ENGLISH

Anybus® Communicator™ - Modbus TCP to EtherCAT MDevice

USER MANUAL

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Important User Information

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1. Preface

1.1. About This Document

This document describes how to install and configure Anybus® Communicator™.

For additional documentation and software downloads, FAQs, troubleshooting guides and technical support, please visit www.anybus.com/support.

1.2. Document Conventions

Lists

Numbered lists indicate tasks that should be carried out in sequence:

1. First do this
2. Then do this

Bulleted lists are used for:

- Tasks that can be carried out in any order
- Itemized information

User Interaction Elements

User interaction elements (buttons etc.) are indicated with bold text.

Program Code and Scripts

```
Program code and script examples
```

Cross-References and Links

Cross-reference within this document: Document Conventions (page 1)

External link (URL): www.anybus.com

Safety Symbols

DANGER
Instructions that must be followed to avoid an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Instructions that must be followed to avoid a potential hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION
Instruction that must be followed to avoid a potential hazardous situation that, if not avoided, could result in minor or moderate injury.

IMPORTANT
Instruction that must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

Information Symbols

NOTE
Additional information which may facilitate installation and/or operation.

TIP
Helpful advice and suggestions.

1.3. Trademarks

Anybus® is a registered trademark of HMS Networks.

All other trademarks are the property of their respective holders.

1.4. About the EtherCAT Terminology

The EtherCAT® Technology Group has changed the terminology for Master and Slave.

Master is called **MainDevice**

Abbreviated: **MDevice**

Slave is called **SubordinateDevice**

Abbreviated: **SubDevice**

2. Safety

2.1. Intended Use

The intended use of this equipment is as a communication interface and gateway.

The equipment receives and transmits data on various physical layers and connection types.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

2.2. General Safety

CAUTION
Ensure that the power supply is turned off before connecting it to the equipment.

CAUTION
This equipment contains parts that can be damaged by electrostatic discharge (ESD). Use ESD prevention measures to avoid damage.

CAUTION
To avoid system damage, the equipment should be connected to ground.

IMPORTANT
Using the wrong type of power supply can damage the equipment. Ensure that the power supply is connected properly and of the recommended type.

3. Cybersecurity

3.1. General Cybersecurity

IMPORTANT
It is important to maintain the cybersecurity of the Communicator.

Before connecting the Communicator to a PLC, ensure the PLC is configured and installed in accordance with the PLC supplier hardening guidelines.

IMPORTANT
To physically secure networks and equipment and to prevent unauthorized access, it is recommended to install the equipment in a locked environment.

IMPORTANT
After completing the configuration of the Communicator, lock the security switch to prevent unauthorized access to the Communicator built-in web interface.

IMPORTANT
To avoid exposure of sensitive data, always perform a factory reset before decommissioning the equipment.

Factory reset will reset any on site made configuration changes and set the Communicator to the same state as leaving HMS production.

See Reset to Factory Settings (page 63).

3.2. Security Advisories

For cybersecurity reasons, stay informed about new vulnerabilities and follow the recommended actions.

HMS Networks Security Advisories includes information about our product vulnerabilities and available solutions.

You find our Safety Advisories at www.hms-networks.com/cybersecurity/security-advisories.

3.3. How to Report a Vulnerability

HMS Networks place the utmost importance on the security of our products and systems, however, despite all the measures we take, it cannot be excluded that vulnerabilities persist.

To report a potential vulnerability in an HMS product or service, please visit www.hms-networks.com/cybersecurity/report-a-vulnerability and follow the instructions.

3.4. Product Cybersecurity Context

3.4.1. Security Defense in Depth Strategy

The defense in depth strategy of the Communicator includes the following security measures:

- Secure Boot: Security standard used to ensure that the Communicator boots using only software that is trusted by HMS Networks.
- Signed firmware: HMS Networks delivers digitally signed firmware. Before the firmware file is imported into the Communicator, the firmware upgrade function performs a validation of the file, to ensure that is authentic.
- Security switch: Used to lock unauthorized access to the Communicator built-in web interface.
- The Communicator is intended to be installed in a Process Control Network (PCN) environment. See Level 1 in the Purdue Model (page 6).
- To physically secure networks and equipment and to prevent unauthorized access, the Communicator is intended to be installed in a locked environment.

3.4.2. Purdue Model

The Communicator is intended to be part of the process control network in Level 1 (E), to enable communication between PLCs or between a PLC and peripheral devices.

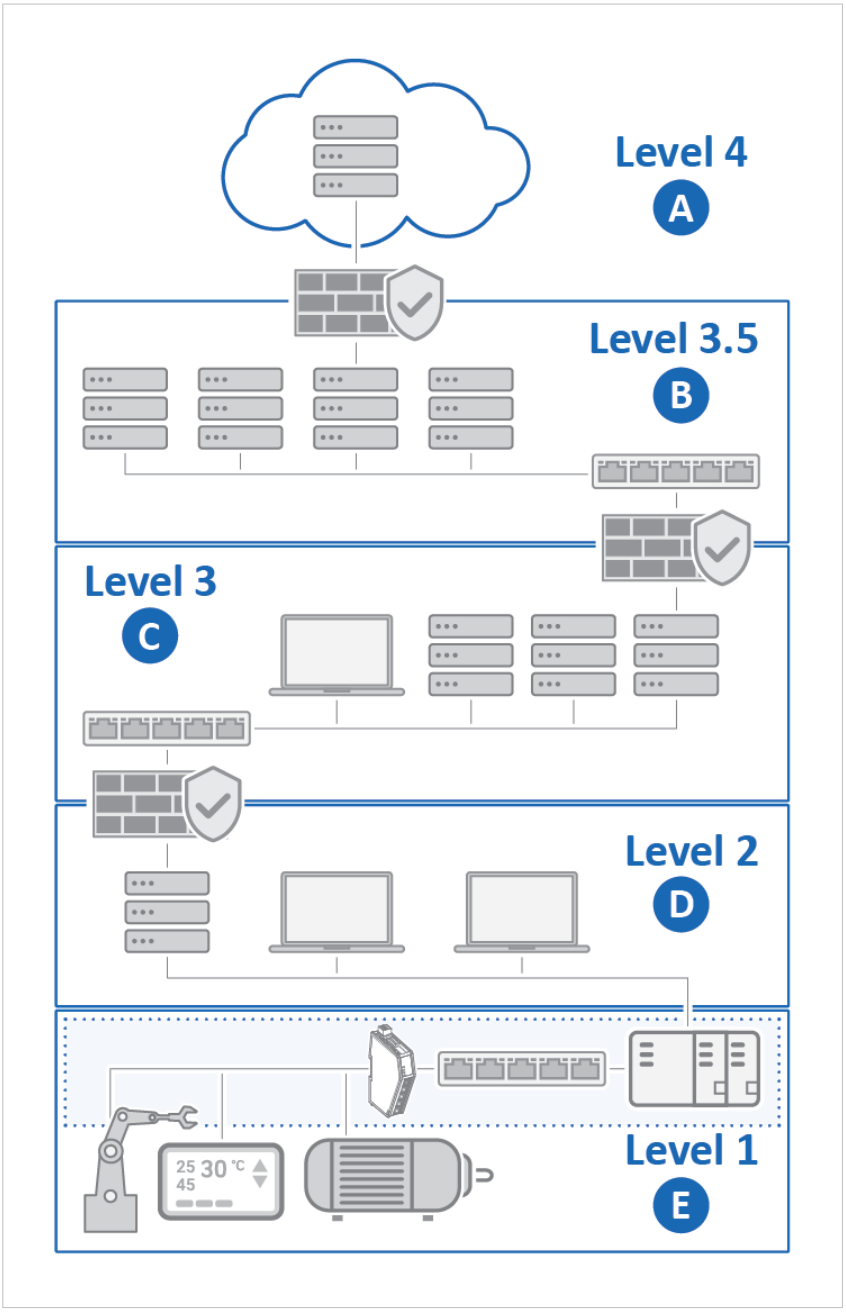


Figure 1. Purdue model, product security context

IT Network

A. **Level 4: Enterprise Network**
Example: Cloud solution, Business LAN (VPN)

B. **Level 3.5: Perimeter Network**
Example: Demilitarized Zone (DMZ)

OT Network

C. **Level 3: Advanced Control Network (ACN)**
Example: SCADA systems, Business control

D. **Level 2: Supervisory Control**
Example: Operator panels, Operator stations, Engineering stations

E. **Level 1: Process Control Network (PCN)**
Environment where the Communicator is installed
Example: Factory floor, Industrial product line

4. Preparation

4.1. Cabling

Have the following cables available:

- Ethernet cable for configuration.
- Ethernet cable x 2 for connecting to the networks.
- Power cable.

4.2. Mechanical Tools and Equipment

Have the following tools available:

- Flat-head screwdriver, size 5.5 mm
  Needed when removing the Communicator from DIN-rail.

4.3. System Requirements

4.3.1. Supported Operating Systems

Operating System	Description
Windows 7 SP1, 32-bit	Windows 7 32-bit with Service Pack 1
Windows 7 SP1, 64-bit	Windows 7 64-bit with Service Pack 1
Windows 10 64-bit	Windows 10 64-bit
Windows 11 64-bit	Windows 11 64-bit

4.3.2. Supported Web Browsers

The Communicator built-in web interface can be accessed from the following standard web browsers.

- Google Chrome
- Microsoft Edge
- Mozilla Firefox

4.4. HMS Software Applications

Download the software installation files and user documentation from www.anybus.com/support.

HMS IPconfig

NOTE
As an alternative, you can set a static IP address within the same IP address range as the Communicator IP address on the computer accessing the Communicator built-in web interface.

NOTE
HMS IPconfig is only available for Windows.

4.5. Third-Party Software Applications

Microsoft Excel

Microsoft Excel, or equivalent software application that supports the Office Open XML Workbook (xlsx) file format. Needed to open and read the **Event log** file.

4.6. Software License Information

For license agreements regarding the third-party software used in the Communicator, refer to the *LICENSE.txt* file(s) included in the Communicator firmware update package zip file.

To download the Communicator firmware update package zip file, please visit www.anybus.com/support.

TIP
Have the product article number available, to search for the product specific support web page. You find the product article number on the product cover.

4.7. Support and Resources

For additional documentation and software downloads, FAQs, troubleshooting guides and technical support, please visit www.anybus.com/support.

TIP
Have the product article number available, to search for the product specific support web page. You find the product article number on the product cover.

5. About Anybus Communicator

5.1. EtherCAT MDevice Communication

5.1.1. EtherCAT MDevice Building Blocks

The following building blocks are used to describe the subnetwork communication.

Node

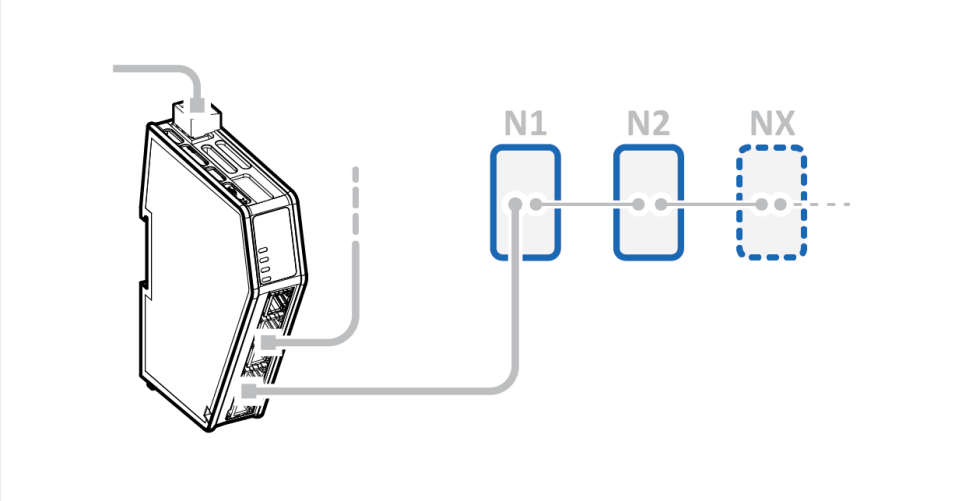


Figure 2. Nodes on a EtherCAT subnetwork

A node represents a single EtherCAT SubDevice on the EtherCAT subnetwork.

Each node can be associated with a number of process data objects.

Nodes and Process Data Objects

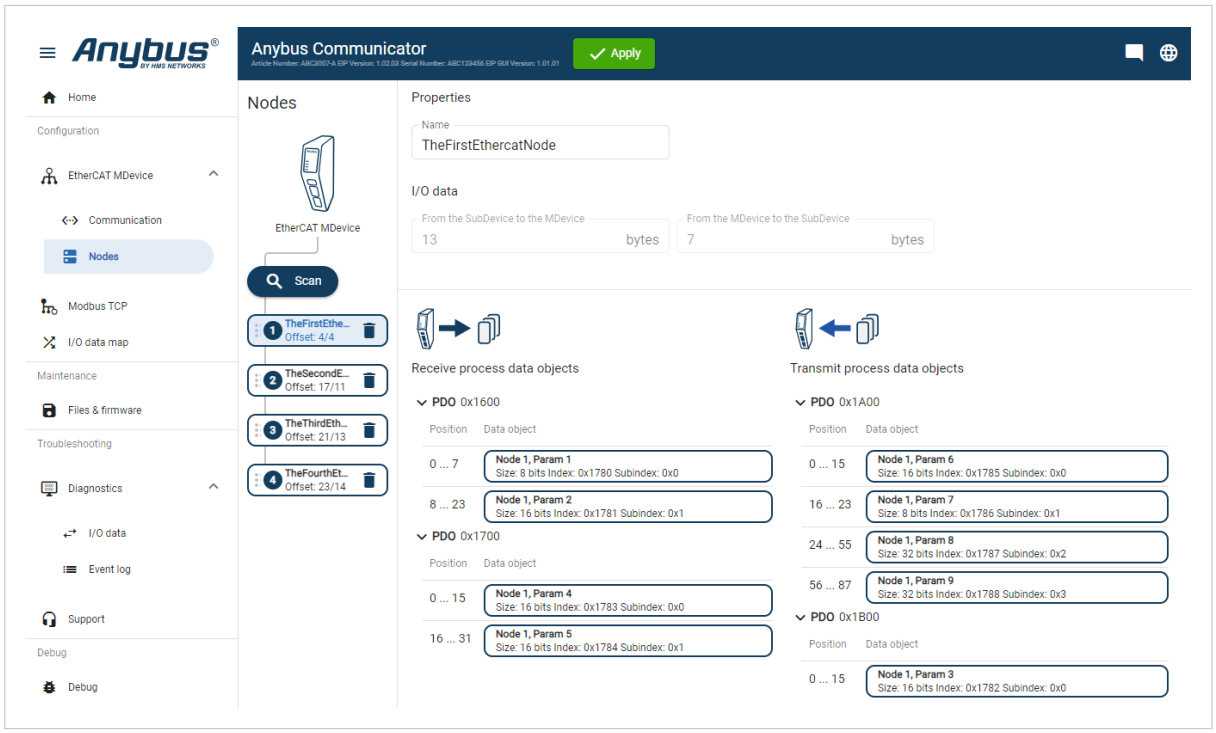


Figure 3. Node with Process data objects

To define how data is to be sent / received, the process data object parameters need to be configured in the EtherCAT MDevice.

Using **Scan** of the EtherCAT subnetwork in the Communicator built-in web interface, the EtherCAT network is scanned and the node(s) configuration with process data objects are uploaded to the Communicator.

5.2. How the Communication Works

The Communicator enables communication, data exchange, between one or more nodes connected to a EtherCAT subnetwork and a client device connected to a high level network.

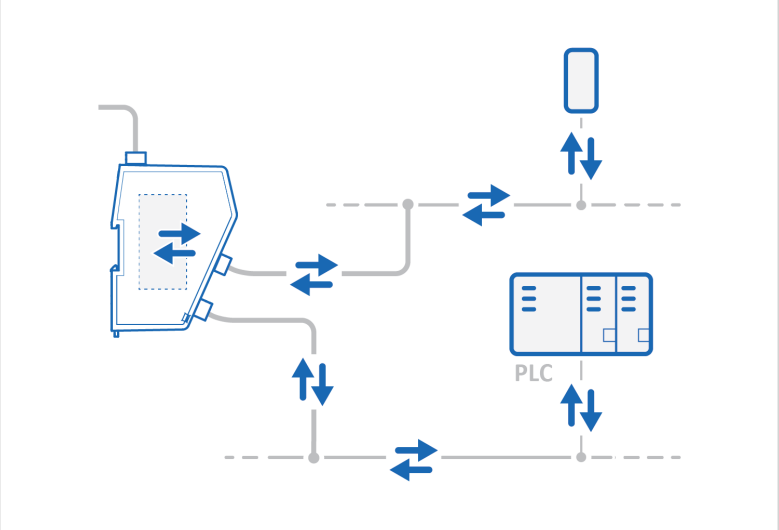


Figure 4. Process data traffic overview

For example:

- The client device can be a PLC or a PC.
- The node(s) can be a sensor, scanner, industrial robot or sniffer.

The Communicator main task is to cyclically send the process data objects that the nodes(s) are configured to execute, in order to request and transfer process data.

Input Process Data

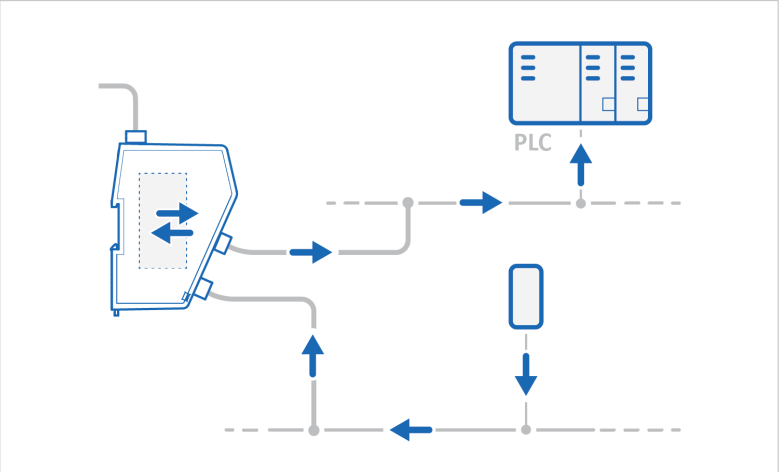


Figure 5. Process data traffic from nodes to client

Receive process data from the EtherCAT subnetwork nodes and make the process data available on the Modbus TCP interface and for the high level network client device.

The process data is specified when the EtherCAT network is scanned and the nodes(s) configuration is uploaded to the Communicator.

Output Process Data

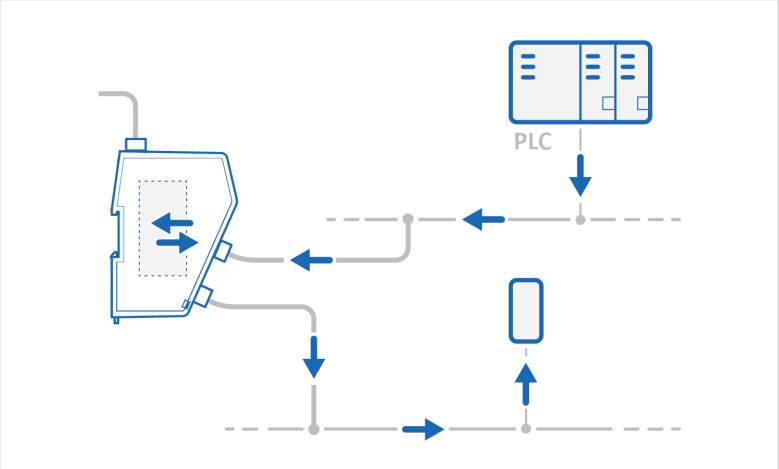


Figure 6. Process data traffic from client to nodes

Transmit process data from the high level network client device and make it available on the EtherCAT interface and for the EtherCAT subnetwork node(s) included in the configuration.

5.3. How the Data Exchange Works

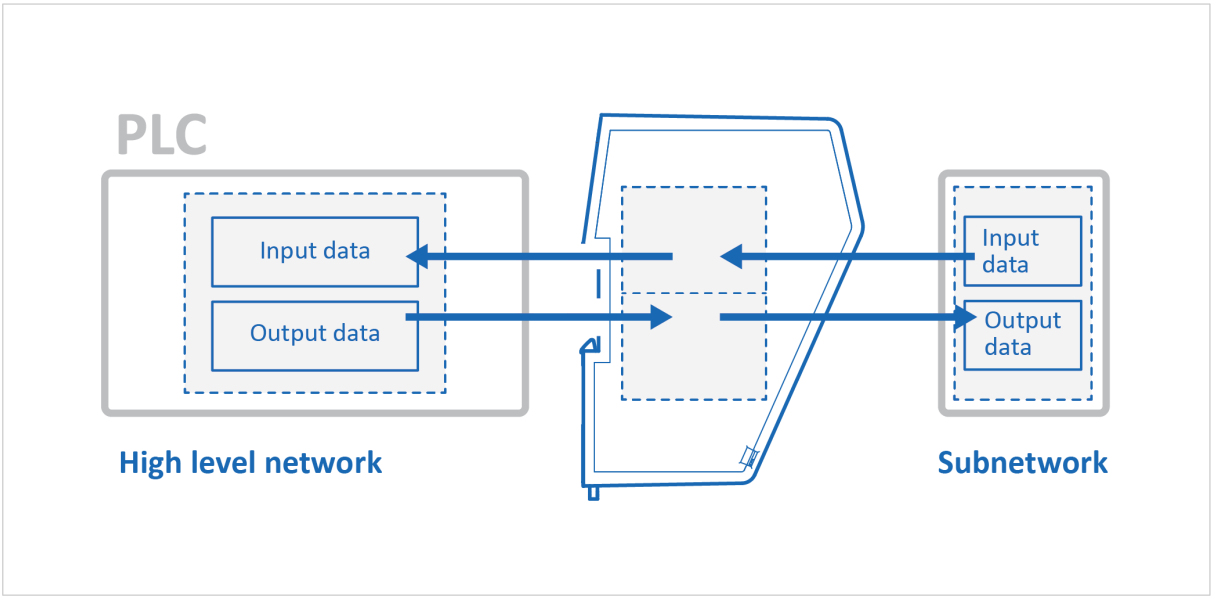


Figure 7. The Communicator internal memory areas

The data exchanged between the Communicator and the EtherCAT subnetwork and the high level network resides in the Communicator internal memory buffer.

To exchange data with the EtherCAT subnetwork, the high level network reads and writes data to the Communicator internal memory buffer.

The same memory locations are exchanged on the EtherCAT subnetwork.

The memory locations are specified when you scan the EtherCAT network and the node(s) configuration is uploaded to the Communicator using the Communicator built-in web interface.

Input Data

The Input data area is read by the high level network.

Output Data

The Output data area is read/written by the high level network.

5.4. Data Integrity

A snapshot of the process data buffer between the EtherCAT Client and the MDevice interface is used during the operation of executing all the process data objects within one cycle.

When the cycle is completed, the process data available on the MDevice and SubDevice(s) interfaces is updated and a new snapshot is created for the next cycle.

6. Installation

6.1. External Parts

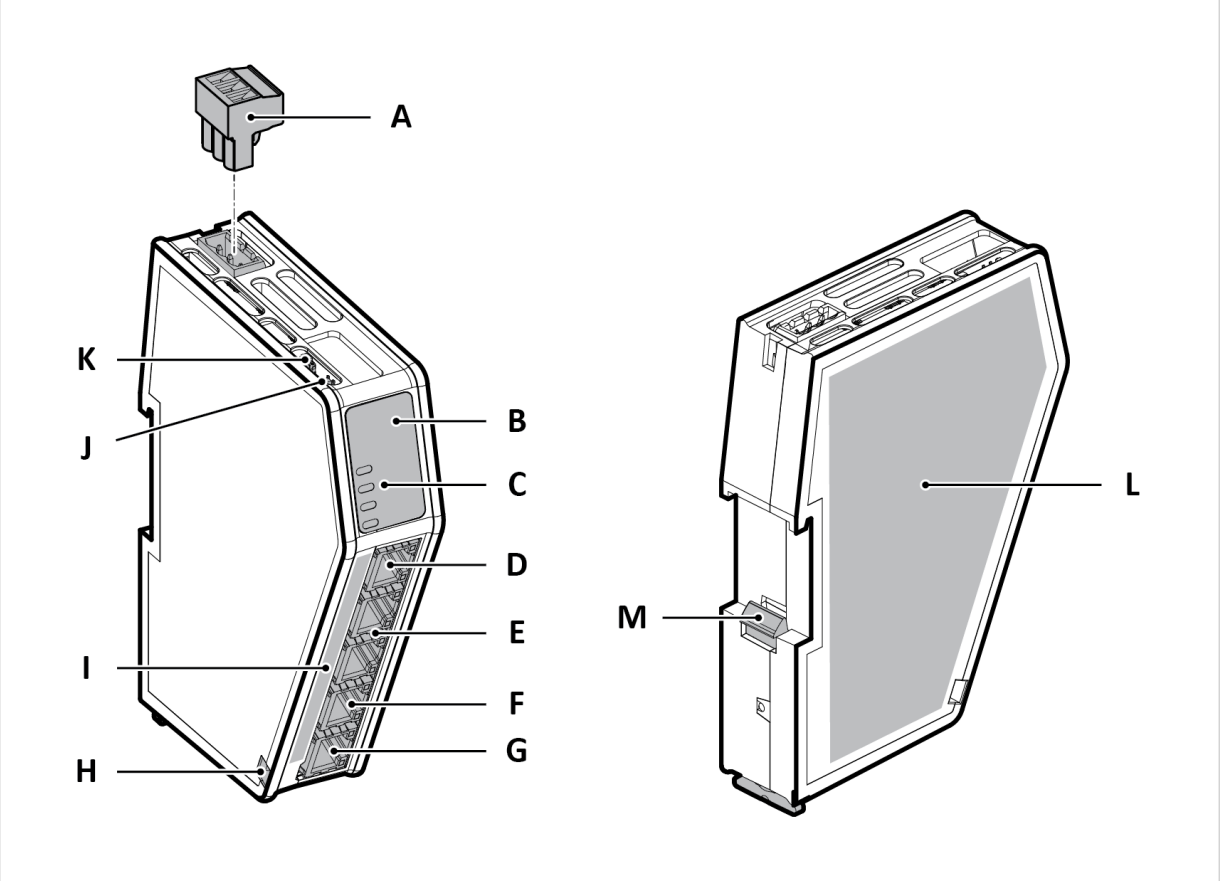


Figure 8. External parts

A. Power connector
B. Label with LED designation
C. Status LEDs
D. Configuration port
E. Modbus TCP port x 2
F. EtherCAT (X3.1) port
G. EtherCAT (X3.2) port
Reserved for future use, do not use
H. Cable tie mount
I. Laser engraved connectors designation
J. Security switch
K. Factory reset button
L. Laser engraved label with product information
M. DIN rail locking mechanism

6.2. Connector Port Guide

This topic applies to different product variants for different networks.

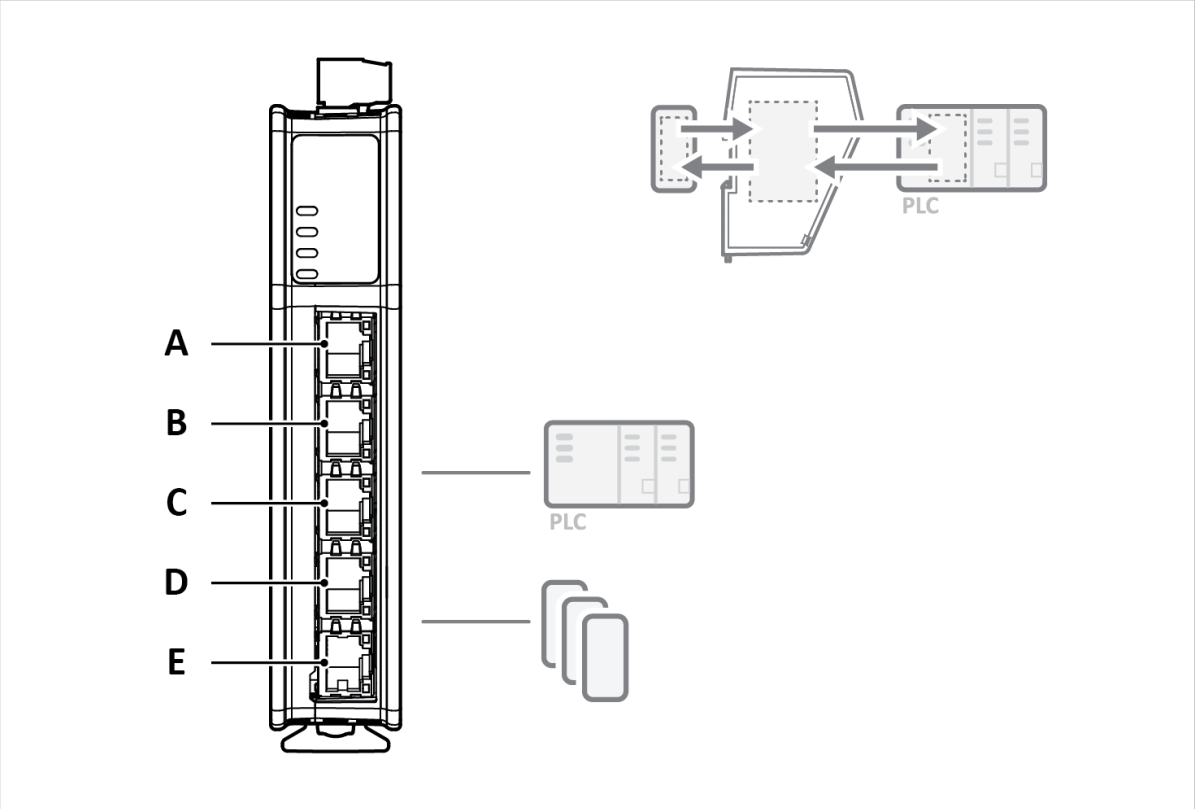


Figure 9. Communicator connector ports

Position	Port Number	Connector Type	Port Usage
A	X1	Ethernet	Configuration port
B	X2.1	Ethernet	Modbus TCP network
C	X2.2	Ethernet	Modbus TCP network
D	X3.1	Ethernet	EtherCAT network
E	X3.2	Ethernet	**NOTE** The Communicator lower EtherCAT port X3.2 (B) is reserved for future use, do not use.

See also Connect to EtherCAT Network (page 17) and Connect to Modbus TCP Network (page 18).

6.3. DIN Rail Mounting

IMPORTANT
The equipment must be electrically grounded through the DIN rail for EMC compliance. Make sure that the equipment is correctly mounted on the rail and that the rail is properly grounded.

IMPORTANT
To physically secure networks and equipment and to prevent unauthorized access, it is recommended to install the equipment in a locked environment.

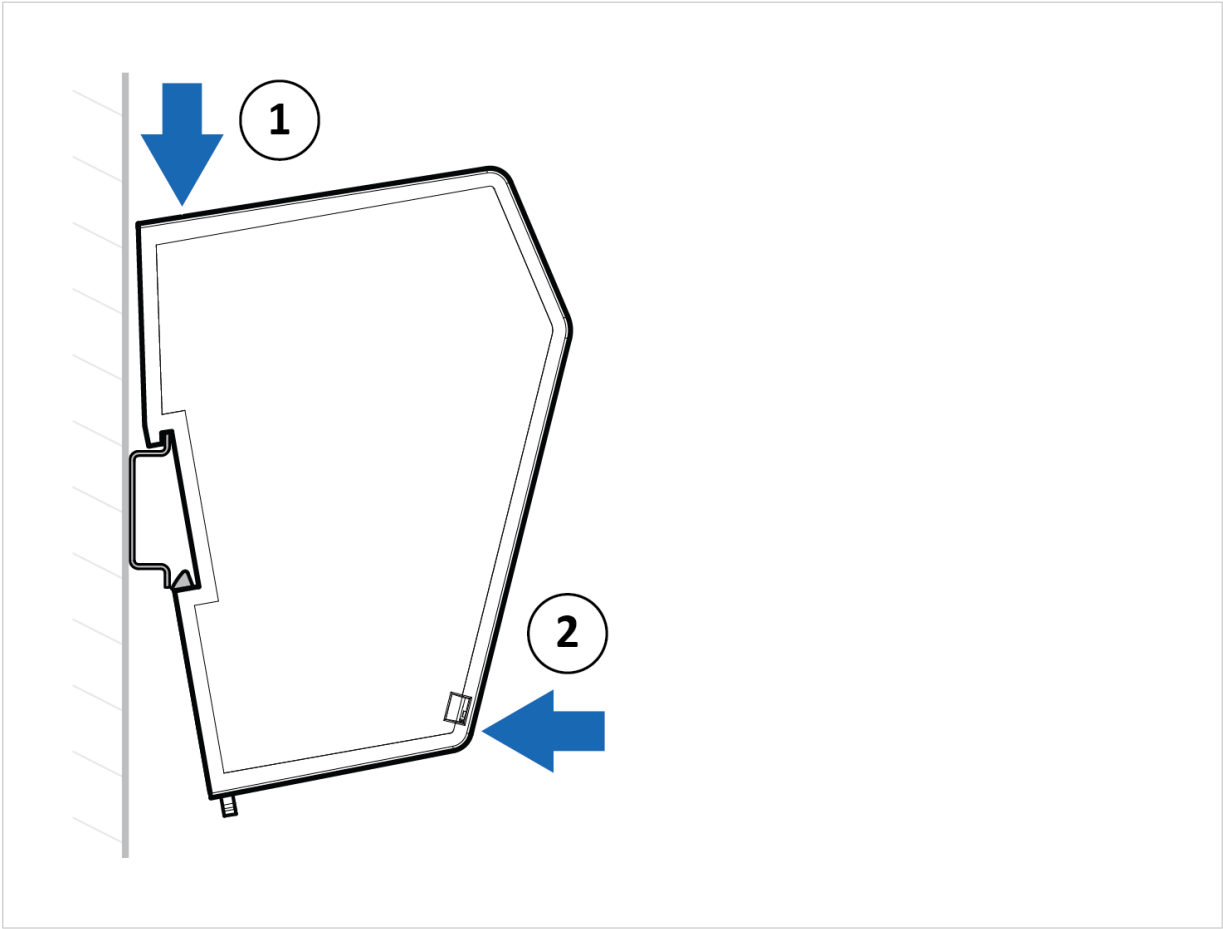


Figure 10. Attach the Communicator on the DIN rail

To attach the Communicator on the DIN rail:

1. Insert the upper end of the DIN rail clip into the DIN rail.
2. Push the bottom of the DIN rail clip into the DIN rail.

6.4. Connect to EtherCAT Network

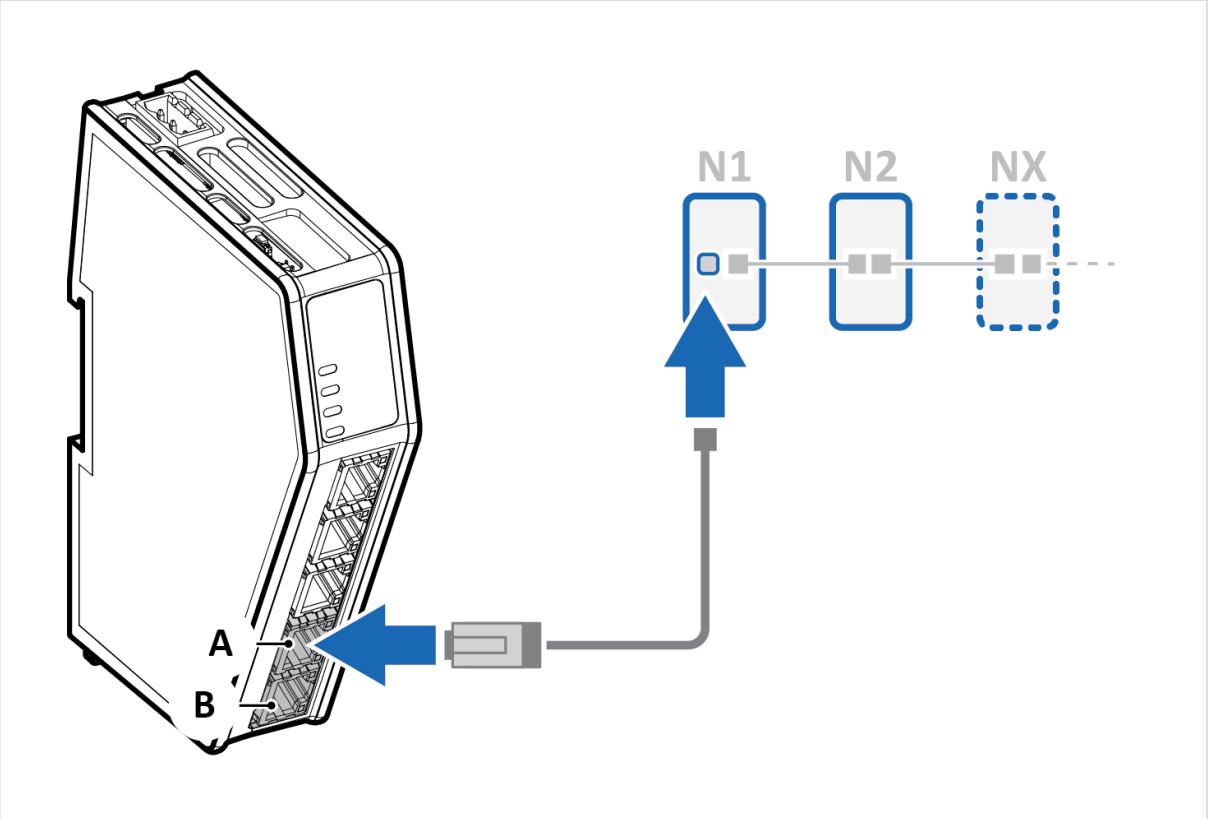


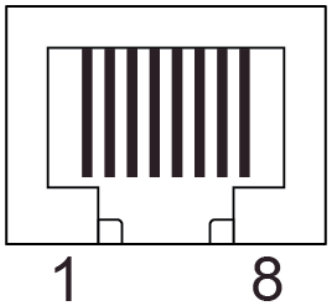
Figure 11. Connect to EtherCAT network

Procedure

Connect the Communicator upper EtherCAT port X3.1 (A) to your EtherCAT network.

NOTE
The Communicator lower EtherCAT port X3.2 (B) is reserved for future use, do not use.

Ethernet RJ45 Connector Pinout

Ethernet RJ45 Connector	Pin	Description
	1	TD+
	2	TD-
	3	RD+
	4	Not used
	5	Not used
	6	RD-
	7	Not used
	8	Not used

6.5. Connect to Modbus TCP Network

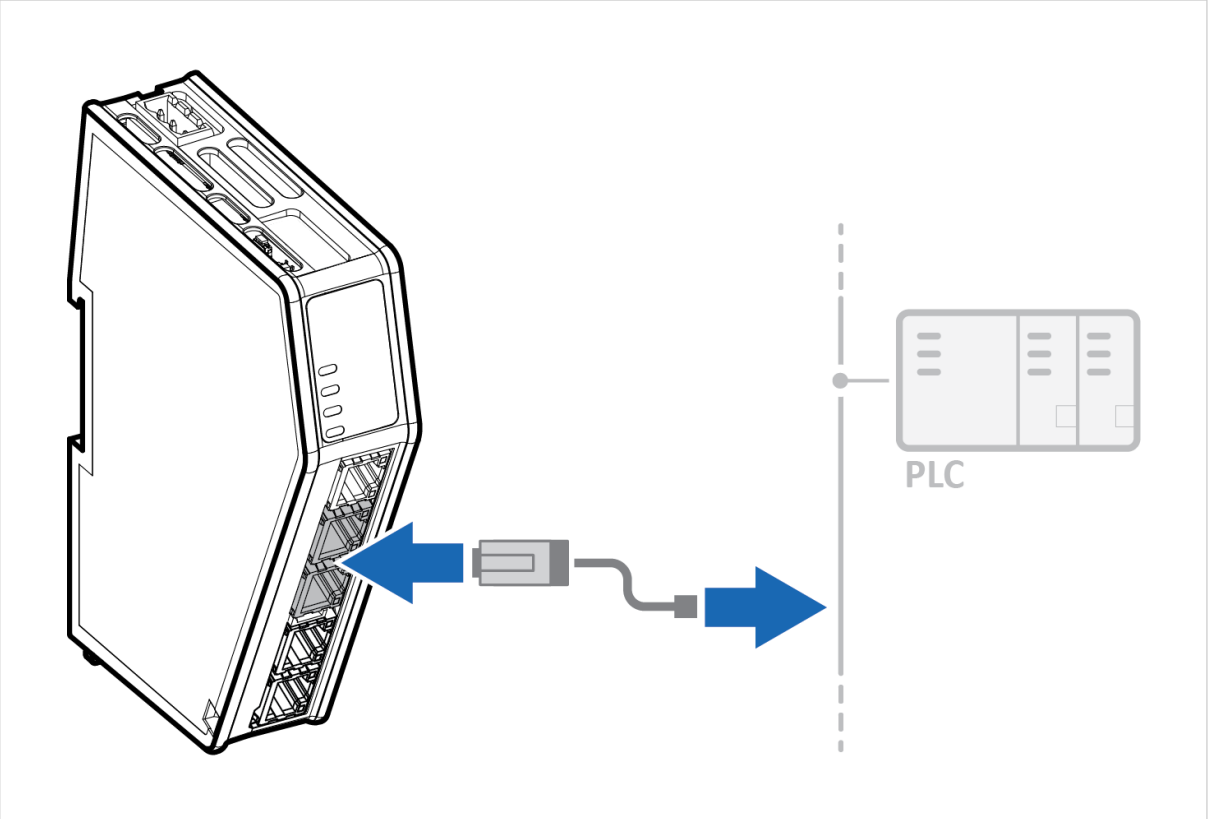
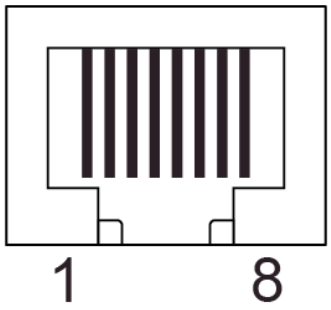


Figure 12. Connect to Modbus TCP network

Procedure

Connect the Communicator to your Modbus TCP network.

Ethernet RJ45 Connector Pinout

Ethernet RJ45 Connector	Pin	Description
	1	TD+
	2	TD-
	3	RD+
	4	Not used
	5	Not used
	6	RD-
	7	Not used
	8	Not used

6.6. Connect to Power

CAUTION
Ensure that the power supply is turned off before connecting it to the equipment.

IMPORTANT
Using the wrong type of power supply can damage the equipment. Ensure that the power supply is connected properly and of the recommended type.

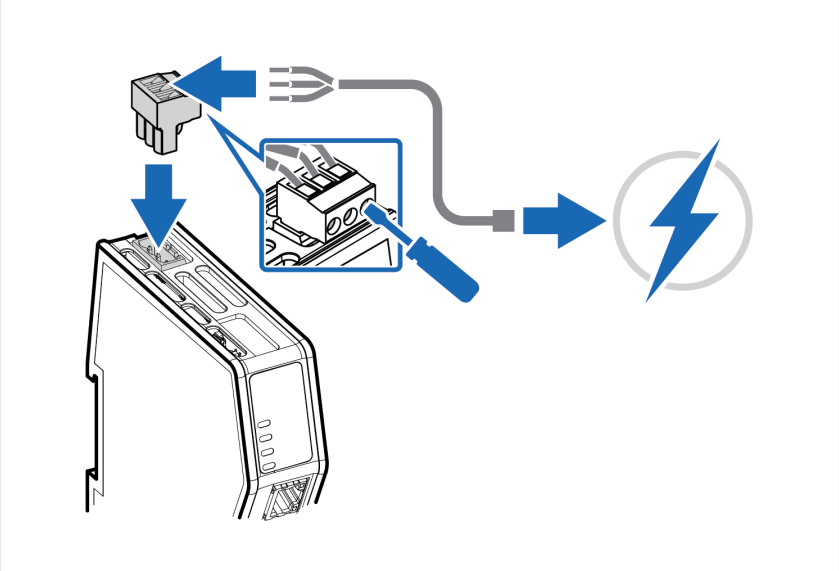
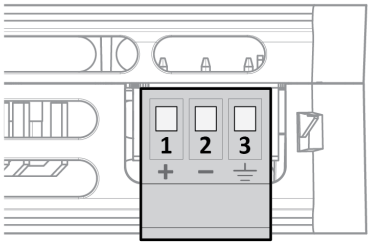


Figure 13. Connect to power

Power Connector Pinout

Power port	Pin	Description
	1	12-30 VDC Power Connector
	2	Ground (GND)
	3	Functional Earth (FE)

Procedure

1. Insert the cable wires to the terminal block and tighten the wire clamp screws.
2. Connect the terminal block to the Communicator.
3. Connect the Communicator to a power supply.
4. Turn on the power supply.

6.7. Security Switch

IMPORTANT
After completing the configuration of the Communicator, lock the security switch to prevent unauthorized access to the Communicator built-in web interface.

When the security switch is in its locked position, the Communicator built-in web interface cannot be accessed, and the Communicator cannot be configured using the built-in web interface. Network specific parameters, configured via the PLC is still available.

To Lock and Unlock the Security Switch

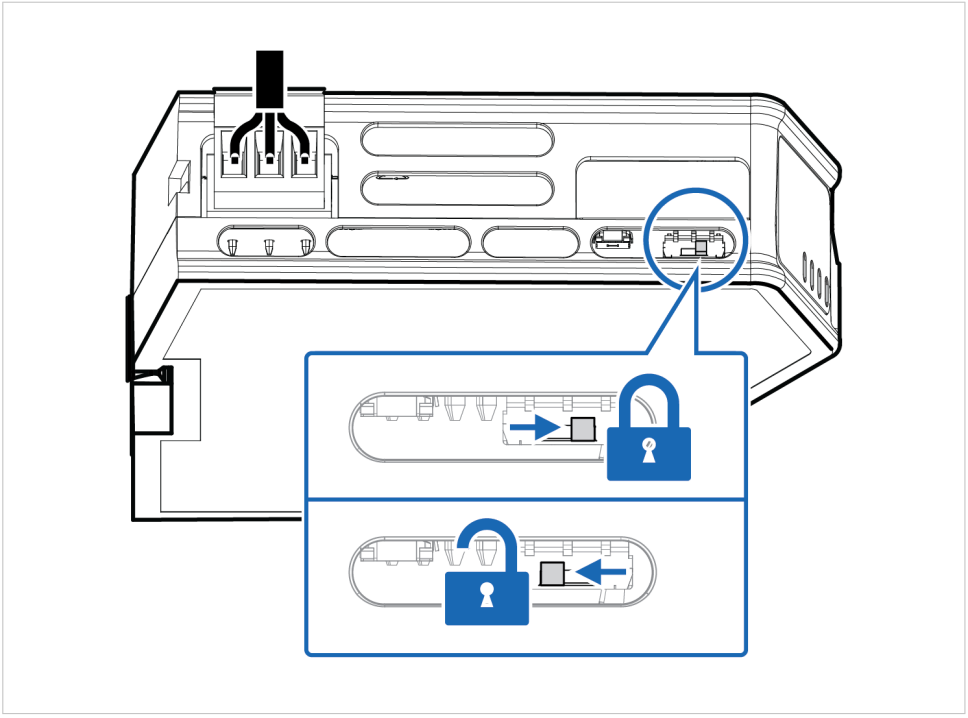


Figure 14. Security switch in locked and unlocked position

Use a pointed object, such as a ballpoint pen.

- To **lock** the security switch, push the toggle towards the **Communicator front**.
- To **unlock** the security switch, push the toggle towards the **Communicator back**.

Security Switch Status LED

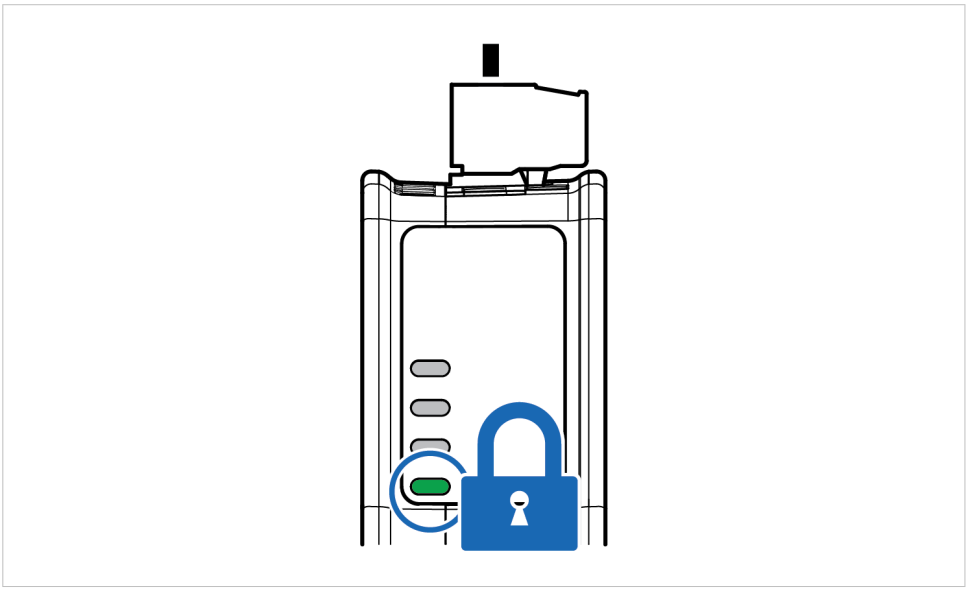


Figure 15. Security switch locked status LED

When the security switch is in its:

- locked position, the security switch status LED turn solid green.
- unlocked position, the security switch status LED is turned off.

6.8. Lock the Cables

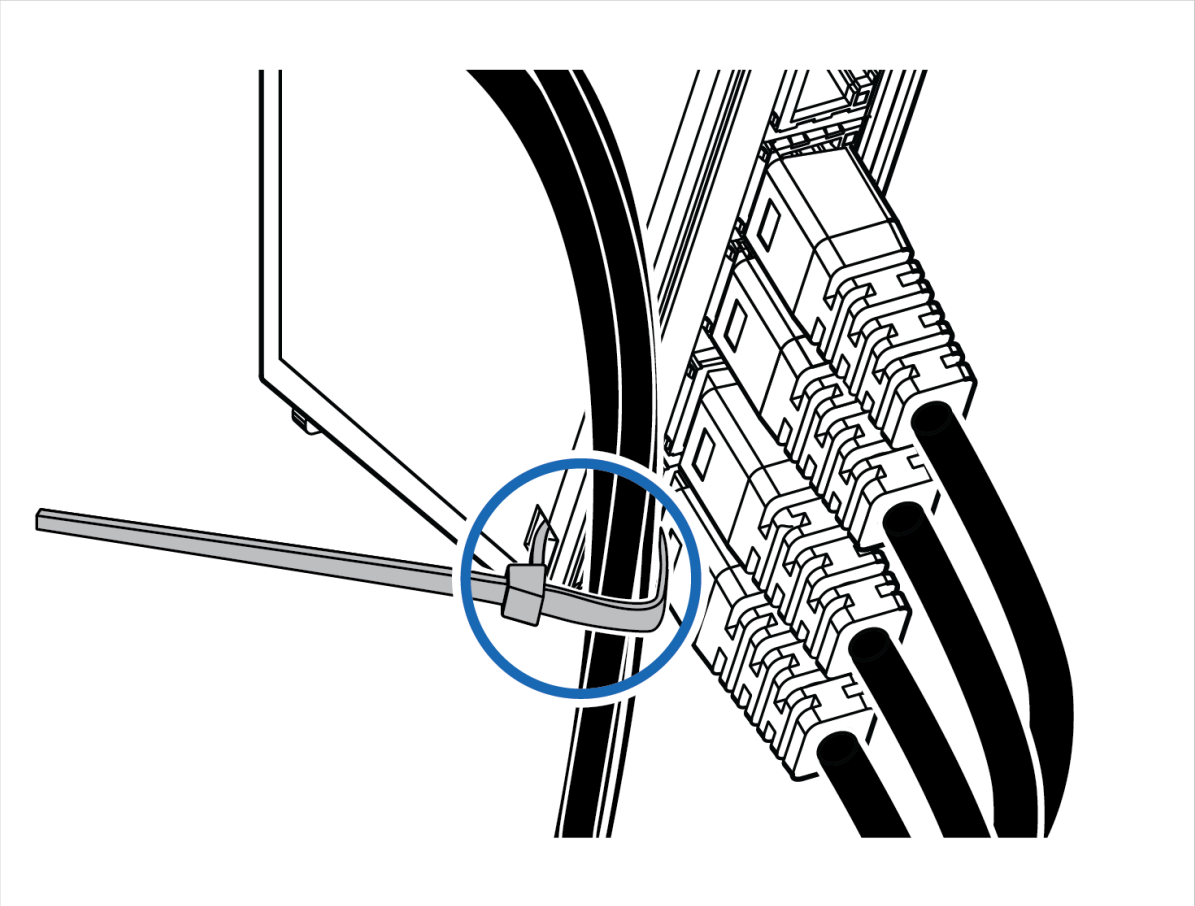


Figure 16. Lock the cables

To strain relieve the cables, place a cable tie in the holder and lock the cables.

6.9. DIN Rail Demount

Before You Begin

IMPORTANT
Be careful when removing the Communicator from the DIN-rail. If not removed properly, the DIN rail locking mechanism and the product cover can break.

Have a flat-blade screwdriver, size 5.5 mm, available.

Procedure

Remove the Communicator from the DIN Rail:

1. Insert the screwdriver into the Communicator DIN rail locking mechanism.
2. To unlock the Communicator DIN rail locking mechanism, turn the screwdriver clockwise.

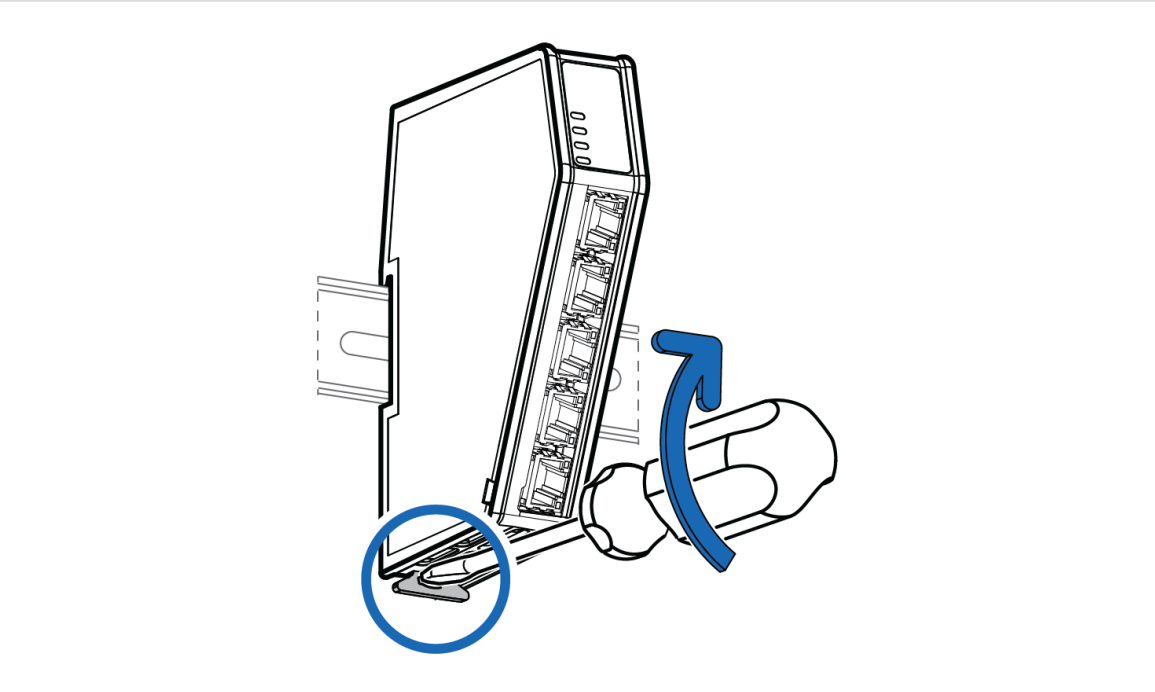


Figure 17. Unlock the Communicator

3. Hold the screwdriver in the DIN rail locking mechanism while you unhook the Communicator from the DIN rail.

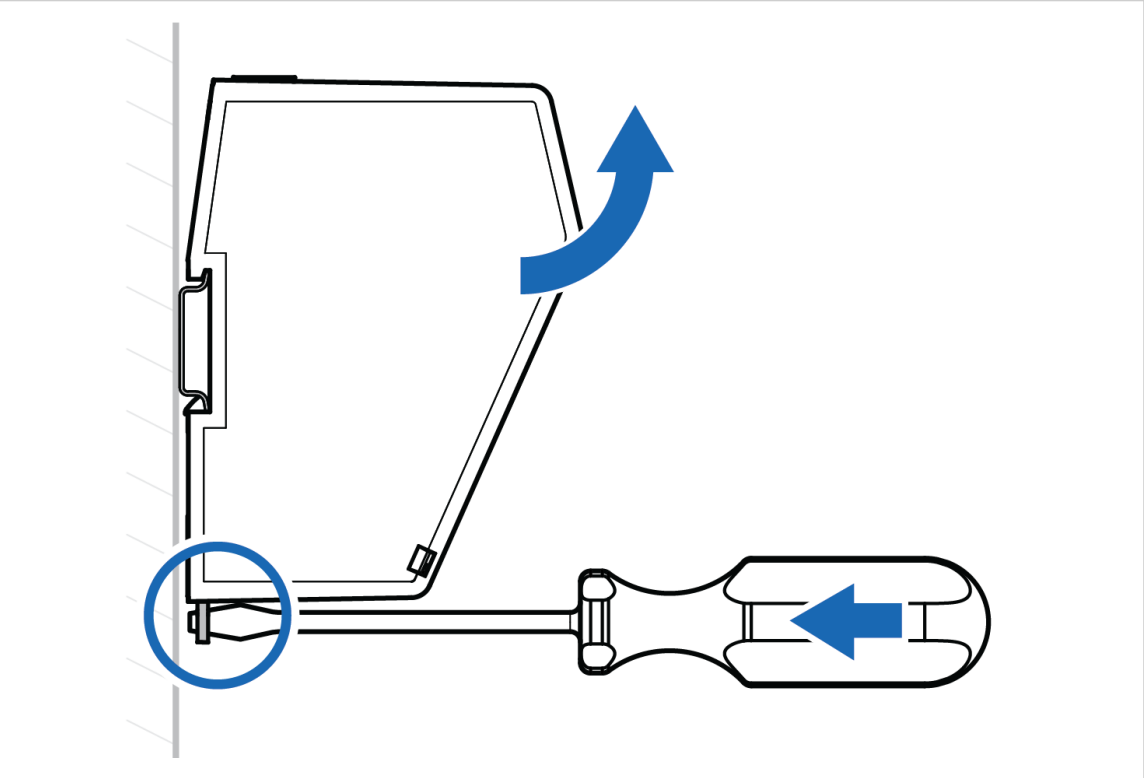


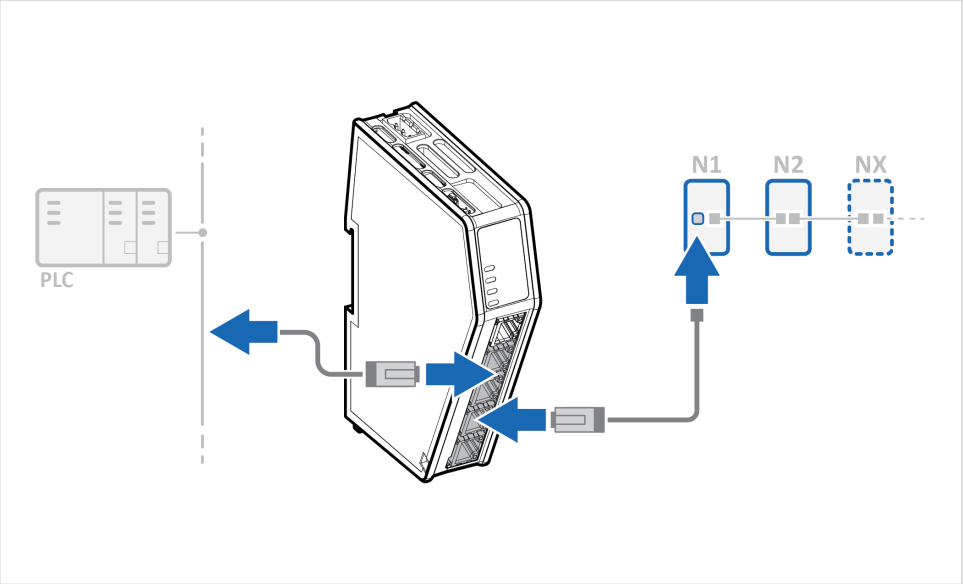
Figure 18. Unhook the Communicator

7. Communicator Configuration

7.1. Connect the Communicator

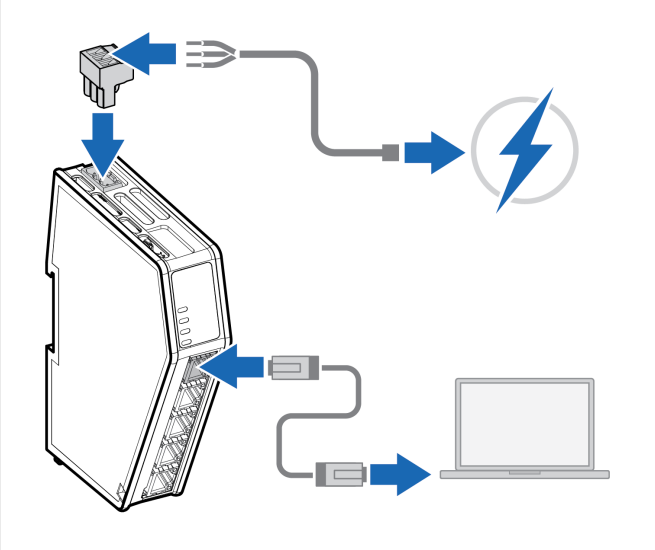
Procedure

Connect to EtherCAT network and Modbus TCP network



1. Connect the Communicator to the high level network.
2. Connect the Communicator to the subnetwork.

Connect to PC and Power



1. Connect an Ethernet cable between the Communicator and your PC.
2. Connect the Communicator to a power supply.

7.2. Access the Built-In Web Interface from HMS IPconfig

Before You Begin

Download the software application HMS IPconfig installation files and user documentation from www.anybus.com/support.

NOTE
The Communicator default IP address is 192.168.0.10.

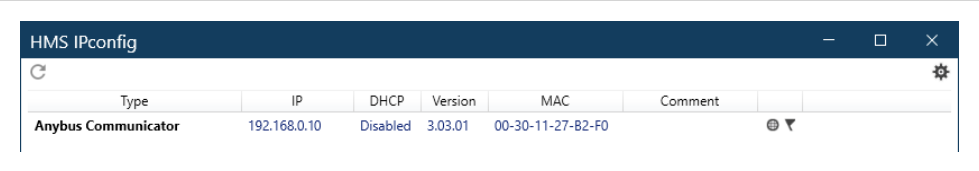
NOTE
To access the Communicator built-in web interface, ensure that Port 80 TCP is open in your Firewall. This applies to any Firewall between the web browser and the gateway.

NOTE
To access the Communicator built-in web interface from HMS IPconfig, ensure that Port 3250 UDP is open in your PC Windows Firewall.

NOTE
Ensure that the security switch is unlocked. HMS IPconfig cannot configure the Communicator if the security switch is locked.

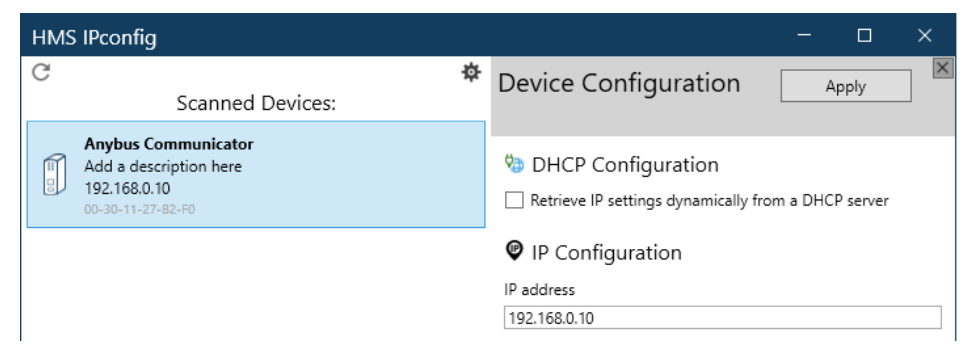
Procedure

1. Install HMS IPconfig on your PC.
2. Open HMS IPconfig.

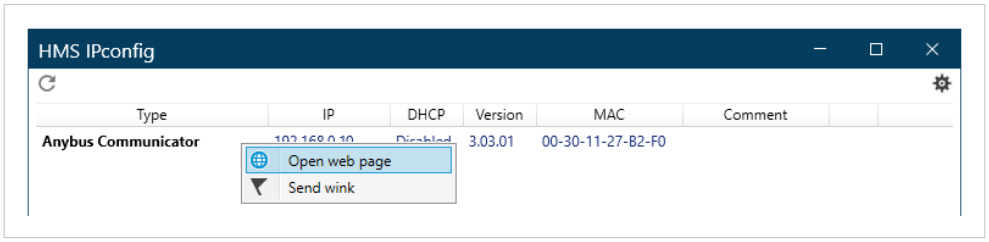


- HMS IPconfig automatically starts scanning for compatible and active HMS devices.
- Found HMS devices are added to the device list.

3. To open the settings pane, click on the Communicator in the device list.
4. Change the Communicator configuration port IP address to one within the same IP address range as your PC.

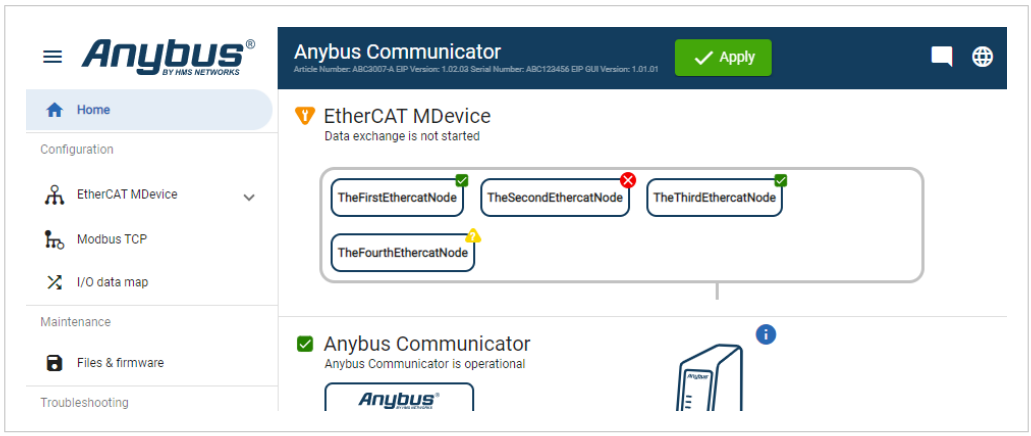


5. To open the **Open web page** built-in web interface, click Communicator.



Result

You are redirected to the Communicator built-in web interface **Home** page.



7.3. Access the Built-In Web Interface from a Web Browser

Before You Begin

NOTE
The Communicator configuration port default IP address is 192.168.0.10.

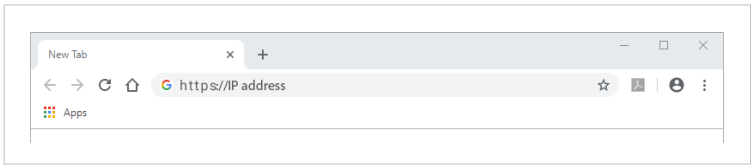
NOTE
To access the Communicator built-in web interface, ensure that Port 80 TCP is open in your Firewall. This applies to any Firewall between the web browser and the gateway.

NOTE
When you change to a static IP address on your computer, internet access may be lost.

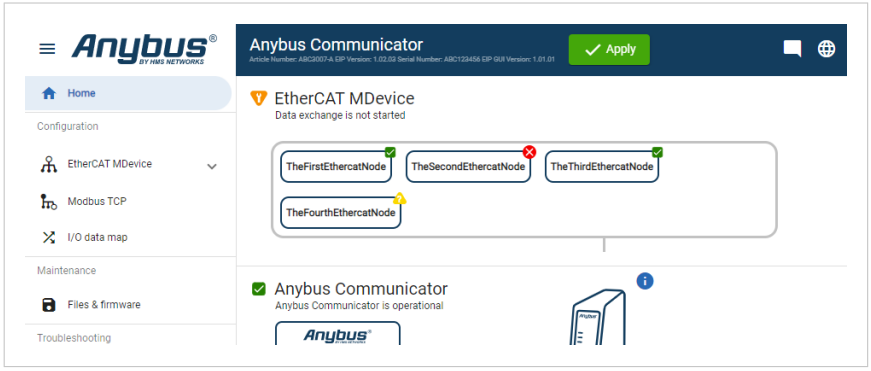
Procedure

1. On the PC accessing the Communicator built-in web interface, set a static IP address within the same IP address range as the Communicator IP address.

2. Open a web browser.
3. Click to select the **Address bar** and enter the Communicator IP address.



4. To open the built-in web interface **Home** page, press **Enter**.



7.4. Communicator Built-In Web Interface Overview

Use the Communicator built-in web interface to configure, maintain and troubleshoot the Communicator.

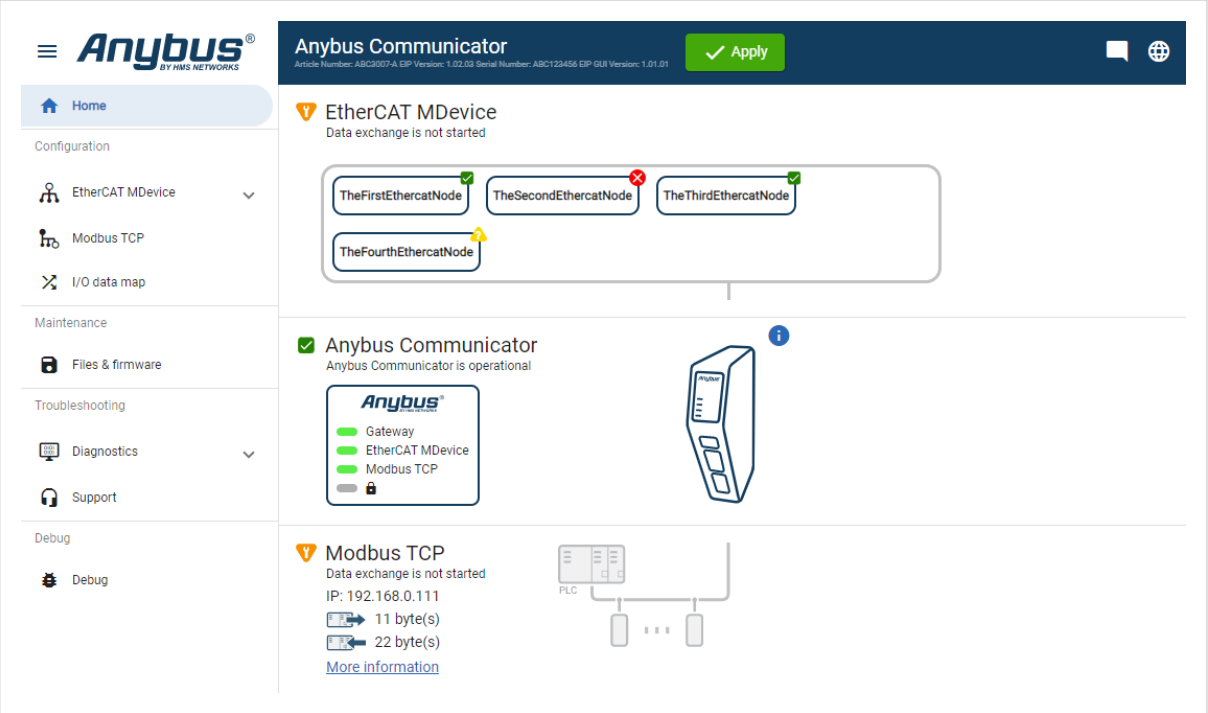


Figure 19. The Communicator built-in web interface Home page

Menu item	Description
Home	View the Communicator, network and node status.
Apply	After configuration changes are made and verified, press Apply to make the settings take effect.
Modbus TCP	Select Cycle time. Scan the EtherCAT MDevice and upload the configuration to the Communicator,
EtherCAT	Configure the network settings for the EtherCAT network.
I/O configuration	View the commands mapped to the Communicator internal memory area.
Files & firmware	Save settings in a configuration files, upload configuration files and upgrade firmware.
Diagnostics	Monitor and troubleshoot the Communicator.
Support	Contains Communicator product information, Anybus contact information, link to Anybus support website, and product file for download. Here you can generate a support package with product information, to send to your Anybus support technician.

7.5. EtherCAT MDevice Settings

7.5.1. Cycle Time Settings

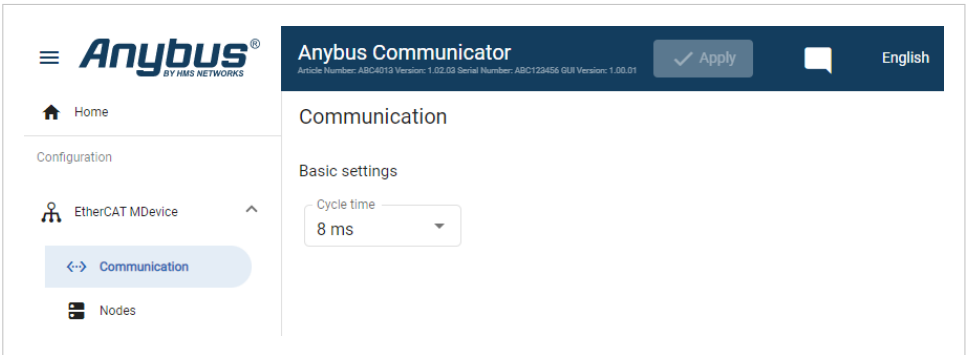


Figure 20. Communication page, Cycle time

Specify how often data is exchanged.

A lower cycle time results in reduced latency and jitter but increased network load.

- The default Cycle time is 8 ms.
- Minimum cycle time: 1 ms
- Maximum cycle time: 128 ms

7.5.2. EtherCAT MDevice Scan

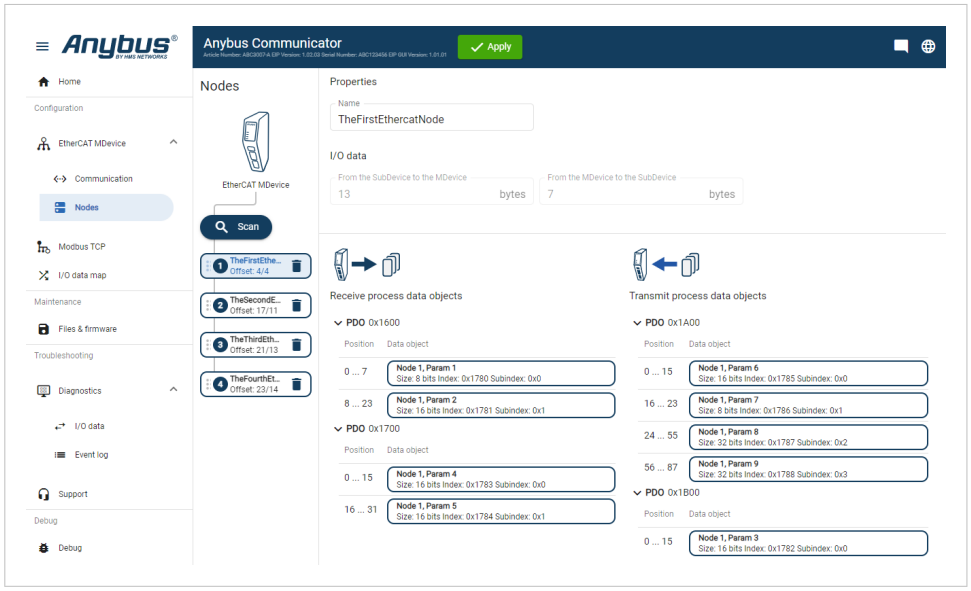


Figure 21. EtherCAT MDevice page, Scan to import nodes

Procedure

1. To import the EtherCAT MDevice nodes, click **Scan**.
2. The **Select nodes** window appears. By default, all nodes are selected.
   - To import all the nodes, click **Select**.
   - To select individual nodes: Uncheck the **Select all** checkbox. Then select the nodes to be imported and click **Select**.

Figure 22. List with all nodes selected

The nodes are imported and listed in the **Nodes** pane.

To view the **Receive process data objects** and **Transmit process data objects** for a specific node, select the node in the list.

7.5.3. Node Properties

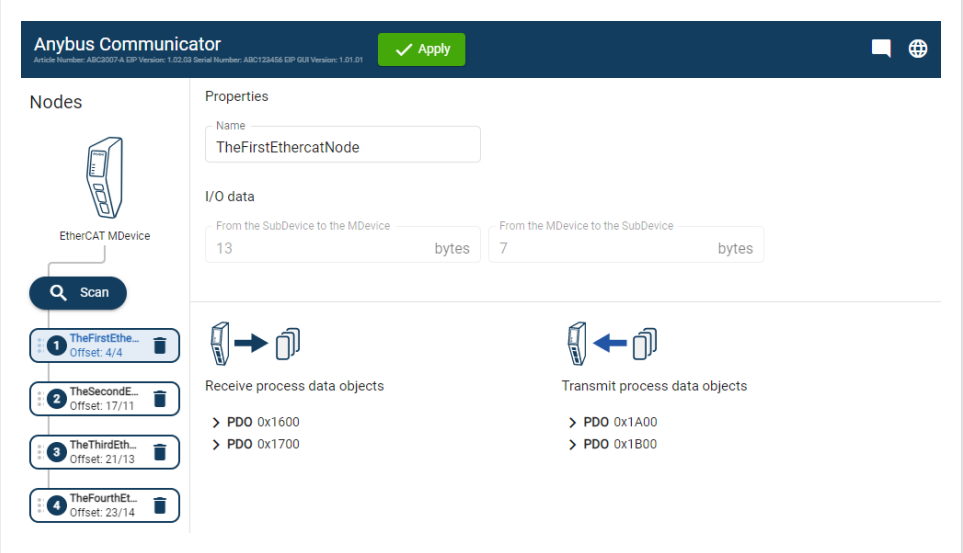


Figure 23. EtherCAT MDevice page, Properties

To view the process data objects and the properties for a specific node, select the node in the list.

The I/O data **From the SubDevice to the MDevice** and **From the MDevice to the SubDevice** are displayed in the **Properties** pane.

To give a node a specific name: Select the node and enter the name in the **Name** field.

7.5.4. Node Order

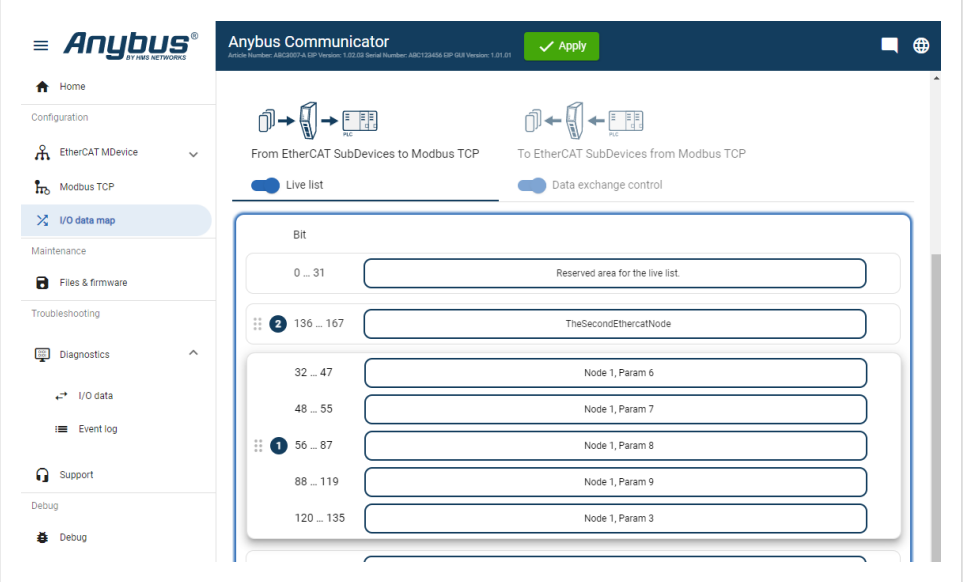


Figure 24. I/O data map page, Properties

Navigate to the **I/O data map** page.

Changing the order of the nodes also changes how they map their data to the client device (PLC or PC) on the subnetwork.

To change the order of the nodes: Drag and drop the node in the list to change the order.

7.6. Modbus TCP Network Settings

Configure the Modbus TCP network settings.

7.6.1. To Use DHCP Server

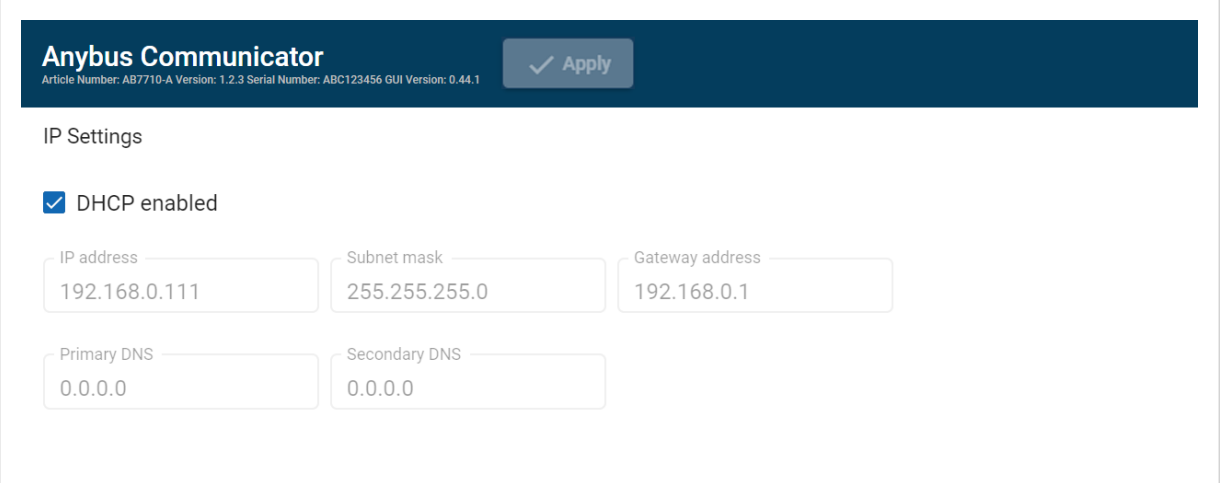


Figure 25. IP Settings, DHCP enabled

To enable DHCP, select the **DHCP enabled** checkbox. The IP settings will be provided by the high level network DHCP server.

7.6.2. To Configure IP Settings Manually

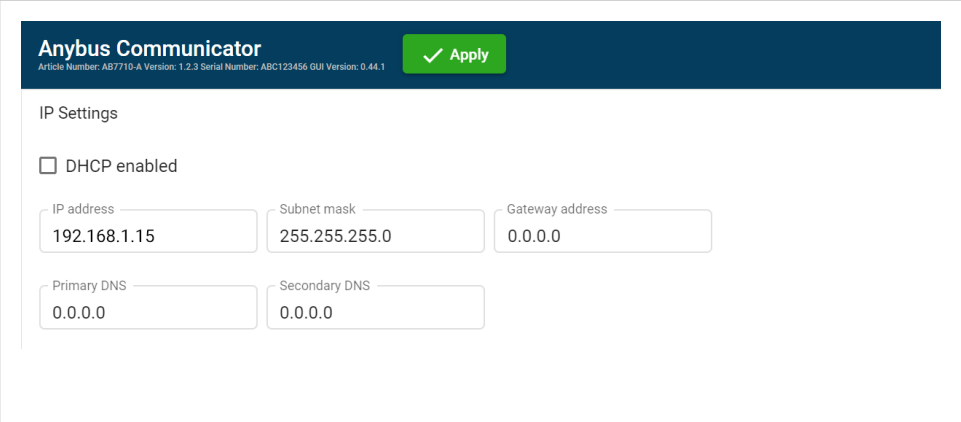


Figure 26. IP Settings, DCHP disabled

1. Deselect the **DHCP enabled** checkbox.

2. Configure the IP settings.

Setting	Description
IP address	The Modbus TCP network IP address in IPv4 dot-decimal notation
Subnet mask	The Modbus TCP network Subnet mask in IPv4 dot-decimal notation.
Gateway address	The Modbus TCP network Gateway address in IPv4 dot-decimal notation. If there is no gateway available, set the Gateway address to: 0.0.0.0
Primary DNS	The Modbus TCP network Primary DNS in IPv4 dot-decimal notation.
Secondary DNS	The Modbus TCP network Secondary DNS in IPv4 dot-decimal notation.

7.6.3. Naming the Host

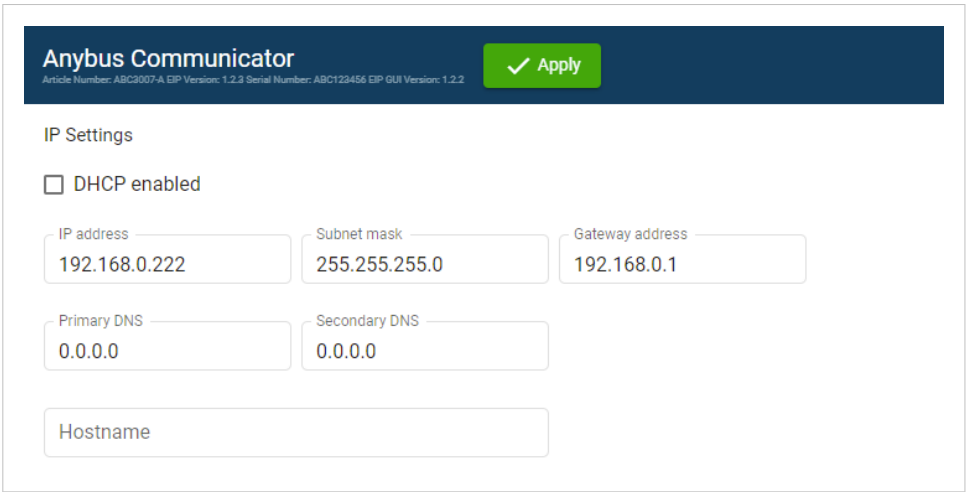


Figure 27. IP Settings Hostname

You can label the Communicator.

- The maximum allowed length of the Hostname is 64 characters.
- No symbol characters, punctuation characters, or whitespace are permitted.
- Write the Hostname as one single word.

7.6.4. Timeout Time Settings

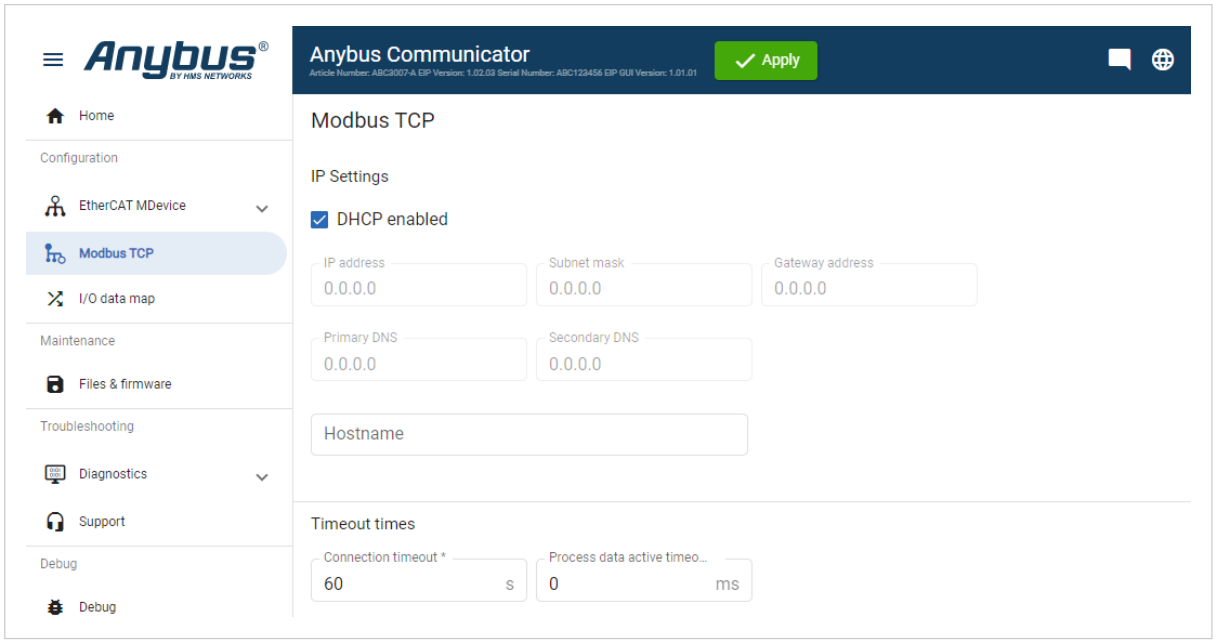


Figure 28. Modbus TCP page, Timeout times

Connection Timeout
Specify how long a Modbus TCP connection may be idle before it is closed by the Communicator.

The default value is 60 seconds.

To disable **Connection timeout**, set the value to 0.

Process Data Active Timeout
Specify the maximum allowed time between two incoming messages in steps of 10 ms.

If this time is exceeded, the high level network is considered to be offline.

The data sent to the sub-network is frozen.

A value of 0 disables this feature, i.e. the high level network can never go offline.

The default value is 0 ms.

7.7. Modbus TCP Advanced Settings

NOTE
The Advanced settings is used to makes the Communicator compatible with the .

7.7.1. Legacy Mode

Advanced settings option for Modbus TCP.

About Legacy Mode

Use Legacy Mode when you want to make a new Communicator compatible with the Communicator Classic Anybus Address Mode.

Legacy mode allows multiple Modbus function codes to be used to access the same data.

See also Legacy Address Mode I/O Data Mapping (page 49).

To Use Legacy Mode

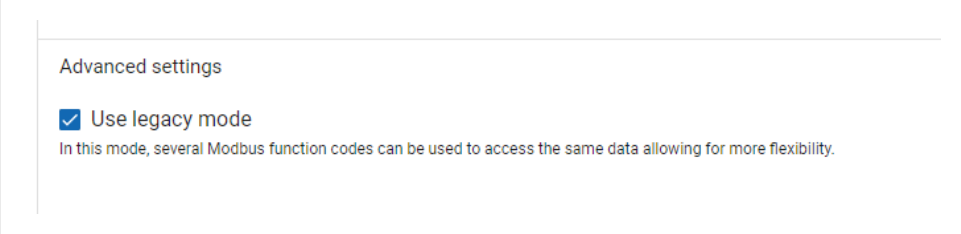


Figure 29. Advanced settings > Use legacy mode

To enable Legacy mode, select the **Use legacy mode** checkbox.

7.8. I/O Data Map

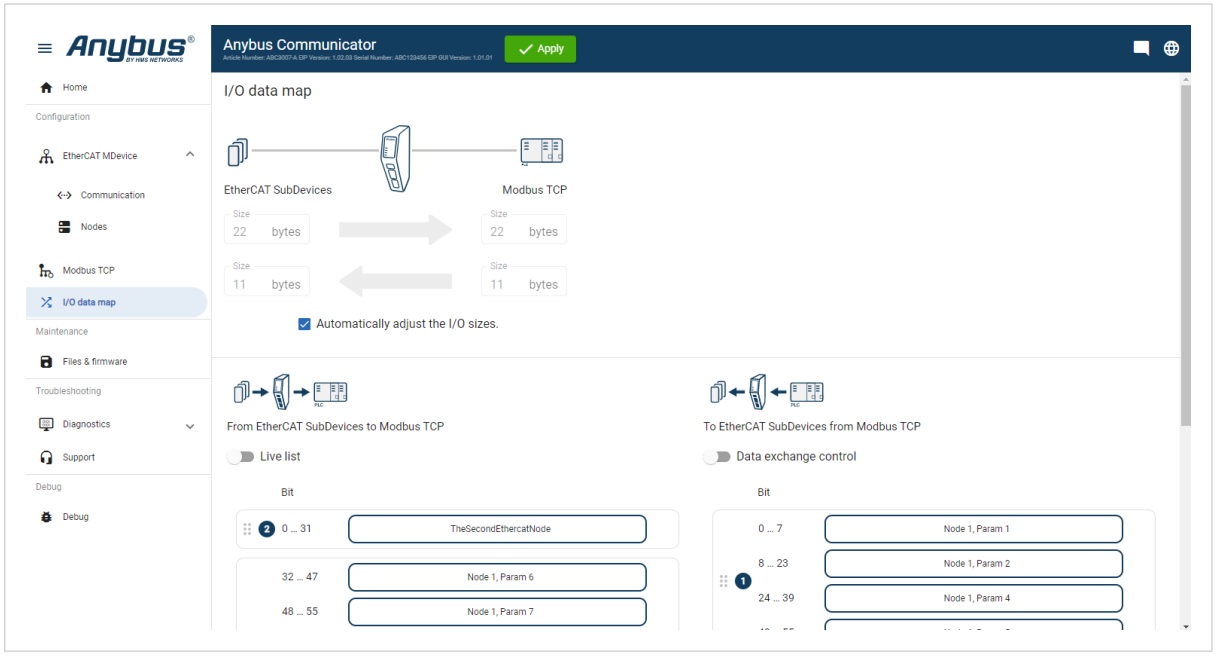


Figure 30. **I/O data map** page

On the **I/O data map** page the data communication between the EtherCAT and the Modbus TCP network is mapped.

The allocated I/O area is auto-generated based on the scanned **EtherCAT** network node(s) configuration and how the settings on the **Modbus TCP** page are configured.

There are two areas: **From EtherCAT SubDevices to Modbus TCP** and **To EtherCAT SubDevices from Modbus TCP**.

I/O Size Settings

By default, the Communicator is set to use the same I/O sizes for both the Modbus TCP network and the EtherCAT SubDevices.

To configure different sizes for the networks, deselect the **Automatically adjust the I/O sizes** checkbox and enter the desired sizes.

7.8.1. Endian Swap

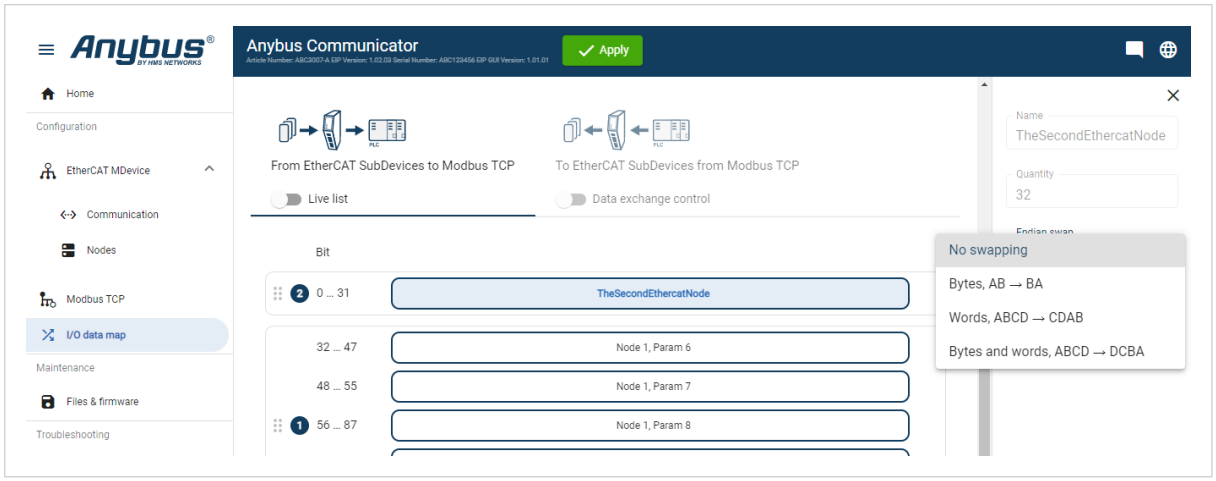


Figure 31. **I/O data map**, Endian swap

To change the byte order:

1. Navigate to the **I/O data map** page.
2. In the data map, select the object for which you want to do swap the byte order.
3. Select the endian swap type from the **Endian swap** drop-down menu.

Setting	Description
No swapping	Default setting No swapping is performed on the data.
Bytes	Swap 2 bytes A B becomes B A
Words	Swap 4 bytes A B C D becomes C D A B
Bytes and words	A B C D becomes D C B A

4. To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

7.8.2. Live List

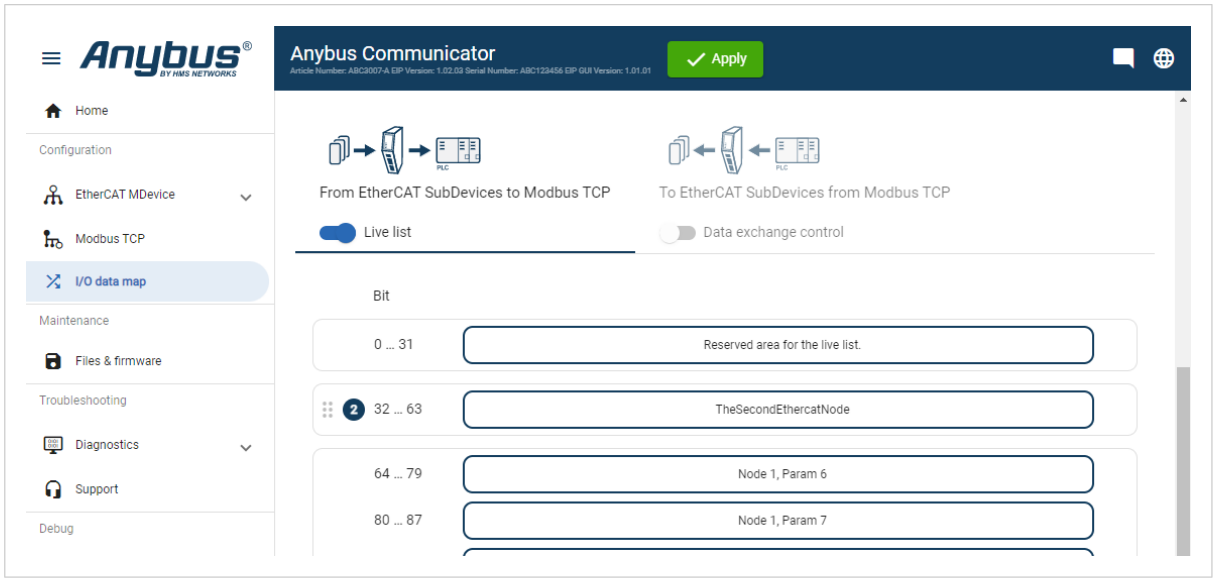


Figure 32. I/O configuration page, Live list enabled

By default, **Live list** is disabled.

About the Live List

- When **Live list** is enabled, the first four bytes of process data on the Modbus TCP network contain the live list.
- Each bit in the **Live list** can hold the status for one node.

- The **Live list** holds 32 bits, a total of 32 nodes connected to the Communicator.
- The bit is 0 when the bit does not correspond to a configured node.
  For example, this occurs when the number of configured nodes is less than 32.
- Each bit is 1 when the corresponding nodes is online.

7.8.3. Data Exchange Control

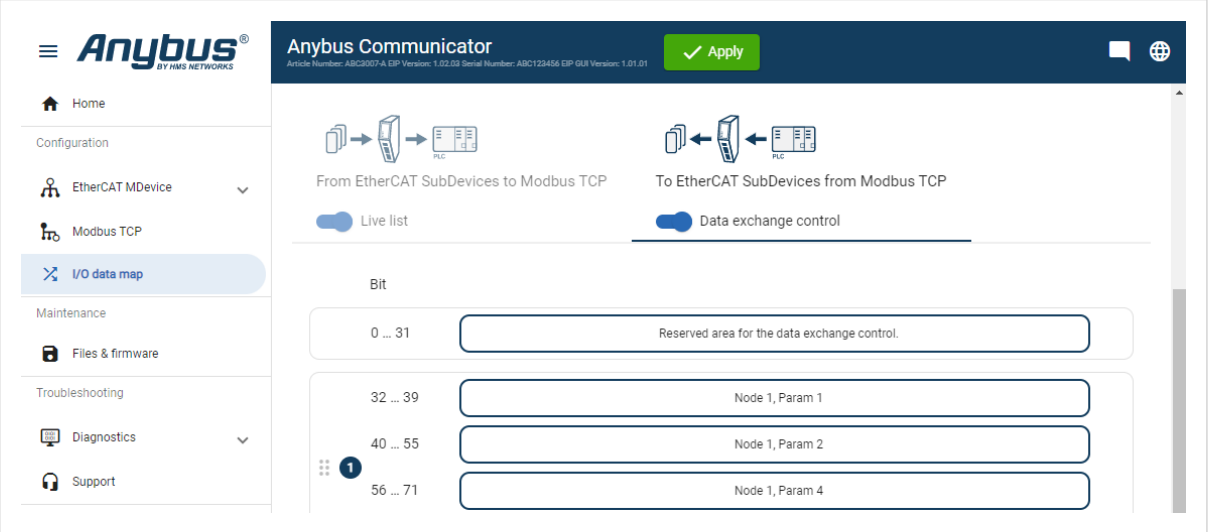


Figure 33. I/O configuration, **Data exchange control** enabled

By default **Data exchange control** is disabled.

When **Data exchange control** is enabled, the first four bytes of process data on the Modbus TCP network contain the data exchange control.

The **Data exchange control** holds 32 bits.

Each bit in the **Data exchange control** can be used to enable/disable data exchange for individual node on the subnetwork.

When the bit is 1, it correspond to a node in the state Operational.

When the Data exchange control bit is 0, the node is put in the state Safe-Operational.

The node order in the **Data exchange control** 32 bit array always matches the Live List.

When data exchange is enabled for the corresponding node, the control bit is 1.

7.9. Configuration Notes

You can add notes to describe the Communicator configuration.

7.9.1. Add Configuration Note

Procedure

1. To open the **Configuration Notes** window, click on the **comments** icon .

Figure 34. Configuration note, comment icon

2. To add a new configuration note, click **Add**.

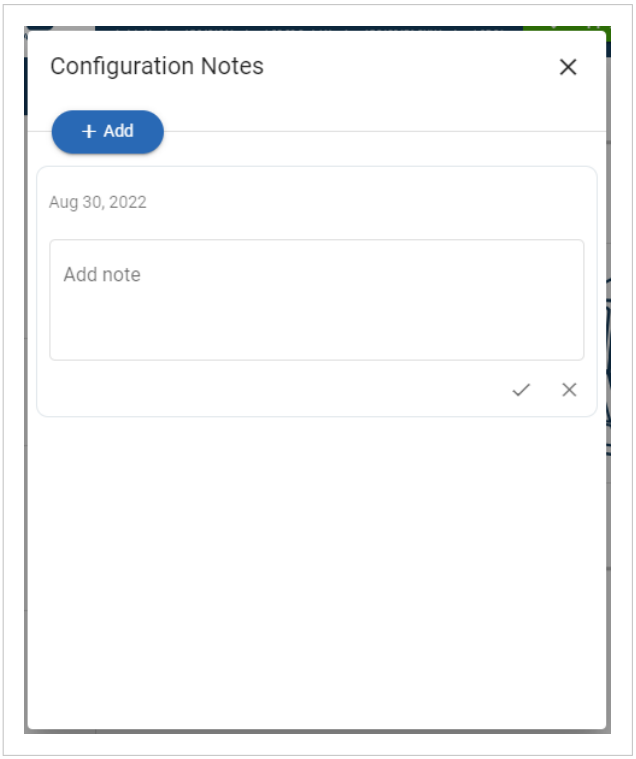


Figure 35. Add new configuration note

3. Write your configuration note and click **accept** ✓.

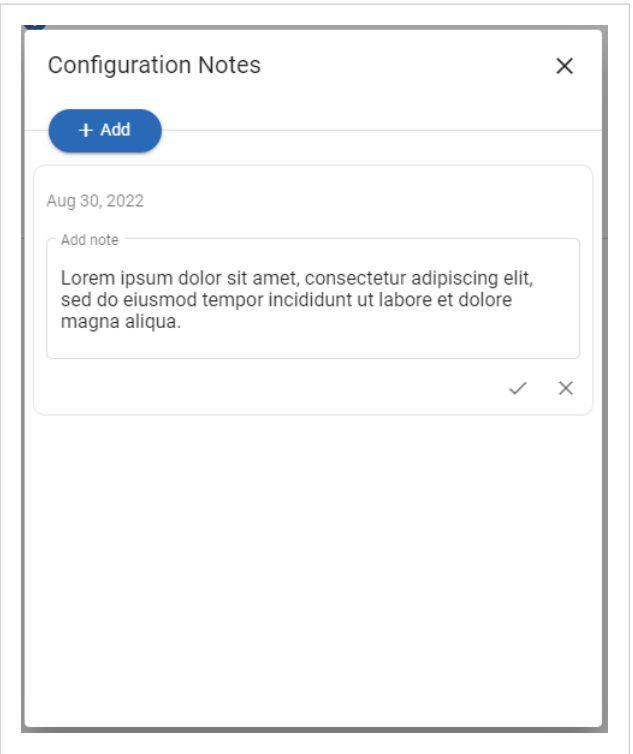


Figure 36. Write a configuration note

The configuration note is added to the list.

4. To close the window, click **close** ×.
5. To save the configuration note, click **Apply** in the web-interface header, and follow the instructions.

7.9.2. View and Edit Configuration Notes

To view and/or edit a note, click on the **comments** icon .

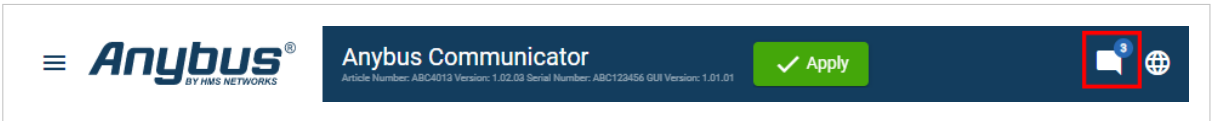


Figure 37. Example: The comment icon indicates that there are three added notes

The configuration notes are listed in the **Configuration Note** window.

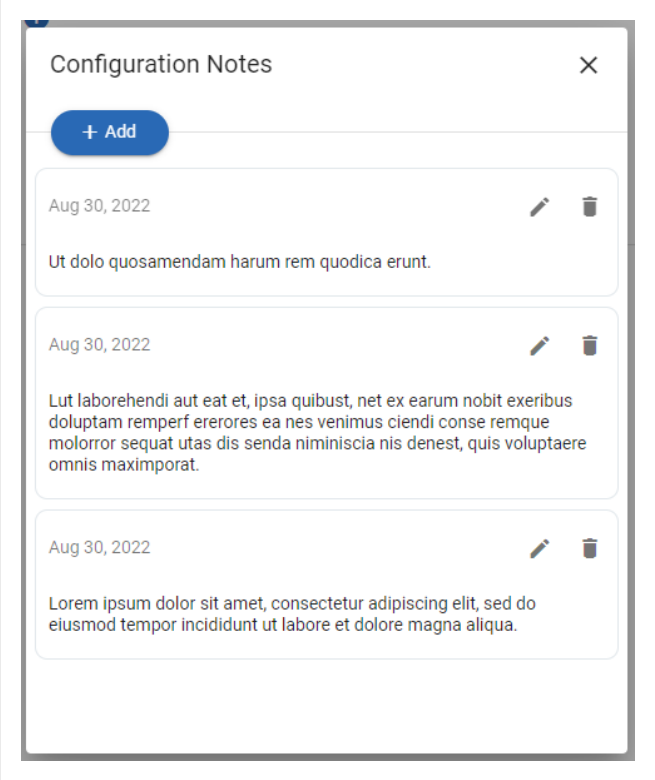


Figure 38. Example: The Configuration Notes window with added notes

7.10. Apply Configuration

Before You Begin

NOTE
When you apply the configuration, any existing configuration is overwritten.

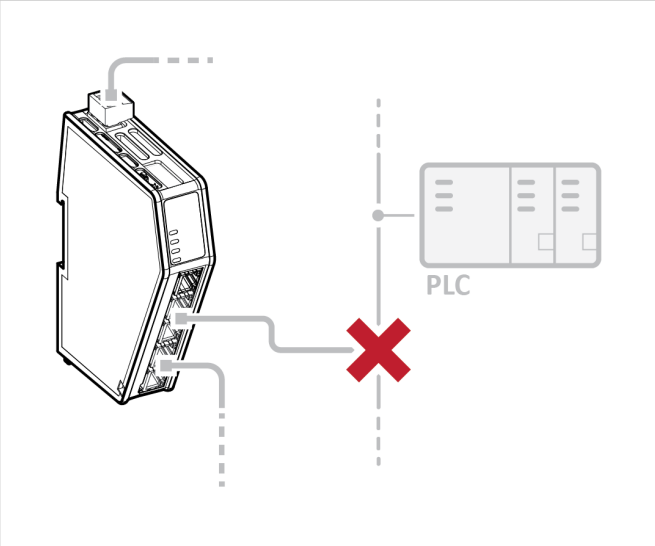


Figure 39. Disconnect the Communicator from the networks

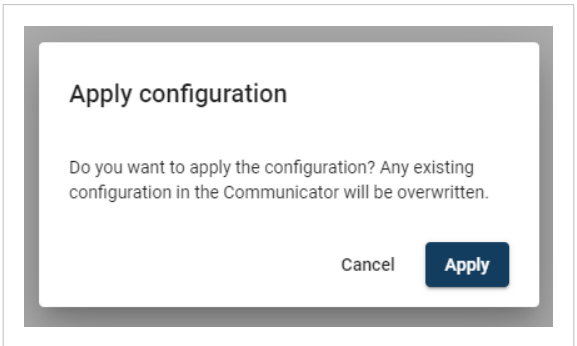
Before you can apply the configuration, ensure that there is no active communication on the Modbus TCP network where the Communicator is connected.

Procedure

To make the settings take effect, download the configuration to the Communicator:

1. In the web-interface header, click **Apply**

2. To confirm download, click **Apply**.
   The configured settings are downloaded and applied to the system.



7.11. To Use an Existing Configuration

When you have configured a Communicator and want to use the same settings to configure additional Communicator, do the following.

Procedure

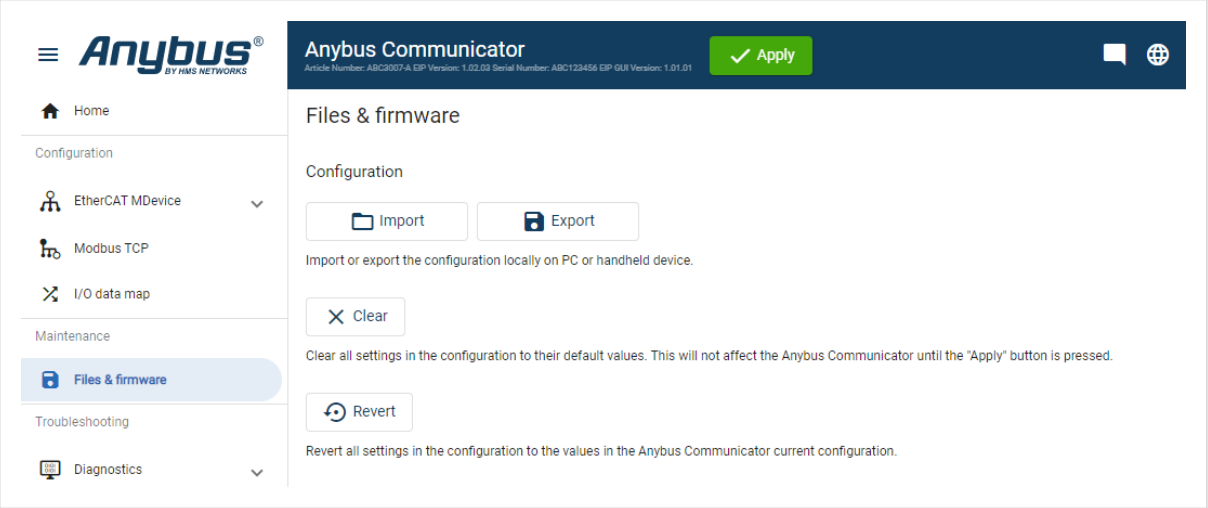


Figure 40. **Files & firmware** page

In the built-in web-interface of the Communicator with the configuration you want to use:

1. On the **Files & firmware** page, click **Export**
   The configuration is saved in a configuration file and downloaded to your PC.

In the built-in web-interface of the new Communicator to be configured:

2. On the **Files & firmware** page, click **Import**
3. In the Import configuration window, click **Select file (.conf)**.
4. In the Open dialog box, browse to, select the configuration file, and click **Open**.
5. To import the configuration file, click **Import**.

Result

All the configuration settings are imported.

To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

8. PLC Configuration

8.1. Modbus Addressing and Register Mapping

For information about the Modbus Transactions, refer to the Modbus Organization.

8.1.1. The Difference Between Address and Register Start

To read or write data from a Modbus TCP device you can use either Address or Register.

TIP

If Register is used, add +1 to the Address value.

Example 1. Modbus Function Code 0x0**4** Read Input Registers

Table 1. Modbus client values

Address	Register	Register
0	1	30001
1	2	30002
2	3	30003

Example 2. Modbus Function Code 0x0**3** Read Holding Registers

Table 2. Modbus client values

Address	Register	Register
0	1	40001
1	2	40002
2	3	40003

8.1.2. To Read and Write Data

To Read Data
To read data, you can use different Modbus Functions.

Discrete Inputs

- Modbus Function 0x02 Read Discrete Input Status

Discrete Input start at address 0.

Input Registers

- Modbus Function 0x04 Read Input Register
- Modbus Function 0x10 Read Holding Registers

The Input Registers starts at address 0 which corresponds to Register 1.

To use Read Holding Registers the address is offset to address 2048 which corresponds to Register 2049.

The first Input Register (30001)
The first Input Register (30001) can be read using Modbus Function code 0x04 Read Input Registers at Address 0 or Register 1.

You can also use Read Holding Registers (Modbus Function code 0x03) to read the same data (at Address 42048 = Register 42049) or use Read Discrete Inputs 0x02 at address 0..15.

To Write Data
To write data, you can use different Modbus Functions.

Coils

- Modbus Function 0x05 Force Single Coil
- Modbus Function 0x0F Force Multiple Coils

Coils starts at address 0.

For Modbus Function 0x05 Force Single Coil a value of FF 00 requests the coil to be ON, a value of 00 00 requests the coil to be OFF.

Holding Registers

- Modbus Function 0x06 Write Single Register
- Modbus Function 0x10 Write Multiple Registers

The Holding Registers starts at address 0 which corresponds to Register 1.

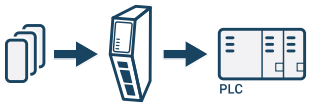
Holding Register (40001)
The first Holding Register (40001) can be written to using Modbus Function code 0x06 Write Single Register at Address 0 or Register 1.

To read back what has been written, you can use Read Holding Registers 0x03 at address 0..749 = Register 1..750 (40001..40750) or Read Coils 0x01 at address 0..11999.

8.1.3. Default Address Mode I/O Data Mapping

The following Modbus function codes are compatible with the default addressing mode.

Input Data to PLC - Data From to Modbus TCP



Process I/O data offset		Discrete input address		Input register address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x001	0 - 1	0x0000 - 0x000F	0 - 15	0x0000	0	0x0800	2048
0x0002 - 0x0003	2 - 3	0x0010 - 0x001F	16 - 31	0x0001	1	0x0801	2049
...	...	...	...	...	...	...	...
0x05D8 - 0x05D9	1496 - 1497	0x2EC0 - 0x2ECF	11968 - 11983	0x02EC	748	0x0AEC	2796
0x05DA - 0x05DB	1498 - 1499	0x2ED0 - 0x2EDF	11983 - 11999	0x02ED	749	0x0AED	2797

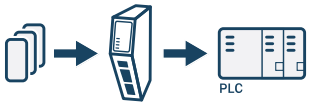
Output Data From PLC - Data From Modbus TCP to EtherCAT

Process I/O data offset		Coil address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x0000 - 0x000F	0 - 15	0x0000	0
0x0002 - 0x0003	2 - 3	0x0010 - 0x001F	16 - 31	0x0001	1
...	...	...	...	...	...
0x05D8 - 0x05D9	1496 - 1497	0x2EC0 - 0x2ECF	11968 - 11983	0x02EC	748
0x05DA - 0x05DB	1498 - 1499	0x2ED0 - 0x2EDF	11983 - 11999	0x02ED	749

8.1.4. Legacy Address Mode I/O Data Mapping

The following Modbus function codes are compatible with the Modbus TCP **Use legacy mode** setting, see Legacy Mode (page 36).

Input Data to PLC - Data From EtherCAT to Modbus TCP



Process I/O data offset		Discrete input address		Coil address		Input register address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x0000 - 0x000F	0 - 15	0x0000 - 0x000F	0 - 15	0x0000	0	0x0000	0
0x0002 - 0x0003	2 - 3	0x0010 - 0x001F	16 - 31	0x0010 - 0x001F	16 - 31	0x0001	1	0x0001	1
...	...	...	...	...	...	...	...	...	...
0x01FC - 0x01FD	508 - 509	0x0FE0 - 0x0FEF	4064 - 4079	0x0FE0 - 0x0FEF	4064 - 4079	0x00FE	254	0x00FE	254
0x01FE - 0x01FF	510 - 511	0x0FF0 - 0x0FFF	4080 - 4095	0x0FF0 - 0x0FFF	4080 - 4095	0x00FF	255	0x00FF	255

Output Data From PLC - Data From Modbus TCP to EtherCAT

Process data offset		Discrete input address		Coil address		Input register address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x4000 - 0x400F	16384 - 16399	0x4000 - 0x400F	16384 - 16399	0x0400	1024	0x0400	1024
0x0002 - 0x0003	2 - 3	0x4010 - 0x401F	16400 - 16415	0x4010 - 0x401F	16400 - 16415	0x0401	1025	0x0401	1025
...	...	...	...	...	...	...	...	...	...
0x01FC - 0x01FD	508 - 509	0x4FE0 - 0x4FEF	20448 - 20463	0x4FE0 - 0x4FEF	20448 - 20463	0x04FE	1278	0x04FE	1278
0x01FE - 0x01FF	510 - 511	0x4FF0 - 0x4FFF	20464 - 20479	0x4FF0 - 0x4FFF	20464 - 20479	0x04FF	1279	0x04FF	1279

8.1.5. Idle Mode

Transaction	Holding Register	Description
Enter/Exit Idle Mode	0x1004	Used by the Modbus TCP client to indicate an idle/offline mode on the network.

9. Verify Operation

Before You Begin

Ensure that the Communicator is connected to your PC, to a power supply and to the OT network.

See Installation (page 14).

9.1. Communicator Status Monitor

On the Home page, you can get a quick overview of the network and the Communicator operating status.

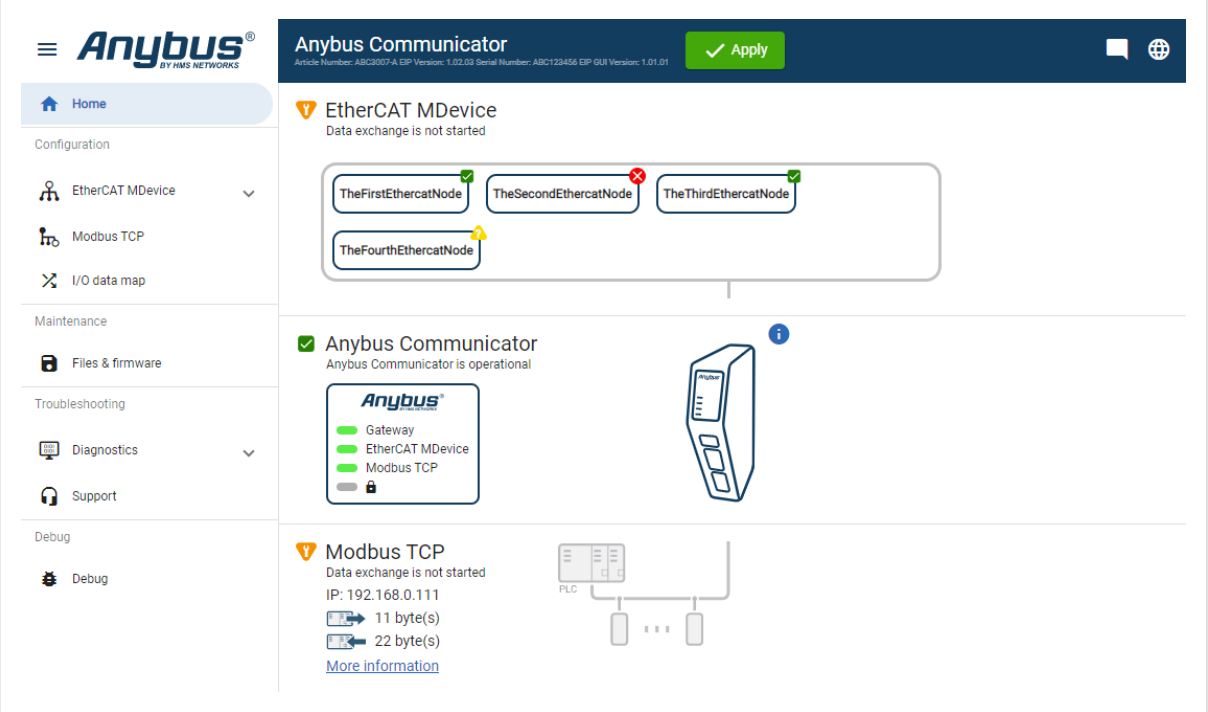


Figure 41. Home page

Gateway Status

Overview the Communicator LED indications remotely.

Refer to Communicator LED Indicators (page 52).

Node Status

Overview the status for each node added to the subnetwork.

Network Status and Settings

Overview communication status and the current networks settings.

Status Symbols

Symbol	Description
	Internal error has occurred, and operation cannot be guaranteed.
	Out of Specification.
	Check Function: • Initial state where non network components are started and configured. • Network startup in progress. • Invalid configuration detected.
	Normal operation.

9.2. Communicator LED Indicators

This topic applies to different product variants for different networks.

NOTE
Before you can verify operation, you must configure the Communicator.

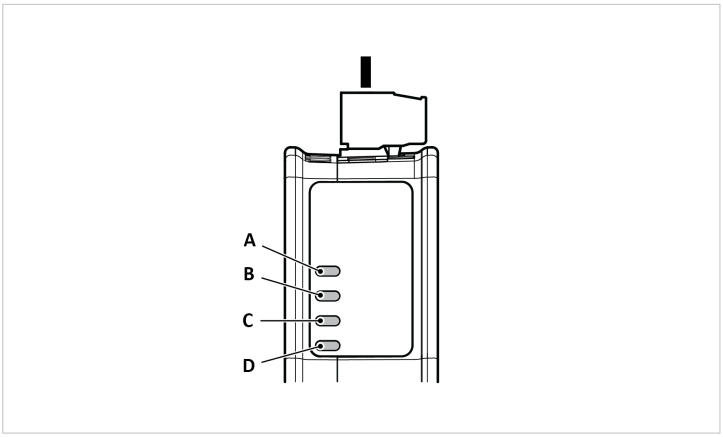


Figure 42. Gateway status (A), Network connection (B)/(C) and Security switch (D)

Gateway status - LED A	
Operation status	**Description**
Off	No power
Green, flashing	Startup phase
Green, solid	Operational
Red, flashing	Invalid configuration
Green/Red, flashing	Power up self-test/Firmware update/Firmware recovery

Connection to client device

- **LED B for product:**
  ABC3107 EtherNet/IP, ABC3128 Modbus TCP, ABC3113 PROFINET, and ABC3190 Common Ethernet
- **LED C for product: ABC3100 PROFIBUS**

Operation status	**PROFIBUS**	**EtherNet/IP**	**Modbus TCP**	**PROFINET**
Off	No power/No data exchange	No power/No IP address	No power/ No IP address	No power/No connection with IO controller
Green, flashing	Clear, data exchange	EtherNet/IP online, no connections established	Modbus TCP online, no messages received	Used by engineering tools to identify the node on the network
Green, one flash	N/A			Connection with IO controller established, IO controller in STOP state or IO data is inaccurate.
Green, solid	Operate, data exchange	Running, one or more connections established		
Red, solid	N/A	IP address conflict detected		N/A
Red, one flash	Parameterization error	N/A		Station name not set
Red, two flash	Configuration error	N/A		IP address not set
Red, three flash	N/A			Expected Identification differs from Real Identification
Red, flashing	N/A	One or more connections timed out	Connection timeout	N/A

EtherCAT MDevice • LED C for product: ABC3107 EtherNet/IP, ABC3128 Modbus TCP, ABC3113 PROFINET, and ABC3190 Common Ethernet • LED B for product: ABC3100 PROFIBUS	
Operation status	**Description**
Off	No power/Subnetwork not running/Node is switched off via a control word
Green, solid	Running
Red, flashing	All nodes are offline

Security switch - LED D	
Operation status	**Description**
Off	No power/Security switch is unlocked/Exception/Fatal error
Green	Security switch is locked

Fatal Error and Exception Error

Fatal error: A fatal error causes the Communicator firmware application to crash in an uncontrolled manner.

Exception error: An exception error causes the Communicator to enter a controlled error state. The Communicator firmware application is still running.

LED	Fatal error	Exception error
A	Red, solid	Red, solid
B	Red, solid	Off
C	Red, solid	Off
D	Off	Off

9.3. EtherCAT LED Indicators

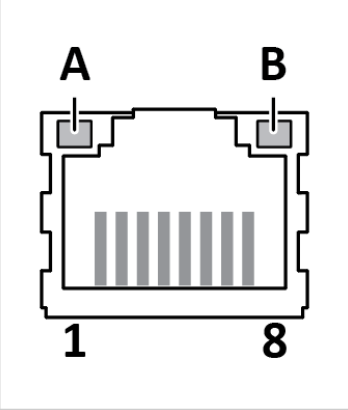


Figure 43. LED A. Activity LED B. Not used

LED A	Function
Off	No link (or no power)
Green	Link (100 Mbit/s) established
Green, flashing	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flashing	Activity (10 Mbit/s)

LED B	Function
Off	Not used

10. Maintenance

10.1. Configuration File Handling

10.1.1. Export Configuration

You can export the current configuration, to import and use the same settings to configure additional Communicator.

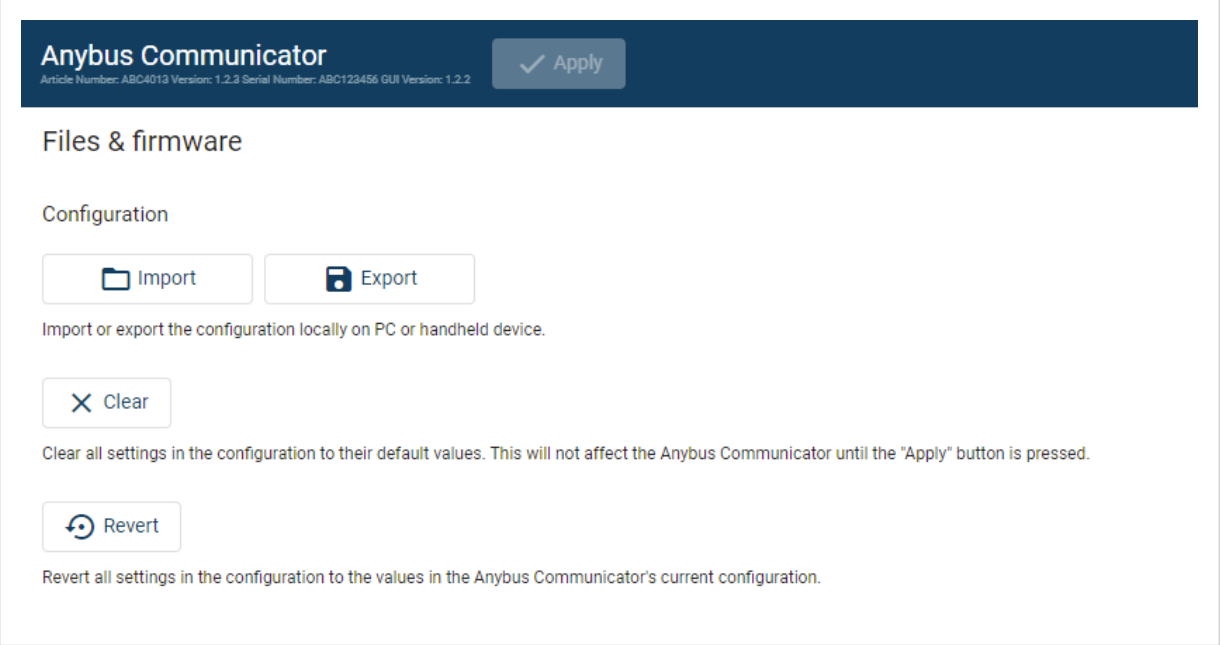


Figure 44. Files & firmware page

To export a configuration file:

In **Files & firmware**, click **Export**.

The configuration settings are stored in a .conf file and downloaded to your PC.

10.1.2. Import Configuration

To easily configure multiple Communicator with the same settings, you can import a configuration file.

Before You Begin

The supported file format is .conf.

Procedure

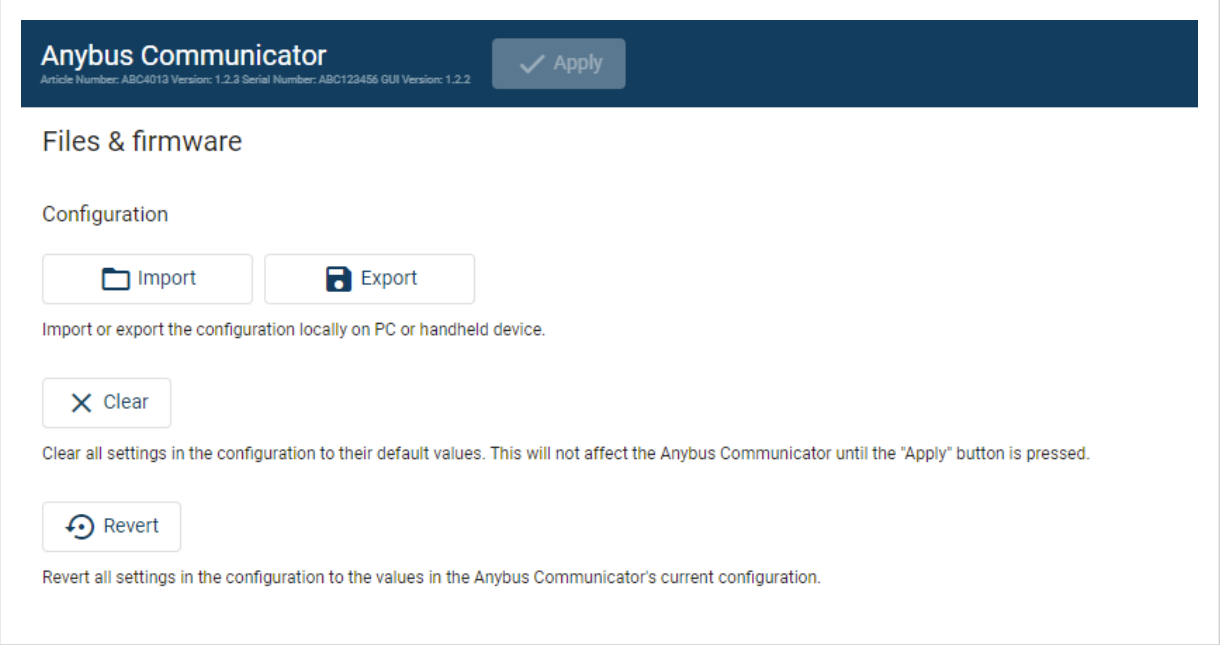


Figure 45. Files & firmware page

Import configuration file:

1. On the **Files & firmware** page, click **Import**.
2. In the Import configuration window, click **Select file (.conf)**.
3. In the Open dialog box, browse to, select the configuration file and click **Open**.
4. In the Import configuration window, click **Import**.
5. In the Communicator address settings window:
   - To import IP settings from the selected configuration file, click **Imported settings**.
     All configuration settings are imported.
   - To continue using the current IP settings, click **Configured settings**.
     All configuration settings except the IP settings are imported.
6. The configuration file is parsed.
   - If the configuration is compatible, the settings are imported.
   - If any compatibility mismatches occur, a message about the mismatch appears.
7. To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

10.2. Clear and Revert Configuration

You can restore all settings in a configuration to the default settings.

Procedure

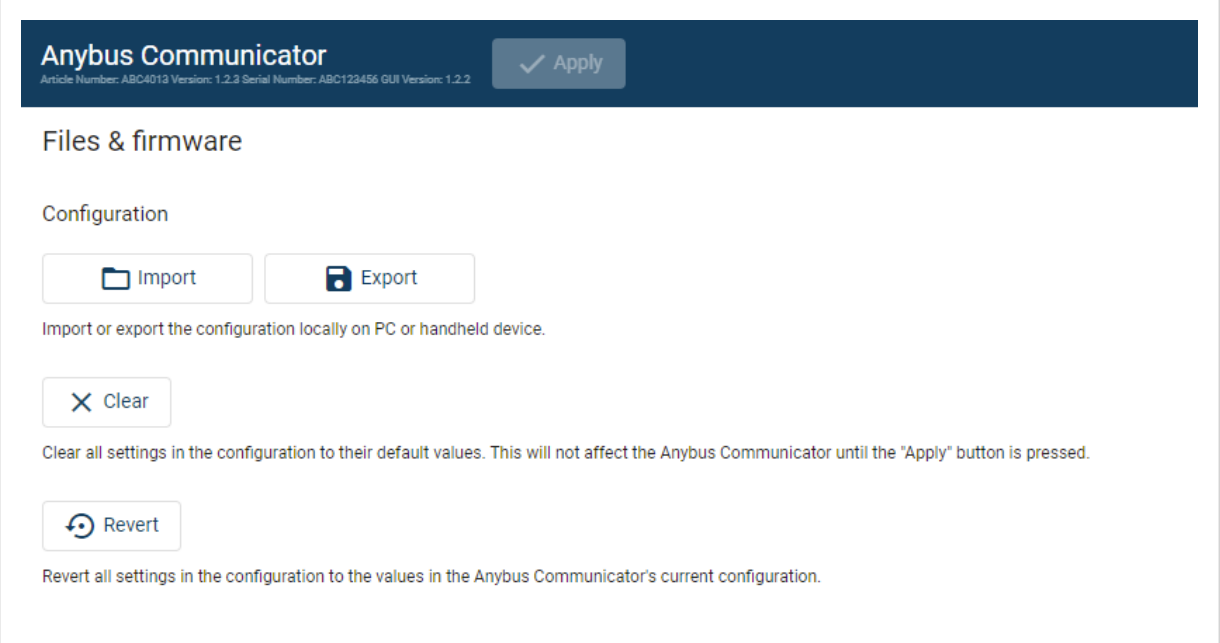


Figure 46. Files & firmware page

To Clear the Configuration

When you want to clear a configuration and return to the default settings.

1. On the **Files & firmware** page, click **Clear**.
2. In the Confirm clear window, click **Clear**.
3. To apply the change, click **Apply** in the web-interface header, and follow the instructions.

To Revert the Configuration

When you want to remove any configuration made in a current session and re-load the configuration from the gateway.

1. On the Files & firmware page, click **Revert**.
2. In the Confirm revert window, click **Revert**.
3. To apply the change, click **Apply** in the web-interface header, and follow the instructions.

10.3. Firmware Management

10.3.1. View the Firmware Version

On the **Support** page, you can view the current applied firmware version.

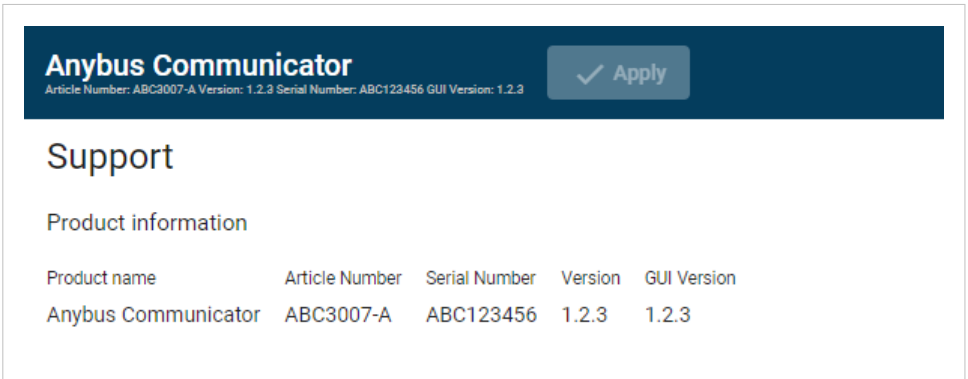


Figure 47. Support page, Product information example

10.3.2. Firmware and Configuration Compatibility

Compatibility after firmware upgrade

Current configuration is still compatible after upgrading the firmware.

Compatibility after firmware downgrade

IMPORTANT

Compatibility after a firmware downgrade cannot be guaranteed.

The current configuration may use features not available in the older firmware version.

10.3.3. Firmware File Validation

Before the firmware file is imported into the system, the firmware upgrade function performs a validation of the file, to ensure that:

- the firmware is compatible with the Communicator hardware
- the firmware is suited for the product
- the officially HMS software signatures are valid
- that the firmware file is not corrupt or damaged

If the firmware file does not pass the validation, the firmware file is rejected and an error message appear.

10.3.4. Update Firmware

Before You Begin

> **IMPORTANT**
> To eliminate the risk of interference with plant operation, firmware update is only available when the Communicator is disconnected from the OT networks.

Ensure to disconnect the Communicator from the OT networks.

Procedure

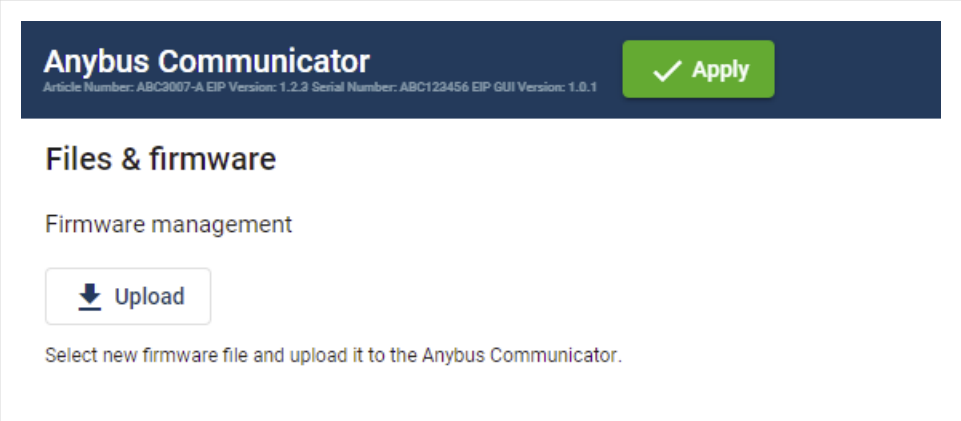


Figure 48. Files & firmware page

To update the firmware:

1. On the **Files & firmware** page, click **Upload**.
2. In the Upload Firmware window, click **Select firmware (.hiff)**.
3. In the Open dialog box, browse to, select the firmware file, and click **Open**.
4. To start the firmware upgrade, click **Update firmware**.
   The firmware file is validated and transferred.

Result

- If the firmware file passes the validation: The firmware is upgraded and then the Communicator automatically reboots, for the upgrade to take effect.
- If the firmware file is rejected: An error message appears.

10.4. Change Language

Default language is **English**.

To change the language of the Communicator built-in web interface:

1. In the Communicator built-in web-interface header, click the **Language** icon .

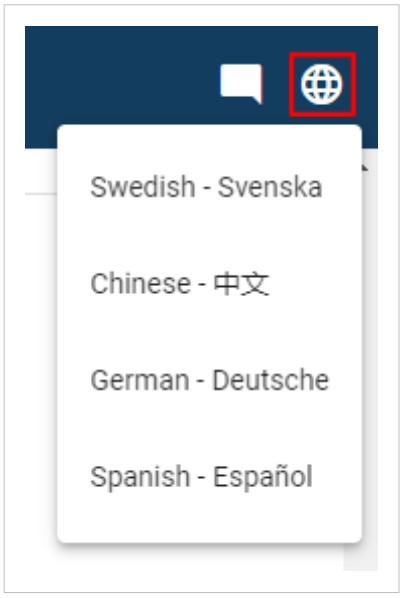


Figure 49. Language menu

2. Select a new language from the list.

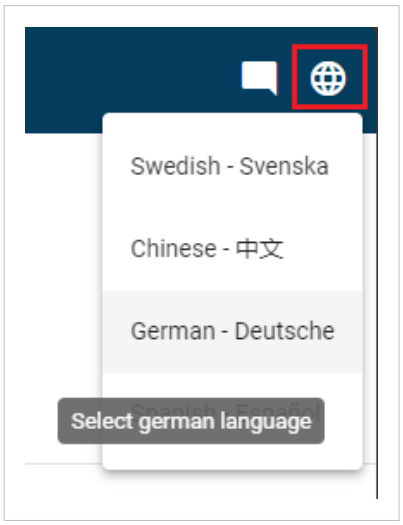


Figure 50. Example: Change language to German

The language change takes effect immediately.

11. Troubleshooting

11.1. Diagnostics

11.1.1. I/O Data

On the **Diagnostics**, **I/O data** page you can monitor how the data flow between the **EtherCAT** side and the **Modbus TCP** side, including any configured endian conversions.

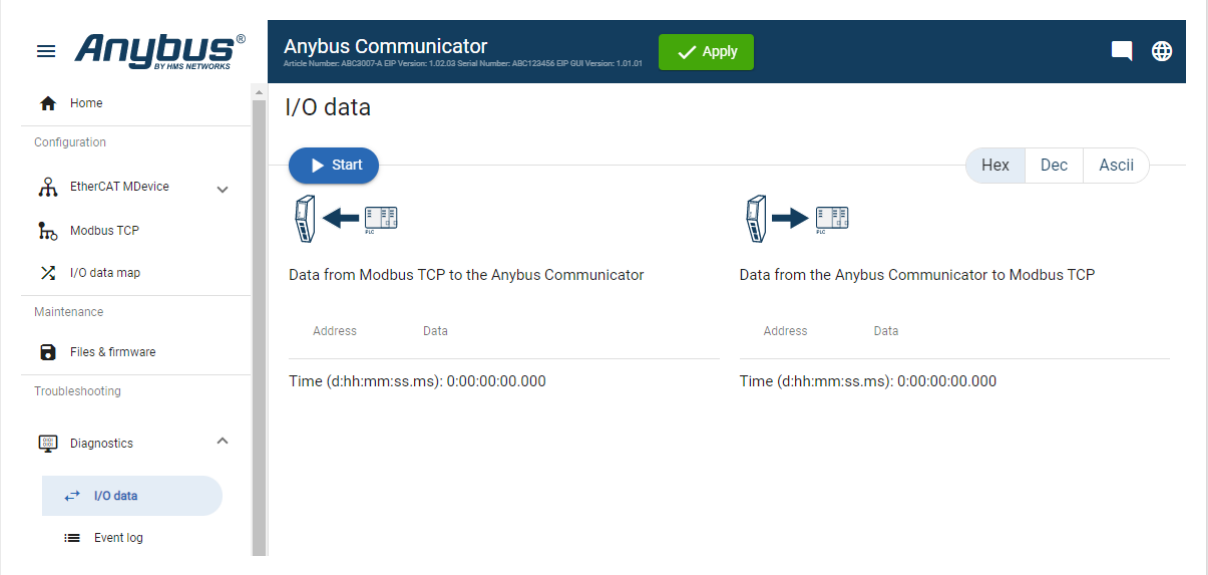


Figure 51. I/O data

I/O data is updated twice every second.

Select how data is displayed

To choose if the data should be displayed in Hexadecimal, Decimal or ASCII, click **Hex**, **Dec** or **Ascii**.

Start and Stop Data flow

- To start the data flow, click **Start**.
- To end the data flow, click **Stop**.

11.1.2. Event Log

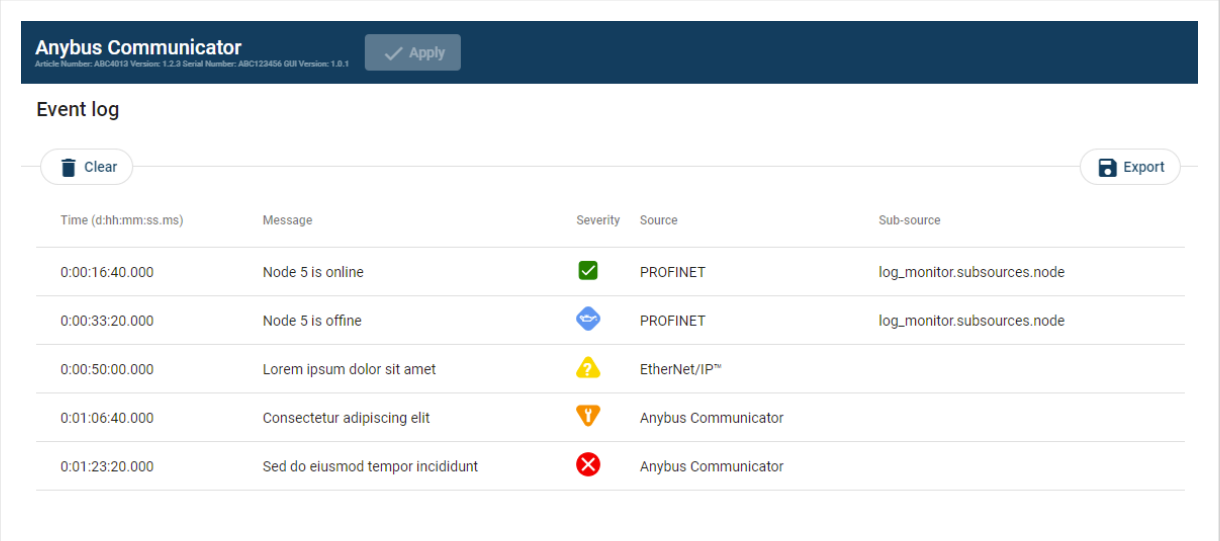


Figure 52. Event log page example

How To Analyze the Information

The log follows the FIFO principle, first in and first out. The oldest (first) value is processed first.

Time (d:hh:mm:ss.ms)	The date and time when the event occurred.	
Message	A brief description of the event.	
Severity	The severity of the event occurred. For description of the symbols, see Communicator Status Monitor (page 50).	
Source	0	Communicator
	1	High level network, Modbus TCP
	2	EtherCAT
Sub-source	The nodes connected to the subnetwork and the PLC connected to the high level network. If there is a problem with a node the node name is displayed in the Sub-source column.	
	Example 3. Sub-source number If the node name is 5, number 5 is displayed in the Sub-source column.	

To clear the current log, click **Clear**.

11.1.3. LED Status

On the Home page, you can remotely monitor the Communicator LED status.

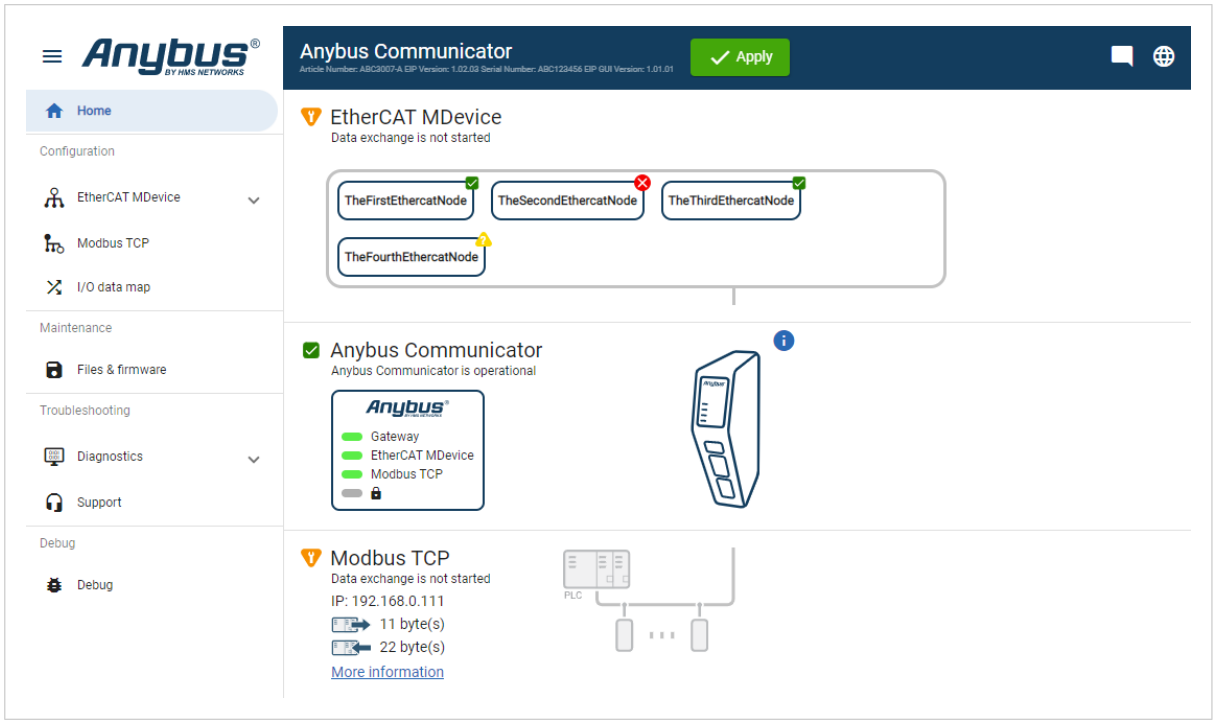


Figure 53. Home page

For information about the LED indication, see Communicator LED Indicators (page 52).

11.2. Reset to Factory Settings

Before You Begin

Procedure

To reset the Communicator:

1. Disconnect the Communicator from power.

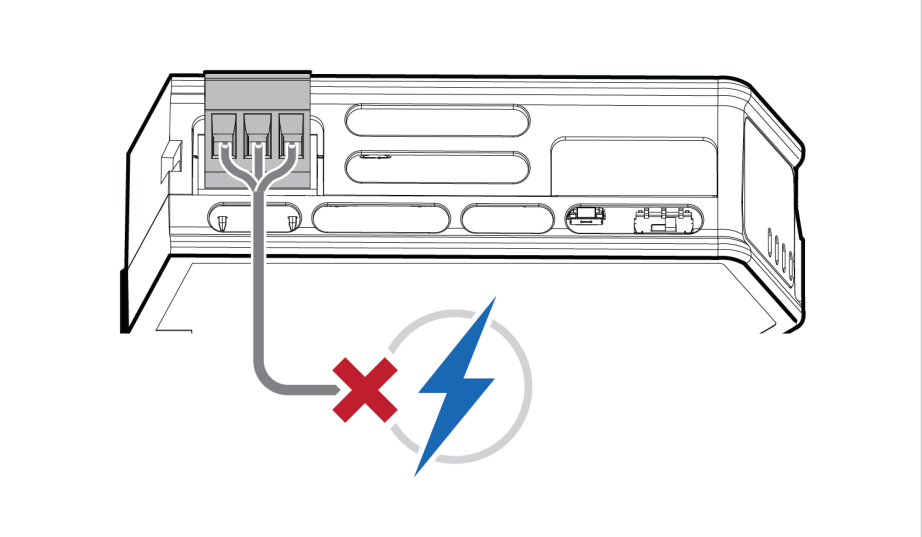


Figure 54. Disconnect power

2. Use a pointed object, such as a ballpoint pen to press and hold the **Reset** button.

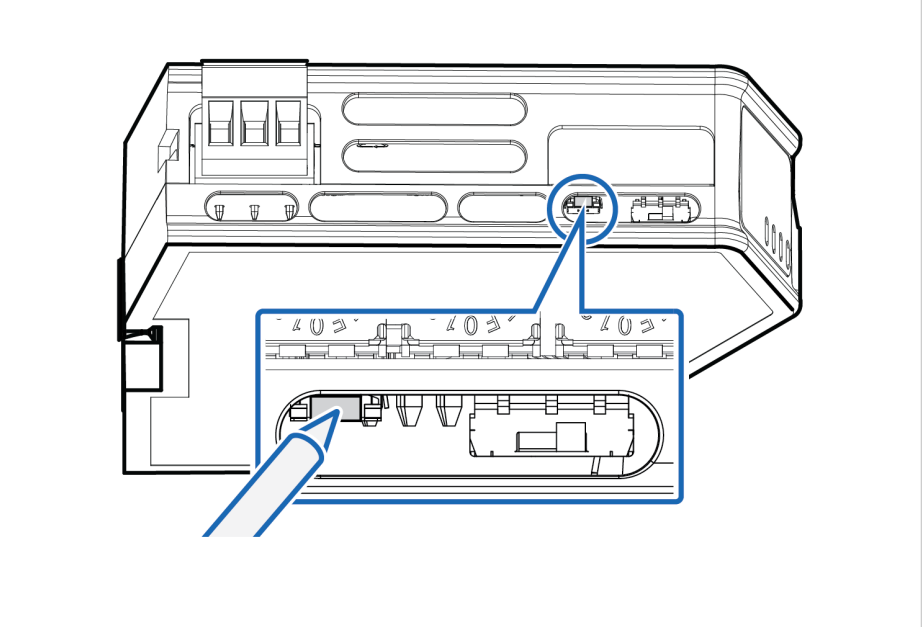


Figure 55. Press and hold **Reset** button

3. While holding the **reset** button, reconnect the Communicator to power.

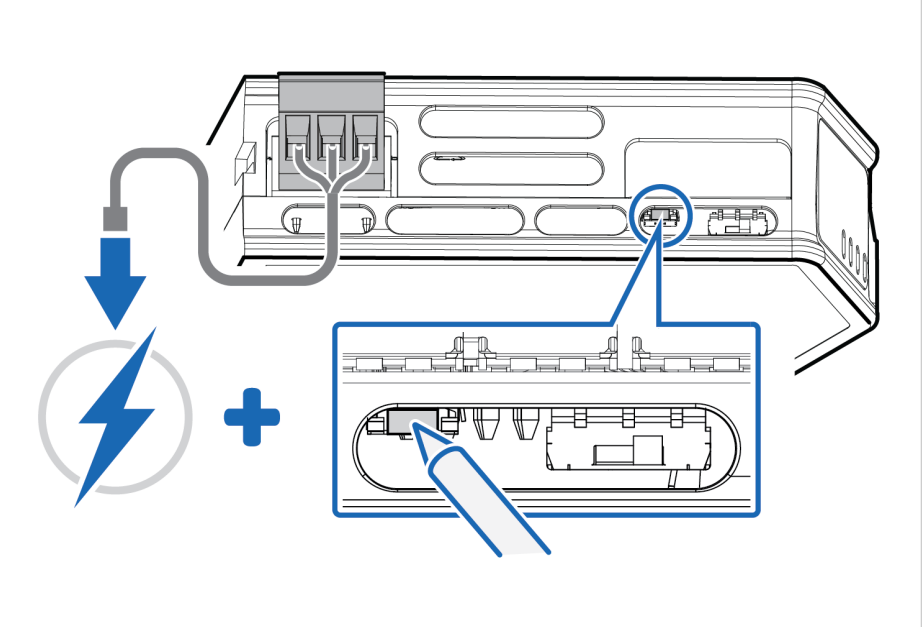


Figure 56. Hold **Reset** button and reconnect power

4. Release the **reset** button.
   The Communicator enters exception state.

5. Reboot the Communicator.

Result

To Do Next

To ensure that the Communicator built-in web-interface is synchronized.

1. Open the Communicator built-in web interface.
2. Navigate to the **Files & firmware** page and click **Revert**.

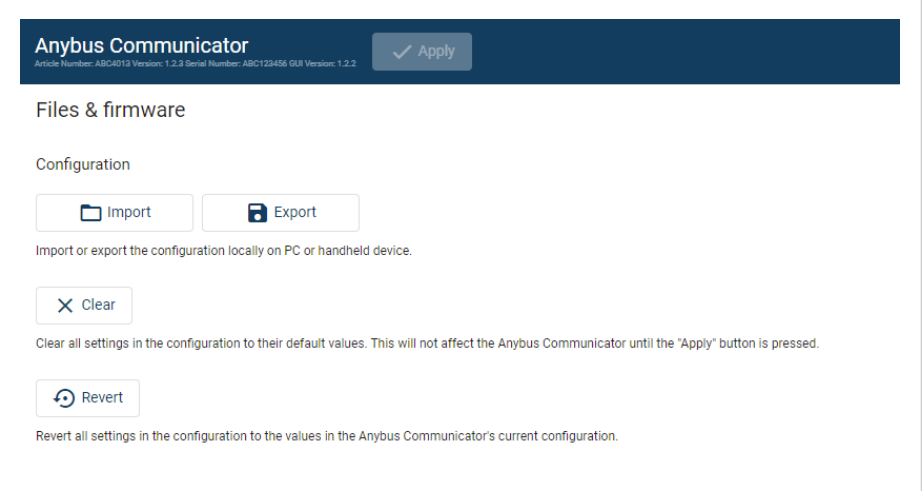


Figure 57. Files & firmware, Revert

11.3. Firmware Upgrade Error Management

Before You Begin

If the firmware update process is interrupted or if the power is lost during the update process, the Communicator goes into fallback mode.

The last working firmware is still available on the flash, but it is not active.

Procedure

To complete the interrupted firmware update:

1. Disconnect the Communicator from power.

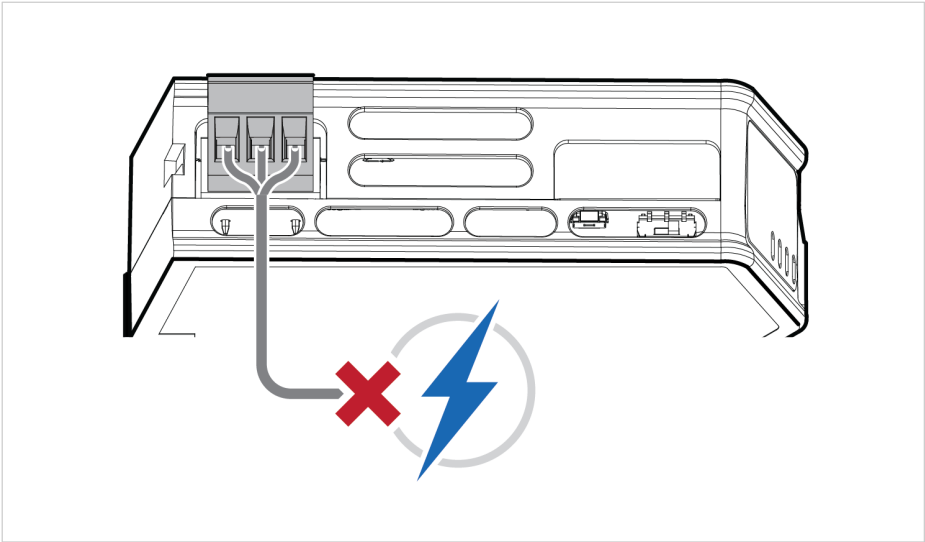


Figure 58. Disconnect power

2. Reconnect the Communicator to power.

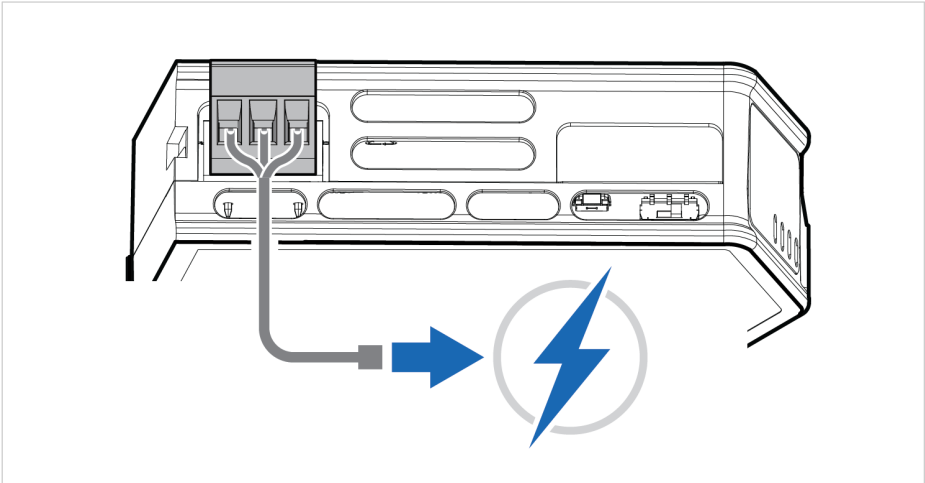


Figure 59. Reconnect power

3. Leave the Communicator for 10 minutes.
   The Gateway status led indicator flashes red and green until the firmware upgrade is completed.

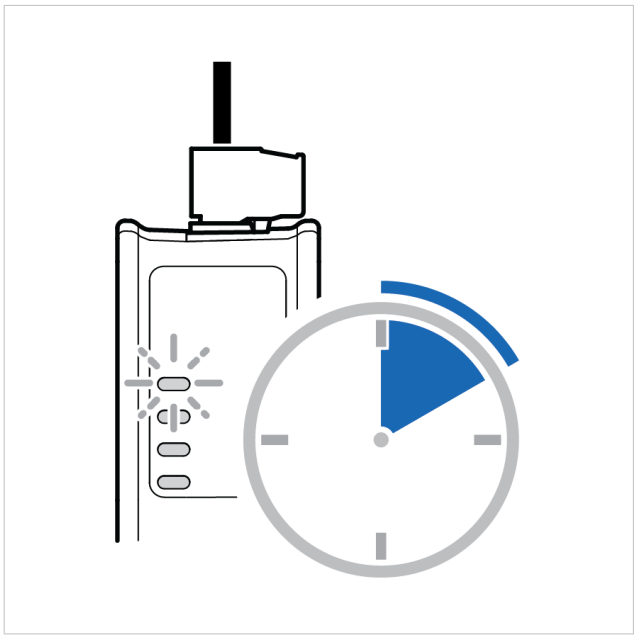


Figure 60. Firmware upgrade LED indication

Result

The Communicator recover and return to normal operation.

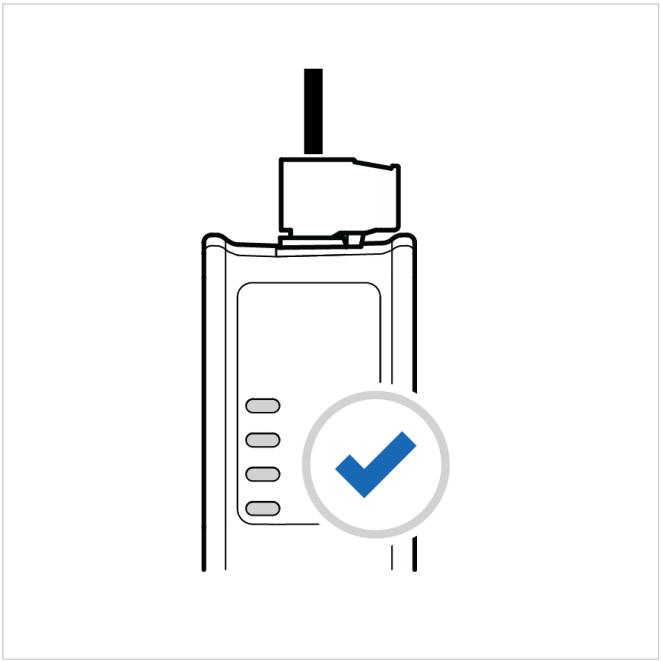


Figure 61. Recover and return to normal operation

To Do Next

To check LED status, refer to Communicator LED Indicators (page 52).

11.4. Support

11.4.1. Support Package

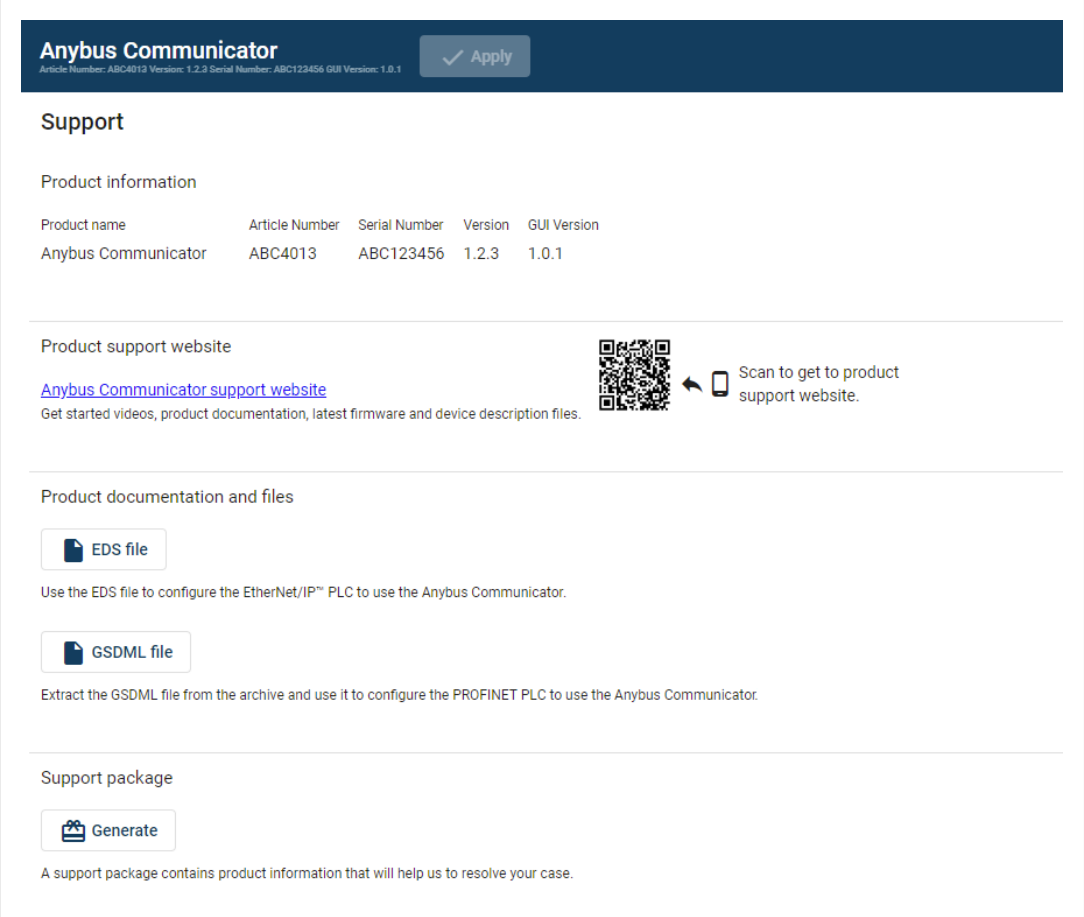


Figure 62. Support page example

Before you create a ticket for technical support, generate a support package.

The support package contains information about what has occurred and will help the Anybus technical support team resolve the support case as quickly and efficiently as possible.

Support Package Content
The information in the support package is available to open and read, the files are not locked or encrypted.

Generate Support Package
On the **Support** page, click **Generate**.

A zip file with the support files is downloaded to your PC.

Create a Support Ticket
1. On the **Anybus Technical Support** page, navigate to the **Support Center** page and click **HMS Support Portal**.
2. In the **HMS Support Portal**, create a support ticket and upload the support package.

12. Technical Data

For complete technical specifications and regulatory compliance information, please visit www.anybus.com.

12.1. Technical Specifications

Article identification	ABC3128
Configuration connector	RJ45
Communication connector	RJ45 x 2
EtherCAT MDevice connector	RJ45 x 2
Power connector	3-pin screw connector
Power supply	12-30 VDC, Reverse voltage protection and short circuit protection
Power consumption	Typical: 90 mA @ 24 V (2.2 W) Max: 3 W
Storage temperature	-40 to +85 °C
Operating temperature	-25 to +70 °C
Humidity	EN 600068-2-78: Damp heat, +40°C, 93% humidity for 4 days EN 60068-2-30: Damp heat, +25°C – +55°C, 95% RH, 2 cycles
Vibration	See datasheet
Housing material	Plastic, See datasheet for details
Protection class	IP20
Product weight	150 g
Dimensions	27 x 144 x 98 mm (W x H x D) with connectors included
Mounting	DIN-rail