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**TURCK**

# TBIP-L...-FDIO1-2IOL Safety Block I/O Module

Getting Started



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# 1 Installing and Licensing Turck Safety Configurator

## 1.1 Downloading the Software

**NOTE**

The Turck Safety Configurator online help contains a detailed program description.

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- Download the Turck safety Configurator from the Turck homepage here:  
<http://www.turck.de>

## 1.2 Installing the Software

- Unpack the downloaded ZIP archive and start the installation via "install.exe".
- The setup assistant leads through the installation.

## 1.3 Licensing the Software

The licensing is done via coupon code.

- Enter the coupon code on the Turck Homepage following this link:  
<http://www.turck.de/en/turck-safety-configurator-license-6174.php>
- If the coupon code is missing, please order a coupon code via e-mail under the following e-mail address:  
[TM-BWSoftwareSupport@turck.com](mailto:TM-BWSoftwareSupport@turck.com)

### 1.3.1 Software Licensing for Virtual Machines (VM)

- Enter the coupon code on the Turck Homepage following this link:  
<http://www.turck.de/de/turck-safety-configurator-license-vm-6177.php>
- If the coupon code is missing, please order a coupon code via e-mail under the following e-mail address:  
[TM-BWSoftwareSupport@turck.com](mailto:TM-BWSoftwareSupport@turck.com)

## 1.4 Starting the Software

- Start the software via the program icon on the desktop.
- The Turck Safety Configurator starts with the Start Assistant, which will lead through the first steps after program start.



## 2 Configuring the device with Turck Safety Configurator

### 2.1 Setting up a New Configuration

- Select "New configuration" in the Start Assistant and create a new configuration for the safety monitor.

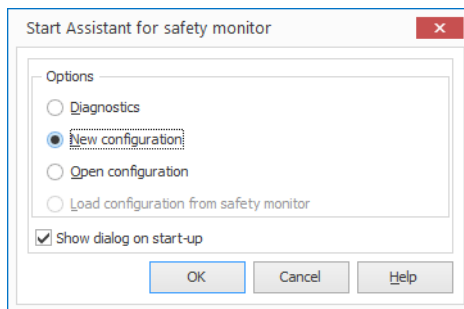


Fig. 1: Start Assistant

#### 2.1.1 Adapting the Monitor Settings

The dialog box "Monitor settings" is used to enter the basic data for the new configuration.

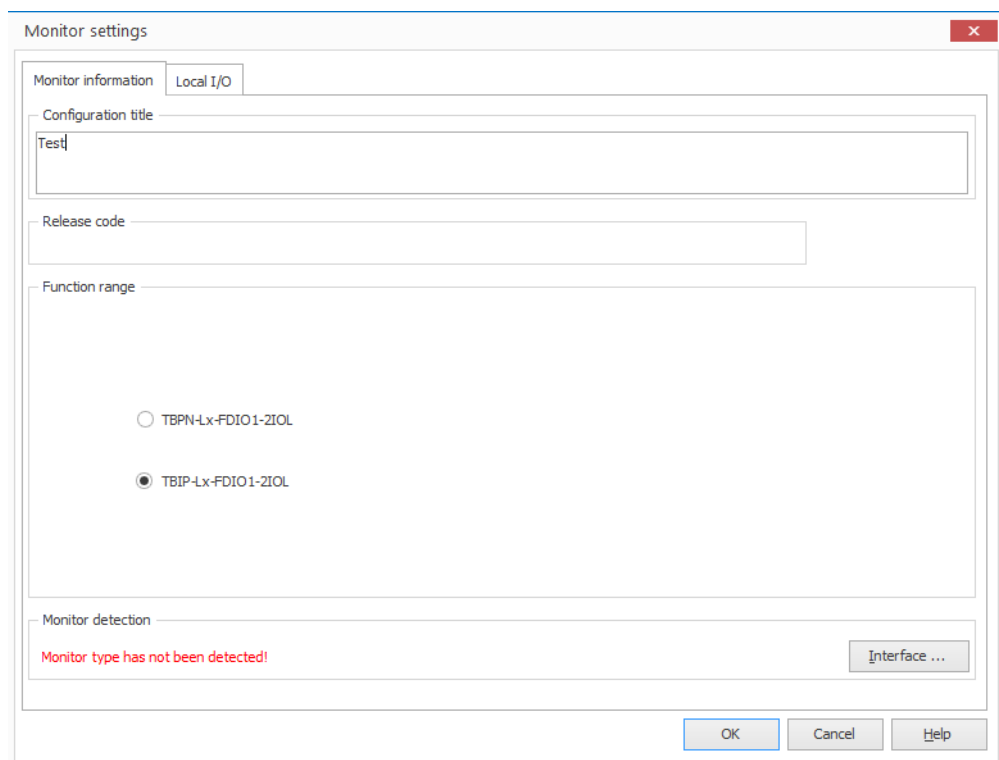


Fig. 2: Monitor settings

- Enter the configuration title in the register tab "Monitor information".
- Select the device type of the safety module (monitor type) in the section "Function range".

- If no monitor is detected, open the settings for the interface to the connected device via the "Interface..."-button and enter the IP address of the connected device under "UDP".

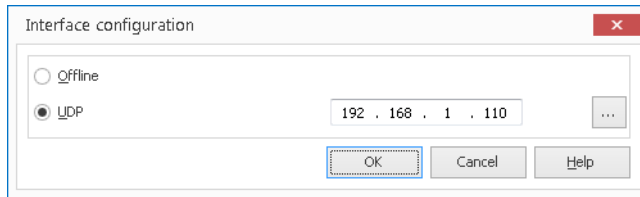


Fig. 3: Interface configuration

- If the IP-address of the device is not known, search the network via the "..."-button.
- Select the device from the list and close with "OK".

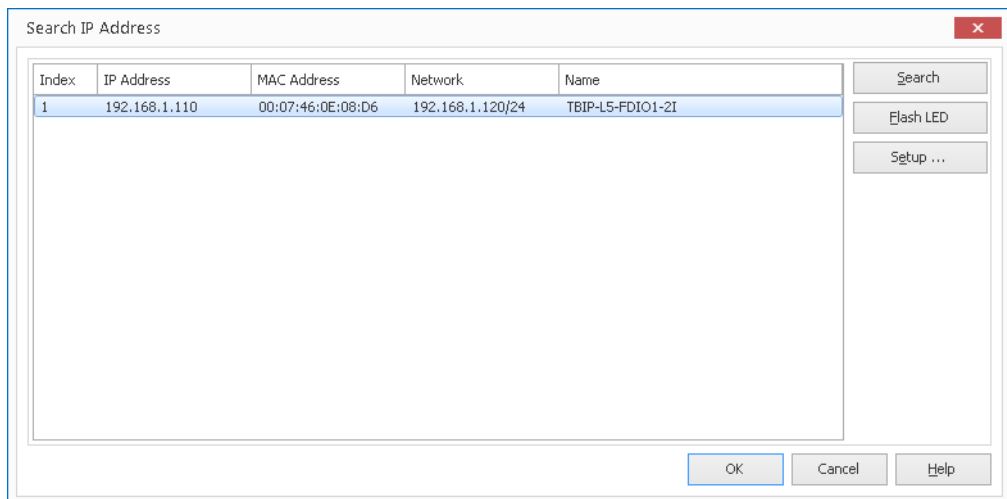


Fig. 4: Search IP address



→ The safety module (monitor type) is detected, the connection is established.

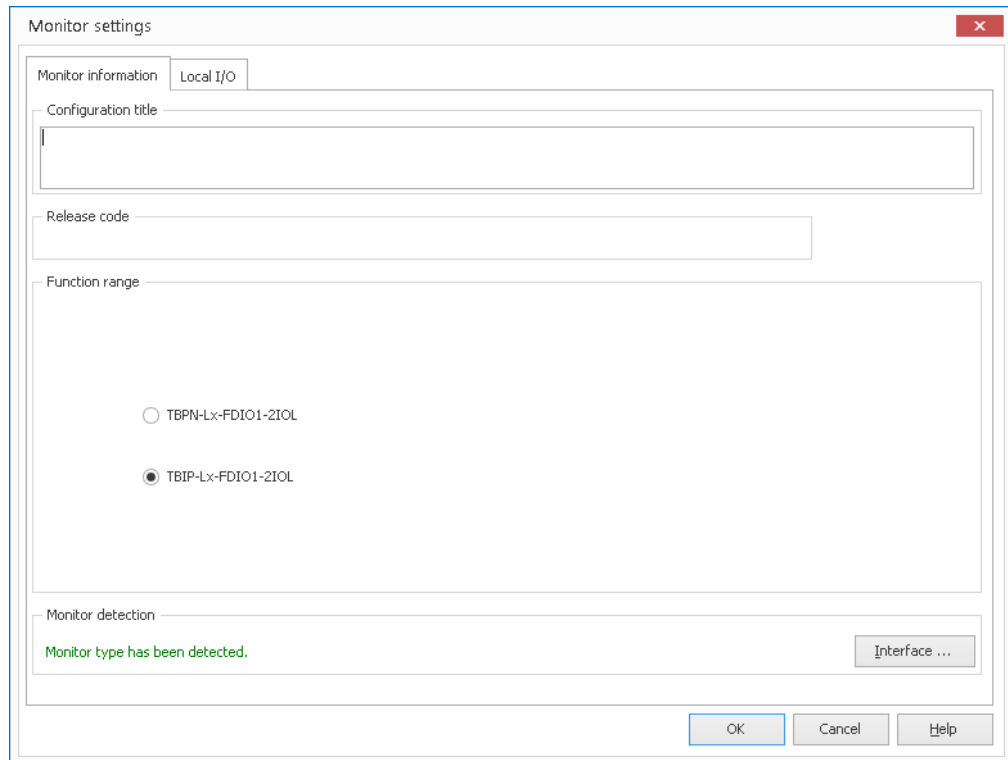


Fig. 5: Device (monitor type) detected

## 2.2 Setting up a Standard Configuration

The register tab "Local I/O" in "Monitor settings" shows the standard configuration for the local device in- and outputs.

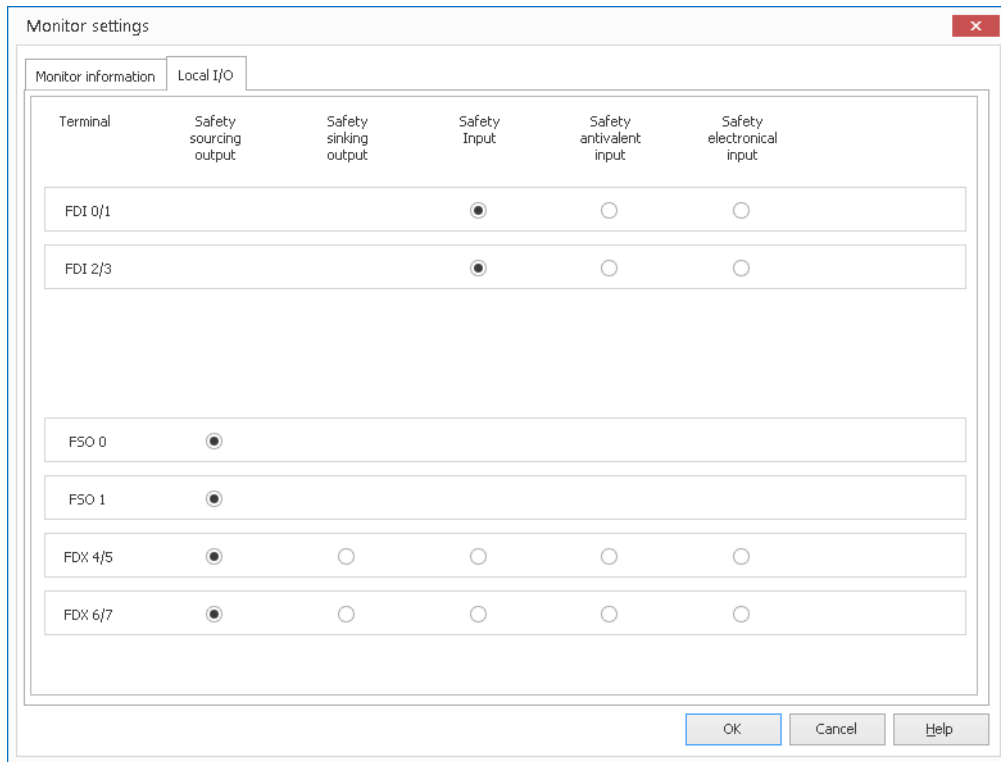


Fig. 6: Standard configuration of the local I/O

- Close the dialog box "Monitor settings" by pressing "OK".
- ➡ The standard configuration is created.

## 2.2.1 Standard Configuration

### Outputs:

For each device output, which means, for the two internal safety outputs FSO0 and FSO1 as well as for the two SIL3-outputs FDX4/5 and FDX6/7 one release circuit (OSSD 1 - OSSD 4) is created. The outputs are automatically linked to the first four CIP Safety input bits.

### Inputs:

Additionally, one release circuit (63. OSSD and 64. OSSD) is created for each of the two SIL3-inputs (FDI0/1 an FDI2/3). The inputs are also automatically assigned to the first two CIP Safety output bits.

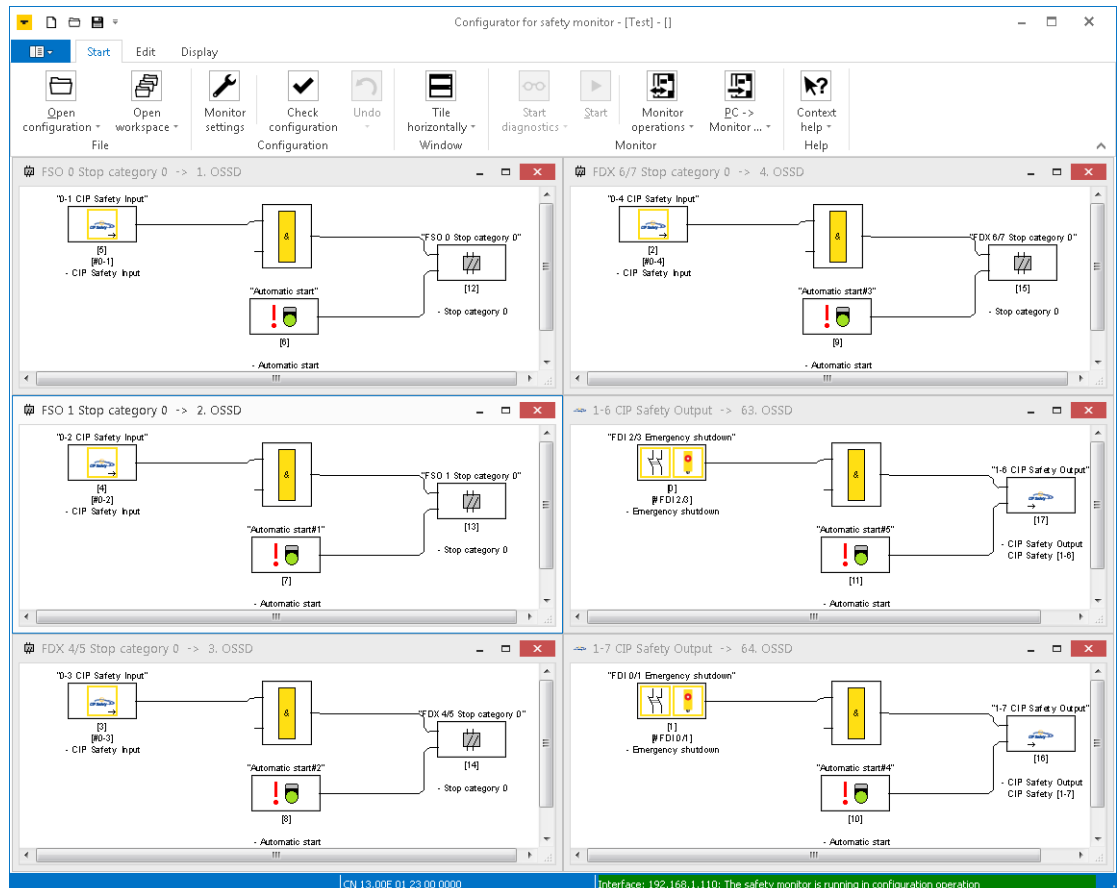


Fig. 7: Release circuits (OSSDs) of the standard configuration

## 2.3 Checking the Configuration

The Turck Safety Configurator checks the created configuration for logical errors, which means, the logical wiring of the single components in the release circuits is checked. The configuration check does not consider double allocation etc.

- ➔ Start the check using the "Check configuration"-button.

## 2.4 Loading the Configuration into the Safety Module.

- Stop the safety module using the "Stop"-button.
- Download the configuration created in the software to the device by using the button "Send configuration" → "PC -> Monitor".

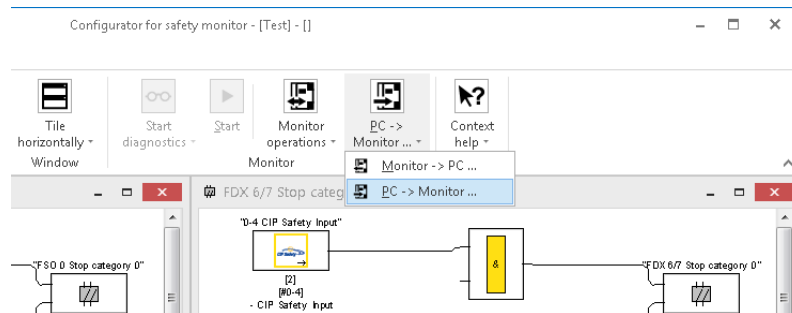


Fig. 8: Send configuration „PC->Monitor“

- Enter the password for the configuration.

During the first download of a configuration to the device, the standard password "SIMON" has to be changed.



### NOTE

If the device is reconfigured, a new password has to be assigned. This password, must be known only to the responsible authorized safety representative.

### 2.4.1 Change Password

- Enter a new password for the application in the "Password dialog".

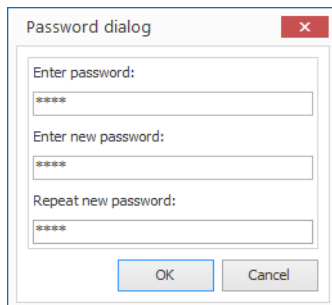


Fig. 9: Entering a new password.

## 2.5 Checking the Configuration

- Confirm the "Information" dialog with "OK" and confirm the configuration validation in the dialog box "Configuration validation".
- Enter the name of the authorized person who is in charge of the validation and enter a password.

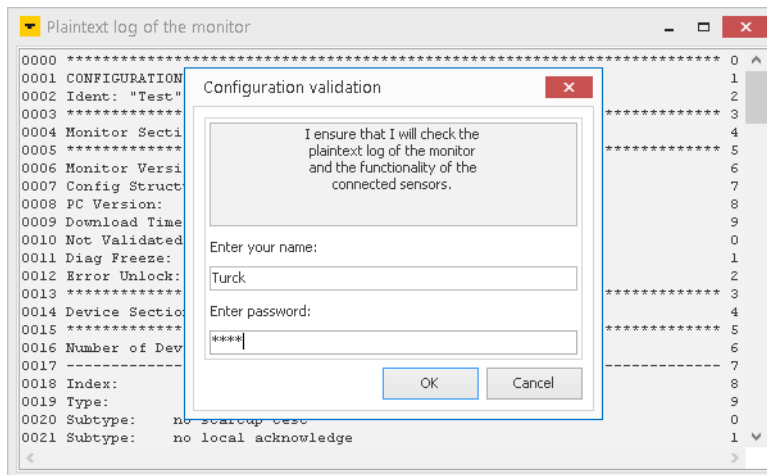


Fig. 10: Configuration release

The configuration log is part of the safety documentation of the machine.

- Copy the plain text log to a text editor, save, print and archive it.
- or
- Save the configuration log as text file via "Monitor operations → configuration log → save as...", print and archive it.



### NOTE

Chapter 5.8 of the software's online help contains a detailed description of the structure of the configuration log.

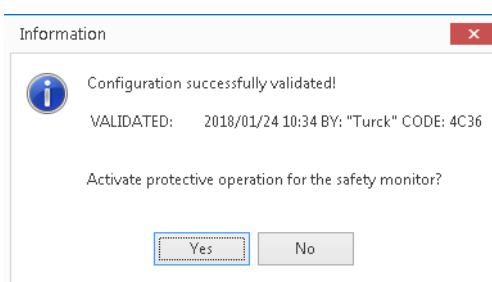


Fig. 11: Releasing the Configuration

- ➔ Closing the dialog box with "Yes" activates the protective operation of the device (safety monitor). The device is started.

➔ After the configuration release, the device is in diagnostics mode.



### NOTE

The CIP Safety section at the end of the configuration log contains the CIP Safety Configuration Signature with ID and time stamp which have to be entered in the EtherNet/IP™ PLC software, s. **Configuration Signature vergeben (page 35)**.

```
Plaintext log of the monitor
0130 FDI 6/7: not used or available 0
0131 FDX 4/5: Safety Output (P) 1
0132 FDX 6/7: Safety Output (P) 2
0133 FSO 0: Safety Output (P) 3
0134 FSO 1: Safety Output (P) 4
0135 ***** 5
0136 CIP Safety 6
0137 ***** 7
0138 Configuration Signature: 8
0139 ID: 485071CE 9
0140 Timestamp: 2018-01-24 10:34:00.000 UTC 0
0141 ----- 1
0142 Output Reference List 2
0143 ----- 3
0144 Instance 1, byte 1, bit 6: device: 17 = "1-6 CIP Safety Output" 4
0145 Instance 1, byte 1, bit 7: device: 16 = "1-7 CIP Safety Output" 5
0146 ***** 6
0147 ***** 7
0148 Validated: 2018-01-24 10:34 by: "Turck" code: 4C36 count: 1 8
0149 End of Configuration 9
0150 ***** 0
```

Fig. 12: CIP Safety Configuration Signature

## 2.6 Loading the Diagnostics Configuration

If the diagnostics are activated, the TSC shows the state of the safety I/Os.

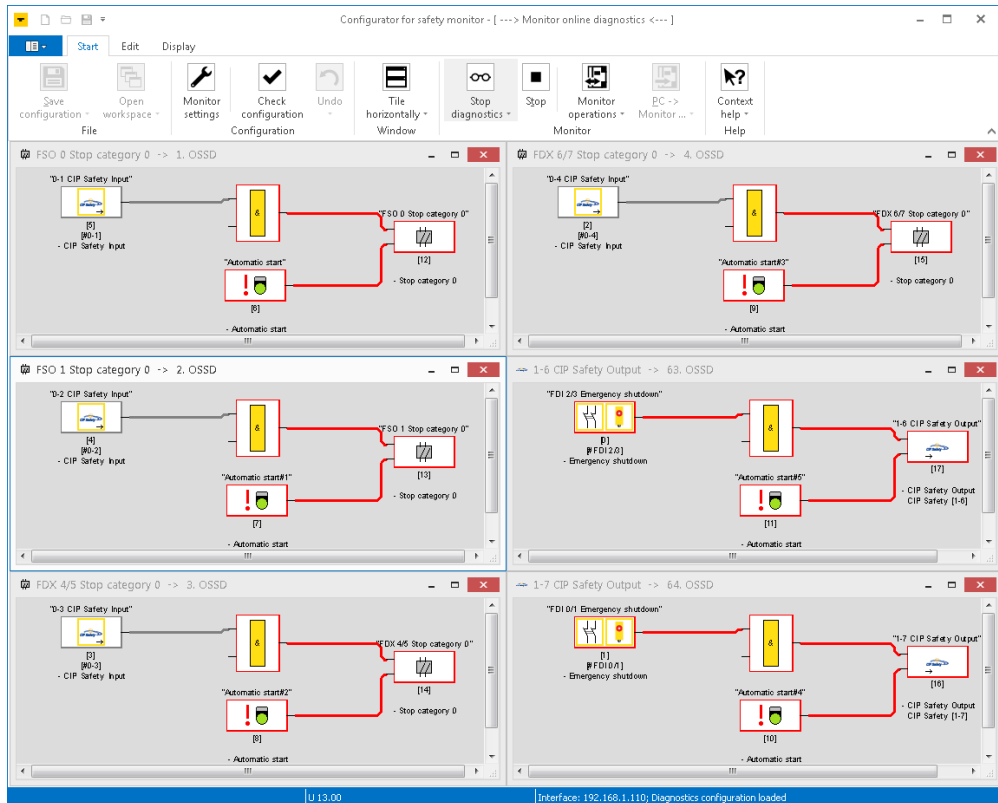


Fig. 13: Released configuration, diagnostics configuration loaded

## 2.7 Customizing the Configuration

The standard configuration in the Turck Safety Configurator can be customized in order to meet the requirements of different applications.

### 2.7.1 Customizing a Standard Application (Preliminary Considerations)

#### 1 What is needed?

- Definition of amount and type of the required in- and outputs
- Which components are used for the safety function:
  - electromechanical components
  - electric components
  - dual channel switching
  - antivalent switching
  - components with semiconductor OSSD output

#### 2 Where will the components be placed??

All red-labeled M12-connectors on the left side of the TBIP-L...-FDIO1-2IOL are designed for connecting safety components.

In the standard configuration, the two lower M12-connectors (C2 and C3) are configured as dual channel SIL3-outputs. However, depending on the application, they can be used as SIL3-inputs. In total, up to four dual channel safety related SIL3-inputs can be connected to the device.

Possible input configurations:

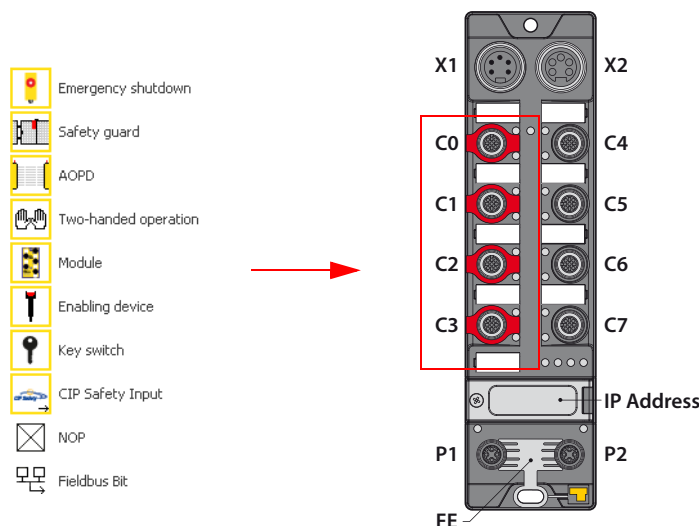


Fig. 14: Input configurations

Possible output configurations:

- PP-switching
- PM-switching

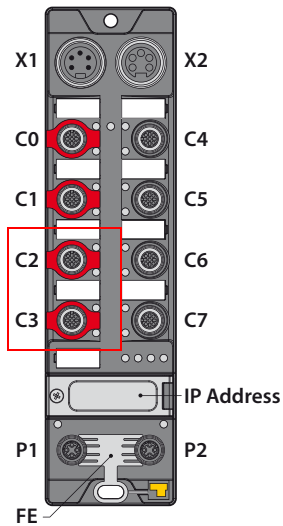


Fig. 15: Output configurations

## 2.7.2 Setting-up an Own configuration

- Adapt the standard configuration of the safety channels in the Turck Safety Configurator under "Monitor settings → Local I/O".

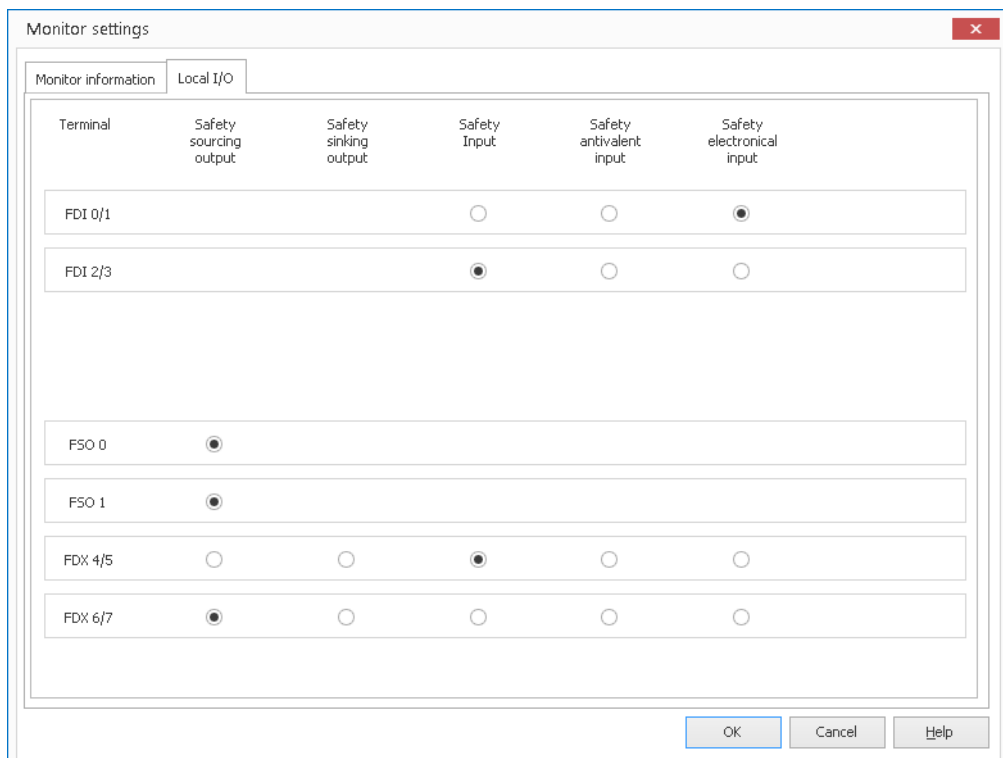
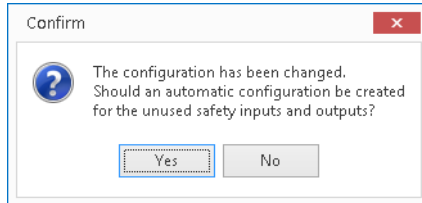


Fig. 16: Customized configuration of the local I/O



- Close the dialog box with "OK".
- The configuration change is done.
- The software generates the new release circuits (OSSDs) if the following dialog box is closed with "yes".



- Again, the CIP Safety in- and output bits are automatically assigned.



**NOTE**

Release circuits (OSSDs) which are no longer used, have to be deleted.

New configuration (assignment of release circuits):

Inputs

- FDX4/5 → 62. OSSD (**new release circuit for the input**)
- FDI0/1 → 64. OSSD
- FDI2/3 → 63. OSSD

Outputs

- FDX6/7 → 4. OSSD
- FDX4/5 → 3. OSSD (**no longer necessary, will be deleted, see Deleting OSSDs (page 16)**)
- FSO0 → 2. OSSD
- FSO1 → 1. OSSD

## 2.7.3 Deleting OSSDs

OSSDs which are no longer necessary are deleted in the software's Component Manager.

- Open the component manager via "Display → Window → Component manager".

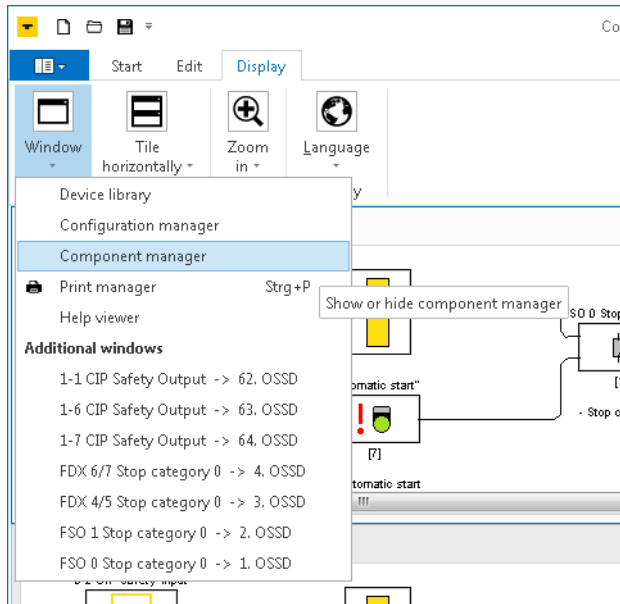


Fig. 17: Open the component manager

- Delete the release circuits (OSSDs) which are no longer used in the component manager (in this example OSSD 3).

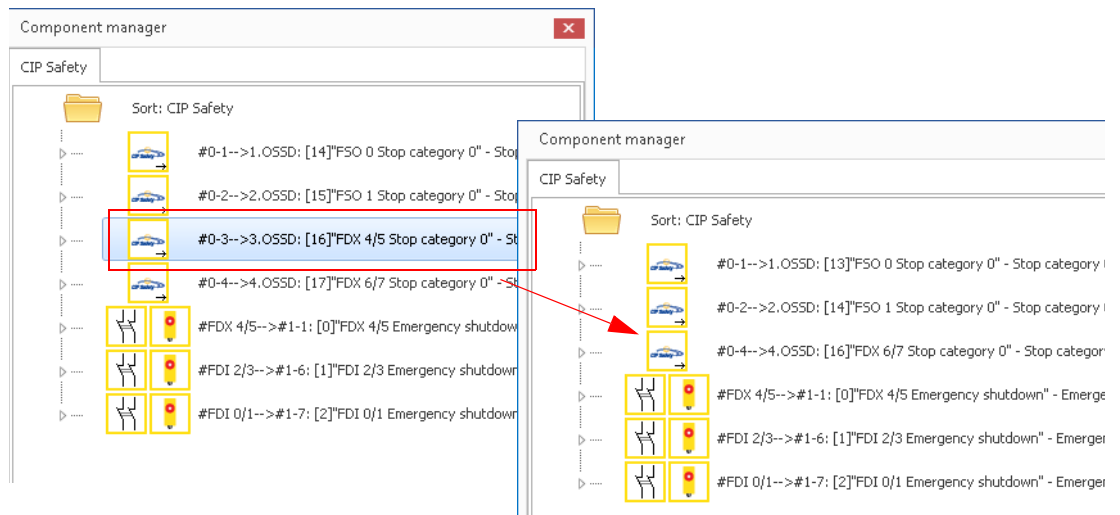


Fig. 18: Deleting OSSDs

## 2.8 Application Example

- Emergency Stop at FDI0/1 at C0 (64. OSSD), **page 18**
- Light grid (AOPD) at input FDI2/3 at C1 (63. OSSD), **page 18**
- Non-safety channels at C4 - C7 will be switched on permanently via the internal safety outputs (1. and 2. OSSD), **page 19**
- Output FDX4/5 at C2 (3. OSSD) is switched off if the emergency stop and/or the light grid are activated, **page 21**
- Output FDX6/7 at C3 (4. OSSD) is switched off, if output FDX4/5 is switched off, **page 24**. The output state is transferred to the F-CPU.
- Release of the complete safety function via a release bit in the F-CPU (3. OSSD), **page 25**

The application example is based on the standard configuration.

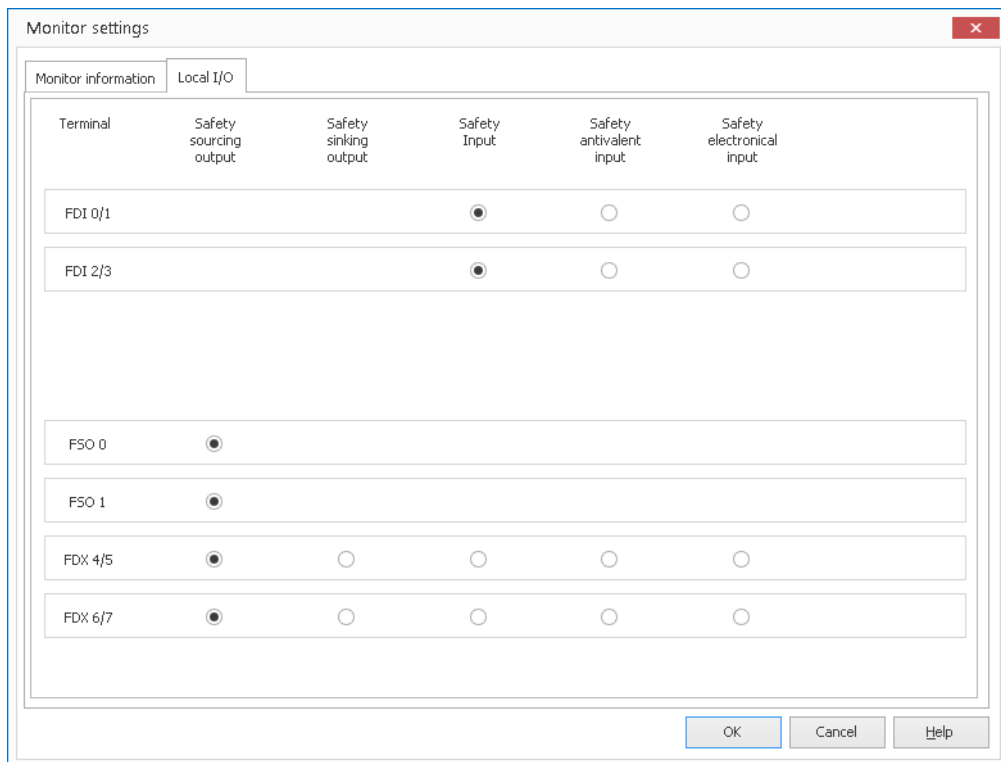


Fig. 19: Standard configuration of the local I/O

## 2.8.1 Add emergency shutdown in 64. OSSD

The release circuit remains unchanged as it corresponds to the standard configuration.

- Emergency shutdown at SIL3-input FDI0/1, assigned to CIP Safety output bit 1-7.

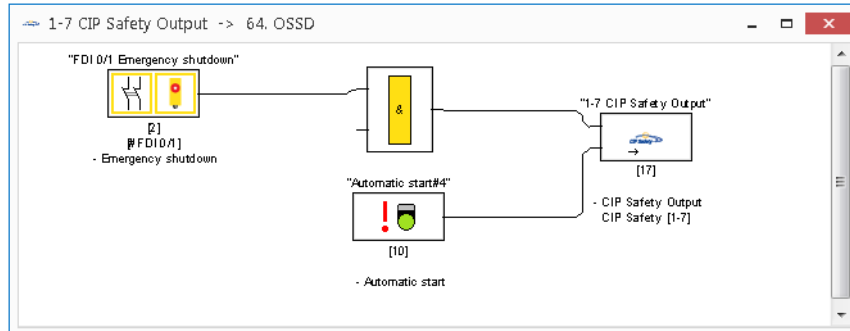


Fig. 20: 64. OSSD with emergency shutdown

## 2.8.2 Light grid (AOPD) in 63. OSSD

- Delete the input element "Emergency shutdown".
- Define the input as Safety electrical input in "Monitor settings → Local I/O".

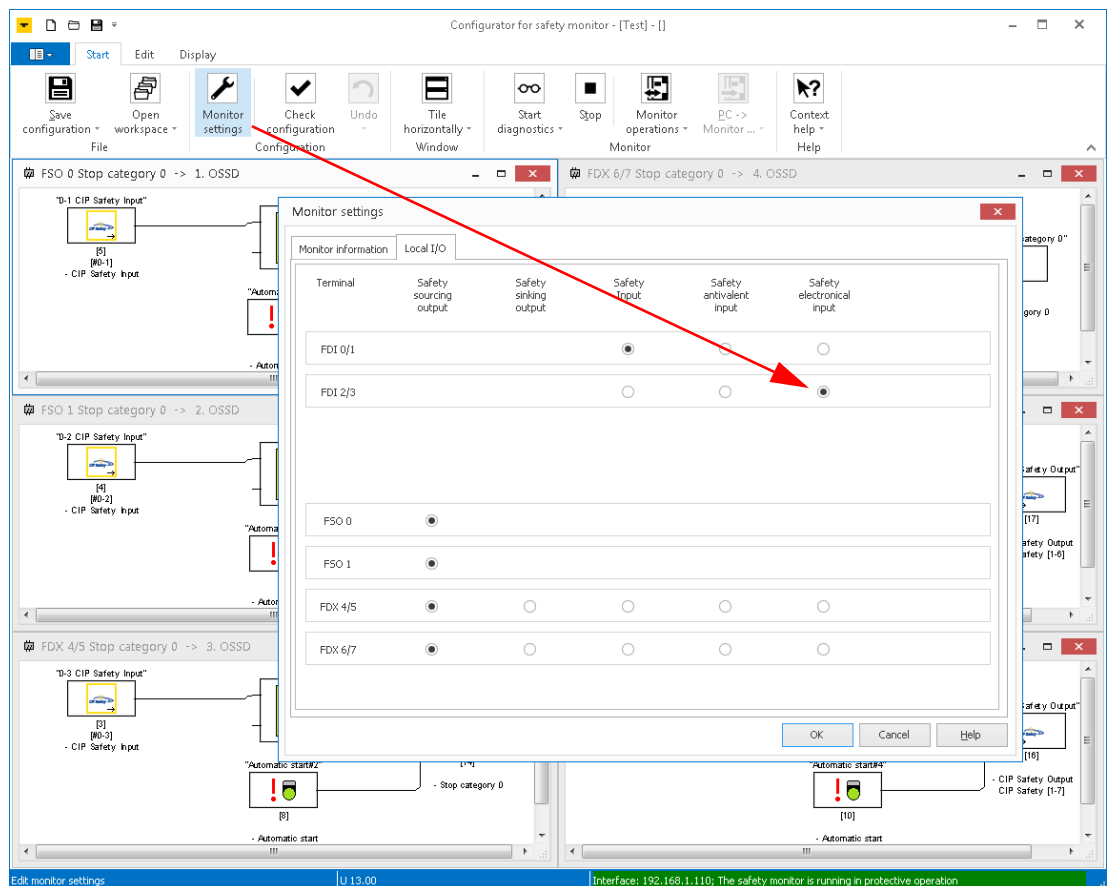


Fig. 21: Define FDI2/3 as Safety electrical input

- Select the light grid from the Device library and add it to the release circuit (OSSD) instead of the emergency shutdown.  
The Device library is opened via "Display → Window → Device library".

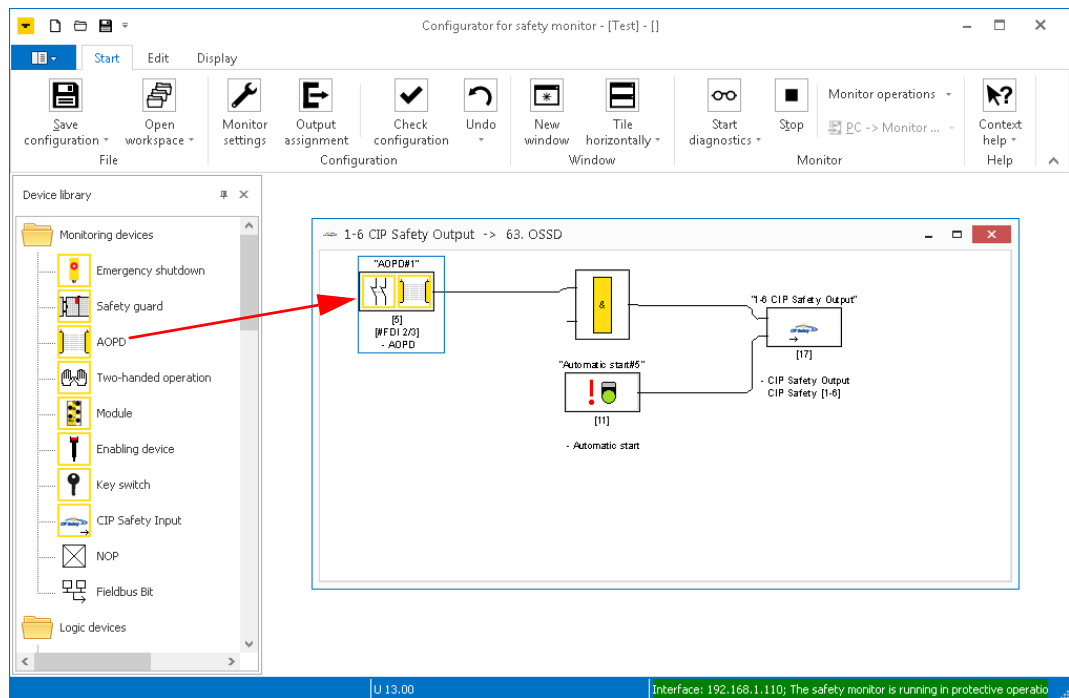


Fig. 22: Light grid (AOPD) in 63. OSSD

- The light grid at FDI2/3 is configured and assigned to CIP Safety output bit 1-6.

### 2.8.3 Switch-on Unsafe Channels Permanently (1. and 2. OSSD)

The non-safety channels at C4 - C7 of the device can be safe switched off via the internal safety outputs FSO0 and FSO1. If they have to be switched on permanently, then FSO0 and FSO1 need a permanent switch-on condition (TRUE). The programming is done in the 1. and 2. OSSD.

- Delete the element "CIP Safety Input" in both OSSDs (1. and 2. OSSD) and replace it by a "TRUE"-element from the device library.

↳ Both internal outputs are permanently active.

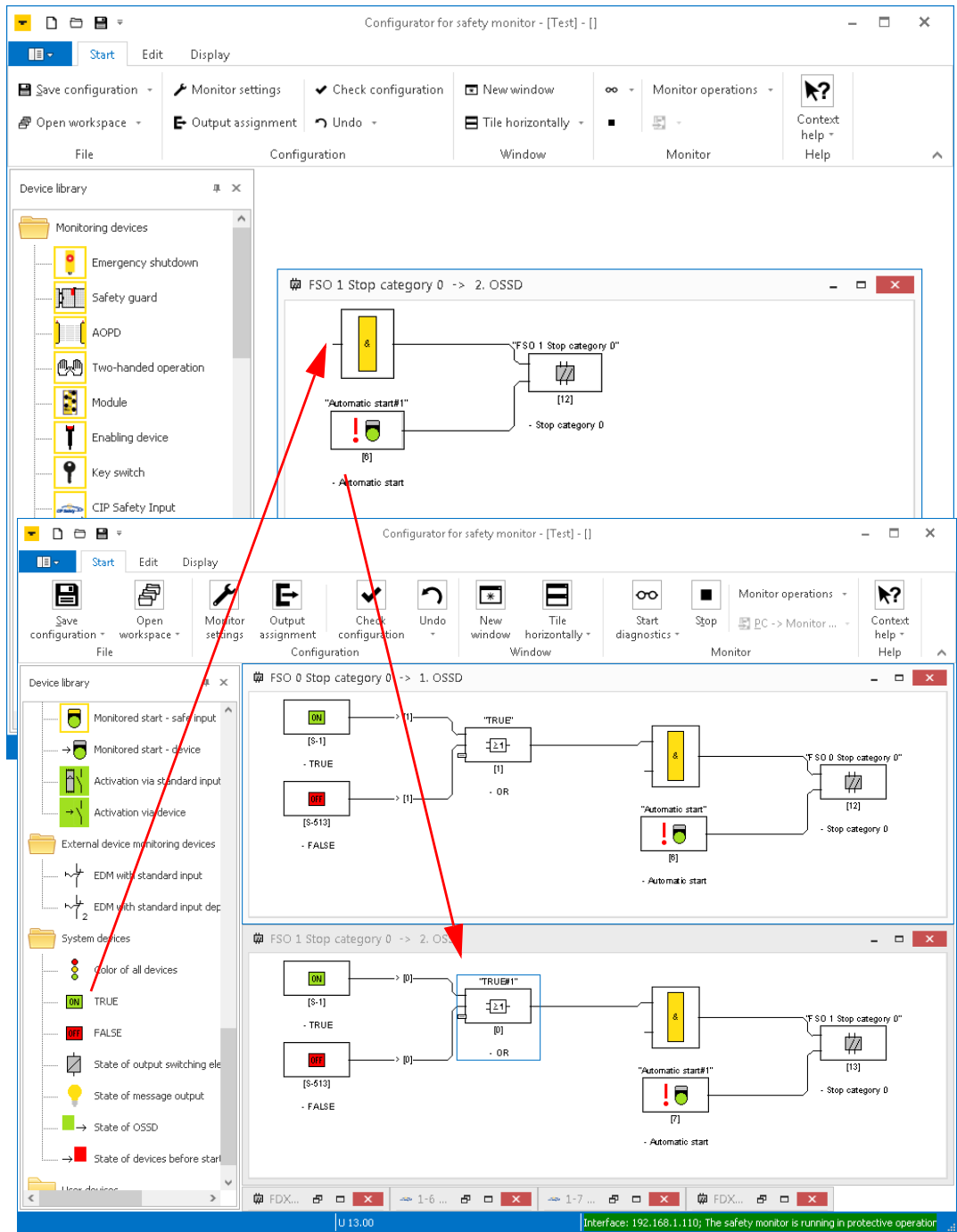


Fig. 23: Permanent activation of FSO0 and FSO1.

## 2.8.4 Switch-off of FDX4/5 if emergency shutdown or light grid activated

Output FDX4/5 at C2 (3. has to be switched off as soon as the emergency shutdown at FDI0/1 (64. OSSD) or the light grid at FDI2/3 (63. OSSD) are activated. This means, the state of the OSSD 63 and 64 controls the state of FDX4/5.

- Delete "CIP Safety input" in OSSD 3.
- Select the element "Output F-CPU" in the Device library and place it at the third input of the function.

- In the dialog box "State of output switching element x" select OSSD 63.

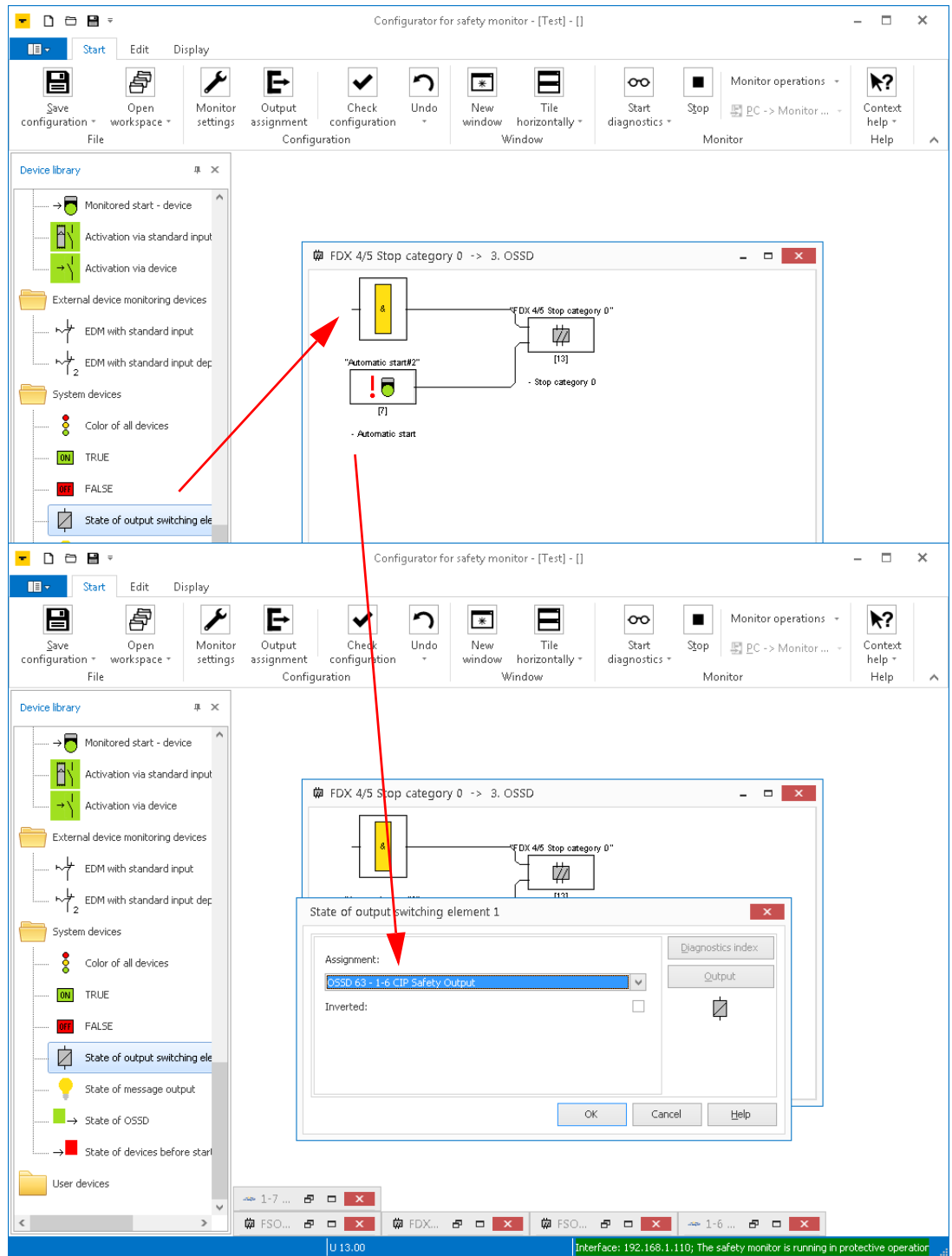


Fig. 24: State of output switching element OSSD 63

- Select the element "Output F-CPU" in the Device library and place it at the third input of the function.



- In the dialog box "State of output switching element x" select OSSD 64.

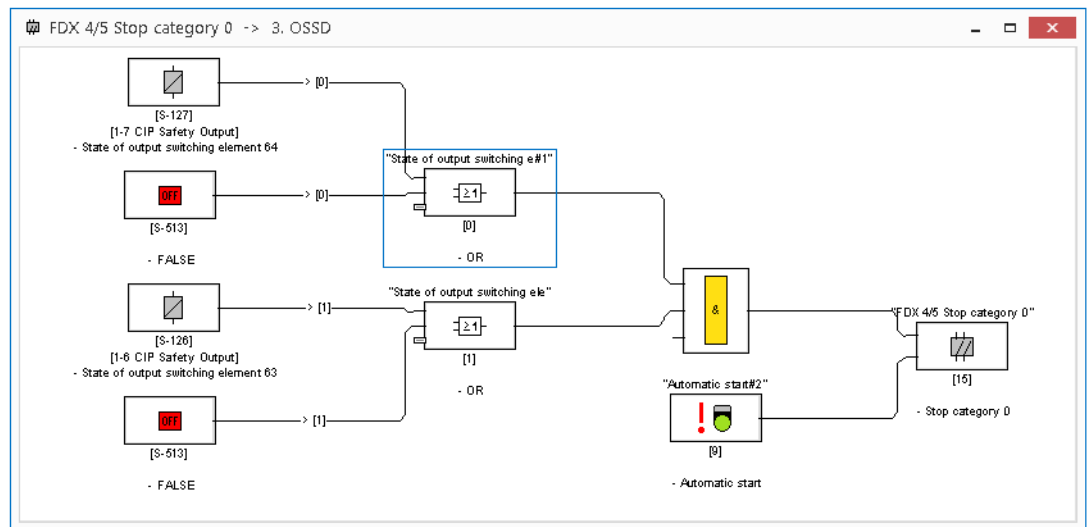


Fig. 25: State of output switching element OSSD 63 and OSSD 64

- The activation of the emergency shutdown at FDI0/1 or the light grid at FDI2/3 switches off output FDX4/5.

## 2.8.5 Switch-off FDX6/7 at C3 (4. OSSD), if output FDX4/5 is switched.

Output FDX6/7 has to switch off if output FDX4/5 (3. OSSD) switches off.

- Delete "CIP Safety input" in OSSD 4.
- Select the element "Output F-CPU" in the Device library and place it at the third input of the function.
- In the dialog box "State of output switching element x" select OSSD 3.

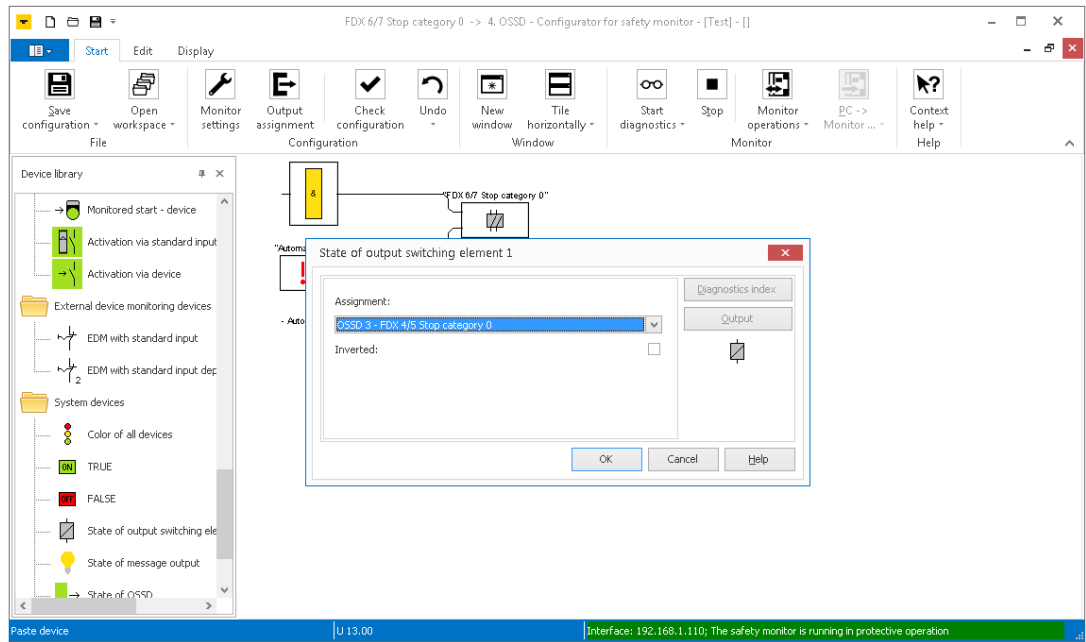


Fig. 26: State of output switching element OSSD 3 in OSSD 4

- The state of 3. OSSD controls the output FDX6/7 in 4. OSSD.

2.8.6 Release of the safety function via a release bit in the F-CPU

The release of the safety function is done using a release bit in the F-CPU. Therefore, an output bit of the F-CPU is assigned to the output function in the 3. OSSD.

- Select the element "CIP Safety input" in the Device library and place it at the third input of the function.

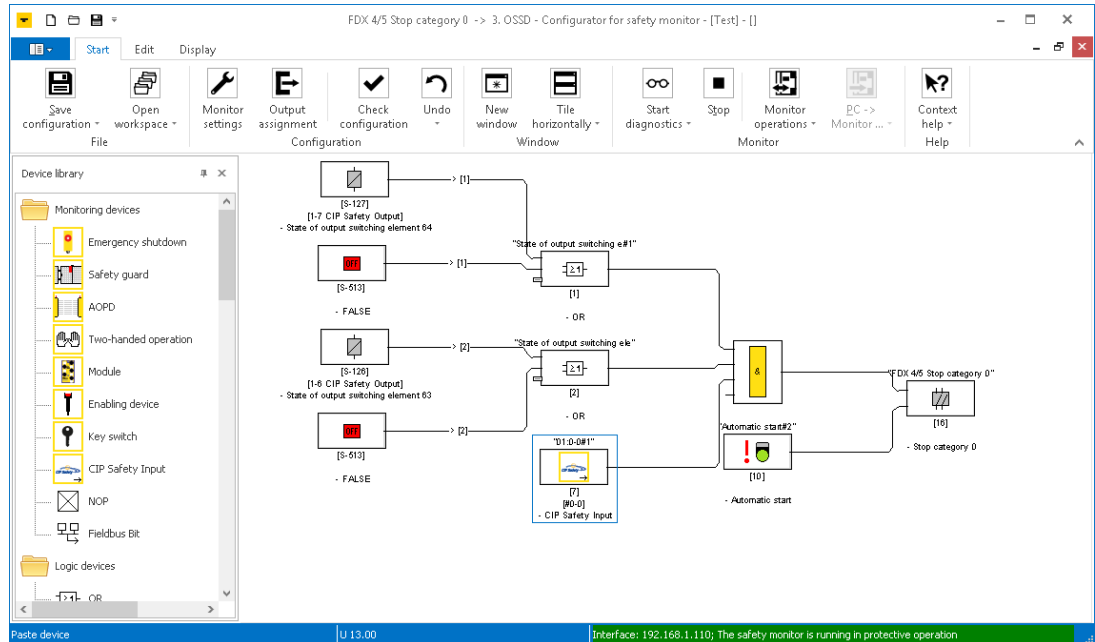


Fig. 27: 3. OSSD with release bit from F-CPU

- After an error, the safety function will only restart if the emergency shutdown as well as the light grid are error free and the release bit in the F-CPU is set.



### 3 Configuring the device at CIP Safety (Rockwell Studio 5000)

#### 3.1 Basic Information

The TBIP-Lx-FDIO1-2IOL has two IP addresses. One IP address (in the example: 192.168.1.110) addresses the safety side (left side) of the device, the second IP address (in the example: 192.168.1.111) addresses the non-safety side (right side) of the device.

The TBIP-Lx-FDIO1-2IOL therefore has to be configured in the following two steps in the configuration software of the safe Ethernet/IP™ PLC.

**1** Generic EtherNet/IP Safety Module: Module for the **safety side**

**2** Generic EtherNet/IP Module: Module for the **none-safety side**

#### 3.1.1 Used Hardware

- TBIP-L5-FDIO1-2IOL
- Allen-Bradley Controller: Compact Logix 1769-L30ERMS/A LOGIX5370

#### 3.1.2 Used Software

- RSLinx (Rockwell Automation)
- Studio 5000 (Rockwell Automation)

### 3.2 RSLinx – Searching the Network for Devices

- Scan the network with RSLinx using the "RSWho"-function.
- The device responds with two IP addresses.  
One IP address (in the example: 192.168.1.110) addresses the safety side (left side) of the device, the second IP address (in the example: 192.168.1.111) addresses the non-safety side (right side) of the device.

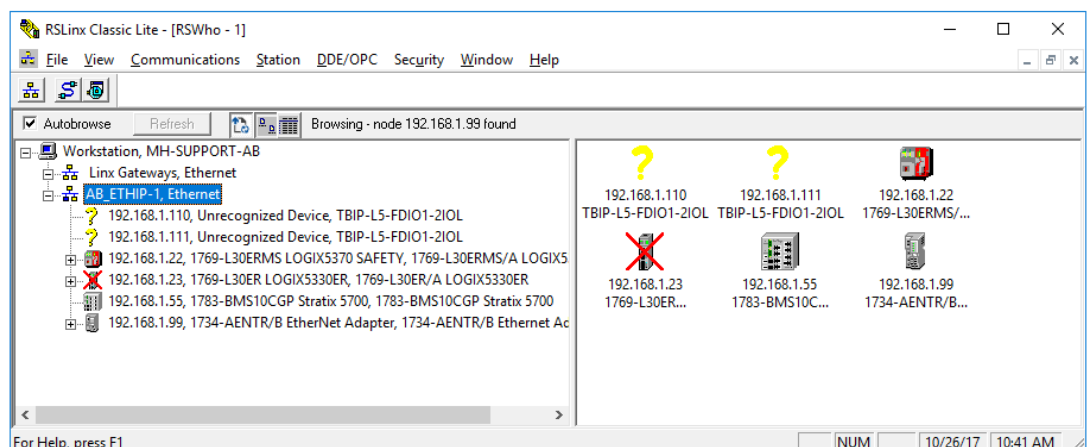


Fig. 28: RSLinx – two IP addresses per device

### 3.3 Creating a New Project

- Start Studio 5000.
- Click "New Project" select the used Safety controller and enter a project name.
- Confirm with "Next".

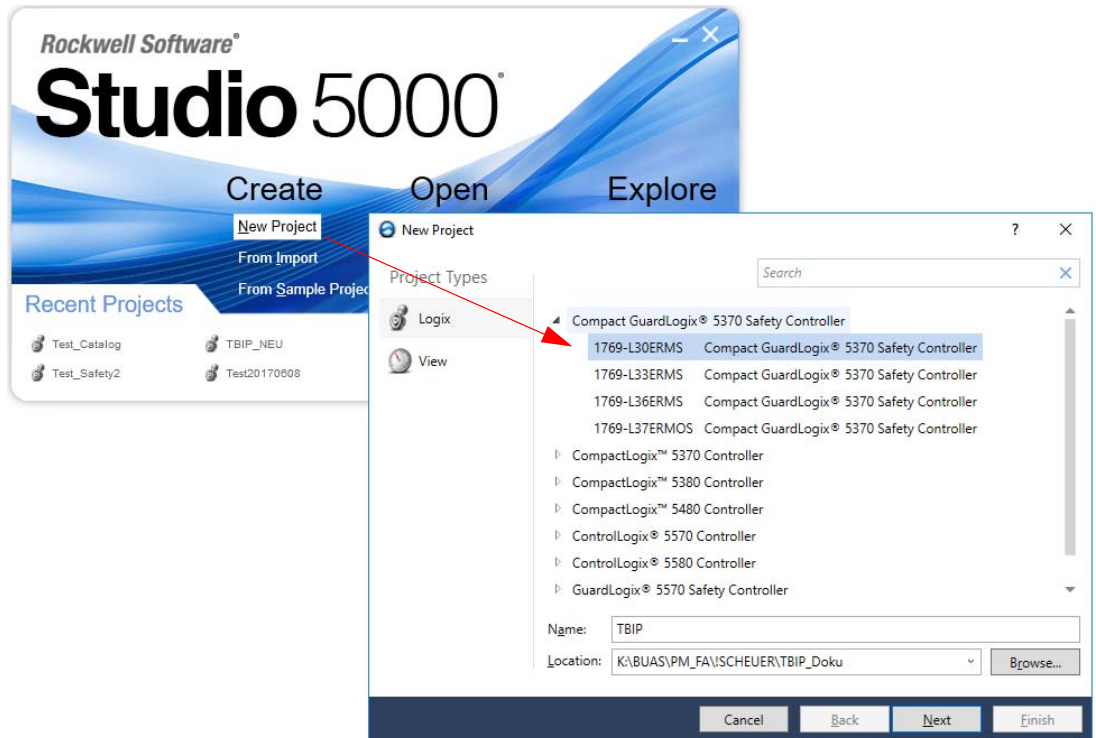


Fig. 29: Studio 5000 – new project

- If necessary, adjust the settings in the "New Project" window and complete the project creation using the "Finish" button.

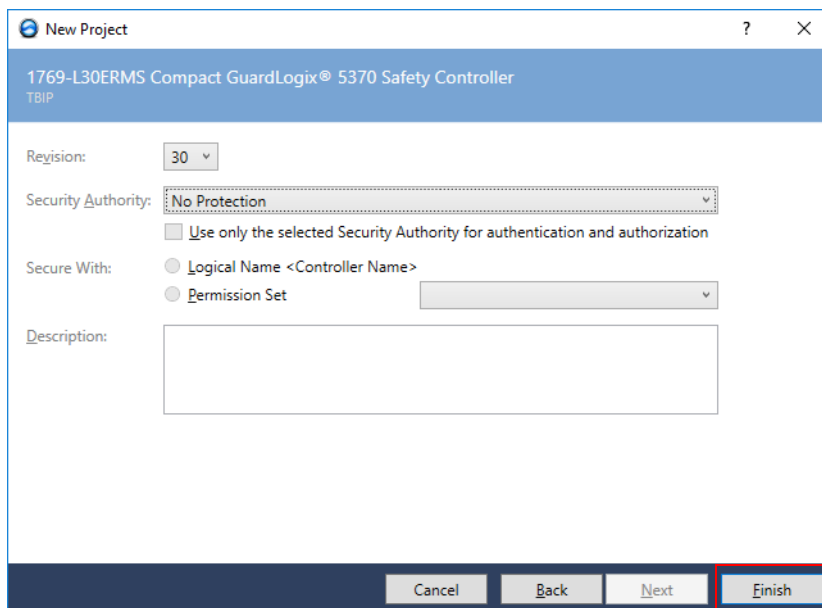


Fig. 30: Completing the project creation

→ The project is created and opened in the RSLogix Designer.

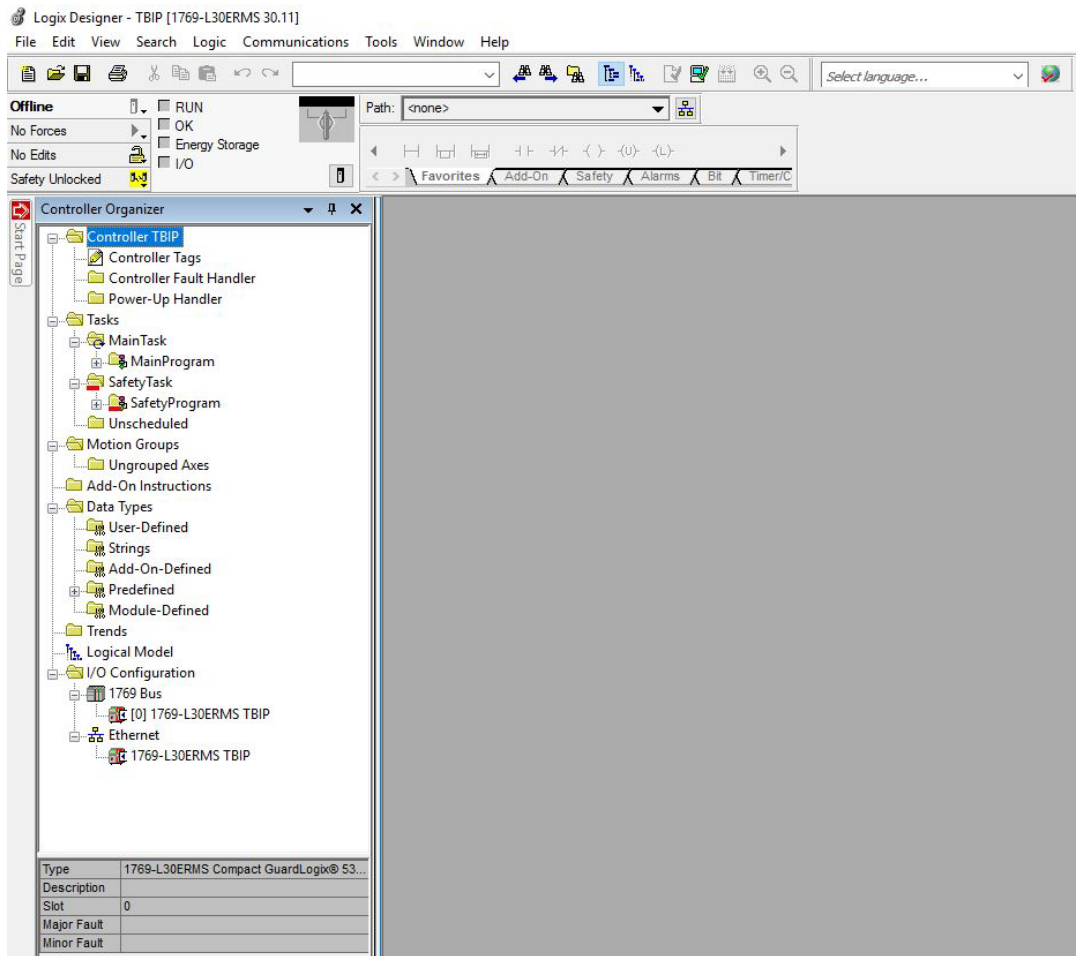


Fig. 31: New project in the RSLogix Designer

## 3.4 Configuring the project in RSLogix Designer

### Defining the Project Path

- Scan the network via "Communications" → "Who Active".

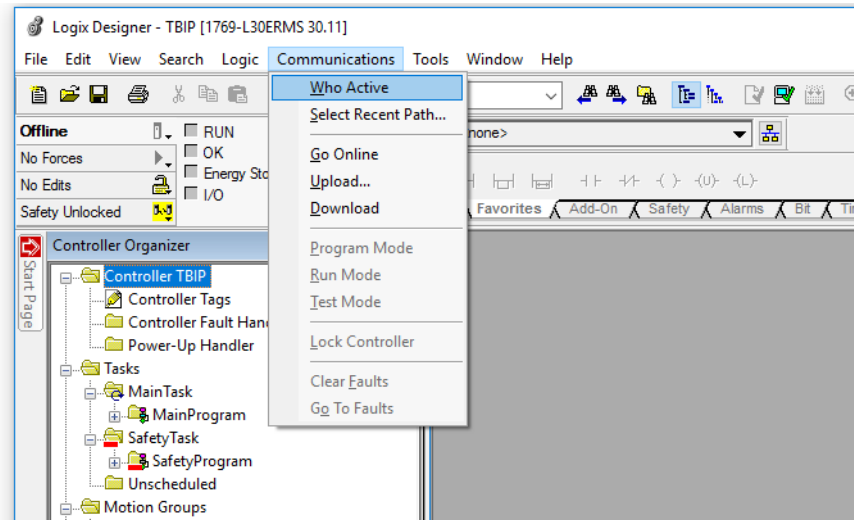


Fig. 32: Calling the "Who Active" function

- Select the used controller.
- Click "Set Project Path" to define the project path for the project.

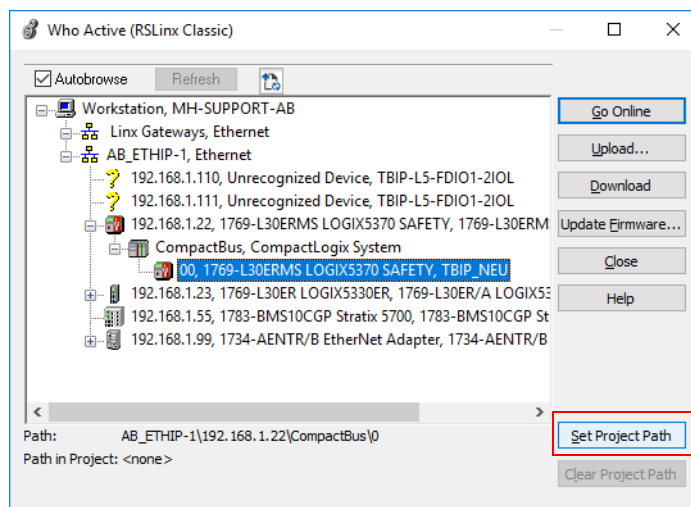


Fig. 33: Setting the project path

- Close the "Who Active" window.



3.4.1 Adding the safety side

- Right-click onto "Ethernet" → "New Module".

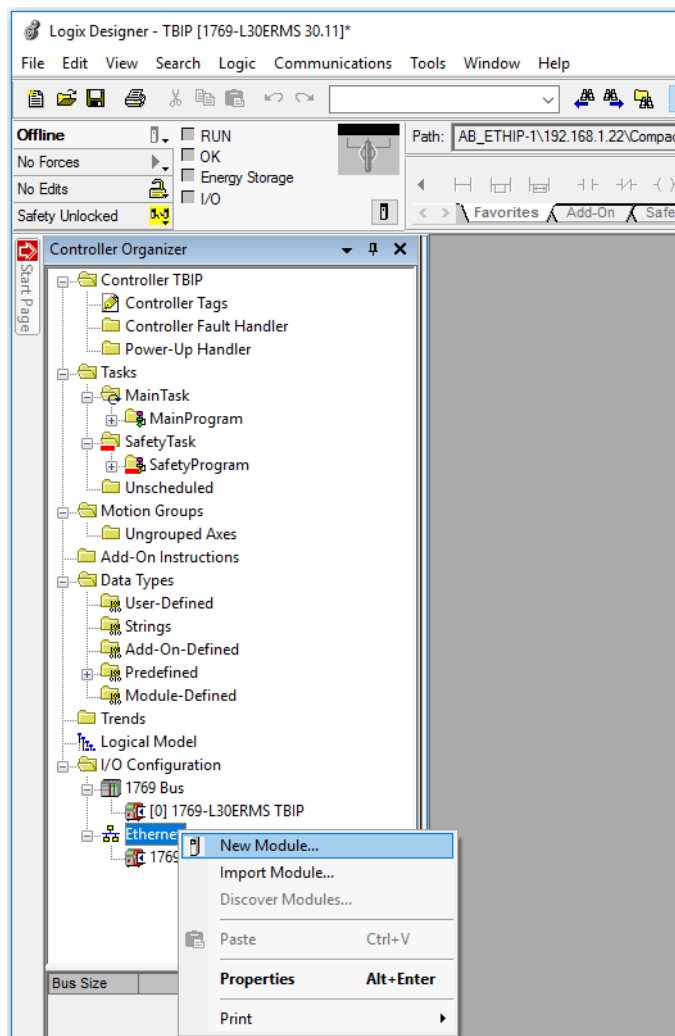


Fig. 34: Adding the device to the Ethernet via "New Module"

- Select the entry "Generic EtherNet/IP Safety Module" in the "Select Module Type" window.

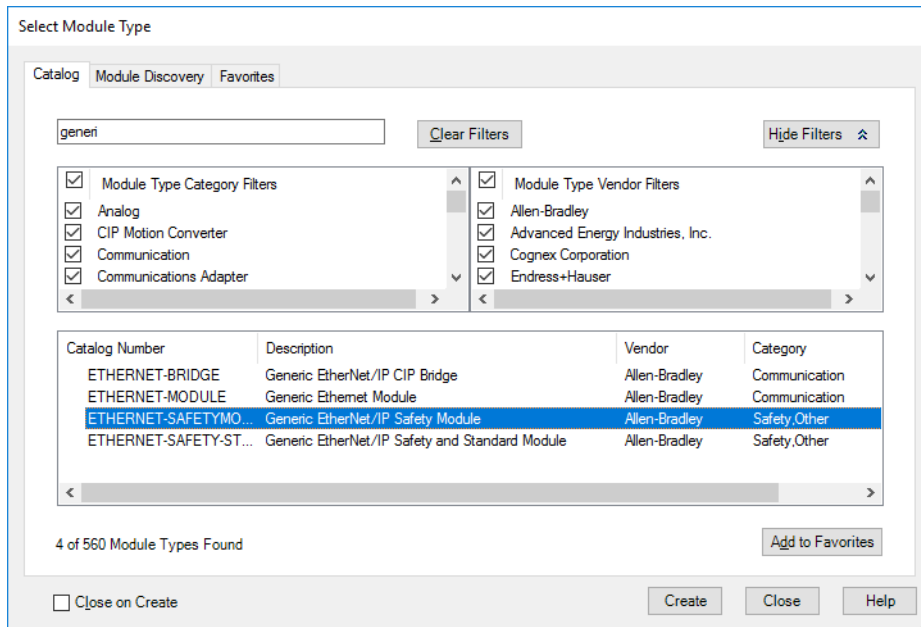


Fig. 35: Generic EtherNet/IP Safety Module

- Click "Create" and create a new module.
- ➔ The window "New Module" is opened.
- Assign a name for the new device and set the IP address (in the example 192.168.1.110).

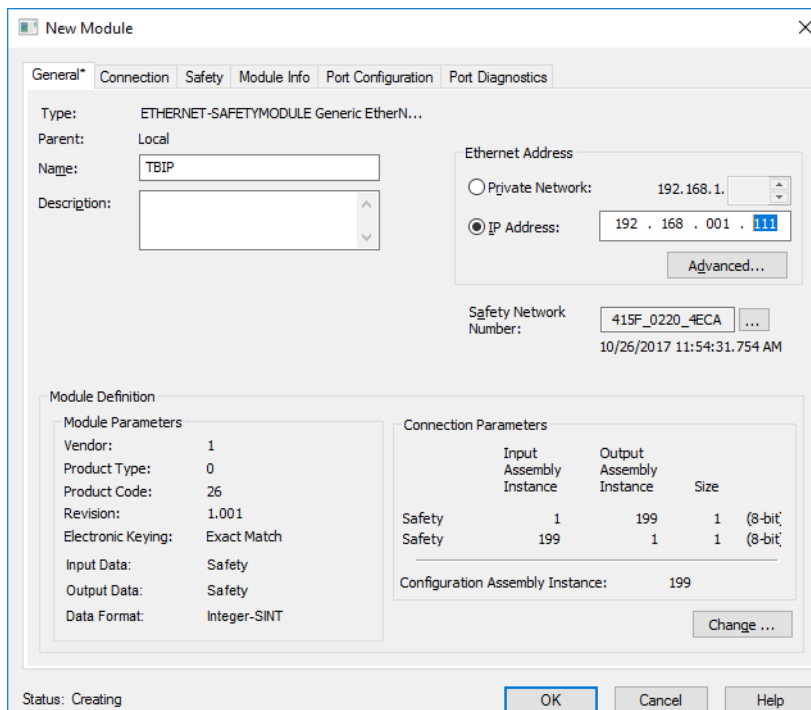


Fig. 36: New Module – Setting name and IP address

- Click "Change..." and set the "Communication Parameters" for the device.  
Enter the following values in the "module" tab:

Module definition	
Vendor	48
Product Type	100
Product Code	14056
Major Revision	2
Minor Revision	8
Electronic Keying	Compatible Module

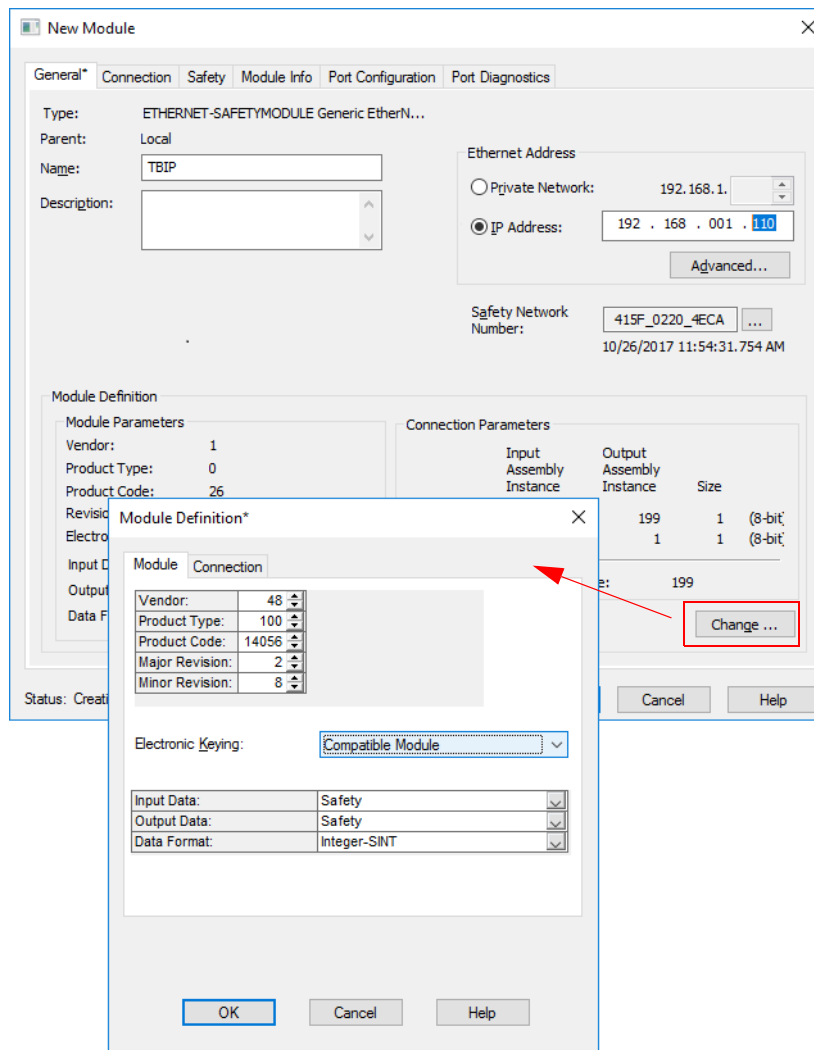


Fig. 37: Module Definition – Module

- Set the following values for the Assembly Instances in the "Connection" tab.

	Input Assembly Instance	Output Assembly Instance	Size (8-bit)
Safety Input	1024	1279	8
Safety Output	1279	1056	8

Configuration Assembly: 1088

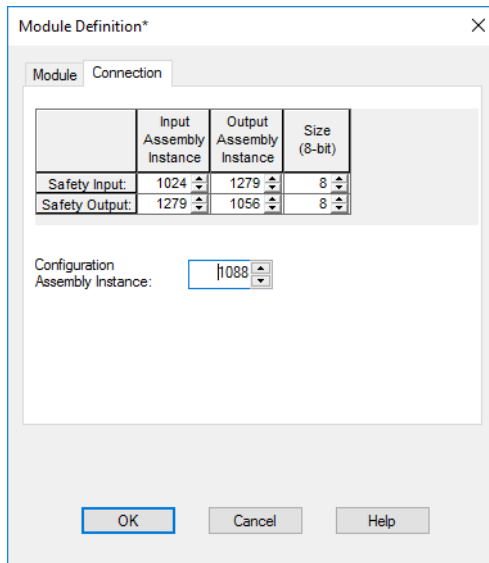


Fig. 38: Module Definition – Connection

- Accept the entries with "OK".
- Confirm the changes in the module properties with "Yes".

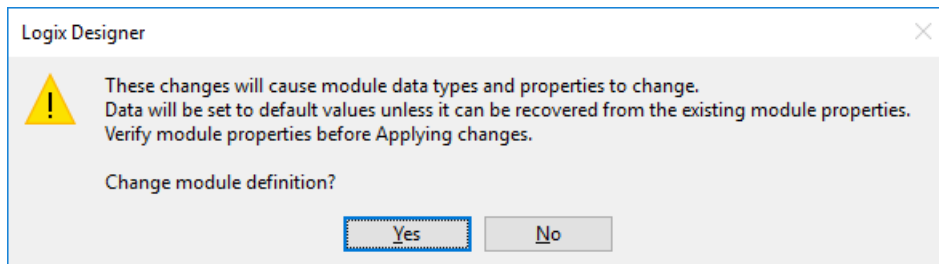


Fig. 39: Logix Designer – accepting the module properties

- Click "OK" in the "New Module" window.
- Click "OK" to confirm the following note.

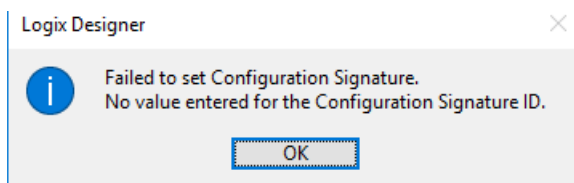


Fig. 40: Note – Configuration Signature

### 3.4.2 Assigning the Configuration Signature

The Configuration Signature serves is used by the Controller to clearly identify the safety device and assures that the configured device matches the connected device concerning the configured safety function. The Configuration Signature is generated by the Turck Safety Configurator and is part of the configuration log in the Turck Safety Configurator ((siehe Seite 13)).



**NOTE**

The time stamp in the configuration protocol of the Turck Safety Configurator is calculated depending on the system time (local time) of the computer on which the software is installed. The time in RSLogix Designer is though based on the UTC. Therefore, a conversion of the system-time based entry in the protocol to the UTC is necessary. In the example 1 hour has to be added to the CET (Central European Time).

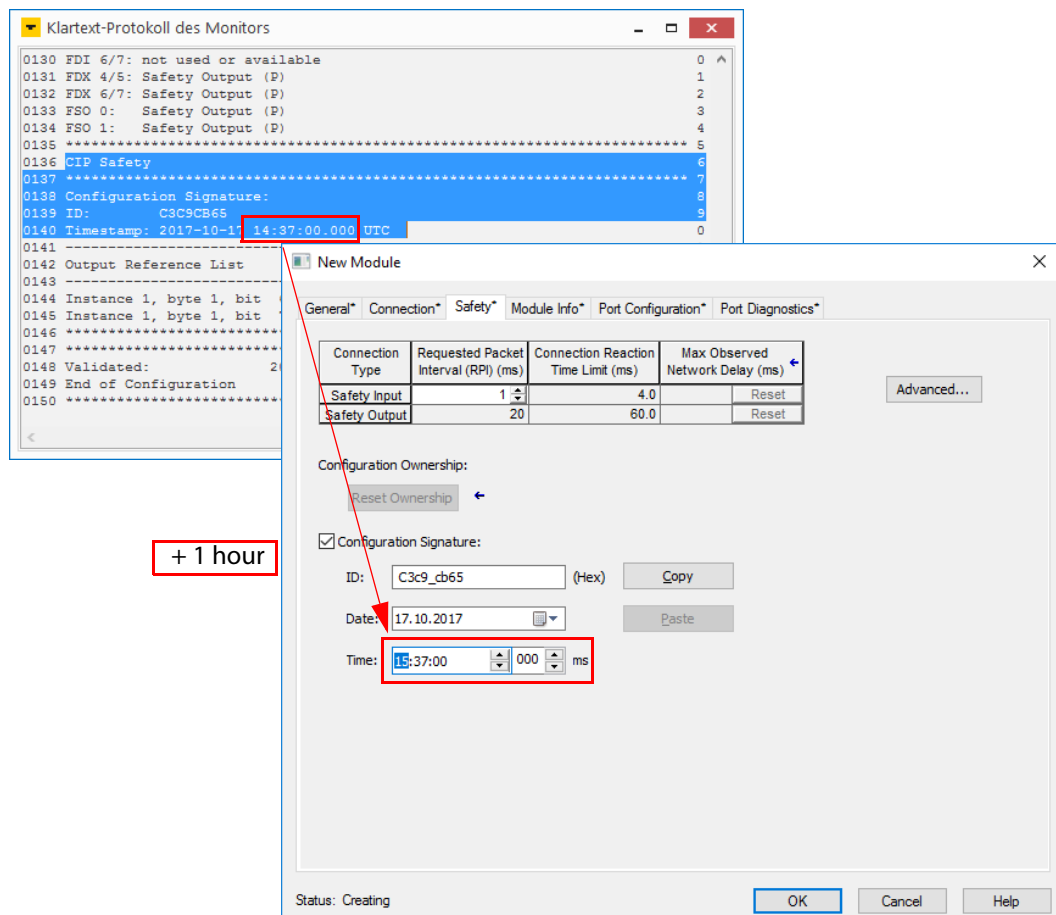


Fig. 41: Entering the Configuration Signature from the configuration protocol

Examples for calculating:

<b>CET (winter time)</b>	<b>UTC MEZ +1 Std.</b>	<b>CEST (summer time)</b>	<b>UTC CEST + 2 hours</b>
1:34:00.000 PM	2:34:00 PM 000 AM	1:34:00.000 PM	3:34:00 PM 000 AM
<b>Minnesota, USA (CST)</b>	<b>UTC CST - 6 hours</b>	<b>Minnesota, USA (CDT)</b>	<b>UTC CDT - 5 hours</b>
2:34:00 000 PM	8:34:00 000 AM	2:34:00 000 PM	7:34:00 000 AM

## 3.4.3 Going Online with the Controller

- Click "Offline" → "Go Online".
- Load the configuration into the controller by pressing the "Download" button in the "Connected To Go Online" window.
- Execute the download in the "Download" window by pressing the "Download" button.

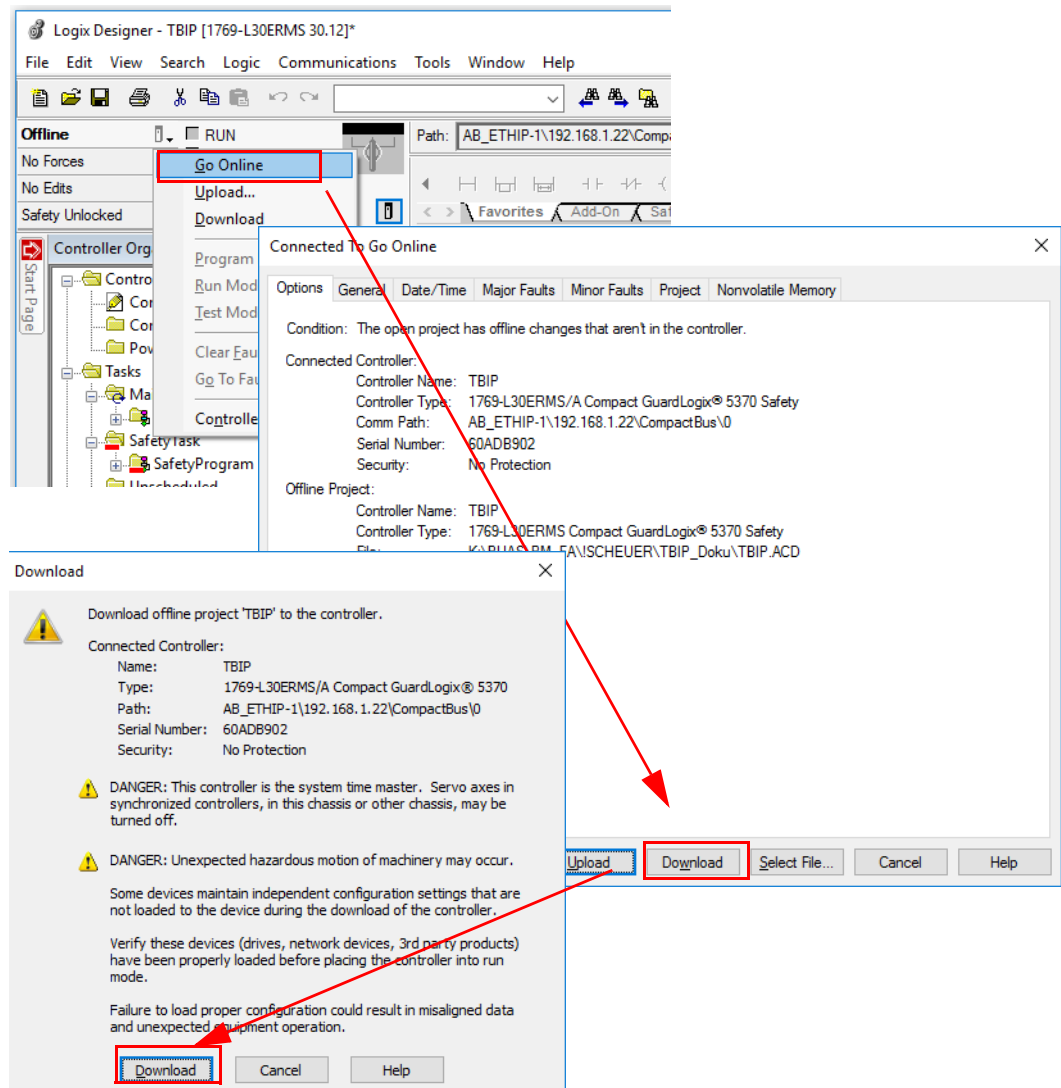


Fig. 42: Downloading the configuration into the controller

- The download is executed.
- The TBIP-Lx-FDIOP1-2IOL (ETHERNET-SAFETYMODULE TBIP) in the project tree is faulty.

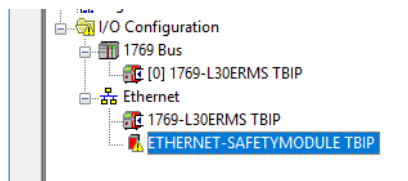


Fig. 43: Error at the TBIP-Lx-FDIOP1-2IOL

- Open the Module Properties by double-clicking the device entry in the project tree.
- The fault is specified under "Module Fault" in the "Connection" tab: "Safety Network Number Mismatch".

### 3.4.4 Assigning the Safety Network Number

The Safety Network Number clearly assigns the safety I/O module to one CIP Safety Controller.

In case of several controllers in one network, this inhibits an unintentional access of another controller to the safety device.

#### Copying the Safety Network Number from the controller

- Go offline.
- Open the "Controller Properties".
- Click to "..." right to the Safety Network Number in the "General" tab and open the "Safety Network Number" window.
- Use the "Copy" button to copy the Safety Network Number and close the window with "OK".

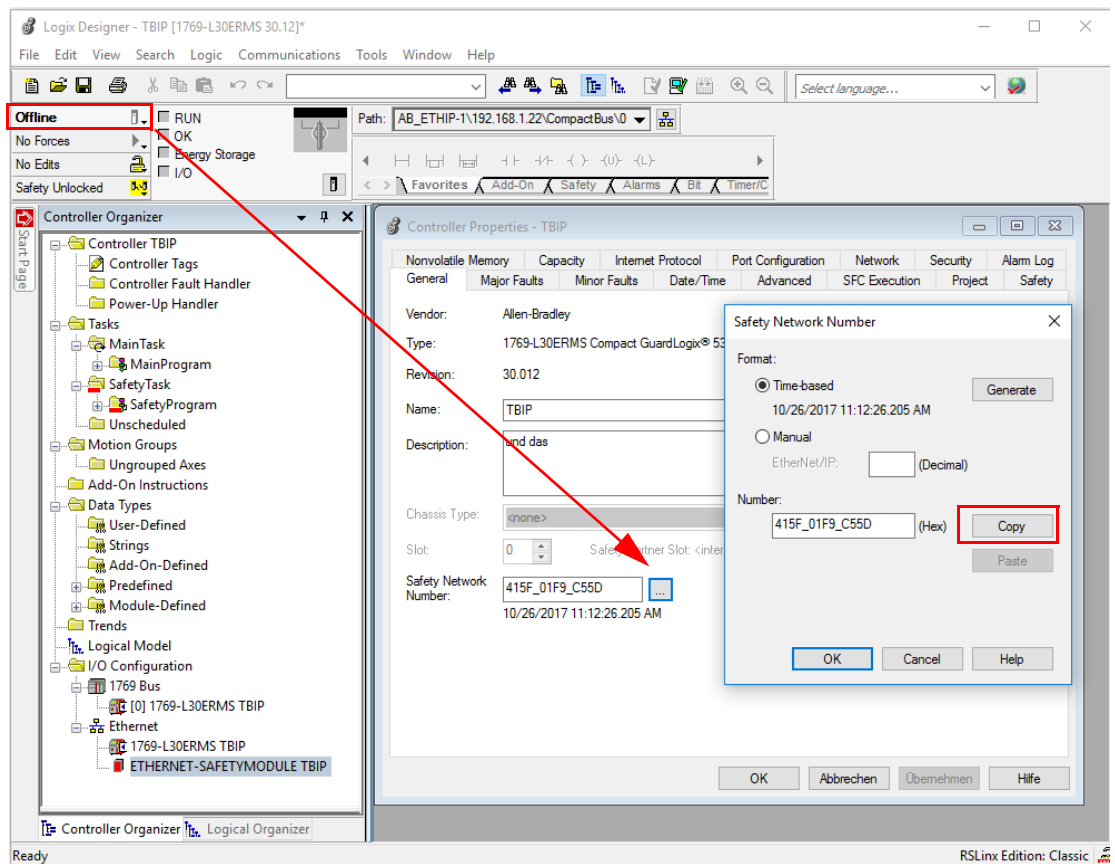


Fig. 44: Copying the Safety Network Number

Assigning the Safety Network Number to the TBIP-Lx-FDIO1-2IOL

- Open the "General" tab in the "module Properties and open the "Safety Network Number" window by pressing the "... " button.
- Use the "Paste" button paste the controller's Safety Network Number into the module configuration and close the window with "OK".

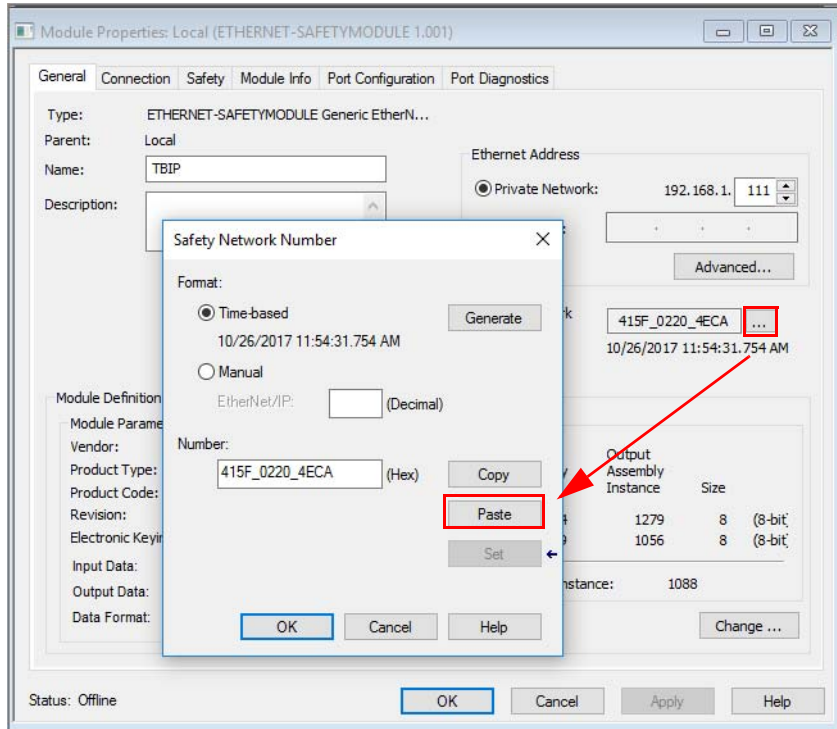


Fig. 45: Copying the Safety Network Number to the module properties



### 3.4.5 Reset Ownership

- Go online.
- Click "Reset Ownership" in the "Safety" tab in the "Module Properties" and confirm all upcoming warnings with "Yes".

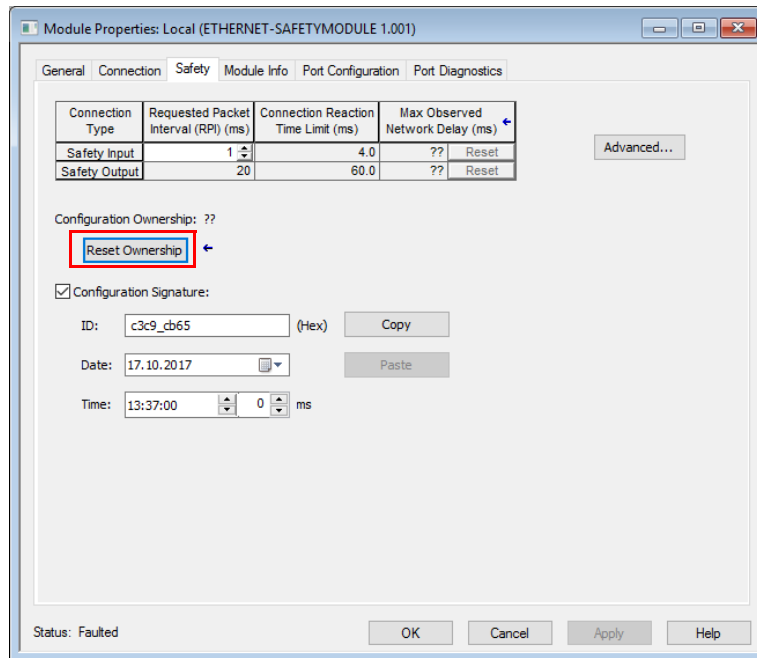


Fig. 46: Reset Ownership

- Open again the "Safety Network Number" window in the "General" tab.
- Press the "set" button to write the Safety Network Number to the device and confirm the writing by pressing the "yes button" in the "Safety Network Number" window.

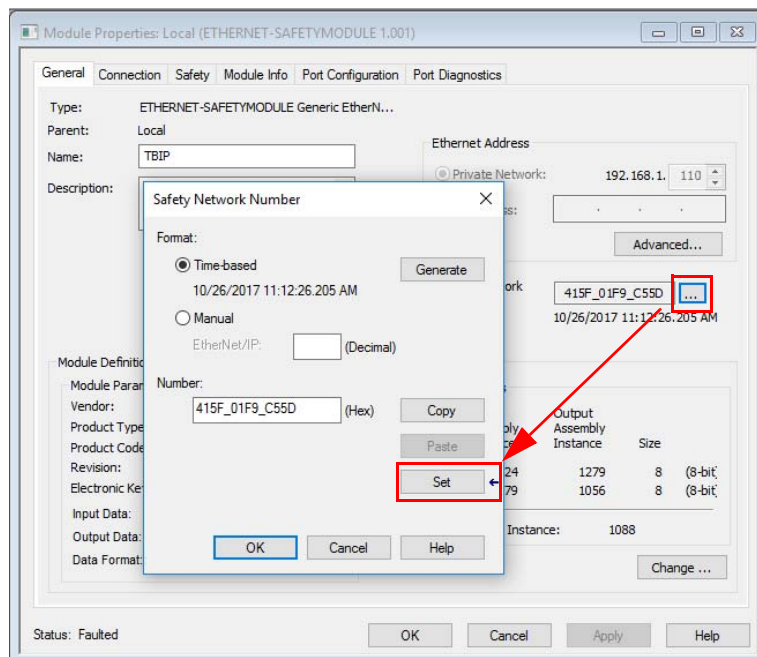


Fig. 47: Writing the Safety Network Number to the device

- ➔ The Safety Network Number now clearly assigns the device to the CIP Safety Controller and the device is running.

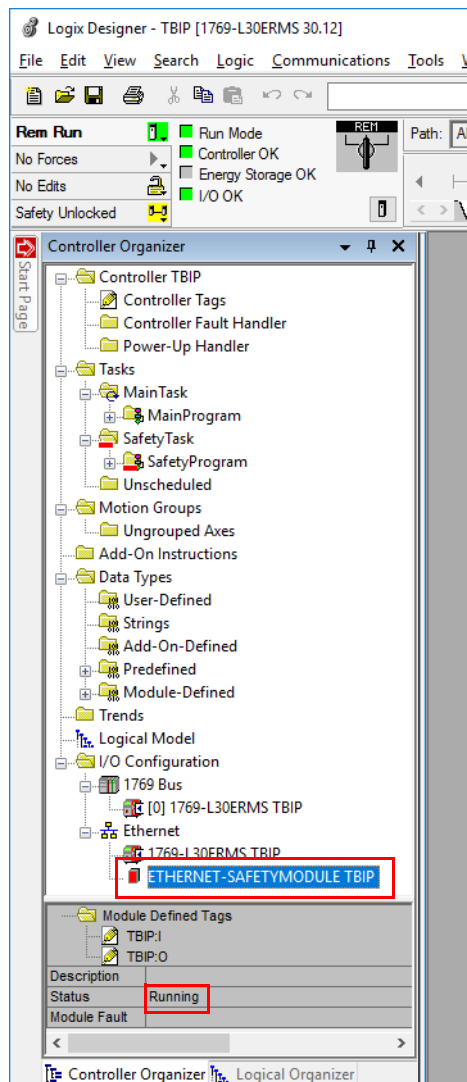


Fig. 48: Logix Designer – device running

### 3.4.6 Reading Process Data

- Open the "Controller Tags" in the project tree by double-clicking the entry.

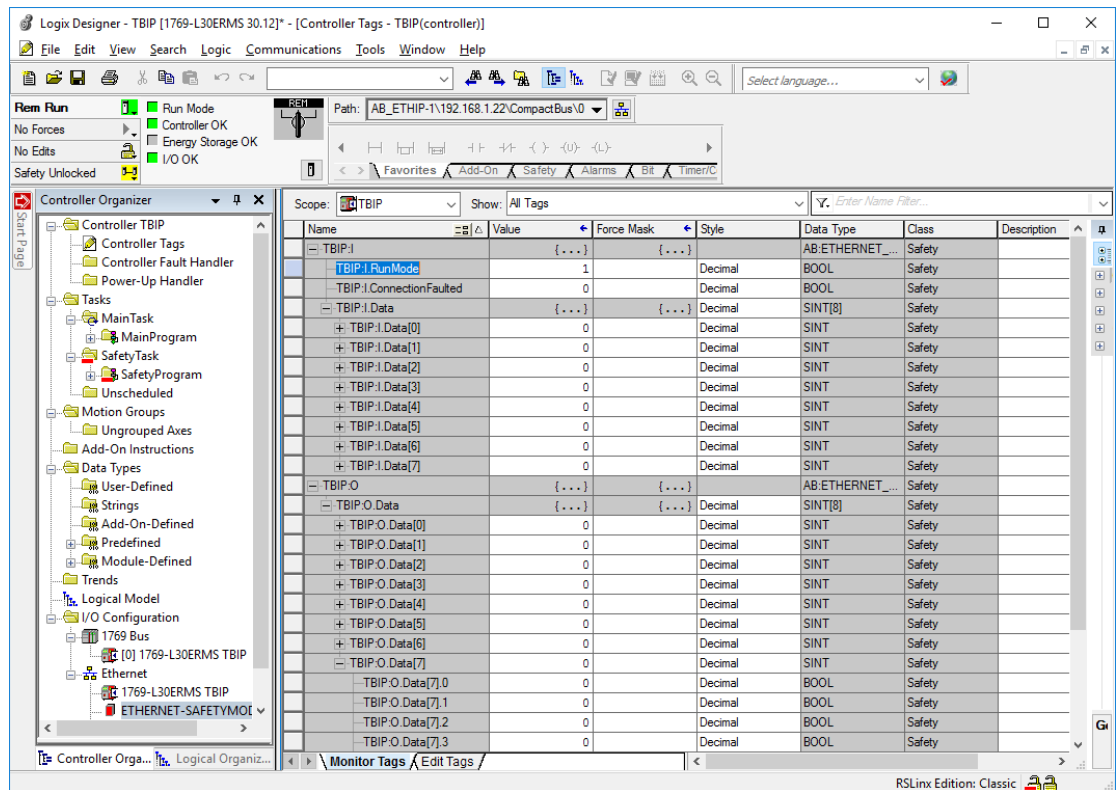


Fig. 49: "Controller Tags" in the project tree

- The access to the input data (TBIP:I) and output data (TBIP:O) is possible.

## 3.4.7 Adding the non-safety side of the TBIP-L5-FDIO1-2IOL to the project

- Go offline.
- Right-click onto "Ethernet" → "New Module".

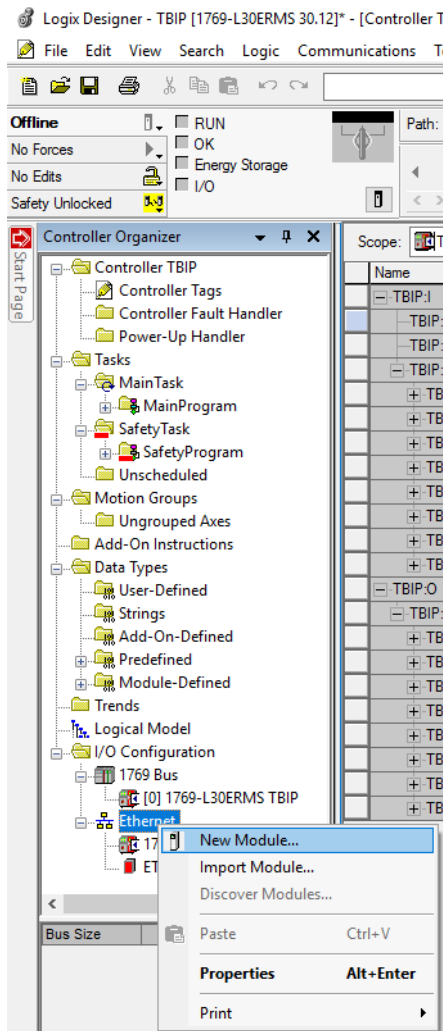


Fig. 50: Adding the device to the Ethernet via "New Module"

- Select the entry "Generic EtherNet/IP Module" in the "Select Module Type" window.

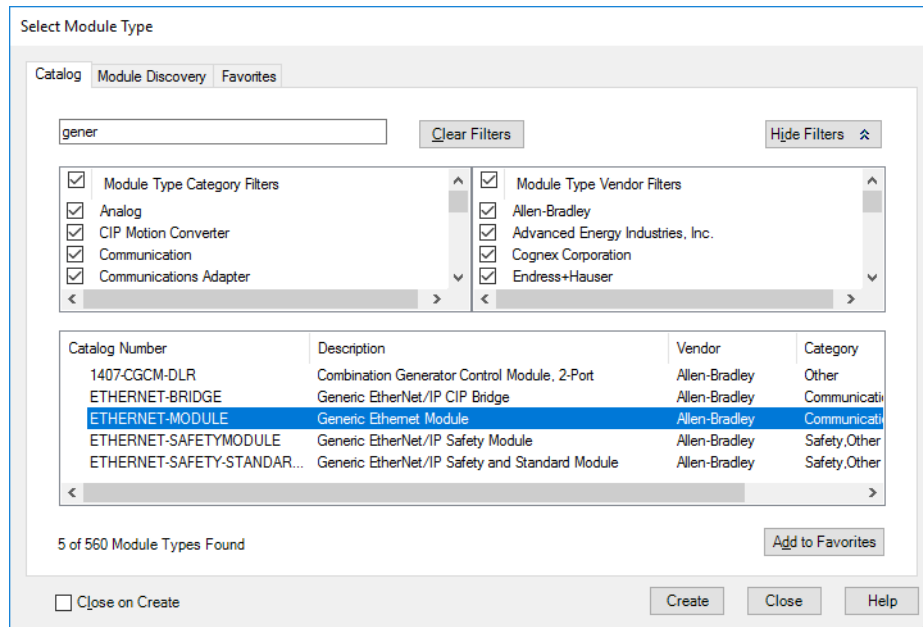


Fig. 51: Generic EtherNet/IP Module

- Click "Create" to create the new device.
- The window "New Module" is opened.
- Assign a name to the new device in the "New Module" window, set the IP address (in the example 192.168.1.111) and enter the following values for the data format (Comm format) and the Assembly Instances:

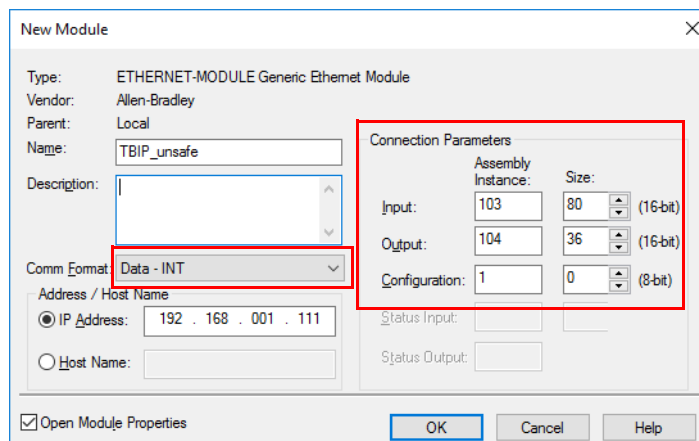


Fig. 52: New Module - defining the data format and the Assembly Instances

- Accept the entries with "OK".

- Adapt the RPI time in the "Connection" tab.

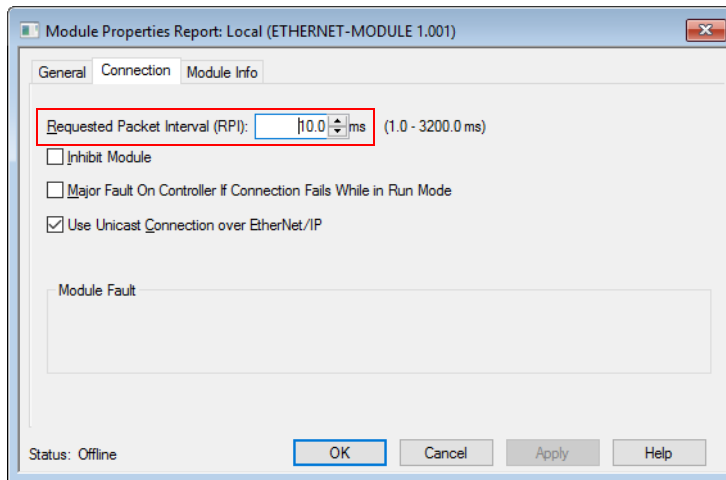


Fig. 53: New Module - adapting RPI

- Go online and download the project to the controller by pressing the "Download" button.
- Confirm the download warning by pressing "Download" and switch back the controller to "remote Run" by pressing "OK".

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