PITreader S with OPC UA and TIA Portal

PILZ
THE SPIRIT OF SAFETY

Product

Type:	Access and Authorization
Name:	PITreader S
Manufacturer:	Pilz GmbH & Co. KG, Safe Automation

Document

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Document Revision History

Release	Date	Changes	Chapter
01	2026-05-28	Creation	all
02	2026-05-28	Correction	all

Validity of Application Note

This present Application Note is valid until a new version of the document is published.
This and other Application Notes can be downloaded in the latest version and for free from www.pilz.com. For a simple search, use our Overview document (1002400) or the Direct search function function in the download area.

The Pilz newsletter is free of charge and keeps you up to date on all the latest issues and trends in safe automation.

Exclusion of Liability

We have taken great care in compiling our application note. It contains information about our company and our products. All statements are made in accordance with the current status of technology and to the best of our knowledge and belief.
While every effort has been made to ensure the information provided is accurate, we cannot accept liability for the accuracy and entirety of the information provided, except in the case of gross negligence. In particular, all information on applicable standards, safety-related classifications and time characteristics should be viewed as provisional. In particular it should be noted that statements do not have the legal quality of assurances or assured properties.
We are grateful for any feedback on the contents.

May 2026

Industrial Security

To secure plants, systems, machines and networks against cyberthreats it is necessary to implement (and continuously maintain) an overall Industrial Security concept that is state of the art.
Perform a risk assessment in accordance with VDI/VDE 2182 or IEC 62443-3-2 and plan the security measures with care. If necessary, seek advice from Pilz Customer Support.

Abbreviations

Abbreviation / term	Description	Source
AN	**A**pplication **N**ote	www.pilz.com > AN content (1002400)
PNOZ	Pilz E-STOP positive-guided (DE: **P**ilz **NO**T-AUS-**Z**wangsgeführt)	www.pilz.com > PNOZ
PSS	Programmable control system (DE: **P**rogrammierbares **S**teuerungs**s**ystem)	www.pilz.com > PSS
PSS u2	**PSS**universal, **2**nd Generation	www.pilz.com > PSS u2
POU	Program organisation unit (EN: **P**rogram **O**rganisation **U**nit)	
N/C	EN: **N**ormally **C**losed	
NO	EN: **N**ormally **O**pen	
OPC UA	**O**pen **P**latform **C**ommunications **U**nified **A**rchitecture	

Definition of symbols

- Information that is particularly important is identified as follows:

CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.

NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken.
It also highlights areas within the text that are of particular importance.

INFORMATION

This gives advice on applications and provides information on special features.

Contents

1 Useful documentation

Reading the documentation listed below is important for understanding these Application Note. The availability of the software used and its safe handling are assumed.

1.1 Documentation from Pilz GmbH & Co. KG

No.	Description	Item No. /Download
1	Pilz international website, download section	www.pilz.com
2	Operating Manual: PITreader	www.pilz.com > 1004806
3	Operating manual PITreader OPC Server UA	www.pilz.com > 1005480
4		

1.2 Documentation from other sources of information

No.	Description	Item No. /Download
1	TIA Help Viewer (integrated online help in the TIA Portal)	
2	S7 user block for the OPC UA Client of a SIMATIC S7-1500	109762770_OPC_UA_PLC-Client_DOC_Vx_en.pdf
3		
4		

2 Used hardware and software

2.1 Pilz products

No.	Description	Order number	Version	Number
1	PITreader S card unit	402321	02.03.01	1
2	PITreader key ye g (Generic transponder key)	402260	-	-
3	PITreader card ye g (Generic transponder card)	402330	-	-
4				

2.2 Third-party products

No.	Description	Order number	Version	Number
1	Siemens S7-1500 CPU 1517TF-3 PN/DP	6ES7 517-3UP00-0AB0	3.1.5	1
2	TIA Portal	-	V21	-
3				
4				

2.3 Structure of the application (schematic)

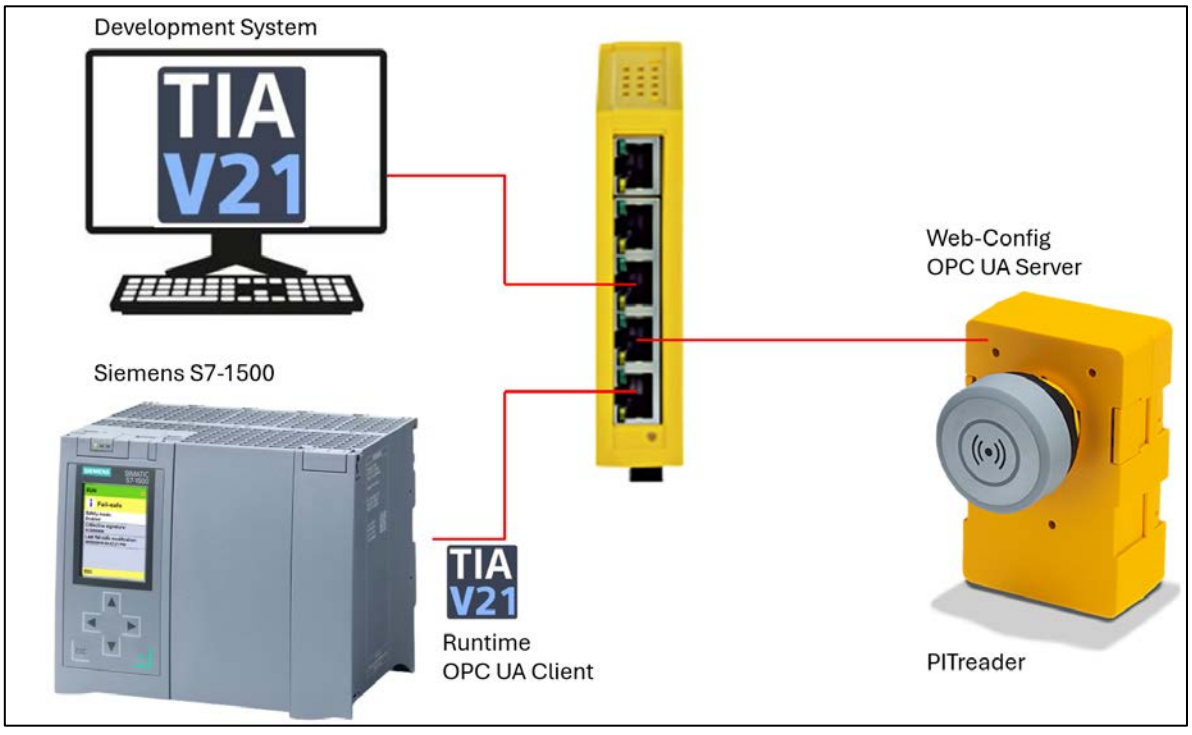


Figure 1: Application – Structure of the hardware (schematic)

3 Preface

This Application Note uses the TIA Portal V21 development environment to describe the commissioning of the PITreader via an OPC UA connection. Communication via OPC UA is based on a Client-Server model. This means that data is always exchanged between OPC UA-enabled OPC Servers and OPC Clients.

The basic step-by-step procedure for a successful basic configuration is shown here, mostly in pictures.

NOTICE

This document only describes the procedure for using the PITreader with item number 402321 and does not represent technical documentation for general use of the software "TIA Portal V21" and other functions from Siemens.

4 TIA Portal and required functions

4.1 Basic information

The TIA Portal from Siemens is an integrated engineering platform for the development, configuration and commissioning of industrial automation systems. By combining control, visualisation and drive technology in a uniform software environment, the TIA Portal enables consistent, efficient and error-reduced engineering. Integrated diagnostic and simulation tools also support virtual commissioning and increase transparency over the entire lifecycle of the plant.

CAUTION!

The TIA Portal V20 cannot be used for OPC UA connection to a PITreader. Errors occur in TIA Portal V20 when encrypting and decrypting OPC device certificates.

4.2 TIA Portal OPC UA Client

The integrated OPC UA Client interface enables automation devices to retrieve standardised, manufacturer-independent data from external servers via the OPC UA protocol and integrate it into control programs. It supports safe, semantically structured communication and allows access to variables, methods and information models from other systems.

5 PITreader

The term "PITreader" includes all RFID authentication systems from PILZ GmbH & Co. KG on which authentication is via a transponder.
The following can be used as transponders, for example:
- Keys
- Cards
- Stickers

The PITreader OPC UA Server is designed for data exchange between a PITreader and an OPC UA Client. This may be visualisation or configuration data, for example. A maximum of one Client connection at a time can be established to a PITreader's OPC UA Server. The OPC UA Client may be the OPC UA Client of the visualisation system PASvisu, for example, or an OPC UA-enabled Client from a third-party manufacturer.

5.1 Changing the configuration of the PITreader OPC UA Server

Configuration changes for the PITreader OPC UA Server can be made in the PITreader's web application. The PITreader must be restarted after each configuration change for the changes to take effect.
The configuration of the PITreader OPC UA Server can be saved and restored as part of the device configuration in the PITreader's web application.

5.2 Activating the OPC UA Server

The PITreader OPC UA Server is deactivated in its default setting or following a factory reset. The OPC UA Server can be activated in the PITreader's web application. Both a Server and a Client certificate are required to activate the OPC UA Server.

▶ To access the PITreader, the PC's IP address must be in the same subnet as the IP address of the PITreader.
Default setting PITreader:
IP address: 192.168.0.12
Subnet mask: 255.255.255.0
Default credentials:
User name: admin
Password: Serial number of the PITreader (on the bottom of the device).

INFORMATION

When the network settings have been changed, the PITreader restarts and is then accessible under the new IP address.

5.2.1 Procedure

1. Start the web browser and enter the IP address of the PITreader.
2. Login and change the default password in order to make changes to the PITreader configuration.
3. In the web application, switch to "*Configuration -> OPC UA Server*".
4. Server certificate
Preferably, you can generate a new Server certificate via the *"Generate new certificate"* button. Or, on the configuration PC, you can use the *"Browse"* button to select the file containing your own Server certificate and click on *"Upload"*.

Requirements of the Server certificate:
See illustration below.

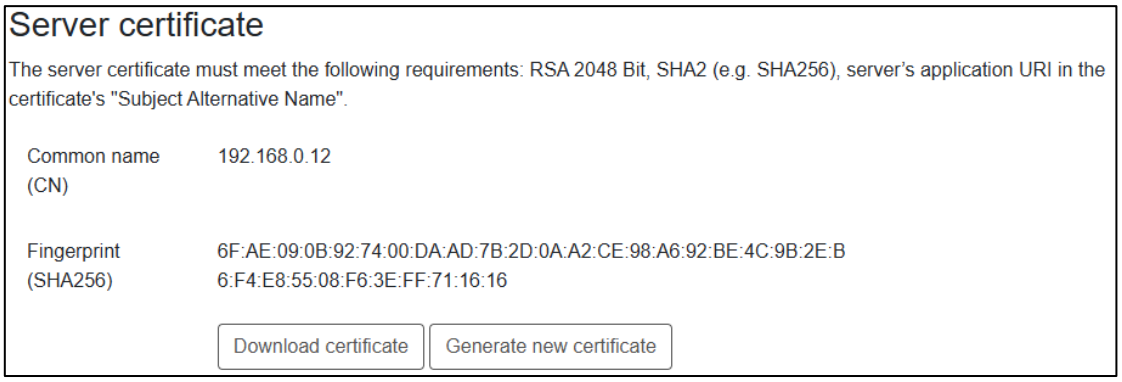


Figure 2: PITreader OPC UA new Server certificate

5. Client certificate:
   On the configuration PC, use the *"Browse"* button to select the file containing the Client certificate and click on *"Upload"*.

   The client certificate must meet the following requirements:
   See illustration below

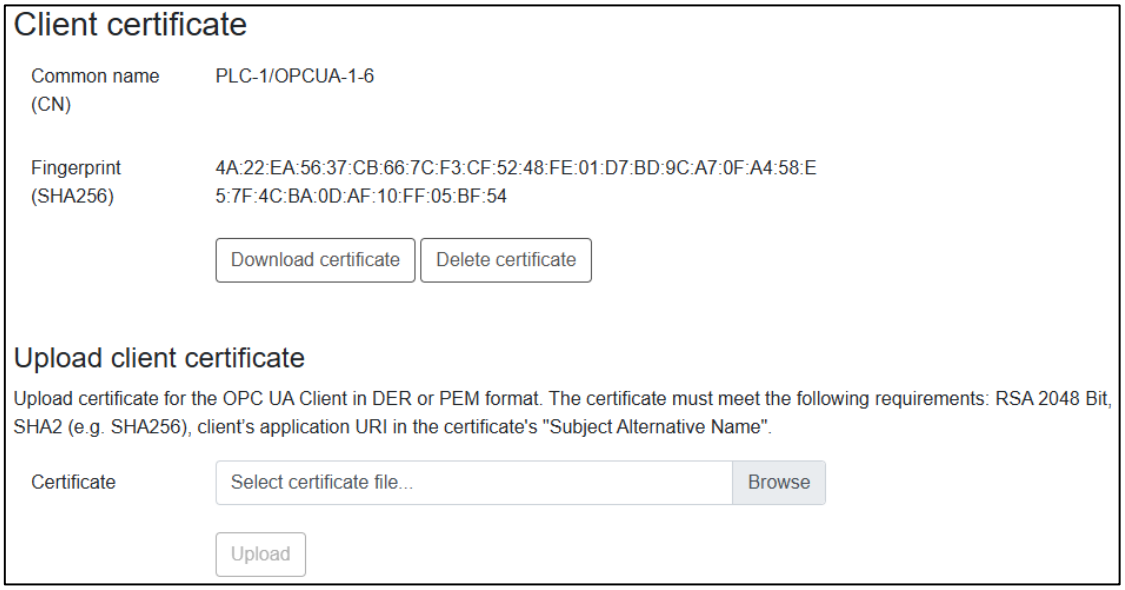


Figure 3: PITreader Uploading the OPC UA Client certificate

6. Activate the PITreader OPC UA Server by first selecting *"Activated"* and then clicking on *"Save"* (Figure 4 red square).

INFORMATION

The PITreader OPC UA Server
can only be activated if a Server certificate has been generated or uploaded, the Client certificate has been uploaded and the certificates have been accepted.

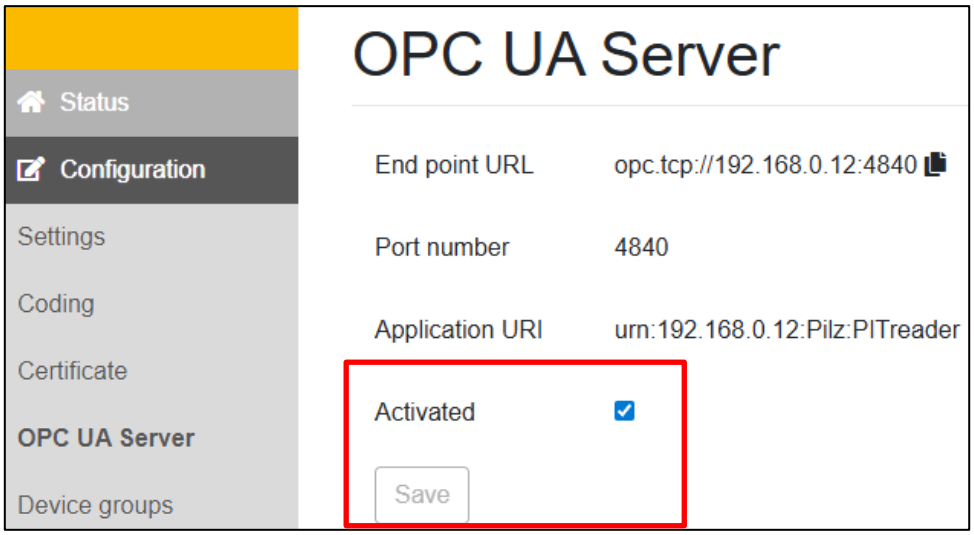


Figure 4: Activating the OPC UA Server

6 Establish connection

6.1 Activate OPC UA Client

In order to use the Siemens S7-1500 as an OPC UA Client, it must be activated. To do this, proceed as follows:

1. Open the TIA Portal and the project in which the OPC UA Client is to be configured.
2. Add your controller in the *"Device configuration"* tab.
3. In the device configuration, click on your configured controller (Figure 5 red square).
4. Then click on the *"Properties"* tab (Figure 5 yellow square).
5. Navigate to *General -> OPC UA -> Client -> General*.
6. Activate the OPC UA Client by selecting *"Activate OPC UA Client"* (Figure 5 blue square).

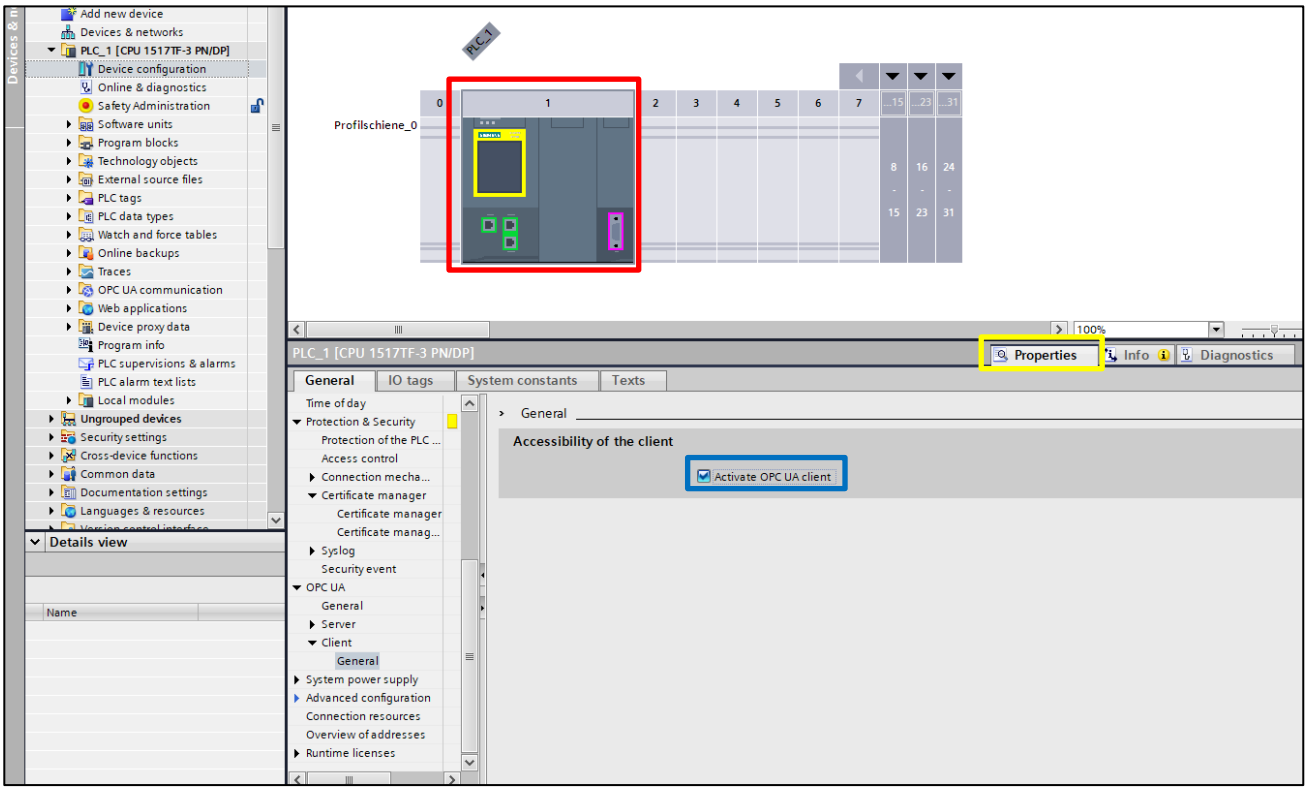


Figure 5: Activating the OPC UA Client

6.2 Protect project

In order to gain access to security functions such as the certificate manager in the TIA Portal, the project must be protected. To do this, proceed as follows:

1. In the project navigation, navigate *to Devices -> Security settings -> Settings* (Figure 6 red square).
2. In the window that opens, click on *"Project protection"* (Figure 6 yellow square).
3. Click on *"Protect this project"* (Figure 6 blue square).

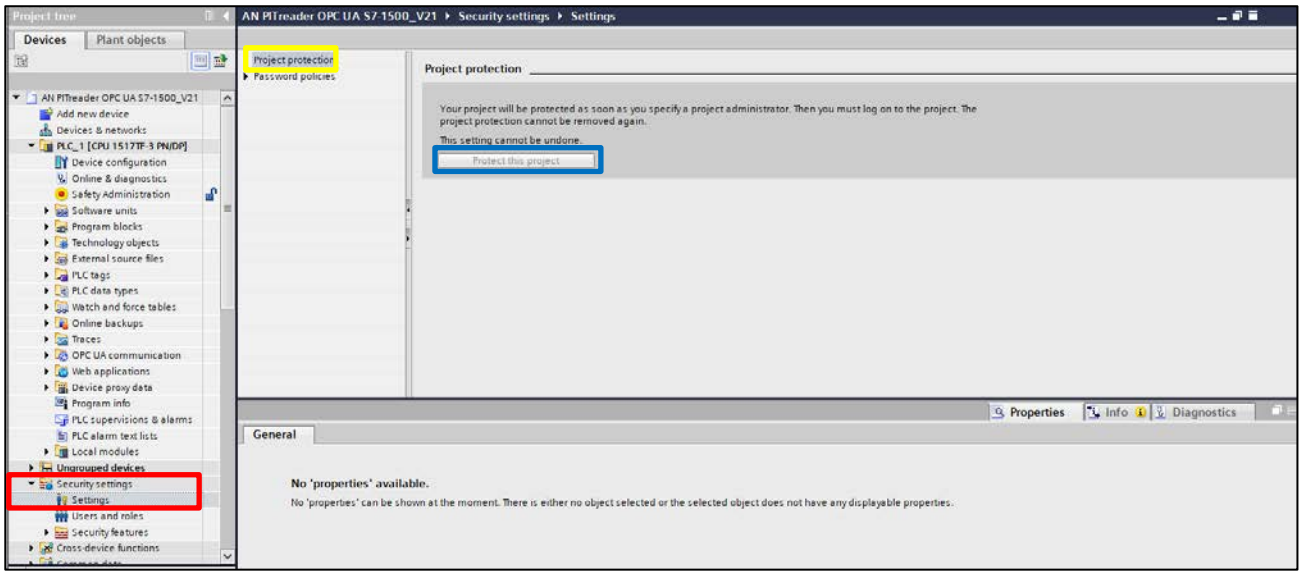


Figure 6: Protect project in the TIA Portal

4. In the window that now opens, enter a user name and password and, if desired, a comment.
5. Confirm by clicking *"OK"*.

6.3 Select licence

In order to use the functionality of the integrated OPC UA Client, the corresponding licence must be activated in the TIA Portal. Proceed as follows:

1. In the device configuration, click on your configured controller (Figure 7 red square).
2. Then click on the *"Properties"* tab (Figure 7 yellow square).
3. Navigate to *General -> Runtime licences -> OPC UA*.
4. Activate the required licence by selecting the licence displayed under *"Type of licence required"* in the *"Type of licence purchased"* drop-down list (Figure 7 blue square).

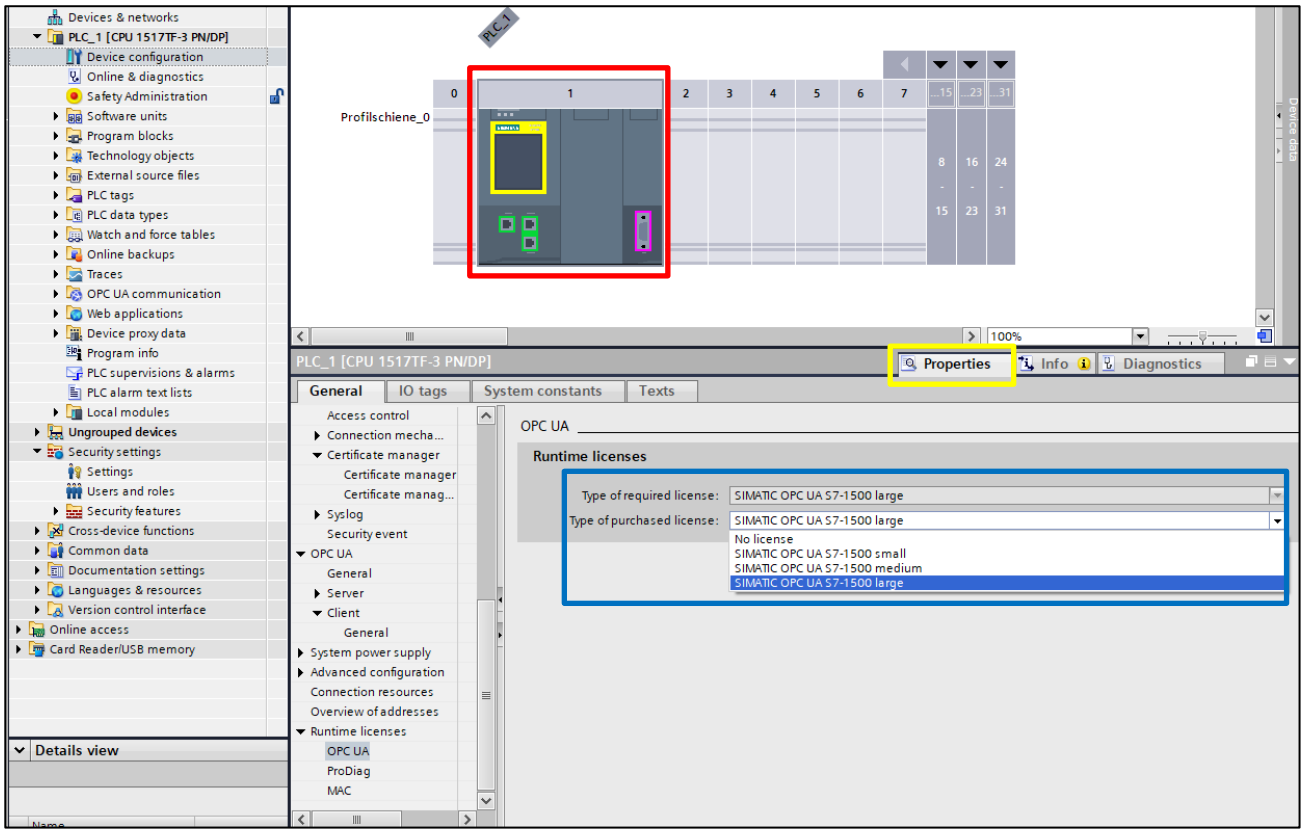


Figure 7: Activating licences in the TIA Portal

6.4 OPC UA Client certificate

In order to establish an OPC UA connection with the PITreader, the PITreader requires the Client certificate of the Siemens S7-1500. Proceed as follows:

1. In the device configuration, click on your configured controller (Figure 8 red square).
2. Then click on the *"Properties"* tab (Figure 8 yellow square).
3. Navigate to *General -> Protection & security -> Certificate manager -> Certificate management with TIA Portal*.
4. Activate *"Use global security settings for the certificate manager"* (Figure 8 blue square).
5. Click on *"<Add new>"* (Figure 8 green square).

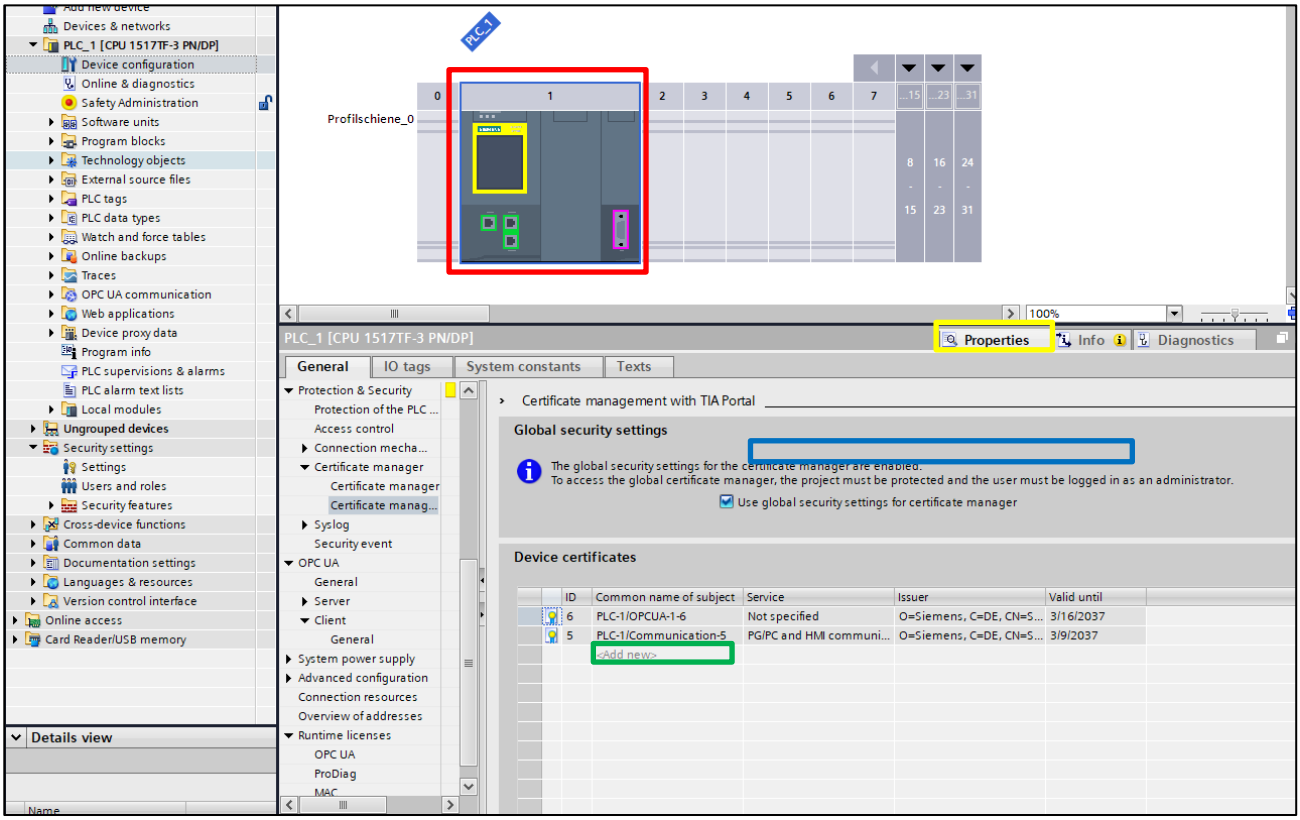


Figure 8: Create OPC UA Client certificate (1)

6. In the window that now opens, click on *"Create"* (Figure 9 red square).

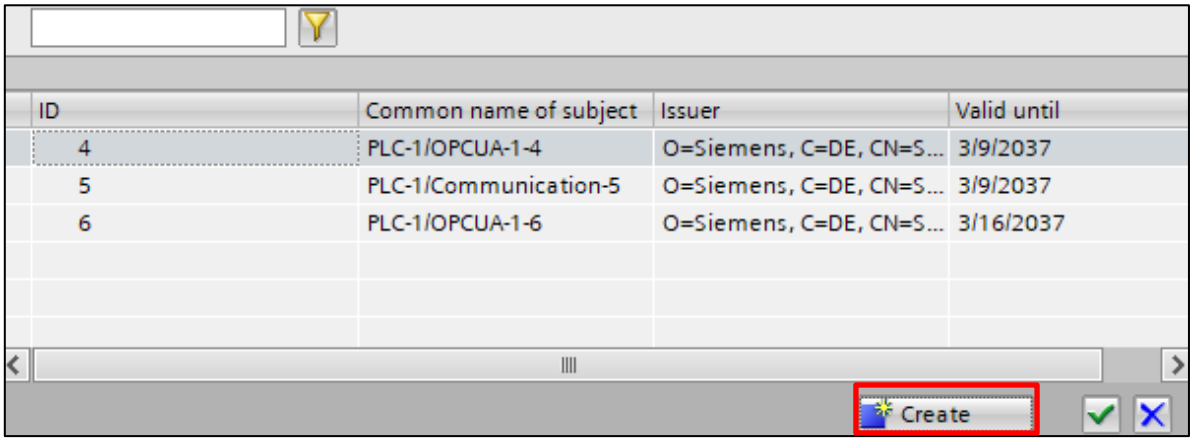


Figure 9: Create OPC UA Client certificate (2)

7. Set the parameters for the relevant OPC UA Client certificate in accordance with the parameters in Figure 10. If necessary, adjust the IP addresses (red square) and then confirm with *"OK"* (yellow square).

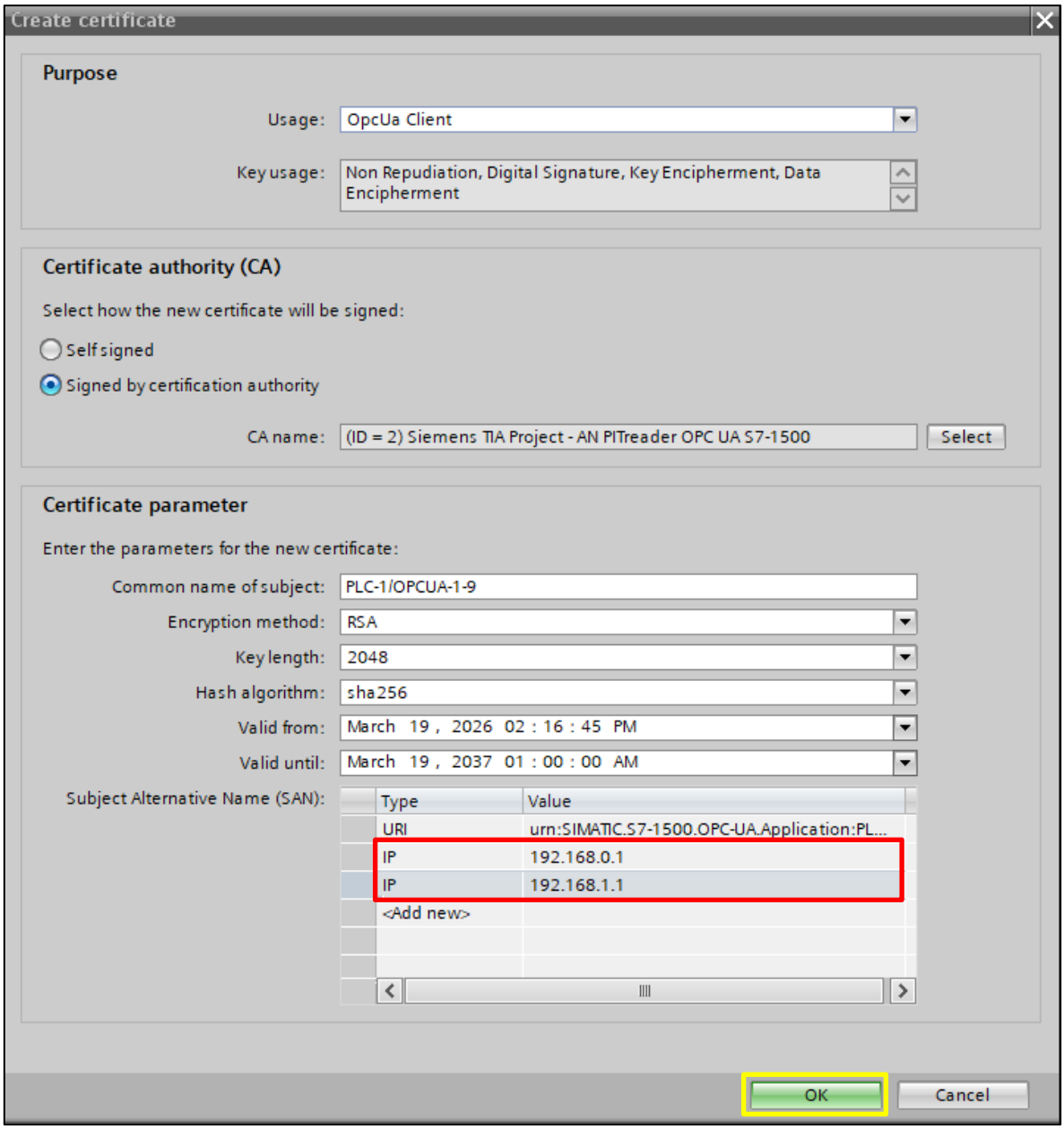


Figure 10: Create OPC UA Client certificate (3)

8. The newly created certificate is now added to the list of device certificates
9. Right-click on the created certificate and press *"Export certificate"* (Figure 11 red square) and save the certificate file.

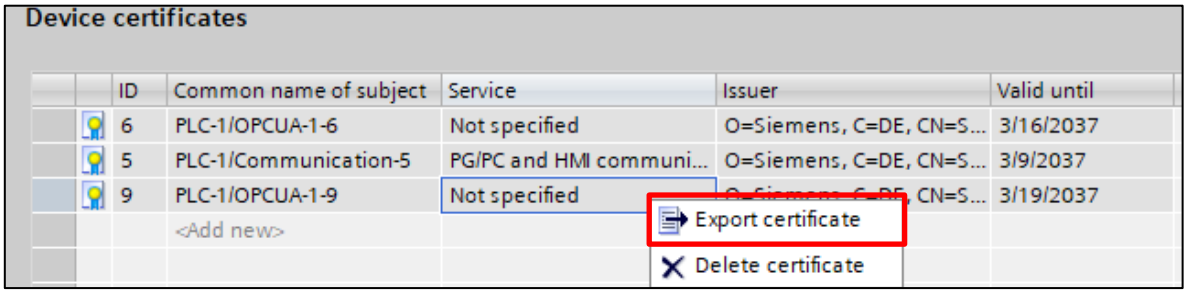


Figure 11: Export OPC UA Client certificate

10. Upload the Client certificate in the web application of the PITreader, in accordance with Chapter 5.2 Activating the OPC UA Server.

6.5 Create and configure OPC UA Client interface

The next step is to create a new OPC UA Client interface. Follow the instructions below:

1. In the project navigation, navigate to *Devices -> OPC UA communication -> Client interfaces* and double-click on *"Add new Client interface"* (Figure 12 red square).
2. Open the newly created Client interface and click on the *"Properties"* tab (Figure 12 yellow square).
3. Navigate to *Configuration -> Connection parameters* (Figure 12 blue square).
4. Enter the IP address and port number of the OPC UA Server (Figure 12 green square). These can be found in the PITreader's web application (Figure 4).

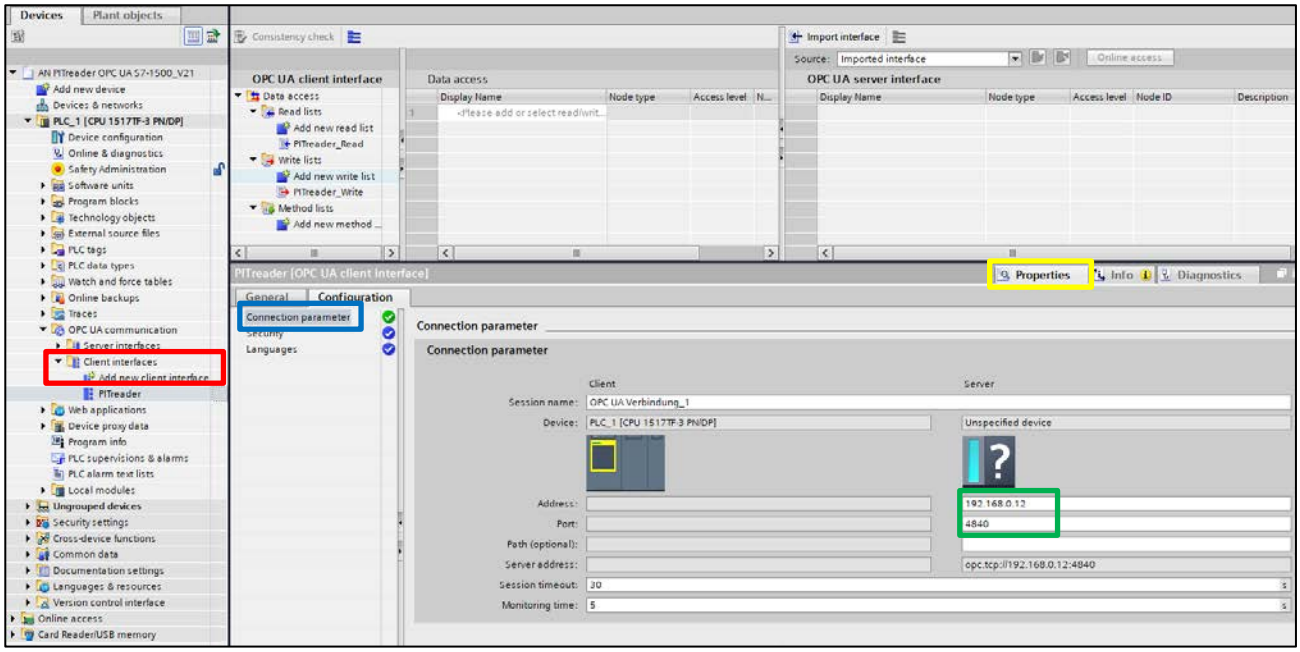


Figure 12: Create and configure OPC UA Client interface (1)

5. Navigate to *Configuration -> Security* (Figure 13 red square).
6. Select the parameters as shown in the illustration (Figure 13 yellow square). Under *"Client certificate"*, select the certificate generated in Chapter 6.4 OPC UA Client certificate.

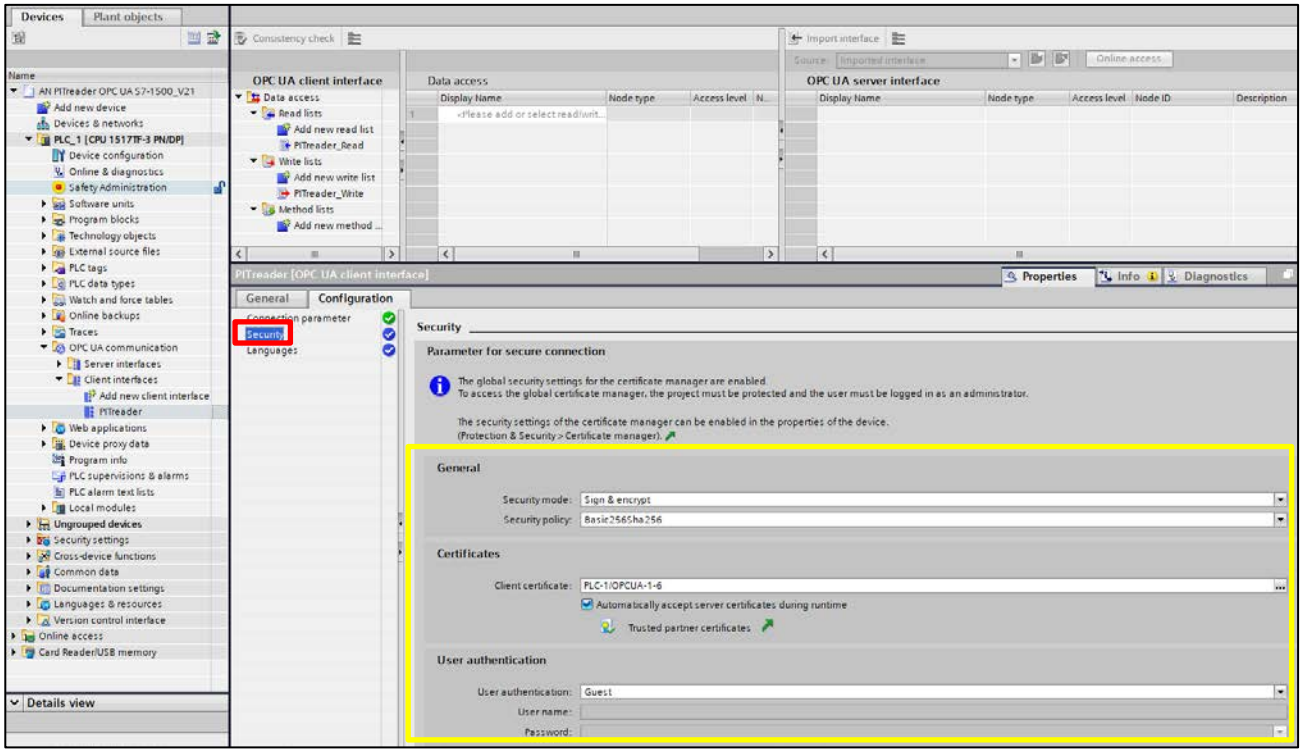


Figure 13: Create and configure OPC UA Client interface (2)

6.6 Import OPC UA Server interface

In order to import the OPC UA Server interface, you can connect online to the PITreader. Follow the instructions below:

1. Under *"Source", s*elect *"Online[]"* (Figure 14 red square).
2. Click on *"Online access"* (Figure 14 yellow square).

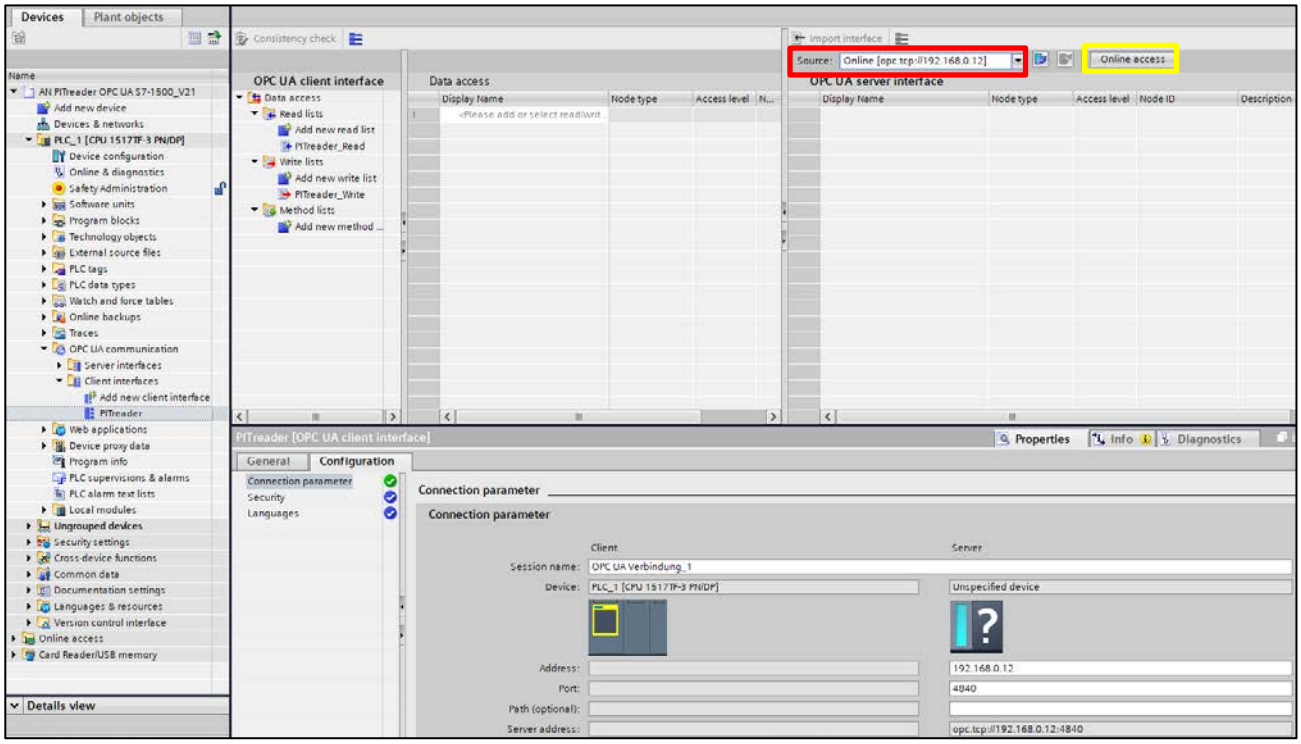


Figure 14: Import OPC UA Server interface

3. In the window that opens, enter the OPC Server address *"opc.tcp:///[IP address of the PITreader]"* under *"OPC UA Server address"* (Figure 15 red square).
4. Click on *"Find selected Server"* (Figure 15 yellow square).
5. Once the OPC UA Server has been found, select the remaining settings as shown in the illustration (Figure 15 blue square). Under *"Certificate (Client)"*, select the certificate generated in Chapter 6.4 OPC UA Client certificate.
6. Click on *"Connect"* (Figure 15 green square).

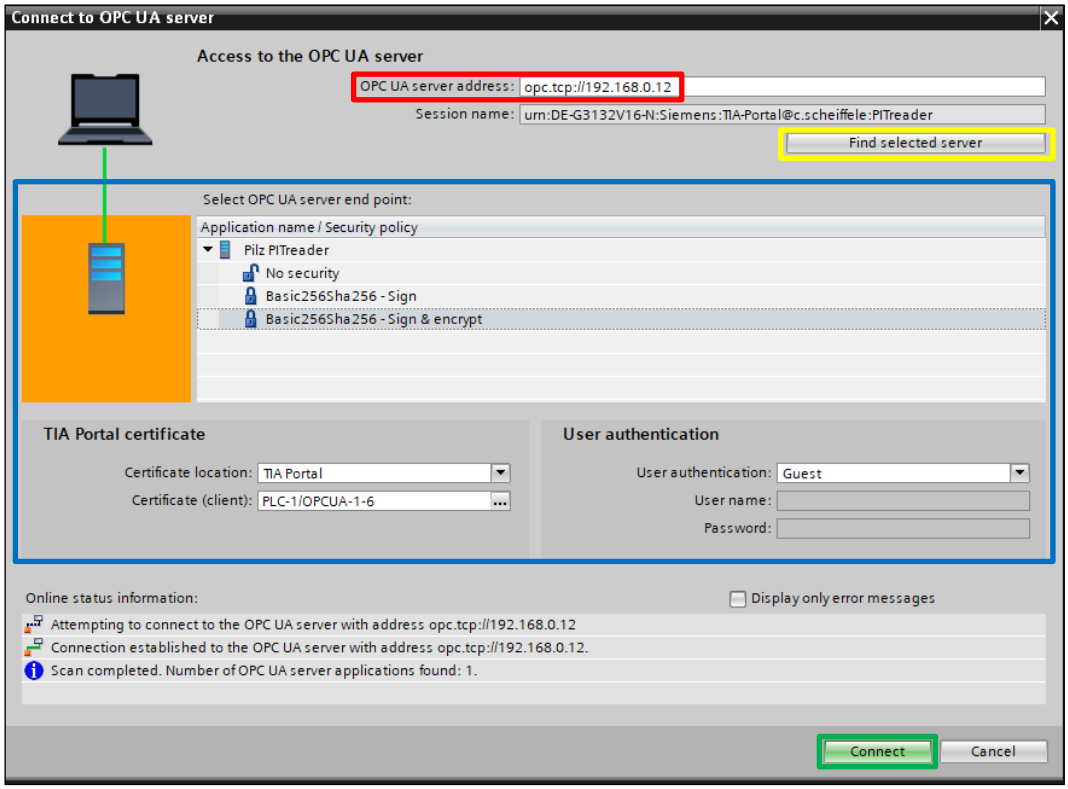
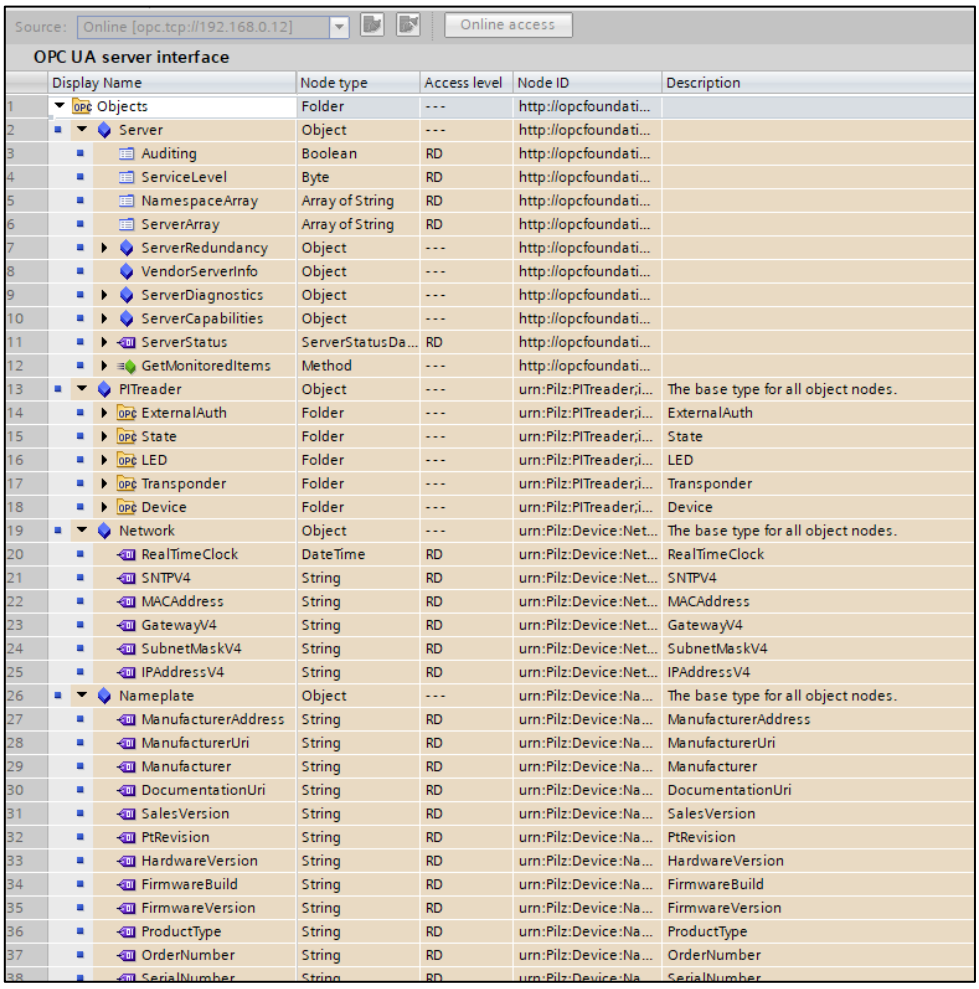


Figure 15: Connection to the OPC UA Server

7. In the window that opens, click on *"Yes"* to trust the PITreader's certificate (Figure 16 red square).

Figure 16: Certificate of the PITreader

8. Once the PITreader certificate has been accepted and a connection has been successfully established, all variables available from the PITreader will be displayed in the OPC UA Server interface (Figure 17).



	Display Name	Node type	Access level	Node ID	Description
1	Objects	Folder	---	http://opcfoundati...	
2	Server	Object	---	http://opcfoundati...	
3	Auditing	Boolean	RD	http://opcfoundati...	
4	ServiceLevel	Byte	RD	http://opcfoundati...	
5	NamespaceArray	Array of String	RD	http://opcfoundati...	
6	ServerArray	Array of String	RD	http://opcfoundati...	
7	ServerRedundancy	Object	---	http://opcfoundati...	
8	VendorServerInfo	Object	---	http://opcfoundati...	
9	ServerDiagnostics	Object	---	http://opcfoundati...	
10	ServerCapabilities	Object	---	http://opcfoundati...	
11	ServerStatus	ServerStatusDa...	RD	http://opcfoundati...	
12	GetMonitoredItems	Method	---	http://opcfoundati...	
13	PITreader	Object	---	urn:Pilz:PITreader;i...	The base type for all object nodes.
14	ExternalAuth	Folder	---	urn:Pilz:PITreader;i...	ExternalAuth
15	State	Folder	---	urn:Pilz:PITreader;i...	State
16	LED	Folder	---	urn:Pilz:PITreader;i...	LED
17	Transponder	Folder	---	urn:Pilz:PITreader;i...	Transponder
18	Device	Folder	---	urn:Pilz:PITreader;i...	Device
19	Network	Object	---	urn:Pilz:Device:Net...	The base type for all object nodes.
20	RealTimeClock	DateTime	RD	urn:Pilz:Device:Net...	RealTimeClock
21	SNTPV4	String	RD	urn:Pilz:Device:Net...	SNTPV4
22	MACAddress	String	RD	urn:Pilz:Device:Net...	MACAddress
23	GatewayV4	String	RD	urn:Pilz:Device:Net...	GatewayV4
24	SubnetMaskV4	String	RD	urn:Pilz:Device:Net...	SubnetMaskV4
25	IPAddressV4	String	RD	urn:Pilz:Device:Net...	IPAddressV4
26	Nameplate	Object	---	urn:Pilz:Device:Na...	The base type for all object nodes.
27	ManufacturerAddress	String	RD	urn:Pilz:Device:Na...	ManufacturerAddress
28	ManufacturerUri	String	RD	urn:Pilz:Device:Na...	ManufacturerUri
29	Manufacturer	String	RD	urn:Pilz:Device:Na...	Manufacturer
30	DocumentationUri	String	RD	urn:Pilz:Device:Na...	DocumentationUri
31	SalesVersion	String	RD	urn:Pilz:Device:Na...	SalesVersion
32	PtRevision	String	RD	urn:Pilz:Device:Na...	PtRevision
33	HardwareVersion	String	RD	urn:Pilz:Device:Na...	HardwareVersion
34	FirmwareBuild	String	RD	urn:Pilz:Device:Na...	FirmwareBuild
35	FirmwareVersion	String	RD	urn:Pilz:Device:Na...	FirmwareVersion
36	ProductType	String	RD	urn:Pilz:Device:Na...	ProductType
37	OrderNumber	String	RD	urn:Pilz:Device:Na...	OrderNumber
38	SerialNumber	String	RD	urn:Pilz:Device:Na...	SerialNumber

Figure 17: Available variables on the PITreader

6.7 Assignment of the available variables

In order to read or write the available variables, they must be made available in the TIA Portal. Proceed as follows:

1. Create a new read list and a new write list in the TIA Portal by double-clicking on *"Add new read list"* and *"Add new write list"* (Figure 18 red square).
2. Variables with read access can be added to the read list you created. Variables with read and write access can be added to both the read and write list (Figure 18 yellow square). The variables are added to the read and write list via drag & drop.

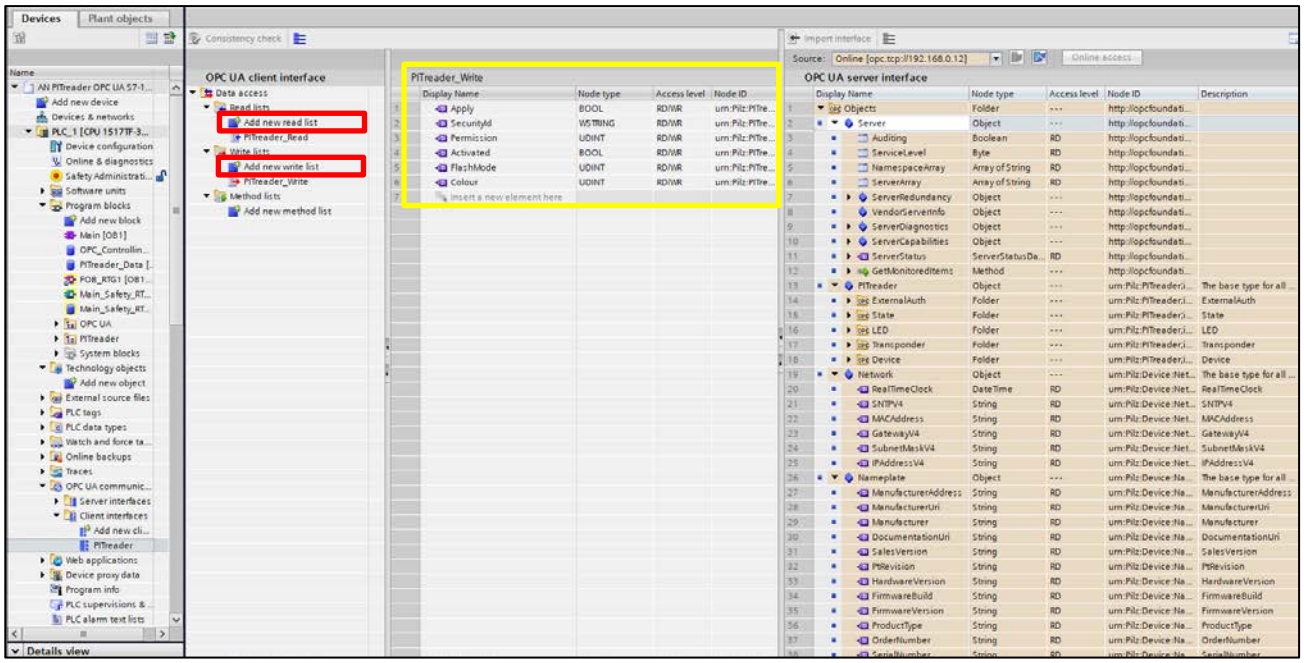


Figure 18: Creating a read and write list in the TIA Portal

3. In the project navigation, navigate *to Devices -> Program blocks -> [Name of the Client interface]_Data [DBx]* (Figure 19 red square).
4. Open *[Name of Client interface]_Write / Read -> Variable* and check whether the variables that have been added to the read and write list are available (Figure 19 yellow square).

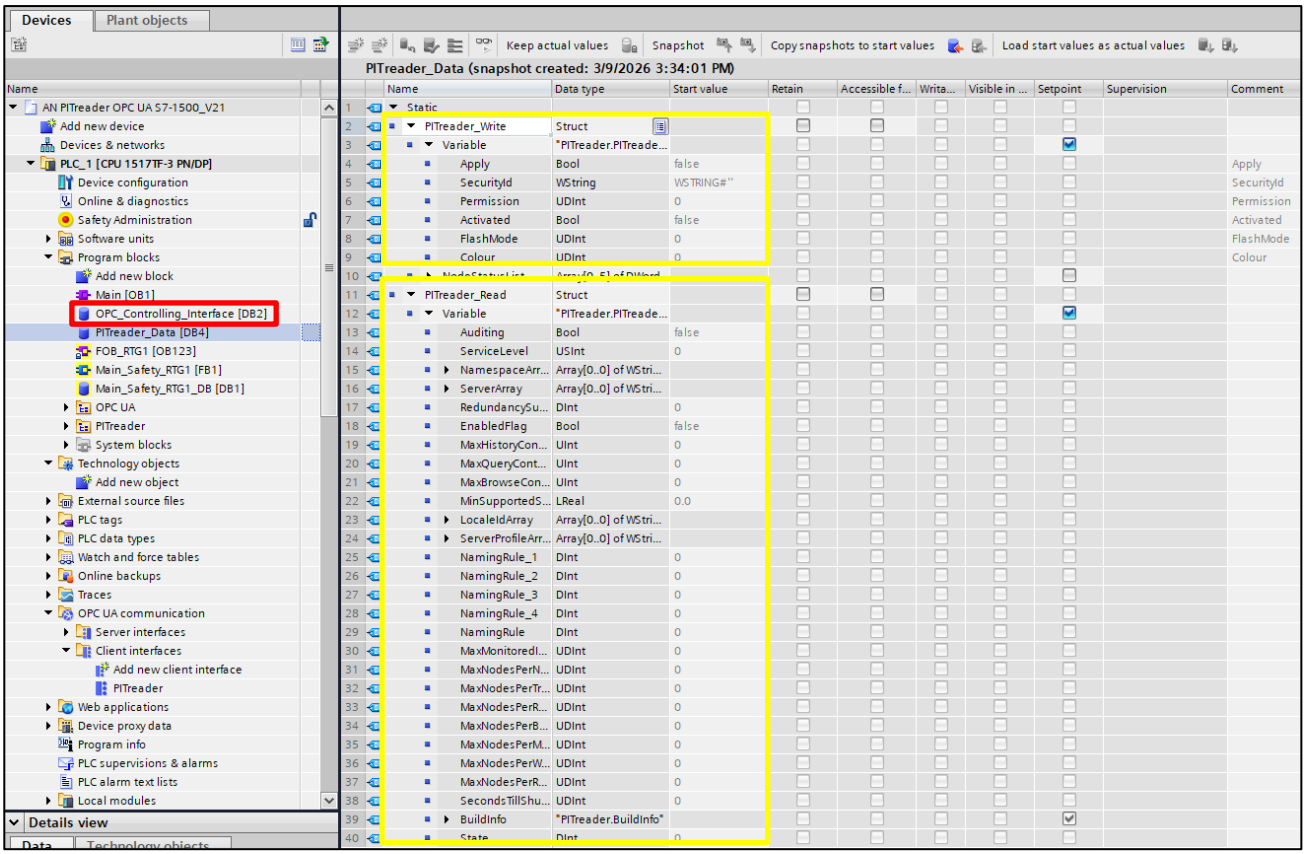


Figure 19: Data block with variables in the read and write list

6.8 Implementation of the OPC UA Client functionalities

To implement the OPC UA Client functionalities, there are corresponding function blocks in the TIA Portal. Open a function block and click on "*Instructions*" (Figure 20 red square). Under *Communication -> OPC UA -> OPC UA Client* you will find all the function blocks required for the functionalities of the OPC UA Client (Figure 20 yellow square).

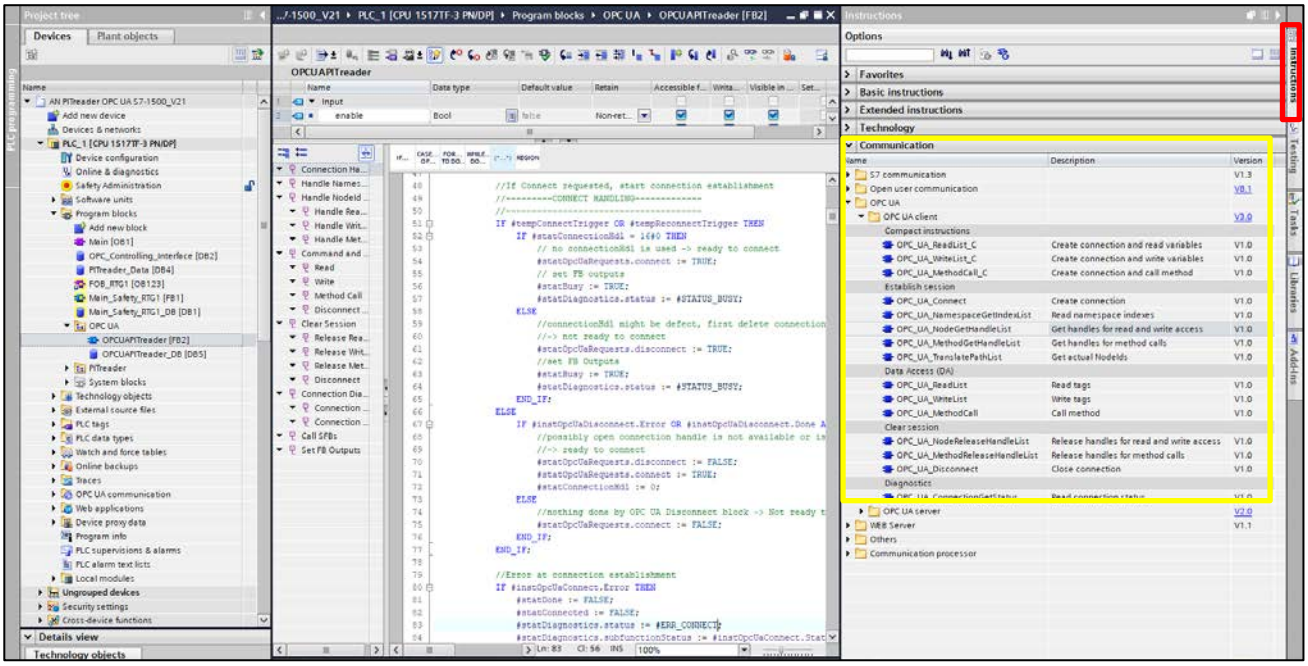


Figure 20: Function blocks for the OPC UA Client functionalities

Please refer to the documentation for implementation of the OPC UA Client functionalities from Siemens.

Support Page - Siemens SiePortal
Enter the following ID in the search: 109762770

Here you will find sample projects with an S7 user block for the OPC UA Client of a SIMATIC S7-1500, as well as the documentation associated with the application example.

6.9 Access to the variables on the PITreader

After you have inserted the user block for the OPC UA Client, you can now test whether you can read and write the available variables on the PITreader.

6.9.1 Read variables

To check that the variables are read correctly, proceed as follows:

1. Open the data block in which the read list's variables are available (Figure 19).
2. Click on *"Watch all"* to display the variables' current values (Figure 21 red square).
3. The variables *"SerialNumber"* and *"OrderNumber"* display the value *"WSTRING#'000000000'"* or*"WSTRING#'0'"* (Figure 21 yellow square), as there is currently no transponder held up to the PITreader's reader unit.

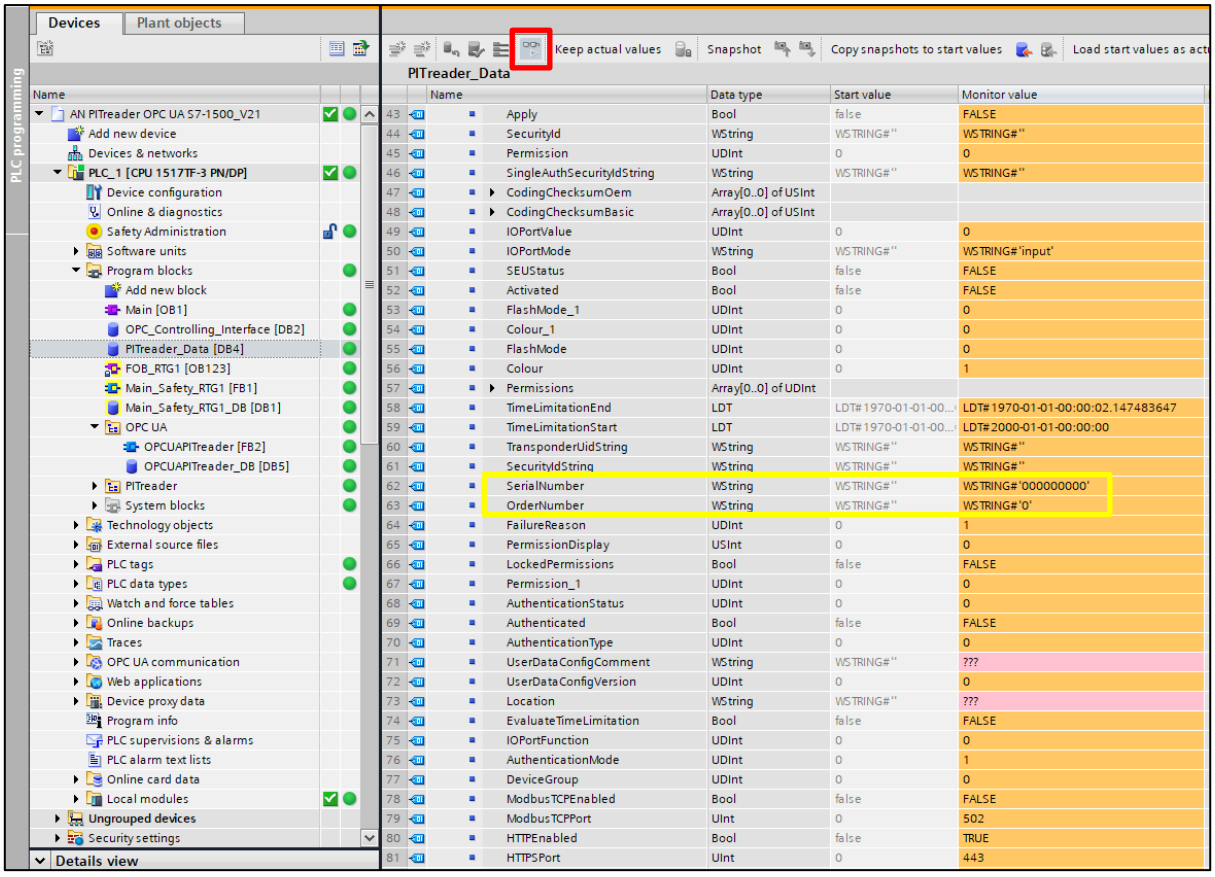


Figure 21: Watch mode with no PITreader transponder present

4. Now hold a transponder to the PITreader's reader unit
5. If the values of the variables *"SerialNumber"* and *"OrderNumber"* change and the correct serial number and order number are displayed for the transponder, there will be read access to the variables provided by the PITreader (Figure 22 red square).

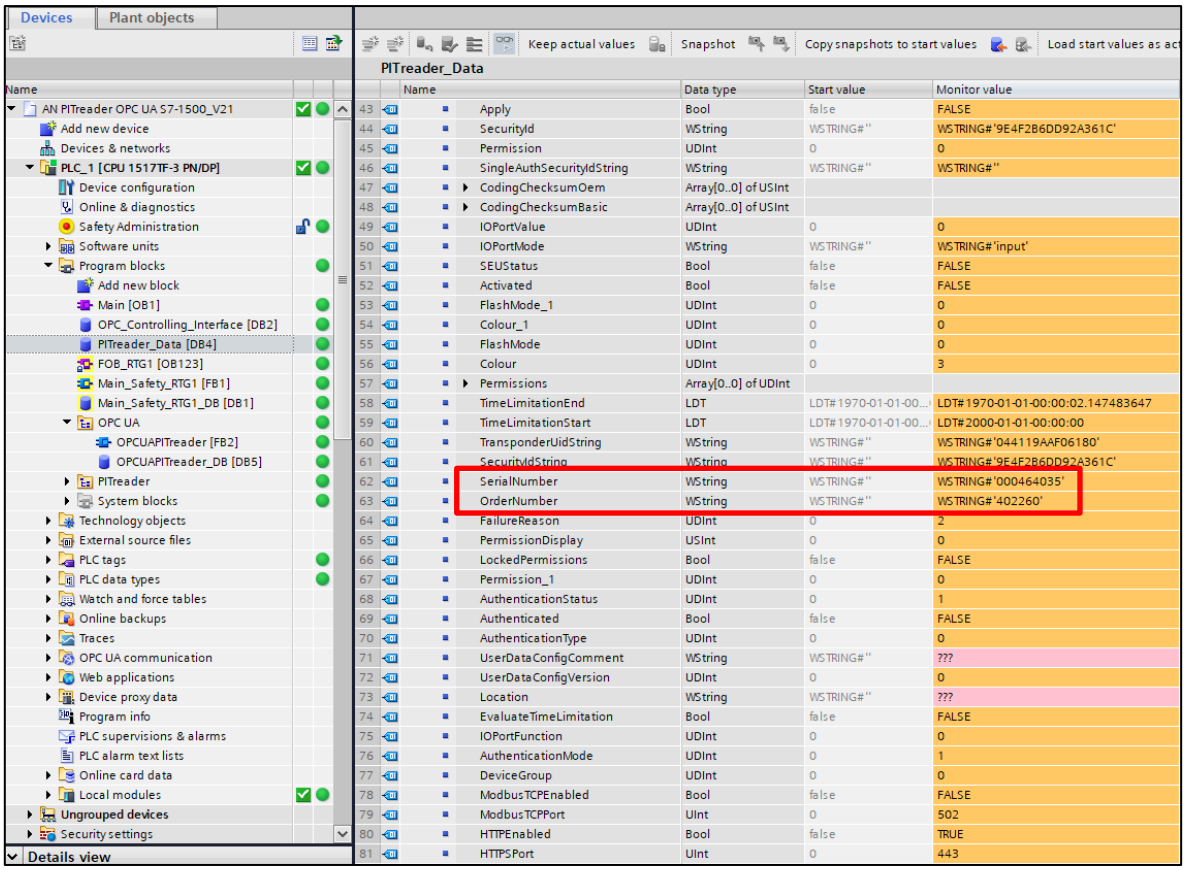


Figure 22: Watch mode with PITreader transponder present

6.9.2 Write variables

To check that the variables are written correctly, proceed as follows:

1. Open the data block in which the read list's variables are available (Figure 19).
2. Click on *"Watch all"* to display the variables' current values (Figure 23 red square).
3. Control the values of the variables *"Activated"*, *"FlashMode"* and *"Colour"* as shown in the illustration (Figure 23 yellow square).

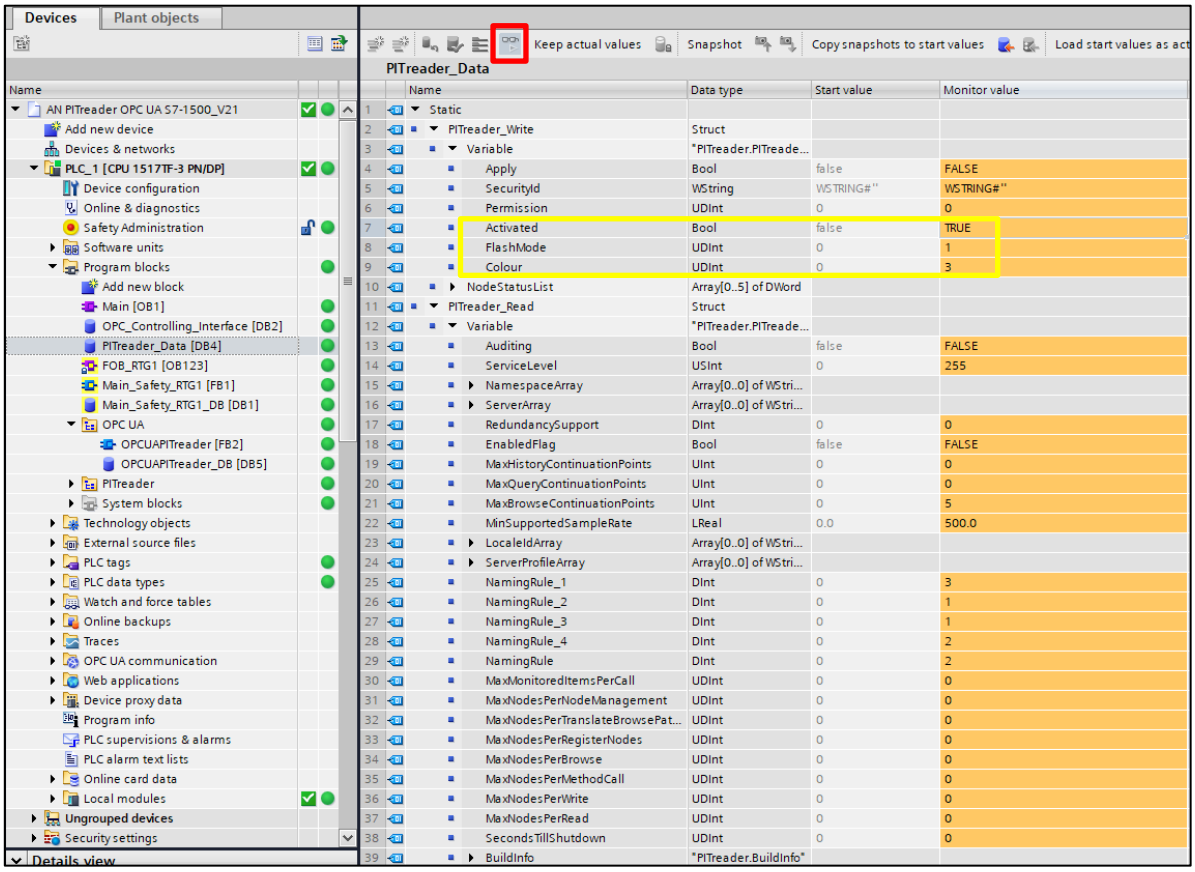


Figure 23: Control the variables on the write list

4. If the integrated LED on the PITreader now flashes red, write access was successful.

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