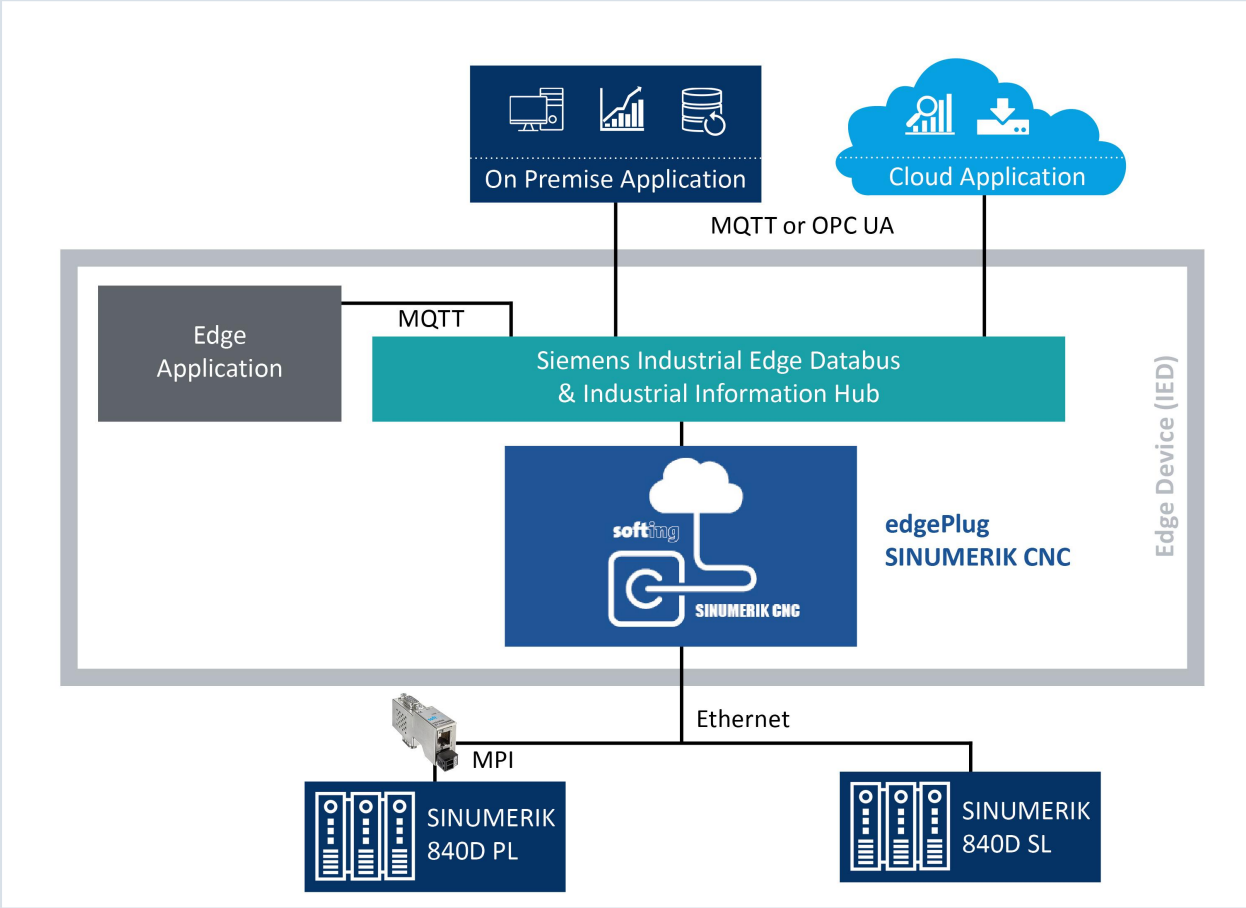
User Guide

edgePlug SINUMERIK CNC



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1 About this guide

1.1 Read me first

Please read this guide carefully before using the device to ensure safe and proper use. Softing does not assume any liability for damages due to improper installation or operation of this product.

This document is not warranted to be error-free. The information contained in this document is subject to change without prior notice. To obtain the most current version of this guide, visit the product website.

1.2 Target audience

This guide is intended for experienced operation personnel and network specialists configuring and maintaining field devices in a Siemens network environment. Before installing and operating the edgePlug SINUMERIK CNC make sure that you have read and fully understood the safety requirements and working instructions in this guide.

1.3 Typographic conventions

The following typographic conventions are used throughout Softing customer documentation:

Keys, buttons, menu items, commands and other elements involving user interaction are set in bold font and menu sequences are separated by an arrow	Open **Start** → **Control Panel** → **Programs**
Buttons from the user interface are enclosed in brackets and set to bold typeface	Press **[Start]** to start the application
Coding samples, file extracts and screen output is set in Courier font type	`MaxDlsapAddressSupported=23`
Filenames and directories are written in italic	Device description files are located in *C:\<Application name>\delivery\software\Device Description files*

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Note

This symbol is used to call attention to notable information that should be followed during installation, use, or servicing of this device.

1.4 Document history

Document version	Changes since last version
1.00	▪ first version
1.10	▪ support to define own NC and PLC variables in the IIH configurator

1.5 Related documentation

The following links direct you to additional product information.

You will find the user manuals and release notes of the Siemens Industrial Edge system in the Documents section of the Siemens Industrial Edge Hub.

1.6 Document feedback

We would like to encourage you to provide feedback and comments to help us improve the documentation. You can write your comments and suggestions to the PDF file using the editing tool in Adobe Reader and email your feedback to support.automation@softing.com.

If you prefer to write your feedback directly as an email, please include the following information with your comments:

- document name
- document version (as shown on cover page)
- page number

2 About edgePlug SINUMERIK CNC

The Softing edgePlug SINUMERIK CNC is a Linux-based containerized software application running on a Docker engine. It has been designed to stream SINUMERIK 840D CNC data to the Siemens Industrial Edge applications.

2.1 Intended use

The edgePlug SINUMERIK CNC integrates smoothly into the Siemens Industrial Edge connectivity and are designed to utilize all services and features of the Siemens connectivity suite.

2.2 Features and benefits

- Access to SINUMERIK 840D CNC machine tool data for the Siemens Industrial Edge
- No change of CNC program needed
- No data point configuration needed with pre-defined standard namespace
- Tight integration into Siemens Industrial Edge
- Use the IIH configurator to configure the edgePlug connectivity
- CS Databus Gateway makes the controller data available at the IE Databus
- Existing applications which use the IE Databus can consume the data provided by the edgePlug without changes

2.3 Technical data

Supported CNCs	Siemens SINUMERIK 840D Solution Line, Software Version >= V2.7 Siemens SINUMERIK 840D Power Line, Software Version >= V5.3
Tested with	Siemens Industrial Edge V1.10.3 Siemens Industrial Information Hub V1.4 Siemens IPC227E
Minimal Hardware Requirements	256 MB free disk space, 32 MB RAM
Licensing	Over Siemens Industrial Marketplace
Software	Siemens Industrial Edge Application

2.4 System requirements

The edgePlug SINUMERIK CNC is a connector for the Siemens Industrial Information Hub. You must have the Siemens Industrial Infomation Hub (IIH) installed on a Siemens Industrial Edge Device to use the edgePlug SINUMERIK CNC.

3 Installation

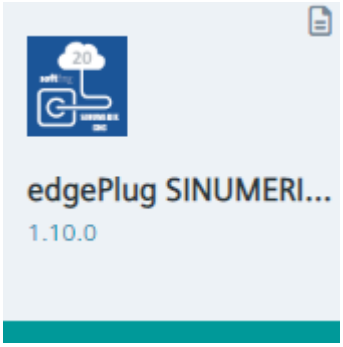
The edgePlug SINUMERIK CNC can be purchased and installed over the Siemens Industrial Edge marketplace.

3.1 Prerequisites

To be able to work with edgePlug SINUMERIK CNC you need a Siemens Industrial Edge Hub Account, a Siemens Industrial Edge Management installation and at least one Siemens Industrial Edge device. Please have a look at the “Industrial Edge Management - Getting Started” manual from Siemens which explains the installation of the Siemens Industrial Edge environment.

3.2 Copying edgePlug to IEM

After you have purchased edgePlug SINUMERIK CNC in the Siemens marketplace check the user manual of the IE Hub for further details on how to copy your edgePlug SINUMERIK CNC to IEM .

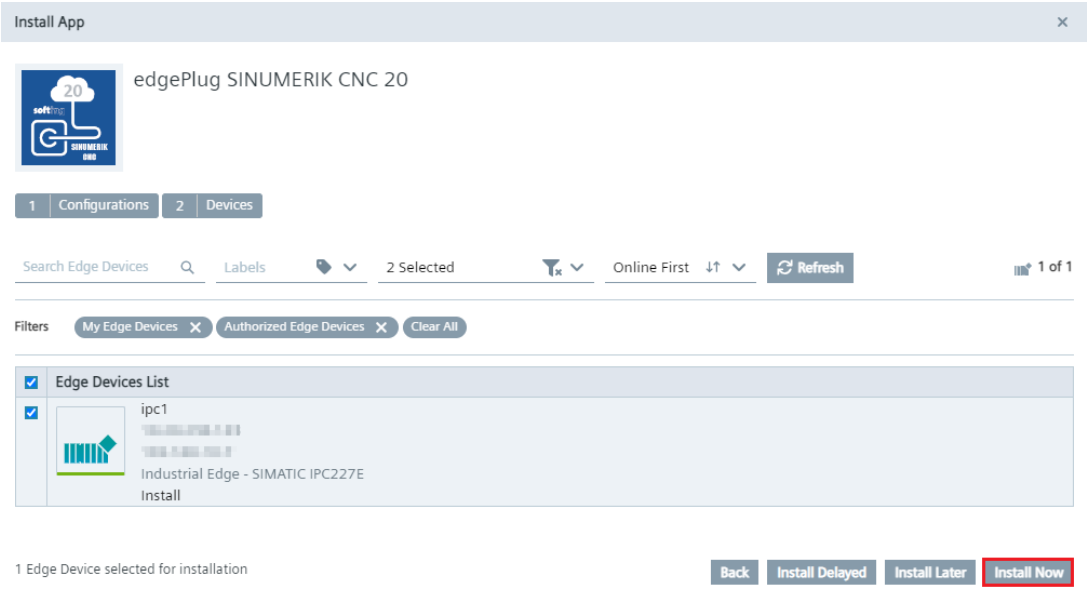


1. Select the **edgePlug SINUMERIK CNC app** icon.
2. Select the **IEM instances** in the displayed dialog to where the app should be copied.
3. Click **Copy latest version to IEM(s)**.
   The edgePlug SINUMERIK CNC will be installed to the **catalog** of the IEM.

3.3 Installing edgePlug to IED

1. Double-click the edgePlug SINUMERIK CNC **icon** in the catalog of the IEM.

2. Click **[Install]**.
3. Open the to Install App dialog.
4. Click **[Next]** on the Configurations page and select the IED to which you want to install the App.



5. Click **[Install Now]** to install the App on the device.

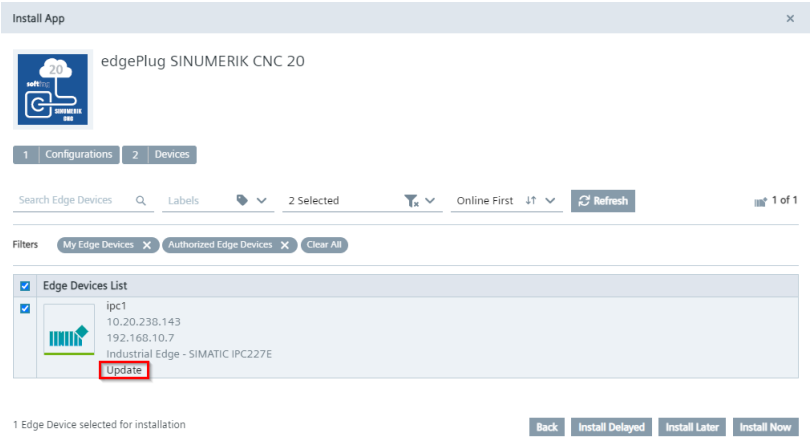
3.4 Updating edgePlug to IED

If an application is installed and you want to update to a new version of the product, do the following:

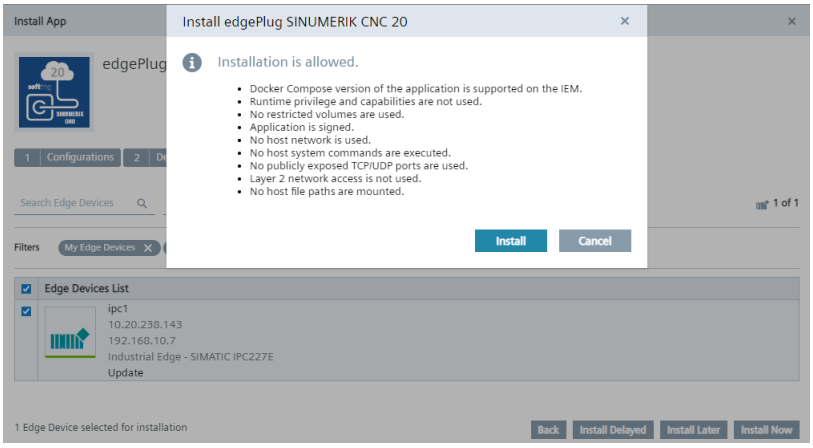
1. Double-click the edgePlug SINUMERIK CNC **icon** in the catalog of the IEM.

2. Click **[Install]**.

3. Click **[Update]** on the Configurations page.



4. Click **[Install]** on the popup page.

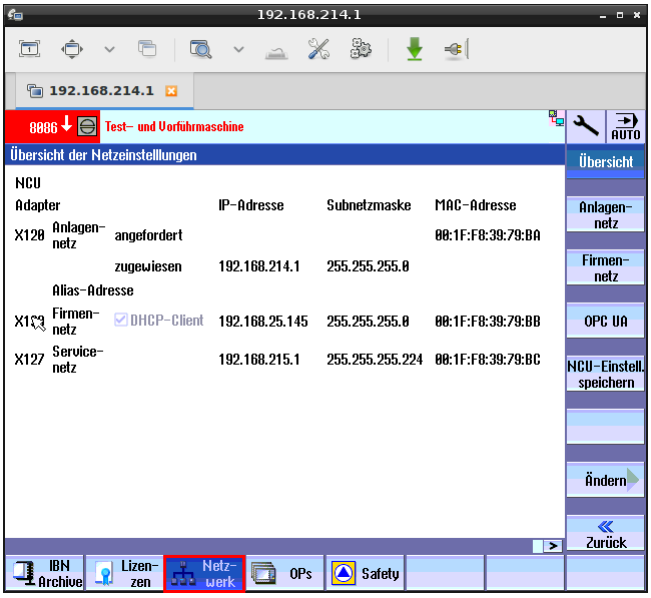


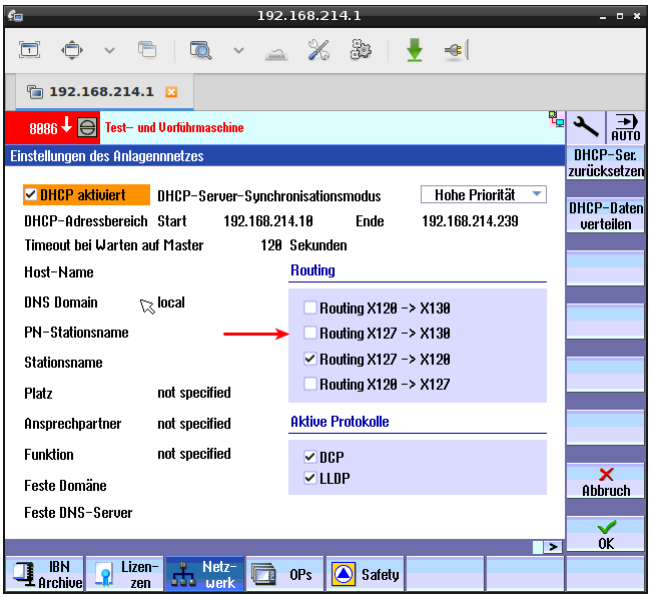
3.5 Physical connection to SINUMERIK 840D controller

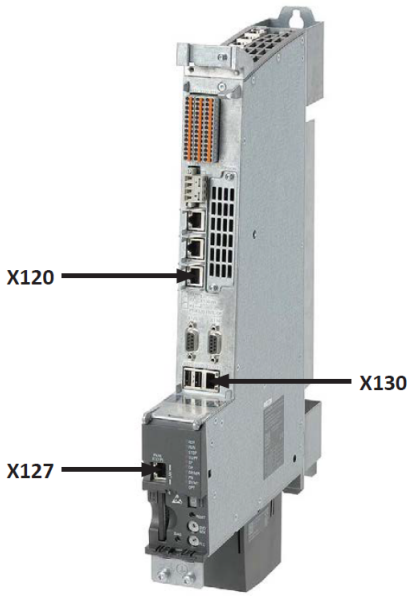
The SINUMERIK 840D variants offer two types of physical connection. SINUMERIK 840D SL variant has 3 Ethernet interfaces while SINUMERIK 840D PL variant only provides MPI access.

3.5.1 SINUMERIK 840D SL

- Ethernet interface X120 for the device connection to HMIs and keyboards
- Ethernet interface X130 for the company network
- Ethernet interface X127 for service purposes







Ethernet interface	Description
X120	This interface is used for connecting the automation network (operator panel interface). The interface is not isolated by a firewall. Ideally, the Softing dataFEED edgeConnector 840D should therefore be operated using this interface. This interface uses the fixed IP address 192.168.214.1. For connecting to the machine network the gateway then should be configured using a fixed IP address as well(e.g. an IP address higher than 192.168.214.250).
X127	This interface serves exclusively as a service socket (service interface). It cannot be used for connection purposes.
X130	This interface connects the controller to the factory network (company Ethernet). This interface can be used as an alternative interface for connecting the dataFEED edgeConnector 840D. Here, however, the NCU firewall (port TCP/102) has to be enabled to allow for SIMATIC S7 communication.

The Softing dataFEED edgeConnector 840D uses the SIMATIC S7 communication protocol (TCP/102) of SINUMERIK 840D SL. By default, this protocol is available at the X120 interface. Alternatively, it can be enabled for the X130 interface.

The host PC running the dataFEED edgeConnector 840D therefore needs either a physical connection to the X120 interface and a unique IPv4 address within the corresponding network or a physical connection to the X130 interface, a unique IPv4 address within the corresponding network as well as the SIMATIC S7 communication protocol explicitly enabled for this interface.

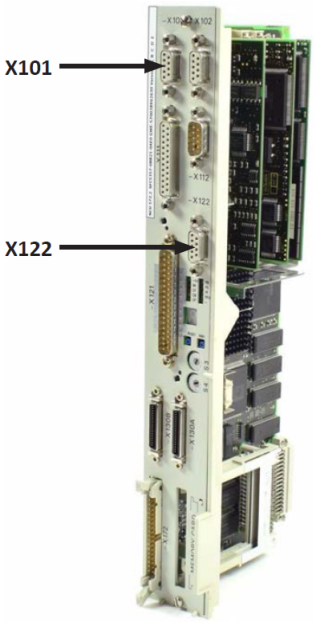
3.5.2 SINUMERIK 840D PL

As the SINUMERIK 840D PL does not have an Ethernet interface, a D-Sub 9 connector is required for connectivity purposes to map the SINUMERIK 840D PL-specific communication to Ethernet communication.

The Softing product echolink S7-compact supports the PG/MPI to Ethernet conversion. The Ethernet-to-MPI converter translates the RFC-1006 TSAP addresses to MPI addresses. As a result the default SINUMERIK 840D PL MPI addresses are translated into the following TSAP settings:

- TSAP NCK (powerline): 03 03
- TSAP PLC (powerline): 03 02

It must be ensured that the SINUMERIK 840D PL has been switched on and its communication settings are correct. Ensure that a valid MPI address is assigned and that it is not assigned twice in the configuration. Individually configured addresses can be determined by checking the hardware configuration of the SIMATIC STEP 7 project. As MPI address 30 is typically not used it can be assigned toecholink S7-compact.



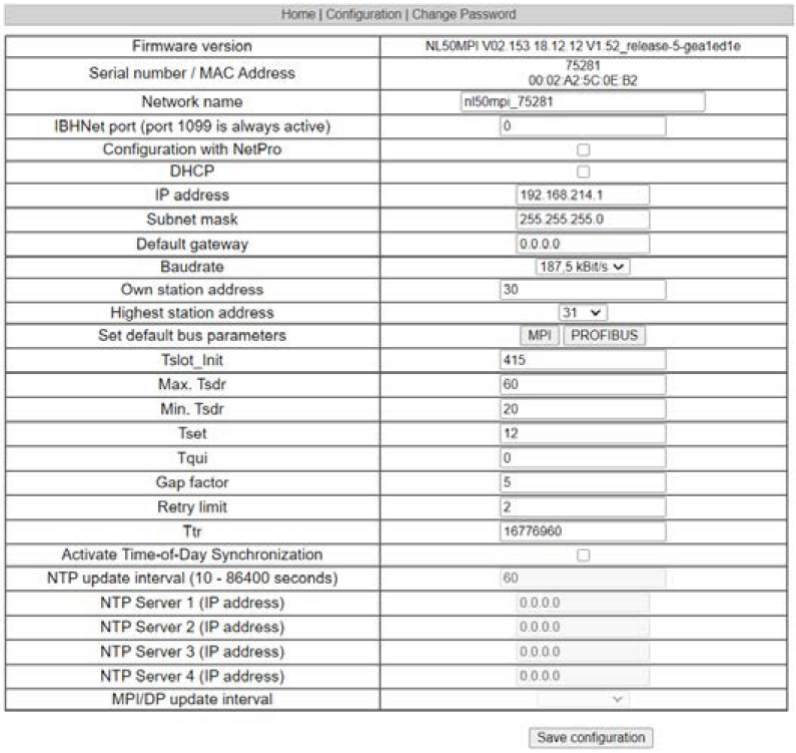
Ethernet interface	Description
X122	This interface is used for connecting a programming or remote maintenance device (PG interface) and is recommended for the echolink S7-compact. It requires its own 24 V power supply, since the connector X122 does not provide any voltage. If a connector is connected echolink S7-compact can be plugged on top or in between.
X101	It is used for connecting the control panel/operating panel (control panel interface) and is not recommended for communication via echolink S7-compact .

Configure echolink S7-compact

The echolink S7-compact configuration is performed in the appropriate configuration page (see the figure below).

The important echolink S7-compact settings include:

Variable	Description
IP Address	Address for reaching echolink S7-compact. The IP address is freely selectable (e.g. 192.168.214.XXX), but has to be located in the same network as the MACHINE network of dataFEED edgeConnector 840D.
Baudrate	The transmission speed has to be set to 187.5 kBit/s.
Own Station Address	MPI address of echolink S7-compact. **Important**: This address must not be used by another station.
Set Default Bus Parameter	Select MPI and use the default parameters.



Home | Configuration | Change Password

Firmware version	NL50MPI V02.153.18.12.12 V1.52_release-5-gea1ed1e
Serial number / MAC Address	75281 00:02:A2:5C:0E:B2
Network name	nl50mpi_75281
IBHNet port (port 1099 is always active)	0
Configuration with NetPro	☐
DHCP	☐
IP address	192.168.214.1
Subnet mask	255.255.255.0
Default gateway	0.0.0.0
Baudrate	187.5 kBit/s
Own station address	30
Highest station address	31
Set default bus parameters	MPI PROFIBUS
Tslot_Init	415
Max. Tsdr	60
Min. Tsdr	20
Tset	12
Tqui	0
Gap factor	5
Retry limit	2
Ttr	16776960
Activate Time-of-Day Synchronization	☐
NTP update interval (10 - 86400 seconds)	60
NTP Server 1 (IP address)	0.0.0.0
NTP Server 2 (IP address)	0.0.0.0
NTP Server 3 (IP address)	0.0.0.0
NTP Server 4 (IP address)	0.0.0.0
MPI/DP update interval	

Save configuration

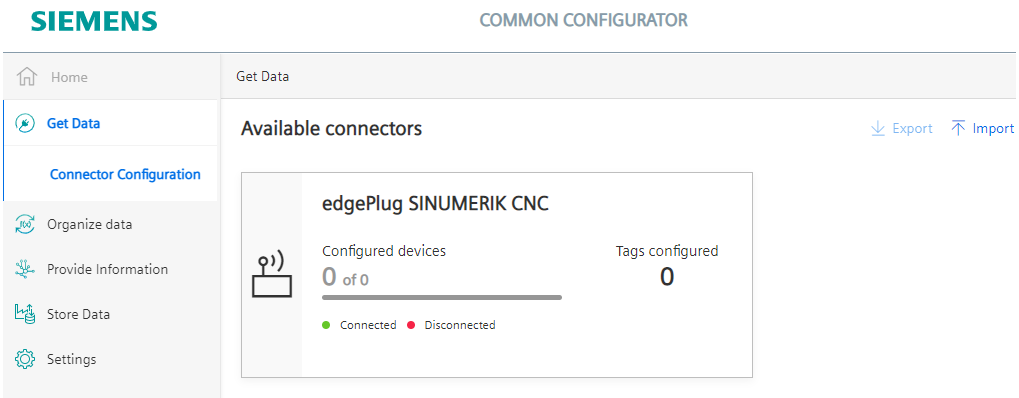
4 Configuration

4.1 Prerequisites

- The IED along with the installed edgePlug SINUMERIK CNC is connected over Ethernet to a SINUMERIK 840D CNC controller.

4.2 IIH Configurator

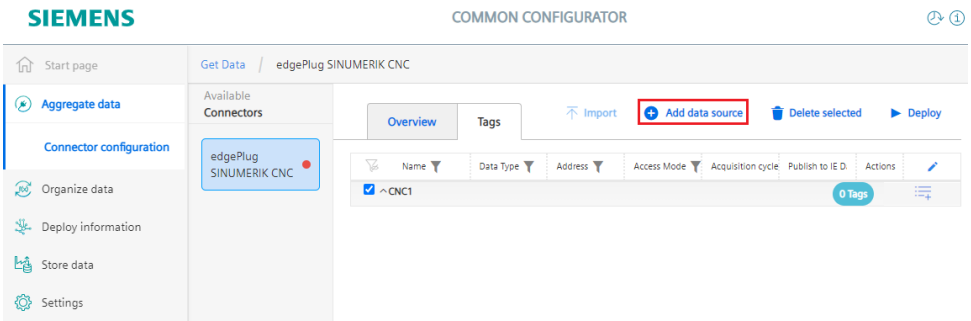
1. Click the **Apps page i**n the user interface of the IED to run the **IIH configurator**.
   The browser will open a new tab displaying the configurator.
2. See the **Connector Configuration** page for a list of installed and running connectors.



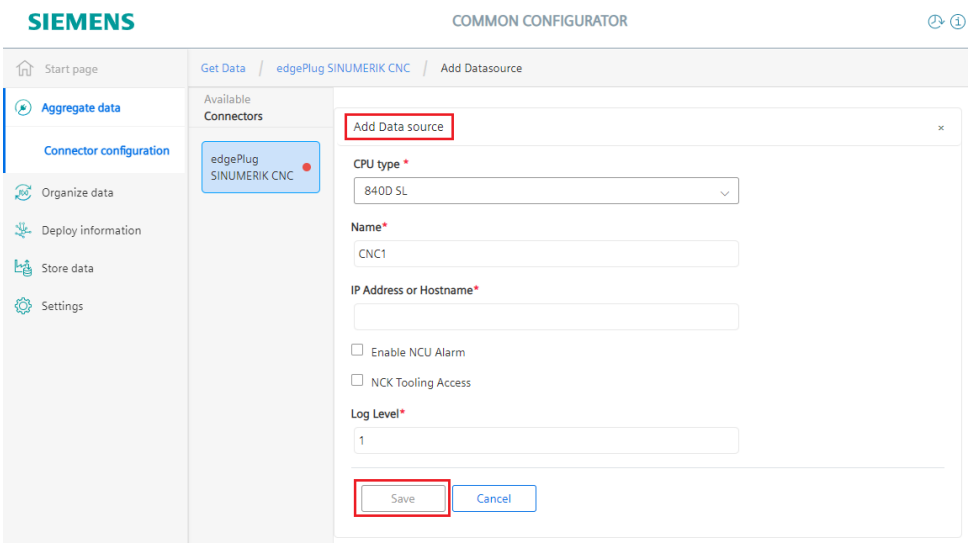
3. Select the edgePlug SINUMERIC CNC.

4.2.1 Data source configuration

1. Open the **Tags** tab of the edgePlug SINUMERIK CNC.
2. Click **Add Data Source**.

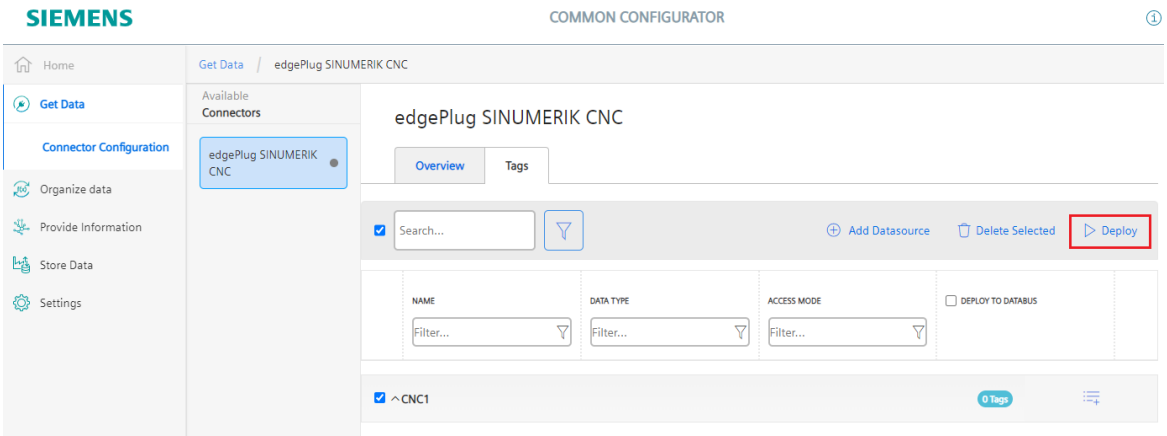


3. See the **Connector Configuration** page for a list of installed and running connectors.
4. Enter the data source connection parameters into the **Add Data Source** dialog fields.
5. Click **[Save]**.

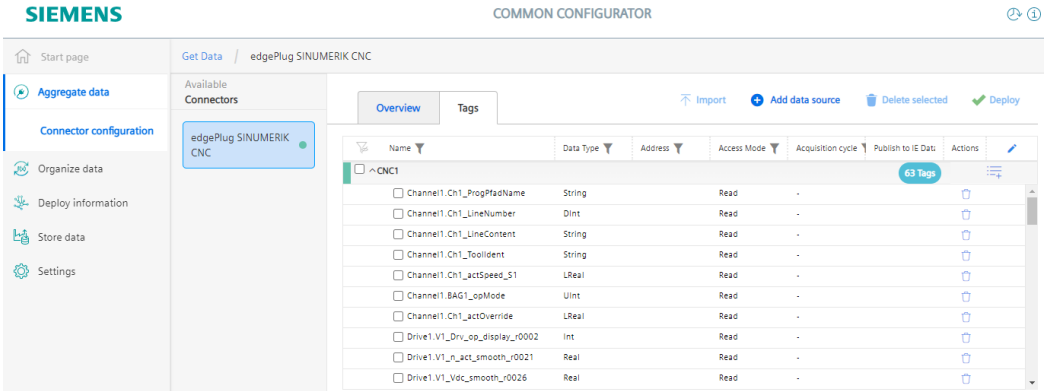


Field	Description
PLC Type	840D SL for SINUMERIK 840D Solution Line controllers 840D PL for SINUMERIK 840D Power Line controllers
Name	Name of the connection used within the IE applications
IP Address or hostname	The IP address or hostname of the SINUMERIK CNC
Enable NCU Alarm	Enable the monitoring of NCU alarms. This creates an additional communication load on the CNC.
NCK Tooling Access	Enable the monitoring of NCU tooling data. This creates an additional communication load on the CNC.
Log Level	The level of generated logs 0 = Only Error logs 1 = Error and Warning logs 2 = Error, Warning and Information logs 3 = Error, Warning, Information and Debug logs

6. Select the data source and press **[Deploy]** to write the configuration to the edgePlug SINUMERIK CNC.



4.2.2 Data point configuration



840D SL

All accessible data points of the default configuration are listed below the connection on the "Tags" page. You can add your own data points. However, by adding your own data points all default data points will be removed.

840D PL

All accessible data points of the default configuration are listed below the connection on the "Tags" page. You can add your own data points. However, by adding your own data points all default data points will be removed.

Note
To see the data points after the configuration of the data source, close the IIH Configurator and reopen it after 30 seconds.

Note
With the V1.2 of the IIH Configurator the configuration of the Databus Gateway is only possible for one connector.

Note
If you wish to see that the default data points have been removed after adding your own data points, close the IIH Configurator and reopen it.

4.2.3 NC data points

4.2.3.1 Default NC data points

- Ch1_ProgPfadName: Workpiece and program name
- Ch1_LineNumber: Line number of current NC instruction (start:1)
- Ch1_LineContent: Part program blocks from the current operation
- Ch1_ToolIdent: Identifier of active tool
- Ch1_actSpeed_S1: Spindle speed, actual value
- BAG1_opMode: Active mode
- Ch1_actOverride: Interpolation feedrate, override
- Axis n
  - Ch1_actFeedRate_AXn: Actual value of axis-specific feedrate
  - Ch1_actPos_MCS_AXn: Act tool base position
  - Ch1_actPos_WCS_AXn: Act tool base position
  - Ch1_lag_AXn: Following error
- Drive n
  - Vn_Drv_op_display_r0002: Drive operating display / Drv op_display
  - Vn_n_act_smooth_r0021: CO: Actual speed smoothed / n_act smooth
  - Vn_Vdc_smooth_r0026: CO: DC link voltage smoothed / Vdc smooth
  - Vn_Mod_depth_smth_r0028: Modulation depth smoothed / Mod_depth smth
  - Vn_Iq_act_smooth_r0030: Current actual value torque-generating smoothed / Iq_act smooth
  - Vn_M_act_smooth_r0031: Actual torque smoothed / M_act smooth
  - Vn_Mot_temp_r0035: CO: Motor temperature / Mot temp

4.2.4 PLC data points

4.2.4.1 Own NC data points

If you do not enter any NC data point, the edgePlug SINUMERIK CNC app will automatically provide a default-set of NC data points. But if at least one user defined data point is configured, then the default-set of NC data points is disabled.

To use none-default NC data points, an `.awl` file needs to be created with the desired data points. The `.awl` file is created by the Siemens NC-VAR-Selektor software, which is part of SINUMERIK Toolbox (6FC5851-1XC45-4YA8). The content of a generated `.awl` file has the following structure:

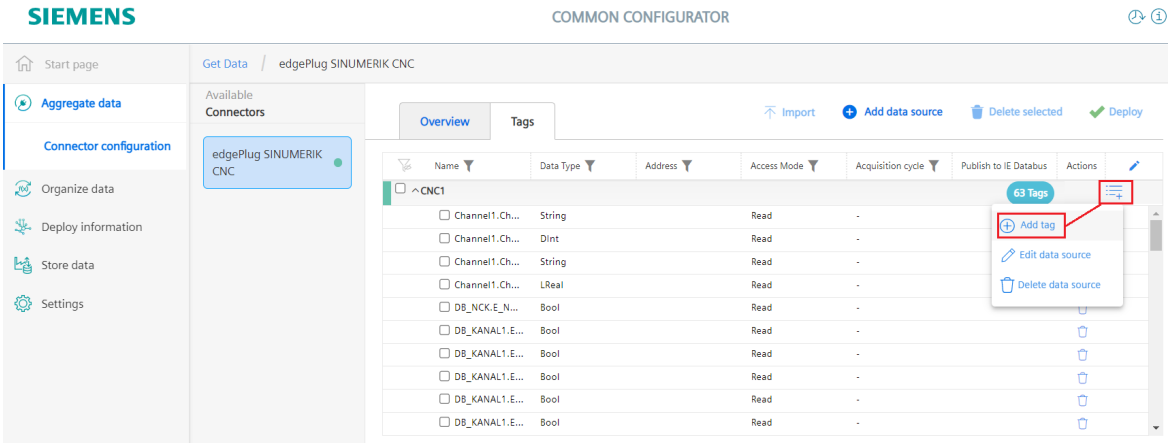
```
=========
DATA_BLOCK DB  120
VERSION : 0.0
STRUCT
 Ch1_ProgPfadName:
   STRUCT
   SYNTAX_ID : BYTE := B#16#82;
   bereich_u_einheit : BYTE := B#16#41;
   spalte : WORD := W#16#10;
   zeile : WORD := W#16#1;
   bausteintyp : BYTE := B#16#7D;
   ZEILENANZAHL : BYTE := B#16#1;
   typ : BYTE := B#16#13;
   laenge : BYTE := B#16#A0;
   END_STRUCT ;

 Ch1_LineNumber:
   STRUCT
   SYNTAX_ID : BYTE := B#16#82;
   bereich_u_einheit : BYTE := B#16#41;
   spalte : WORD := W#16#9;
   zeile : WORD := W#16#1;
   bausteintyp : BYTE := B#16#7D;
   ZEILENANZAHL : BYTE := B#16#1;
   typ : BYTE := B#16#7;
   laenge : BYTE := B#16#4;
   END_STRUCT ;

 Ch1_LineContent:
   STRUCT
   SYNTAX_ID : BYTE := B#16#82;
   bereich_u_einheit : BYTE := B#16#41;
   spalte : WORD := W#16#4;
   zeile : WORD := W#16#2;
   bausteintyp : BYTE := B#16#7D;
   ZEILENANZAHL : BYTE := B#16#1;
   typ : BYTE := B#16#13;
   laenge : BYTE := B#16#42;
   END_STRUCT ;
 END_STRUCT ;
BEGIN
END_DATA_BLOCK
==========
```

Where:

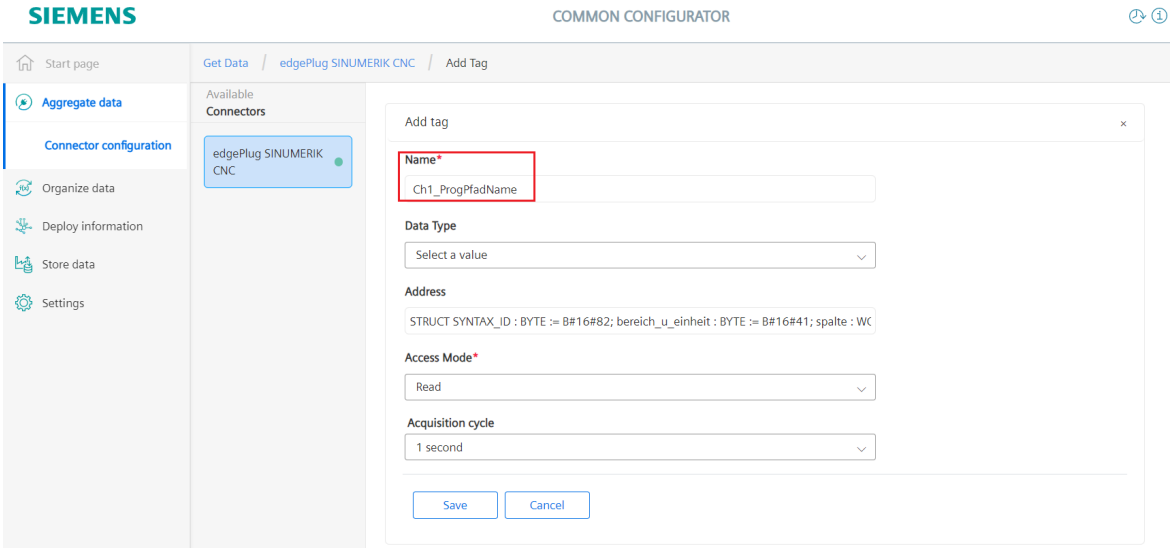
- The NC address definition starts with the name of the data point followed by the double colon (:)
- followed by the keyword STRUCT
- followed by the address definition itself
- ending with the keyword END_STRUCT

How to insert an NCK data point

1. Click **[Add tag]** in the data point overview of a connection.

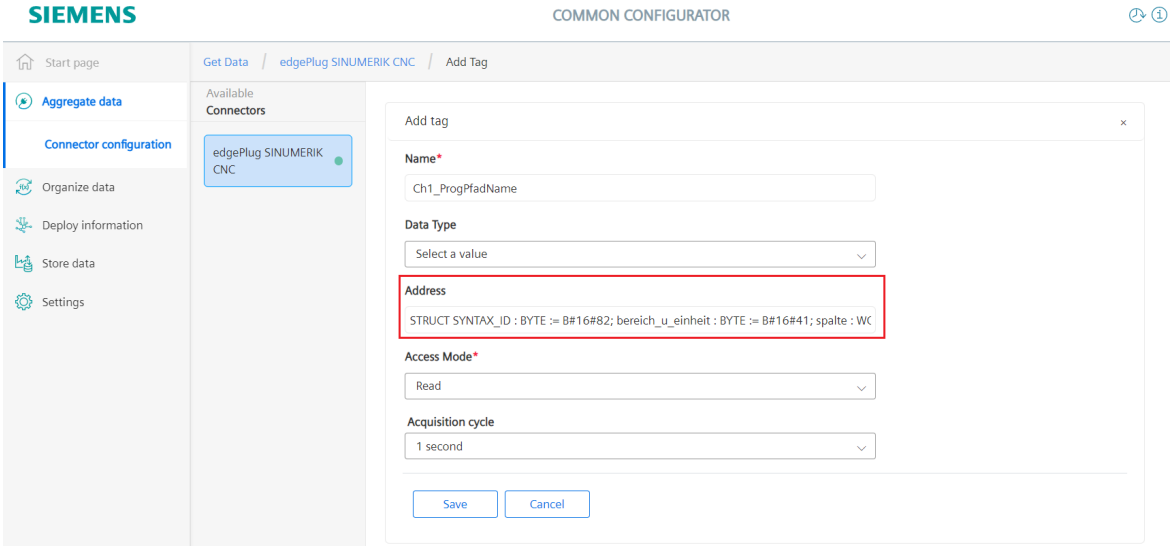


2. Enter the name of the data point in the name field of the IIH-configurator.
   For example insert Ch1_ProgPfadName from the .awl example above.



3. Copy the NCK address beginning with the keyword STRUCT and ending with the END_STRUCT into the text editor.

4. Enter the NCK address into the address field of the IIH-configurator. Any new line should be automatically removed by this copy&paste operation.
   So with the example Ch1_ProgPfadName the content of the address field should look like this:
   `STRUCT SYNTAX_ID : BYTE := B#16#82; bereich_u_einheit : BYTE := B#16#41; spalte : WORD := W#16#10; zeile : WORD := W#16#1; bausteintyp : BYTE := B#16#7D; ZEILENANZAHL : BYTE := B#16#1; typ : BYTE := B#16#13; laenge : BYTE := B#16#A0; END_STRUCT ;`



5. Click **[Save]**.

6. Select all data points and deploy the connection configuration.
   See Chapter Databus gateway 24 on how to do this.

4.2.4.2 Default PLC data points

Data point	Description
E_NCKalarm	NCK alarm is active
E_ProgRunn	The Sinumerik program is running
E_ProgWait	The Sinumerik program is waiting
E_ProgStop	TheSinumerik program is stopped
E_ProgInterrupt	The Sinumerik program is interrupted
E_ProgrAborted	The Sinumerik program is aborted

4.2.4.3 Own PLC data points

If you do not enter any PLC data point, then the edgePlug Sinumerik CNC app will automatically provide a default-set of PLC data points. But if at least one user defined data point is configured, then the default-set of PLC data points is disabled.

To use none-default PLC data points, the addresses of the data points need to be provided in DB syntax as shown below:

Alphabetical code of the areas

Data point	Area
AO	Analog Output
P	Peripheral Addressing
I or E	Inputs
Q, A, or O	Outputs
M or F	Marker or Flags
DB	Data Blocks (must be followed by the DB number and an optional dot).
DI	Instance Data Blocks (must be followed by the DB number and an optional dot).

Specifier of the data type

Data type	Specifier
X	Boolean
B	Byte
C	Char
W	Word
I	Integer
R	Real
S	String
D	Double
DW	Double Word
DI	Double Integer

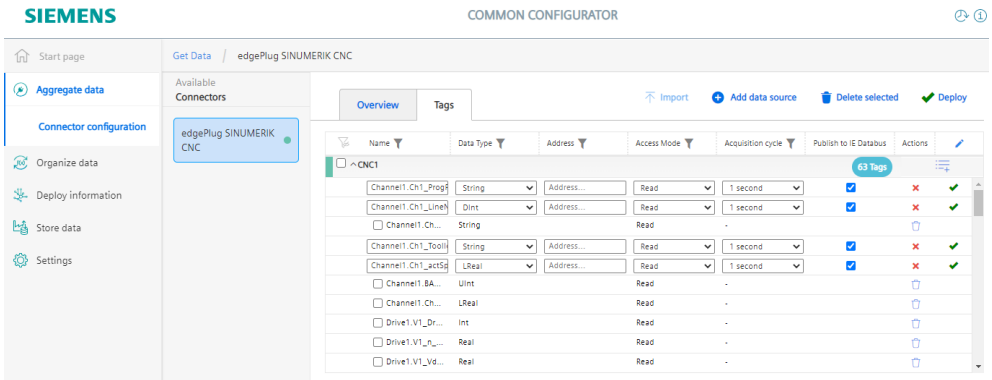
Start address
The numerical start address of the data point within the given area.

Bit-number in case of Boolean type
A dot . followed by bit number (0 to 7) in case of Boolean type

4.2.5 Databus gateway

1. Select the data points you want to make available on the IE Databus.

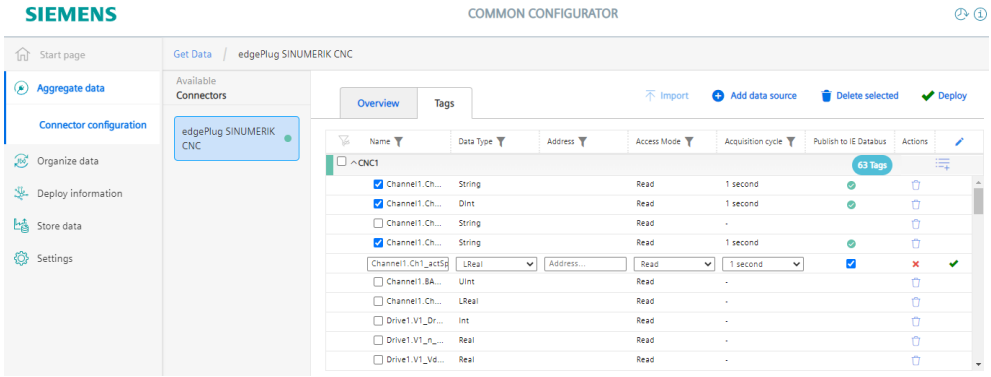
2. Double-click each data point you want to make available.
   The selected data point will appear with framed dropdown list followed by a checkbox ☐ and the icons ✖ and ✔.



3. Tick the checkbox ☑ **Publish to IE Databus**.

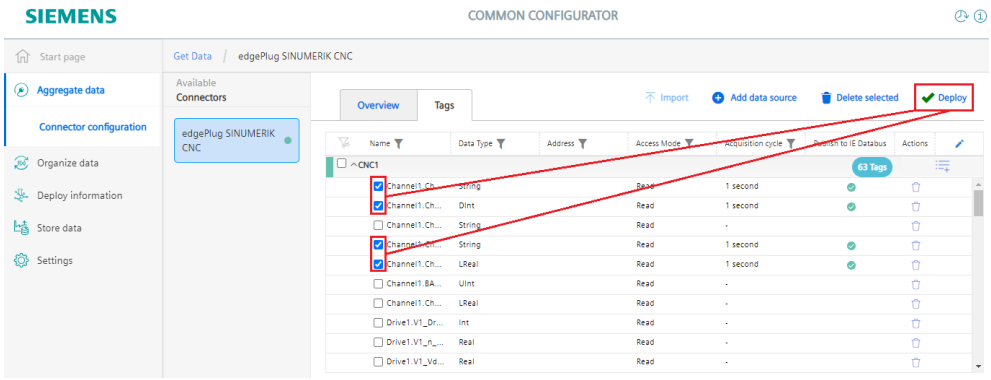
4. Choose an **Acquisition cycle** from the list.

5. Click the green apply icon ✔ at the end of the line.
   The data point configuration is confirmed. The icons ✖ and ✔ will disappear and instead of the blue checkbox the icon will appear.



6. Select the variables that are to be deployed.

7. Press **[Deploy]**.
   This will reconfigure and restart the **Databus Gateway** and will make the data points available on the IE Databus.


SIEMENS
COMMON CONFIGURATOR
Start page
Aggregate data
Connector configuration
Organize data
Deploy information
Store data
Settings
Get Data
edgePlug SINUMERIK CNC
Available Connectors
edgePlug SINUMERIK CNC
Overview
Tags
Import
Add data source
Delete selected
Deploy
Name
Data Type
Address
Access Mode
Acquisition cycle
Publish to IE Databus
Actions
CNC1
63 Tags

4.3 Diagnosis

The Softing Support Team will assist you in troubleshooting your edgePlug SINUMERIK CNC.

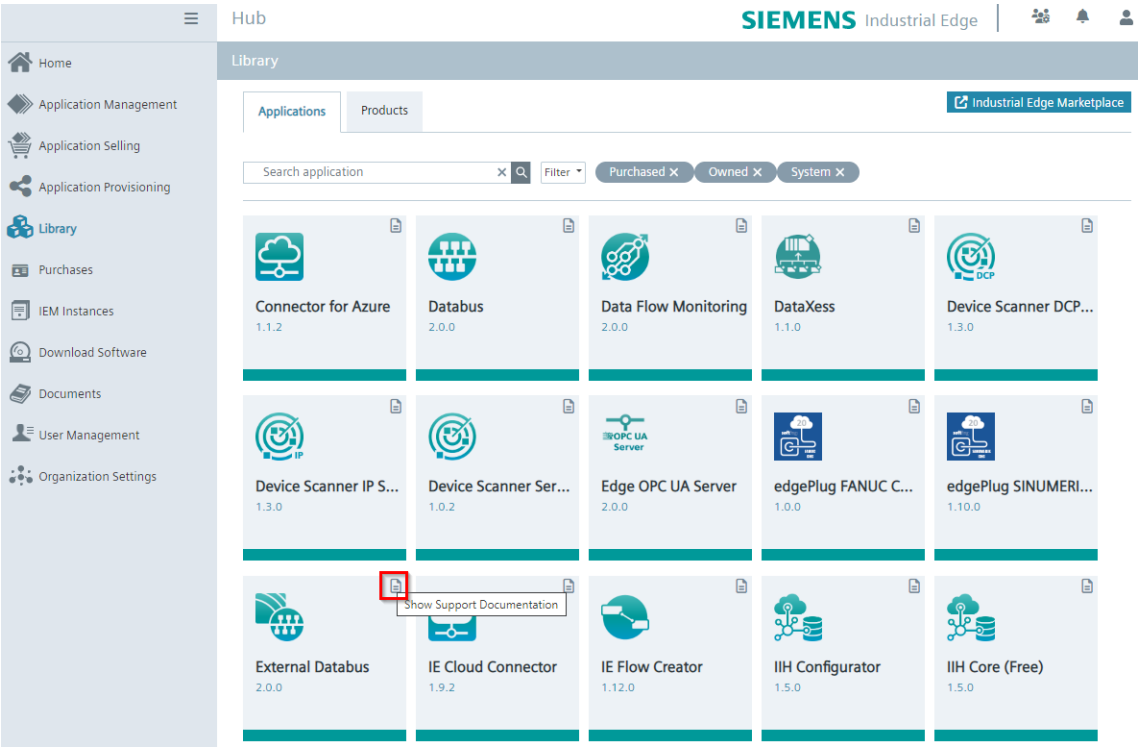
1. Open the **IIH Configurator** and set the Log Level of one of the configured data sources to 3 and deploy it.
   This will give you a complete set of diagnostic data.
2. Contact Softing support and email our team the diagnostics of your edgePlug SINUMERIK CNC.
3. Open the **Apps** page.
4. Click the 3 dots of the edgePlug SINUMERIK CNC and select the **Download Logs** menu.
   The Log file is downloaded to the Downloads folder of your PC.

5 Connecting with External Databus

The easiest way to access the data points on the IE Databus is by using External Databus.

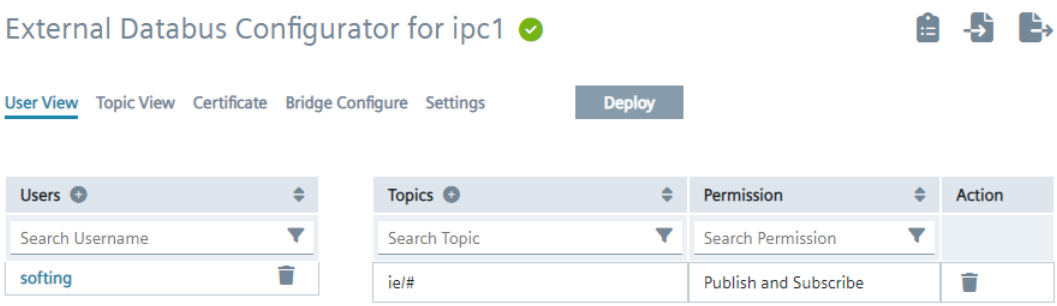
5.1 How to configure the External Databus

1. Download the User Manual of the External Bus by pressing the icon **Show Support Documentation**.

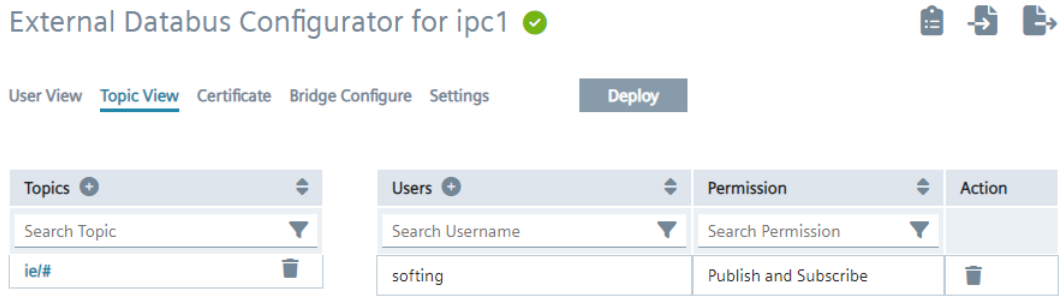


The User Manual describes how to configure the External Databus.

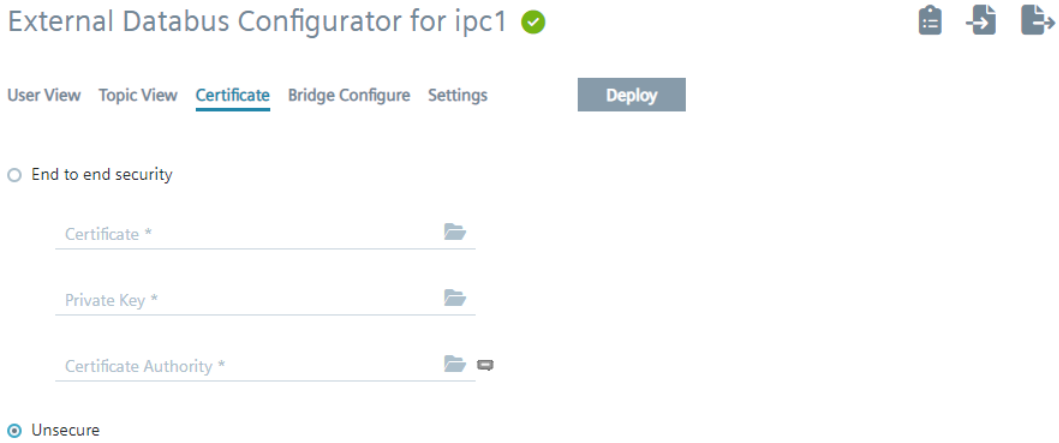
2. Select a **user**.



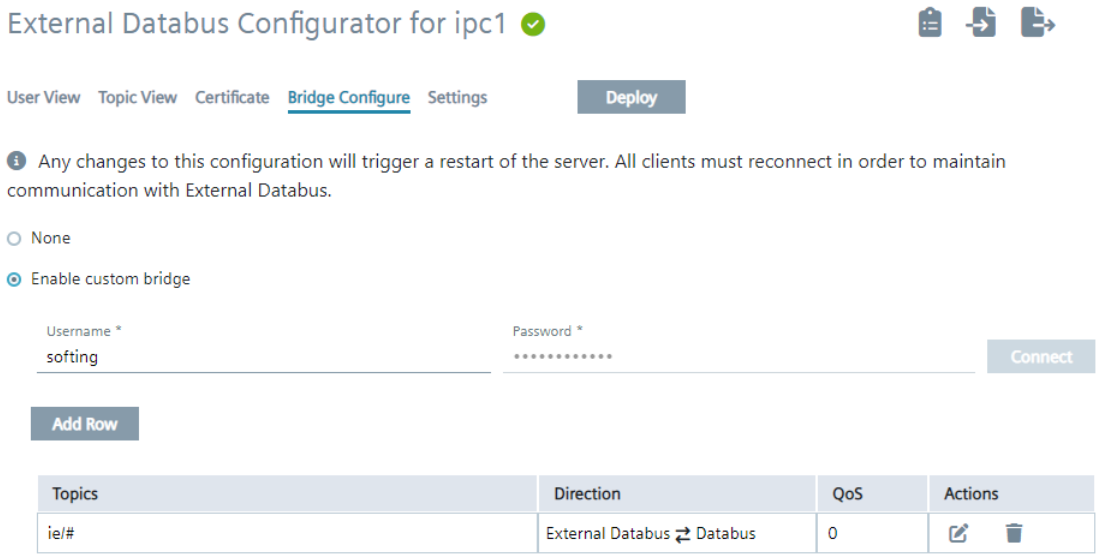
3. Select a topic.



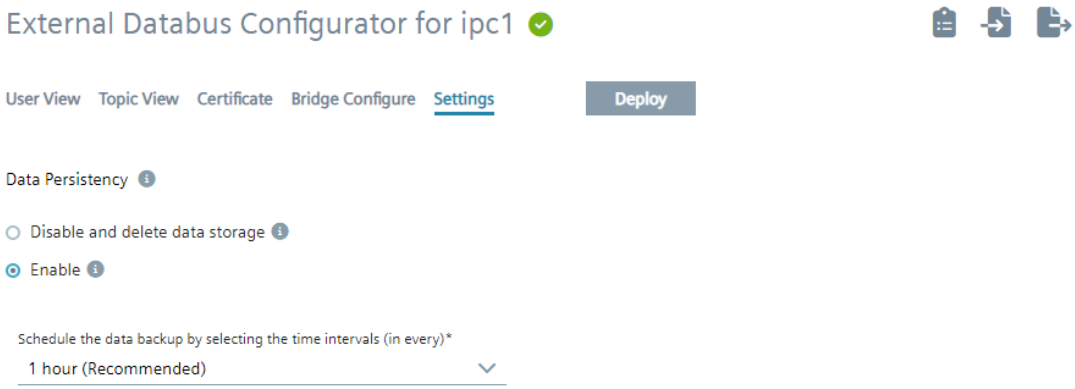
4. Select the required security mechanism.



5. Define the direction on each topic for communicating between External Databus and IE Databus.



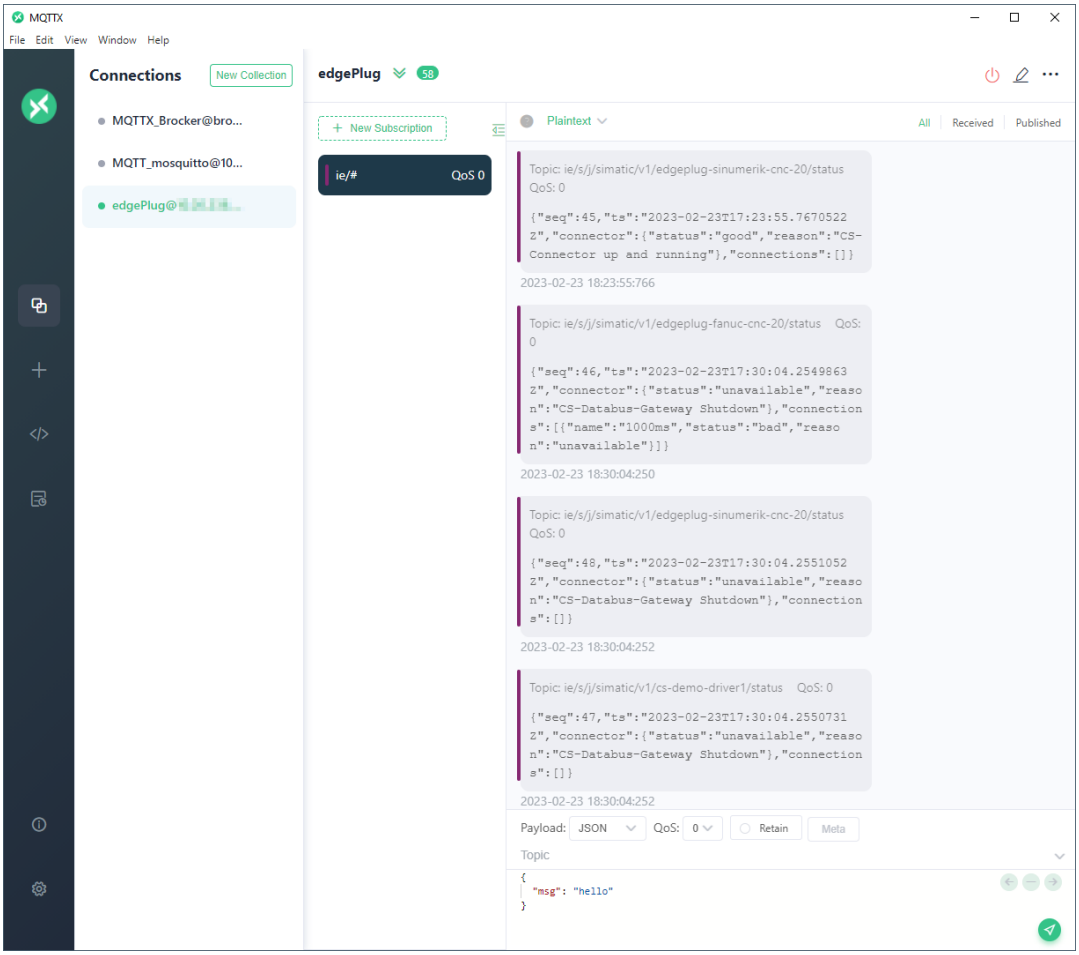
6. Select the preferred **Data Persistency** option for your project.


External Databus Configurator for ipc1
User View
Topic View
Certificate
Bridge Configure
Settings
Deploy
Data Persistency
Disable and delete data storage
Enable
Schedule the data backup by selecting the time intervals (in every)*
1 hour (Recommended)

5.2 How to connect an MQTT client

You can use a standard MQTT client like MQTTX as shown in the screenshot to connect to the IE MQTT Connector. The URL for the connection is: *mqtt://<IP Address of the IED>:9883*

1. Use the configured user credentials (softing user an password) in the configuration mask.
2. Subscribe to the „ie/#“ topic tree.



You will receive MQTT messages on the following topics:

- ie/s/j/simatic/v1/edgeplug-sinumerik-cnc-20/status
  Status messages of the Databus Gateway regarding the edgePlug connector
- ie/m/j/simatic/v1/edgeplug-sinumerik-cnc-20/dp
  Metadata of the Databus Gateway for the edgePlug connector. This includes information about subscribed data points
- ie/d/j/simatic/v1/edgeplug-sinumerik-cnc-20/dp/r/<Connection Name>
  Change notifications for the values of the subscribed data points

6 Glossary

Terms & Abbreviations	Definition
CNC	Computerized Numerical Control
IED	Industrial Edge Device
IEM	Industrial Edge Management
MQTT	Message Queuing Telemetry Transport
OPC UA	OPC Unified Architecture
PL	Power Line
PLC	Programmable Logic Controller
SaaS	Software as a Service
SL	Solution Line

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