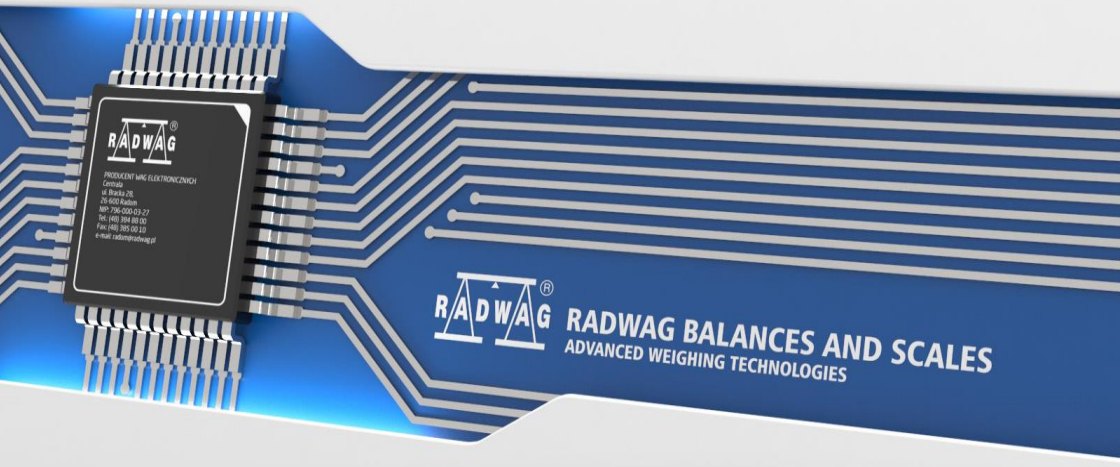
PROFINET

Communication protocol:
PUE HX7 Weighing Indicator

SOFTWARE MANUAL

ITKP-23-02-04-23-EN



CONTENTS

1. WEIGHING INDICATOR SETTINGS - CONFIGURATION

To set indicator communication via PROFINET protocol go to **<SETUP / Additional modules / Anybus module>**. For detailed description of settings configuration read **„PUE HX7 - Software manual”** user manual.

2. DATA STRUCTURE

2.1. Input Address

Input variables:

Variable	Offset	Length [WORD]	Data type
Platform 1 mass	0	2	float
Platform 1 tare	4	2	float
Platform 1 unit	8	1	word
Platform 1 status	10	1	word
Platform 1 LO threshold	12	2	float
Platform 2 mass	16	2	float
Platform 2 tare	20	2	float
Platform 2 unit	24	1	word
Platform 2 status	26	1	word
Platform 2 LO threshold	28	2	float
Process status (Stop, Start)	64	1	word
Input status	66	1	word
Min	68	2	float
Max	72	2	float
Fast dosing threshold	76	2	float
Slow dosing threshold	80	2	float
Lot number	84	2	dword
Operator	88	1	word
Product	90	1	word
Customer	92	1	word
Packaging	94	1	word
Formulation	100	1	word
Dosing process	102	1	word

2.2. Input Registers

Platform mass – returns platform mass in current unit.

Platform tare – returns platform tare in an adjustment unit.

Platform unit – determines current mass unit of a given platform.

Unit bits	
0	gram [g]
1	kilogram [kg]
2	carat [ct]
3	pound [lb]
4	ounce [oz]
5	Newton [N]

Example:

Read HEX value: 0x02. Binary form:

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

The unit of the weighing instrument is kilogram [kg].

Platform status – determines state of a given weighing platform.

Status bits	
0	Measurement correct (the weighing instrument does not report any error)
1	Measurement stable
2	Weighing instrument indicates zero
3	Weighing instrument tared
4	Weighing instrument in II weighing range
5	Weighing instrument in III weighing range
6	Weighing instrument reports NULL error
7	Weighing instrument reports LH error
8	Weighing instrument reports FULL error

Example:

Read HEX value: 0x13

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1

The weighing instrument does not report any error, measurement stable in II weighing range.

LO threshold – returns value of platform's **LO** threshold in an adjustment unit.

Process status – determines dosing or formulations process status:

0x00 – process disabled
0x01 – process stopped
0x02 – process aborted
0x03 – process finished

Input state – bitmask of indicator inputs. The first 4 least significant bits represent weighing terminal inputs.

Example:

Read HEX value: 0x000B

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1

Inputs 1, 2 and 3 of the weighing indicator take HI state.

MIN - response: **MIN** threshold value (in current unit).

MAX - response: **MAX** threshold value (in current unit).

Fast dosing threshold - returns fast dosing threshold value in an adjustment unit.

Slow dosing threshold - returns slow dosing threshold value in an adjustment unit.

Lot number – response: lot number. Only numerical values are accepted! All other characters are skipped.

Operator – response: code of logged in operator.

Product – response: code of selected product.

Customer – response: code of selected customer.

Packaging – response: code of selected packaging.

Formulation – response: code of selected formulation.

Dosing process – response: code of selected dosing process.

2.3. Output Address

Input variables:

Variable	Offset	Length [WORD]	Data type
Command	0	1	word
Command with parameter	2	1	word
Platform	4	1	word
Tare	6	2	float
LO threshold	10	2	float
Output state	14	1	word
Min	16	2	float
Max	20	2	float
Lot number	32	2	dword
Operator	36	1	word
Product	38	1	word
Customer	40	1	word
Packaging	42	1	word
Formulation	48	1	word
Dosing process	50	1	word

2.4. Output Registers

Basic command – writing the register with respective value triggers the following actions:

Bit No.	Operation
0	Zero the platform
1	Tare the platform
2	Delete statistics
3	Save/Print
4	Start

5	Breakdown (STOP without confirmation)
6	Tare/Zero the platform
7	Lock keypad
8	Unlock keypad

	***A command is executed once upon detecting that its bit has been set. If the command is to be executed more than once, it is necessary to zero the bit first, and reset it to the required value next.***

Example:

Writing the register with value 0x02

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

This causes scale taring.

<u>Complex command</u> – setting a respective value results with performance of a given task, see the table:

Bit No.	Operation
0	Setting tare value for a given platform
1	Setting LO threshold value for a given platform
2	Setting lot number
3	Setting outputs status
4	Operator selection
5	Product selection
6	Packaging selection
7	Setting MIN threshold value
8	Customer selection
11	Dosing process selection
12	Setting MAX threshold value

	***Complex command requires setting a respective parameter (offset from 4 to 50 – refer to output registers table)***

	***A command with a parameter is executed once upon detecting that its bit has been set. If the command is to be executed more than once, it is necessary to zero the bit first, and reset it to the required value next.***

Example:

Sending tare of 1.0 value for the 1st platform.

Carrying out the command requires writing 3 registers:

offset 2 – command with parameter - value 0x01 – i.e. tare setting.

offset 4 – number of a weighing platform to which the tare is to be written - 0x01 value for the 1st first platform.

offset 6 – tare value in float format - 1.0.

Platform – complex command parameter: weighing platform number (1 or 2).

Tare – complex command parameter: tare value (in an adjustment unit).

LO threshold – complex command parameter: LO threshold value (in an adjustment unit).

Output state – complex command parameter: determines state of the weighing indicator and communication module outputs.

Example:

Setting high state to outputs 1 and 3 of the weighing indicator.

Output mask has the following format:

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

After conversion to HEX the result is 0x05

Carrying out the command requires writing 2 registers:

offset 2 – command with parameter - value 0x08 – i.e. record of outputs state.

offset 14 – outputs mask 0x05

As a result, outputs number 1 and 3 take high state.

MIN – complex command parameter: MIN threshold value (in a unit of current working mode).

MAX – complex command parameter: MAX threshold value (in a unit of current working mode).

Lot number – complex command parameter: lot number value. Only numerical values are accepted! All other characters are skipped.

Operator – complex command parameter: operator code (digits only).

Product – complex command parameter: product code (digits only).

Customer – complex command parameter: customer code (digits only).

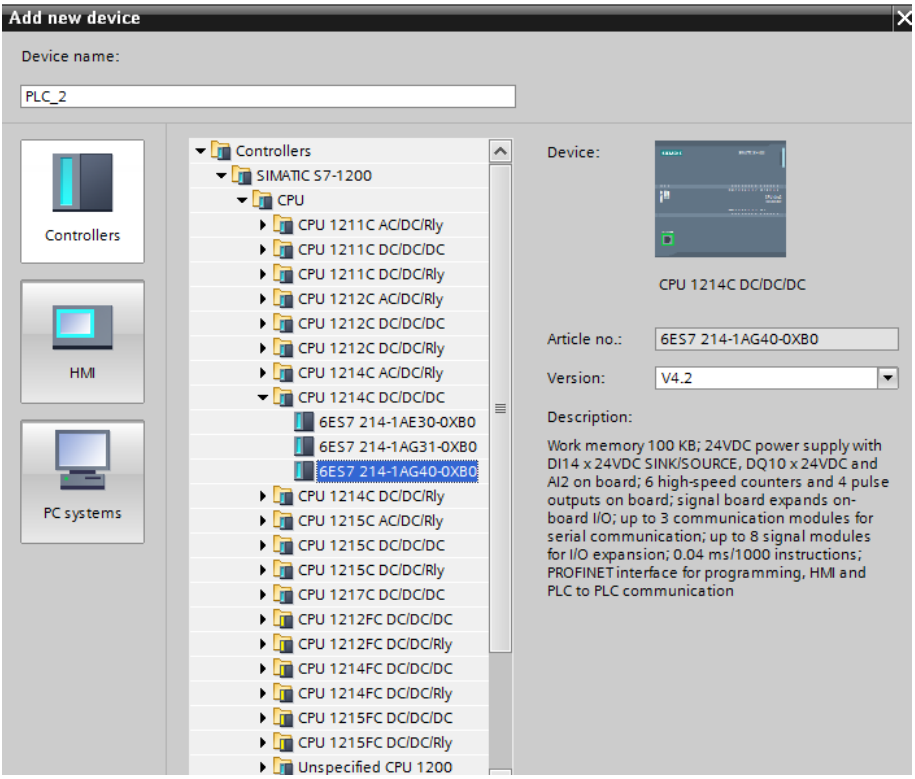
Packaging – complex command parameter: packaging code (digits only)

Formulation – complex command parameter: formulation code (digits only).

Dosing process – complex command parameter: dosing process code (digits only).

3. CONFIGURATION OF PROFINET MODULE IN TIA PORTAL V14 ENVIRONMENT

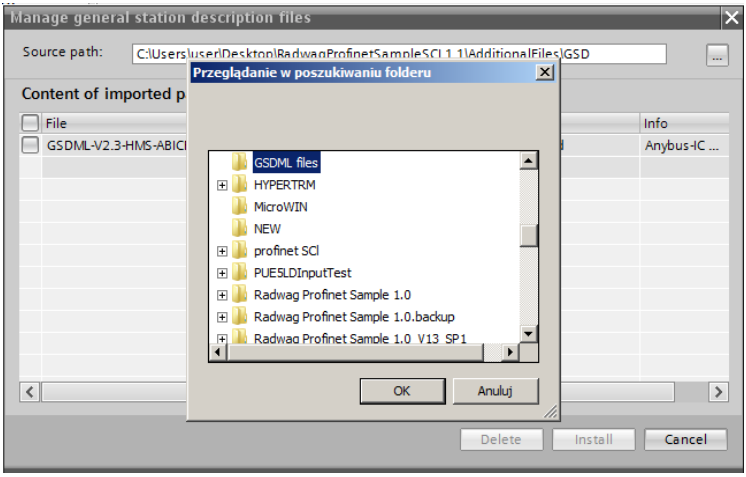
Start operation in the environment by setting up a new project, where topology of PROFIBUS network with MASTER controller will be specified, in this case the MASTER controller is SIEMENS controller of S7-1200 series.



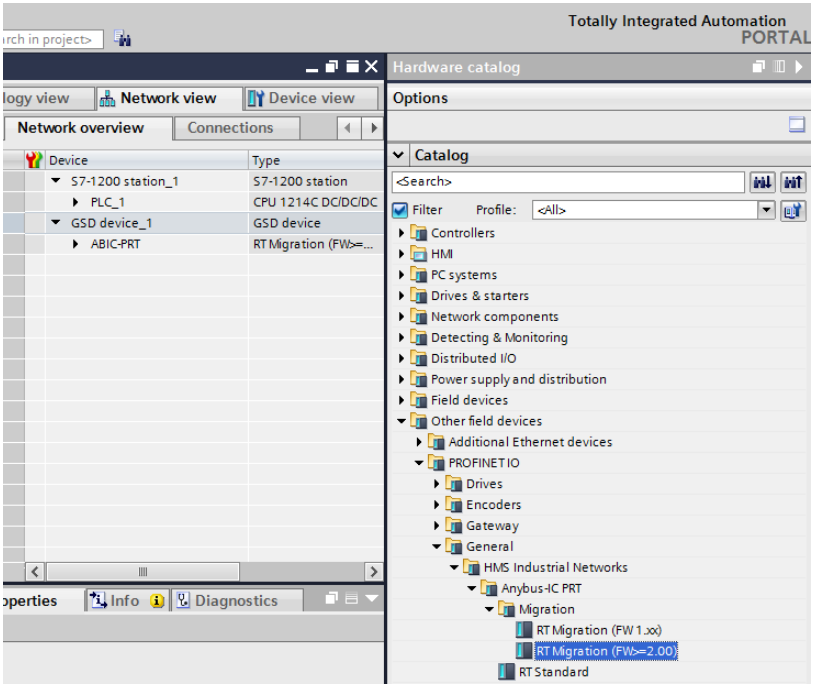
3.1. Import GSD

Using a delivered configuration file (GSD), add a new device into the environment.

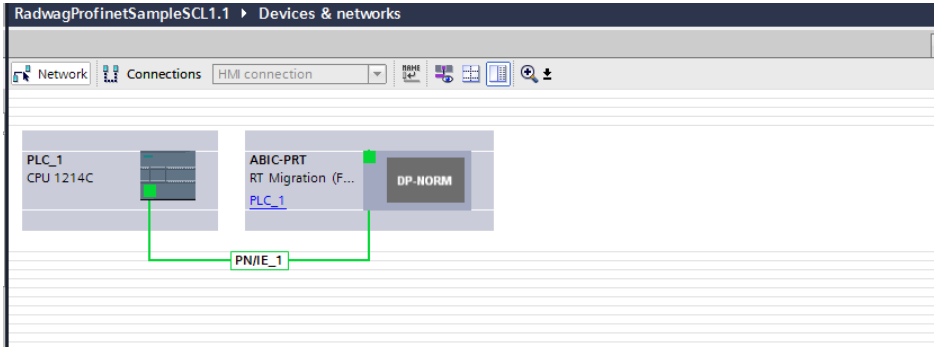
Open OPTIONS tab, next click MANAGE GENERAL STATION DESCRIPTION FILES (GSD) entry and select access path to the GSD file.



With the file successfully added, the ABIC-PRT module is displayed on the list of the devices.

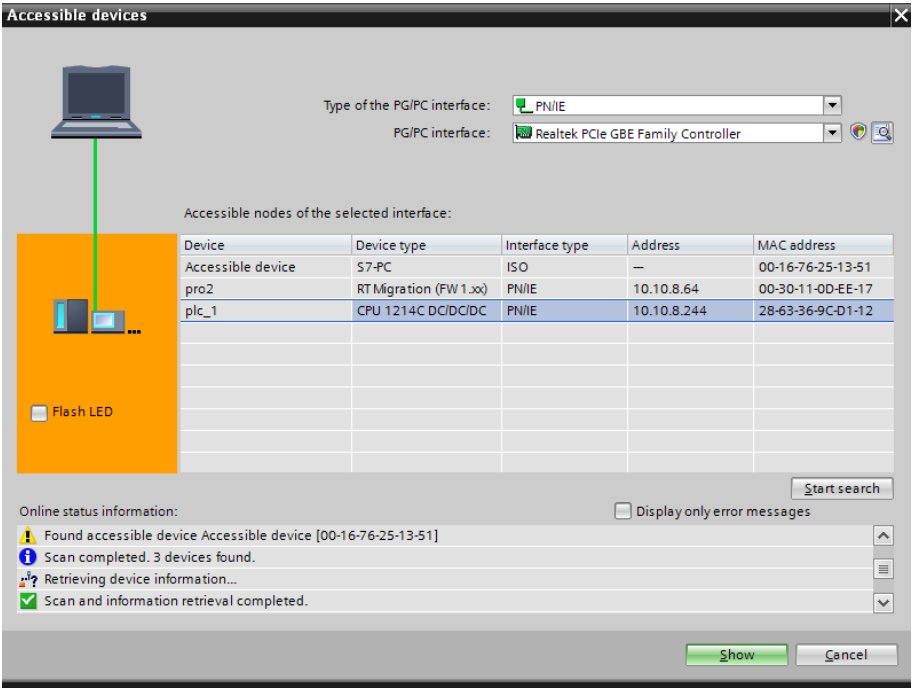


Now you can make a network comprising a MASTER controller and a newly added SLAVE module.

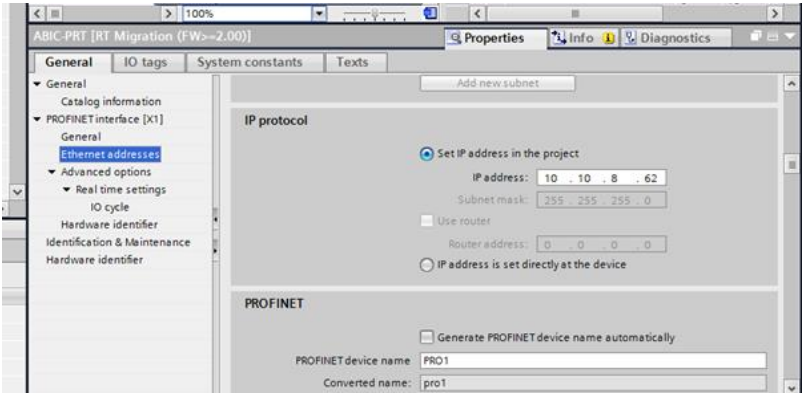


3.2. Module Configuration

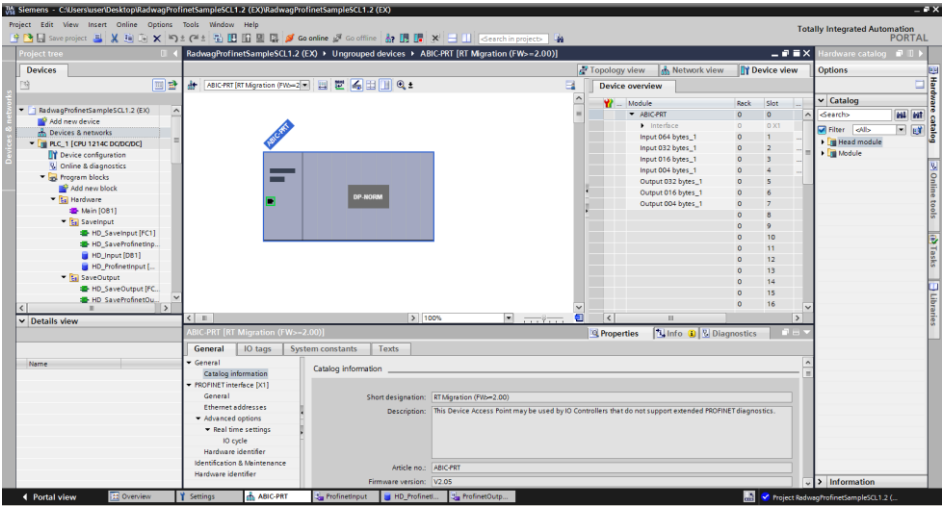
At this stage, it is necessary to create a network consisting of MASTER controller and SLAVE device (scale). Upon connecting to the mains, use ACCESSIBLE DEVICES function to search for devices in the environment. As a result, MASTER and SLAVE modules can be found on the list:

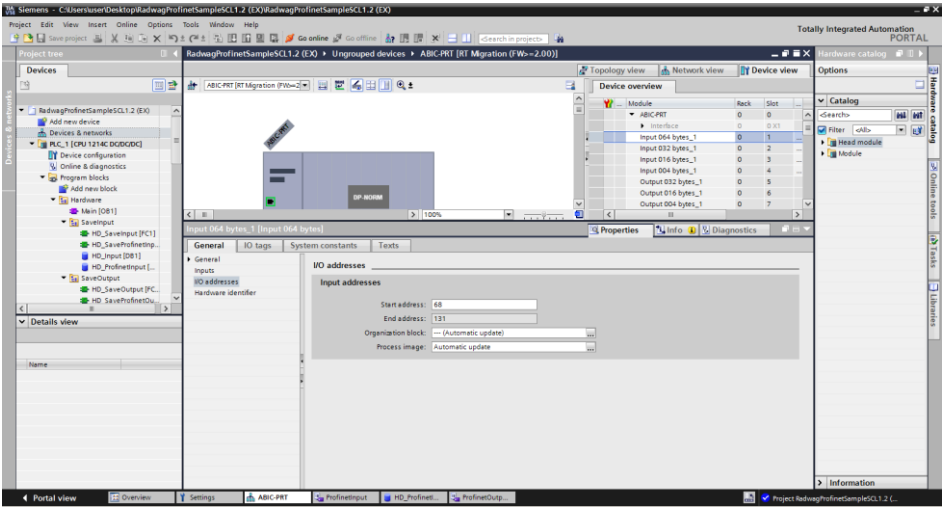


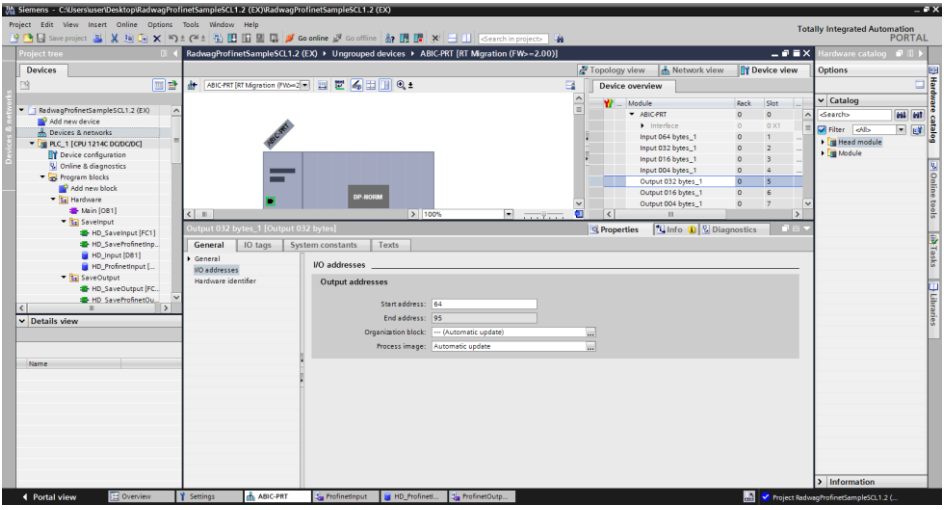
Now, specify the module IP address and its name in the PROFINET network. After selecting the module in the PROPERTIES tab, find the PROFINET INTERFACE submenu and enter the IP address and a name. Make sure that the setting is accordant with the parameters set in the scale menu. Make sure that IP SLAVE address is in the same subnet as the MASTER address.



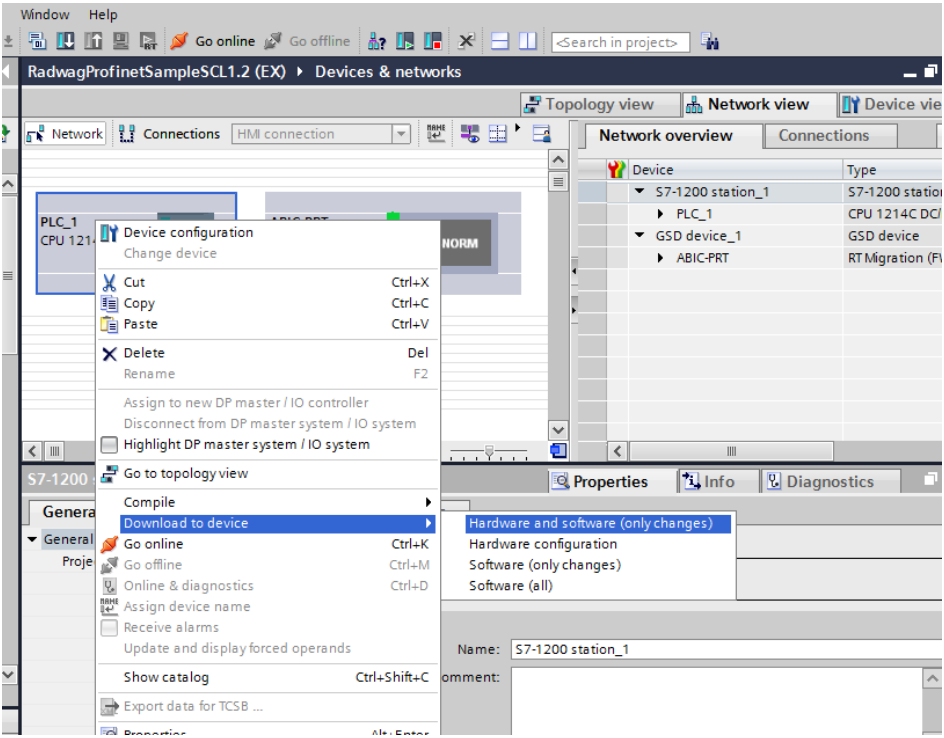
Next configure the module. First specify input and output registers size, define their start addresses. From the list of available INPUT and OUTPUT modules select such modules as presented in the screenshot below. Maximum size of input data is 116 bytes, maximum size of output data is 116 bytes too. In the project, default start addresses have been used – 68 for the INPUT module and 64 for the OUTPUT module:



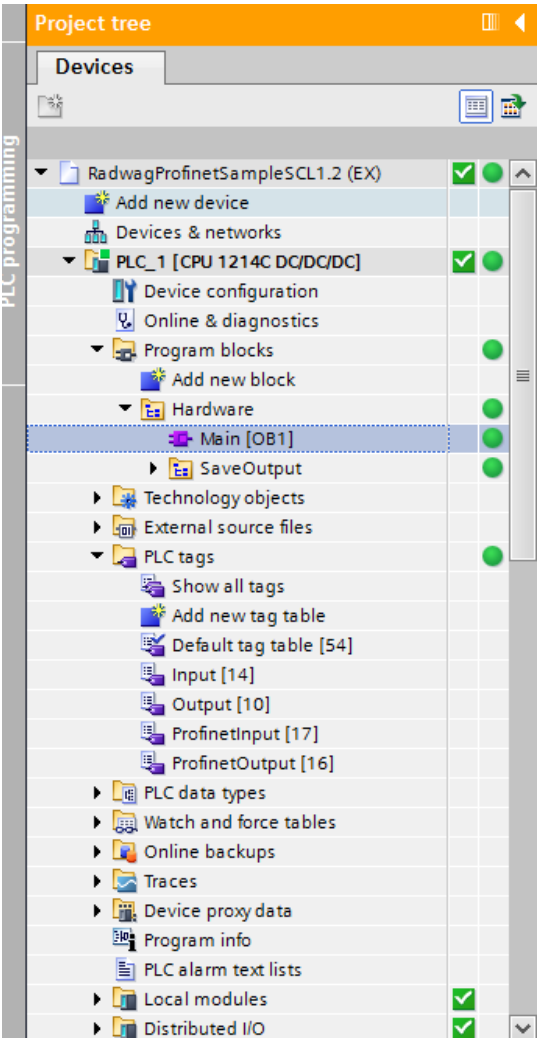

Siemens – C:\Users\user\Desktop\RadwagProfinetSampleSCL1.2 (EX)\RadwagProfinetSampleSCL1.2 (EX)
Totally Integrated Automation
PORTAL
RadwagProfinetSampleSCL1.2 (EX) ▸ Ungrouped devices ▸ ABIC-PRT [RT Migration (FW>=2.00)]
Input 064 bytes_1 [Input 064 bytes]
General
IO tags
System constants
Texts
I/O addresses
Input addresses
Start address: 68
End address: 131
Organization block: --- (Automatic update)
Process image: Automatic update


Siemens – C:\Users\user\Desktop\RadwagProfinetSampleSCL1.2 (EX)\RadwagProfinetSampleSCL1.2 (EX)
Totally Integrated Automation
PORTAL
RadwagProfinetSampleSCL1.2 (EX) ▸ Ungrouped devices ▸ ABIC-PRT [RT Migration (FW>=2.00)]
Output 032 bytes_1 [Output 032 bytes]
General
IO tags
System constants
Texts
I/O addresses
Output addresses
Start address: 64
End address: 95
Organization block: --- (Automatic update)
Process image: Automatic update

At this stage it is possible to upload the hardware configuration into the controller, and to start data upload.



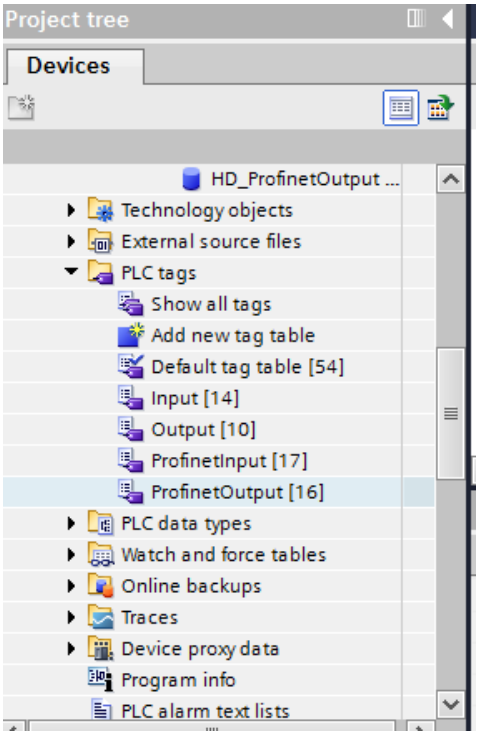
Upon successful compilation and code reading, the MASTER and SLAVE shall establish communication. It can be verified via ONLINE connection. The result should be as presented below:



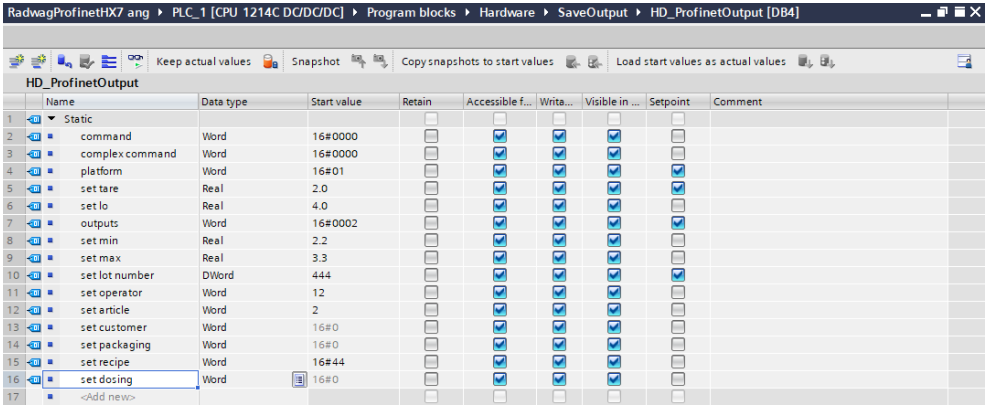
Now proceed to the process of program code making.

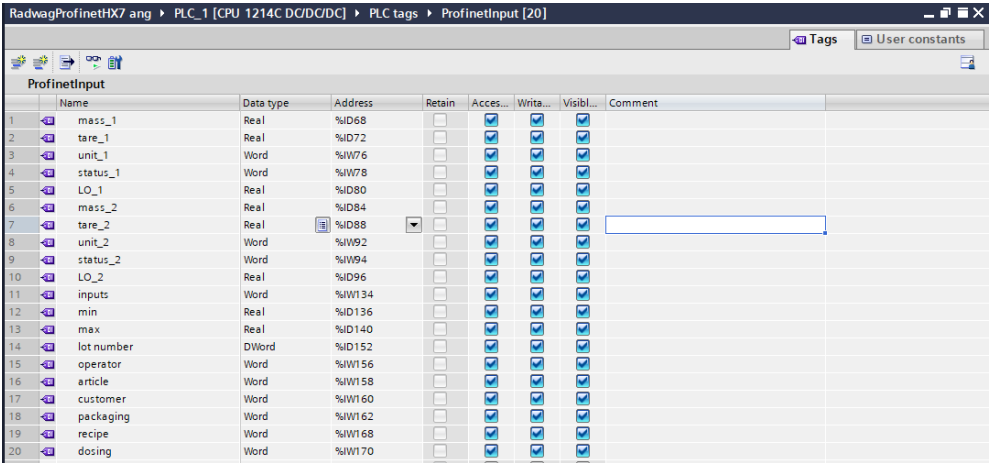
4. DIAGNOSTICS APP

Start creating the app by defining names of symbolic input and output registers. For this purpose, use a branch of the PLC TAGS tree. For the purpose of this example, tag tables have been created as presented below:



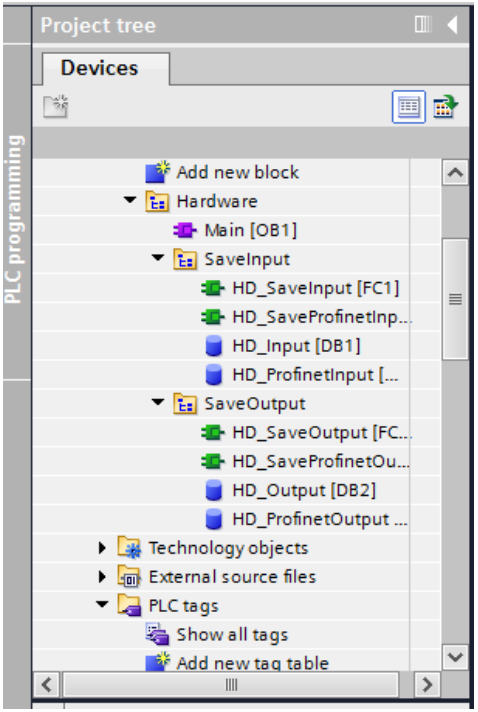
INPUT and OUTPUT tables refer to physical inputs/outputs of the MASTER controller and are not relevant in this application. ProfinetInput and ProfinetOutput blocks represent input/output registers of the scale's PROFINET module. See the screenshots below (names and addresses are examples only):



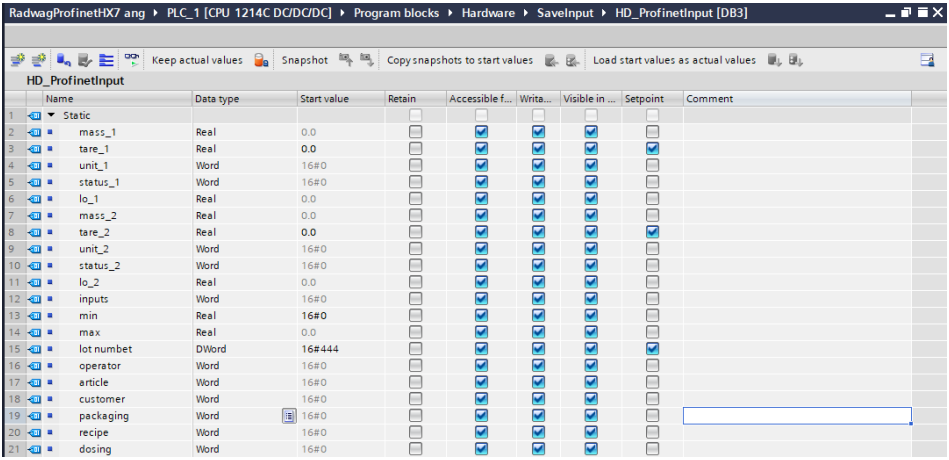


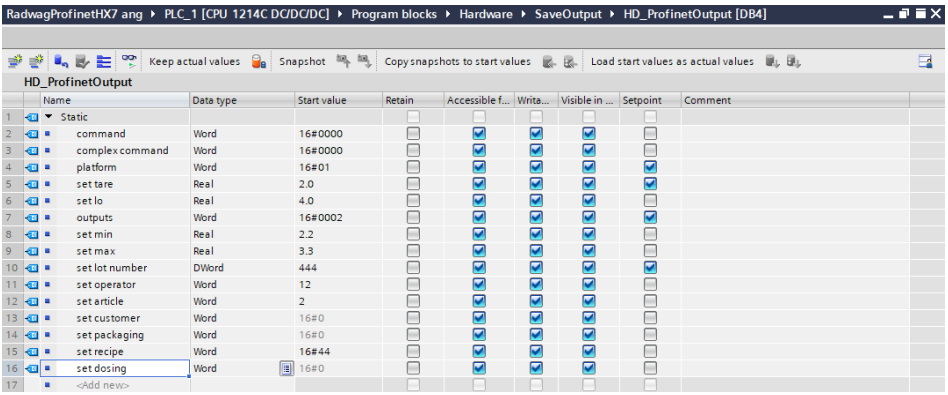
	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Comment
1	mass_1	Real	%ID68		☑	☑	☑	
2	tare_1	Real	%ID72		☑	☑	☑	
3	unit_1	Word	%IW76		☑	☑	☑	
4	status_1	Word	%IW78		☑	☑	☑	
5	LO_1	Real	%ID80		☑	☑	☑	
6	mass_2	Real	%ID84		☑	☑	☑	
7	tare_2	Real	%ID88		☑	☑	☑	
8	unit_2	Word	%IW92		☑	☑	☑	
9	status_2	Word	%IW94		☑	☑	☑	
10	LO_2	Real	%ID96		☑	☑	☑	
11	inputs	Word	%IW134		☑	☑	☑	
12	min	Real	%ID136		☑	☑	☑	
13	max	Real	%ID140		☑	☑	☑	
14	lot number	DWord	%ID152		☑	☑	☑	
15	operator	Word	%IW156		☑	☑	☑	
16	article	Word	%IW158		☑	☑	☑	
17	customer	Word	%IW160		☑	☑	☑	
18	packaging	Word	%IW162		☑	☑	☑	
19	recipe	Word	%IW168		☑	☑	☑	
20	dosing	Word	%IW170		☑	☑	☑	

In order not to operate using module's physical inputs/outputs create data blocks containing representations of these registers and functions rewriting values between them. Create HARDWARE group in the PROGRAM BLOCKS branch and determine data blocks as below:

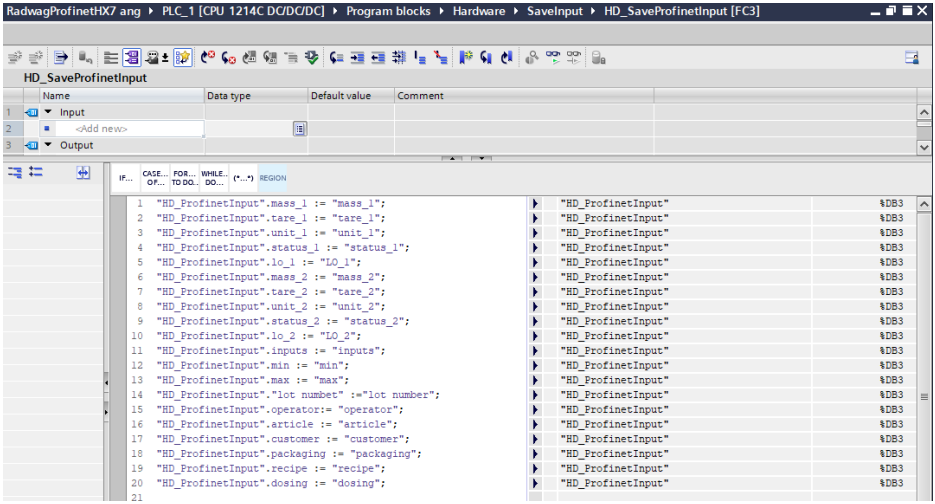


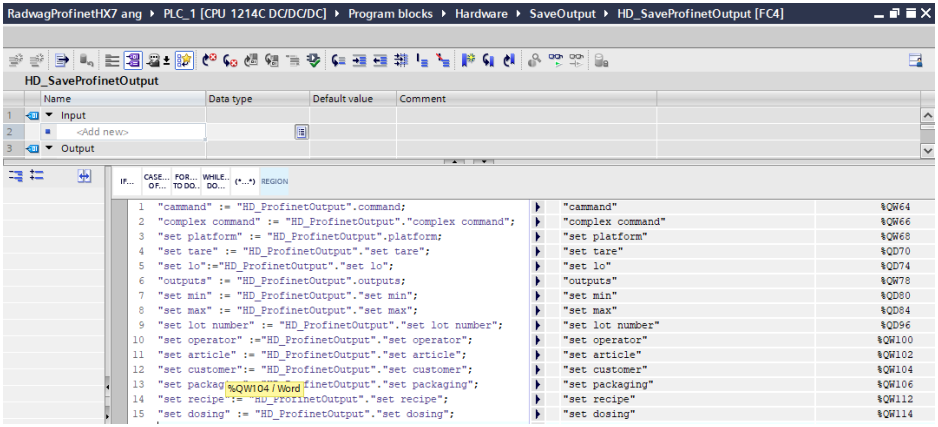
HD_OUTPUT and HD_INPUT blocks represent physical input/output registers of the MASTER controller and are not relevant in this project. HD_ProfinetOutput and HD_ProfinetInput blocks represent input/output registers of the scale's PROFINET module. See the screenshots below:



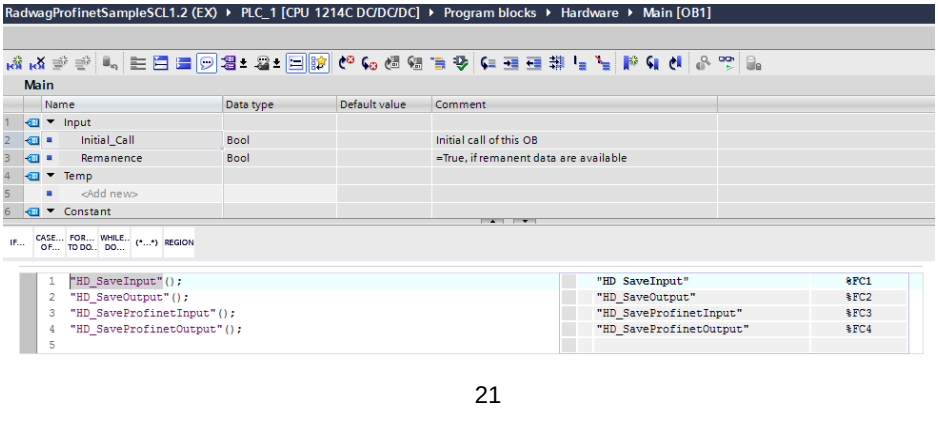


Functions rewriting the values between module's physical inputs/outputs may look as presented below.





Now, in the main program loop, trigger required functions.



Upon compilation and upload of the program to the controller, in data block it is possible to read input registers (MONITOR ALL) and to record output registers (e.g. by change of START VALUE and LOAD START VALUES AS ACTUAL) of the SLAVE module.

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