Instruction Manual

Model FU20-FTS/MTS
Differential pH/ORP sensor

YOKOGAWA ◆

IM12B06J03-05EN-P
4th edition

(BG)

Всички улътвания за продукти от серията ATEX Ex се предлагат на английски език. Ако се нуждаете от улътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

(CZ)

Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schváleni ATEX Ex, jsou dostupné v angličtině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentačni kancelář Yokogawa.

(D)

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch. Sollten Sie die Betriebs- anleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichem Yokogawa-Vertreter in Verbindung.

(DK)

Alle brugervejledninger for produkter relateret til CE er tilgængelige på engelsk. Skulle De ønske yderligere oplysninger om håndtering af CE produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

(EST)

Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima lokagava (Yokogawa) kontori või esindaja poole.

(E)

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

(F)

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

(GB)

All instruction manuals for ATEX Ex related products are available in English. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

(GR)

Ολα τα εγχειριδια λειτουργιας των προιοντων με ATEX Ex διατιθενται στα Αγγλικα. Σε περιπτωση πον χρειαζεοτε οδηγιεξ σχετικα με Ex στην τοπικη γλωσσα παρακαλονμε επικοινωνηστε με το πλησιεστερο γραφειο τηζ Yokogawa η αντιπροσωπο τηξ.

(H)

Az ATEX Ex mûszerek gépkönyveit angol nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

(I)

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

(LV)

Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

(LT)

Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø kalbomis. Norëdami gauti priestaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës Yokogawa biuru arba atstovu.

(M)

Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta' Yokogawa.

(NL)

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

(P)

Todos os manuals de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

(PL)

Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim. Jeżeli wymagana jest instrukcja obsługi w Państwa lokalnym je zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

(RO)

Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

(S)

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

(SF)

Kaikkien ATEX Ex-tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-. Mikäli tarvitsette Ex-tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

(SK)

Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

(SLO)

Vsi predpisi in navodila za AEX Ex sorodni pridelki so pri roki v angliščini. Če so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

Contents

1. PREFACE

1.1 Introduction

This instruction manual provides information for the installation and use of the FU20-FTS and FU20-MTS, four-in-one wide body pH sensors. Like the other members of the FU20 family the FU20-FTS/MTS is the choice for the majority of typical wastewater and process applications. The FU20-FTS/MTS uses a salt sensitive reference technology
to eliminate problems of conventional reference systems.
The Model FU20-FTS/MTS offers a simple and cost-effective solution with the possibility to combine this sensor with SENCOM SMART technology. This all-in-one sensor provides simultaneous measurement of pH, pNa, redox (ORP) and temperature if desired.

The rugged body is designed for easy installation into on-line and immersion applications via the 3/4" NPT threaded connections provided on both ends of the sensor. Like the conventional FU20 sensors the salt sensitive sensor fits with the PR10 retractable fitting for installation in continuous processes where minimum process interruption is required. Optional quick-removal adapters in both stainless steel and titanium are available to make calibration and maintenance even easier.

The FU20-FTS/MTS comes with a multipole VP connector and requires separate cable type WU10-V-D or WE10- H-D that are available in several lengths.

Additionally, the models type VP and VS can be mounted in all angles including Upside Down.

The VP and VS model can be used with an analogue analyzer in combination with universal WU10- cable or halogen free WE10- cable. Both cables are available in different lengths.

The VS model with integrated ID-chip can be used with SA11-P2 Smart Adapter, which is placed directly on top of this connector, or remotely connected using the 3 meter WE10-H-D-003-V2 cable.

1.2 Unpacking and Checking

Upon delivery, unpack the sensor carefully and inspect it to ensure it was not damaged during shipment. If damage is found, retain the original packing materials and then immediately notify the carrier and the relevant Yokogawa sales office. Make sure the Model Code and Serial Number on the sensor are the same as on the packing list. Also, check any option(s) that were ordered are included and correct.

For some specific sensor information, the size of the sensor label is not big enough. For that reason, a separate label is delivered. This label needs to be connected onto the sensor cable

1.3 Warranty and Service

Yokogawa products and parts are guaranteed free from defects in workmanship and material under normal use and service for a period of (typically) 12 months from the date of shipment from the manufacturer. Individual sales organizations can deviate from the typical warranty period, and the conditions of sale relating to the original purchase order should be consulted. Damage caused by wear and tear, inadequate maintenance, corrosion, or by the effects of chemical processes are excluded from this warranty coverage. In the event of warranty claim, the defective goods should be sent (freight paid) to the Service Department of the relevant sales Organization for repair or replacement (at Yokogawa's discretion).

The following information must be included in the letter accompanying the returned goods:
• Model Code and Serial Number.
• Original Purchase Order and Date.
• Length of time in service and description of the process.
• Description of the fault and circumstances of the failure.
• Process/environmental conditions that may be related to the failure of the sensor
• Statement as to whether warranty or non-warranty service is requested.
• Complete shipping and billing instructions for return of material, plus the name and phone number of a contact person that can be reached for further information.
• Clean Statement
Returned goods that have been in contact with process fluids must be decontaminated and disinfected prior to shipment. Goods should carry a certificate to this effect, for the health and safety of our employees. Material Safety Data sheets must be included for all components of the process to which the sensor(options) have been exposed.

1.4 Serial number

The Serial number is defined by nine (9) alphanumeric characters:

X_1X_2	Production location
X_3X_4	Year/Month code
X_5X_6 X_7X_8 X_9	Tracking number

Example: N3P600028

Table 1: Production Year code

Year	Year code	Year	Year code
2014	P	2027	4
2015	R	2028	5
2016	S	2029	6
2017	T	2030	7
2018	U	2031	8
2019	V	2032	9
2020	W	2033	A
2021	X	2034	B
2022	Y	2035	C
2023	Z	2036	D
2024	1	2037	E
2025	2	2038	F
2026	3	2039	G

Table 2: Production Month code

Month	Month code
January	1
February	2
March	3
April	4
May	5
June	6
July	7
August	8
September	9
October	A
November	B
December	C

2. GENERAL SPECIFICATIONS

2.1 Measuring elements

: pH glass electrode
: Salt sensitive glass electrode
: Solid platinum electrode (LE/ORP)
: Pt1000 temperature sensor.

2.2 Wetted Parts

Sensor body	: PVDF-GF20
Earthing pin	: Solid Platinum
Measuring sensor	: pH: L-glass
	: Salt sensitive: Na-glass
LE glass tube	: LF44
Sealing material	: FTS : Viton, Silicone
	: MTS : FFKM, EPDM
Body insert	: PVDF

2.3 Functional specifications (at 25 °C)

Isothermal point	: pH 7, pNa 0 (pH 7 at 1 M NaCl)
Reference system	: Salt sensitive, Ag/AgCl in 1 M NaCl
Glass impedance	: 400-1000 MΩ
Liquid outlet	: non-flow no junction
Temperature element	: Pt1000 to IEC 751
Asymmetry potential	: 0 ± 15 mV
Slope	: ≥ 90 % in pH 2-12 with pH = pNa+2 (of theoretical value)

Note: The temperature sensor included in the FU20-FTS-MTS is designed for process compensation and for indication. It is NOT designed for process temperature control.

2.4 Dynamic specifications

Response time pH	: t90 < 15 sec. (for 7 to 4 pH step)
Response time temperature	: t90 < 120 sec. (for 10 °C step)
Stabilization time pH	: < 120 sec. (for 0.02 pH deviation during 10 sec.)

2.5 Operating range

pH	: 2 to 14 (pH = pNa + 2)
ORP	: -1500 to 1500 mV
Temperature	: 0 to +105 ºC (32 to 221 ºF)
Pressure	: At 25ºC and 105 ºC to a max. of 5 bar
	: Barng 0 to 0.985 (0 to 14.36 psi) (under pressure) Over complete temperature range
Conductivity	: > 10 µS/cm

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

Note: The upper process temperature for the intrinsically safe version is limited by the ambient temperature (Tamb.) defined for each temperature class (T3, T4, T5 and T6)

2.6 Shipping details

FU20-FTS/MTS

Package size (L x W x H)	: 300 x 100 x 75 mm (11.8 x 3.9 x 3.0 inch)
Package weight (max.)	: 0.33 kg (0.73 lbs)

2.7 Environmental conditions

Storage temperature	: -10 to +50 °C (14 to 122 °F)
Ingress Protection	: IP67 (conform IEC 60529)

2.8 Mechanical specifications

Max. torque on sensor body	: - FTS -MTS	8 Nm

2.9 Regulatory standards and Declaration certificates

Equipment ratings:

Item	Description	Values
Electrical parameters (Note 1)	Maximum input voltage Maximum input current Maximum input power Maximum internal capacitance Maximum internal inductance	Ui= 18 VDC Ii= 170 mA Pi= 400mW Ci= 0nF for connector types without ID-chip Ci= 0.4nF for connector types with ID-chip Ci= 150nF for permanent cable types Li= 0mH for connector types Li= 0.1mH for permanent cable types
Temperature class	T6 T5 T4 T3	-40°C ≤ Ta ≤ +40°C -40°C ≤ Ta ≤ +55°C -40°C ≤ Ta ≤ +55°C -40°C ≤ Ta ≤ +105°C
Specific conditions of use	Potential electrostatic charging hazard: pH sensors containing accessible plastic parts and/or external conductive parts must be installed and used in such a way, that dangers of ignition due to hazardous electrostatic charges cannot occur, especially in the case that the process medium is non-conductive. Use a damp cloth for cleaning the equipment.	

Note 1: Models without ID-chip (VP type):
I/O signals are from/to an associated intrinsically safe certified pH/ORP transmitter (e.g. Yokogawa transmitter Model FLX21/FLX202 series or Yokogawa transmitter Model PH202S series).

Models with ID-chip (VS type):
I/O signals are from/to an associated intrinsically safe certified pH/ORP transmitter, Yokogawa Smart Adapter Model SA11-P2.

WARNING When the sensor has been connected to non-intrinsically safe equipment which exceeds the restrictions regarding the sensor input circuits, the sensor is not suitable anymore for intrinsically safe use.

Regulatory compliances:

Item	Description, Approval, Certification
ATEX (EU, UK)	ATEX approval (Issue No. 2): DEKRA 11ATEX0014 X CE0344 Ex II 1 G Ex ia IIC T3...T6 Ga Applied standards: • EN IEC 60079-0 • EN 60079-11 For specific conditions of use, see certificate.
IECEx	IECEx approval (Issue No. 1): IECEx DEK 11.0064X Ex ia IIC T3...T6 Ga Applied standards: • IEC 60079-0 • IEC 60079-11 For specific conditions of use, see certificate.
FM (Canada)	FM approval Canada: FM20CA0062X IS SI CL I, DIV 1, GP ABCD, T3...T6 CL I, ZN 0, Ex ia IIC, T3...T6 Ga Control Drawing: D&E 2020-023-A51 Applied standards: • CAN/CSA-C22.2 No. 60079-0 • CAN/CSA-C22.2 No. 60079-11 • CAN/CSA-C22.2 No. 61010-1 For specific conditions of use, see certificate.
FM (United States)	FM approval United States: FM20US0123X IS CL I, DIV 1, GP ABCD, T3...T6 CL I, ZN 0, AEx ia IIC, T3...T6 Ga Control Drawing: D&E 2020-023-A50 Applied standards: • FM Class 3600 • FM Class 3610 • FM Class 3810 • ANSI/ISA 60079-0 • ANSI/ISA 60079-11 • ANSI/ISA 61010-1 For specific conditions of use, see certificate.
NEPSI (China)	NEPSI approval: GYJ21.2891X Ex ia IIC T3...T6 Ga Applied standards: • GB 3836.1 • GB 3836.4 • GB 3836.20 For specific conditions of use, see certificate.

PESO (India)	PESO approval (Issue No. 2): DEKRA 11ATEX0014 X PESO approval is based on ATEX approval Equipment reference numbers: P512760/1 Applied standards: • EN IEC 60079-0 • EN 60079-11 For specific conditions of use, see certificate.
TS (Taiwan)	TS approval: IECEx DEK 11.0064X TS Safety Label is based on IECEx approval Identification Number: TD04000C Applied standards: • IEC 60079-0 • IEC 60079-11 For specific conditions of use, see certificate.
KCs (Korea)	Korea Ex certificates (Issue No. 1): IECEx DEK 11.0064X Korea Ex certificate is based on IECEx approval and applicable for the following models: FU20-VP-CG: 21-KA4BO-0416X FU20-VS-CG: 21-KA4BO-0417X FU20-**-CG: 21-KA4BO-0418X Applied standards: • IEC 60079-0 • IEC 60079-11 • KS C IEC 60079-14 For specific conditions of use, see certificate.
EAS Ex (Russia)	EAC Ex certificate: RU C-NL.AA87.B.00229/19 0Ex ia IIC T6...T3 Ga X Applied standards: • GOST 31610.0 (IEC 60079-0) • GOST 31610.11 (IEC 60079-11) • GOST IEC 60079-14 For specific conditions of use, see certificate.

Declaration of Conformity for FU20

CE UK CA

YOKOGAWA

EU DECLARATION OF CONFORMITY

We: **Yokogawa Process Analyzers Europe B.V.**
Euroweg 2, 3825 HD Amersfoort
The Netherlands

herewith declare under our sole responsibility that the product, model: **FU20**
further specified with model suffix- and option codes: **As listed in Annex-1 in this document,**
is manufactured in accordance with the requirements for CE-marking of products as stated in EC Decision:

768/2008/EC on a common framework for the marketing of products

by applying the following standards:

EN-ISO 9001: 2015 Quality management systems - Requirements

Subject product (all suffix- and option codes codes) is:
- Produced according to appropriate quality control procedures.
- In compliance with the essential requirements of the specific product legislation:
  - **Pressure Equipment** **Directive 2014/68/EU**
    by applying Article 4.3: Sound Engineering Practice
  - **RoHS** **Directive 2011/65/EU**
    Commission Delegated Directive (EU) 2015/863 amending Annex II as regards the list of restricted substances, by applying the following standards:
    EN-IEC 63000: 2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Subject product (all suffix- and option codes except -T2 (Pt100) and codes explaining Tokuchu) is:
- In compliance with the essential requirements of the specific product legislation:
  - **Potentially explosive atmospheres** **Directive 2014/34/EU (ATEX)**
    by applying the following standards:
    EN IEC 60079-0: 2018 Explosive atmospheres – Part 0: Equipment – General requirements
    EN 60079-11: 2012 Explosive atmospheres – Part 11: Equipment protection by intrinsic safety “i”
    /IS 01: 2014

    The provisions fulfilled are: Ex II 1 G Ex ia IIC T3...T6 Ga

    Number of the EU-type Examination Certificate: **DEKRA 11ATEX0014 X (issue 2)**
    Name of the notified body: DEKRA Certification B.V., Identification number of the notified body that issued the EU Quality Assurance Notification: 0344
    Address of the notified body: Meander 1051, 6825 MJ Arnhem, The Netherlands

The CE-mark has been affixed on the product in 2012 for the first time.

If applicable, the product is checked against the latest official released revision of the standards mentioned above; differences do not affect the certified product identified on this declaration.

Amersfoort – July 01, 2024

Md Bruijn

M. de Bruijn
General Manager
Yokogawa Process Analyzers Europe B.V.

YOKOGAWA

Annex-1

Model	Suffix Code	Option	Description
FU20			Wide Body sensor
Type	-03		3 m cable (not available for -FTD, -FTS, -MTS)
	-05		5 m cable (not available for -FTD, -FTS, -MTS)
	-10		10 m cable (not available for -FTD, -FTS, -MTS)
	-20		20 m cable (not available for -FTD, -FTS, -MTS)
	-VP		No Cable; VarioPin connector
	-VS		No Cable; VarioPin connector with ID-chip
	-ZZ		Tokuchu
Temperature Sensor	-T1		Pt1000, IS for ATEX/IECEx
	-T2		Pt100 → not available for -VS, -FTD, -FTS, -MTS
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
	-ZZZ		Tokuchu
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
		/Z	Tokuchu

Model FU20 with suffix code -T2 is not ATEX/IECEx certified.
Model FU20 as Tokuchu is not ATEX/IECEx certified.

For suffix -NPT, -FSM, -FTD:
further specifications can be found in General Specification Sheet GS12B06J03-00EN-P.

For suffix -FTS, -MTS:
further specifications can be found in General Specification Sheet GS12B06J03-05EN-P.

Protection of environment Certificate for FU20

This document is valid only in China.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
传感器	×	○	○	○	○	○
电缆	×	○	○	○	○	○

○： 表示该有害物质在该部件中所有均质材料中的含有量都在GB/T26572所规定的限量要求以下。

×： 表示该有害物质至少在该部件的某一均质材料中的含有量超出 GB/T26572 所规定的限量要求。

环保使用期限：这个标志是基于SJ/T11364，在中国（不包括台湾，香港，澳门）贩售的电子电器产品所适用的环保使用期限。

只要遵守产品上关于安全及使用上的注意事项，从制造之日起计算在该年限内，不会发生制品内的有害物质外泄，突然变异，对环境或人体以及财产产生重大影响的情况。

（注） 该年限是《环境保护使用期限》，不是产品的保质期限。
另外，关于替换部件的推荐替换周期，请阅读使用说明书。

Production date

关于生产日期

生产日期在产品铭牌上9位数的序列号中，用以下形式表示生产日期。

从左数第3位数：生产年份

R:2015，S:2016，T:2017，U:2018，V:2019，W:2020，X:2021，Y:2022，Z:2023，

1:2024，2:2025，3:2026，…

从左数第4位数：生产月份

1：1月，2：2月，3：3月，…，9：9月，A：10月，B：11月，C：12月

（示例）N3S700001：2016 年 7 月

Subject to change without notice

Label information:

All statutory required label information is written on metallized product label. This includes MS-code, serial number and process operating specifications - see example in figure 1.

Figure 1: Sensor MS code label

For other region-specific information, the product label is not big enough to show all details. Therefore, for this an additional label is provided. This label needs to be attached to the sensor cable.
Label content of additional label see example in figure 2.

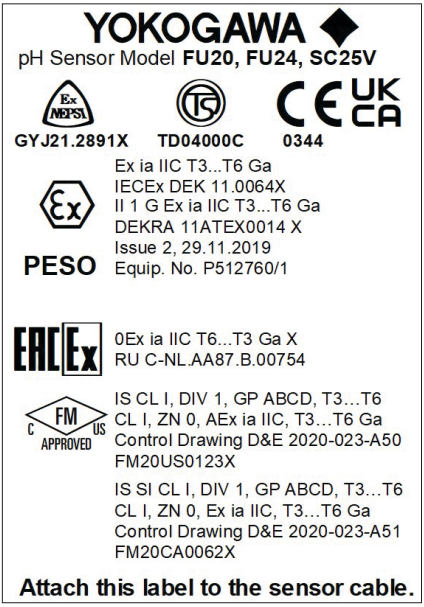
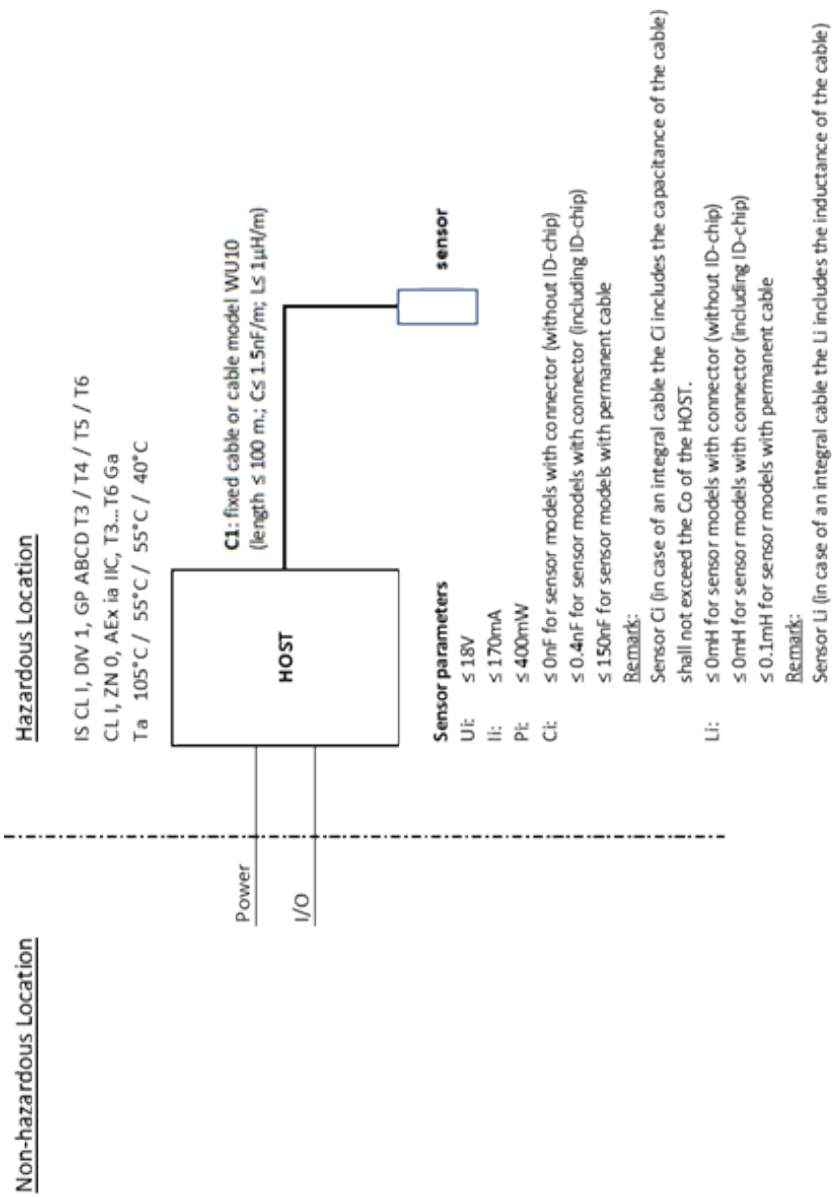


Figure 2: Additional info label

Control drawing: D&E 2020-023-A50 (part 1)



Remarks:

1 No revision to this drawing without prior approval of FM.

2 Installation must be in accordance with the National Electrical Code (ANSI/NFPA 70), ANSI/ISA-RP12.06.01, and relevant local codes.

3 The sensor shall be installed to a certified intrinsically safe HOST with the following maximum values: Uo= 18 V, Io = 170 mA, Po = 400 mW.

4 The sensor does not provide isolation from earth. Installers shall take necessary measures to prevent the possibility of sparking resulting from differing earth potentials between the sensors and interconnecting equipment. This can be realized for example by selecting interconnecting equipment which provides input to-output and input-to-earth isolation up to 500 V rms.

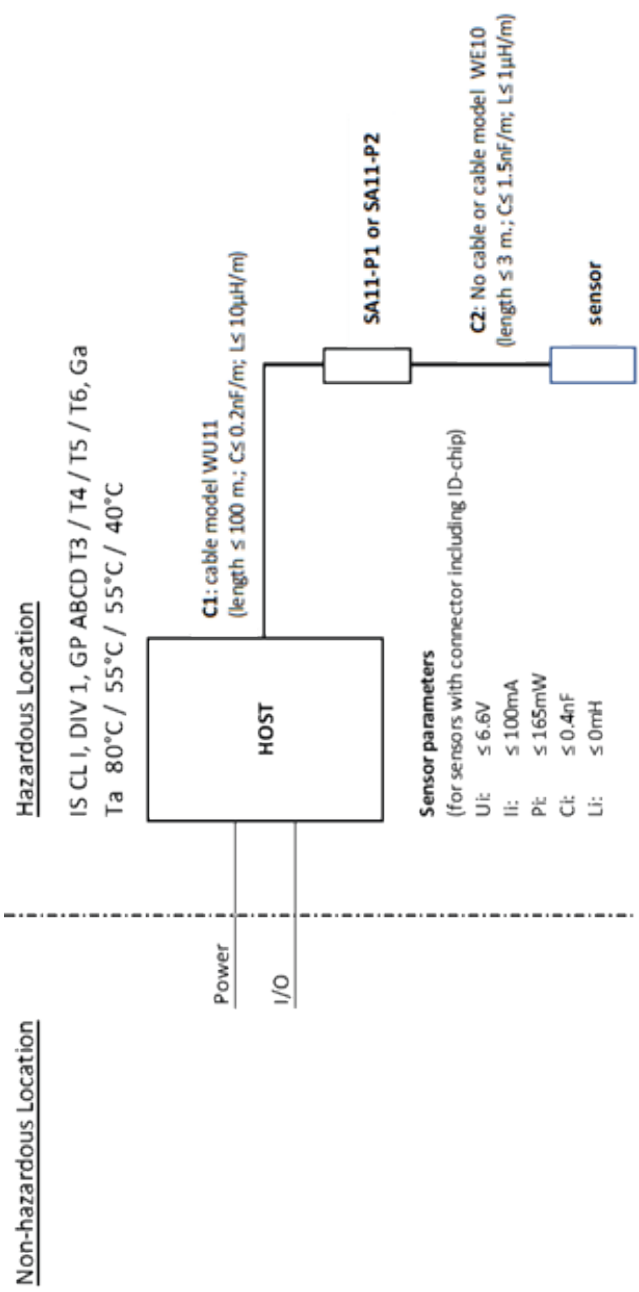
5 Sensor Model code:

Table 3:

Model	Suffix Code	Option Codes
FU20	-ab-cd-efg	/h
ab	Connection type:	Two alphanumeric characters identifying the length of the permanent cable, each character from 0 to 9 VP Connector without ID-chip VS Connector with ID-chip
cd	Temperature sensor + Region:	T1 Pt1000, IS for ATEX/IECEx, FM-US, FM-CAN
efg	Type:	FTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/Silicon&Viton sealings MTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/FFKM&EPDM sealings RTS PPS body/Tapered Thread/Dome shaped/Sodium-ions sensitive membrane/Silicon&VITON sealings
h	Option code:	Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)

6 WARNING - POTENTIONAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
pH sensors containing accessible plastic parts and/or external conductive parts, must be installed and used in such a way, that dangers of ignition due to hazardous electrostatic charges cannot occur, especially in the case that the process medium is non-conductive.

Control drawing: D&E 2020-023-A50 (part 2)



Remarks:

1 No revision to this drawing without prior approval of FM.

2 Installation must be in accordance with the National Electrical Code (ANSI/NFPA 70), ANSI/ISA-RP12.06.01, and relevant local codes.

3 The sensor shall be installed to a certified intrinsically safe Smart Adapter, model SA11-P2 with the following maximum values: Uo= 6.6 V, Io = 100 mA, Po= 165 mW.

4 The installers shall take necessary measures to prevent the possibility of sparking resulting from differing earth potentials between the sensors and interconnecting equipment. The sensor itself does not provide 500 V rms isolation from earth, the interconnecting equipment Model SA11-P2 Smart Adapter however provide this required isolation.

5 Sensor Model code:

Table 4:

Model	Suffix Code	Option Codes
FU20	-ab-cd-efg	/h
ab	Connection type:	VS Connector with ID-chip
cd	Temperature sensor + Region:	T1 Pt1000, IS for ATEX/IECEx, FM-US, FM-CAN
efg	Type:	FTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/Silicon&Viton sealings MTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/FFKM&EPDM sealings RTS PPS body/Tapered Thread/Dome shaped/Sodium-ions sensitive membrane/Silicon&VITON sealings
h	Option code:	Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)

6 WARNING - POTENTIONAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS

pH sensors containing accessible plastic parts and/or external conductive parts, must be installed and used in such a way, that dangers of ignition due to hazardous electrostatic charges cannot occur, especially in the case that the process medium is non-conductive.

FM-Canada

Applying standards	: CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-11
Certificate no.*	: FM20CA0062X IS CL I, DIV 1, GP ABCD, T3...T6 CL I, ZN 0, Ex ia IIC, T3...T6 Ga Control Drawing: D&E 2020-023-A51
Electrical data	: See Note 4.
Specific conditions of use	: See Control Drawing D&E 2020-023-A51.

Note 4: Intrinsically safe, entity, for Class I, Division 1, Groups A, B, C and D; Class I, Zone 0, Ex ia IIC, Ga (entity) for hazardous (classified) locations when installed per control drawing D&E 2020-023-A51.
Sensor input parameters:
Ui= 18V; Ii= 170 mA; Pi= 0.4 W;
Li= 0.1 mH (models with fixed cable) or Li= 0 mH (VS/VP type);
Ci= 150 nF (models with fixed cable) or
Ci= 0.4 nF (VS type) or Ci= 0 nF (VP type).

Ambient temperature:
-40 °C to +40 °C for temperature class T6,
-40 °C to +55 °C for temperature class T4 and T5,
-40 °C to +105 °C for temperature class T3.

When the sensor has been connected to non intrinsically safe equipment which exceeds the restrictions regarding the sensor input circuits, the sensor is not suitable anymore for intrinsically safe use.

* Certification is subject to change, due to new regulations or changes in the product itself. When a certificate is updated, a new revision under the same certificate number is created with a new date.
- FM-Canada:
  FM20CA0062X (effective from 03-2021)

Control drawing: D&E 2020-023-A51 (part 1)

Remarks:

1 No revision to this drawing without prior approval of FM.

2 Installation must be in accordance with the Canadian Electrical Code (CEC) CSA22.1, and relevant local codes.

3 The sensor shall be installed to a certified intrinsically safe HOST with the following maximum values: Uo= 18 V, Io = 170 mA, Po = 400 mW.

4 The sensor does not provide isolation from earth. Installers shall take necessary measures to prevent the possibility of sparking resulting from differing earth potentials between the sensors and interconnecting equipment. This can be realized for example by selecting interconnecting equipment which provides input-to-output and input-to-earth isolation up to 500 V rms.

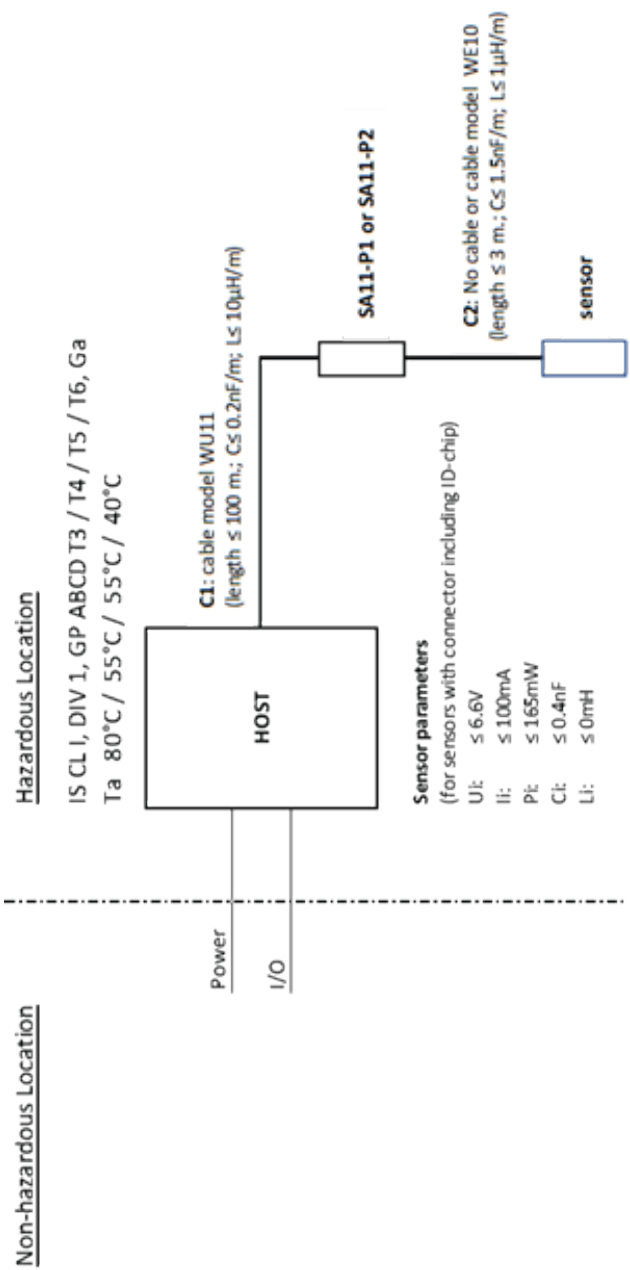
5 Sensor Model code:

Table 5:

Model	Suffix Code	Option Codes
FU20	-ab-cd-efg	/h
ab	Connection type:	Two alphanumeric characters identifying the length of the permanent cable, each character from 0 to 9 VP Connector without ID-chip VS Connector with ID-chip
cd	Temperature sensor + Region:	T1 Pt1000, IS for ATEX/IECEx, FM-US, FM-CAN
efg	Type:	FTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/Silicon&Viton sealings MTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/FFKM&EPDM sealings RTS PPS body/Tapered Thread/Dome shaped/Sodium-ions sensitive membrane/Silicon&VITON sealings
h	Option code:	Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)

6 WARNING - POTENTIONAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
pH sensors containing accessible plastic parts and/or external conductive parts, must be installed and used in such a way, that dangers of ignition due to hazardous electrostatic charges cannot occur, especially in the case that the process medium is non-conductive.
AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES – VOIR LES INSTRUCTIONS
Les sondes de pH contenant des pièces en plastique accessibles et / ou des pièces conductrices externes doivent être installées et utilisées de manière à éviter tout risque d'inflammation dû à des charges électrostatiques dangereuses, en particulier dans le cas où le fluide de procédé n'est pas conducteur.

Control drawing: D&E 2020-023-A51 (part 2)



Remarks:

1 No revision to this drawing without prior approval of FM.
2 Installation must be in accordance with the Canadian Electrical Code (CEC) CSA22.1, and relevant local codes.
3 The sensor shall be installed to a certified intrinsically safe Smart Adapter, model SA11-P2 with the following maximum values: Uo= 6.6 V, Io = 100 mA, Po = 165 mW.
4 The installers shall take necessary measures to prevent the possibility of sparking resulting from differing earth potentials between the sensors and interconnecting equipment. The sensor itself does not provide 500 V rms isolation from earth, the interconnecting equipment Model SA11-P2 Smart Adapter however provide this required isolation.
5 Sensor Model code:

Table 6:

Model	Suffix Code	Option Codes
FU20	-ab-cd-efg	/h
ab	Connection type:	Two alphanumeric characters identifying the length of the permanent cable, each character from 0 to 9 VS Connector with ID-chip
cd	Temperature sensor + Region:	T1 Pt1000, IS for ATEX/IECEx, FM-US, FM-CAN
efg	Type:	FTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/Silicon&Viton sealings MTS PVDF body/Tapered Thread/ Dome shaped/Sodium-ions sensitive membrane/FFKM&EPDM sealings RTS PPS body/Tapered Thread/Dome shaped/Sodium-ions sensitive membrane/Silicon&VITON sealings
h	Option code:	Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)

6 WARNING - POTENTIONAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
pH sensors containing accessible plastic parts and/or external conductive parts, must be installed and used in such a way, that dangers of ignition due to hazardous electrostatic charges cannot occur, especially in the case that the process medium is non-conductive.
AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES – VOIR LES INSTRUCTIONS
Les sondes de pH contenant des pièces en plastique accessibles et / ou des pièces conductrices externes doivent être installées et utilisées de manière à éviter tout risque d'inflammation dû à des charges électrostatiques dangereuses, en particulier dans le cas où le fluide de procédé n'est pas conducteur.

3. INSTALLATION OF FU20-FTS/MTS

For optimum measurement results, the FU20-FTS/MTS should be installed in a location that offers an acceptable representation of the process composition and **DOES NOT** exceed the specifications of the sensor.

The FU20-FTS/MTS is designed with 3/4" NPT threaded connections on both ends of the sensor to allow installation in a wide variety of applications.

3.1 Typical installation

The FU20-FTS/MTS sensor is designed for versatile in-line, immersion or off-line installation. For best results the FU20-FTS/MTS should be mounted with the process flow coming towards the sensor.

The FU20-FTS/MTS can be mounted in all angles with respect to the horizontal plane including Upside Down.

3.2 Preparing the sensor for use

Remove the sensor from its shipping box and slide of the so-called 'wet pocket', the tube filled with solution to prevent drying out of the measuring elements during shipment or storage. Although on the Quality Inspection Certificate (QIC) all factory calibration data is stored, it is recommended to calibrate the sensor before first use. A general calibration procedure is described in Section 6 of this Instruction Manual.

3.3 Mounting the sensor

The simplest mounting is to use one of the 3/4" NPT threaded connection of the sensor. Apply Teflon tape to the appropriate threaded end, then install the sensor in the process Tighten the sensor using a wrench on the sensor flats. (see Figure 3).

Note: Do not overtighten the sensor body. Max. torque applicable in paragraph 2.8

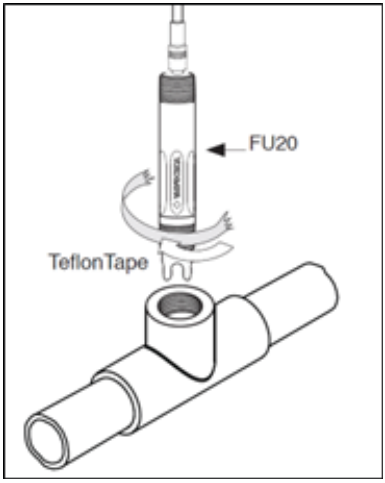


Figure 3: Simple mounting of sensor

3.4 Mounting FU20-FTS/MTS using quick removal adapters

The FU20-FTS/MTS can also be mounted using one of the optional quick-removal adapters (/NSS, /NTI, /BSS, /BTI, see Figure 4). For a detailed description of these adapters see Sections 4 and 7 of this Instruction Manual.

1. Apply Teflon tape to the threaded end of this adapter;
2. Install the adapter in the process connection. Tighten the adapter using a wrench on the adapter flats.
3. Apply Teflon tape to the appropriate threaded end of the sensor;
4. Place the O-ring and screw the mating part of the adapter on the sensor;
5. Mount the sensor in the adapter, making sure that the O-ring seals properly;
6. Hand-tighten the adapter nut.

Other mounting examples of the FU20-FTS/ MTS are given in Figure 6 and 7.

Note: DO NOT over tighten the adapter to prevent damage.

The maximum applicable torque is 8 Nm.

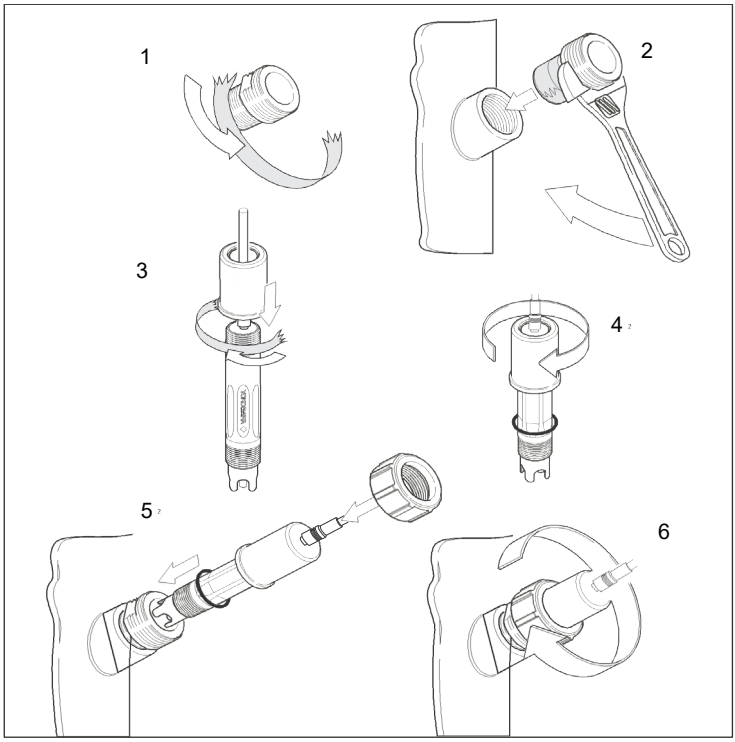


Figure 4: Mounting of sensor with option /NSS, /NTI, /BSS or /BTI

3.5 Mounting the FU20-FTS/MTS in PR10 retractable

1. Take the sensor out of the box and apply Teflon tape to the appropriate threaded end.
2. Bind the separate wires of the cable together with a piece of tape.
3. Take the fitting out of the box and remove the option(s), if necessary.
4. Release the pigtail (cable gland) completely. Do not undo the part in the metal tube!
5. Lead the sensor cable through the tube of the fitting, from the side where the knurled knob has been removed. Attach the sensor and cable as usual.
6. Hold the sensor still and turn the metal tube onto the sensor. Don't rotate the cell, but rotate the tube of the fitting, because the cable can be disconnected from the cell, when rotating it.
7. Lead the loose part of the pigtail onto the cable and screw it onto the fixed part.
8. Remove the tape.

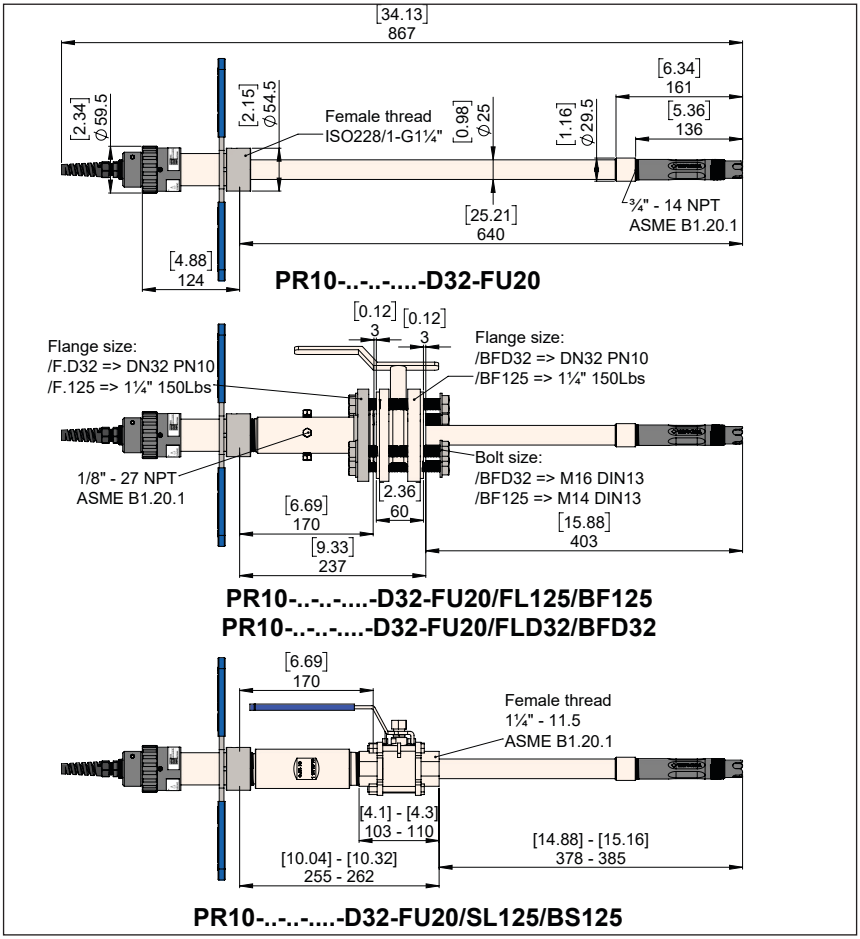


Figure 5: Dimensional drawing PR10...-D32 with mounted FU20 sensor

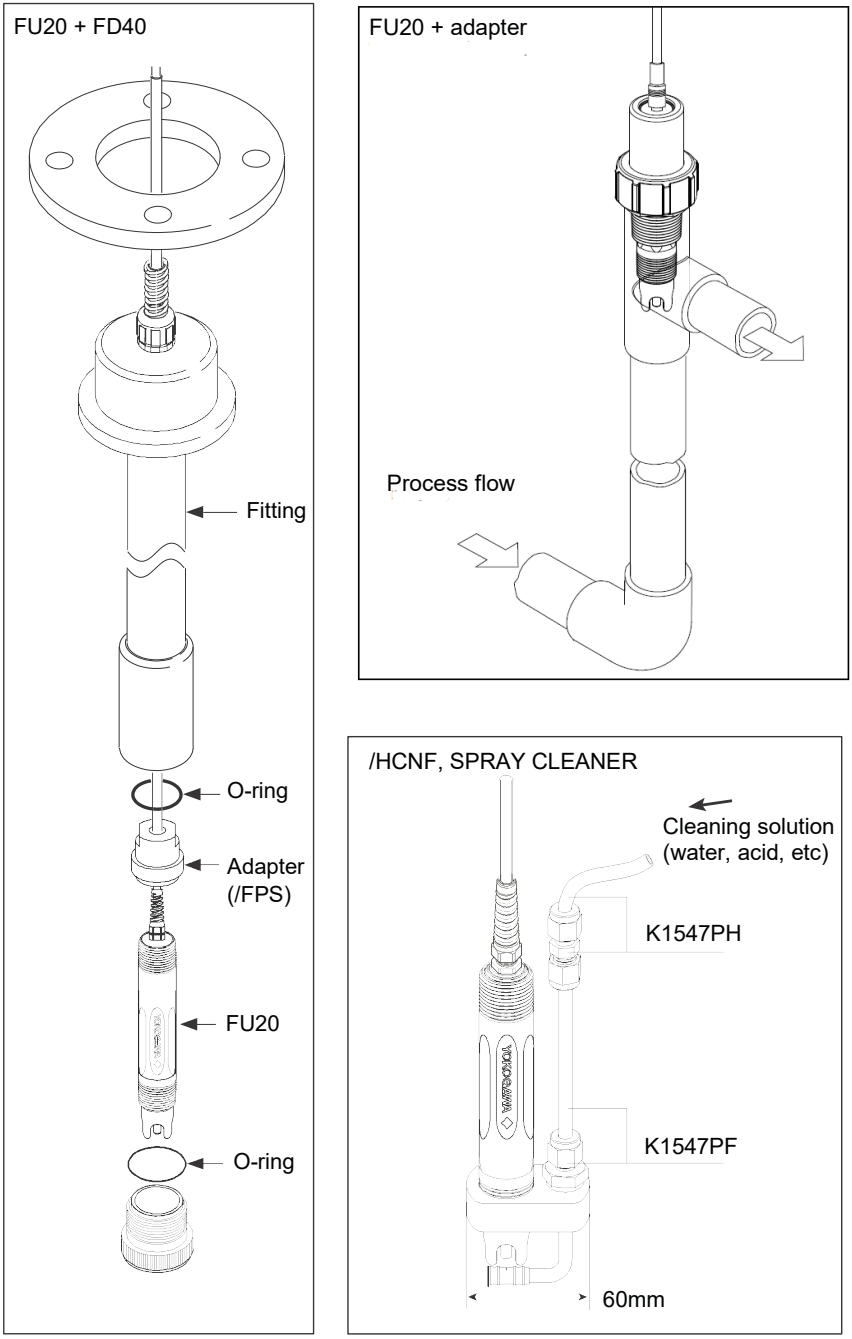


Figure 6: Installation examples for the FU20

4. DIMENSIONS

Dimensions in mm (inches)

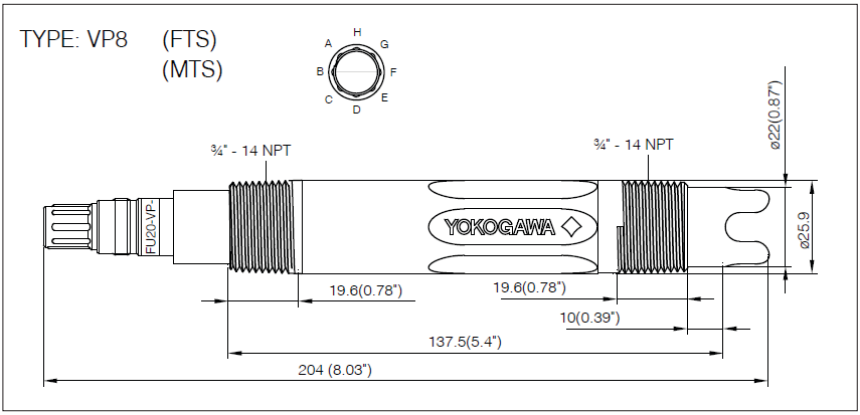


Figure 7: Dimensions FU20-FTS/MTS

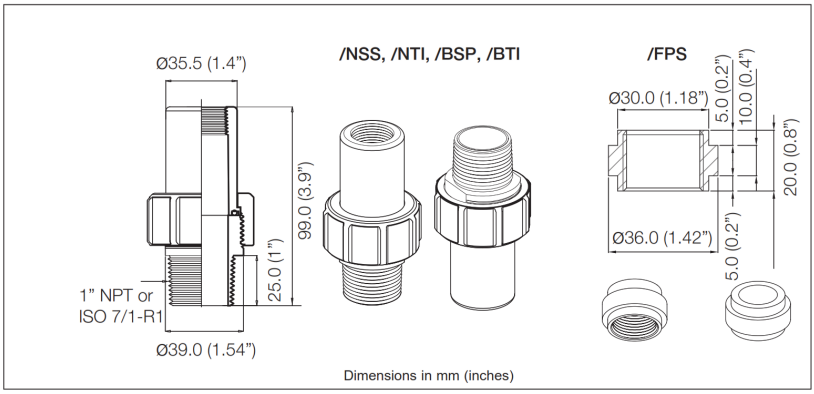


Figure 8: Dimensions 1" FU20-FTS/MTS adapter Stainless Steel & Titanium and FU20 -FTS/MTS adapter for FF40, FS40 and FD40 fittings

5. WIRING

The FU20-FTS/MTS sensor is provided with a 8 pins Vario Pin connector (type VP without ID-chip and type VS with ID-chip).

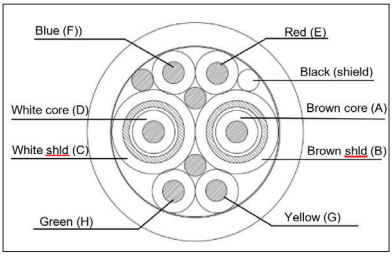


Figure 9: Cable layout Dual coax

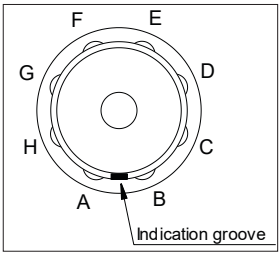


Figure 10: Variopin (top view)

Table 7: Fixed cable parameter

Item	Wire Pin no.	Wire color	Description
A	15	Brown Core	pH
B	16	Brown Shield	pH Guard
C	13	White Core	Reference
D	17	White Shield	Reference Guard
E	11	Red	Temperature
F	12	Blue	Temperature
G	14	Yellow	LE
H		Green	

Table 8: VP-6, VP-8 pin cable parameter

PIN no.	VP Type (WU10-V-S)		VS type (WU10-V-D)	
	Wire color	Description	Wire color	Description
A	Brown Core	pH	Brown Core	pH
B	Brown Shield	pH Guard	Brown Shield	pH Guard/ ID-VCC
C	White Core	Reference	White Core	Reference
D	White Shield	Ref. Guard	White Shield	Ref. Guard
E	Red	Temperature	Red	Temperature
F	Blue	Temperature	Blue	Temp./ ID-GND
G	Yellow	LE	Yellow	LE
H			Green	ID DATA

Note: Preferred connection cable is Yokogawa Model WU10-V-S, WU10-V-D or WE10. For detailed information on these cables, please check IM12B06W02-02EN-P.

6. GENERAL CALIBRATION & MAINTENANCE PROCEDURE

Calibration of the FU20-FTS/MTS sensor has to be done with the pH analyzer connected. Normally the pH standards that are preprogrammed in the pH analyzer can be used for calibration with the pH analyzer set to **"AUTOCAL"**. The FU20-FTS/MTS however is a differential pH sensor which needs pH buffers that have the same ionic strength because the sodium reference will change as the ionic strength changes. These pH buffers are not preprogrammed in the pH analyzer, which means the calibration has to be done with specific buffer solutions (see Section 6.1) and the pH analyzer set to **"MANUAL"** calibration. Refer to the analyzer Instruction Manual for details. Calibration data of the sensor is stored into the pH analyzer.

6.1 Calibration for pH measurement

To calibrate the FU20-FTS/MTS sensor, two buffer solutions with known pH values are required. It is recommended that one buffer solution has a value near to pH 7.00. Depending on the process value to be measured, the second buffer solution should be either acidic (below pH 7.00) or alkaline (above pH 7.00). Buffers which are available are: pH 4.00, pH 7.00 and pH 9.00. See Section 8 for ordering information.

The following is a very general 2-point calibration procedure:

1. Clean the sensor using a 5% solution of HCl;
2. Rinse sensor thoroughly with tap water (**DO NOT** use demineralized water);
3. Immerse the sensor in the first buffer solution (pH 7.00 is recommended);
4. Set the pH analyzer to "**MANUAL**" calibration. Wait until the pH reading is stable.
5. Adjust the pH reading in the pH analyzer to the value indicated on the bottle (in this case 7.00). Go to solution 2 to do a 2-point calibration;
6. Rinse sensor thoroughly with tap water;
7. Immerse the sensor in the second buffer (pH 4.00 is recommended); Wait until the pH reading is stable. Adjust the pH reading in the pH analyzer to the value indicated on the bottle (in this case 4.00). Quit the manual calibration routine by accepting the new calculated calibration data of zero and slope.
8. After calibration, re-install the sensor into the process.

Note: It is important to understand it is possible the FU20-FTS/MTS differential sensor does not show the correct pH value in process after buffer calibration. The reason is that the ionic strength of the buffers is 1 mol NaCl, which can deviate from the ionic strength of the process. For an accurate pH reading an extra 1 point process calibration has to be done (see Section 6.2) to compensate for differences in ionic strength.

During calibration, the temperature compensation should be active. The EXA/FLXA analyzer automatically compensates for the sensitivity change of the pH sensor at different temperatures. After calibration, replace or re-install the sensor into the process.

6.2 Process calibration

The following is a specific 1-point manual calibration procedure for the process to measure: Set the pH analyzer to "**MANUAL**" calibration. Wait until the pH reading is stable. Adjust the pH reading in the pH analyzer to the value of the process sample that is analyzed using a laboratory measurement. For the laboratory measurement, we advise to use the Yokogawa PH72 personal pH meter. Quit the manual calibration routine by accepting the new calculated calibration data of zero. Slope value will be unchanged.

6.3 Calibration of ORP and rH measurements

For calibration of ORP and rH, the procedure for MANUAL CALIBRATION can be used as described in the Instruction Manual of the analyzer. The rH value is a function of the reference system and the pH value of the buffer solution. The FU20-FTS/MTS sensor has a reference system of 1molal Silver/Silver Chloride (Ag/AgCl). The commonly used standards for ORP and rH calibration are made from Chinhydron (Quinhydrone) powder dissolved in pH buffer solutions (1g / 200 ml). In Table 5 the measurement values are given as function of the used pH buffer solution with Chinhydron powder. The accuracy of the standards is approximately ± 10 mV.

Table 9: ORP, pH compensated ORP and rH as function of pH buffer solution with Chinhydron powder.

pH buffer	ORP (mV) Na	ORP (mV) pH compensated	rH (mV)
4.00	228	51	23.6
7.00	51	51	23.6
9.00	-67	51	23.6

6.4 Maintenance of the FU20-FTS/MTS sensor

A pH sensor requires routine maintenance to keep the measuring elements clean and functioning. Because the FU20-FTS/MTS sensor does not have an open reference junction and is hermetically sealed from the process, it does not suffer from poisoning, diffusion and fouling. This means the FU20-FTS/MTS sensor requires very little maintenance.

Avoid cleaning the complete sensor with solution. Some cleaning solutions will damage the model code sticker and connector which are placed on top of the sensor. Only clean the measuring elements at the bottom side of the sensor.

In most cases cleaning with water, iso-propanol or methanol is sufficient. In other cases, the measuring elements of the sensor have to be cleaned with specific solutions.

Examples:

1. Deposits of limes, hydroxides or carbonates can be removed by immersing the bottom part of the sensor in a solution containing dilute hydrochloric acid (5% is recommended). Afterwards rinse the sensor with water.
2. Deposits of oil and fat can be removed with hot water with a detergent. When the results are unsatisfactory, a mild (carbonate based) abrasive can be used.
3. Protein deposits should be removed with a protein enzymatic solution, for instance a solution containing 8.5 mL concentrated hydrochloric acid and 10 grams of pepsin in 1 liter of water.

A soft toothbrush may be used to accelerate the cleaning process.

Note: Avoid cleaning with non-polar solvent like tri-chloro ethylene, toluene or hexane. The non-polar solvents will break up the gel-layer on the pH glass bulb and requires that the sensor has to be soaked in water for at least 12 hours before it will function again.

7. MODEL CODES

Table 10: Model and suffix code table

Model	Suffix Code	Option code	Description		
FU20			Wide Body sensor		
Connection	-3		3 m cable		not available for FTD, FTS & MTS
	-5		5 m cable		
	-10		10 m cable		
	-20		20 m cable		
	-VP		No Cable; VarioPin connector ® not available for MTS		
	-VS		No Cable; VarioPin connector with ID-chip		
Temperature Sensor	-CG		Pt1000, IS for KCs		
	-T1		Pt1000, IS for ATEX/IECEx/FM-US/FM-CAN/NEPSI/PESO/TS/EACEx		
	-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 / Salt Sensitive membrane / Silicone and FKM (Viton) sealing		
	-FTS		PVDF body / Tapered Thread / Salt Sensitive membrane / FFKM and EPDM sealing		
	-MTS				
Options			Material	Process Connection	Part No.
		/FPS	PPO	Adapter for F*40	K1523DD
		/NSS	SS316	1” NPT	K1547PK
		/NTI	Titanium	1” NPT	K1547PM
		/BSS	SS316	1” BSP	K1547PL
		/BTI	Titanium	1” BSP	K1547PN
		/HCNF	Hastelloy cleaning system		K1547PJ

For suffix –NPT, -FSM, FTD: further specifications can be found in GS12B06J03- 02..-.
*T2 is not intrinsically safe certified

8. SPARE PARTS

Table 11: FU20 spare parts

Part Number		Description
K1523DD	FU20	/FPS Adapter for FF40, FS40 and FD40 fittings (PPO)
K1547PK		/NSS 1” NPT, Stainless Steel adapter (Viton O-ring)
K1547PL		/BSS ISO 7/1-R1, Stainless Steel adapter (Viton O-ring)
K1547PM		/NTI 1” NPT, Titanium adapter (Viton O-ring)
K1547PN		/BTI ISO 7/1-R1, Titanium adapter (Viton O-ring)
K1500FR		Viton O-rings 29.82*2.62 (5 pcs) for 1” adapter
K1500FS		EPDM O-rings 29.82*2.62 (5 pcs) for 1” adapter
K1500FT		Silicone O-rings 29.82*2.62 (5 pcs) for 1” adapter
K1526RF		Protection CAP/WET-POCKET FU20 (10 PCS)
K1547PJ	Cleaning system for FU20	Hastelloy cleaning system (HCNF)
K1547PG		Hastelloy nozzle and mounting set (HCNF)
K1547PH		Nylon tube (10 metre) and tube mounting set for chemical cleaning system
K1520BF	Buffer solutions	Buffer Solution pH4.01+6.87+9.18(3x0.5L)
K1520BH		Buffer Solution pH 1.68 (3x 0.5L)
K1520BJ		Buffer Solution pH 4.01 (3x 0.5L)
K1520BK		Buffer Solution pH 6.87 (3x 0.5L)
WU10-V-D-XX	Connection cables for Suffix -VP, -VS	Variopin cable (XX = 02, 05, 10, 15 and 20m)
WE10-H-D-XX		Extension cable for SENCOM SMART ADAPTER SA11
BA11	Connection equipment for Suffix -VS	Active Junction box
SA11-P1		SENCOM SMART adapter
WU11		Interconnection cable
IB100		Interface box
K1522PS	Part K1522PS Protection sleeve	Protection sleeve for 3/4” NPT sensor

9. CHEMICAL COMPATIBILITY

Table 12: Chemical compatibility chart (Note*)

			Material																	
			Viton			FFKM			EPDM			Silicon			PVDF			Glass		
		Temp. °C / Conc. %	20	60	100	20	60	100	20	60	100	20	60	100	20	60	100	20	60	100
Inorganic acid	Sulfiric acid	10	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
		50	o	o	o	o	o	o	o	x	-	-	-	-	o	o	o	o	o	o
		95	o	o	o	o	o	o	x	-	-	-	-	-	o	x	-	o	o	o
		fuming	o	o	o	o	o	o	-	-	-	-	-	-	-	-	-	o	o	o
	Hydrochloric acid	10	o	o	o	o	o	o	o	o	o	x	-	-	o	o	o	o	o	o
		sat.	o	o	o	o	o	o	x	x	x	x	-	-	o	o	o	o	o	o
	Nitric acid	25	o	o	x	o	o	o	o	x	-	o	o	x	o	o	x	o	o	o
		50	-	-	-	o	o	o	-	-	-	x	-	-	o	o	x	o	o	o
		95	-	-	-	o	o	o	-	-	-	-	-	-	o	x	-	o	o	o
		fuming	-	-	-	o	o	o	-	-	-	-	-	-	-	-	-	o	o	o
	Phosphoric acid	25	o	o	o	o	o	o	o	o	o	o	o	x	o	o	o	o	o	o
		50	o	o	o	o	o	o	o	o	o	o	o	x	o	o	o	o	o	o
		95	x	x	-	o	o	o	o	o	o	o	x	x	o	o	o	o	o	o
	Hydrofluoric acid	40	o	o	o	o	o	o	-	-	-	-	-	-	o	o	o	x	x	x
		75	o	o	x	o	o	o	-	-	-	-	-	-	o	o	o	-	-	-
Organic acid	Acetic acid	10	-	-	-	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
		glacial	-	-	-	o	o	o	x	x	x	o	o	o	o	x	-	o	o	o
	Formic acid	80	-	-	-	o	o	x	o	o	x	o	o	o	o	o	o	o	o	o
	Citric acid	50	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Alkali	Calcium hydroxide	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Potassium hydroxide	50	o	o	o	o	o	o	o	x	-	o	o	o	o	o	x	o	o	x
	Sodium hydroxide	40	x	x	x	o	o	o	o	x	-	o	o	o	o	o	x	o	o	x
	Ammonia in water	30	x	x	x	o	o	o	o	o	o	o	o	o	o	o	o	o	o	x
Acid salt	Ammonium chloride	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Zinc chloride	50	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Iron(III) chloride	50	o	o	o				o			o	o	o	o	o	o	o	o	o
	Sodium sulfite	sat.	-	-	-	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Basic salt	Sodium carbonate	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Potassium chloride	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Sodium sulfate	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Calcium chloride	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Neutral salt	Sodium chloride	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Sodium nitrate	50	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Aluminium chloride	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Hydrogen peroxide	30	o	o	o	o	o	o	o	o	x	x	x	x	o	o	o	o	o	o
Oxidizing agent	Sodium Hypochloride	50	o	o	x	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Potassium dichromate	sat.	o	o	o	o	o	o	o	o	o	o	o	o	o	x	-	o	o	o
	Chlorinated lime											o	o	o	o	o	o	o	o	o
	Ethanol	80	x	-	-	o	o	o	o	o	o	o	o	o	o	o	x	o	o	o
Organic solvent	Cyclohexane		o	o	o	o	o	o	-	-	-	-	-	-	o	o	x	o	o	o
	Toluene		-	-	-	o	o	o	-	-	-	-	-	-	o	o	o	o	o	o
	Trichloroethane		x	x	x	o	o	o	-	-	-	-	-	-	x	x	x	o	o	o
	Water		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

o = can be used x = shortens useful life - = cannot be used Blank = no data currently available

Note*: Information in this list is based on our general experience and literature data and given in good faith. However Yokogawa is unable to accept responsibility for claims related to this information.

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