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1. About this document

1.1. Version

Version	Date	Change/addition	Chapter
01-06/26	06/2026	Prepared	All

1.2. Scope

This application describes the integration and configuration of the Electronic-Key-System EKS2 (hereinafter abbreviated to EKS2) with PROFINET-IO interface in SIEMENS TIA Portal from version 19.

1.3. Target group

Design engineers and installation planners for safety devices on machines as well as setup and servicing staff possessing the following expertise:

- specialist knowledge in handling safety components
- expertise in the installation, setup, programming and diagnostics of programmable logic controllers (PLC) and bus systems
- knowledge about the applicable EMC regulations
- knowledge about the applicable regulations on operational safety and accident prevention.

1.4. Supplementary documents

The overall documentation for this application consists of the following documents:

Document title (document number)	Contents	
Operating instructions (MAN20001715)	Transponder-coded Electronic-Key-System EKS2	
Possibly enclosed data sheets	Item-specific information about deviations or additions	

1.5. Notice

This document is based on the operating instructions for the EKS2. You can refer to the operating instructions for technical details and more information.

2. Components/modules used

2.1. EUCHNER

Description	Order number / item
Evaluation unit/read unit EKS2	170904 / EKS2-E-PN-MH1-170904
	170915 / EKS2-R-I1A1-B1-170915
Electronic-Key EKS2	168433 / EKS2-K-K-B-D2-BK-168433
	168434 / EKS2-K-K-B-D2-BU-168434
	168435 / EKS2-K-K-B-D2-GN-168435
	168438 / EKS2-K-K-B-D2-OG-168438
	168432 / EKS2-K-K-B-D2-RD-168432
	168437 / EKS2-K-K-B-D2-WH-168437
	168436 / EKS2-K-K-B-D2-YE-168436



TIP!

More information and downloads for the aforementioned EUCHNER products can be found at www.euchner.com. Simply enter the order number in the search box.

2.2. Others

Description	Order number / item
SIMATIC ET200SP, CPU 1512SP F-1 PN	6ES7 512-1SK01-0AB0

2.3. Software

Description	Version
Totally Integrated Automation Portal	Version V19 Update 3
STEP 7 Professional	Version V19 Update 3

3. Functional description

3.1. General

This application supports integration of the EKS2. The description covers hardware integration, as well as integration and use of the optional software library for data preparation.

The EKS2 operates as an IO device on the PROFINET network.

The EKS2 operating instructions contain the communication data.

4. PROFINET configuration

The EKS2 exchanges the data in the PROFINET environment via data blocks with the associated communication data. The configuration software uses the GSDML file for configuration and parameterization of the required modules.

4.1. Installing GSDML file

1. Download GSDML file from the Download area at www.euchner.com.
2. In *Options*, select the *Manage general station description files* function.
3. Install the latest GSDML file.

4.2. Integrating evaluation unit EKS2

1. In the *Hardware catalog*, in *Other field devices*, select evaluation unit EKS2.
2. Using drag & drop, drag the evaluation unit to the network view and connect to the control system.
3. Select the evaluation unit by double-clicking it to configure the parameters.
➡ The *Device View* opens.
4. The following parameters can be specified:
 - Name of the device in *General*
 - IP address in *PROFINET interface/Ethernet addresses*
5. Assign device name to the EKS2.

4.3. Modules and submodules

The following modules are available and are either already included in the GSDML for the evaluation unit as a standard configuration or, optionally, can be added:

Module	Parameter [default value]	Description	Slot	
EKS2 Diagnose Basic	Alarm setting: Activated/Deactivated [Deactivated] Data format setting: Little/Big Endian [Big Endian]	- Reading status messages - Parameterizing the alarms - Parameterizing the data format	1	
EKS2 Diagnose Extended	Alarm setting: Activated/Deactivated [Deactivated] Data format setting: Little/Big Endian [Big Endian]	- Reading status and diagnostic messages - Parameterizing the alarms - Parameterizing the data format	1	
Read: Transponder UID Standard mode with 8 bytes		- Activating standard mode, see operating instructions - Reading the transponder's unique serial number (UID)	2	
Read: Transponder UID-only mode with 8 bytes		- Activating UID-only mode, see operating instructions - Reading the transponder's unique serial number (UID) - Selection of operating mode not possible	2	
Read: EU001 Base Module	Automatic data evaluation: Yes/No [Yes]	Activating automatic data evaluation	3	3.1
	Company: [0] Plant: [0] Department: [0]	These fields are evaluated one after the other as a hierarchy.		
	Cost center: 1 - 5 [0]	These fields are combined with an OR operator.		
	Exception value: 1, 2 [0]	The values in these fields are superordinate to the other fields in the evaluation.		
	Use expiry date: Yes/No [No]	- Internal evaluation of the transponder's expiry date - The current date additionally must be defined in the control system and sent to the evaluation unit via an acyclical command.		
	Automatic Electronic-Key management: Activated/Deactivated [Deactivated]	Activating automatic Electronic-Key management		
Read: EU001 header data with 18 bytes		Additional reading of the header data in the control system		3.2
Read: EU001 User data with 16 bytes	Start address: [26] Number of bytes to be read: [dependent on the module]	Reading user data with 16 bytes ¹⁾		3.3
Read: EU001 User data with 32 bytes		Reading user data with 32 bytes ¹⁾		3.3
Read: EU001 User data with 64 bytes		Reading user data with 64 bytes ¹⁾		3.3
Read: EU001 User data with 90 bytes		Reading user data with 90 bytes ¹⁾		3.3
Read: EU000 Base Module	Use expiry date: Yes/No [No]	- Internal evaluation of the transponder's expiry date - The current date additionally must be defined in the control system and sent to the evaluation unit via an acyclical command.	3	3.1
	Start address of the expiry date: [0]	Start address of the expiry date		
Read: EU000 User data with 16 bytes	Start address: [0] Number of bytes to be read: [dependent on the module]	Reading user data with 16 bytes		3.2
Read: EU000 User data with 32 bytes		Reading user data with 32 bytes		
Read: EU000 User data with 64 bytes		Reading user data with 64 bytes		
Read: EU000 User data with 116 bytes		Reading user data with 116 bytes (default)		
Read/Write: EU001 MO Module	Machine group: 1-4 [1] Operating mode after system start: MO0-MO5 [MO0]	- Compatible only with EU001 Base Module - Setting the machine group - Configuring the parameters for selection of operating mode in the evaluation unit	4	
Read/Write: EU000 MO Module	Start address of the MO value: [0] Operating mode after system start: MO0-MO5 [MO0]	- Compatible only with EU000 Base Module - Configuring the parameters for selection of operating mode in the evaluation unit		

¹⁾ The first four bytes contain the personnel number.

The standard modules are in bold.

Table 1: EKS2 modules

The *Hardware catalog* in *Device view* contains the standard modules and the optional modules of the evaluation unit.

Device overview									
	Module	Rack	Slot	I address	Q address	Type	Article no.	Firmware	
	▼ EUCHNER-EKS2	0	0			EKS2-E-PN-MH1-1...	170904	V1.*.*	
	▶ Interface	0	0 X1			EUCHNER-EKS2			
	EKS2 Diagnose Extended_1	0	1	68...71	68	EKS2 Diagnose Ext...			
	Read: Transponder UID Standard mode with 8 bytes_1	0	2	72...79		Read: Transponder ...			
	▼ Read: EU001 Base module_1	0	3			Read: EU001 Base ...			
	Read: EU001 Base module	0	3 1			Read: EU001 Base ...			
		0	3 2						
	Read: EU001 User data with 90 bytes	0	3 3	98...187		Read: EU001 User ...			
	Read/Write: EU001 MO Module_1	0	4	188...193	188...191	Read/Write: EU001 ...			
		0	5						

Fig. 1: Standard configuration

4.4. EU001 data structure

4.4.1. Configuration of a module

The optional *Read: EU001 header data with 18 bytes* submodule supplements the standard configuration to illustrate the configuration. The control system uses it to read the header data and display them. Applications without header data do not require the following explanation.

Device overview								Options	
	Module	Rack	Slot	I address	Q address	Type	Article no.		
	▼ EUCHNER-EKS2	0	0			EKS2-E-PN-MH1-170904	170904		
	▶ Interface	0	0 X1			EUCHNER-EKS2			
	EKS2 Diagnose Extended_1	0	1	68...71	68	EKS2 Diagnose Extended			
	Read: Transponder UID Standard mode with 8 bytes_1	0	2	72...79		Read: Transponder UID Stan...			
	▼ Read: EU001 Base module_1	0	3			Read: EU001 Base module			
	Read: EU001 Base module	0	3 1			Read: EU001 Base module			
	Read: EU001 Header data with 18 bytes	0	3 2	80...97		Read: EU001 Header data ...			
	Read: EU001 User data with 90 bytes	0	3 3	98...187		Read: EU001 User data with...			
	Read/Write: EU001 MO Module_1	0	4	188...193	188...191	Read/Write: EU001 MO Mod...			
		0	5						

Hardware catalog

Options

▼ Catalog

<Search>

Filter Profile: <All>

Head module

Module

Submodules

EU001

Read: EU001 Header data with 18 bytes

Read: EU001 User data with 16 bytes

Read: EU001 User data with 32 bytes

Read: EU001 User data with 64 bytes

Read: EU001 User data with 90 bytes

Fig. 2: Adding a submodule

4.4.2. Parameterization of the endianness

The endianness must be compatible with the control system used for correct interpretation of the data stored in the EKS2 Electronic-Key. This application uses a Siemens control system with big endian format. Therefore, select the *Big Endian* setting.

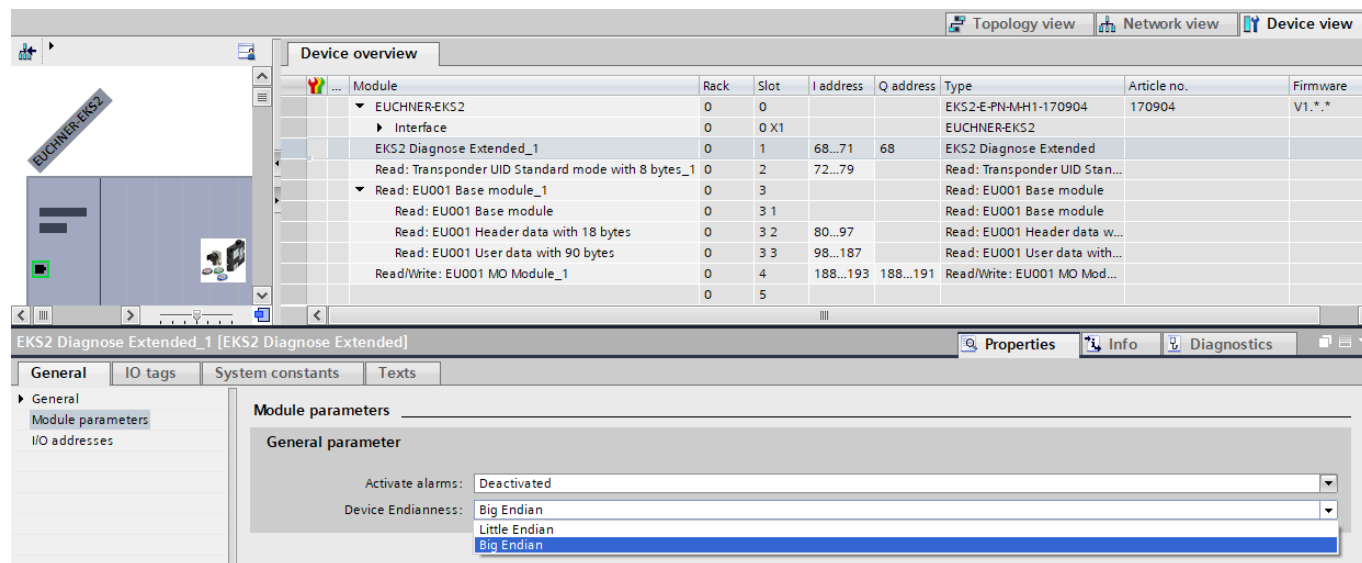


Fig. 3: Parameterization of the endianness

4.5. EU000 data structure

4.5.1. Configuration of the modules and submodules

In order to use the EU000 data structure, two preconfigured modules must be replaced with the associated EU000 modules. The *Device view* of TIA Portal contains the preconfigured EU001 modules. Replace these modules with the corresponding EU000 modules from the *Hardware catalog* on the right.

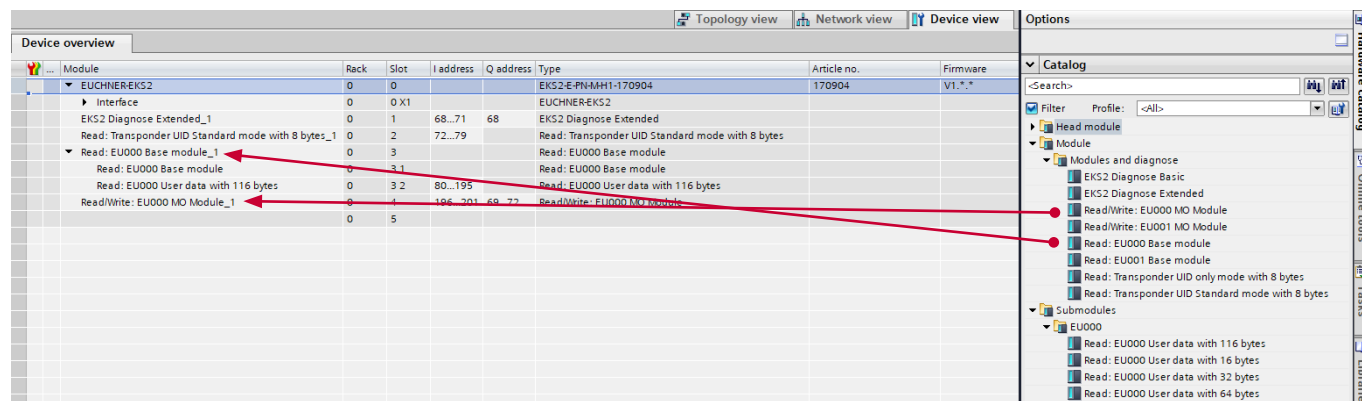


Fig. 4: Configured EU000 modules



NOTICE

The *Read: EU000 User data with 116 bytes* submodule in the *Read: EU000 Base module* module is already preconfigured. If fewer freely programmable bytes are required, the submodule can be replaced with smaller submodules.



NOTICE

The parameterization of the configured submodules depends on the application's requirements. *Table 1* contains the associated parameters.

5. Using the TIA Portal library (from TIA V19)

The library provides templates for simple integration of the EKS2 into the application.

The Applications area under the Downloads area at www.euchner.com contains the EKS2 library.

5.1. Retrieving the library

1. Change to the *Task Card* view (shortcut: Ctrl+3).
2. Select the *Libraries* entry.
3. Use the *Open global library* button to open the Open dialog.

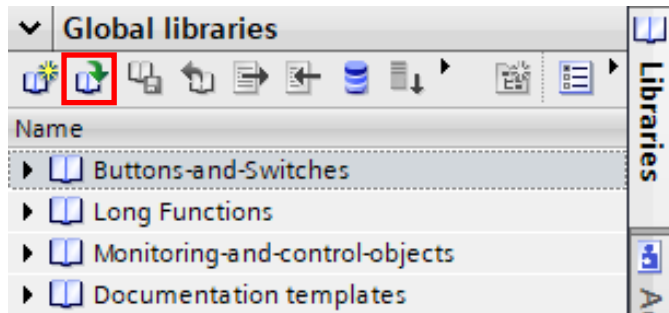


Fig. 5: Opening the library

4. Select the *Compressed libraries...* file type.
5. Open the EKS2 library.
6. TIA Portal from version V20 updates the library on retrieval. The library was created using TIA Portal V19.

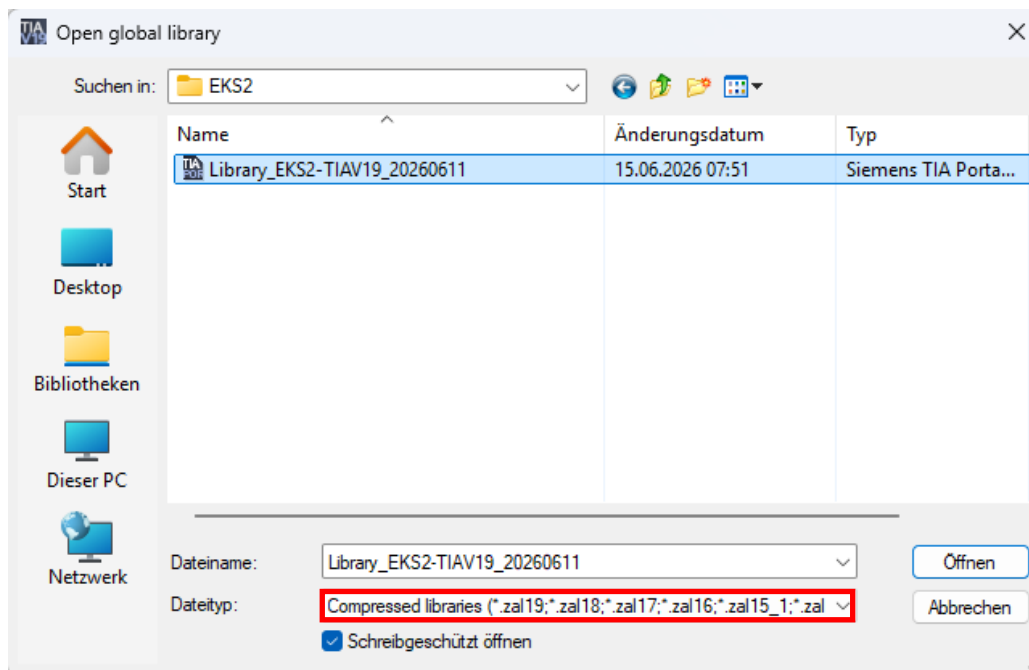


Fig. 6: Selecting the library



IMPORTANT!

Evaluation units EKS2 from **version 1.2.0** support the library.

5.2. EU001 data structure

5.2.1. Copying the data types

Select the data types suitable for the hardware configuration and add them to the *Project tree* in the *PLC Data Types* area using drag & drop.

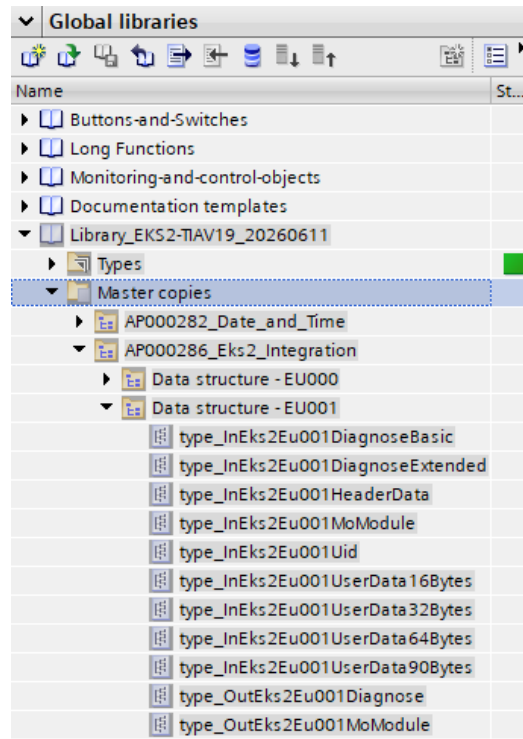


Fig. 7: Opened library

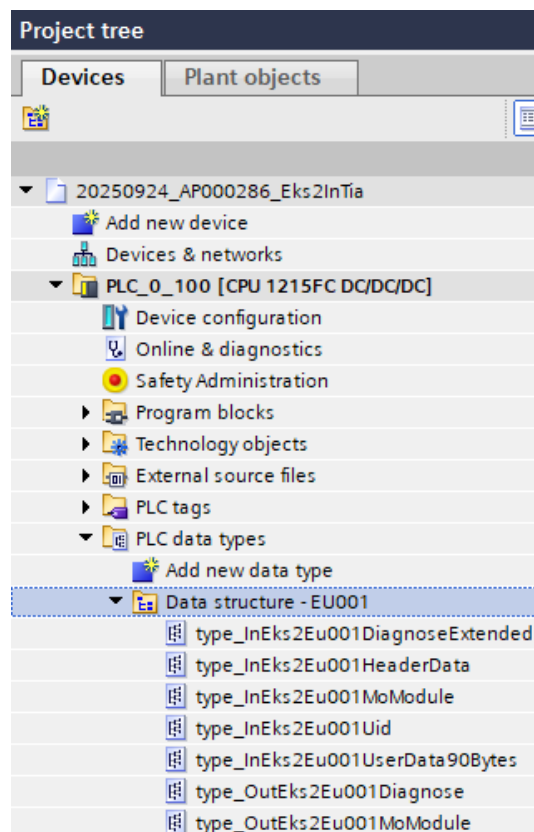


Fig. 8: Copied data types in the *Project tree*

5.2.2. Using the data types

Create the variables of the corresponding file types in a variable table to depict the data provided by the EKS2 in a clear and traceable manner during programming. The respective input and output addresses clearly assign the data to the associated variables.

Eks2							
	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...
1	InEks2DiagExt	*type_InEks2Eu001DiagnoseExtended*	%I68.0	☐	☒	☒	☒
2	InEks2Uid	*type_InEks2Eu001Uid*	%I72.0	☐	☒	☒	☒
3	InEks2HeaderData	*type_InEks2Eu001HeaderData*	%I80.0	☐	☒	☒	☒
4	InEks2UserData	*type_InEks2Eu001UserData90Bytes*	%I98.0	☐	☒	☒	☒
5	OutEks2Diag	*type_OutEks2Eu001Diagnose*	%Q68.0	☐	☒	☒	☒
6	InEks2Mo	*type_InEks2Eu001MoModule*	%I188.0	☐	☒	☒	☒
7	OutEks2Mo	*type_OutEks2Eu001MoModule*	%Q188.0	☐	☒	☒	☒

Fig. 9: Created variable table

After transfer to the control system, establish an online connection to the control system and observe the variable table. The figure below shows the prepared data of the advanced diagnostics data and the Electronic-Key's UID.

Eks2							
	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...
1	InEks2DiagExt	*type_InEks2Eu001Diagnose...	%I68.0	☐	☒	☒	☒
2	deviceReadyForOperation	Bool	%I68.0		☒	☒	☒
3	electronicKeyDetected	Bool	%I68.1		☒	☒	☒
4	acyclicalJobError	Bool	%I68.2		☒	☒	☒
5	readyForAcyclicalJob	Bool	%I68.3		☒	☒	☒
6	deviceError	Bool	%I68.4		☒	☒	☒
7	cyclicalJobError	Bool	%I68.5		☒	☒	☒
8	readyForCyclicalJob	Bool	%I68.6		☒	☒	☒
9	cyclicalJobInProgress	Bool	%I68.7		☒	☒	☒
10	noUserAreaIncluded	Bool	%I69.0		☒	☒	☒
11	selectionOfSafeOperating...	Bool	%I69.1		☒	☒	☒
12	nc10	Bool	%I69.2		☒	☒	☒
13	nc11	Bool	%I69.3		☒	☒	☒
14	nc12	Bool	%I69.4		☒	☒	☒
15	electronicKeyInvalid	Bool	%I69.5		☒	☒	☒
16	electronicKeyValid	Bool	%I69.6		☒	☒	☒
17	nc15	Bool	%I69.7		☒	☒	☒
18	extDiagnosticByte	Word	%IW70		☒	☒	☒
19	InEks2Uid	*type_InEks2Eu001Uid*	%I72.0	☐	☒	☒	☒
20	uniqueid	Array[0..7] of Byte	%I72.0		☒	☒	☒
21	uniqueid[0]	Byte	%IB72		☒	☒	☒
22	uniqueid[1]	Byte	%IB73		☒	☒	☒
23	uniqueid[2]	Byte	%IB74		☒	☒	☒
24	uniqueid[3]	Byte	%IB75		☒	☒	☒
25	uniqueid[4]	Byte	%IB76		☒	☒	☒
26	uniqueid[5]	Byte	%IB77		☒	☒	☒
27	uniqueid[6]	Byte	%IB78		☒	☒	☒
28	uniqueid[7]	Byte	%IB79		☒	☒	☒

Fig. 10: Prepared online data

5.3. EU000 data structure

5.3.1. Copying the data types

Select the data types suitable for the hardware configuration and add them to the *Project tree* in the *PLC Data Types* area using drag & drop.

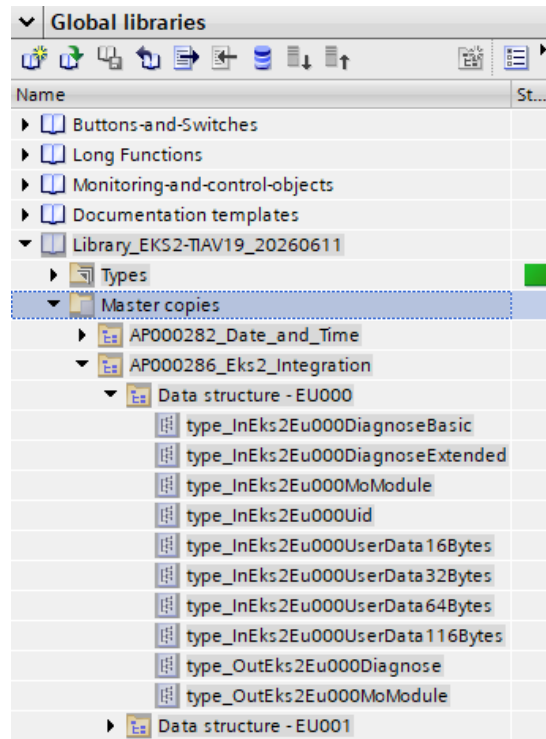


Fig. 11: Opened library

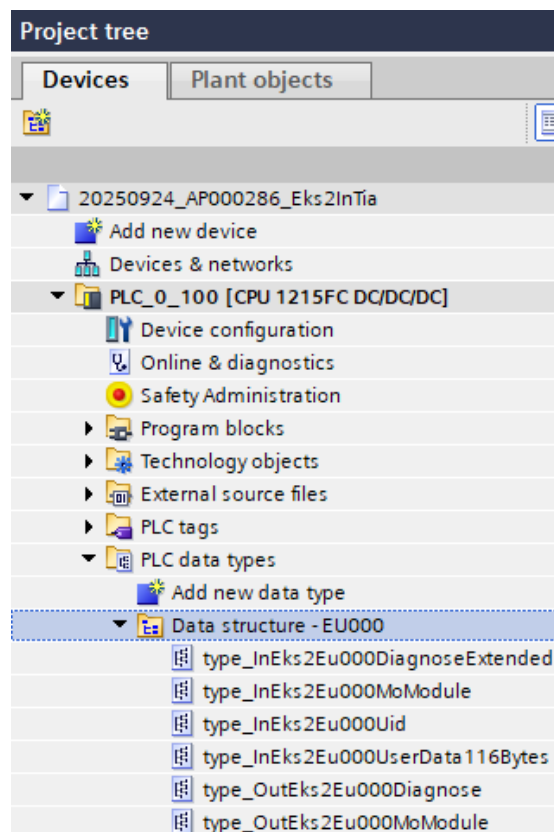
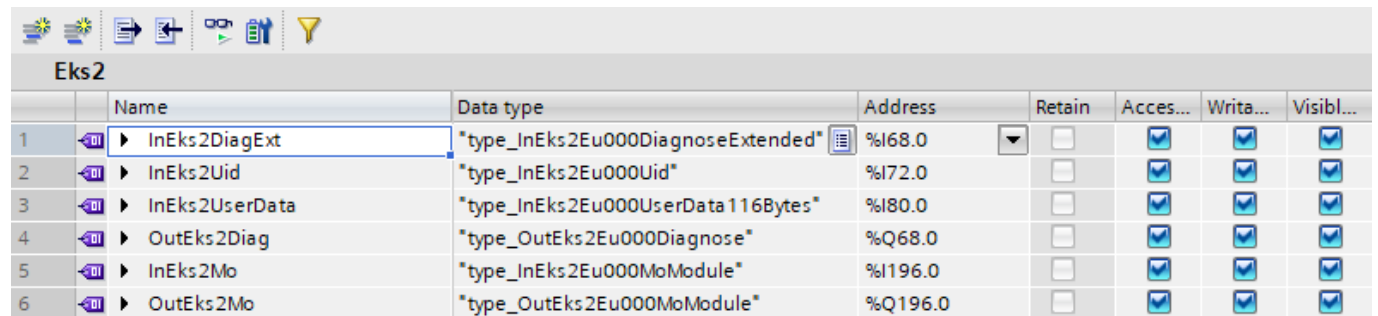


Fig. 12: Copied data types in the *Project tree*

5.3.2. Using the data types

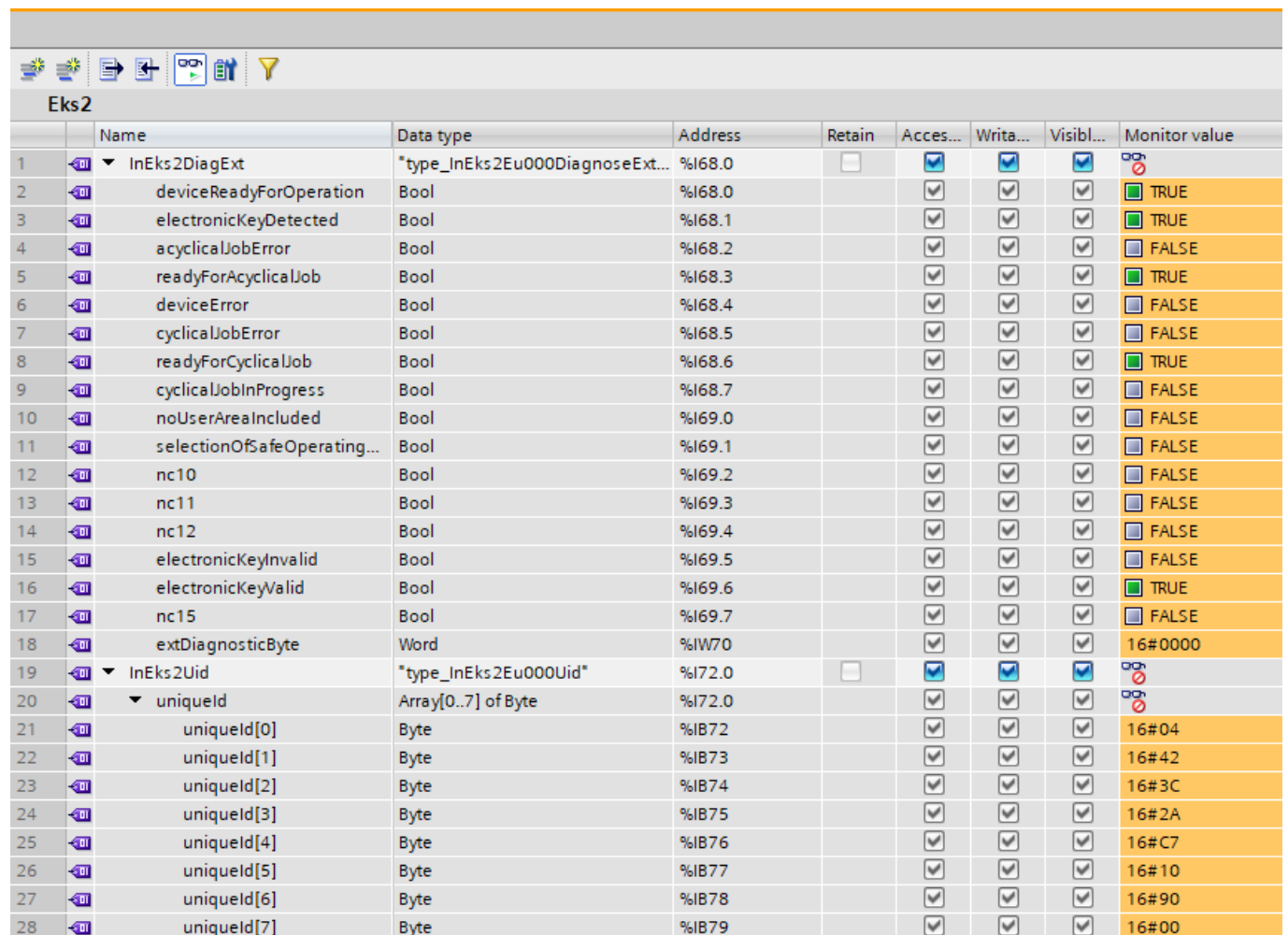
Create the variables of the corresponding file types in a variable table to depict the data provided by the EKS2 in a clear and traceable manner during programming. The respective input and output addresses clearly assign the data to the associated modules.



	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...
1	InEks2DiagExt	*type_InEks2Eu000DiagnoseExtended*	%I68.0		☒	☒	☒
2	InEks2Uid	*type_InEks2Eu000Uid*	%I72.0		☒	☒	☒
3	InEks2UserData	*type_InEks2Eu000UserData116Bytes*	%I80.0		☒	☒	☒
4	OutEks2Diag	*type_OutEks2Eu000Diagnose*	%Q68.0		☒	☒	☒
5	InEks2Mo	*type_InEks2Eu000MoModule*	%I196.0		☒	☒	☒
6	OutEks2Mo	*type_OutEks2Eu000MoModule*	%Q196.0		☒	☒	☒

Fig. 13: Created variable table

Establish an online connection to the control system and observe the variable table. The figure below shows the prepared variables of the advanced diagnostics data and the Electronic-Key's UID.



	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Monitor value
1	InEks2DiagExt	*type_InEks2Eu000DiagnoseExt...	%I68.0	☐	☒	☒	☒	
2	deviceReadyForOperation	Bool	%I68.0		☒	☒	☒	TRUE
3	electronicKeyDetected	Bool	%I68.1		☒	☒	☒	TRUE
4	acyclicalJobError	Bool	%I68.2		☒	☒	☒	FALSE
5	readyForAcyclicalJob	Bool	%I68.3		☒	☒	☒	TRUE
6	deviceError	Bool	%I68.4		☒	☒	☒	FALSE
7	cyclicalJobError	Bool	%I68.5		☒	☒	☒	FALSE
8	readyForCyclicalJob	Bool	%I68.6		☒	☒	☒	TRUE
9	cyclicalJobInProgress	Bool	%I68.7		☒	☒	☒	FALSE
10	noUserAreaIncluded	Bool	%I69.0		☒	☒	☒	FALSE
11	selectionOfSafeOperating...	Bool	%I69.1		☒	☒	☒	FALSE
12	nc10	Bool	%I69.2		☒	☒	☒	FALSE
13	nc11	Bool	%I69.3		☒	☒	☒	FALSE
14	nc12	Bool	%I69.4		☒	☒	☒	FALSE
15	electronicKeyInvalid	Bool	%I69.5		☒	☒	☒	FALSE
16	electronicKeyValid	Bool	%I69.6		☒	☒	☒	TRUE
17	nc15	Bool	%I69.7		☒	☒	☒	FALSE
18	extDiagnosticByte	Word	%IW70		☒	☒	☒	16#0000
19	InEks2Uid	*type_InEks2Eu000Uid*	%I72.0	☐	☒	☒	☒	
20	uniqueId	Array[0..7] of Byte	%I72.0		☒	☒	☒	
21	uniqueId[0]	Byte	%IB72		☒	☒	☒	16#04
22	uniqueId[1]	Byte	%IB73		☒	☒	☒	16#42
23	uniqueId[2]	Byte	%IB74		☒	☒	☒	16#3C
24	uniqueId[3]	Byte	%IB75		☒	☒	☒	16#2A
25	uniqueId[4]	Byte	%IB76		☒	☒	☒	16#C7
26	uniqueId[5]	Byte	%IB77		☒	☒	☒	16#10
27	uniqueId[6]	Byte	%IB78		☒	☒	☒	16#90
28	uniqueId[7]	Byte	%IB79		☒	☒	☒	16#00

Fig. 14: Prepared online data

6. Important notice – please observe carefully!

This document is intended for a design engineer who possesses the requisite knowledge in safety engineering and knows the applicable standards, e.g. through training for qualification as a safety engineer. Only with the appropriate qualification is it possible to integrate the example provided into a complete safety chain.

The example represents only part of a complete safety chain and does not fulfill any safety function on its own. In order to fulfill a safety function, the energy switch-off function for the danger zone and the software must also be considered in the safety evaluation, for example.

The applications provided are only examples for solving certain safety tasks for protecting safety doors. The examples cannot be comprehensive due to the application-dependent and individual protection goals within a machine/installation.

If questions concerning this example remain open, please contact us directly.

According to the Machinery Directive 2006/42/EC, the design engineer of a machine or installation has the obligation to perform a risk assessment and take measures to reduce the risk. While doing this, the engineer must comply with the applicable national and international safety standards. Standards generally represent the current state-of-the-art. Therefore, the design engineer should continuously inform himself about changes in the standards and adapt his considerations to them. Relevant standards for functional safety include EN ISO 13849 and EN 62061. This application must be regarded only as assistance for the considerations about safety measures.

The design engineer of a machine/installation has the obligation to assess the safety engineering himself. The examples must not be used for an assessment, because only a small excerpt of a complete safety function was considered in terms of safety engineering here.

In order to be able to use the safety switch applications correctly on safety doors, it is indispensable to observe the standards EN ISO 13849-1, EN ISO 14119 and all relevant C-standards for the respective machine type. Under no circumstances does this document replace the engineer's own risk assessment, and it cannot serve as the basis for a fault assessment.

In particular in relation to a fault exclusion, it must be noted that a fault can be excluded only by the machine's or installation's design engineer and this action requires justification. A general fault exclusion is not possible. More information about fault exclusion can be found in EN ISO 13849-2.

Changes to products or within assemblies from third-party suppliers used in this example can lead to the function no longer being ensured or the safety assessment having to be adapted. In any event, the information in the operating instructions on the part of EUCHNER, as well as on the part of third-party suppliers, must be used as the basis before this application is integrated into an overall safety function. If contradictions should arise between the operating instructions and this document, please contact us directly.

Use of brand names and company names

All brand names and company names stated are the property of the related manufacturer. They are used only for the clear identification of compatible peripheral devices and operating environments in relation to our products.

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