EUCHNER

Application

Integration of EKS with TCP/IP Interface in Rockwell Studio 5000®

EN

Contents

1. About this document

1.1. Version

Version	Date	Change/addition	Chapter
01-02/20	1/10/2020	Prepared	All
02-08/20	8/3/2020	Addition: writing Electronic-Key	5.5/5.8
03-04/21	4/16/2021	- Data type of "JobFinishedActiveTime" variable changed from UINT to INT - "IMPORTANT!" added: network card selection	5.1 5.3

1.2. Scope

The purpose of this document is the integration and configuration of the EKS with TCP/IP interface in Rockwell Studio 5000 Logix Designer®.

1.3. Target group

Design engineers and installation planners for safety systems on machines, as well as setup and servicing staff possessing special expertise in handling safety components as well as expertise in the installation, setup, programming and diagnostics of programmable logic controllers (PLCs) and bus systems.

1.4. Supplementary documents

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

Document title (document number)	Contents	
Manual (2100420)	Electronic-Key-System Manual for Electronic-Key adapter EKS and EKS FSA with Ethernet TCP/IP interface	
Possibly enclosed data sheets	Item-specific information about deviations or additions	

1.5. Notice

This application is based on the manual for the EKS with TCP/IP interface. Please refer to the manual for the technical details and other information. In the rest of this document, the EKS with TCP/IP interface is referred to as the "EKS" for short.

EN

2. Components/modules used

2.1. EUCHNER

Description	Order number / item
EKS with TCP/IP interface	100401 / EKS-A-IEX-G01-ST02/03
	099265 / EKS-A-IEXA-G01-ST02/03/04

TIP!

More information and downloads about 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
1756-L81ES GuardLogix® 5580 Safety Controller	1756-L81ES
1756-L8SP GuardLogix® 5580 Safety Partner	1756-L8SP

2.3. Software

Description	Version
Studio 5000 Logix Designer	Version 32.01.00 - Professional Edition

3. Functional description

EKS TCP/IP devices are read/write systems with electronics for the inductive bidirectional interface to the transponder and interface electronics.

The system is connected via the integrated TCP/IP interface, which is designed as an RJ45 socket. A separate switch may be required for the TCP/IP connection. The EKS does not have an integrated switch.

The current state of the Electronic-Key adapter is displayed using a 3-color LED.

The Electronic-Key is placed on the Electronic-Key adapter for operation. The power supply for the transponder and the data are transferred between the Electronic-Key adapter and the Electronic-Key without using any contacts.

The data transmission between the control system and EKS is realized using an Add-On Instruction (AOI). The AOI handles establishing communication between the control system and EKS as well as sending and receiving the TCP/IP communication telegrams.

The AOI can be downloaded from www.euchner.com in the area *Service/Downloads/Software/Sample files and Libraries/EKS*.

4. Importing the Add-On Instruction

1. By right-clicking Add-On Instructions in the *Controller Organizer*, open the context menu and select *Import Add-On Instruction*.

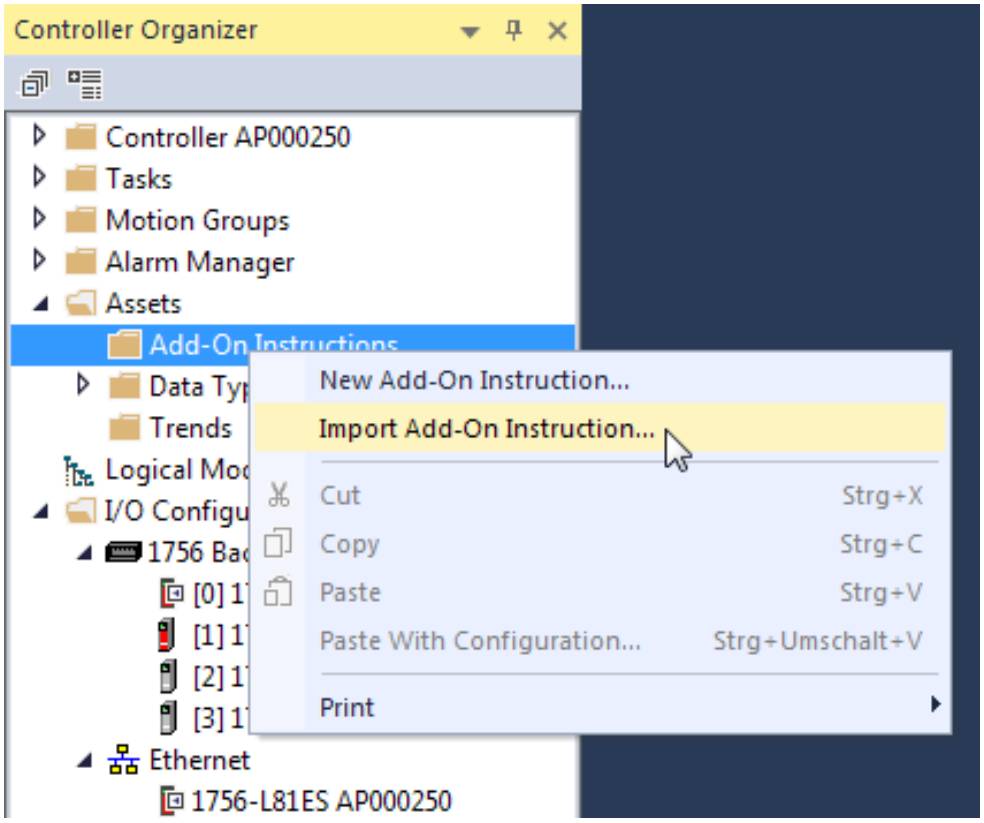


Fig. 1: Add-On Instruction context menu

2. Select the folder with the downloaded AOI and open the AOI using *Open*.

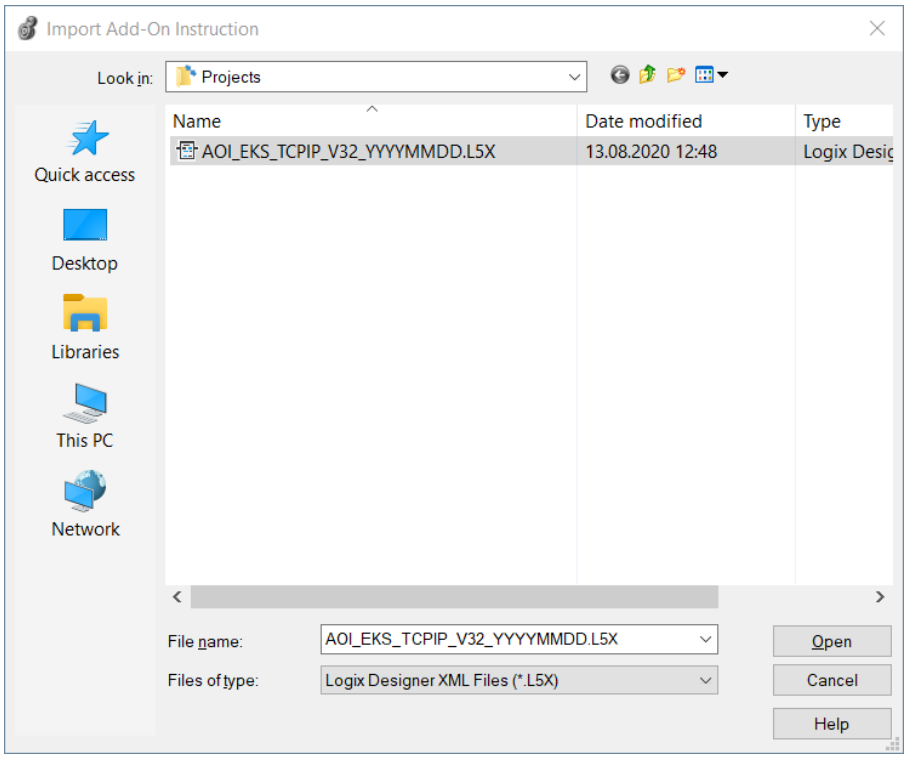


Fig. 2: Import Add-On Instruction dialog box

EN

3. Complete the import in the *Import Configuration* window using *OK* without making any changes.

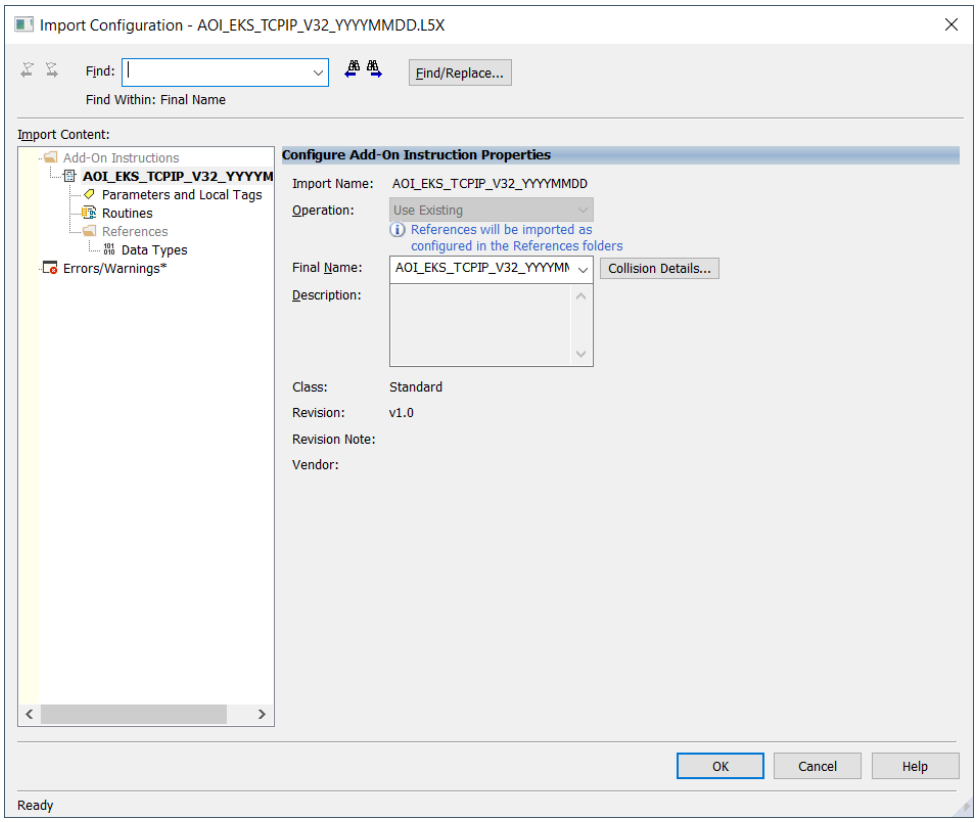


Fig. 3: Import Configuration window

The following data types and the Add-On Instruction are added to the *Controller Organizer* during the import.

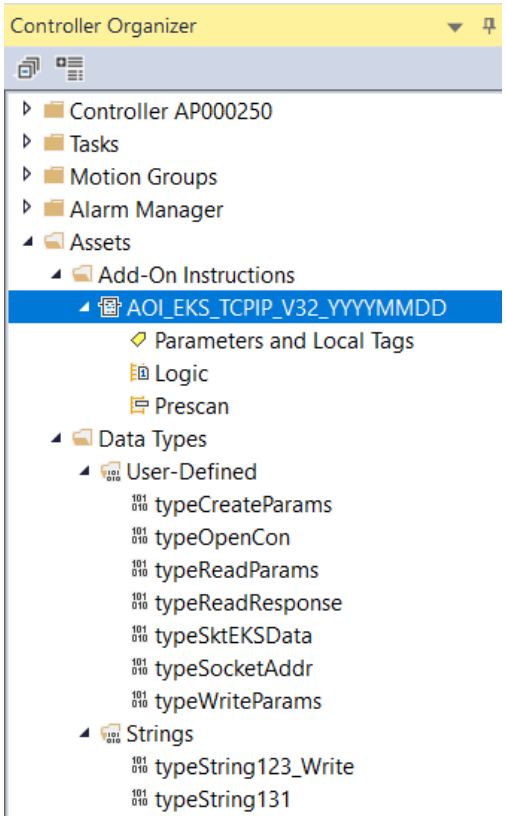
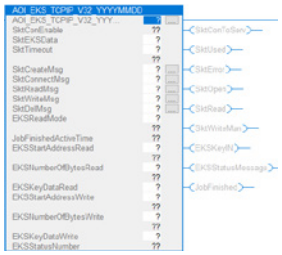


Fig. 4: Imported data types and AOI

5. Integrating the Add-On Instruction

5.1. Variable table for the Add-On Instruction



Variable	Use	Data type	Description
AOI_EKS_TCPIP_V32_YYYYMMDD	-	AOI_EKS_TCPIP_V32_YYYYMMDD	Instance for the AOI
SktConEnable	Input	BOOL	Activates TCP/IP socket connection
SktEKSData	InOut	typeSktEKSData	This variable contains all necessary data for the messages
SktTimeout	Input	DINT	Time limit for the messages (in ms)
SktCreateMsg	InOut	MESSAGE	Message for creating the TCP/IP socket
SktConnectMsg	InOut	MESSAGE	Message for establishing the TCP/IP socket connection
SktReadMsg	InOut	MESSAGE	Message for reading the content of the TCP/IP telegram
SktWriteMsg	InOut	MESSAGE	Message for writing the TCP/IP telegram
SktDelMsg	InOut	MESSAGE	Message for deleting the TCP/IP socket connection
EKSReadMode	Input	SINT	Mode for the request 1= manual; 2= automatic
JobFinishedActiveTime	Input	INT	Time value (in ms) indicating how long the *JobFinished* bit is to remain active after the write process
EKSStartAdressRead	Input	SINT	Start address for the Electronic-Key data to be requested
EKSNumberOfBytesRead	Input	SINT	Amount of Electronic-Key data to be requested
EKSKeyDataRead	InOut	SINT[124]	Reply with the user data from the EKS Electronic-Key
EKSStartAddressWrite	Input	SINT	Start address of the Electronic-Key data to be written
EKSNumberOfBytesWrite	Input	SINT	Amount of Electronic-Key data to be written
EKSKeyDataWrite	InOut	SINT[116]	Electronic-Key data to be written
EKSStatusNumber	Output	INT	EKS status
SktConToServ	Output	BOOL	Attempting to establish a server connection
SktUsed	Output	BOOL	TRUE = the socket connection process is started; FALSE = the socket connection process is stopped
SktError	Output	BOOL	Socket connection error
SktOpen	Output	BOOL	Socket connection open
SktRead	Output	BOOL	Receiving telegram
SktWrite	Output	BOOL	Sending telegram
EKSKeyIN	Output	BOOL	EKS Electronic-Key placed in the Electronic-Key adapter
EKSStatusMessage	Output	BOOL	An EKS status message has been received
JobFinished	Output	BOOL	Write process completed

Table 1: AOI variable table

EN

5.2. Creating the controller tags

1. Open a program (e.g. *MainRoutine*) and drag the AOI to a new rung using drag & drop.

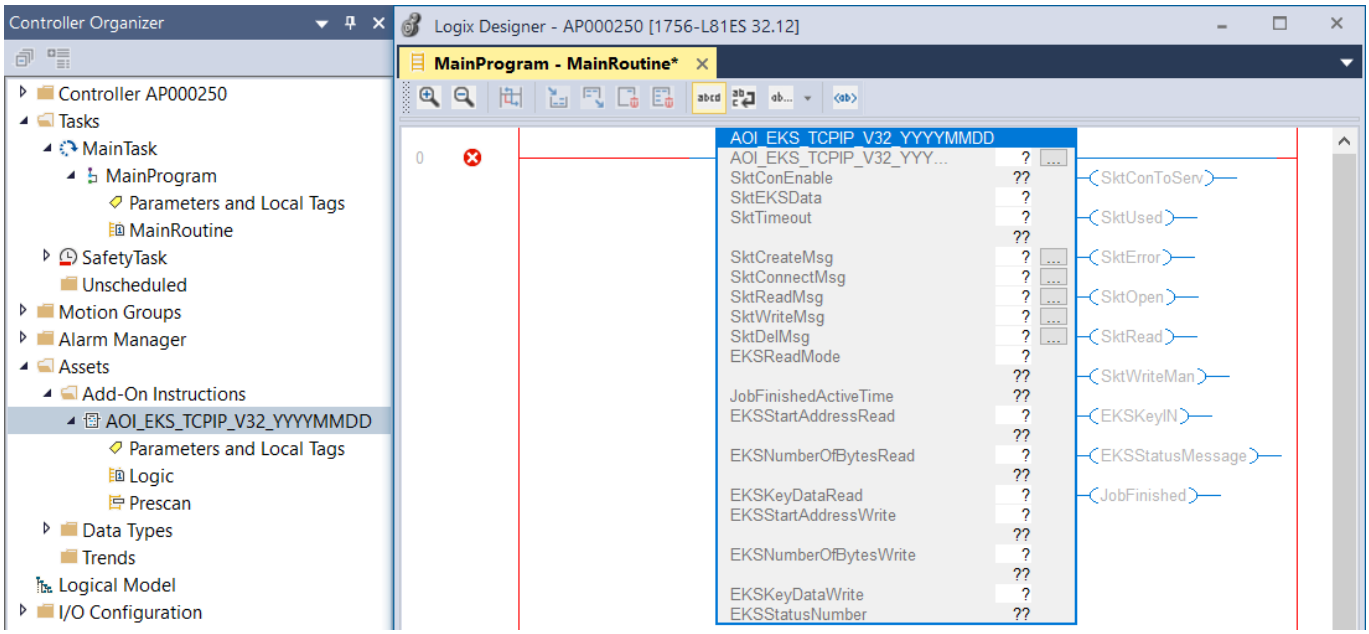


Fig. 5: Adding the AOI to the main program

2. Create the instance of the AOI. Type the name of the instance in the field for the variable *AOI_EKS_TCPIP_V32_YYYYMMDD* and open the context menu by right-clicking. In this example, select *New "AOI_EKS_Milling."*

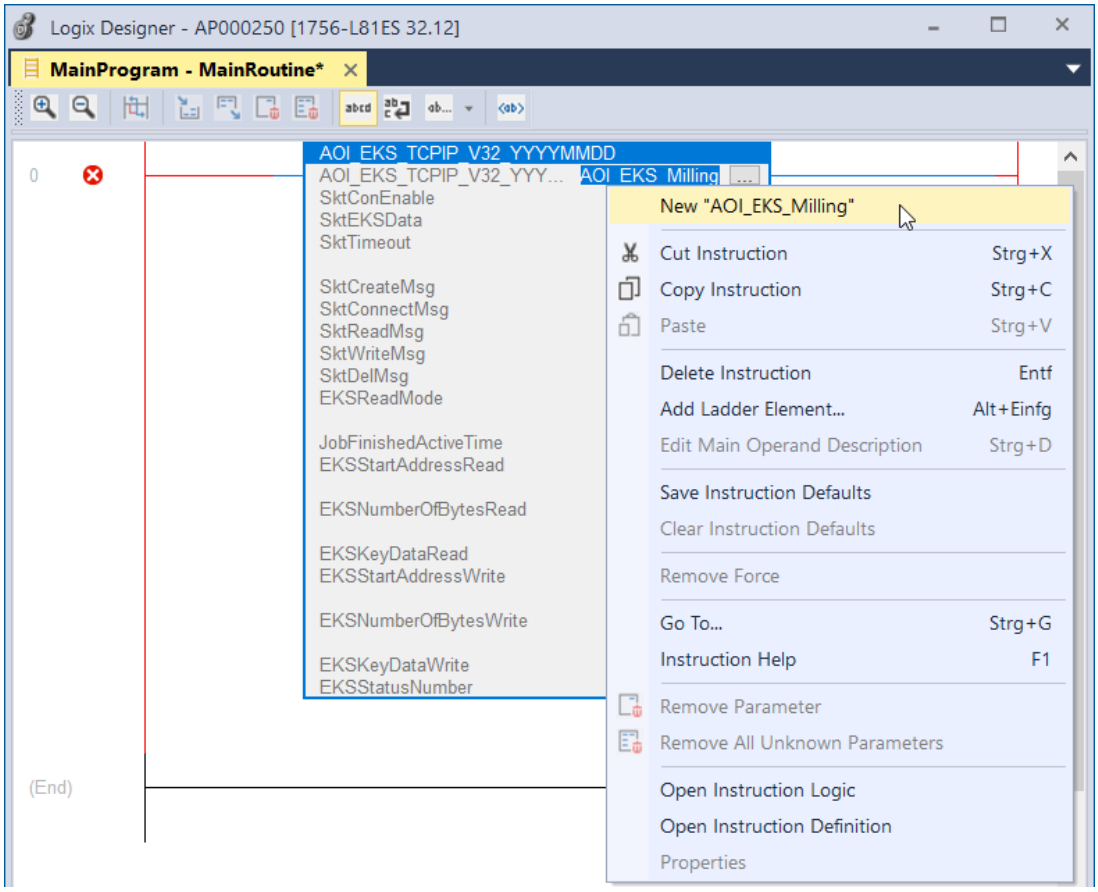


Fig. 6: Adding instance variable

3. The necessary information is already entered in the *New Tag* window. Click *Create* to create the variable.

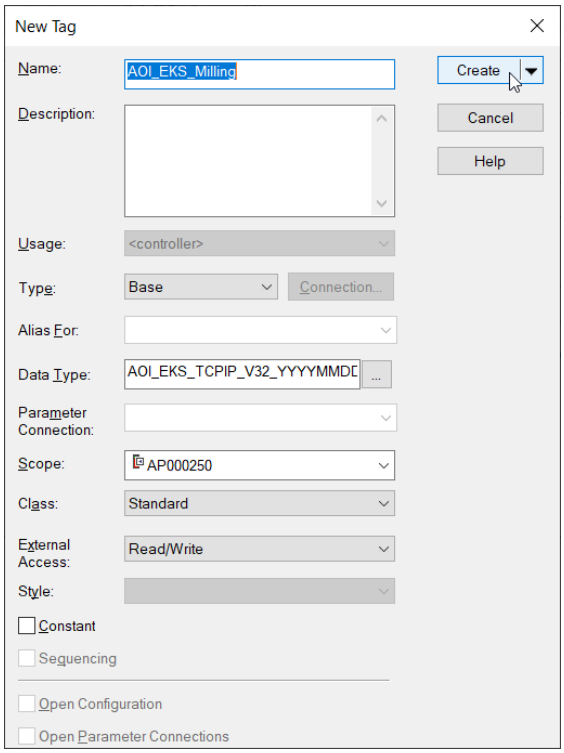


Fig. 7: Creating instance variable

4. Create the variable for the EKS socket connection. Type the variable name in the related variable field and open the context menu by right-clicking. In this example, select *New "EKS_Milling."* Then create the variable using *Create* without making any changes.

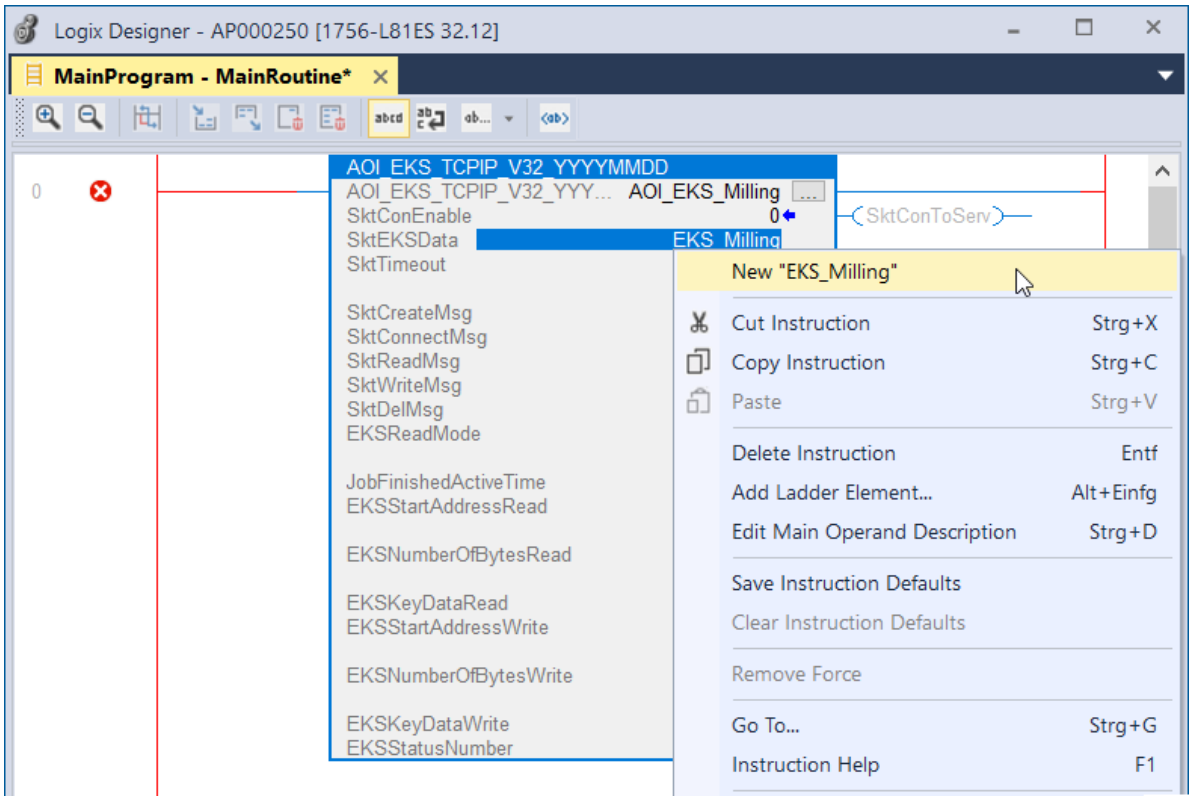


Fig. 8: Creating variable for the EKS socket data

EN

5. Create the variable for the Socket Create Message. Type the variable name in the related variable field and open the context menu by right-clicking. In this example, select *New "EKS_Skt_Create_Msg."*

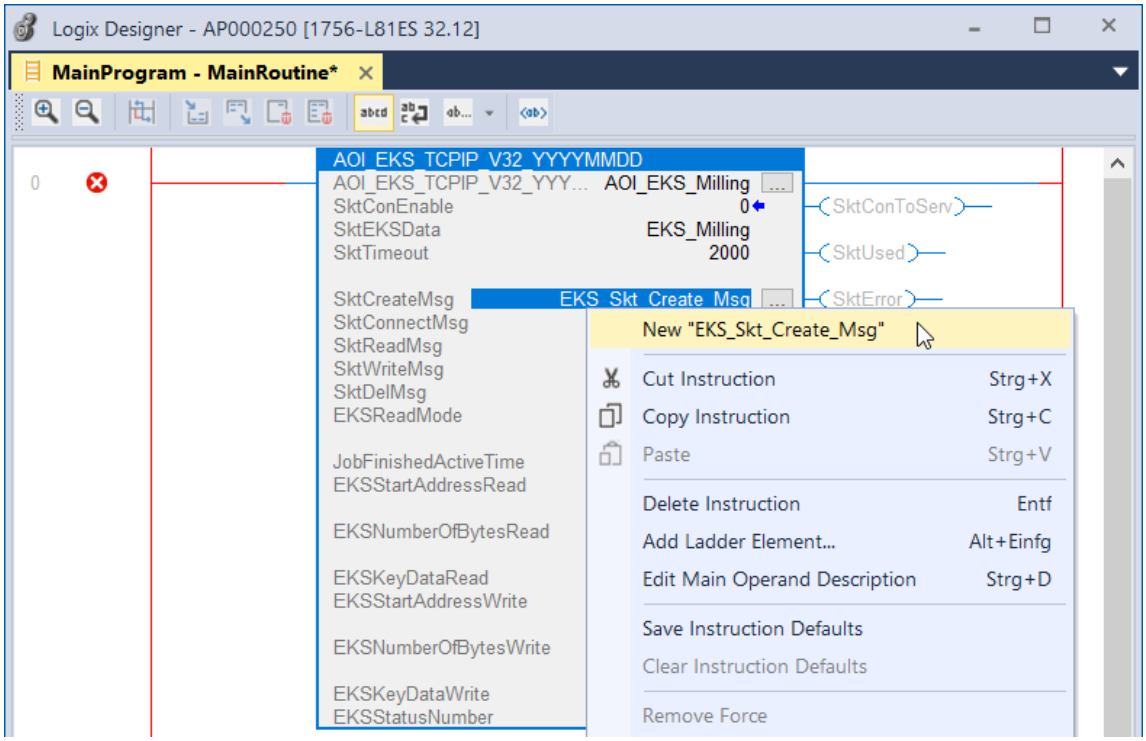


Fig. 9: Creating the Socket *Create Message* variable

6. Then create the variable using *Create* without making any changes.

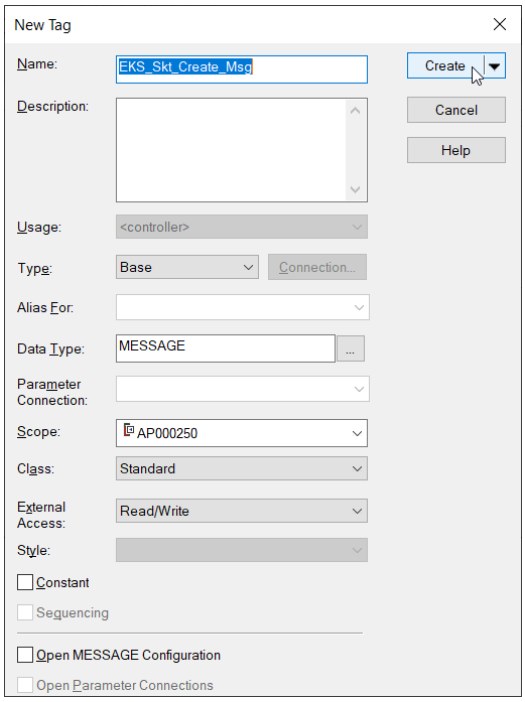


Fig. 10: Creating the *Socket Create Message* variable

IMPORTANT

Repeat the creation of the message variables (steps 5 and 6) for the variables *SktConnectMsg*, *SktReadMsg*, *SktWriteMsg* and *SktDelMsg*. Additionally create the *EKSKeyDataRead* and *EKSKeyDataWrite* variables.

7. Entering values for the input variables.

Variable	Value
SktTimeout	2,000 (ms)
EKSReadMode	1 = manual mode; the Electronic-Key data are received by triggering the variable *SktWrite* 2 = automatic mode; the reception of the Electronic-Key data is triggered by reading the Electronic-Key status *KeyIN* (see manual)
JobFinishedActiveTime	Variable (value from 0 to 65,535) → Time value (in ms) indicating how long the *JobFinished* bit is to remain active after the write process
EKSStartAddressRead	Variable (value from 0 to 116) → Start address for the user data used
EKSNumberOfBytesRead	Variable (value from 0 to 124) → Number of bytes to be read
EKSStartAddressWrite	Variable (value from 0 to 112) → Start address for the user data used
EKSNumberOfBytesWrite	Variable (value from 4 to 116) → Number of bytes to be written

IMPORTANT

On the Electronic-Key read/write with 116 bytes freely programmable, the memory is organized in 4-byte blocks. This means the start address for writing must be given in the range byte number 0 to byte number 112, always in 4-byte steps (byte number 0, 4, 8 ... 112). Also, a multiple of 4-byte-sized blocks must always be written (4, 8, 12 ... 116 bytes)!

However, during reading it is possible to access the memory byte-by-byte without the above-mentioned restriction for writing.

The Electronic-Key read/write also has a unique 8-byte serial number that is permanently written to the memory during the Electronic-Key production process. The serial number therefore cannot be changed. This serial number is used for secure differentiation of every single Electronic-Key. It is necessary that all 8 bytes are completely evaluated for secure differentiation. The serial number is appended to the freely programmable memory. The serial number can be read by entering the start address byte number 116 and the number of bytes 8.

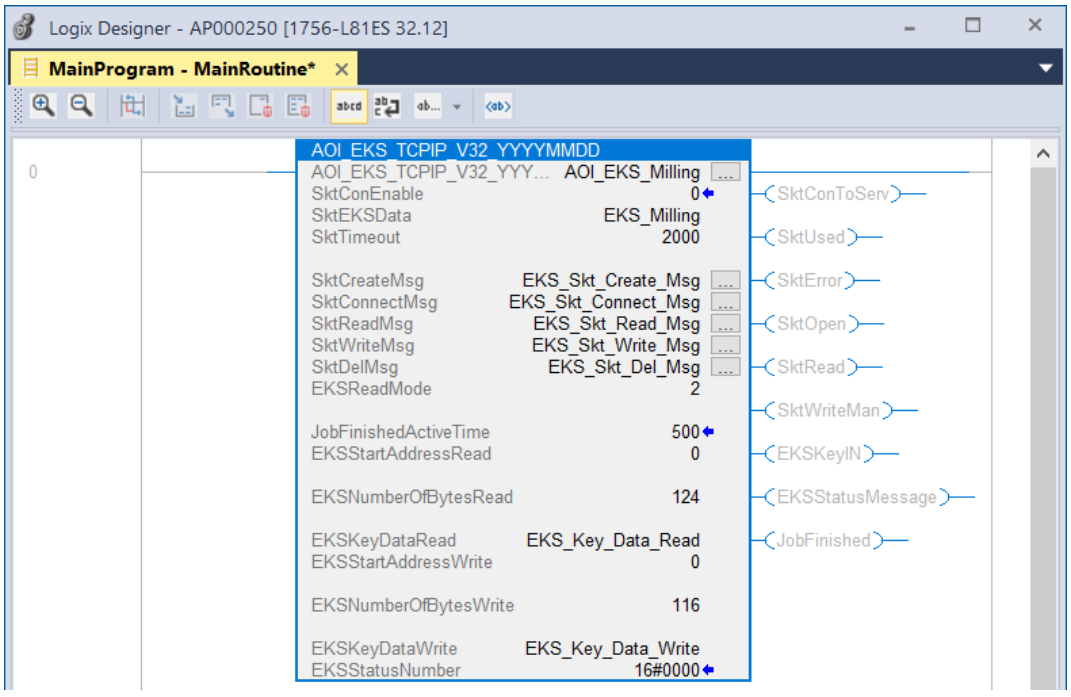


Fig. 11: Completed AOI

EN

5.3. Configuring the messages

1. Open the *Configuration Dialog* for *SktCreateMsg*.

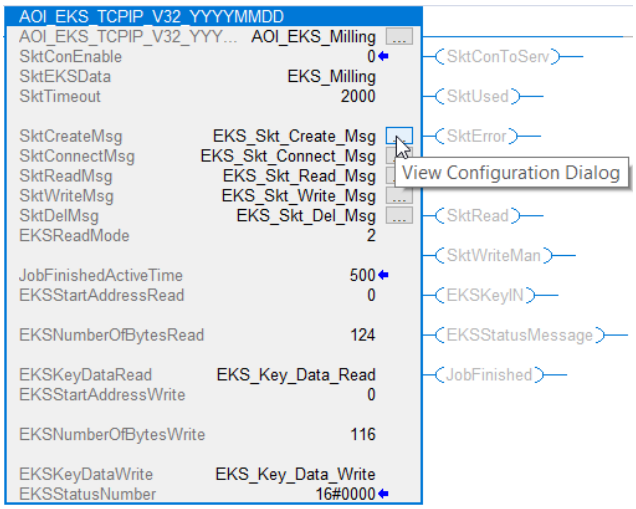


Fig. 12: Opening the *Configuration Dialog*

2. Select *Service Type: Socket Create*. Configure the following parameters:

Parameter	Value
Source Element	EKS_Milling.CreateSrc
Destination Element	EKS_Milling.Inst
Path	THIS (you will find the *Path* parameter on the *Communication* tab)

IMPORTANT

The network interface via which the EKS is to communicate must be specified in the *Path* parameter. If there are several network cards, make sure that the correct network card is selected in the *Path* parameter. This concerns every *Message* configuration.

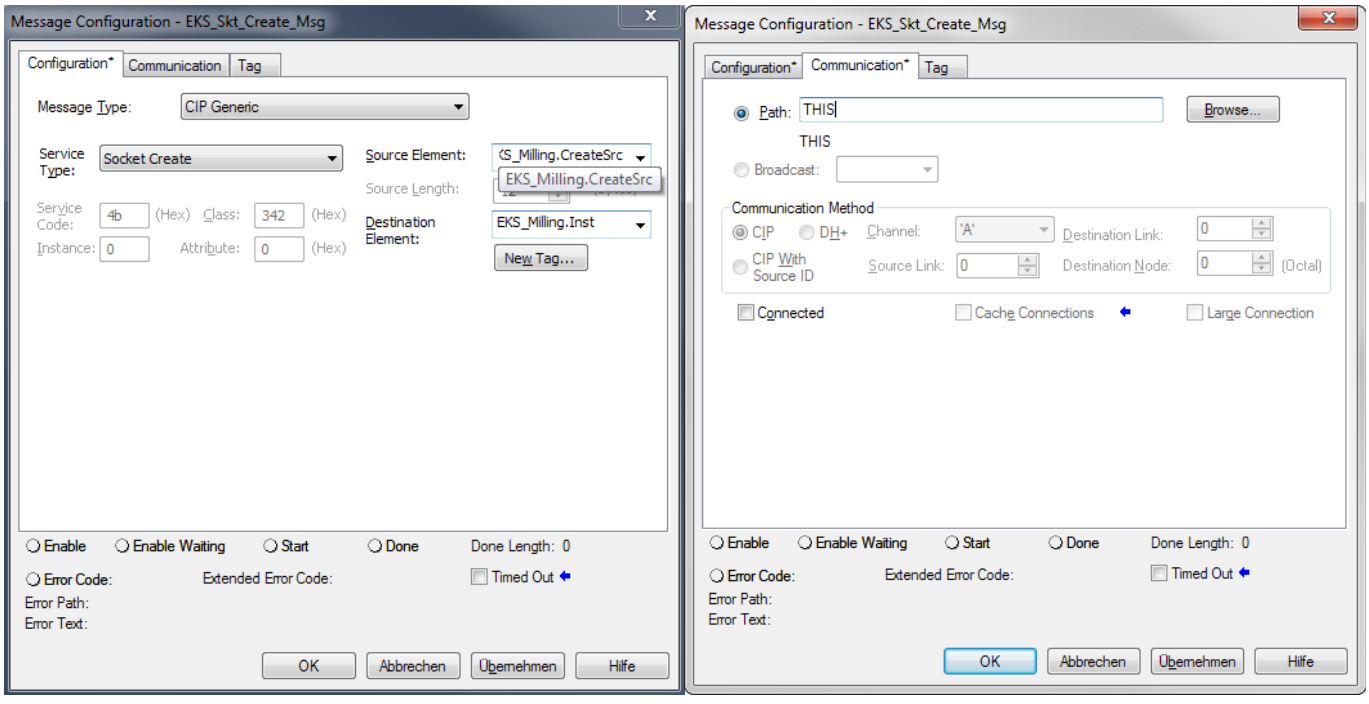


Fig. 13: Configuring parameters for *Socket Create Message*

3. Open the *Configuration Dialog* for *SktConnectMsg*. Select *Service Type: OpenConnection*. Configure the following parameters:

Parameter	Value
Source Element	EKS_Milling.OpenSrc
Source Length	1
Instance	0
Path	THIS (you will find the *Path* parameter on the *Communication* tab)

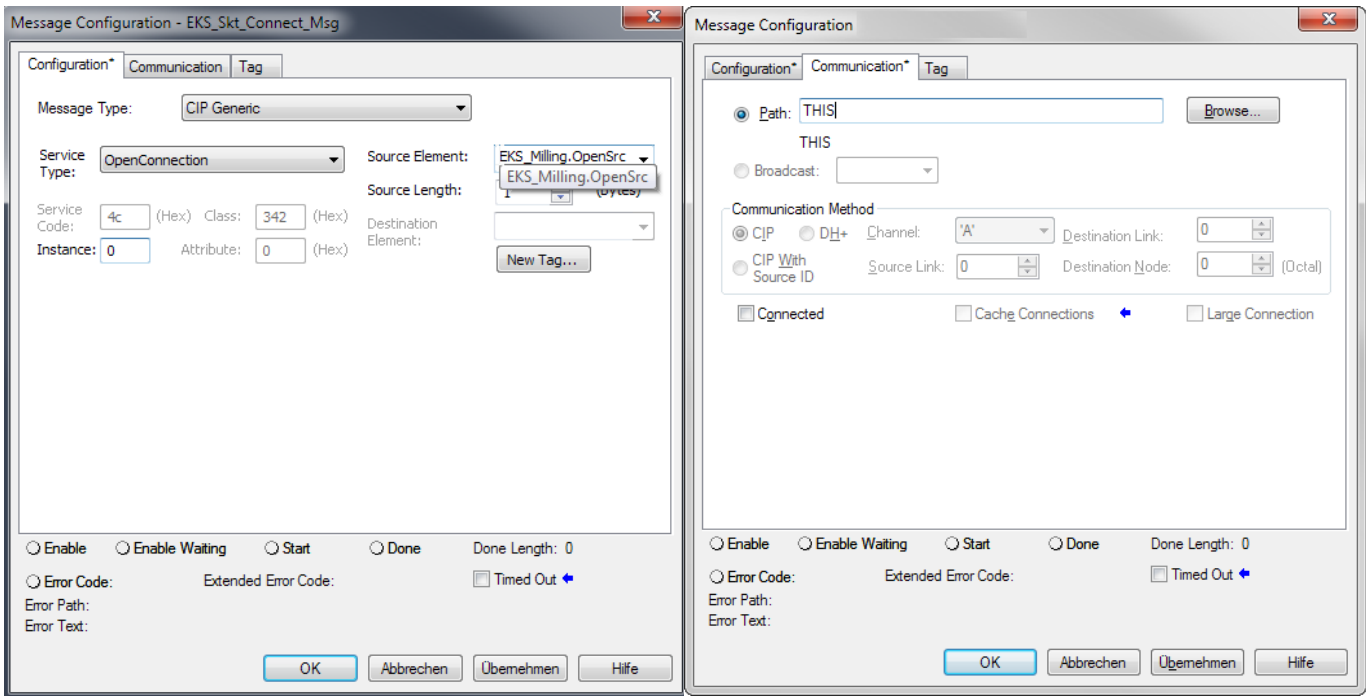


Fig. 14: Configuring parameters for OpenConnection Message

EN

4. Open the *Configuration Dialog* for *SktReadMsg*. Select *Service Type: ReadSocket*. Configure the following parameters:

Parameter	Value
Source Element	EKS_Milling.ReadSrc
Destination Element	EKS_Milling.ReadResponse
Instance	0
Path	THIS (you will find the *Path* parameter on the *Communication* tab).

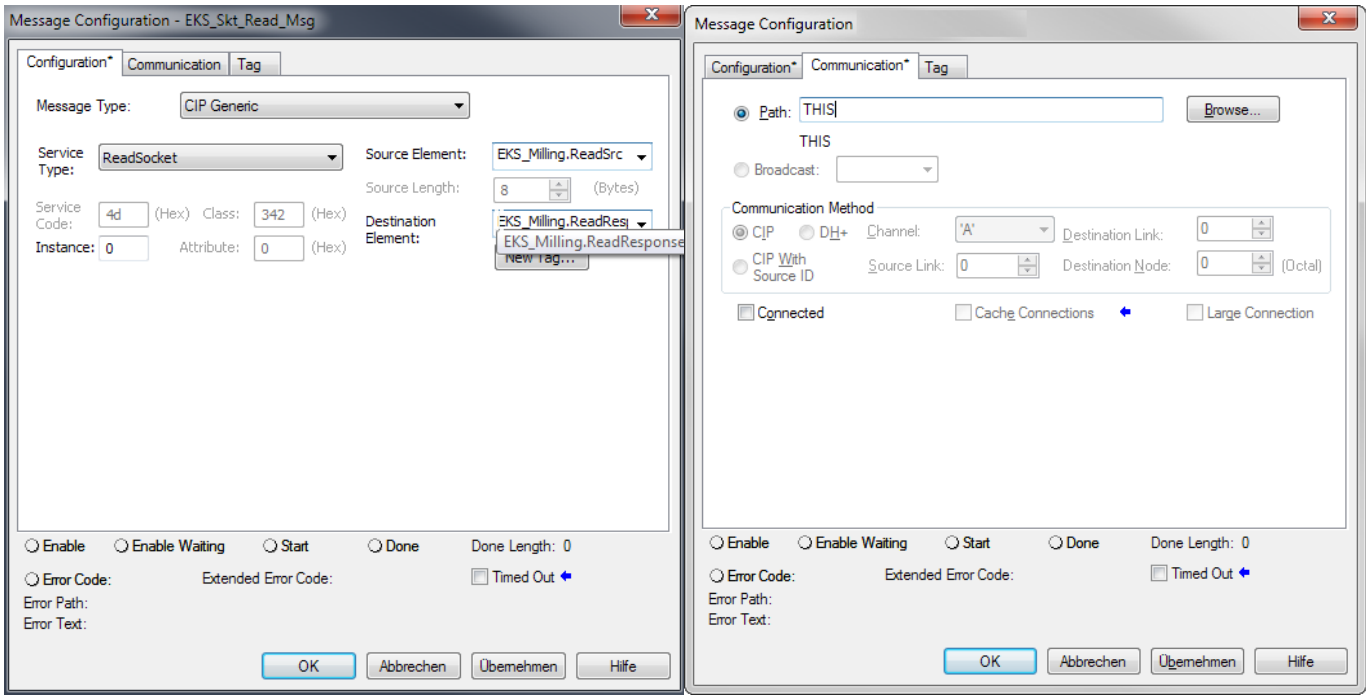


Fig. 15: Configuring parameters for *ReadSocket* Message

5. Open the *Configuration Dialog* for *SktWriteMsg*. Select *Service Type: WriteSocket*. Configure the following parameters:

Parameter	Value
Source Element	EKS_Milling.WriteSrc
Destination Element	EKS_Milling.WriteSizeSent
Source Length	1
Instance	0
Path	THIS (you will find the *Path* parameter on the *Communication* tab)

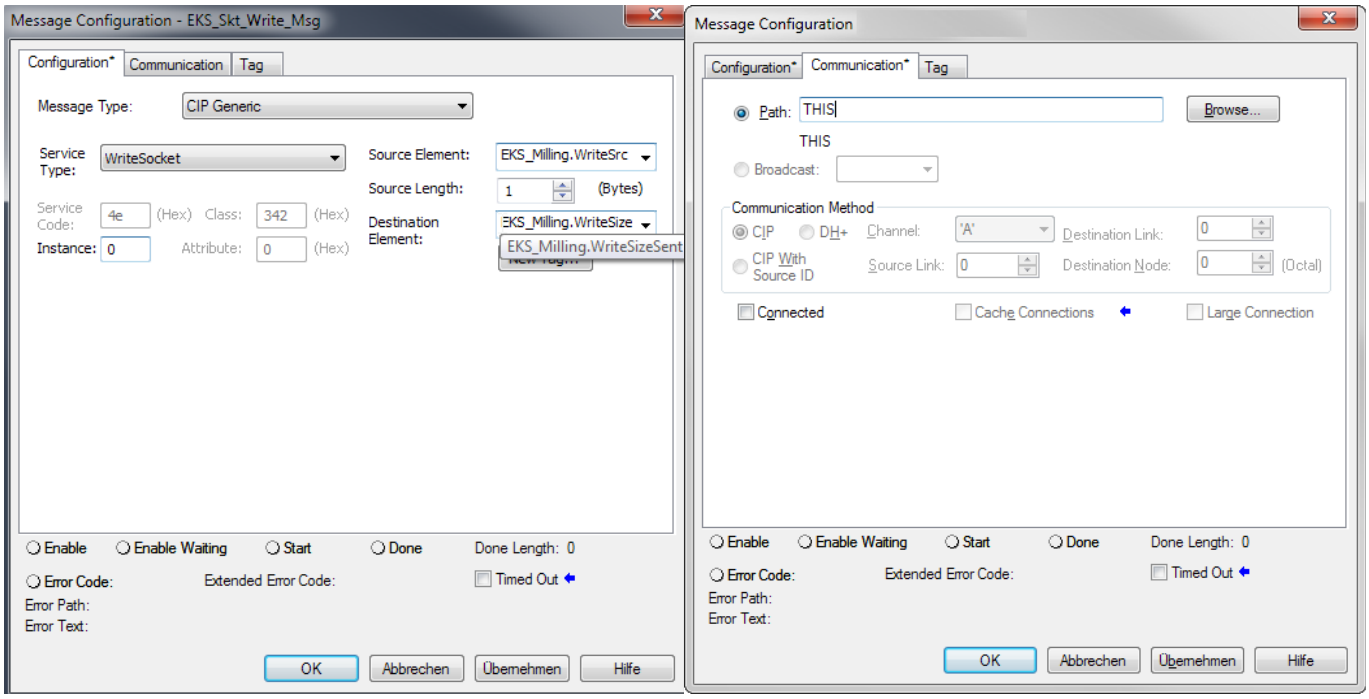


Fig. 16: Configuring parameters for *WriteSocket* Message

EN

6. Open the *Configuration Dialog* for *SktDelMsg*. Select *Service Type: DeleteSocket*. Configure the following parameters:

Parameter	Value
Instance	0
Path	THIS (you will find the *Path* parameter on the *Communication* tab)

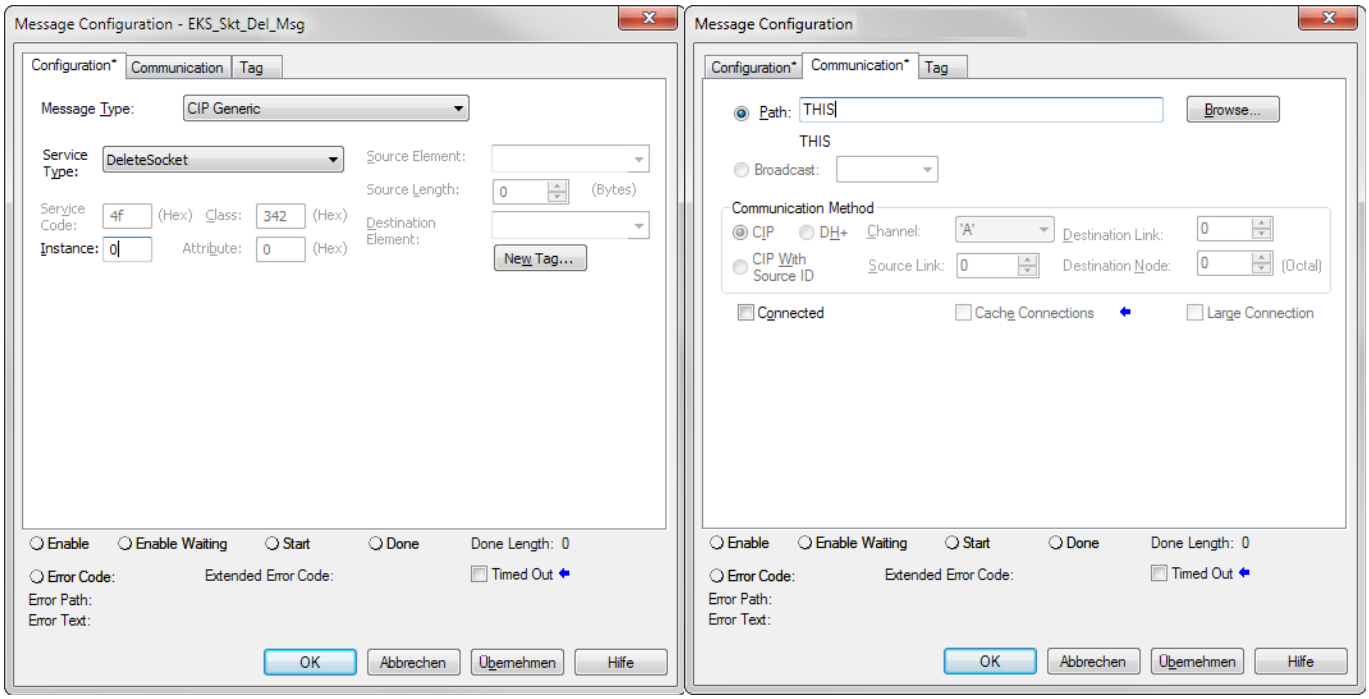


Fig. 17: Configuring parameters for *DeleteSocket* Message

5.4. Activating socket connection

Create a new rung. Add an input variable (e.g. *EnableSocket*) to the rung as a contact (*Examine On*). Add the variable *SktConEnable* from the AOI as an output (*Output Energize*).

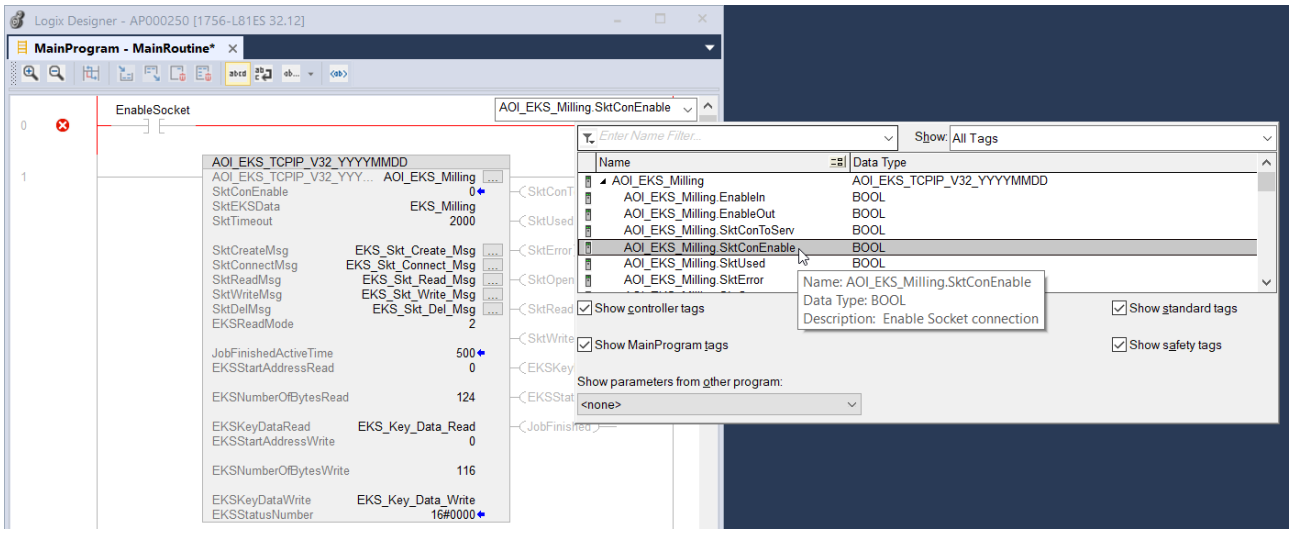


Fig. 18: Rung for activating the socket connection

5.5. Command for writing Electronic-Key

Create another rung and add an input variable (e.g. WriteKey) as a contact. Add the variable *EKSWriteKeyCommand* from the AOI as an output.

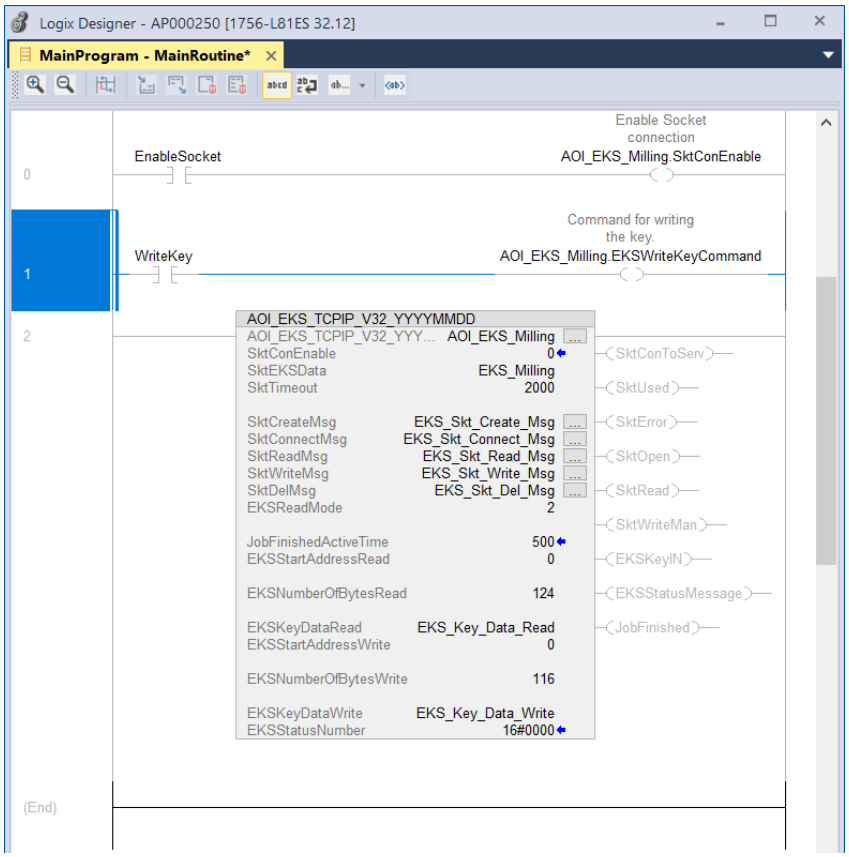


Fig. 19: Rung for writing Electronic-Key

EN

5.6. Configuring the parameters for the IP address

TIP

The IP address of the Electronic-Key adapter EKS is assigned using the web interface. You will find the related description in the manual, chapter 7.2.

Open the *Controller Tags* and change the view to *Monitor Tags*. Select the instance *EKS_Milling* and enter the IP address as a string.

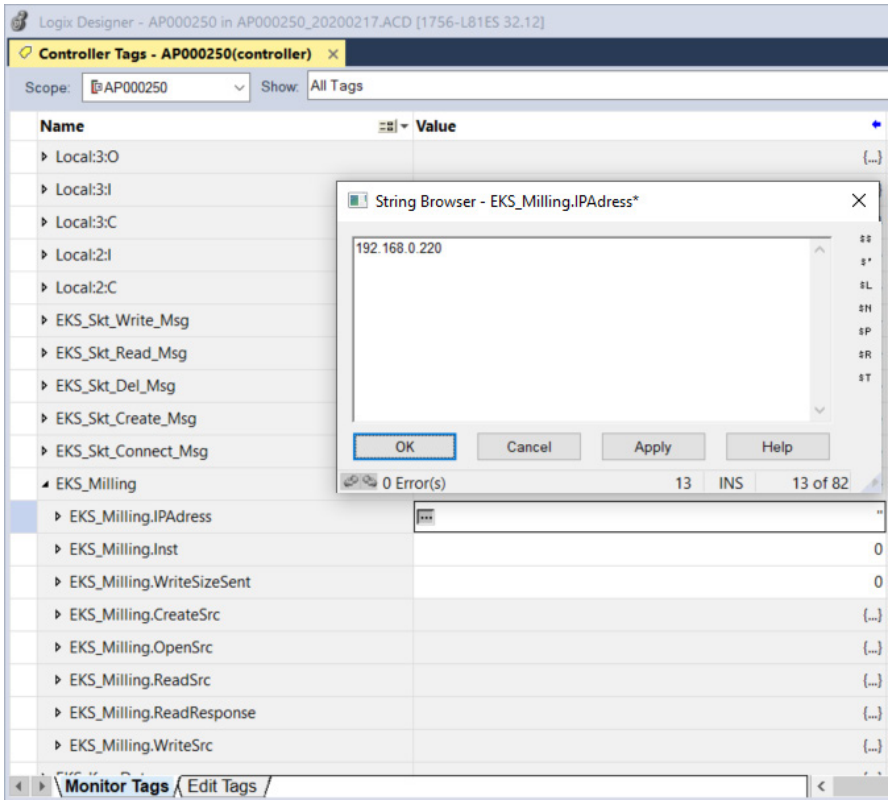


Fig. 20: Entering the IP address

5.7. Starting the program

Load the program into the control system. Go *Online* and set the bit *EnableSocket* (=*TRUE*). The socket connection is open if the output bit *SktOpen* for the AOI is *TRUE*. If an Electronic-Key is placed in the Electronic-Key adapter, the output bit *EKSKeyIN* = *TRUE* and the data read are saved in the *EKS_Key_Data_Read* array.

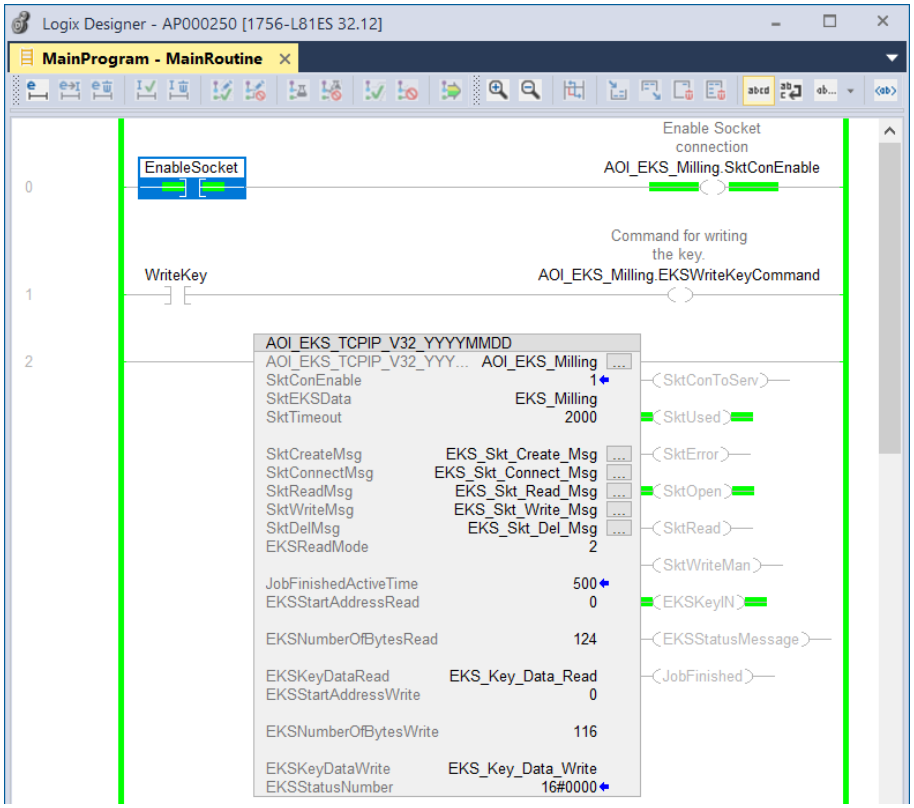


Fig. 21: Socket connection established

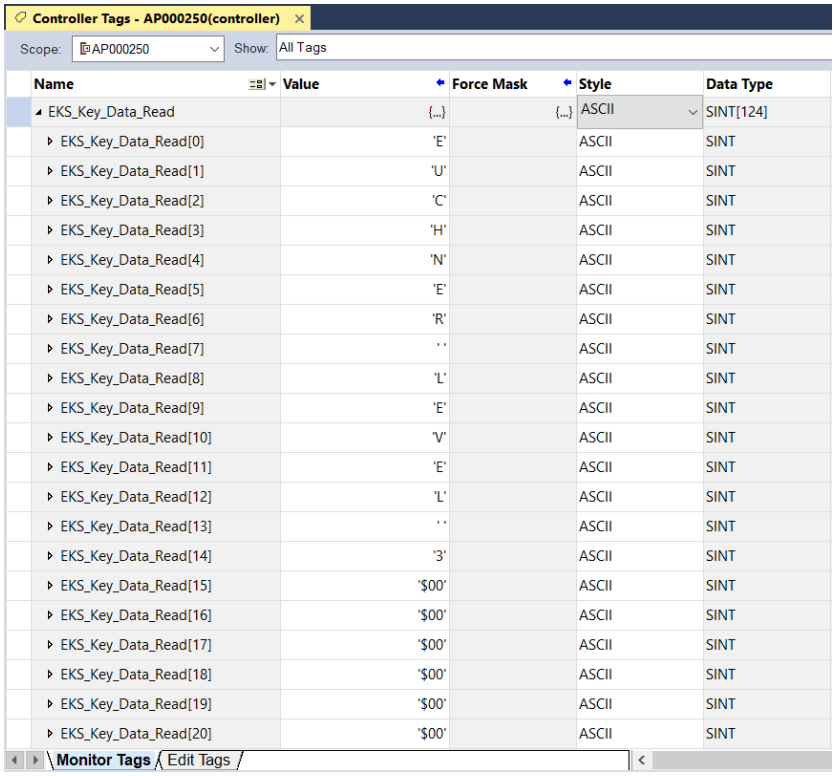


Fig. 22: Result in *EKS_Key_Data_Read* array

EN

5.8. Writing the Electronic-Key

To write an Electronic-Key, the *EKS_Key_Data_Write* array must be filled with the data to be written. As the Electronic-Key is always written in 4-byte blocks, all bytes into which you have not entered any values will be overwritten with 0. If you want to change individual data items on the Electronic-Key, you must always write the data that are not to be changed to the array as well. In this example, we will change stage 3 to stage 5.

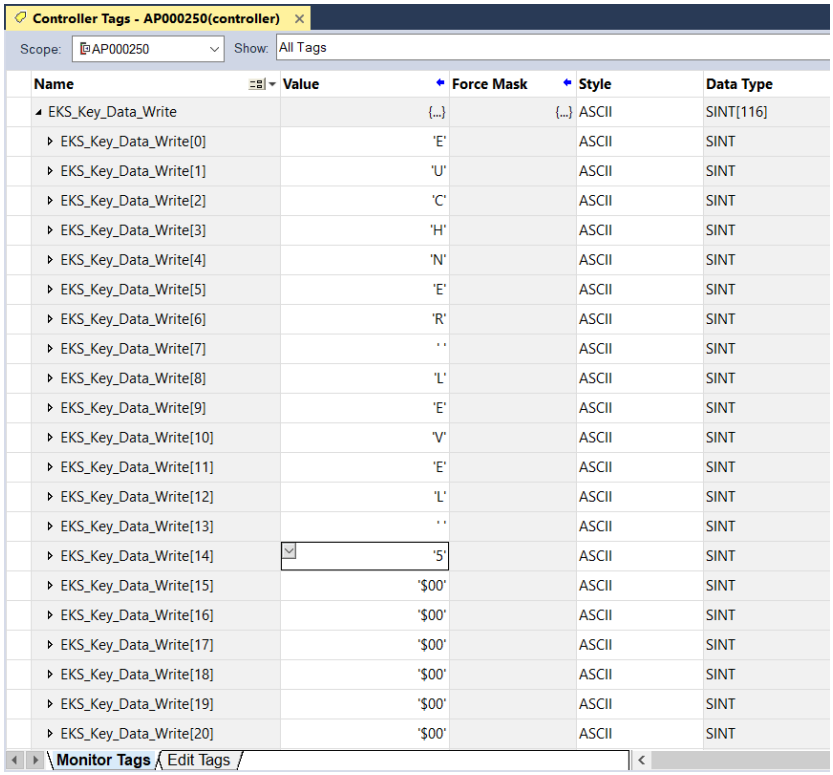


Fig. 23: Filling the array *EKS_Key_Data_Write*

If you now want to write the data from the array to the Electronic-Key, the *WriteKey* bit will require an edge. The data are written to the Electronic-Key and are then immediately displayed in the *EKS_Key_Data_Read* array.

Fig. 24: Writing data to the Electronic-Key

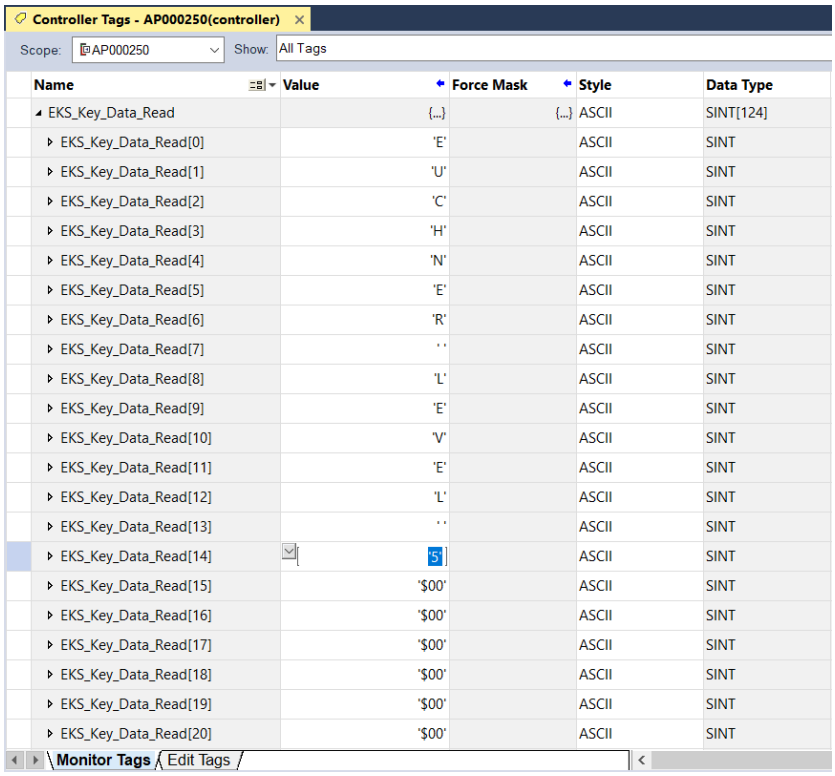


Fig. 25: New Electronic-Key data

EN

6. Important note – 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 technology 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.

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
Germany
info@euchner.de
www.euchner.com

Edition:
AP000250-03-04/21
Title:
Application EKS
Integration of EKS with TCP/IP Interface in Rockwell Studio 5000®