PNOZ m EF EtherCAT FSoE KUKA KRC5

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Product

Type:	PNOZmulti 2 communication modules
Name:	PNOZ m EF EtherCAT FSoE, EtherCAT- EL6695-1001, KUKA KRC5
Manufacturer:	Pilz GmbH & Co. KG, Safe Automation

Document

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Document Revision History

Release	Date	Changes	Chapter
01	2025-08-06	Creation	all
02	2025-08-06	Editorial	all

Validity of Application Note

This present Application Note is valid until a new version of the document is published.
This and other Application Notes can be downloaded in the latest version and for free from www.pilz.com. For a simple search, use our content document (1002400) or the direct search function in the download area.

The Pilz newsletter is free of charge and keeps you up to date on all the latest issues and trends in safe automation.

Exclusion of Liability

We have taken great care in compiling our application note. It contains information about our company and our products. All statements are made in accordance with the current status of technology and to the best of our knowledge and belief.
While every effort has been made to ensure the information provided is accurate, we cannot accept liability for the accuracy and entirety of the information provided, except in the case of gross negligence. In particular, all information on applicable standards, safety-related classifications and time characteristics should be viewed as provisional. In particular it should be noted that statements do not have the legal quality of assurances or assured properties.
We are grateful for any feedback on the contents.

August 2025

Industrial Security

To secure plants, systems, machines and networks against cyberthreats it is necessary to implement (and continuously maintain) an overall Industrial Security concept that is state of the art.
Perform a risk assessment in accordance with VDI/VDE 2182 or IEC 62443-3-2 and plan the security measures with care. If necessary, seek advice from Pilz Customer Support.

Abbreviations

Abbreviation / term	Description	Source
AN	**A**pplication **N**ote	www.pilz.com > AN content (1002400)
PNOZ	Pilz E-STOP positive-guided (DE: **P**ilz **NO**T-AUS-**Z**wangsgeführt)	www.pilz.com > PNOZ
PSS	Programmable control system (DE: **P**rogrammierbares **S**teuerungs**s**ystem)	www.pilz.com > PSS
PSS u2	**PSSu**niversal, **2**nd generation	www.pilz.com > PSS u2
POU	**P**rogram **O**rganisation **U**nit	
NC	**N**ormally **C**losed	
NO	**N**ormally **O**pen	
FSoE	**F**ail **S**afe **o**ver **E**therCAT	
CoE	**C**AN application protocol **o**ver **E**therCAT	
MDevice	**MainDevice**	
SubDevice	**S**ubordinary**D**evice	
FSoE MInstance	**FSoE M**ain**Instance**	
FSoE SubInstance	**FSoE Sub**ordinary**Instance**	
ESI-Datei	**E**terCAT **S**lave **I**nformation	www.ethercat.org > ESI

Definition of Symbols

Information that is particularly important is identified as follows:

CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage and also provides information on preventive measures that can be taken.

NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken.
It also highlights areas within the text that are of particular importance.

INFORMATION

This gives advice on applications and provides information on special features.

Contents

1 Useful documentation

Reading the documentation listed below is necessary for understanding this Application Note. The availability of the software used, and its safe handling are also presupposed for the user.

1.1 Documentation from Pilz GmbH & Co. KG

No.	Description	Item No. /Download
1	Pilz international homepage, download section	www.pilz.com
2	Operating Manual PNOZmulti 2 Communication interfaces 1002971-EN-xx	www.pilz.com > 1002971
3	Operating Manual PNOZ m EF EtherCAT FSoE 1006493 -EN-xx	www.pilz.com > 1006493
4	Operating Manual PNOZ m B1 1003790	www.pilz.com > 1003790
5	System description PNOZmulti system expansion 1002217-EN-xx	www.pilz.com > 1002217
6	Aplication Note PNOZ m EF EtherCAT FSoE mit TwinCAT 3 und CODESYS 3.5 1006828-EN-XX	www.pilz.com > 1006828

1.2 Documentation from other sources of information

No.	Description	Item No. / Download
1	Beckhoff Information System	Beckhoff Information System
2	Official CODESYS-help page	CODESYS Online Help
3	Communication between KRC5 (EL6695-1001 secRev04) und Beckhoff PLC	SS5081 / KUKA Xpert

2 Used hardware and software

2.1 Pilz products

No.	Descriptions	Order number	Version	Number
1	PNOZ m B1	772101	V1.11	1
2	PNOZ m EF EtherCAT FSoE	772123	V1.0	1
3	Industrial PI 4	A1000003	--	1
4	PNOZmulti Configurator	--	V11.5	--

2.2 Third-party products

No.	Descriptions	Order number	Version	Number
1	Beckhoff CX5020 with TwinCAT 3	--	--	1
2	Beckhoff EK1100	--	--	1
3	Beckhoff EtherCAT-Bridge KUKA	EL6695-1001	ab Revision 04	1
4	KUKA KRC5 Robot control system	--	--	1
5	Beckhoff TwinCAT 3	--	v3.1.4024.	--
6	CODESYS	--	V3.5.20 Patch 4	--

2.3 Structure of the application (schematic)

2.3.1 Setup without external EtherCAT Main Device

The description can be found in chapter 6.1, chapter 7.

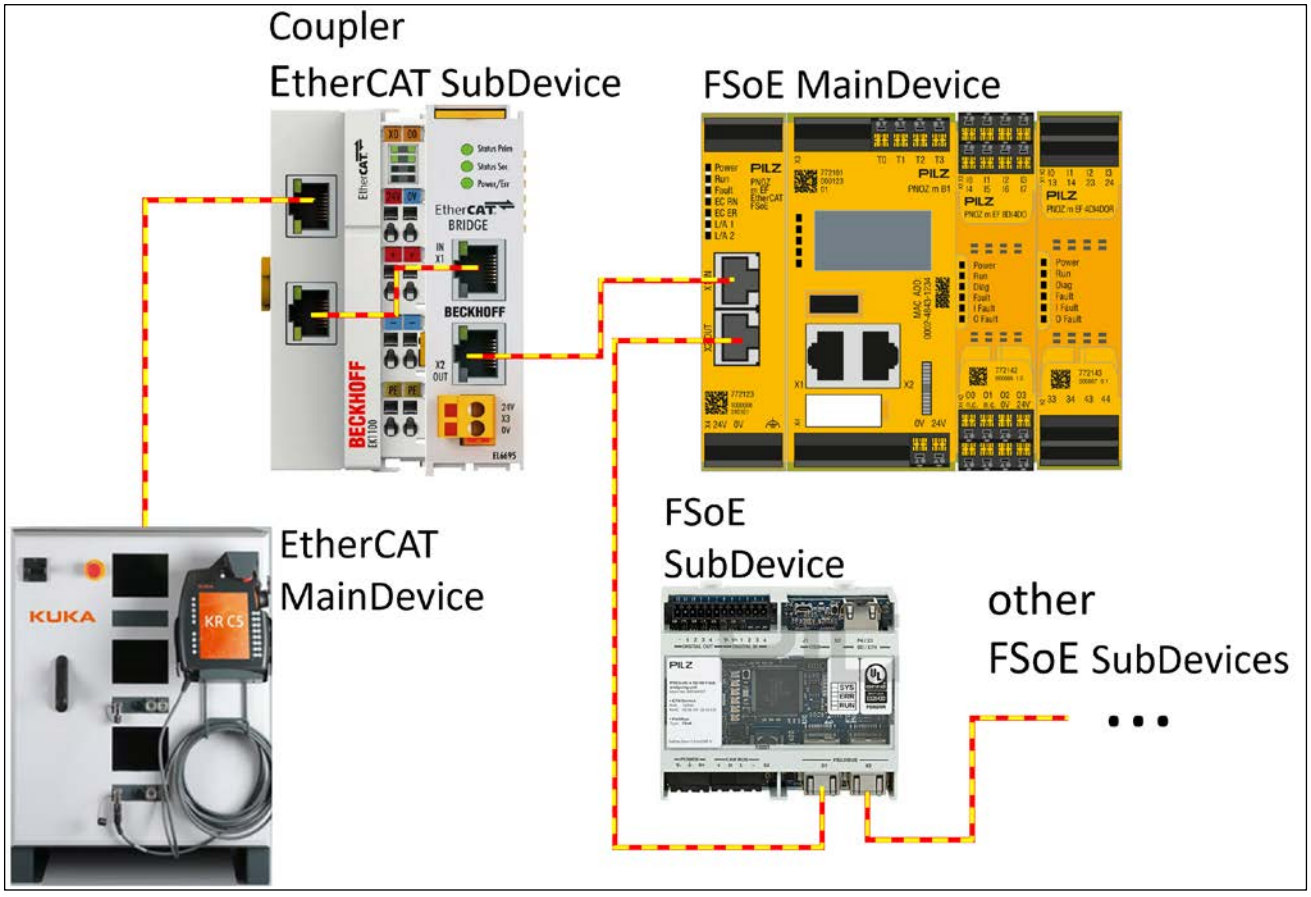


Figure 1: Application without external EtherCAT Main Device

2.3.2 Setup with external EtherCAT Main Device

The description can be found in chapter 6.2, chapter 7 and chapter 8

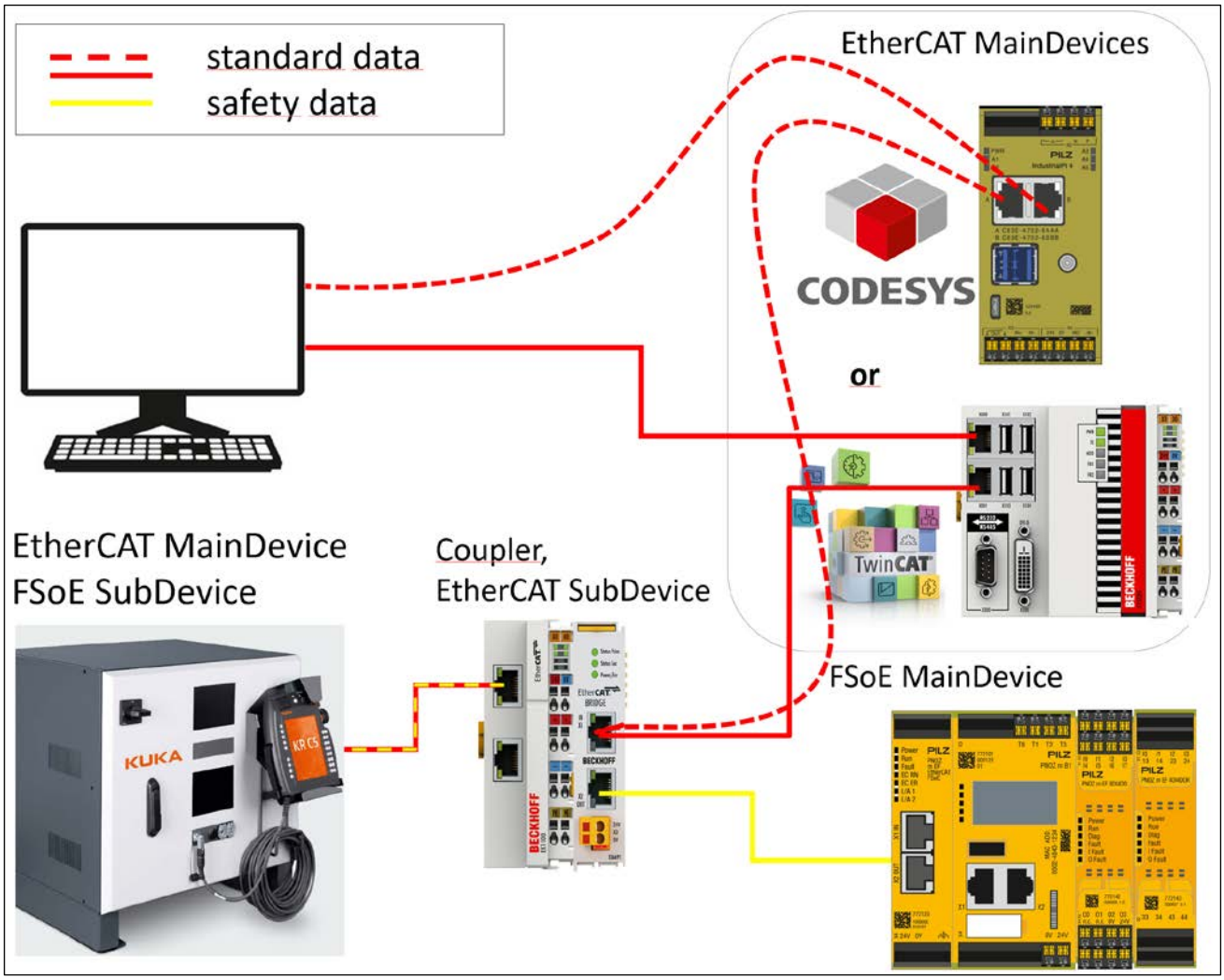


Figure 2: Application with external EtherCAT Main Device

3 Preface

With the aid of the respective development environment, this application note basically describes the commissioning of the module PNOZ m EF EtherCAT FSoE with the KUKA robot controller KRC5 as EtherCAT MainInstance, in chapter 6.1, chapter 7 and PNOZ m EF EtherCAT FSoE with the KUKA robot controller KRC5 on a Beckhoff TwinCAT 3 or CODESYS PLC in chapter 6.2, chapter 7 and chapter 8.
The basic step-by-step procedure for a successful basic configuration is shown here, mostly in pictures.

This description is equally applicable to the KUKA robot controllers KRC4 and KRC5. Unless otherwise stated, the functions and processes described apply equally to both controller generations.

NOTICE

The "PNOZ m EF EtherCAT FSoE" module can only be connected to the PNOZ m B1.

A detailed explanation of the safety functions employed in the failsafe application and their evaluation in terms of functional safety are not part of this document.

This document is not technical documentation for general use of the software "TwinCAT3" from Beckhoff, "CODESYS" from the CODESYS Group and "Work Visual" from KUKA.

INFORMATION

The ETG (EtherCAT Technology Group) has replaced the terms Master and Slave.

This change has already been taken into account in the application note; the screenshots for the tools still contain the previous terms.

Old terminology	New name	New terminology
Master device	MainDevice	MDevice
Slave device	SubordinaryDevice	SubDevice
Master instance	FSoE MainInstance	FSoE MInstance
Slave instance	FSoE SubordinaryInstance	FSoE SubInstance

Figure 3: Terminology adjustment

4 Properties of the module PNOZ m EF EtherCAT FSoE

4.1 MDevice / SubDevice

The module PNOZ m EF EtherCAT FSoE is part of an EtherCAT network and acts as a SubDevice, and simultaneously as an FSoE MInstance and FSoE SubInstance.
In the EtherCAT network, the data is received and sent in the module PNOZ m EF EtherCAT FSoE (SubDevice). The module PNOZ m EF EtherCAT FSoE provides standard and failsafe data.
For more information, please refer to the operating manual.

NOTICE

As the module PNOZ m EF EtherCAT FSoE has no MDevice functionality, it is necessary to integrate an MDevice into the network.
The MDevices in this application note are:
- KUKA robot controller KRC5,
- Beckhoff TwinCAT3 PLC or
- CODESYS PLC.

4.2 FSoE MInstance / FSoE SubInstance

The module PNOZ m EF EtherCAT FSoE can be configured as FSoE MInstance and FSoE SubInstance.
- Up to 60 connections can be configured as an FSoE MInstance, a maximum of 512 Bits of failsafe input and 512 Bits of failsafe output data can be transmitted.
- Up to 4 connections can be configured as FSoE SubInstance.

NOTICE

System limits of the module PNOZ m EF EtherCAT FSoE

Number of Connections	min. per Connection	max. per Connection	max. per FSoE MInstance
60 FSoE MInstance to FSoE SubInstance	8 Bit Fail-Safe Inputs and 8 Bit Fail-Safe Outputs	16 Byte Fail-Safe Inputs and 16 Bytes Fail-Safe Outputs	512 Bit Fail-Safe Inputs and 512 Bit Fail-Safe Outputs
4 as an FSoE SubInstance			

Figure 4: PNOZ m EF EtherCAT FSoE – Overview of system limits

4.3 Network topology

The MDevices, the SubDevices, the FSoE MInstance and the FSoE SubInstance are all distributed across two networks. These are connected to each other via the EtherCAT Coupler and the EtherCAT Bridge KUKA EL6695-1001. From the perspective of the MDevice, the FSoE MInstance is a SubDevice.
The structure is shown schematically in the chapter 2.3.

5 Properties of the module EL6695-1001 EtherCAT Bridge

5.1 FSoE MInstance / FSoE SubInstance

The EtherCAT Bridge FSoE can be used to establish safe communication between a third-party controller (e.g. PLC) and a KRC5. The third-party controller is the FSoE MainInstance and the KRC5 is the FSoE SubInstance.

5.2 Hardware configuration

The EtherCAT Bridge FSoE consists of a bus coupler and the EtherCAT Bridge terminal. The controller that is connected to the bus coupler is the primary controller. The controller that is connected to the bridge terminal is the secondary controller. Which controller is configured as primary or secondary depends on the bus line in which the bridge terminal is installed.

NOTICE

Safe communication is only possible with the EtherCAT bridge terminal EL6695-1001.
If the EtherCAT bridge terminal EL6695-0000 from Beckhoff is used, only **non**-safety-related I/O data can be exchanged.
To use safe communication via FSoE, the robot controller must be connected on the primary side of the EtherCAT Bridge terminal EL6695-1001.
The EtherCAT Bridge EL6695-1001 must have at least revision 04, HW05 and FW08.

- Outputs on the primary side are inputs on the secondary side and vice versa.

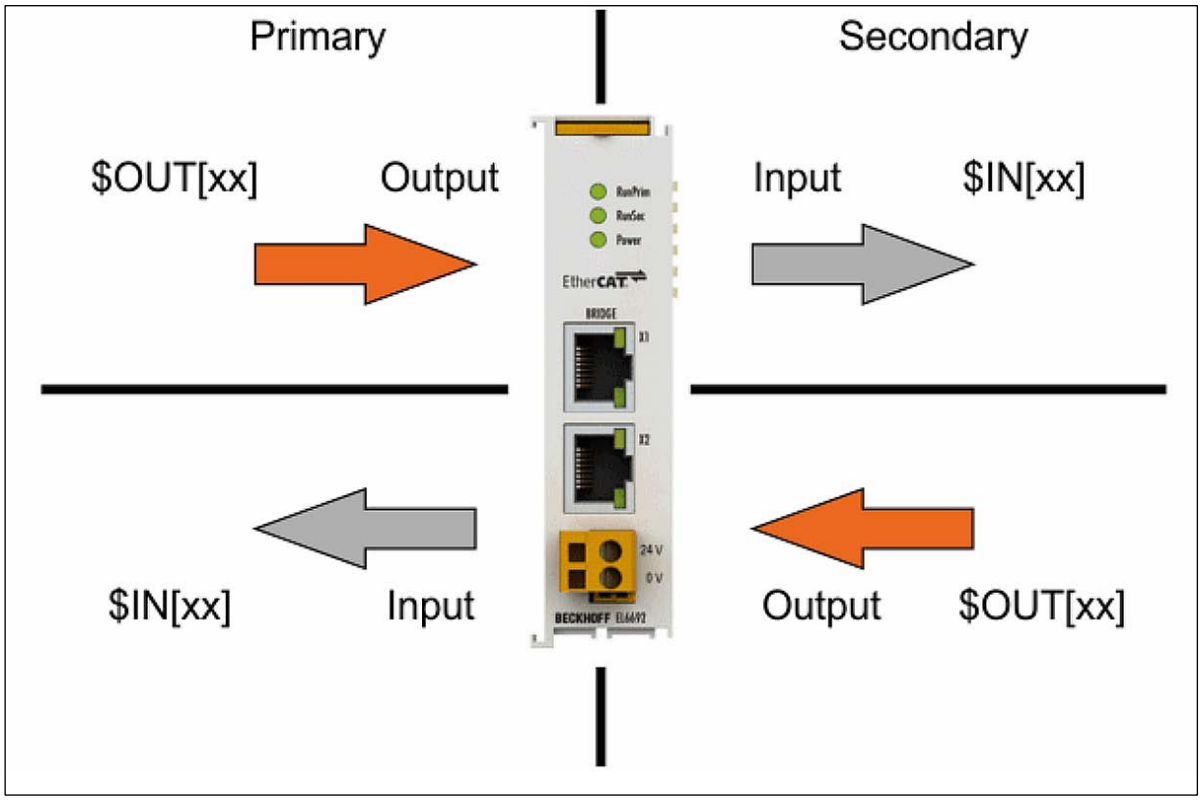


Figure 5: Primary and secondary side

6 Configuration in "WorkVisual"

INFORMATION

The device description files must be obtained from the manufacturer and imported into the development environments

The device description file for the bridge terminal EL6695-1001 with the name Kuka_EL6695prim.xml can be obtained from KUKA.

Information on processes in WorkVisual can be found in the WorkVisual documentation.

6.1 Application without external EtherCAT MDevice

NOTICE

The primary side must be connected to the secondary side via the network (patch cable), see Figure 1.

- To ensure that the configuration works without an external EtherCAT Main Device, the KRC4 EL6695-1001 is connected to the PNOZ m EF EtherCAT FSoE on the secondary side, where the safety program then runs.
- The PNOZ m EF EtherCAT FSoE module is an FSoE MainInstance but an EtherCAT SubInstance.
- The KRC4 EL6695-1001 must be integrated into "WorkVisual" on the primary and secondary side and configured in the same way.
- The safe signals are thus mapped from the secondary side to the primary side and vice versa.

6.1.1 Configuration without FSoE SubDevice

6.1.1.1 Bus configuration

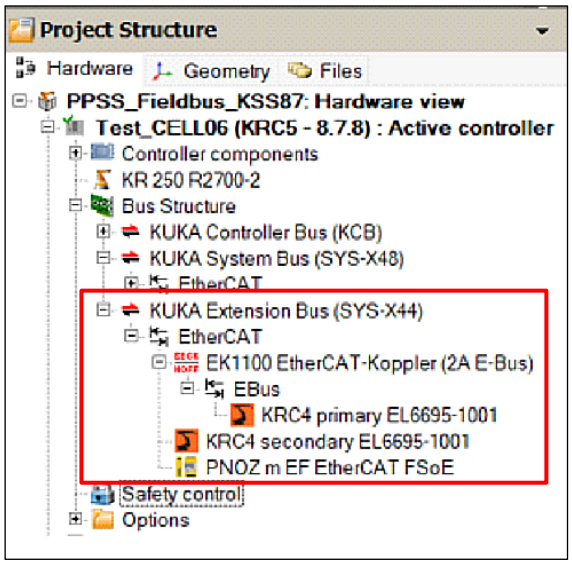


Figure 6: Configuration of the modules on the KUKA Extension Bus

- Restart after error should be set to automatic.

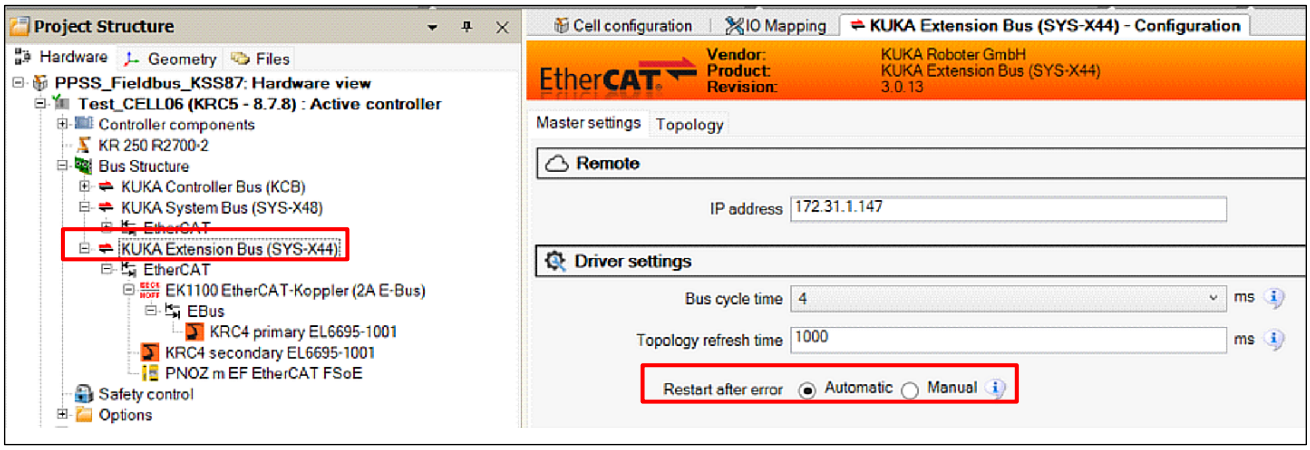


Figure 7: EtherCAT Main Instance settings

- No adjustment is normally necessary in the topology.

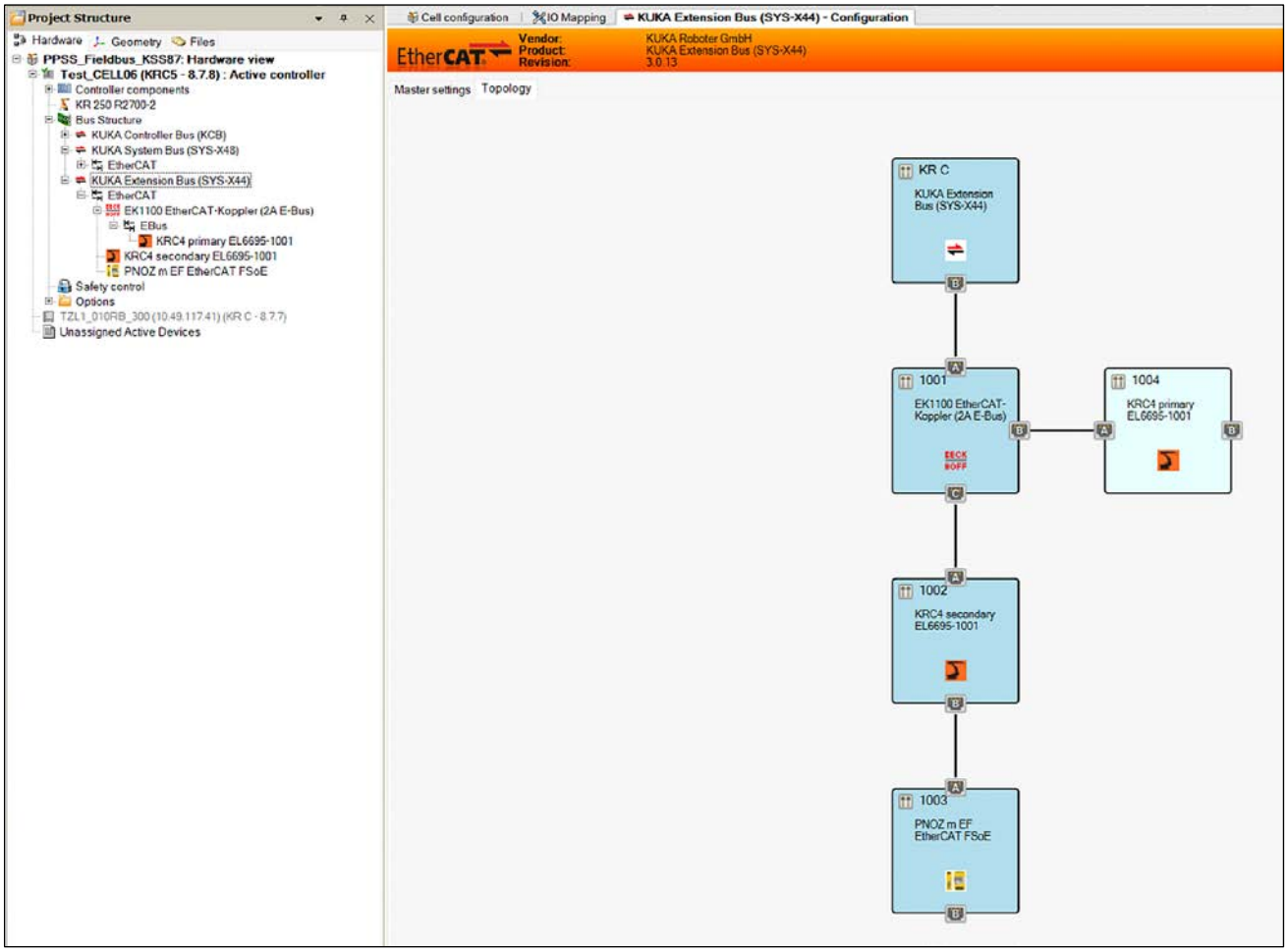


Figure 8: EtherCAT topology

- Set FSoE address for the robot controller (default: 8504dez)

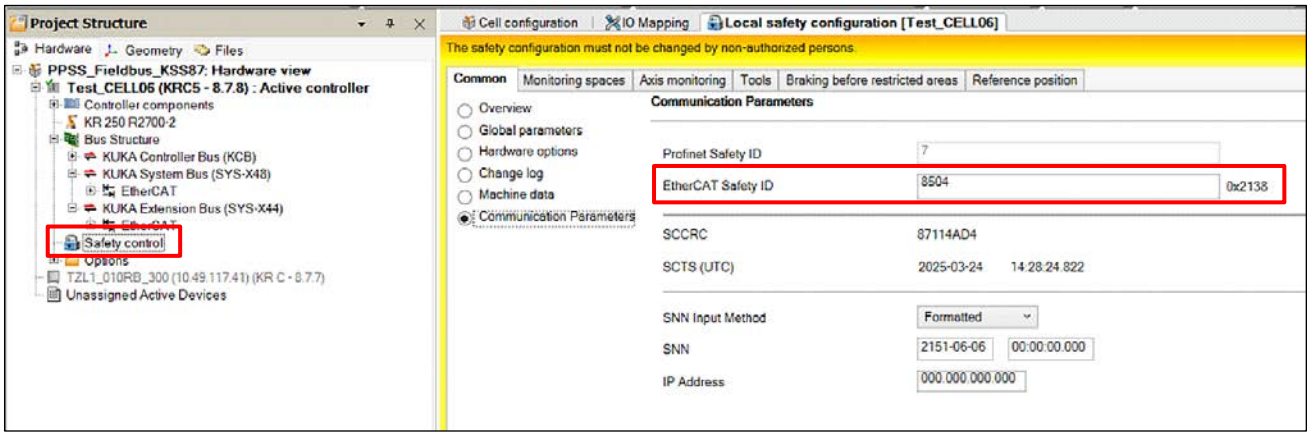


Figure 9: FSoE address robot controller

6.1.1.2 Settings for KRC4 primary EL6695-1001

- The settings for the KRC4 primary EL6695-1001 and KRC4 secondary EL6695-1001 must match.
- Tick the box as shown in the figure below
  - EL6695 SYNC Inputs
  - Safety inputs (8 Byte)
  - Std. In (4 Byte)
  - Safety outputs (8 Byte)
  - Std. Out (4 Byte)

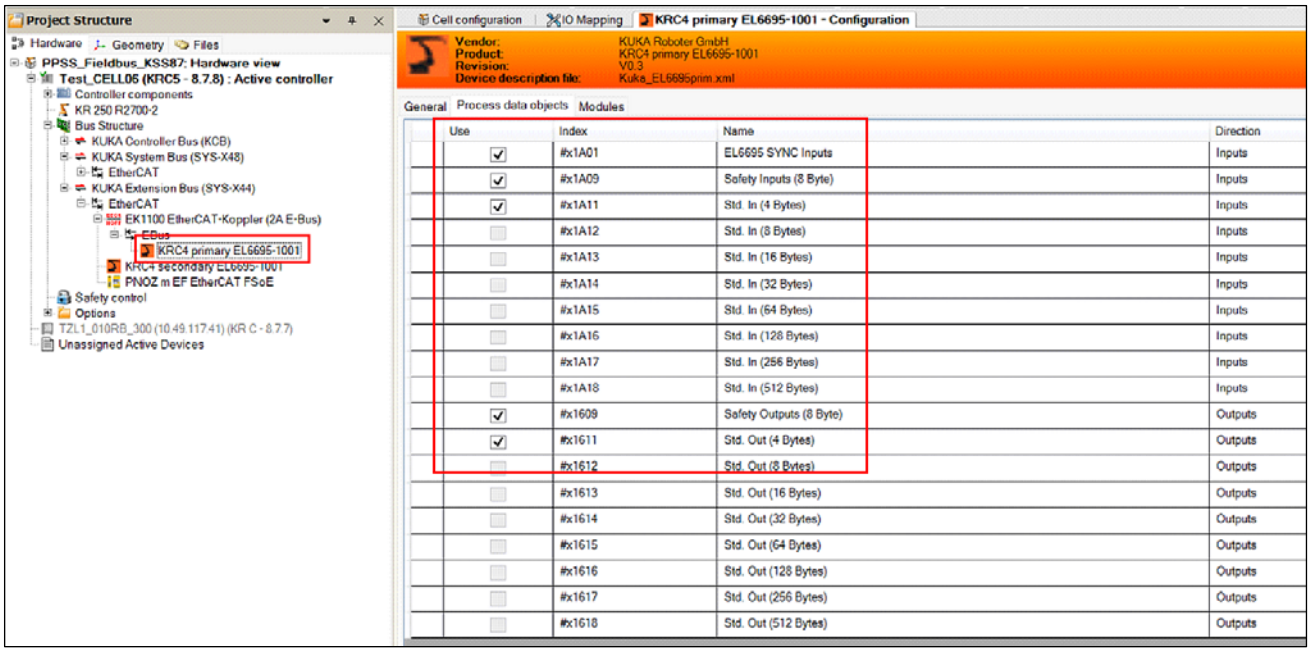


Figure 10: "Primary" settings

6.1.1.3 Settings for KRC4 secondary EL6695-1001

- The settings for the KRC4 secondary EL6695-1001 and KRC4 primary EL6695-1001 must match.
  - Slot 001: Sync Inputs Compact
  - Slot 002: Safety Data Bitf (8 Byte) Safety Robot
  - Slot 003: Default IO Std. IO 4 Byte

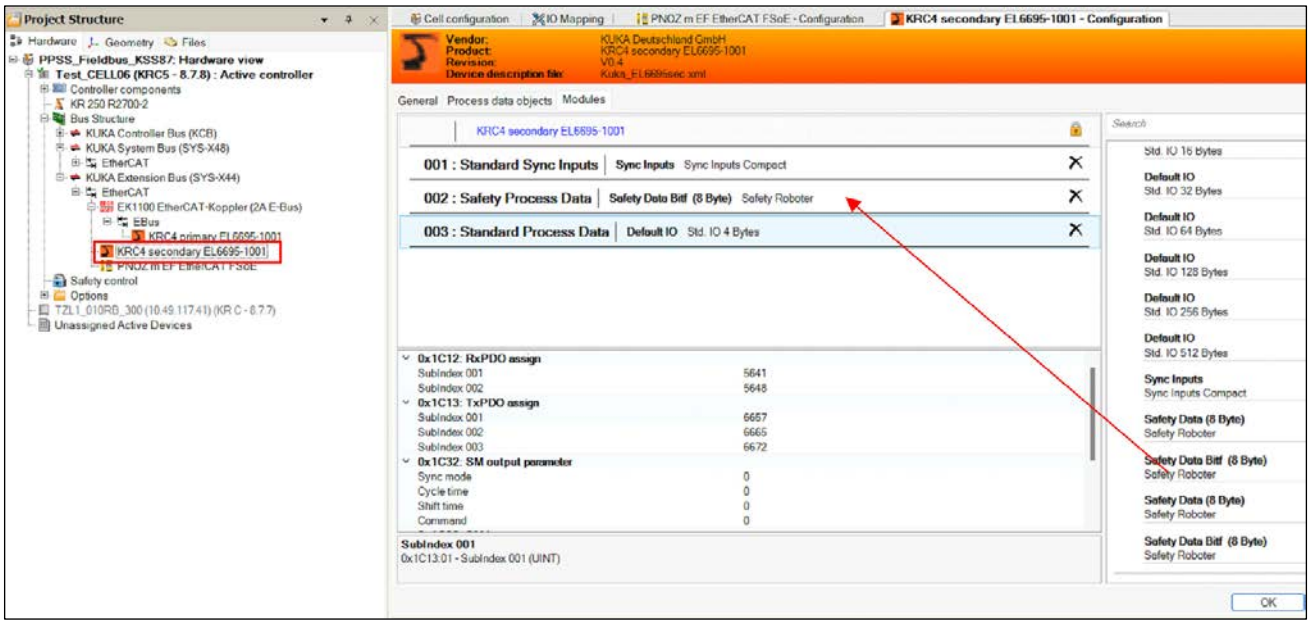


Figure 11: "Secondary" settings

6.1.1.4 Settings for the PNOZ m EF EtherCAT FSoE

- The size of the inputs and outputs on the PNOZ m EF EtherCAT FSoE must match the settings for the KRC4 secondary EL6695-1001 (Slot 002: Safety Data Bitf (8 Byte) Safety Robot).
- Insert the corresponding Pilz FSoE Master module:
  - Slot 001: FSoE_M_8BYTE_IN_8BYTE_OUT

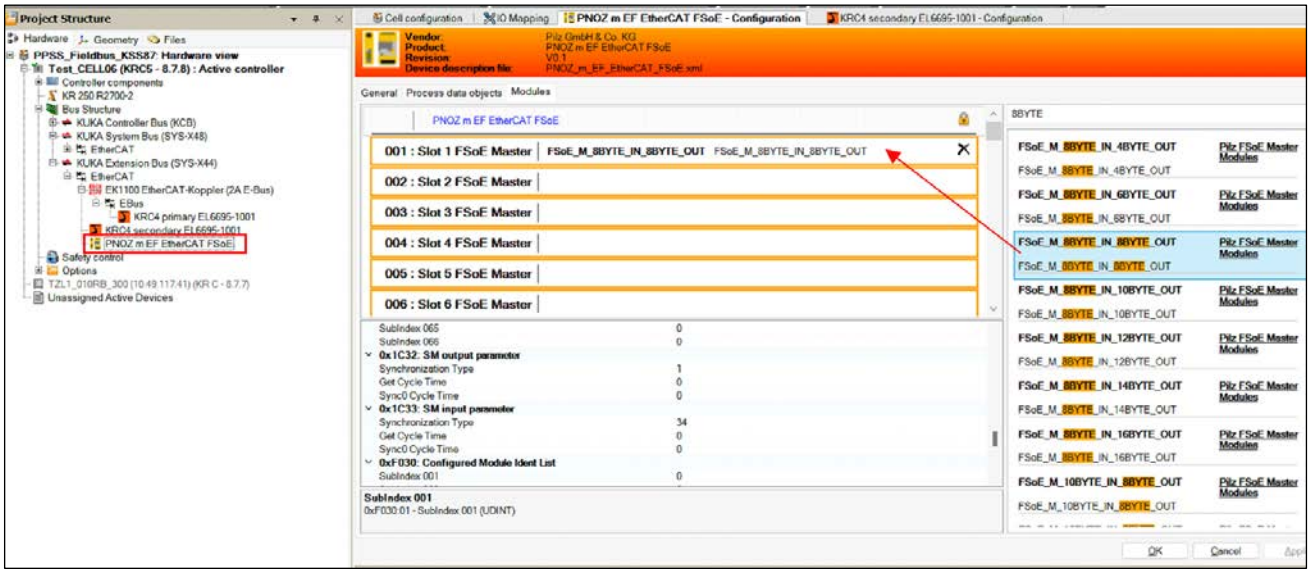


Figure 12: Modules PNOZ m EF EtherCAT FSoE

- For simpler IO mapping, all 6 SafeOutputX and 6 SafeInputX BYTEs must be split into BITs on PNOZ m EF EtherCAT FSoE module 1.

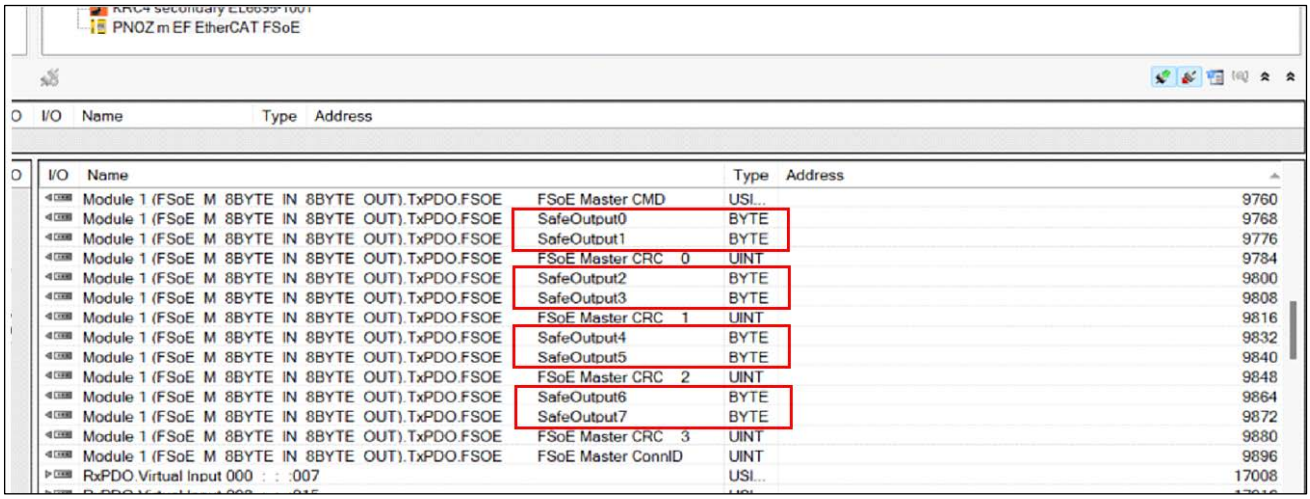


Figure 13: Splitting SafeOut and SafeIn Bytes into Bits

- Splitting is achieved via the signal editor (select PNOZ m EF EtherCAT FSoE on the **right-hand side**).

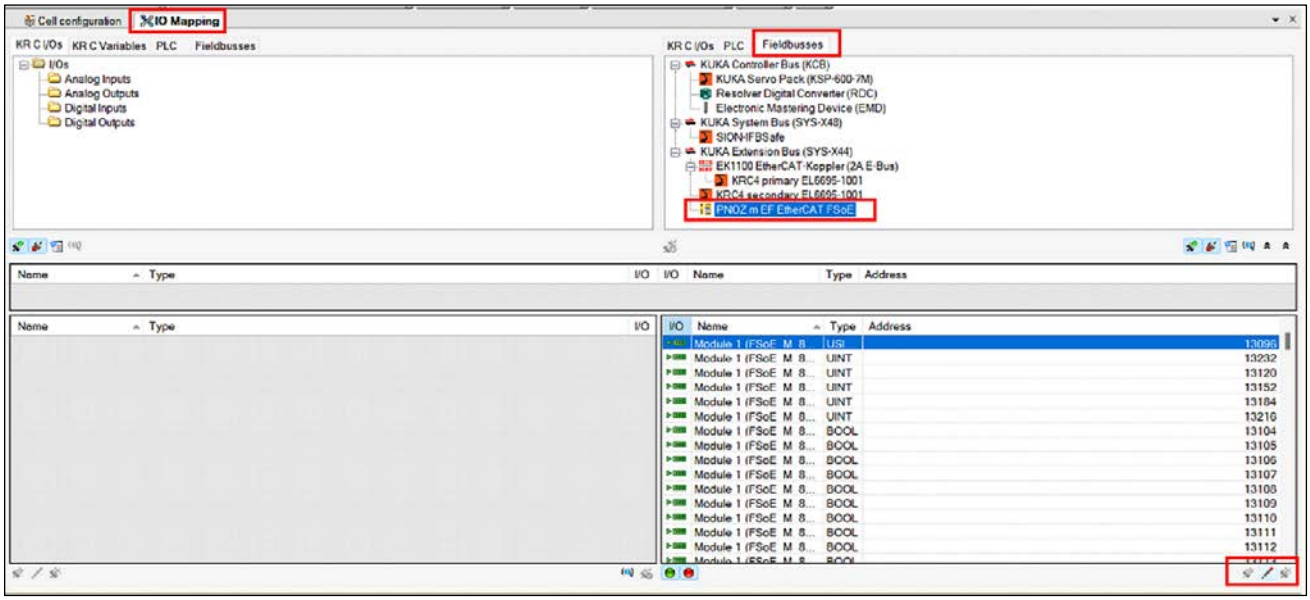


Figure 14: Signal selection

- Right mouse button → "Split Signal"

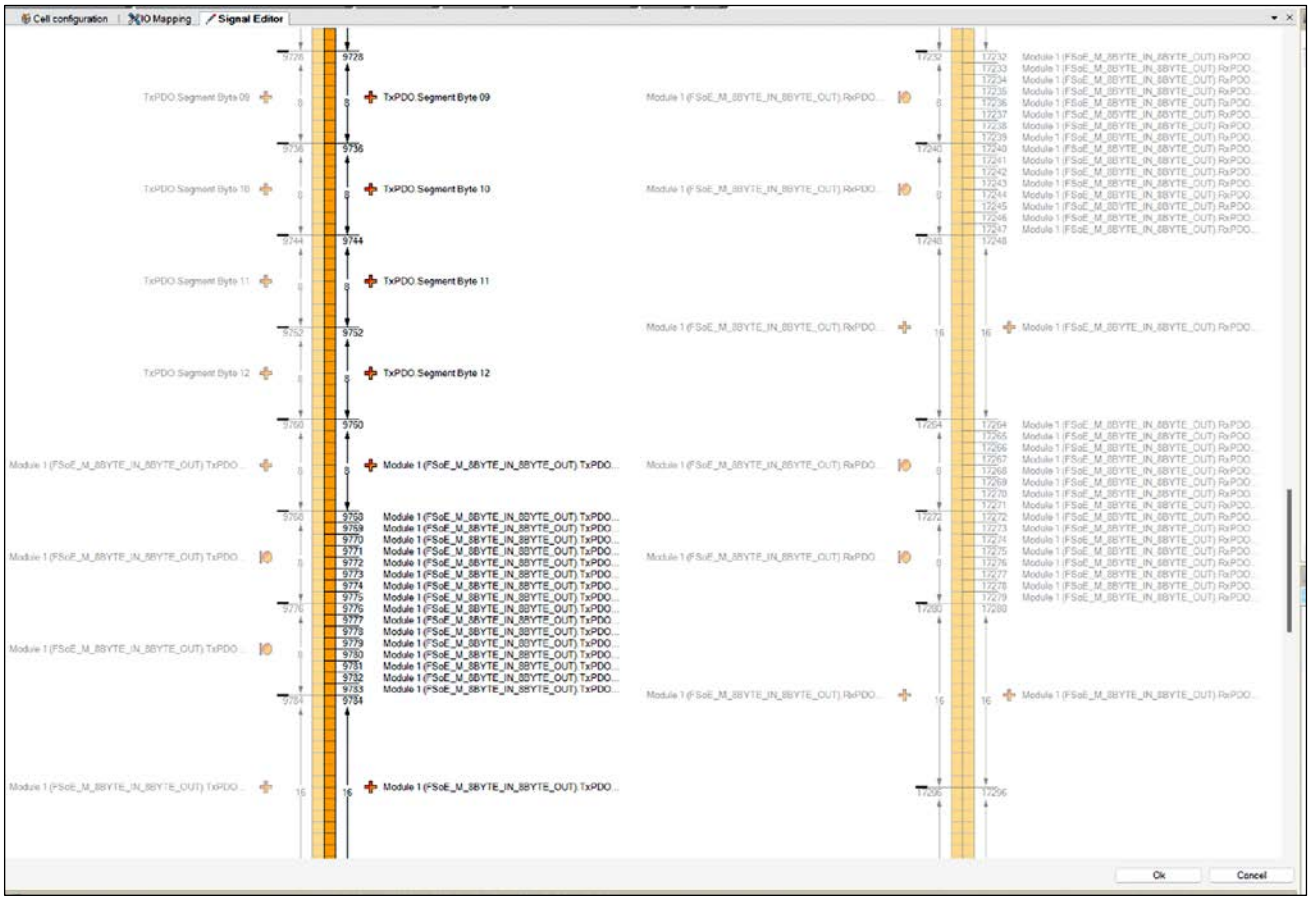


Figure 15: Signal editor

- Connect fieldbus inputs and outputs of KRC4 secondary EL6695-1001 and PNOZ m EF EtherCAT FSoE via "IO mapping".
- Selection left KRC4 secondary EL6695-1001 / right PNOZ m EF EtherCAT FSoE.
- Sort via the "Address" column, so that the signals are in the correct order. Then connect one to one.

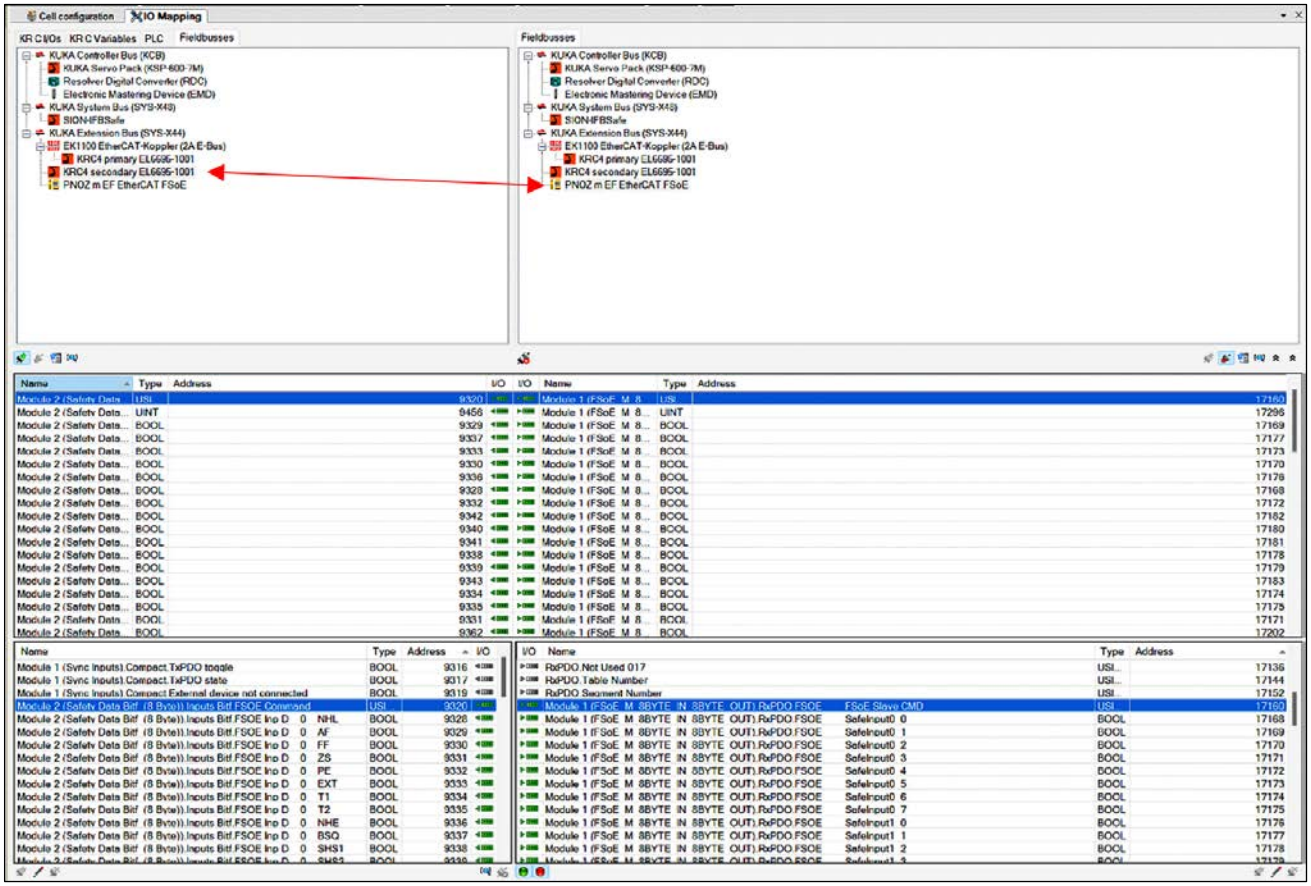


Figure 16: IO mapping KRC4 to PNOZ m

- Selection left PNOZ m EF EtherCAT FSoE / right KRC4 secondary EL6695-1001.
- Sort via the "Address" column, so that the signals are in the correct order. Then connect one to one.

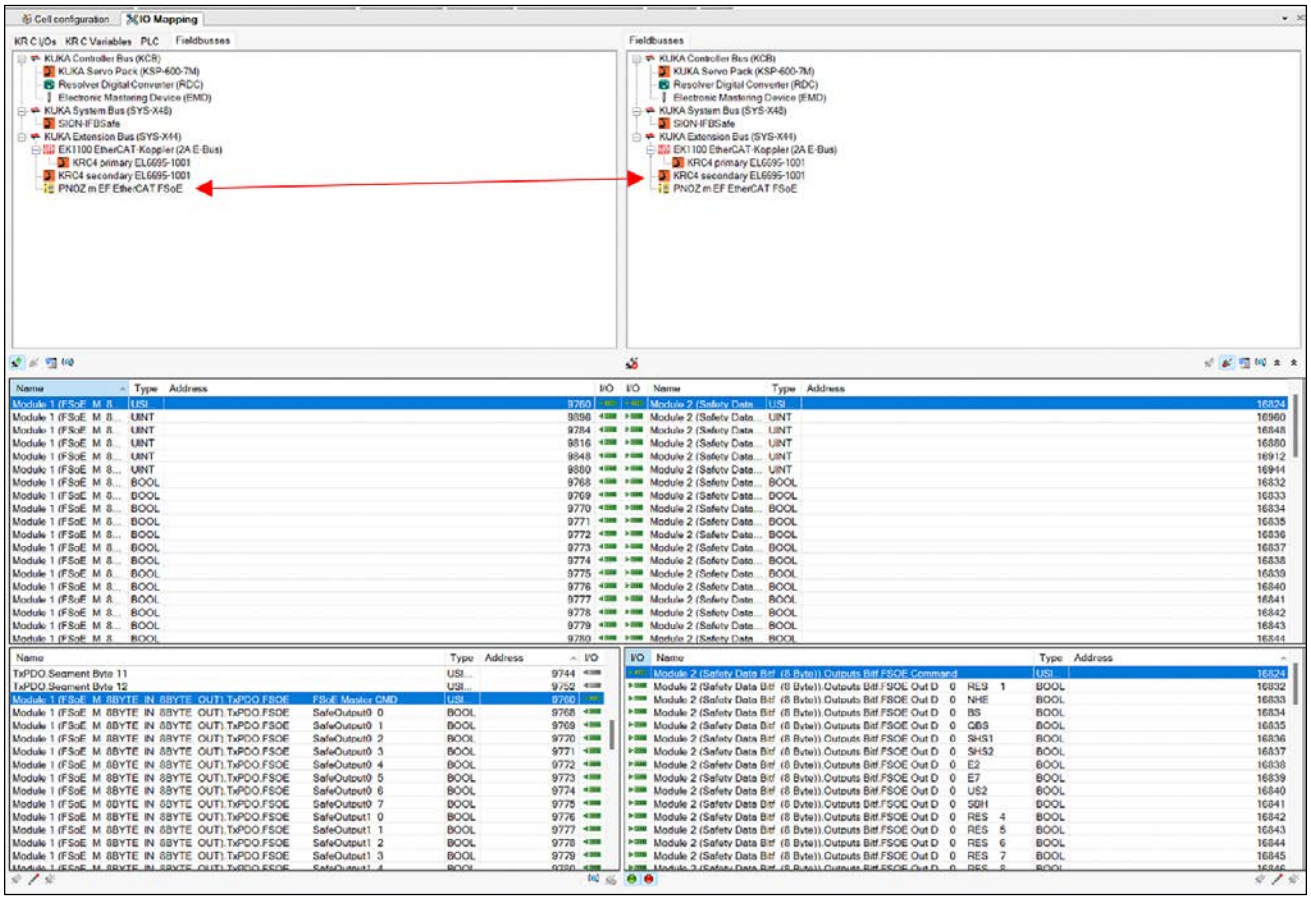


Figure 17: IO mapping PNOZ m to KRC4

6.1.2 Additional configuration with FSoE SubDevice (PSEN rd1)

- Add sensor PSEN rd1 to the KUKA Extension Bus (SYS-X44) after the PNOZ m EF EtherCAT FSoE.

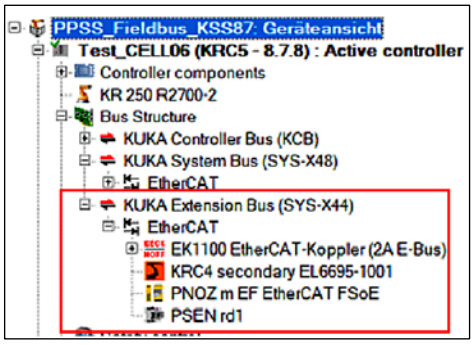


Figure 18: Inserting the safe radar sensor

- No adjustment is normally necessary in the topology.

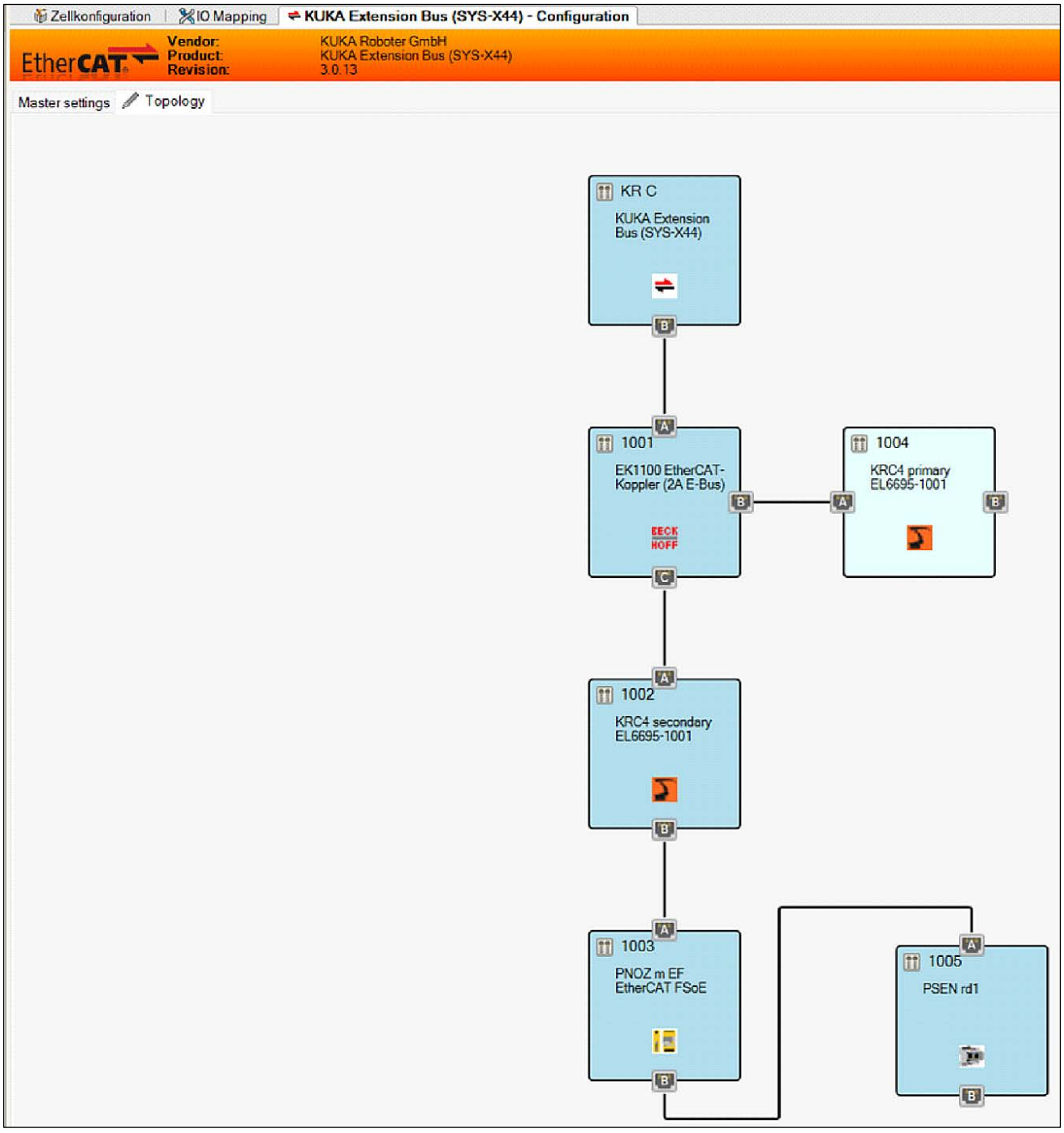


Figure 19: EtherCAT topology

- Vendor ID / Product Code check should be deactivated.

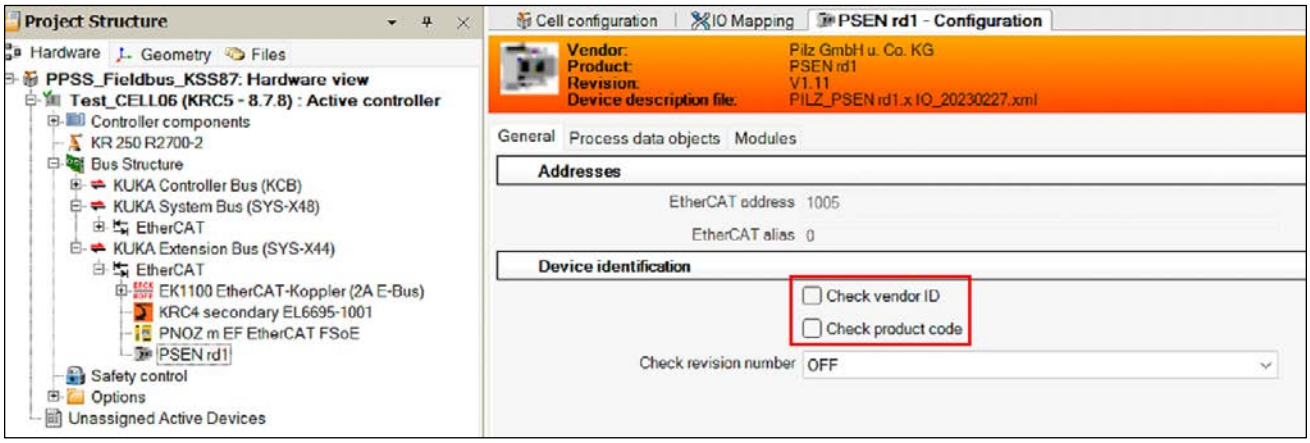


Figure 20: Deactivating device identification

- The settings (size of the IOs) for PNOZ m EF EtherCAT FSoE must match the settings on the PSEN rd1.
- Slot 002: FSoE_M_2BYTE_IN_2BYTE_OUT

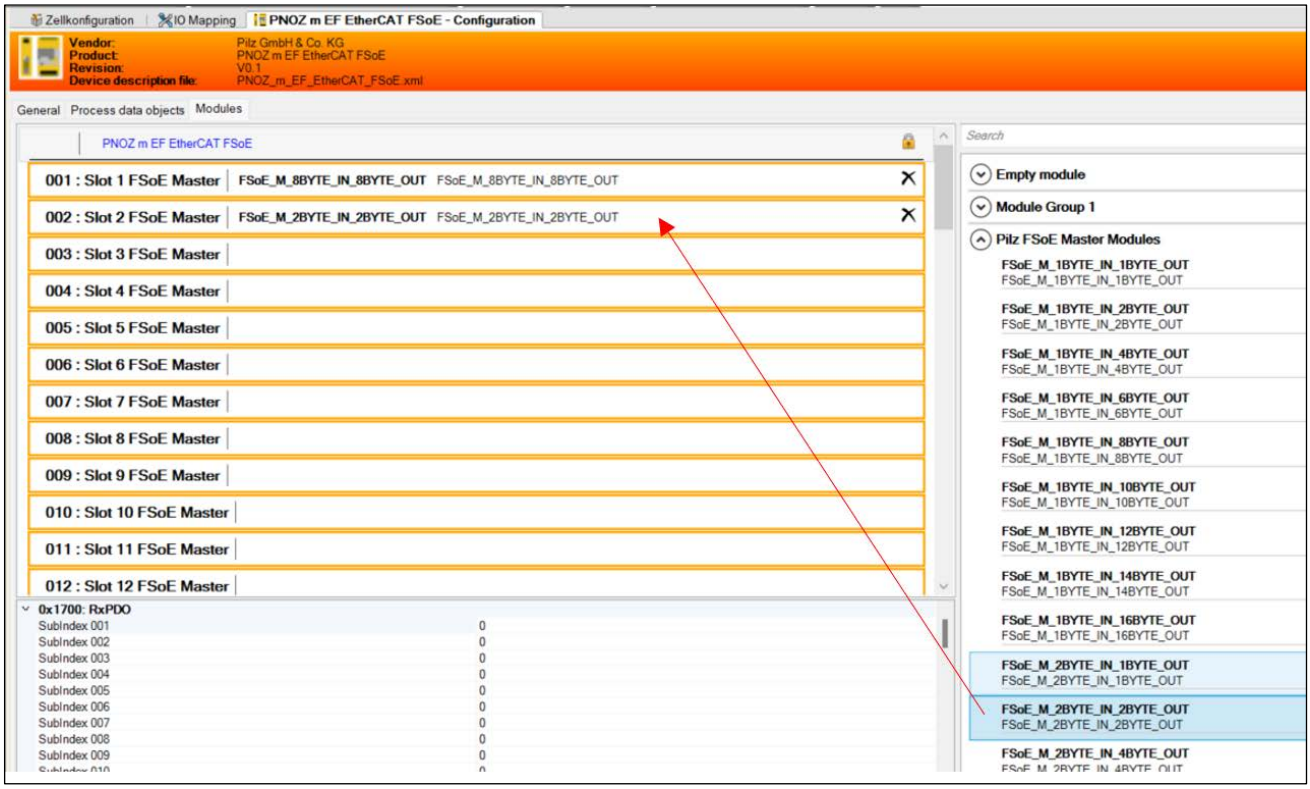


Figure 21: Modules PSEN rd1

- For simpler IO mapping, both SafeOutputX and both SafeInputX BYTEs must be split into BITs on PNOZ m EF EtherCAT FSoE module 2.
- This is achieved via the signal editor.

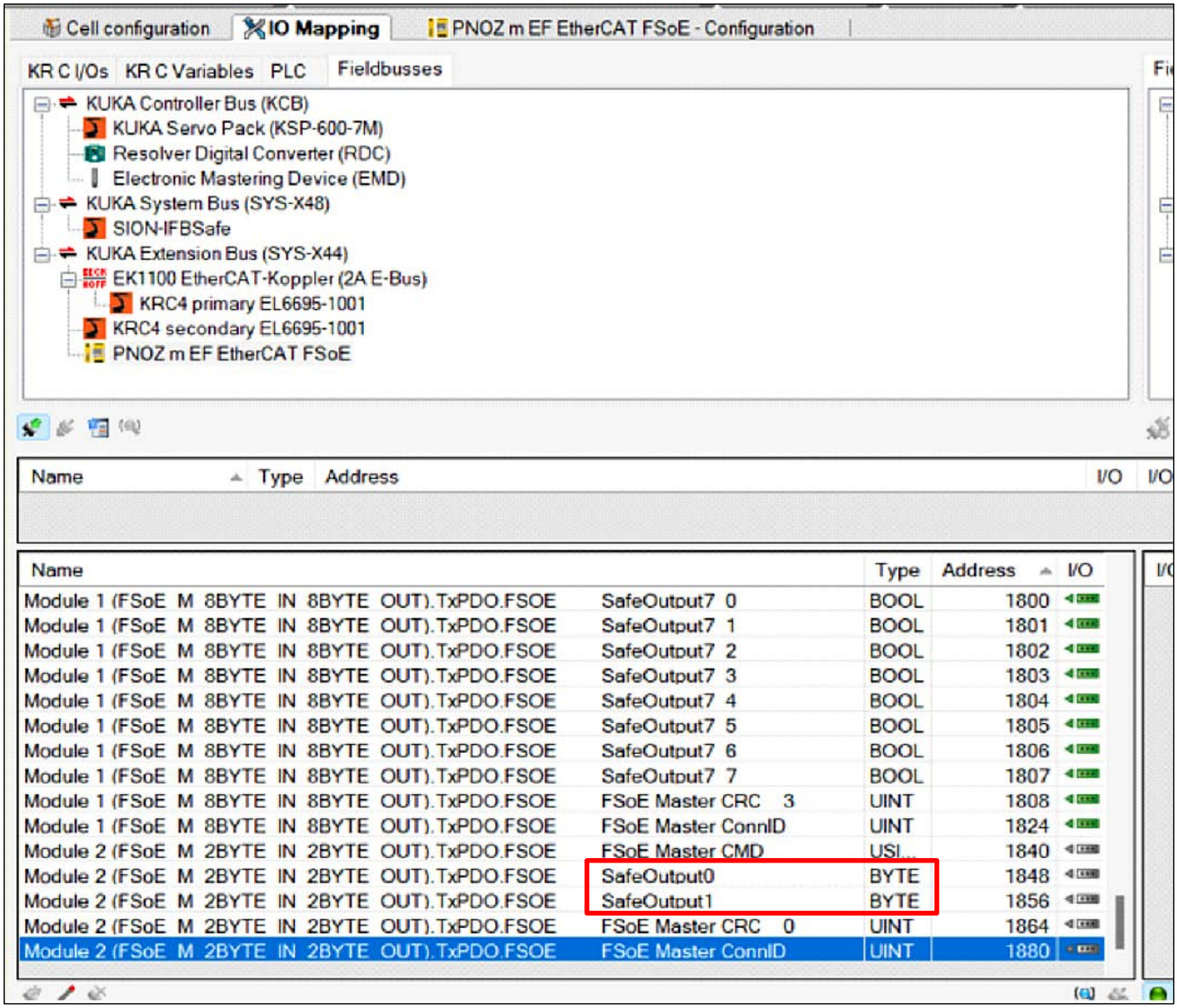


Figure 22: Splitting SafeOut and SafeIn Bytes into Bits

- Connect fieldbus inputs and outputs of PSEN rd1 and PNOZ m EF EtherCAT FSoE via IO mapping.
- Selection left PSEN rd1 / right PNOZ m EF EtherCAT FSoE.
- Sort via the "Address" column, so that the signals are in the correct order. Then connect one to one.

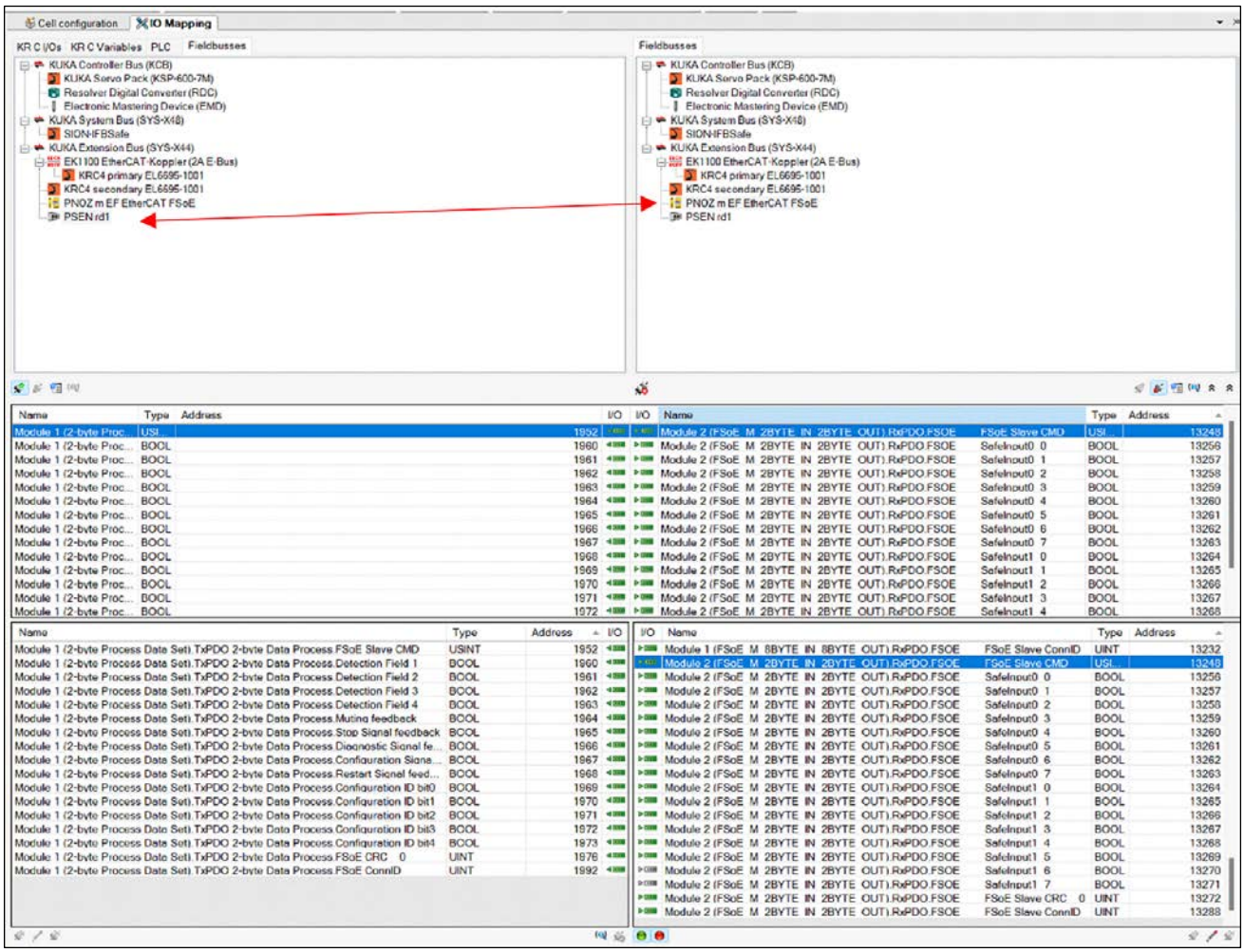


Figure 23: IO mapping PSEN rd1 to PNOZ m

- Selection left PNOZ m EF EtherCAT FSoE / right PSEN rd1.
- Sort via the "Address" column, so that the signals are in the correct order. Then connect one to one.

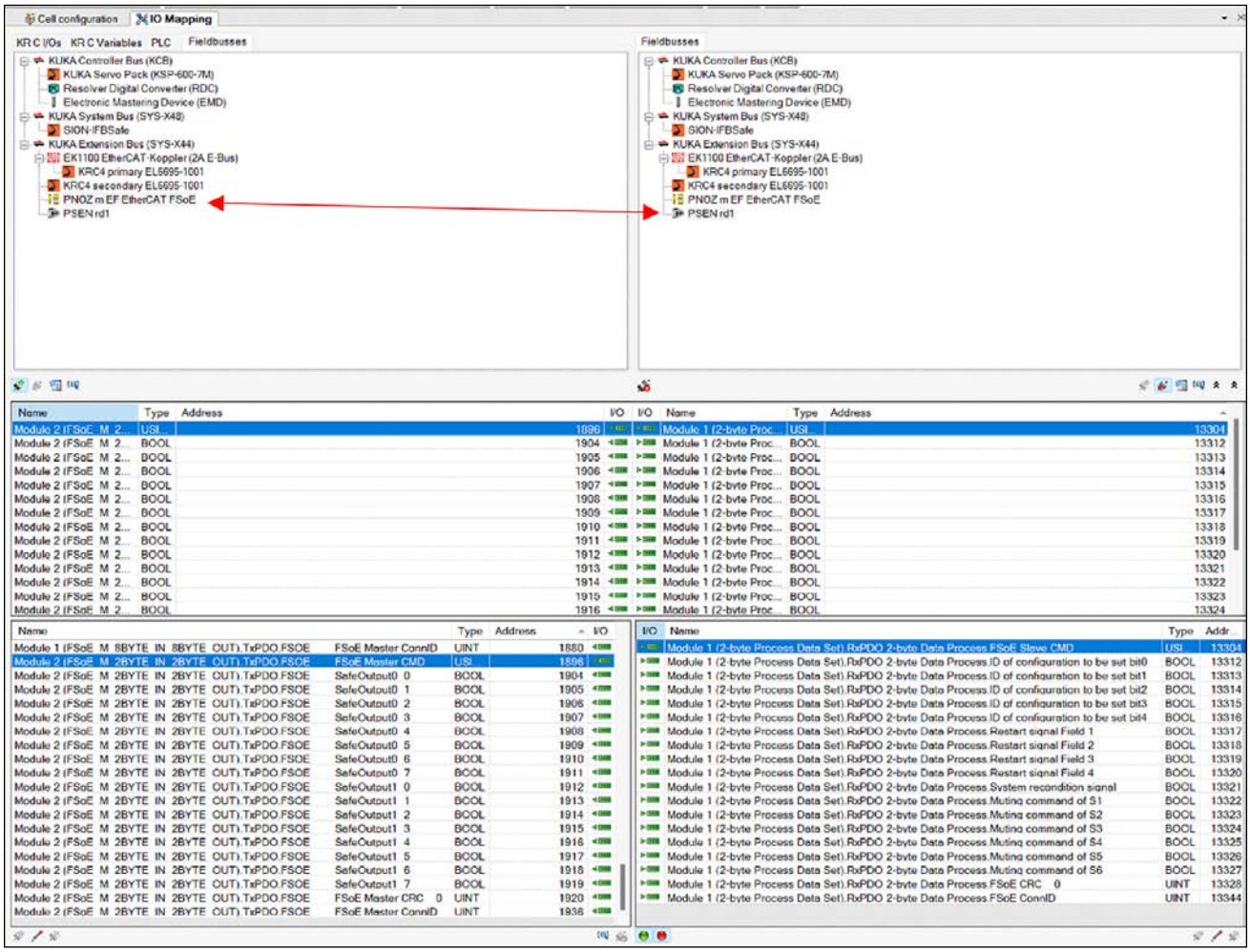


Figure 24: IO mapping PNOZ m to PSEN rd1

6.2 Application with external EtherCAT MDevice

- Right-click on the terminal "KRC4 primary EL6695-1001" and select "Settings..." in the context menu.
- Activate the safe inputs and outputs in the "Process data objects" tab.
- Safety inputs (8 Byte) and safety outputs (8 Byte) must always be ticked at the same time.

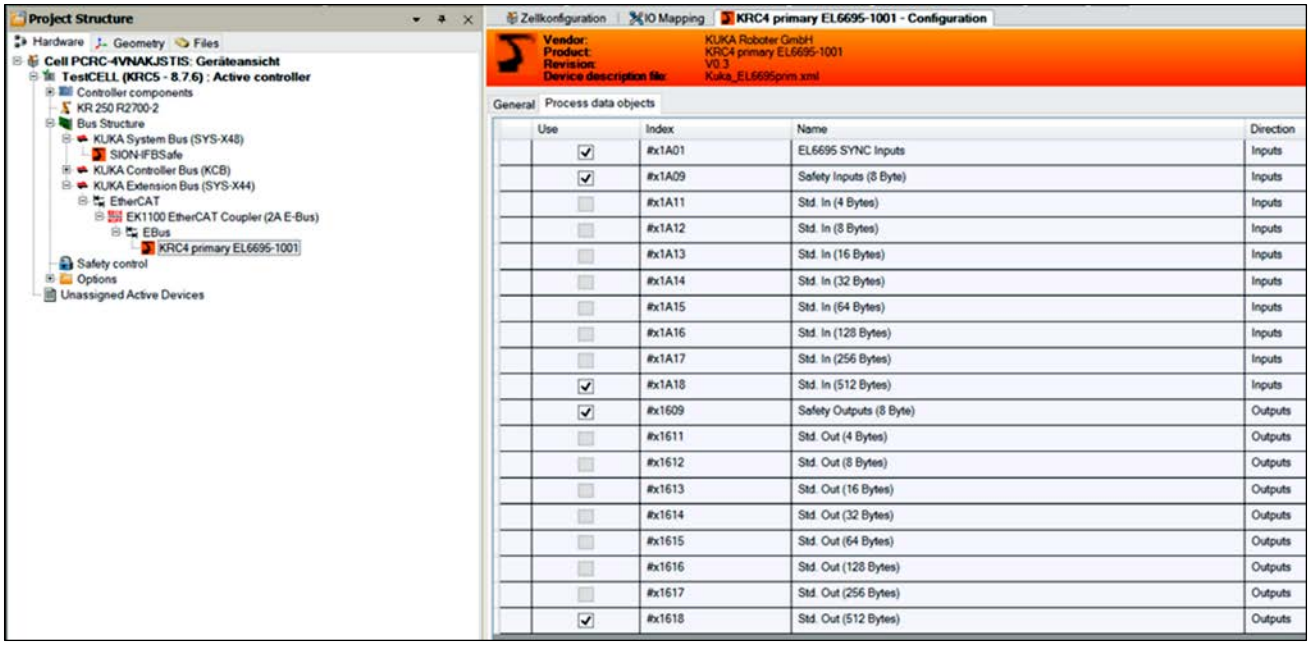


Figure 25: Activation of the safety-related and non-safety-related inputs and outputs

- In the "Safety configuration" (Safety control) tab, select the Communication parameters range and set the FSoE address.
- If more than one FSoE SubInstance is used, the EtherCAT Safety ID (FSoE address) must be changed. This must be unique in the system and must match the partner controller. KUKA recommends setting the FSoE address in the range of 8000-9000. In this case, the FSoE address is - 8504 (see figure below).

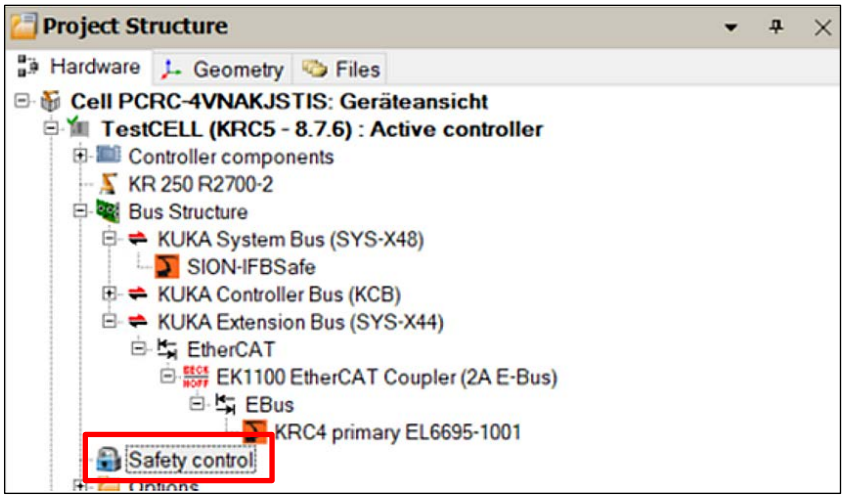


Figure 26: Safety settings

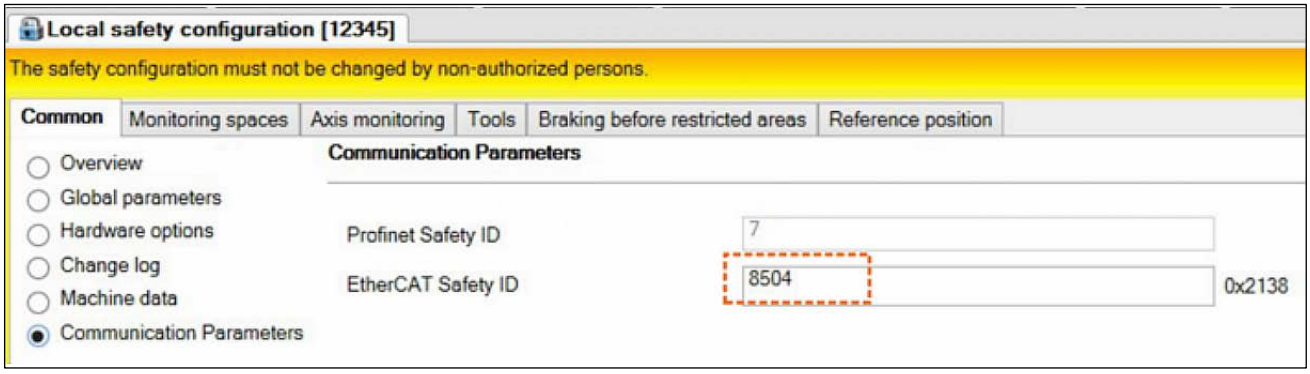


Figure 27: Setting the EtherCAT FSoE address of the KRC4

- Standard FSoE address of the robot controller - **8504**.
- More information on the connection to the robot controller is available in the document KUKA Xpert_SS5081_Guide_EL6695-1001.pdf, see chapter 1.2.

7 Configuration in "PNOZmulti Configurator"

INFORMATION

In this application note, a TwinCAT 3 PLC is used as the MDevice. Alternatively, the procedure with CODESYS V3.5 is also described.

Other MDevices that can read and process ESI files with FSoE elements can also be used.

NOTICE

Only one communication module can be used to the left of the base unit. If the module PNOZ m EF EtherCAT FSoE is inserted, no further communication module can be inserted. Exception: PNOZ m EF SafetyNET

Modbus TCP and TCP/IP can also be used via the integrated ETH interface on the PNOZ m B1.

The module provides standard EtherCAT functionality similar to the PNOZ m ES EtherCAT. For more details, see the documentation for the module PNOZ m EF EtherCAT FSoE.

- Create new PNOZmulti project
- Insert base unit PNOZ m B1, PNOZ m EF EtherCAT FSoE and additional expansion modules on the right if required.

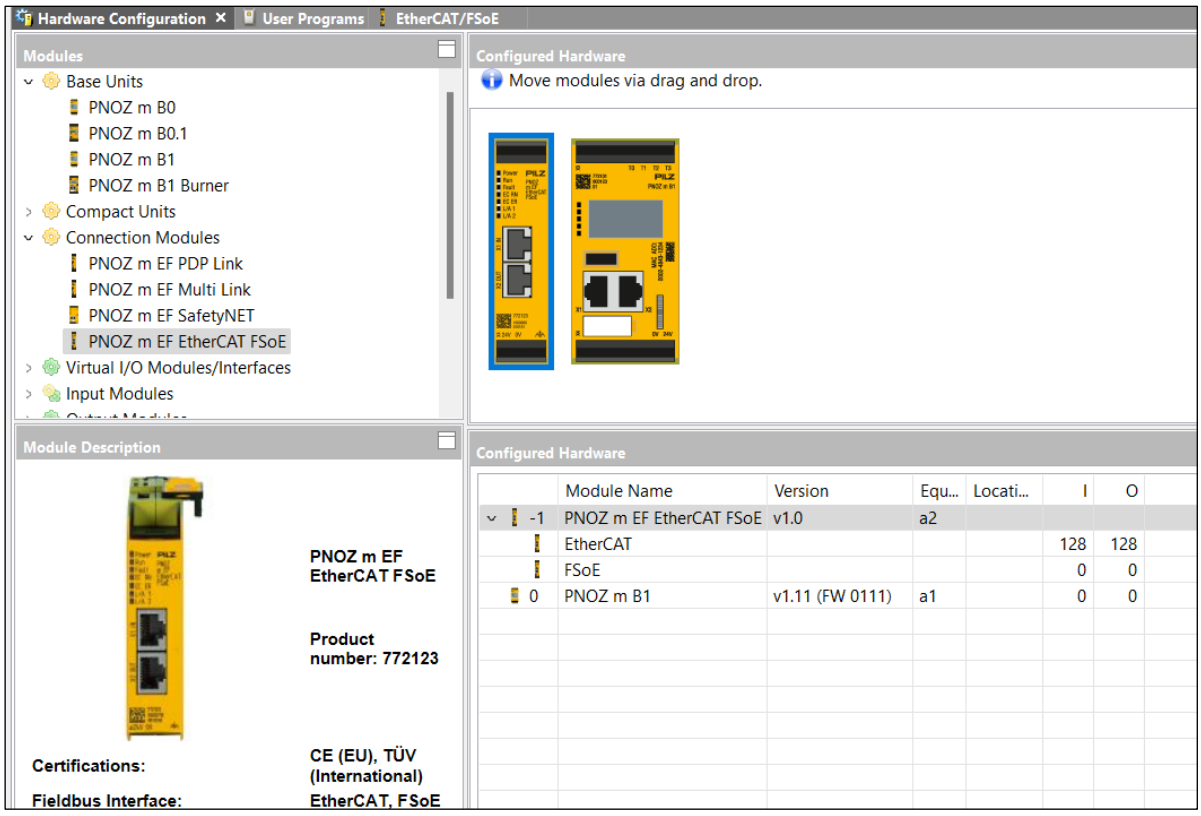


Figure 28: Hardware configuration

7.1 Import ESI files

- An ESI file must be installed for **all** FSoE SubInstances that are to be used.
- Open FSoE configuration, right-click on the module PNOZ m EF EtherCAT FSoE.

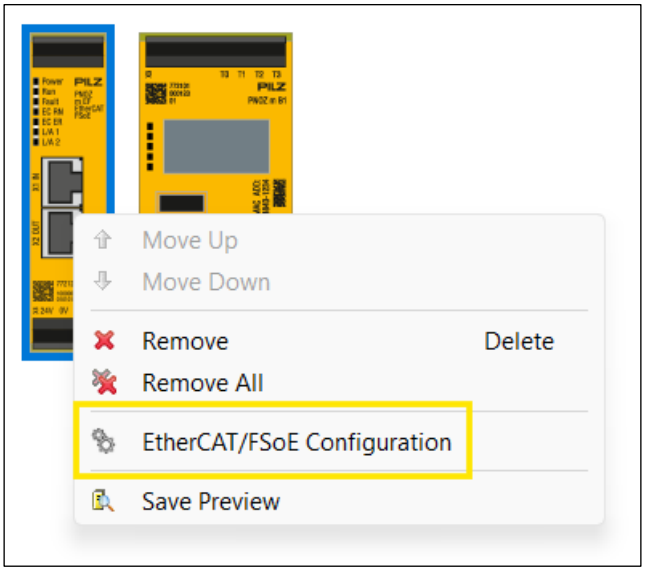


Figure 29: Starting the FSoE configuration

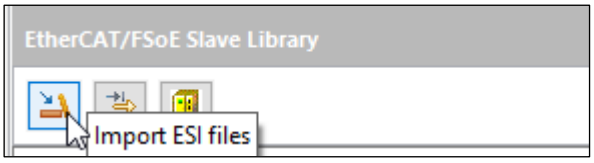


Figure 30: Import ESI file

- Once the ESI file has been imported successfully (provided there is FSoE data containing the BOOL data type), the device appears in the library.

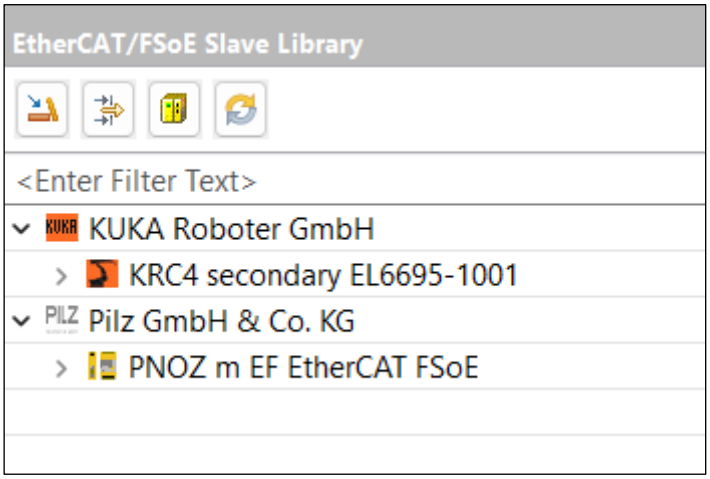


Figure 31: EtherCat/FSoE SubInstance Library

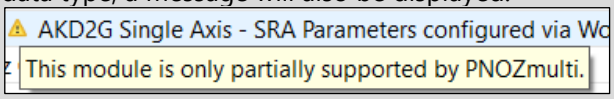
- The imported ESI files are stored in the directory *C:\ProgramData\Pilz\PNOZmulti Configurator_v11.X.X\AppData\Esi Library* and can also be deleted there if required.

7.2 FSoE configuration

- All FSoE SubInstances to which a connection is to be established are selected in the FSoE configuration.
- The FSoE SubInstances that are available after the ESI import are displayed in the library on the right-hand side.
- Devices can be added from the library via drag and drop.

NOTICE

The module PNOZ m EF EtherCAT FSoE only supports the BOOL data type. Only ESI files that contain the BOOL data type are supported. If there is no BOOL data type in the ESI file, it will still be imported, but it will be greyed out and a message will be displayed.
If the ESI file contains at least one variable with the data type BOOL and a non-supported data type, a message will also be displayed.



- In the KUKA ESI file, there are two modules in the library for selection. In this case it is important to use the module "Safety Data Bitf (8 Byte)", ModuleIdent 0x104.

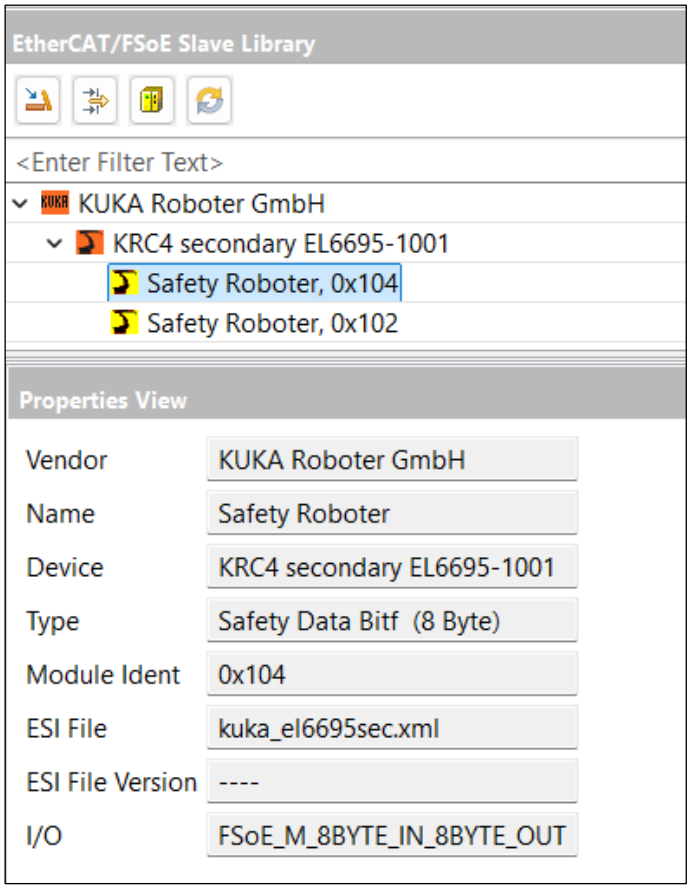


Figure 32: Selecting the safety module

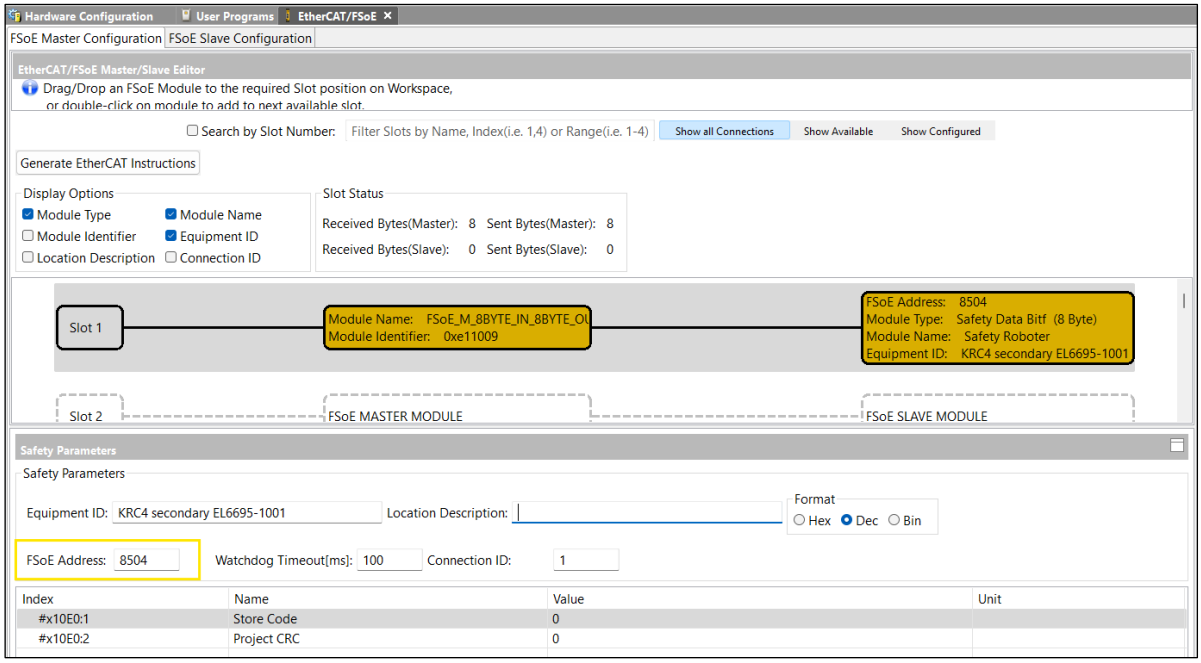


Figure 33: Adding the FSoE connections

- The FSoE address must be entered here and must match the address set on the FSoE SubInstance. The standard FSoE address for the robot controller is 8504 (see Figure 27).
- The FSoE address may only occur once in the EtherCAT network.
- The PNOZmulti Configurator creates the connection ID automatically and checks whether it is used once.
- The watchdog timeout must also be set for each connection. The default value is 100ms

CAUTION!

The EtherCAT cycle time (set in the MDevice) has a direct impact on the watchdog timeout and therefore the reaction times!
Please read the documentation for the module PNOZ m EF EtherCAT FSoE.

8 Configuration of the controllers

8.1 Configuration in "CODESYS V3.5"

INFORMATION

The device description files must be obtained from the manufacturer and imported into the development environments

The device description file for KUKA EtherCAT-Bridge EL6695-1001 with the name Kuka_EL6695sec.xml can be obtained from KUKA.
An ESI file is also required for the module PNOZ m EF EtherCAT FSoE. This can be downloaded from www.pilz.com > 3001165A01.

Information on more detailed processes in CODESYS V3.5 can be found in the CODESYS V3 documentation.

8.1.1 Import ESI file

- The ESI file can be installed in the device repository.

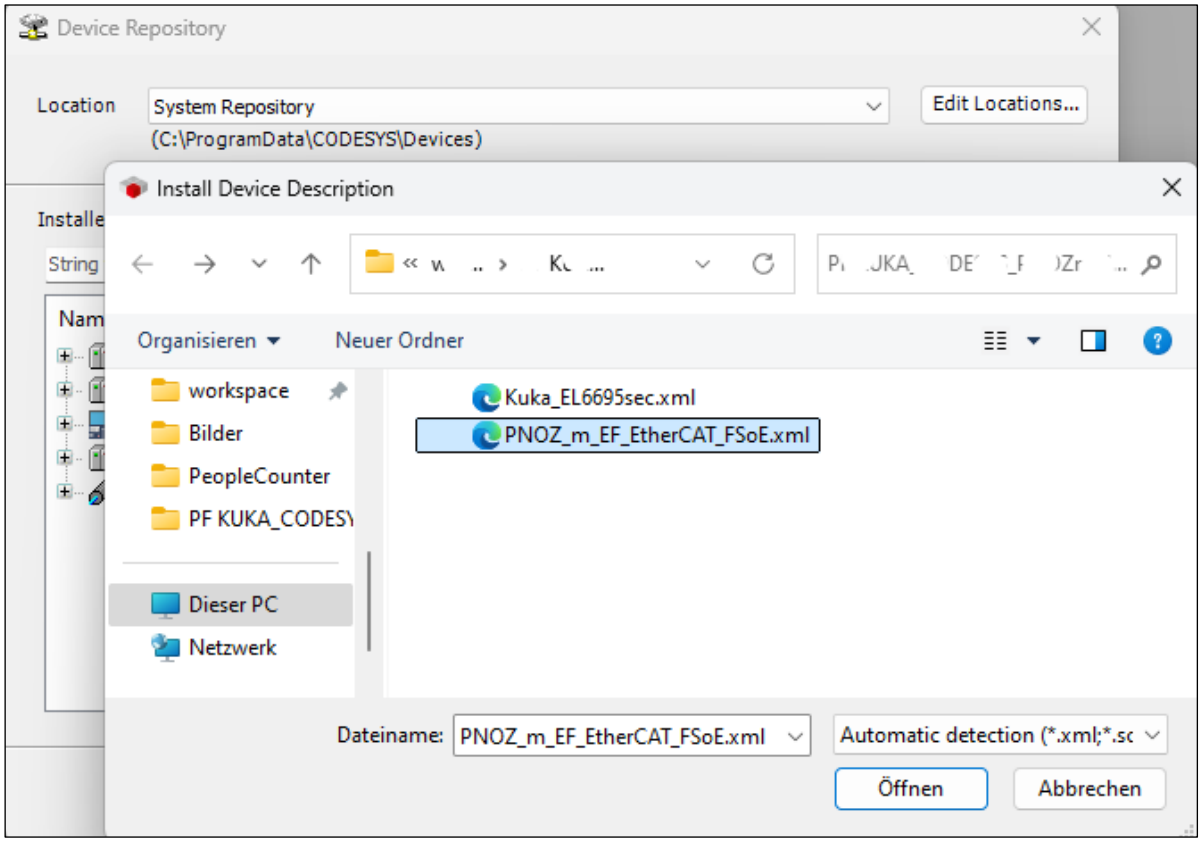


Figure 34: Installing the ESI file

8.1.2 EtherCAT configuration

- All EtherCAT devices in the network must be created in the MDevice.
- The device scan can perform the task automatically, but it is recommended that all the devices are created manually.
- Right-click on Device > "Attach device..." to add the EtherCAT MDevice to the project tree.

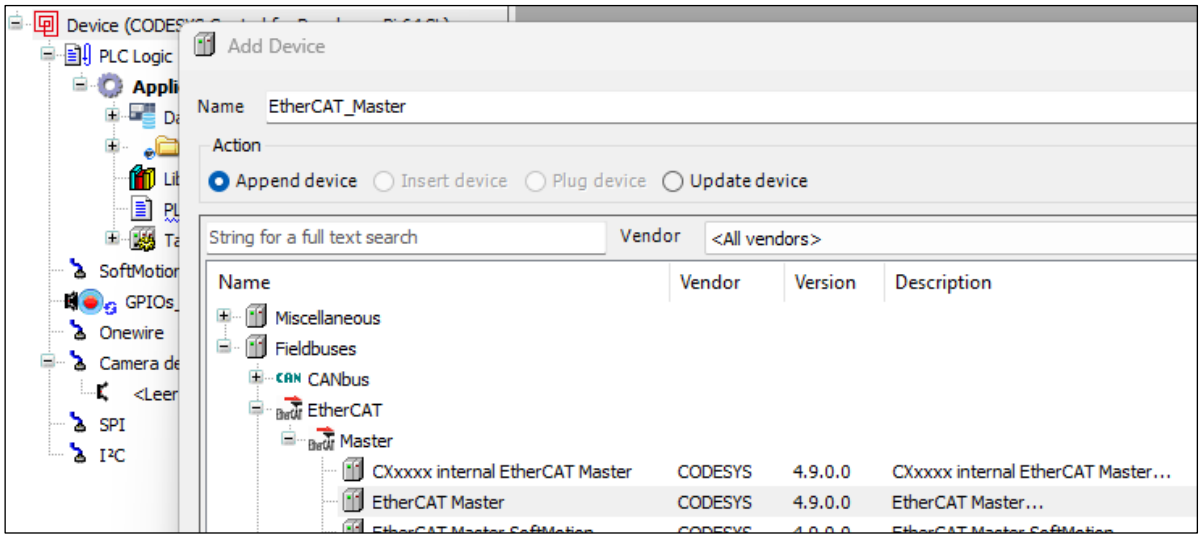


Figure 35: Attaching the MDevice

- Right-click on EtherCAT MDevice > "Attach device..." to add the EtherCAT SubDevices to the project tree.

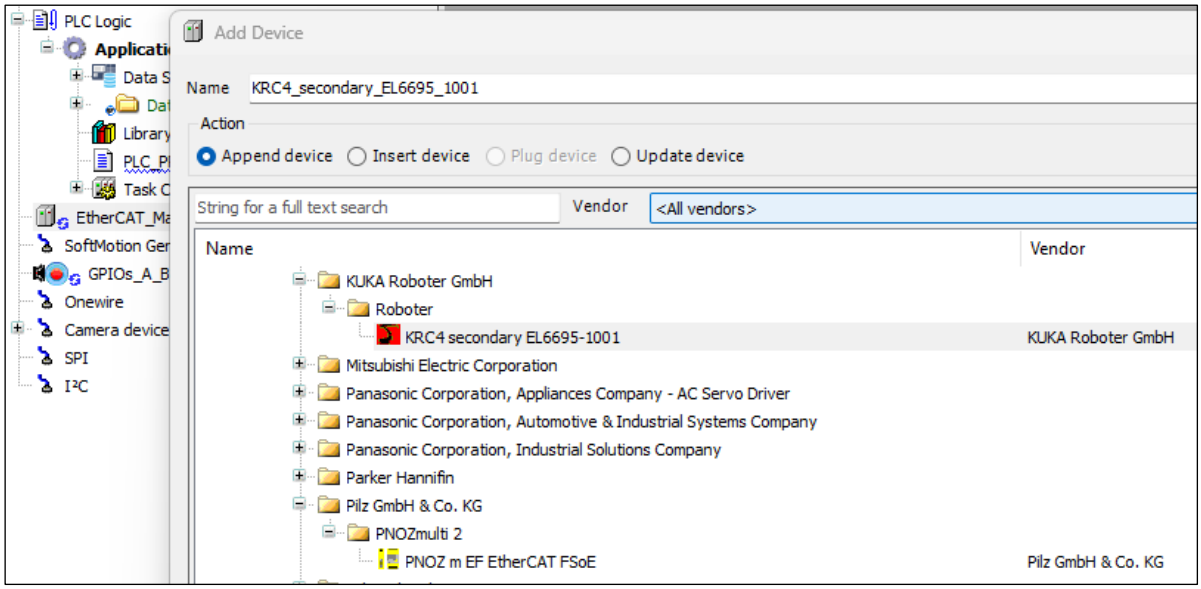


Figure 36: Attaching the SubDevices

8.1.3 Slot configuration

- Once all the EtherCAT subscribers have been configured, the identical configuration to that in the EtherCAT/FSoE tab in the PNOZmulti Configurator must now be created in the Slots tab.
- Make sure that the modules are configured in the same order with the identical length.

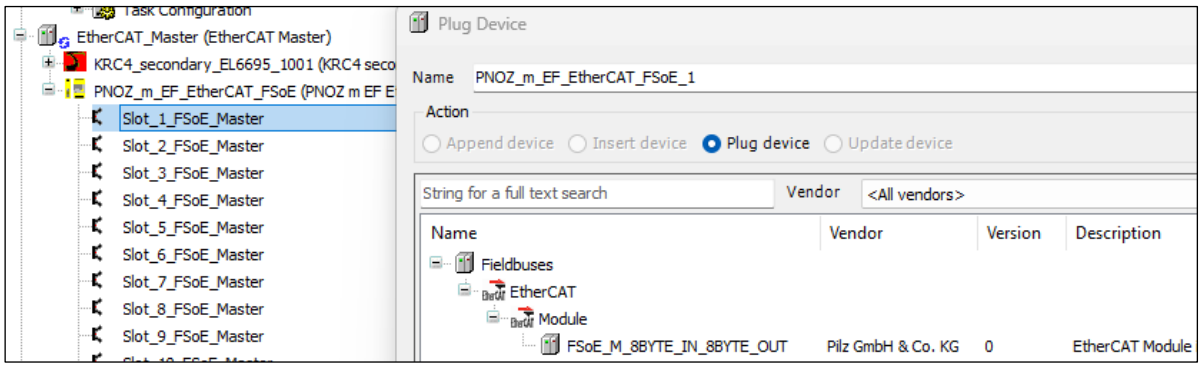


Figure 37: Slot configuration

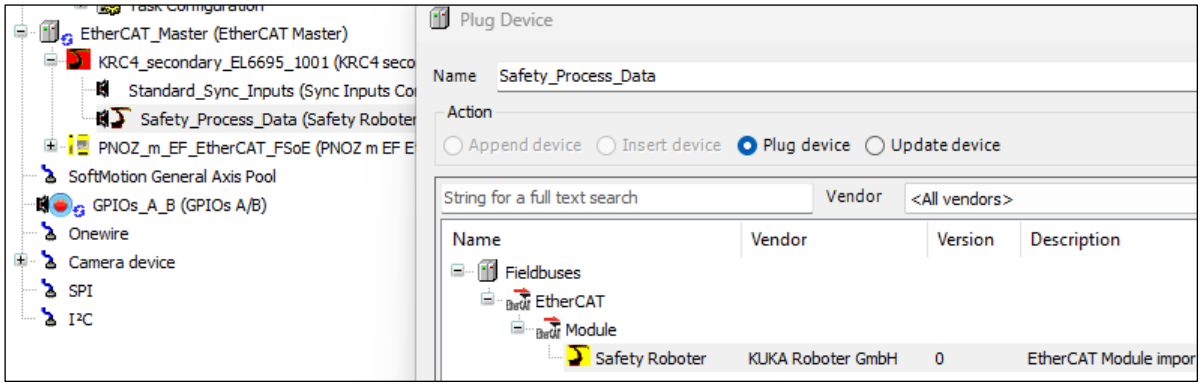


Figure 38: Safety process data, robot

8.1.4 Copying the FSoE data

8.1.4.1 Type 1: Internal CODESYS mapping

- CODESYS version 3.5.20 Patch 4 added a simple, internal type that enables mapping between devices in the EtherCAT network.
- Once the devices in the project have been scanned and created, the EtherCAT Master is called and the "Safety FSoE connections" tab is clicked.
- After that, FSoE SubDevice connections can be selected for all configured FSoE MDevice connections via the drop-down menu.
- These must match the expected process data size for the configured FSoE MDevice connections to be displayed in the drop-down menu. This completes the whole configuration, and the project can be loaded!

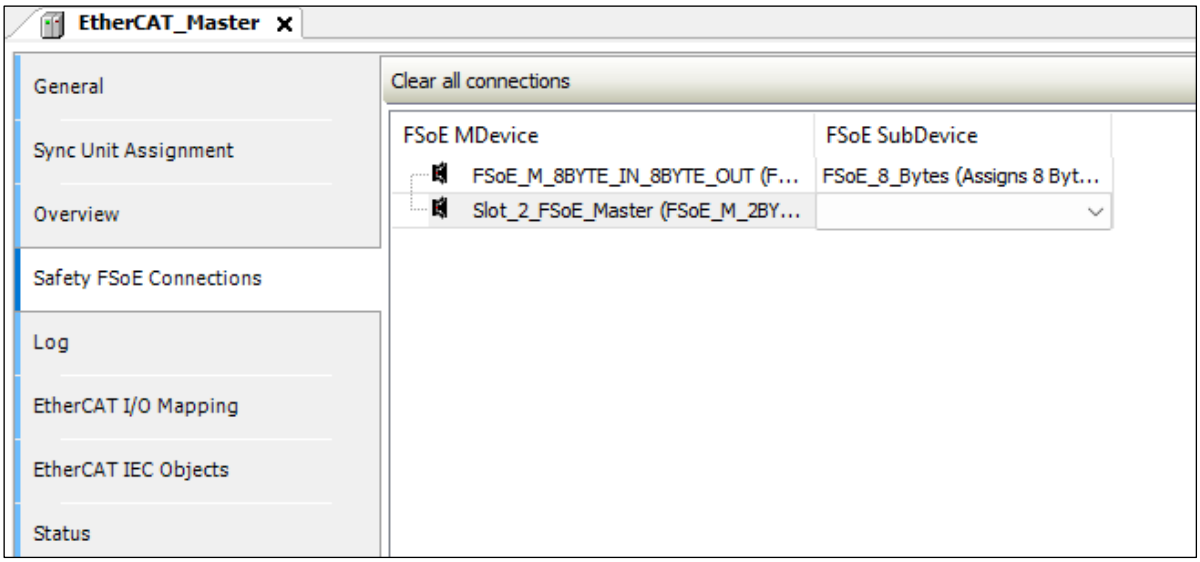


Figure 39: Safety FSoE connections in the EtherCAT Master

- If you now want to read the values of the transferred process data in CODESYS, the desired addresses must be polled in the main task. However, this does not yet work reliably (as of v3.5.20.50) and sometimes data can only be queried on the MDevice (Tx or Rx) or only on the SubDevice (Tx or Rx).

8.1.4.2 Type 2: CODESYS addresses

- For CODESYS versions prior to 3.5.20 Patch 4, this type can be used for mapping.

- For the FSoE MInstance to receive the data from the FSoE SubInstances, a mapping must be created for these in CODESYS.
- With CODESYS, this is achieved via the user program.
- Addresses can be read from the "Module I/O image" of the individual components. This is displayed by double-clicking on the respective FS module under the "Module I/O image" tab.
- The important addresses here are always the CMD addresses, as they indicate the start of an FSoE frame. This must be carried out for all SubDevices.

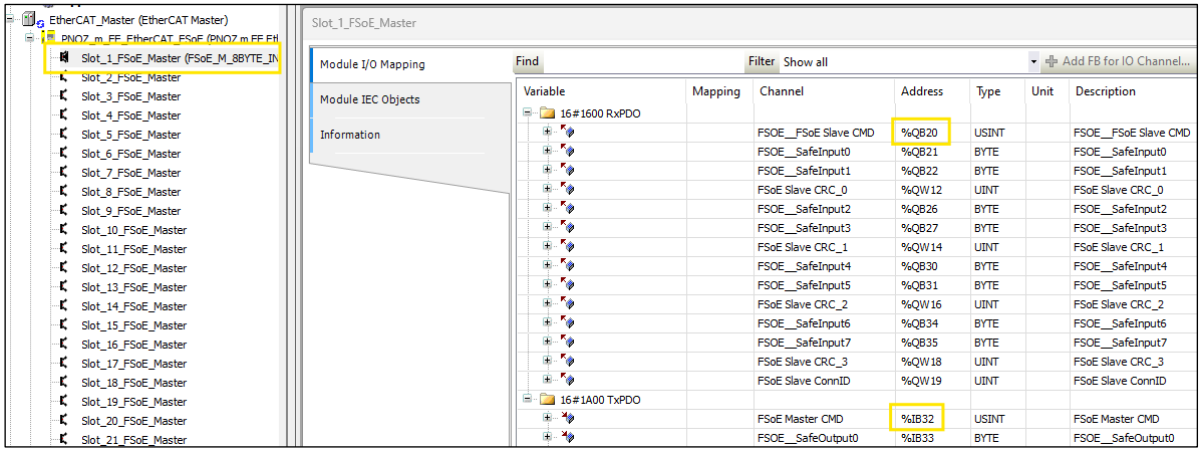


Figure 40: I/O image PNOZ m FSoE MainInstance

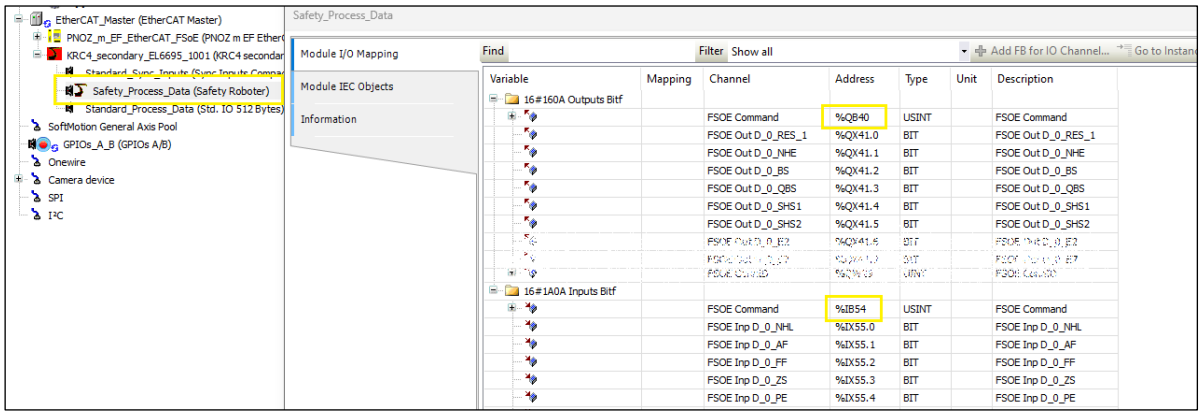


Figure 41: I/O image addresses KUKA KRC4 SubInstance

- Example of copying the FSoE I/O data with the I/O addresses read out above:

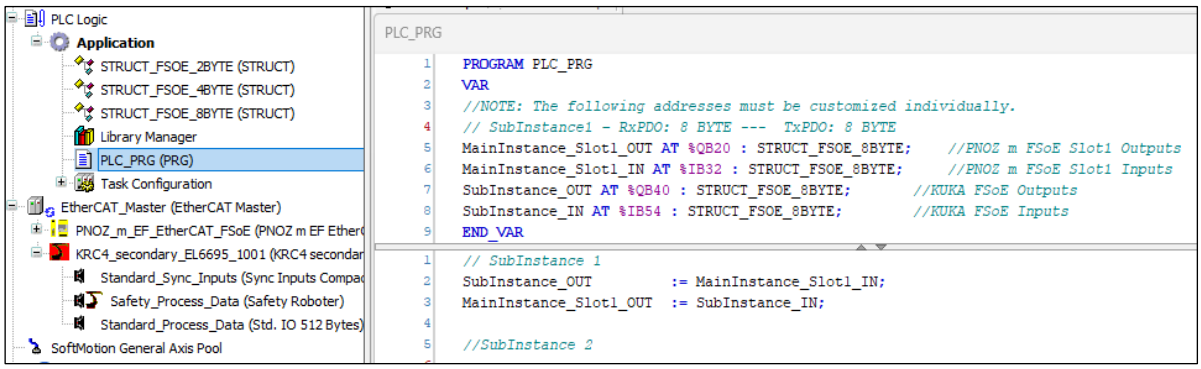


Figure 42: Copying the FSoE I/O data

- More information on the configuration and diagnostics of the module PNOZm EF EtherCAT FSoE can be found in the application note "PNOZ m EF EtherCAT FSoE with TwinCAT 3 and CODESYS 3.5", number 1006828.
- Link [www.pilz.com > AN 1006828]

8.2 Configuration in "TwinCAT"

INFORMATION

The device description files must be obtained from the manufacturer and imported into the development environments

The device description file for KUKA EtherCAT-Bridge EL6695-1001 with the name Kuka_EL6695sec.xml can be obtained from KUKA.
An ESI file is also required for the module PNOZ m EF EtherCAT FSoE. This can be downloaded from www.pilz.com > 3001165A01.

Information on processes in TwinCAT 3 can be found in the TwinCAT 3 documentation.

8.2.1 Import ESI files

- An ESI file must be installed for all FSoE SubInstances that are to be used.
- All ESI files must be copied to the TwinCAT directory, the default path is: *C:\Program Files (x86)\Beckhoff\TwinCAT\3.1\Config\Io\EtherCAT*
- After inserting an ESI file, TwinCAT must be restarted or updated via the menu: *TwinCAT – EtherCAT Devices – Reload Device Descriptions*
- In the EtherCAT Device window, expand the tree "KUKA Roboter GmbH>Roboter" and select the terminals "KRC4 secondary EL6695-1001" and then under "PILZ GmbH & Co. KG > PNOZmulti 2" select "PNOZm EF EtherCAT FSoE".
- Scanning and using the online data is not recommended, as this can lead to problems with the configuration.

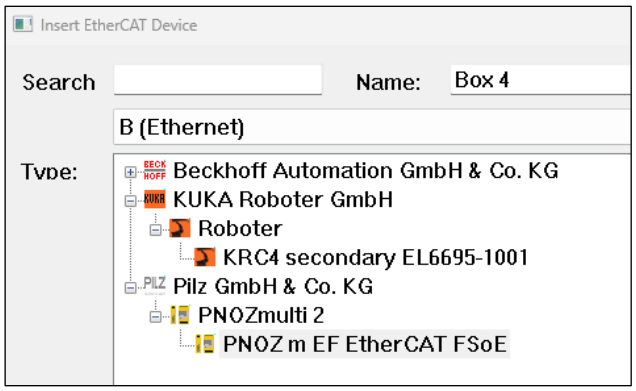


Figure 43: Insert EtherCAT SubDevice

8.2.2 Slot configuration EL6695-1001

- Double-click to open the properties of the terminal and select the Slots tab.

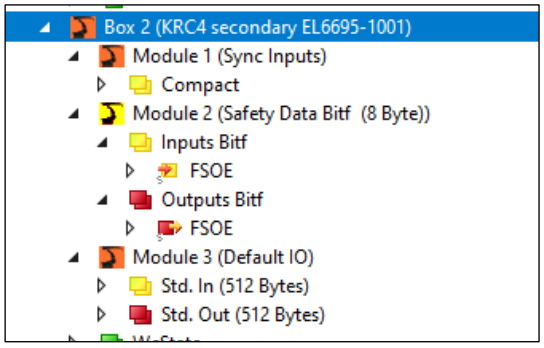


Figure 44: Safety and standard inputs and outputs

- Select the Safety Process Data slot. This sends the secure signals and is active by default.
- In the new ESI, there are two modules to choose from for the "Safety Process Data" slot. In this case it is important to use the module "Safety Data Bitf (8 Byte)", ModulIdent 0x00000104.
- The safe inputs and outputs are displayed bit by bit on the secondary side. Each bit also has an abbreviation for the function. The abbreviation is based on the documentation. This enables simpler wiring, as the function of each individual input and output is made clear.

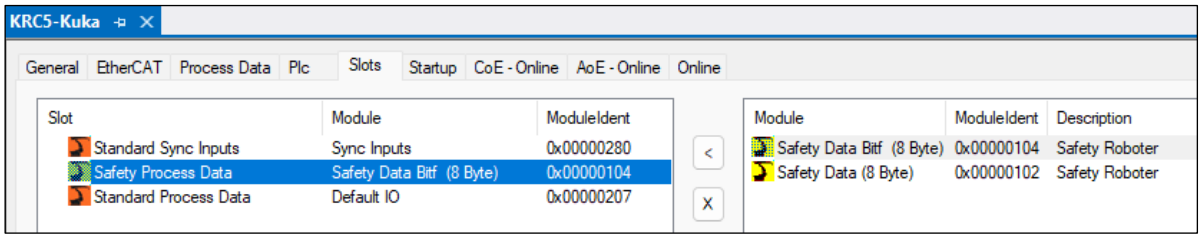


Figure 45: EL6695 Safety Process Data slot

- The module "FSoE_M_8BYTE_IN_8BYTE_OUT", ModulIdent 0x00E11099 must be used in this case, so that the slot configuration on the PNOZ m EF EtherCAT FSoE matches the configuration on the EL6695-1001.

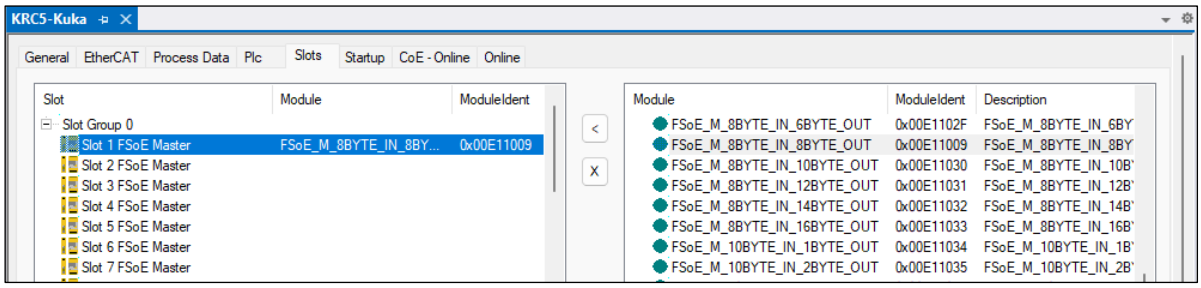


Figure 46: PNOZm EF EtherCAT FSoE Safety Process Data slot

8.2.3 Mapping the FSoE data

- In order for the FSoE MInstance to receive the data from the FSoE SubInstances, a mapping must be created for these in TwinCAT.

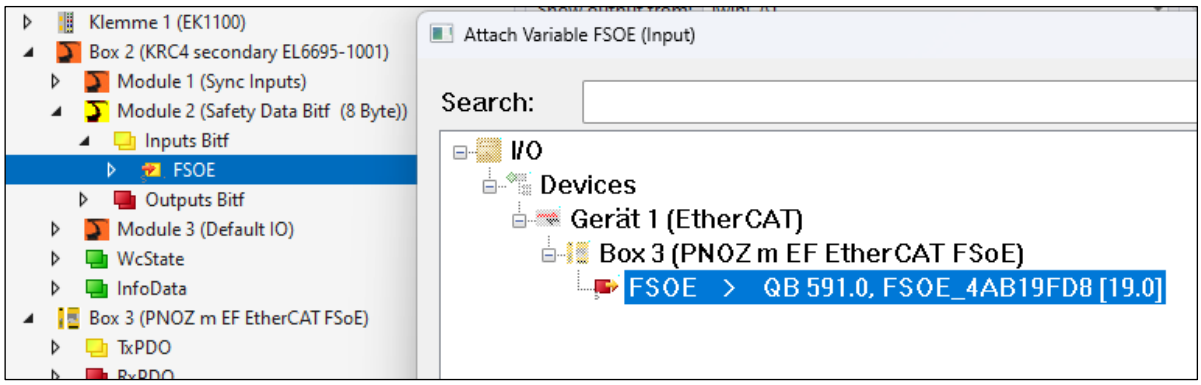


Figure 47: Variable linking of the FSoE data

9 Table of figures

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