PN/CAN LINK – Configuring the "CAN transparent" operating mode

TIA Portal V15, SIMATIC S7

https://support.industry.siemens.com/cs/ww/en/view/109760971

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 **DANGER**	**indicates that death or severe personal injury will result if proper precautions are not taken.**

 **WARNING**	**indicates that death or severe personal injury may result if proper precautions are not taken.**

 **CAUTION**	**indicates that minor personal injury can result if proper precautions are not taken.**

NOTICE	**indicates that property damage can result if proper precautions are not taken.**

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

 **WARNING**	**Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.**

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Table of contents

Task 1

This application example explains the operation of two PN/CAN LINKs in "CAN transparent" operating mode. During configuration, the following is considered:

- Sending and receiving CAN messages with fixed ID
- Sending and receiving CAN messages with variable ID

  For CAN messages with variable ID, the message ID is not set during configuration but during program execution.

Knowledge required

The following knowledge is required:

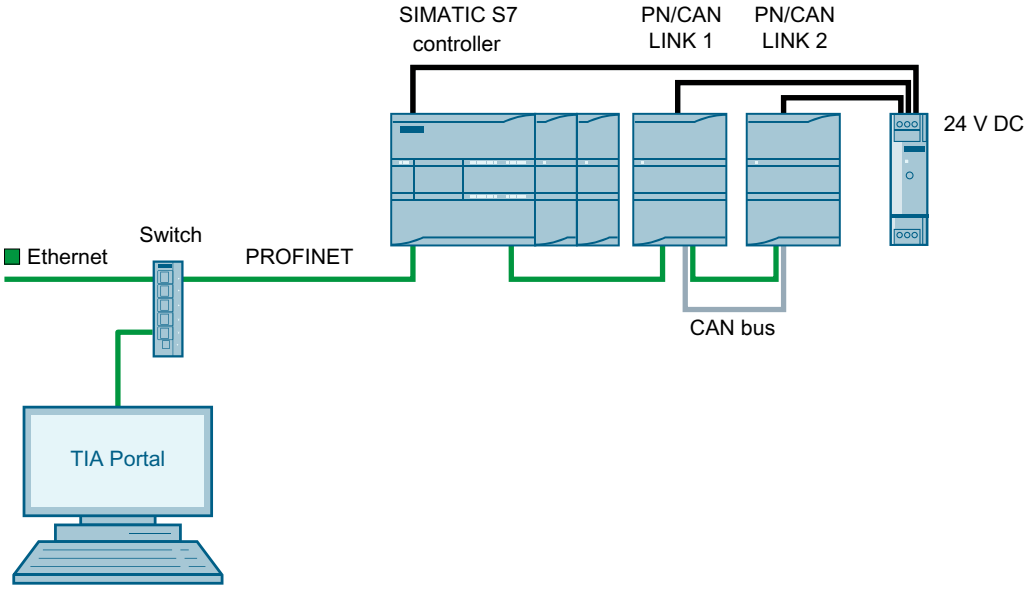
- Knowledge of programming a SIMATIC S7 controller
- Knowledge of configuration with TIA Portal
- Knowledge of working with the PROFINET fieldbus
- In-depth knowledge of the CAN or CANopen communication protocols
- General knowledge in the field of automation technology
- General knowledge of communication networks

Solution

2

2.1 System configuration

For the application example use the following configuration:



The PN/CAN LINKs are connected via PROFINET to the SIMATIC S7 control system. The PN/CAN LINKs are configured as follows:

- PN/CAN LINK 1 - in "transparent" operating mode

  PN/CAN LINK 1 is configured in such a way that it sends messages.

- PN/CAN LINK 2 - in "transparent" operating mode

  PN/CAN LINK 2 is configured in such a way that it receives messages.

The configuration takes place on a PC with installed TIA Portal.

2.2 Hardware and software components

The application example was created with the following components:

Hardware components

Component	Number	Article number	Comment
SIMATIC S7 control system	1	6AG1215-1AG40-5XB0	CPU 1215C DC/DC/DC
PN/CAN LINK	2	6BK1620-0AA00-0AA0	Network transition between PROFINET and CAN Bus
Power supply SIMATIC S7-1200 Power Module PM1207	1	6EP1332-1SH71	For power supply of control system and PN/CAN LINK

Software components

Component	Number	Article number	Comment
TIA Portal V15	1	6ES7810-5CC00-0YM2	SIMATIC STEP 7 Professional and Update 3 have to be installed

Example files and projects

File	Comment
109760971_network_transitions_pncan_link_transparent_de.pdf	The German version of this document
109760971_network_transitions_pncan_link_transparent_en.pdf	The English version of this document
CAN_Transparent_TIAproj_V15.zip	The TIA project of the application example

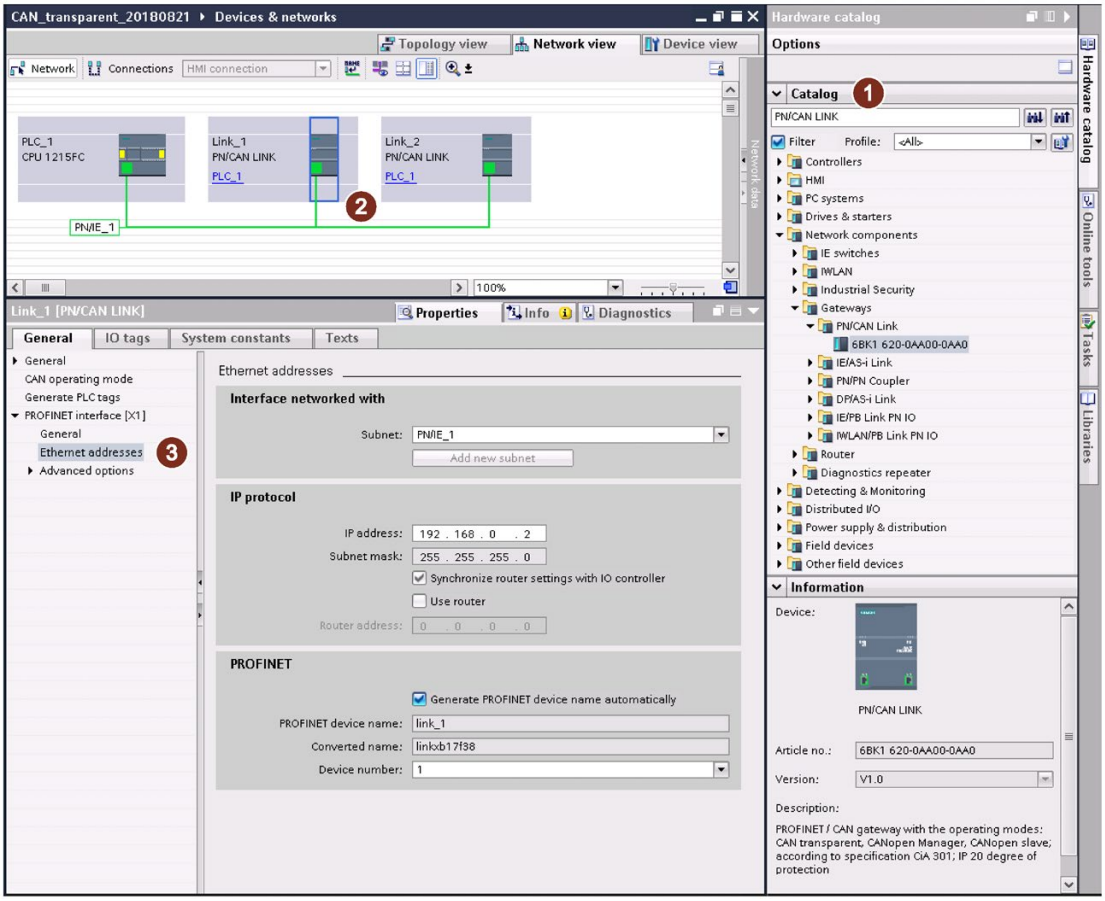
You can find the download link in the section "Internet links (Page 40)".

2.3 General procedure

Proceed as follows:

1. Create a project.
2. Set English as language for the graphical interface.
3. Insert the HSP for TIA Portal V15.

   You can find the required HSP there – HSP (https://support.industry.siemens.com/cs/ww/en/view/54163658).
4. Click on "Catalog" ① and insert the devices as described in the section "Hardware and software components (Page 6)".
5. Connect CPU and PN/CAN LINKs in the "Network view" window with PROFINET ②.
6. Configure the PROFINET interface ③ for both PN/CAN LINKs based on the conditions of your PROFINET network.



You can follow the TIA project "CAN_Transparent_TIAproj_V15.zip" with the workflows described below.

Configuring messages and assigning parameters to tags

3

The "CAN transparent" operating mode provides the option to send and receive messages for which no send or receive messages have been configured.

Subsequent configuration is possible using send and receive proxies, which need to be added to the existing project.

3.1 Configuring messages

For sending and receiving, send and receive messages with a data record length ≤ 8 bytes are configurable in "CAN transparent" operating mode.

The data packets transported by means of the CAN bus have a message ID, which the CAN bus nodes can use to decide whether the received message is to be processed or not.

Note

In the following application example, 2 PN/CAN LINKs are used for sending and receiving. This is used to generate data traffic on the CAN bus.

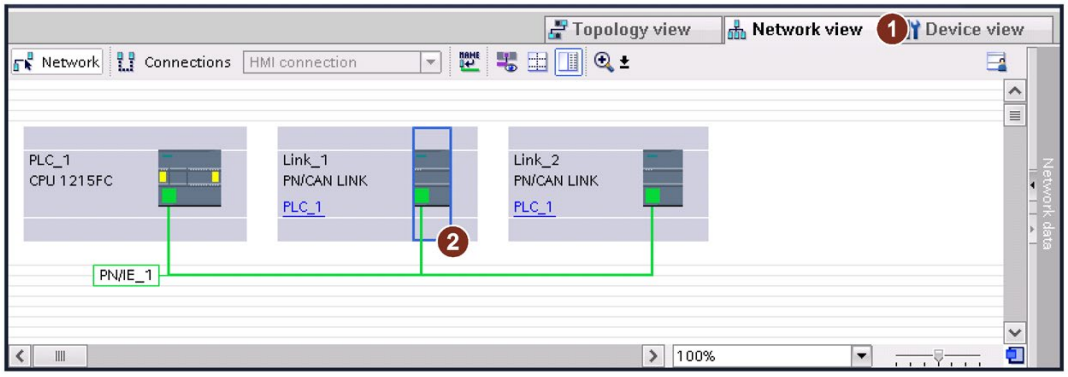
Of course, a PN/CAN LINK can be operated simultaneously as sender and receiver.

3.1.1 Inserting messages for PN/CAN LINK

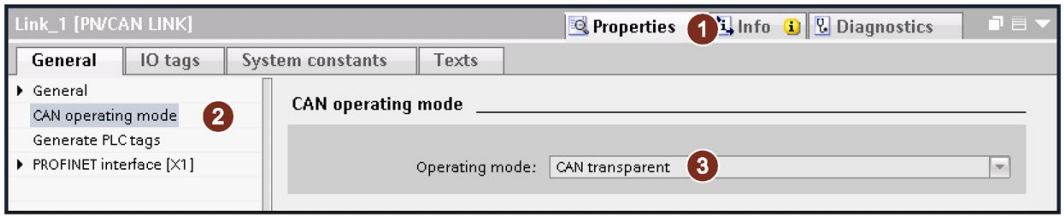
Set "CAN transparent" operating mode

Proceed as follows:

1. Select "Network view ① → Link_1 ②".



2. Select "Properties ① → General → CAN operating mode ②".



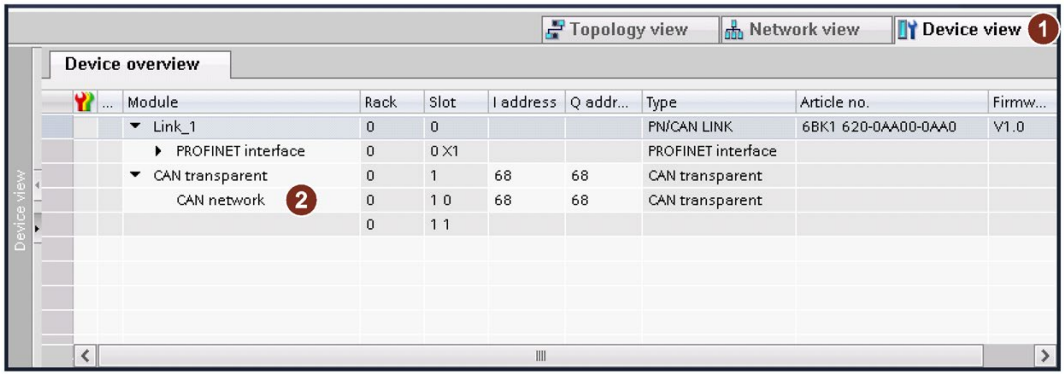
3. Select "CAN transparent" ③.

Repeat this operation for "Link_2".

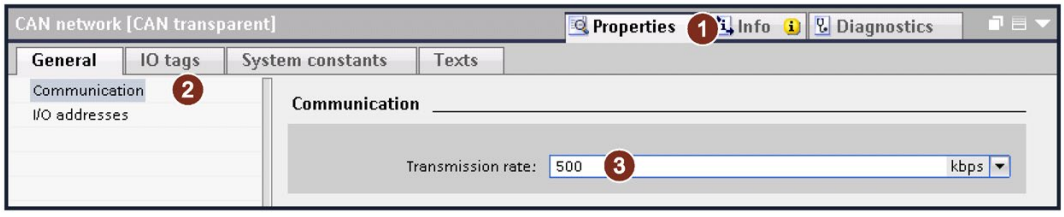
Set transmission rate

Proceed as follows:

1. Select "Network view → Link_1".
2. Select "Device view ① → Device overview → CAN network ②".



3. Select "Properties ① → General → Communication ②"



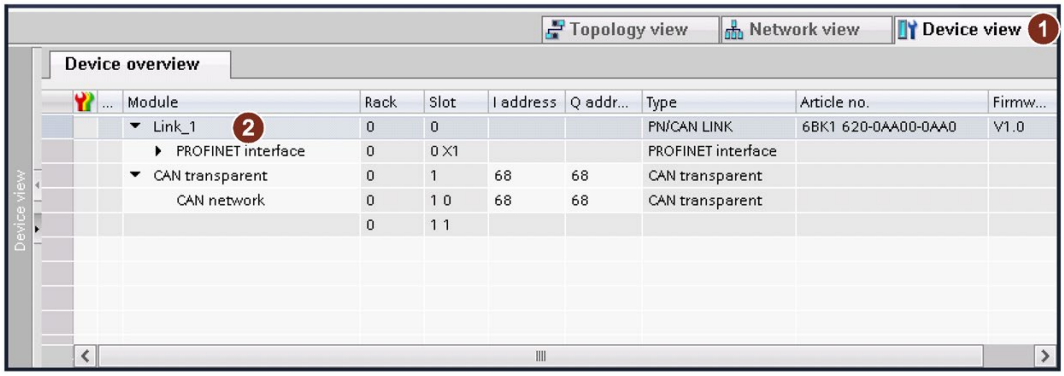
4. Set 500 kbps ③ as transmission rate.

Repeat this operation for "Link_2".

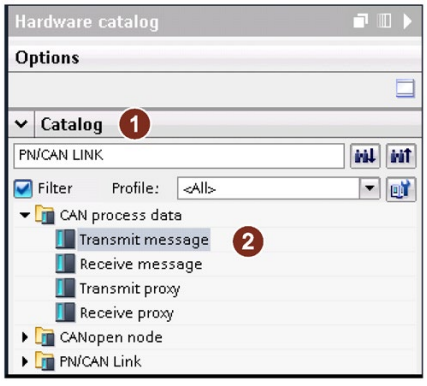
Inserting send messages for Link_1

Proceed as follows:

1. Select "Network view → Link_1".
2. Select "Device view ① → Device overview → Link_1 ②".



3. Select "Catalog ① → CAN process data → Transmit messages ②".



4. Insert a send message by double-clicking.
5. Repeat this step twice.

Inserting receive messages for Link_2

The previously configured send messages are sent on the CAN bus. For the PN/CAN LINK to be able to process these messages further, a corresponding receive message must be configured for each send message, i.e. send and receive messages have the same ID.

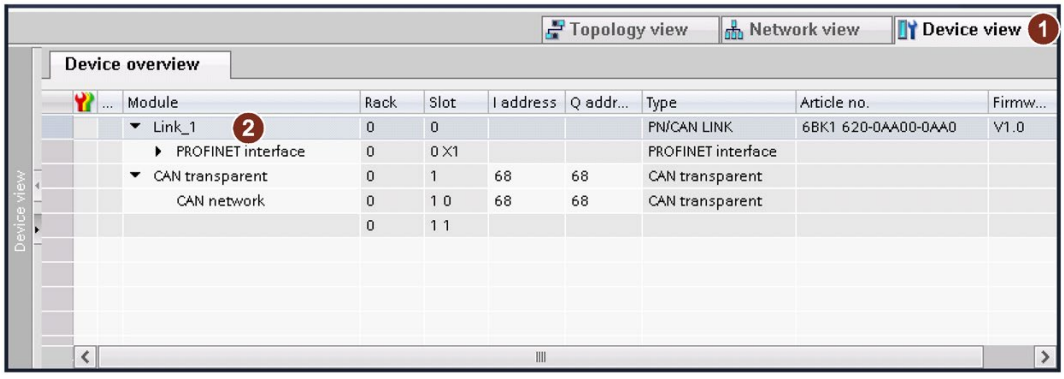
Note

If no receive message is configured for a send message, it will still be sent to the CAN bus. If other CAN bus nodes have configured a corresponding receive message, the message of this is processed.

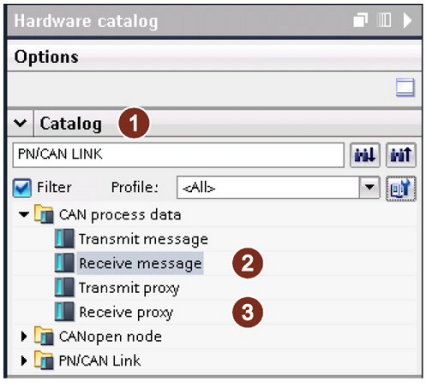
For the three configured send messages, the following three receive messages must now be configured in the device view of the PN/CAN LINK 2.

Proceed as follows:

1. Select "Network view → Link_2".
2. Select "Device view ① → Device overview → Link_2 ②".



3. Select "Catalog ① → CAN process data → Receive messages ②".

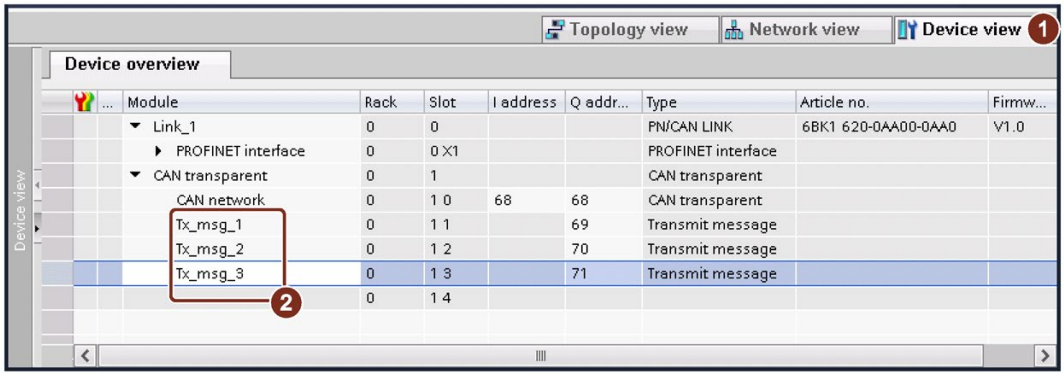


4. Insert a receive message by double-clicking.
5. Repeat this step twice.
6. Select "Catalog ① → CAN process data → Receive proxy ③".
7. Insert a "Receive proxy" by double-clicking.

Renaming send messages

Proceed as follows:

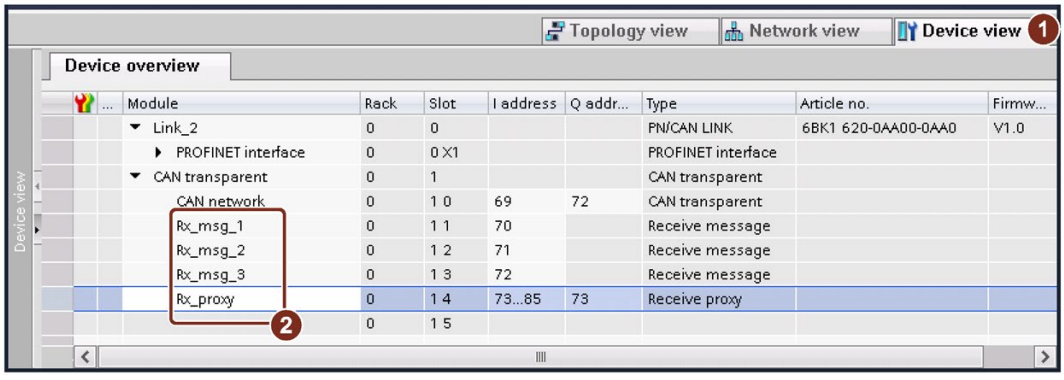
1. Select "Network view → Link_1".
2. Select "Device view ① → Device overview → CAN transparent".
3. Change the names of the messages as indicated in ②.



Renaming receive messages

Proceed as follows:

1. Select "Network view → Link_2".
2. Select "Device view ① → Device overview → CAN transparent".
3. Change the names of the messages as indicated in ②.

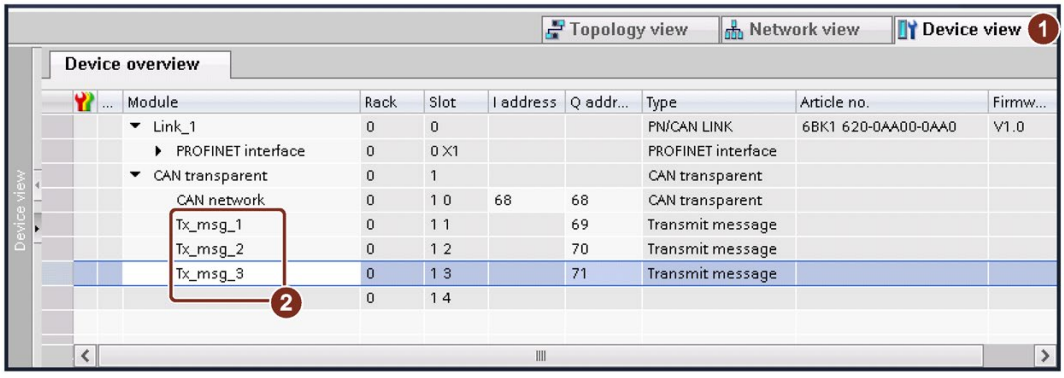


3.1.2 Assigning parameters to PN/CAN LINK 1

Activate Link_1

Proceed as follows:

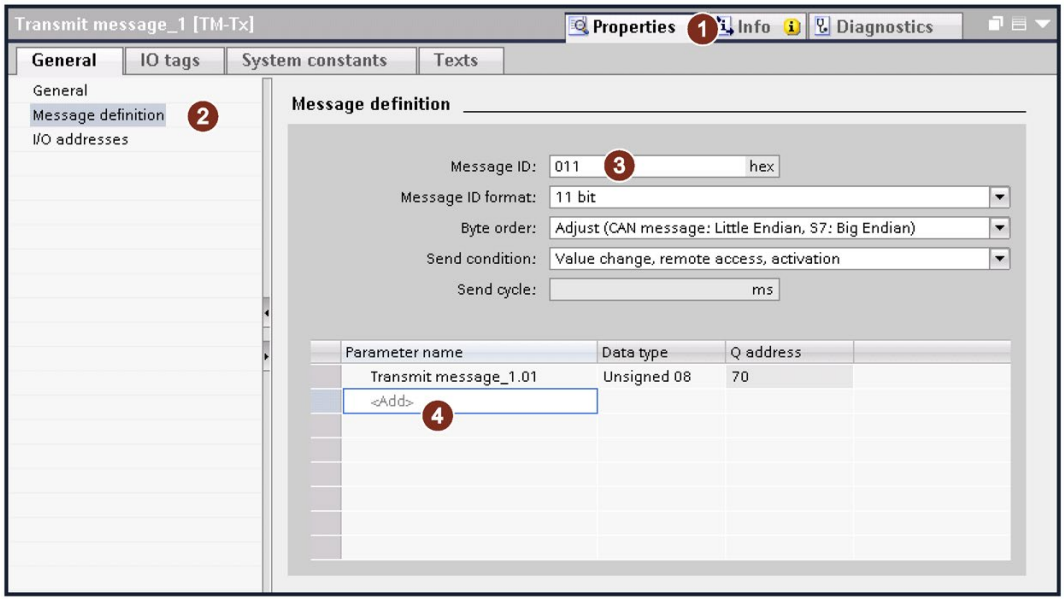
1. Select "Network view → Link_1".
2. Select "Device view ① → Device overview → CAN transparent".



Configuring send message Tx_msg_1

Proceed as follows:

1. Select "Tx_msg_1".
2. Select "Properties ① → General → Message definition ②".



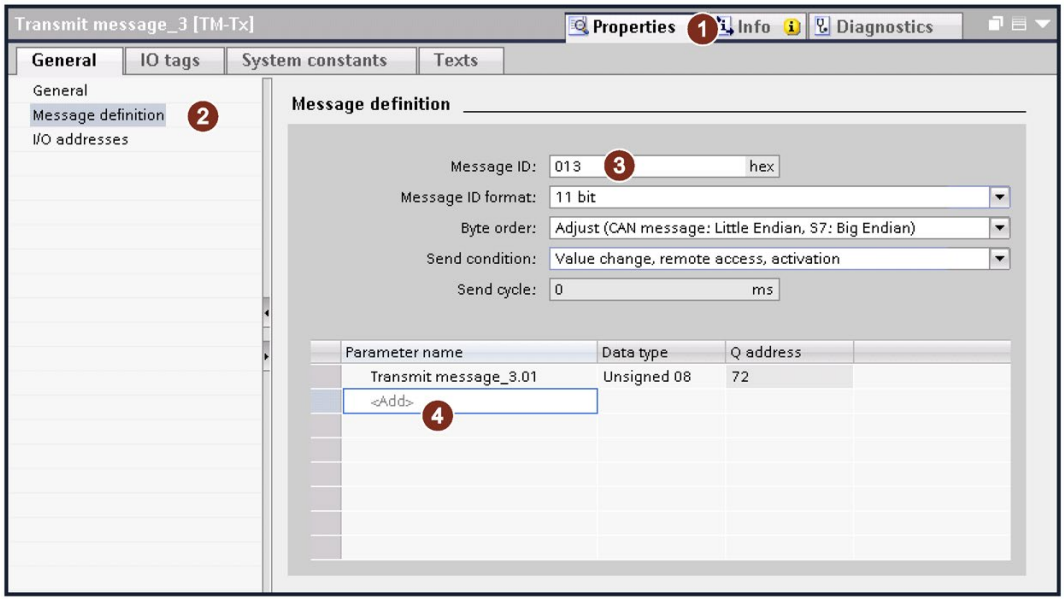
3. Enter "011" ③ as message ID.
4. Click <Add> ④.

   The parameter name and the data type "Unsigned 08" are inserted.

Configuring send message Tx_msg_2

Proceed as follows:

1. Select "Tx_msg_2".
2. Select "Properties ① → General → Message definition ②".



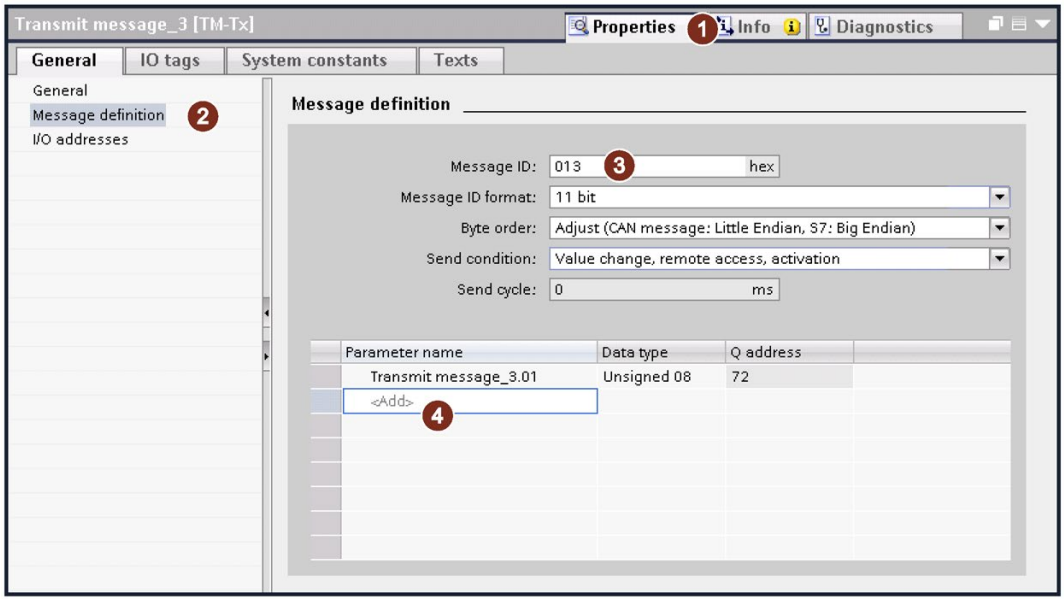
3. Enter "012" ③ as message ID.
4. Click <Add> ④.

   The parameter name and the data type "Unsigned 08" are inserted.

Configuring send message Tx_msg_3

Proceed as follows:

1. Select "Tx_msg_3".
2. Select "Properties ① → General → Message definition ②".



3. Enter "013" ③ as message ID.
4. Click <Add> ④.

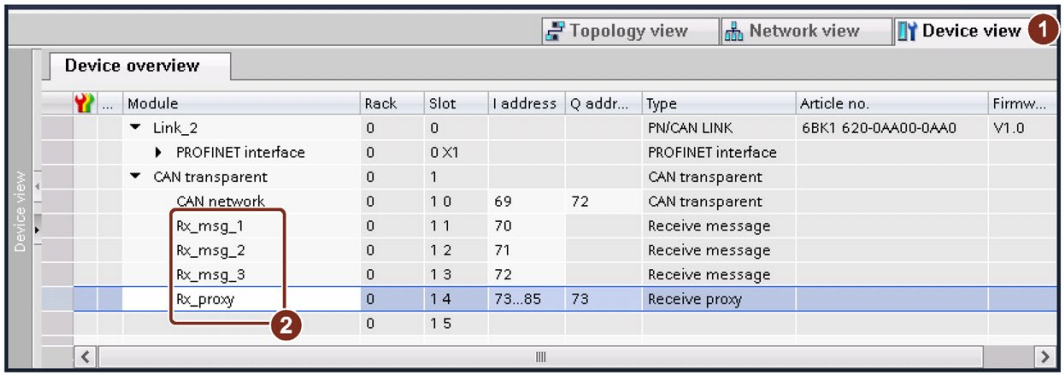
   The parameter name and the data type "Unsigned 08" are inserted.

3.1.3 Assigning parameters to PN/CAN LINK 2

Activate Link_2

Proceed as follows:

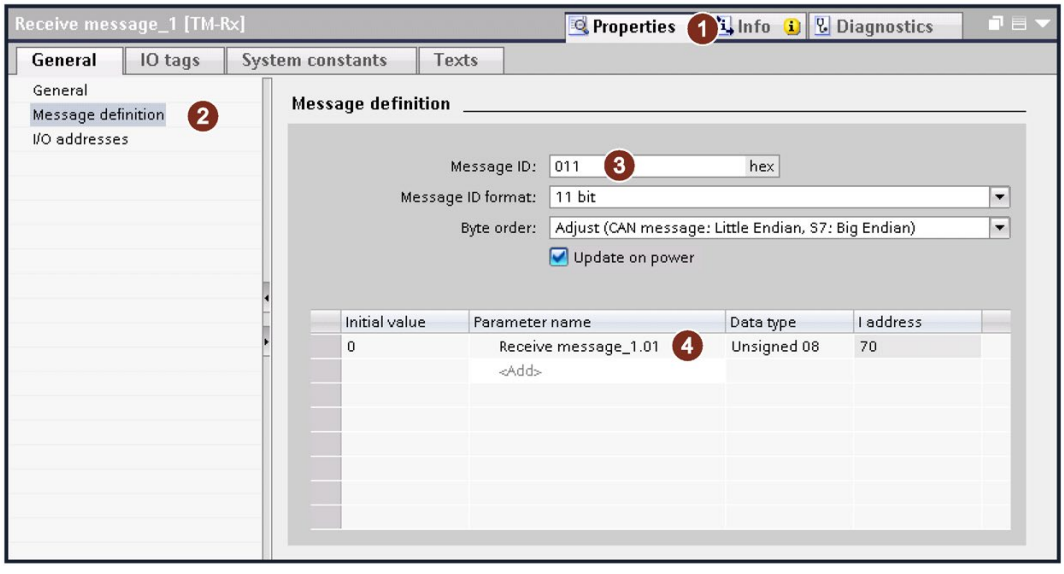
1. Select "Network view → Link_2".
2. Select "Device view ① → Device overview → Link_2".



Configuring a receive message Rx_msg_1

Proceed as follows:

1. Select "Rx_msg_1".
2. Select "Properties ① → General → Message definition ②".



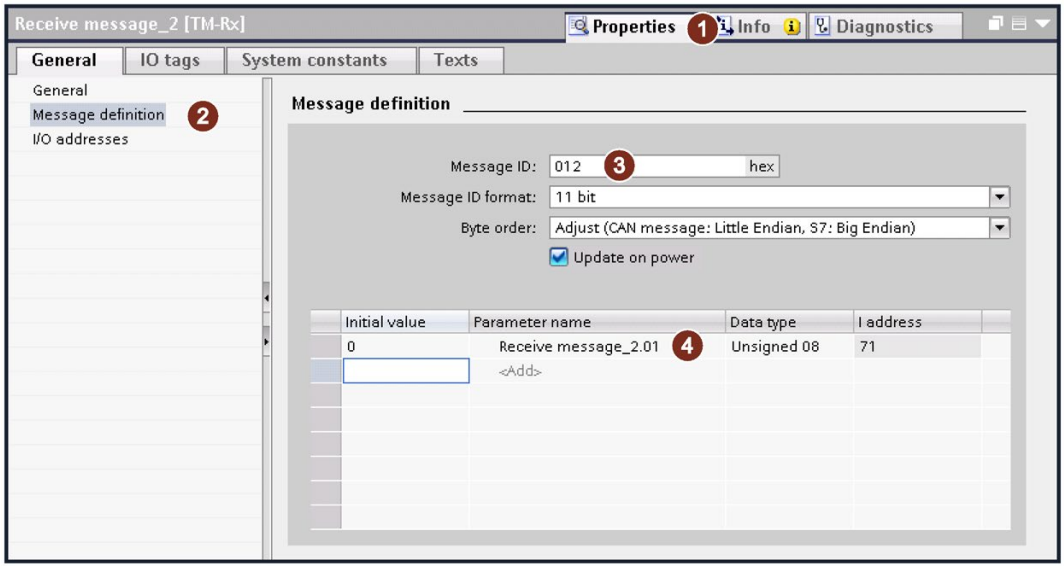
3. Enter "011" ③ as message ID.
4. Click <Add> ④.

   The parameter name and the data type "Unsigned 08" are inserted.

Configuring a receive message Rx_msg_2

Proceed as follows:

1. Select "Rx_msg_2".
2. Select "Properties ① → General → Message definition ②".



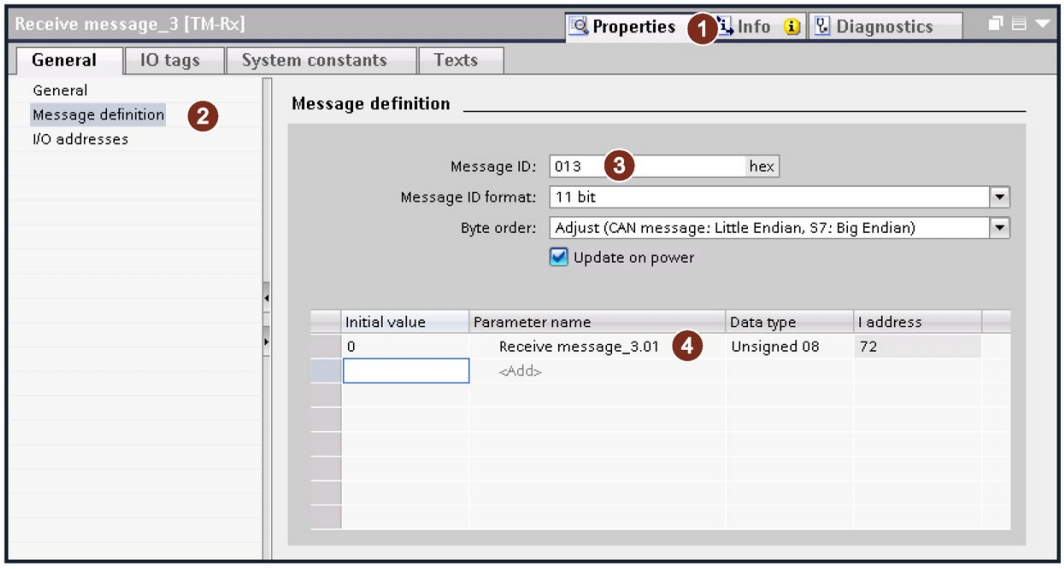
3. Enter "012" ③ as message ID.
4. Click <Add> ④.

   The parameter name and the data type "Unsigned 08" are inserted.

Configuring a receive message Rx_msg_3

Proceed as follows:

1. Select "Rx_msg_3".
2. Select "Properties ① → General → Message definition ②".



3. Enter "013" ③ as message ID.
4. Click <Add> ④.

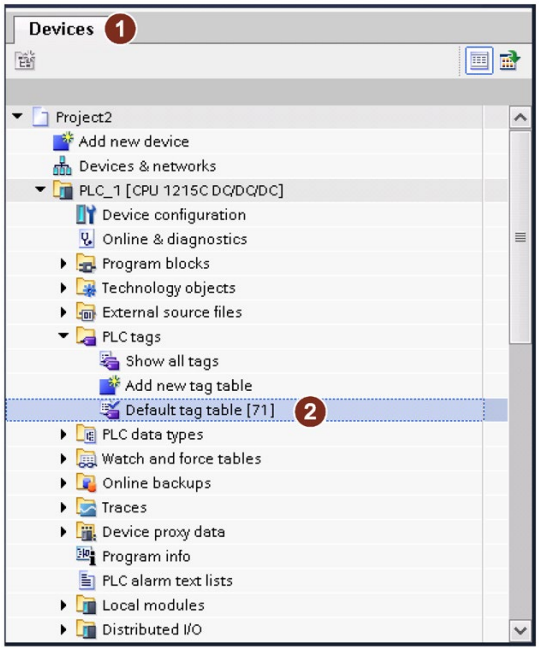
   The parameter name and the data type "Unsigned 08" are inserted.

3.1.4 Completing the tag table

Add tags

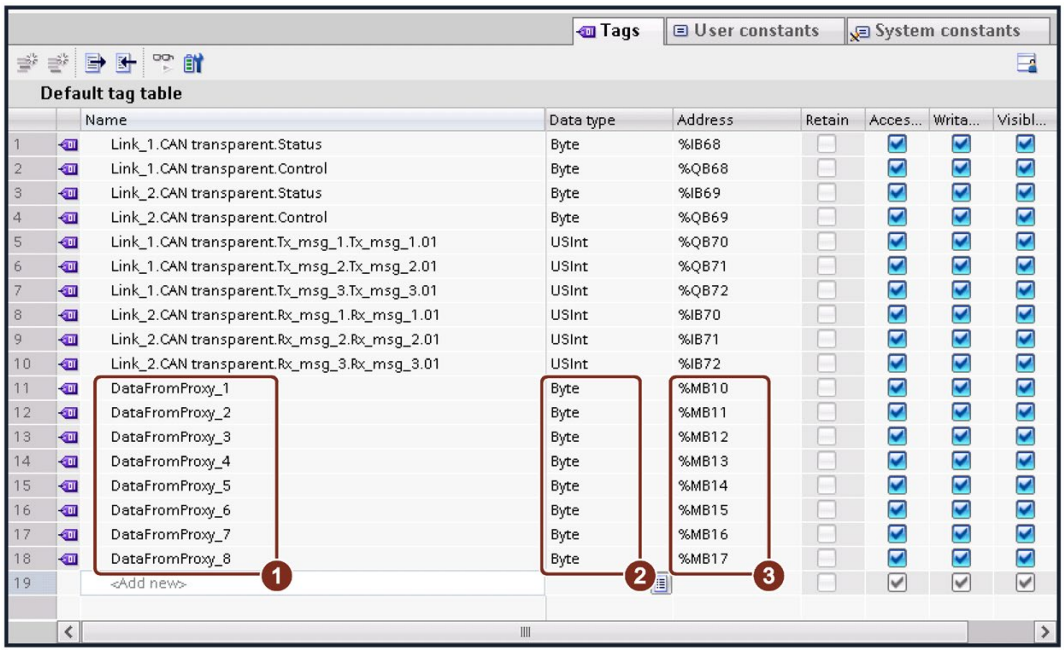
Proceed as follows:

1. Switch to the project navigation and click "Devices ① → PLC_1 → PLC tags → Default tag table ②".



2. Double-click "Default tag table".

   The "Default tag table" tag table is displayed.



3. Enter the tags ① as indicated.

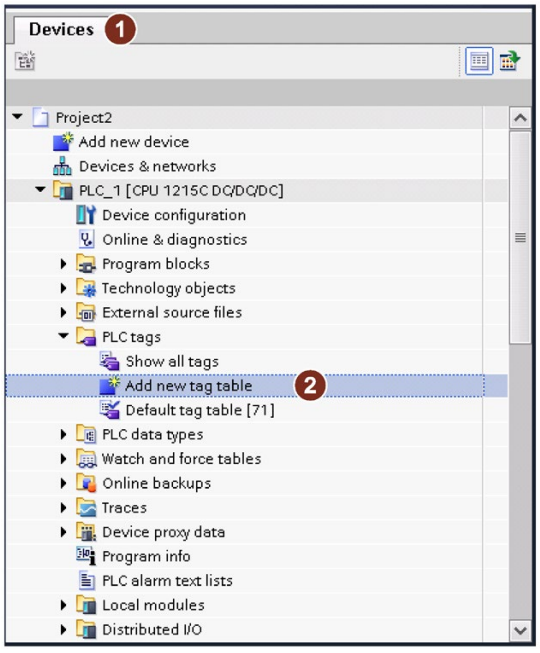
   The tags of rows 12 to 18 can be pasted using "Copy & Paste".

4. Adjust the data types ② and the addresses ③.

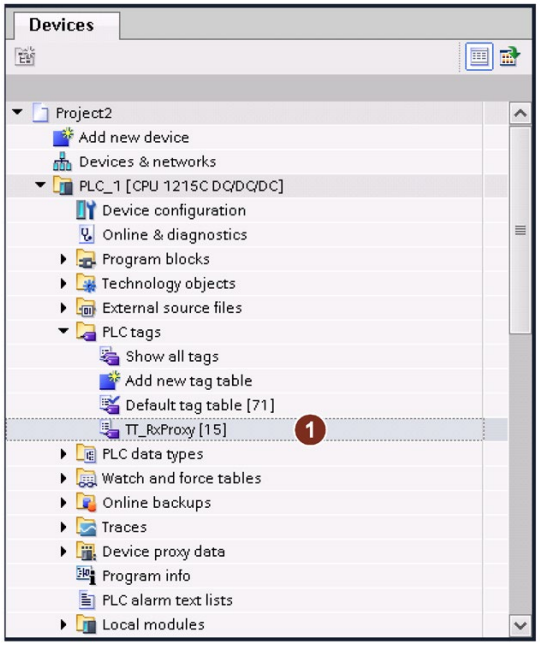
Insert proxy tags

Proceed as follows:

1. Switch to the project navigation and click "Devices ① → PLC_1 → PLC tags → Add new tag table ②".

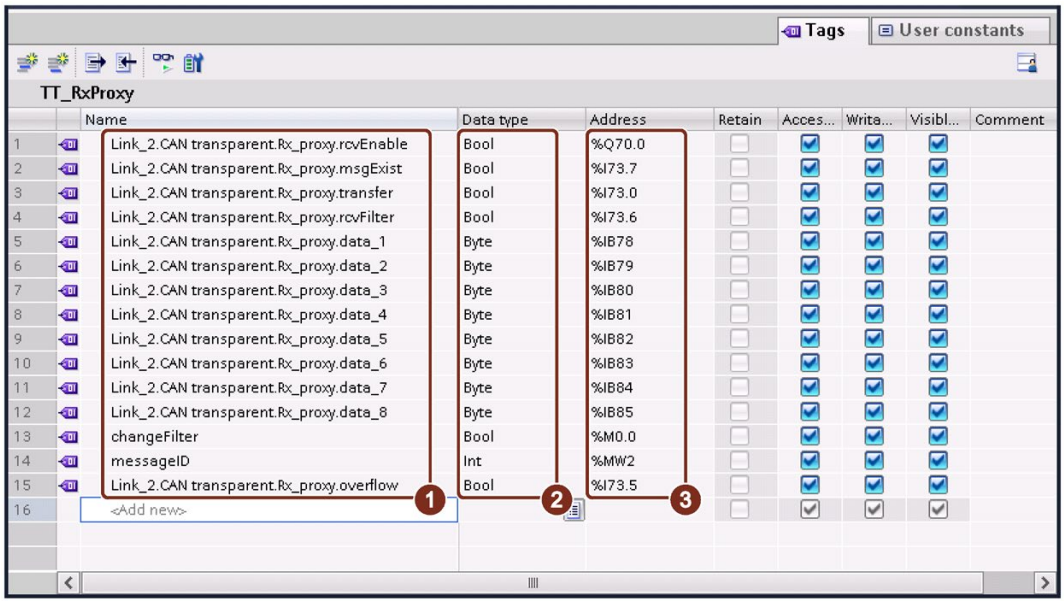


2. Rename the created tag table ① as "TT_RxProxy".



3. Double-click "TT_RxProxy".

   The "TT_RxProxy" tag table is displayed.



4. Enter the tags ① as indicated.
5. Change the data types ② and the addresses ③ as indicated.

Inserting blocks and setting online

4

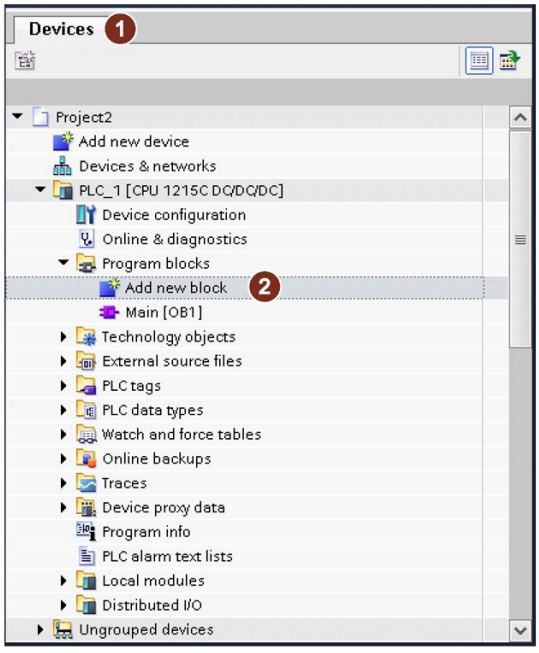
4.1 Inserting function blocks

4.1.1 Inserting a "GeneratingData" function block

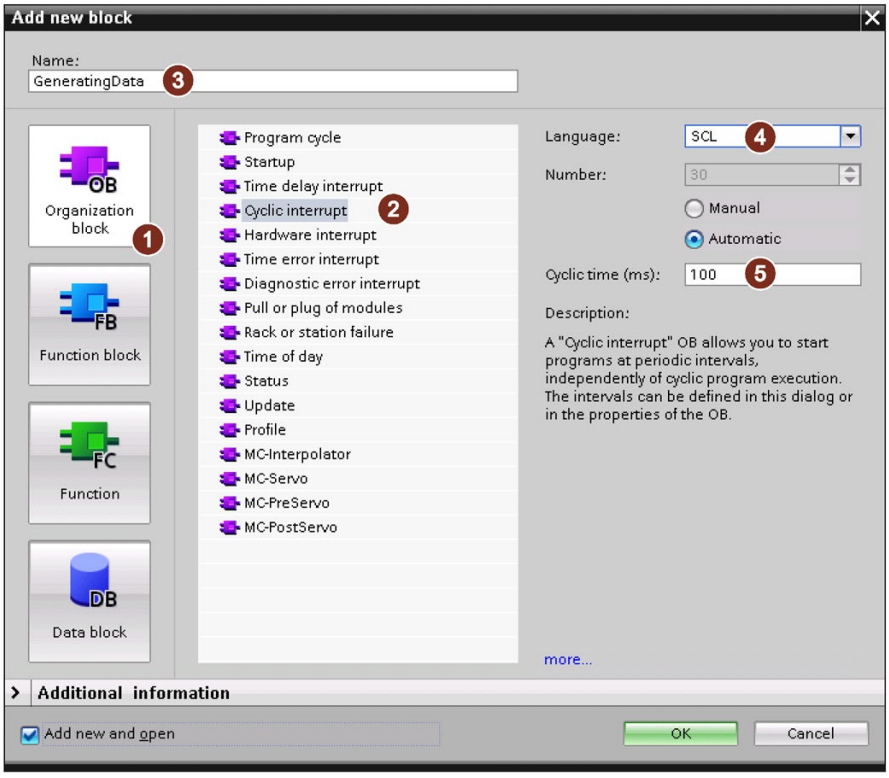
Insert block

Proceed as follows:

1. Switch to the project navigation and double-click "Devices ① → PLC_1 → Program blocks → Add new block ②".



The "Add new block" window is displayed.



2. Click "Organization block" ①.
3. Click "Cyclic interrupt" ②.
4. Enter "GeneratingData" ③ as the name.
5. Check whether ③ and ④ are set as shown.
6. Confirm the entry with "OK".

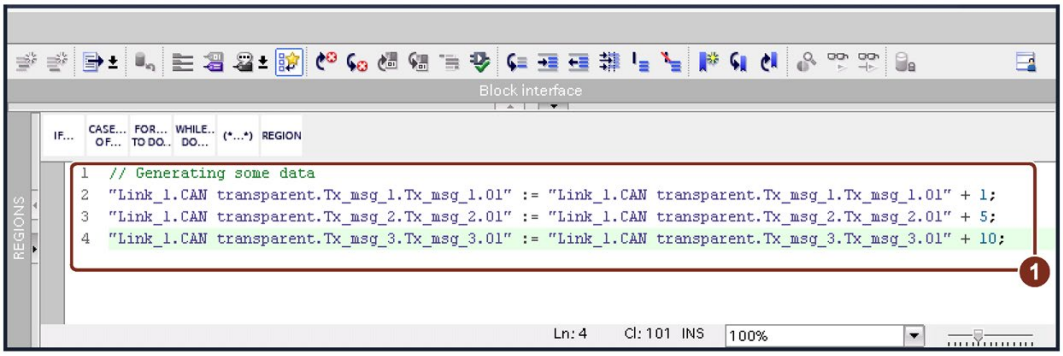
   The dialog box is closed and the function block is inserted in the project tree.

Enter program code

Proceed as follows:

1. Switch to the project navigation and click "Devices → PLC_1 → Program blocks → GeneratingData" ①.

   The following dialog box is displayed.



2. Specify the program code ①.

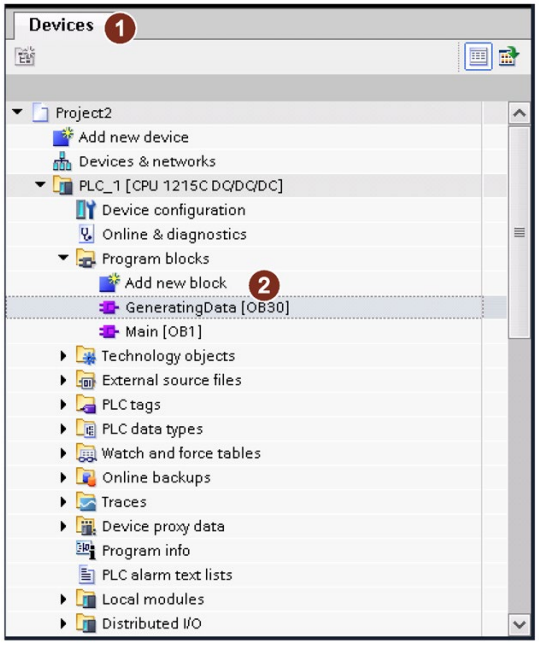
   The configuration of the function block is then complete.

4.1.2 Inserting the "StartUp" function block

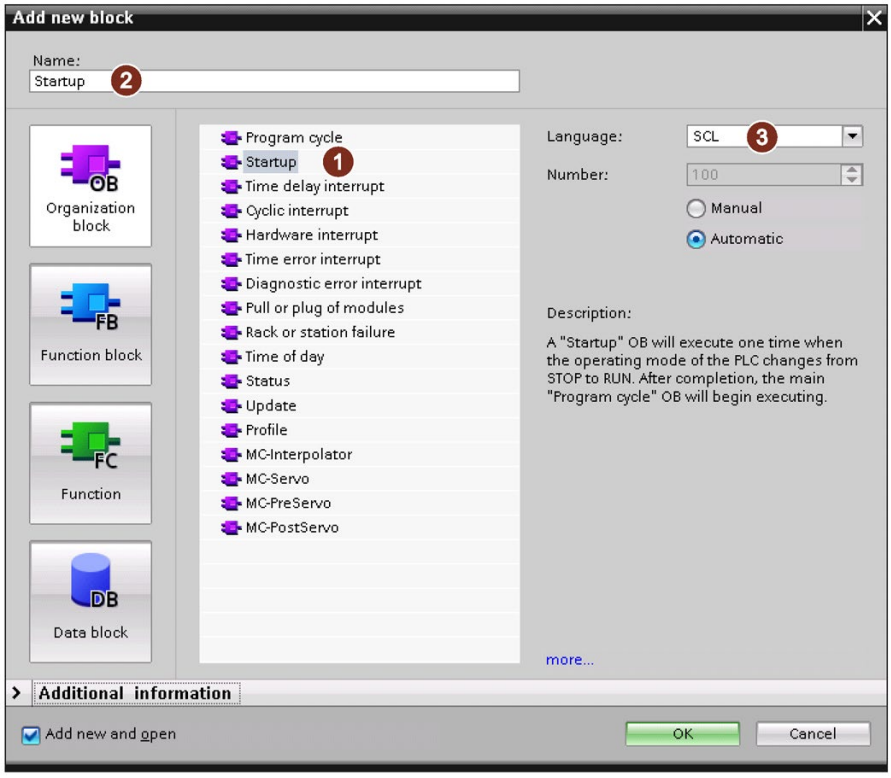
Insert block

Proceed as follows:

1. Switch to the project navigation and double-click "Devices ① → PLC_1 → Program blocks → Add new block ②".



The "Add new block" window is displayed.



2. Click "Startup" ①.
3. Check whether ② and ③ are set as shown.
4. Confirm the entry with "OK".

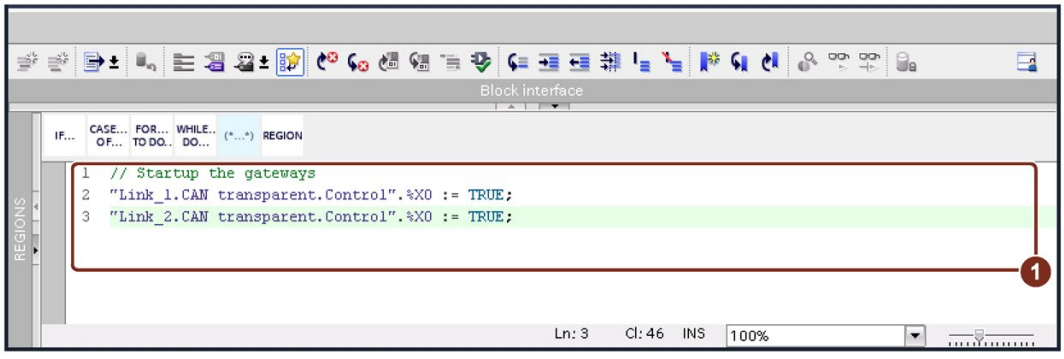
   The dialog box is closed and the function block is inserted in the project tree.

Enter program code

Proceed as follows:

1. Switch to the project navigation and click "Devices → PLC_1 → Program blocks → Startup" ①.

   The following dialog box is displayed.



2. Specify the program code ①.

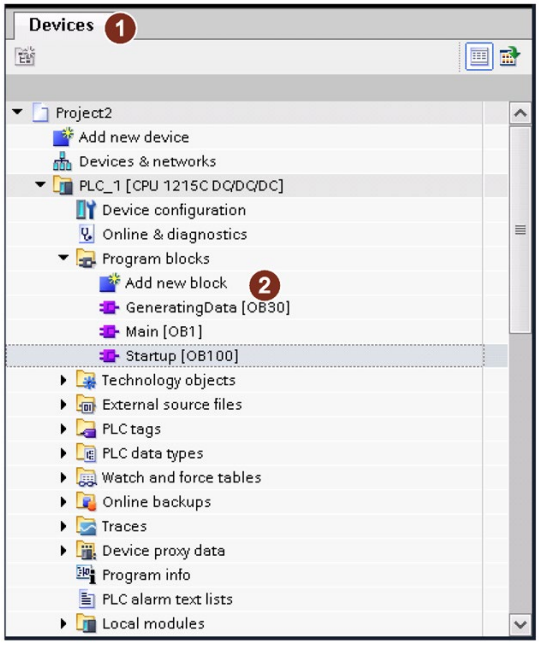
   The configuration of the function block is then complete.

4.1.3 Inserting a "FilterHandling" function block

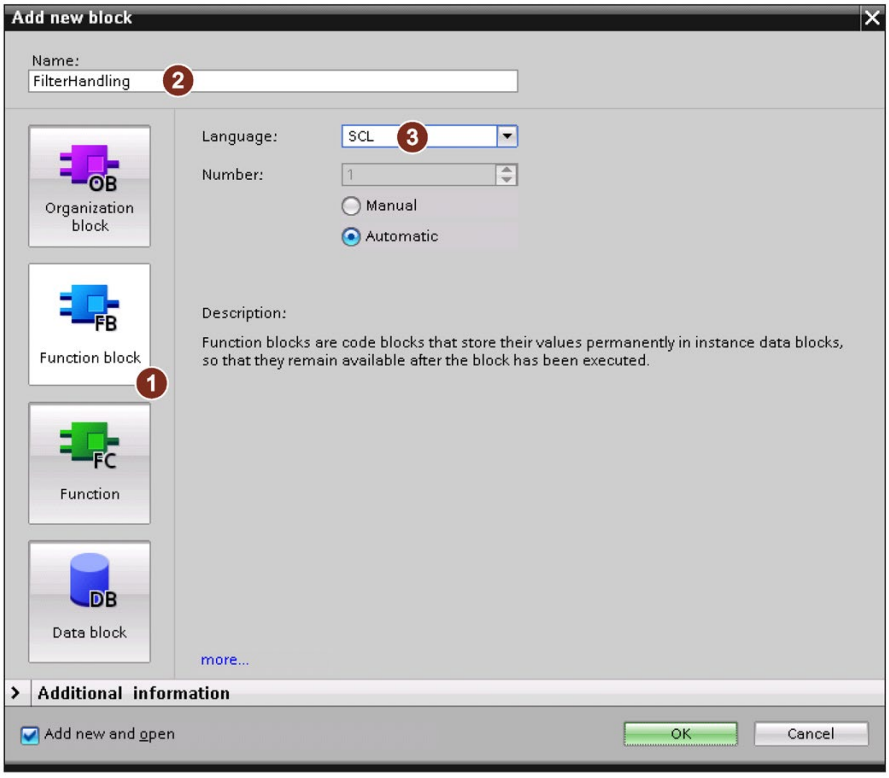
Insert block

Proceed as follows:

1. Switch to the project navigation and double-click "Devices ① → PLC_1 → Program blocks → Add new block ②".



The "Add new block" window is displayed.



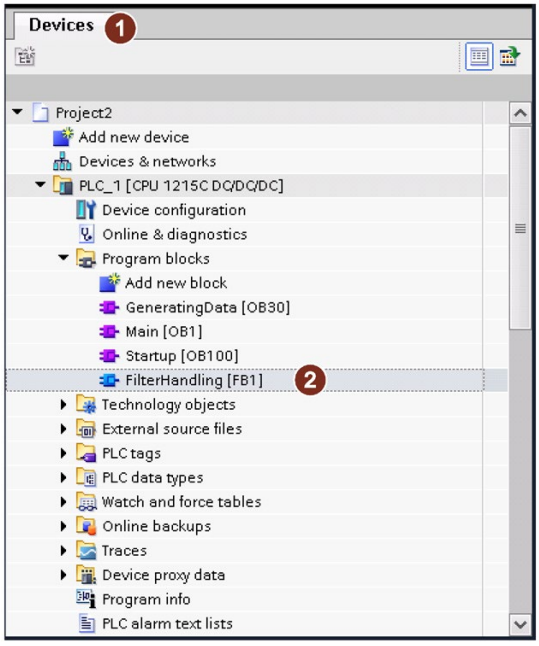
2. Click "Function block" ①.
3. Enter "FilterHandling" ② as the name.
4. Check whether ③ is set as shown.
5. Confirm the entry with "OK".

   The dialog box is closed and the function block is inserted in the project tree.

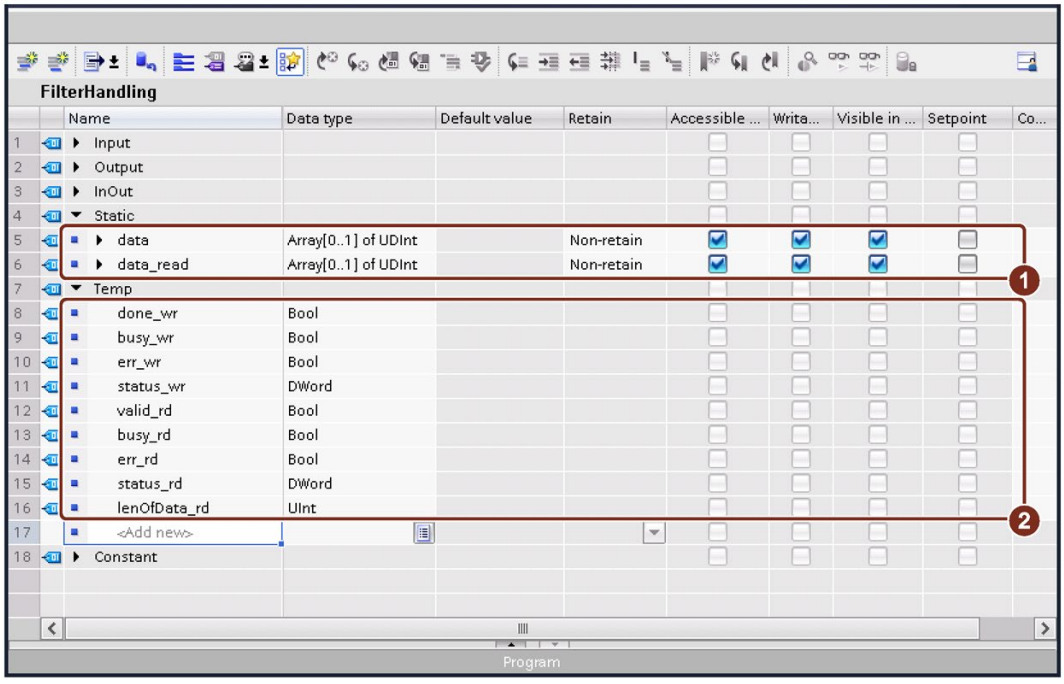
Insert and configure tags

Proceed as follows:

1. Switch to the project navigation and click "Devices ① → PLC_1 → Program blocks → FilterHandling ②".



2. Switch to the "Block interface" window.



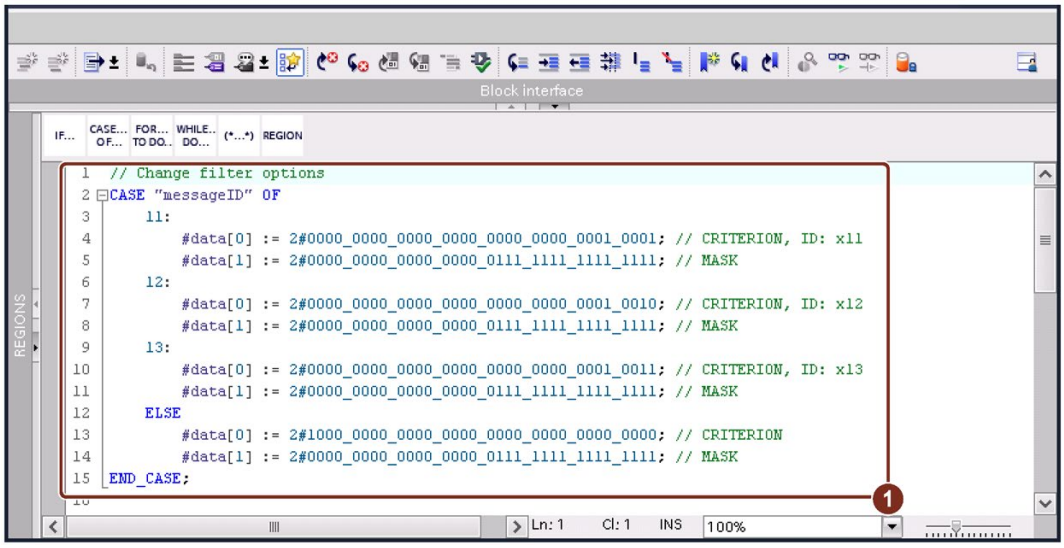
3. Insert the 2 static tags ① as indicated.
4. Insert the 9 temporary tags ② as indicated.

Enter program code

Proceed as follows:

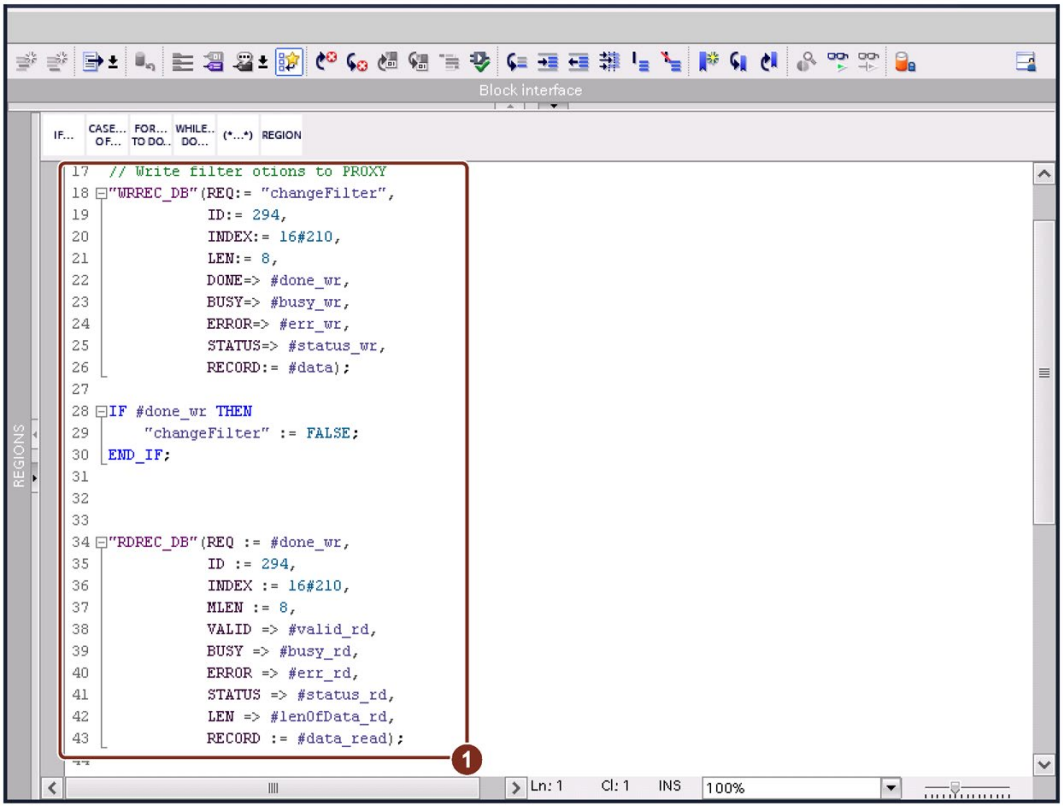
1. Click "Devices → PLC_1 → Program blocks → FilterHandling".

   The following dialog box is displayed.

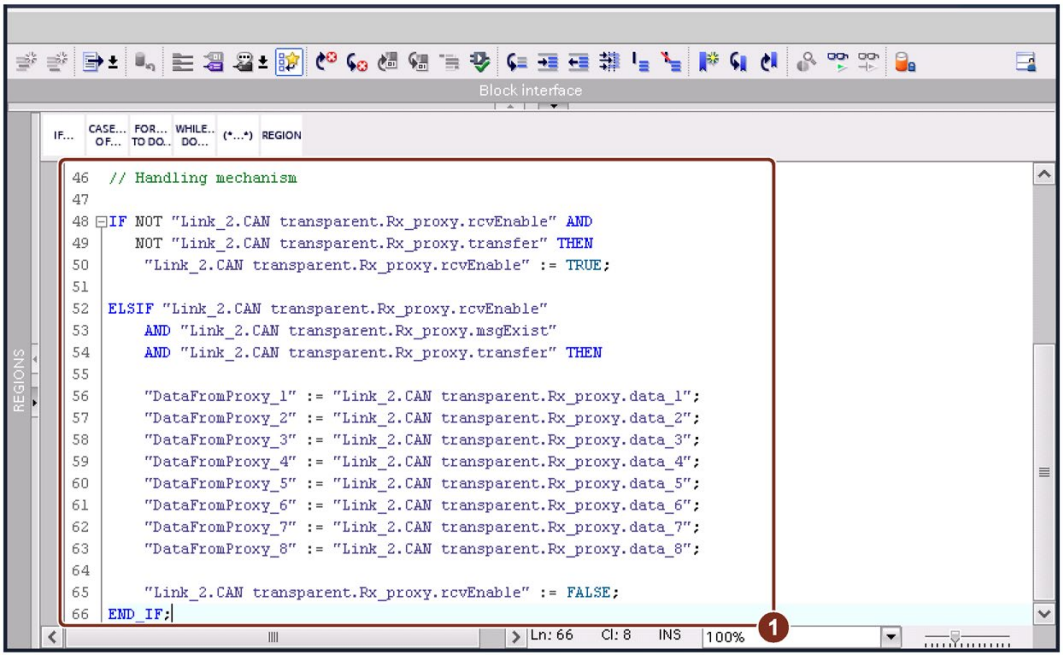


2. Enter the program code for "Change filter options" ①.

3. Enter the program code for "Write filter options to PROXY" ①.



4. Enter the program code for "Handling mechanism" ①.



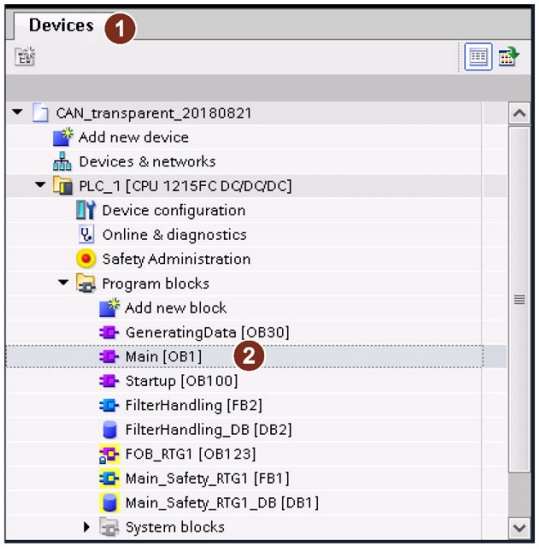
The configuration of the function block is then complete.

4.2 Inserting the organization block OB1 and watch tables

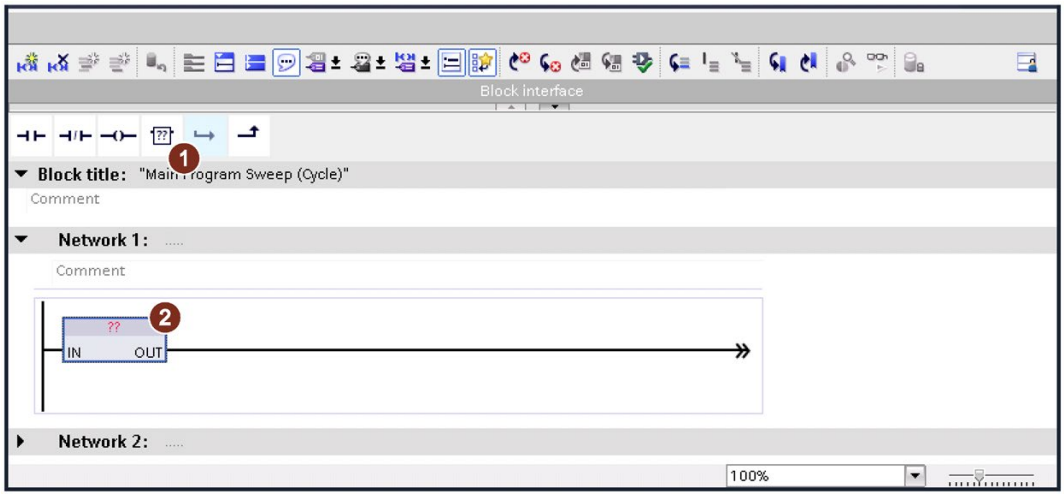
Insert OB1

Proceed as follows:

1. Switch to the project navigation and click "Devices ① → PLC_1 → Program blocks → Main [OB1] ②".



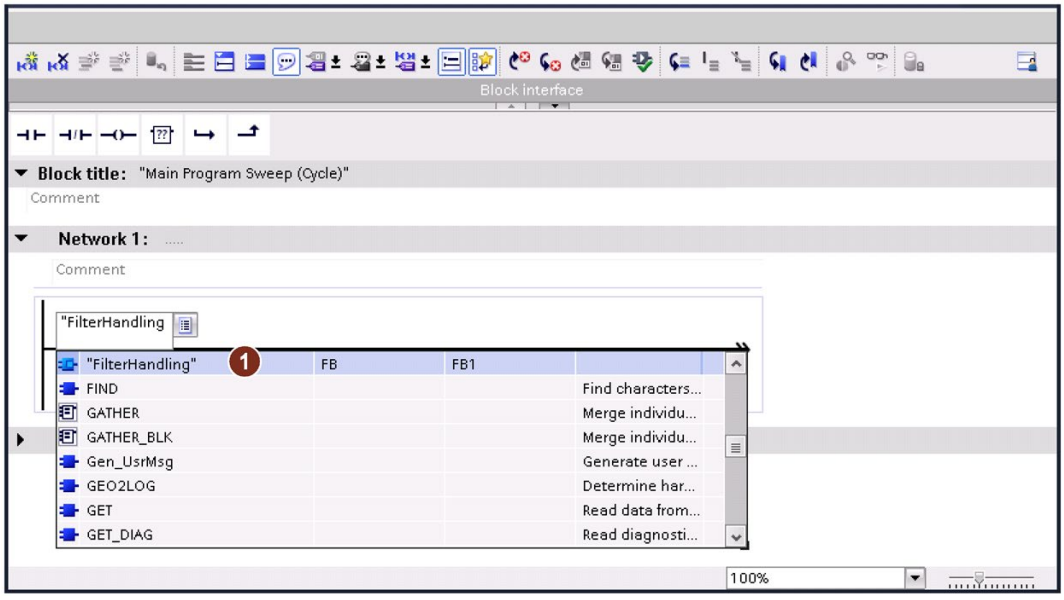
2. Click "Empty box" ①.



An empty box ② is added to network 1.

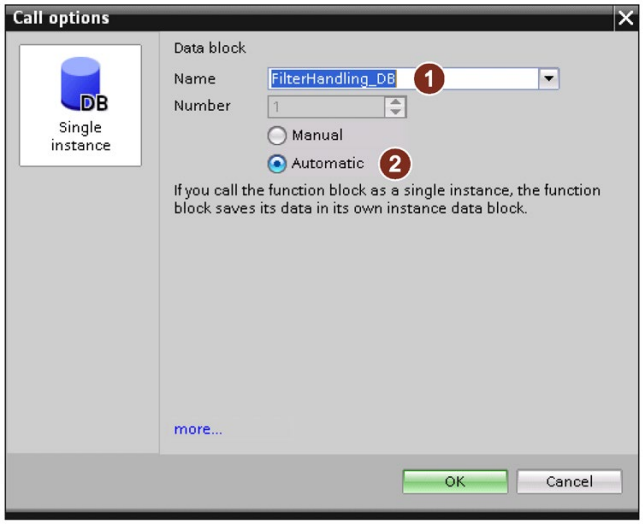
3. Click "??" ②.

   A list box is displayed.



4. Insert the "FilterHandling" ① function block.
5. Confirm with "Enter".

   The following dialog is displayed.



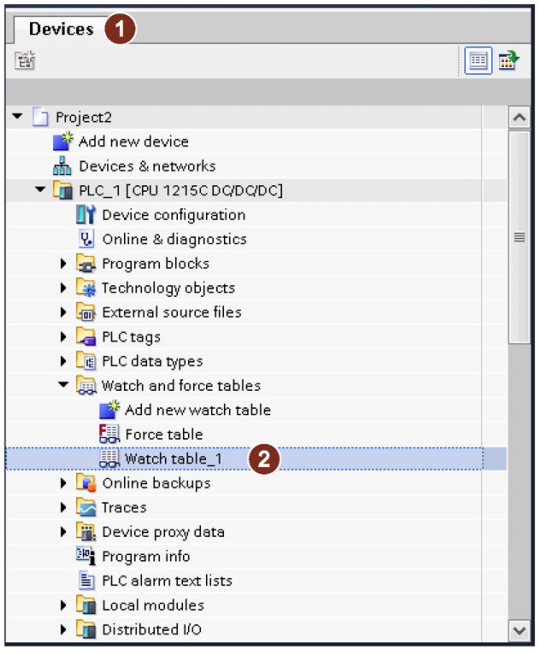
6. Select "FilterHandling" ① and "Automatic" ②.
7. Click "OK" to confirm.

   The dialog closes.

Insert the watch table "WT_TxRx_comparison"

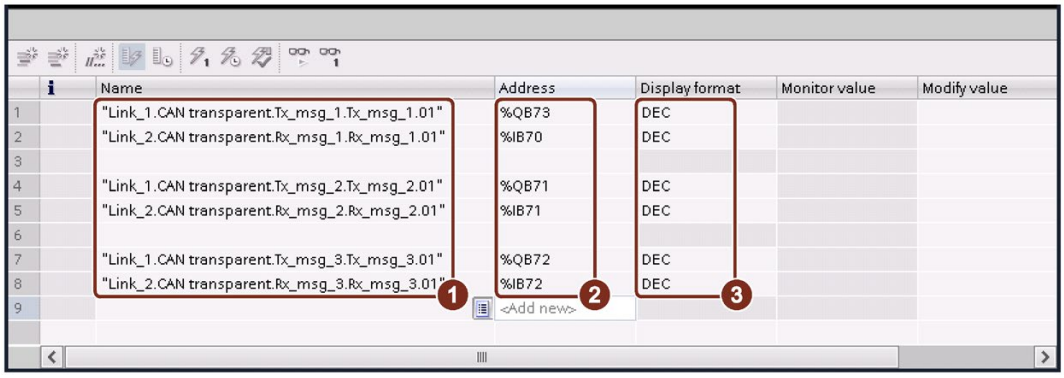
Proceed as follows:

1. Switch to the project navigation and click "Devices ① → PLC_1 → Watch and force tables".



2. Double-click "Add new watch table ②".

   The "Watch table_1" window ① is displayed.

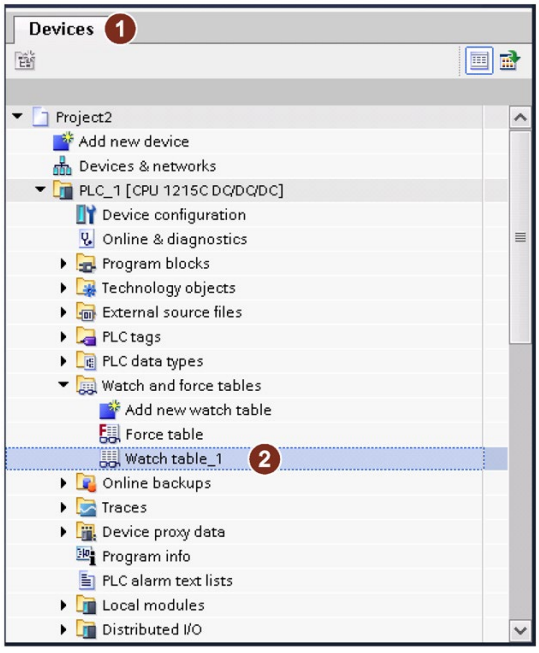


3. Enter the tags ① as indicated.
4. Enter the addresses ② and display formats ③ as indicated.
5. Change the name of the watch table from "Watch table_1" to "WT_TxRx_comparison".

Insert the watch table "WT_RxProxy"

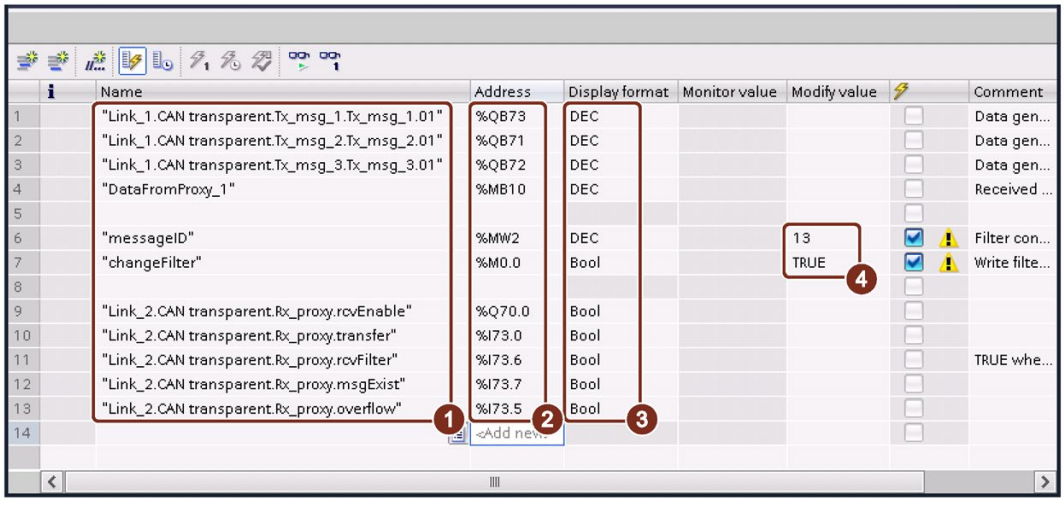
Proceed as follows:

1. Switch to the project navigation and click "Devices ① → PLC_1 → Watch and force tables".



2. Double-click "Add new watch table ②".

   The "Watch table_1" window ① is displayed.

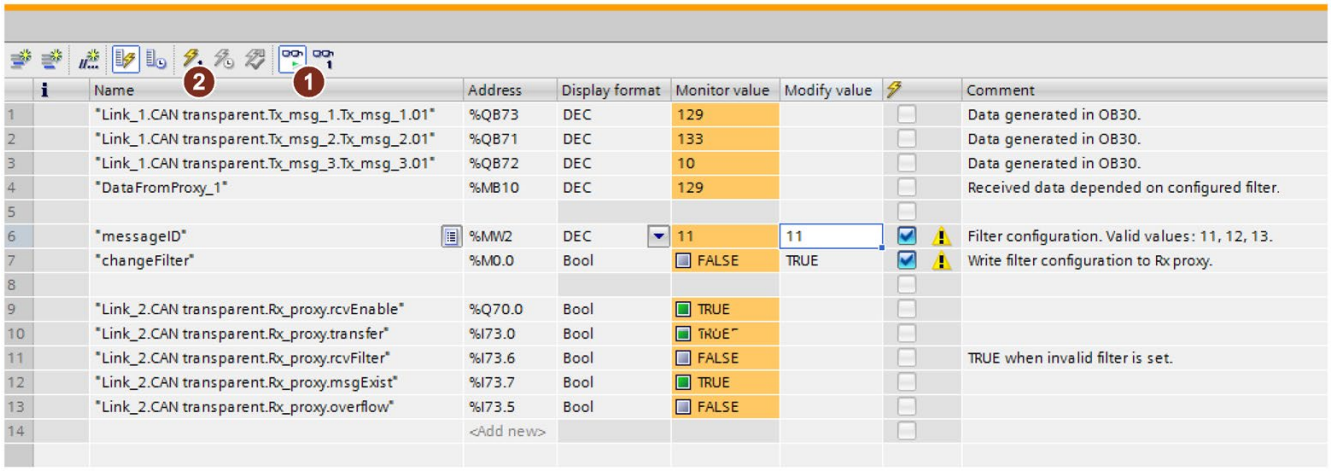


3. Enter the tags ① as indicated.
4. Enter the addresses ② and display formats ③ as indicated.
5. Specify the value change ④.
6. Change the name of the watch table from "Watch table_1" to "WT_RxProxy".

4.3 Setting the watch table "WT_RxProxy" online

Proceed as follows:

1. Click "Monitor all" ① and then "Modify all selected values once and now" ②.



	Name	Address	Display format	Monitor value	Modify value	Comment
1	"Link_1.CAN transparent.Tx_msg_1.Tx_msg_1.01"	%QB73	DEC	129		Data generated in OB30.
2	"Link_1.CAN transparent.Tx_msg_2.Tx_msg_2.01"	%QB71	DEC	133		Data generated in OB30.
3	"Link_1.CAN transparent.Tx_msg_3.Tx_msg_3.01"	%QB72	DEC	10		Data generated in OB30.
4	"DataFromProxy_1"	%MB10	DEC	129		Received data depended on configured filter.
5						
6	"messageID"	%MW2	DEC	11	11	Filter configuration. Valid values: 11, 12, 13.
7	"changeFilter"	%M0.0	Bool	FALSE	TRUE	Write filter configuration to Rx proxy.
8						
9	"Link_2.CAN transparent.Rx_proxy.rcvEnable"	%Q70.0	Bool	TRUE		
10	"Link_2.CAN transparent.Rx_proxy.transfer"	%I73.0	Bool	TRUE		
11	"Link_2.CAN transparent.Rx_proxy.rcvFilter"	%I73.6	Bool	FALSE		TRUE when invalid filter is set.
12	"Link_2.CAN transparent.Rx_proxy.msgExist"	%I73.7	Bool	TRUE		
13	"Link_2.CAN transparent.Rx_proxy.overflow"	%I73.5	Bool	FALSE		
14		<Add new>				

The watch table "WT_RxProxy" goes online. The values in the "Monitor value" column are updated cyclically.

Appendix A

A

A.1 Internet links

No.	Subject area
1	Entry – PN/CAN LINK – Configuring "CAN transparent" operating mode (https://support.industry.siemens.com/cs/products?search=109760971&mfn=ps&o=DefaultRankingDesc&lc=en-WW)
2	Industry Online Support (https://support.industry.siemens.com/cs/start?lc=en-WW)
3	Mall (https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10140445?activeTab=ProductInformation&tree=CatalogTree)
4	Industrial communication (https://w3.siemens.com/mcms/automation/en/industrial-communications/Pages/Default.aspx)
5	Your personal contact (http://w3.siemens.com/aspa_app/)

A.2 History

Edition	Comment
10/2018	First edition

A.3 List of abbreviations

bps	bits per second
CAN	Controller Area Network
CPU	Central Processor Unit
DC	Direct Current
I/O	Input/output
HSP	Hardware Support Package
ID	Identifier
IP	Internet Protocol
PLC	Programmable Logic Controller
PM	Power Module
PN	PROFINET
TIA	Totally Integrated Automation
TT	Tag table
WT	Watch table