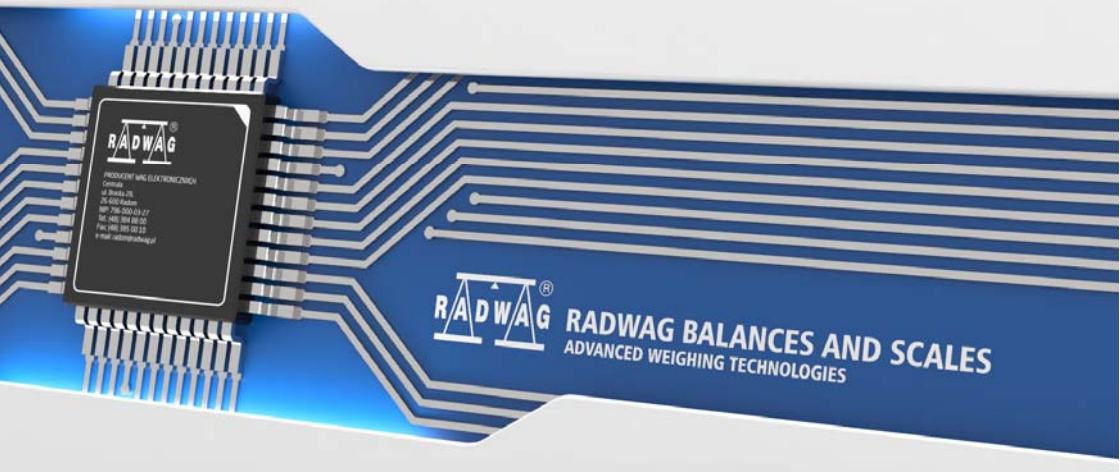
PROFINET

Communication Protocol of PUE HX5.EX Indicator

SOFTWARE MANUAL

ITKP-02-02-08-18-EN



AUGUST 2018

CONTENTS

1. DATA STRUCTURE

1.1. Input Address

Input variables list:

Variable	Offset	Length [WORD]	Data type
Mass	0	2	float
Tare	4	2	float
Unit	8	1	word
Platform status	10	1	word
LO threshold	12	2	float
Process status (Stop, Start)	16	1	word
Inputs status	66	1	word
Min	68	2	float
Max	72	2	float
Lot number	84	2	dword
Operator	88	1	word
Product	90	1	word
Customer	92	1	word
Packaging	94	1	word
Source warehouse	-	-	-
Target warehouse	-	-	-
Formulation/Dosing	100	1	word

Platform mass – response: platform mass in current unit.

Platform tare – response: platform tare in adjustment unit.

Platform unit – determines currently displayed mass unit of a platform.

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

Example:

bit No.	**B5**	**B4**	**B3**	**B2**	**B1**	**B0**
value	0	0	0	0	1	0

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

Platform status – determines status of a weighing platform.

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

Example:

bit No.	**B8**	**B7**	**B6**	**B5**	**B4**	**B3**	**B2**	**B1**	**B0**
value	0	0	0	0	1	0	0	1	1

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

LO threshold – response: **LO** threshold value of a platform in adjustment unit.

Process status – determines process status:

Decimal value	**Process status**	**bit No.**	
		B1	**B0**
0	process disabled	0	0
1	process start	0	1
2	process stop	1	0
3	process complete	1	1

Inputs status – response: status of set inputs:

Input No.	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
OFF	0	0	0	0	0	0	0	0	0	0	0	0
ON	1	1	1	1	1	1	1	1	1	1	1	1

Example:

Mask of set 2 and 4 inputs: 0000 0000 0000 1010

MIN – response: **MIN** threshold value (in the current unit selected for active working mode).

MAX – response: **MAX** threshold value (in the current unit selected for active working mode).

Lot number – response: lot number.

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.

1.2. Output Address

Input variables list:

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
Outputs status	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
Source warehouse	-	-	-
Target warehouse	-	-	-
Formulation/Dosing	48	1	word

Basic command – setting respective value performs the task in accordance with the table:

Bit No.	Command
0	Zero the platform
1	Tare the platform
2	Delete statistics
3	Save/Print
4	Start
5	Stop (error)

Example:

0000 0000 0010 0000 – process start.

Complex command – setting respective value performs the task in accordance with the table:

Decimal value	Command
0	Setting the tare value for given platform
1	Setting LO threshold value for 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
9	Source warehouse selection
10	Target warehouse selection
11	Dosing selection
12	Setting MAX threshold value

Complex command requires setting address of respective parameter (from 2 to 24 – refer to: 'Complex command parameters' table).

Example:

0000 0000 0000 0010 – command sets LO threshold to the value set in LO parameter (address 5 – refer to: 'Complex command parameters' table).

Platform – complex command parameter: weighing platform number.

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

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

Outputs status – complex command parameter: determines status of weighing indicator outputs.

Output No.	12	11	10	9	8	7	6	5	4	3	2	1
OFF	0	0	0	0	0	0	0	0	0	0	0	0
ON	1	1	1	1	1	1	1	1	1	1	1	1

Example:

Mask of active 2 and 4 outputs: 0000 0000 0000 1010

MIN – complex command parameter: MIN threshold value (in the current unit selected for active working mode).

MAX – complex command parameter: MAX threshold value (in the current unit selected for active working mode).

Lot number – complex command parameter: lot number.

Operator – complex command parameter: code of logged in operator.

Product – complex command parameter: code of selected product.

Customer – complex command parameter: code of selected customer.

Packaging – complex command parameter: code of selected packaging.

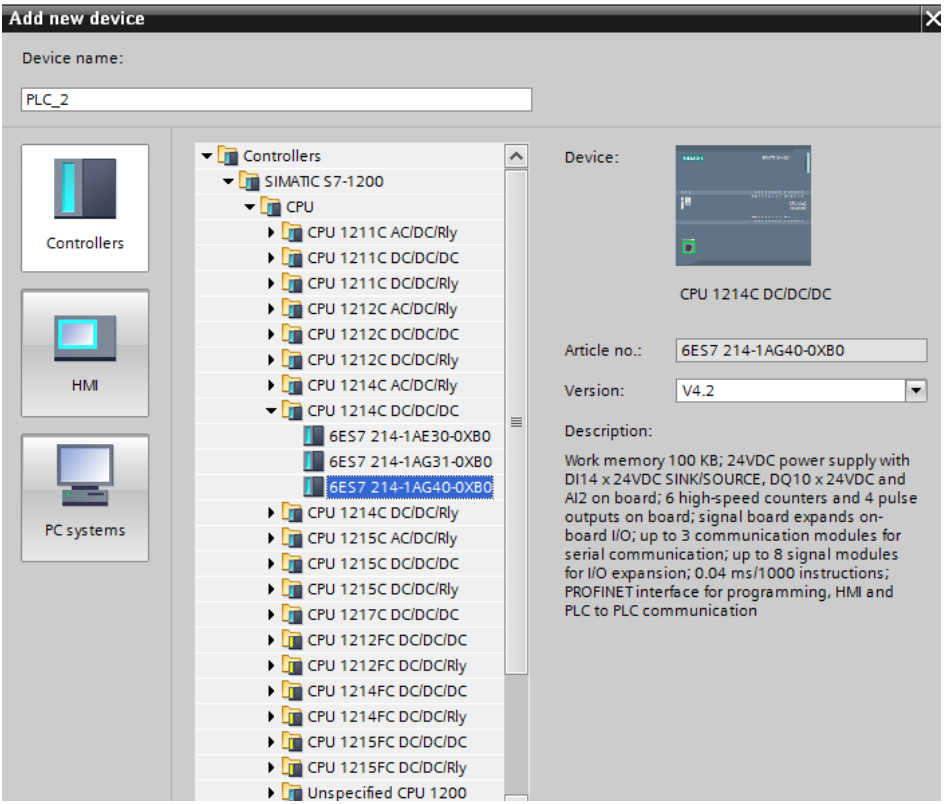
A command or a command with parameter is executed once when its bit setting is detected. If the command with the same bit is to be executed again, zero the bit.

Example:

Command	
Taring	0000 0000 0000 0010
Command bits zeroing	0000 0000 0000 0000
Taring	0000 0000 0000 0010

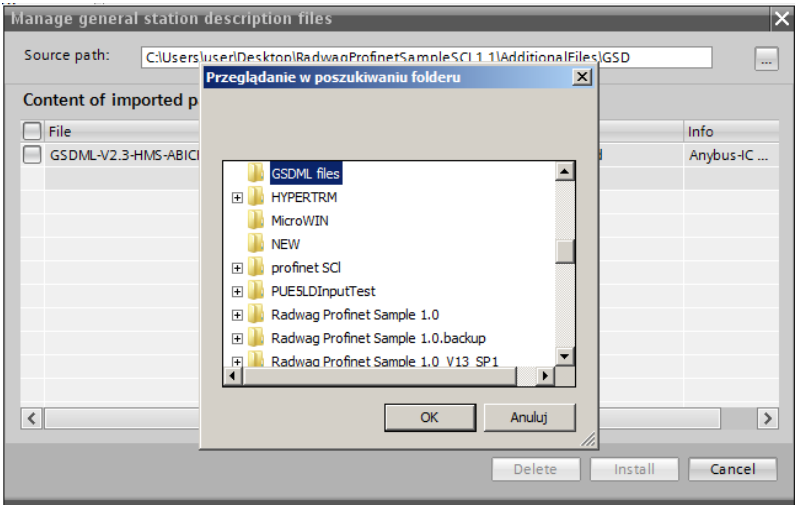
2. CONFIGURATION OF PROFINET MODULE IN TIA PORTAL V14

Operating the environment has to be preceded with creating a new project in which the topology of the PROFINET network with MASTER PLC is determined (in this example: SIEMENS S7-1200).

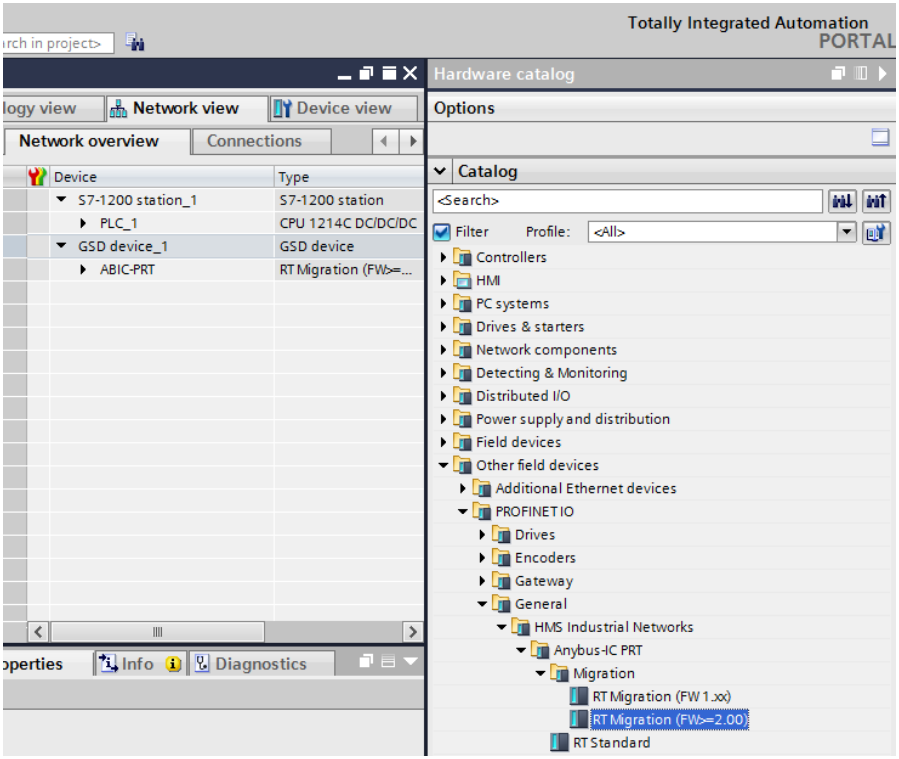


2.1. GSD Import

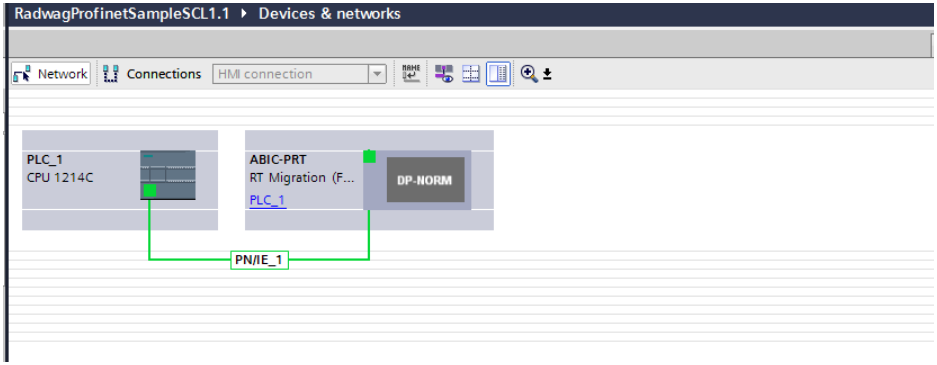
Using the included GSD configuration file add new device to the environment. Use OPTIONS tab first, MANAGE GENERAL STATION DESCRIPTION FILES (GSD) next and indicate the path to GSD file.



Upon successful adding of the file using list of devices, find ABIC-PRT module:

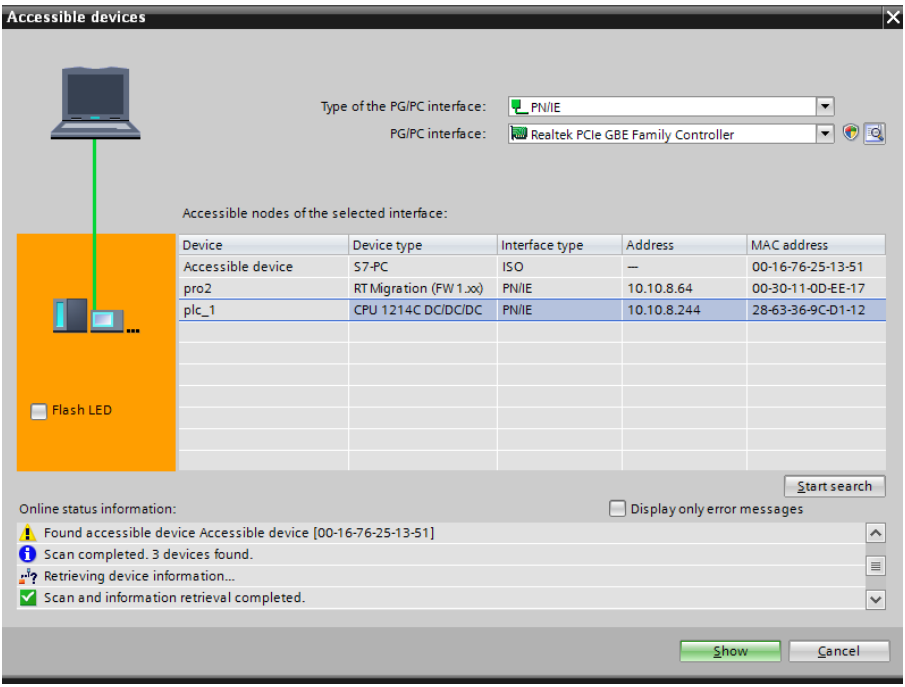


You can now create a network consisting of one MASTER PLC and added SLAVE module:

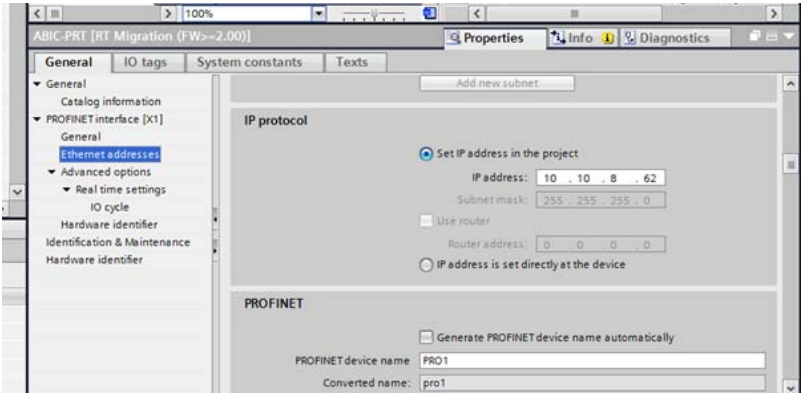


2.2. Module Configuration

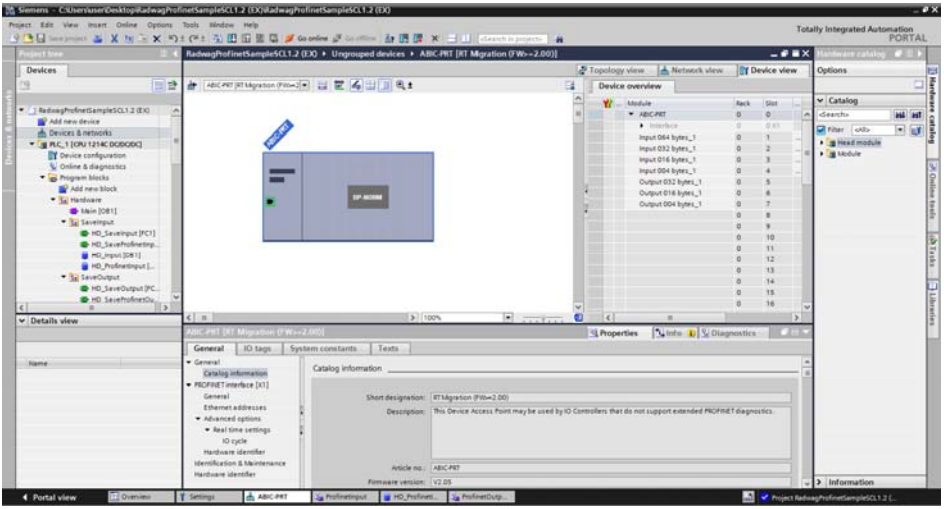
At this stage, create a network consisting of MASTER device and SLAVE device (weighing instrument). Upon connecting the power supply, search for device using ACCESSIBLE DEVICES function. The list should contain MASTER and SLAVE devices:

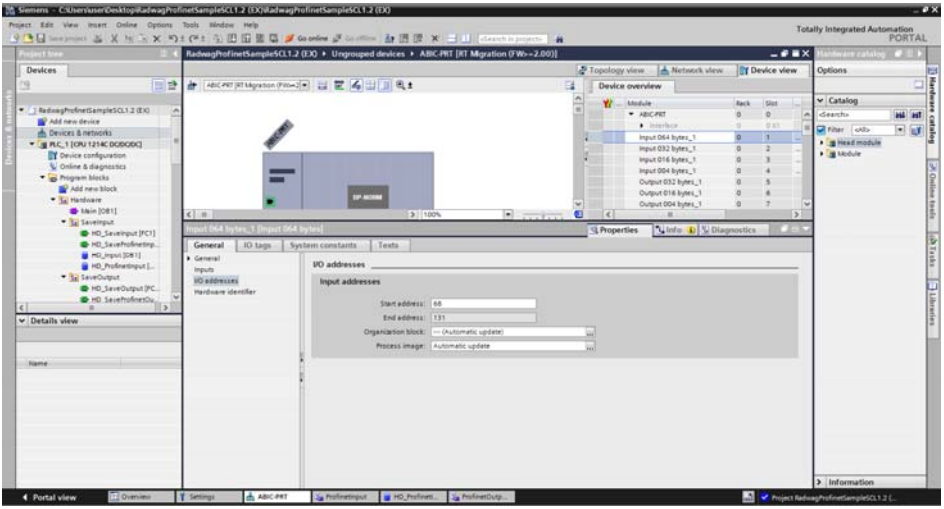


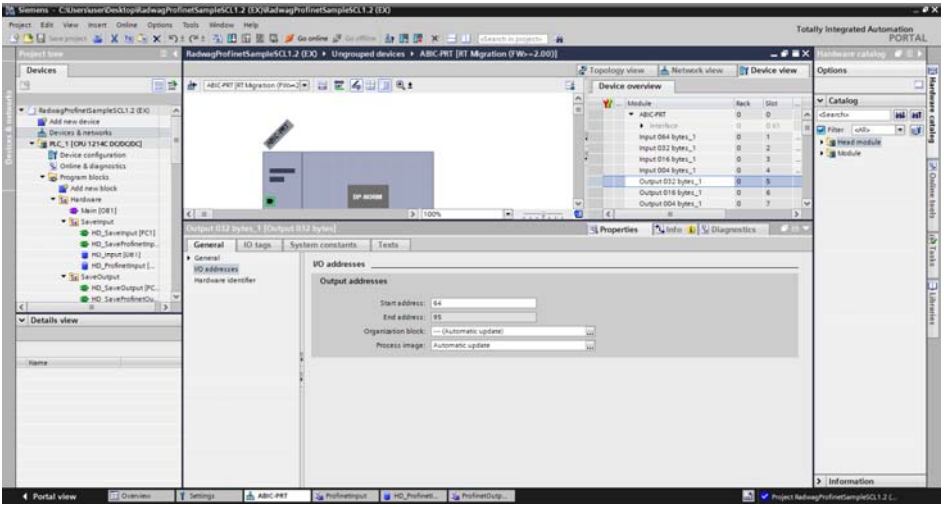
Next, specify the IP address of the module and its name in PROFINET network. Upon selecting the module in PROPERTIES tab, find PROFINET INTERFACE and enter IP address and name. Those settings have to be the same as the ones set in the weighing instrument menu. IP SLAVE address has to be part of the same subnet as the MASTER address.



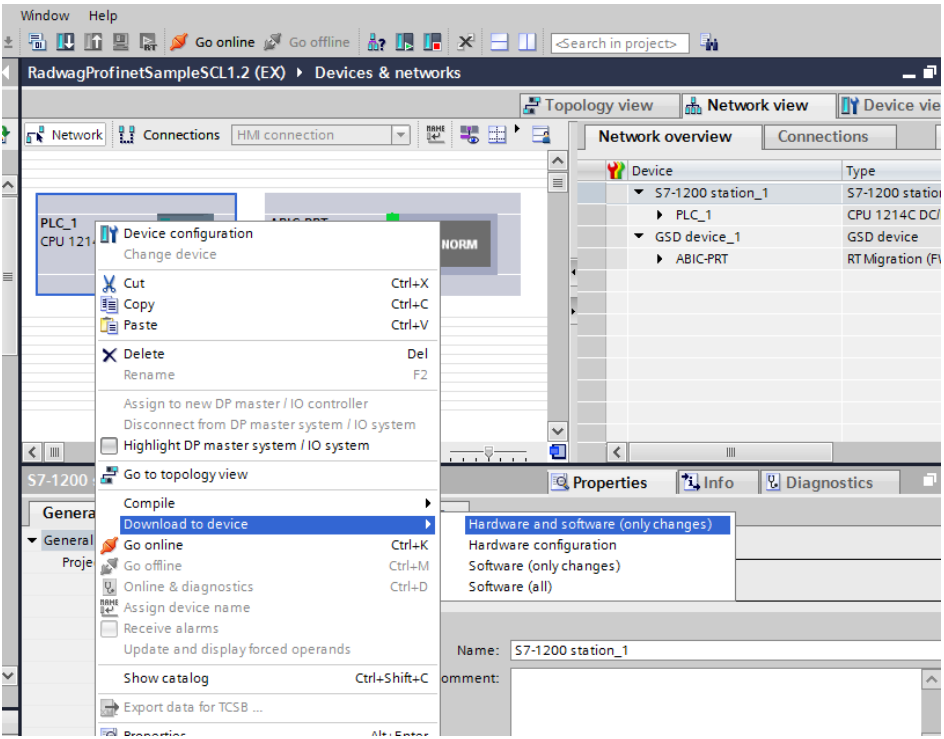
Proceed to module configuration. Start by determining the size and the starting address of input and output registers. To do this, select modules from the list of INPUT and OUTPUT modules as in the picture below. The maximum size of the input and output data is 116 bytes each. Default starting addresses were used in the project - 68 for INPUT module and 64 for OUTPUT module:



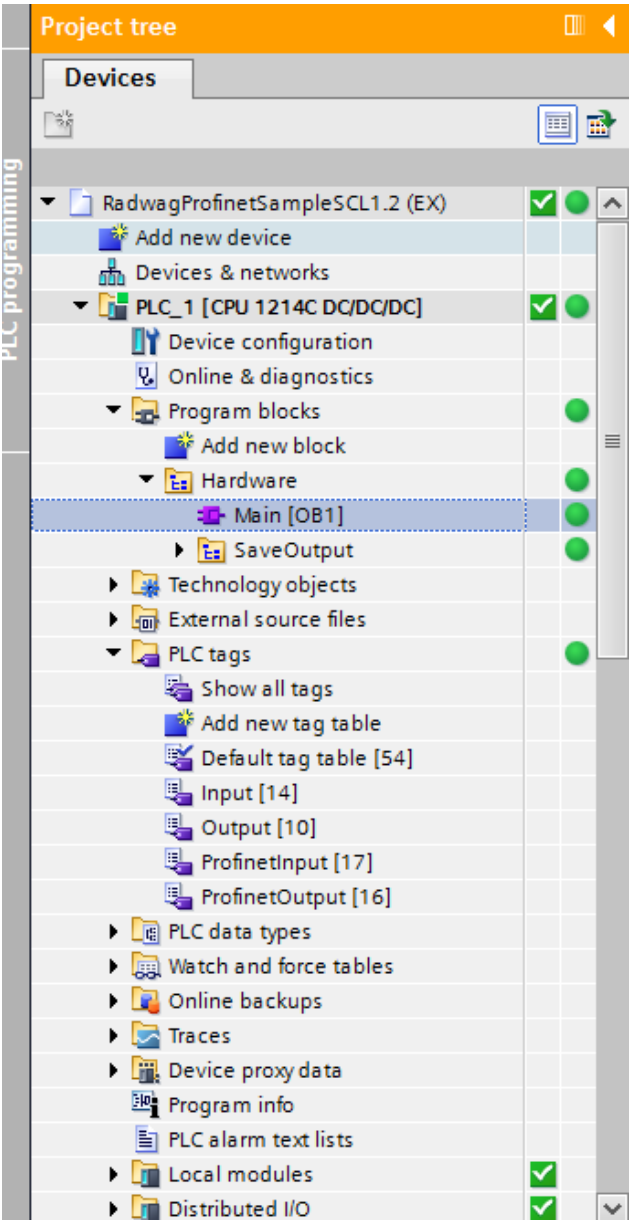

Totally Integrated Automation
PORTAL
RadwagProfinetSampleSCL1.2 (EX) ▸ Ungrouped devices ▸ ABIC-PRT [RT Migration (FW>=2.00)]
Devices
Topology view
Network view
Device view
Device overview
Options
Catalog
Properties
Info
Diagnostics
General
IO tags
System constants
Texts
I/O addresses
Input addresses
Start address: 68
End address: 131
Organization block: (Automatic update)
Process image: Automatic update
Details view
Information
Portal view
Overview


Totally Integrated Automation
PORTAL
RadwagProfinetSampleSCL1.2 (EX) ▸ Ungrouped devices ▸ ABIC-PRT [RT Migration (FW>=2.00)]
Devices
Topology view
Network view
Device view
Device overview
Options
Catalog
Properties
Info
Diagnostics
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
Details view
Information
Portal view
Overview

On this stage you can download hardware and software configuration to the device and download data to the device.



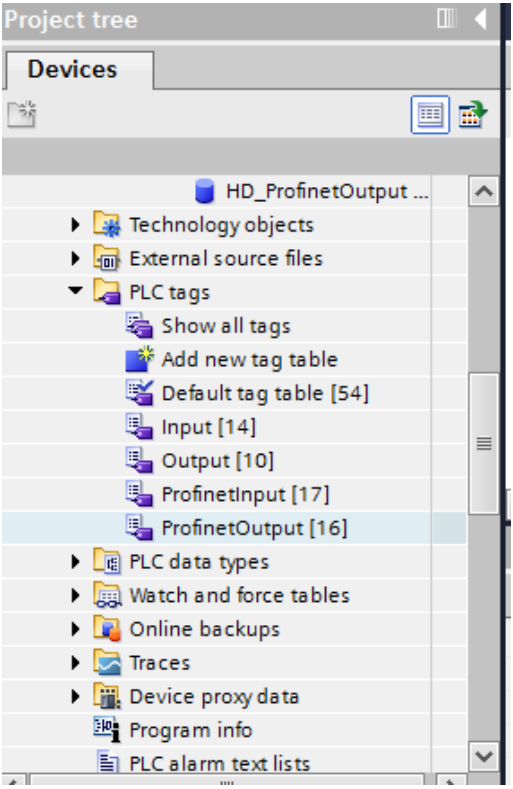
Upon successful compilation and loading of the code, MASTER and SLAVE modules should establish communication. You can check this by pressing GO ONLINE field. The result has to be similar to the result presented below.



The next step will be to create program code.

3. PLC SOFTWARE SAMPLE

Start creating the application by determining symbolic names of input and output registers. For this purpose, use the branch of the project tree: PLC TAGS. For the purpose of this example, the figure below contains exemplary tags tables:



INPUT and OUTPUT tables refer to the physical inputs/outputs of the MASTER device and are not relevant in terms of this application. The PROFINET module input and output registers are specified in ProfinetInput and ProfinetOutput tables.

The pictures below present determined symbolic names and addresses:

RadwagProfinetSampleSCL1.2 ang(EX) ▸ PLC_1 [CPU 1214C DC/DC/DC] ▸ PLC tags ▸ ProfinetInput [17]

ProfinetInput

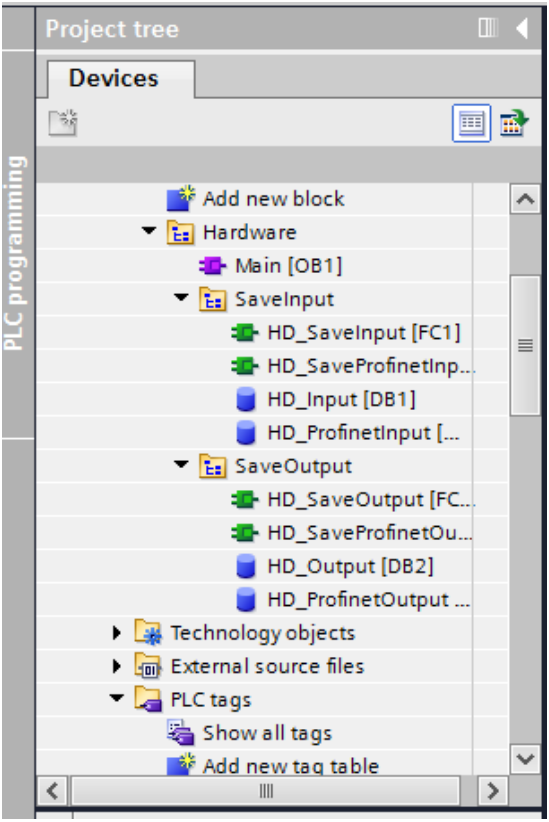
	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Comment
1	mass	Real	%ID68		☑	☑	☑	
2	tare	Real	%ID72		☑	☑	☑	
3	unit	Word	%IW76		☑	☑	☑	
4	status	Word	%IW78		☑	☑	☑	
5	LO	Real	%ID80		☑	☑	☑	
6	process status	Word	%IW84		☑	☑	☑	
7	inputs	Word	%IW134		☑	☑	☑	
8	min	Real	%ID136		☑	☑	☑	
9	max	Real	%ID140		☑	☑	☑	
10	lot number	DWord	%ID152		☑	☑	☑	
11	operator	Word	%IW156		☑	☑	☑	
12	article	Word	%IW158		☑	☑	☑	
13	customer	Word	%IW160		☑	☑	☑	
14	packaging	Word	%IW162		☑	☑	☑	
15	source warehuse	Word	%IW164		☑	☑	☑	
16	target warehouse	Word	%IW166		☑	☑	☑	
17	formulation/dosing process	Word	%IW168		☑	☑	☑	
18	<Add new>				☑	☑	☑	

RadwagProfinetSampleSCL1.2 ang(EX) ▸ PLC_1 [CPU 1214C DC/DC/DC] ▸ PLC tags ▸ ProfinetOutput [16]

ProfinetOutput

	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Comment
1	cammand	Word	%QW64		☑	☑	☑	
2	complex command	Word	%QW66		☑	☑	☑	
3	platform	Word	%QW68		☑	☑	☑	
4	set tare	Real	%QD70		☑	☑	☑	
5	set lo	Real	%QD74		☑	☑	☑	
6	outputs	Word	%QW78		☑	☑	☑	
7	set min	Real	%QD80		☑	☑	☑	
8	set max	Real	%QD84		☑	☑	☑	
9	set lot	DWord	%QD96		☑	☑	☑	
10	set operator	Word	%QW100		☑	☑	☑	
11	set article	Word	%QW102		☑	☑	☑	
12	set customer	Word	%QW104		☑	☑	☑	
13	set source warehouse	Word	%QW108		☑	☑	☑	
14	set target warehouse	Word	%QW110		☑	☑	☑	
15	set formulation/dosing	Word	%QW112		☑	☑	☑	
16	set packaging	Word	%QW106		☑	☑	☑	
17	<Add new>				☑	☑	☑	

In order to avoid working directly on module physical inputs/outputs, create data blocks containing the representations of those registers and create function 'rewriting' the values between them. Create HARDWARE group in PROGRAM BLOCKS branch and determine data blocks in the same way as presented below:



HD_OUTPUT and HD_INPUT blocks refer to physical MASTER inputs/outputs and are not relevant in terms of this project. HD_ProfinetOutput and HD_ProfinetInput blocks refer to the PROFINET module input/output registers on a weighing instrument. They look as follows:

RadwagProfinetSampleSCL1.2 ang(EX) ▸ PLC_1 [CPU 1214C DC/DC/DC] ▸ Program blocks ▸ Hardware ▸ SaveInput ▸ HD_ProfinetInput [DB3]

Keep actual values | Snapshot | Copy snapshots to start values | Load start values as actual values

HD_ProfinetInput

	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Comment
1	Static								
2	mass	Real	0.0		☑	☑	☑		
3	tare	Real	0.0		☑	☑	☑		
4	unit	Word	16#0		☑	☑	☑		
5	status	Word	16#0		☑	☑	☑		
6	lo	Real	0.0		☑	☑	☑		
7	process status	Word	16#0		☑	☑	☑		
8	inputs	Word	16#0		☑	☑	☑		
9	min	Real	0.0		☑	☑	☑		
10	max	Real	0.0		☑	☑	☑		
11	lot number	DWord	16#0		☑	☑	☑		
12	operator	Word	16#0		☑	☑	☑		
13	article	Word	16#0		☑	☑	☑		
14	customer	Word	16#0		☑	☑	☑		
15	packaging	Word	16#0		☑	☑	☑		
16	source warehouse	Word	16#0		☑	☑	☑		
17	target warehouse	Word	16#0		☑	☑	☑		
18	formulation/dosing pr...	Word	16#0		☑	☑	☑		

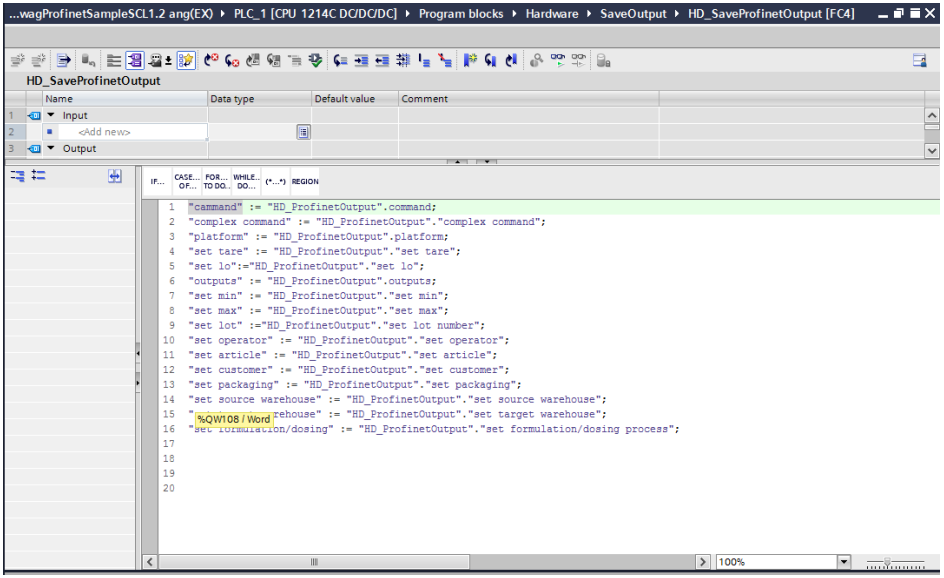
RadwagProfinetSampleSCL1.2 ang(EX) ▸ PLC_1 [CPU 1214C DC/DC/DC] ▸ Program blocks ▸ Hardware ▸ SaveOutput ▸ HD_ProfinetOutput [DB4]

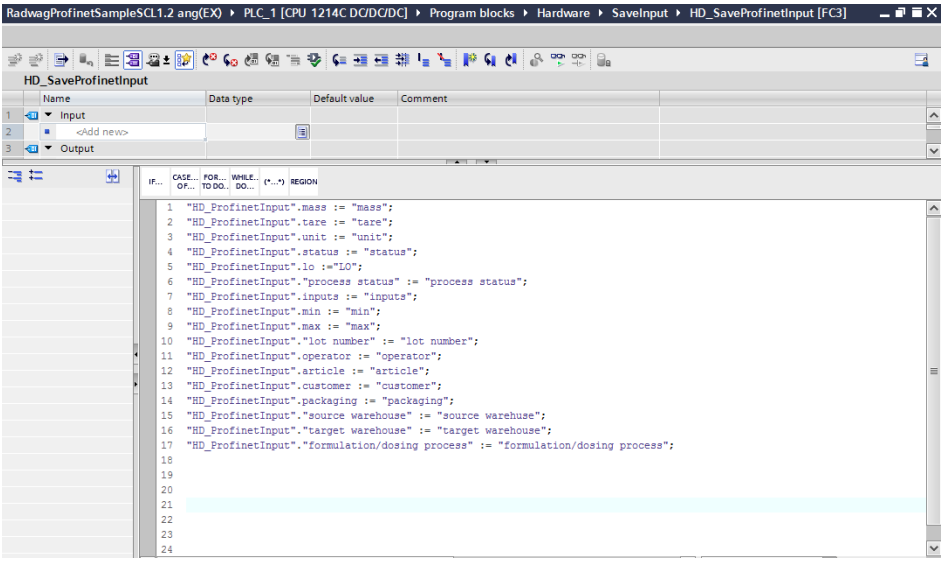
Keep actual values | Snapshot | Copy snapshots to start values | Load start values as actual values

HD_ProfinetOutput

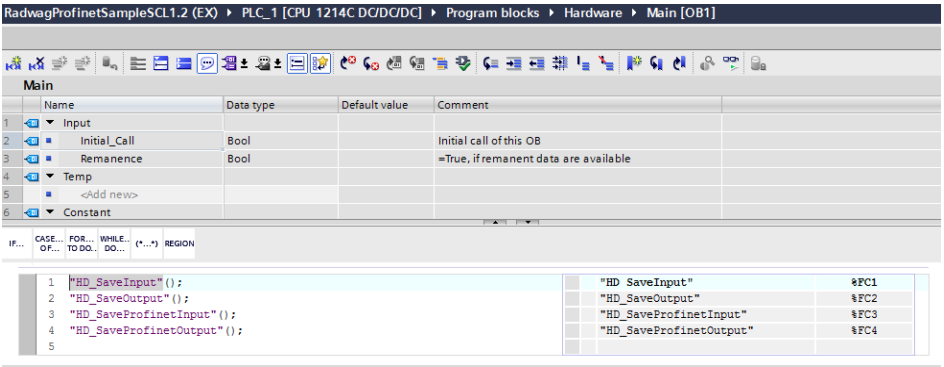
	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Comment
1	Static								
2	command	Word	16#02		☑	☑	☑		
3	complex command	Word	16#0008		☑	☑	☑	☑	
4	platform	Word	16#0001		☑	☑	☑		
5	set tare	Real	2.0		☑	☑	☑		
6	set lo	Real	1.5		☑	☑	☑		
7	outputs	Word	16#0000		☑	☑	☑	☑	
8	set min	Real	2.1		☑	☑	☑		
9	set max	Real	2.2		☑	☑	☑		
10	set lot number	DWord	16#0000		☑	☑	☑		
11	set operator	Word	16#0004		☑	☑	☑		
12	set article	Word	16#0001		☑	☑	☑		
13	set customer	Word	16#01		☑	☑	☑		
14	set packaging	Word	16#0004		☑	☑	☑		
15	set source warehouse	Word	16#0		☑	☑	☑		
16	set target warehouse	Word	16#0		☑	☑	☑		
17	set formulation/dosin...	Word	16#0		☑	☑	☑		

The functions that rewrite values between physical inputs/outputs of the module may look like this:





Invoke the functions in the main program loop.



Upon compiling and loading the program to the device in the data block you can read interesting output registers (MONITOR ALL) and save output registers (e.g. by changing START VALUE and LOAD START VALUES AS ACTUAL) of the SLAVE mode.

RADWAG BALANCES AND SCALES
ADVANCED WEIGHING TECHNOLOGIES