General Specifications

Model FX1002/FX1004/FX1006/
FX1008/FX1010/FX1012
FX1000 Paperless Recorder

GS 04L21B01-02EN

■ OVERVIEW

The FX1000 (Model FX1002/FX1004/FX1006/FX1008/FX1010/FX1012) is a Paperless Recorder that displays real-time measured data on a color LCD and saves data on a CompactFlash memory card (CF card)[*1] *or SD card*[*2]*. 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/SD 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.)
*2: On FXs that have a SD card slot (suffix code -7.)

■ 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*1, 50 Hz, 60 Hz
FX1004	4		
FX1006	6	1 s, 2 s, 5 s	AUTO*1, 50 Hz, 60 Hz, 100 ms*2
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: IEC 60584-1, DIN EN 60584-1, JIS C1602
*2: W: W-5%Re/W-26%Re (Hoskins Mfg. Co.), ASTM E988-96 (Type C equivalent of OMEGA Engineering Inc.)
*3: L: Fe–CuNi, DIN 43710, U: Cu–CuNi, DIN 43710
*4: WRe: W-3%Re/W-25%Re (Hoskins Mfg. Co.), ASTM E988-96 (Type D equivalent of OMEGA Engineering Inc.)
*5: Pt100: JIS C 1604, IEC 60751, DIN EN 60751 JPt100: JIS C 1604, JIS C 1606. 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 μA.

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*6	0.800 to 5.200 V	
TC	R*1	0.0 to 1760.0°C	32 to 3200°F
	S*1	0.0 to 1760.0°C	32 to 3200°F
	B*1	0.0 to 1820.0°C	0.0 to 3308°F
	K*1	–200.0 to 1370.0°C	–328 to 2498°F
	E*1	–200.0 to 800.0°C	–328.0 to 1472.0°F
	J*1	–200.0 to 1100.0°C	–328.0 to 2012.0°F
	T*1	–200.0 to 400.0°C	–328.0 to 752.0°F
	N*1	–270.0 to 1300.0°C	–454 to 2372°F
	W*2	0.0 to 2315.0°C	32 to 4199°F
	L*3	–200.0 to 900.0°C	–328.0 to 1652.0°F
	U*3	–200.0 to 400.0°C	–328.0 to 752.0°F
	WRe*4	0.0 to 2400.0°C	32 to 4352°F
RTD	Pt (Pt100)*5	–200.0 to 600.0°C	–328.0 to 1112.0°F
	JPt (JPt100)*5	–200.0 to 550.0°C	–328.0 to 1022.0°F
DI	Level	0: Less than 2.4 V. 1: 2.4 V or higher (judged at the 6 V range)	
	Contact*7	0: Open. 1: Closed (parallel capacitance of 0.01 μF or less)	

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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

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Trend intervals:
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.
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.
Switchable to the secondary trend interval.
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:
Displays the measured value on a bar graph
Direction Vertical or horizontal
Base position End or center
Update rate 1 s (scan interval if the scan interval is greater than 1 s)
Scale Display a scale for each channel
Color scale band, and alarm point marks can be displayed on the scale.

Historical trend display:
Redisplays the display data or event data in the internal memory or external storage medium*
* On FXs that have a CF card slot (suffix code -4.)/ SD card slot (suffix code -7.) or USB interface (/ USB1 option).
Display formats
All screen or half screen (only when the display data is being redisplayed)
Time axis operation
The time axis can be reduced or expanded, and data can be displayed continuously.
Add message
Messages can be added.
Background color
Select from white, cream, black, or light gray.

Overview Display:
Displays the measured values of all channels and the alarm statuses.

Information display:
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 450 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 of the data in the memory.
Specify a file with the cursor and jump to the corresponding section on the historical trend display.
Save the data in the internal memory to the external storage medium using keys.
* On FXs that have a CF card/SD card slot or USB interface (/USB1 option)

Report (/M1, /PM1, and /PWR1 or /PWR5)
Displays report data from the internal memory
Stacked bar graph (/M1, /PM1, and /PWR1 or / PWR5)
Displays the report data of each report group in a stacked bar graph.
Display formats:
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)
Report groups:
Report channels are arranged in groups of six starting with the first report channel (R01). The group arrangements are fixed.
Scale/grid: Fixed at four divisions
Update interval: 1 s
The report data of the channels in the specified group is displayed in a stacked bar graph.
However, only channels that have the same unit of measurement as the first channel in the group are displayed.

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
Modbus master status (/C2, /C3):
Displays the communication status on the Modbus master

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)

System information display:
Displays the number of measurement and computation channels, options, MAC address, firmware version, and internal memory capacity, the kind of external storage medium.

Network information display (/C7):
Displays the FX network setup information

3. Other Displayed Information

Tag display: Tag
Up to 16 characters

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.
Write destination
Select only the displayed group or all groups.

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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/ SD card slot), alarm status, function usage status (key lock, computation function—/M1, /PM1, /PWR1 or /PWR5), 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 (up to 32GB)
Format FAT32 or FAT16
External storage medium (on FXs with a SD card slot):
Medium SD card (SD/SDHC) (up to 32GB)
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 or /PWR5

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

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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 MB/(8 bytes + 12 × 4 bytes + 24 × 8 bytes) = Approximately 32,258 samples
Sampling time per file (8 MB)
= 32,258 × 60 seconds = 1,935,480 seconds = Approximately 22 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 MB/(8 bytes + 12 × 2 bytes + 24 × 4 bytes) = Approximately 62,500 samples
Sampling time per file (8 MB)
= 62,500 × 1 seconds = 62,500 seconds = Approximately 17 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 or /PWR5)

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/SD card or communication output

7. Saving Data to the External Storage Medium (On FXs with a CF card/SD 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.

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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/SD card" or "constantly retain the most recent data files in the CF card/SD card (media FIFO)."
* This is only valid on FXs that have a CF card/SD 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))/SD card slot (only valid on FXs that have a SD card slot (suffix code -7)).
Manual save: CF card (only valid on FXs that have a CF card slot (suffix code -4)/SD card slot (only valid on FXs that have a SD card slot suffix code -7) or USB flash memory (/USB1 option)
Directory name: Specify using up to 20 characters.

8. Setup Data (On FXs with a CF card/SD 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/SD card or USB flash memory (/USB1)

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

Function: Load and show the display data or event data in a CF card/SD 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/SD 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/SD 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 ±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

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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 reflash 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 or /PWR5)
Reading and writing communication input data (/M1, /PM1, and /PWR1 or /PWR5)
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 or /PWR5)

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 or /PWR5)
Reading and writing communication input data (/M1, /PM1, and /PWR1 or /PWR5)
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.

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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: –9999999 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.

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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 ±(0.1% of rdg + 0.05% of range) or less, excluding the error of reference junction compensation
RTD input ±(0.2% of range + 2 digits) or less

Input source resistance:
TC input With variation of +1 kΩ: ±10 μV or less
RTD input With variation of 1 Ω per wire (resistance of all three wires must be equal): ±(0.1% of rdg + 1 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 mADC

Max. output current:
25 mADC (overcurrent protection operation current: approx. 68 mADC)

Allowable conductor resistance:
RL ≤ (17.8 – minimum transmitter operation voltage)/0.02 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

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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)
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.
The USB memory with security functions not supported.

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 ±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 MΩor 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.

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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, /PWR5)

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:
/PWR1

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

/PWR5

Rated Current	Current Range (Fixed)	Allowable Input Current	Crest Factor
5 A	5 A	6 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
/PWR1

Input (AC)	Rated Power	Input Measuring Range*1	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	

/PWR5

Input (AC)	Rated Power	Input Measuring Range*1	Approximate Consumed VA	
			Voltage	Current
120 V/5 A	500 W	–600 to 600 W	0.2 VA	0.2 VA
240 V/5 A	1000 W	–1200 to 1200 W	0.4 VA	

Single-phase three-wire system
/PWR1

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

/PWR5

Input (AC)	Rated Power	Input Measuring Range	Approximate Consumed VA	
			Voltage	Current
200 V/5 A	1000 W	–1200 to 1200 W	0.2 VA/ Phase	0.2 VA/ Phase

Three-phase three-wire system
/PWR1

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	

/PWR5

Input (AC)	Rated Power	Input Measuring Range	Approximate Consumed VA	
			Voltage	Current
120 V/5 A	1000 W	–1200 to 1200 W	0.2 VA/ Phase	0.2 VA/ Phase
240 V/5 A	2000 W	–2400 to 2400 W	0.4 VA/ Phase	

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*2 must be less than 10 GW.

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*1: Input measuring range (W) = Primary side input power in W^{*2}/(VT ratio × CT ratio).
*2: Primary side input power = Secondary side rated power in W × 1.2 × VT ratio × CT 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 ± 2°C, 55 ± 10%RH; power supply frequency: 50/60 Hz ± 1% or less; rated input: ±1% or less, power factor: 1 ± 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): ±1.0% of range (/PWR1)
±0.5% of range (/PWR5)
Voltage (V): ±1.0% of range (/PWR1)
±0.5% of range (/PWR5)
Current (A): ±1.0% of range (/PWR1)
±0.5% of range (/PWR5)
Apparent power, reactive power, and power factor:
Value calculated from the measured values ± 1 digit

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 × A	$Q = \sqrt{((VA)^2 - P^2)}$	ΣP/ΣVA (Without using the reactive power measurement method)
Single-phase, three-wire system	VAi = Vi × Ai i = 1, 2 ΣVA = VA1 + VA2	$Qi = \sqrt{((VAi)^2 - Pi^2)}$ i = 1, 2 ΣQ = Q1 + Q2	
Three-phase three-wire system	VAi = Vi × Ai i = 1, 3 $\Sigma VA = \sqrt{3}/2(VA1 + VA3)$	$Qi = \sqrt{((VAi)^2 - Pi^2)}$ i= 1, 3 ΣQ = Q1 + Q3	

* 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 Σ 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: ±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 × 1.2 applied for 2 hours)

Instantaneous overload:
Within the degree of accuracy (rated voltage × 1.5 applied for 10 seconds, rated current × 2 applied for 10 seconds, rated current × 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 MΩ (500 VDC between the current input, voltage input, and earth)

Computation functions:
The same as the computation function (/M1)

Effects of the operating conditions:
Ambient temperature
±0.05%/°C (under the following conditions: 0 to 50°C, 0.05 In ≤ I ≤ Imax, power factor = 1)
±0.07%/°C (under the following conditions: 0 to 50°C, 0.1 In ≤ I ≤ Imax, 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: ±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.

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■ 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) × 144 (H) × 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 (However, less than moisture content of 40°C 80%RH at 40°C or more), No condensation
Vibration: 10 to 60 Hz, 0.2 m/s^2
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 voltage
30 VACrms, ±60 VDC, or less for all ranges (Maximum common mode noise voltage: 250 VACrms (50 or 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 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: Be sure to set a low grounding resistance.

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^2 maximum
Shock: 392 m/s^2 maximum (in packaged condition)

6. Supported Standards

CSA: CAN/CSA-C22.2 No. 61010-1, CAN/CSA-C22.2 No. 61010-2-030, Overvoltage Category II or I[*1], Pollution Degree 2[*2], Measurement Category II[*3]
UL: UL 61010-1, UL 61010-2-030 (CSA NRTL/C), Overvoltage Category II or I[*1] , Pollution Degree 2[*2], Measurement Category II[*3]
CE, UKCA:
EMC directive
EN 61326-1 Class A, Table 2 (For use in industrial locations) compliant
EN 61000-3-2 compliant
EN IEC 61000-3-2 compliant
EN 61000-3-3 compliant
EN 55011 Class A, Group 1 compliant

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Low voltage directive
EN 61010-1, EN IEC 61010-2-030,
Overvoltage Category II or I[*1] Pollution
Degree 2[*2], Measurement Category II[*3]
EU RoHS directive
EN IEC 63000 compliant
WEEE directive: Compliant
EMC Regulatory Arrangement in Australia and New Zealand (RCM)
EN 55011 Class A, Group 1 compliant
KC marking: KS C9811, KS C9610-6-2 compliant

*1: Overvolatge Category : Describes a number which defines a transient overvoltage condition. limplies the regulation for impulse withstand voltage. "II" applies to electrical equipment which is supplied from the fixed installation like a distribution board.
II: Applied to standard power supply (100-240 VAC)
I: Applied to /P1 option (24 VAC/DC)

*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.

*3: Measurement Category II:
Applies to measuring circuits connected to low voltage installation, and electrical instruments supplied with power from fixed equipment such as electric switchboards.

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)	0.1°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)	

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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) =±(0.05% × 5 V + 3 digits) = ±(0.0025 V [3 digits] + 3 digits) = ±6 digits
Multiplier = {2000 digits (0.000 to 2.000)}/4000 digits (1.000 to 5.000) = 0.5
Thus, accuracy during scaling = ±(6 × 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: ±1.0°C
Type K, J, E, T, N, L, and U: ±0.5°C.
Type B: Internal reference compensation is fixed to 0°C

Maximum input voltage: ±60 VDC (continuous)

Input resistance:
1 V range or less and TC: 10 MΩ or more
2 V range or higher: Approx. 1 MΩ

Input source resistance:
Volt, TC 2 kΩ or less
RTD input 10 Ω 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 Ω 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 ± 0.1%, 500 Ω unbalanced, between the minus terminal and ground)
When the A/D integration time is 16.7 ms
120 dB (60 Hz ± 0.1%, 500 Ω 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 ± 0.1%)
When the A/D integration time is 16.7 ms
40 dB or more (60 Hz ± 0.1%)

8. Effects of Operating Conditions

Ambient temperature (with temperature variation of 10°C):
DC voltage, TC range
±(0.1% of rdg + 0.05% of range) or less
* Excluding the error of reference junction compensation
RTD range
±(0.1% of rdg + 2 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 ±2 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:
±(0.1% of rdg + 10 digits) or less

Input source resistance:
DC voltage range
With variation of +1 kΩ:
1 V range or less: ±10 μV or less
2 V range or higher: ±0.15% of rdg or less
TC range
With variation of +1 kΩ: ±10 μV or less
RTD range (Pt100)
With variation of 10 Ω per wire (resistance of all three wires must be equal): ±(0.1% of rdg + 1 digits) or less
With maximum difference of 40 mΩ between wires: Approx. 0.1 °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 m/s^2:
±(0.1% of rdg + 1 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)

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■ Application Software

DAQSTANDARD
Please download the software from the following web page.

http://www.yokogawa.com/ns/fx1000/soft/

1. Operating environment

Operating System (OS):
Windows 11
Home
Pro
Enterprise

Yokogawa will also stop supporting OSs that Microsoft Corporation no longer supports.

CPU and Main Memory:
Core-i5 or faster and 8th generation later Intel processor, 8 GB or more
Hard Disk:
64 GB or more of free space
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

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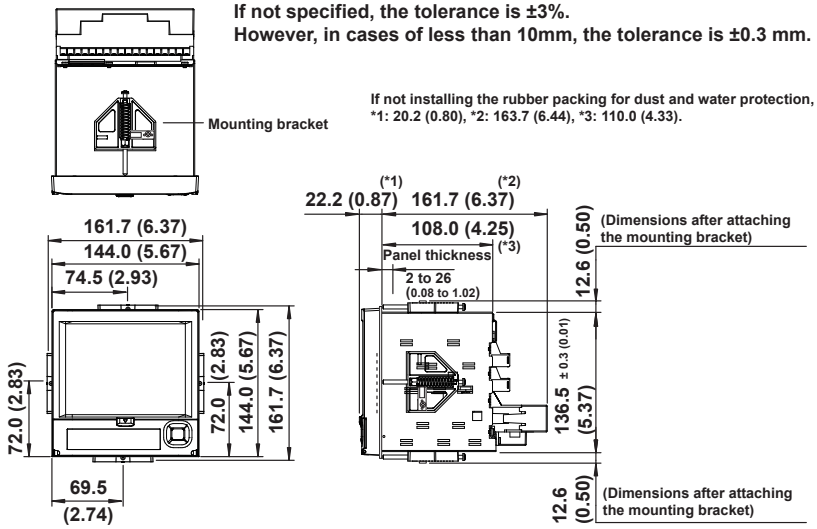
■ Dimensions

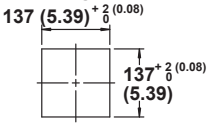
External dimensions

If not specified, the tolerance is ±3%.
However, in cases of less than 10mm, the tolerance is ±0.3 mm.

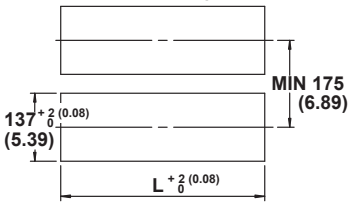


Panel cut dimensions

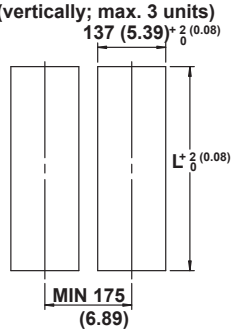
Single-unit mounting



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 × n) – 6 [(5.67 × n) – 0.24]

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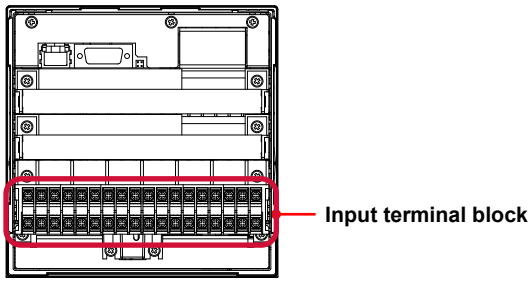
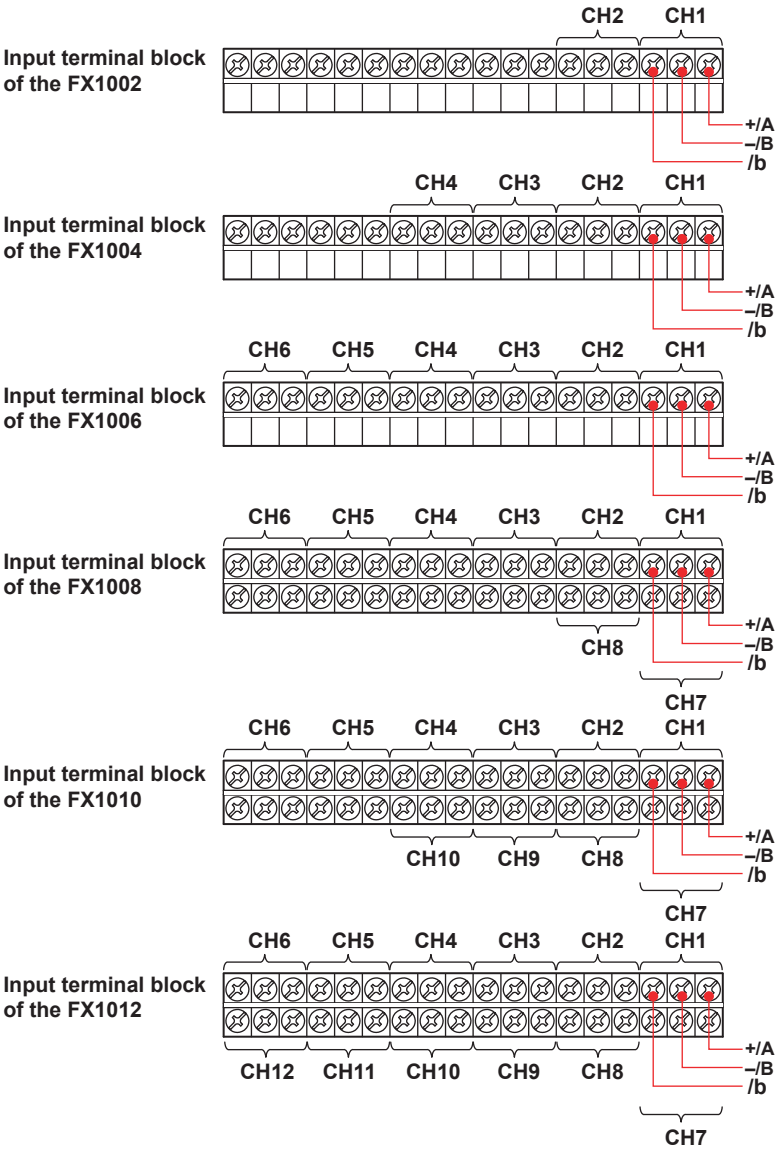
■ Arrangement of the Terminals

1. Input Terminals





For TC input, use shielded compensating lead wires for wiring.
For RTD input, lead wire resistance per wire of 10 Ω 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 Ω ± 0.1%.

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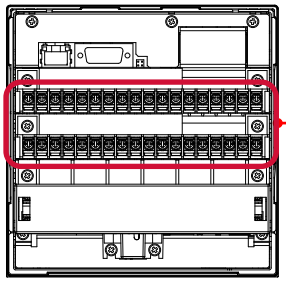
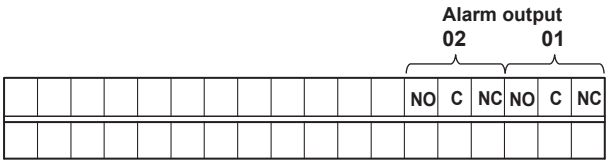
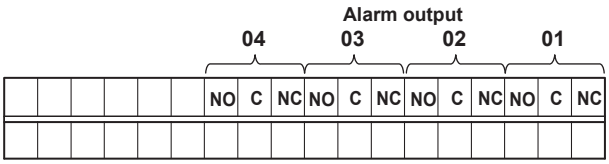
2. Optional Terminals



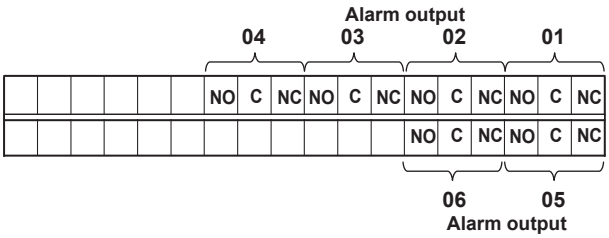
/A1



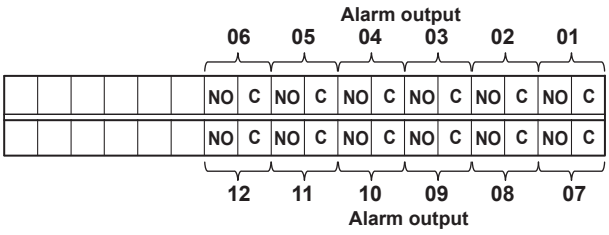
/A2



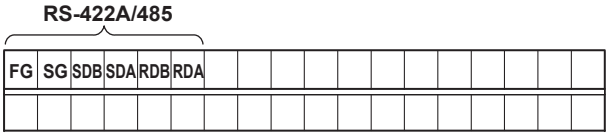
/A3



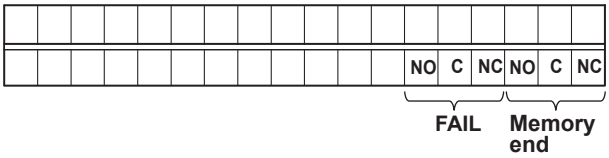
/A4A



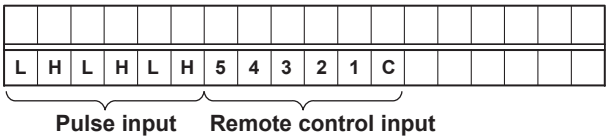
/C3



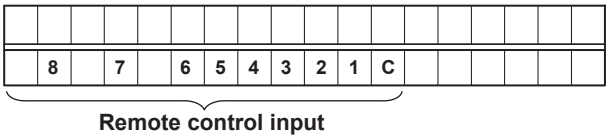
/F1



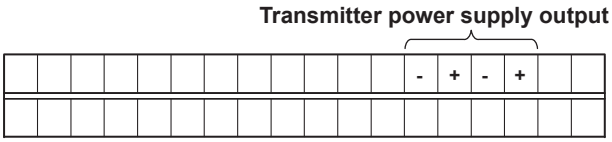
/PM1



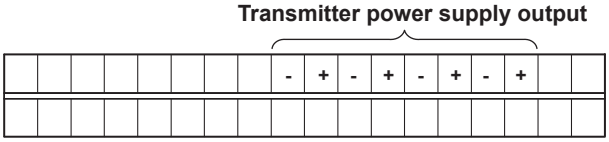
/R1



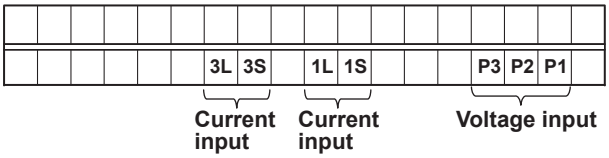
/TPS2



/TPS4



/PWR1, /PWR5



/A1 when installed in the FX with a /TPS2

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■ 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/SD card slot and medium (Note)
	-4				With CF card slot and medium (512MB)
	-7				With SD card slot and medium (1GB)
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)*1*10
				/A2	Alarm output 4 points (C-contact)*1
				/A3	Alarm output 6 points (C-contact)*1*3
				/A4A	Alarm output 12 points (A-contact)*1*3
				/C2	RS-232 interface*2
				/C3	RS-422A/485 interface*2
				/C7	Ethernet interface
				/F1	FAIL/Status output*3
				/M1	Mathematical functions (including Report functions)
				/N2	3 leg isolated RTD*4
				/N3F	Extended input type (without Pt1000)
				/P1	24 VDC/AC power supply
				/R1	Remote control 8 points*5
				/TPS2	24VDC transmitter power supply (2 loops)*6*10
				/TPS4	24VDC transmitter power suply (4 loops)*7
				/USB1	USB interface (1 port)
				/PM1	Pulse input 3 points, Remote control 5 points (including Mathematical functions)*8
				/CC1	Calibration correction function
				/LG1	Log scale
				/PWR1	Power monitor (1A) (including Mathmatical functions)*9*10*11
				/PWR5	Power monitor (5A) (including Mathmatical functions)*9*10*11

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 or /PWR5 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 or /PWR5 cannot be specified.
*9 If /PWR1 or /PWR5 is specified, /A3, /A4A, /F1, /R1, /PM1, or /M1 cannot be specified.
*10 /TPS2, /PWR1 or /PWR5, and /A1 cannot be specified together.
*11 /PWR1 and /PWR5 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).

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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
Model FX1002/FX1004/FX1006/FX1008/FX1010/FX1012 FX1000 Paperless Recorder Safety Precautions and Installation Guide Installing FXA120 DAQSTANDARD FX1000 Mode Transition Diagram Setting Mode / Basic Setting Mode Maps	IM 04L21B01-03EN	1	A3 size
CF card*1	772093	1	512 MB
SD card*2	773001	1	1 GB

*1 On FXs that have a CF card slot (suffix code -4.)
CF card capacity is subject to change.
*2 On FXs that have a SD card slot (suffix code -7.)
SD card capacity is subject to change.
*3 Download the software (DAQSTANDARD) and electronic manuals from the YOKOGAWA website.

■ Optional Accessories (Sold Separately)

Name	Model	Q'ty	Notes
CF card	772093	1	512 MB
	772094	1	1 GB
	772095	1	2 GB
SD card	773001	1	1 GB
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)

■ Basic Conditions and Individual Contracts at the Time of Purchase

The warranty for this product is defined in the basic conditions and individual contracts at the time of purchase.
The individual conditions are as follows.

- **Validation**
  Yokogawa does not guarantee the final outcome of validation work even if there is a defect in the product.
  For the warranty of validation services, please contact the company that performed the validation work.
- **Warranty period of firmware**
  The firmware warranty period is one year.

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