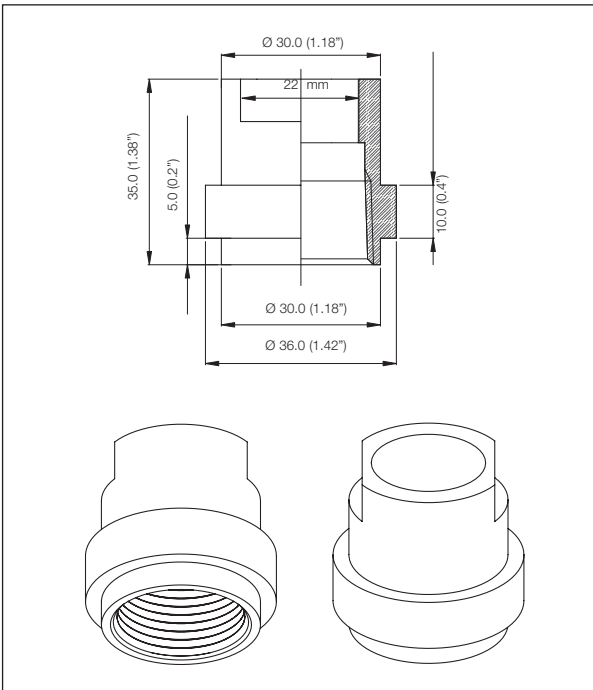
Dimensions PPS adapter for FF40, FS40 and FD40 fittings (/FPS or K1523DD)
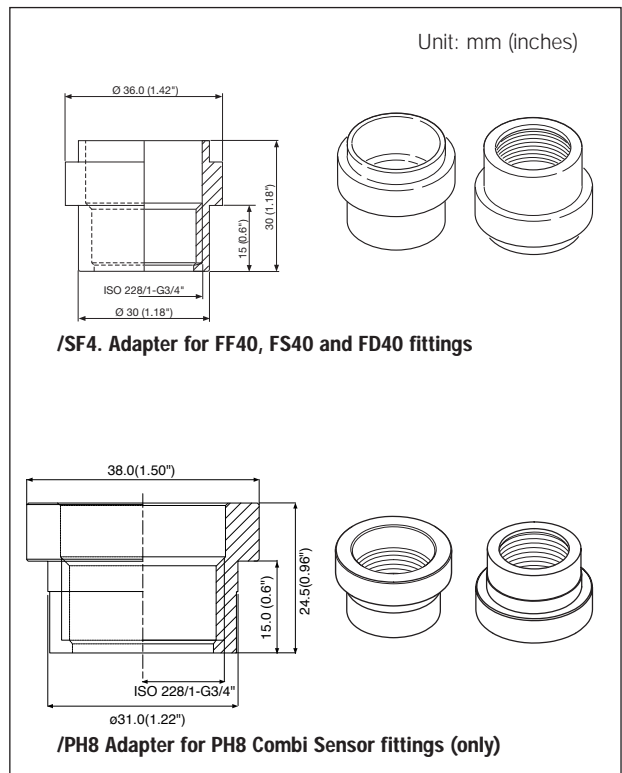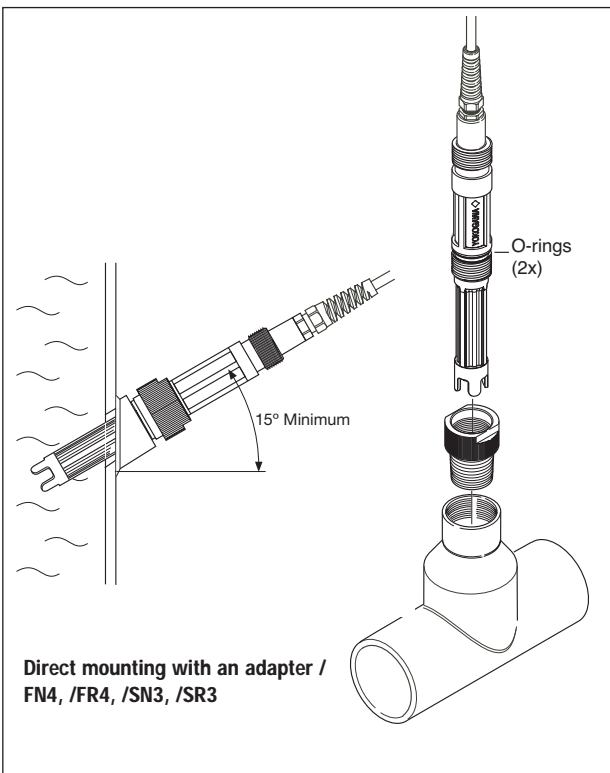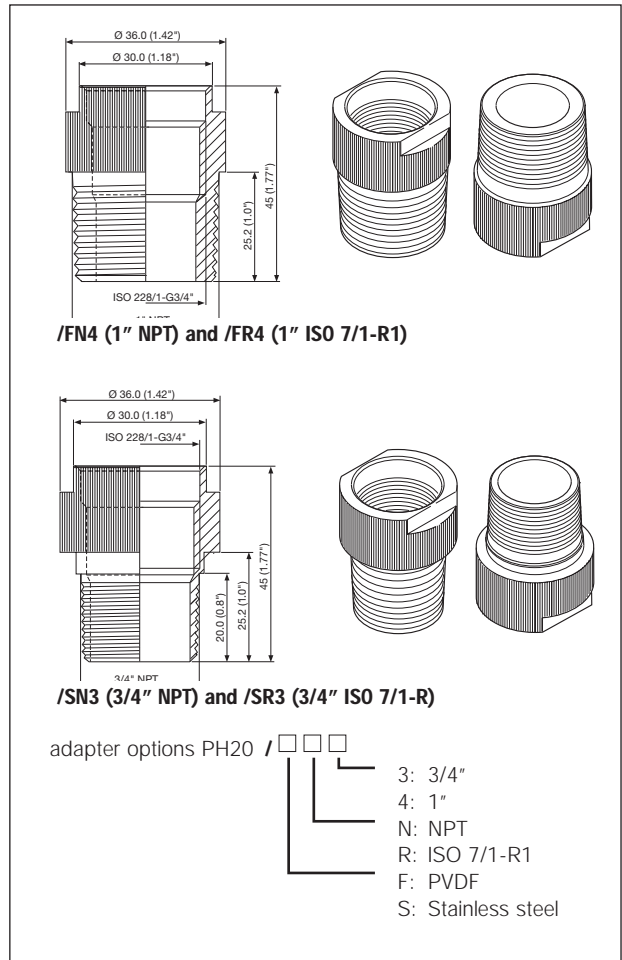**Note: old part K1523DC is not compatible with VP connector and sensors manufactered after December 2009.**

FU20 + adapter

FS20 installation example for FU24

K1521JA

O-ring

FS20-S32-WE

K1521JA

XXXX

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FS20-S33*B
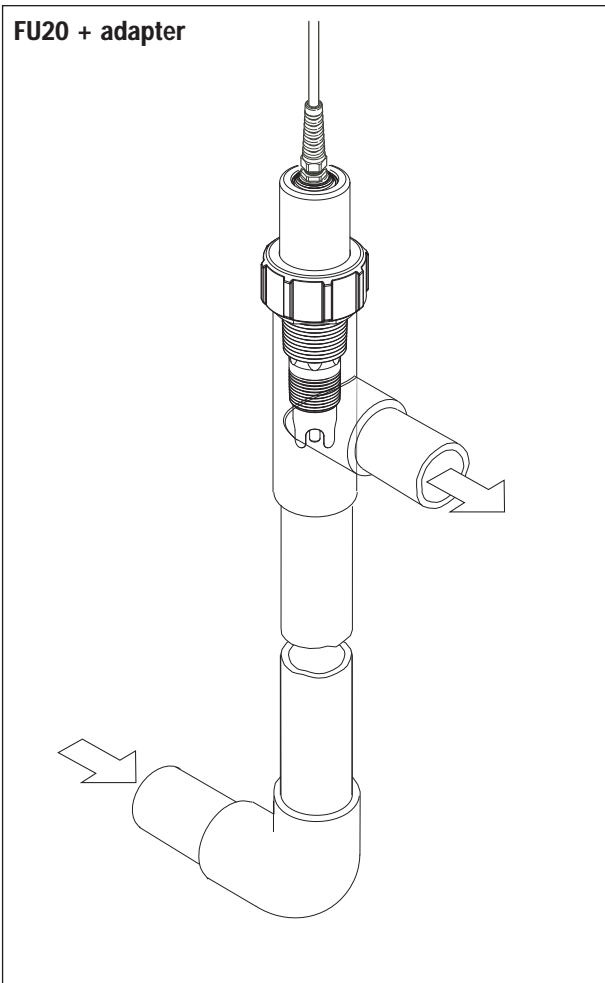
Installation examples using the PH20 adapter range

Sensor cable

Plug-in sensor

/SF4 adapter

FS40-S22-WE

FS40-S22-TP

Front- and backend mounting in the FF40

Using the /SF4 adapter, the PH20 can be mounted in the standard range of conductivity flow fitting (FF40..), the immersion fittings (FD40-..) and sub-assemblies (FS40..). The adapter can be mounted on the front thread, or the back thread dependent on the required insertion depth.

Ø 36.0 (1.42")
Ø 30.0 (1.18")
25.2 (1.0")
45 (1.77")
ISO 228/1-G3/4"

/FN4 (1" NPT) and /FR4 (1" ISO 7/1-R1)

Ø 36.0 (1.42")
Ø 30.0 (1.18")
ISO 228/1-G3/4"
20.0 (0.8")
25.2 (1.0")
45 (1.77")
3/4" NPT

/SN3 (3/4" NPT) and /SR3 (3/4" ISO 7/1-R)

adapter options PH20 /□□□

3: 3/4"
4: 1"
N: NPT
R: ISO 7/1-R1
F: PVDF
S: Stainless steel

15° Minimum

O-rings (2x)

Direct mounting with an adapter / FN4, /FR4, /SN3, /SR3

Unit: mm (inches)

Ø 36.0 (1.42")
30 (1.18")
15 (0.6")
ISO 228/1-G3/4"
Ø 30 (1.18")

/SF4. Adapter for FF40, FS40 and FD40 fittings

38.0(1.50")
15.0 (0.6")
24.5(0.96")
ISO 228/1-G3/4"
ø31.0(1.22")

/PH8 Adapter for PH8 Combi Sensor fittings (only)

MODEL CODES

Model Code	Suffix	Option	Description
FU20			Wide Body sensor
Cable length	-03		3 m cable
	-05		5 m cable
	-10		10 m cable
	-20		20 m cable
	-VP		No Cable; Vario Pin connector
	-VS		No Cable; Vario Pin for SENCOM connector
Temp. Sensor	-T1		Pt1000
	-T2		Pt100 (not available for FTD, FTS,MTS and VS)
Model	-NPT		PPS body / Tapered Thread / Dome shaped
	-FSM		PPS body / Tapered Thread / Flat Surface
	-FTD		PVDF body / Tapered Thread / Dome shaped
	-FTS		PVDF body / Tapered Thread / Salt Sensitive membrane/ Silicone sealing
	-MTS		PVDF body / Tapered Thread / Salt Sensitive membrane/ FFKM sealing
Options		/HCNF	Complete Hastelloy cleaning system
		/FPS	Adapter F*40 from PPO
		/NSS	1" NPT, SS316
		/NTI	1" NPT, Titanium
		/BSS	1" BSP, SS316
		/BTI	1" BSP, Titanium

(-03, -05, -10, -20: not available for FTD, FTS and MTS)

Model Code	Suffix Code	Option	Description
FU24			Wide body sensor
Type	- VP		No Cable; Vario Pin connector
	- VS		No Cable; Vario Pin for SENCOM connector
	- 05		Fixed cable, 5 meter
	- 10		Fixed cable, 10 meter
Temp. element	- T1		Pt1000
Model		- NPT	Dome shape model
		- FSM	Flat surface model

Model Code	Suffix Code	Option	Description
PH20			"4 in 1" combination sensor
Material	-F		Polyvinylideenfluoride (PVDF)
Menbrane	-G		
Cable length	-02		2 meter
	-05		5 meter
	-10		10 meter
	-20		20 meter
	-30		30 meter
Temp. element	-T1		
	-N -A		Always -N-A
Options		/SN3	Stainless steel 3/4" NPT adapter (316L)
		/SR3	Stainless steel 3/4" R adapter (316L)
		/FN4	PVDF 1" NPT adapter
		/FR4	PVDF 1" R adapter
		/PH8	Adapter for PH8 combi sensor fittings (only)
		/SF4	Stainless steel adapter for FF40, FS40 and FD40 fitings
		/HCNF	Hastelloycleaning system

Model & Suffix codes WU10

Model	Suffix Code	Description
WU10		Universal sensor cable
Connector type	-V	Variopin
Cable type	-S	Single Coax
	-D	Dual Coax
Cable length	-02	2 meters
	-05	5 meters
	-10	10 meters
	-15	15 meters
	-20	20 meters

Spare parts PH20, FU20, FU24 & cleaning system

| Part no.	Description
K1500EK	O-rings Viton 6.07x1.78 (5x2)
K1500ER	O-ring set Viton FF20-S22
K1500FR	O-rings Viton 29.82x2.62 (5)
K1500FS	O-rings EPDM 29.82x2.62 (5)
K1500FT	O-rings Silicone, 29.82x2.62 (5)
K1511DP	O-rings Viton 21.9x2.62 (5x2)
K1511DQ	O-rings EPDM 21.9x2.62 (5x2)
K1520FA	Ferrule set PEEK/PTFE
K1520ZD	Mounting nut for PH20
K1521JA	SS holder FU24 1"NPT FF20 + FS20
K1521JB	Holder for FU24(F) in FF20-F3* (PVDF)
K1521JD	Holder for FU20(F) in FF20-S3* (SS)
K1521JE	Holder for FU20(F) in FF20-F3* (PVDF)
K1521JF	Holder for FU20(F) in FF20-P3* (PP)
K1523DD	/FPS, FU20-mounting in F*40
K1547PC	/FN4 for PH20
K1547PD	/FR4 for PH20
K1547PE	/PH8 for PH20
K1547PF	Nozzle and mounting HCN2/3/F
K1547PG	Nozzle and mounting HCN4
K1547PH	10 m PVDF Tube and mounting
K1547PJ	Hastelloy cleaning unit HCNF
K1547PK	Adapter 1" NPT, SS 316 for FU20
K1547PL	Adapter 1" BSP, SS 316 for FU20
K1547PM	Adapter 1" NPT, Ti for FU20
K1547PN	Adapter 1" BSP, Ti for FU20
K1547PP	Spare Part EPDM spraying valves
K1547QA	/SN3 for PH20
K1547QB	/SR3 for PH20
K1547QF	/SR3 for PH20

Spare Parts

Prod. No.	Description
K1520BA	Starters Kit: (3x 500 ml)
	Buffer Solutions pH 4.01 / 6.87 / 9.18
K1520BB	Buffer Solution (500 ml) pH 1.68
K1520BC	Buffer Solution (500 ml) pH 4.01
K1520BD	Buffer Solution (500 ml) pH 6.87
K1520BE	Buffer Solution (500 ml) pH 9.18

Connection equipment	
BA10	Junction box for pH extension cables
WF10-xxx-F	pH signal cable with terminated ends. Specify length in whole meters
WU10-V-S-XX	Variopin cable

Cleaning system for FU20 & PH20

Some applications require frequent cleaning of the electrode. For these applications Yokogawa designed a chemical cleaning system that can either be used in the Yokogawa fitting range (HCN2, HCN3 or HCN4) or as back-end mounting option for the PH20 and FU20. The /HCNF option comes with a hastelloy cleaning nozzle, Stainless steel mounting and ferrules sets and a nylon tube of 10 meters.
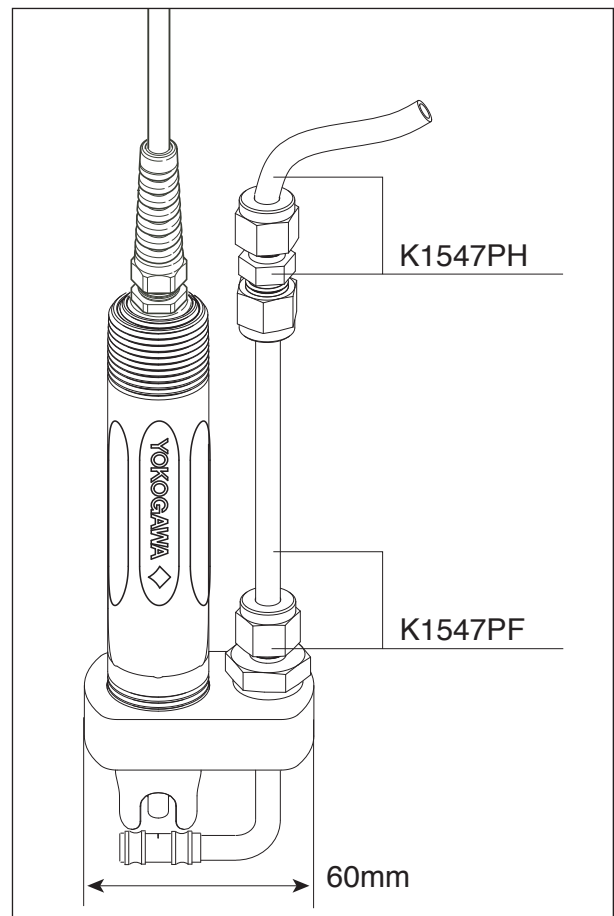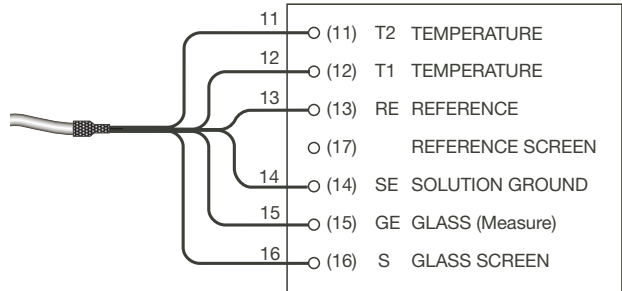

Option /HCNF

Wiring of the PH20 / FU20 / FU24

pH (& ORP) WIRING DIAGRAM

Conventional pH (& ORP) wiring
Connect the cable versions PH20, FU20 or FU24 to the EXA or EXAxt PH analyzer as shown. With this configuration, it is possible to measure ORP (or rH) at the same time (Refer to the EXA or EXAxt manual for appropriate impedance jumper and Service Code settings).
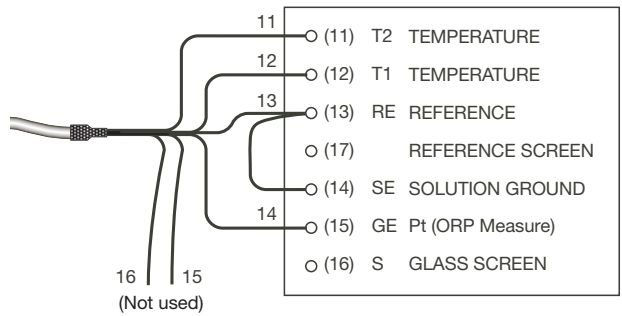
(11)	T2	TEMPERATURE
(12)	T1	TEMPERATURE
(13)	RE	REFERENCE
(17)		REFERENCE SCREEN
(14)	SE	SOLUTION GROUND
(15)	GE	GLASS (Measure)
(16)	S	GLASS SCREEN

ORP WIRING DIAGRAM with normal reference

Wiring for ORP measurement with normal reference
Connect the PH20, FU20 or FU24 to the EXA PH analyzer as shown. Refer to the EXA manual for appropriate impedance jumper and Service Code settings.
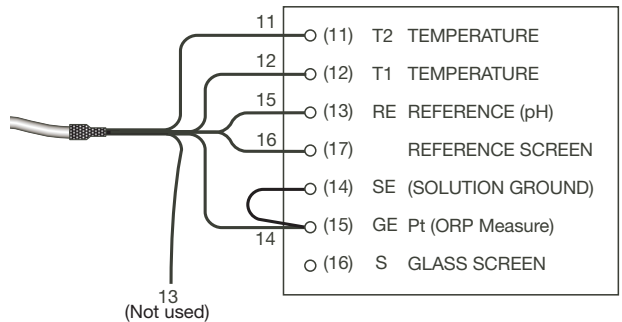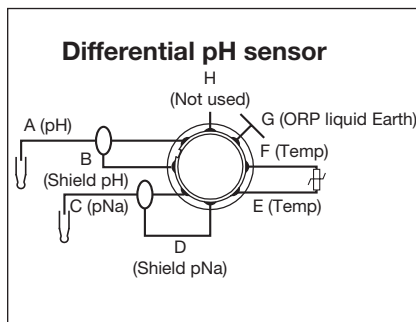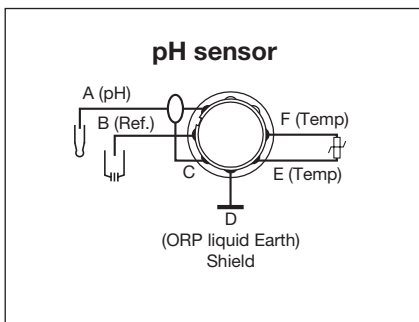
(11)	T2	TEMPERATURE
(12)	T1	TEMPERATURE
(13)	RE	REFERENCE
(17)		REFERENCE SCREEN
(14)	SE	SOLUTION GROUND
(15)	GE	Pt (ORP Measure)
(16)	S	GLASS SCREEN

16 15
(Not used)

ORP WIRING DIAGRAM with pH sensor as reference

Wiring for ORP measurement with pH reference
Connect the PH20, FU20 or FU24 to the EXA Glass PH analyzer as shown. Refer to the EXA manual for appropriate impedance jumper and Service Code settings.

(11)	T2	TEMPERATURE
(12)	T1	TEMPERATURE
(13)	RE	REFERENCE (pH)
(17)		REFERENCE SCREEN
(14)	SE	(SOLUTION GROUND)
(15)	GE	Pt (ORP Measure)
(16)	S	GLASS SCREEN

13
(Not used)

Pin lay-out for Variopin sensors

pH sensor

A (pH)
B (Ref.)
F (Temp)
C
E (Temp)
D
(ORP liquid Earth)
Shield

Differential pH sensor

H
(Not used)
A (pH)
G (ORP liquid Earth)
B
(Shield pH)
F (Temp)
C (pNa)
E (Temp)
D
(Shield pNa)

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