



MINT V2.0.1

GUIDELINE REV2.4

MICHEAS GOETHALS

Table of Contents

1	Terminology	4
2	Required knowledge.....	5
3	MINT configuration preparation	6
3.1	Download MINT configuration	6
3.2	Creating a MINT project in CodeCreator	9
3.3	Importing the “Code Generator” (.zip)	14
3.4	Creating a MINT Project	17
4	Preparing the PLC	25
4.1	Firmware update	25
4.2	System services	27
4.3	Firewall settings.....	27
4.4	NTP synchronisation.....	28
4.5	Adding MQTT Certificate to the PLC	28
4.6	Checking the PLC via Linux	30
4.6.1	Check the firmware.....	31
4.6.2	Checking the NTP server	32
5	MULTI PLC.....	33
5.1	Download site configuratie.....	33
5.2	MULTI PLC certification	33
5.2.1	Trust Stores.....	33
5.2.2	Identity Stores	35
5.3	Firewall settings.....	37
5.4	Changes in PLCnext Engineer	38
5.4.1	MAIN PLC	38
5.4.2	SUB PLC 1 “Sub_1”	38
5.4.3	MAIN PLC 2 “Sub_2”	38
5.5	MUTLI PLC / MINT Licentie.....	39
5.6	MUTLI PLC / MQTT Credentials	39
6	Starting a MINT project	40
6.1	Starting the MINT Project / MULTI PLC	41
7	Verifying the MINT Project	42
7.1	MINT Licence Active	42

7.2	MQTT Connection Active	42
7.3	Collector data	43
7.4	Charging Station Data	43
7.5	MINT Scaling.....	44

Table of Revisions

Date	Version	Description of Changes	Status	Author
06-03-2025	1.0	Concept	Draft	Micheas Goethals
07-03-2025	2.0	Addition of MULTI PLC	Draft	Micheas Goethals
11-03-2025	2.1	Update to V2.0.1	Draft	Micheas Goethals
07-04-2025	2.2	Expansion of descriptions	Draft	Femke Parthoens
06-10-2025	2.3	Firmware change for PLC AXC 2152	Done	Micheas Goethals
20-11-2025	2.4	Basis firewall settings change	Done	Micheas Goethals

1 Terminology

- **MINT Core;** A MINT Core system is the control system responsible for continuously monitoring all defined limits.
- **MINT Advanced;** As soon as an additional feature is included in a MINT installation, it is referred to as MINT Advanced. These features may include generating optimised charging recommendations followed by the PLC, or visualisation. The MINT Core is always present and continuously monitors the fuse.
- **Multi PLC;** When the number of assets exceeds the limits for a single PLC and multiple PLCs are required for one MINT installation, this is referred to as a Multi PLC system. One PLC will act as the Main PLC, while the others are Sub PLCs.
- **Main;** Refers to the primary PLC in a Multi PLC system. This PLC is configured with the full installation to be monitored and will calculate all asset setpoints and forward them to the required Sub PLCs.
- **Sub;** Refers to PLCs subordinate to the Main PLC. A Sub PLC handles communication with part of the field devices, sends data to the Main PLC, and executes the calculated commands received from the Main PLC. A Sub PLC does not perform any calculations itself.
- **Advice;** A recommendation generated by an optimiser to control assets in an optimal way. A simple example is postponing charging sessions until solar intensity increases later in the day, resulting in lower charging costs and reduced CO₂ impact.
- **NTP (Network Time Protocol);** NTP defines the behaviour of systems within the same network that compare their configured time settings to ensure each device maintains accurate time. A standalone device may drift over time. Specialised NTP servers maintain accurate time and can be used for synchronisation.
- **Firewall;** A device's firewall is a network security system that determines whether specific network traffic is allowed to reach the device. In the case of a private firewall, such as that of a PLC, it can be configured directly on the device. It may also be necessary to adjust settings in the overarching network firewall in which the PLC operates to realise the project.

2 Required knowledge

To create MINT projects, experience with PLCnext Engineer and Code Creator, along with familiarity with firewalls, Modbus, MQTT, Linux, and the principles of electricity, is ideal.

However, using this step-by-step plan (or guideline) and the described tools, a large part of the preparations can be carried out with minimal prior knowledge.

For final verification, it is strongly recommended that someone with insight into the electrical network reviews the preparations.

3 MINT configuration preparation

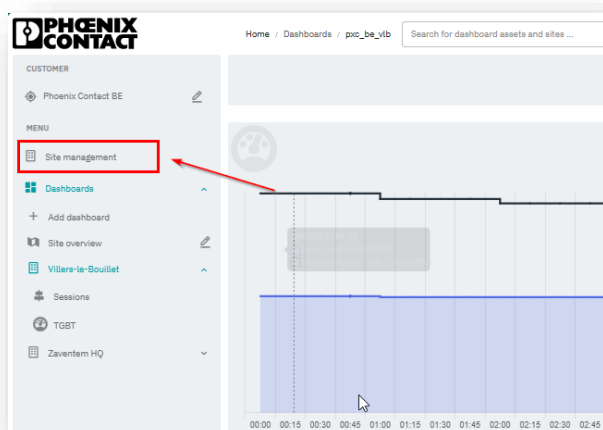
3.1 Download MINT configuration

The site configuration can be downloaded via the MINT Portal.
Follow the steps below:

Go to the following URL to access the MINT Portal:

[| Phoenix Contact Mint](#)

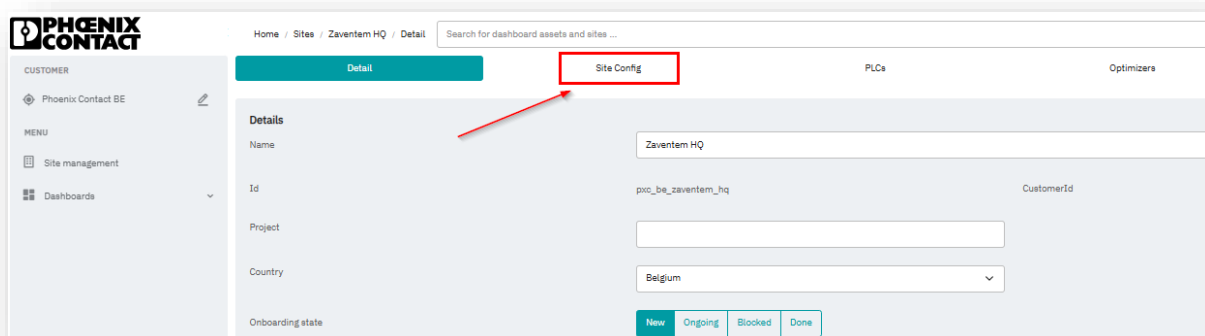
Navigate to “site management”.



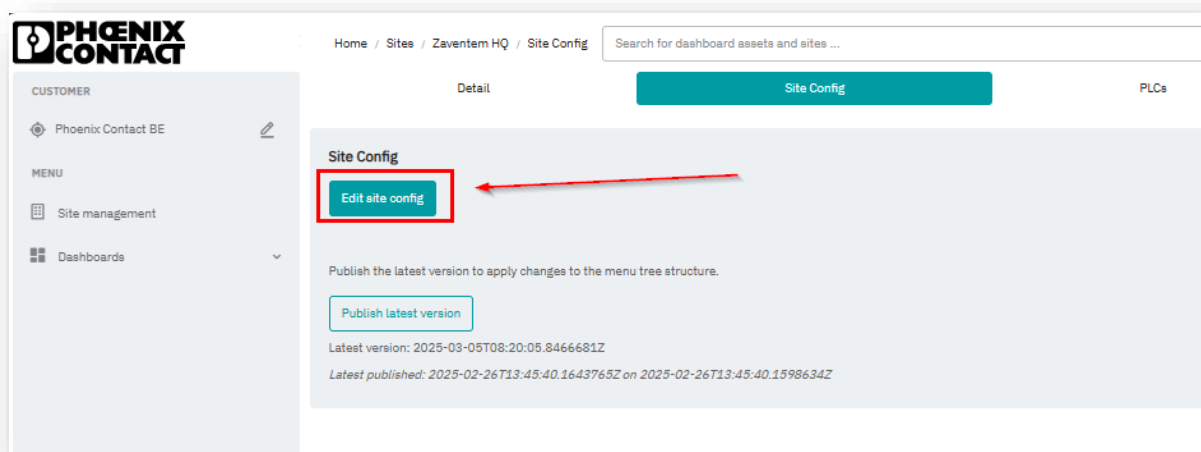
Navigate to “view”.

#	Name	Project	Country	Onboarding state	Product type	OCPI	Action
pac_be_vib	Villiers-le-Bouillet		be	New	CORE	<input type="checkbox"/>	View
pac_be_zaventem_hq	Zaventem HQ		be	New	ADVANCED	<input type="checkbox"/>	View

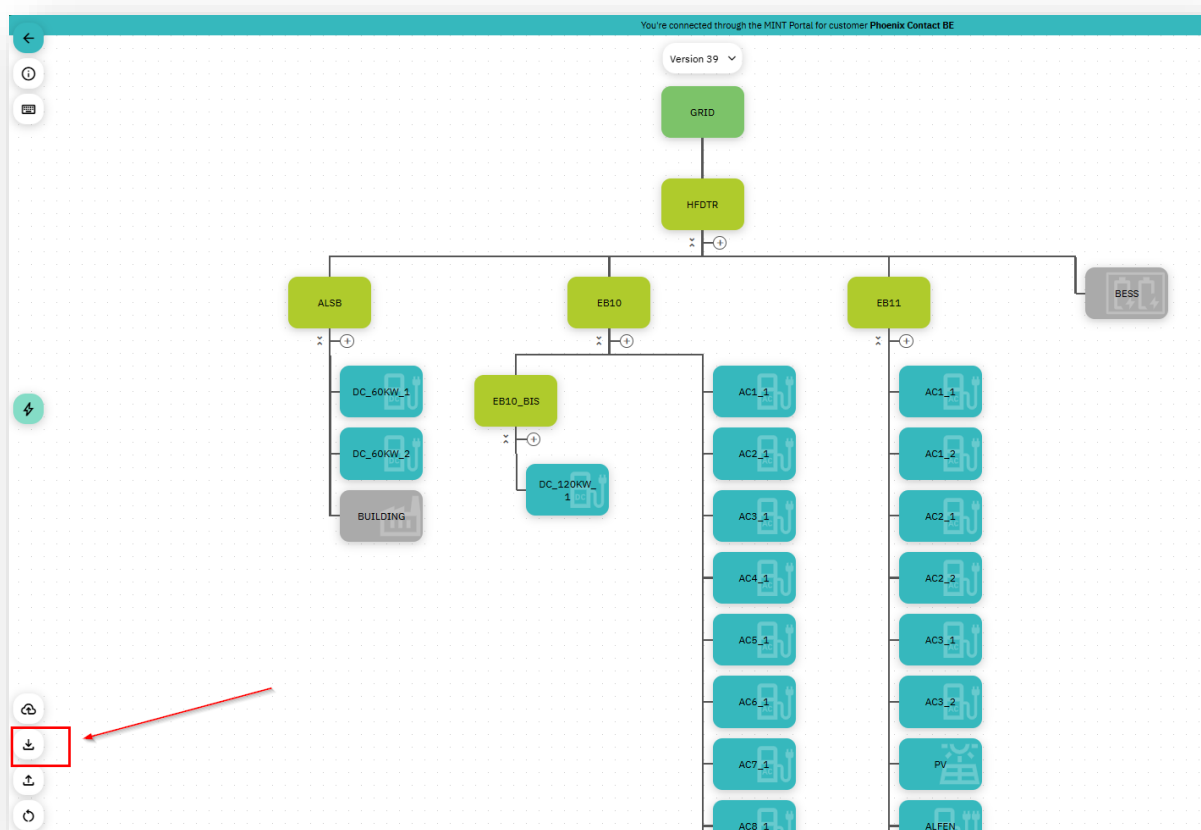
Navigate to “Site Config”



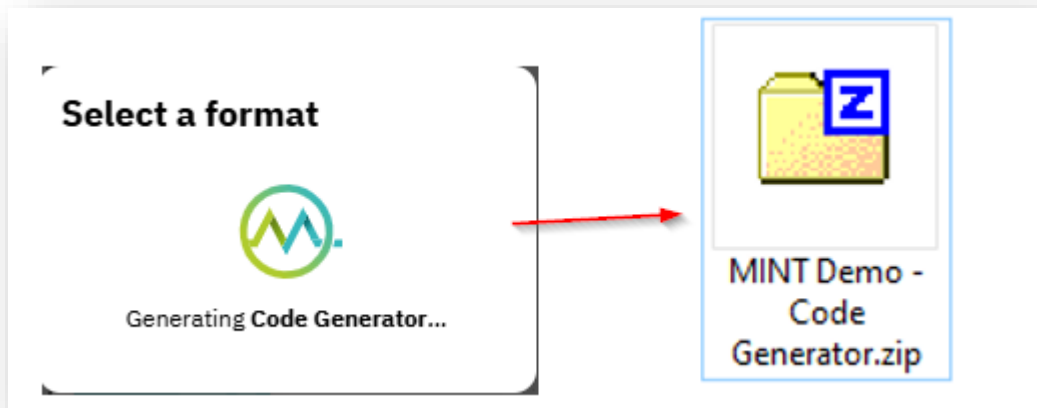
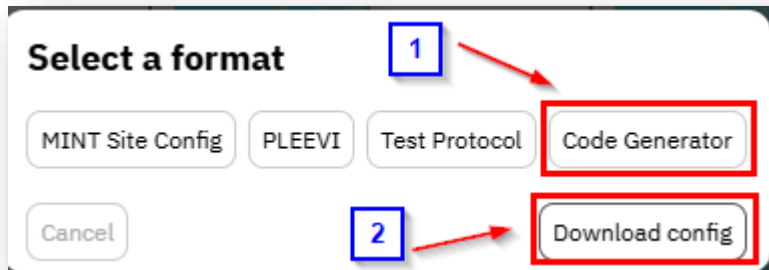
Navigate to “Edit site config”



Click on the download icon.

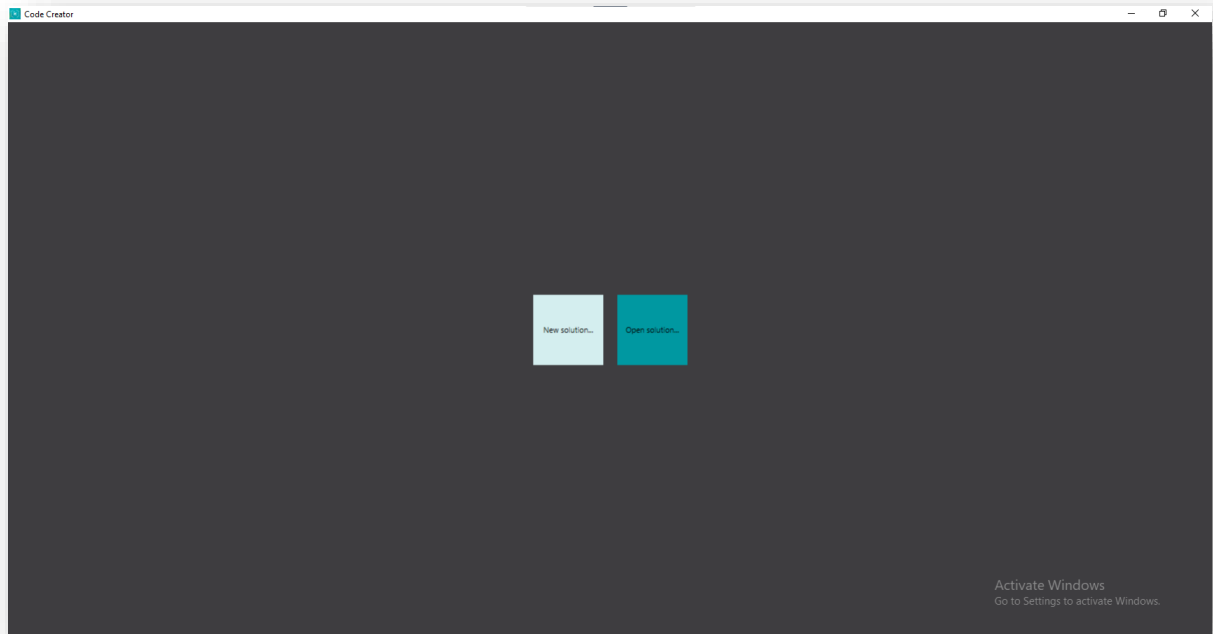


Select “Code Generator”, followed by “Download Config”

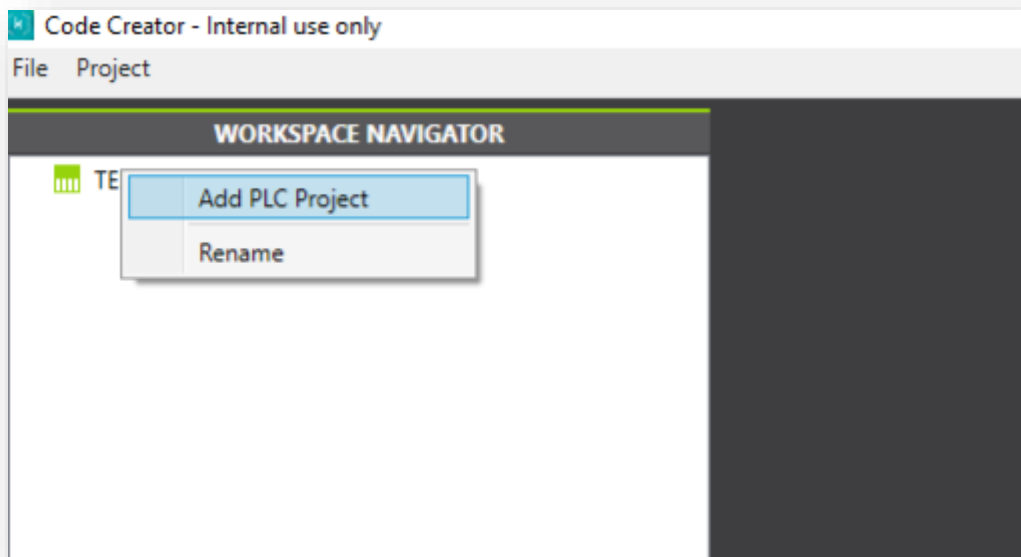


3.2 Creating a MINT project in CodeCreator

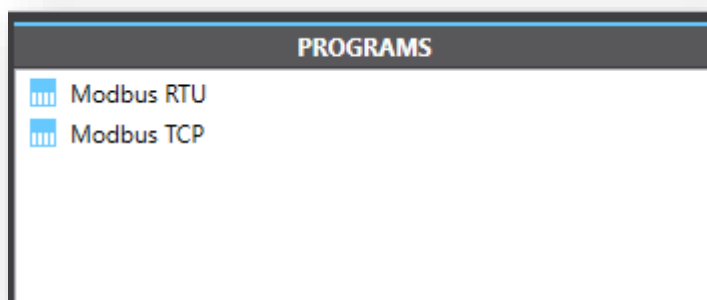
Open a new project using 'New Solution...'



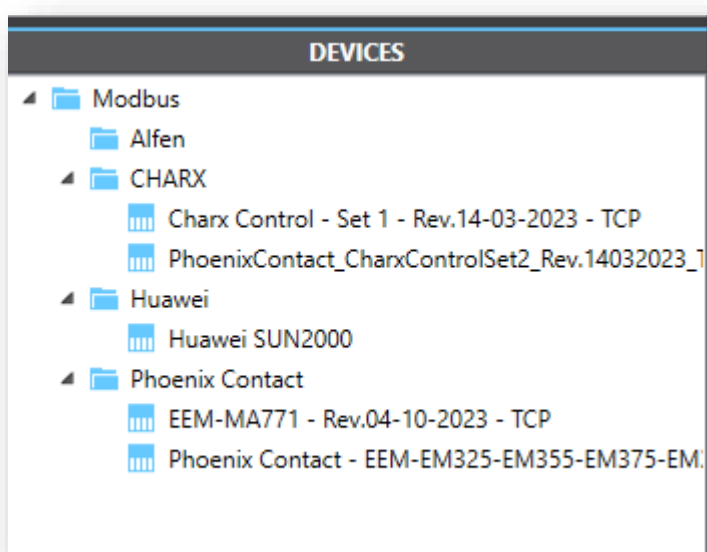
Right-click on the project name and choose 'Add PLC Project'



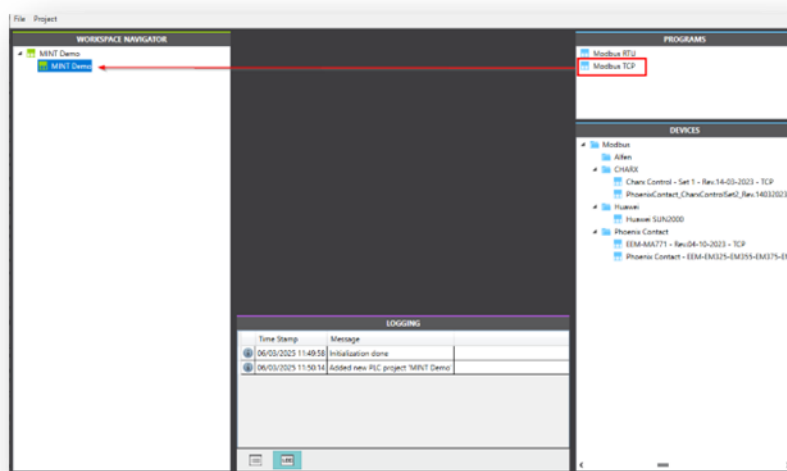
Import the programmes listed below.



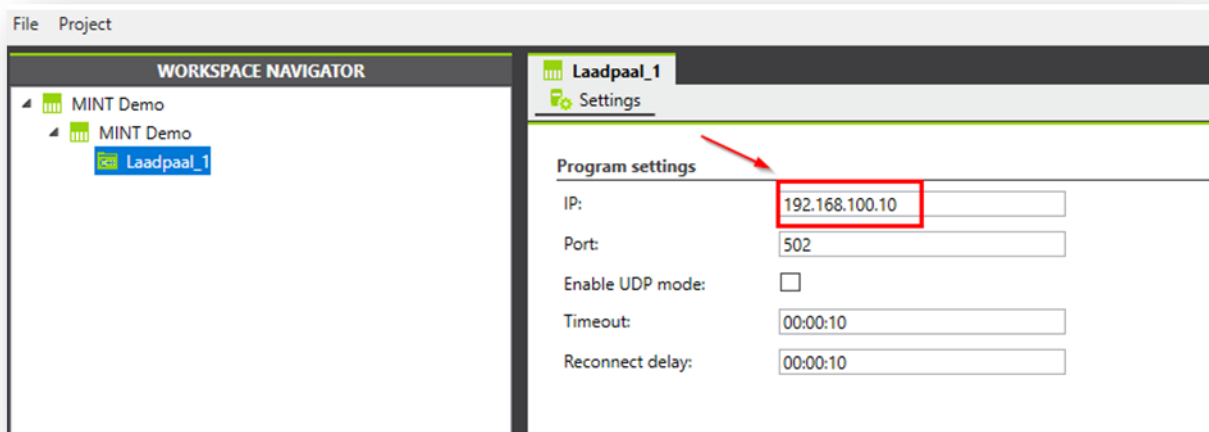
As well as the required device packages.



Add the necessary Modbus communication programme for each physical device.

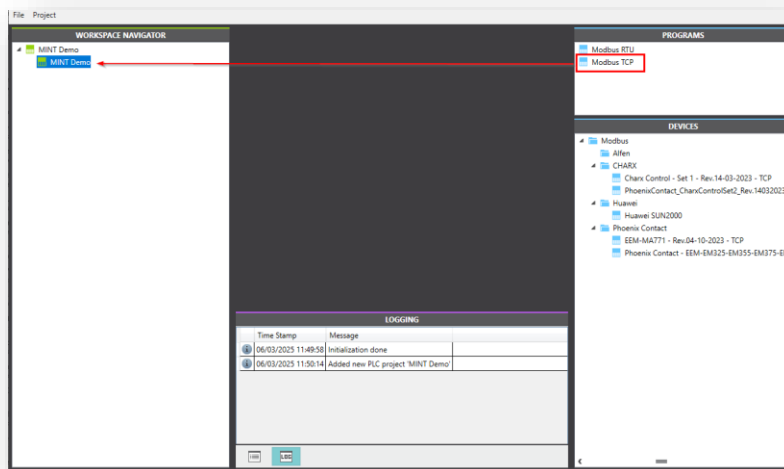


For communication via Modbus TCP, add one 'Modbus TCP' programme per IP address and enter the corresponding address.

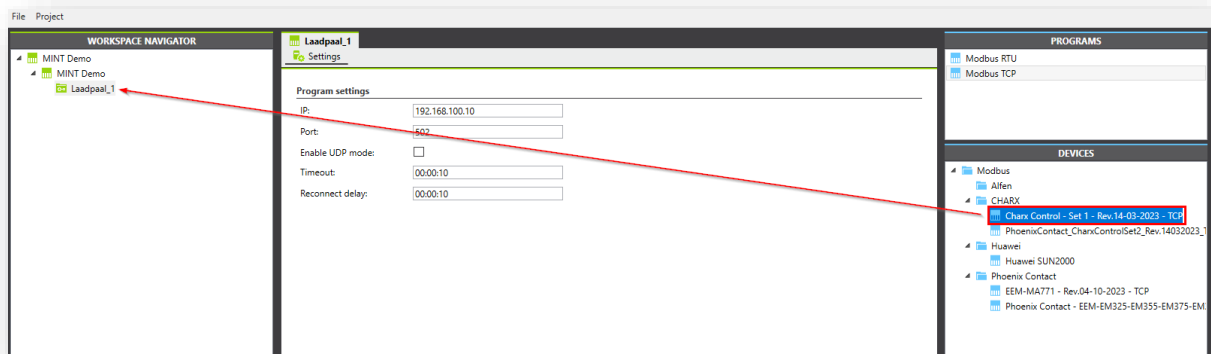


For communication via Modbus RTU, add one 'Modbus RTU' programme per serial connection. Choose the option that matches the hardware card connected to the PLC.

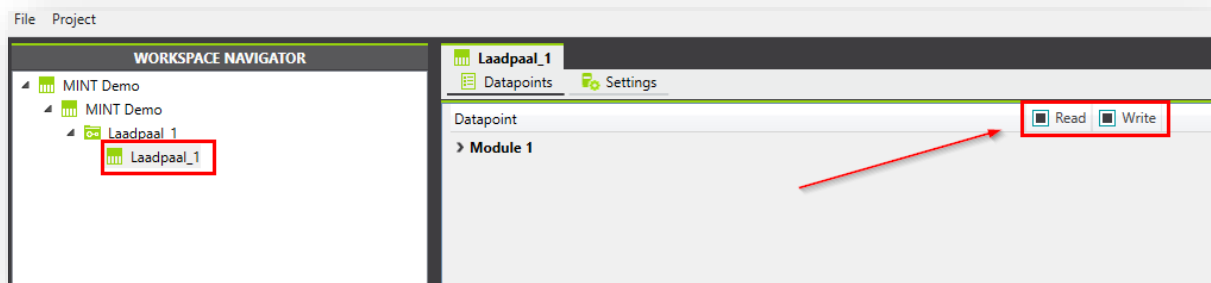
The names assigned to these blocks will be the names of the communication programmes in the PLC project. Pay close attention to naming conventions and ensure there are no spaces in the names.



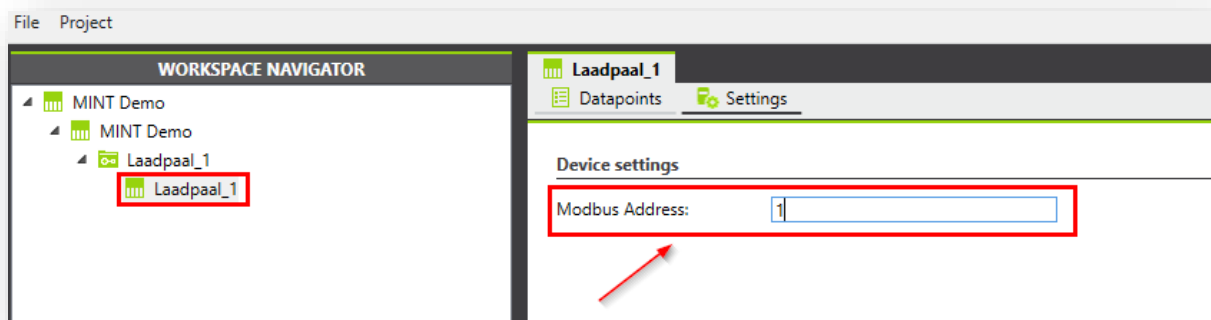
Next, add the required devices to the corresponding communication programme.



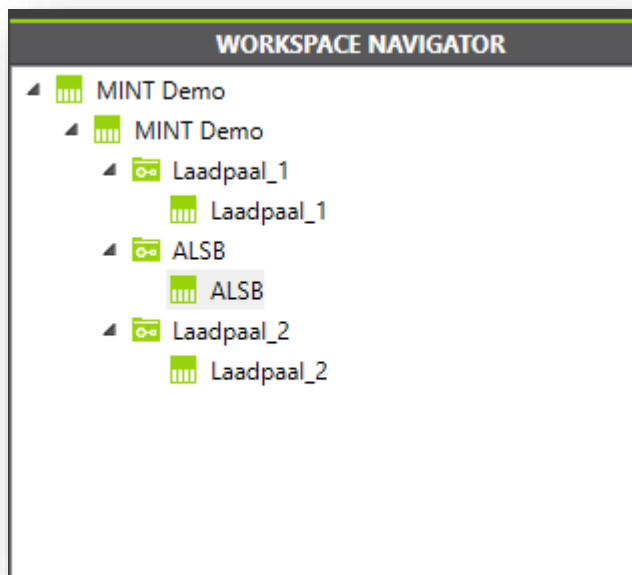
Indicate the necessary Read and Write registers.



In the Settings for each device, fill in the Modbus Address field with the corresponding unique identifier. If none exists, enter 1.



The final result should look like this:






3.3 Importing the “Code Generator” (.zip)

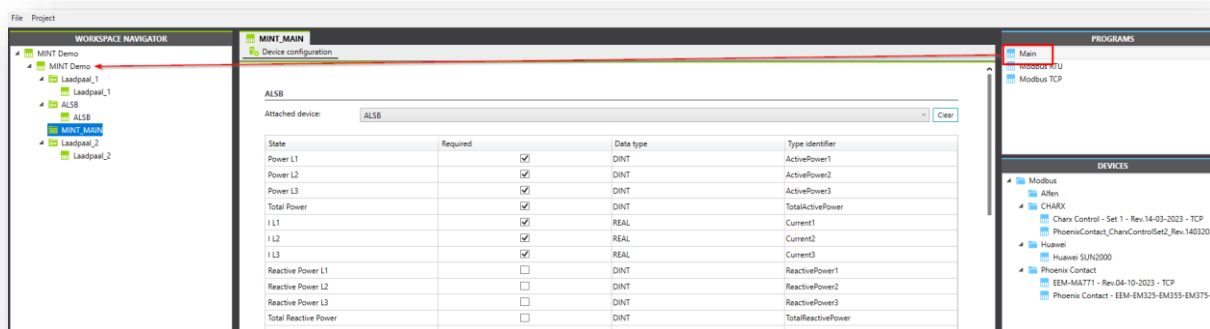
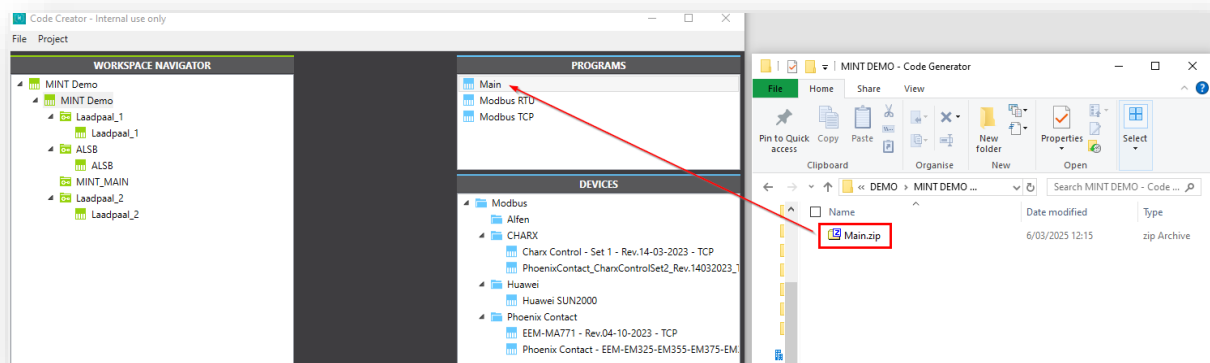
Once all steps from section 1.2 have been completed for the current setup, you can import the downloaded “Code Generator” into CodeCreator.

In the download folder, there will be one zipped folder for each required PLC project (naming convention: Main.zip, Sub X.zip).

Unpack the download folder and use these .zip folders as input files for CodeCreator.

<input type="checkbox"/> Name	Date modified	Type	Size
 MINT DEMO - Code Generator	6/03/2025 13:34	File folder	
 MINT DEMO - Code Generator.zip	6/03/2025 13:34	zip Archive	6 KB

MINT DEMO - Code Generator			
<input type="checkbox"/> Name	Date modified	Type	Size
 Main.zip	6/03/2025 12:15	zip Archive	6 KB



Establish a link between the Code Generator input and the devices in the Workspace Navigator.

Note: It is not necessary to tick or untick any boxes in this view; they are purely informative for this application of CodeCreator.

MINT_MAIN
 Device configuration

Attached device: Laadpaal_1 Clear

State

State				
Power L1	<input checked="" type="checkbox"/>	DINT	ActivePower2	
Power L2	<input checked="" type="checkbox"/>	DINT	ActivePower3	
Power L3	<input checked="" type="checkbox"/>	DINT	TotalActivePower	
Total Power	<input checked="" type="checkbox"/>	DINT	Current1	
I L1	<input checked="" type="checkbox"/>	REAL	Current2	
I L2	<input checked="" type="checkbox"/>	REAL	Current3	
I L3	<input checked="" type="checkbox"/>	REAL	ReactivePower1	
Reactive Power L1	<input type="checkbox"/>	DINT	ReactivePower2	
Reactive Power L2	<input type="checkbox"/>	DINT	ReactivePower3	
Reactive Power L3	<input type="checkbox"/>	DINT	TotalReactivePower	
Total Reactive Power	<input type="checkbox"/>	DINT		

ALSB_LAADPAAL_1

Attached device: Laadpaal_1 Clear

State

State				
Total Power	<input checked="" type="checkbox"/>	INT	CommandMaxChargingCurrent	
Max Charging Current	<input checked="" type="checkbox"/>	REAL	Current1	
I L1	<input checked="" type="checkbox"/>	REAL	Current2	
I L2	<input checked="" type="checkbox"/>	REAL	Current3	
I L3	<input checked="" type="checkbox"/>	REAL	strVehicleStatus	
Vehicle status	<input checked="" type="checkbox"/>	STRING	ActivePower1	
Power L1	<input type="checkbox"/>	DINT	ActivePower2	
Power L2	<input type="checkbox"/>	DINT	ActivePower3	
Power L3	<input type="checkbox"/>	DINT		

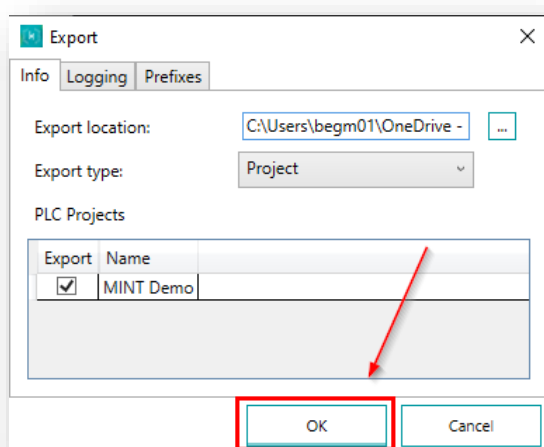
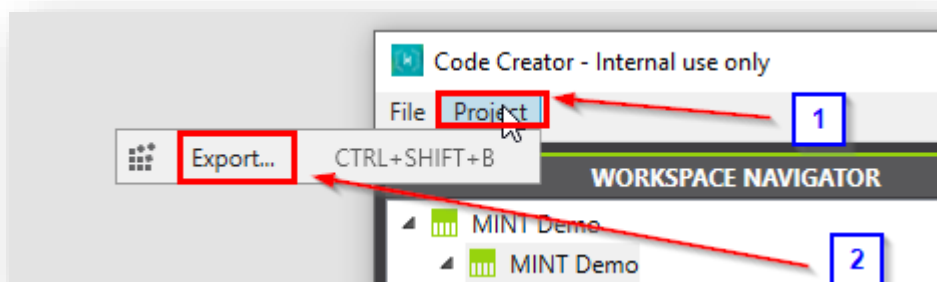
ALSB_LAADPAAL_2

Attached device: Laadpaal_2 Clear

State

State				
Total Power	<input checked="" type="checkbox"/>	INT	CommandMaxChargingCurrent	
Max Charging Current	<input checked="" type="checkbox"/>	REAL	Current1	
I L1	<input checked="" type="checkbox"/>	REAL	Current2	
I L2	<input checked="" type="checkbox"/>	REAL	Current3	
I L3	<input checked="" type="checkbox"/>	REAL	strVehicleStatus	
Vehicle status	<input checked="" type="checkbox"/>	STRING	ActivePower1	
Power L1	<input type="checkbox"/>	DINT	ActivePower2	
Power L2	<input type="checkbox"/>	DINT	ActivePower3	
Power L3	<input type="checkbox"/>	DINT		
Charging Plug Capacity	<input type="checkbox"/>	INT	ChargingPlugCapacity	
U L1_N	<input type="checkbox"/>	REAL	Voltage_1N	
U L2_N	<input type="checkbox"/>	REAL	Voltage_2N	

After completing all the steps above, export the code.



If the following “Message” appears, CodeCreator is ready.

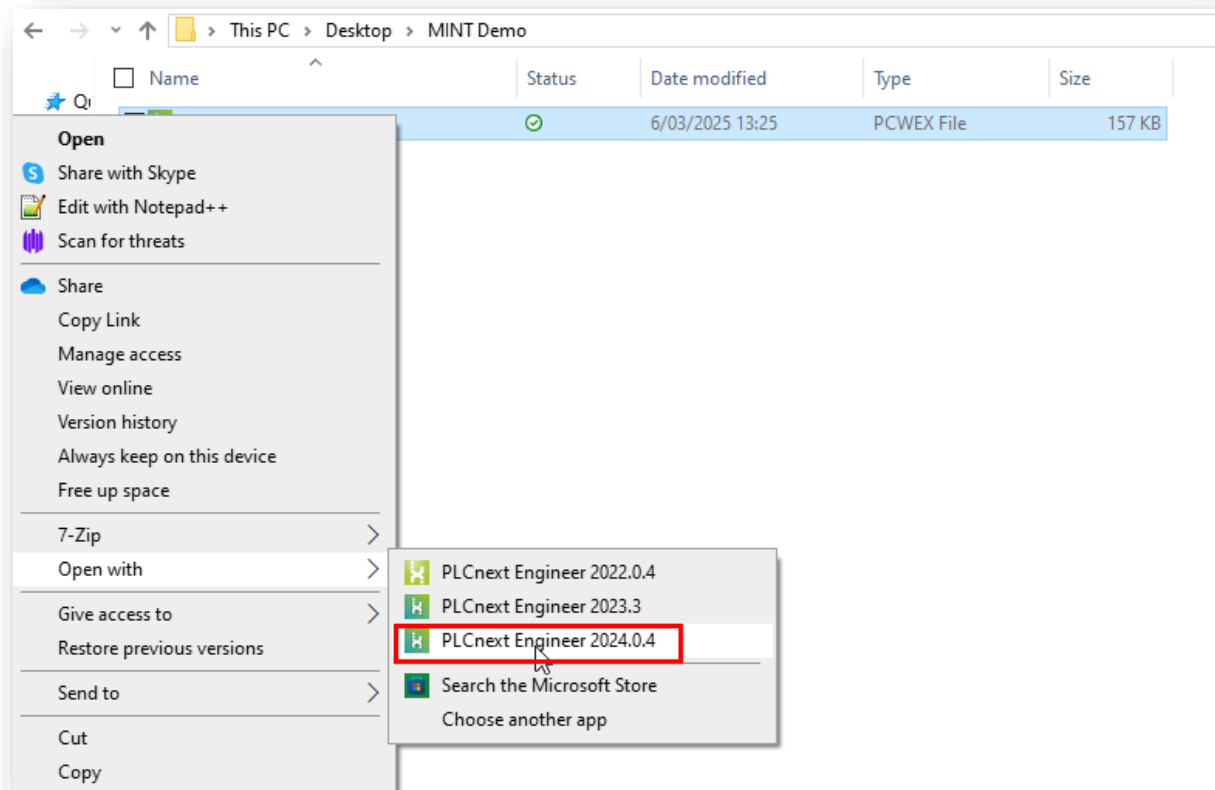
06/03/2025 13:23:20	Creating project	
06/03/2025 13:23:26	MINT Demo: Project is ready (C:\Users\begm01\OneDrive - PHOENIX CONTACT GmbH & Co. KG\Other\Desktop\MINT Demo.pcwex)	
06/03/2025 13:23:26	Done exporting	

Upon creation, a .pcwex file will be generated.

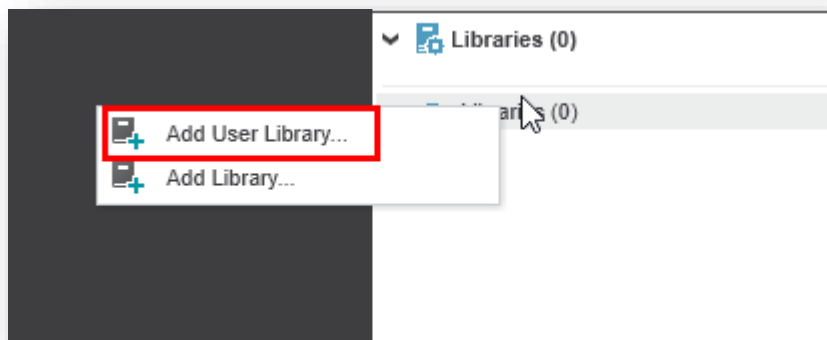
Name	Status	Date modified	Type	Size
MINT Demo.pcwex	✓	6/03/2025 13:25	PCWEX File	157 KB

3.4 Creating a MINT Project

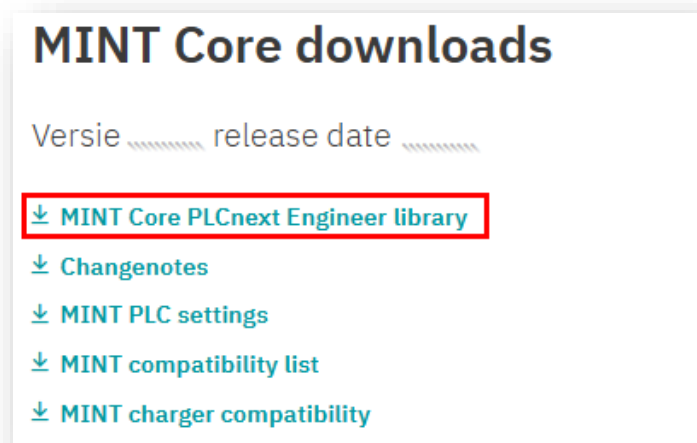
Open the generated file via CodeCreator using **PLCnext Engineer 2024.0.4 LTS**.



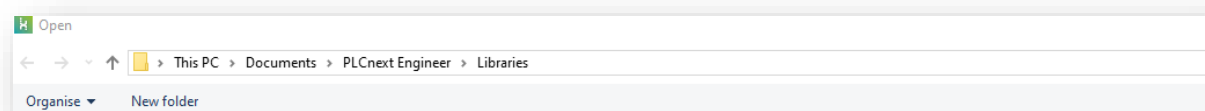
Import the correct libraries.



The required libraries for **MINT V2.0** can be downloaded via:
[MINT energiebeheer met AI | Phoenix Contact](#)

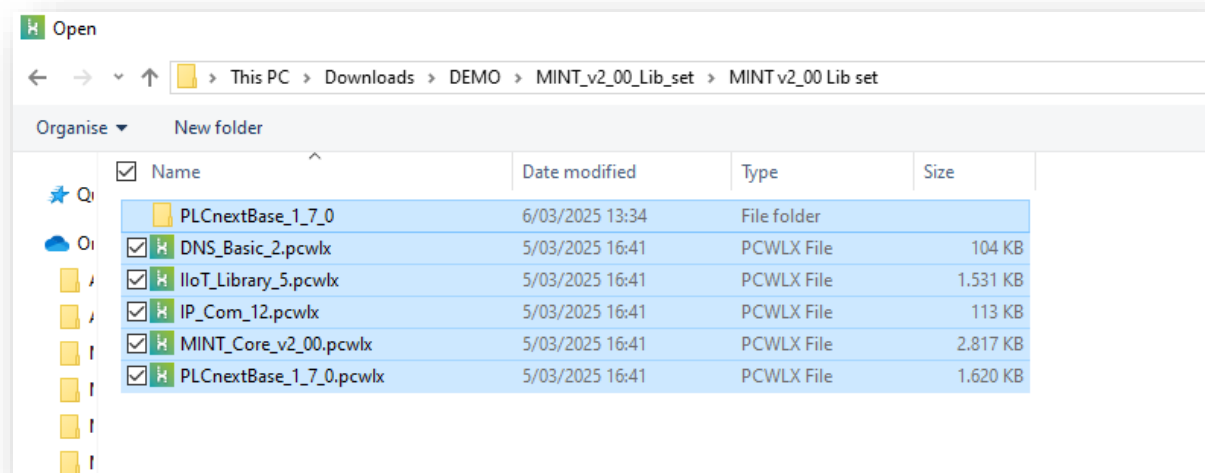


Copy the path to the libraries from PLCnext Engineer.

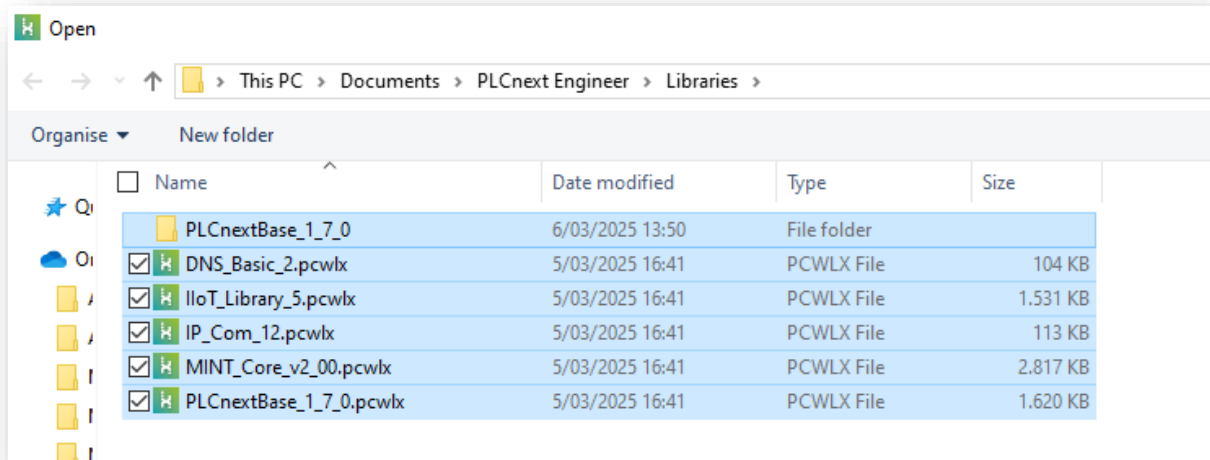


Copy all these files (libraries).

The example below uses version V2.0.0 — always use the latest version (!)

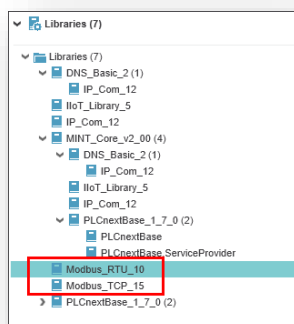
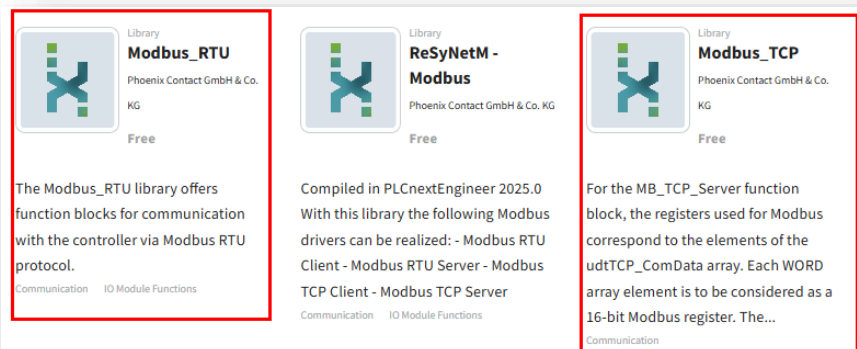


Return to the library path in PLCnext Engineer and place the libraries there.
 Again, the example uses V2.0.0 – always use the latest version (!)



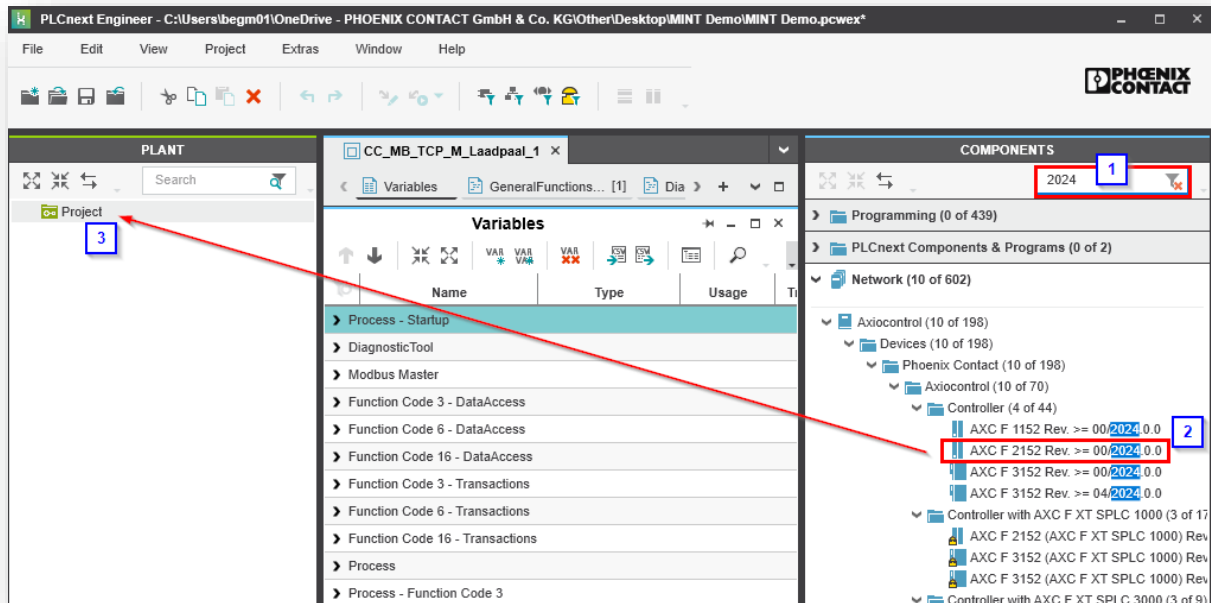
It is also necessary to download the correct communication libraries via the PLCnext Store ([PLCnext Store | The open software store for automation](#)), such as Modbus_TCP and Modbus_RTU.

- Modbus_TCP 15 has been successfully tested.
- Modbus_RTU 10 has been successfully tested.



Adding a PLC to the project;

Use the search function to look for “2024”, then drag AXC F 2152 Rev. ≥ 00/2024.0.0 into the project.

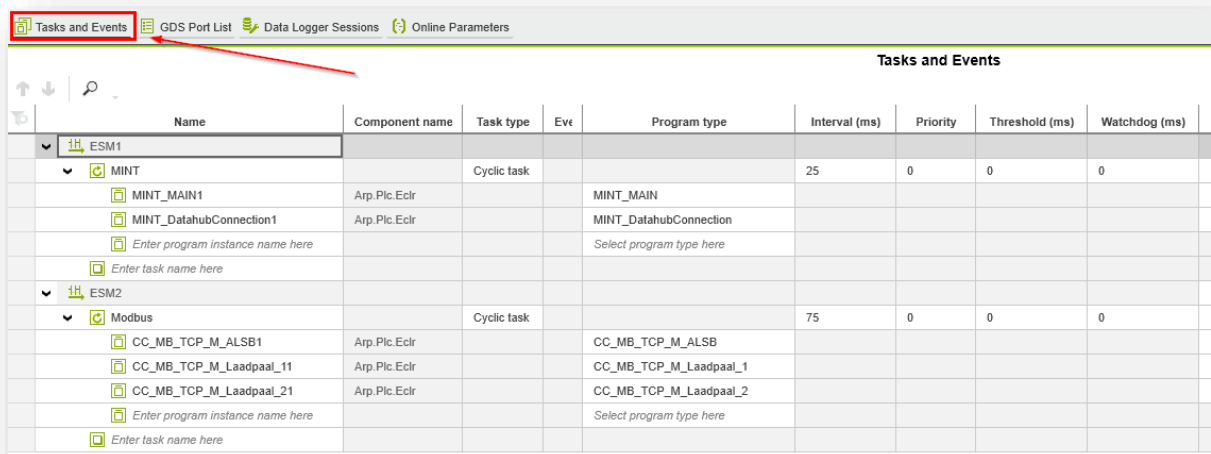


Creating Tasks and Events

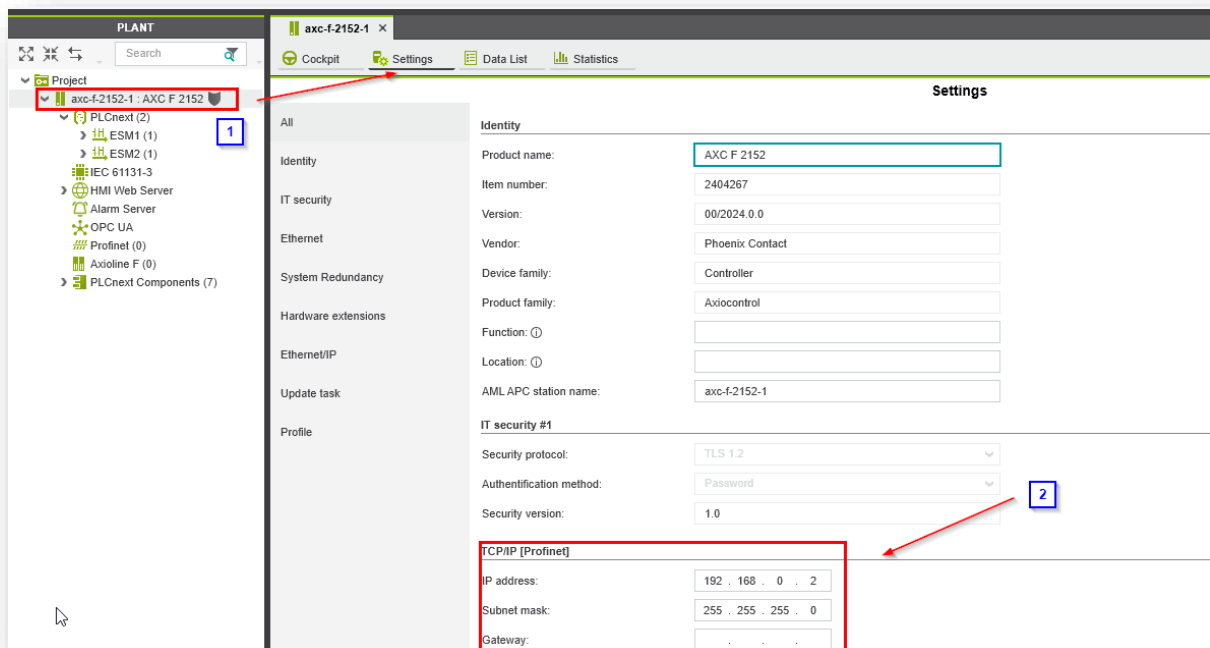
For the MINT section, a task must be created with a cycle time of 25 ms.

Add the generated MINT programme and the MINT_DatahubConnection programme to this task to ensure they are properly aligned. Disable the watchdog by setting it to 0.

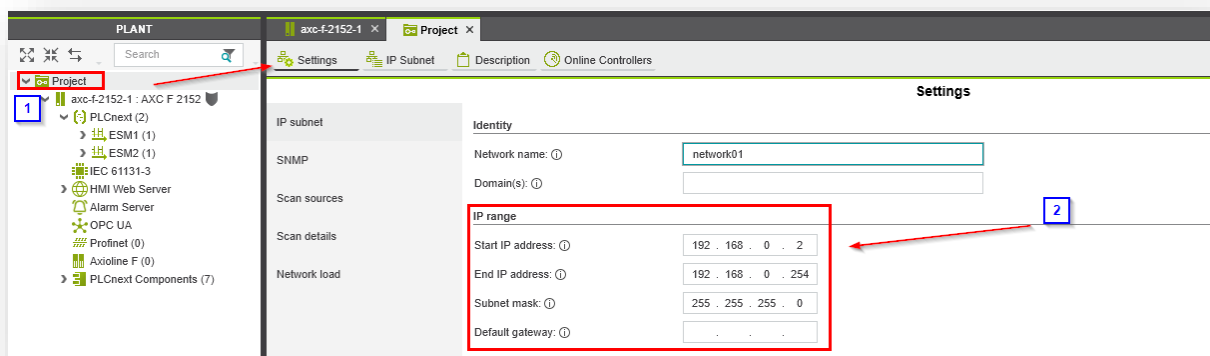
Add the communication programmes to the second core, choose a suitable cycle time, and disable the watchdog.



Adjusting the PLC IP address



The IP range must also be updated in the project to reflect the actual situation.

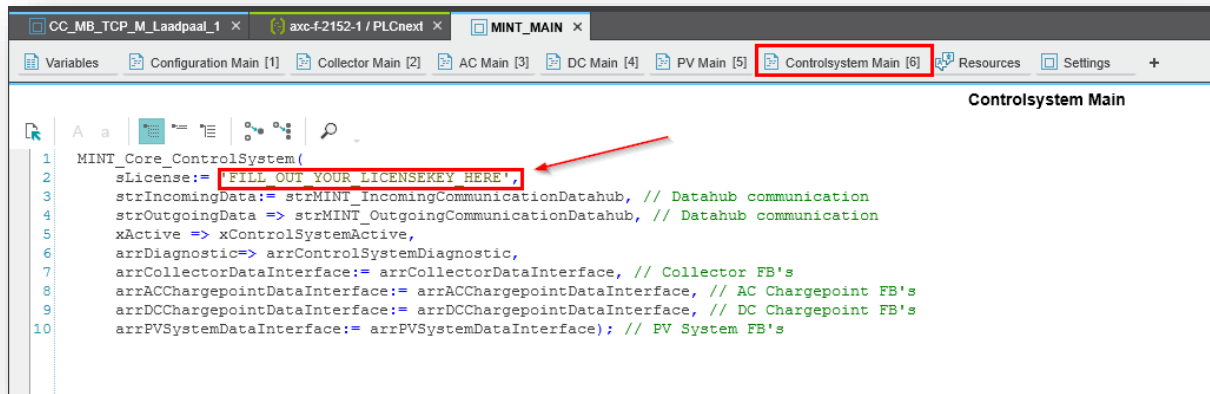


In the GDS Port List, link the IN PORTS and OUT PORTS of the MINT programme to their counterparts in the communication programmes

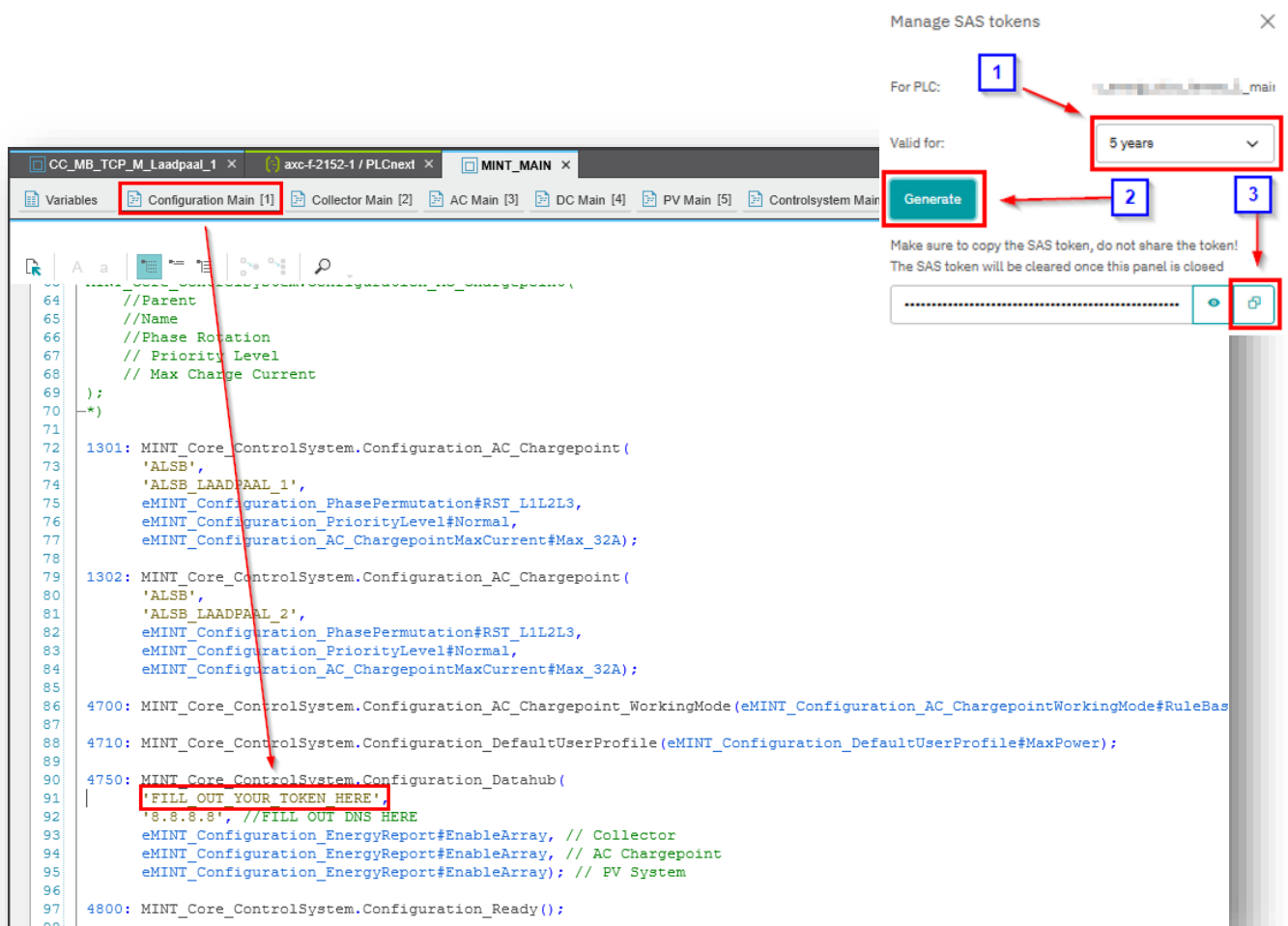
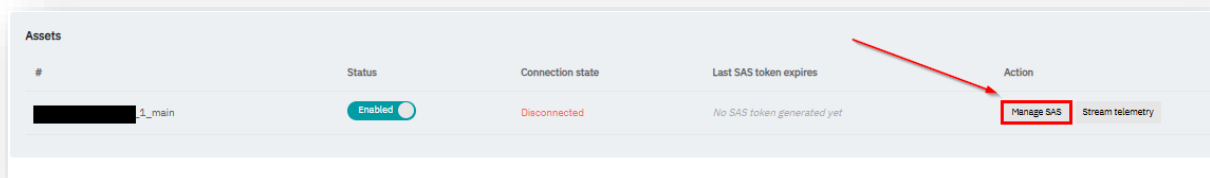
GDS Port List			
OUT Port	IN Port	Function	
Arp.Plc.Eclr / MINT_MAIN1 : strMINT_OutgoingCommunicationDatahub	Select IN Port here		
Arp.Plc.Eclr / MINT_MAIN1 : OUT_ALSB_LAADPAAL_1	Select IN Port here		
Arp.Plc.Eclr / MINT_MAIN1 : OUT_ALSB_LAADPAAL_2	Select IN Port here		
Arp.Plc.Eclr / MINT_DatahubConnection1 : strMINT_Datahub_OUT	Select IN Port here		
Select OUT Port here	Arp.Plc.Eclr / MINT_MAIN1 : strMINT_IncomingCommunicationDatahub		
Select OUT Port here	Arp.Plc.Eclr / MINT_MAIN1 : IN_ALSB		
Select OUT Port here	Arp.Plc.Eclr / MINT_MAIN1 : IN_ALSB_LAADPAAL_1		
Select OUT Port here	Arp.Plc.Eclr / MINT_MAIN1 : IN_ALSB_LAADPAAL_2		
Select OUT Port here	Arp.Plc.Eclr / MINT_DatahubConnection1 : strMINT_Datahub_IN		
Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : strCC_MB_TCP_M_NotificationSystem	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : ALSB_OUT_PORT	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : strCC_MB_TCP_M_NotificationSystem	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : LAADPAAL_1_OUT_PORT	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : strCC_MB_TCP_M_NotificationSystem	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : LAADPAAL_2_OUT_PORT	Select IN Port here		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : CHARXSettings		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : ALSB_IN_PORT		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : CHARXSettings		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : LAADPAAL_1_IN_PORT		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : CHARXSettings		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : LAADPAAL_2_IN_PORT		
Select OUT Port here	Select IN Port here		

GDS Port List			
OUT Port	IN Port	Function	
Arp.Plc.Eclr / MINT_MAIN1 : strMINT_OutgoingCommunicationDatahub	Arp.Plc.Eclr / MINT_DatahubConnection1 : strMINT_Datahub_IN		
Arp.Plc.Eclr / MINT_MAIN1 : OUT_ALSB_LAADPAAL_1	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : LAADPAAL_1_IN_PORT		
Arp.Plc.Eclr / MINT_MAIN1 : OUT_ALSB_LAADPAAL_2	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : LAADPAAL_2_IN_PORT		
Arp.Plc.Eclr / MINT_DatahubConnection1 : strMINT_Datahub_OUT	Arp.Plc.Eclr / MINT_MAIN1 : strMINT_IncomingCommunicationDatahub		
Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : ALSB_OUT_PORT	Arp.Plc.Eclr / MINT_MAIN1 : IN_ALSB		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : LAADPAAL_2_OUT_PORT	Arp.Plc.Eclr / MINT_MAIN1 : IN_ALSB_LAADPAAL_1		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : LAADPAAL_1_OUT_PORT	Arp.Plc.Eclr / MINT_MAIN1 : IN_ALSB_LAADPAAL_2		
Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : strCC_MB_TCP_M_NotificationSystem	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : strCC_MB_TCP_M_NotificationSystem	Select IN Port here		
Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : strCC_MB_TCP_M_NotificationSystem	Select IN Port here		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : CHARXSettings		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_ALSB1 : ALSB_IN_PORT		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_11 : CHARXSettings		
Select OUT Port here	Arp.Plc.Eclr / CC_MB_TCP_M_Laadpaal_21 : CHARXSettings		
Select OUT Port here	Select IN Port here		

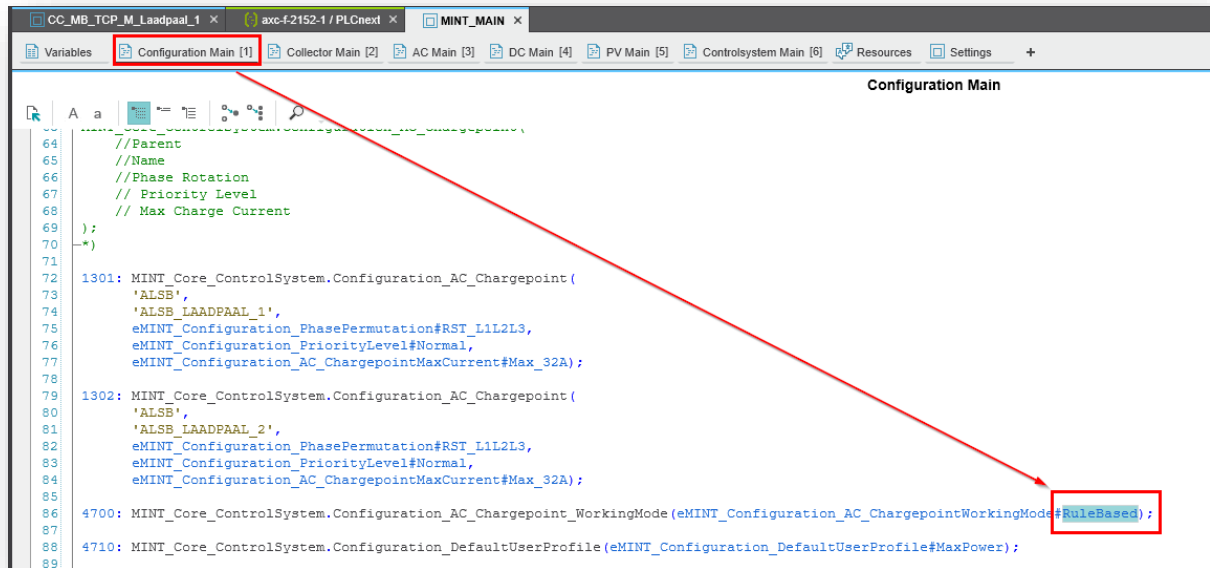
Adding the MINT licence, this can be obtained via Phoenix Contact.



Adding the MQTT SAS Token, this can be obtained via Phoenix Contact or via the MINT Portal. It is required to set up outbound communication from the PLC.



For a MINT Core, the working modes of the asset types must be set to #RuleBased.
(See example below for AC charging stations)

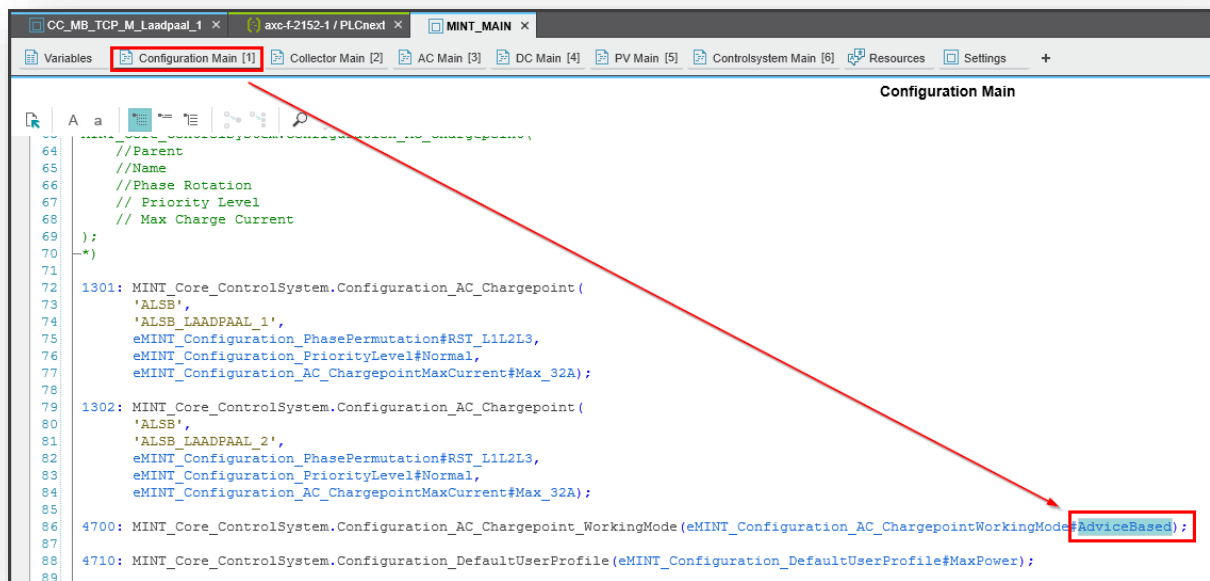


```

64 //Parent
65 //Name
66 //Phase Rotation
67 // Priority Level
68 // Max Charge Current
69 );
70 -*)
71
72 1301: MINT_Core_ControlSystem.Configuration_AC_Chargepoint(
73     'ALSB',
74     'ALSB_LAADPAAL_1',
75     eMINT_Configuration_PhasePermutation#RST_L1L2L3,
76     eMINT_Configuration_PriorityLevel#Normal,
77     eMINT_Configuration_AC_ChargepointMaxCurrent#Max_32A);
78
79 1302: MINT_Core_ControlSystem.Configuration_AC_Chargepoint(
80     'ALSB',
81     'ALSB_LAADPAAL_2',
82     eMINT_Configuration_PhasePermutation#RST_L1L2L3,
83     eMINT_Configuration_PriorityLevel#Normal,
84     eMINT_Configuration_AC_ChargepointMaxCurrent#Max_32A);
85
86 4700: MINT_Core_ControlSystem.Configuration_AC_Chargepoint_WorkingMode(eMINT_Configuration_AC_ChargepointWorkingMode#RuleBased);
87
88 4710: MINT_Core_ControlSystem.Configuration_DefaultUserProfile(eMINT_Configuration_DefaultUserProfile#MaxPower);
89

```

For a MINT Advanced with optimised charging schedules, the working modes of the asset types must be set to #AdviceBased.
(See example below for AC charging stations)



```

64 //Parent
65 //Name
66 //Phase Rotation
67 // Priority Level
68 // Max Charge Current
69 );
70 -*)
71
72 1301: MINT_Core_ControlSystem.Configuration_AC_Chargepoint(
73     'ALSB',
74     'ALSB_LAADPAAL_1',
75     eMINT_Configuration_PhasePermutation#RST_L1L2L3,
76     eMINT_Configuration_PriorityLevel#Normal,
77     eMINT_Configuration_AC_ChargepointMaxCurrent#Max_32A);
78
79 1302: MINT_Core_ControlSystem.Configuration_AC_Chargepoint(
80     'ALSB',
81     'ALSB_LAADPAAL_2',
82     eMINT_Configuration_PhasePermutation#RST_L1L2L3,
83     eMINT_Configuration_PriorityLevel#Normal,
84     eMINT_Configuration_AC_ChargepointMaxCurrent#Max_32A);
85
86 4700: MINT_Core_ControlSystem.Configuration_AC_Chargepoint_WorkingMode(eMINT_Configuration_AC_ChargepointWorkingMode#AdviceBased);
87
88 4710: MINT_Core_ControlSystem.Configuration_DefaultUserProfile(eMINT_Configuration_DefaultUserProfile#MaxPower);
89

```

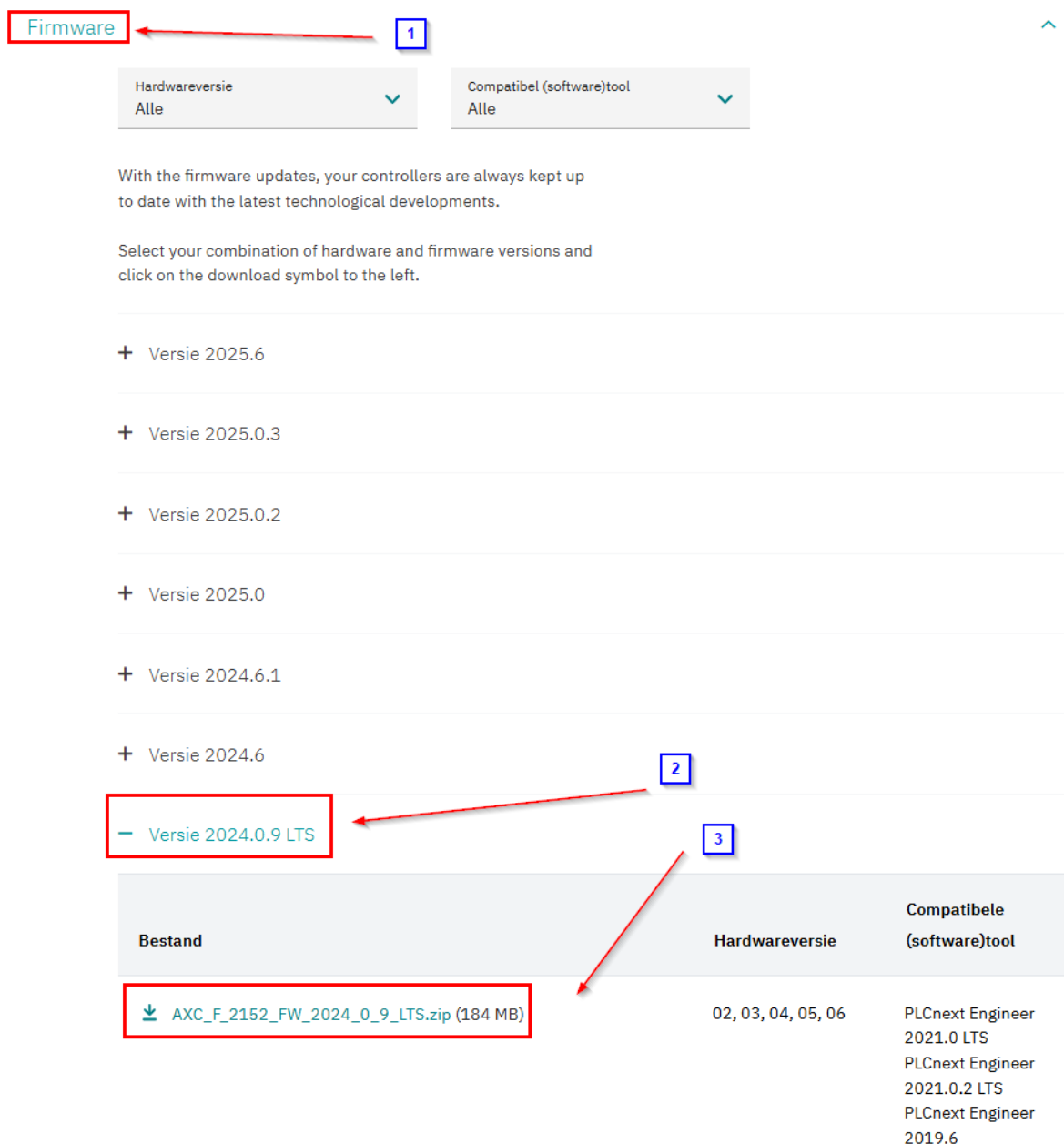
4 Preparing the PLC

For the MINT V2.0.1 update, the PLC must also undergo several updates and adjustments. These are explained below.

4.1 Firmware update

The PLC (or PLCs) must be updated to version 2024.0.9 LTS.

This version can be found on the Phoenix Contact website: ([AXC F 2152 - Besturing - 2404267 | Phoenix Contact](#))



Firmware 1

Hardwareversie Alle ▼ Compatibel (software)tool Alle ▼

With the firmware updates, your controllers are always kept up to date with the latest technological developments.

Select your combination of hardware and firmware versions and click on the download symbol to the left.

- + Versie 2025.6
- + Versie 2025.0.3
- + Versie 2025.0.2
- + Versie 2025.0
- + Versie 2024.6.1
- + Versie 2024.6
- **Versie 2024.0.9 LTS** 2

Bestand	Hardwareversie	Compatibele (software)tool
↓ AXC_F_2152_FW_2024_0_9_LTS.zip (184 MB) 3	02, 03, 04, 05, 06	PLCnext Engineer 2021.0 LTS PLCnext Engineer 2021.0.2 LTS PLCnext Engineer 2019.6

Navigate to the WBM (Web-Based Management) interface of the PLC and go to “Firmware Update”. (!) **This update must be performed twice (!)**

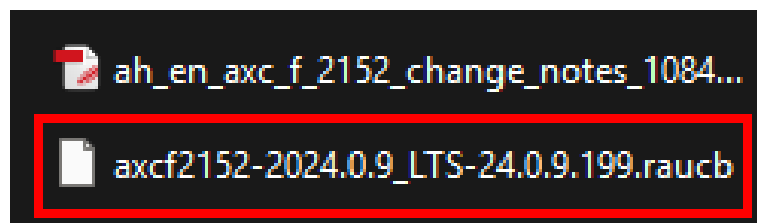


Administration

Firmware Update

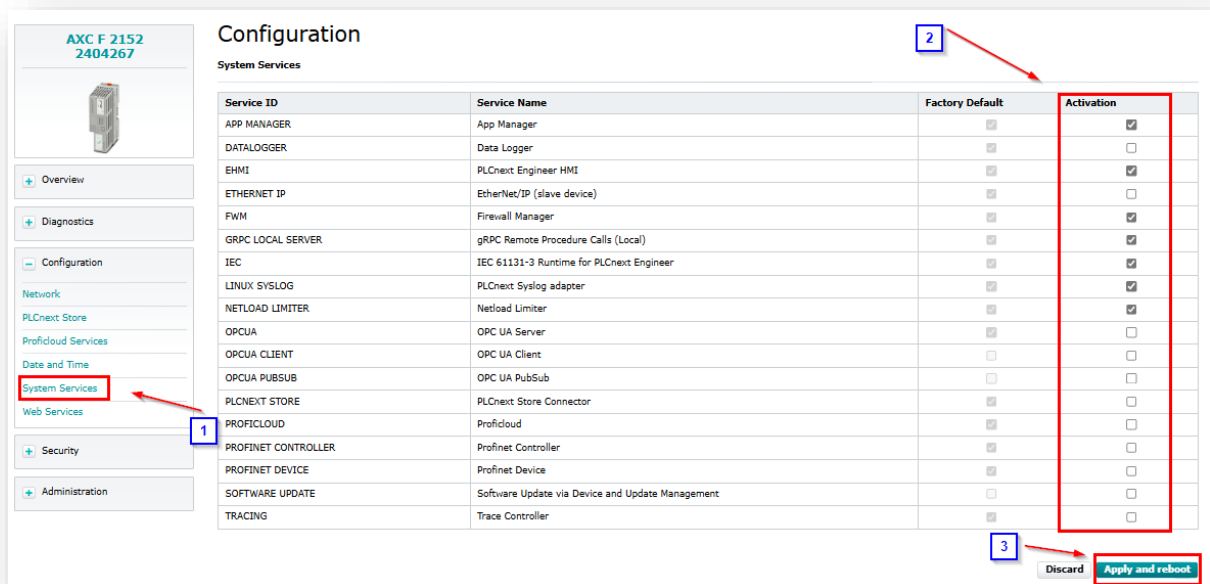


Select the .raucb file.



4.2 System services

Navigate to “System Services” in the PLC’s WBM.
Ensure all settings match the configuration shown below.



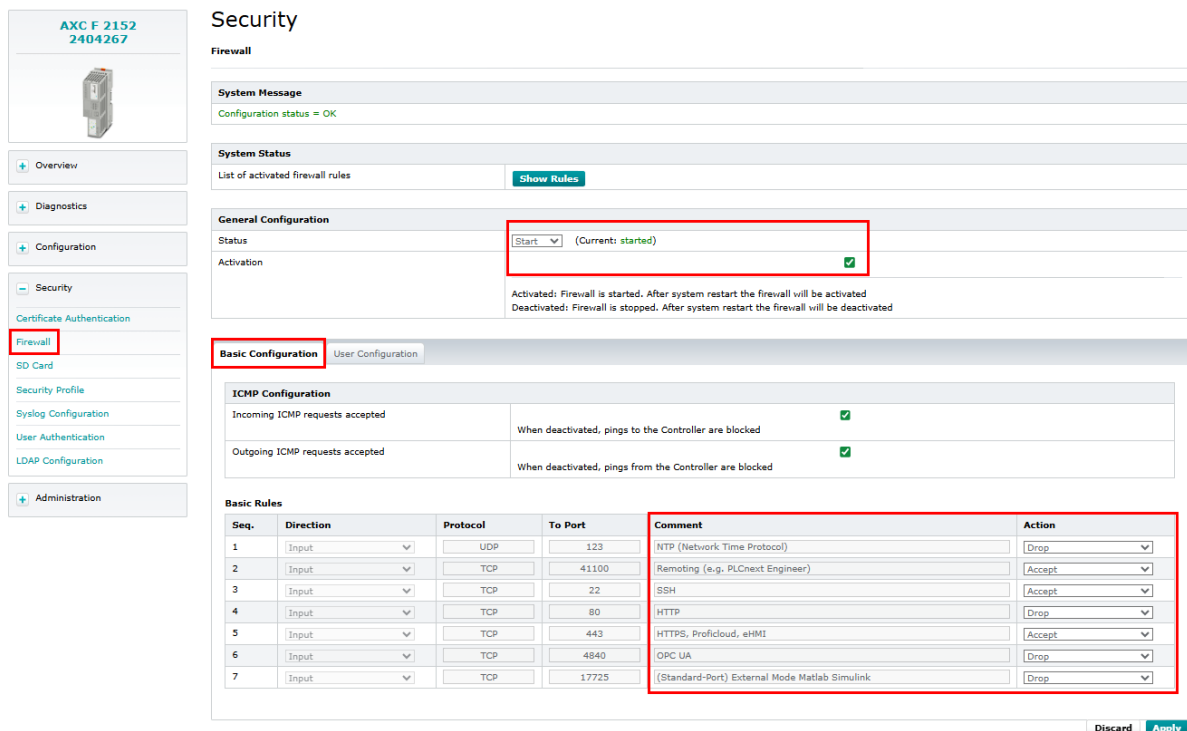
Configuration

System Services

Service ID	Service Name	Factory Default	Activation
APP MANAGER	App Manager	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DATALOGGER	Data Logger	<input checked="" type="checkbox"/>	<input type="checkbox"/>
EHMI	PLCnext Engineer HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ETHERNET IP	EtherNet/IP (slave device)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FWM	Firewall Manager	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
GRPC LOCAL SERVER	gRPC Remote Procedure Calls (Local)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IEC	IEC 61131-3 Runtime for PLCnext Engineer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LINUX SYSLOG	PLCnext Syslog adapter	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NETLOAD LIMITER	Netload Limiter	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
OPCUA	OPC UA Server	<input checked="" type="checkbox"/>	<input type="checkbox"/>
OPCUA CLIENT	OPC UA Client	<input type="checkbox"/>	<input type="checkbox"/>
OPCUA PUBSUB	OPC UA PubSub	<input type="checkbox"/>	<input type="checkbox"/>
PLCNEXT STORE	PLCnext Store Connector	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PROFICLOUD	Proficloud	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PROFINET CONTROLLER	Profinet Controller	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PROFINET DEVICE	Profinet Device	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SOFTWARE UPDATE	Software Update via Device and Update Management	<input type="checkbox"/>	<input type="checkbox"/>
TRACING	Trace Controller	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Discard **Apply and reboot**

4.3 Firewall settings



Security

Firewall

System Message
Configuration status = OK

System Status
List of activated firewall rules [Show Rules](#)

General Configuration

Status: Start (Current: started) ☒

Activation: ☒

Activated: Firewall is started. After system restart the firewall will be activated
Deactivated: Firewall is stopped. After system restart the firewall will be deactivated

Basic Configuration [User Configuration](#)

ICMP Configuration

Incoming ICMP requests accepted	When deactivated, pings to the Controller are blocked	<input checked="" type="checkbox"/>
Outgoing ICMP requests accepted	When deactivated, pings from the Controller are blocked	<input checked="" type="checkbox"/>

Basic Rules

Seq.	Direction	Protocol	To Port	Comment	Action
1	Input	UDP	123	NTP (Network Time Protocol)	Drop
2	Input	TCP	41100	Remoting (e.g. PLCnext Engineer)	Accept
3	Input	TCP	22	SSH	Accept
4	Input	TCP	80	HTTP	Drop
5	Input	TCP	443	HTTPS, Proficloud, eHMI	Accept
6	Input	TCP	4840	OPC UA	Drop
7	Input	TCP	17725	(Standard-Port) External Mode Matlab Simulink	Drop

Discard **Apply**

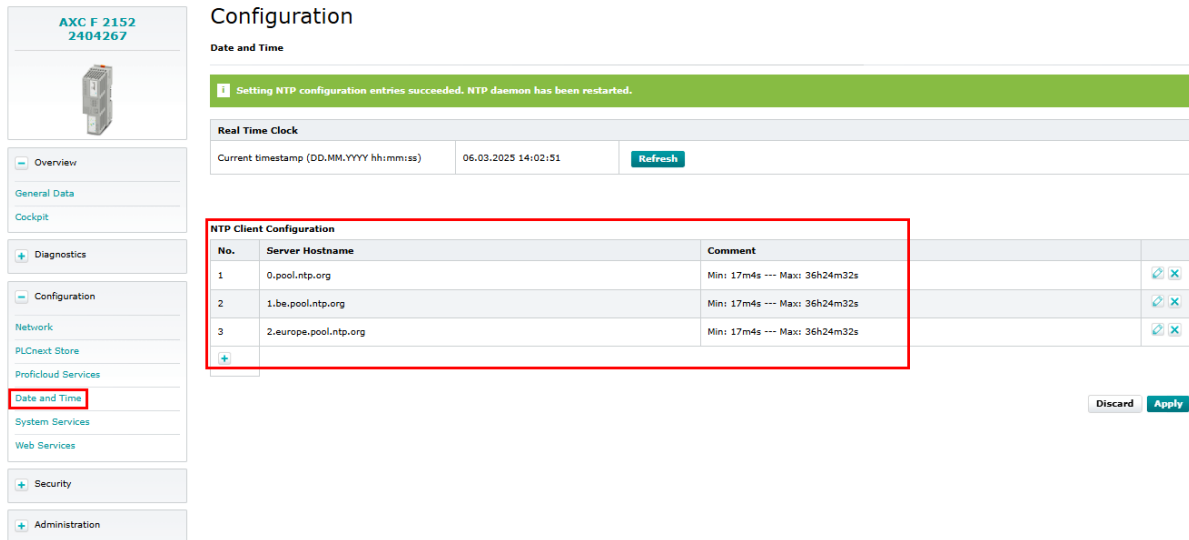
4.4 NTP synchronisation

Add the following NTP servers:

- 0.pool.ntp.org
- 1.be.pool.ntp.org
- 2.europe.pool.ntp.org

min. polling van: 17m4s

max. polling van: 36h24m32s



Configuration

Date and Time

Setting NTP configuration entries succeeded. NTP daemon has been restarted.

Real Time Clock

Current timestamp (DD.MM.YYYY hh:mm:ss) 06.03.2025 14:02:51 [Refresh](#)

NTP Client Configuration

No.	Server Hostname	Comment	
1	0.pool.ntp.org	Min: 17m4s --- Max: 36h24m32s	✎ ✕
2	1.be.pool.ntp.org	Min: 17m4s --- Max: 36h24m32s	✎ ✕
3	2.europe.pool.ntp.org	Min: 17m4s --- Max: 36h24m32s	✎ ✕

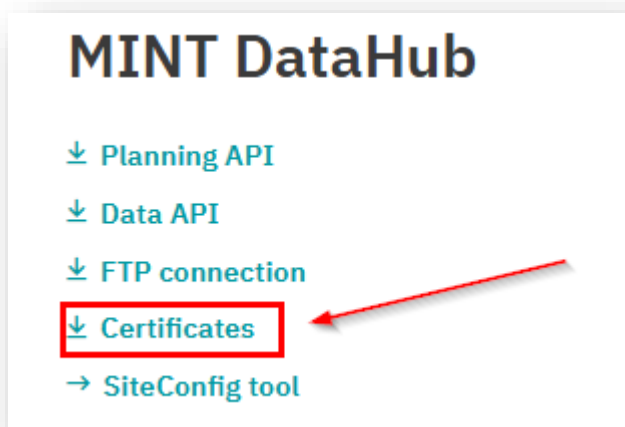
[Discard](#) [Apply](#)

4.5 Adding MQTT Certificate to the PLC

Use the tool WinSCP to log in using the PLC's username and password.

The certificate **"DigiCertGlobalRootG2.cer"** must be uploaded to the PLC.

This certificate can be downloaded via: [MINT energiebeheer met AI | Phoenix Contact](#).



MINT DataHub

- ↓ Planning API
- ↓ Data API
- ↓ FTP connection
- ↓ **Certificates**
- SiteConfig tool

plcnext - 192.168.0.2 - WinSCP

Local Mark Files Commands Tabs Options Remote Help

Synchronize Queue Transfer Settings Default

192.168.0.2 X New Tab

My documents Upload Edit Properties New

C:\Users\Administrator\Documents

Name	Size	Type	Changed
..		Parent directory	8/10/2024 14:55:39
Automation		File folder	9/02/2022 17:12:23
PLCnext Engineer		File folder	8/10/2024 14:56:05

/opt/plcnext/

Name	Size	Changed	Rig
..		28/03/2024 19:16:39	rw
apps		28/03/2024 19:17:13	rw
appshome		11/07/2024 20:21:42	rw
config		28/03/2024 19:17:10	rw
data		3/11/2024 21:32:15	rw
installed_apps		28/03/2024 19:16:59	rw
logs		19/11/2024 10:48:59	rw
ltnng		9/03/2018 13:34:56	rw
projects		31/10/2024 16:40:06	rw
retaining		28/03/2024 19:17:22	rw
Security		9/03/2018 13:34:56	rw
shadowing		13/11/2024 15:46:58	rw
DigiCertGlobalRootG2.cer	2 KB	21/08/2024 9:38:25	rw
PLCnextBase.ServiceProvider.log	2 KB	14/05/2024 9:00:57	rw

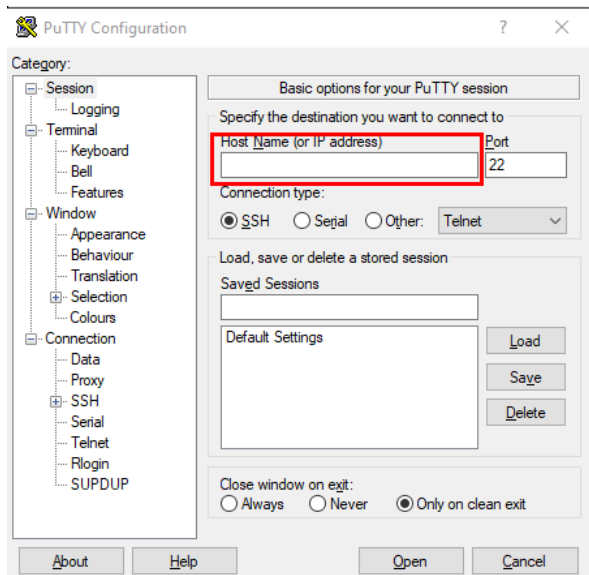
0 B of 0 B in 0 of 2 4 hidden 0 B of 2,84 KB in 0 of 13 3 hidden

SFTP-3 0:00:36

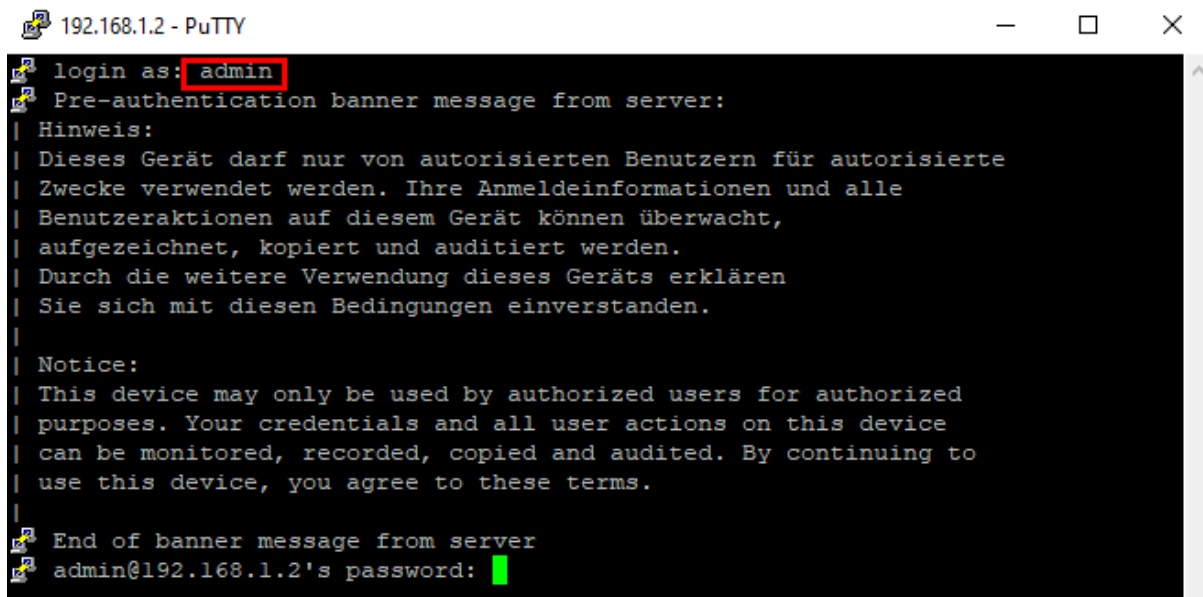
4.6 Checking the PLC via Linux

Use the tool 'PuTTY'.

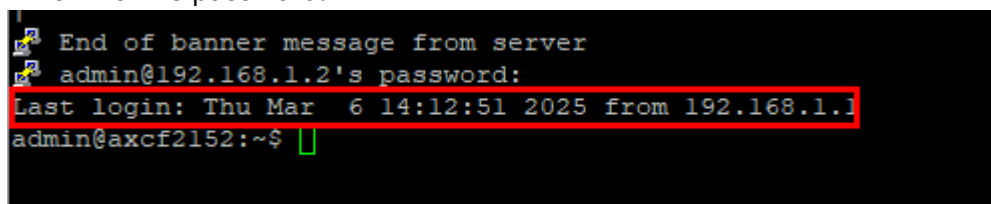
Enter the IP address of the PLC.



Log in as: 'admin'



Enter the PLC password.



4.6.1 Check the firmware

Enter the command: “**rauc status --detailed**”

```
admin@axcf2152:~$ rauc status --detailed
=== System Info ===
Compatible:  axcf2152_v1
Variant:
Booted from: rootfs.1 (B)
```

```
=== Slot States ===
x [rootfs.1] (/dev/mmcblk0p3, ext4, booted)
  bootname: B
  mounted: /media/rfs/ro
  boot status: good
  slot status:
    bundle:
      compatible=axcf2152_v1
      version=24.0.8.183
      description=Update container for axcf2152
      build=20241113101132
      hash=e59ba2934155c641f18dcf7d3eae4159b968c5db46f71f2e0d2c996db5973193
```

```
o [rootfs.0] (/dev/mmcblk0p2, ext4, inactive)
  bootname: A
  boot status: good
  slot status:
    bundle:
      compatible=axcf2152_v1
      version=24.0.8.183
      description=Update container for axcf2152
      build=20241113101132
```


4.6.2 Checking the NTP server

Enter the command: “date”

This should return the time in UTC. The time must be accurate, otherwise outbound communications will fail. It is possible that the clock is still synchronising, but do not leave the system unattended if this has not yet occurred.

```
admin@axcf2152:~$ date
Thu Mar  6 14:23:58 UTC 2025
```

Enter the command “ntpq -p”

This table must be filled. It is important that the system has NTP synchronisation capabilities. Over time, the clock will begin to drift, and outbound communication will eventually fail.

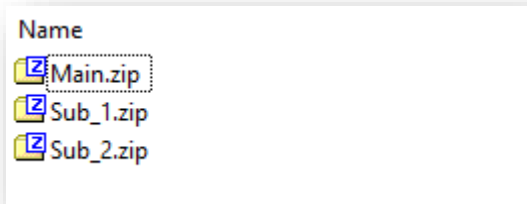
```
admin@axcf2152:~$ ntpq -p
      remote           refid      st t when poll reach   delay   offset   jitter
=====
*LOCAL(0)          .LOCL.           14 l  21   64  377    0.000    +0.000    0.002
time.cloudflare    10.78.8.4         3 u  201 1024    3   31.809    -2.254    0.281
212.129.177.91.    45.87.78.35       3 u  205 1024    3   33.882    -0.517    1.752
91.109.118.94 (    185.57.191.229  2 u  154 1024    3   38.936    -1.173    1.849
admin@axcf2152:~$
```

5 MULTI PLC

When more than one PLC is present in the project, it is considered a **MULTI-PLC project**. This consists of one **main** PLC and one or more **sub** PLCs.

5.1 Download site configuratie

The MINT Portal ([Phoenix Contact Mint](#)) also provides downloads for MULTI PLC projects. This download includes a separate configuration file for each PLC. See example below:

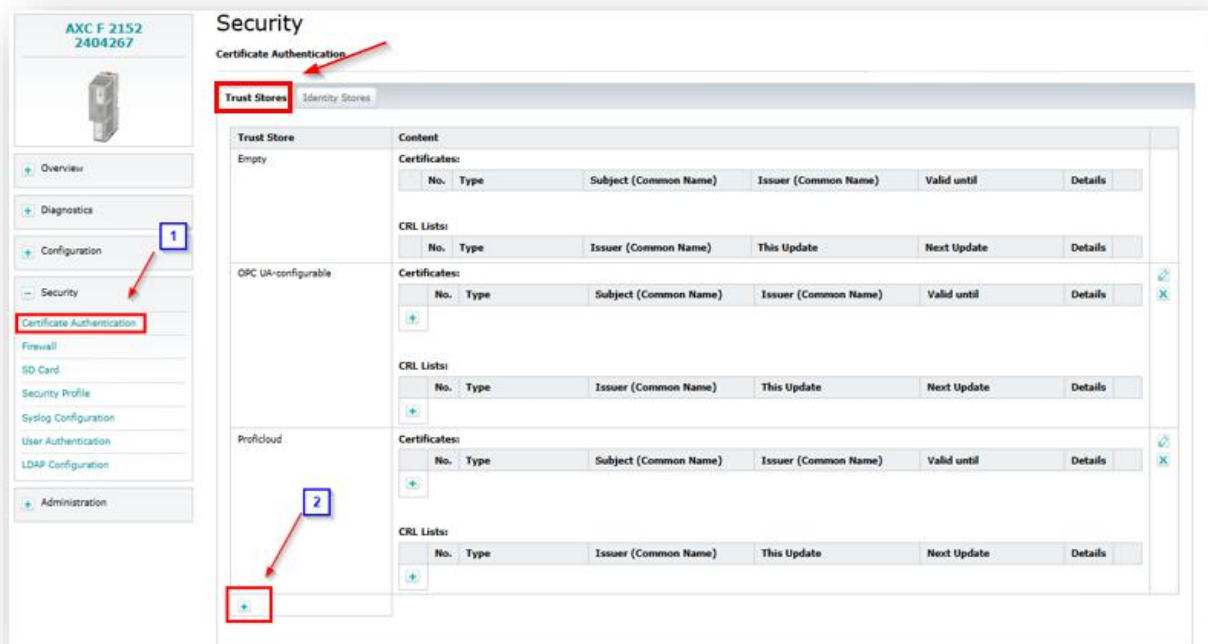


Each PLC must go through the steps outlined in sections **1.2** and **1.3**.

5.2 MULTI PLC certification

Navigate to the **WBM** (Web-Based Management) interface of all PLCs in the project.


5.2.1 Trust Stores




Add Trust Store

Name

MintSecureServer

Certificates:						
No.	Type	Subject (Common Name)	Issuer (Common Name)	Valid until	Details	
						

CRL Lists:						
No.	Type	Issuer (Common Name)	This Update	Next Update	Details	
						


Add Certificate

Trust Store

Certificate Type


Certificate content in PEM Format:

Input Method

<input type="checkbox"/>	Name	Date modified	Type	Size
	MintSecureConnection.pem	7/03/2025 9:48	PEM File	3 KB

Upload the certificate, which can be downloaded via [MINT energiebeheer met AI | Phoenix Contact](#) under “MINT DataHub”.





MINT DataHub

- ↓ Planning API
- ↓ Data API
- ↓ FTP connection
-  ↓ Certificates
- SiteConfig tool


It should appear as shown below.

MintSecureServer

Certificates:

	No.	Type	Subject (Common Name)	Issuer (Common Name)	Valid until	Details	
	1	Trusted Certificate	Mint	Mint	9999-12-31T23:59:59 UTC		
							

CRL Lists:

	No.	Type	Issuer (Common Name)	This Update	Next Update	Details	
							

5.2.2 Identity Stores

AXC F 2152
2404267

Overview

Diagnostics

Configuration

Security **1**

Certificate Authentication

Firewall

SD Card

Security Profile

Syslog Configuration

User Authentication

LDAP Configuration

Administration

Security

Certificate Authentication

Trust Stores

Identity Stores

Identity Store	No.	Element	Type	Description	Details
IDevID	1	Key Pair	RSA 2048 Hardware protected key	RSA Key Pair	
	2	Certificate	Key Certificate	Common Name: AXC F 2152 Valid not after: 9999-12-31T23:59:59 UTC	
	3	Certificate	Issuer Certificate	Common Name: PLCnext Device Signing CA Valid not after: 2023-11-29T23:59:59 UTC	
	4	Certificate	Issuer Certificate	Common Name: PhoenixSign License PLCnext Sub CA G1 Valid not after: 2024-09-06T23:59:59 UTC	
	5	Certificate	Issuer Certificate	Common Name: PhoenixSign License Root CA G1 Valid not after: 2024-09-06T23:59:59 UTC	
HTTPS-self-signed	1	Key Pair	RSA 2048	RSA Key Pair	
	2	Certificate	Key Certificate	Common Name: PLCnext HTTPS Interface List Valid not after: 9999-12-31T23:59:59 UTC	
OPC UA-self-signed	1	Key Pair	RSA 2048	RSA Key Pair	
	2	Certificate	Key Certificate	Common Name: eUAServer@axc-f-2152-1 Valid not after: 9999-12-31T23:59:59 UTC	
Profilcloud	1	Key Pair	Error: StoreNotFound	ECDSA Key Pair	
	2	Certificate	Key Certificate	Certificate not available. Please add a Key Certificate via the "Set" button on the right.	

+

Add Identity Store

Name

MintSecureClient

Key Pair

Enter

Key Pair in PEM Format:

Input Method


File Upload

Browse...

MintSecureConnection.pem

Add

Cancel

MintSecureClient							
	No.	Element	Type	Description	Details		
	1	Key Pair	RSA 2048	RSA Key Pair			
	2	Certificate	Key Certificate	Certificate not available. Please add a Key Certificate via the "Set" button on the right.			

Set Key Certificate

Identity Store

Certificate Source

Certificate content in PEM Format:

Input Method

Browse...



MintSecureConnection.pem

The issuer certificate(s) will also be reset or replaced.

Save

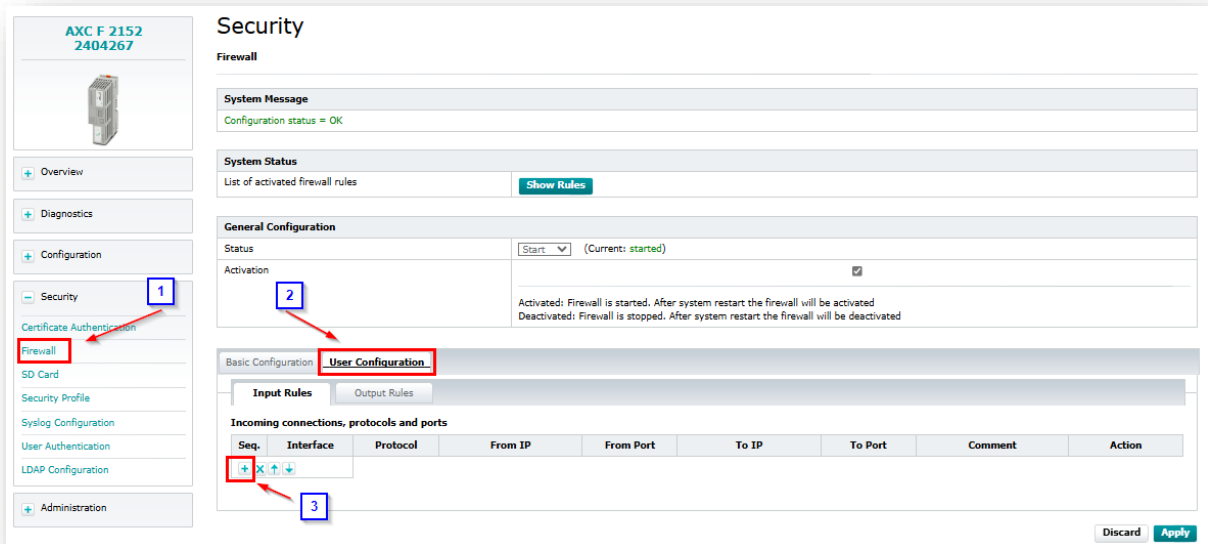
Cancel

It should appear as shown below.

MintSecureClient							
	No.	Element	Type	Description	Details		
	1	Key Pair	RSA 2048	RSA Key Pair			
	2	Certificate	Key Certificate	Common Name: Mint Valid not after: 9999-12-31T23:59:59 UTC			
							

5.3 Firewall settings

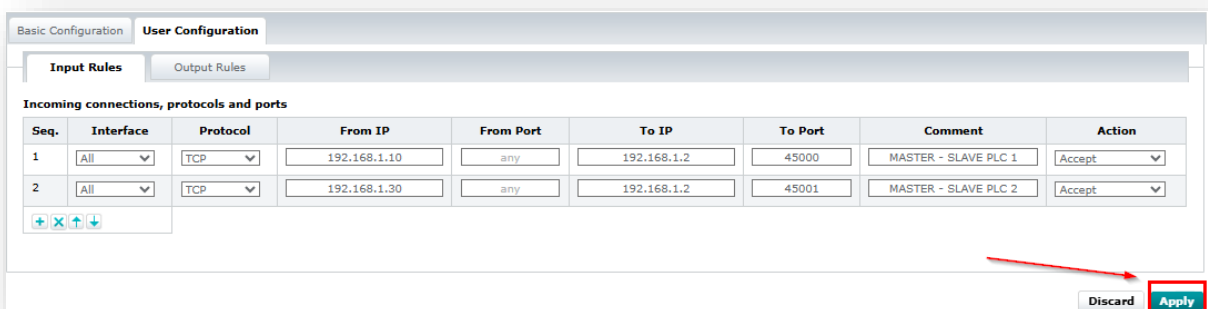
To enable communication between PLCs, the following firewall settings must be adjusted on the **main PLC**.



In the example below, we assume:

- MASTER PLC = 192.168.1.2
- SLAVE PLC 1 = 192.168.1.10 (Port 45000)
- SLAVE PLC 2 = 192.168.1.30 (Port 45001)

Seq.	Interface	Protocol	From IP	From Port	To IP	To Port	Comment	Action
1	All	TCP	192.168.1.10	any	192.168.1.2	45000	MASTER - SLAVE PLC 1	Accept
2	All	TCP	192.168.1.30	any	192.168.1.2	45001	MASTER - SLAVE PLC 2	Accept



5.4 Changes in PLCnext Engineer

When building a MULTI PLC project, an additional line (or lines) will appear under the **“Configuration”** tab.

These lines refer to the MASTER and SLAVE PLCs.

5.4.1 MAIN PLC

- SUB PLC 1 “sub_1”

MINT_Core_ControlSystem.Configuration_Connection('Sub_1','xx.xx.xx.xx',UINT#45000);

Replace xx.xx.xx.xx with the corresponding IP address.

- SUB PLC 2 “sub_2”

MINT_Core_ControlSystem.Configuration_Connection('Sub_2','xx.xx.xx.xx',UINT#45001);

Replace xx.xx.xx.xx with the corresponding IP address.

```
3000: MINT_Core_ControlSystem.Configuration_Connection('Sub_1','xx.xx.xx.xx',UINT#45000);  
3001: MINT_Core_ControlSystem.Configuration_Connection('Sub_2','xx.xx.xx.xx',UINT#45001);
```

5.4.2 SUB PLC 1 “Sub_1”

MINT_Core_ControlSystem.Configuration_Connection('Main','xx.xx.xx.xx',UINT#45000);

Replace xx.xx.xx.xx with the IP address of the MASTER PLC.

```
1: MINT_Core_ControlSystem.Configuration_Connection('Main','xx.xx.xx.xx',UINT#45000);
```

5.4.3 MAIN PLC 2 “Sub_2”

MINT_Core_ControlSystem.Configuration_Connection('Main','xx.xx.xx.xx',UINT#45001);

Replace xx.xx.xx.xx with the IP address of the MASTER PLC.





```
1: MINT_Core_ControlSystem.Configuration_Connection('Main','xx.xx.xx.xx',UINT#45001);
```

5.5 MUTLI PLC / MINT Licentie

Each PLC in a MULTI PLC project must have its own MINT licence.
The MASTER PLC will hold a licence for all assets and collectors.
The SLAVE PLCs will receive a SLAVE MINT licence.

5.6 MUTLI PLC / MQTT Credentials

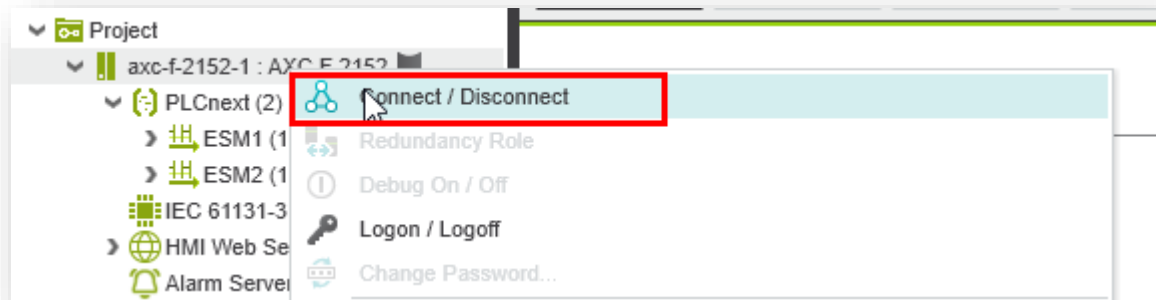
Each PLC in a MULTI PLC project must have its own MQTT connection (if applicable).
The SAS token can be generated per PLC.

Assets				
#	Status	Connection state	Last SAS token expires	Action
zav_1_main	Enabled 	Connected		Manage SAS Stream telemetry
zav_1_sub1	Enabled 	Connected		Manage SAS Stream telemetry

6 Starting a MINT project

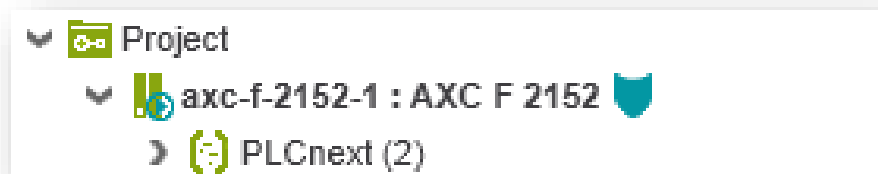
Once all preparations are complete, the MINT software can be deployed on-site. This begins by opening PLCnext Engineer 2024.0.4 LTS with the prepared MINT software.

Right-click on “axc-f-2152-1 : AXC F 2152” and select “Connect / Disconnect”.

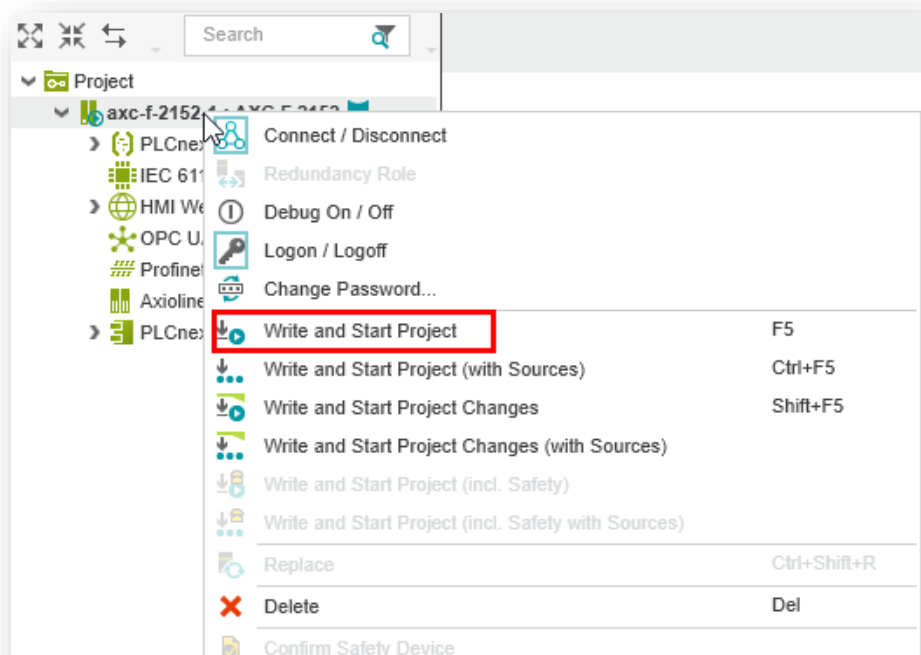


Log in using the PLC’s username and password.

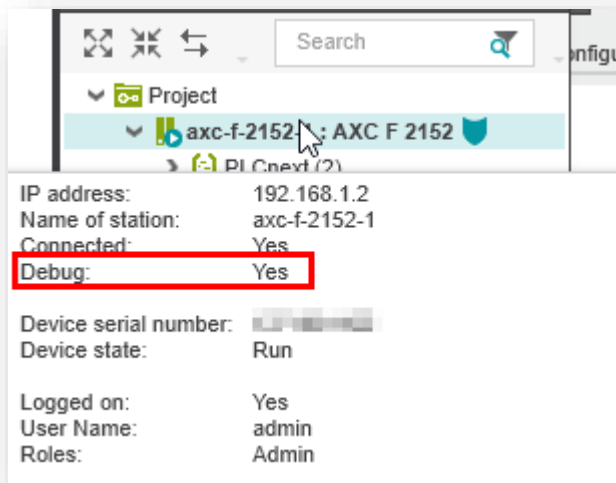
If the connection to the PLC is successful, it will appear as follows:



Write and Start Project



If the build is successful, the PLC will automatically switch to debug mode.
You can confirm the debug status by hovering over “axc-f-2152-1 : AXC F 2152”.



6.1 Starting the MINT Project / MULTI PLC

For best practice, we recommend starting the **SLAVE PLCs first**, followed by the **MASTER PLC**.

7 Verifying the MINT Project

Nadat de MINT software is gedownload naar de PLC, dienen onderstaande checks uitgevoerd te worden om de software te valideren naar correcte werking.

7.1 MINT Licence Active

xControlSystemActive must be set to “TRUE”.

```
1 MINT_Core_ControlSystem(
2   sLicense:= '...', // License key
3   strIncomingData:= strMINT_IncomingCommunicationDatahub {...}, // Datahub communication
4   strOutgoingData => strMINT_OutgoingCommunicationDatahub {...}, // Datahub communication
5   xActive => xControlSystemActive TRUE,
6   arrDiagnostic=> arrControlSystemDiagnostic {...},
7   arrCollectorDataInterface:= arrCollectorDataInterface {...}, // Collector FB's
8   arrACChargepointDataInterface:= arrACChargepointDataInterface {...}, // AC Chargepoint FB's
9   arrDCChargepointDataInterface:= arrDCChargepointDataInterface {...}, // DC Chargepoint FB's
10  arrPVSystemDataInterface:= arrPVSystemDataInterface {...}; // PV System FB's
```

7.2 MQTT Connection Active

The variable xConnect must be set to “TRUE”.

```
MINT_FB_Datahub_Interface( xActivate := strMINT_Datahub_IN.strSettings.xConnect TRUE,
  sHost := strMINT_Datahub_IN.strSettings.sHost,
  sUsername := strMINT_Datahub_IN.strSettings.sUserName,
  sPassword := strMINT_Datahub_IN.strSettings.sPassword,
  sPort := strMINT_Datahub_IN.strSettings.sPort,
  sClientID := strMINT_Datahub_IN.strSettings.sDatahubId,
  sPersistDir := '',
  diBufferMessages := DINT#100,
  strConnectOptions := strConnectOptions {...},
  xConnected => xConnected TRUE,
  xTimeout => xTimeout FALSE,
  xError => xError FALSE,
  strDiagnose => strDiagnose {...},
  xReadyToReceive => xReadyToReceive TRUE,
  xNewDataAvailable => xNewDataAvailable FALSE);
```

7.3 Collector data

Are the energy values from the collector being received correctly?

If no vehicles are currently charging, the collector may not show current values. However, voltage should always be present.

```
// *** Collector *** HFDTR *****
```

Collector_001.Input_Measurements{	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strP.rScaledValue	19069.81
	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strP1.rScaledValue	6797.94
	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strP2.rScaledValue	6298.95
	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strP3.rScaledValue	5972.93
	IN_HFDTR.strRead.strInstantaneous.strData.strI1.rScaledValue	36.83
	IN_HFDTR.strRead.strInstantaneous.strData.strI2.rScaledValue	28.57
	IN_HFDTR.strRead.strInstantaneous.strData.strI3.rScaledValue	28.64
	IN_HFDTR.strRead.strInstantaneous.strData.strPF.rScaledValue	0.86
Collector_001.Input_TotalPowerFactor{	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strQ.rScaledValue	-11467.81
Collector_001.Input_TotalReactivePower{	TO_ULINT(IN_HFDTR.strRead.strMeterReadings.strData.strTotalActiveEnergyDemand.rScaledValue	8.1050541
Collector_001.Input_TotalEnergy{	TO_ULINT(IN_HFDTR.strRead.strMeterReadings.strData.strTotalActiveEnergyDelivery.rScaledValue	99
Collector_001.Input_ConductorVoltage{	IN_HFDTR.strRead.strInstantaneous.strData.strU12.rScaledValue	413.26
	IN_HFDTR.strRead.strInstantaneous.strData.strU23.rScaledValue	412.18
	IN_HFDTR.strRead.strInstantaneous.strData.strU31.rScaledValue	413.87
Collector_001.Input_Voltage{	IN_HFDTR.strRead.strInstantaneous.strData.strU1.rScaledValue	239.14
	IN_HFDTR.strRead.strInstantaneous.strData.strU2.rScaledValue	238.11
	IN_HFDTR.strRead.strInstantaneous.strData.strU3.rScaledValue	238.27
Collector_001.Input_ReactivePower{	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strQ1.rScaledValue	-5600.56
	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strQ2.rScaledValue	-2566.74
	TO_DINT(IN_HFDTR.strRead.strInstantaneous.strData.strQ3.rScaledValue	-3300.52
Collector_001.Input_PowerFactor{	IN_HFDTR.strRead.strInstantaneous.strData.strPF1.rScaledValue	0.77
	IN_HFDTR.strRead.strInstantaneous.strData.strPF2.rScaledValue	0.93
	IN_HFDTR.strRead.strInstantaneous.strData.strPF3.rScaledValue	0.88
Collector_001.Input_Frequency{	IN_HFDTR.strRead.strInstantaneous.strData.strF.rScaledValue	49.98
Collector_001{sName:= 'HFDTR',		
xCommunicationValid:= IN_HFDTR.strDiag.iSecondsSinceLastSuccessfulTransaction	1 < 30,	
arrDataInterface:= arrCollectorDataInterface	{...};	

Collector_001.Input_ConductorVoltage{	IN_HFDTR.strRead.strInstantaneous.strData.strU12.rScaledValue	413.26
	IN_HFDTR.strRead.strInstantaneous.strData.strU23.rScaledValue	412.18
	IN_HFDTR.strRead.strInstantaneous.strData.strU31.rScaledValue	413.87
Collector_001.Input_Voltage{	IN_HFDTR.strRead.strInstantaneous.strData.strU1.rScaledValue	239.14
	IN_HFDTR.strRead.strInstantaneous.strData.strU2.rScaledValue	238.11
	IN_HFDTR.strRead.strInstantaneous.strData.strU3.rScaledValue	238.27

7.4 Charging Station Data

Is data from the charging stations being received correctly?

If there is no active charging session at a station, no current or power will be visible. However, voltage should still be present.

```
// *** AC Chargepoint *** EB11_AC1_1 *****
```

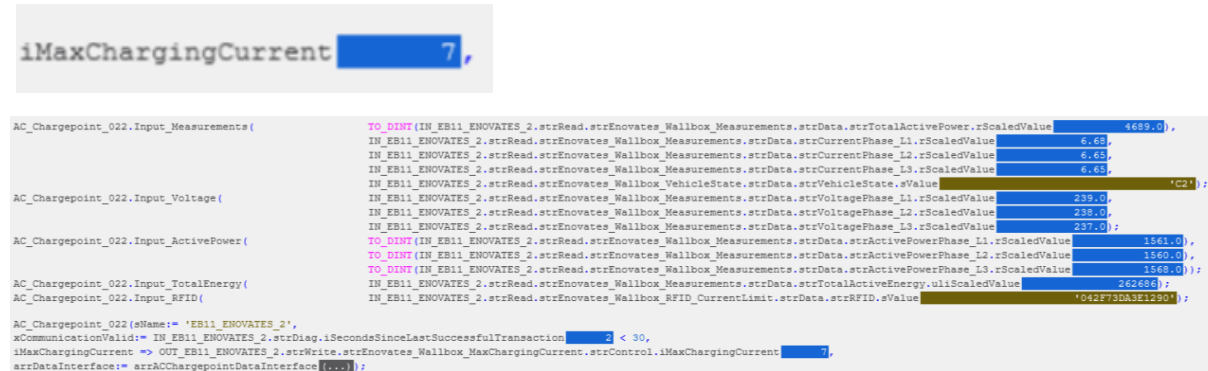
AC_Chargepoint_014.Input_Measurements{	TO_DINT(IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strTotalActivePower.rScaledValue	0.0
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strCurrentPhase_L1.rScaledValue	0.0
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strCurrentPhase_L2.rScaledValue	0.0
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strCurrentPhase_L3.rScaledValue	0.0
AC_Chargepoint_014.Input_Voltage{	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVehicleStatus.sValue	'A1'
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVoltagePhase_L1.N.rScaledValue	238.6
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVoltagePhase_L2.N.rScaledValue	239.53
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVoltagePhase_L3.N.rScaledValue	238.73
AC_Chargepoint_014.Input_ChargingPlugCapacity{	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strChargingPlugCapacity.iScaledValue	0
AC_Chargepoint_014.Input_TotalEnergy{	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strTotalActiveEnergy.ulrScaledValue	573440
AC_Chargepoint_014.Input_RFID{	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strBadgeRFID.sValue	'FAE888F5'
AC_Chargepoint_014{sName:= 'EB11_AC1_1',		
xCommunicationValid:= IN_EB11_AC1_1.strDiag.iSecondsSinceLastSuccessfulTransaction	1 < 30,	
iMaxChargingCurrent => OUT_EB11_AC1_1.strWrite.strModule_1_MaxChargingCurrent.strControl.iMaxChargingCurrent	6,	
arrDataInterface:= arrACChargepointDataInterface	{...};	

AC_Chargepoint_014.Input_Voltage{	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVoltagePhase_L1.N.rScaledValue	238.6
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVoltagePhase_L2.N.rScaledValue	239.53
	IN_EB11_AC1_1.strRead.strModule_1_Measurement.strData.strVoltagePhase_L3.N.rScaledValue	238.73

7.5 MINT Scaling

The MINT software will scale up the allowed setpoint of the charging stations if sufficient power is available. See the example below:

Setpoint of 7A:



Setpoint of 8A:

