MITSUBISHI ELECTRIC
*Changes for the Better*

Automating the World

FACTORY AUTOMATION

# MELSEC iQ-F Series
# iQ Platform-compatible PLC

## Cloud Utilization

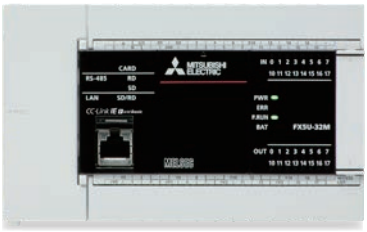
## Digitalization for Improved Data Management and Operation Efficiency


MELSEC iQ-F series

From Onsite IoT to Data Utilization

# MELSEC iQ-F Advantages

## Standard features

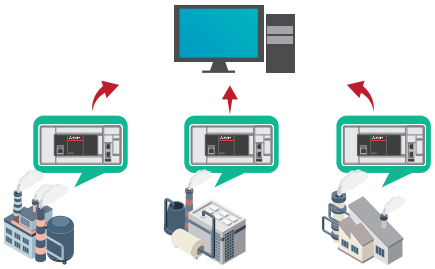


Onsite operations can be inefficient and time-consuming...
The simple-setup MELSEC iQ-F Series solves such problems through a smooth transition to onsite IoT capabilities.

**Improved connectivity** **Data collection** **Data visualization**

## Requested applications

- Centralized management of devices in multiple locations
- Effective utilization of collected data
- Remote monitoring with error notification functionality



## Advanced features

### Collecting data in the cloud over time makes it easy to solve even fundamental onsite problems!

**Improved productivity** **Predictive maintenance** **Simplified troubleshooting**

**Enhanced performance!**

### Take advantage of cloud-based data collection with the advanced FX5-ENET!


**Ethernet module FX5-ENET**

**Firmware version: 1.200 or later* Serial number: 234✶✶✶ or later**

## Benefits of the FX5-ENET

- ☑ **Start saving data in the cloud even with standalone devices!**
- ☑ **Easily incorporate existing cloud systems with simple setup!**

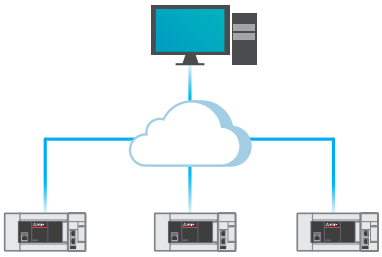
✶: Updating from current firmware versions to Ver. 1.2✶✶ is not possible.

# MQTT Protocol Support for Direct Cloud Connectivity

**New feature** **MQTT communication specifications**

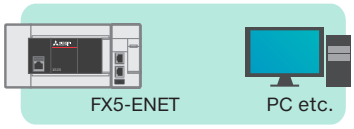
## MQTT introduction

MQTT is a lightweight and simple communication protocol optimized for use with IoT devices and used mainly for cloud connectivity.
It includes security features such as retransmission if a message is not received, TLS encryption, and client authentication.
Data transmission and reception are only performed as needed, helping to reduce the load on communication circuits.



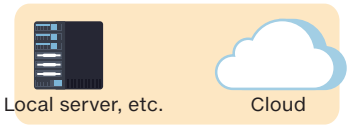
## Construction

The MQTT protocol adopts the Publish–Subscribe model.
When an FX5-ENET device submits a Publish request to an MQTT broker, the MQTT broker transmits the information to all Subscribe request reception devices.



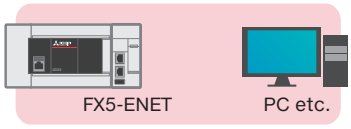

**MQTT Publisher**
Client

Uploads data from manufacturing sites to the cloud




**MQTT broker**
Server

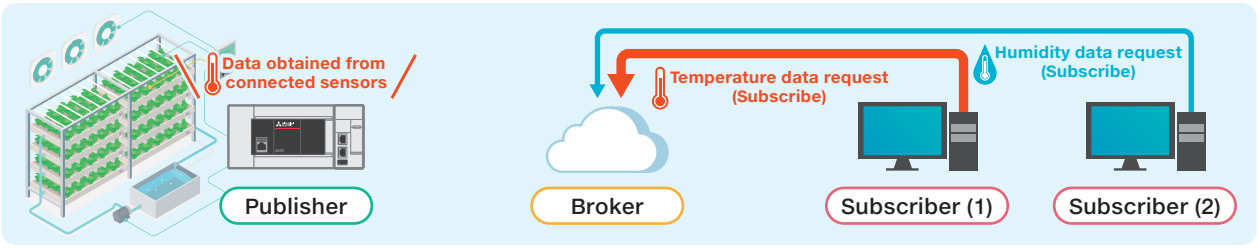
Transmits data received from the Publisher to the Subscribers



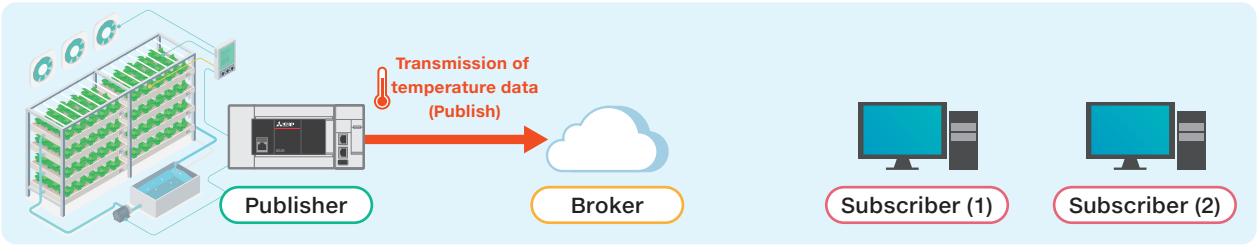

**MQTT Subscriber**
Client

Determines which data is necessary for reception

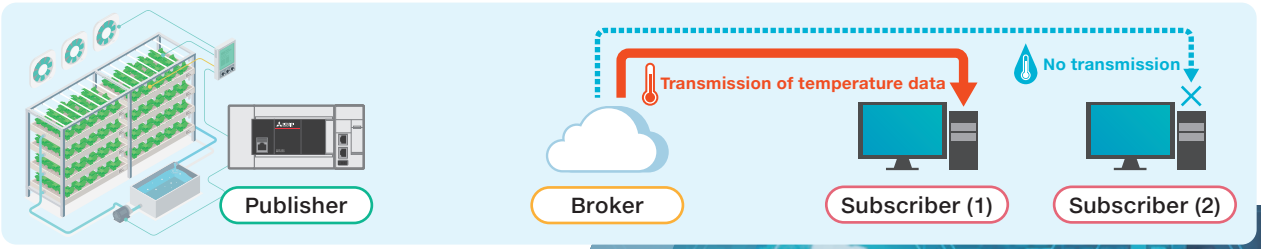
**STEP 1** **The Subscribers specify the data (topics) to be received by the broker and request delivery of the necessary data.**




**STEP 2** **The broker receives data transmitted from the Publisher.**




**STEP 3** **The broker delivers the specified data to the Subscribers.**



What do I need to do?

# Equipment Setup and Installation

## Setup

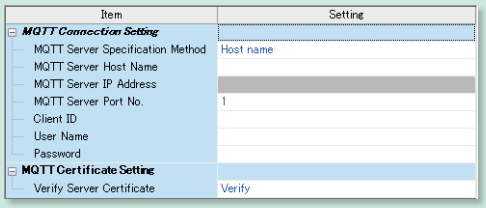
- GX Works3
- Certificate Configuration Tool for FX5-ENET*

### MQTT communication setup and programming

Mainly for equipment program designers

GX Works3

Ver. 1.095Z or later



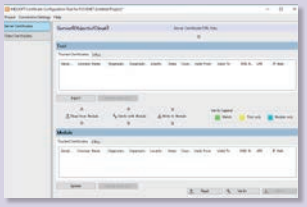

- Easy-to-configure communication settings with intuitive parameters
- Dedicated FB with a wide variety of programs for easy, clean configuration

### Client authentication and server verification

Mainly for IT system integrators

Certificate Configuration Tool for FX5-ENET

Ver. 1.00A or later



- Configurable certificates when connecting to an MQTT broker
- Custom client certificates and support for server certificate management

## Setup complete

### Cloud setup

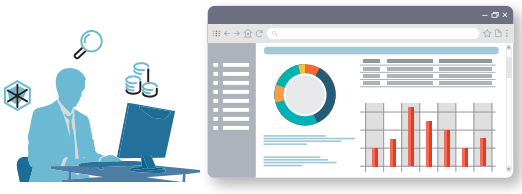
- Device registration
- Client authentication
- Device authorization

## Installation

### Add to existing cloud systems

**Customer-based cloud application development**

Dashboard example



or

### What can I do after installation?

**Create new cloud systems**

Dashboard example

*: Please contact your local Mitsubishi Electric sales office or representative.

What can I do after installation?

# Application Examples

## Collection and monitoring of temperature, humidity, and other control device data as well as error notification

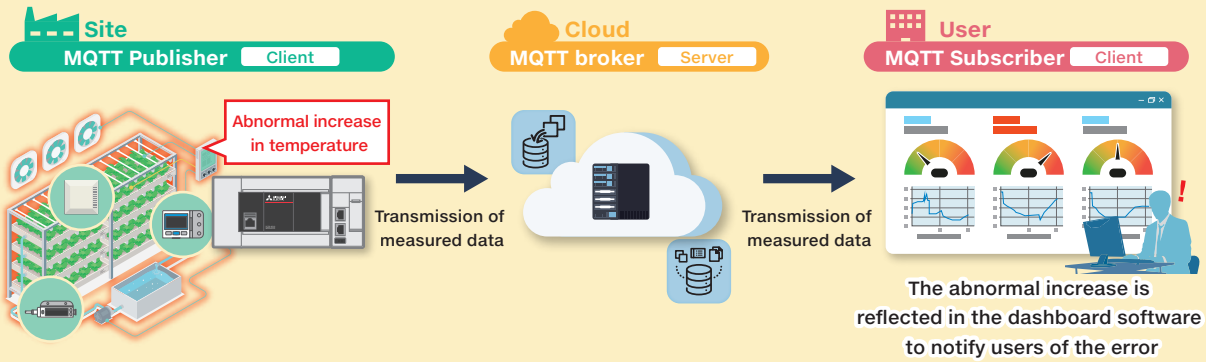
### Normal status

**Site**
Various sensors are used to measure the temperature and humidity in the factory.

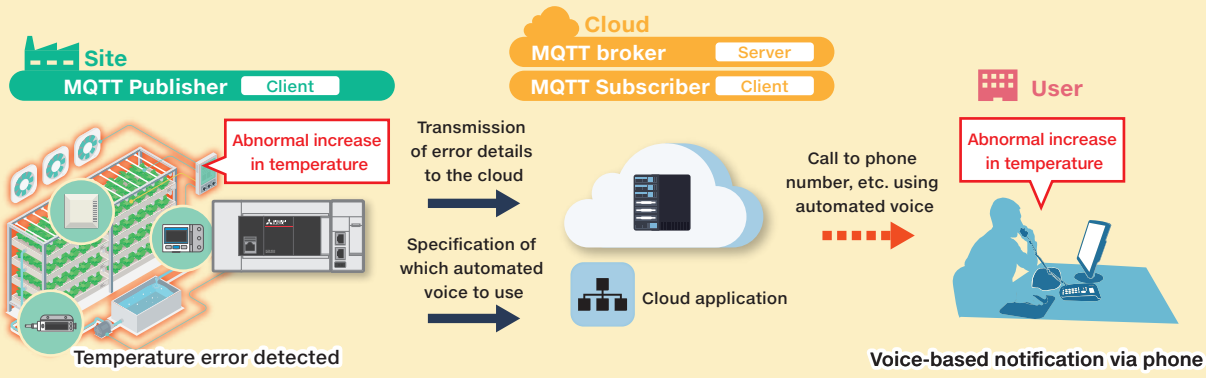
**Cloud**
Measured data is collected and saved in the cloud.

**User**
Users can access the cloud to obtain the data they need.

### Temperature threshold exceeded




### Using the cloud application to generate voice message error notifications




### Other cloud application features...

# Support for major cloud networks

Review the latest trends and applications of each cloud service to determine which cloud network is right for you.

powered by aws

Company Amazon Web Services, Inc.
URL https://aws.amazon.com/

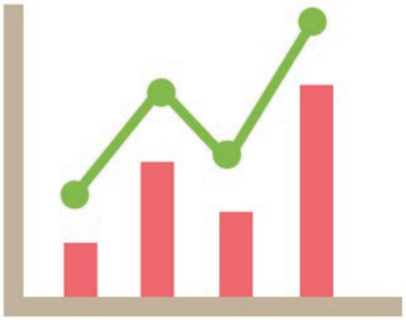
Latest information/Customer reference ▶

## Discover Cloud for Small and Medium Businesses

### 1 Reducing IT costs

Find ways to migrate your critical data, backups, and more from costly on-premises infrastructure to the cloud. AWS offers real savings you can see and measure.

https://aws.amazon.com/smart-business/savings/



### 2 Gaining business insights

Unify your data to make strategic decisions quickly. AWS helps make analytics reporting more actionable and affordable.

https://aws.amazon.com/smart-business/gain-insights/


### 3 Securing your business

Get access to software that helps you make security a number one priority. Prevent, detect, respond, and address data security incidents with AWS.

https://aws.amazon.com/smart-business/security/

Microsoft Azure

Microsoft Corporation
https://www.microsoft.com/en-us/

What's New ▶

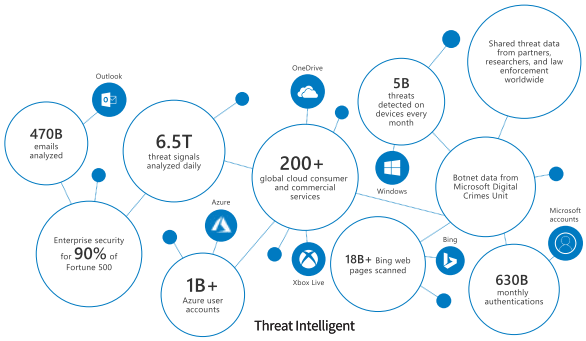
Technical Information ▶

Case Studies ▶

## Benefits of using Azure

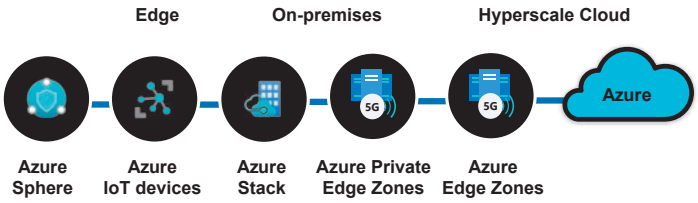
### 1 Is the cloud secure?

Microsoft invests more than $110 billion annually in cybersecurity and has one of the largest threat intelligence databases (Database of cyber attack methods) in the world. It is also used for Azure security services.




### 2 More than just the cloud

We provide IoT services that can connect more than 1 million devices at low cost.
Azure provides services including the edge, such as Azure Stack Edge, which can run cloud services in Edge.




### 3 More than 60 data centers worldwide at your disposal

Data centers in more than 60 regions around the world. Using Terabit's high-speed backbone, it can be placed in a data center where you want to use not only IaaS but also various PaaS services, and you can combine them at low cost.

## ■ General Specifications

| Items | Specifications | |
|---|---|---|
| Dielectric withstand voltage | 500 V AC for 1 minute | Between all terminals and ground terminal |
| Insulation resistance | 10 MΩ or higher by 500 V DC insulation resistance tester | |

## ■ Power Supply Specifications

| Items | | Specifications |
|---|---|---|
| Internal power supply | Power supply voltage | 24 V DC |
| | Current consumption | 110 mA |

## ■ Performance Specifications

| Items | | | | Specifications |
|---|---|---|---|---|
| CC-Link IE Field Network Basic | Station type | | | Master station |
| | Maximum number of connectable stations*1 | | | 32 |
| | Number of stations occupied by a remote station | | | 1 to 4 |
| | Maximum number of link points per network | | RX | 2048 points |
| | | | RY | 2048 points |
| | | | RWr | 1024 points |
| | | | RWw | 1024 points |
| | Maximum number of link points per station | Master station | RX | 2048 points |
| | | | RY | 2048 points |
| | | | RWr | 1024 points |
| | | | RWw | 1024 points |
| | | Remote station*2 | RX | 64/128/192/256 points |
| | | | RY | 64/128/192/256 points |
| | | | RWr | 32/64/96/128 points |
| | | | RWw | 32/64/96/128 points |
| | UDP port number used in the cyclic transmission | | | 61450 |
| | UDP port number used in automatic detection of connected devices | | | Master station: An unused port number is assigned automatically.<br>Remote station: 61451 |
| | Transmission specifications | Data transmission speed | | 100 Mbps |
| | | Interface | | RJ45 connector |
| | | Maximum station-to-station distance | | 100 m |
| | | Overall cable distance | | Depends on the system configuration |
| | | Number of cascade connections | 100BASE-TX | When using a switching hub, check the number of cascaded stages with the manufacturer of the hub to be used. |
| | Network topology | | | Star topology, line topology |
| | Hub*3 | | | Hubs with 100BASE-TX ports*4 can be used. |
| | Connection cable*5 | | 100BASE-TX | Ethernet cable of category 5 or higher (STP cable) |
| Generalpurpose Ethernet communication | Transmission specifications | Data transfer speed | | 100/10 Mbps |
| | | Communication mode | | Full-duplex or half-duplex*3 |
| | | Transmission method | | Base band |
| | | Interface | | RJ45 connector |
| | | Maximum segment length | | 100 m (length between hub and node)*6 |
| | | Number of cascade connections | 100BASE-TX | 2 levels maximum*7 |
| | | | 10BASE-T | 4 levels maximum*7 |
| | Protocol type*8 | | | MELSOFT connection, SLMP server (3E/1E frame), socket communication, simple CPU communication, BACnet/IP, MQTT communication, Email notification |
| | Number of connections | | | Total of 32 connections*9<br>(Up to 32 external devices can access one FX5-ENET moduleat the same time.) |
| | Hub*3 | | | Hubs with 100BASE-TX or 10BASE-T ports*10can be used. |
| | Connection cable*5 | | 100BASE-TX | Ethernet cable of category 5 or higher (STP cable) |
| | | | 10BASE-T | Ethernet cable of category 3 or higher (STP/UTP cable) |
| Number of ports | | | | 2*11 |
| Number of occupied I/O points | | | | 8 points |
| Applicable CPU module | | | | • FX5UJ CPU module (From the first)<br>• FX5U CPU module (Ver. 1.110 or later)<br>• FX5UC CPU module*12 (Ver. 1.110 or later) |
| Applicable engineering tool | GX Works3 | | | • FX5UJ CPU module(Ver. 1.060N or later)<br>• FX5U/FX5UC CPU module (Ver. 1.050C or later) |
| | Certificate Configuration Tool for FX5-ENET | | | Ver. 1.00A or later |
| Number of connectable units | | | | 1 module |

*1 : Maximum number of connected remote stations that FX5-ENET (master station) can manage.
*2 : Value for 1-station occupation, 2-station occupation, 3-station occupation, or 4-station occupation.
*3 : IEEE802.3x flow control is not supported.
*4 : The ports must comply with the IEEE802.3 100BASE-TX standards.
*5 : A straight/cross cable can be used.
*6 : For maximum segment length (length between hubs), consult the manufacturer of the hub used.
*7 : This number applies when a repeater hub is used. When using a switching hub, check the number of cascaded stages with themanufacturer of the hub to be used.
*8 : For a compatible version of each protocol, refer to the following manual.
→ MELSEC iQ-F FX5-ENET User's Manual
*9 : The first device for MELSOFT connection is not included in the number of connections. (The second and the following devices are included.)
The CC-Link IE Field Network Basic communication is not included in the number of connections.
*10 : The ports must comply with the IEEE802.3 100BASE-TX or IEEE802.3 10BASE-T standards.
*11 : Since the IP address is shared by two ports, only one address can be set.
*12 : FX5-CNV-IFC or FX5-C1PS-5V is necessary to connect to the FX5UC CPU module.

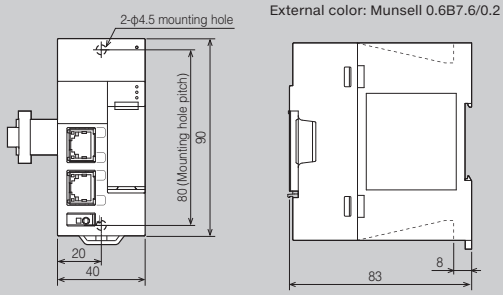
## ■ MQTT communication specifications

| Items | Specifications |
|---|---|
| MQTT function | • Connecting to the MQTT server (broker)<br>• Sending messages to the MQTT server as a Publisher<br>• Receiving messages from the MQTT server as a Subscriber |
| MQTT protocol version | V3.1.1 |
| Number of connections | Maximum of 1 connection |
| Encrypted communication | TLS1.3 and TLS1.2 supported |
| Key length (client certificate) | • 1024 bits<br>• 2048 bits |
| Maximum size of Topic | • 511 characters (ASCII, excluding NULL characters)<br>• 255 characters (Unicode strings, excluding NULL characters)*1 |
| Maximum message size of Publish | • 32768 bytes (binary)<br>• 32767 characters (ASCII (excluding NULL characters))<br>• 16383 characters (Unicode strings (excluding NULL characters))*1 |
| MQTT server address | IP address or host name (ASCII) can be specified.<br>Number of characters: 1 character or more*2 |
| MQTT server port number | 1 to 65534 |
| Client ID | Set with Unicode strings.*1<br>Number of characters: 1 character or more*2 |
| User name | Set with Unicode strings.*1<br>Number of characters: 0 characters or more*2 |
| Password | Set with ASCII strings.<br>Number of characters: 0 characters or more*2 |

*1 : Unicode text (UTF-16) is converted to UTF-8 by the FX5-ENET for communication with the MQTT broker.
*2 : A string that satisfies the following conditions.
A+(B+C)×2+D≤984
A: Number of characters in MQTT server host name
B: Number of characters in client ID
C: Number of characters in user name
D: Number of characters in password

## ■ External Dimensions

MASS (Weight): Approx. 0.2 kg Unit: mm
External color: Munsell 0.6B7.6/0.2




## ■ Product list

| Model | Specifications |
|---|---|
| FX5-ENET | Ethernet module |
| FX5-U-HW-E | MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)<br>Model code: 09R584 |
| FX5-U-ENET-E | MELSEC iQ-F FX5-ENET User's Manual<br>Model code: 09R736 |
| GXW3-O-E | GX Works3 Operating Manual |

### ⚠ Safety Warning

・To ensure proper use of the products in this document, please be sure to read the instruction manual prior to use.

### Registration

・The company names, system names and product names mentioned in this document are either registered trademarks or trademarks of their respective companies.
・In some cases, trademark symbols such as '™' or '®' are not specified in this document.

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
www.MitsubishiElectric.com

L(NA)08880ENG-A 2305(MEE)
New publication, effective May 2023
Specifications subject to change without notice.