

# PENKO Engineering B.V.

Your Partner for Fully Engineered Factory Solutions



How to...

Connect a SGM720 to a Codesys PLC with  
Modbus TCP



**PENKO**

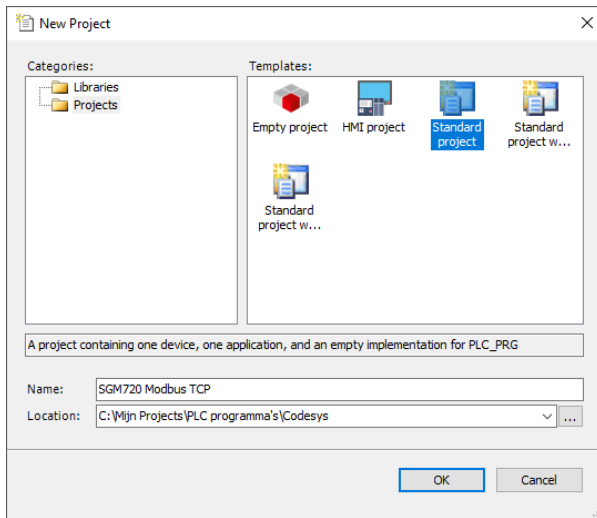
*an ETC Company*

## Inhoudsopgave

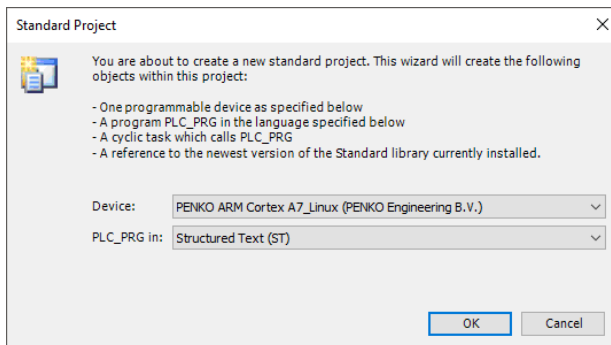
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## Set up the Codesys project

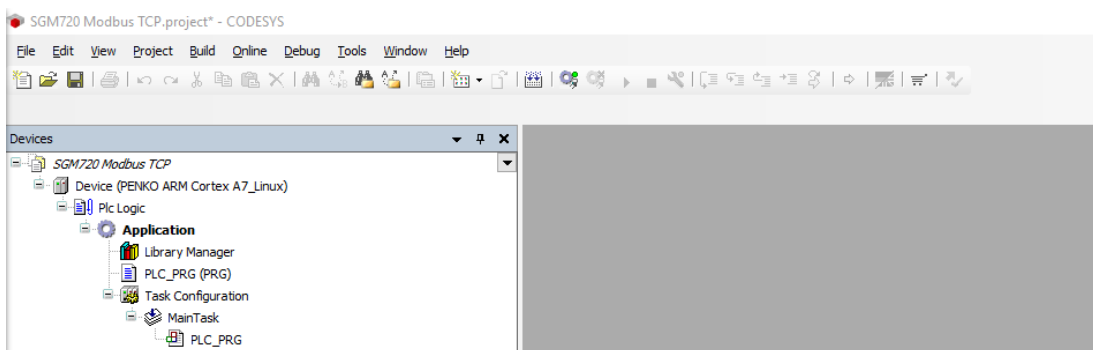
Open Codesys and open a new project.



Select your device and choose Structured Text.

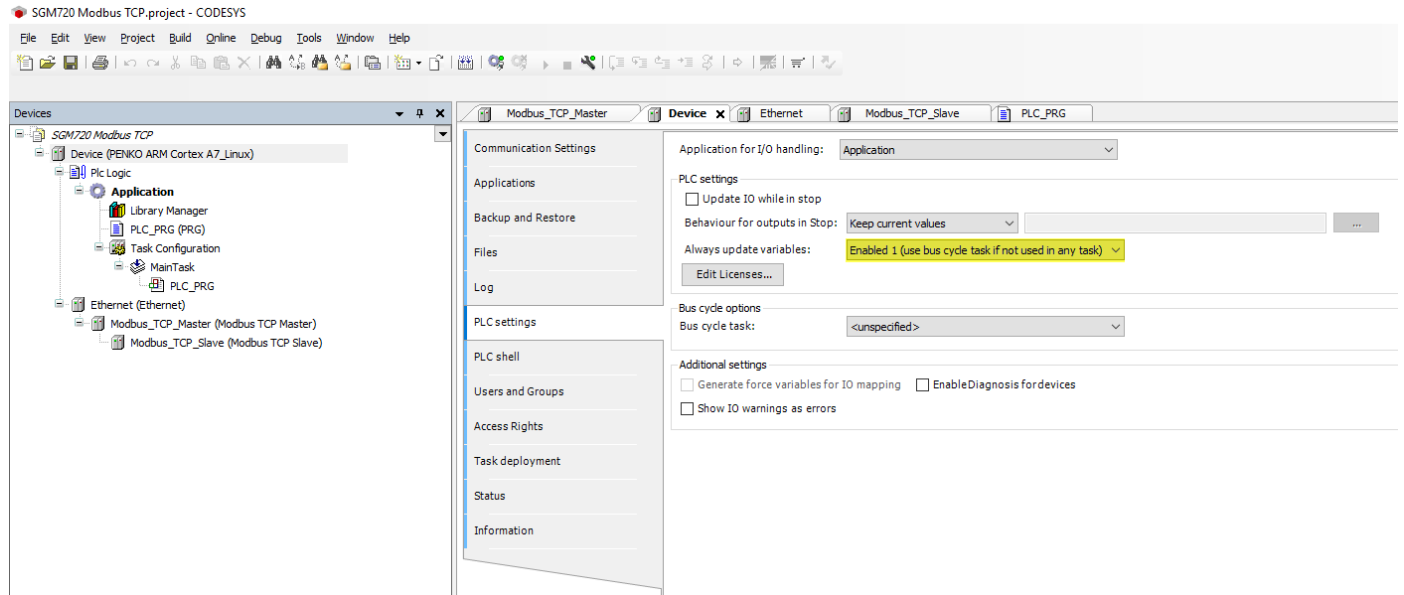


Now the project is opened.

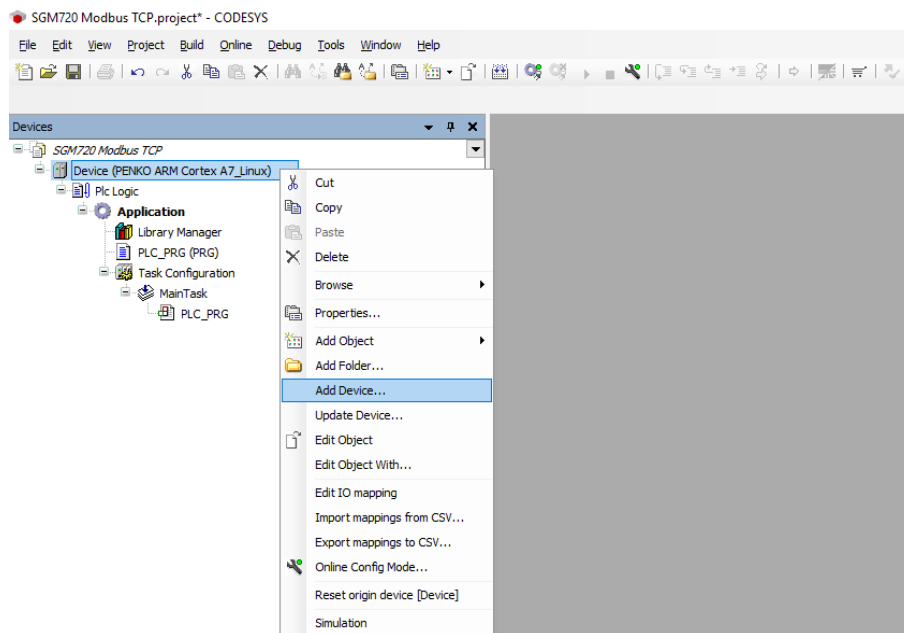


## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

Double click on Device and open the Tab PLC Settings and set Always update variables to Enabled 1 (use bus cycle if not used in any task).



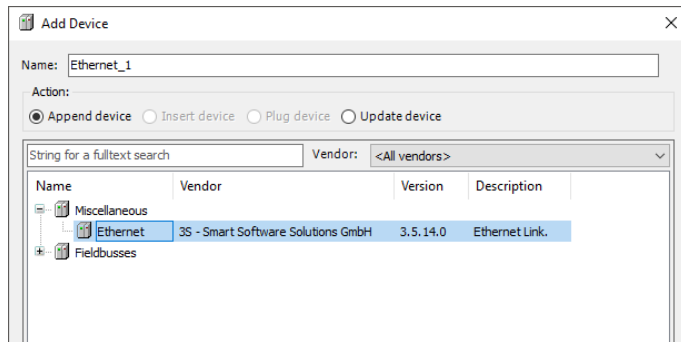
Right-click on Device and click on Add Device.



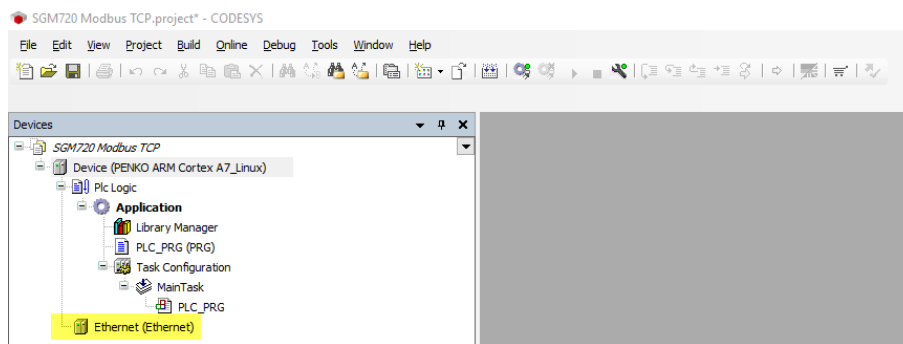
## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

Open Miscellaneous and double click on Ethernet and close the window.

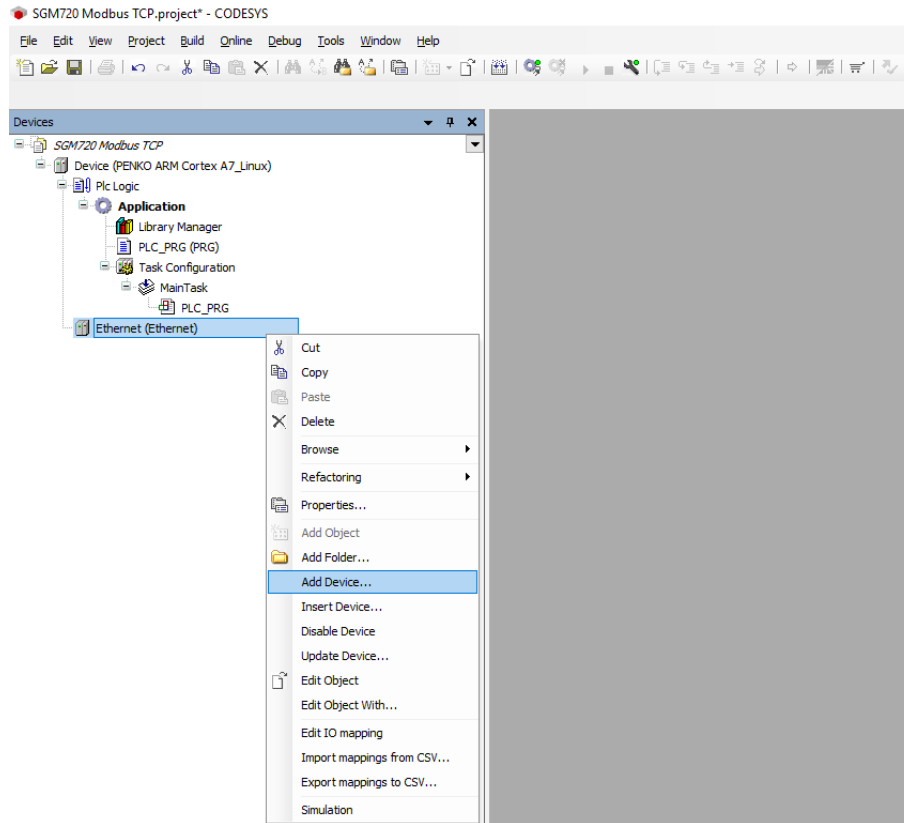


Now the Ethernet port is added to the project.

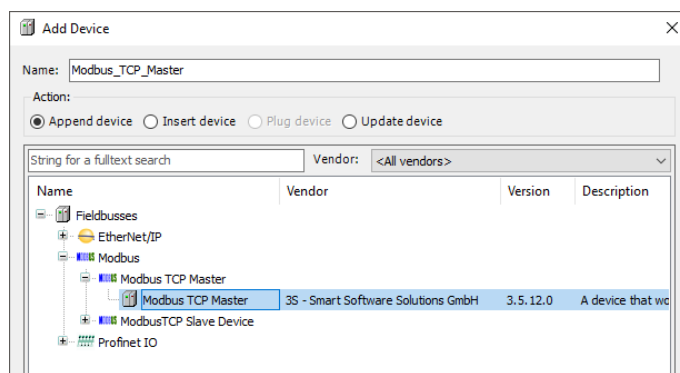


## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

Right-click on Ethernet and click on Add Device.



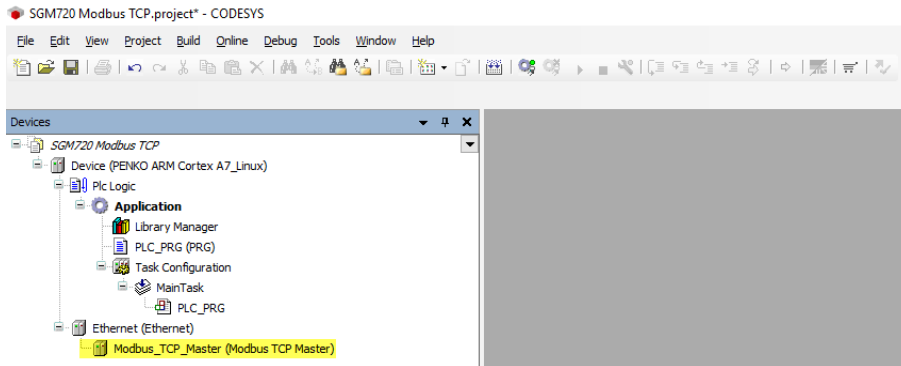
Open Fieldbuses – Modbus – Modbus TCP Master and double click on Modbus TCP Master and close the window.



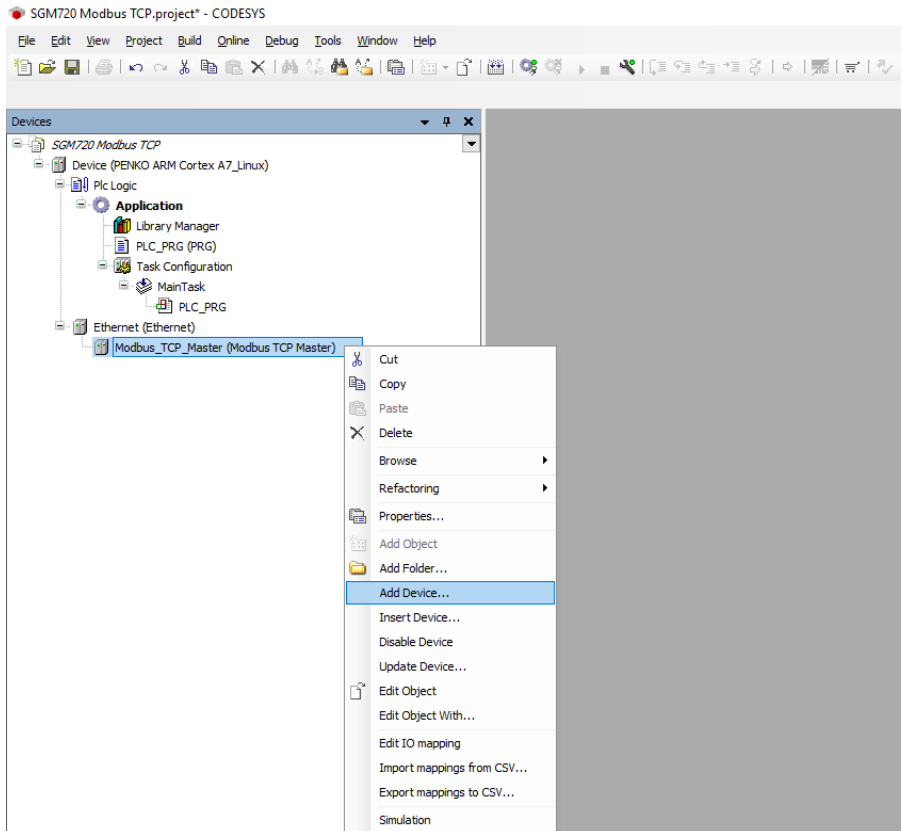
## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

Now the Modbus TCP Master is added to the project.



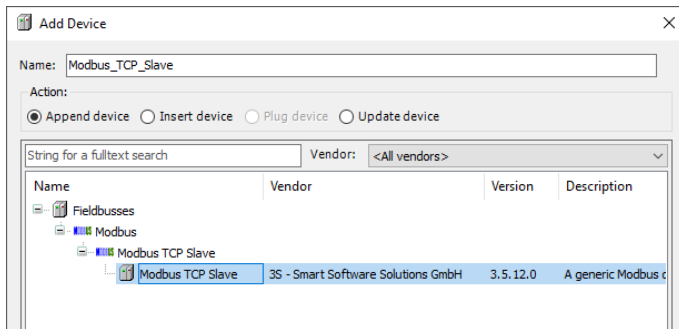
Right-click on Modbus TCP Master and click on Add Device.



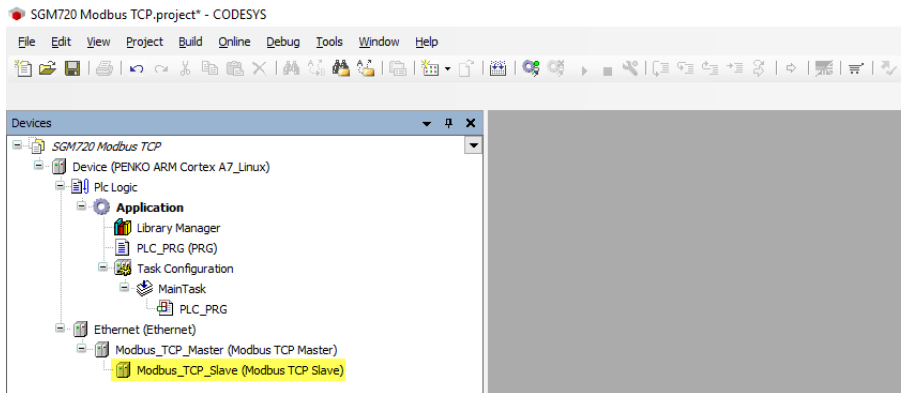
## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

Open Fieldbusses – Modbus – Modbus TCP Slave and double click on Modbus TCP Slave and close the window.



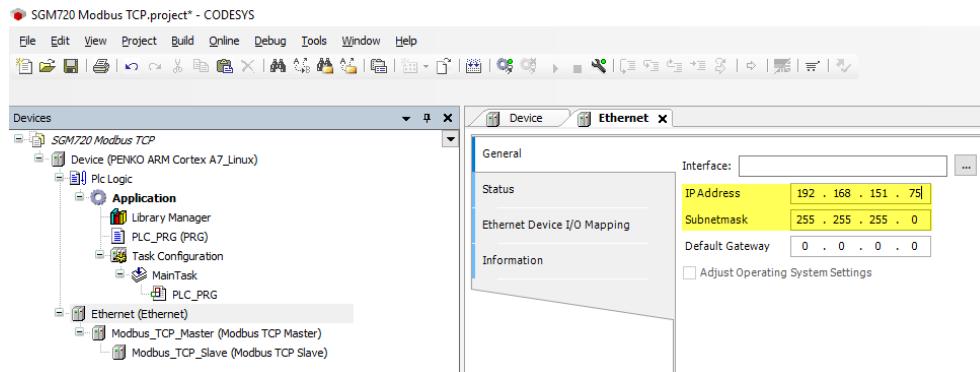
Now the Modbus TCP Master is added to the project.





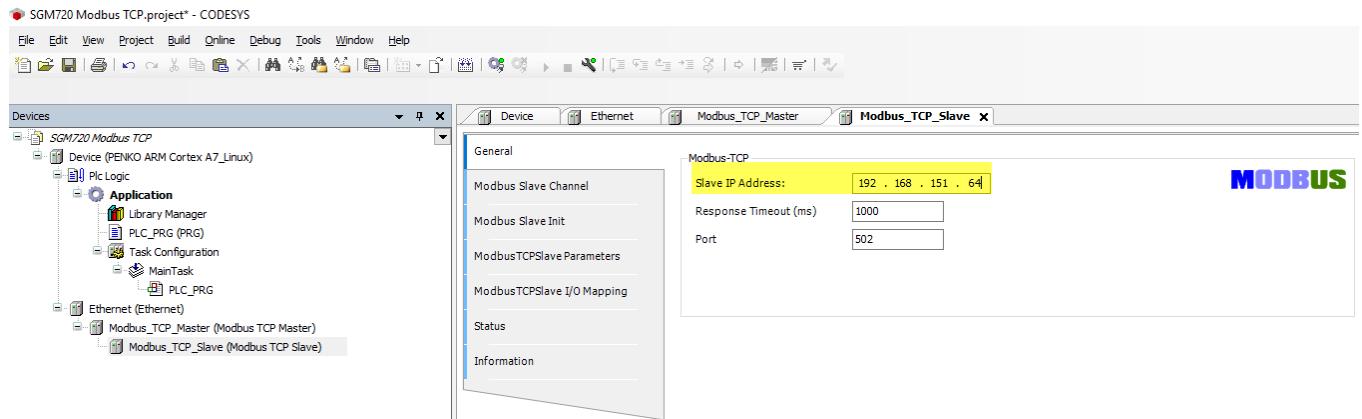
## Set up the Modbus TCP Master

Double click on Ethernet and set the IP address and Subnetmask of the Modbus TCP Master in the General Tab.



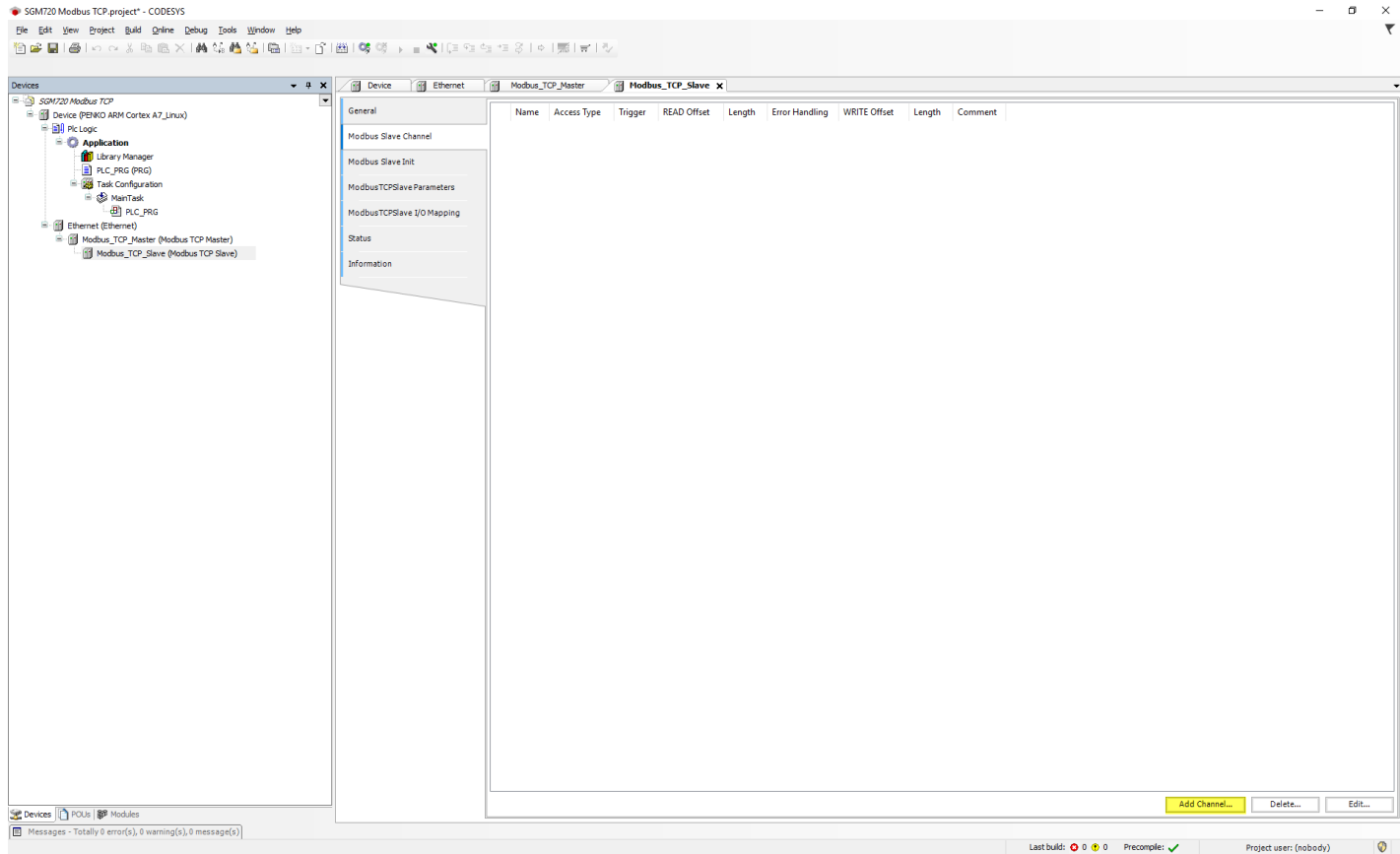
## Set up the Modbus TCP Slave

Double click on Modbus TCP Slave and set the IP address of the Modbus TCP Slave in the General Tab.



## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

Open the Tab Modbus Slave Channel and click on Add Channel...



## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

Here you can choose the data that you want to send or receive, in this example we want to read all 19 indicators.

First give the channel a name.

Select the Access Type.

Set the offset (the indicator start at address 101 so the offset is 100 or 0x0064 in hex).

Set the Length in words (19 double words indicators is 38 words).

When everything is set up click on OK.

The screenshot shows the 'ModbusChannel' configuration dialog box. The 'Channel' section has 'Name' set to 'Indicators', 'Access Type' set to 'Read Input Registers (Function Code 4)', 'Trigger' set to 'Cyclic', and 'Cycle Time (ms)' set to '100'. The 'READ Register' section has 'Offset' set to '0x0064', 'Length' set to '38', and 'Error Handling' set to 'Keep last Value'. The 'WRITE Register' section has 'Offset' and 'Length' (set to '1') fields.

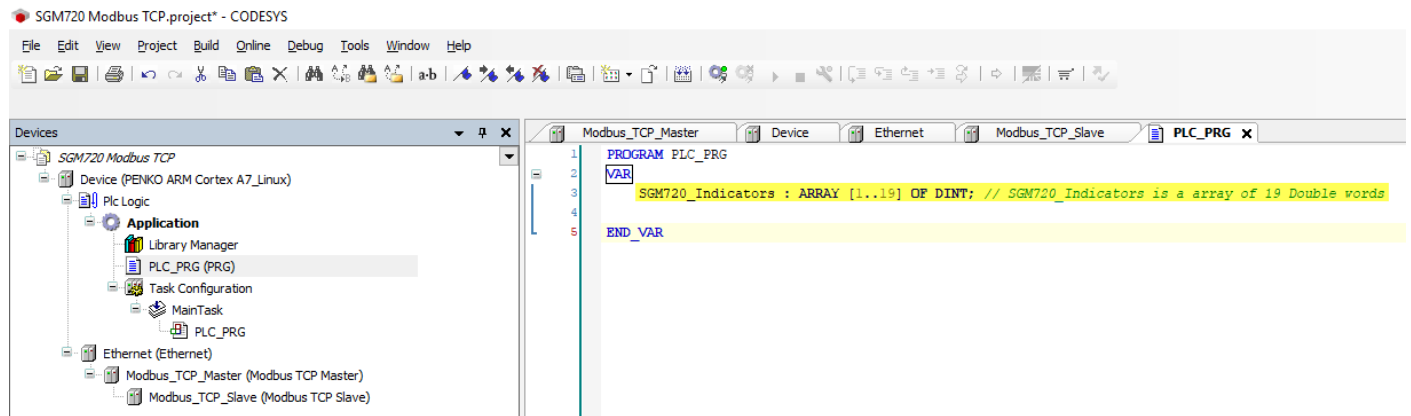
The Channel is now added to the Modbus Slave.

The screenshot shows the Codesys IDE interface for 'SGM720 Modbus TCP project\* - CODESYS'. The 'Devices' tree on the left shows the project structure, including 'Modbus\_TCP\_Slave (Modbus TCP Slave)'. The 'Modbus\_TCP\_Slave' properties window is open, showing the 'General' tab. A table lists the configured Modbus channels:

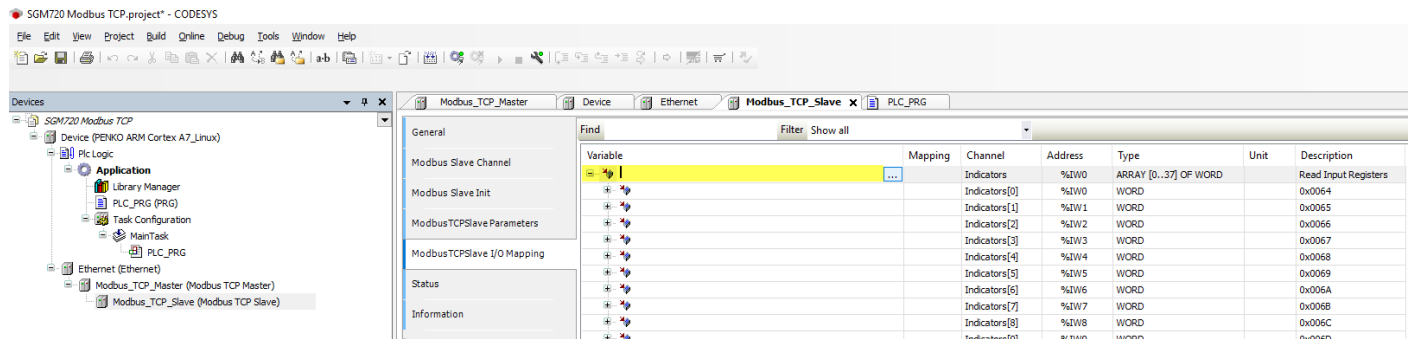
Name	Access Type	Trigger	READ Offset	Length	Error Handling	WRITE Offset	Length	Comment
0 Indicators	Read Input Registers (Function Code 04)	Cyclic, t#100ms	16#0064	38	Keep last Value			

## Set up the program

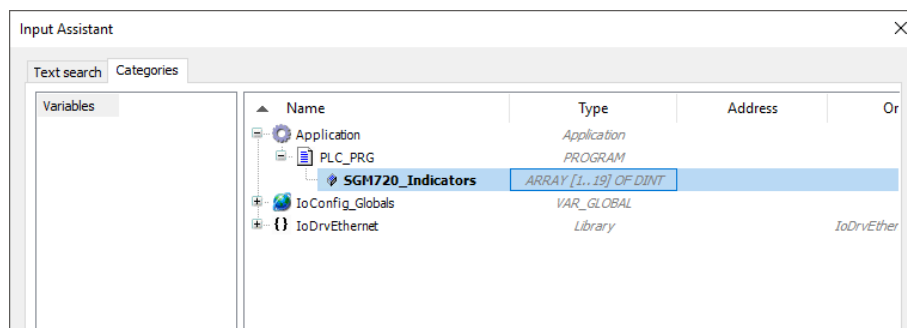
Double click on PLC\_PRG and type the code shown in yellow. This will make an array of 19 double integers for the SGM720 indicators.



Double click on Modbus TCP Slave and open the Tab ModbusTCPSlave I/O Mapping double click on the empty space marked in yellow. Now the button with 3 dots will appear and click on that button.

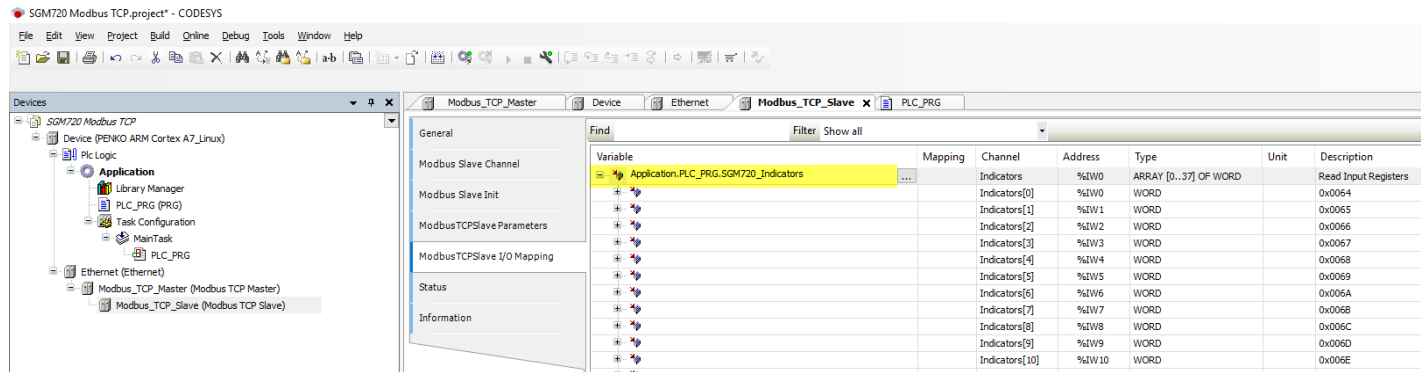


Open Application – PLC\_PRG and double click on SGM720\_Indicators

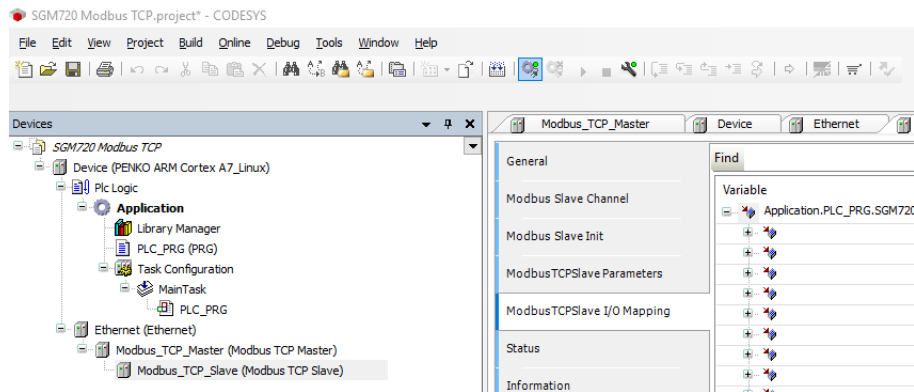


## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

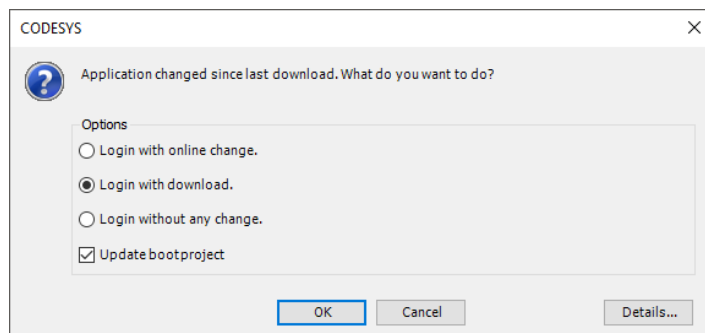
Now the array is linked to the Indicators of the Modbus Slave.



Click on the Login button.

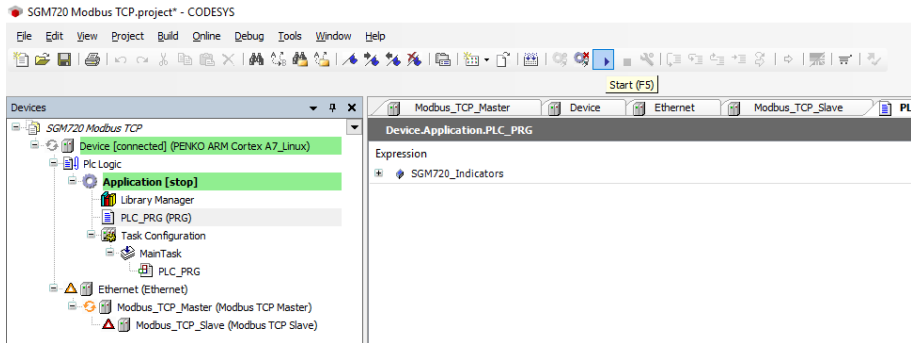


Click on the Login with download and click on OK.

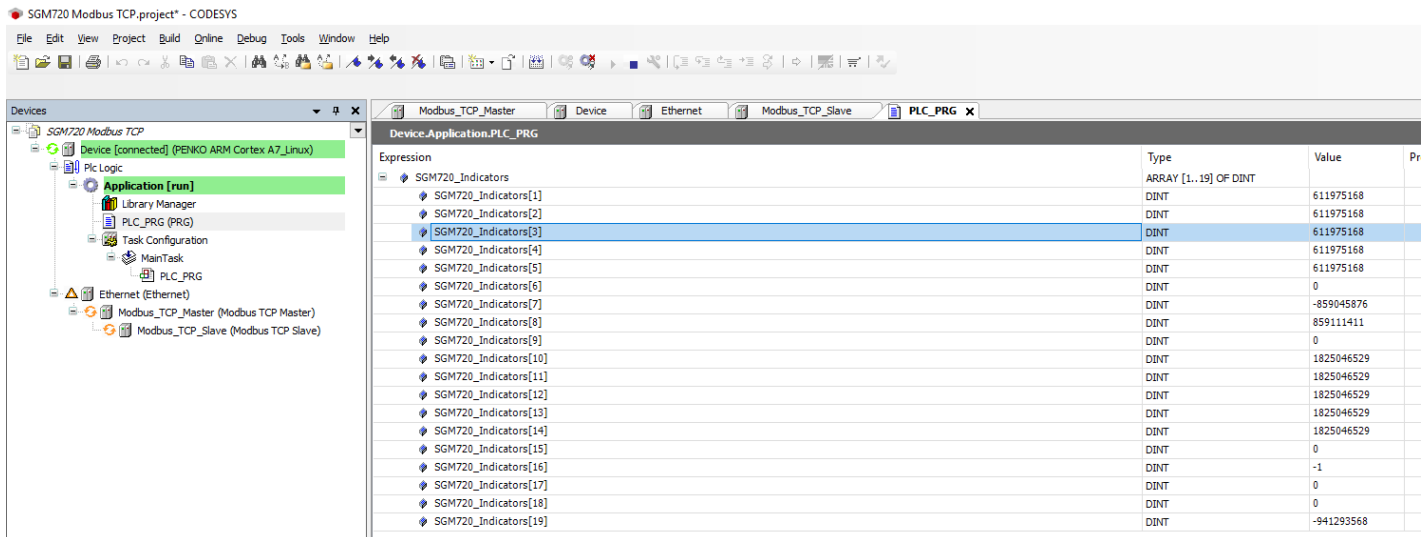


## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

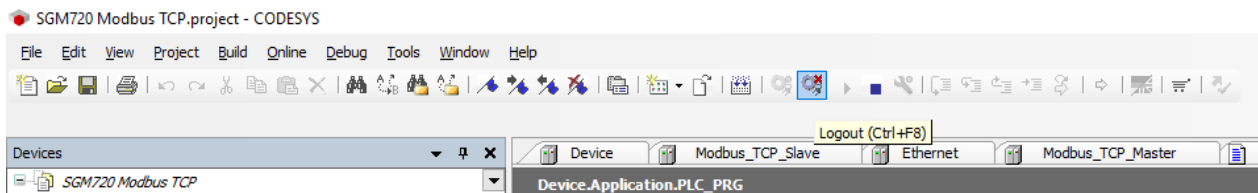
Click on Start.



Double click on PLC\_PRG to view the actual SGM720 Indicators. The values are too high so in order to get normal values we need to swap the words.

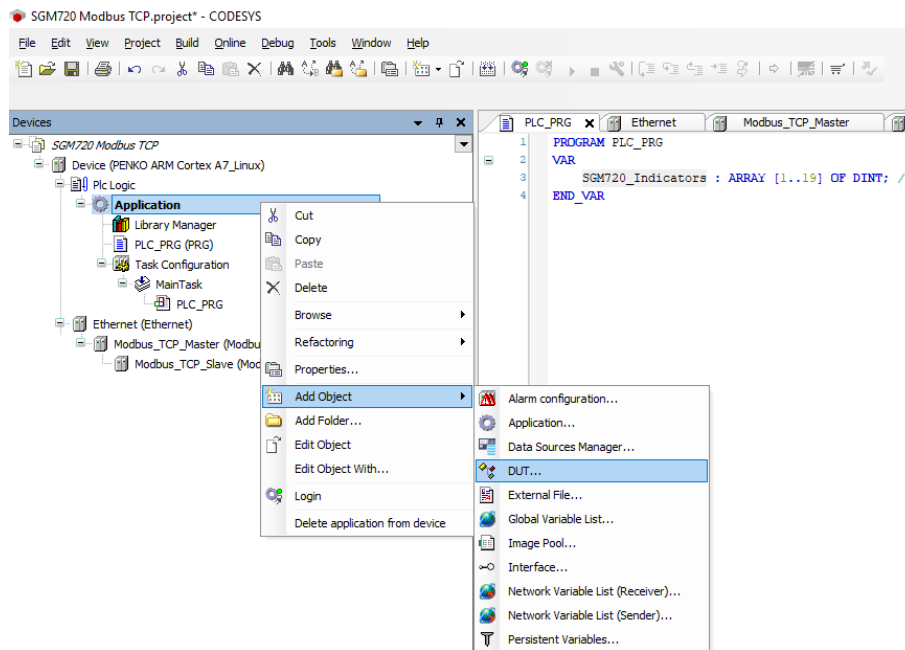


Click on Logout.

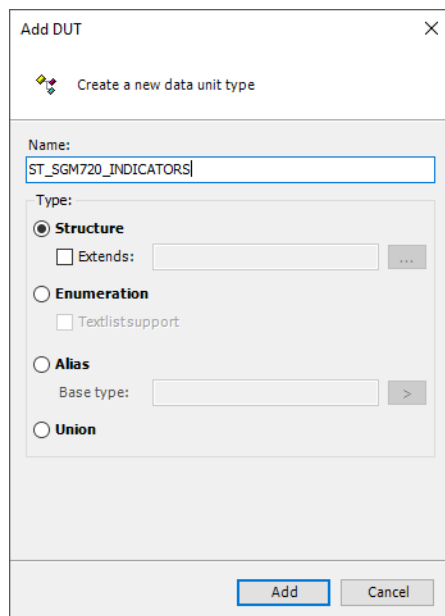


## Swap words

Right-click on Application, click on Add Object and click on DUT...

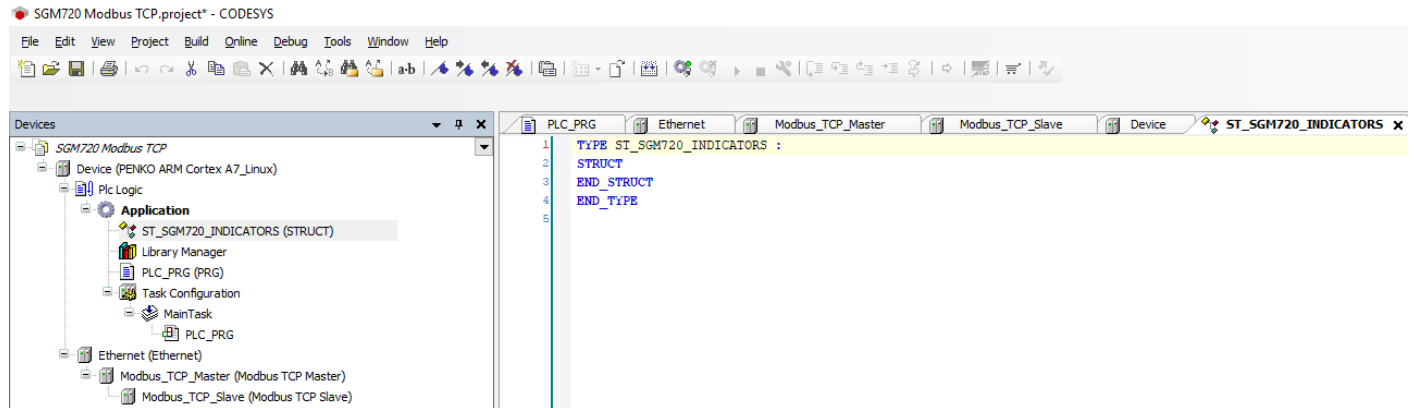


Give the DUT a name and click on Add.

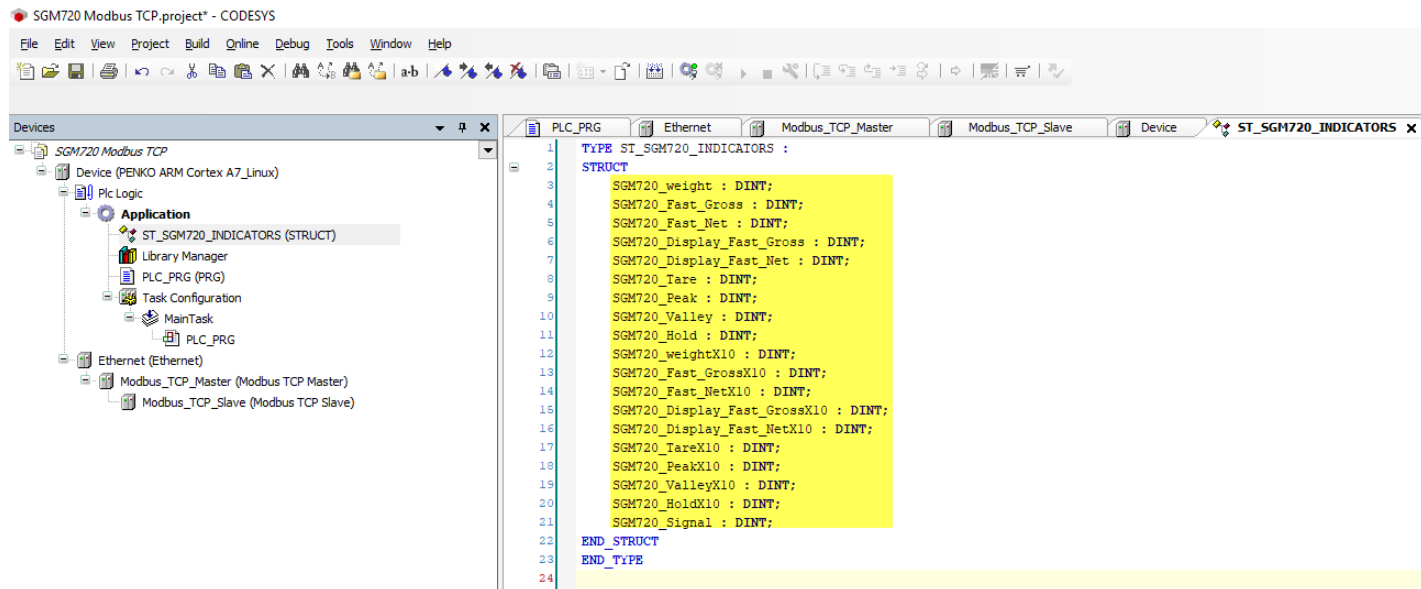


## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

The DUT is now opened.



Add the code highlighted in yellow, this will give a name to the array of 19 double integers.

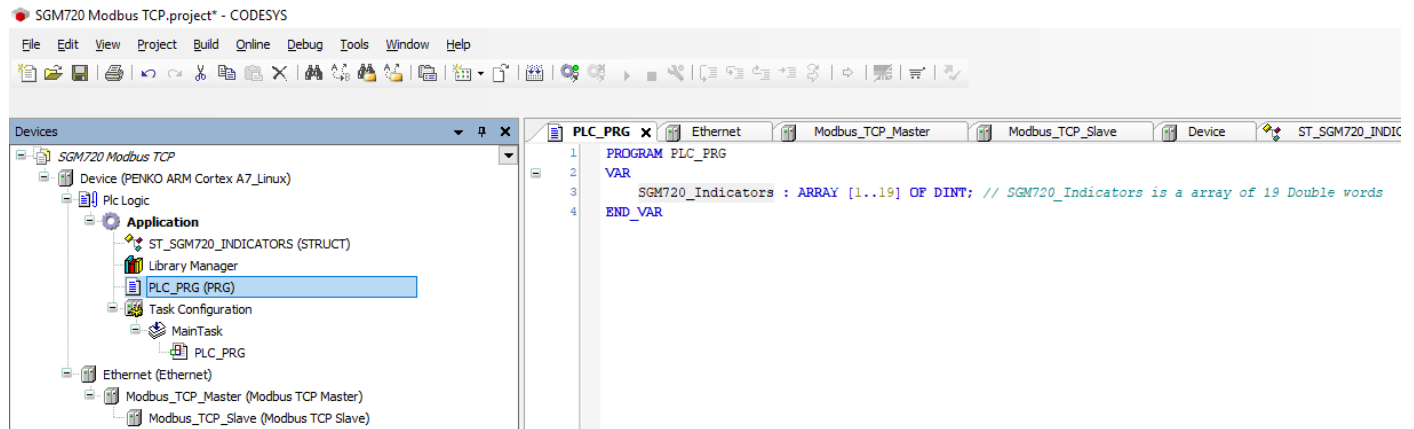




## PENKO How to...

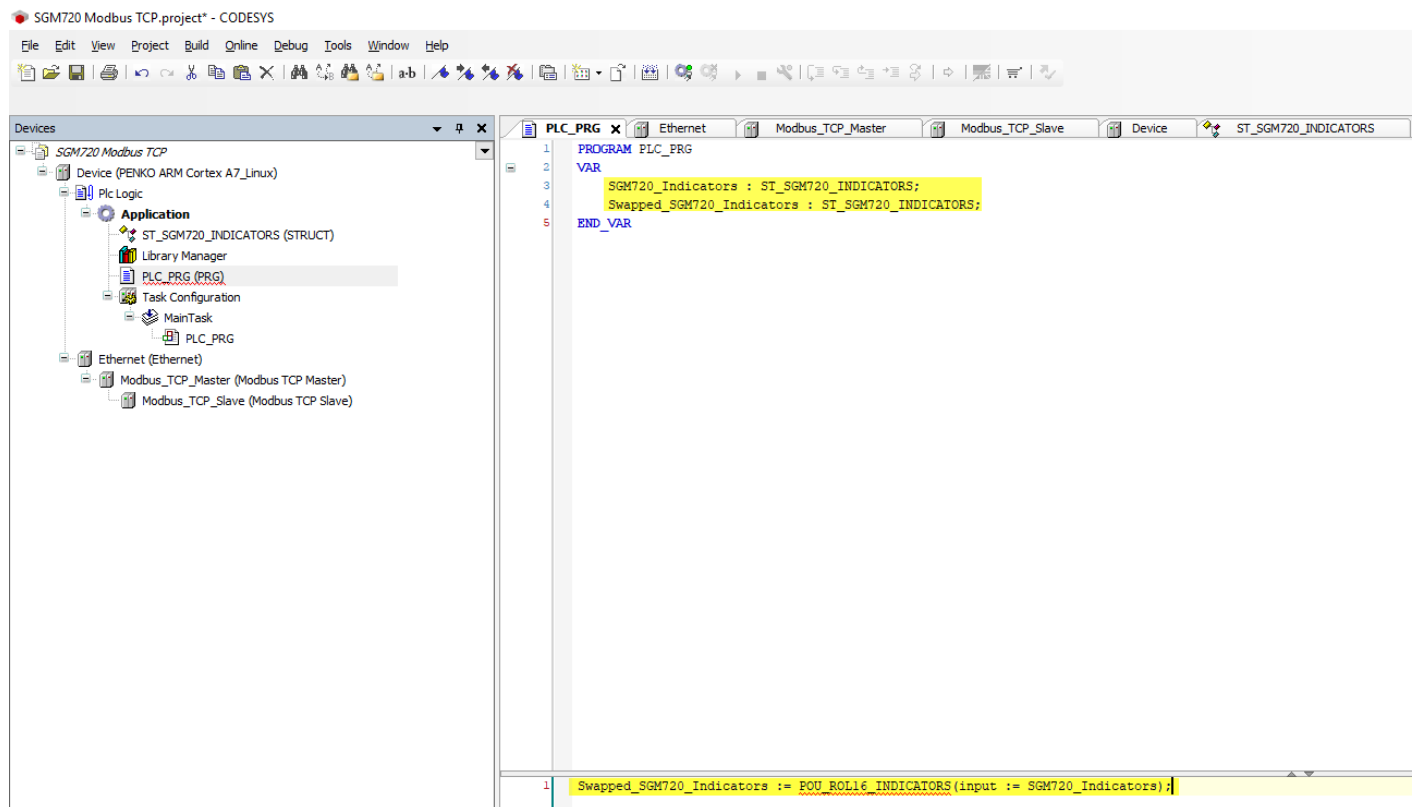
### Connect a SGM720 to a Codesys PLC with Modbus TCP

Double click on PLC\_PRG and change the old code from:



```
SGM720 Modbus TCP.project* - CODESYS
File Edit View Project Build Online Debug Tools Window Help
[Icons]
Devices
  SGM720 Modbus TCP
    Device (PENKO ARM Cortex A7_Linux)
      Plc Logic
        Application
          ST_SGM720_INDICATORS (STRUCT)
          Library Manager
          PLC_PRG (PRG)
          Task Configuration
            MainTask
              PLC_PRG
        Ethernet (Ethernet)
          Modbus_TCP_Master (Modbus TCP Master)
          Modbus_TCP_Slave (Modbus TCP Slave)
  Ethernet (Ethernet)
    Modbus_TCP_Master (Modbus TCP Master)
    Modbus_TCP_Slave (Modbus TCP Slave)
PLC_PRG x Ethernet Modbus_TCP_Master Modbus_TCP_Slave Device ST_SGM720_INDICATORS
1 PROGRAM PLC_PRG
2 VAR
3   SGM720_Indicators : ARRAY [1..19] OF DINT; // SGM720_Indicators is a array of 19 Double words
4 END_VAR
```

To:

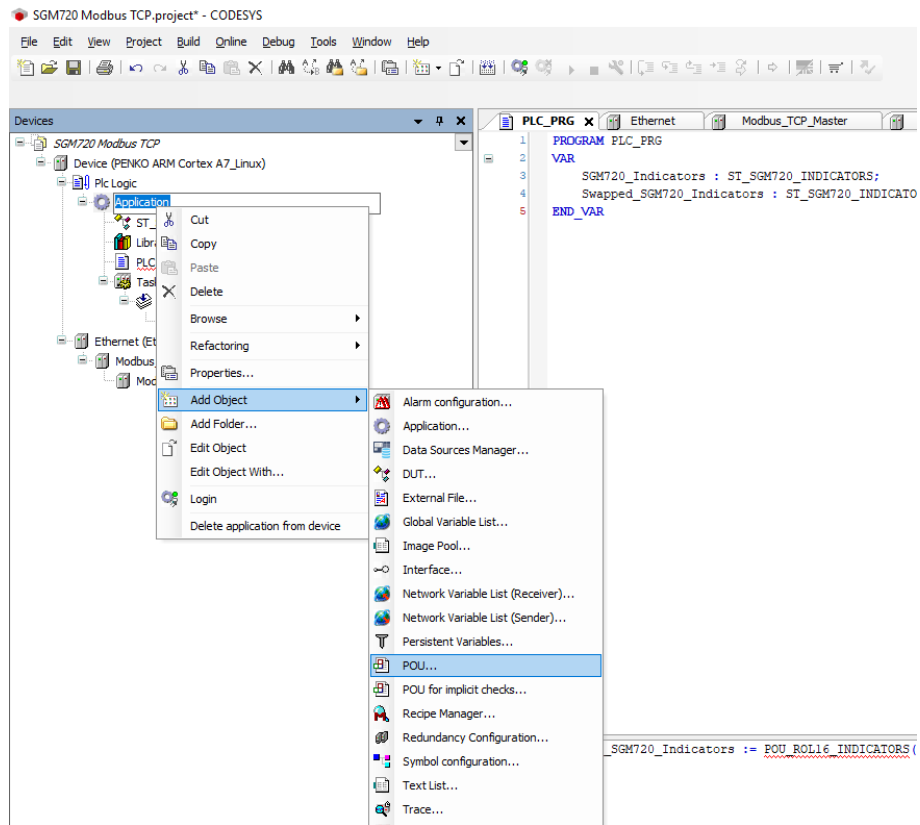


```
SGM720 Modbus TCP.project* - CODESYS
File Edit View Project Build Online Debug Tools Window Help
[Icons]
Devices
  SGM720 Modbus TCP
    Device (PENKO ARM Cortex A7_Linux)
      Plc Logic
        Application
          ST_SGM720_INDICATORS (STRUCT)
          Library Manager
          PLC_PRG (PRG)
          Task Configuration
            MainTask
              PLC_PRG
        Ethernet (Ethernet)
          Modbus_TCP_Master (Modbus TCP Master)
          Modbus_TCP_Slave (Modbus TCP Slave)
  Ethernet (Ethernet)
    Modbus_TCP_Master (Modbus TCP Master)
    Modbus_TCP_Slave (Modbus TCP Slave)
PLC_PRG x Ethernet Modbus_TCP_Master Modbus_TCP_Slave Device ST_SGM720_INDICATORS
1 PROGRAM PLC_PRG
2 VAR
3   SGM720_Indicators : ST_SGM720_INDICATORS;
4   Swapped_SGM720_Indicators : ST_SGM720_INDICATORS;
5 END_VAR
1 Swapped_SGM720_Indicators := FOU_ROLI6_INDICATORS(input := SGM720_Indicators);
```

## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

#### Right-click on Application – Add Object – POU...



Set up the POU as below:

The 'Add POU' dialog box is shown with the following settings:

- Name:** POU\_ROL16\_INDICATORS
- Type:**  **Function**
- Extends:**  (empty)
- Implements:**  (empty)
- Access specifier:** (dropdown menu)
- Method implementation language:** Structured Text (ST)
- Return type:** DWORD
- Implementation language:** Structured Text (ST)

Buttons: Add, Cancel

## PENKO How to... Connect a SGM720 to a Codesys PLC with Modbus TCP

Add the code highlighted in yellow.

The screenshot shows the CODESYS IDE interface for a project named "SGM720 Modbus TCP.project". The left pane displays the project tree with the following structure:

- SGM720 Modbus TCP
  - Device (PENKO ARM Cortex A7\_Linux)
    - Plc Logic
      - Application
        - ST\_SGM720\_INDICATORS (STRUCT)
          - Library Manager
          - PLC\_PRG (PRG)
          - POU\_ROL16\_INDICATORS (FUN)
        - Task Configuration
          - MainTask
          - PLC\_PRG
      - Ethernet (Ethernet)
        - Modbus\_TCP\_Master (Modbus TCP Master)
        - Modbus\_TCP\_Slave (Modbus TCP Slave)

The right pane shows the ladder logic for the function block "POU\_ROL16\_INDICATORS : ST\_SGM720\_INDICATORS". The code is as follows:

```
1 FUNCTION POU_ROL16_INDICATORS : ST_SGM720_INDICATORS
2
3 VAR_INPUT
4     input : ST_SGM720_INDICATORS;
5 END_VAR
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Click on the Login button.

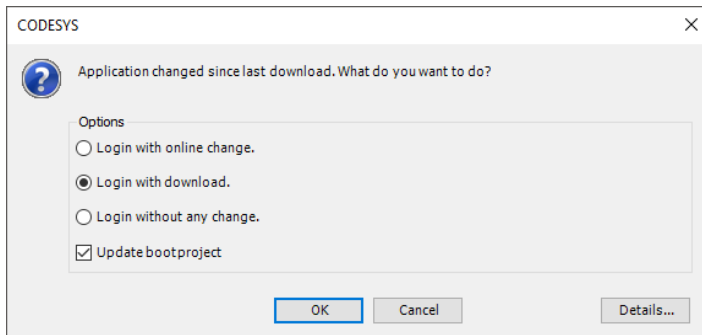
The screenshot shows the same CODESYS IDE interface as above, but with the "Login" button highlighted in yellow in the ladder logic code. The code is as follows:

```
1 FUNCTION POU_ROL16_INDICATORS : ST_SGM720_INDICATORS
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3 VAR_INPUT
4     input : ST_SGM720_INDICATORS;
5 END_VAR
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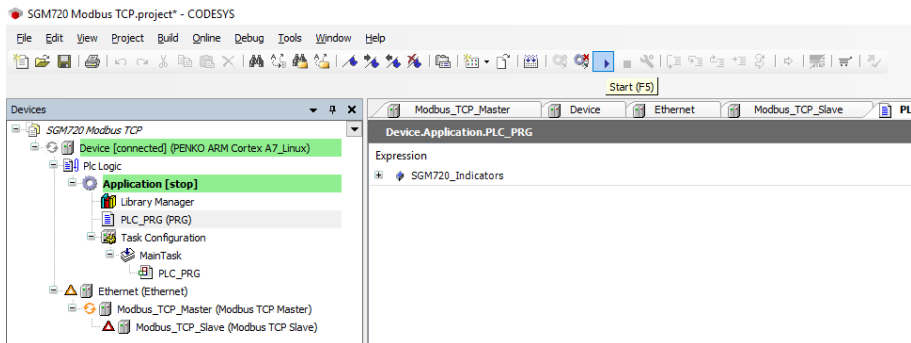
## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

Click on the Login with download and click on OK.



Click on Start.



## PENKO How to...

### Connect a SGM720 to a Codesys PLC with Modbus TCP

Double click on PLC\_PRG to view the actual SGM720 Indicators. Now you can see the values from the Modbus Slave (SGM720) and the swapped data shown in yellow.

Expression	Type	Value
SGM720_Indicators	ST_SGM720_INDICATORS	
SGM720_weight	DINT	630980608
SGM720_Fast_Gross	DINT	630980608
SGM720_Fast_Net	DINT	630980608
SGM720_Display_Fast_Gross	DINT	630980608
SGM720_Display_Fast_Net	DINT	630980608
SGM720_Tare	DINT	0
SGM720_Peak	DINT	-859045876
SGM720_Valley	DINT	859114111
SGM720_Hold	DINT	0
SGM720_weightX10	DINT	2015100929
SGM720_Fast_GrossX10	DINT	2015100929
SGM720_Fast_NetX10	DINT	2015100929
SGM720_Display_Fast_GrossX10	DINT	2015100929
SGM720_Display_Fast_NetX10	DINT	2015100929
SGM720_TareX10	DINT	0
SGM720_PeakX10	DINT	-1
SGM720_ValleyX10	DINT	0
SGM720_HoldX10	DINT	0
SGM720_Signal	DINT	-846135296
Swapped_SGM720_Indicators	ST_SGM720_INDICATORS	
SGM720_weight	DINT	9628
SGM720_Fast_Gross	DINT	9628
SGM720_Fast_Net	DINT	9628
SGM720_Display_Fast_Gross	DINT	9628
SGM720_Display_Fast_Net	DINT	9628
SGM720_Tare	DINT	0
SGM720_Peak	DINT	838860
SGM720_Valley	DINT	-838860
SGM720_Hold	DINT	0
SGM720_weightX10	DINT	96284
SGM720_Fast_GrossX10	DINT	96284
SGM720_Fast_NetX10	DINT	96284
SGM720_Display_Fast_GrossX10	DINT	96284
SGM720_Display_Fast_NetX10	DINT	96284
SGM720_TareX10	DINT	0
SGM720_PeakX10	DINT	-1
SGM720_ValleyX10	DINT	0
SGM720_HoldX10	DINT	0
SGM720_Signal	DINT	52625

## Modbus addresses

Modbus_TCP_Slave x PLC_PRG Device Modbus_TCP_Master ST_SGM720_OUTPUTS ST_SGM720_EXT_REGISTERS_READ ST_SGM720_INDICATORS									
Name	Access Type	Trigger	READ Offset	Length	Error Handling	WRITE Offset	Length	Comment	
0 Indicators	Read Input Registers (Function Code 04)	Cyclic, t#100ms	16#0064	38	Keep last Value				
1 Inputs	Read Discrete Inputs (Function Code 02)	Cyclic, t#100ms	16#0000	3	Keep last Value				
2 Outputs	Read Discrete Inputs (Function Code 02)	Cyclic, t#100ms	16#00C8	4	Keep last Value				
3 Markers read	Read Coils (Function Code 01)	Cyclic, t#100ms	16#0190	8	Keep last Value				
4 Markers write	Write Multiple Coils (Function Code 15)	Cyclic, t#100ms				16#0190	8		
5 Read Ext. Registers	Read Input Registers (Function Code 04)	Cyclic, t#100ms	16#03E8	20	Keep last Value				
6 Write Ext. Registers	Write Multiple Registers (Function Code 16)	Cyclic, t#100ms				16#03E8	20		
7 Indicator status	Read Discrete Inputs (Function Code 02)	Cyclic, t#100ms	16#0440	15	Keep last Value				
8 Control	Write Multiple Coils (Function Code 15)	Cyclic, t#100ms				16#03E8	8		



## About PENKO

Our design expertise include systems for manufacturing plants, bulk weighing, check weighing, force measuring and process control. For over 35 years, PENKO Engineering B.V. has been at the forefront of development and production of high-accuracy, high-speed weighing systems and our solutions continue to help cut costs, increase ROI and drive profits for some of the largest global brands, such as Cargill, Sara Lee, Heinz, Kraft Foods and Unilever to name but a few.

Whether you are looking for a simple stand-alone weighing system or a high-speed weighing and dosing controller for a complex automated production line, PENKO has a comprehensive range of standard solutions you can rely on.

## Certifications

PENKO sets high standards for its products and product performance which are tested, certified and approved by independent expert and government organizations to ensure they meet – and even – exceed metrology industry guidelines. A library of testing certificates is available for reference on:

[http://penko.com/nl/publications\\_certificates.html](http://penko.com/nl/publications_certificates.html)



## PENKO Professional Services

PENKO is committed to ensuring every system is installed, tested, programmed, commissioned and operational to client specifications. Our engineers, at our weighing center in Ede, Netherlands, as well as our distributors around the world, strive to solve most weighing-system issues within the same day. On a monthly basis PENKO offers free training classes to anyone interested in exploring modern, high-speed weighing instruments and solutions. A schedule of training sessions is found on: [www.penko.com/training](http://www.penko.com/training)

## PENKO Alliances

PENKO's worldwide network: Australia, Belgium, Brazil, China, Denmark, Germany, Egypt, Finland, France, India, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Syria, Turkey, United Kingdom, South Africa, Slovakia Sweden, Switzerland and Singapore. A complete overview you will find on: [www.penko.com/dealers](http://www.penko.com/dealers)

