

**SMARTDAC+**



**SENCOM®**

**SENSTATION**

Time Saving • Trendsetting • Traceable data

**SENSTATION**

**YOKOGAWA** ♦

# SENSTATION

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# SENSTATION

## PRODUCT SELECTION

## ❖ **Introduction (1/2)**

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- ❖ **SENSTATION** a pH measurement solution that will improve efficiency and profitability
- ❖ **SENSTATION** from Yokogawa is a new concept that combines the unique capabilities of two of the company's leading products: SENCOM smart sensors and SMARTDAC+ datalogging and monitoring station.
- ❖ **SENSTATION** provides a scalable integrated pH measurement solution. It will improve a plant or factory's efficiency and increase its profitability by making daily maintenance easier, more predictable and traceable.
- ❖ Key features of **SENSTATION** include remote monitoring and reporting and the ability to access real time data and diagnostic information via a user's web browser, smartphone or tablet. Instead of calibration in the field, the SENCOM digital pH sensors can be calibrated and validated in the laboratory or workshop. The sensors also provide diagnostic information to aid in predictive maintenance or the timing of projected replacements.

## ❖ **Introduction (2/2)**

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- ❖ Additionally, the customized SMARTDAC+ display with touchscreen and swipe capabilities will create a detailed and holistic real-time overview of all connected sensors at a facility. Users can analyse actual and historical data, and based on the conditions the system can generate automated e-mail warnings in case of an error or when maintenance is required.
- ❖ In order to support numerous applications the SMARTDAC+ network protocols enable smooth integration with SCADA, PLC and DCS systems, and will support embedded OPC-UA server functionality.
- ❖ With **SENSTATION** Yokogawa will set a whole new level for measuring pH by providing a comprehensive and a scalable holistic solution to sensing and monitoring station.

## ↗ Product Selection : step 1, 2 and 3

### SENSTATION

#### Product Selection

1

- GX10
- GX20
- FX1006

Data acquisition  
system

2

- Model S8000
- IP20 or IP66
- ModBus TCP

Galvanic  
Isolation box

3

- General purpose
- Harsh application
- WU11 cable

Sensors &  
Cables

↗ Product Selection : step 1

## SENSTATION

Data acquisition and monitoring system

1

- max 4 sensors
- 5.7" TFT color LCD
- touch screen
- Custom display

**GX10**

2

- max 8 sensors
- 5.7" TFT color LCD
- Touch screen
- Custom display

**GX20**

3

- 5.7" TFT color LCD
- max. 4 sensors
- Trend Display
- Numerical Display

**FX1006**

# ↗ GX10 Smartdac+ recorder and HMI station

Model	Suffix	Options	description
GX10_Q	1E	Smartdacplus paperless recorder with touch screen HMI	standard memory 500MB
	2E	Smartdacplus paperless recorder with touch screen HMI	large memory 2GB
	with standard Ethernet communication supporting Modbus TCP		Ethernet communication
	without /UH		base model without USB interface
		/S8000	Sencom communication via S8000 connection box incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
		/S8000/FL	Sencom communication via S8000 connection box incl. Fail Output option /FL incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
	/UH		base model incl. USB interface
		/S8000	Sencom communication via S8000 connection box incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
		/S8000/FL	Sencom communication via S8000 connection box incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
	Other options		
		/P1	24 V DC/AC power supply
		/E1	Ethernet/IP communication
		/E2	WT communication
		/LG	logarithmic scale
		/BC	black cover
		/UC10	with analog input module, 10 ch (clamp terminal)
		/UC20	with analog input module, 20 ch (clamp terminal)
		/UC30	with analog input module, 30 ch (clamp terminal)
		/US10	with analog input module, 10 ch (screw terminal)
		/US20	with analog input module, 20 ch (screw terminal)
		/US30	with analog input module, 30 ch (screw terminal)
		/CR01	with digital I/O module (output:0, input 16)
		/CR10	with digital I/O module (output:6, input 0)
		/CR11	with digital I/O module (output:6, input 16)
		/CR20	with digital I/O module (output:12, input 0)
		/CR21	with digital I/O module (output:12, input 16)
		/CR40	with digital I/O module (output:24, input 0)
		/CR41	with digital I/O module (output:24, input 16)



# ↗ GX20 Smartdac+ recorder and HMI station

Model	Prefix	Options	description
GX20	-1E	Smartdacplus paperless recorder with touch screen HMI	standard memory 500MB
	-2E	Smartdacplus paperless recorder with touch screen HMI	large memory 2GB
		with standard Ethernet communication supporting Modbus TCP	Ethernet communication
		without /UH	base model without USB interface
		/S8000	Sencom communication via S8000 connection box incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
		/S8000/FL	Sencom communication via S8000 connection box incl. Fail Output incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
	/UH		base model incl. USB interface
		/S8000	Sencom communication via S8000 connection box incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
		/S8000/FL	Sencom communication via S8000 connection box incl. RS422 serial interface option /C3 incl. communication channels /MC and math option /MT incl. custom display option /CG for Sencom application incl. Pre-configuration by QDC
	Other options		
		/P1	24 V DC/AC power supply
		/E1	Ethernet/IP communication
		/E2	WT communication
		/LG	logaritmic scale
		/BC	black cover
		/UC10	with analog input module, 10 ch (clamp terminal)
		/UC20	with analog input module, 20 ch (clamp terminal)
		/UC30	with analog input module, 30 ch (clamp terminal)
		/UC40	with analog input module, 40 ch (clamp terminal)
		/UC50	with analog input module, 50 ch (clamp terminal)
		/US10	with analog input module, 10 ch (screw terminal)
		/US20	with analog input module, 20 ch (screw terminal)
		/US30	with analog input module, 30 ch (screw terminal)
		/US40	with analog input module, 10 ch (screw terminal)
		/US50	with analog input module, 10 ch (screw terminal)
		/CR01	with digital I/O module (output:0, input 16)
		/CR10	with digital I/O module (output:6, input 0)
		/CR11	with digital I/O module (output:6, input 16)
		/CR20	with digital I/O module (output:12, input 0)
		/CR21	with digital I/O module (output:12, input 16)
		/CR40	with digital I/O module (output:24, input 0)
		/CR41	with digital I/O module (output:24, input 16)



- max 16 sensors
- 12.1" TFT color LCD
- touch screen
- Custom Display

## ↗ FX1006 basic paperless recorder and HMI station

Model	Suffix	Options	Description
FX1006_Q	-2-4-L	/S8000	paperless recorder
			Sencom communication via S8000 connection box
			incl RS422 serial interface option /C3
			incl.communication channels and math option /M1
			incl. pre-configuration at QDC
	/C7		base model with Ethernet interface
	/USB1		base model with USB
	<b>Other options</b>		
		/A1	Alarm outputs 2 points
		/A2	Alarm outputs 4 points
		/F1	FAIL/Status output
		/R1	Remote Control 8 inputs

### FX1006



- 5.7" TFT color LCD
- max. 4 sensors
- Trend Display
- Numerical Display

↗ Product Selection : step 2

## SENSTATION

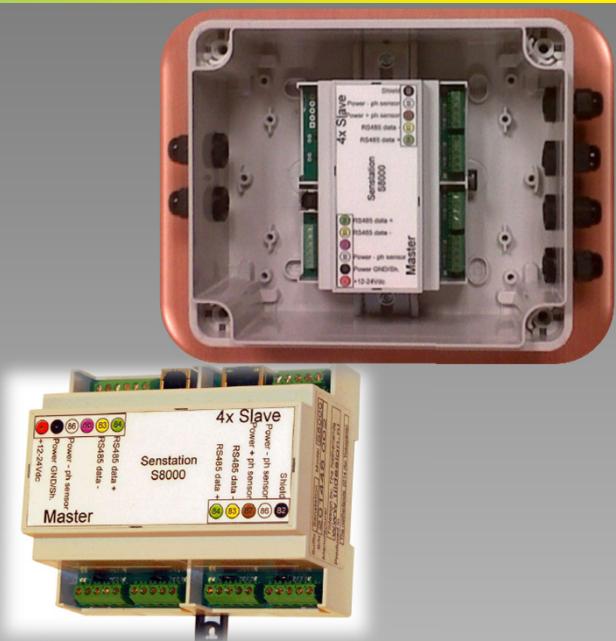
Galvanic Isolation box

- 4 inputs
- Standard USB
- Standard Modbus
- RS485
- IP54 or IP65

S8000

## ❖ Order instruction : step two – Galv. Isolation box

Model	Suffix code	Option Code	Description
S8000			Galvanic Isolation box
<b>Sensor inputs</b> <b>4 per box</b>	-04A		One box, max. 4 sensors, IP20
	-04B		One box, max. 4 sensors, IP66
	-08A		Two boxes, max. 8 sensors, IP20
	-08B		Two boxes, max. 8 sensors, IP66
<b>A = IP20</b>	-12A		Three boxes, max. 12 sensors, IP20
<b>B = IP65</b>	-12B		Three boxes, max. 12 sensors, IP66
	-16A		Four boxes, max. 16 sensors, IP20
	-16B		Four boxes, max. 16 sensors, IP66
<b>Sensor type including quantity selection</b>	/SNA		No sensor
	/PH1		FU20F-NPT
	/PH2		FU20F-FSM
	/PH3		FU24F-NPT
	/PH4		FU24F-FSM
	/PH5		SC25F-AGP25-120
	/PH6		SC25F-AGP25-225
	/PH7		SC25F-ALP25-120
	/PH8		SC25F-ALP25-225
<b>Cable length</b>	/CNA		No cable
	/C3M		3 meter WU11 SENCOM cable
<b>Including quantity</b>	/C5M		5 meter WU11 SENCOM cable
	/C10M		10 meter WU11 SENCOM cable
	/C20M		20 meter WU11 SENCOM cable
<b>Extra cable</b>	/WU11		Wired pins 3 meter WU11 cable
Calibration Software	/SW		SPS24 calibration software



- Power and communication galvanically isolated
- Up to Four sensor inputs
- IP20 or IP66 housing
- RS485 communication standard
- USB port standard for easy (maintenance) access
- MODbus communication protocol standard

## ↗ Product Selection : step 3

### SENSTATION

#### SENSORS AND CABLES

1

- FU20F-NPT
- FU20F-FSM
- SC25F-AGP25-120
- SC25F-AGP25-225

General  
purpose

2

- FU24F-NPT
- FU24F-FSM
- SC25F-ALP25-120
- SC25F-ALP25-225

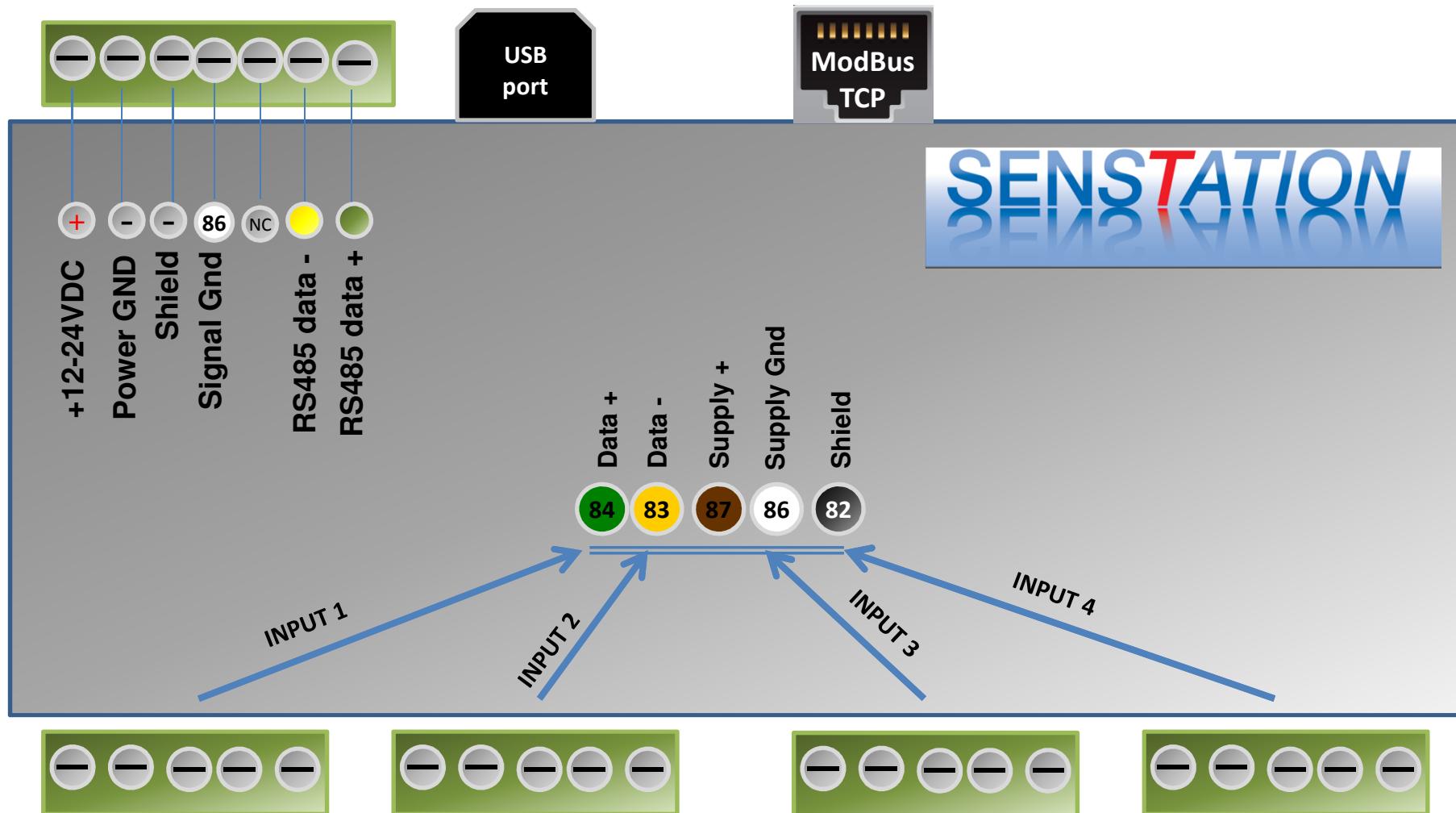
Harsh or  
(U)PW

3

- WU11-3 meter
- WU11-5 meter
- WU11-15 meter
- WU11-20 meter

Cables

# Wiring diagram SENSTATION





**Find more information at  
[www.yokogawa.com/eu](http://www.yokogawa.com/eu)**

# General Specifications

## Model S8000



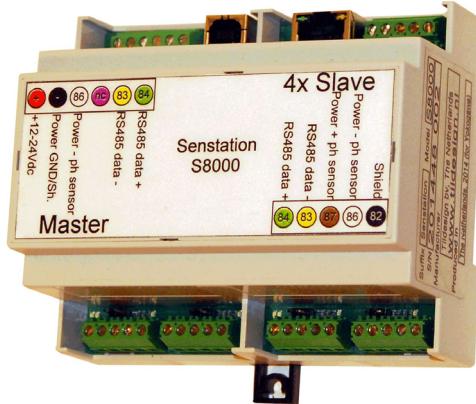
Galvanic isolation is a principle of isolating functional sections of electrical systems to prevent current flow; no direct conduction path is permitted.

Galvanic isolation is used where two or more electric circuits must communicate, but their grounds may be at different potentials. It is an effective method of breaking ground loops by preventing unwanted current from flowing between two units sharing a ground conductor.

Especially for pH measurements where there is a high danger of ground loop currents and interference due to the high resistance of the pH glass.

This Galvanic isolation box isolates both power and communication signal to prevent the groundloop currents or any interference that will disrupt the measurement.

This box can be used to interface the SENCOM SMART sensors and the SMARTDAC+ data acquisition to provide a scalable solution.



### Features

- Up to four connections in one box
- RS485 communication standard
- Power and communication both galvanically isolated
- USB connection standard for easy maintenance
- IP20 and IP66 housing available
- Ethernet connection for MODBus over TCP
- Interface for SENCOM SMART sensors and SMARTDAC+ data acquisition systems

### Power

Input voltage	12-24VDC, min 9V, max 30 V
Frequency	50/60Hz
Output voltage	2.6-3.6 VDC (4x)
with standing voltage	250 VAC
Power consumption :	3W (12V 250 mA /24V 125 mA)

### Communication

isolated RS485 connections	RS485 and MODbus TCP
Baud rate	Four, with pH sensor power supply (3.3V)
USB port	9600
Ethernet port	USB CDC Class
Multidrop	MODbus over TCP, def. IP add 192.168.0.1
Maximum cable length for RS485	Up to four boxes through multidrop
	1200 m

### Wiring

Sensor cable	max 100m, shielded
master RS485 kabel	max.1200m, shielded
Ethernet kabel (Modbus over Ethernet)	max.100m shielded CAT5

### Hardware

Housing	IP50 and optional IP66 (Nema 4.4x)
IP20 material	UL94-V0 flame retardant polycarbonate
IP66 material	ABS
IP20 mounting	DIN rail
IP66 mounting	Wall mounting
S8000 with IP20 housing	0.30 kg
S8000 with IP66 housing	0.70 kg
Cable recommendation	shielded cable (2 wires, 0.5mm <sup>2</sup> )

### Environmental

Temperature operating range	-10 °C to + 40 °C (14 °F to 104 °F)
Storage temperature	-10 °C to + 40 °C (14 °F to 104 °F)

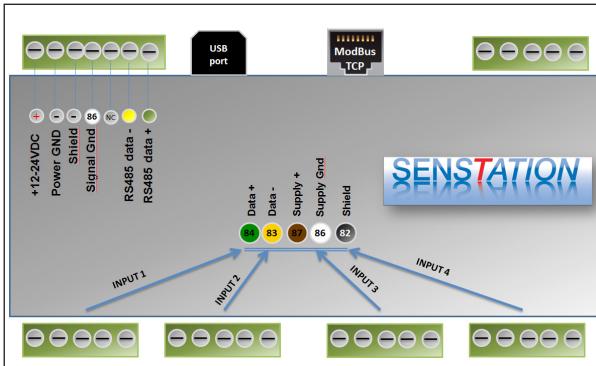


Figure 1 connections

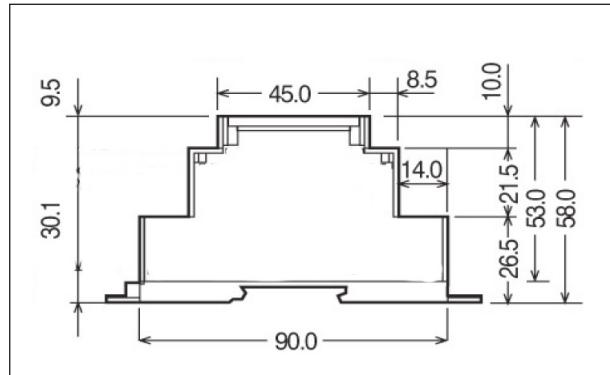


Figure 2 IP20 dimensions

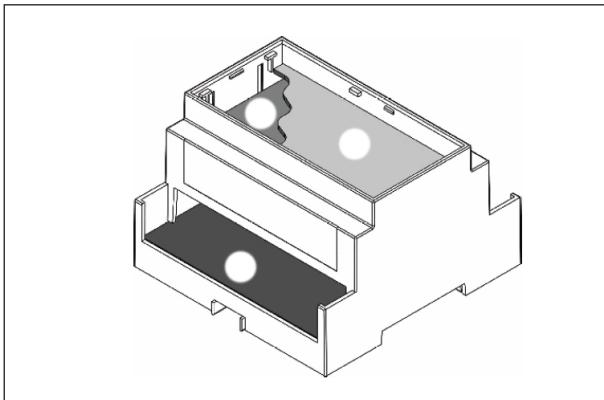


Figure 3 IP20



Figure 4 IP66

Model	Suffix code	Option Code	Description
S8000			Galvanic Isolation box
Sensor inputs 4 per box	-04A -04B -08A -08B A = IP20 B = IP66		One box, max. 4 sensors, IP20 One box, max. 4 sensors, IP66 Two boxes, max. 8 sensors, IP20 Two boxes, max. 8 sensors, IP66 Three boxes, max. 12 sensors, IP20 Three boxes, max. 12 sensors, IP66 Four boxes, max. 16 sensors, IP20 Four boxes, max. 16 sensors, IP66
Sensor type including quantity selection		/SNA /PH1 /PH2 /PH3 /PH4 /PH5 /PH6 /PH7 /PH8	No sensor FU20F-NPT FU20F-FSM FU24F-NPT FU24F-FSM SC25F-AGP25-120 SC25F-AGP25-225 SC25F-ALP25-120 SC25F-ALP25-225
Cable length Including quantity		/CNA /C3M /C5M /C10M /C20M	No cable 3 meter WU11 SENCOM cable 5 meter WU11 SENCOM cable 10 meter WU11 SENCOM cable 20 meter WU11 SENCOM cable
Extra cable		/WU11	Wired pins 3 meter WU11 cable
Calibration Software		/SW	SPS24 calibration software

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**YOKOGAWA** ♦

# General Specifications

SENCOM® FU20F / FU24F / SC25F  
Digital pH/ORP-sensor



In today's market analytical measurements are moving from classical analogue measurement towards the use of digital smart measuring solutions. This tendency is initiated by evolving demand for solutions supporting increased diagnostics. Among these analytical measurements also the measurement of pH, an important control parameter in a variety of application is, following the trend resulting in the development of intelligent smart pH sensors at Yokogawa. The smart sensors developed in Yokogawa Process Analysers are the heart of the complete SENCOR®-platform.

The SENCOR® platform is build up around Yokogawa's FLEXA21 transmitter. By insertion of the so called SENCOR® module, the SPS24 software package and suitable SENCOR® sensors the digital features become available for customers' convenience. Yokogawa's SENCOR® technology allows sensors to transmit and receive data when connected to Yokogawa's FLEXA21 transmitter or to any PC with the SPS24 software installed. Sensor specific characteristics such as calibration data and other parameters are stored directly in the sensor, making configuration and setup simple and straightforward.

## SENCOR® features and benefits:

- Reduced maintenance time
- Off-line calibration minimizing process impact
- Easier asset management
- Improved statistical process control
- Monitoring extreme usage conditions
- Increased data transfer distance (upto 60 mtr.)

In this specification document we will only focus on the available sensors, **FU20F**, **FU24F**, **SC25F**, which are part of a complete measuring loop. For the specifications of the **SENCOR® module** and the SPS24 software supporting the platform, refer to the applicable GS sheet available through our internet page.

<http://www.yokogawa.com/us/products/analytical-products/ph-orp/sencom-digital-sensor-communication.htm>

SENCOR® sensors maintain specific measurement and calibration data on an integrated chip along that is an integral part of the sensor. This data can be exchanged between the sensor and either a process transmitter (FLEXA), or a laboratory PC using the SENCOR® SPS24 data management software. Using historical measurement, calibration and diagnostic data from the sensor, the SPS24 data management system provides technicians with the tools to predict maintenance and calibration frequency, estimate sensor life and project life expectancy.

Calibration data can be downloaded or uploaded to and from the SENCOR® Sensor to the FLEXA analyzer allowing for true plug and play field installation.

## Data stored in the sensor includes:

- Calibration Values (Asymmetry, Slope, Temperature Offset)
- Sensor Status Signals (e.g. Glass Impedance Detection)
- Reference Junction Resistance
- Sensor details (Model, Serial Number, and Production Manufacturing Date)



SENCOR® sensors can be calibrated in the laboratory, or at the process site using the analyzer buffer calibration function instead of stored data from the sensor. When the sensor is connected to the data management software the calibration is downloaded into the history file. The available calibration methods using SMART Sensors and FLEXA analyzer are:

- pH: Manual/Automatic: Zero/Slope, Zero/Slope/ITP (3 point), Zero/Slope 1,2 (3 point)
- ORP: Manual 1, 2 (point)
- Temperature



## FU20F

The new Yokogawa FU20F smart pH/ORP sensor is the first in the company's SENCOM® family combining Yokogawa's proven pH sensor expertise with built-in intelligence and direct digital communication.

FU20F pH/ORP sensor, is called "SENCOM®" because of the digital communication possibility with this sensor. It shows how Yokogawa applies the motto "Simply the Best" to sensor technology.

The wide body sensor (26 mm diameter) holds four separate measuring elements in one unbreakable and chemical resistant PPS 40GF (Ryton™) body.

The long life and anti-fouling reference system diaphragm prolongs the life time of the sensor. This makes the sensor an excellent choice in general chemical environments.

The sensor communicates through bi-directional digital communication (RS 485) with limited MODBUS support to a Flexa transmitter. This feature makes the sensor true plug and play, decreasing the process impact due to maintenance.

For mounting, the sensor is equipped with a ¾" NPT thread. Optional quick removal adapters that allow the user to easily remove and install sensors are available. For detailed description of the possibilities please refer to the instruction manual of the FU20F.

### Features

- Solid Platinum ORP/LE electrode for accurate simultaneous pH and ORP measurements.
- Integral Pt1000 element for enhanced pH accuracy.
- Extended life time by saturated Ag/AgCl reference system with double junction combined with ion-trap, and porous PTFE reference diaphragm.
- Easy setup by sensor specific characteristics stored in the sensor itself.
- Simple maintenance by comprehensive design.
- Available in two versions, a robust dome shape model for applications with a limited amount of solids, and a flat surface model for slurry applications.
- ATEX, CSA and FM.

## MODEL AND SUFFIX CODES

Model	Suffix Code	Option code	Description
FU20F			SENCOM® pH Wide Body sensor
Model	-NPT -FSM		Dome Shape Model Flat Surface Model
Options	/HCNF /FPS /NSS /NTI /BSS /BTI		Complete Hastelloy cleaning system Adapter F*40 from Noryl 1" NPT, SS316 1" NPT, Titanium 1" BSP, SS316 1" BSP, Titanium

## GENERAL SPECIFICATIONS FU20F

### Measuring elements

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

### Wetted parts

Sensor body : PPS 40GF (Ryton™ with glass filing)  
Measuring sensor : G-glass  
Reference junction : Porous PTFE  
Earth pin : Solid Platinum  
O-ring : Viton

### Functional specifications (at 25°C)

#### Measuring system

Isothermal point : pH 7  
Reference system : Ag/AgCl with saturated KCl  
Glass impedance  
- Dome shape : 200 MΩ nominal  
- Flat surface : 700 MΩ nominal  
Liquid contact : Non-flow double junction  
Junction resistance : 1 to 15 kΩ  
Temperature element : Pt1000 to IEC 751  
Asymmetry potential (zero) : 8 ± 15 mV  
Slope : > 96 % (of theoretical value)

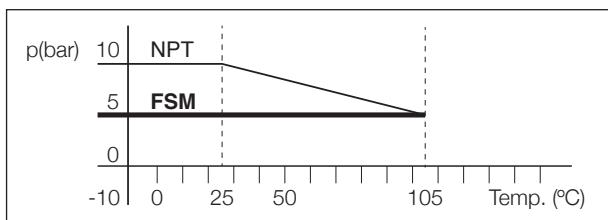
**Note:** The FU20F temperature sensor is designed for cell compensation and for indication.  
It is **NOT** designed for process temperature control.

#### Dynamic specifications

Response time pH :  $t_{90} < 15$  sec. (for 7 to 4 pH step)  
Response time temperature  
- Dome shape :  $t_{90} < 1$  min. (for 10°C step)  
- Flat surface :  $t_{90} < 4$  min. (for 10°C step)  
- Stabilization time pH : < 2 min (0.02 pH/10 sec.)

#### 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.

#### Transmission signal (Data + and Data -)

General : Bi-directional digital communication (RS 485) with limited MODBUS support  
Data rate : 9600 b/s (8,E,1)  
Output function : -pH and temperature compensated pH  
-ORP, pH compensated ORP, rH  
-Temperature  
-Junction resistance value

-Sensor details (Model, Serial Number, production date)  
-Sensor calibration data (zero, slope, temperature offset)  
-Sensor status signals (e.g. Glass impedance detection)

**Note:** The output functions and settings of the sensor are accessible using a dedicated device such as the Yokogawa FLXA analyzer.

#### Power supply (Supply+ versus Supply Gnd)

Operating range : +2.7 to +3.6 VDC  
Power consumption : ≤ 20 mW

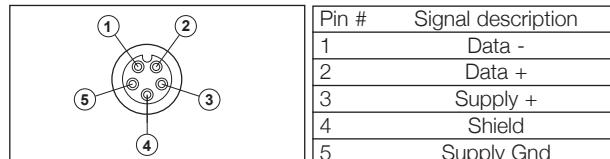


Figure 1: Sensor connector (front view) with gold plated pins

#### Regulatory standards

**CE**  
- ATEX : Decision 768/2008/EC N200  
- Directive 94/9/EC, as amended by Regulation (EC) no. 1882/2003  
- Certificate no. : DEKRA 11ATEX0064 X  
- Electrical data : For sensor input circuits (by connector) connected to a certified intrinsically safe circuit with the following maximum values  
Ui = 6.1 V; Ii = 230 mA; Pi = 1.2 W; Li = 4 µH; Ci = 30 µF  
or  
Certified intrinsically safe Yokogawa transmitter Model FLXA21 series

#### CSA

Certificate no. : 2516979  
Master contract no. : 182892  
- IS, Class I Div. 1, GP A, B, C, D T3...T6  
- Electrical data : For sensor input circuits (by connector), connected to a certified intrinsically safe circuit, with the following maximum values  
Ui = 6.1 V; Ii = 230 mA; Pi = 1.2 W; Li = 4 µH; Ci = 30 µF  
or  
Certified intrinsically safe Yokogawa transmitter Model FLXA21 series.  
Ambient temperature : T6 for Tamb. -40 °C to +60 °C  
T5 for Tamb. -40 °C to +75 °C  
T4 for Tamb. -40 °C to +110 °C  
T3 for Tamb. -40 °C to +125 °C

#### FM

Certificate no. : 3046277  
- IS, Class I Div. 1, GP A, B, C, D T3...T6  
- Electrical data : For sensor input circuits (by connector), connected to a  
FM approved intrinsically safe apparatus meeting the entity parameters of the SENCOM® sensor:  
Ui = 6.1 V; Ii = 230 mA; Pi = 1.2 W; Li = 4 µH; Ci = 30 µF  
or  
FM approved intrinsically safe Yokogawa transmitter Model FLXA21 series.  
Ambient temperature: : T6 for Tamb. -40 °C to +60 °C  
T5 for Tamb. -40 °C to +75 °C  
T4 for Tamb. -40 °C to +85 °C  
T3 for Tamb. -40 °C to +85 °C

## DIMENSIONS

Dimensions in mm (inches)

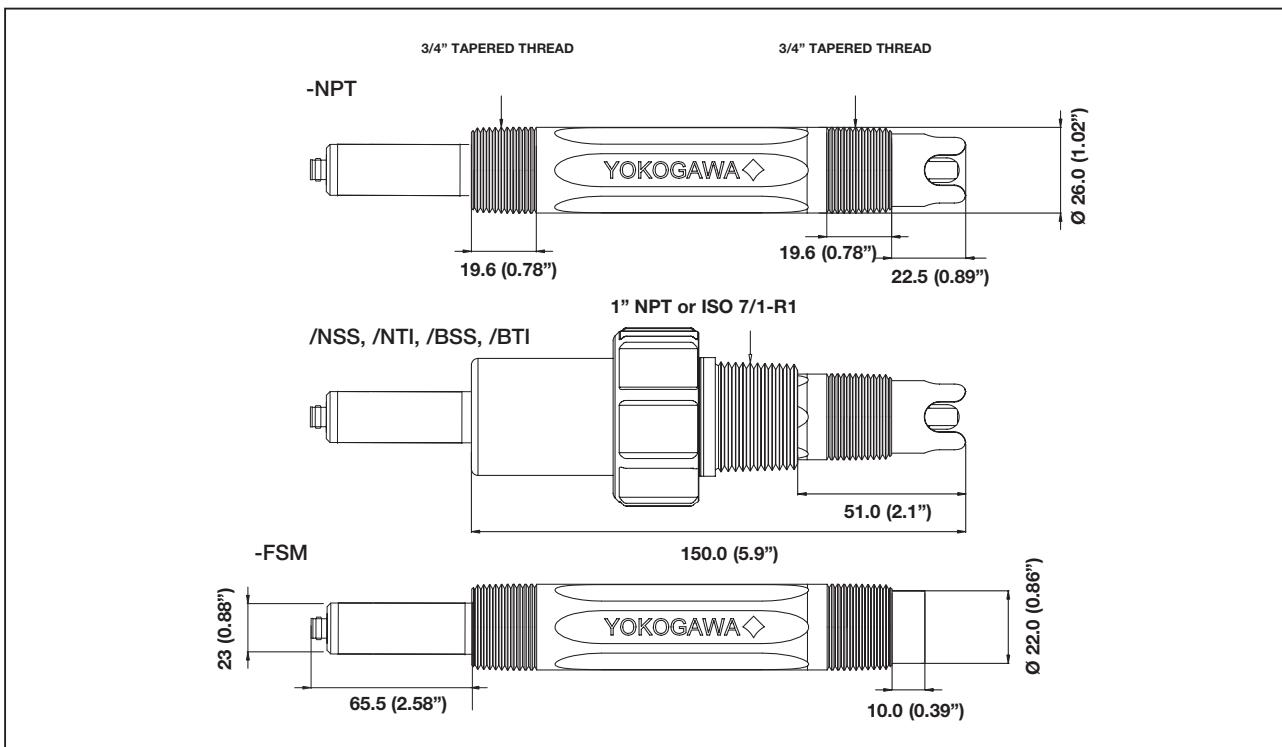


Figure 2: Dimensions of FU20F Sensor

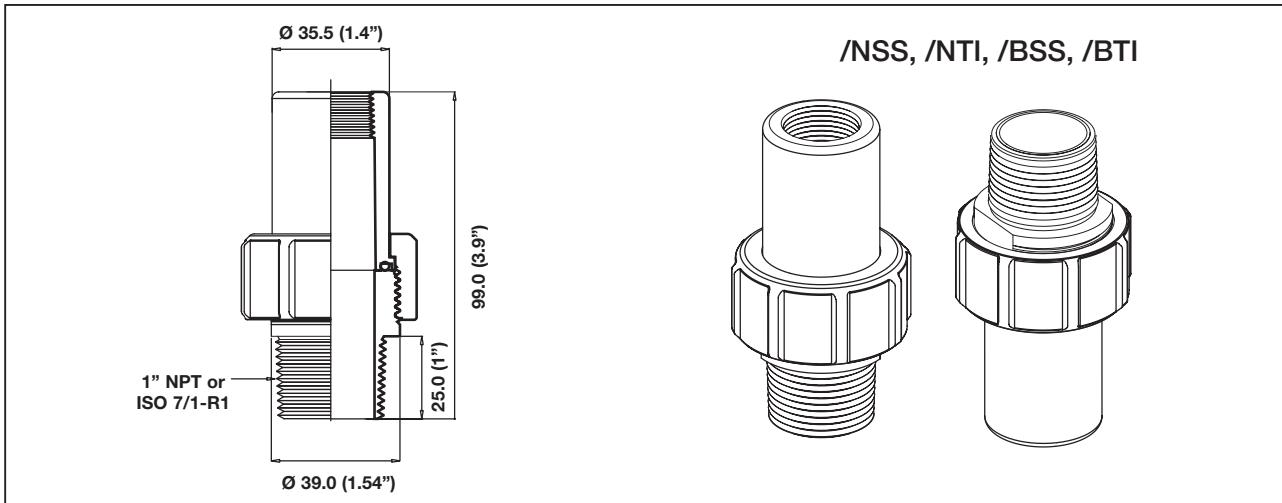


Figure 3: Dimensions of quick-removal adapters /NSS, /NTI, /BSS, /BTI

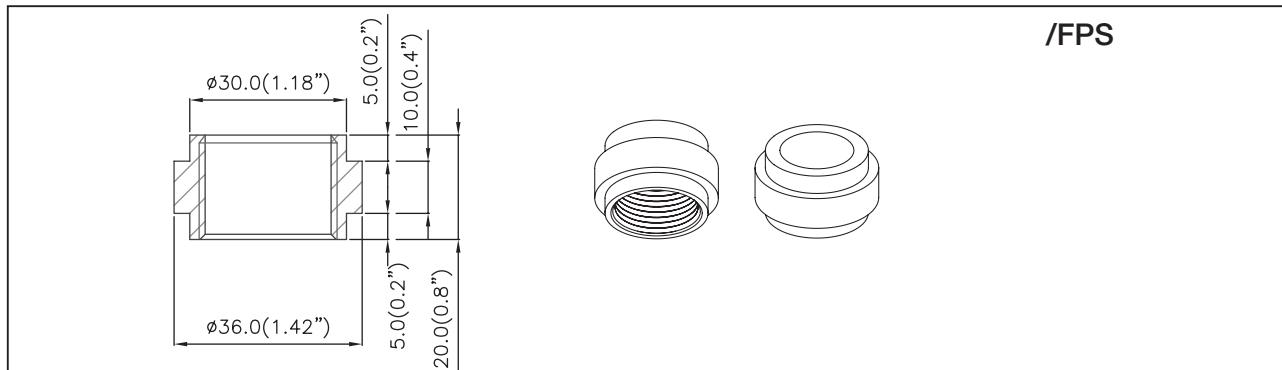


Figure 4: Dimensions of F\*40 adapter /FPS

## INSTALLATION OF FU20F

For optimum measurement results, the FU20F 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 FU20F is designed with 3/4" NPT threaded connections on both ends of the sensor to allow installation in a wide variety of applications.

### Typical installation

The FU20F sensor is designed for versatile in-line, immersion or off-line installation. For best results the FU20F should be mounted with the process flow towards the sensor, and positioned at least 15° above the horizontal plane to eliminate air bubbles in the pH glass bulb (see Figure 5).

### Mounting the sensor

The simplest mounting is to use one of the 3/4" NPT threaded connections (see Figure 6).

The FU20F can also be mounted using one of the optional quick-removal adapters /NSS, /NTI, /BSP or /BTI (see Figure 7).

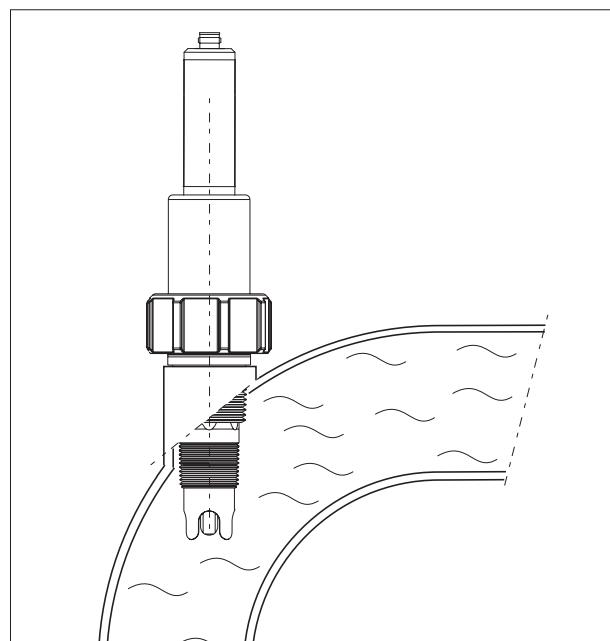
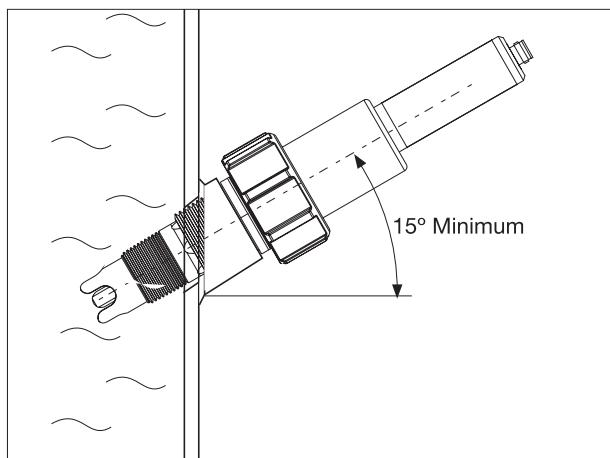


Figure 5: Sensor installation

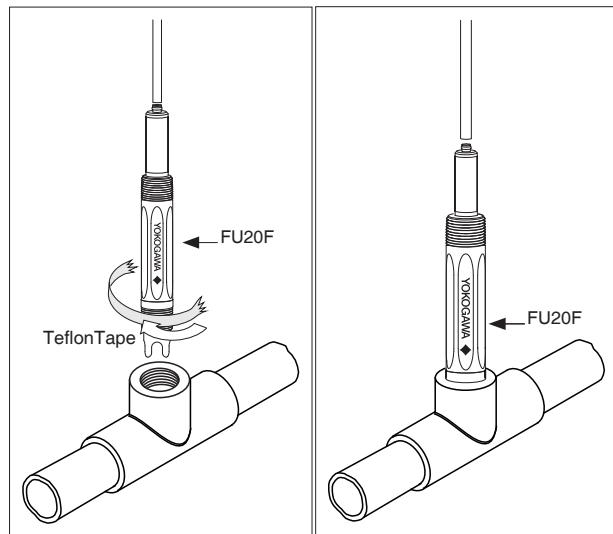


Figure 6: Simple mounting of sensor

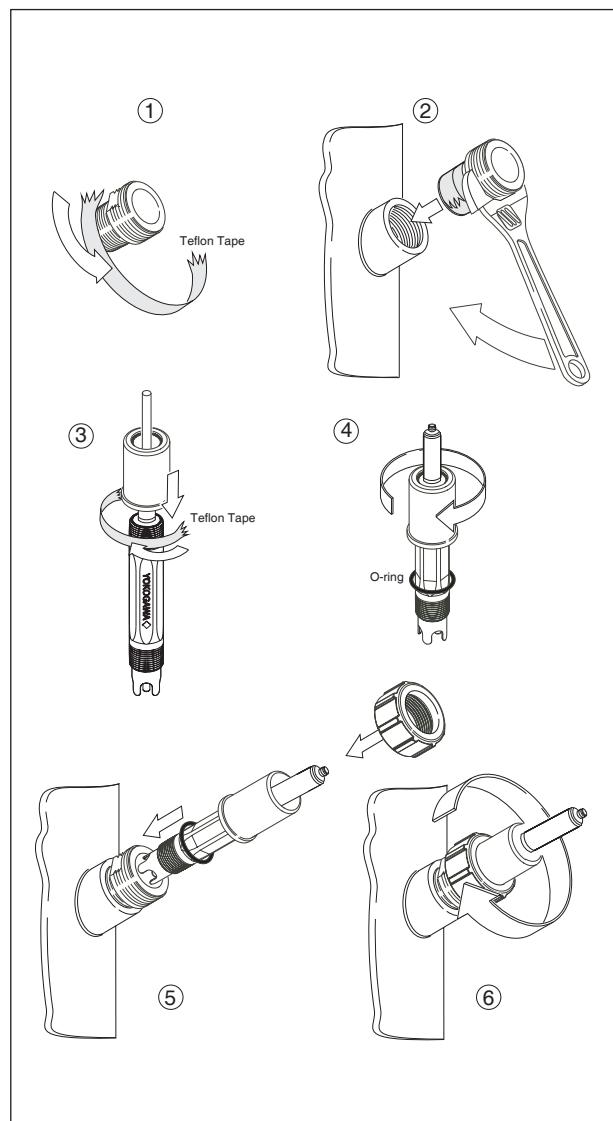
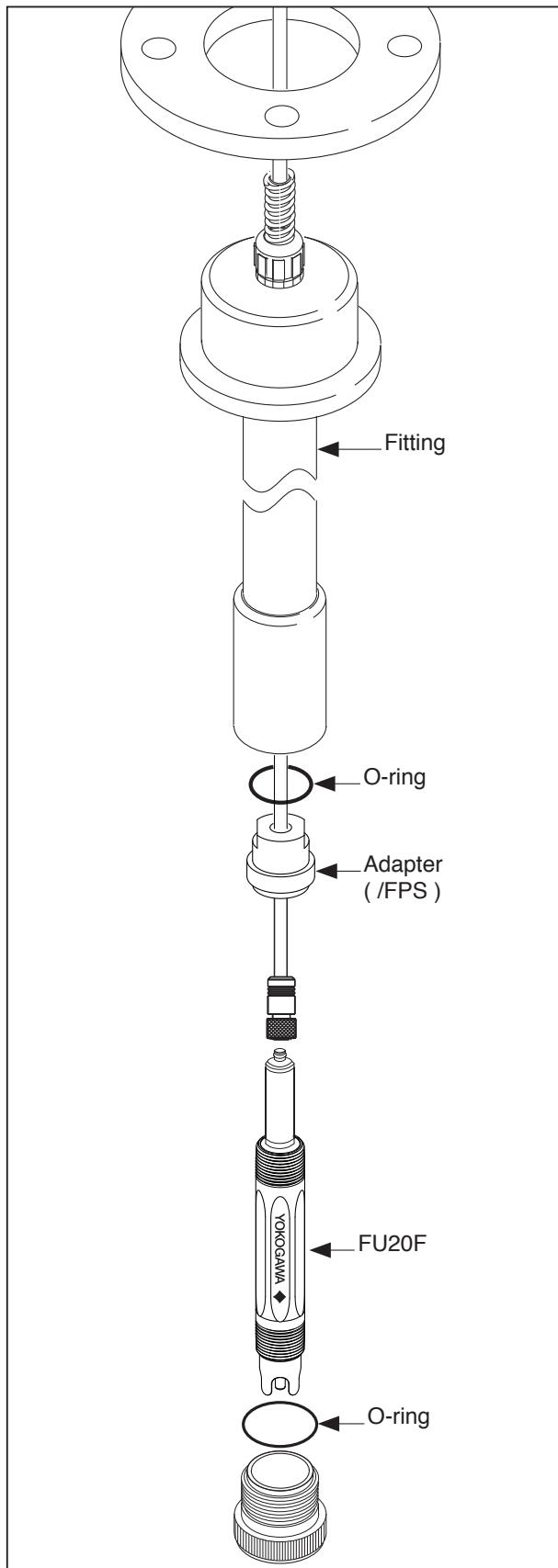
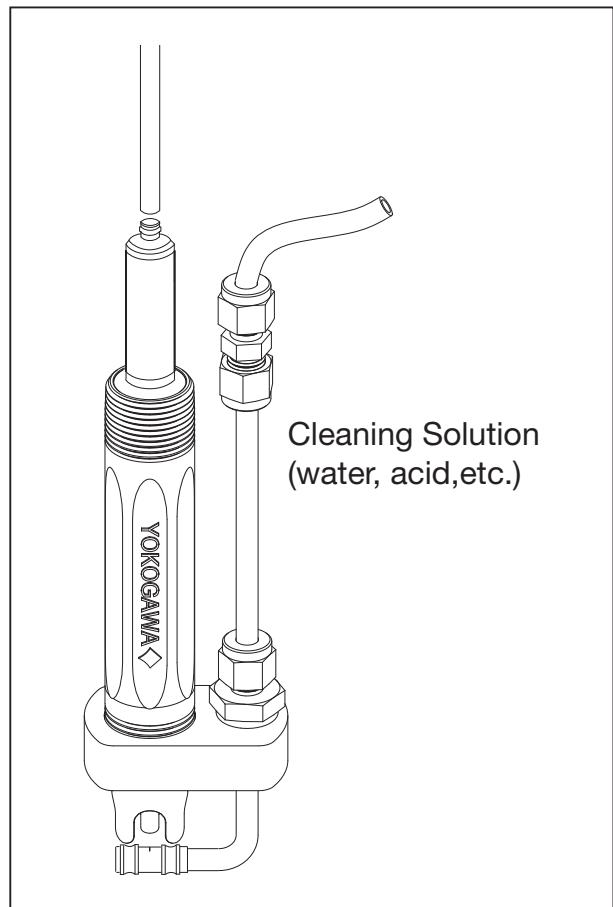


Figure 7: Mounting of sensor with /NSS, /NTI, /BSS or /BTI

Other mounting examples of the FU20F are given in Figure 8 and Figure 9.



**Figure 8: Mounting of sensor with /FPS**  
GS 12B06J03-04E-E



**Figure 9: Mounting of sensor with /HCNF**

## FU24F



Processes in which sensors are subjected to pressure changes normally decrease the useful life time. The internal pressure compensation feature of the analogue is made available for customers using digital sensors in the FU24F sensor.

The pressure changes of the process may cause fast desalting and dilution of the reference electrolyte. This on its turn will change the reference voltage being reason for drifting pH-measurement.

By using the successful Yokogawa patented Bellow system integrated in the FU24F 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.

For applicability in chemically harsh applications chemical resistant PPS 40GF has been selected for manufacturing the sensor body.

### Features

#### FU24F

- Simple installation due to two sided threaded body.
- Direct easy installation in-line.
- Installation in by-pass loop or immersion assembly.
- Flow fitting installation in FF20 using adapter K1521JA or K1521JB
- Optimal sensor for fluctuating pressure application due to patented bellow technique

### Model and suffix codes

Model code	Suffix code	Option code	Description
FU24F			SENCOM® pH Wide Body Sensor
Sensor tip	-FSM -NPT		Flat Surface Model Dome Shaped Model

## GENERAL SPECIFICATIONS FU24F

### Measuring elements

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

### Wetted parts

Sensor body	: PPS 40GF (RytonTM with glass filling)
Measuring sensor	: G-glass
LE glass tube	: AR-glass
Reference junction	: Porous PTFE
Earth pin	: Solid Platinum
O-ring	: Viton
Bellow system	: Viton

### Functional specifications (at 25°C)

Measuring system	
Isothermal point	: pH 7
Reference system	: Ag/AgCl with saturated KCl
Glass impedance	
- Dome shape	: 200 MΩ nominal
- Flat surface	: 700 MΩ nominal
Liquid junction	: Non-flow double junction
Junction resistance	: 1 to 15 kΩ
Temperature element	: Pt1000 to IEC 751
Asymmetry potential(zero)	: 8 ± 15 mV
Slope	: > 96 % (of theoretical value)

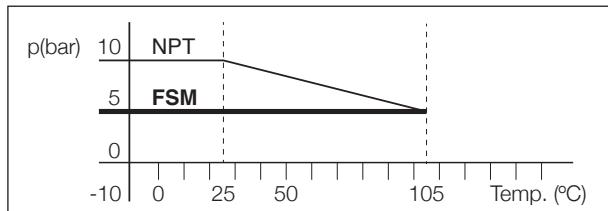
**Note:** The FU24F temperature sensor is designed for cell compensation and for indication.  
It is NOT designed for process temperature control.

### Dynamic specifications

Startup time sensor	: < 60 sec.
Response time pH	: t90 < 15 sec. (for 7 to 4 pH step at 25 °C)
Response time temperature	
- Dome shape	: t90 < 1 min. (for 10 °C step)
- Flat surface	: t90 < 4 min. (for 10 °C step)
Stabilization time pH	: < 2 min. (for 0.02 pH unit during 10 sec.)

### 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)



Conductivity : > 10 µS/cm

**Note:** The pH operating range is 0-14 pH, but using the sensor at temperature- and / or pH-extremes will seriously shorten the lifetime.

**Note:** Sensor is suitable for pure water applications.

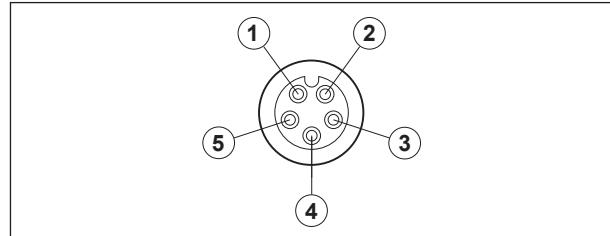
### Transmission signal (Data + and Data -)

General	: Bi-directional digital communication (RS 485) with limited MODBUS support
Data rate	: 9600 b/s (8,E,1)
Output function	: pH or temperature compensated pH : ORP, pH compensated ORP, rH : Temperature : Junction resistance : Sensor details (Model, Serial Number, production date) : Sensor calibration data (zero, slope, temperature offset) : Sensor status signals (e.g. Glass impedance detection)

**Note:** The output functions and settings of the sensor are accessible using a dedicated device such as the Yokogawa FLXA analyzer.

### Power supply (Supply+ versus Supply Gnd)

Operating range	: +2.7 to +3.6 VDC
Power consumption	: ≤ 20 mW



**Figure 1: Sensor connector (front view) with gold plated contacts.**

Pin #	Signal description
1	Data -
2	Data +
3	Supply +
4	Shield
5	Supply Gnd

## REGULATORY STANDARDS

**CE**

- ATEX : Decision 768/2008/EC EN200 : Directive 94/9/EC, as amended by Regulation (EC) no. 1882/2003 : DEKRA 11ATEX0064 X : Ex II 1 G Ex ia IIC T3...T6 Ga : For sensor input circuits (by connector) connected to a certified intrinsically safe circuit with the following maximum values  
Ui = 6.1 V; Ii = 230 mA; Pi = 1.2 W; Li = 4 µH; Ci = 30 µF or  
Certified intrinsically safe Yokogawa transmitter Model FLXA21 series.

Special conditions (X)

- : T6 for Tamb. -40 °C to +60 °C  
T5 for Tamb. -40 °C to +75 °C  
T4 for Tamb. -40 °C to +110 °C  
T3 for Tamb. -40 °C to +125 °C  
: Electrostatic charges on the sensor enclosure shall be avoided.

- Pressure	: Directive 97/23/EC, as amended by Regulation (EC) no. 1882/2003
Applying article	: 3.3 (Sound Engineering Practice) : Damaging the screw thread of the sensor might influence the maximum process pressure.
- EMC	: Directive 2004/108/EC IEC 61326-1: 2006 Class A (control and laboratory use) IEC 61326-2-3: 2006 (use in industrial locations)
- Low Voltage	: Directive 2006/95/EC Sensor contains glass parts which if broken can cause cutting injuries.
- WEEE	: Directive 2012/19/EU
- RoHS	: Directive 2011/65/EU

**IECEx**

Applying standards	: IEC 60079-0: 2007 IEC 60079-11: 2006 IEC 60079-26: 2006
Certificate no.	: IECEx DEK 11.0065X Ex ia IIC T3...T6 Ga

**CSA**

Certificate no.	: 2516979
Master contract no.	: 182892 IS, Class I Div. 1, GP A, B, C, D T3...T6
Electrical data	: For sensor input circuits (by connector), connected to a certified intrinsically safe circuit, with the following maximum values : $U_i = 6.1 \text{ V}$ ; $I_i = 230 \text{ mA}$ ; $P_i = 1.2 \text{ W}$ $L_i = 4 \mu\text{H}$ ; $C_i = 30 \mu\text{F}$ or Certified intrinsically safe Yokogawa transmitter Model FLXA21 series.
Ambient temperature	: T6 for Tamb. $-40^\circ\text{C}$ to $+60^\circ\text{C}$ T5 for Tamb. $-40^\circ\text{C}$ to $+75^\circ\text{C}$ T4 for Tamb. $-40^\circ\text{C}$ to $+110^\circ\text{C}$ T3 for Tamb. $-40^\circ\text{C}$ to $+125^\circ\text{C}$

**Note:** Intrinsically safe when connected as per Control Drawing FF1-K1226QV

**FM**

Certificate no.	: 3046277
Electrical data	IS, Class I Div. 1, GP A, B, C, D T3...T6
Ambient temperature	: For sensor input circuits (by connector), connected to a FM approved intrinsically safe apparatus meeting the entity parameters of the SENCOM® sensor: : $U_i = 6.1 \text{ V}$ ; $I_i = 230 \text{ mA}$ ; $P_i = 1.2 \text{ W}$ $L_i = 4 \mu\text{H}$ ; $C_i = 30 \mu\text{F}$ or FM approved intrinsically safe Yokogawa transmitter Model FLXA21 series.
Ambient temperature	: T6 for Tamb. $-40^\circ\text{C}$ to $+60^\circ\text{C}$ T5 for Tamb. $-40^\circ\text{C}$ to $+75^\circ\text{C}$ T4 for Tamb. $-40^\circ\text{C}$ to $+85^\circ\text{C}$ T3 for Tamb. $-40^\circ\text{C}$ to $+85^\circ\text{C}$

**Note:** Intrinsically safe when connected as per Control Drawing FF1-K1226QT (see

**INSTALLATION**

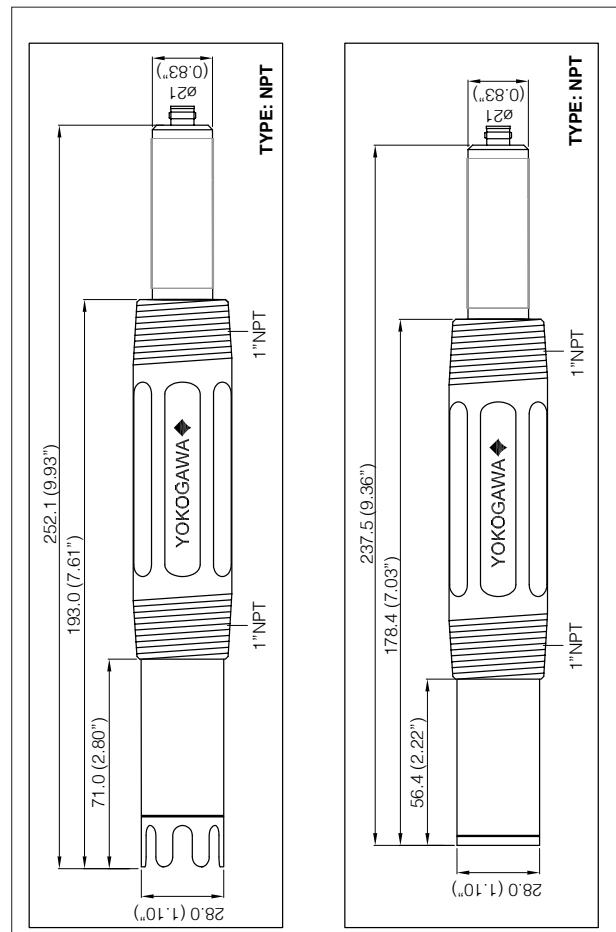
For optimum measurement results, the FU24F should be installed in a location that offers an acceptable representation of the process fluid composition and does not exceed the specifications of the sensor. The FU24F is designed with 1" NPT threads on either end of the body to allow installation in a wide variety of applications.

**Typical installation**

The FU24F sensor can be installed in-line, in a bypass loop or in an immersion assembly. For best results the FU24F should be mounted with the process fluid flowing towards the sensor. The sensor can also be mounted horizontally or any other angle.

**Mounting the sensor**

The FU24F can be mounted using the threads on the body of the sensor. For mounting the sensor in a FF20 flow fitting, use sparepart K1521JA or K1521JB.

**Dimensional Drawings**

## SC25F



The SC25F pH sensor, is the first 12 mm combined sensor released under the "SENCOM®" label. Under the SENCOP® product line digital communication functionality is added to sensors applied in process analysis. This digital communication and storage capability in the sensor opens additional advantages to our customers.

The basic features of the SC25F are similar to the analog SC25V sensor.

### Features

- 12mm PG13.5 pH electrode with Titanium LE element.
- Versatile in-line, immersion or off-line installation.
- Extended life time by saturated Ag/AgCl reference system with double junction combined with ion-trap, and porous PTFE reference diaphragm.
- Easy setup by sensor specific characteristics stored in the sensor itself.
- Integrated Pt1000 element for enhanced pH accuracy.
- Quality Inspection Certificate delivered with each sensor.

The SC25F SENCOP® sensors are equipped with PG13.5 connector and can be installed in the process by using:

- Retractable fitting PR10.
- Flow fitting FF20.
- Subassembly FS20.
- Immersion fitting FD20.
- Yokogawa's Exacompat series PD20, PF20, PS20.

Using adapter K1523AJ it is also possible to install the sensor in the FF40 fitting supplied by Yokogawa. The last installation option in the small flow fitting K1598 requires the use of PG13,5 adapter K1523JB. For detailed information refer to the instruction manual for the SC25V

### Specifications

Type	Membrane	Resistance MΩ/ 25°C	pH-range	Temp. range (°C)	Pressure range (kPa)	Reference liquid	Diaphragm system	Reference	Atex	SENCOP
SC25F-AGP25	Universal pH glass bulb	175-275	0-14	-10-80	0-1000	Saturated KCl	Ag/AgCl wire	PTFE	Yes	Yes
SC25F-ALP25	High T chem.res.	500-700	0-14	15-130	0-1000	Saturated KCl	Ag/AgCl wire	PTFE	Yes	Yes

### Modelcode

Model	Suffix Code	Option code	Description
SC25F			12mm SENCOP® pH sensor: pH, Ref, LE, Temp.
Sensor type	-AGP25 -ALP25		General purpose High temperature chemical resistant.
Sensor length	-120 -225		120 mm 225 mm

## GENERAL SPECIFICATIONS SC25F

### Measuring elements

pH glass electrode  
Silver Chloride reference  
Solid Titanium electrode  
Pt1000 temperature sensor

### Wetted parts

Sensor body : Glass, PPS  
Measuring sensor : G-glass or L-glass  
Reference junction : Porous PTFE  
Earth pin : Solid Titanium  
O-ring : Viton

### Functional specifications (at 25°C)

#### Measuring system

Isothermal point : pH 7  
Reference system : Ag/AgCl with saturated KCl  
Glass impedance : -G-glassb 400 MΩ nominal  
: -L-glass 775 MΩ nominal  
Liquid outlet : Non-flow junction  
Junction resistance : 0.2 to 5 kΩ  
Temperature element : Pt1000 to IEC 751  
Asymmetry potential(zero) : 8 ± 15 mV  
Slope : > 96 % (of theoretical value)

**Note:** The SC25F temperature sensor is designed for cell compensation and for indication.  
It is **NOT** designed for process temperature control.

### Dynamic specifications

Response time pH : t90 < 15 sec. (for 7 to 4 pH step)  
Response time temp. : t90 < 1.5 min. (for 10 °C step)  
Stabilization time pH : < 2 min.  
(for 0.02 pH / 10 sec.)

### Operating range

pH : 0 to 14  
Temperature G-glass : -10 °C to 80 °C (14 °F to 176 °F)  
L-glass : +15°C to 130°C (59 °F to 266 °F)  
Pressure : 0 to 10 bar (0 to 145 PSIG)  
Conductivity : > 10 µS/cm

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

### Transmission signal (Data + and Data -)

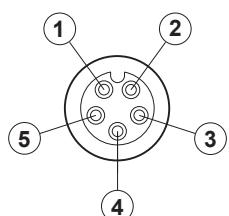
General : Bi-directional digital communication (RS 485) with limited MODBUS support  
Data rate : 9600 b/s (8,E,1)  
Output function : -pH or temperature compensated pH  
-Temperature  
-Junction resistance value  
-Sensor details (Model, Serial Number, production date)  
-Sensor calibration data (zero, slope, temperature offset)  
-Sensor status signals (e.g. Glass impedance detection)

**Note:** The output functions and settings of the sensor are accessible using a dedicated device such as the Yokogawa FLXA analyzer

### Power supply (Supply+ versus Supply Gnd)

Operating range : +2.7 to +3.6 VDC  
Power consumption : ≤ 20 mW

Pin #	Signal description
1	Data -
2	Data +
3	Supply +
4	Shield
5	Supply Gnd



### Regulatory standards

#### CE

- ATEX : Decision 768/2008/EC    
: Directive 94/9/EC, as amended by Regulation (EC) no. 1882/2003  
: DEKRA 11ATEX0064 X for  II 1 G Ex ia IIC T3...T6 Ga

Certificate no.

Electrical data : For sensor input circuits (by connector) connected to a certified intrinsically safe circuit with the following maximum values  
Ui = 6.1 V; Ii = 230 mA; Pi = 1.2 W;  
Li = 4 µH; Ci = 30 µF

or Certified intrinsically safe Yokogawa transmitter Model FLXA21.

Special conditions (X) : T6 for Tamb. -40 °C to +60 °C  
T5 for Tamb. -40 °C to +75 °C  
T4 for Tamb. -40 °C to +110 °C  
T3 for Tamb. -40 °C to +125 °C  
Electrostatic charges on the sensor enclosure shall be avoided.

#### - Pressure

Applying article   
: 3.3 (Sound Engineering Practice)  
Damaging the screw thread of the sensor might influence the maximum process pressure.

#### - EMC

: Directive 97/23/EC, as amended by Regulation (EC) no. 1882/2003  
: 3.3 (Sound Engineering Practice)  
Damaging the screw thread of the sensor might influence the maximum process pressure.

#### - Low Voltage

  
: Directive 2004/108/EC  
Sensor contains glass parts which if broken can cause cutting injuries.

#### - WEEE

: Directive 2012/19/EU 

#### - RoHS

: Directive 2011/65/EU

### IECEx

Applying standards : IEC 60079-0: 2007; IEC 60079-11: 2006; IEC 60079-26: 2006  
Certificate no.

### FM

Certificate no.

Electrical data : 3046277  
IS, CL I Div. 1, GP A, B, C, D T3...T6 : For sensor input circuits (by connector), connected to a FM approved intrinsically safe apparatus meeting the entity parameters of the SENCOM® sensor:  
Ui = 6.1 V; Ii = 230 mA;  
Pi = 1.2 W; Li = 4 µH; Ci = 30 µF

or  
FM approved intrinsically safe Yokogawa transmitter Model FLXA21 series.

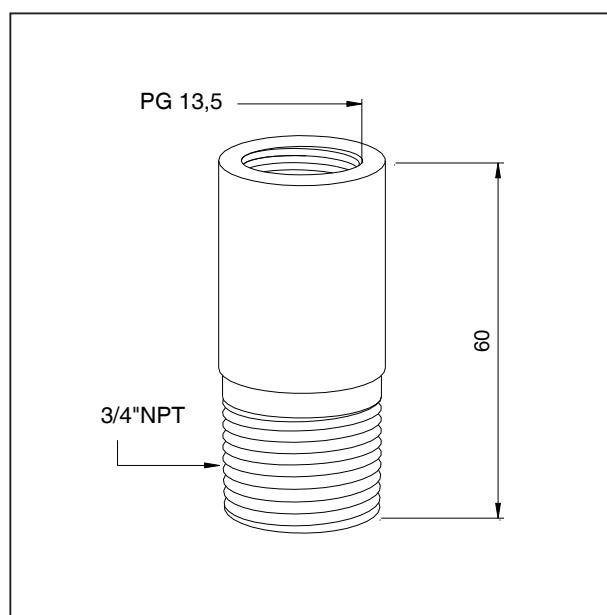
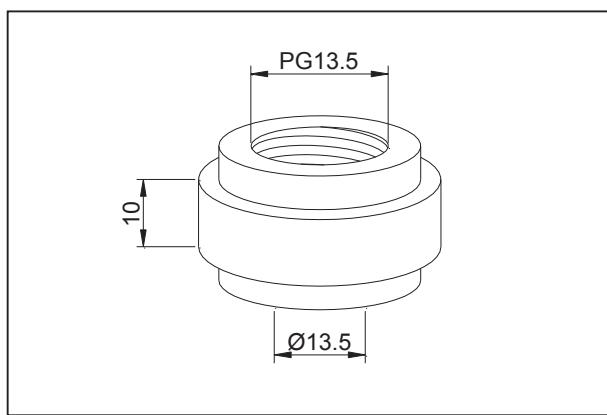
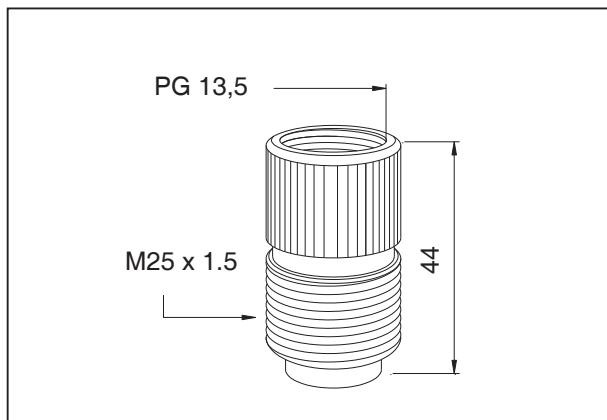
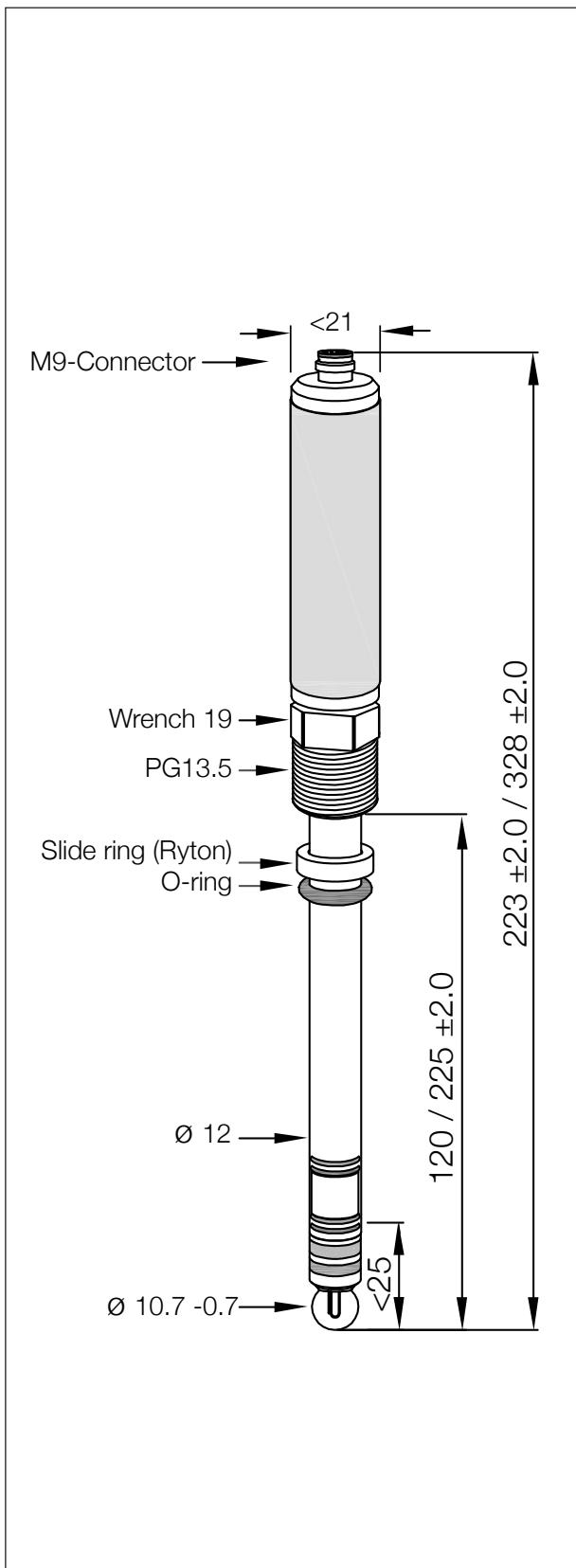
Ambient temperature

: T6 for Tamb. -40 °C to +60 °C  
T5 for Tamb. -40 °C to +75 °C  
T4 for Tamb. -40 °C to +85 °C  
T3 for Tamb. -40 °C to +85 °C

**Note:** Intrinsically safe when connected as per Control Drawing FF1-K1224QT

## DIMENSIONS

Dimensions in mm



## INSTALLATION OF SC25F

For optimum measurement results, the SC25F 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 SC25F is designed with PG13.5 threaded connection to allow installation in a wide variety of applications.

### Typical installation

The SC25F sensor is designed for versatile in-line, immersion or off-line installation. For best results the SC25F should be mounted with the process flow towards the sensor, and positioned at least 15° above the horizontal plane to eliminate air bubbles in the pH glass bulb (see Figure 14).

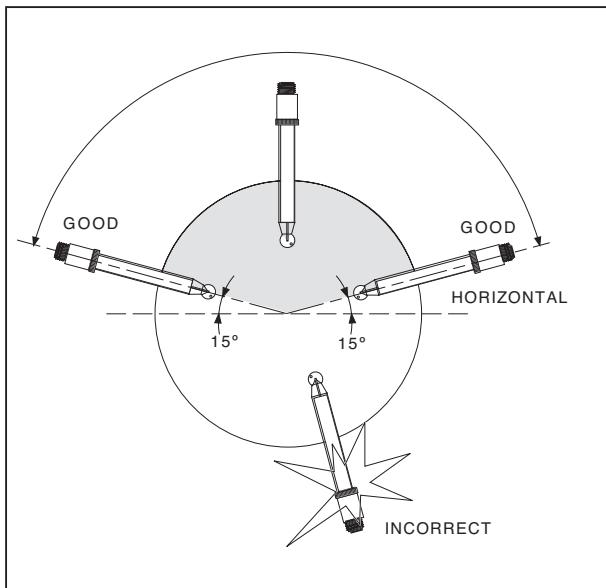


Fig 14: Mounting positions of sensor

### Preparing the sensor for use

Remove the sensor from its shipping box and slide off the so-called 'wet pocket', the tube filled with solution to prevent drying out of the measuring elements during shipment or storage. During shipment, electrolyte in the sensor could be dislocated. To correct this, place the sensor upright for 24 hours. Before installing the sensor in the process it should be calibrated.

### Mounting the sensor

The simplest way is to use the PG13.5 threaded connection of the sensor. The sensor is standard with a slide ring (Ryton) and an O-ring (Silicon) for direct mounting in a fitting provided with PG13.5 thread (see Figure 15). Other O-ring materials are available as a spare part.

**Note:** When sensor is to be installed in a fitting which is already provided with a spacer for the sensor, remove the pre-installed slide ring and O-ring and follow the installation instructions of the fitting.

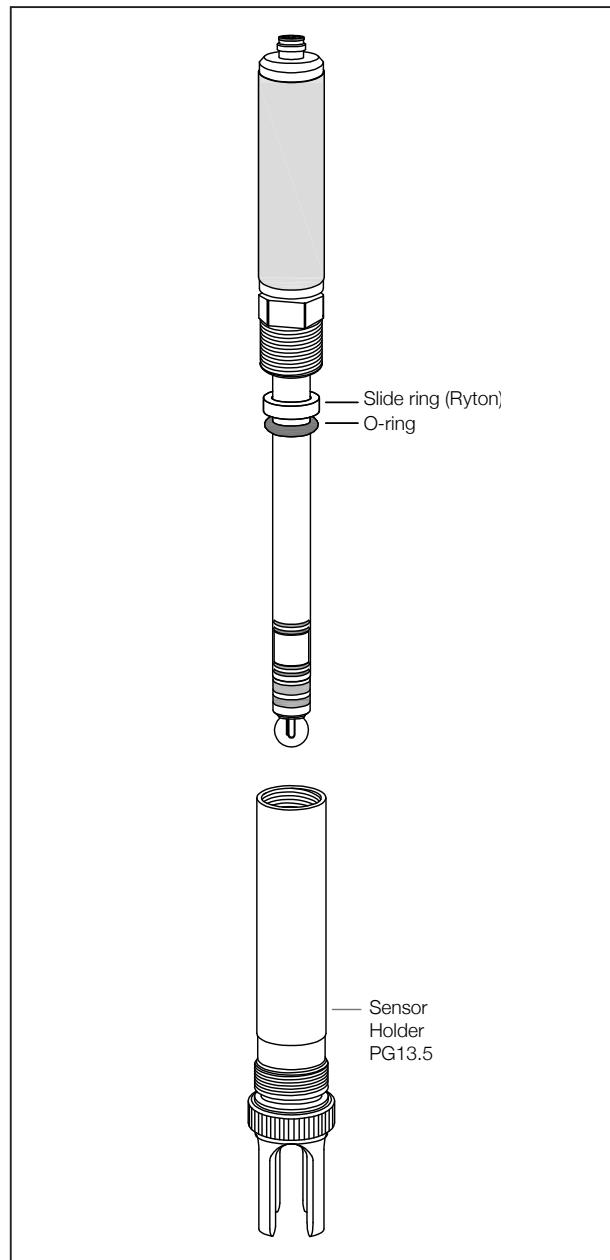


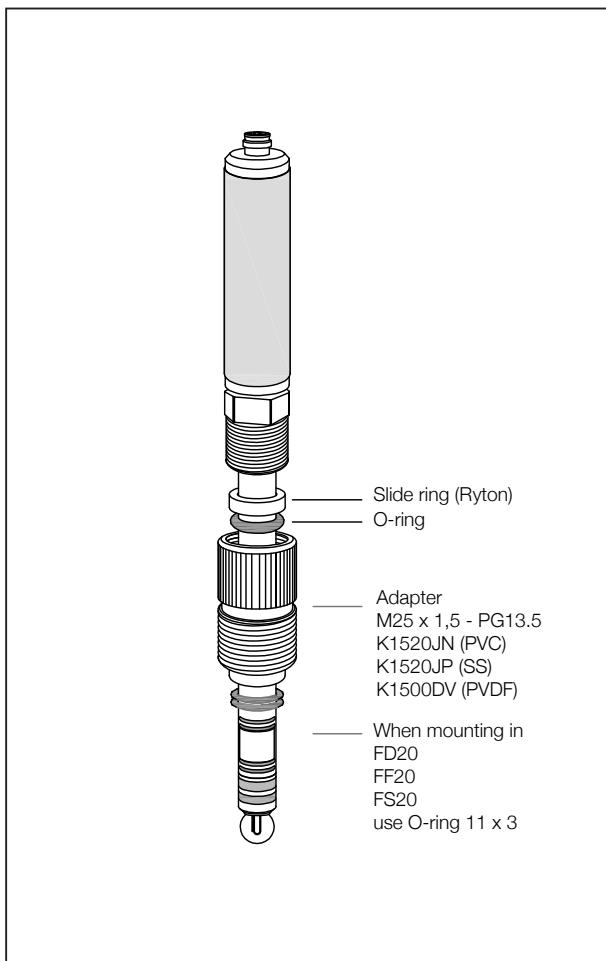
Fig 15: Simple mounting of sensor in PR10 retractable fitting

**Note:** Mounting the sensor in fittings where the sealing is situated nearby the sensortip, incorrect placement of the sensor will damage the measuring glass elements. Please handle with care.

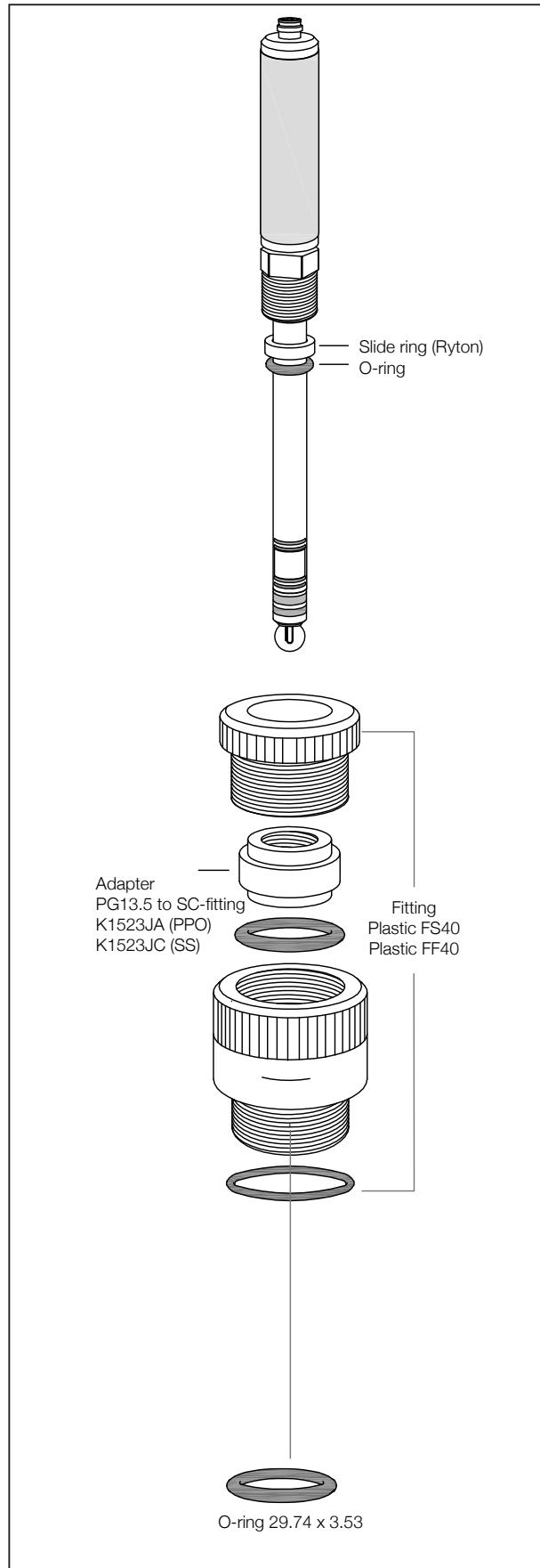
**Note:** First install the sensor in the adapter before mounting in the fitting.

The SC25F sensor can also be mounted in other fittings using a quick-removal adapter.

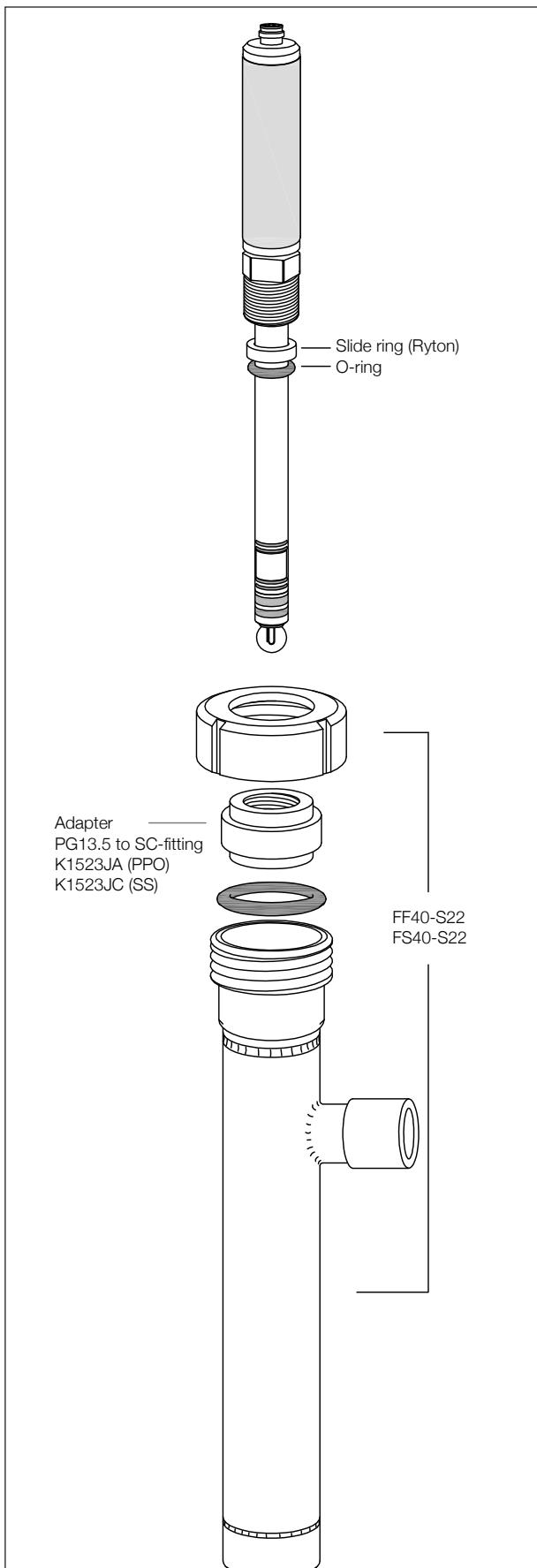
Examples of mounting the SC25F sensor using an adapter are given in Figures 16, 17, 18 and 19.



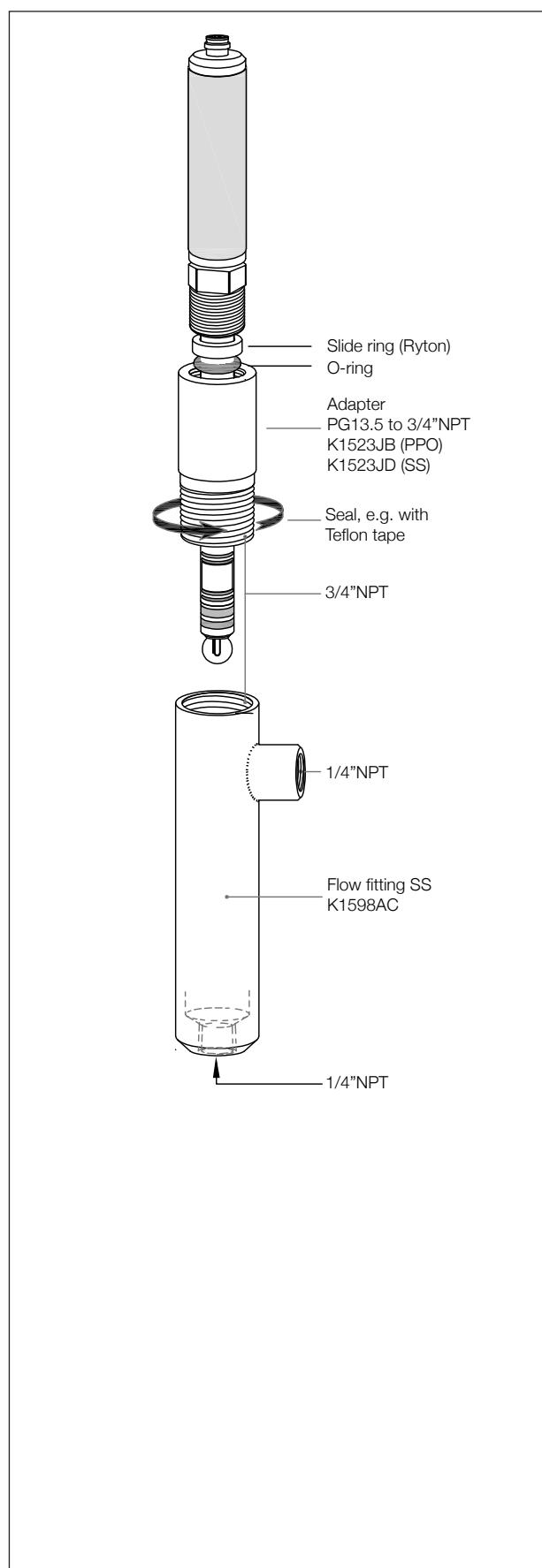
**Fig 16: Mounting of sensor in FD20/FF20/FS20 fitting using M25x1.5 adapter  
K1500DV/ K1520JN / K1520JP**



**Fig 17: Mounting of sensor in plastic FS40 / FF40 fitting, using adapter K1523JA / K1523JC**



**Fig 18: Mounting of sensor in metal FF40 fitting, using adapter K1523JA / K1523JC**



**Fig 19: Mounting of sensor in fitting K1598AC, using adapter K1523JB / K1523JD**

GS 12B06J03-04E-E

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# General Specifications

## Model WU11 Interconnection Cable for SENCOM sensor

The WU11 interconnection cable is specified for reliable transfer of digital signals between the SENCOM sensors and Yokogawa FLXA analyzer.

It is especially designed to be installed in a heavy industrial environment.

The cable is water proof, allowing it to be submerged as a whole.

The cable has a wide temperature operation range which is sufficient for most of the applications.

The materials used for the cable are flame retardant to resist the spread of fire.

### Features

- Double shielding to protect connected devices for interference from high voltages and currents
- Available in four different lengths. Long cable runs up to 100 m (328 ft) are possible
- Easy connection to a SENCOM pH Sensor by one 5- pins molded connector, and to the analyzer by 5 wired pins
- Flame retardant recognized by UL (fileno. E124763) and CSA (fileno. LL105324)
- IP67
- Operating temperature from - 40°C up to + 85°C (-40°F up to +185°F)

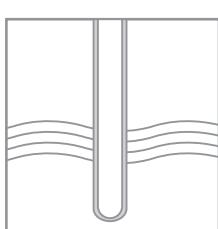


### GENERAL SPECIFICATIONS WU11

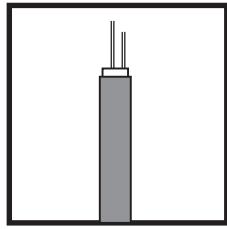
#### Cable materials

Twisted pair cables	: Tinned copper conductors 0.25 mm <sup>2</sup> (24 AWG)
Outside shield	: Foil shield with drain wire, 125% coverage. Braid, tinned copper 0.008 mm <sup>2</sup> (38 AWG), 95% coverage
Insulator	: Polyethylene for the twisted pair cables Color twisted pair #1: green / yellow Color twisted pair #2: brown / white  Polyvinylchloride for the outside jacket, solid extrusion Color black

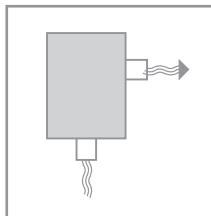
#### System configuration



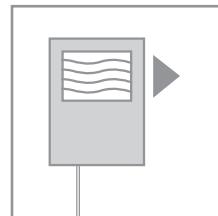
Sensors



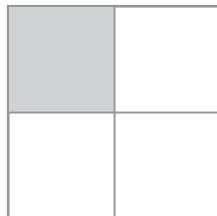
Cables



Fittings



Transmitters



Accessories

#### Connector materials

Housing	: Polybutylene terephthalate UL94V-0, color: black
O-ring	: Nitrilbutadienrubber, color: black
Nut	: Brass
Contact finishing	: Gold plated

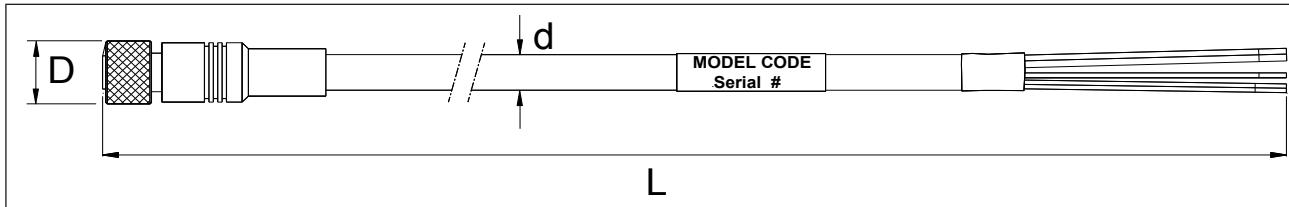
#### Electrical specifications

Twisted pair cables	: Capacity < 50 pF/m Resistance < 100 Ω/km Characteristic Impedance 120 Ω
Connector	: Maximum rated current 5 A Maximum voltage 125 V

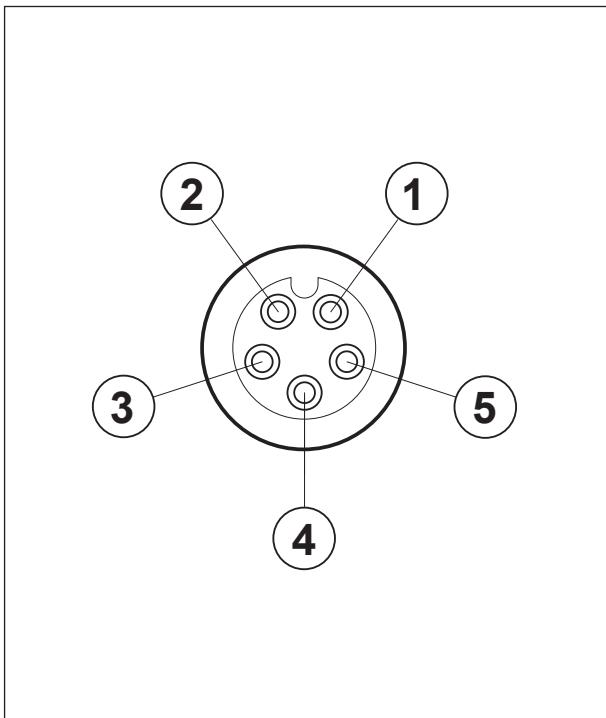
#### Operational specifications

Temperature	: - 40°C up to + 85°C (-40°F up to +185°F)
Water Proof	: IP67 (conform IEC60529)

## DIMENSIONS

**Figure 9: Dimensions of WU11 cable**

Length (L) : 3, 5, 10, 20 m (9.8, 16.4, 32.8, 65.6 ft)  
 Diameter connector (D) :  $10.6 \pm 0.2$  mm ( $0.417 \pm 0.008$  inch)  
 Diameter cable (d) :  $5.8 \pm 0.1$  mm ( $0.228 \pm 0.004$  inch)  
 Wire pins : 8 x 1.3 mm (0.31 x 0.05 inch)

**Figure 10: Front view cable connector with gold plated contacts**

## CONNECTOR LAYOUT

### Definition connector pin to cable

Pin #	Twisted pair #	Wire color	Wire number
1	1	yellow	83
2	1	green	84
3	2	brown	87
4	drain	black	82
5	2	white	86

### Connection cable to FLXA analyzer

Signal Description	Wire color	Wire number	FLXA terminal
Supply +	brown	87	87
Supply Gnd	white	86	86
Data +	green	84	84
Data -	yellow	83	83
Shield	black	82	82

### Model and Suffix Codes

Model	Suffix	Description
WU11		
Conn. type	-M9	M9 connector
Cable length	-03 -05 -10 -20	3 m (9.8 ft) 5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft)
Cable finishing	-WP	Wire pins
Jacket material	-V	PVC

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# General Specifications

GS 04L51B01-01EN

GX10/GX20  
Paperless Recorder  
(Panel mount type)

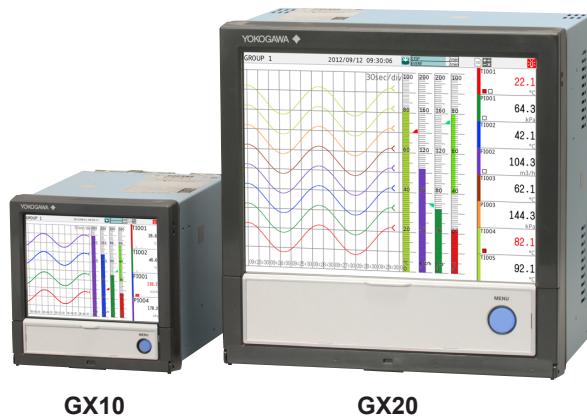
**SMARTDAC+**®

## ■ OVERVIEW

The GX10/GX20 are paperless recorders that display real-time measured data on a touch screen and save data on an external storage medium (SD card).

For the input/output module specification, please see GX90XA/GX90XD/GX90YD/GX90WD Input/Output Module General Specification (GS 04L53B01-01EN.)

- The number of analog input is a maximum of 100 channels in GX10 with expandable I/O, and a maximum of 450 channels in GX20 with expandable I/O.
  - \* Max. number of input/output channels is 500 channels.
- The GX10/GX20 have the large internal memory (GX10/GX20 standard type: 500MB, GX20 large memory type: 1.2 GB), and prolonged record and preservation are possible.
- As the input signal, a DC voltage, thermocouple, resistance temperature detector, DI (DCV input (TTL), contact signal), or mA (DC current) can be set to each channel.
- Input and output have module structure and it can extend them easily. (GX10: max. 3\*, GX20: max. 10\*)
  - \* In case of using expandable I/O, GX10 can extend two units, GX20 can extend 9 units.
- A module type is four types, an analog input, a digital input, a digital output, and a digital input/output.
- A maximum of six units of expandable I/O can be connected to GX10/GX20. Each expandable I/O can incorporate a maximum of six modules. With expandable I/O connected, the large memory type GX10 and GX20 can use multiple channels. Furthermore, the I/O ports can be installed in separate locations from where GX10/GX20 is located, helping you reduce wiring requirements and build a decentralized configuration.
- The intuitive operation by flick, pinch in, pinch out, and swipe are possible.
- The past trend under recording can be seamlessly displayed on a trend screen.
- Moreover, the measurement data of the time specified on the calendar screen can be searched and displayed.
- Various functions, such as a freehand message, a PDF/Excel output of a report file, a direct output to a network printer, a scale movement of a trend display, and a buzzer sound, are equipped.
- It can be hooked up to network via Ethernet, which enables to inform by Email and to monitor on Web site as well as to transfer files by using FTP. Also, it can communicate with Modbus/RTU or Modbus/TCP.
- A setup of GX can be performed on-line from the web browser on PC. A setup by off-line is also possible.
- Universal Viewer software allows a PC to display waveforms on its screen and to print out waveforms.



**GX10**

**GX20**

- The measuring accuracies noted in the general specifications have a margin of error that takes into account the product's components and the equipment used for adjustment and testing. However, the actual values calculated from the accuracy testing data upon shipment of the instrument from the factory are as follows.

Input type		Measuring accuracy*1 (typical value*2)
DCV	20 mV	± (0.01% of reading + 5 µV)
	6V (1-5V)	± (0.01% of reading + 2 mV)
RTD	Pt100	± (0.02% of reading + 0.2 °C)
	Pt100 (high resolution)	± (0.02% of reading + 0.16 °C)

\*1 General operating conditions: 23±2 °C, 55±10% RH, supply voltage 90–132, 180–250 VAC, supply frequency within 50/60 Hz ±1%, warm-up of 30 minutes or more, no vibrations or other hindrances to performance.

\*2 For the measuring accuracy (guaranteed), see the module's general specifications (GS04L53B01-01EN).

## ■ MAIN UNIT SPECIFICATIONS

### ■ FUNCTIONAL SPECIFICATION

#### Input Specifications

Please see GX90XA/GX90XD/GX90YD/GX90WD I/O Module General Specifications.

Model	Name	General Specification No.
GX90XA	Analog input module	GS 04L53B01-01EN
GX90DX	Digital input module	
GX90YD	Digital output module	
GX90WD	Digital input/output module	

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## Measuring Functions

- The number of installable modules and I/O channels (total for GX and expandable I/O)

### GX10/GX20 standard type

Item	GX10/GX20 standard type
Number of module	Max. 10
Number of input/output module	Max. 100

### GX20 large memory type

Item	GX20 large memory type
Number of module	Max. 45
Number of input/output module	Max. 500 (or max. 450 for AI only)

#### Restrictions of module connection:

- A maximum of 10 modules can be installed, as a total for GX90YD digital output modules and GX90WD digital I/O modules.
- A maximum of one GX90WD digital I/O module can be installed in GX and in each expandable I/O.
- Expandable I/O connection  
Number of connectable units: Max. 6

## Display Functions

### Display groups:

Number of groups; GX10: 30, GX20 standard type: 50, GX20 large memory type: 60  
Number of channels that can be assigned to each group; GX10: 10, GX20: 20  
Scan interval:  $100^{*12}$ ,  $200^{*12}$ , 500 ms $^{*1}$ , 1, 2, 5 s  
\*1 Cannot be specified if an electromagnetic relay scanner type (Type Suffix Code: -T1) analog input module is in use.  
\*2 Cannot be specified for L-model DCV/TC/DI, scanner type (Type Suffix Code: -L1).

### Display color (Trend/Bar graph/Digital display):

Channel: Select from 24 colors  
A desired display color can be selected freely using its RGB value.  
Background: Select from white or black

### Display type:

- Trend display (T-Y)  
Display method:  
Direction: Horizontal, vertical  
Trend interval:  $5^{*12}$ ,  $10^{*12}$ ,  $15^{*1}$ , 30 s/div, 1, 2, 5, 10, 15, 20, 30 min/div, 1, 2, 4, 10 h/div  
\*1 Cannot be specified if an electromagnetic relay scanner type analog input module is in use.  
\*2 Cannot be specified for L-model DCV/TC/DI, scanner type (Type Suffix Code: -L1).
- Trend line width: Thick, normal, thin  
Scale; GX10: Max. 6, GX20: Max. 10  
Current value bar graph, color scale band, and alarm point marks can be displayed on the scale.
- Moving scale; Scale can be moved on any waveform.  
A bitmap image scale can be attached.
- Others; Grid (Auto, 4 to 12), Trip line, Message, Zone display, Partial expanded display

- Historical trend display (T-Y display)  
Redisplays the display data or event data in the internal memory or external storage medium  
Time axis operation: The time axis can be reduced or expanded.

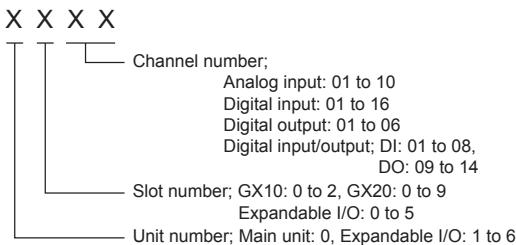
Data search: Waveforms from the internal memory can be displayed through the specification of a date and time, calendar, each summary  
Moving scale; A bitmap image scale can be attached.

All historical trends can be displayed in one screen.

- Bar graph display  
Direction: Vertical or horizontal  
Scale: Display a scale for each channel  
Color scale band, and alarm point marks can be displayed on the scale.
- Digital display  
Displays measured values numerically  
A DI input state can be displayed as an arbitrary character string (0=Off/1=On, etc.)  
Update rate: 0.5 s
- Overview display  
Display format: All channels, each groups  
Displays the measured values of all channels and the alarm statuses
- Alarm summary display  
Displays a log of up to 1000 alarms  
Specify an alarm with the cursor and jump to the corresponding section on the historical trend display.
- Message summary display  
Time and content of up to 500 messages (including 50 add messages)  
Specify a message with the cursor and jump to the corresponding section on the historical trend display.
- Memory summary display  
Displays the information (up to 500) of the data in the memory  
Specify a file with the cursor and jump to the corresponding section on the historical trend display.
- Report display  
Displays the report data residing in the internal memory  
For more details, see "MATHEMATICAL FUNCTIONS WITH REPORT FUNCTION (/MT)."
- Log display  
Displays the event log, error log, communication log, FTP log, Web log, e-mail log, SNTP log, DHCP log, and Modbus log.
- Multi-panel display  
Divides the screen into two to six sections and displays some different display formats.
- Internal switch/relay state display  
Displays the internal switch and ON/OFF state of DO  
Operates the internal switch and ON/OFF state
- Other displays  
Network information display  
System information display  
System configuration display

**Auto scroll ON/OFF:**

- The displayed groups can be automatically switched at a specified interval.
- The display switches in ascending group order.

**Names of channels:****Tags:**

- Tag and Tag numbers can be displayed.
- Tag number; Number of characters: Up to 16  
Displayable characters: Alphanumeric characters
- Tag numbers can be enabled or disabled.
- Tag; Number of characters: Up to 32  
Displayable characters: Alphanumeric characters

**Message:**

- Write messages to the trend display.
- Number of messages: 100
- Number of characters: Up to 32
- Write method: Write a preset message or write an arbitrary message on the spot.
- Write destination: Select only the displayed group or all groups.
- Auto message: Write a message when the GX recovers from a power failure while memory sampling is in progress.
- Write a message when the trend interval is switched during memory sampling.

**Add message:**

- Write messages to the past data positions.
- Message: The same as the "Message" item above

Number of writable messages per file: 50 messages (including 10 freehand messages)

**Freehand message:**

- Can be written by dedicated pen.

Number of writable messages per file: 50 messages (including 10 Add messages)

**Data Saving Functions****Internal memory:**

- Temporarily saves various types of data.
- Medium: Flash memory
- File storage capacity:  
GX10, GX20 standard type: 500 MB  
GX20 large memory type: 1.2 GB

**External storage medium:**

- Medium SD card (SD/SDHC) (up to 32 GB)
- Format: FAT32 or FAT16

**Data type:**

- Display data, Event data, Alarm summary data, Manual sampled data, Screen image data, Setup data, and Report data

**Display data:**

- Target: Measurement (input/output module)/math/communication channels, alarm summary, message summary  
Description: Maximum or minimum value per recording interval
- Recording intervals: Determined by the trend interval, recording data type (display data/display data + event data, GX20 large memory type)  
For GX20 standard type

Trend interval (div)	Number of channels
5 s	100
10 s	200
15 s or longer	500

**For GX20 large memory type**

Trend interval (div)	Number of channels	
	Display data	Display data + Event data
5 s	200	100
10 s	500	200
15 s	1000	500
30 s or longer	1000	1000

Note that the maximum number of channels is fixed at 100 in the GX10.

- Data size:  
Analog input data: 12 bytes/ch.  
Digital I/O data: 4 bytes/ch.  
Math channel data: 12 bytes/ch.  
Communication channel data: 12 bytes/ch.
- File size: Up to 18 MB
- Number of files for GX10, GX20 standard type: Up to 500 (including event data), for GX20 large memory type; Up to 1000 (including event data)  
Operation in the internal memory: FIFO (First In First Out)
- Data format: Binary or text
- Recording: Records data at all times.
- Display data file sample time  
Measurement channel = 30. Math Channel = 0

Internal Memory	500 MB
Trend interval (minute/div)	30 minutes
Recording interval (s)	60 s
Total sample time	Approx. 2.5 years

**Event data:**

- Target: Measurement (input/output module)/math/communication channels, alarm summary, message summary, operation log  
Description: Instantaneous value per recording interval
- Recording intervals: Determined by the sample rate, recording data type (display data/display data + event data, GX20 large memory type)  
For GX20 standard type

Sampling rate	Number of channels
100 ms	100
200 ms	200
500 ms or longer	500

### For GX20 large memory type

Trend interval (div)	Number of channels	
	Display data	Display data + Event data
100 ms	500	100
200 ms	500	200
500 ms	1000	500
1 s or longer	1000	1000

Note that the maximum number of channels is fixed at 100 in the GX10.

- Data size;  
Analog input data: 6 bytes/ch.  
Digital I/O data: 2 bytes/ch.  
Math channel data: 6 bytes/ch.  
Communication channel data: 6 bytes/ch.
- File size: Up to 18 MB
- Number of files for GX10, GX20 standard type: Up to 500 (including display data), for GX20 large memory type; Up to 1000 (including display data)
- Operation in the internal memory: FIFO (First In First Out)
- Data format: Binary or text
- Mode; Free: Records data at all times.  
Trigger: Starts recording data when a certain event occurs and records for the specified interval.  
Repetition trigger: Repeat Trigger mode
- Event data file sample time  
Measurement channel = 30. Math Channel = 0

Internal Memory	500 MB
Recording interval (s)	1 s
Total sample time	Approx. 1 month

### Alarm Functions

- Number of alarms: Up to four alarms (level) for each measurement channels
- Alarm type: High limit, low limit, difference high limit, difference low limit, high limit on rate-of-change alarm, low limit on rate-of-change alarm, delay high limit, and delay low limit
- Alarm delay time: 1 s to 24 hours (for each channel)
- Rate-of-change calculation interval of rate-of-change alarms: 1 to 32 times the scan interval (common to all channels)
- Hysteresis: 0.0 to 5.0% of the span (for each alarm (level))
- Alarm output: Output to the internal switch  
Internal switch operation: AND/OR operation selectable
- Display: Displays the status on the respective operation screen and an alarm icon on the status display section when an alarm occurs.  
Display operation: Hold or not hold the display until the alarm acknowledge operation
- Alarm hide function (alarm no logging function)  
Not display alarms nor record to the alarm summary (for each channel)
- Alarm information: Displays a log of alarm occurrences on the alarm summary

- Reflash: The duration for which the reflash relays are deactivated can be set to 500 ms, 1 s, or 2 s.
- Individual alarm ACK function:  
Alarm display and relay output can be cancelled on individual alarms

### Event Action Functions

- Event action: Execute a specified operation when a given event occurs.
- Number of settings: 50  
Events: Remote control input, etc.  
Timer; Number of timers: 4  
Match time timer; Number of timers: 4  
Action: Specify memory start/stop, alarm ACK, etc.

### Security Functions

- Operation lock function: Limitations to touch operation, access to the external storage medium, and various operations
- Login function: Only registered users can operate the GX.  
It can be set to each of touch operation and communication access.  
System administrators and Users: 50 (totally)  
Number of Authority of user: 10 level

### Manual Sampled Data

- Item: Instantaneous value at an arbitrary time
- Target: Measurement (input/output module)/math/communication channels
- Number of recording channels;  
GX10, GX20 standard type: Max. 50  
GX20 large memory type: Max. 100
- Maximum number of data values that the internal memory can store: 400
- Data format: Text

### Report Data

- Item: Report at each scheduled time of report
- Target: Measurement (input/output module)/math/communication channels
- Maximum number of reports that the internal memory can store: 800
- Data format: Text

### Snapshot Data

- Item: Displayed screen image data
- Data format: PNG
- Output destination: External medium or communication output

### Setup Data

- Item: GX setup data
- Data format: Text
- Output/read destination (for saving/loading): External medium

### Clock Functions

- Clock: With a calendar function
- Accuracy:  $\pm 5$  ppm (0 to 50°C), excluding a delay (of 1 second, maximum) caused each time the power is turned on.
- Time setting: Using touch operation, communication command, event action function, or SNTP client function

- Time adjustment method:  
Limit in which the time is gradually adjusted:  
Select from the available settings between 5 s and 15 s.  
Whether to change an out-of-limit operation immediately or report it as an error can be selected.  
While memory sampling: Corrects the time by 1 ms for each second.  
While memory is stopped: Immediately change the time.
- DST: The date/time for switching between standard time and DST can be specified.
- Time zone: Sets the time difference from GMT.
- Date format: Select "YYYY/MM/DD", "MM/DD/YYYY", "DD/MM/YYYY" or "DD.MM.YYYY".  
MM expression can be selected from the numeric character or ellipsis. Ex. January: 01 or Jan  
The delimiter can be selected from "/", ".", "-".

### Ethernet Communication Functions

- Electrical specifications: Conforms to IEEE 802.3
- Connection: Ethernet (10BASE-T/100BASE-TX)
- Max. segment length: 100 m
- Max. connecting configuration: Cascade Max. 4 level (10BASE-T), Max. 2 level (100BASE-TX)
- Connector: RJ-45
- Protocols: TCP, UDP, IP, ICMP, ARP, DHCP, HTTP, FTP, SMTP, SNTP, Modbus, and dedicated protocols
- E-mail client: Automatically send e-mail at specified times.  
E-mail is sent by events as below.
  - Alarm occurring/alarm canceling
  - Recover from power failure
  - Report data generating
  - Storage medium error, FTP client function error
  - Specified time period
- POP before SMTP and SMTP authentication (PLAIN and CRAM-MD5) is available.
- FTP client: Automatically transfer data files to the FTP server.  
Applicable files: Display data, event data, screen image data, report data, etc.
- FTP Server: Transfer files, delete files, manipulate directories, and output file lists of the GX.
- Number of the simultaneous connection: Max. 4
- Web server: GX real-time monitoring and setting changes/operations can be performed with the Web browser.  
The screen layout can be determined independently of the screen of the GX main unit.
- Number of the simultaneous connection: Max. 4
- SNTP client: Inquires the time to the SNTP server and sets the GX.
- SNTP server: Outputs the GX time.  
Time resolution: 5 ms
- DHCP client: Automatically obtain the network address settings from the DHCP server.
- Modbus client: Reads data from another device and writes to the registers.  
Number of connectable sever;
  - GX10, GX20 standard type: Max. 16
  - GX20 large memory type: Max. 32

- Modbus server: Loads measurement and math channel data  
Loads and writes communication channel data  
Some control commands such as memory start Modbus client\* register access limitations  
\*: Required /MC option  
Number of the simultaneous connection: Max. 4
- Setting/Measurement server: Operate, set, and output data of the GX using a dedicated protocol.
- DARWIN compatible communication server:  
Supports some DARWIN commands  
Communication with GX is possible using DARWIN communication commands.
- Output-related commands: Output measurement (IO) channel data, Output calculation channel data, Output relay status, Output the position of the decimal point for the measurement (IO) channel, Output the position of the decimal point for the calculation channel, Output the information on system configuration
- Setup-related commands: Range, Scale unit, Alarm, Time, Moving average
- Operation-related commands: Reset alarm, Reset timer, Start MATH calculation, Rebuild system, Initialize, Input communication, Output communication DO, Write message

### Batch Function

- Function: Data management using batch names.  
Enter text fields and batch comments in the data file.
- Batch name: Added to the file name of the display data and event data.  
Structure: Batch number (up to 32 characters) + lot number (up to 8 digits)  
Use/not use selectable for lot number, on/off selectable for auto increment function.
- Text field: Adds text to the display data and event data.  
There are 24 available text fields.  
Up to 20 title characters and 30 other characters can be entered per field.
- Batch comment: Adds text to the display data and event data.  
3 comments (max. 50 characters) are available.

### Printer Output Function

- Snapshot Data can be printed out with any LAN-connected printer supporting the HP-PCL5c language.

### SSL Communication Functions

- Communication that sends and receives information encrypted by the SSL (Secure Socket Layer) protocol is possible.
- Server function:  
Supported servers: HTTP server and FTP server (Port number: 443 when encryption is used)  
Private key: Created in GX and saved in the internal memory  
Server certificate: Server certificates created by users can be saved in the internal memory.  
Self-signed certificates can be created in GX.
- Client function:  
Supported clients: FTP client and SMTP client (Port number: 443 when encryption is used)  
Trusted certificate: Trusted certificates (a total of up to 100 KB) can be saved in the internal memory.

## Electronic Signature Function

Electronic signatures can be added to report files created in PDF format using the PDF form creation function. An electronic signature is provided each time a report file is created.

- Certificate for electronic signature: Certificates for electronic signatures created by users can be saved in the internal memory.

## Other Functions

- Buzzer: GX makes a buzzer sound at touch screen operation, or when alarm occurs.
- Backlight saver function: Dim or turn off the LCD backlight if there is no key operation for a specified time.
- Favorite display: Register frequently used displays to the Favorite and show them through simple operation.
- The main alarm is indicated using the MENU key LED.
- No alarm: Blue (same condition as power-on)
- Alarm condition: Red.
- User function feature: A button (user function key) to which the user can assign a desired function is provided. It can be assigned to an event triggered by the event action function.
- Firmware update function: The Web application, the IO module, or the expansion module firmware can be updated by operating GX.

## ■ HARDWARE SPECIFICATIONS (MAIN UNIT)

### Display

#### Display unit\*:

GX10: 5.7-inch TFT color LCD (640 × 480 dots)

GX20: 12.1-inch TFT color LCD (800 × 600 dots)

\* A small number of missing or steady-on LCD pixels and minor variations in brightness uniformity is a normal display characteristic and not a malfunction.

#### Touch screen:

4 wire resistive touch screen

### Construction

- Mounting: Flush panel mounting (on a vertical plane)
- Mounting angle: Inclined backward up to 30 degrees from a horizontal plane. Left and right horizontal
- Panel thickness: 2 to 26 mm
- Material:  
Case: Metal plate  
Bezel and display cover: Polycarbonate
- Color:  
Case: Smoke blue  
Bezel: Charcoal grey light
- Front panel: Water and dust proof: Complies with IEC529-IP65 and NEMA No.250 TYPE 4 (except External Icing Test), except for side-by-side mounting
- External dimensions:  
When installing modules  
GX10: 144(W) × 144(H) × 255(D) mm  
GX20: 288(W) × 288(H) × 220(D) mm  
When uninstalling modules  
GX10: 144(W) × 144(H) × 174(D) mm  
GX20: 288(W) × 288(H) × 169(D) mm  
(D: depth from the panel mounting plane)
- Weight:  
GX10: Approx. 2.1 kg, GX20: Approx. 6.0 kg  
(excluding modules)

### Power Supply

- Rated supply voltage: 100 to 240 VAC
- Allowable power supply voltage range: 90 to 132, 180 to 264 VAC
- Rated power supply frequency: 50/60 Hz
- Power consumption:

Supply voltage	LCD backlight off	Normal operation	Maximum
100 VAC	GX10: 16 VA GX20: 28 VA	GX10: 20 VA GX20: 34 VA	GX10: 48 VA GX20: 90 VA
240 VAC	GX10: 24 VA GX20: 38 VA	GX10: 30 VA GX20: 45 VA	GX10: 60 VA GX20: 110 VA

\* The following combinations are assumed for LCD backlight off and normal operation.

GX10: 1 AI module, 1 DO module, 1 DI module

GX20: 5 AI modules, 4 DO modules, 1 DI module

- Module power supply voltage: The total allowable power consumption of respective modules is up to 6 W in the GX10 and up to 20 W in the GX20.
- Allowable interruption time: Less than 1 cycle of the power supply frequency

## Isolation

- Insulation resistance: Between the Ethernet, RS-422/485, and each insulation terminals and earth: 20 MΩ or greater at 500 VDC
- Withstand voltage:
  - Between the power terminal and earth: 3000 V AC at 50/60 Hz for one minute
  - Between the contact output terminal and earth: 3000 V AC at 50/60 Hz for one minute
  - Between the input/output modules and earth: Depends on the specification of I/O module.
- Grounding: Be sure to set a low grounding resistance.
- Isolation:

Power terminal	FAIL output terminal	Internal circuit
	Ethernet port	
	RS-422/485 terminal	
	Input and output module terminal	
	Input and output module internal circuit	
	Earth (PE) terminal	
	RS-232 terminal	

The circuits divided by lines are insulated mutually.

## Safety and EMC Standards

- CSA: CSA22.2 No.61010-1, installation category II <sup>1</sup>, pollution degree 2 <sup>2</sup>, and CSA-C22.2 NO. 61010-2-030-12
- UL: UL61010-1, UL 61010-2-030 (CSA NRTL/C)
- CE:
  - EMC directive
    - EN61326-1 compliance, Class A Table 2
    - EN61000-3-2 compliance
    - EN61000-3-3 compliance
    - EN55011 Class A Group 1
  - Low voltage directive
    - EN61010-1, EN 61010-2-030
    - Installation category II <sup>1</sup>
    - Pollution degree 2 <sup>2</sup>
    - Measurement category <sup>3</sup>
- EMC Regulatory Arrangement in Australia and New Zealand (RCM): EN55011 compliance, Class A Group 1
- KC marking: Electromagnetic wave interference prevention standard, electromagnetic wave protection standard compliance

<sup>1</sup> Installation category (overvoltage category) II: Describes a number which defines a transient overvoltage condition.  
Implies the regulation for impulse withstand voltage.  
"II" applies to electrical equipment which is supplied from the fixed installation like a distribution board.

<sup>2</sup> Pollution degree 2: Describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering.  
"2" applies to normal indoor atmosphere.  
Normally, only non-conductive pollution occurs.

<sup>3</sup> Measurement category: Depends on the specification of each modules

Category	Measurement category	Description	Remarks
II	CAT II	Available in the testing and measuring circuits directly connected to a usage location (receptacle or the like) of a low-voltage main power supply facility.	Appliances, portable equipment, etc.
III	CAT III	Available in the testing and measuring circuits connected to a power distribution portion of a low-voltage main power supply facility.	Distribution board, circuit breaker, etc.
IV	CAT IV	Available in the testing and measuring circuits connected to a power source of a low-voltage main power supply facility.	overhead wire, cable systems, etc.

- WEEE Directive: Compliant

## Normal Operating Conditions

- Power supply voltage: 100 to 240 V AC ±10 %
- Power supply frequency: 50/60 Hz ±2 %
- Ambient temperature: 0 to 50 °C
- Ambient humidity: 20 to 80 %RH (at 5 to 40°C) (no condensation)
- Magnetic field: 400 A/m or less (DC and 50/60 Hz)
- Vibration:
  - 5 ≤ f < 8.4 Hz amplitude 3.5 mm (peak)
  - 8.4 ≤ f ≤ 160 Hz acceleration 9.8 m/s<sup>2</sup>
- Shock (IEC-60068-2-27):
  - Non-energization, 500 m/s<sup>2</sup> or less, approximate 10 ms, 6 directions (±X, ±Y, ±Z), 3 times in each direction
- Mounting position: Can be inclined up to 30 degrees backward. Left and right horizontal when installing the panel mount and wall mount.
- Altitude: 2000 m or less
- Installation location: Indoors
- Warm-up time: At least 30 minutes after power on

## Other Specifications

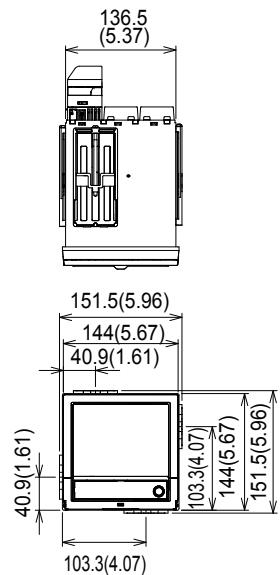
- Memory backup: A built-in lithium battery backs up the settings and runs the clock
- Recommended replacement periods of Battery: Approximately 10 years (at room temperature)

## Transport and Storage Conditions

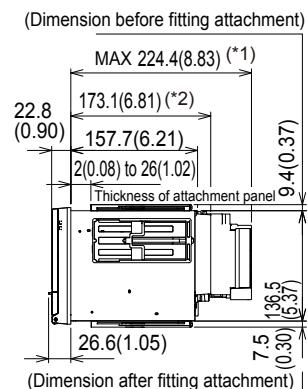
- Ambient temperature: -25 to 60°C
- Ambient humidity: 5 to 95 %RH (no condensation)
- Vibration: 10 to 60 Hz, 4.9 m/s<sup>2</sup> maximum
- Shock: 392 m/s<sup>2</sup> maximum (in packaged condition)

## ■ EXTERNAL DIMENSIONS AND PANEL CUTOUT DIMENSIONS

GX10:



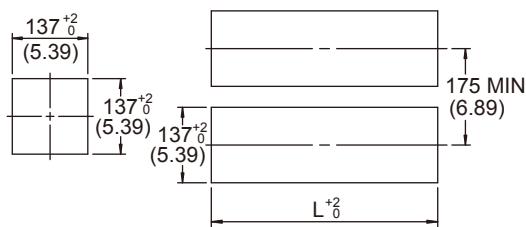
Unit: mm (approx. inch)  
Unless otherwise specified, tolerance is  $\pm 3\%$  (however, tolerance is  $\pm 0.3$  mm when below 10 mm).



(Dimension before fitting attachment)  
 \*1: with modules  
 \*2: without modules

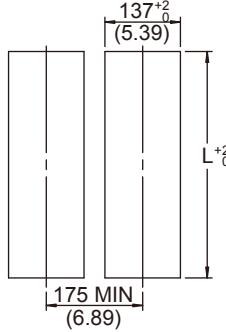
Panel cut dimensions

Single-Unit Mounting



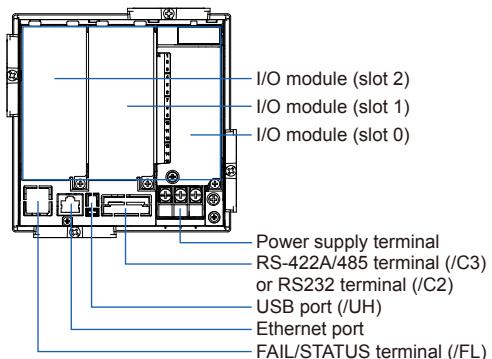
Side-by-Side Mounting (horizontally)

Side-by-Side Mounting (vertically, max. 3 units)

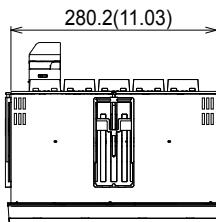


Units	$L^{+2}_0$
2	282 (11.10)
3	426 (16.77)
4	570 (22.44)
5	714 (28.11)
6	858 (33.78)
7	1002 (39.45)
8	1146 (45.12)
9	1290 (50.79)
10	1434 (56.46)
n	$(144 \times n) - 6$

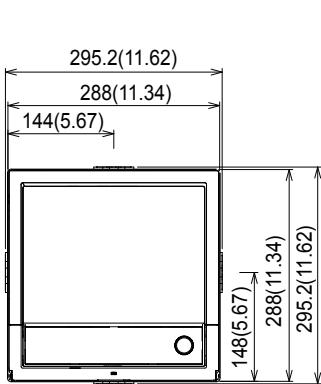
Rear view



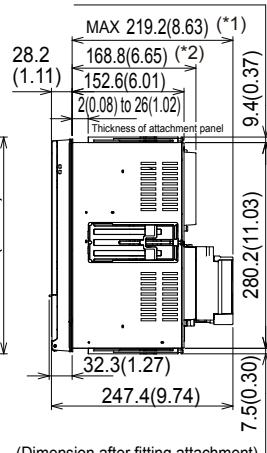
GX20:



Unit: mm (approx. inch)  
Unless otherwise specified, tolerance is  $\pm 3\%$  (however, tolerance is  $\pm 0.3$  mm when below 10 mm).



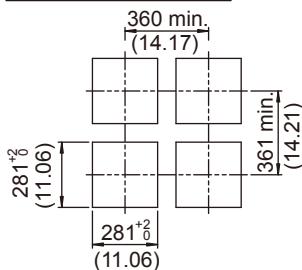
(Dimension before fitting attachment)



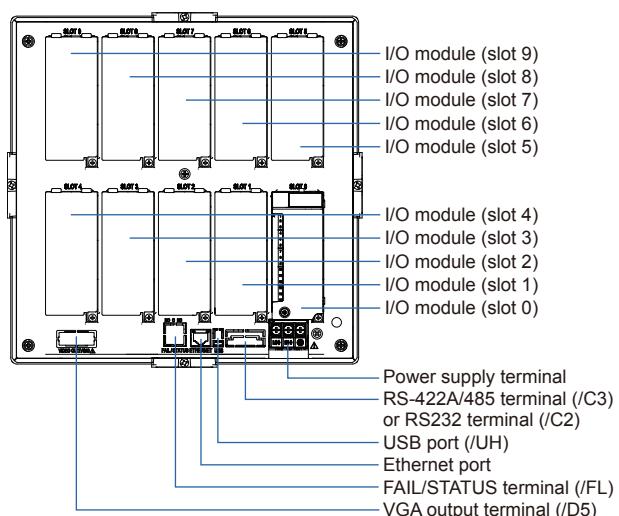
(Dimension after fitting attachment)

\*1: with modules  
 \*2: without modules

Panel cut dimensions



Rear view



## ■ SPECIFICATIONS OF OPTIONAL FUNCTIONS

### ADVANCED SECURITY FUNCTION (/AS)

Security and electronic record/signature functions have been added that are compliant with the USA's FDA title 21 CFR Part 11.

- Enabling/disabling the advanced security function:  
You can enable or disable the advanced security function.
- \* The set values and data stored in the internal memory are initialized each time the function is enabled or disabled.
- Data anti-tamper function:  
Settings and measured data are saved as encrypted binary files.
- Data type:  
Only for display or event  
Trigger mode is not possible with event data.
- Login function:  
Using the login function described below, you can enter security settings on the instrument
  - User name
  - Password
  - User ID (depend on setting)
  - User level and number of users:  
System administrator (all can be operated), General user (With user restrictions, you can set restrictions on performing operations and sign authority.), Monitor user (monitoring only), totally 100 users
  - User restrictions setting: 10 kinds (for general users)
- Password expiration time:  
select form Off, 1month, 3 month, 6month
- Password control function:  
Logins are verified by a Kerberos v5 authentication server\* (only user name and password)  
Encryption method:  
AES128-CTS-HMAC-SHA1-96  
AES256-CTS-HMAC-SHA1-96  
ARCFOUR-HMAC-MD5
- Pre-Auth function: use
  - \* The function has confirmed compatibility with Windows Server2003 SP2/Windows Server2008 SP2/Windows Server2012 ActiveDirectory
- Signature function:  
After checking data that has finished being recorded, you can add three levels of electronic signature, select a pass/fail, and enter comments (50 characters maximum)
- Audit trail function:  
The operation log, the settings change log and the settings file when the change was made are saved.

### SERIAL COMMUNICATION INTERFACE (/C2, /C3)

- Connection: EIA RS-232(/C2) or EIA RS-422/485(/C3)
- Protocol: Dedicated protocol or Modbus protocol
- Setting/measurement server function: Operation, setting or output of measurement data are available by dedicated protocol.
- Synchronization: Start-stop synchronization
- Transmission mode (RS-422/485):  
RS-422: Four-wire half-duplex multi-drop

- connection (1:n (n = 1 to 31))
- RS485: Two-wire half-duplex multi-drop connection (1:n (n = 1 to 31))
- Baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 bps
- Data length 7 or 8 bits
- Start bit: 1 bit
- Stop bit: 1 bit or 2 bit
- Parity: ODD, EVEN, or NONE
- Handshaking Off: Off, XON: XON, XON: RS, and CS: RS
- Communication distance: RS-422/485: 1200 m, RS-232: 15 m
- Modbus/RTU communication: Reading or writing of measurement data on other instruments is available by Modbus protocol.  
Communication channel function option (/MC) is needed to read measurement data from other instruments.
- Operation modes: Master or slave
- Execution of a communication command using a bar code: The entered text can be executed as a communication command.

### CUSTOM DISPLAY (/CG)

Using DXA170 DAQStudio, screen creation software, a custom screen can be constructed and displayed in which display components (such as trend, digital, and bar graphs) are freely placed. The screen data is transferred from DAQStudio to the internal memory via communication, or loaded from an external medium to the internal memory and displayed.

- Number of screens: 30 (internal memory)
- Display components:
  - Normal components (digital value, bar graph, tag No., tag comment, simple digital value, simple bar graph, alarm mark, unit, alarm indicator, lower-limit span value, upper-limit span value, group name, system icon, memory sample bar, date/time view, batch name, and user name)
  - Trend components (trend group display (with scale board))
  - List components (alarm list view and message list view)
  - Operation components (DO (DO operable), internal switch (internal switch operable), numeric value operations (viewing data of and writing data to communication channels), and button operations (writing numeric values, operating bits, switching screens, and executing communication commands))
  - Text components (labels)
  - Figure components (line view, rectangle view, and circle view)
  - Figure components (line view, rectangle view, and circle view)
- Configuring screens: Screen creation software Creation using DXA170 DAQStudio (GX does not have a creation function)
- Saving/loading screen data:  
A specified screen or all the screens is/are loaded from an external storage medium to the internal memory, or a specified screen or all the screens in the internal memory is/are saved on an external storage medium.

## VGA VIDEO OUTPUT (/D5) (Only for GX20)

- External display:  
Resolution: 800 × 600 dots (VGA)  
Connector: 15-pin D-Sub

## EtheNet/IP COMMUNICATION (/E1)

Can be joined to an Ethernet/IP network as an adapter (or a server).

- Loading data from the I/O channel or calculation channel
- Loading and writing data from/to the communication input channel

## WT COMMUNICATION (/E2)

Collects data by connecting to WT equipment manufactured by Yokogawa Meters & Instruments Corp. via Ethernet communication.

- Supported models: WT1800, WT500, and WT300
- Number of connectable units:  
GX10: 8  
GX20: 16
- Communication cycle: 500 ms/1 s/2 s/5 s/10 s/15 s/20 s/30 s
- Types of data that can be obtained: Voltage, current, power, power factor, phase, electrical energy, high-frequency wave, etc.

## FAIL OUTPUT (/FL)

- Contact: C contact, 1 point
- FAIL output:  
The relay contact output on the rear panel indicates the occurrence of CPU failure.  
Relay operation: Energized during normal operation and de-energized on CPU failure.
- Status output: The relay contact, which is de-energized in normal output state, is energized upon the occurrence of a memory/media error, measurement error, communication error, recording stop, or alarm.
- Rated power supply voltage: 24 V DC or 250 V AC or less
- Rated load current: 3A (DC)/3A (AC), resistance load
- Min. load current: 100 mA
- Recommended replacement periods of contact:  
Electrical: 30,000 more ON-OFF operations,  
Mechanical: 5,000,000 more ON-OFF operations

## Log SCALE (/LG)

A logarithmic voltage that has been converted from a physical value is applied to the GX, and then the GX's Log scale (logarithmic scale) is used to display and record the physical value.

- Input type: Log input (logarithmic input), Pseudo log input: An input that supports pseudo logs, Log linear input: Input that is linear on a logarithmic scale.
- Range: 20mV/60mV/200mV/1V/2V/6V/20V/50V

- Scalable range:

- Log input:  
1.00E-15 to 9.99E+15 (15decade maximum)  
Scale\_L < Scale\_U

If the lower limit mantissa is 1.00, the difference between the exponents must be 1 or more.

If the lower limit mantissa is a value other than 1.00, the difference between the exponents must be 2 or more.

- Pseudo Log Input/Log linear input  
1.00E-15 to 9.99E+15 (15decade maximum)

The higher limit mantissa is the same as the lower limit mantissa).

If the lower limit mantissa is 1.00, the value must be between 1.00E-15 and 1.00E+15, the difference between the exponents must be 1 or more, and the maximum decades is 15.

If the lower limit mantissa is a value other than 1.00, the value must be between 1.01E-15 and 9.99E+15, the difference between the exponents must be 1 or more and the maximum decades is 15.

- Alarm type: High limit, low limit, delay high limit, and delay low limit
- Alarm setting range: The range converted into the LOG scale corresponding to -5% to 105% of the span width.
- Alarm hysteresis: Fixed to 0
- Green band setting range: The lower limit to the upper limit of the scale. However, the lower limit of the display position must be smaller than the upper limit.
- Position of the decimal point: 1 to 2
- Misc: Nonlinear input is possible by correcting the input value

## MATHEMATICAL FUNCTIONS WITH REPORT FUNCTION (/MT)

### Mathematical Function:

- Number of math channels; GX10: 50, GX20: 100

#### Operation:

General arithmetic operations: Four arithmetic operations (+, -, \*, /), square root, absolute, common logarithm, natural logarithm, exponential, and power

Relational operations: <, ≤, >, ≥, =, and ≠

Logic operations: AND, OR, NOT, and XOR

Statistical operations: TLOG or CLOG

Special operations: PRE, HOLD, RESET, and CARRY

Conditional operation: [a?b:c]

Bit operation: BIT

Integer extracting operation: INT

Remainder extracting operation: MOD

Trigonometric functions: SIN, COS

- Computation accuracy: Double-precision floating point

- Data that can be used;

Channel data: Measurement channels

(GX10: 0001 to 6516, GX20: 0001 to 6516), mathematical channels (GX10: A001 to A050, GX20: A001 to A100), Communication channels (GX10 standard type: C001 to C300, GX20 large

memory type: C001 to C500), Constants:100 (K001 to K100), Internal switch: 100 (S001 to S100), Flag: 20 (F01 to F20), Recording state (REC01)

#### Report function:

- Number of report channels; GX10: 50, GX20: 60
- Report types: Hourly + daily, daily + weekly, daily + monthly, Batch, Day custom
- Computation types: Average, maximum, minimum, sum, or instantaneous value
- Unit of sum: OFF, /s, /min, /hour, /day
- Report templates: Office Open XML spreadsheet files (which can be displayed with Microsoft Office Excel) or PDF files can be output or printed out with any LAN-connected printer supporting the HP-PCL5c language.

### COMMUNICATION CHANNEL FUNCTIONS (/MC)

- Number of communication channels; GX10 standard type: 300 (C001 to C300)  
GX20 large memory type: 500 (C001 to C500)
- \* Required to record data from Modbus devices or PCs on the GX.

### 24 V DC/AC POWER SUPPLY (/P1)

- Rated power supply: 24 V DC/24 V AC (50/60 Hz)
- Allowable power supply voltage range: 21.6 to 26.4 V DC/AC
- Insulation resistance: 20 MΩ or greater at 500 V DC between power terminal and earth
- Withstand voltage: 500 V AC at 50/60 Hz for one minute between power terminal and earth
- Rated power supply frequency (for AC): 50/60 Hz
- Allowable power supply frequency (for AC): 50 Hz ± 2%, 60 Hz ± 2 %
- Influence of power supply voltage variation:  
Variations of the measured value must be within ±1 digit in the range from 21.6 to 26.4 VAC/VDC.
- Influence of power supply frequency variation (for AC): Variations of the measured value must be within ±(0.1% of rdg + 1 digit) at a rated frequency of ±2 Hz.
- Power consumption:

Supply voltage	LCD backlight off	Normal operation	Maximum
24 V DC	GX10: 7 VA GX20: 13 VA	GX10: 9 VA GX20: 16 VA	GX10: 24 VA GX20: 48 VA
24 V AC	GX10: 14 VA GX20: 25 VA	GX10: 17 VA GX20: 29 VA	GX10: 42 VA GX20: 76 VA

- \* The following combinations are assumed for LCD backlight off and normal operation.  
GX10: 1 AI module, 1 DO module, 1 DI module  
GX20: 5 AI modules, 4 DO modules, 1 DI module
- Module power supply voltage: The total allowable power consumption of respective modules is up to 6 W in the GX10 and up to 20 W in the GX20.

### USB INTERFACE (/UH)

- USB port: Complies with USB 2.0 and host function
- Number of ports: 2 (one each on the front panel and rear panel)

- Connectable devices: Only connect the devices listed below to prevent damage to the devices.

Keyboard: Complies with HID Class Ver. 1.1  
104/89 keyboard (US) and 109/89 keyboard (Japanese)

Mouse: Complies with HID Class Ver. 1.1  
External medium: USB flash memory

Does not guarantee the operation of all  
USB flash memories

External medium such as a hard disk, ZIP,  
MO, and optical discs are not supported.

Barcode reader: USB HID Class Ver. 1.1  
compatible  
English (U.S.) standard USB keyboard  
compatible

- Execution of a communication command using a bar code: The entered text can be executed as a communication command.

- Power supply: 5 V ±10%, 500 mA \*1

\*1: Devices which need more than 500 mA total bus power for 2 ports cannot be connected at the same time.

For low powered devices (bus power < 100 mA):

5V ± 5%

For high powered devices (bus power < 500 mA):

5V ± 10%

## ■ INPUT/OUTPUT MODULE SPECIFICATIONS

### ANALOG INPUT MODULE (Model GX90XA or Option /Uxx0)

### DIGITAL INPUT MODULE (Model GX90XD or Options /CRx1)

### DIGITAL OUTPUT MODULE (Model GX90YD, or Options /CR1x, /CR2x, /CR4x)

Please see GX90XA/GX90XD/GX90YD/GX90WD Input/Output Module General Specification (GS 04L53B01-01EN.)

## ■ APPLICATION SOFTWARE

### SMARTDAC+ STANDARD

- Universal viewer
- Web application/Hardware configurator

Download the latest version of the software from the following URL;

[www.smartdacplus.com/software/en/](http://www.smartdacplus.com/software/en/)

### Operating environment

#### OS:

OS	Type
Windows Vista	Home Premium SP2 (Except for 64-bits Editions)
	Business SP2 (Except for 64-bits Editions)
Windows 7	Home Premium SP1 (32-bit and 64-bit Editions)
	Professional SP1 (32-bit and 64-bit Editions)
Windows 8.1	Pro

#### Processor and main memory:

OS	Processor and main memory
Windows Vista	Intel Pentium 4, 3GHz or faster x64 or x86, 2GB or more
Windows 7 Windows 8.1	32-bit edition Intel Pentium 4, 3GHz or faster x64 or x86, 2GB or more 64-bit edition Intel x64 processor that is equivalent to Intel Pentium 4, 3 GHz or faster, 2GB or more

#### Browser:

Browser	Version
Windows Internet Explorer Java Runtime Environment 1.7.0 xx (Version 7 Update xx) xx is more than 51	Internet Explorer 8, Internet Explorer 9, Internet Explorer 10, or Internet Explorer 11

#### Hard disk:

- 100MB or more of free space

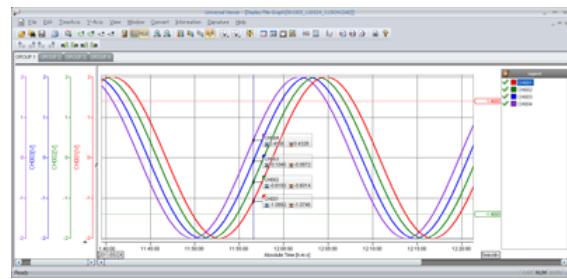
#### Display:

- A video card that is recommended for the OS and a display that is supported by the OS, has a resolution of 1024 x 768 or higher, and that can show 65,536 colors (16-bit, high color) or more.

#### Universal Viewer software

The universal viewer can display the following data generated by the recorder on the screen and print it out on the printer.

- Display data file
- Event data file
- Report data file (Including Hour, Day, Week Month)
- Manual sample data file

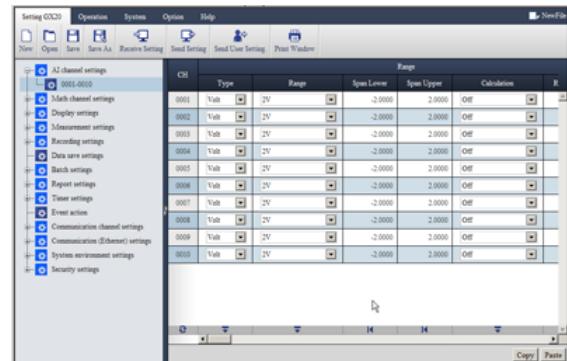


- Viewer function  
Waveform display, digital display, circular display, list display, report display, operation log display etc.
- Data conversion:  
File conversion to ASCII or MS-Excel format

#### Web application/Hardware configurator

- Online setting on Web browser (IE)
- Offline setting on Web browser (IE)

Both settings can be made using browsers such as Internet Explorer 8, 9, 10 and 11.



## ■ MODEL AND SUFFIX CODES

Model	Suffix Code	Optional code	Description
<b>GX10</b>			Paperless recorder (Panel mount type, Small display) <sup>*13</sup>
<b>GX20</b>			Paperless recorder (Panel mount type, Large display) <sup>*13</sup>
Type	<b>-1</b>		Standard (Max. measurement channels: 100 ch)
	<b>-2</b>		Large memory (Max. measurement channels: 500 ch) <sup>*12</sup>
Display language	<b>E</b>		English, degF, DST (summer/winter time) <sup>*10</sup>
Optional features	<b>/AS</b>		Advanced security function (Part 11)
	<b>/BC</b>		Black cover
	<b>/C2</b>		RS-232 <sup>*1</sup>
	<b>/C3</b>		RS-422/485 <sup>*1</sup>
	<b>/CG</b>		Custom display
	<b>/D5</b>		VGA output <sup>*2</sup>
	<b>/E1</b>		EtherNet/IP communication
	<b>/E2</b>		WT communication <sup>*14</sup>
	<b>/FL</b>		Fail output, 1 point
	<b>/LG</b>		Log scale
	<b>/MT</b>		Mathematical function (with report function)
	<b>/MC</b>		Communication channel function
	<b>/P1</b>		24 V DC/AC power supply
	<b>/UH</b>		USB interface (Host 2 ports)

### Analog input module, Digital I/O module:

Please add the following suffix codes to the main unit model and specification codes.

Option	Optional code	Description
Optional features (Analog input) <sup>*3*11</sup>	<b>/UC10</b>	With analog input module, 10ch (Clamp terminal)
	<b>/UC20</b>	With analog input module, 20ch (Clamp terminal) <sup>*7</sup>
	<b>/UC30</b>	With analog input module, 30ch (Clamp terminal) <sup>*8</sup>
	<b>/UC40</b>	With analog input module, 40ch (Clamp terminal) <sup>*5</sup>
	<b>/UC50</b>	With analog input module, 50ch (Clamp terminal) <sup>*5</sup>
	<b>/US10</b>	With analog input module, 10ch (M3 screw terminal)
	<b>/US20</b>	With analog input module, 20ch (M3 screw terminal) <sup>*7</sup>
	<b>/US30</b>	With analog input module, 30ch (M3 screw terminal) <sup>*8</sup>
	<b>/US40</b>	With analog input module, 40ch (M3 screw terminal) <sup>*5</sup>
	<b>/US50</b>	With analog input module, 50ch (M3 screw terminal) <sup>*5</sup>
Optional features (Digital I/O) <sup>*4</sup>	<b>/CR01</b>	With digital I/O module, (Output:0, Input:16) <sup>*8*9</sup>
	<b>/CR10</b>	With digital I/O module, (Output:6, Input:0) <sup>*8*9</sup>
	<b>/CR11</b>	With digital I/O module, (Output:6, Input:16) <sup>*7*8*9</sup>
	<b>/CR20</b>	With digital I/O module, (Output:12, Input:0) <sup>*6*9</sup>
	<b>/CR21</b>	With digital I/O module, (Output:12, Input:16) <sup>*6*9</sup>
	<b>/CR40</b>	With digital I/O module, (Output:24, Input:0) <sup>*6*9</sup>
	<b>/CR41</b>	With digital I/O module, (Output:24, Input:16) <sup>*6*9</sup>

\*1 /C2 and /C3 cannot be specified together.

\*2 /D5 can be specified only for the GX20.

\*3 Only one option can be specified.

\*4 Only one option can be specified.

\*5 /UC40, /UC50, /US40 and /US50 cannot be specified for the GX10.

\*6 /CR20, /CR21, /CR40 and /CR41 cannot be specified for the GX10.

\*7 If /UC20 or /US20 is specified, /CR11 cannot be specified for the GX10.

\*8 If /UC30 or /US30 is specified, /CR01, /CR10 and /CR11 cannot be specified for the GX10.

\*9 Digital input module and digital output module have M3 screw terminals.

\*10 The Display language is selectable from English, German, French, Russian, Korean, Chinese, Japanese. (As of Mar., 2013)  
To confirm the current available languages, please visit the following website.  
URL: <http://www.yokogawa.com/ns/language/>

\*11 Solid state relay scanner type (Type Suffix Code: -U2). If you need the electromagnetic relay scanner type, current scanner type, L-model DCV/TC/DI, scanner type, purchase it separately.

\*12 Large memory type can be specified only for the GX20.

\*13 To connect an expandable I/O, you will need one expansion module for the GX.

\*14 /MC option must be separately specified when the WT communication is selected.

#### **Analog input module, Digital I/O module (sold separately):**

**MODEL and SUFFIX Code (GX90XA)**

**MODEL and SUFFIX Code (GX90XD)**

**MODEL and SUFFIX Code (GX90YD)**

**MODEL and SUFFIX Code (GX90WD)**

Please see GX90XA/GX90XD/GX90YD/GX90WD Input/Output Module General Specification (GS 04L53B01-01EN.)

#### **When connecting the Expandable I/O**

Please see GX60 Expandable I/O, GX90EX Expansion Module General Specification (GS 04L53B00-01EN.)

### **■ Standard Accessories**

Product	Qty
Mounting bracket (for GX10 or GX20)	2
SD memory card (1GB)	1
Stylus pen (touch pen)	1
Tag sheet (for GX10 or GX20)	1
Sheet (paper) (for GX10 or GX20)	1

### **■ Optional Accessories (Sold Separately)**

Product	Model/part no.
Model SD memory card (1GB)	773001
Mounting bracket	B8740DY
Stylus pen (touch pen)	B8740BZ
Shunt resister for M3 terminal (10 Ω ± 0.1 %)	X010-010-3
Shunt resister for M3 terminal (100 Ω ± 0.1 %)	X010-100-3
Shunt resister for M3 terminal (250 Ω ± 0.1 %)	X010-250-3
Shunt resister for Clamp terminal (10 Ω ± 0.1 %)	438922
Shunt resister for Clamp terminal (100 Ω ± 0.1 %)	438921
Shunt resister for Clamp terminal (250 Ω ± 0.1 %)	438920
Validation Documents (For /AS option)	773230

**Calibration certificate (sold separately)**

When ordering the GX10/GX20 with options (analog input), the calibration certificate for the modules is included in and shipped with the calibration certificate of the main unit. When ordering an analog input module separately, each module gets its own calibration certificate (one certificate per module).

**Test certificate (QIC, sold separately)**

When ordering the GX10/GX20 with options (analog/digital I/O), the QIC for each module is included in and shipped with the QIC of the main unit. When ordering analog input modules and digital I/O modules separately, each module gets its own QIC (one QIC per module).

**User's Manual**

Product user's manuals can be downloaded or viewed at the following URL. To view the user's manual, you need to use Adobe Reader 7 or later by Adobe Systems.

URL: [www.smartdacplus.com/manual/en/](http://www.smartdacplus.com/manual/en/)

**Product Purchase Specifications**

The GX10/GX20 is composed of the main unit, I/O modules, Expandable I/O, and Expansion module.

There are two ways to purchase I/O modules.

One way is to purchase them individually by specifying models GX90XA, GX90XD, and GX90YD.

The other way is to purchase them as an option (/UCxx or /USxx). Purchasing them as an option is convenient, but this places limitations on the number of analog inputs that you can obtain.

If you want to use more than 50 channels, please purchase the I/O modules individually.

To connect expandable I/O (GX60) to GX10 or GX20, you must purchase one unit of expansion module (GX90EX) for GX10/GX20 in addition to the expandable I/O.

**Trademarks**

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# General Specifications

Paperless Recorder  
FX1000

**FX1000™**

GS 04L21B01-02EN

## ■ OVERVIEW

The FX1000 is a Paperless Recorder that displays real-time measured data on a color LCD and saves data on a CompactFlash memory card (CF card<sup>1</sup>). It can be hooked up to network via Ethernet, which enables to inform by Email and to monitor on Web site as well as to transfer files by using FTP. Also, it can communicate with Modbus/RTU or Modbus/TCP. It comes with a two, four, six, eight, ten-channel or twelve-channel model. As the input signal, a DC voltage, thermocouple, resistance temperature detector, or contact signal can be set to each channel. The data saved on a CF card or the data transferred via networks can be converted to Lotus 1-2-3, Excel, or ASCII format file, facilitating processing on a PC. Not only this, the Viewer software allows a PC to display waveforms on its screen and to print out waveforms.

\*1: On FXs that have a CF card slot (suffix code -4.)

## ■ Signal Input and Alarms

### 1. Measurement Input

Number of inputs, scan interval, and A/D integration time:

Model	No. of Measurement Channels	Scan Interval	A/D converter integration time
FX1002	2	125 ms, 250 ms	AUTO <sup>1</sup> , 50 Hz, 60 Hz
FX1004	4		
FX1006	6		
FX1008	8		
FX1010	10		
FX1012	12		

\*1: AUTO: The FX automatically switches between 50 Hz and 60 Hz depending on the power supply frequency.

\*2: You can only set the integration time to 100 ms on models FX1006 through FX1012. If you set the integration time to 100 ms, you can only set the scan interval to 2 or 5 seconds.

\*1: R, S, B, K, E, J, T, N: IEC584-1 (1995), DIN IEC584, JIS C1602-1995

\*2: W: W-5%Re/W-26%Re (Hoskins Mfg. Co.), ASTM E988-96

(Type C equivalent of OMEGA Engineering Inc.)

L: Fe-CuNi, DIN43710, U: Cu-CuNi, DIN43710

\*4: WRe: W-3%Re/W-25%Re (Hoskins Mfg. Co.), ASTM E988-96

(Type D equivalent of OMEGA Engineering Inc.)

\*5: Pt100: JIS C1604-1997, IEC751-1995, DIN IEC751-1996

JPt100: JIS C1604-1989, JIS C1606-1989.

Measuring current i = 1 mA (Pt100, JPt100).

\*6: The range for linear scaling of 1-5V inputs. Burnout detection and low-cut functions are available.

\*7: The detected current value is approximately 10  $\mu$ A.



Input Type: DC voltage, 1-5V, thermocouple (TC), resistance temperature detector (RTD), ON/OFF input (DI), and DC current (by adding an external shut resistor)  
Measurement range and measurable range:

Input Type	Range	Measurable Range	
DC voltage	20 mV	-20.000 to 20.000 mV	
	60 mV	-60.00 to 60.00 mV	
	200 mV	-200.00 to 200.00 mV	
	1 V	-1.0000 to 1.0000 V	
	2 V	-2.0000 to 2.0000 V	
	6 V	-6.000 to 6.000 V	
	20 V	-20.000 to 20.000 V	
	50 V	-50.00 to 50.00 V	
1-5V	1 to 5 V <sup>6</sup>	0.800 to 5.200 V	
TC	R <sup>1</sup>	0.0 to 1760.0°C	32 to 3200°F
	S <sup>1</sup>	0.0 to 1760.0°C	32 to 3200°F
	B <sup>1</sup>	0.0 to 1820.0°C	0.0 to 3308°F
	K <sup>1</sup>	-200.0 to 1370.0°C	-328 to 2498°F
	E <sup>1</sup>	-200.0 to 800.0°C	-328.0 to 1472.0°F
	J <sup>1</sup>	-200.0 to 1100.0°C	-328.0 to 2012.0°F
	T <sup>1</sup>	-200.0 to 400.0°C	-328.0 to 752.0°F
	N <sup>1</sup>	-270.0 to 1300.0°C	-454 to 2372°F
	W <sup>2</sup>	0.0 to 2315.0°C	32 to 4199°F
	L <sup>3</sup>	-200.0 to 900.0°C	-328.0 to 1652.0°F
RTD	U <sup>3</sup>	-200.0 to 400.0°C	-328.0 to 752.0°F
	WRe <sup>4</sup>	0.0 to 2400.0°C	32 to 4352°F
DI	Pt (Pt100) <sup>5</sup>	-200.0 to 600.0°C	-328.0 to 1112.0°F
	JPt (JPt100) <sup>5</sup>	-200.0 to 550.0°C	-328.0 to 1022.0°F
Contact <sup>7</sup>	Level	0: Less than 2.4 V. 1: 2.4 V or higher (judged at the 6 V range)	
	Contact <sup>7</sup>	0: Open. 1: Closed (parallel capacitance of 0.01 $\mu$ F or less)	

**YOKOGAWA** ♦

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Thermocouple burnout:  
Burnout upscale/downscale selectable (for each channel).  
Normal: 2 kΩ or less., Burnout: 100 kΩ or more (parallel capacitance of 0.01 µF or less)  
Detection current: Approx. 10 µA

1-5 range burnout:  
Burnout upscale/downscale selectable (for each channel).

Burnout detection:  
Greater than "scale upper limit + 10% of scale width" (upscale), or less than "scale lower limit – 5% of scale width" (downscale)

TC reference junction compensation:  
Internal reference junction compensation or external reference junction compensation

Filter function:  
Takes the moving average of the input values (for each channel).  
Moving average data points: 2 to 400

Computation:  
Difference computation:  
Computable range: DC voltage, TC, RTD, and DI

Linear scaling:  
Computable range: DC voltage, TC, RTD, and DI  
Scalable range: –30000 to 30000. The decimal place is within 4 digits to the right of the decimal point.  
Unit: 6 characters or less  
Over value detection: The value can be set to over value when ±5% of the scale range is exceeded.

Square root computation:  
Takes the square root of the input and apply linear scaling  
Computable type: DC voltage  
Scalable range and unit: Same as linear scaling  
Low-cut: Set the low-cut value in the range of 0.0% to 5.0% of the span.  
Over value detection: Same as linear scaling

1-5V:  
Computable range: 1 to 5 V  
Scalable range and unit: Same as linear scaling  
Low-cut: The low-cut point is fixed to the span lower limit.  
Over value detection: Same as linear scaling

## 2. Alarms

Number of alarms:  
Up to 4 alarms (levels) per measurement channel

Alarm type:  
High limit, low limit, difference high limit, difference low limit, high limit on rate-of-change alarm, low limit on rate-of-change alarm, delay high limit, and delay low limit

Alarm delay time:  
1 to 3600 s (for each channel)

Rate-of-change calculation interval of rate-of-change alarms:  
1 to 32 times the scan interval (common to all channels)

Alarm output:  
Output to the internal switch  
Number of internal switches: 30  
Internal switch operation: AND/OR operation selectable

Hysteresis:  
High and low limit alarm: 0.0 to 5.0% of the span (common to all channels)  
Difference high and low limit alarms: 0.0 to 5.0% of the span (common to all channels)

Display:  
Displays the status on the respective operation screen and an alarm icon on the status display section when an alarm occurs.  
Display operation: Hold or not hold the display until the alarm acknowledge operation.

Alarm hide function (alarm no logging function):  
Not display alarms nor record to the alarm summary (for each channel)

Alarm information:  
Displays a log of alarm occurrences on the alarm summary.

## ■ Display

### 1. Display

Display\*: 5.7-inch TFT color LCD (240 × 320 dots)

Brightness: 8 levels

Backlight saver function:

Dim or turn off the LCD backlight if there is no key operation for a specified time.

\* A section of the LCD monitor may contain pixels that are always on or off. The brightness of the LCD may also not be uniform due to the characteristics of the LCD. This is not a malfunction.

### 2. Displayed Information

Display groups:

Assign channels to groups on the trend display, digital display, and bar graph display and display.

Number of groups: 10

Number of channels that can be assigned to each group:  
Up to six

Display color:

Channel: Select from 24 colors

Background:

White or black (excludes the Overview display. See the item on the Historical trend display for information on that display.)

Trend display:

Waveform line width

Select from 1, 2, and 3 dots

Display method

Orthogonal axis display with time axis (T) and measured value axis (Y)

Layout: Vertical, horizontal, or wide

Trend intervals:	* On FXs that have a CF card slot or USB interface (/USB1 option)
15 s, 30 s, 1 min, 2 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 h, 2 h, 4 h, or 10 h/div for the FX1002 and FX1004.	Report (/M1, /PM1, and /PWR1) Displays report data from the internal memory
30 s, 1 min, 2 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 h, 2 h, 4 h, or 10 h/div for the FX1006, FX1008, FX1010, and FX1012.	Stacked bar graph (/M1, /PM1, and /PWR1) Displays the report data of each report group in a stacked bar graph.
Switchable to the secondary trend interval.	Display formats:
Scale	Display a scale for each channel. Current value bar graph, color scale band, and alarm point marks can be displayed on the scale.
Others	Grid (divisions: 4 to 12), trip line (line width: 1, 2, or 3 dots), message, zone display, and partial expanded display
Digital Display:	Displays measured values numerically
Update rate	1 s (scan interval if the scan interval is greater than 1 s)
Bar graph display:	Report groups: Report channels are arranged in groups of six starting with the first report channel (R01). The group arrangements are fixed.
Direction	H+D (hourly data is used for the display), Day+Week (daily data is used for the display), D+M (daily data is used for the display)
Base position	Scale/grid: Fixed at four divisions
Update rate	Update interval: 1 s The report data of the channels in the specified group is displayed in a stacked bar graph.
Scale	However, only channels that have the same unit of measurement as the first channel in the group are displayed.
Historical trend display:	Status Display Relay status display: Displays the ON/ OFF status of the alarm output relay and internal switch.
*	Modbus client status (/C7): Displays the communication status on the Modbus client
Display formats	Modbus master status (/C2, /C3): Displays the communication status on the Modbus master
Time axis operation	Log display: Displays the login log, error log, communication log (/C2, /C3, and /C7), FTP log (/C7), Web log (/C7), e-mail log (/C7), SNTP log (/C7), and DHCP log (/C7)
Add message	System information display: Displays the number of measurement and computation channels, options, MAC address, firmware version, and internal memory capacity.
Background color	Network information display (/C7): Displays the FX network setup information
Overview Display:	<b>3. Other Displayed Information</b>
Information display:	Tag display: Tag Up to 16 characters
Alarm summary display	Message: Write messages to the trend display. Number of messages 100 Maximum number of saved messages 400 Character Up to 32 characters Write method Write a preset message or write an arbitrary message on the spot.
Message summary display	Write destination Select only the displayed group or all groups.
Memory summary display	Auto message Write a message when the FX recovers from a power failure while memory sampling is in progress. Write a message when the trend interval is switched during memory sampling.

## Add message:

Write messages to the past data positions.

Message The same as the "Message" item above  
Maximum number of saved messages 50

## Status display section:

Displays the FX status in the upper part of the display

## Displayed contents

Year, month, day, time, displayed group name/display name, user name (when the login function is in use), batch name (when the batch function is in use), internal memory status, external storage medium status (on FXs with a CF card slot), alarm status, function usage status (key lock, computation function—/M1, /PM1, /PWR1), and e-mail (/C7)

## Auto switching of displayed groups:

Switches the display group at a given interval.  
Interval: Select from the available settings between 5 s and 1 min.

## Default display:

Specify the display to be shown automatically when keys are not operated.  
Time until the display switches: Select from the available settings between 1 min and 1 h.

## Display language:

Select from English, Japanese, German, French, Chinese, Italian, Spanish, Portuguese, Russian, and Korean.

## Display selection menu customization:

Show/hide and change the positions of each item in the display menus and sub menus  
Insert/delete separators.

## Function menu customization:

Show/hide and change the display positions of each item.

## ■ Data Saving Function

### 1. Configuration

## Internal memory:

Temporarily saves various types of data.

Medium Flash memory

## External storage medium (on FXs with a CF card slot):

Medium CF card

Format FAT32 or FAT16

### 2. Data Type

FX data types and file name extensions

Data Type	Extension	Notes
Display data	.DAD	
Event data	.DAE	
Manual sampled data	.DAM	
Screen image data	.PNG	
Setup data	.PDL	
Report data	.DAR	/M1, /PM1, and /PWR1

### 3. Display Data and Event Data

## Internal memory:

File storage capacity 400 MB  
Number of files Up to 400  
Operation FIFO (First In First Out)

## Display data:

Target Measurement/computation channel  
Sampling intervals Synchronized to the trend interval.

Content Maximum and minimum value per sampling interval

File size Up to 8 MB

Data format Binary

Recording Records data at all times.

## Event data:

Target Measurement/computation channel.  
Sampling interval

Determined by the sample rate.  
125 ms, 250 ms, 500 ms, (FX1002 and FX1004 only)

1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, or 10 min

The sampling interval cannot be shorter than the scan interval.

Content Data per sampling interval

File size Up to 8 MB

Data format Binary

Mode Free: Records data at all times.

Trigger: Starts recording data when a certain event occurs and records for the specified interval.

## Combinations of saved data:

Display data only, event data only, or display data and event data.

## Sampled Data Size

- Data Size of Display Data and Event Data

Channel	Display Data	Event Data
Measurement channel	4 bytes/channel	2 bytes/channel
Computation channel	8 bytes/channel	4 bytes/channel

Time data common to all channels is added for each sample.

Time data	8 bytes/sample
-----------	----------------

## • Data Size per Sample

## Display Data

(Number of measurement channels×4 bytes) + (number of computation channels×8 bytes) + 8 bytes (time data)

## Event Data

(Number of measurement channels×2 bytes) + (number of computation channels×4 bytes) + 8 bytes (time data)

## Sampling Time for a Single File (8 MB)

The sampling time for a single file (8 MB) is calculated as follows:

Number of samples × sampling interval.

The number of samples is calculated as follows:

8 MB/(the data size per sample)

**Only Display Data**

If the display data from the 12 measurement channels and the 24 computation channels is recorded at the trend interval of 30 min/div and the display data's sampling interval is 60 seconds:

**Number of samples**

$$= 8 \text{ MB}/(8 \text{ bytes} + 12 \times 4 \text{ bytes} + 24 \times 8 \text{ bytes}) = \text{Approximately } 32,258 \text{ samples}$$

**Sampling time per file (8 MB)**

$$= 32,258 \times 60 \text{ seconds} = 1,935,480 \text{ seconds} = \text{Approximately } 22 \text{ days}$$

**Only Event Data**

If the event data from the 12 measurement channels and the 24 computation channels is recorded at the sampling interval of 1 second:

**Number of samples**

$$= 8 \text{ MB}/(8 \text{ bytes} + 12 \times 2 \text{ bytes} + 24 \times 4 \text{ bytes}) = \text{Approximately } 62,500 \text{ samples}$$

**Sampling time per file (8 MB)**

$$= 62,500 \times 1 \text{ seconds} = 62,500 \text{ seconds} = \text{Approximately } 17 \text{ hours}$$

**Display data and event data****Display data file size = 8 MB****Event data file size = 8 MB**

You can use these figures to calculate the sampling time per file in the same manner as was used for the case of "Only Display Data" or "Only Event Data." You can save multiple files such as those described above to the internal memory or to an external memory device (the number of files that can be stored is limited by the size of the internal memory or external memory device).

**Calculation Examples of the Sampling Time for a Single File (8 MB)**

Examples of the sampling time for a single file (8 MB) are shown below. You cannot actually set recording conditions so that the sampling time exceeds 31 days. If the sampling time exceeds 31 days, the file will be divided even if it is not 8 MB in size.

**4 Measurement Channels and No Computation Channels****Display data file**

Trend interval (time/div)	15 s	30 s	1 min	2 min	5 min	10 min
Sampling interval	0.5 s	1 s	2 s	4 s	10 s	20 s
Sampling time (approx.)	42.7 hours	3 days	7 days	14 days	35 days (> 31 days)	71 days (> 31 days)

**Event data file**

Sampling interval	125 ms	0.5 s	1 s	2 s	5 s	10 s
Sampling time (approx.)	15.4 days	2 days	5 days	10 days	25 days	51 days (> 31 days)

**12 Measurement Channels and 24 Computation Channels****Display data file**

Trend interval (time/div)	30 s	1 min	5 min	10 min	30 min	1 hour
Sampling interval	1 s	2 s	10 s	20 s	1 min	2 min
Sampling time (approx.)	9 hours	17.9 hours	3 days	7 days	22 days	44 days (> 31 days)

**Event data file**

Sampling interval	1 s	2 s	5 s	10 s	30 s	1 min
Sampling time (approx.)	17.3 hours	1.4 days	3.6 days	7.2 days	21 days	43 days (> 31 days)

**4. Manual Sampled Data**

Item: Measured value at an arbitrary time  
Maximum number of data values that the internal memory can store: 400

Data format: Text

**5. Report Data (/M1, /PM1, and /PWR1)**

Item: Report at each scheduled time of report  
Maximum number of reports that the internal memory can store: 100

Data format: Text

**6. Snapshot Data**

Item: Displayed screen image data  
Data format: PNG  
Output destination:

CF card or communication output

**7. Saving Data to the External Storage Medium (On FXs with a CF card slot or the /USB1 option)****Data Saving:**

Saves the data in the internal memory to the external storage medium.

**Manual save**

Saves when the external storage medium is inserted with a key operation.

**Auto save\***

Display data: Every file save interval

Event data: Every data length

Manual sampled data:

When manual sampling is executed.

Report data: When report is created.

Snapshot data: When a snapshot is taken

**Auto save operation\***

Select "save data only if there is sufficient free space on the CF card" or "constantly retain the most recent data files in the CF card (media FIFO)."

\* This is only valid on FXs that have a CF card slot.

File name Select from "sequence number+user-assigned string+date," "sequence number+user-assigned string," or "sequence number+batch name."

**Save destination**

Auto save: CF card (only valid on FXs that have a CF card slot (suffix code -4).)

Manual save: CF card (only valid on FXs that have a CF card slot (suffix code -4) or USB flash memory (/USB1 option))  
Directory name: Specify using up to 20 characters.

## 8. Setup Data (On FXs with a CF card slot or the /USB1 option)

Item: FX setup data  
Data format: Binary  
File name: Specify using up to 32 characters.  
Output/read destination (for saving/loading):  
CF card or USB flash memory (/USB1)

## 9. Data File Loading (On FXs with a CF card slot or the /USB1 option)

Function: Load and show the display data or event data in a CF card or USB flash memory (/USB1).

## 10. Miscellaneous

Header comment:  
Add up to 50 characters of comment to display data, event data, manual sampled data, or report data file.

## ■ Other Standard Functions

### 1. Event Action Function

Event action:  
Execute a specified operation when a given event occurs.  
Number of settings: 40  
Events: Remote control input, etc.  
Timer Number of timers: 4  
Match time timer Number of timers: 4  
Action: Specify memory start/stop, alarm ACK, etc.  
There are limitations on the combinations of events and actions.

### 2. Security Function

Key lock function:  
Limitations to key operation, access to the external storage medium (on FXs with a CF card slot or the /USB1 option), and various operations  
Login function:  
Only registered users can operate the FX.  
System administrators  
5 administrators (with total operation access)  
Users 30 users (with access to operations based on their user access rights)  
User access rights setting  
Limitations to key operation, access to the external storage medium (on FXs with a CF card slot or the /USB1 option), and various operations  
Automatic logout function  
Users are logged out automatically if there are no key operations for the specified period of time.

## 3. Time Related Functions

Clock: With a calendar function  
Accuracy  $\pm 50$  ppm (0 to 50°C); does not include the delay (1 second or less) that occurs when the power is turned on  
Time setting: Set by way of key operations, communication commands (/C2, /C3, and /C7), the event action function, or the SNTP client function (/C7)  
Time adjustment method:  
While memory sampling  
Corrects the time by 40 ms for each second.  
Limit in which the time is gradually adjusted: Select from the available settings between 10 s and 5 min.  
If the time is outside the limit, the time is immediately corrected.  
Cannot be used after hour 0 on January 1st, 2038.  
While memory sampling is stopped  
Immediately change the time.  
DST: The date/time for switching between standard time and DST can be specified.  
Time zone: Sets the time difference from GMT.  
Date format:  
Select YYYY/MM/DD, MM/DD/YYYY, DD/MM/YYYY, or DD.MM.YYYY.

## 4. Types of Characters That Can Be Handled

Characters:  
Alphabet characters, numbers, and symbols (limitation exists)  
European special character and Cyrillic can be entered via communication command and DAQSTANDARD software.

## 5. Miscellaneous

Decimal point type: Period or comma

## 6. Batch Function

Function: Data management using batch names.  
Enter text fields and batch comments in the data file.  
Batch name:  
Added to the file name of the display data and event data.  
Structure Batch number (up to 32 characters) + lot number (up to 8 digits)  
Text field: Adds text to the display data and event data. There are 8 available text fields.  
Up to 20 title characters and 30 other characters can be entered per field.  
Batch comment:  
Adds text to the display data and event data. Up to 3 comments with 50 characters or less.

## ■ Options

### 1. Alarm Output Relay (/A1, /A2, /A3, and /A4A)

Action: Outputs relay contact signals from the terminals on the rear panel when alarms occur.

Number of outputs: 2 (/A1), 4 (/A2), 6 (/A3), and 12 (/A4A)

Relay contact rating: 250 VAC (50/60 Hz)/3 A, 250 VDC/0.1 A (for resistance load)

Output format: 2 (/A1), 4 (/A2), 6 (/A3): NO-C-NC, and 12 (/A4A): NO-C

Relay operation: Energized/deenergized, AND/OR, hold/non-hold, and refresh settings are selectable.

### 2. RS-232 Interface (/C2) and RS-422A/485 Interface (/C3)

Connection: EIA RS-232(/C2) or EIA RS-422A/485(/C3)

Protocol: Dedicated protocol or Modbus protocol

Synchronization: Start-stop synchronization

Transmission mode (RS-422A/485): Four-wire half-duplex multi-drop connection (1:N (N = 1 to 32))

Data rate: 1200, 2400, 4800, 9600, 19200, or 38400 bps

Data length: 7 or 8 bits

Stop bit: 1 bit

Parity: Odd, even, or none

Handshaking: Off:Off, XON:XON, XON:RS, and CS:RS

Communication distance (RS-422A/485): 1200 m

Modbus master: Reading information such as measured data from other instruments and writing information to registers

Modbus slave: Reading data from measurement and computation channels (/M1, /PM1, and /PWR1)

Reading and writing communication input data (/M1, /PM1, and /PWR1)

Some control commands such as memory start

### 3. Ethernet Communication Interface (/C7)

Electrical and mechanical specifications: Conforms to IEEE 802.3 (Ethernet frames conform to the DIX specification).

Medium: Ethernet (10BASE-T)

Protocol: Dedicated protocol as well as the TCP, IP, UDP, ICMP, ARP, DHCP, HTTP, FTP, SMTP, SNTP, and Modbus protocols

E-mail client: Automatically send e-mail at specified times.

FTP client: Automatically transfer the following types of data files to the FTP server: Display data, event data, screen image (snapshot) data, and report data (/M1, /PM1, and /PWR1)

### FTP Server:

Moving and deleting files on the FX, managing directories, and generating file lists

### Web server:

Displaying the FX screen on a Web browser

### SNTP client:

Setting the FX time to the results of an SNTP server query

Cannot be used after hour 0 on January 1st, 2036.

### SNTP server: Generating the FX's time.

Time resolution: 5 ms

Cannot be used after hour 0 on January 1st, 2036.

### DHCP client:

Automatically obtain the network address settings from the DHCP server.

### Modbus client:

Reads data from another device and writes to the registers.

### Modbus server:

Reading data from measurement and computation channels (/M1, /PM1, and /PWR1)

Reading and writing communication input data (/M1, /PM1, and /PWR1)

Some control commands such as memory start. Modbus client access limitations.

### Setting/Measurement server:

Using the dedicated protocol control, and configure the FX, and generate data from the FX.

### Maintenance/test server:

Outputs connection information and network information.

### Instrument information server:

Generating the information (such as the serial number and model name) of the connected FX.

## 4. FAIL/Status Output Relay (/F1)

FAIL output: Relay contact output on CPU error

### Relay operation

Energized during normal operation and de-energized on system error.

### Status output:

Output a relay contact signal when a selected condition occurs.

A combination of the following conditions can be selected:

Low memory, memory failure, media error, A/D hardware error, burnout detection, communication error (Modbus master or client communication error), memory sampling stop.

### Relay operation:

Relay is energized when a condition occurs.

### Relay contact rating:

250 VAC (50/60 Hz)/3 A, 250 VDC/0.1 A (for resistance load)

## 5. Computation Function (including the report function) (/M1)

Number of computation channels:

FX1002 and FX1004: 12 channels (101 to 112)  
FX1006, FX1008, FX1010, and FX1012: 24 channels (101 to 124)

Operation:

General arithmetic operations:

Four arithmetic operations, square root, absolute, common logarithm, natural logarithm, exponential, and power

Relational operations: <, ≤, >, ≥, =, and ≠

Logic operations: AND, OR, NOT, and XOR

Statistical operations: TLOG and CLOG

Special operations:

PRE, HOLD, RESET, and CARRY

Conditional operation: [a?b:c]

Computation accuracy:

Double-precision floating point

Data that can be used:

Channel data

Measurement and computation channels

Constants 60 constants

Communication input data 24

Remote control input status 0/1 (/R1)

Pulse input Counts the number of pulses (/PM1)

Status input Internal switch, alarm output relay (/A[ ] and /A4A), flags

Rolling average:

Performs moving average on the computed results.

Measurement range: -99999999 to 99999999  
Decimal place: 0 to 4 digits to the right of the decimal point

Unit: Up to 6 characters in length

Sum scales: Off, /s, /min, /h, /day

Alarms: High limit, low limit, delay high limit, and delay low limit

Hysteresis: High and low limit alarm: 0.0% to 5.0% of the span.

Display: Same as the measurement channels

Data saving: Same as the measurement channels

Report function:

Number of report channels: 12 or 24  
(same as the number of computation channels)

Computation types:

Average, maximum, minimum, sum, or instantaneous value

Report types:

Hourly, daily, hourly + daily, daily + weekly, daily + monthly

## 6. 3-Wire Isolated RTD Input (/N2)

Input terminal:

All the RTD input terminals (A, B, and b) are isolated on each channel.

Applies to the FX1006, FX1008, FX1010, and FX1012

Note: On the FX1002 and FX1004 standard models, the A, B, and b terminals are already isolated on each channel.

## 7. Extended Input (/N3F)

Measurement/display accuracy: Under standard operating conditions

Input Type		Measuring Range		Measurement Accuracy	Max. Resolution	
Thermocouple	Kp vs Au7Fe	0.0 to 300.0 K	0 to 20 K	Within ±4.5 K	0.1 K	
			20 to 300 K	Within ±2.5 K		
	PLATINEL	0.0 to 1400.0°C	±(0.25% of rdg + 2.3°C)		0.1°C	
	PR40-20	0.0 to 1900.0°C	0 to 450°C	Accuracy not guaranteed		
			450 to 750°C	±(0.9% of rdg + 3.2°C)		
			750 to 1100°C	±(0.9% of rdg + 1.3°C)		
			1100 to 1900°C	±(0.9% of rdg + 0.4°C)		
	NiNiMo	0.0 to 1310.0°C	±(0.25% of rdg + 0.7°C)			
	W/WRe26	0.0 to 2400.0°C	0 to 400°C	±15.0°C		
			400 to 2400°C	±(0.2% of rdg + 2.0°C)		
	Type N (AWG14)	0.0 to 1300.0°C	±(0.2% of rdg + 1.3°C)			
	XK GOST	-200.0 to 600.0	-200 to -100°C	±(0.25% of rdg + 1.0°C)		
			-100 to 600°C	±(0.25% of rdg + 0.8°C)		
RTD*1	Ni100 (SAMA)	-200.0 to 250.0°C	±(0.15% of rdg + 0.4°C)			
	Ni100 (DIN)	-60.0 to 180.0°C	±(0.15% of rdg + 0.4°C)			
	Ni120	-70.0 to 200.0°C	±(0.15% of rdg + 0.4°C)			
	Pt100 GOST	-200.0 to 600.0°C	±(0.15% of rdg + 0.3°C)			
	Cu100 GOST	-200.0 to 200.0°C	±(0.15% of rdg + 0.3°C)			
	Cu50 GOST	-200.0 to 200.0°C	±(0.4% of rdg + 0.5°C)			
	Pt200 (WEED)	-100.0 to 450.0°C	±(0.3% of rdg + 0.6°C)			

\*1: Measuring current i = 1 mA

## Input source resistance:

Thermocouple input: 2 kΩ or less

RTD input: 1 Ω or less per wire (The resistance of all three wires must be equal).

## Ambient temperature influence (with temperature variation of 10°C):

TC input  $\pm(0.1\% \text{ of rdg} + 0.05\% \text{ of range})$  or less, excluding the error of reference junction compensationRTD input  $\pm(0.2\% \text{ of range} + 2 \text{ digits})$  or less

## Input source resistance:

TC input With variation of  $+1 \text{ k}\Omega$ :  $\pm 10 \text{ }\mu\text{V}$  or lessRTD input With variation of 1 Ω per wire (resistance of all three wires must be equal):  $\pm(0.1\% \text{ of rdg} + 1 \text{ digit})$  or less

With maximum difference of 100 mΩ between wires: Approx. 1 °C

**8. Remote Control (/R1)**

## Number of input terminals: 8

Input type: Isolated from the main circuitry through a photocoupler, built-in isolated power supply for the input terminals, and shared common.

## Input type and signal level:

Voltage-free contact

Contact closed at 200 Ω or less and contact open at 100 kΩ or greater.

Open collector

ON voltage: 0.5 V or less (sink current 30 mA or more), leakage current when OFF: 0.25 mA or less

## Allowable input voltage: 5 VDC

## Signal type: Level or edge (250 ms or more)

Action: Executes a specified action by applying a given signal to the remote signal input terminal.

Action assignment: Set using the event action function

**9. 24 VDC Transmitter Power Supply (/TPS2 and /TPS4)**

## Number of loops: 2 (/TPS2) or 4 (/TPS4)

## Output voltage:

22.8 to 25.2 VDC (under rated load current)

## Rated output current: 4 to 20 mA/DC

## Max. output current:

25 mA/DC (overcurrent protection operation current: approx. 68 mA/DC)

## Allowable conductor resistance:

RL  $\leq (17.8 - \text{minimum transmitter operation voltage})/0.02 \text{ A}$  where 17.8 V is the result obtained by subtracting the maximum drop voltage of 5 V when the load shunt resistance is 250 Ω from the minimum output voltage of 22.8 V

## Max. length of wiring:

2 km (when using the CEV cable)

## Insulation resistance:

20 MΩ or more at 500 VDC between output terminal and ground

## Dielectric strength:

500 VAC (50/60 Hz, I = 10mA) for one minute between output terminal and ground

500 VAC (50/60 Hz, I = 10mA) for one minute between output terminals

**10. USB Interface (/USB1)**

USB port: Complies with Rev. 1.1 and host function

Number of ports: 1 (front panel)

Power supply: 5 V, 500 mA

## Connectable devices:

Only connect the devices listed below to prevent damage to the devices.

Keyboard Complies with HID Class Ver. 1.1  
104 keyboard/89 keyboard (US) and  
109 keyboard/89 keyboard (Japanese)

Number of connectable units: 1

## External medium

USB flash memory

Does not guarantee the operation of all USB flash memories.

External medium such as a hard disk, ZIP, MO, and optical discs are not supported.

Number of connectable units: 1

**11. Pulse Input (/PM1)**

## Pulse input:

## Number of inputs

3 (8 when using the remote control input terminals)

Input type Isolated from the main circuitry through a photocoupler and built-in isolated power supply for the input terminals.

Shared common for pulse inputs.

## Input type and signal level

Voltage-free contact

Contact closed at 200 Ω or less and contact open at 100 kΩ or greater

Open collector

ON voltage: 0.5 V or less (sink current 30 mA or more), leakage current when OFF: 0.25 mA or less

Counting Counts the rising edges of pulses.

For voltage-free contact input:

Contact open to contact close

For open collector:

Voltage level of the terminal H from high to low

Allowable input voltage 30 VDC

Max. sampling pulse period 100 Hz

Minimum detected pulse width

5 ms or more for both low (closed) and high (open)

Pulse detection period Approx. 3.9 ms (256 Hz)

Pulse measuring accuracy  $\pm 1$  pulse

Pulse count interval Scan interval or 1 s

## Miscellaneous

Pulse input terminals can be used as remote control input terminals, isolated from remote control input terminals

## Remote control:

Number of inputs: 5. Same as remote control (/R1) for the other specifications

## Computation function:

Same as the computation function (/M1)

**12. Calibration Correction (/CC1)**

## Calibration correction method:

Corrects the measured value of each channel using segment linearizer approximation.

Number of segment points: 2 to 16 (including the start and end points)

### 13. DC/AC 24 V Power Supply (/P1)

Rated supply voltage:

24 VDC and 24 VAC (50/60Hz)

Allowable power supply voltage range:

21.6V to 26.4 VDC/AC

Insulation resistance:

Between power terminal and earth: 20 MΩ or greater at 500 VDC.

Withstand voltage:

Between power terminal and earth: 500 VAC at 50/60 Hz for one minute

Rated power supply frequency (for AC): 50/60 Hz

Allowable power supply frequency range (for AC):

50 Hz ±2%, 60 Hz ±2%

Power supply fluctuation:

With variation within 21.6 to 26.4 VDC/AC: ±1digit or less

Power supply frequency fluctuation (for AC):

With variation of ±2 Hz from rated power supply frequency: ±(0.1% of rdg+1digit) or less

Rated power consumption:

18 VA (for DC), 30 VA (for AC)

Power consumption:

Supply voltage	LCD backlight off	Normal	Maximum
24 VDC	5 VA	7 VA	18 VA
24 VAC (50/60Hz)	8 VA	12 VA	30 VA

### 14. Log Scale (/LG1)

Function: A logarithmic voltage that has been converted from a physical value is applied to the FX, and then the FX's Log scale (logarithmic scale) is used to display and record the physical value.

Input type: Log input: Logarithmic input (LogType1)

Log linear input: Input that is linear on a logarithmic scale (LogType2)

Pseudo log input: An input that supports pseudo logs. (LogType2)

Nonlinear log input: An input that supports nonlinear logs on which calibration correction (/CC1 option) is applied.

Calibration correction is performed using voltage values. (LogType1)

Range: 20 mV, 60 mV, 200 mV, 2 V, 6 V, 20 V, 50 V, and 1 V

Unit symbol:

Up to 6 characters in length

Scalable range:

Log input (LogType1)  
1.00E-15 to 1.00E+15 (15 decades maximum)

Lower limit mantissa range: 1.00 to 9.99.

Upper limit mantissa range: 1.00 to 9.99.

Scale\_L < Scale\_U

If the lower limit mantissa is 1.00, the difference between the exponents must be 1 or more.

If the lower limit mantissa is a value other than 1.00, the difference between the exponents must be 2 or more.

Log linear input/Pseudo Log Input (LogType2)

Lower limit mantissa range: 1.00 to 9.99. Upper limit mantissa range: N/A (the value is the same as the lower limit mantissa).

If the lower limit mantissa is 1.00, the value must be between 1.00E-15 and 1.00E+15, the difference between the exponents must be 1 or more, and the maximum decades is 15.

If the lower limit mantissa is a value other than 1.00, the value must be between 1.01E-15 and 9.99E+14, the difference between the exponents must be 1 or more and the maximum decades is 14.

Alarm:

Kind

High limit, low limit, delay high limit, and delay low limit

Range

1.00E-16 to 1.00E+16, mantissa: 1.00 to 9.99

Hysteresis 0% (fixed)

Color scale band range:

1.00E-16 to 1.00E+16, mantissa: 1.00 to 9.99

The display position lower limit must be less than the display position upper limit.

Number of mantissa display digits: 2 or 3

Type of LogType2: Select from Log linear or Pseudo Log.

### 15. Power Monitor (/PWR1)

Measurement element:

By including power measurement elements in an expression, you can measure a variety of power values. Active power, regenerative electric power, reactive power, apparent power, voltage, current, frequency, power factor (LEAD: -, LAG: +), and electric energy (active energy, regenerative energy, reactive energy—LAG: +, reactive energy—LEAD: —, and apparent energy)

\* The LEAD/LAG sign is calculated from the phase difference between P1 (voltage) and I1 (current.)

Phase and wiring system:

Single-phase two-wire system, single-phase three-wire system, and three-phase three-wire system

Frequency: 45 to 65 Hz

Rated input voltage:

Rated Voltage	Voltage Range (Variable)	Allowable Input Voltage	Crest Factor
120 V	120 V	150 V	2
240 V	240 V	300 V	2

Rated input current:

Rated Current	Current Range (Fixed)	Allowable Input Current	Crest Factor
1 A	1 A	1.2 A	2

Allowable input range:

150 Vrms (when the voltage range is set to 120 V), 300 Vrms (when the voltage range is set to 240 V), and 1.2 A (when using current input)

Rated input power and measuring range:  
Single-phase two-wire system

Input (AC)	Rated Power	Input Measuring Range <sup>1</sup>	Approximate Consumed VA	
			Voltage	Current
120 V/1 A	100 W	-120 to 120 W	0.2 VA	0.2 VA
240 V/1 A	200 W	-240 to 240 W	0.4 VA	

Single-phase three-wire system

Input (AC)	Rated Power	Input Measuring Range	Approximate Consumed VA	
			Voltage	Current
200 V/1 A	200 W	-240 to 240 W	0.2 VA/ Phase	0.2 VA/ Phase

Three-phase three-wire system

Input (AC)	Rated Power	Input Measuring Range	Approximate Consumed VA	
			Voltage	Current
120 V/1 A	200 W	-240 to 240 W	0.2 VA/ Phase	0.2 VA/ Phase
240 V/1 A	400 W	-480 to 480 W	0.4 VA/ Phase	

Expressions (V and A are rms values)

	Apparent Power (VA)	Reactive Power (Q) (Without using the reactive power measurement method)	Power Factor(PF)
Single-phase two-wire system	$VA = V \times A$	$Q = \sqrt{(VA)^2 - P^2}$	
Single-phase, three-wire system	$VA_i = V_i \times A_i$ $i = 1, 2$ $\Sigma VA = VA_1 + VA_2$	$Q_i = \sqrt{(VA_i)^2 - P_i^2}$ $i = 1, 2$ $\Sigma Q = Q_1 + Q_2$	$\Sigma P / \Sigma VA$ (Without using the reactive power measurement method)
Three-phase three-wire system	$VA_i = V_i \times A_i$ $i = 1, 3$ $\Sigma VA = \sqrt{3/2}(VA_1 + VA_3)$	$Q_i = \sqrt{(VA_i)^2 - P_i^2}$ $i = 1, 3$ $\Sigma Q = Q_1 + Q_3$	

- \* The FX's apparent power (VA), reactive power (Q), power factor (PF), and phase (deg) are determined from the voltage(V), current(A), and active power(P) by means of digital computations. Therefore, for distorted signal input, the value obtained on the FX may differ from that obtained on other instruments that use a different method.
- \* Make sure that the voltage input is at least 10% of the rated value and the current input is at least 5% of the rated value.
- \* In the  $\Sigma Q$  computation, each phase's Q value is computed as negative (-) if the current input is leading the voltage input and as positive (+) if the current input is lagging the voltage input.

Frequency:  $\pm 1.0$  Hz

- \* The frequency of the voltage line input to voltage P1 is output in units of Hz.

Response time: 2 sec

Continuous overload:

Within the degree of accuracy (rated voltage and rated current  $\times 1.2$  applied for 2 hours)

Instantaneous overload:

Within the degree of accuracy (rated voltage  $\times 1.5$  applied for 10 seconds, rated current  $\times 2$  applied for 10 seconds, rated current  $\times 10$  applied for 3 seconds)

Dielectric strength:

2500 VAC (50/60 Hz) for 1 minute (between the current input, voltage input, and earth)

Insulation resistance:

100 M $\Omega$  (500 VDC between the current input, voltage input, and earth)

Computation functions:

The same as the computation function (/M1)

The input measuring range when you are using a VT and CT is calculated using the following equation. The measuring range must be within the input measuring ranges listed above, and the primary side input power<sup>2</sup> must be less than 10 GW.

\*1: Input measuring range (W) = Primary side input power in  $W^2 / (VT \text{ ratio} \times CT \text{ ratio})$ .

\*2: Primary side input power = Secondary side rated power in  $W \times 1.2 \times VT \text{ ratio} \times CT \text{ ratio}$ .

Measuring range:

Power factor: (LEAD) 0.5 to 1 to (LAG) 0.5

Frequency: 45 to 65 Hz

Measurement accuracy:

The performance values listed here were recorded under the following standard operating conditions:  $23 \pm 2^\circ\text{C}$ ,  $55 \pm 10\%$ RH; power supply frequency: 50/60 Hz  $\pm 1\%$  or less; rated input:  $\pm 1\%$  or less, power factor:  $1 \pm 1\%$  or less; warm-up time: 30 minutes or more; and a location in which vibration and other factors do not affect the operation of the instrument.

Active power (W):  $\pm 1.0\%$  of range

Voltage (V):  $\pm 1.0\%$  of range

Current (A):  $\pm 1.0\%$  of range

Apparent power, reactive power, and power factor:

Value calculated from the measured values  $\pm 1$  digit

Effects of the operating conditions:

Ambient temperature

$\pm 0.05^\circ\text{C}$  (under the following conditions:  $0$  to  $50^\circ\text{C}$ ,  $0.05 \text{ ln} \leq I \leq I_{\text{max}}$ , power factor = 1)

$\pm 0.07^\circ\text{C}$  (under the following conditions:  $0$  to  $50^\circ\text{C}$ ,  $0.1 \text{ ln} \leq I \leq I_{\text{max}}$ , power factor = 0.5)

In: Rated current

Voltage variation

Within the degree of accuracy (90 to 132 VAC or 180 to 250 VAC; frequency is 50 or 60 Hz)

External magnetic fields

400 A/m or less

Active power and voltage:  $\pm 1.0\%$  of range

Effect of the input frequency

For a change within 45 to 65 Hz, the effect on the active power, voltage, and current is within the accuracies.

## ■ General Specifications

### 1. Construction

Mounting: Flush panel mounting (on a vertical plane)  
 Mounting angle:  
     Inclined backward up to 30 degrees from a horizontal plane.  
 Allowable panel thickness: 2 to 26 mm  
 Material Case: Metal plate  
     Bezel and display cover: Polycarbonate  
 Color Case: Grayish blue green (Munsell 2.0B5.0/1.7 or equivalent)  
     Bezel: Charcoal gray light (Munsell 10B3.6/0.3 or equivalent)  
 Front panel:  
     Water and dust proof: Complies with IEC529-IP65, except side-by-side mounting  
 External dimensions:  
     144 (W) x 144 (H) x 161.7 (D) mm (D: depth from the panel mounting plane)  
 Weight: FX1002, FX1004, FX1006: 1.3 kg, FX1008, FX1010, FX1012: 1.4 kg, not including options

### 2. Normal Operating Conditions

Supply voltage: 90 to 132, 180 to 250 VAC  
 Power supply frequency: 50 Hz ± 2%, 60 Hz ± 2%  
 Ambient temperature: 0 to 50°C  
 Ambient humidity:  
     20 to 80%RH (at 5 to 40°C), 10 to 50% (at 40 to 50°C)  
 Vibration: 10 to 60 Hz, 0.2 m/s<sup>2</sup>  
 Shock: Not allowed  
 Magnetic field: 400 A/m or less (DC and 50/60 Hz)  
 Noise:  
     Normal mode (50/60 Hz)  
     DC voltage The peak value including the signal must be less than 1.2 times the measuring range.  
 Thermocouple  
     The peak value including the signal must be less than 1.2 times the measuring thermal electromotive force.  
 RTD 50 mV or less  
 Common mode noise  
     250 VACrms or less for all ranges (50/60 Hz)  
 Maximum noise voltage between channels  
     FX1xxx-x-x-H: 250 VACrms (50 or 60 Hz) or less  
     FX1xxx-x-x-L: 60 VACrms (50 or 60 Hz) or less  
 Mounting position:  
     Can be inclined up to 30 degrees backward. Left and right horizontal.  
 Warm-up time: At least 30 minutes after power on  
 Installation location: Indoors  
 Operating altitude: 2000 m or less

### 3. Power Supply

Rated supply voltage: 100 to 240 VAC  
 Allowable power supply voltage range:  
     90 to 132, 180 to 264 VAC  
 Rated power supply frequency: 50 Hz, 60 Hz

Power consumption:

Supply voltage	LCD backlight off	Normal	Maximum
100 VAC	10 VA	15 VA	35 VA
240 VAC	15 VA	20 VA	45 VA

Allowable interruption time:

Less than 1 cycle of the power supply frequency

### 4. Isolation

Insulation resistance:  
     Between the Ethernet, RS-422A/485, and insulation terminals and earth: 20 MΩ or greater at 500 VDC  
 Withstand voltage:  
     Between the power terminal and earth: 2300 VAC at 50/60 Hz for one minute  
     Between the contact output terminal and earth: 1600 VAC at 50/60 Hz for one minute  
     Between the measurement input terminal and earth: 1500 VAC at 50/60 Hz for one minute  
     Between the measurement input terminals (excluding the RTD input terminal of the FX1006, FX1008, FX1010, FX1012): FX1xxx-x-x-H: 1000 VAC (50 or 60 Hz) for 1 minute  
     FX1xxx-x-x-L: 400 VAC (50 or 60 Hz) for 1 minute  
     Between the remote input terminal and earth: 1000 VDC for one minute  
     Between the pulse input terminal and earth: 1000 VDC for one minute  
     Between the power monitor input terminals (current input, voltage input, and earth): 2500 VAC (50 or 60 Hz) for 1 minute  
 Ground: Grounding resistance: 100 Ω or less

### 5. Transport and Storage Conditions

Ambient temperature: -25 to 60°C  
 Ambient humidity: 5 to 95%RH (no condensation)  
 Vibration: 10 to 60 Hz, 4.9 m/s<sup>2</sup> maximum  
 Shock: 392 m/s<sup>2</sup> maximum (in packaged condition)

## 6. Supported Standards

CSA: CSA22.2 No.61010-1, CSA C22.2 No. 61010-2-030, installation category II<sup>1</sup> and pollution degree 2<sup>2</sup>

UL: UL61010-1, UL61010-2-030 (CSA NRTL/C)

CE:  
EMC directive  
EN61326-1 compliance, Class A, Table 2 (For use in industrial locations)  
EN61000-3-2 compliance  
EN61000-3-3 compliance  
EN55011 compliance, Class A, Group 1  
Low voltage directive  
EN61010-1, EN61010-2-030, installation category II<sup>1</sup> and pollution degree 2<sup>2</sup>

EMC Regulatory Arrangement in Australia and New Zealand

EN55011 compliance, Class A, Group 1

\*1: Installation category (overvoltage category) II:  
Describes a number which defines a transient overvoltage condition. Imply the regulation for impulse withstand voltage. "II" applies to electrical equipment which is supplied from the fixed installation like a distribution board.

\*2: Pollution degree 2: Describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to normal indoor atmosphere. Normally, only non-conductive pollution occurs.

## 7. Standard Performance

Measurement/display accuracy:

Standard operating conditions:

Temperature: 23 ± 2°C

Humidity: 55% ± 10%RH

Power supply voltage: 90 to 132 or 180 to 250 VAC

Power supply frequency: 50/60 Hz ± 1%

Warm-up time: At least 30 minutes.

Other ambient conditions such as vibration should not adversely affect the operation.

Input Type	Range	Measurement Accuracy (Digital display)	Digital Display Max. Resolution
DC voltage	20 mV	±(0.05% of rdg + 12 digits)	1 µV
	60 mV	±(0.05% of rdg + 3 digits)	10 µV
	200 mV		10 µV
	1 V		100 µV
	2 V	±(0.05% of rdg + 12 digits)	100 µV
	1 to 5 V	±(0.05% of rdg + 3 digits)	1 mV
	6 V		1 mV
	20 V		1 mV
	50 V		10 mV
Thermocouple (Not including the accuracy of reference junction compensation; when the burnout detection function is off.)	R	±(0.15% of rdg + 1°C) R, S: 0 to 100°C: ±3.7°C, 100 to 300°C: ±1.5°C B: 400 to 600°C: ±2°C; accuracy not guaranteed for temperatures less than 400°C	0.1°C
	S		
	B		
	K	±(0.15% of rdg + 0.7°C) -200 to -100°C: ±(0.15% of rdg + 1°C)	
	E	±(0.15% of rdg + 0.5°C) -200 to -100°C: ±(0.15% of rdg + 0.7°C)	
	J		
	T		
	N	±(0.15% of rdg + 0.7°C) -200 to 0°C: ±(0.35% of rdg + 0.7°C) Accuracy not guaranteed for values less than -200°C.	
	W	±(0.15% of rdg + 1°C)	
	L	±(0.15% of rdg + 0.5°C) -200 to -100°C: ±(0.15% of rdg + 0.7°C)	
	U		
	WRe	±(0.2% of rdg + 2.5°C) 0 to 200°C: ±4.0°C	
RTD	Pt100	±(0.15% of rdg + 0.3°C)	
	JPt100		
DI	Voltage	Threshold level (Vth=2.4 V) accuracy ± 0.1 V	
	Contact	With parallel capacitance of 0.01 µF or less, 1 kΩ or less: 1 (ON). 100 kΩ or more: 0 (OFF)	

## Measuring accuracy in case of scaling

Accuracy during scaling (digits) =  
measurement accuracy (digits) ×  
multiplier + 2 digits (rounded up)

- \* Fractions rounded up  
where the multiplier = scaling span (digits)/  
measuring span (digits).

Example For 1-5 V range (A/D integration time is  
16.7 ms or more), measurement span  
of 1.000 to 5.000 V, and scaling span of  
0.000 to 2.000

The measuring accuracy for 5 V input is  
as follows.

Measuring accuracy (1-5 Vrange)  
=  $\pm(0.05\% \times 5 V + 3 \text{ digits}) = \pm(0.0025 V$

[3 digits] + 3 digits) =  $\pm 6 \text{ digits}$

Multiplier = {2000 digits (0.000 to  
2.000)}/4000 digits (1.000 to 5.000) =

0.5

Thus, accuracy during scaling =  $\pm(6 \times$   
0.5 + 2) digits = 5 digits (rounded up)

## Reference junction compensation accuracy:

When measuring temperature  
greater than or equal to 0 °C and  
when input terminal temperature is  
balanced

Type R, S, W, and WRe:  $\pm 1.0^\circ\text{C}$

Type K, J, E, T, N, L, and U:  $\pm 0.5^\circ\text{C}$ .

Type B: Internal reference compensation is fixed  
to 0°C

Maximum input voltage:  $\pm 60 \text{ VDC}$  (continuous)

## Input resistance:

1 V range or less and TC:  $10 \text{ M}\Omega$  or more

2 V range or higher: Approx.  $1 \text{ M}\Omega$

## Input source resistance:

Volt, TC  $2 \text{ k}\Omega$  or less

RTD input  $10 \text{ }\Omega$  or less per wire (The resistance of  
all three wires must be equal).

## Bias current:

10 nA or less (except when burnout  
detection function is enabled)

## Maximum common mode noise voltage:

250 VACrms (50 Hz/60 Hz)

## Maximum noise voltage between channels:

FX1xxx-x-x-H 250VACrms (50/60Hz)

FX1xxx-x-x-L 60VACrms (50/60Hz)

## Interference across channels:

120 dB (when the input source resistance  
is  $500 \text{ }\Omega$  and the input to other channels is  
60 VDC)

## Common mode rejection ratio:

When the A/D integration time is 20 ms

120 dB (50 Hz  $\pm 0.1\%$ ,  $500 \text{ }\Omega$   
unbalanced, between the minus terminal  
and ground)

When the A/D integration time is 16.7 ms

120 dB (60 Hz  $\pm 0.1\%$ ,  $500 \text{ }\Omega$   
unbalanced, between the minus terminal  
and ground)

## Normal mode rejection ratio:

When the A/D integration time is 20 ms

40 dB or more (50 Hz  $\pm 0.1\%$ )

When the A/D integration time is 16.7 ms

40 dB or more (60 Hz  $\pm 0.1\%$ )

## 8. Effects of Operating Conditions

Ambient temperature (with temperature variation of  
10°C):

DC voltage, TC range  
 $\pm(0.1\% \text{ of rdg} + 0.05\% \text{ of range})$  or less

\* Excluding the error of reference junction  
compensation

RTD range

$\pm(0.1\% \text{ of rdg} + 2 \text{ digits})$  or less

Power supply fluctuation

With variation within 90 to 132 V and 180  
to 250 VAC (50/60 Hz):

Accuracy specifications are satisfied.

With variation of  $\pm 2 \text{ Hz}$  from rated  
power frequency (power supply voltage  
100 VAC): Accuracy specifications are  
satisfied.

Magnetic field:

AC (50/60 Hz) and DC 400 A/m fields:  
 $\pm(0.1\% \text{ of rdg} + 10 \text{ digits})$  or less

Input source resistance:

DC voltage range

With variation of  $+1 \text{ k}\Omega$ :

1 V range or less:  $\pm 10 \text{ }\mu\text{V}$  or less

2 V range or higher:  $\pm 0.15\%$  of rdg or less

TC range

With variation of  $+1 \text{ k}\Omega$ :  $\pm 10 \text{ }\mu\text{V}$  or less

RTD range (Pt100)

With variation of  $10 \text{ }\Omega$  per wire  
(resistance of all three wires must be  
equal):  $\pm(0.1\% \text{ of rdg} + 1 \text{ digits})$  or less

With maximum difference of  $40 \text{ m}\Omega$

between wires: Approx.  $0.1^\circ\text{C}$

Effects of vibration:

Effects from a sinusoidal vibration along  
all three axis at a frequency between 10  
to 60 Hz and an acceleration of  $0.2 \text{ m/s}^2$ :  
 $\pm(0.1\% \text{ of rdg} + 1 \text{ digit})$  or less

## 9. Miscellaneous

Memory backup:

A built-in lithium battery backs up the  
settings and runs the clock

Battery life: Approximately 10 years (at  
room temperature)

## ■ Application Software

### 1. Operating environment

Operating System (OS):

Windows XP

Home Edition SP3

Professional SP3 (excluding 64-bit  
Editions)

Windows Vista

Home Premium SP2 (excluding 64-bit  
editions)

Business SP2 (excluding 64-bit editions)

Windows 7

Home Premium, SP1 (32- or 64-bit  
edition)

Professional, SP1 (32- or 64-bit edition)

CPU and Main Memory:

When Using Windows XP

Pentium III, 600 MHz or faster Intel x64  
or x86 processor; 128 MB or more of  
memory

When Using Windows Vista

Pentium 4, 3 GHz or faster Intel x64 or  
x86 processor; 2 GB or more of memory

When Using Windows 7

32-bit edition: Intel Pentium 4, 3 GHz  
or faster x64 or x86 processor; 2 GB or  
more of memory

64-bit edition: Intel x64 processor that is  
equivalent to Intel Pentium 4, 3 GHz or  
faster; 2 GB or more of memory

Hard Disk:

A free space of 100 MB or more (more  
space may be required, depending on the  
amount of data stored).

CD-ROM Drive:

To be used for installing the software.

Mouse: A mouse supported by Windows.

Monitor: A video card that is recommended for the  
OS and a display that is supported by  
the OS, has a resolution of 1024×768 or  
higher, and that can show 65,536 colors  
(16-bit, high color) or more.

Printer: A printer supported by Windows is  
required. An appropriate printer driver is  
also required.

Adobe Reader: Adobe Reader 7 or later

### 2. Configuration software:

Setting mode:

Configuration of setting mode and basic  
setting mode

Configuration via communication:

Configuration of setting mode and basic  
setting mode without communication  
configuration (ex. IP address)

### 3. Data viewer software:

Number of display channels:

32 channels per group, 50 groups  
maximum

Viewer function:

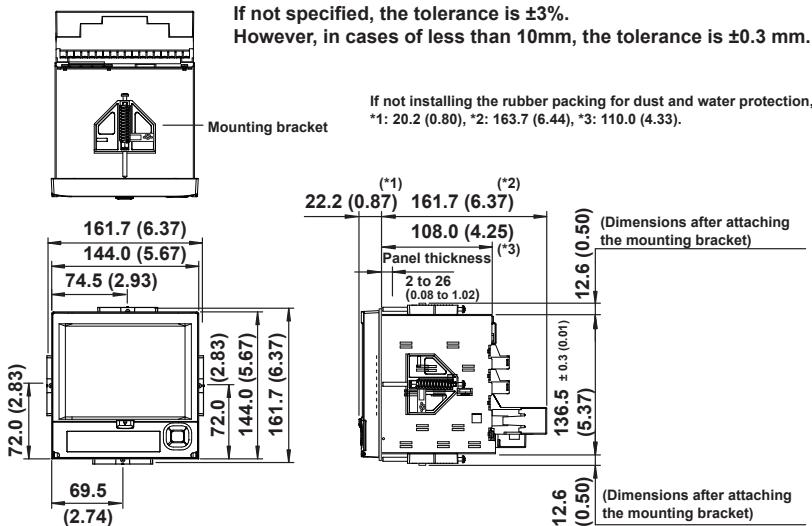
Waveform display, digital display, circular  
display, list display, report display, etc.

Data conversion:

File conversion to ASCII, Lotus 1-2-3 or  
MS-Excel format

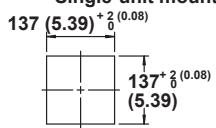
## ■ Dimensions

### External dimensions

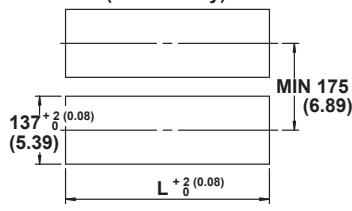


### Panel cut dimensions

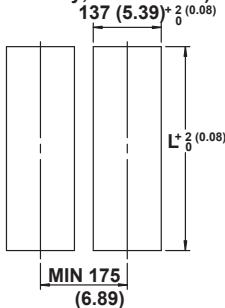
#### Single-unit mounting



#### Side-by-side mounting (horizontally)



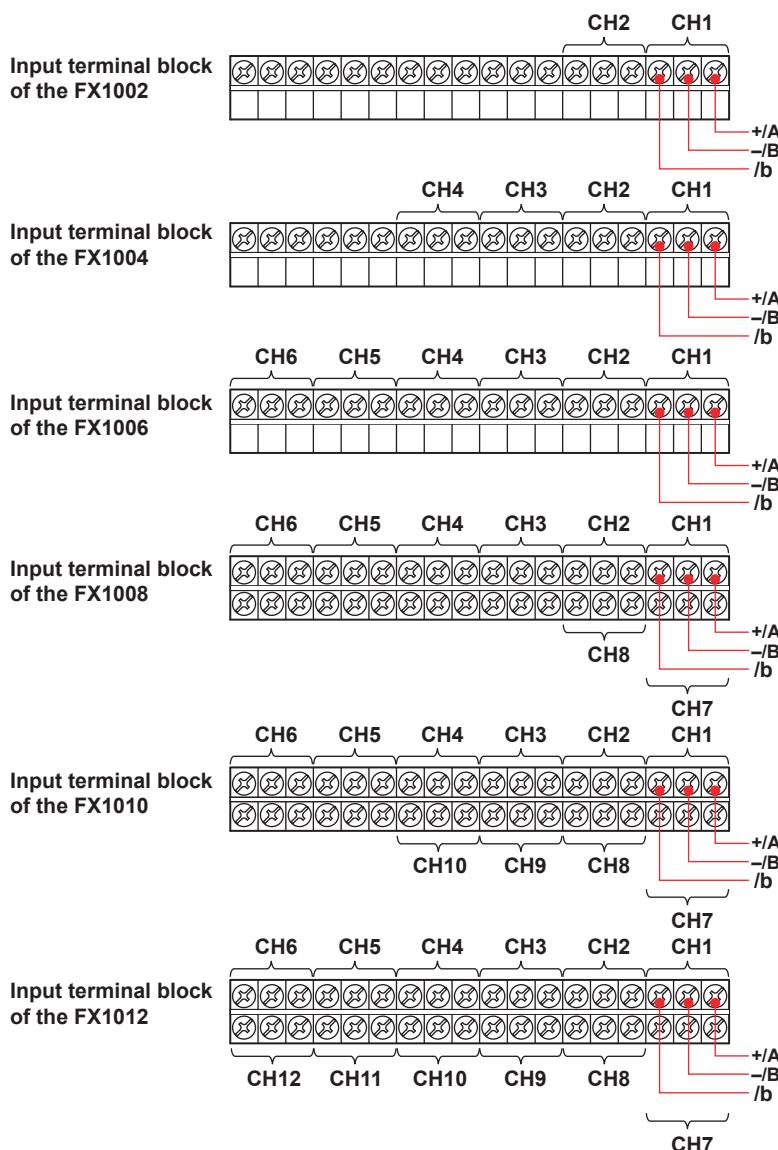
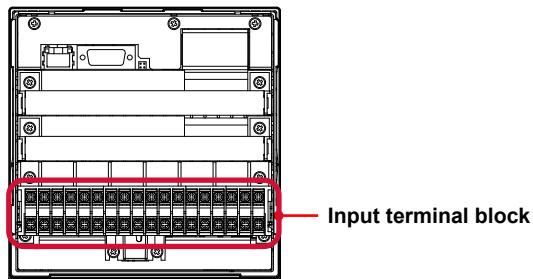
#### Side-by-side mounting (vertically; max. 3 units)



Units	$L {}^{+2}_{-0}$ (0.08) in mm (approx. inches)
2	282 (11.10)
3	426 (16.77)
4	570 (22.44)
5	714 (28.11)
6	858 (33.78)
7	1002 (39.45)
8	1146 (45.12)
9	1290 (50.79)
10	1434 (56.46)
n	$(144 \times n) - 6 [(5.67 \times n) - 0.24]$

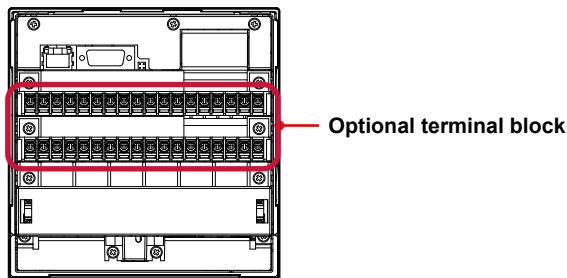
## ■ Arrangement of the Terminals

### 1. Input Terminals



For TC input, use shielded compensating lead wires for wiring.  
 For RTD input, lead wire resistance per wire of  $10\ \Omega$  or less. Make the resistances of the three wires equal.  
 For DCA input, example: for 4 to 20 mA input, use a shunt resistor of  $250\ \Omega \pm 0.1\%$ .

## 2. Optional Terminals



/A1	/A2
Alarm output 02      01 	04      Alarm output 03      02      01 
04      Alarm output 03      02      01 	06      05      04      03      02      01 
/C3	/F1
<b>RS-422A/485</b> 	
<b>/PM1</b> 	<b>/R1</b> 
<b>/TPS2</b> 	<b>/TPS4</b> 
<b>/PWR1</b> 	<b>/A1 when installed in the FX with a /TPS2</b> 

## ■ Model and Suffix Code

Model code	Suffix code	Optional code	Description
FX1002			2ch, Shortest measurement interval: 125ms
FX1004			4ch, Shortest measurement interval: 125ms
FX1006			6ch, Shortest measurement interval: 1s
FX1008			8ch, Shortest measurement interval: 1s
FX1010			10ch, Shortest measurement interval: 1s
FX1012			12ch, Shortest measurement interval: 1s
External storage medium slot	-0		Without CF card slot and medium <sup>(Note)</sup>
	-4		With CF card slot and medium
Language	-2		English/Japanese/German/French/Chinese/Italian/Spanish/Portuguese/Russian/Korean, deg F and DST
Withstanding voltage between measuring input terminals	-H		1000 VAC(50/60 Hz), 1 min
	-L		400 VAC(50/60 Hz), 1 min
Options		/A1	Alarm output 2 points (C-contact) <sup>*1*10</sup>
		/A2	Alarm output 4 points (C-contact) <sup>*1</sup>
		/A3	Alarm output 6 points (C-contact) <sup>*1*3</sup>
		/A4A	Alarm output 12 points (A-contact) <sup>*1*3</sup>
		/C2	RS-232 interface <sup>*2</sup>
		/C3	RS-422A/485 interface <sup>*2</sup>
		/C7	Ethernet interface
		/F1	FAIL/Status output <sup>*3</sup>
		/M1	Mathematical functions (including Report functions)
		/N2	3 leg isolated RTD <sup>*4</sup>
		/N3F	Extended input type (without Pt1000)
		/P1	24 VDC/AC power supply
		/R1	Remote control 8 points <sup>*5</sup>
		/TPS2	24VDC transmitter power supply (2 loops) <sup>*6*10</sup>
		/TPS4	24VDC transmitter power suply (4 loops) <sup>*7</sup>
		/USB1	USB interface (1 port)
		/PM1	Pulse input 3 points, Remote control 5 points (including Mathematical functions) <sup>*8</sup>
		/CC1	Calibration correction function
		/LG1	Log scale
		/PWR1	Power monitor (including Mathematical functions) <sup>*9*10</sup>

Note: To load data, the FX must be equipped with a communication interface (/C2, /C3, or /C7 option) or the USB interface (/USB1 option).

\*1 Any combination of /A1, /A2, /A3, and /A4A cannot be specified together.

\*2 /C2 and /C3 cannot be specified together.

\*3 /A3 or /A4A cannot be specified together with /F1.

\*4 /N2 cannot be specified for FX1002 or FX1004.

\*5 If /R1 is specified, /A4A, /TPS2, /TPS4, /PM1, or /PWR1 cannot be specified.

\*6 If /TPS2 is specified, /TPS4, /A2, /A3, /A4A, /F1, /R1, or /PM1 cannot be specified.

\*7 If /TPS4 is specified, /TPS2, /A1, /A2, /A3, /A4A, /F1, /R1, or /PM1 cannot be specified.

\*8 If /PM1 is specified, /A4A, /M1, /R1, /TPS2, /TPS4, or /PWR1 cannot be specified.

\*9 If /PWR1 is specified, /A3, /A4A, /F1, /R1, /PM1, or /M1 cannot be specified.

\*10 /TPS2, /PWR1, and /A1 cannot be specified together.

### Precaution on purchasing the Log scale (Optional code, /LG1)

To support the nonlinear output of vacuum gauges, the FX must be required with the Log scale (/LG1) and the calibration correction function (/CC1).

Model code	Description
FXA120	DAQSTANDARD software

\* DAQSTANDARD software (R9.02.01 or earlier) does not support the pseudo log and nonlinear log settings of the FX1000.

## ■ Standard Accessories

Name	Model	Qty.	Notes
Mounting brackets	B8730BU	2	For panel mounting
Rubber packing for dust and water protection	-	1	For single-unit mounting
FX1000 DAQSTANDARD/Manuals	FXA120	1	CD. Contains the software and user's manuals.
FX1000 Safety Precautions and Installation Guide	IM 04L21B01-03EN	1	A3 size
How to Use the CD Installing FXA120 DAQSTANDARD and Opening FX1000 Manuals	IM 04L21B01-66EN	1	A4 size
CF card <sup>*1</sup>	772093	1	512 MB

\*1 On FXs that have a CF card slot (suffix code -4.)  
CF card capacity is subject to change.

## ■ Optional Accessories (Sold Separately)

Name	Model	Q'ty	Notes
CF card	772093	1	512 MB
	772094	1	1 GB
	772095	1	2 GB
CF card adapter	772090	1	-
Shunt resistor	X010-250-3	1	250 Ω ± 0.1%
	X010-100-3	1	100 Ω ± 0.1%
	X010-010-3	1	10 Ω ± 0.1%
Mounting brackets	B8730BU	2	-
Terminal screws	B8730CZ	-	M3 (spares for I/O terminals)
	B8730CY	-	M4 (spares for power terminals)

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