CoriolisMaster FCB400, FCH400, FCD400
Coriolis mass flowmeter

EtherNet/IP, Modbus TCP, Webserver
FCB400, FCH400: Valid from firmware version 01.07.00
FCD400: Valid from firmware version 01.11.00

PROFINET®:Valid from firmware version 01.11.00

Measurement made easy

—
CoriolisMaster FCB430 / 450
CoriolisMaster FCH430 / 450
CoriolisMaster FCD450

Introduction

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

- CoriolisMaster FCB430 / 450
- CoriolisMaster FCH430 / 450
- CoriolisMaster FCD450

Additional Information

Additional documentation on CoriolisMaster FCB400, FCH400, FCD400 is available for download free of charge at www.abb.com/flow. Alternatively simply scan this code:

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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.

Warnings

The warnings in these instructions are structured as follows:

> ⚠ **DANGER**
>
> The signal word '**DANGER**' indicates an imminent danger. Failure to observe this information will result in death or severe injury.

> ⚠ **WARNING**
>
> The signal word '**WARNING**' indicates an imminent danger. Failure to observe this information may result in death or severe injury.

> ⚠ **CAUTION**
>
> The signal word '**CAUTION**' indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

> *NOTICE*
>
> The signal word '*NOTICE*' indicates possible material damage.

Note
'**Note**' indicates useful or important information about the product.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is 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 anti-virus programs, etc.) 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 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.

Manufacturer's address

ABB AG
Measurement & Analytics
Schillerstr. 72
32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

Customer service center
Tel: +49 180 5 222 580
Email: automation.service@de.abb.com

2   Supported Ethernet-based communication protocols

EtherNet/IP™ defined in IEEE 802.03 and PROFINET®

- Cyclic communication is supported with a suitable PLC e.g. Siemens S7-400 (PCS 7), S7-1200, S7-1500 with TIA Portal or ABB 800xA.
- Process variables, diagnostic values and Device Status Information are accessible cyclically.
- For device configuration a Webserver or Modbus® TCP is available, providing full access to all parameters.

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.

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 in case of no function.

EtherNet/IP™ and PROFINET®:
- Protocol could be deactivated via HMI in case of no function.

Unsecured protocols

Use the HMI menu to enable or disable the protocols:
- EtherNet/IP™ – use ports TCP 44818, UDP 2222
- PROFINET® – use ports UDP 34964, UDP 49152
- Modbus® TCP – use port TCP 502.

3 Installation

Install the plug-in cards

Ethernet card

The Flowmeter has two slots for the components that follow:
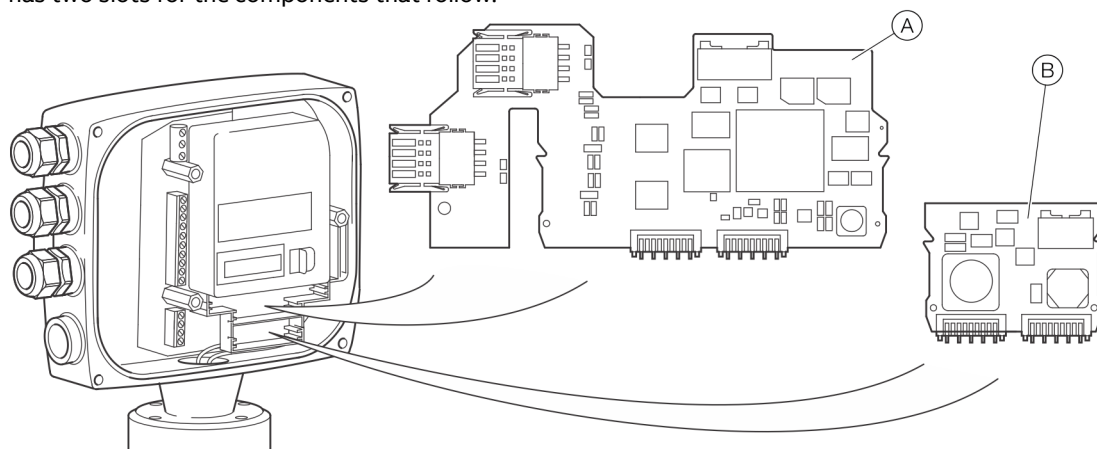
Ⓐ Ethernet card (part number 3KQZ400037U0100)   Ⓑ Power over Ethernet (PoE) card (part number 3KQZ400039U0100)

Figure 1:   Install the plug-in cards

Connect the retractable plug to the Ethernet card
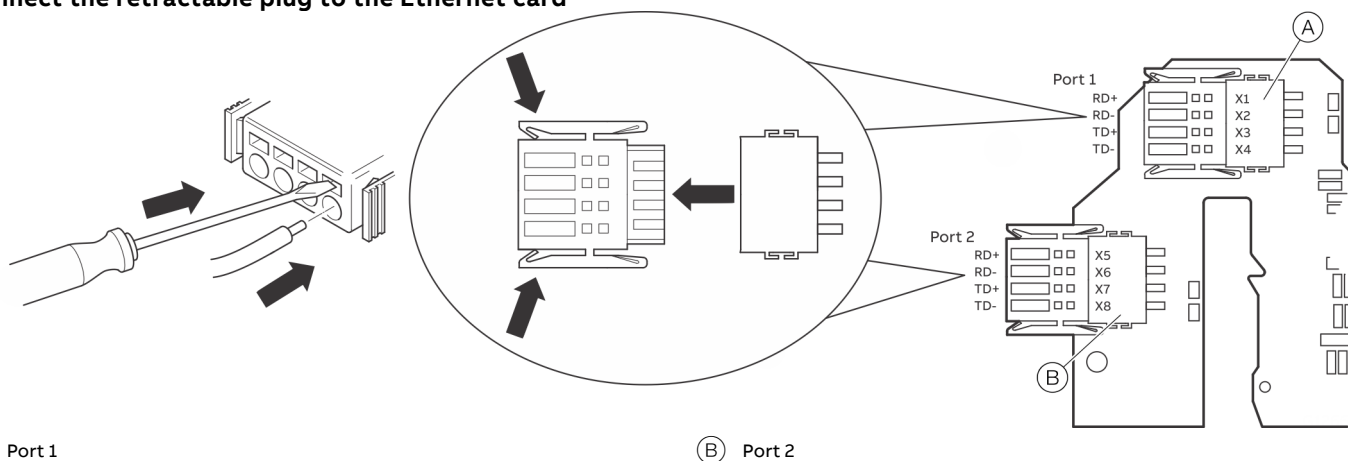
Ⓐ Port 1   Ⓑ Port 2

Figure 2:   Ethernet card connection

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:   Install the plug-in cards
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 supplies power through the Ethernet connection, so that an external 24 V DC power supply for the flowmeter is not required.
The PoE card 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:

Port/Pin	Version 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−

NOTICE

Damage to components due to incorrect connections
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−.

Preparing the EtherNet Cat5e cable
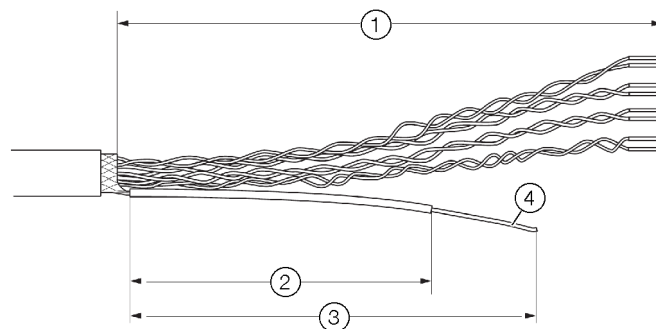
①	90 mm (3.54 in)	③	60 mm (2.36 in)
②	39 mm (1.54 in)	④	Tin 10 mm of the end of the braided shield of the cable

Figure 3:   Preparing the EtherNet Cat5e cable

Ground the Ethernet connection cable

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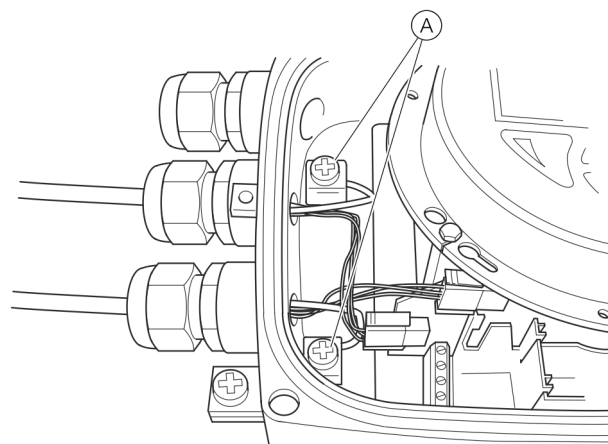
Ⓐ   Screw terminal

Figure 4:   Ground the Ethernet connection cable

… 3 Installation

M12 connector (optional)

A variety of options are available for the M12 connector through the model code:

- Flowmeter equipped with 1 × M12 (four-wire, connection to Port 1)
- Flowmeter equipped with 2 × M12 (four-wire, connection to Port 1 and 2)
- Flowmeter equipped with 1 × M12 (eight-wire, connection to Port 1 and 2)

These options enable connection to various network topologies:

Topology	Four-wire	Four-wire	Four-wire	Eight-wire
	1 x M12 (four-wire)	2 x M12 (four-wire)		1 x M12 (eight-wire)
Star	Y	Y		Y
Ring or daisy chain	N	Y		N
PoE	N	N		Y

Electrical connections

You can reference the internal wiring in the transmitter and the corresponding pin assignment in the M12 connector in the following table:

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

Use in Potentially Explosive Atmospheres

⚠ **WARNING**

There are limitations to the M12 connector in combination with an ATEX / IECEx / EAC-Ex approved flowmeter.

	No Ex area	ATEX/IECEx/ EAC-Ex Zone 2	Div 2
Ethernet cable connected directly to the terminals of the Ethernet plug-in card	Y	Y	Y
Ethernet cable connected to the M12 connector on the transmitter housing	Y	Y	N

Locking clip

⚠ **WARNING**

A locking clip must be attached when using the M12 connector in combination with an ATEX / IECEx / EAC-Ex approved flowmeter.

- Use or operation of the device without the M12 locking clip is not permitted.
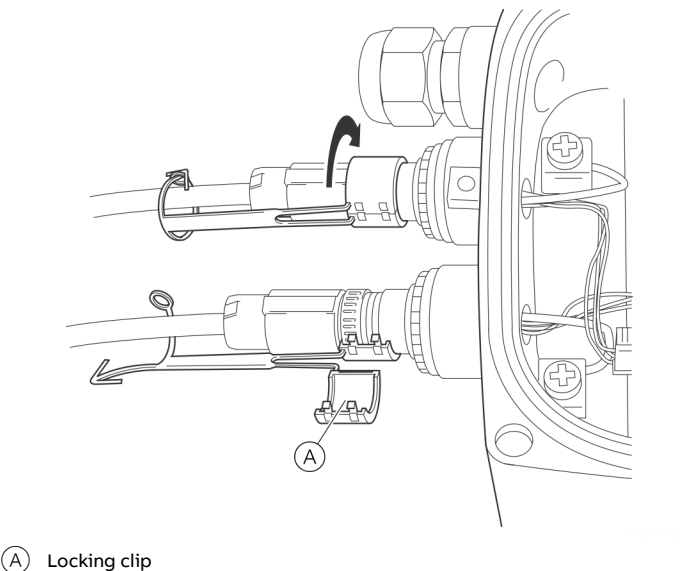
Ⓐ Locking clip

Figure 5:   Fastening the locking clip

⚠ **DANGER**

Explosion hazard

Explosion hazard caused by connecting or disconnecting the M12 connector when the device is in live state.

- Connect or disconnect the M12 connector only if the device is de-energized.

1. Remove the sealing cap of the M12 metal connector on the transmitter housing when delivered.
2. Connect the customer-provided M12 connector cable.
3. Place the enclosed locking clip around the M12 connector and close it until the locking clip engages, then secure the locking clip by closing the pin and pin boss.

... 3 Installation

RJ45 connector (optional)

A variety of options are available for the RJ45 connector through the model code: The RJ45 connector is equipped with an Ethernet cable of a specific length, depending on the model code.

The flowmeter is supplied with an Ethernet cable, which is connected to the terminals in the transmitter at the factory.
- Flowmeter equipped with 1 × RJ45 (four-wire, connection to Port 1)
- Flowmeter equipped with 2 × RJ45 (four-wire, connection to Port 1 and 2)
- Flowmeter equipped with 1 ×RJ45 (eight-wire, connection to Port 1 and 2)

These options enable connection to various network topologies:

Topology	Four-wire	Four-wire	Four-wire	Eight-wire
	1 x RJ45 (four-wire)	2 x M12 (four-wire)		1 x RJ45 (eight-wire)
Star	Y	Y		Y
Ring or daisy chain	N	Y		N
PoE	N	N		Y

Electrical connections

You can reference the in the transmitter and the corresponding pin assignment in the RJ45 connector in the following table:

Wiring inside the transmitter	Color	Ethernet plug-in card Port/pin
RJ45 four-wire	Yellow	Port 1 X1
	Orange	Port 1 X2
	White	Port 1 X3
	Blue	Port 1 X4
RJ45 eight-wire	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

Use in potentially explosive atmospheres

⚠ WARNING

There are limitations to the RJ45 connector in combination with an ATEX / IECEx / EAC-Ex approved flowmeter.

	No Ex area	ATEX/IECEx/EAC-Ex Zone 2	Div 2
Ethernet cable with RJ45 connector mounted to the transmitter housing	Y	Y	N

Wiring with different network topologies

Ⓐ Daisy-chain   Ⓒ Star
Ⓑ Ring
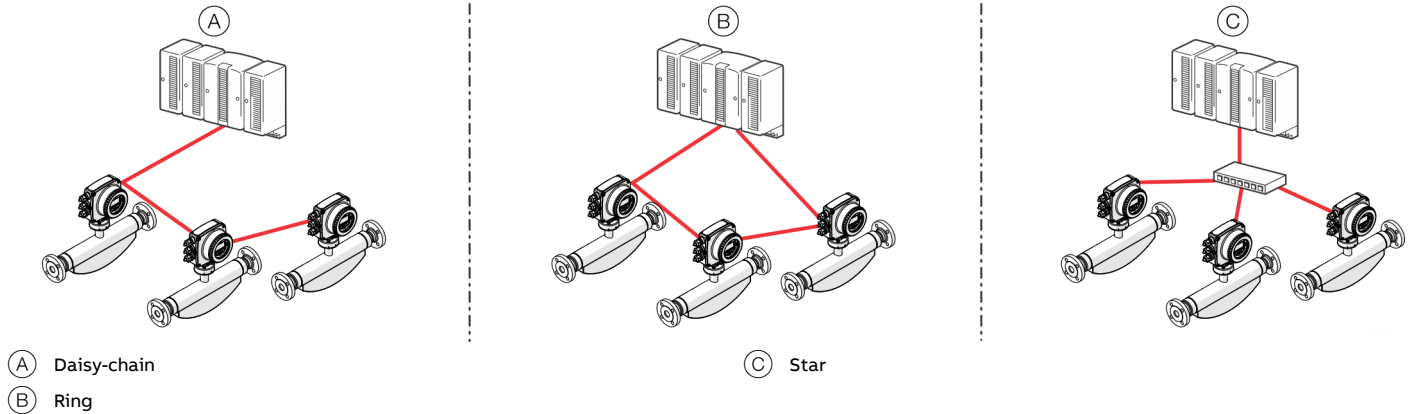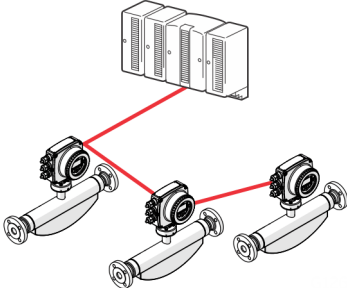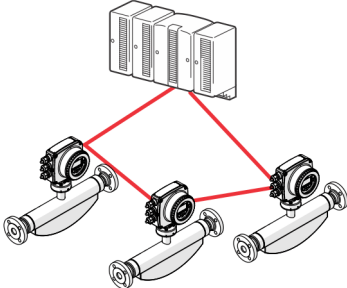
Figure 6: Connection topologies

Topology	No. Ethernet cables connected	No. wires in Ethernet cable	PoE	Port	Clamp	Function	Cable
Star	1	4	No	1	1	RD+	white / orange
					1	RD−	orange
					3	TD+	white / green
					4	TD−	green
	1	8	No	1	1	RD+	white / orange
					2	RD−	orange
					3	TD+	white / green
					4	TD−	green
				2	1	Spare 1+	white / blue
					2	Spare 1−	blue
					3	Spare 2+	white / brown
					4	Spare 2−	brown
	1	4	Yes	1	1	Recommendation:	
					2	Use cable with 8 wires	
					3		
					4		
	1	8	Yes	1	1	RD+	white / orange
					2	RD−	orange
					3	TD+	white / green
					4	TD−	green
				2	1	Spare 1+	white / blue
					2	Spare 1−	blue
					3	Spare 2+	white / brown
					4	Spare 2−	brown

... 3 Installation

... Wiring with different network topologies

Topology	No. Ethernet cables connected	No. wires in Ethernet cable	PoE	Port	Clamp	Function	Cable
Ring or daisy-chain	2	4*	No	1	1	RD+	white / orange
					2	RD−	orange
					3	TD+	white / green
					4	TD−	green
				2	1	RD+	white / orange
					2	RD−	orange
					3	TD+	white / green
					4	TD−	green

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

Ethernet card status LEDs

The 8 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'.

(A) Link port 1

(B) Activity 1

(C) Link port 2

(D) Activity 2

(E) Module Status (Mod)

(F) Network Status (Net)

(G) Card status indication on LCD indicator (example)
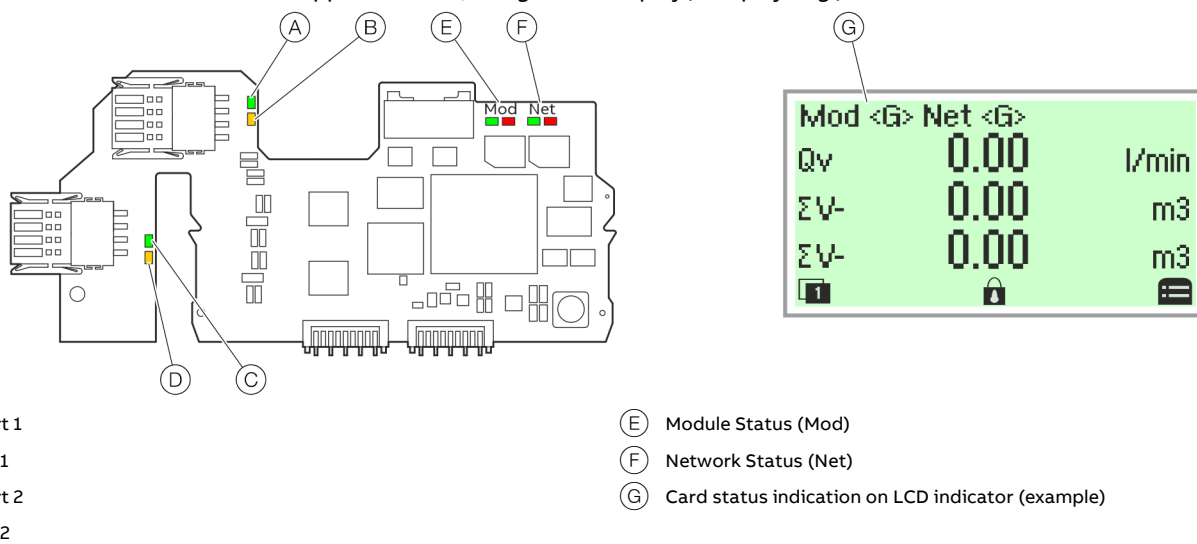
Figure 7:   Ethernet card status LEDs

EtherNet/IP™ communication

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 < >	A fixable configuration error. For example: an incorrect or incomplete configuration.
	red, ON	Mod showing <R> continously	Major Error. Non removable serious error, please contact service
	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 (1Hz)		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	Net showing < > contionusly	No supply voltage or IP Address.
	red, flashing (1 Hz)	Mod changing between <R> and < >	Connection timeout

... 3 Installation

... Ethernet card status LEDs

PROFINET® communication

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	PROFINET configuration complete
	green, Flashing (1 Hz)	Mod changing between <G> and < >	Blink Test (Profinet)
	green/ red, Flashing (1Hz)		Device performs "Power-On" Test
	red, Flashing (1 Hz)	Mod changing between <R> and < >	A fixable configuration error. For example: an incorrect or incomplete configuration.
	red, ON	Mod showing <R> continously	Major Error. Non removable serious error, please contact service
	OFF	Mod showing < > continously	Startup or Device is turned off. No supply voltage.
(F) Network-Status (Net)	green, ON	Net showing <R> continously	PLC connected
	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 (1Hz)		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	Net showing < > continously	No supply voltage or IP Adress. Device does not have IP Adress or is turned off.
	red, flashing (1 Hz)	Mod changing between <R> and < >	No PLC connection

4   Menu Structure in HMI

Parameter descriptions

Menu / parameter	Description
Communication / Ethernet	
...General	Selection of submenu '**...General**' via ▱.
...Internet layer	Selection of submenu '**...Internet layer**' via ▱.
...Webserver	Selection of submenu '**...Webserver**' via ▱.
...EtherNetIP	Selection of submenu '**...EtherNetIP**' via ▱.
...PROFINET	Selection of submenu '**PROFINET**' via ▱.
...ModbusTCP	Selection of submenu '**...ModbusTCP**' via ▱.
...Data link layer	Selection of submenu '**...Data link layer**' via ▱.
...Diagnostics	Selection of submenu '**...Diagnostics**' via ▱.

Menu / parameter	Description
Communication / ...General	
Base Protocol Stack	Displays the communications protocol for information purposes only.
	• Ethernet IP
	• PROFINET
EtherNetIP Flash	Sets the communications protocol to Ethernet/IP.
PROFINET Flash	Sets the communications protocol to PROFINET.

Menu / parameter	Description
Communication / ...Internet layer	
DHCP client	Factory setting: Enabled.
	If 'disabled-fixed IP' has been selected, the host IP address is 192.168.001.122 by default.
	• Enabled
	• disabled-fixed IP
	For PROFINET communication, the DHCP function (Dynamic Host Configuration Protocol) is not supported, the PROFINET DCP (Discovery and Configuration Protocol) is used instead.
Host IP address	Allows the IP address to be set. 192.168.001.122 is the factory setting, if the DHCP client is set to fixed IP.
Subnet mask	Factory setting: 255,255,255,000
Gateway IP address	Factory setting = 000.000.000.000
	If you are dealing with a part of a subnet, the first block of numbers should identical with the HOST IP - for example, 192.168.001.xxx.
NTPServer1 IP addr.	Factory setting: 000,000,000,000
NTPServer2 IP addr.	Factory setting: 000,000,000,000
Host name	Factory setting: ABB-Flow-EMF
Domain name	Factory setting: my-domain
DNS1 IP address	automatically set at DHCP = ON: 000,000,000,000
DNS2 IP address	

Menu / parameter	Description
Communication / ...Webserver	
Access	Factory setting: full
	• Disabled
	• read only
	• full
Reset credentials	Allows the reset of the web server password.
Session timeout	Time out period to close the web server session.
	Standard value: 30 minutes.
	Possible settings: Min.: 1 minute, Max. 99999 minutes.

… 4 Menu Structure in HMI

… Parameter descriptions

Menu / parameter	Description
Communication / EtherNetIP	
Access	Factory setting: full.
	Set to 'full' or 'read only' for Omron or Rockwell PLCs.
	• Disabled
	• read only
	• full
Device status	Mod**<G>** Net **<G>** P1
	• P1: Port 1 of the Ethernet card
	• Mod: Module status
	– Mod constantly shows **<G>** = device is ready for operation. Functioning correctly.
	– Mod switches between **<G>** and **< >** = Standby. Device not configured yet
	– Mod switches between **<R>** and **< >** = simple errors that can be eliminated
	– Mod constantly shows **<R>** = Serious error. Serious error that cannot be eliminated
	– Mod continuously shows **< >** = No power
	• Net: Network status.
	– Net continuously shows **<G>** = Connected. Device has at least one existing connection.
	– Net switches between **<G>** and < > = No connection.
	Device has not connections established, but has been assigned an IP address.
	– Net constantly shows **<R>** = Duplicated IP address.
	The device has determined that the device IP address is already in use.
	– Net constantly shows **< >** = No supply voltage or IP address.
	– Net switches between **<R>** and **< >** = Connection time out
Vendor ID	46
Product/Device type	43
Product name	CoriolisMaster FCB4/FCH4/FCD4
Product code	5002
Product major rev.	1
Product minor rev.	1

Menu / parameter	Description
Communication / PROFINET	
Access	Factory setting: full.
	Set to 'full' or 'read only' for Omron or Rockwell PLC.
	• Disabled
	• read only
	• full
Device status	Corresponds to the LEDs on the Ethernet plug-in card, see **Ethernet card status LEDs** on page 13.
Device Name	PROFINET station name (can only be written via PROFINET)
	40 x ASCI characters
Tag function	Can only be written via PROFINET (e.g. I&M1)
	32 x ASCI characters
Select Device Type	Selection of device profile
	• ABB 0x3436: Manufacturer-specific GSD (factory setting)
	• PA Profiles 0xB333: PNO Profile GSD
SNMP access	Activate / deactivate SNMP access.
	• Disabled
	• read only
	• full (Recommended for PROFINET)

Communication / …ModbusTCP	
Access	Factory setting: full.
	• Disabled
	• read only
	• full
IEEE Format	Factory setting: Enabled.
	• Enabled
	• disabled

Menu / parameter	Description
Communication / …Data link layer	
Chasis MAC address	Example: 00-24-59-11-00-69
P1 MAC address*	
P2 MAC address*	
P1 auto negotiation	• Enabled
	• disabled
P1 speed set	10 Mbit/s, 1000 Mbit/s, 1000 Mbit/s
P1 duplex set	• Half Duplex
	• Full Duplex
P1 speed status	Example: 100 MBits/s
P1 duplex status	Example: Full Duplex
P2 auto negotiation	• Enabled
	• disabled
P2 speed set	10 Mbit/s, 1000 Mbit/s, 1000 Mbit/s
P2 duplex set	• Half Duplex
	• Full Duplex
P2 speed status	Example: 100 MBits/s
P2 duplex status	Example: Full Duplex

Communication / 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

* If base PROFINET protocol selected.

Basic Setup

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:
3. Set 'Communication / Ethernet / …Internet layer / DHCP client' to 'Enabled'.
4. Make sure that the flowmeter IP address (host IP address) is set.
5. Set 'Communication / Ethernet / …Webserver / Access' to 'full'.
6. Set 'Communication / Ethernet / …EtherNetIP / Access' to 'full'.
7. Set 'Display / Display Tag' to 'Bus Address'.

5   Webserver for device configuration

Introduction

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' .
2. To assign the device address through the network, set 'DHCP client to 'Enabled'. Use this address to access the device through the webserver.
    –   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.
3. Use the Flowmeter HMI menu to go to 'Communication / …Ethernet / …Webserver / Access' .
4. Set 'Access' to 'full'.
5. Use the Flowmeter HMI menu to go to 'Communication / …Ethernet / …EtherNetIP / Access' .
6. 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 http://192.168.1.122.

Password protection

The default password is 'password'. The system will prompt you to set a new password.
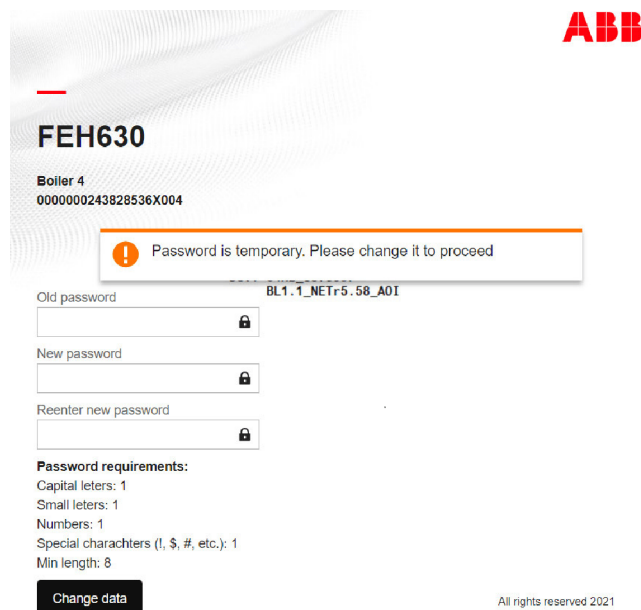
Figure 8:   Change data

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**'.
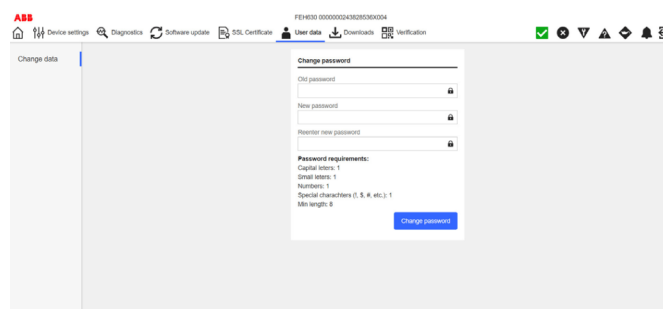
Figure 9:   Change password

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.

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.

… 5   Webserver for device configuration

Using the web server

The Ethernet card introduces access to the device via web browser.

1. To access the Flowmeter's webserver, enter the IP address (for example, https://192.168.1.122) in the web browser.
2. To access the webpage the user has to sign in. After signing in a session is started for a user. Each action made on webpage refreshes this session. If user is inactive the session will timeout which will result in signing out.
   - This inactivity timeout can be changed either in HMI menu 'Communication / …Ethernet / …Webserver / Session timeout' or via webpage 'Device settings / Communication / Ethernet / Webserver / Session timeout'. Default value: 30 min.

Note
The webpage can be used only by one user at a time. If other user will try to access webpage at this time, error message will be shown indicating that someone else is signed in.

Main page
This is the first page seen when accessing device via web browser.

The Main Page provides two main elements:
  - Device identification consisting of:
    – Device type
    – Sensor Location Tag
    – Calibration Certificate Number
    – IP address
    – Device host name
  - Sign in form, for more information about sign in process refer to .

Overview
This page focuses on process variables in the system presenting.

It is divided into the following four sections.

Overview / Datalogger
This Page presents the main process variables as numerical values, and line graphs.

Overview
The Line graph presents last 10 readout of main process variables. The values are updated each 5 seconds.
Hovering over dot in line graph shows exact value of variable. Switching visibility of variables is done by checking/unchecking checkbox next to variable name or by clicking variable name in graph legend.

Up to eight signals can be represented on the overview-page at the same time. The signals are selected from a drop-down list for each signal.

Datalogger
Further each signal can be logged.
The settings for datalogger are located on the bottom of the overview-page.
The user can set a sampling rate and choose which of the three reserved files should be used for datalogging. A logfile is limited to 1MB, so the sampling rate effects the maximum recording time. For a set sampling rate, a maximum recording time is calculated and represented next to the sampling rate setting.

The logging process can be started by clicking on the 'Start data logger' button. Running state of data logger is represented by a rotating gear wheel on the button. The Datalogger can be stopped either by the user clicking the button or automatically when the logfile exceeds a size of 1MB. While datalogger is running no settings can be made on the overview-page. Logfiles can be downloaded in the download section.

Observe
Presents all process variables on one page.

Totalizer
Presents totalized values which for improved readability are grouped.

Identification
Contains general information about the device itself.
It also provides link to product identification page.

Device settings
This page presents in a convenient way values available in HMI menu. The structure of this page is based on HMI menu but shows multiple values on one screen.
- The values are read from the device when user enters sub-page or tab in device settings page.
- After the value is updated, the content of active tab is refreshed.

The procedure of changing values depends on controller in which values is presented:
- Standard inputs – The value can be changed by clicking the controller and typing in new value. When controller is clicked, two buttons on right side of input are shown. One button applies changes and second button cancels making changes. After value is changed and apply button is clicked, new value is validated. If an invalid value was entered information below input will be shown with detailed information. If value was valid, this value will be updated on the device. Result of this update will be presented below the input.
- Drop down menus – The value can be changed by selecting new value from list available after clicking on the controller. When value is changed, update on the device will start. Result of this update will be presented below the drop down menu.
- Slider – presents a percentage value by displaying numerical value next to slider and graphical representation of slider. Changing value is possible by clicking on the dot on the slider and moving it left or right. After sliding move ends, update on the device is started. Result of this update will be presented below the slider.
- Buttons – represent available action. After clicking button, confirmation is needed to start action. After starting action result of starting it is presented below. Note: result shows if action was started correctly, not that it was completed correctly.

Software update
The Webserver provides an interface to perform firmware update of the Ethernet card.
This webpage shows information about currently loaded software and a form to load new software package.

Software update process
Software update process can be divided into stages:
1. Upload the new software package by selecting new software package in webpage form.
   - After the software package is uploaded the device validates the package and shows the validation result
   - If the package is valid, the firmware version from that package and the package checksum is shown. The Checksum is an SHA-256 checksum which can be used to check package integrity.
2. The option to upload the new software package or switch to the new software is available.
3. Switching to new software will start software update process. This can take couple of minutes to complete
4. Result of software update is presented

Note
While the software update is in progress the access to all protocols available via Ethernet card is not possible.

... 5   Webserver for device configuration

... Using the web server

Diagnostics
Ethernet card provides multiple diagnostics of the device and
Ethernet card itself.

Alarms
Shows all active alarms coming from the device.
These are the same alarms that can be seen in HMI Menu.

The alarm indications can be seen in top right of the page. The
Icons indicate if there is any alarm active in particular group.
Clicking these icons will navigate to this page.

There is one additional alarm that can be active which is not see
in HMI menu. This alarm indicates problems with connection
between Motherboard and Ethernet Card. If this alarm is active
process variables will not be updated and changing some
configuration options will not be possible.

Module alarms
Additionally to the device alarms, the Ethernet card has its own
alarms. These alarms show problems on Ethernet card itself.
Possible alarms are:
- Webserver certificate is near expiration
- Webserver certificate has expired

Audit Log
Audit log a CSV file containing events happening on Ethernet
card. The Page allows viewing last 30 events and an option to
download whole log.

There is a size limit and after audit log reaches its max size
oldest logs are overwritten. Note that the size limit is connected
to physical size of audit log, not to number of entries in audit
logs.

Audit log tracks following events:
- Changes in objects done via webserver
- Modbus TCP write functions
- Change in webserver SSL certificates
- User management:
  - Sign in
  - Entering wrong password
  - Password change
- Software update
  - Uploading package
  - Package verification result
  - Activation request
  - Update result
- Changing access type from protocols:
  Webserver, Modbus TCP
- Device reset
- MB diagnostics change – each time alarm is activated or
  cleared on MB, such event will be recorded

Counters
The Ethernet card tracks multiple performance counters which
can be viewed via webpage.

There are two ways to view counters:
- Active view – counters are updated each 10 seconds
  starting from signing in
- History view – shows values of counters in last 15 minutes
  with data aggregated in 1 minute time spans

The following counters are tracked on the device:
- Modbus TCP
  - Active connections - Number of currently active
    connections
  - Started connections - Total number of started
    connections
  - Rejected connections - New connection is rejected
    when max connections are reached and all active
    connections have ongoing transaction
  - Dropped connections - Connection is dropped when it
    is inactive, max active connections is reached and new
    connection is requested
  - Received transactions - Number of correctly received
    transactions
  - Rejected transactions - Transaction is rejected when
    device is busy and is not able to handle new
    transactions
  - Corrupted transactions - Transactions which had
    errors in MBAP header
  - Incomplete transactions - Transactions which had
    incorrect length
- Ethernet for each Port
  - RX bytes - Total number of bytes received
  - RX packets - Total number of packets received
  - TX bytes - Total number of bytes sent
  - TX packets - Total number of packets sent
  - Collisions - Total number of collisions. If this number
    is higher than 0 then most probably there is speed
    and/or duplex mismatch. In case half-duplex is
    selected manually collisions should be expected
  - Dropped - Total number of dropped packets. Packets
    are dropped if it was not possible to transmit that
    packet. This indicates that network is becoming
    congested
  - Error - Total number of errors. Errors happen due to:
    Electromagnetic interference near cables or network
    devices, Faulty cabling or Faulty hardware
  - Delayed

- TCP/IP
  - Opened sockets - Number of opened sockets on the device
  - Established - Total number of established connections
  - UDP RX packets - Total number of UDP datagrams received
  - UDP RX errors - Total number of UDP datagrams received with checksum errors
  - UDP TX packets - Total number of UDP datagrams sent
  - TCP RX packets - Total number of TCP segments received
  - TCP RX errors - Total number of TCP segments received with checksum errors
  - TCP TX packets - Total number of TCP segments sent
  - TCP TX retransmissions - Total number of TCP segments retransmitted. Retransmissions happen due to: Network congestion causing segments to be dropped, TCP segments arriving out of order, QoS settings in the network
    Less than 3% of retransmissions is not a problem
  - TCP out resets - Number of segments sent with the RESET flag on. If packets are not received by target then there are some problems on network. If packets are received by target then there might be a problem with application on the receiver side
  - TCP established resets - Number of connections that were reset. Usually connection is reset when connection on other side was closed, it received segment with unacceptable data or no process is listening on port to which connection was started

Time sync
To avoid an old timestamp on the device the device-time can be set manually by user. This is useful especially in case no NTP-server is accessible in network.

By clicking the button, the current system-time of user's device (PC, smartphone etc.) is taken and send to the device.

... 5 Webserver for device configuration

... Using the web server

SSL Certificate management
The Page enables viewing current SSL certificate used for the webserver access.

All certificates in chain are presented in a tree type structure. Each certificate is presented with: subject name, issuer name, serial number, valid from, valid till and type of certificate.

It is also possible to upload or generate new certificate for the device. For more information refer to .

User management
The Webserver supports only single account.
This webpage allows user to change the password.

Downloads
The webpage contains download links for files which are relevant to the device.

The following downloads are available:
- EDS file
- EDS collection file
- Device configuration file
- Data logging files
- GSDML file

Verification
Provides QR code which can be used in my Installed Base (myIB) application to perform device verification.

Device Parameter Upload
All device settings which can be done via webserver can be saved in a single configuration file. A configuration file for a device can be generated in the device parameter upload menu and then downloaded in the download section.

This is useful e.g., if user want to store current device-settings or to copy settings of device to another.

When uploading a configuration file, it is verified, the device type must match the type of device where it is uploaded. Therefore, for example, it is not possible to upload an electromagnetic flow meter configuration to a Coriolis.

The last activated configuration is represented on the left side of the menu page, the representation contains following information of the device where the configuration file was generated:
- Date of generation (system time of the device)
- Device type
- Meter size
- Sensor serial number
- Sensor location tag
- Transmitter location tag

After uploading a configuration file and a successful verification, above mentioned information also is represented for the uploaded configuration file.

When a configuration file is uploaded to the device, it can be activated by the user. If also ethernet settings should be written to the device, user must activate a checkbox. In this case connection will get lost, the webserver will not response and a reloading of the webpage is necessary.

Time handling
The Ethernet board needs time for Audit Log, Alarms and Counters. The Time is incremented based on device running time.

The Time is synchronized using two time sources.
- First one is SW build time.
- Second one is SNTP server time, which is synchronized each 30 seconds.

The SW built time is checked against current time on the device during system startup and if SW build time is newer, device time is updated. In case of SNTP, if valid time is provided by server, device time is updated.

6   Device to network

EtherNet/IP™ communication

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

Based on the device order the device is either shipped with DCHP active or with a default / or customer IP and hostname:

Configuration parameter	Default setting
IP-Address	192.168.1.122
Gateway	0.0.0.0
Subnet mask	255.255.255.0
Hostname for CoriolisMaster	ABB-Flow-Coriolis

Table 1:   Default Ethernet/IP settings

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'.

PROFINET® communication

You can configure the IP address and the PROFINET name of the device.

With PROFINET communication, the DHCP (Dynamic Host Configuration Protocol) function is not supported and PROFINET DCP (Discovery and Configuration Protocol) is used instead.

Based on the device order the device is either shipped with DCHP active or with a default / or customer IP and hostname:

Configuration parameter	Default setting
IP-Address	0.0.0.0
Gateway	0.0.0.0
Subnet mask	255.255.255.0
Hostname for CoriolisMaster	Empty string

Table 2:   Default PROFINET settings

The most important network parameter for the PROFINET network is the PROFINET name. This unique name is similar to the PROFIBUS-address. The following letters for PROFINET name are allowed: '0' to '9', 'a' to 'z' and '-' ('-' only inside string, not at begin, not at the end).

Network related parameters are accessible through the HMI menu.
- To check the PROFINET name, use the Flowmeter HMI menu to go to 'Communication / …Ethernet / PROFINET / Device Name'.
- To check the IP settings, use the Flowmeter HMI menu to go to 'Communication / …Ethernet / …Internet layer / Host IP address'.

7   Device profiles

Ethernet/IP™

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

The FCx4xx (CoriolisMaster) has the EtherNet/IP ProductCode '5001' and refer to the following EDS file:
        FCB4_FCH4_01_01.eds

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

PROFINET®

The PROFINET functionality corresponds to the PA Profile 4.02 Specification and supports Manufacturer specific features, described in the GSDML Files.

The FCx4xx (CoriolisMaster) refers to the following GSDML files:
- Manufacturer specific:
  GSDML-V2.42-ABB_001A-3436_FLOW_CORIOLIS-20230127.xml or later
- Profile specific:
  GSDML-V2.43-PA_Profile_V4.02-B333-FLOW_CORIOLIS-20220802.xml or later

Supported standards and protocols
- Common Industrial Protocol (CIP™) Vol 1, Ed 3.25
- Ethernet/IP Adaptation of CIP Vol2, Vol 2, Ed 1.23.
- PROFINET PNIO_Version V2.42 or later

8   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.

EtherNet/IP™ communication

Static (DHCP Client disabled)

For static IP addressing, the DHCP Client is disabled and the IP address is set ether 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 15)
- Open DHCP (www.dhcpserver.sourceforge.net)
- DHCP server from Windows server editions
- DHCP servers 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 data packet with its MAC address.
3. Double-click on the MAC address and enter the required IP address.
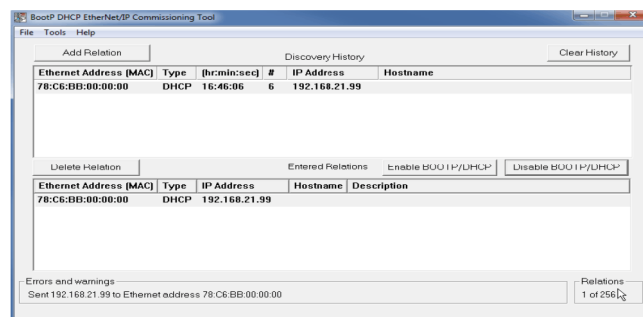
Figure 10:   BootP DHCP EtherNet/IP™ Commissioning Tool

… 8 Set the IP-Address and Local Host name

PROFINET® communication

IP address and PROFINET® name setting with DCP

The DCP (Discovery and configuration protocol) is used by PROFINET to determine PROFINET devices and to make basic settings.
- IP-Address
- Subnet Mask
- Device Name

Static IP address and PROFINET name setting with PRONETA

PRONETA BASIC is a tool from Siemens, which supports DCP for settings relevant Parameter of the PROFINET communication.

PRONETA Basic 3.5 Commissioning and Diagnostics Tool for PROFINET
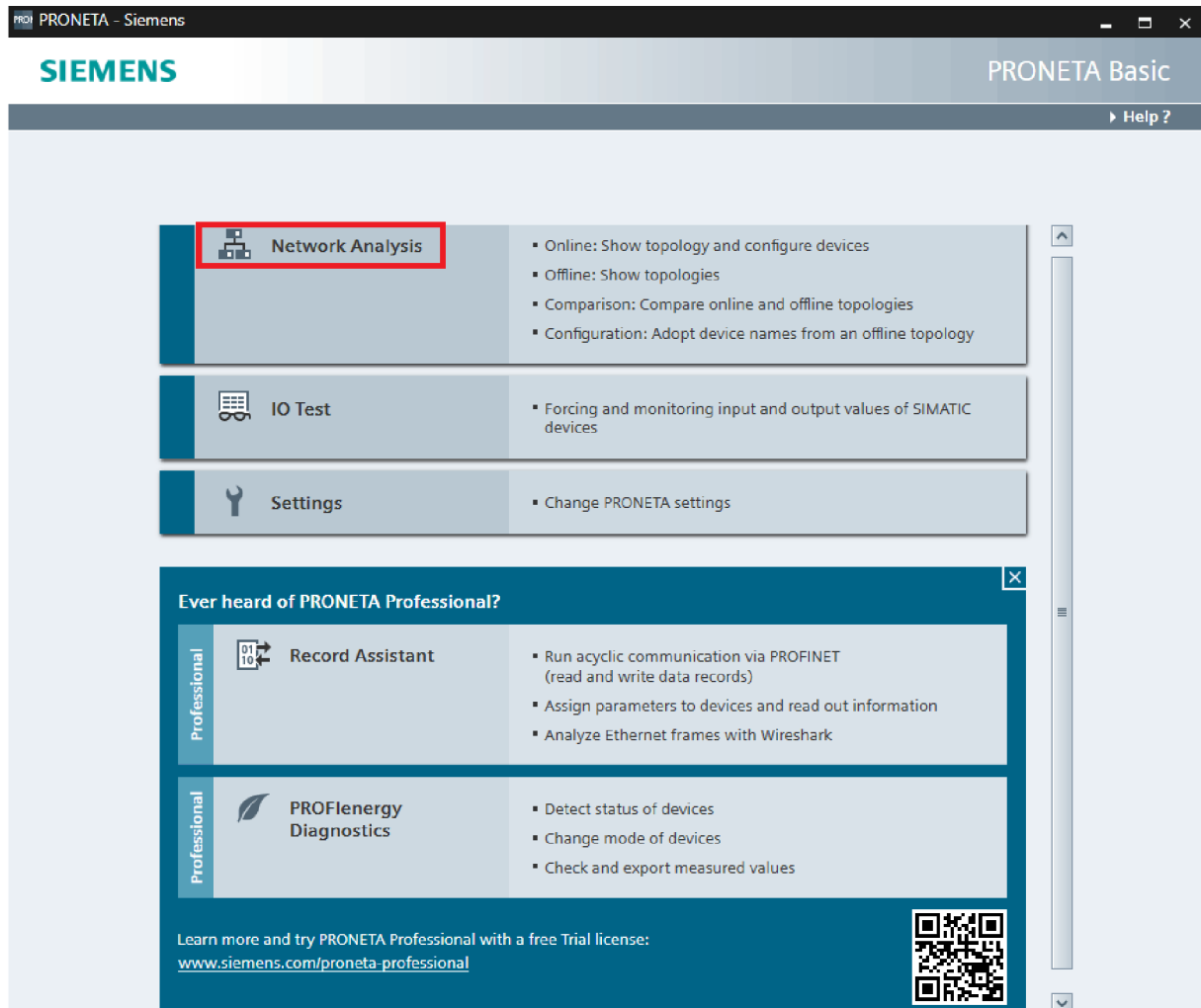
Figure 11:   Homescreen of PRONETA Basic

1. Select 'Network Analysis' on the Homescreen of PRONETA Basic.
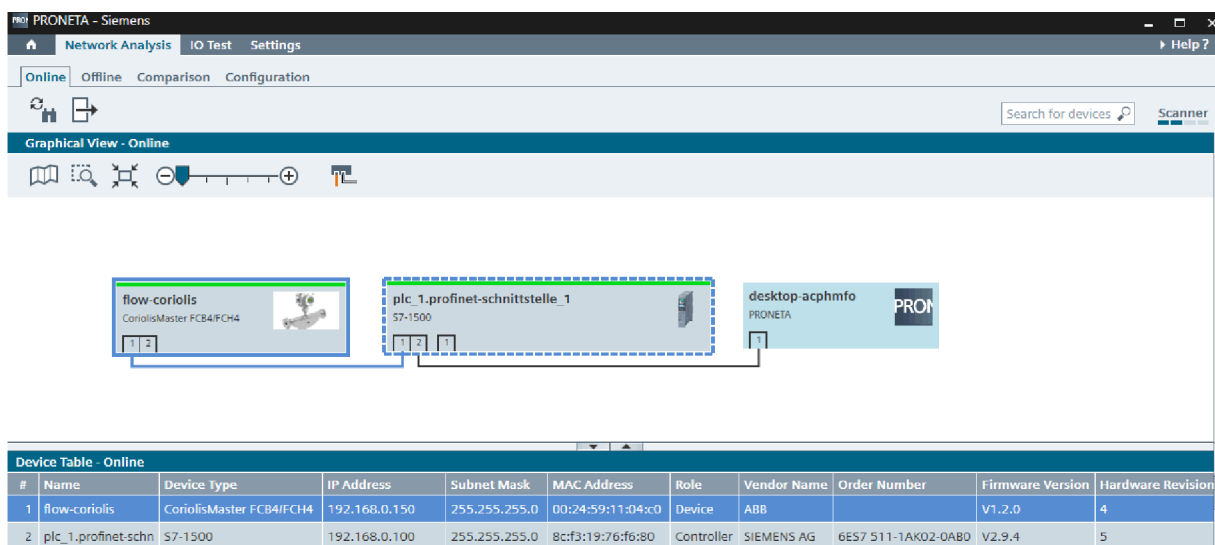
Figure 12:   Graphical online Network view of PRONETA Basic

2.   Change the device name if necessary.

3.   Change the IP adress if necessary.

4.   Change the subnet mask if necessary.

9 EtherNet/IP™ interface

Process Values Input Assemblies FCx4xx -> PLC

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 (Feature Flow)	104 (Feature Totalizer)	105 (Correction Values)	106 (All Process Inputs)
Volume_Flow	Totalizer_Qm_Fwd	Driver_Output	Net_Mass_Flow	Totalizer_Net_Qm_ Fwd	Pressure	Volume_Flow
Mass_Flow	Totalizer_Qm_Rev	Sensor_Signal_A	Net_Volume_Flow	Totalizer_Net_Qm_ Rev	Density	Volume_Flow_Ratio
Density	Totalizer_Qm_Diff	Sensor_Signal_B	Volume_Flow_at_ Tref	Totalizer_Net_Qm_ Diff	Pressure_Unit	Mass_Flow
Temperature	Totalizer_Qm_Sum	Tube_Frequency	Density_at_Tref	Totalizer_Net_Qm_ Sum	Density_Unit	Mass_Flow_Ratio
Volume_Flow_Unit	Totalizer_Qv_Fwd	Current_Output_ 31_32_Reading	Specific_Gravity	Totalizer_Net_Qv_ Fwd	Device_Status_ Summary	Density
Mass_Flow_Unit	Totalizer_Qv_Rev	Device_Status_ Summary	API_Gravity	Totalizer_Net_Qv_ Rev		Density_Ratio
Density_Unit	Totalizer_Qv_Diff		Concentration	Totalizer_Net_Qv_ Diff		Temperature
Temperature_Unit	Totalizer_Qv_Sum		Concentration_Percent	Totalizer_Net_Qv_ Sum		Temperature_Ratio
Device_Status_ Summary	Mass_Unit		Volume_Flow_Unit	Totalizer_at_Tref_Qv_ Fwd		Pressure
	Volume_Unit		Mass_Flow_Unit	Totalizer_at_Tref_ Qv_Rev		Driver_Output
	Device_Status_Summary		Density_Unit	Totalizer_at_Tref_ Qv_Diff		Sensor_Signal_A
			Temperature_Unit	Totalizer_at_Tref_ Qv_Sum		Sensor_Signal_B
			Concentration_Unit	Totalizer_Mass_Unit		Tube_Frequency
			Device_Status_ Summary	Totalizer_Volume_ Unit		Current_Output_31_32_ Reading
				Device_Status_ Summary		Totalizer_Qm_Fwd
						Totalizer_Qm_Rev
						Totalizer_Qm_Diff
						Totalizer_Qm_Sum
						Totalizer_Qv_Fwd
						Totalizer_Qv_Rev
						Totalizer_Qv_Diff
						Totalizer_Qv_Sum
						Net_Mass_Flow
						Net_Mass_Flow_ Ratio
						Net_Volume_Flow
						Net_Volume_Flow_ Ratio
						Volume_Flow_at_ Tref

100 (Flow)	101 (Totalizer)	102 (Diag Values)	103 (Feature Flow)	104 (Feature Totalizer)	105 (Correction Values)	106 (All Process Inputs)
						Volume_Flow_at_Tref_Ratio
						Density_at_Tref
						Density_at_Tref_Ratio
						Specific_Gravity
						API_Gravity
						Concentration
						Concentration_Ratio
						Concentration_Percent
						Totalizer_Net_Qm_Fwd
						Totalizer_Net_Qm_Rev
						Totalizer_Net_Qm_Diff
						Totalizer_Net_Qm_Sum
						Totalizer_Net_Qv_Fwd
						Totalizer_Net_Qv_Rev
						Totalizer_Net_Qv_Diff
						Totalizer_Net_Qv_Sum
						Totalizer_at_Tref_Qv_Fwd
						Totalizer_at_Tref_Qv_Rev
						Totalizer_at_Tref_Qv_Diff
						Totalizer_at_Tref_Qv_Sum
						Volume_Flow_Unit
						Mass_Flow_Unit
						Density_Unit
						Temperature_Unit
						Concentration_Unit
						Mass_Unit
						Volume_Unit
						Pressure_Unit
						Device_Status_Summary

Table 3:   **Process Values Input Assemblies FCx4xx -> PLC (T->O)**

... 9 EtherNet/IP™ interface

Device Status FCx4xx -> PLC

107 (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_cutted_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
Co3132Uco_curr_loop_readback_failure_3_4
DSP_Failure_on_Frontend_Board_3_5
Density_failure_3_6
Sensor_temperature_out_max_range_3_7
Sensor_temperature_measure_error_4_0
Sensor_amplitude_out_of_range_4_1
Sensor_driver_current_to_high_4_2
Density_too_lowEmpty_pipe_gas_4_3
Density_exceeds_minmax_limits_4_4
Medium_temp_exceeds_limits_4_5
Density_to_1_gcm3_4_6
Concentr_in_unit_exceeds_limits_4_7
Concentr_in_ratio_exceeds_limits_5_0
FEB_voltages_outside_max_range_5_1
Sensor_ampl_below_customer_limit_5_2

Table 4: Device Status FCx4xx -> PLC (T>O)

110 (Output)
Pressure_Correction_Level_Activation
Density_Fixed_Value_Activation
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
Pressure_Correction_Level
Density_Fixed_Value

Table 5: Output Assembly PLC->FCx4xx (O->T)

Assembly-Instances and Data Types

The following Assembly Instances are implemented:

Instance	Description	Attr . ID	Access	Bytes
100	Flow	3	Get	32
101	Totalizer	3	Get	44
102	Diag Values	3	Get	28
103	Feature Flow	3	Get	52
104	Feature Totalizer	3	Get	60
105	Correction Values	3	Put	20
106	All Inputs	3	Get	212
110	Full	3	Get	12

Table 6: 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
Density	REAL	Float	4	Read Only
Temperature	REAL	Float	4	Read Only
Volume_Flow_Unit	INT	Hex	2	Read Only
Mass_Flow_Unit	INT	Hex	2	Read Only
Density_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
Empty_Int	INT	HEX	2	Read Only

Table 7: Assembly / Instance 100, Flow

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

Table 8: Assembly / Instance 101, Totalizer

102 (Diag Values)	Data Type	Display	Bytes	Access
Driver_Output	REAL	Float	4	Read Only
Sensor_Signal_A	REAL	Float	4	Read Only
Sensor_Signal_B	REAL	Float	4	Read Only
Tube_Frequency	REAL	Float	4	Read Only
Current_Output_31_32_ Reading	REAL	Float	4	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	Hex	1	Read Only
Empty_Int	INT	HEX	2	Read Only

Table 9: Assembly / Instance 102, Diag Values

103 (Feature Flow)	Data Type	Display	Bytes	Access
Net_Mass_Flow	REAL	Float	4	Read Only
Net_Volume_Flow	REAL	Float	4	Read Only
Volume_Flow_at_Tref	REAL	Float	4	Read Only
Density_at_Tref	REAL	Float	4	Read Only
Specific_Gravity	REAL	Float	4	Read Only
API_Gravity	REAL	Float	4	Read Only
Concentration	REAL	Float	4	Read Only
Concentration_Percent	REAL	Float	4	Read Only
Volume_Flow_Unit	INT	Hex	2	Read Only
Mass_Flow_Unit	INT	Hex	2	Read Only
Density_Unit	INT	Hex	2	Read Only
Temperature_Unit	INT	Hex	2	Read Only
Concentration_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	HEX	1	Read Only

Table 10: Assembly / Instance 103, Feature Flow

104 (Feature Totalizer)	Data Type	Display	Bytes	Access
Totalizer_Net_Qm_Fwd	REAL	Float	4	Read Only
Totalizer_Net_Qm_Rev	REAL	Float	4	Read Only
Totalizer_Net_Qm_Diff	REAL	Float	4	Read Only
Totalizer_Net_Qm_Sum	REAL	Float	4	Read Only
Totalizer_Net_Qv_Fwd	REAL	Float	4	Read Only
Totalizer_Net_Qv_Rev	REAL	Float	4	Read Only
Totalizer_Net_Qv_Diff	REAL	Float	4	Read Only
Totalizer_Net_Qv_Sum	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Fwd	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Rev	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Diff	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Sum	REAL	Float	4	Read Only
Totalizer_Mass_Unit	INT	Hex	2	Read Only
Totalizer_Volume_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	Hex	1	Read Only
Empty_Int	INT	HEX	2	Read Only

Table 11: Assembly / Instance 104, Feature Totalizer

105 (Correction Values)	Data Type	Display	Bytes	Access
Pressure	REAL	Float	4	Read Only
Density	REAL	Float	4	Read Only
Pressure_Unit	INT	Hex	2	Read Only
Density_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	Hex	1	Read Only
Empty_Int	INT	HEX	2	Read Only

Table 12: Assembly / Instance 105, Correction Values

106 (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
Density	REAL	Float	4	Read Only
Density_Ratio	REAL	Float	4	Read Only
Temperature	REAL	Float	4	Read Only
Temperature_Ratio	REAL	Float	4	Read Only
Pressure	REAL	Float	4	Read Only
Driver_Output	REAL	Float	4	Read Only
Sensor_Signal_A	REAL	Float	4	Read Only
Sensor_Signal_B	REAL	Float	4	Read Only
Tube_Frequency	REAL	Float	4	Read Only
Current_Output_31_32_ Reading	REAL	Float	4	Read Only

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... Assembly-Instances and Data Types

106 (All Process Inputs)	Data Type	Display	Bytes	Access
Totalizer_Qm_Fwd	REAL	Float	4	Read Only
Totalizer_Qm_Rev	REAL	Float	4	Read Only
Totalizer_Qm_Diff	REAL	Float	4	Read Only
Totalizer_Qm_Sum	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_Qv_Sum	REAL	Float	4	Read Only
Net_Mass_Flow	REAL	Float	4	Read Only
Net_Mass_Flow_Ratio	REAL	Float	4	Read Only
Net_Volume_Flow	REAL	Float	4	Read Only
Net_Volume_Flow_Ratio	REAL	Float	4	Read Only
Volume_Flow_at_Tref	REAL	Float	4	Read Only
Volume_Flow_at_Tref_Ratio	REAL	Float	4	Read Only
Density_at_Tref	REAL	Float	4	Read Only
Density_at_Tref_Ratio	REAL	Float	4	Read Only
Specific_Gravity	REAL	Float	4	Read Only
API_Gravity	REAL	Float	4	Read Only
Concentration	REAL	Float	4	Read Only
Concentration_Ratio	REAL	Float	4	Read Only
Concentration_Percent	REAL	Float	4	Read Only
Totalizer_Net_Qm_Fwd	REAL	Float	4	Read Only
Totalizer_Net_Qm_Rev	REAL	Float	4	Read Only
Totalizer_Net_Qm_Diff	REAL	Float	4	Read Only
Totalizer_Net_Qm_Sum	REAL	Float	4	Read Only
Totalizer_Net_Qv_Fwd	REAL	Float	4	Read Only
Totalizer_Net_Qv_Rev	REAL	Float	4	Read Only
Totalizer_Net_Qv_Diff	REAL	Float	4	Read Only
Totalizer_Net_Qv_Sum	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Fwd	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Rev	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Diff	REAL	Float	4	Read Only
Totalizer_at_Tref_Qv_Sum	REAL	Float	4	Read Only
Volume_Flow_Unit	INT	Hex	2	Read Only
Mass_Flow_Unit	INT	Hex	2	Read Only
Density_Unit	INT	Hex	2	Read Only
Temperature_Unit	INT	Hex	2	Read Only
Concentration_Unit	INT	Hex	2	Read Only
Mass_Unit	INT	Hex	2	Read Only
Volume_Unit	INT	Hex	2	Read Only
Pressure_Unit	INT	Hex	2	Read Only
Device_Status_Summary	BYTE	Hex	1	Read Only
Empty_Byte	SINT	Hex	1	Read Only
Empty_Int	INT	HEX	2	Read Only

107 (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

Table 13:   Assembly / Instance 106, All Inputs

107 (Extended_Device_Status)	Data Type	Display	Bytes	Access
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
Co3132Uco_curr_loop_readback_failure_3_4	BOOL	Decimal		Read Only
DSP_Failure_on_Frontend_Board_3_5	BOOL	Decimal		Read Only
Density_failure_3_6	BOOL	Decimal		Read Only
Sensor_temperature_out_max_range_3_7	BOOL	Decimal	1	Read Only
Sensor_temperature_measure_error_4_0	BOOL	Decimal		Read Only
Sensor_amplitude_out_of_range_4_1	BOOL	Decimal		Read Only
Sensor_driver_current_to_high_4_2	BOOL	Decimal		Read Only
Density_too_lowEmpty_pipe_gas_4_3	BOOL	Decimal		Read Only
Density_exceeds_minmax_limits_4_4	BOOL	Decimal		Read Only
Medium_temp_exceeds_limits_4_5	BOOL	Decimal		Read Only
Density_to_1_gcm3_4_6	BOOL	Decimal		Read Only
Concentr_in_unit_exceeds_limits_4_7	BOOL	Decimal	1	Read Only
Concentr_in_ratio_exceeds_limits_5_0	BOOL	Decimal		Read Only
FEB_voltages_outside_max_range_5_1	BOOL	Decimal		Read Only
Sensor_ampl_below_customer_limit_5_2	BOOL	Decimal		Read Only
Reserved1_5_3	BOOL	Decimal		Read Only
Reserved2_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 14:   Assembly / Instance 107, Extended Device Status

Assembly 110 (Output)	Data Type	Display	Bytes	Access
Pressure_Correction_Level_Activation	BOOL	Hex		Read/Write
Density_Fixed_Value_Activation	BOOL	Hex		Read/Write
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	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
Pressure_Correction_Level	REAL	Float	4	Read/Write
Density_Fixed_Value	REAL	Float	4	Read/Write

Table 15:   Assembly / Instance 110, Output

... 9 EtherNet/IP™ interface

EtherNet/IP™ Alarms FCx4xx

Error messages of the FCx4xx are displayed 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.

In addition, this data type also includes a byte enumeration at the beginning which, in summary, includes the device status:
- 0x00: NO Alarm
- 0x01: Check Function Alarm
- 0x02: Off Specification Alarm
- 0x03: Maintenance Alarm
- 0x04: Failure Alarm.

For meanings of the alarms see operating instructions **OI/FCB400/FCH400/FCD400**.

107 (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

Table 16:   EtherNet/IP™ Alarms FCx4xx

107 (Extended_Device_Status)	Data Type	Display	Bytes	Access
Communication_card_not_responding_3_3	BOOL	Decimal		Read Only
Co3132Uco_curr_loop_readback_failure_3_4	BOOL	Decimal		Read Only
DSP_Failure_on_Frontend_Board_3_5	BOOL	Decimal		Read Only
Density_failure_3_6	BOOL	Decimal		Read Only
Sensor_temperature_out_max_range_3_7	BOOL	Decimal	1	Read Only
Sensor_temperature_measure_error_4_0	BOOL	Decimal		Read Only
Sensor_amplitude_out_of_range_4_1	BOOL	Decimal		Read Only
Sensor_driver_current_to_high_4_2	BOOL	Decimal		Read Only
Density_too_lowEmpty_pipe_gas_4_3	BOOL	Decimal		Read Only
Density_exceeds_minmax_limits_4_4	BOOL	Decimal		Read Only
Medium_temp_exceeds_limits_4_5	BOOL	Decimal		Read Only
Density_to_1_gcm3_4_6	BOOL	Decimal		Read Only
Concentr_in_unit_exceeds_limits_4_7	BOOL	Decimal	1	Read Only
Concentr_in_ratio_exceeds_limits_5_0	BOOL	Decimal		Read Only
FEB_voltages_outside_max_range_5_1	BOOL	Decimal		Read Only
Sensor_ampl_below_customer_limit_5_2	BOOL	Decimal		Read Only
Reserved1_5_3	BOOL	Decimal		Read Only
Reserved2_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 16:   EtherNet/IP™ Alarms FCx4xx

10 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 17: **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 18: **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 19: **Reset**

Service Code	Service Name
0x0E	GAS

Table 20: **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
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 21: **Instance attributes**

Bit(s)	Description
0-3	Not supported (= 0)
4-6	Extended Device Status (Refer to **Table 23**)
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	0

Table 22: **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 23: **Description of Bits 4 to 7 for Attribute 5**

[Message Router] 0x02

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 24:   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	Get	UINT
	class attributes		
7	maximum ID number	Get	UINT
	instance attributes		

Table 25:   Class attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 26:   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 27:   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 28:   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
0	number of attributes	0	UINT
0	optional attributes	0	ARRAY of UINT
6	Maximum ID Number	Get	UINT
	Class Attributes		
7	Maximum ID Number	Get	UINT
	Instance Attributes		

Table 29:   Class-Attributes

Service Code	Service Name
0x0E	GAS
0x10	SAS

Table 30:   Instance-Services

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

Table 31:   Instance-Atributes

... 10 EtherNet/IP™ interface details

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[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 32: 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 33: 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 34: 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 35: Instance-Attributes

[File] 0x37

Service Code	Service Name
0x0E	GAS

Table 36: Class-Services

Attr 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 37: Class-Attributes

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

Table 38: 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 39: 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 40:   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 41:   Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 42:   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 of:
12	Capability Flags	Get	DWORD

Table 43:   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 QoSrelated 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 44:   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 45:   Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	SAS

Table 46:   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 47:   Instance-Attributes

... 10 EtherNet/IP™ interface details

... EtherNet/IP™ Alarms FCx4xx

[Port] 0x55

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 48:   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 49:   Class-Attributes

Service Code	Service Name
0x0E	GAS
0x01	GAA

Table 50:   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 51:   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 52:   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 53:   Class-Attributes

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

Table 54:   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 55:   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 56:   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 57:   Class-Attributes

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

Table 58:   Instance-Services

... 10 EtherNet/IP™ interface details

... EtherNet/IP™ Alarms FCx4xx

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:	
	In Octets	0	UDINT	
	In Ucast Packets	0	UDINT	
	In NUcast Packets	0	UDINT	
	In Discards	0	UDINT	
	In Errors	0	UDINT	
	In Unknown Protos	0	UDINT	
	Out Octets	0	UDINT	
	Out Ucast Packets	0	UDINT	
	Out NUcast Packets	0	UDINT	
	Out Discards	0	UDINT	
	Out Errors	0	UDINT	
5	Media Counters	Get	STRUCT of:	
	Alignment Errors	0	UDINT	
	FCS Errors	0	UDINT	
	Single Collisions	0	UDINT	
	Multiple Collisions	0	UDINT	
	SQE Test Errors	0	UDINT	
	Deferred Transmissions	0	UDINT	
	Late Collisions	0	UDINT	
	Excessive Collisions	0	UDINT	
	MAC Transmit Errors	0	UDINT	
	Carrier Sense Errors	0	UDINT	
	Frame Too Long	0	UDINT	
	MAC Receive Errors	0	UDINT	
6	Interface Control	Get/Set	STRUCT of:	
	Control Bits	0	WORD	
	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:	
	Capability Bits	0	DWORD	
	Speed/Duplex Options	0	STRUCT of:	
	USINT	0	Speed/Duplex Array Count	
	ARRAY of STRUCT of:	0	Speed/Duplex Array	
	UINT	0	Interface Speed	
	USINT	0	Interface Duplex Mode	
14	Ethernet Errors	Get	UDINT	
15	Link_Down Counter	Get	UDINT	

Table 59:   Instance-Attributes

11 PROFINET interface

Introduction

The main purpose of the PROFINET Interface is the cyclic interaction with an PLC.
Part of this interface is the communication of device relevant process values like volume or mass flow, support of device diagnosis & alarm management and support of the start-up parameters.

Device Profile / GSDML file

The cyclic and acyclic device capabilities within a PROFINET Network are clearly described by so called GSDML file – used as device integration to the PLC.

Interface description

PROFINET IO device model

Manufacturer specific extension of Coriolis Mass flow meter according PA Profile 4.02MU1: Profile Ident Nr. 0x3436					
Coriolis Mass flow meter according PA Profile 4.02MU1: Profile Ident Nr. 0xB333		Subslot 1	Subslot 2	Subslot 3	Subslot 4
Slot 0	Module Physical	DAP Submodule	Device Management	Physical Block	Transducer Block
Slot 1	Module FB-Cyclic	Analog Input Mass Flow			
Slot 2	Module FB-Cyclic	Analog Input Density			
Slot 3	Module FB-Cyclic	Analog Input Temperature			
Slot 4	Module FB-Cyclic	Totalizer Mass / Totalizer + Setpoint Mass			
Slot 5	Module FB-Cyclic	Analog Input INPUT_SELECTOR	Default: Volume Flow		
Slot 6	Module FB-Cyclic	Analog Input INPUT_SELECTOR	Default: Driver Output		
Slot 7	Module FB-Cyclic	Analog Input INPUT_SELECTOR	Default: Tube Frequency		
Slot 8	Module FB-Cyclic	Analog Input INPUT_SELECTOR	Default: Totalizer QM FWD		
Slot 9	Module FB-Cyclic	Analog Output Pressure			

... 11 PROFINET interface

... Interface description

PROFINET characteristics of the CoriolisMaster FCB4/FCH4/FCD4 according to the GSDML file
Overview

Item	Value (Manufacturer GSDML File)	Value (Profile specific GSDML File)
Vendor	ABB	Profile for Process Control Devices
Vendor ID	0x001A	0xF100
Main family	Sensors	PA Profiles
Product family	CoriolisMaster FCB4/FCH4/FCD4	Flow
Device ID	0x3436	0xB333
Information	Flow Coriolis: CoriolisMaster	Coriolis

Device Access Point(s)

Item	Value (Manufacturer GSDML File)	Value (Profile specific GSDML File)
PNIO Version	V2.42	V2.43
Information	ABB Flow Coriolis	PA 4.02 Profile Flow Coriolis

Device Access Points - Certification Info (selection):

Item	Value (Manufacturer GSDML File)	Value (Profile specific GSDML File)
Conformance Class	B	B
Application Class	ProcessAutomation	ProcessAutomation
Netload Class	III	II
Physical Slots	0…9	0…4
Fixed in Slots	0	0
Physical Subslots	32769…32770	32769…32770
Auto Configuration Supported	NO	NO
Supports Multiple Write	YES	YES
CiR Supported	YES	YES

Interface Info (selection): Manufacturer GSDML File and Profile specific GSDML File

Item	Value
Supports Realtime Class	Class 1
Supports Realtime Classes	RT_Class_1
Supports Isochronus Mode	No
Supported Protocols	SNMP, LLDP
Supported Service Protocols	CLRPC
Number of Application Relationships	2
Supported Role	Client
System redundancy supported	S2

Physical Startup Parameter Settings
(Index 24616 @ Manufacturer GSDML File, length 38 Byte)

Field Name	Data Type	Byte Offset	Default Value	Changeable	Visible
Startup settings	Unsigned8	0	0 (None applied)	yes	yes
Device tag	VisibleString[32]	1		yes	yes
Language	VisibleString[2]	33	en	yes	yes
Alarm delay	Unsigned16	35	0 (NO)	yes	yes
Parameter change acknowledge mode	Unsigned8	37	1 (Manual acknowledge)	yes	yes

Transducer Block

Item	Value
Information	Coriolis Transducer Block
Fixed in Slots	4
Assigned to API	0 @ Manufacturer GSDML File
	38656 @ Profile specific GSDML File
Supports PROFISave Profile	NO
Supports PROFISave PIR	false
I&M 5 Supported	NO

Flow Parameter	(Manufacturer GSDML File)					
Field Name	**Data Type**	**Byte Offset**	**Default Value**	**Allowed Values**	**Changeable**	**Visible**
Flow Unit	Unsigned16	0	1322:kg/s	1322 1330 1318 1319 1320 1321 1323 1324 1325 1327 1328 1329 1331 1332 1333 1521	yes	yes
Low flow cut off	Float32	6	0		yes	yes
Flow direction	Unsigned8	10	0:Forward		yes	yes

Density Parameter	(Manufacturer GSDML File)					
Field Name	**Data Type**	**Byte Offset**	**Default Value**	**Allowed Values**	**Changeable**	**Visible**
Density Unit	Unsigned16	2	1103:kg/l	1103 1107 1097 1100 1104 1105 1108 1114 1523	yes	yes

... 11 PROFINET interface

... Interface description

Temperature Parameter	(Manufacturer GSDML File)					
Field Name	**Data Type**	**Byte Offset**	**Default Value**	**Allowed Values**	**Changeable**	**Visible**
Temperature Unit	Unsigned16	4	1001:°C	1000 1001 1002 1524	yes	yes

Pressure Parameter	(Only Manufacturer GSDML File)					
Field Name	**Data Type**	**Byte Offset**	**Default Value**	**Allowed Values**	**Changeable**	**Visible**
Pressure Unit	Unsigned16	11	1137:bar	1130 1133 1137 1138 1141	yes	yes

Module : Massflow

Item	Value
Information	Function Block providing process value and status
Fixed in Subslots	1
Assigned to API	0 @Manufacturer GSDML File
Supports PROFISave Profile	NO
Supports PROFISave PIR	false
I&M 5 Supported	NO

Cyclic Input Data	
Name	**Data Type**
Mass flow + status	Float32+ Unsigned8

Startup parameters
(Index 24592 @ Manufacturer GSDML File, length 4 Byte)

Name	Data Type	Byte Offset	Default Value	Allowed Values	Changeable	Visible
Damping	Float32	0	1.0		yes	yes

Module : Density

Item	Value
Information	Function Block providing process value and status
Fixed in Subslots	1
Assigned to API	0 @Manufacturer GSDML File
Supports PROFISave Profile	NO
Supports PROFISave PIR	false
I&M 5 Supported	NO

Cyclic Input Data	
Name	**Data Type**
Density + status	Float32 + Unsigned8

Startup parameters
(Index 24592 @Manufacturer GSDML File, length 4 Byte)

Name	Data Type	Byte Offset	Default Value	Allowed Values	Changeable	Visible
Damping	Float32	0	1.0		yes	yes

Module: Temperature

Item	Value
Information	Function Block providing process value and status
Fixed in Subslots	1
Assigned to API	0 @Manufacturer GSDML File
Supports PROFISave Profile	NO
Supports PROFISave PIR	NO
I&M 5 Supported	NO

Cyclic Input Data	
Name	**Data Type**
Density + status	Float32 + Unsigned8

Startup parameters
(Index 24592 @Manufacturer GSDML File, length 4 Byte)

Name	Data Type	Byte Offset	Default Value	Allowed Values	Changeable	Visible
Damping	Float32	0	0.0		yes	yes

... 11 PROFINET interface

... Interface description

Modules : Mass & Mass + totalizer control

Item	Value
Information	Function Block providing process value and status
Fixed in Subslots	1
Assigned to API	0 @Manufacturer GSDML File
Supports PROFISave Profile	NO
Supports PROFISave PIR	false
I&M 5 Supported	NO

Cyclic Input Data	
Name	**Data Type**
Mass + status	Float32 + Unsigned8

Cyclic Output Data	
Name	
Mass + status	Float32 + Unsigned8

Startup parameters
(Index 24596 @ Manufacturer GSDML File length 9 Byte)

Name	Data Type	Byte Offset	Default Value	Allowed Values	Changeable	Visible
Unit	Unsigned16	0	1088:kg	Manufacturer GSDML File: 1088 1092 1094 1089 1525 Profile specific GSDML File: 1088 1092 1094	yes	yes
Totalizer operation mode	Unsigned8	2	1:Forward		yes	yes
Totalizer failure behavior	Unsigned8	3	0:Continue		yes	yes
Preset value	Float32	4	0.0		yes	yes
Assign process variable	Unsigned8	8	0:Mass		No	No

Modules: Flexible Inputs (Only Manufacturer GSDML File)

Item	Value
Information	Function Block providing process value and status
Fixed in Subslots	1
Assigned to API	0
Supports PROFISave Profile	NO
Supports PROFISave PIR	false
I&M 5 Supported	NO

Cyclic Input Data	
Name	**Data Type**
value + status	Float32+
	Unsigned8

Startup parameters

Name	Data Type	Byte Offset	Default Value	Allowed Values	Changeable	Visible
Input selector	Unsigned16	0	1:TB1	1	No	No
Input Selector Measurement Value	Unsigned16	2	Flex. Input 1: 0:Volume1,2, 3,…43 Flex. Input 2: 6:Sensor Driver Output[mA] Flex. Input 3: 9:Tube Frequency[Hz] Flex. Input 4: 24:Mass Forward		yes	yes
Damping	Float32	4	0.0		yes	yes

... 11 PROFINET interface

... Interface description

Module: Pressure Output (Only Manufacturer GSDML File)

Item	Value
Information	Function Block providing process value and status
Fixed in Subslots	1
Assigned to API	0
Supports PROFISave Profile	NO
Supports PROFISave PIR	false
I&M 5 Supported	NO

Cyclic Output Data	
Name	**Data Type**
value + status	Float32+
	Unsigned8

Startup parameters

Name	Data Type	Byte Offset	Default Value	Allowed Values	Changeable	Visible
Failure delay [s]	Float32	0	1.0		yes	yes
Failure action after failure delay	Unsigned8	4	2: Actual Process value (status bad)	0, 1, 2	yes	yes
Substitution value	Float32	5	0.0		yes	yes
Pressure unit	Unsigned16	9	1137 (bar)	1130 1133 1137 1138 1141	yes	yes

Annex of allowed values for the modules/names/parameters for the Manufacturer GSDML file

Available Units		Input Selector Measurement	

Value	Description	Value	Description
1000	K	0	Volume Flow
1001	°C	1	Mass Flow [% of range]
1002	°F	2	Volume Flow [% of range]
1524	temperature	3	Density [% of range]
1103	kg/l	4	Temperature [% of range]
1107	lb/ft³	5	Pressure
1097	kg/m³	6	Sensor Driver Output [mA]
1100	g/cm³	7	Sensor Signal A [mV]
1104	g/ml	8	Sensor Signal B [mV]
1105	g/l	9	Tube Frequency [Hz]
1108	lb/gal	10	Current Output 31/32 [mA]
1114	SGU	11	Net Mass Flow
1523	mass/volume	12	Net Mass Flow [% of range]
1322	kg/s	13	Net Volume Flow
1330	lb/s	14	Net Volume Flow [% of range]
1318	g/s	15	Volume Flow @Tref
1319	g/min	16	Volume Flow @Tref [% of range]
1320	g/h	17	Density @Tref
1321	g/d	18	Density @Tref [% of range]
1323	kg/min	19	Specific Gravity
1324	kg/h	20	°API Gravity
1325	kg/d	21	Concentration
1327	t/min	22	Concentration scaled [% of range]
1328	t/h	23	Concentration [%]
1329	t/d	24	Mass Forward
1331	lb/min	25	Mass Reverse
1332	lb/h	26	Mass Diff
1333	lb/d	27	Mass Sum
1521	mass/time	28	Volume Forward
1088	kg	29	Volume Reverse
1092	t	30	Volume Diff
1094	lb	31	Volume Sum
1089	g	32	Net Mass Forward
1525	mass	33	Net Mass Reverse
1130	Pa	34	Net Mass Diff
1133	kPa	35	Net Mass Sum
1137	bar	36	Net Volume Forward
1138	mbar	37	Net Volume Reverse
1141	psi	38	Net Volume Diff
		39	Net Volume Sum
		40	Volume @Tref Forward
		41	Volume @Tref Reverse
		42	Volume @Tref Diff
		43	Volume @Tref Sum

Table 60:   Available Units

... 11 PROFINET interface

... Interface description

Flow direction

Value	Description
0	Forward
1	Reverse

Table 61:   Flow direction

Totalizer Operation mode

Value	Description
0	Diff
1	Forward
2	Reverse

Table 62:   Totalizer Operation mode

Totalizer failure behavior

Value	Description
0	Continue
1	Hold
2	Last valid value + continue

Table 63:   Totalizer failure behavior

Startup Parameter (Physical Block)

Value	Description
0	None applied
1	Only units applied
2	All applied
4	Only units and device tag applied

Table 64:   Startup Parameter (Physical Block)

Update Event Mode (Physical Block)

Value	Description
0	Auto acknowledge
1	Manual acknowledge

Table 65:   Update Event Mode (Physical Block)

Pressure Output: Failure action after failure delay

Value	Description
0	Substitution value (status uncertain)
1	Last valid Process value (status uncertain)
2	Actual Process value (status bad)

Table 66:   Pressure Output: Failure action after failure delay

Annex of allowed values for the modules/names/parameters for the profile specific GSDML file

Available Units

Value	Description
1000	K
1001	°C
1002	°F
1103	kg/l
1107	lb/ft³
1097	kg/m³
1322	kg/s
1330	lb/s
1088	kg
1092	t
1094	lb

Table 67:   Available Units

Flow direction

Value	Description
0	Forward
1	Reverse

Table 68:   Flow direction

Totalizer Operation mode

Value	Description
0	Diff
1	Forward
2	Reverse

Table 69:   Totalizer Operation mode

Totalizer failure behavior

Value	Description
0	Continue
1	Hold
2	Last valid value + continue

Table 70:   Totalizer failure behavior

Startup Parameter (Physical Block)

Value	Description
0	None applied
1	Only units applied
2	All applied

Table 71:   Startup Parameter (Physical Block)

Update Event Mode (Physical Block)

Value	Description
0	Auto acknowledge
1	Manual acknowledge

Table 72:   Update Event Mode (Physical Block)

... 11 PROFINET interface

... Interface description

Annex overview channel diagnosis

Number (only manufacturer specific GSDML)	Description
4096	Mass flowrate exceeds limits
4097	Flow rate exceeds limits
4098	Simulation is on. Simulating process/output Value
4099	Flowrate to zero
4100	Maintenance interval is reached
4101	All totalizer stopp
4102	Totalizer reset. Reset of one or more Totalizers
4103	Display value is in <1600h at Qmax
4104	Device is not calibrated
4105	Sensor memory defective
4106	NV data defect
4107	No Frontend Board detected
4108	Frontend Board communication error
4109	Incompatible Frontend Board
4110	NV chips defect on Motherboard
4111	Pulse output is cut off
4112	Current Output 31/32 is saturated
4113	Current Output V1/V2, V3/V4 saturated
4114	Current Output 31/32 communication error
4115	Option Card 1 communication error
4116	Option Card 2 communication error
4117	Safety Alarm Current Output 31/32
4118	Current Output 31/32 not calibrated
4119	Current Output V1/V2 not calibrated
4120	Current Output V3/V4 not calibrated
4121	Motherboard voltages outside range
4122	An alarm is simulated
4123	Communication card is not responding
4124	CO31/32 readback current deviates
4125	DSP Failure on Frontend Board
4126	Density failure
4127	Sensor temperature is out of range
4128	Sensor temperature measure error
4129	Sensor amplitude error
4130	Sensor driver current too high
4131	Density too low. Empty pipe. Gas bubbles in pipe
4132	Density exceeds min/max limits
4133	Medium temperature exceeds limits
4134	Density to 1 g/cm^2
4135	Concentration in unit exceeds limits
4136	Concentration in percent exceeds limits
4137	Frontend Board voltages outside range
4138	Sensor amplitude out of range

Number (manufacturer specific GSDML)	Number (Profile specific GSDML)	Description
16	16	CI_pnetParameterFault
16384	36864	Sensor element exciter faulty
16385	36865	Error in evaluation electronics
16386	36866	Error in internal energy supply
16387	36867	Error in sensor element
16388	36868	Error in actuator element
16389	36869	Faulty install at e.g. dead space
16390	36870	Parameter setting error
16392	36872	Overloading
16393	36873	Wrong polarity of aux power
16394	36874	Maximum line length exceeded
16395	36875	Corrosion /abrasion by medium
16396	36876	Fouling on sensor element
16397	36877	Auxil medium missing or insuffic
16398	36878	Wear reserve used up (operation)
16399	36879	Wear reserve used up (wear)
16400	36880	Error in peripherals
16401	36881	Electromag interference too high
16402	36882	Temperature of medium too high
16403	36883	Ambient temperature too high
16404	36884	Vibration/Impact load too high
16405	36885	Auxiliary power range off-spec
16406	36886	Auxiliary medium missing
16407	36887	Excessive temperature shock
16408	36888	Deviation from measurement
16409	36889	Humidity in electronics area
16410	36890	Medium in electronics area
16411	36891	Mechanical damage
16412	36892	Communication error
16413	36893	Foreign material in electro area
16632	37112	Gas bubbles in the liquid
16633	37113	Fouling, clogging
16634	37114	Erosion, corrosion
16635	37115	Faulty mounting
16636	37116	Asymmetry of measuring tubes
16637	37117	External vibrations
16638	37118	Pulsating flow
16639	37119	Incomplete filling
17101	37581	DIA_MAINTENANCE
17104	37584	DIA_MAINTENANCE_ALARM
17105	37585	DIA_MAINTENANCE_DEMANDED
17106	37586	DIA_FUNCTION_CHECK
17107	37587	DIA_OUT_OF_SPEC
17108	37588	DIA_UPDATE_EVENT

12 EtherNet/IP™ and PROFINET®

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	PROFINET
Massflow units	gram per second	g/s	1437	1318
	gram per minute	g/min	140F	1319
	gram per hour	g/h	1436	1320
	gram per day	g/d	1435	1321
	kilogram per second	kg/s	1404	1322
	kilogram per minute	kg/min	1445	1323
	kilogram per hour	kg/h	1410	1324
	kilogram per day	kg/d	1444	1325
	pounds per second	lb/s	140B	1330
	pounds per minute	lb/min	140C	1331
	pounds per hour	lb/h	140D	1332
	pounds per day	lb/d	145C	1333
	metric ton per second	t/s	1464 (in FW)	1326 In FW – not in GSDML
	metric ton per minute	t/min	1463	1327
	metric ton per hour	t/h	1462	1328
	metric ton per day	t/d	1461	1329
	custom selectable	xx/yy	0803	1521
Mass units	gram	g	2501	1089
	kilogram	kg	2500	1088
	Pound	lb	2505	1094
	metric ton	t	2503	1092
	custom selectable	xx/yy	0804	1525

Group	name	Code	Ethernet/IP	PROFINET
Volumeflow units	cubic meter per second	m3/s	1405	1347
	cubic meter per minute	m3/min	1433	1348
	cubic meter per hour	m3/h	1432	1349
	cubic meter per day	m3/d	1431	1350
	cubic foot per second	ft3/s	1467	1356
	cubic foot per minute	ft3/min	1402	1357
	cubic foot per hour	ft3/h	1466	1358
	cubic foot per day	ft3/d	1465	1359
	milliliter per second	ml/s	1407	1577
	milliliter per minute	ml/min	1411	1563
	liter per second	l/s	1406	1351
	liter per minute	l/min	1413	1352
	liter per hour	l/h	1414	1353
	liter per day	l/d	1446	1354
	hecto liter per hour	hl/h	1439	1635
	mega liter per day	Ml/d	1438	1355
	us gallons per second	ugal/s	1408	1362
	us gallons per minute	ugal/min	1409	1363
	us gallons per hour	ugal/h	140A	1364
	us gallons per day	ugal/d	1434	1365
	mega us gallons per day	Mugal/d	1447	1366
	imperial gallons per second	igal/s	1443	1367
	imperial gallons per minute	igal/min	1442	1368
	imperial gallons per hour	igal/h	1441	1369
	imperial gallons per day	igal/d	1440	1370
	oil barrels per second	bbl/s	143F	1371
	oil barrels per minute	bbl/min	143E	1372
	oil barrels per hour	bbl/h	143D	1373
	oil barrels per day	bbl/d	143C	1374
	brew barrels per second	bls/s	141C	1642
	brew barrels per minute	bls/min	141B	1643
	brew barrels per hour	bls/h	141A	1644
	brew barrels per day	bls/d	1419	1645
	custom selectable	xx/yy	0801	1522

Group	Name	Code	Ethernet/IP	PROFINET
Volume units	cubic meter	m3	2E01	1034
	cubic feet	ft3	2E06	1043
	Milliliters	Ml	2E03	1040
	Liter	l	2E02	1038
	hecto liter	hl	2E13	1041
	us gallons	Ugal	2E08	1048
	imperial gallons	Igal	2E15	1049
	oil barrels	bbl	2E14	1051
	brew barrels	Bls	2E1F	1641
	custom selectable	xx/yy	0802	1526
Density units	gram per cubic centimeter	g/cm3	2F13	1100
	kilogram per cubic meter	kg/m3	2F07	1097
	gram per milliliter	g/ml	2F0E	1104
	gram per liter	g/l	2F0F	1105
	kilogram per liter	kg/l	2F10	1103
	pounds per cubic feet	lb/ft3	2F0C	1107
	pounds per us gallons	lb/ugal	2F0A	1108
	specific gravity	SG	2F26	1114
	custom selectable	xx/yy	0805	1523
Temperature units	Kelvin	K	1202	1000
	Celsius	° C	1200	1001
	Fahrenheit	°F	1201	1002
	custom selectable	xx/yy	0806	1524
Concentration units	%	%	1007	—
	Brix	Brix	320D	—
	Variable matrix	Variable matrix	0807	—
	Baume	Baume	0803	—
	°API	°API	3000	—
Pressure units	Pascal	Pa	1309	1130
	kilo pascal	kPa	130A	1133
	Bar	bar	1307	1137
	milli bar	Mbar	1308	1138
	pound per square inch	psi	1300	1141

13 Ethernet card firmware update

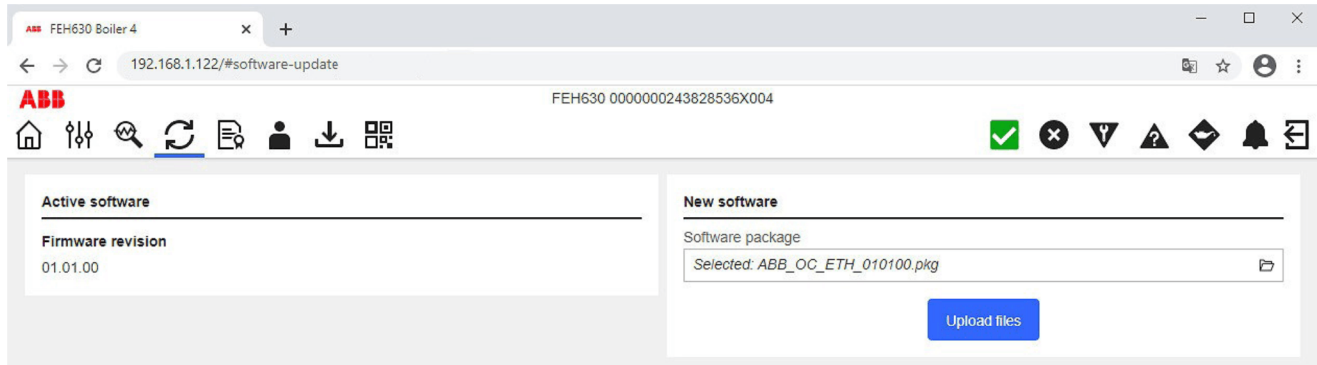To update the Ethernet card firmware, log on to the flowmeter's webserver.
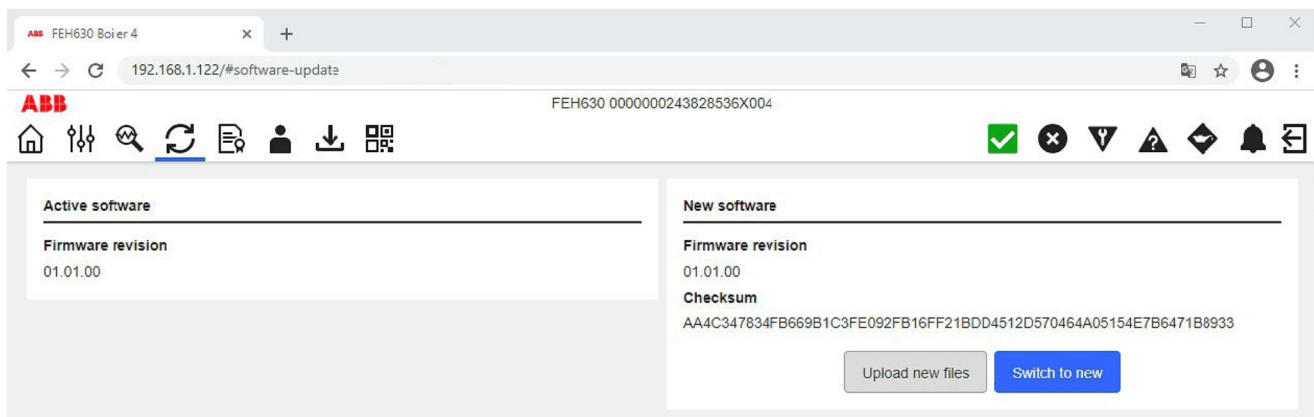

Figure 13: Upload files

Figure 14: Switch to new

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 displays 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

Note
- 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.

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Modbus is a registered trademark of Schneider Automation Inc.

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Notes

Notes

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ABB Measurement & Analytics

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

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