ABB MEASUREMENT & ANALYTICS | INTERFACE DESCRIPTION | COM/FEM630/E/MB-EN REV. A

ProcessMaster Wafer FEM630

Electromagnetic flowmeter

EtherNet/IP, Modbus TCP, Webserver
Valid from firmware version 01.09.00

Measurement made easy

Introduction

This manual describes how to configure an Ethernet connection for the following electromagnetic flowmeters:

- ProcessMaster Wafer FEM630

For more information

Additional documentation on ProcessMaster, HygienicMaster FEX600 series is available for download free of charge at www.abb.com/flow.

Alternatively, simply scan this code:

Contents

1 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.

For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.

The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions.

Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.

The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Notes on data safety

This product is designed to be connected to and to communicate information and data via a network interface.

It is the operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be).

Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of antivirus programs) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB Automation Products GmbH and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

2 Supported Ethernet-based communication protocols

EtherNet/IP defined in IEEE 802.03

- Cyclic/implicit communication is supported
- Process variables, diagnostic values and Device Status Information are accessible
- For device configuration a Webserver or Modbus TCP is available, providing full access to all parameter.

Webserver – Secure http (https)

Use the Webserver or Modbus TCP to configure all of the device parameters.

Modbus TCP

The common Modbus registers are accessible through Ethernet via Modbus TCP Protocol. Access to all Registers allows for device configuration.

3 Security

Secured protocols

Webserver https:

- Security modes
- Used ports by Webserver: TCP 443
- Security is based on .x509 Certificates
- Protocol could be deactivated via HMI if not needed.

Unsecured protocols

Use the HMI menu to enable or disable the protocols:

- Ethernet/IP – use ports TCP 44818, UDP 2222
- Modbus TCP – use port TCP 502.

4 Connecting Ethernet to the flowmeter

Ethernet card – Port function assignment and color-coding

The Flowmeter has two slots for the components that follow:

- Slot Ⓐ: Ethernet card (part number 3KQZ400037U0100)
- Slot Ⓑ: Power over Ethernet (PoE) card (part number 3KQZ400039U0100)

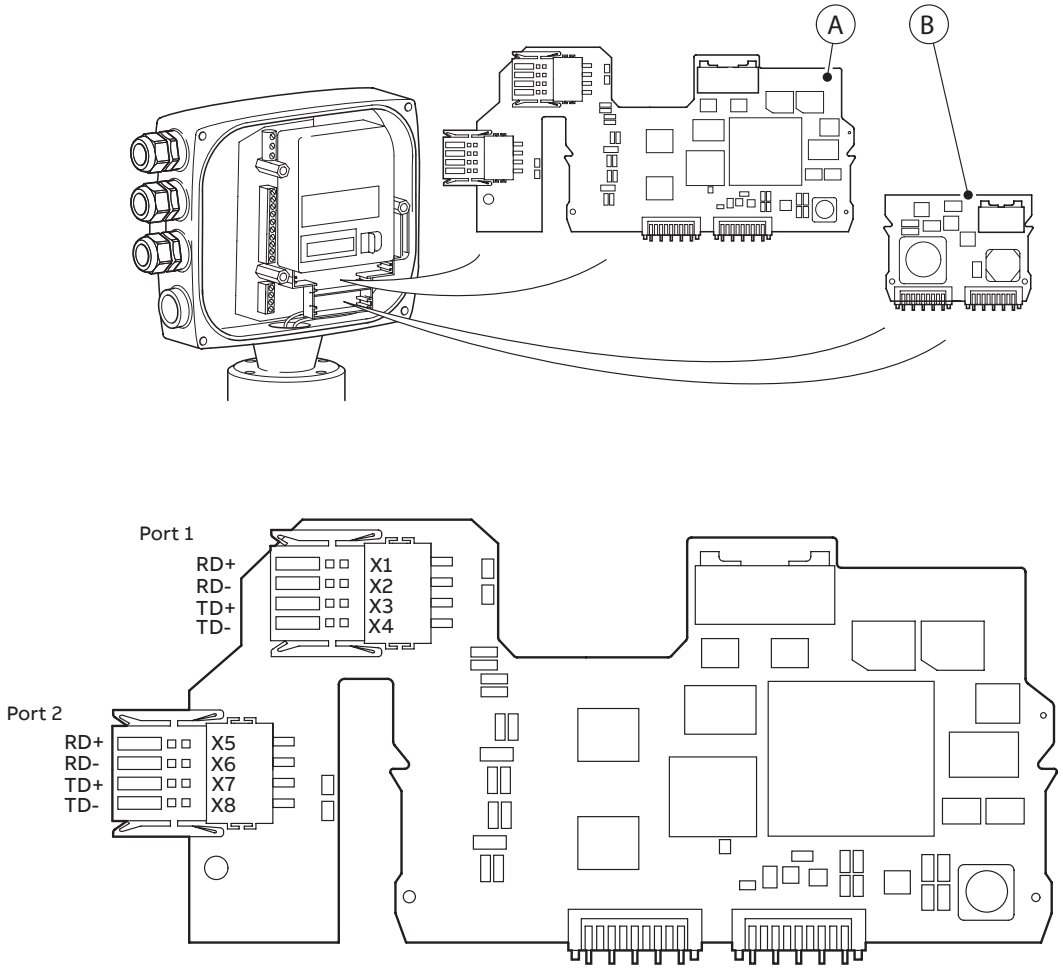


Figure 1 Ethernet card

Port/Pin	Color code on the Ethernet card plug
Port 1 X1	White/orange
Port 1 X2	Orange
Port 1 X3	White/green
Port 1 X4	Green
Port 2 X5	White/blue
Port 2 X6	Blue
Port 2 X7	White/brown
Port 2 X8	Brown

The color code is in accordance with EIA/TIA 568B.

For the functionality assigned to each pin of the Ethernet card ports, refer to Figure 1.

The Ethernet card has two connection ports. These ports are not independent.

The internal switch allows for a daisy-chain or ring topology.

The Ethernet card supports one IP address (IPv4).

Power over Ethernet (PoE)

The PoE card (B) supplies power through the Ethernet connection, so that an external 24 V DC power supply for the flowmeter is not required. The PoE card (B) converts the 37 to 57 V supply from the Ethernet cable to 24 V DC. This 24 V DC is available from terminals V3 and V4 and connects to terminals 1+ and 2+, supplying power to the flowmeter. Each port supports PoE.

The specification is in accordance with IEEE 802.3at/af. PoE Class 0.

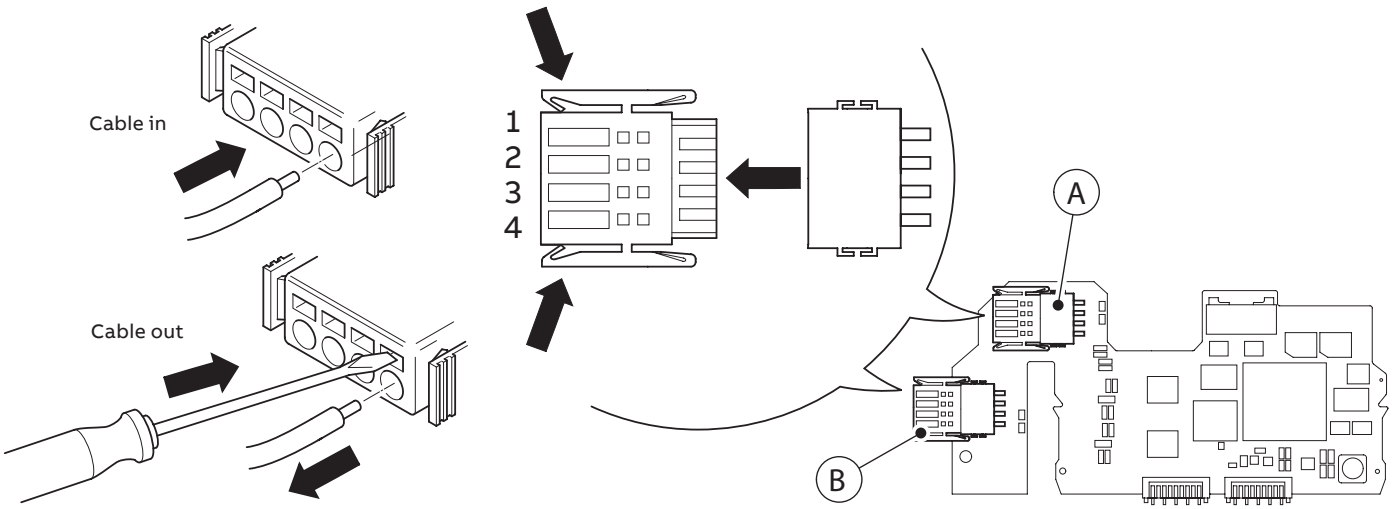
Dependent on how power is supplied over the Ethernet cable, there are four possible configurations for connecting to the ports of the PoE card.

Port/Pin	Verion 1	Version 2	Version 3	Version 4
Port 1 X1	RD+ & Pwr+	Spare	RD+	Pwr+
Port 1 X2	RD- & Pwr+	Spare	RD-	Pwr+
Port 1 X3	TD+ & Pwr-	Spare	TD+	Pwr-
Port 1 X4	TD- & Pwr-	Spare	TD-	Pwr-
Port 2 X5	Spare	RD+ & Pwr+	Pwr+	RD+
Port 2 X6	Spare	RD- & Pwr+	Pwr+	RD-
Port 2 X7	Spare	TD+ & Pwr-	Pwr-	TD+
Port 2 X8	Spare	TD- & Pwr-	Pwr-	TD-

⚠ CAUTION

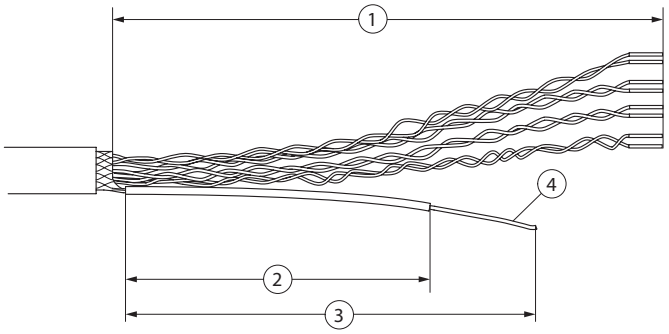
When using PoE, make sure that the PoE card and the red and blue wires within the transmitter's termination area are in place and connected correctly.
Terminal V3 connects to Terminal 1+ and Terminal V4 connects to terminal 2-.
When using PoE, do not connect any other external supply power to the transmitter's power supply Terminals 1+, 2-.

How to operate the Ethernet card port plugs



...Connecting Ethernet to the flowmeter

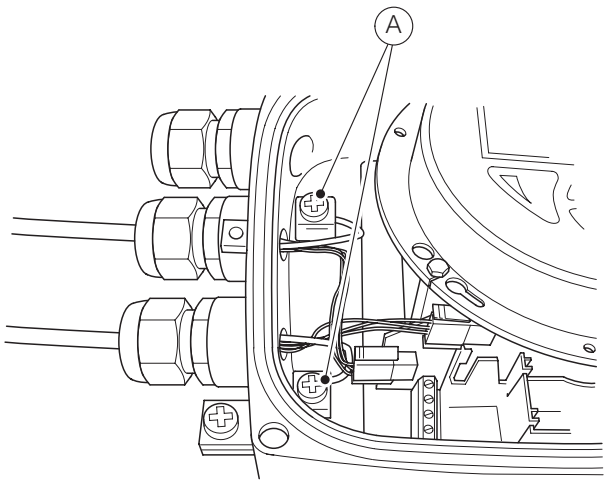
Preparing the EtherNet Cat5e cable



① = 90 mm (3.54 in)
② = 39 mm (1.54 in)
③ = 60 mm (2.36 in)
④ = Tin 10 mm of the end of the braided shield of the cable

How to connect the shielding of the Ethernet cable

Connect the outer shield of the Ethernet cable to the screw terminal Ⓐ.



M12 plug (option)

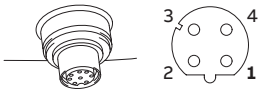
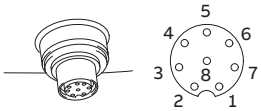
Various options for M12 plugs are available from the model code:

- Flowmeter equipped with 1 x M12 (with 4 wires, connecting to Port 1)
- Flowmeter equipped with 2 x M12 (with 4 wires each, connecting to Port 1 &2)
- Flowmeter equipped with 1 x M12 (with 8 wires, connecting to Port 1 &2)

These options allow for connection to different network topologies:

Topology	4 wires	4 wires	4 wires	8 wires
	1 x M12 (4 wires)	2 x M12 (4 wires)		1 x M12 (8 wires)
Star	Y	Y		Y
Ring or daisy-chain	N	Y		N
PoE	N	N		Y

For the internal wiring inside the transmitter and the related pinout within the M12 Plug, refer to table below:

	Wiring inside the transmitter		
	M12 Connector pin	Color	Ethernet card port/pin
 M12 plug with 4 wires	1	Yellow	Port 1 X1
	2	Orange	Port 1 X2
	3	White	Port 1 X3
	4	Blue	Port 1 X4
 M12 plug with 8 wires	1	White	Port 1 X1
	2	Blue	Port 1 X2
	3	Brown	Port 1 X3
	4	Green	Port 1 X4
	5	Pink	Port 2 X5
	6	Yellow	Port 2 X6
	7	Grey	Port 2 X7
	8	Red	Port 2 X8

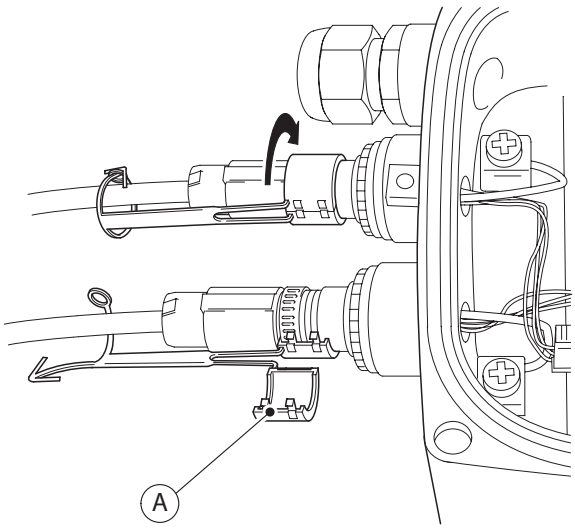
⚠ WARNING

There are limitations of the M12 plug in combination with a hazardous-area-design flowmeter.

	No Ex Area	ATEX/IEX Zone 2	Div 2
Ethernet cable directly connected to Ethernet card terminals	Y	Y	Y
Ethernet cable connected to M12 plug at transmitter housing	Y	Y	N

⚠ WARNING

When using the M12 Plug in combination with a hazardous-area-design Flowmeter, a retainer clip must be put in place.



Ⓐ – Retaining clip

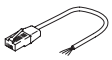
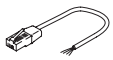
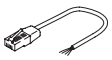
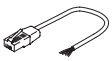
RJ45 connector (option)

Various Options for RJ45 connection are available from the Modelcode. The RJ45 connector is equipped with a certain length of Ethernet cable – as per model code.

The flowmeter is shipped with the Ethernet cable fitted to the terminals inside the transmitter:

- Flowmeter equipped with 1 x RJ45 (with 4 wires, connecting to Port 1)
- Flowmeter equipped with 2 x RJ45 (with 4 wires each, connecting to Port 1 and 2)
- Flowmeter equipped with 1 x RJ45 (with 8 wires, connecting to Port 1 and 2)

These options allow for connection to different network topologies:

Topology	4 wires 	4 wires 	4 wires 	8 wires 
	1 x RJ45 (4 wires)	2 x RJ45 (4 wires)		1 x RJ45 (8 wires)
Star	Y		Y	Y
Ring or daisy-chain	N		Y	N
PoE	N		N	Y

For the internal wiring inside the transmitter and the related pinout within the RJ45 connector, refer to table below:

	Wiring inside the transmitter	
	Color	Ethernet card port/pin
RJ45 with 4 wires	Yellow	Port 1 X1
	Orange	Port 1 X2
	White	Port 1 X3
	Blue	Port 1 X4
RJ45 with 8 wires	White/orange	Port 1 X1
	Orange	Port 1 X2
	White/green	Port 1 X3
	Green	Port 1 X4
	White/blue	Port 2 X5
	Blue	Port 2 X6
	White/brown	Port 2 X7
	Brown	Port 2 X8

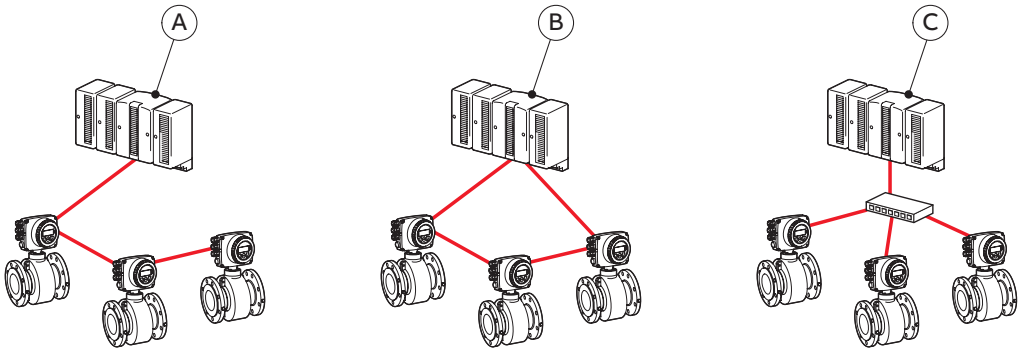
⚠ WARNING

There are limitations of the RJ45 plug in combination with a hazardous-area-design flowmeter.

	No Ex Area	ATEX/IEX Zone 2	Div 2
Ethernet cable with RJ45 connector fitted at transmitter housing	Y	Y	N

...Connecting Ethernet to the flowmeter

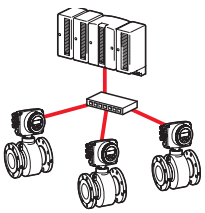
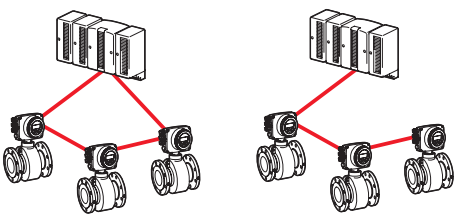
Wiring with different network topologies



(A) – Daisy-chain

(B) – Ring

(C) – Star

Topology	No. Ethernet cables connected	No. wires in Ethernet cable	PoE	Port	Pin	Function	Cable
Star 	1	4	No	1	X1	RD+	yellow
					X2	RD-	orange
					X3	TD+	white
					X4	TD-	blue
	1	8	No	1	X1	RD+	white / orange
					X2	RD-	orange
					X3	TD+	white / green
					X4	TD-	green
				2	X5	Spare 1+	white / blue
					X6	Spare 1-	blue
					X7	Spare 2+	white / brown
					X8	Spare 2-	brown
	1	4	Yes	1	X1	Recommendation: use cable with 8 wires	
					X2		
					X3		
					X4		
	1	8	Yes	1	X1	RD+	white / orange
					X2	RD-	orange
					X3	TD+	white / green
					X4	TD-	green
				2	X5	Spare 1+	white / blue
					X6	Spare 1-	blue
					X7	Spare 2+	white / brown
					X8	Spare 2-	brown
Ring or daisy-chain 	2	4*	No	1	X1	RD+	yellow
					X2	RD-	orange
					X3	TD+	white
					X4	TD-	blue
				2	X5	RD+	yellow
					X6	RD-	orange
					X7	TD+	white
					X8	TD-	blue

* If you use 8-wire cables, 4 wires will not be connected.

Parameterization for start-up

On initial start, do the steps that follow:

1 Make sure that the transmitter is connected to the Ethernet.

2 Log on to the flowmeter and set the parameters:

- **a** Set **DHCP Client** to **enabled**.
- **b** Make sure that the flowmeter IP address (host IP address) is set.
- **c** Set **Webserver Access** to **Full**.
- **d** Set **EtherNet IP Access** to **Full**.
- **e** Set **Display Tag** to **Bus Address**.

Communication				
	Ethernet			
		General		
		Internet layer		
			DHCP client	**enabled**
			Host IP address	**192.168.1.122**
			Subnet mask	
		Webserver		
			Access	**Full**
		Ethernet IP		
			Access	**Full**

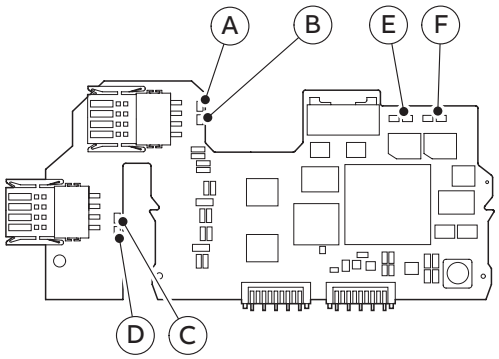
Display		
	Language	
	Contrast	
	Operator Page 1	
	Operator Page 2	
	Autoscroll	
	Flow Format	
	Date Format	
	Display Tag	
		Bus Address (Ethernet address)

...Installation

Ethernet card status LEDs

The 6 LEDs on the Ethernet card indicate the status of each port and the network.

To enable card status indication in the upper HMI Line, navigate to **Display** > **Display Tag** > **Ethernet Status**.



LED	Status	HMI display	Description
(A) Port 1	ON		Network connection (link up)
	OFF		No network
(B) Activity 1	Flashing or ON		Traffic
	OFF		No traffic
(C) Port 2	ON		Network connection (link up)
	OFF		No network
(D) Activity 2	Flashing or ON		Traffic
	OFF		No traffic
(E) Module Status (Mod)	Green, ON	Mod showing **<G>** continously	Device ready for Operation. Working properly
	Green, flashing (1 Hz)	Mod changing between **<G>** and **< >**	Standby. Device not configured yet
	Green/ red, flashing (1Hz)		Device performs "Power-On" Test
	Red, flashing (1 Hz)	Mod changing between **<R>** and **< >**	Simple Error, which can be fixed
	Red, ON	Mod showing **<R>** continously	Major Error. Non removable serious error
	OFF	Mod showing **< >** continously	No Power
(F) Network Status (Net)	Green, ON	Net showing **<G>** continously	Connected. Device has at least one established connection
	Green, flashing (1 Hz)	Net changing between **<G>** and **< >**	No Connection. Device did not establish any connections, but was assigned an IP address
	Green/red, flashing (1 Hz)		Device performs "Power-On" Test
	Red, ON	Net showing **<R>** continously	Dublicated IP address. Device has detected that the device IP address is already in use
	OFF	Mod showing **< >** continously	No supply voltage or IP Address.
	Red, flashing (1 Hz)	Mod changing between **<R>** and **< >**	Connection timeout

Note
For card status indication in the upper HMI Line, navigate to **Display** > **Display Tag** > **Ethernet Status**.

5 Webserver for device configuration

The built-in webserver allows for device configuration using a web browser. You must log in to access the device. The device allows for one user to log in at a time.

Note
When you connect for the first time, the web browser displays a warning that the connection is not private or has expired. This is because the Flowmeter sends an unknown certificate to the web browser.

Flowmeter settings

1 Use the Flowmeter HMI menu to go to **Communication** > **Ethernet** > **Internet layer** > **DHCP Client**.

   f To assign the device address through the network, set **DHCP Client** to **enabled**. Use this address to access the device through the webserver.

   g To use a fixed IP address, set **DHCP Client** to **disabled - fixed IP**. Make sure that the HOST IP address in the device is set. The factory default is 192.168.001.122.

2 Use the Flowmeter HMI menu to go to **Communication** > **Ethernet** > **Webserver** > **Access**.

3 Set **Access** to **full**.

4 Use the Flowmeter HMI menu to go to **Communication** > **Ethernet** > **EtherNetIP/Access**.

5 Set **Access** to **full**.

Computer settings

The IP address of the Ethernet adapter must be set up so that the subnet of the Flowmeter is accessible.

1 Configure the Ethernet adapter for a fixed IP address under TCP/IPV4.

2 To access the Flowmeter's webserver, enter the IP address (for example, https://192.168.1.122) in the web browser.

Note

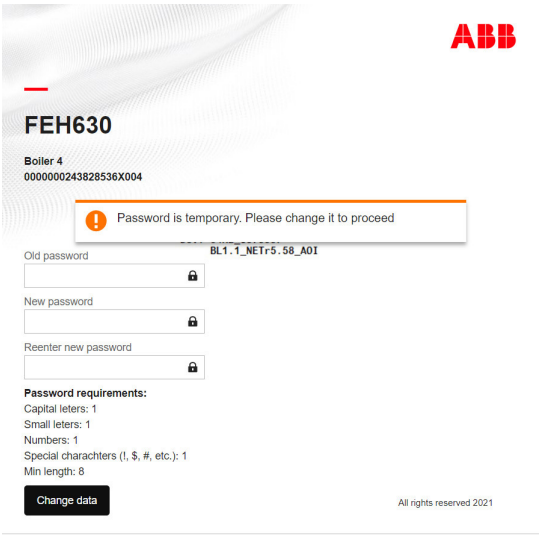
The IP address of the Ethernet adapter of the computer and the Flowmeter must be different, to avoid IP address collision.

For example, set the IP address of the computer's Ethernet adapter to 192.168.1.1, and the IP address of the Flowmeter to 192.168.1.122.

6 Web page access

Password

The default password is **password**. The system will prompt you to set a new password.

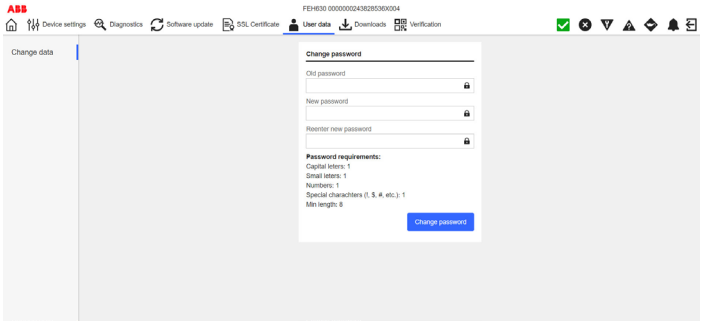


Note
You must set a new password to continue.

Change the password

1 To change the password, go to **http://192.168.1.122**.

2 Go to **User data** > **Change data** > **Change password**.



Note
The password must have the properties that follow:
- At least 8 characters
- At least 1 numeric character
- At least 1 capital letter
- At least 1 small letter
- At least 1 special character.

Note
If an incorrect password is entered three times in a row then sign in cooldown starts. Cooldown takes 10 minutes and blocks any sign in request.

...Web page access

Webpage certificates

The device generates a default certificate. The certificate has the properties that follow:

- Issuer: ABB Device Root CA
- Subject: my-hostname.my-domain
- Serial: Randomly generated
- Valid From: Time of generation
- Valid Till: Time of generation plus 365 days
- Subject Alt name: 192.168.1.122, my-hostname.my-domain
- Key: 384-bit EC key with secp384 curve.

Upload your own certificate

To upload your own certificate, do the steps that follow:

1 Go to webpage menu **SSL Certificate** > **New certificate**.

2 When prompted, attach the certificates that follow:

- Root CA certificate
- Server certificate
- Private key associated with server certificate

Note
The files can be in PEM or DER format. The file names are not important, the device renames them internally.

3 Wait for the device to verify the files.

4 Make sure that a summary of the certificates shows on the webpage.

5 If necessary, upload new certificates or switch to a different certificate.

6 If you switch to a new certificate, sign in at the prompt.

Intermediate CA

A more complex PKI structure is supported, with intermediate certificates.

-----BEGIN CERTIFICATE-----

<Endpoint certificate for server>

-----END CERTIFICATE-----

-----BEGIN CERTIFICATE-----

<Intermediate certificate #1>

-----END CERTIFICATE-----

...

-----BEGIN CERTIFICATE-----

<Intermediate certificate #n>

-----END CERTIFICATE-----

Private keys protected with passwords are not supported.

Generate a certificate

1 Go to webpage menu **SSL Certificate** > **Generate certificate**.

2 Sign in at the prompt.

Note
The certificate has the properties that follow:

- Issuer: ABB Device Root CA
- Subject: <Host name>.<Domain Name>
- Serial: Randomly generated
- Valid From: Time of generation
- Valid Till: Time of generation plus 365 days
- Subject Alt name: <IP address>, <Host name>.<Domain Name>
- Key: 384-bit EC key with secp384 curve.

7 Device to network

You can configure the IP address and the hostname of the device. The device supports the DHCP function.

The device is shipped with DHCP enabled.

The default IP address with DHCP disabled is **192.168.1.122**.

The default hostname is **my-hostname**.

Network related parameters are accessible through the HMI menu.

Once a server is assigned an IP address, the factory default IP address and hostname will be replaced by the ones assigned through the DHCP server.

To check the IP settings, use the Flowmeter HMI menu to go to **Communication** > **EtherNet** > **Internet layer** > **Host IP address**.

8 EtherNet/IP

Device profile

The device corresponds to the profile 0x43, Generic Device, (keyable).

Supported standards and protocols:

- Common Industrial Protocol (CIP™) Vol 1, Ed 3.25
- Ethernet/IP Adaptation of CIP Vol2, Vol 2, Ed 1.23.

9 Menu Structure in HMI

Menu	Settings	Description
Communication		
Ethernet		
General		
Base Protocol Stack	EtherNet/IP	Indicates the communication protocol for information purposes only
Internet layer		
DHCP client	enabled, disabled	Factory default: enabled. If disabled, the host IP address defaults to 192.168.001.122
Host IP address		Allows for IP address setting 192.168.001.122 is the factory default in case DHCP client is set to fixed IP
Subnet mask		
	255.255.255.000	factory default: 255.255.255.000
Gateway IP address		
	000.000.000.000	Factory default = 000.000.000.000 If it's part of the subnet, the first block of numbers should be identical to HOST IP - for example, 192.168.1.10
NTPServer1 IP address		factory default: 000.000.000.000
NTPServer2 IP address		factory default: 000.000.000.000
Host name		factory default: ABB-Flow
Domain name		factory default: my-domain
DNS1 IP address		automatically set with DHCP = ON: 000.000.000.000
DNS2 IP address		
Webserver		
Access	"disabled, Read only, Full"	factory default: Full
Reset credentials		Allows for resetting the webserver password
Session timeout	5 min	Timeout time closing the webserver session. Default value: 5 minutes Possible settings: Min: 1 Max: 4294967000
EthernetIP		
Access	disabled, Read only, Full	Factory Default is **disabled** Set to **Full** or **Read Only** with Omron or Rockwell PLCs
Device status		
	Mod**<G>** Net **<G>** P1	P1 = Port 1 of the Ethernet card
		Mod = Module Status
		Mod showing **<G>** continously = Device ready for Operation. Working properly
		Mod changing between **<G>** and **< >** = Standby. Device not configured yet
		Mod changing between **<R>** and **< >** = Simple error which can be fixed
		Mod showing **<R>** continously = Major Error. Non removable serious error
		Mod showing **< >** continously = No Power
		Net = Network Status
		Net showing **<G>** continously = Connected. Device has at least one established connection
		Net changing between **<G>** and **< >** = No Connection. Device did not establish any connections, but was assigned an IP address
		Net showing **<R>** continously = Dublicated IP address. Device has detected that the device IP address is already in use
		Net showing **< >** continously = No supply voltage or IP Address.
		Net changing between **<R>** and **< >** = Connection timeout
Vendor ID	46	
Product / Device Type	43	
Product name	EMF FEW5/FEP_FEH6	
Product code	5002	
Product major rev.	1	
Product minor rev.	1	

Menu	Settings	Description
ModbusTCP		
Access	disabled, Read only, Full	Factory Default is disabled
IEEE Format	enabled, disabled	factory default: Enabled
Data link layer		
Chassis MAC address		Example: 00-24-59-11-00-69
P1 MAC address		
P2 MAC address		
P1 auto negotiation	enabled, disabled	enabled
P1 speed set		
P1 duplex set		
P1 speed status		Example: 100 MBits/s
P1 duplex status		Example: Full duplex
P2 auto negotiation	enabled, disabled	enabled
P2 speed set		
P2 duplex set		
P2 speed status		Example: 100 MBits/s
P2 duplex status		Example: Full duplex
Diagnostics		
TCP connections		Example: 14
P1 received		Example: 1207269 Bytes
P1 transmitted		Example: 2001589 Bytes
P1 receive errors		Example: 000000
P1 transm. collisions		Example: 000000
P2 received		Example: 000000 Bytes
P2 transmitted		Example: 000000 Bytes
P2 receive errors		Example: 000000
P2 transm. collisions		Example: 000000

10 Set the IP-Address and Local Host name

The device must be given an IP address before communication with the device is possible. Usually the IP address is set via DHCP.

Alternatively, a static IP address can be configured.

IP address setting

Static (DHCP Client disabled)

For static IP addressing, the DHCP Client is set to **disabled - fixed IP** and the IP address is set either via the EtherNet/IP protocol or utilizing the local HMI. For address setting using the HMI, navigate to **Communication** > **Ethernet** > **Internet Layer** > **DHCP Client** for configuration.

Note
Disabling the DHCP Client, the static IP address defaults to **192.168.1.122**. To change the static IP address, navigate to **Communication** > **Ethernet** > **Internet Layer** > **Host IP address** for configuration.

The IP-address can be changed via the Ethernet/IP Interface TCP/IP 0xF5, Attribute 5.

DHCP (DHCP Client enabled)

The device raises a DHCP request to obtain an initial IP address. The DHCP Server detects this request and assigns an IP address to the device. The Flowmeter Factory Default is **DHCP Client = enabled**.

The device waits until the DHCP server assigns the IP address.

You can use the DHCP servers that follow:

- BOOTP/DHCP server from Rockwell (refer to **Menu Structure in HMI on page 14**)
- Open DHCP (http://dhcpserver.sourceforge.net/)
- DHCP server from Windows server editions
- DHCP dervers implemented in network switches (for example, Cisco SG350-Series).

Note
Make sure that your firewall settings allow IP address assignment by a DHCP server.

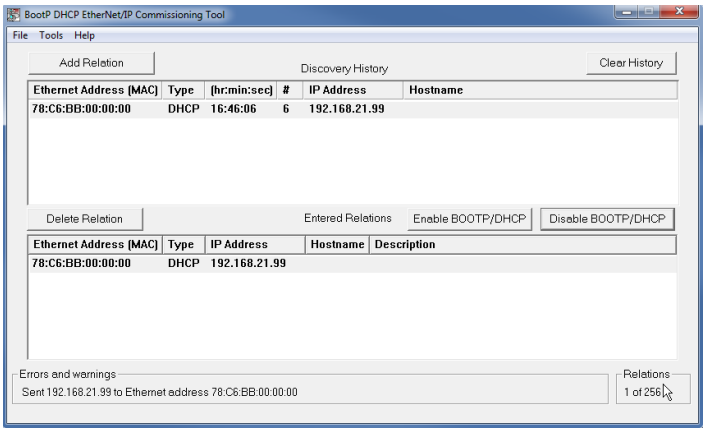
Addressing via Rockwell's BOOTP/DHCP Server

Use the interactive BOOTP/DHCP Server Tool to assign the IP address to “answer” the device’s BOOTP/DHCP request:

1 Make sure that the device is switched to “ON”.

2 Wait for the device to send a DHCP request with its MAC address.

3 Double-click on the MAC address and enter the required IP address.



11 EtherNet/IP interface

The Assemblies (100-107 and 110) can be implicitly transferred. A summary of these assemblies is shown below.

100 (Flow)	101 (Totalizer)	102 (Diag Values)	103 (All Process Inputs)
Volume_Flow	Totalizer_Qv_ Fwd	Conductivity	Volume_Flow
Mass_Flow	Totalizer_Qv_ Rev	Coil_ Temperature	Volume_Flow_ Ratio
Flow_Velocity	Totalizer_Qv_ Diff	Inhouse_ Temperature	Mass_Flow
Volume_Flow_ Unit	Totalizer_Qm_ Fwd	Current_ Output_31_32_ Reading	Mass_Flow_ Ratio
Mass_Flow_Unit	Totalizer_Qm_ Rev	Conductivity_ Unit	Flow_Velocity
Flow_Velocity_ Unit	Totalizer_Qm_ Diff	Temperature_ Unit	Totalizer_Qv_ Fwd
Device_Status_ Summary	Volume_Unit	Device_Status_ Summary	Totalizer_Qv_ Rev
	Mass_Unit		Totalizer_Qv_ Diff
	Device_Status_ Summary		Totalizer_Qm_ Fwd
			Totalizer_Qm_ Rev
			Totalizer_Qm_ Diff
			Conductivity
			Coil_ Temperature
			Inhouse_ Temperature
			Current_ Output_31_32_ Reading
			Volume_Flow_ Unit
			Mass_Flow_Unit
			Flow_Velocity_ Unit
			Volume_Unit
			Mass_Unit
			Conductivity_ Unit
			Temperature_ Unit
			Device_Status_ Summary

Table 1 Process Values Input Assemblies FEx>PLC (T>O)

104 (Extended_Device_Status)
Device_Status
Mass_flowrate_exceeds_limits_0_0
Volume_flowrate_exceeds_limits_0_1
Simulation_is_on_0_2
Flowrate_to_zero_0_3
Maintenance_interval_is_reached_0_4
All_totalizer_stop_0_5
Totalizer_reset_0_6
Display_value_is1600h_at_Qmax_0_7
Device_not_calibrated_1_0
Sensor_memory_defective_1_1
NV_data_defect_Data_storage_1_2
No_Frontend_Board_detected_1_3
FEB_communication_error_1_4
Incompatible_Frontend_Board_1_5
NV_chips_defect_on_Motherboard_1_6
Pulse_output_is_cut_off_1_7
Current_output_3132_is_saturated_2_0
CurrOut_V1V2_V3V4_saturated_2_1
CurrOut_3132_com_error_2_2
Option_Card_1_com_error_2_3
Option_Card_2_com_error_2_4
Safety_Alarm_CurrOut_3132_2_5
CurrOut_3132_not_calibrated_2_6
CurrOut_V1V2_not_calibrated_2_7
CurrOut_V3V4_not_calibrated_3_0
MB_voltages_outside_range_3_1
An_alarm_is_simulated_3_2
Communication_card_not_responding_3_3
Reserved_0
Coil_regulation_error_3_5
Coil_wiring_Detection_3_6
Coil Impedance measurement_3_7
Electrode short circuit detection_4_0
Electrode open circuit detection_4_1
DC Feedback Regulation Error_4_2
Monitoring Comm ADC and RX210_4_3
Coil Isolation_4_4
Gas bubble alarm_4_5
Conductivity exceeds limits_4_6
Sensor Temperature exceeds limits_4_7
TFE alarm_5_0
EPD alarm_5_1
ADC Signal overrange_5_2
SIL self check alarm_5_3
Inhouse temperature exceeds limits_5_4

Table 2 Device Status FEP63x/FEH63x/FEW53x > PLC (T>O)

...EtherNet/IP interface

110 (Output)
DO_Function_Activation
DO_Flow_To_Zero
DO_System_Zero_Adjust
DO_Counter_Reset
DO_Counter_Stop
DO_Dual_Range_Mass
DO_Dual_Range_Volume
DO_Batch_Start_Stop

Table 3 Output Assembly PLC > FEP63x/FEH63x/FEW53x (O->T)

Instance	Description	Attr. ID	Access	Bytes
100	Flow	3	Get	20
101	Totalizer	3	Get	32
102	Diag Values	3	Get	24
103	All Process Inputs	3	Get	76
104	Extended_Device_Status	3	Get	1
110	Output	3	Get	8

Table 4 Assembly-Instances and Data Types

100 (Flow)	Data Type	Display	Bytes	Access
Volume_Flow	REAL	Float	4	Read Only
Mass_Flow	REAL	Float	4	Read Only
Flow_Velocity	REAL	Float	4	Read Only
Volume_Flow_Unit	INT	Hex	2	Read Only
Mass_Flow_Unit	INT	Hex	2	Read Only
Flow_Velocity_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	Hex	1	Read Only

Table 5 Assembly/Instance 100, Flow

101 (Totalizer)	Data Type	Display	Bytes	Access
Totalizer_Qv_Fwd	REAL	Float	4	Read Only
Totalizer_Qv_Rev	REAL	Float	4	Read Only
Totalizer_Qv_Diff	REAL	Float	4	Read Only
Totalizer_Qm_Fwd	REAL	Float	4	Read Only
Totalizer_Qm_Rev	REAL	Float	4	Read Only
Totalizer_Qm_Diff	REAL	Float	4	Read Only
Volume_Unit	INT	Hex	2	Read Only
Mass_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Int	INT	Hex	2	Read Only
Empty_Byte	SINT	Hex	1	Read Only

Table 6 Assembly/Instance 101, Totalizer

102 (Diag Values)	Data Type	Display	Bytes	Access
Conductivity	REAL	Float	4	Read Only
Coil_Temperature	REAL	Float	4	Read Only
Inhouse_Temperature	REAL	Float	4	Read Only
Current_Output_31_32_ Reading	REAL	Float	4	Read Only
Conductivity_Unit	INT	Hex	2	Read Only
Temperature_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Int	INT	Hex	2	Read Only
Empty_Byte	SINT	Hex	1	Read Only

Table 7 Assembly/Instance 102, Diag Values

103 (All Process Inputs)	Data Type	Display	Bytes	Access
Volume_Flow	REAL	Float	4	Read Only
Volume_Flow_Ratio	REAL	Float	4	Read Only
Mass_Flow	REAL	Float	4	Read Only
Mass_Flow_Ratio	REAL	Float	4	Read Only
Flow_Velocity	REAL	Float	4	Read Only
Totalizer_Qv_Fwd	REAL	Float	4	Read Only
Totalizer_Qv_Rev	REAL	Float	4	Read Only
Totalizer_Qv_Diff	REAL	Float	4	Read Only
Totalizer_Qm_Fwd	REAL	Float	4	Read Only
Totalizer_Qm_Rev	REAL	Float	4	Read Only
Totalizer_Qm_Diff	REAL	Float	4	Read Only
Conductivity	REAL	Float	4	Read Only
Coil_Temperature	REAL	Float	4	Read Only
Inhouse_Temperature	REAL	Float	4	Read Only
Current_Output_31_32_ Reading	REAL	Float	4	Read Only
Volume_Flow_Unit	INT	Hex	2	Read Only
Mass_Flow_Unit	INT	Hex	2	Read Only
Flow_Velocity_Unit	INT	Hex	2	Read Only
Volume_Unit	INT	Hex	2	Read Only
Mass_Unit	INT	Hex	2	Read Only
Conductivity_Unit	INT	Hex	2	Read Only
Temperature_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	Hex	1	Read Only

Table 8 Assembly/Instance 103, All Process Inputs

104 (Extended Device Status)	Data Type	Display	Bytes	Access
Device_Status	BYTE	Hex	1	Read Only
Mass_flowrate_exceeds_limits_0_0	BOOL	Decimal		Read Only
Volume_flowrate_exceeds_limits_0_1	BOOL	Decimal		Read Only
Simulation_is_on_0_2	BOOL	Decimal		Read Only
Flowrate_to_zero_0_3	BOOL	Decimal		Read Only
Maintenance_interval_is_reached_0_4	BOOL	Decimal		Read Only
All_totalizer_stop_0_5	BOOL	Decimal		Read Only
Totalizer_reset_0_6	BOOL	Decimal		Read Only
Display_value_is1600h_at_Qmax_0_7	BOOL	Decimal	1	Read Only
Device_not_calibrated_1_0	BOOL	Decimal		Read Only
Sensor_memory_defective_1_1	BOOL	Decimal		Read Only
NV_data_defect_Data_storage_1_2	BOOL	Decimal		Read Only
No_Frontend_Board_detected_1_3	BOOL	Decimal		Read Only
FEB_communication_error_1_4	BOOL	Decimal		Read Only
Incompatible_Frontend_Board_1_5	BOOL	Decimal		Read Only
NV_chips_defect_on_Motherboard_1_6	BOOL	Decimal		Read Only
Pulse_output_is_cutted_off_1_7	BOOL	Decimal	1	Read Only
Current_output_3132_is_saturated_2_0	BOOL	Decimal		Read Only
CurrOut_V1V2_V3V4_saturated_2_1	BOOL	Decimal		Read Only
CurrOut_3132_com_error_2_2	BOOL	Decimal		Read Only
Option_Card_1_com_error_2_3	BOOL	Decimal		Read Only
Option_Card_2_com_error_2_4	BOOL	Decimal		Read Only
Safety_Alarm_CurrOut_3132_2_5	BOOL	Decimal		Read Only
CurrOut_3132_not_calibrated_2_6	BOOL	Decimal		Read Only
CurrOut_V1V2_not_calibrated_2_7	BOOL	Decimal	1	Read Only
CurrOut_V3V4_not_calibrated_3_0	BOOL	Decimal		Read Only
MB_voltages_outside_range_3_1	BOOL	Decimal		Read Only
An_alarm_is_simulated_3_2	BOOL	Decimal		Read Only
Communication_card_not_responding_3_3	BOOL	Decimal		Read Only
Reserved_0	BOOL	Decimal		Read Only
Coil_regulation_error_3_5	BOOL	Decimal		Read Only
Coil_wiring_Detection_3_6	BOOL	Decimal		Read Only
Coil Impedance measurement_3_7	BOOL	Decimal	1	Read Only
Electrode short circuit detection_4_0	BOOL	Decimal		Read Only
Electrode open circuit detection_4_1	BOOL	Decimal		Read Only
DC Feedback Regulation Error_4_2	BOOL	Decimal		Read Only
Monitoring Comm ADC and RX210_4_3	BOOL	Decimal		Read Only
Coil Isolation_4_4	BOOL	Decimal		Read Only
Gas bubble alarm_4_5	BOOL	Decimal		Read Only
Conductivity exceeds limits_4_6	BOOL	Decimal		Read Only
Sensor Temperature exceeds limits_4_7	BOOL	Decimal	1	Read Only
TFE alarm_5_0	BOOL	Decimal		Read Only
EPD alarm_5_1	BOOL	Decimal		Read Only
ADC Signal overrange_5_2	BOOL	Decimal		Read Only
SIL self check alarm_5_3	BOOL	Decimal		Read Only
Inhouse temeprature exceeds limits_5_4	BOOL	Decimal		Read Only
Reserved3_5_5	BOOL	Decimal		Read Only
Reserved4_5_6	BOOL	Decimal		Read Only
Reserved5_5_7	BOOL	Decimal	1	Read Only
Reserved6	SINT	Hex	1	Read Only

Table 9 Assembly/Instance 104, Extended Device Status

110 (Output)	Data Type	Display	Bytes	Access
DO_Function_Activation	BOOL	Hex		Read/Write
Empty	BOOL	Hex		Read/Write
Empty	BOOL	Hex		Read/Write
Empty	BOOL	Hex		Read/Write
Empty	BOOL	Hex		Read/Write
Empty	BOOL	Hex		Read/Write
Empty	BOOL	Hex		Read/Write
Empty	BOOL	Hex	1	Read/Write
Empty	BYTE	Hex	1	Read/Write
DO_Flow_To_Zero	BOOL	Hex		Read/Write
DO_System_Zero_Adjust	BOOL	Hex		Read/Write
DO_Counter_Reset	BOOL	Hex		Read/Write
DO_Counter_Stop	BOOL	Hex		Read/Write
DO_Dual_Range_Mass	BOOL	Hex		Read/Write
DO_Dual_Range_Volume	BOOL	Hex		Read/Write
DO_Batch_Start_Stop	BOOL	Hex		Read/Write
Reserved1	BOOL	Hex	1	Read/Write
Empty	BYTE	Hex	1	Read/Write

Table 10 Assembly/Instance 110, Output

...EtherNet/IP interface

EtherNet/IP Alarms FEP63x / FEH63x / FEW53x

Error messages of the FEP63x / FEH63x / FEW53x are displayed as alarm bits. If an error occurs, one or more corresponding warning and/or alarm bits are set. If an error disappears, one or more corresponding warning and/or alarm bits are reset.

This data type also includes a byte enumeration at the beginning which includes the device status:

- 0x00: NO Alarm
- 0x01: Check Function Alarm
- 0x02: Off Specification Alarm
- 0x03: Maintenance Alarm
- 0x04: Failure Alarm.

Table 11 Ethernet/IP Alarms FEP63x / FEH63x / FEW53x

104 (Extended_Device_Status)	Data Type	Display	Bytes	Access
Device_Status	BYTE	Hex	1	Read Only
Mass_flowrate_exceeds_limits_0_0	BOOL	Decimal		Read Only
Volume_flowrate_exceeds_limits_0_1	BOOL	Decimal		Read Only
Simulation_is_on_0_2	BOOL	Decimal		Read Only
Flowrate_to_zero_0_3	BOOL	Decimal		Read Only
Maintenance_interval_is_reached_0_4	BOOL	Decimal		Read Only
All_totalizer_stop_0_5	BOOL	Decimal		Read Only
Totalizer_reset_0_6	BOOL	Decimal		Read Only
Display_value_is1600h_at_Qmax_0_7	BOOL	Decimal	1	Read Only
Device_not_calibrated_1_0	BOOL	Decimal		Read Only
Sensor_memory_defective_1_1	BOOL	Decimal		Read Only
NV_data_defect_Data_storage_1_2	BOOL	Decimal		Read Only
No_Frontend_Board_detected_1_3	BOOL	Decimal		Read Only
FEB_communication_error_1_4	BOOL	Decimal		Read Only
Incompatible_Frontend_Board_1_5	BOOL	Decimal		Read Only
NV_chips_defect_on_Motherboard_1_6	BOOL	Decimal		Read Only
Pulse_output_is_cut_off_1_7	BOOL	Decimal	1	Read Only
Current_output_3132_is_saturated_2_0	BOOL	Decimal		Read Only
CurrOut_V1V2_V3V4_saturated_2_1	BOOL	Decimal		Read Only
CurrOut_3132_com_error_2_2	BOOL	Decimal		Read Only
Option_Card_1_com_error_2_3	BOOL	Decimal		Read Only
Option_Card_2_com_error_2_4	BOOL	Decimal		Read Only
Safety_Alarm_CurrOut_3132_2_5	BOOL	Decimal		Read Only
CurrOut_3132_not_calibrated_2_6	BOOL	Decimal		Read Only
CurrOut_V1V2_not_calibrated_2_7	BOOL	Decimal	1	Read Only
CurrOut_V3V4_not_calibrated_3_0	BOOL	Decimal		Read Only
MB_voltages_outside_range_3_1	BOOL	Decimal		Read Only
An_alarm_is_simulated_3_2	BOOL	Decimal		Read Only
Communication_card_not_responding_3_3	BOOL	Decimal		Read Only
Reserved_0	BOOL	Decimal		Read Only
Coil_regulation_error_3_5	BOOL	Decimal		Read Only
Coil_wiring_Detection_3_6	BOOL	Decimal		Read Only
Coil Impedance measurement_3_7	BOOL	Decimal	1	Read Only
Electrode short circuit detection_4_0	BOOL	Decimal		Read Only
Electrode open circuit detection_4_1	BOOL	Decimal		Read Only
DC Feedback Regulation Error_4_2	BOOL	Decimal		Read Only
Monitoring Comm ADC and RX210_4_3	BOOL	Decimal		Read Only
Coil Isolation_4_4	BOOL	Decimal		Read Only
Gas bubble alarm_4_5	BOOL	Decimal		Read Only
Conductivity exceeds limits_4_6	BOOL	Decimal		Read Only
Sensor Temperature exceeds limits_4_7	BOOL	Decimal	1	Read Only
TFE alarm_5_0	BOOL	Decimal		Read Only
EPD alarm_5_1	BOOL	Decimal		Read Only
ADC Signal overrange_5_2	BOOL	Decimal		Read Only
SIL self check alarm_5_3	BOOL	Decimal		Read Only
Inhouse temperature exceeds limits_5_4	BOOL	Decimal		Read Only
Reserved3_5_5	BOOL	Decimal		Read Only
Reserved4_5_6	BOOL	Decimal		Read Only
Reserved5_5_7	BOOL	Decimal	1	Read Only
Reserved6	SINT	Hex	1	Read Only

12 EtherNet/IP interface details

This section lists all the available classes, attributes and services included in the EtherNet/IP Interface.

The flow meter supports the following standard objects:

- Identity Object (0x01)
- Message Router Object (0x02)
- Assembly Object (0x04)
- Connection Manager Object (0x06)
- Device Level Ring Object (0x47)
- File (0x37)
- Quality of Service Object (0x48)
- TCP/IP Interface Object (0xF5)
- Ethernet Link Object (0xF6).

Abbreviations for service names:

- GAA = Get Attribute All
- GAS = Get Attribute Single
- SAA = Set Attribute All
- SAS = Set Attribute Single.

[Identity] 0x01

This object provides identification data from and general information about the device.

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 12 Class-Services

Attr ID	Name	Access Rule	Data Type	Value
1	Revision	Get	UINT	1
2	Max Instance	Get	UINT	1
3	Number of Instances	Get	UINT	1
6	Maximum ID Number Class Attributes	Get	UINT	7
7	Maximum ID Number Instance Attributes	Get	UINT	7

Table 13 Class attributes

Reset-Type	Description
0	Emulated power cycle reset (Power supply off/on, warm start)
1	The device is reset to factory settings and restarted. Communication parameters are also reset to factory settings, for example, IP address
2	Return to factory settings except communications parameters

Table 14 Reset

Service Code	Service Name
0x0E	GAS

Table 15 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	Vendor ID	Get	UINT
2	Device Type	Get	UINT
3	Product Code	Get	UINT
4	Revision	Get	STRUCT of
0	Major Revision	Get	USINT
0	Minor Revision		USINT
5	Status	Get	WORD
6	Serial Number	Get	UDINT
7	Product Name	Get	SHORT_ STRING

Table 16 Instance attributes

Bit(s)	Description
0-3	Not supported (= 0)
4-7	Extended Device Status (Refer to Table 18)
8	Easily recoverable error The device detected an internal error that can probably be corrected. The error does not put the device in Error State.
9	Minor unrecoverable error The device detected an internal error that probably cannot be corrected. Error does not put the device in Error State.
10	Serious recoverable error The device detected an internal error that triggered the error status **Serious recoverable error** in the sensor.
11	Serious unrecoverable error The device detected an internal error that triggered the error status **Serious unrecoverable error** in the sensor.
12-15	Reserved

Table 17 Description of Bits related for Attribute 5

ID	Description
0	Self-test or unknown (not supported)
1	Firmware update in progress (not supported)
2	At least one I/O connection is faulty (not supported)
3	No I/O connection established
4	Non-volatile storage is insufficient (not supported)
5	Serious error (Bit 10 - 11)
6	At least one I/O connection in **run mode** (not supported)
7	At least one I/O connection established, all in **idle mode**
8	0
9	Reserved
10-15	0 (not supported)

Table 18 Description of Bits 4 to 7 for Attribute 5

[Message Router] 0x02

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 19 Class-Services

Attr ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
4	Optional attribute list	Get	STRUCT of
	number of attributes		UINT
	optional attributes		ARRAY of UINT
5	Optional service list	Get	STRUCT of
	number services	0	UINT
	optional services	0	ARRAY of UINT
6	maximum ID number class attributes	Get	UINT
7	maximum ID number instance attributes	Get	UINT

Table 20 Class attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 21 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	Object_list	Get	STRUCT of
	Number	0	UINT
	Classes	0	ARRAY of UINT
2	Number Available	Get	UINT
3	Number active		UINT

Table 22 Instance-Attributes

[Assembly] 0x04

The Assembly Object binds attributes of multiple objects, that data can be sent or received from any object over a single connection. Assembly objects can be used to bind input or output data. The terms "input" and "output" are defined from the point of view of the network. An input generates data on the network and an output consumes data from the network.

Service Code	Service Name
0x0E	GAS

Table 23 Class-Services

Attrib ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
4	Optional attribute list	Get	STRUCT of
0	number of attributes	0	UINT
0	optional attributes	0	ARRAY of UINT
6	Maximum ID Number Class Attributes	Get	UINT
7	Maximum ID Number Instance Attributes	Get	UINT

Table 24 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x10	SAS

Table 25 Instance-Services

Attr ID	Name	Access Rule	Data Type
3	Data	Get / Set	ARRAY of BYTE
4	Size	Get	UINT

Table 26 Instance-Atributes

...EtherNet/IP interface details

[Connection Manager] 0x06

The Connection Manager Class assigns and manages in-device resources associated with the I/O and Explicit Messaging connection types. The instance generated by the Connection Manager Class is called a Connection Instance or Connection Object.

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 27 Class-Services

Attrib ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
4	Optional attribute list	Get	STRUCT of
	number of attributes	0	UINT
	optional attributes	0	ARRAY of UINT
6	Maximum ID Number Class Attributes	Get	UINT
7	Maximum ID Number Instance Attributes	Get	UINT

Table 28 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x02	SAA
0x01	GAA
0x10	SAS
0x4E	Forward Close
0x52	Unconnected_Send
0x54	Forward_Open
0x5A	Get_Connection_Owner
0x5B	Large_Forward_Open

Table 29 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	Open Requests	Get/Set	UINT
2	Open Format Rejects	Get/Set	UINT
3	Open Resource Rejects	Get/Set	UINT
4	Open Other Rejects	Get/Set	UINT
5	Close Requests	Get/Set	UINT
6	Close Format Rejects	Get/Set	UINT
7	Close Other Rejects	Get/Set	UINT
8	Connection Timeouts	Get/Set	UINT

Table 30 Instance-Attributes

[File] 0x37

Service Code	Service Name
0x0E	GAS

Table 31 Class-Services

Attrib ID	Description	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
6	Max ID Number Class Attributes	Get	UINT
7	Max ID Number Instance Attributes	Get	UINT
32	Directory	Get	STRUCT of 1 UNIT and 2 STRING

Table 32 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x4B	Initiate Upload
0x4F	Upload Transfer

Table 33 Instance-Services

Attr ID	Description	Access Rule	Data Type
1	State	Get	USINT
2	Instance Name	Get	STRINGI
3	File Format Version	Get	UINT
4	File Name	Get	STRINGI
5	File Revision	Get	STRUCT of
	Major Revision	Get	USINT
	Minor Revision	Get	USINT
6	File Size	Get	UDINT
7	File Checksum	Get	UINT
8	Invocation Method	Get	USINT
9	File Save Parameters	Get	BYTE
10	File Access Rule	Get	USINT
11	File Encoding Format	Get	USINT

Table 34 Instance-Attributes

[DLR] 0x47

The Device Level Ring (DLR) object provides the configuration and status information interface for the DLR protocol. The DLR protocol is a Layer 2 protocol that enables the use of an Ethernet ring topology. The DLR object provides the CIP application-level interface to the protocol.

An instance of the DLR object is implemented for each supported DLR ring port pair.

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 35 Class-Services

Attr ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT

Table 36 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 37 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	Network Topology	Get	USINT
2	Network Status	Get	USINT
10	Active Supervisor Address	Get	STRUCT
12	Capability Flags	Get	DWORD

Table 38 Instance-Attributes

[QoS] 0x48

Quality of Service (QoS) is a common term for mechanisms for handling data streams with different priorities or other delivery characteristics. Standard QoS mechanisms include IEEE 802.1D/Q (Ethernet frame priority) and Differentiated Services (DiffServ) in the TCP/IP protocol suite.

The QoS object provides the ability to configure specific QoS-related mechanisms in Ethernet/IP devices.

The QoS object is required for devices that support sending Ethernet/IP messages with Nonzero DiffServ code points (DSCP) or sending Ethernet/IP messages in 802.1Q tagged frames.

Service Code	Service Name
0x0E	GAS

Table 39 Class-Services

Attr ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
6	Maximum ID Number Class Attributes	Get	UINT
7	Maximum ID Number Instance Attributes	Get	UINT

Table 40 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	SAS

Table 41 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	802.1Q Tag Enable	Get / Set	USINT
2	DSCP PTP Event	Get / Set	USINT
3	DSCP PTP General	Get / Set	USINT
4	4 DSCP Urgent	Get / Set	USINT
5	DSCP Scheduled	Get / Set	USINT
6	DSCP High	Get / Set	USINT
7	DSCP Low	Get / Set	USINT
8	DSCP Explicit	Get / Set	USINT

Table 42 Instance-Attributes

...EtherNet/IP interface details

[Port] 0x55

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 43 Class-Services

Attr ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instance	Get	UINT
6	Maximum ID Number Class Attributes	Get	UINT
7	Maximum ID Number Instance Attributes	Get	UINT
8	Entry Port	Get	UINT
9	Port Instance Info	Get	UINT
0	Port Type	See instance attribute #1	UINT
0	Port Number	See instance attribute #2	UINT

Table 44 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 45 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	Port Type	Get	UINT
2	Port Number	Get	UINT
3	Link Object	Get	STRUCT of
	Path Length	Get	UINT
	Link Path	Get	Padded EPATH
4	Port Name	Get	SHORT_STRING
7	Port Number and Node Address	Get	Padded EPATH
10	Port Routing Capabilities	Get	UDINT

Table 46 Instance-Attributes

[TCP/IP Interface] 0xF5

The TCP/IP Interface object configures the TCP/IP network interface of a device, such as the IP address, network mask, and gateway address.

Each interface that supports the TCP/IP protocol is a physical communication interface related to the TCP/IP interface object.

The TCP/IP Interface object provides an attribute that identifies the connection-specific object for the associated physical communication interface. This connection-specific object typically provides counters and all connection-specific configuration attributes.

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 47 Class-Services

Attr ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
4	Optional attribute list	Get	STRUCT of
	number of attributes	0	UINT
	optional attributes	0	ARRAY of UINT
6	Maximum ID Number Class Attributes	Get	UINT
7	Maximum ID Number Instance Attributes	Get	UINT

Table 48 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA
0x10	SAS
0x02	SAA

Table 49 Instance-Services

Attr ID	Name	Access Rule	Data Type
1	Status	Get	DWORD
2	Configuration Capability	Get	DWORD
3	Configuration Control	Get/Set	DWORD
4	Physical Link Object	Get	STRUCT of:
	Path size	0	UINT
	Path	0	Padded EPATH
5	Interface Configuration	Get/Set	STRUCT of:
	IP Address	0	UDINT
	Network Mask	0	UDINT
	Gateway Address	0	UDINT
	Name Server	0	UDINT
	Name Server 2	0	UDINT
	Domain Name	0	STRING
6	Host Name	Get/Set	STRING
8	TTL Value	Get/Set	USINT
9	Mcast Config	Get/Set	STRUCT of:
	Alloc Control	0	USINT
	Reserved	0	USINT
	Num Mcast	0	UINT
	Mcast Start Addr	0	UDINT
10	SelectAcd	Set	BOOL
11	LastConflictDetected	Set	STRUCT of:
	AcdActivity	0	USINT
	RemoteMAC	0	Array of 6 USINT
	ArpPdu	0	ARRAY of 28 USINT
13	Encapsulation Inactivity Timeout	Set	UINT
16	Active TCP Connections	Get	UINT
17	Non-CIP Encapsulation Messages /s	Get	UDINT

Table 50 Instance-Attributes

[Ethernet Link] 0xF6

The Ethernet Link Object manages connection-specific counters and status information for an IEEE 802.3 communication interface. Each device supports exactly one instance of the Ethernet Link Object for each IEEE 802.3 communication interface in the module.

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 51 Class-Services

Attr ID	Name	Access Rule	Data Type
1	Revision	Get	UINT
2	Max Instance	Get	UINT
3	Number of Instances	Get	UINT
4	Optional attribute list	Get	STRUCT of
	number of attributes	0	UINT
	optional attributes	0	ARRAY of UINT
6	Maximum ID Number Class Attributes	Get	UINT
7	Maximum ID Number Instance Attributes	Get	UINT

Table 52 Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA
0x10	SAS

Table 53 Instance-Services

...EtherNet/IP interface details

Attr ID	Name	Access Rule	Data Type	
1	Interface Speed	Get	UDINT	Value is operation dependent
2	Interface Flags	Get	DWORD	
3	Physical Address	Get	ARRAY of 6 USINTs	
4	Interface Counters	Get	STRUCT of:	
0	In Octets	0	UDINT	
0	In Ucast Packets	0	UDINT	
0	In NUcast Packets	0	UDINT	
0	In Discards	0	UDINT	
0	In Errors	0	UDINT	
0	In Unknown Protos	0	UDINT	
0	Out Octets	0	UDINT	
0	Out Ucast Packets	0	UDINT	
0	Out NUcast Packets	0	UDINT	
0	Out Discards	0	UDINT	
0	Out Errors	0	UDINT	
5	Media Counters	Get	STRUCT of:	
0	Alignment Errors	0	UDINT	
0	FCS Errors	0	UDINT	
0	Single Collisions	0	UDINT	
0	Multiple Collisions	0	UDINT	
0	SQE Test Errors	0	UDINT	
0	Deferred Transmissions	0	UDINT	
0	Late Collisions	0	UDINT	
0	Excessive Collisions	0	UDINT	
0	MAC Transmit Errors	0	UDINT	
0	Carrier Sense Errors	0	UDINT	
0	Frame Too Long	0	UDINT	
0	MAC Receive Errors	0	UDINT	
6	Interface Control	Get/Set	STRUCT of:	
0	Control Bits	0	WORD	
0	Forced Interface Speed	0	UINT	
7	Interface Type	Get	USINT	
8	Interface State	Get	USINT	
9	Admin State	Get/Set	USINT	
10	Interface Label	Get	SHORT_	
11	Interface Capability	Get	STRUCT of:	
0	Capability Bits	0	DWORD	
0	Speed/Duplex Options	0	STRUCT of:	
0	USINT	0	Speed/Duplex Array Count	
0	ARRAY of STRUCT of:	0	Speed/Duplex Array	
0	Interface Speed	0	UINT	
0	Interface Duplex Mode	0	USINT	
14	Ethernet Errors	Get	UDINT	
15	Link_Down Counter	Get	UDINT	

Table 54 Instance-Attributes

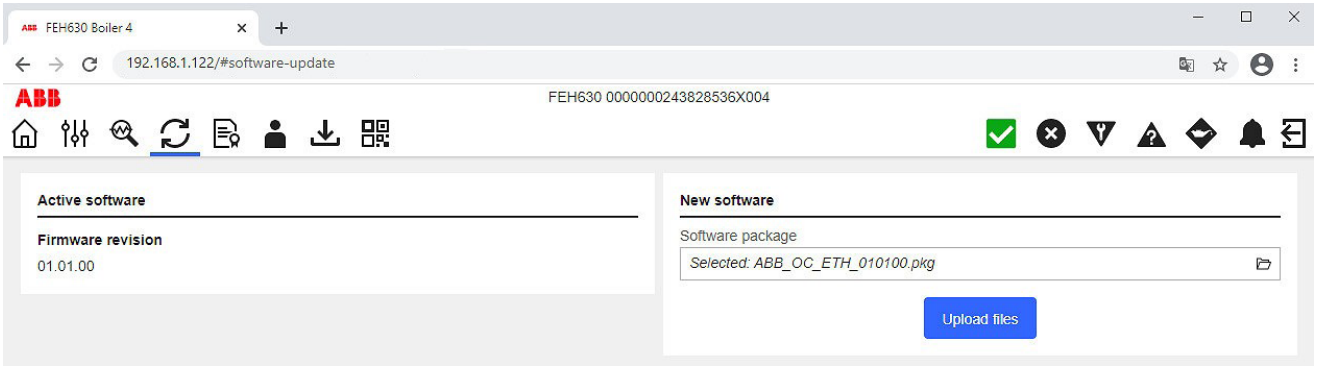
13 EtherNet/IP unit overview

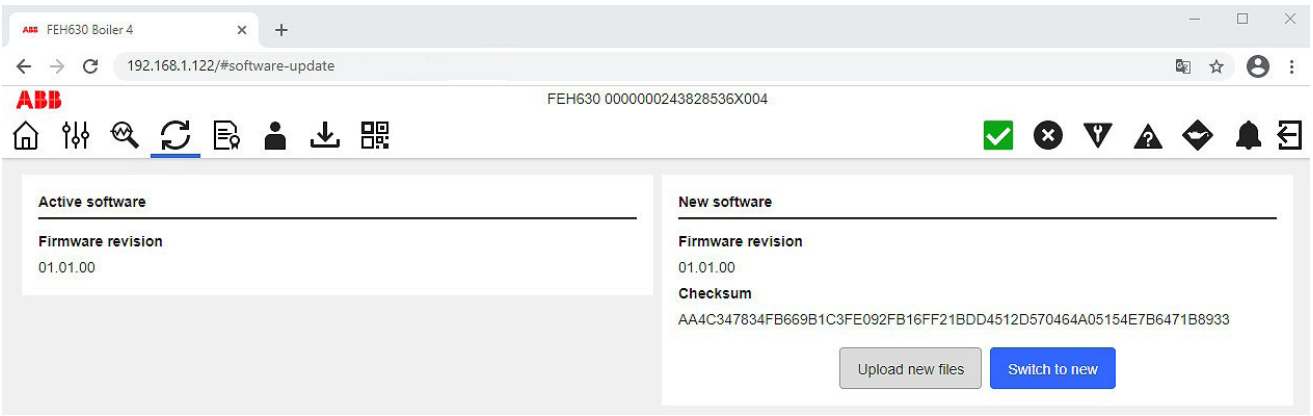
The following units are available in the device. The unit codes correspond to the Common Industrial Protocol (CIP™) Vol 1, Ed 3.25 Appendix D.

Group	name	Code	Ethernet/IP
Hex: 0x	gram per second	g/s	1437
	gram per minute	g/min	140F
	gram per hour	g/h	1436
	gram per day	g/d	1435
	kilogram per second	kg/s	1404
	kilogram per minute	kg/min	1445
	kilogram per hour	kg/h	1410
	kilogram per day	kg/d	1444
	pounds per second	lb/s	140B
	pounds per minute	lb/min	140C
	pounds per hour	lb/h	140D
	pounds per day	lb/d	145C
	metric ton per minute	t/min	1463
	metric ton per hour	t/h	1462
	metric ton per day	t/d	1461
	custom selectable	xx/yy	0803
Mass units	gram	g	2501
	kilogram	Kg	2500
	Pound	Pound	2505
	metric ton	t	2503
	custom selectable	xx/yy	0804
Volumeflow units	cubic meter per second	m3/s	1405
	cubic meter per minute	m3/min	1433
	cubic meter per hour	m3/h	1432
	cubic meter per day	m3/d	1431
	cubic foot per second	ft3/s	1467
	cubic foot per minute	ft3/min	1402
	cubic foot per hour	ft3/h	1466
	cubic foot per day	ft3/d	1465
	milliliter per second	ml/s	1407
	milliliter per minute	ml/min	1411
	liter per second	l/s	1406
	liter per minute	l/min	1413
	liter per hour	l/h	1414
	liter per day	l/d	1446
	hecto liter per hour	hl/h	1439
	mega liter per day	Ml/d	1438
	us gallons per second	ugal/s	1408
	us gallons per minute	ugal/min	1409
	us gallons per hour	ugal/h	140A
	us gallons per day	ugal/d	1434
	mega us gallons per day	Mugal/d	1447
	imperial gallons per second	igal/s	1443
	imperial gallons per minute	igal/min	1442
	imperial gallons per hour	igal/h	1441
	imperial gallons per day	igal/d	1440
	oil barrels per second	bbl/s	143F
	oil barrels per minute	bbl/min	143E
	oil barrels per hour	bbl/h	143D
	oil barrels per day	bbl/d	143C
	brew barrels per second	bls/s	141C
	brew barrels per minute	bls/min	141B
	brew barrels per hour	bls/h	141A
	brew barrels per day	bls/d	1419
	custom selectable	xx/yy	0801
Volume units	cubic meter	m3	2E01
	cubic feet	ft3	2E06
	Milliliters	Ml	2E03
	Liter	l	2E02
	hecto liter	St	2E13
	us gallons	Ugal	2E08
	imperial gallons	Igal	2E15
	oil barrels	Ff	2E14
	brew barrels	Bls	2E1F
	custom selectable	xx/yy	0802
Density unit	kilogram per cubic meter	kg/m3	2F07
Temperature unit	Celsius	° C	1200

14 Ethernet card firmware update

To update the Ethernet card firmware, log on to the flowmeter's webserver.





1 Browse for the new firmware and select **Upload files**.

2 Wait for the files to upload to the Ethernet card.

3 Wait for the device to shown the validation result for the firmware package.

4 If the firmware validation fails, use the webserver to browse for a different firmware pack.

Note:
If the firmware package is valid, the webserver displayes the firmware version and checksum. The checksum is an SHA-256 checksum, allowing for package-integrity-check.

5 To install the firmware on the Ethernet card, select **switch to new**.

6 When **Updating SW will disable all protocols from OC for the time of the update** is displayed, click **OK**.

7 Wait for the webserver to display the message **Software upgraded successfully. Please sign in to continue**.

8 Use the default password to log on to the webserver, which is **Password**.

9 Change the password when prompted.

Note:
The password requirements are as follows:
- Capital letters: 1
- Small letters: 1
- Numbers: 1
- Special characters (!, $, #, etc.): 1
- Min length: 8

Cyber Security

Version and checksum for the current Ethernet card firmware is:

Verification of installed Firmware Version to Ethernet plug-in card:

Firmware Version	SHA2 Checksum
01.01.00	AA4C347834FB669B1C3FE092FB16FF21B DD4512D570464A05154E7B6471B8933

Device firmware is not available for download from the ABB library.

Please refer to your local ABB Service Organization if a firmware update is required.

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/measurement

3KXF231630R4001

COM/FEM630/E/MB-EN Rev. A 11.2021