OPERATION MANUAL

DIGIFORCE® 9311
PROFINET Integration into TIA Portal

© 2025 burster
praezisionsmesstechnik gmbh & co kg
All rights reserved

Valid from: **22.04.2025**
Applies to: **DIGIFORCE® 9311-VXX03**

Manufacturer:
burster
präzisionsmesstechnik gmbh & co kg
Talstr. 1 - 5
76593 Gernsbach
Germany

P.O. Box 1432
76587 Gernsbach
Germany

Tel.: +49-7224-645-0
Fax.: +49-7224-645-88
Email: info@burster.com
www.burster.com

4677-BA9311PROFINETTIAEN-5799-041529

Table of Contents

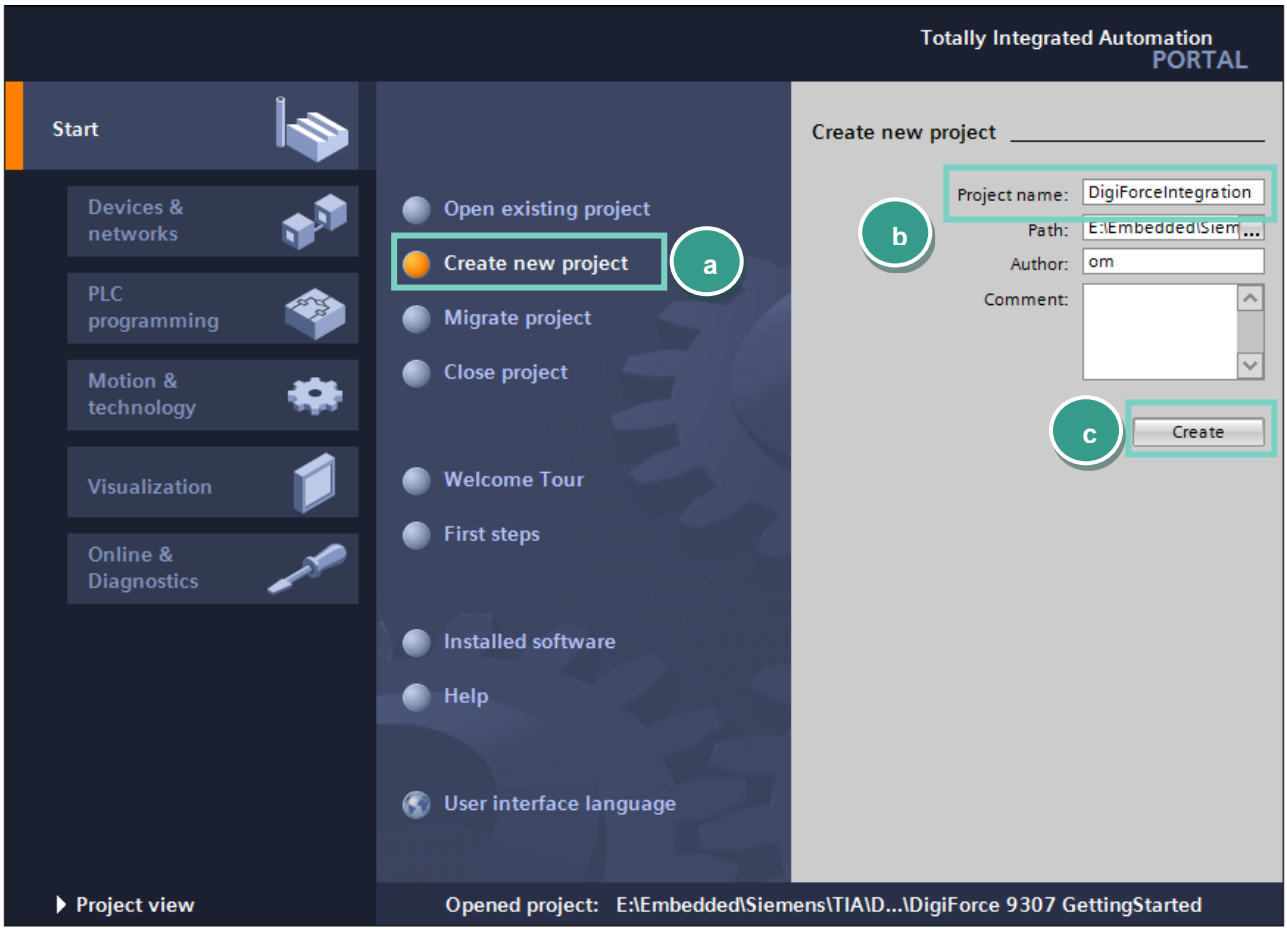
Introduction

This quick start guide describes an approach how you can configure the DIGIFORCE® 9311 via TIA Portal using the example of S7-1511 CPU. Please note that the samples here cannot be directly used in your production line because they have beed extremely simplified to reach a better understanding. Therefore, you may have to complete them by checking of status, error, length values etc.

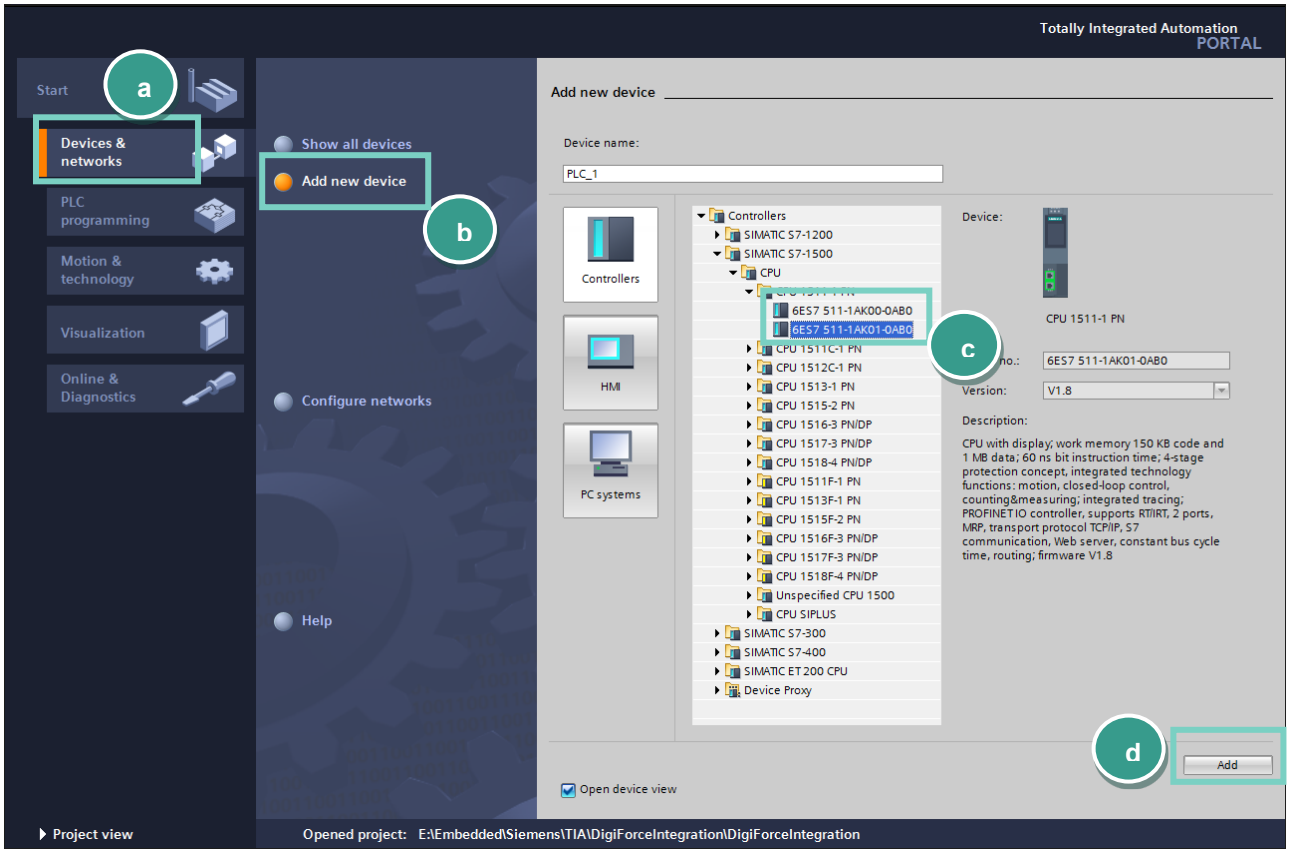
Please also note that you will have to use the DIGIFORCE 9311 PROFINET manual to get futher information about input and output parameters (cyclic as well acyclic data transfer)

1. Creating new project

➢ Start the **Totally Integrated Automation Protal**, select ***Create New Project*** (a), assign the project a name (b) and click ***Create*** (c)*:*



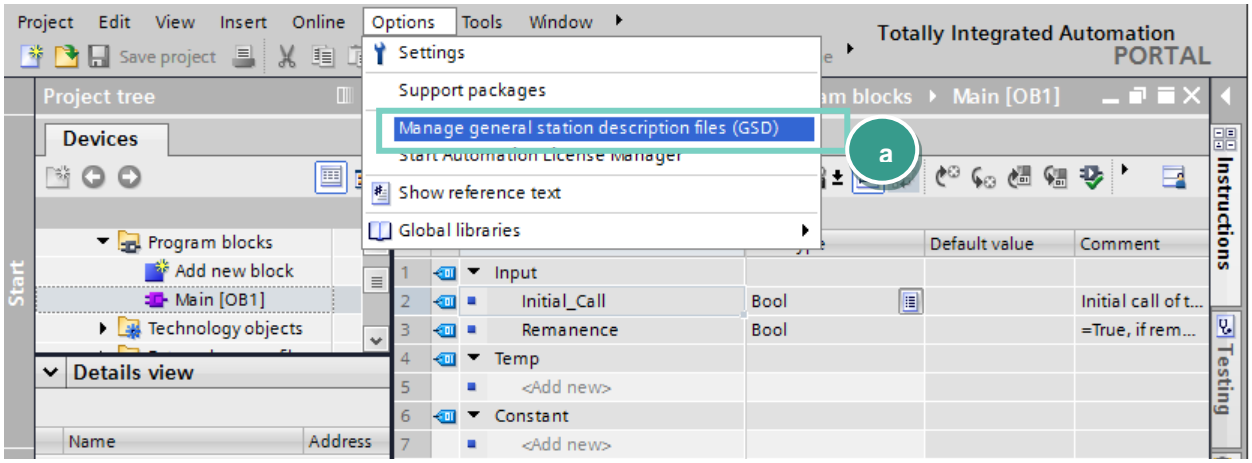
➢ Go to ***Devices & networks*** (a) on the left side select ***Add new device*** *(b)* and look for yor CPU (c). Afterwards click the **Add** button (d).



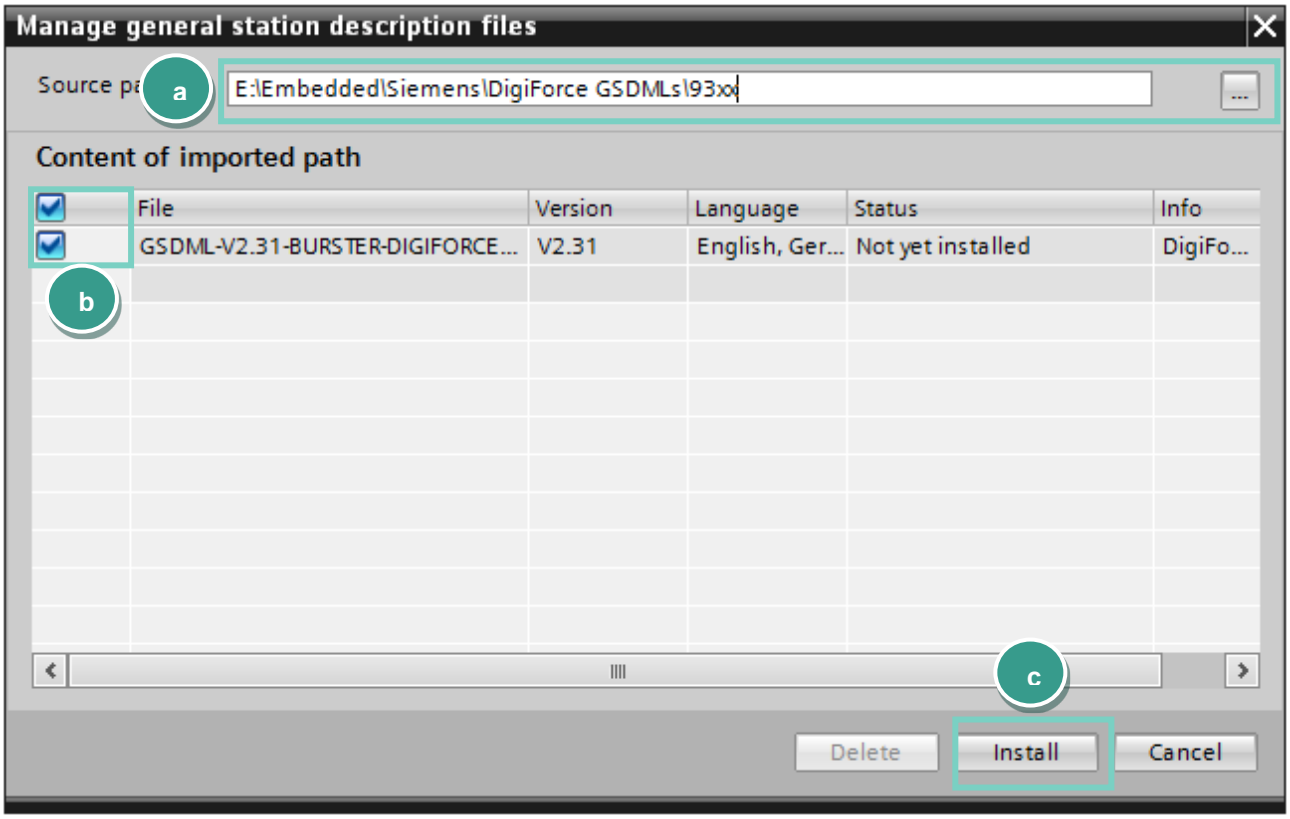
2. Installation of GSDML files

Note: Please make sure that your GSDML file is compatible to the field bus firmware in the DIGIFORCE® 9311. Also for compatibility reasons, uninstall all previous GSDML files of particular device if you have any!

➢ Go to ***Options->Manage general station description files (GSD)***



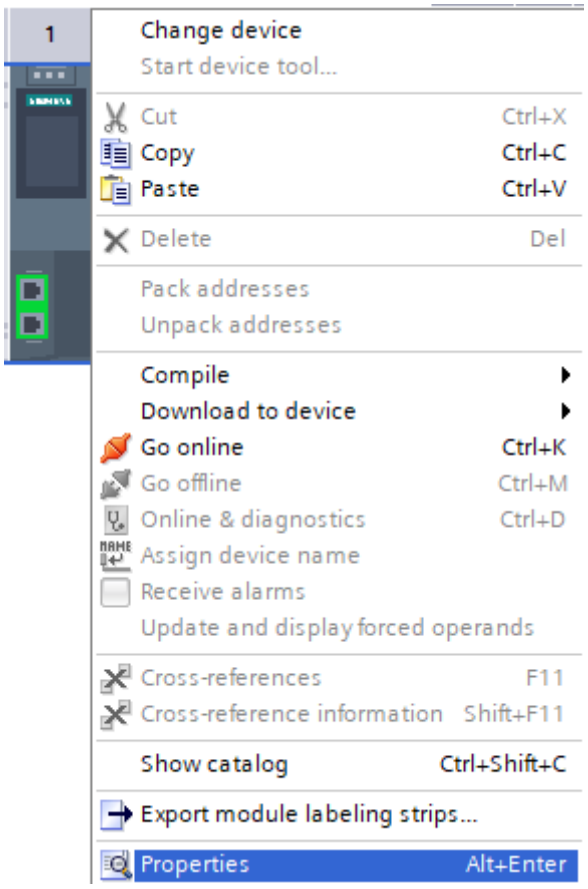
➢ Navigate to your DIGIFORCE® 9311 GSDML directory (a)(you will find the GSD files on burster DVD that you got with your DIGIFORCE® 9311 device or on burster.com), select the GSD file (b) and click ***Install*** (c)

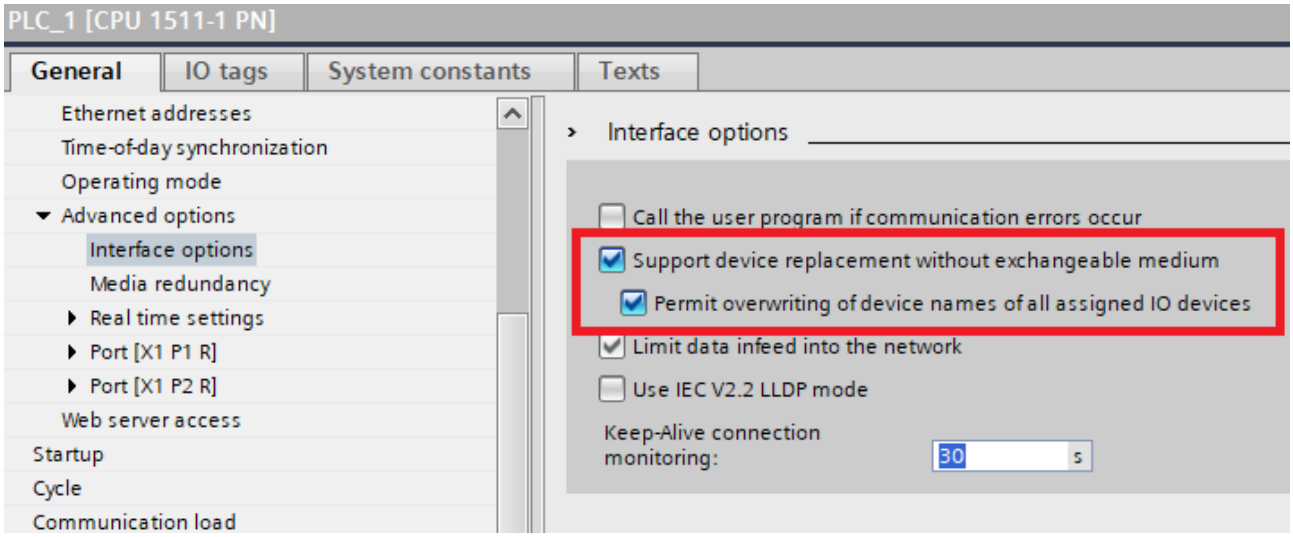


3. Device replacement without exchangeable medium

To be able to exchange a device with another one later without setting the PROFINET station name of the new device manually you can allow overwriting of device names by the PLC-Controller.

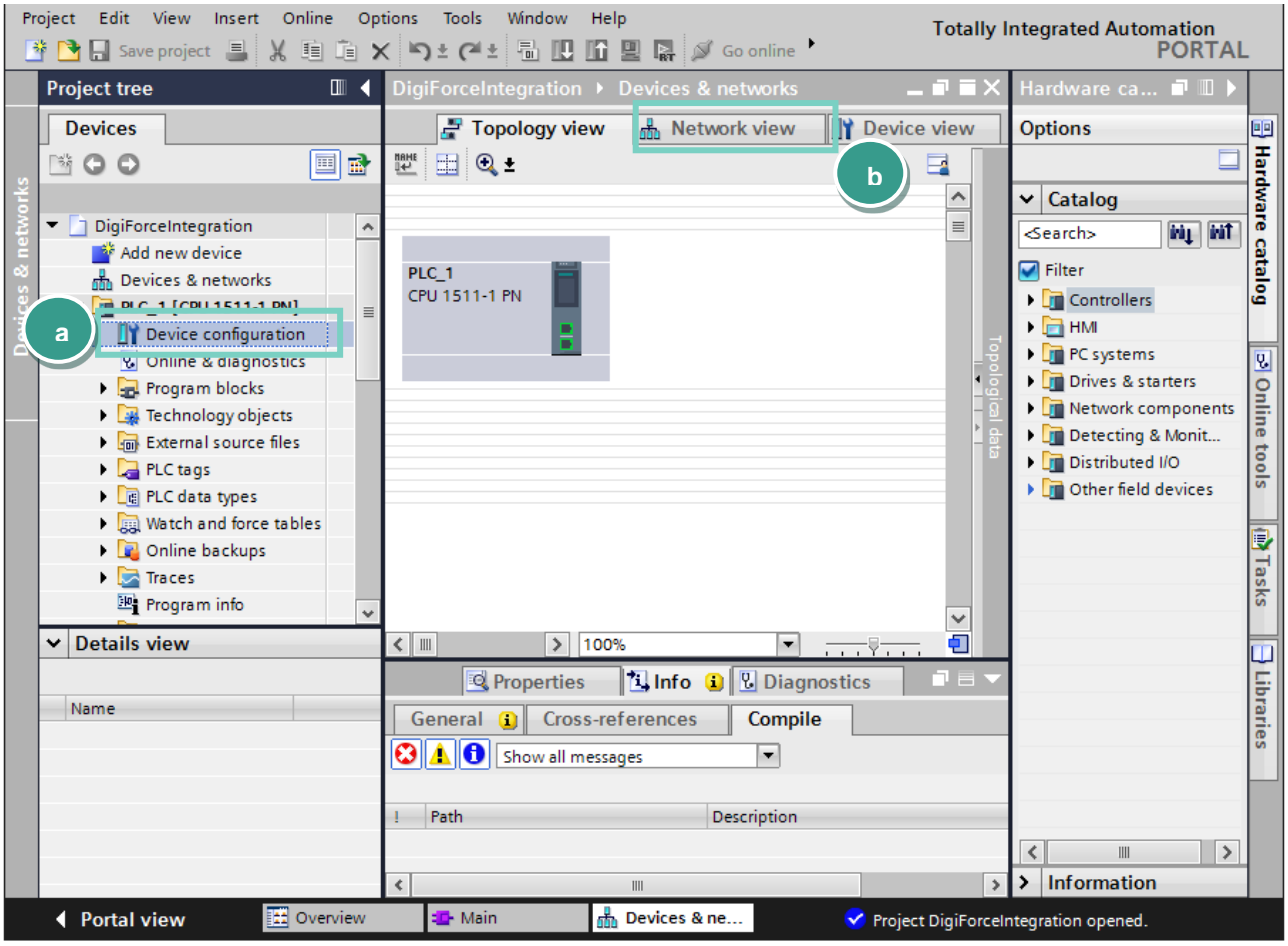
Go to the the properties of your PLC Controller and then to *Interface options* and *Permit overwriting of device names…*



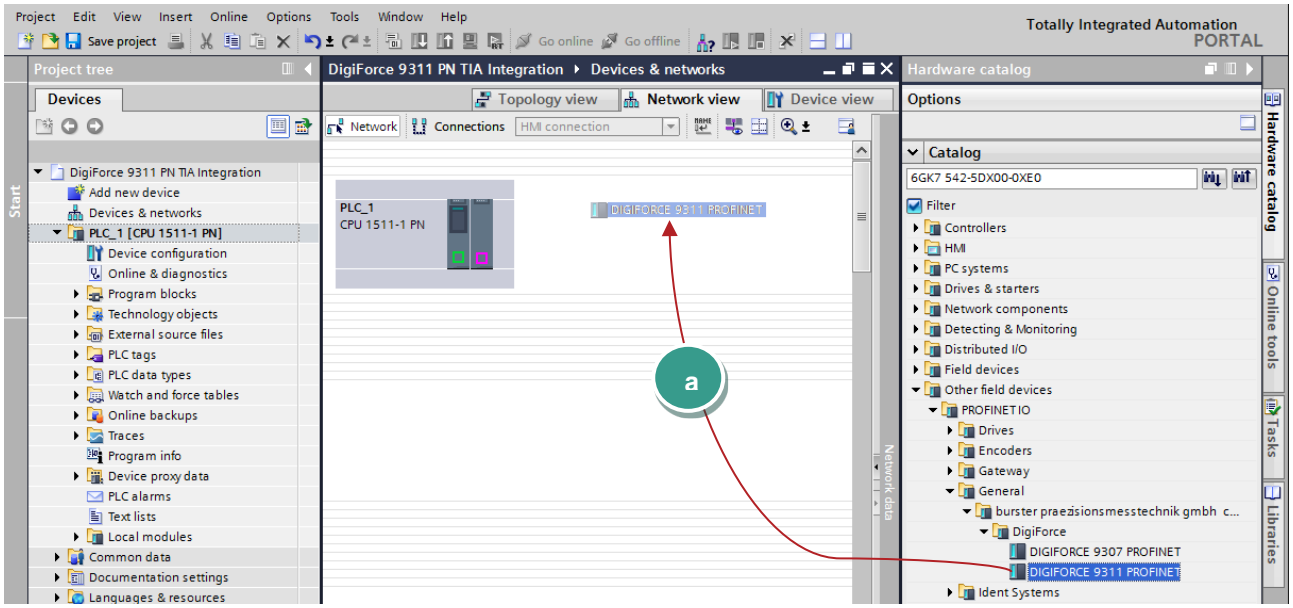


4. Creation of network connections

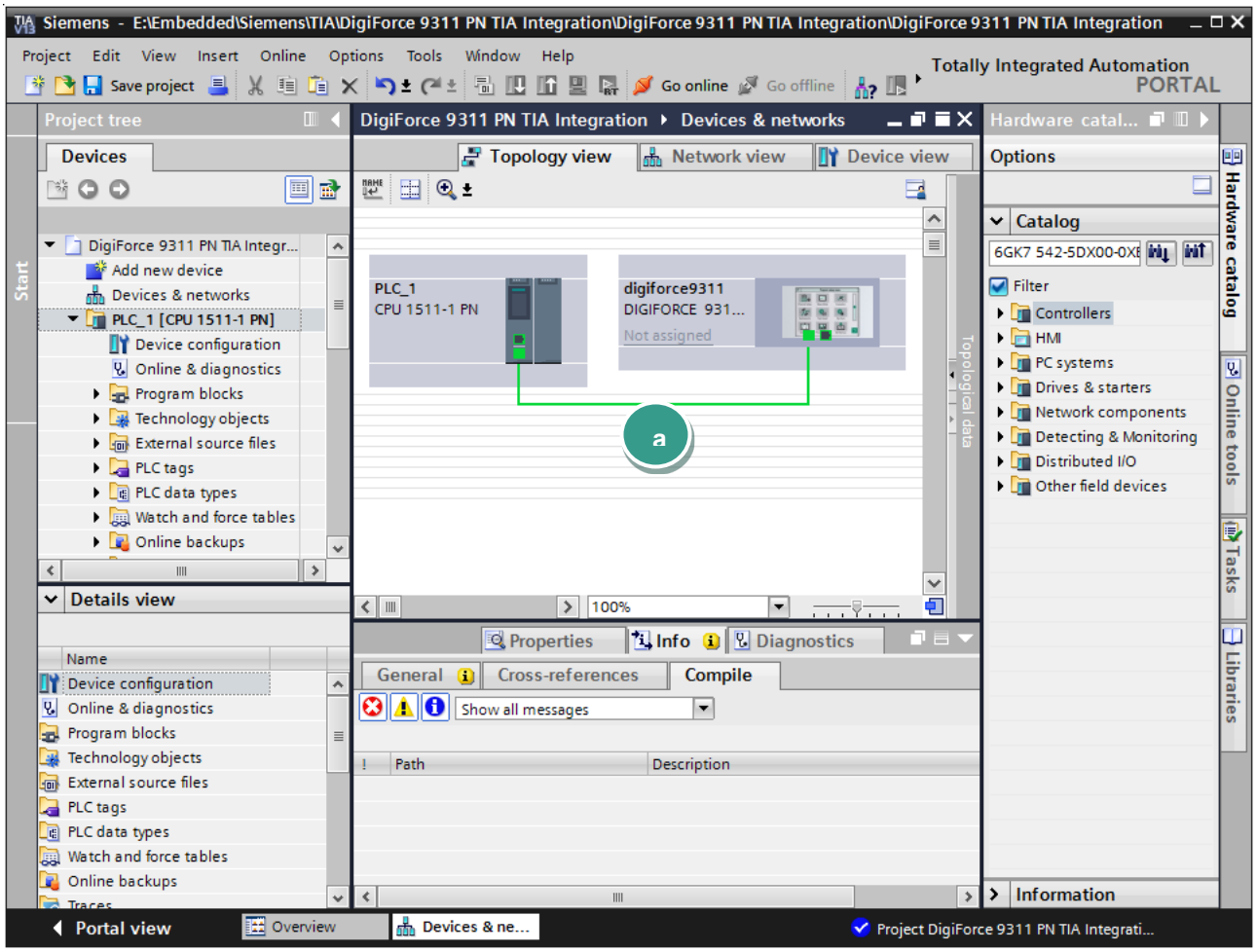
➢ Double click ***Device Configuration*** (a) in the project tree und switch to **Network view** (b) :



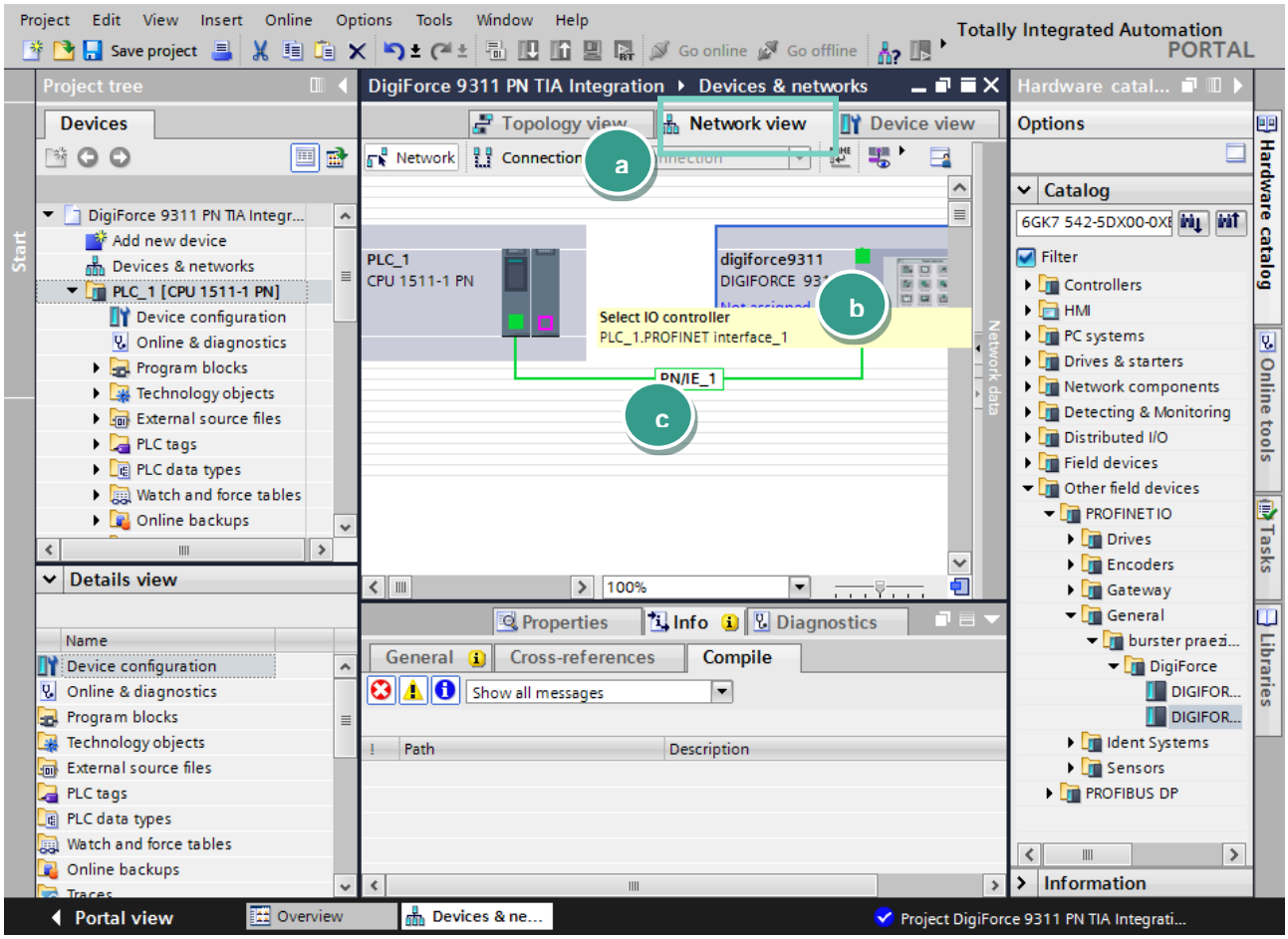
➢ Now select the DIGIFORCE® 9311 device in the catalog and drag & drop it into the working area (a):



➢ Please select an ethernet port on the S7 and hold the left mouse button down to connect the S7 with DIGIFORCE® 9311:



➢ Change now to **Network view** (a) to assign a controller to the DIGIFORCE® 9311. Click on the link "Not assigned" (b) of DIGIFORCE® 9311 and select your controller (c):

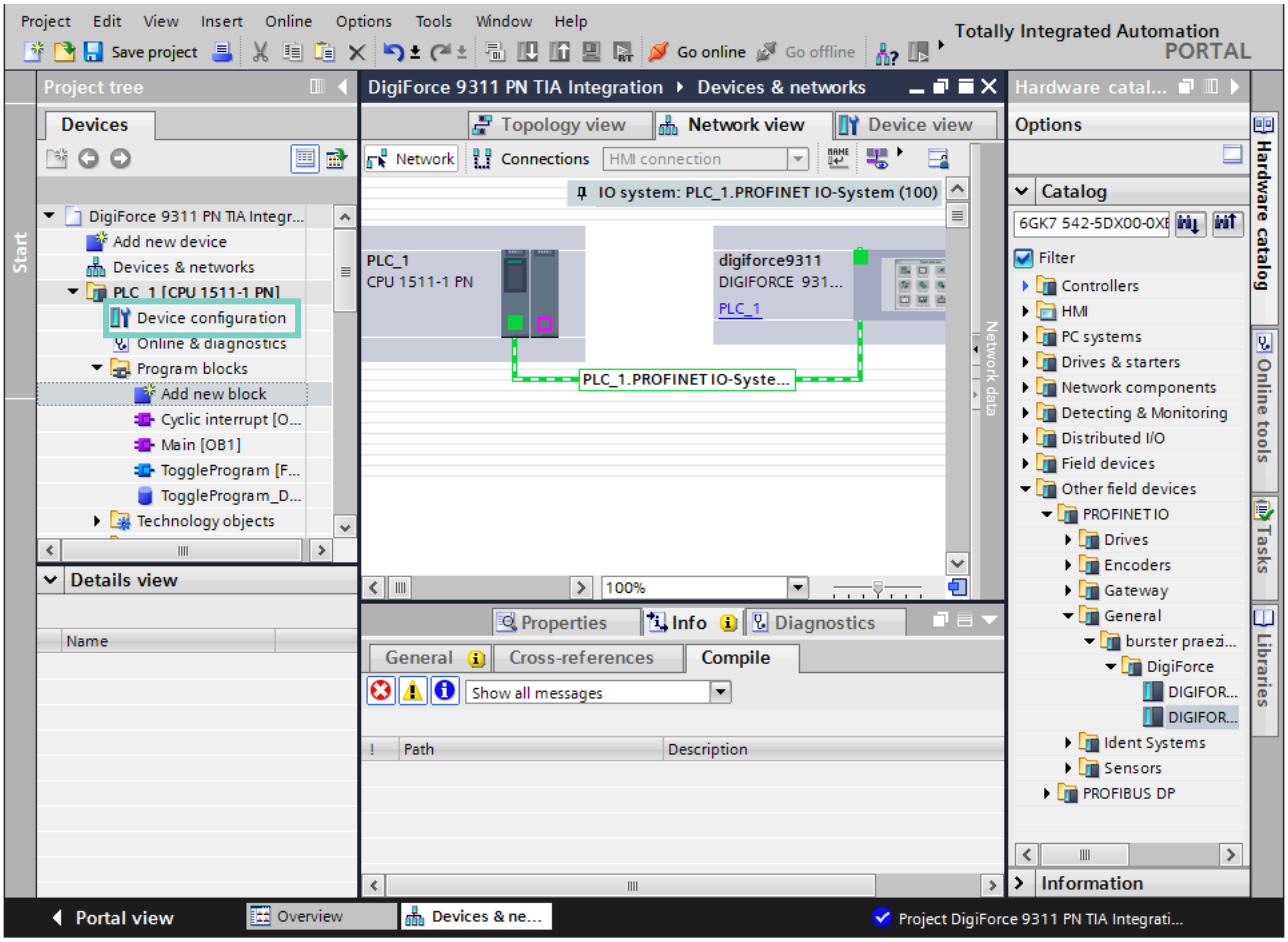


Check if devices also connected physically to the right ports. You find the port number assignment in the section *4.3 Port-Identification of* **DIGIFORCE® 9311 PROFINET** manual

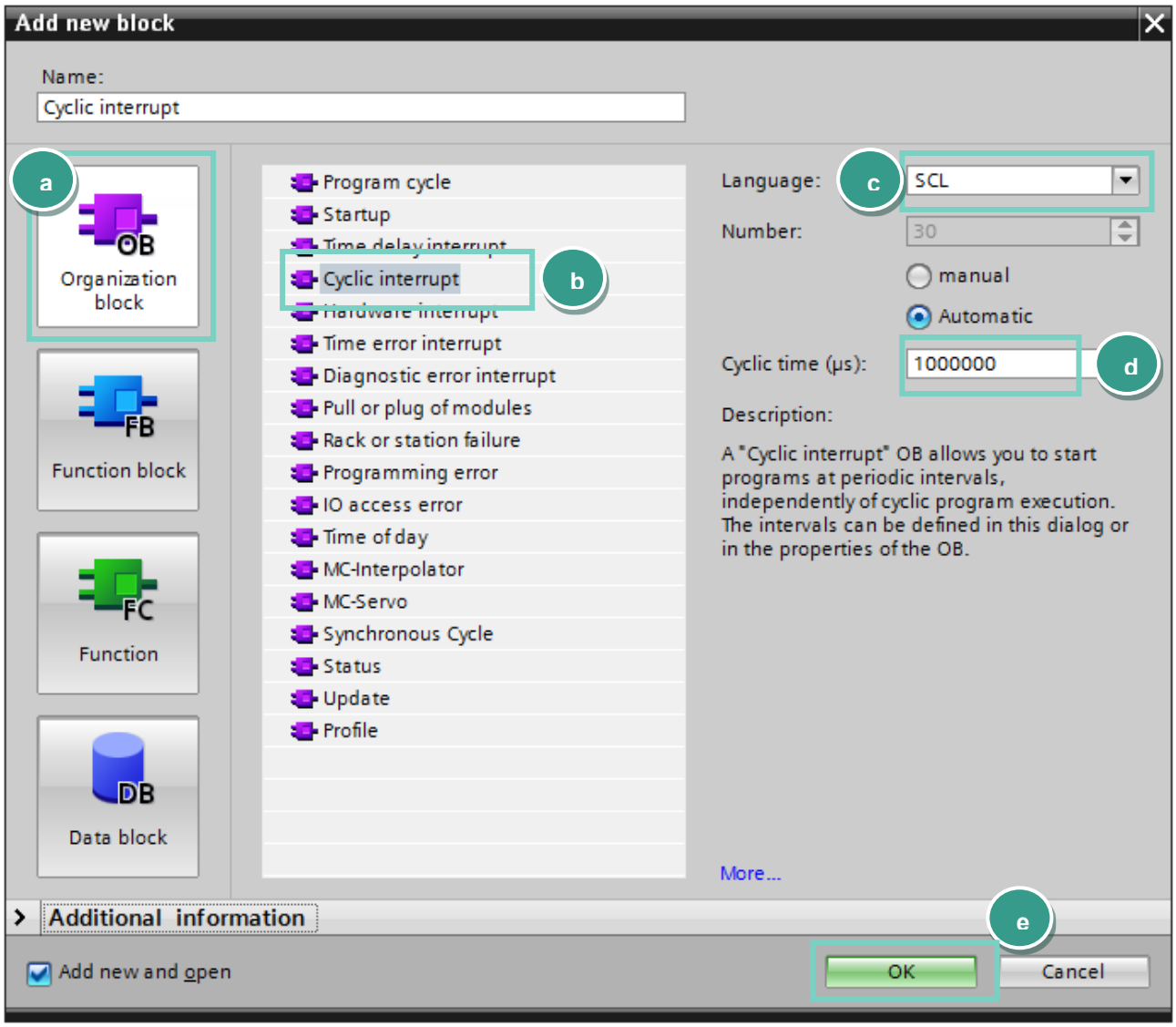
5. Create a sample program

In this section, you will learn how to create a simple program to start and stop a measurement periodically. You will need to refer to sections *7.2 PLC inputs* and *7.3 PLC outputs* of the **DIGIFORCE® 9311 PROFINET** manual to understand the meaning of inputs and outputs bytes.

➢ Expand the tree node ***Program blocks*** in the Project tree and double click ***Add new block:***



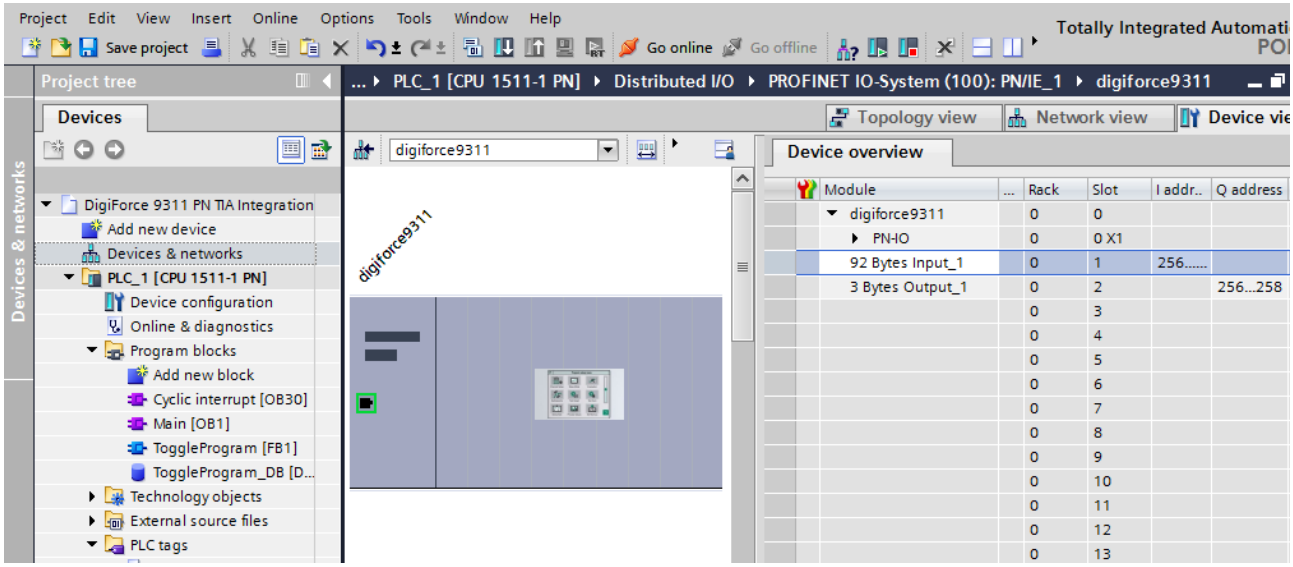
➢ Select in the new window ***Organization block*** (a) and then ***Cyclic interrupt*** (b)**.** As language set SCL (c), change the cyclic time to 1.000.000 µs (d) and click OK (e):



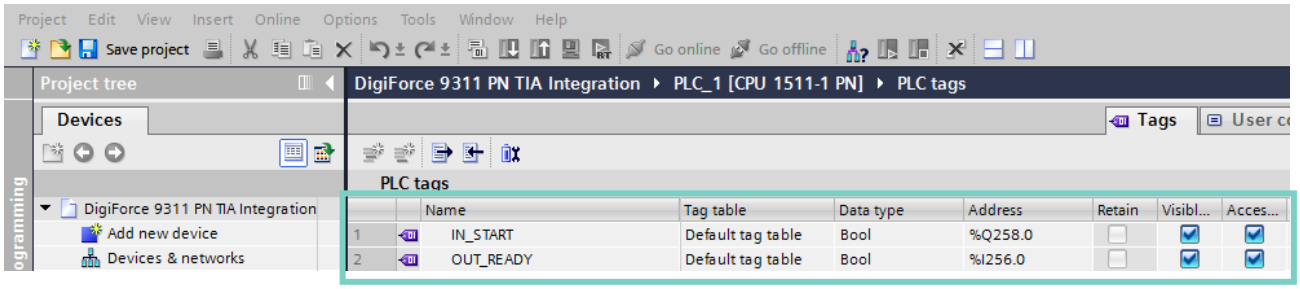
➢ Type in the following source code in the code fild of the new block:

```
IF %Q258.0 = TRUE THEN                  // is IN_START (measurement start) set?
  %Q258.0 := FALSE;                     // IN_START (measurement start) is set, then reset it
ELSE                                    // IN_START is not set
  IF %I256.0 = FALSE THEN               // is OUT_READY  (DIGIFORCE® 9311 ready for
    RETURN;                             measurement) set?
  END_IF;                               // If not -
  %Q258.0 := TRUE;                      // return
END_IF;

                                        // set IN_START(measurement start)
```

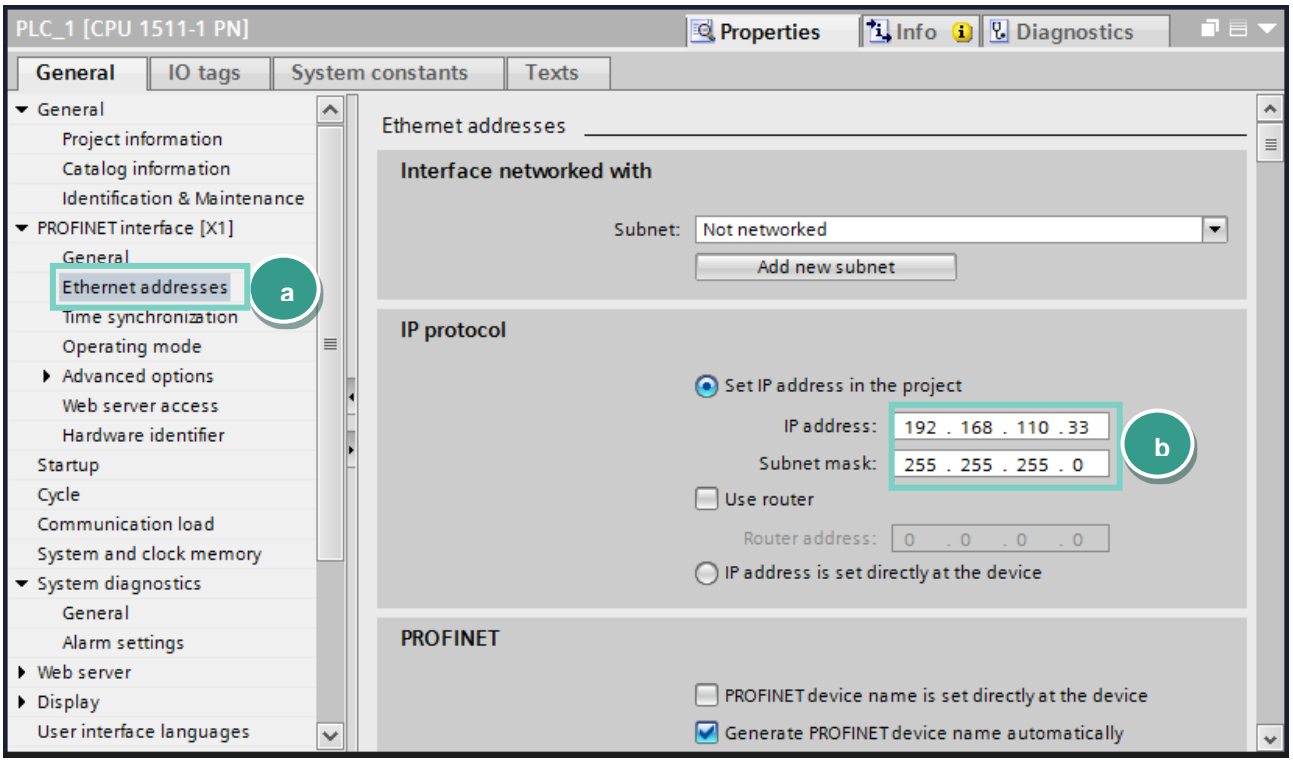
Please note: the addresses may be different. You have to check them in the **Device view->Device overview** of the DIGIFORCE® 9311.



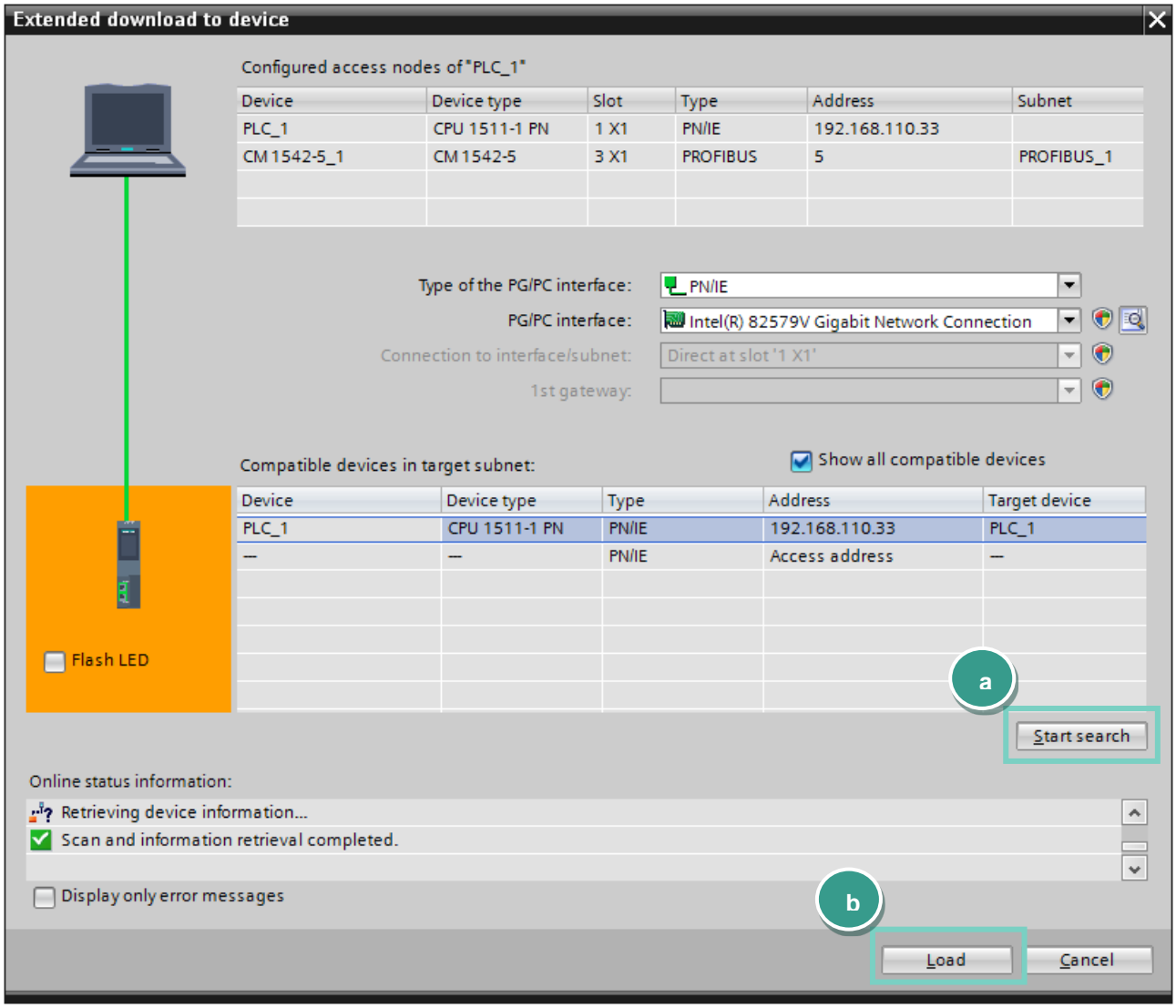
You will also see that the TIA-Editor replaces the input/output addresses with tags. You can change the tags names in PLC Tag table (e.g. to IN_START and OUT_READY):



➢ Before you load the project into the CPU you have to set the IP addresse of your CPU. To do this please go to **Device view** and select ***Ethernet addresses*** (a) in ***General*** tab. Set now the IP-Address and a subnet mask(b) assigned to your in section ***IP-Protocol***:



➢ To load the configuration into the CPU select it first go to ***Online->Download to device*** and click on ***Start search*** (a) to look for your controller. Then select the controller and click on ***Load*** (b):

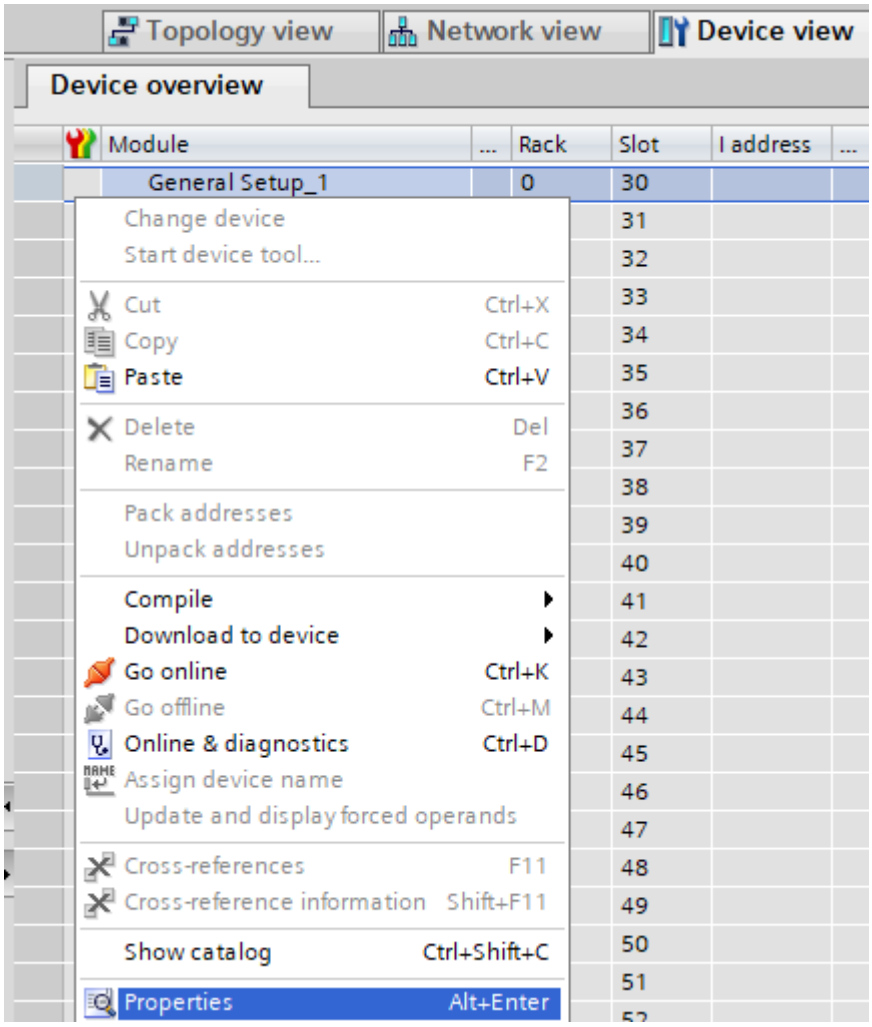


The DIGIFORCE® 9311 starts now a new measurement, wait a second, stops the measurement, wait a second and starts the measurement again and so on.

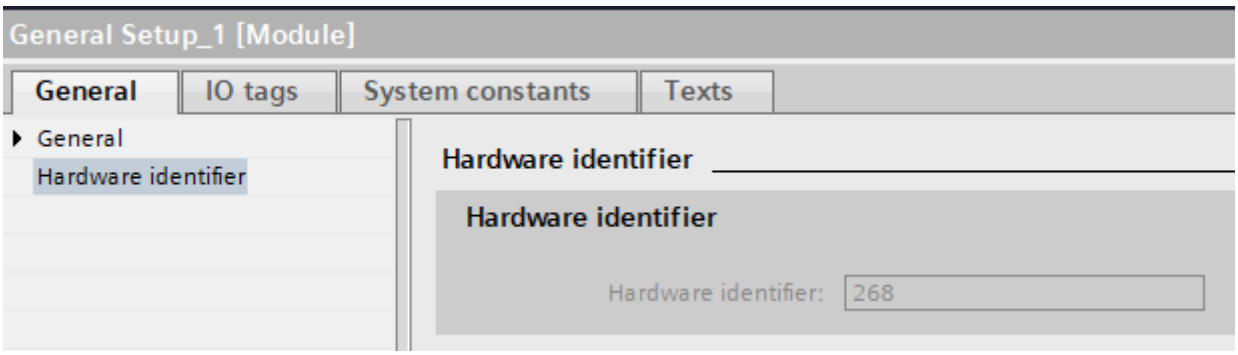
Note: Make sure that PROFINET Control is enabled in DIGIFORCE® 9311. For details, see chapter *4.5 Configuration menu in DIGIFORCE® 9311* of *the* **DIGIFORCE® 9311 PROFINET** manual.

6. Further Examples

In the followed examples, a *Hardware-ID* is used to access a certain slot. To find this, please select a DIGIFORCE® 9311 device in **Topology view** or **Network view** and then switch to **Device view**. Click with the right mouse button on the desired module, e.g. *General Setup* and select ***Properties***:



You will see the hardware indentifier in the tab ***General***:



5.1 Reading and Writing of string data types

Example 1: Reading Device ID and write it as station name to device

In this example, we perform a read access on slot 30/Subslot 1/index 10 to get the device type of DIGIFORCE® 9311 and then we will set the first nine characters of this string as DIGIFORCE® 9311 station name on Slot 30/Subslot 1/Index 17. For these acyclic operations, you will need an instance of RDREC und WRREC blocks. You can see the new station name in the **info menu** of DIGIFORCE® 9311.

PLC parameters table:

		Name	Data type	Default value
4		Temp		
5		Valid	Bool	
6		Busy	Bool	
7		Error	Bool	
8		Status	DWord	
9		Done	Bool	
10		lenRead	UInt	
11		data	Array[0..18] of Byte	

Sourcecode:

```
REPEAT
"RDREC_DB"(REQ:=TRUE,
        ID:=268,                    // 268: HW-ID for General Setup (see introduction of 'Further examples')
        INDEX:=10,                  // Index 10: Device Detection
        MLEN:=18,                   // Max. lenth of data to read
        VALID=>#Valid,              // New Data Received and valid
        BUSY=>#Busy,                // Read not completed yet
        ERROR=>#Error,              // Error
        STATUS=>#Status,            // State
        LEN=>#lenRead,              // Number of bytes was read from device
        RECORD:= #data);            // Array[0..18] of Byte
UNTIL NOT #Busy
END_REPEAT;

IF #Error = TRUE OR #Status <> 0 THEN
   RETURN;
END_IF;

REPEAT
"WRREC_DB"(REQ:=TRUE,
        ID:=268,                    // 268: HW-ID for General Setup (see introduction of 'Further examples')
        INDEX:=17,                  // Index 17: Station Name
        LEN:=9,                     // Length of data to write
        DONE=>#Done,                // Write done
        BUSY=>#Busy,                // Write not completed yet
        ERROR=>#Error,              // Error
        STATUS=>#Status,            // State
        RECORD:=#data);   // Write the data has being read in RDREC_DB (first 9 bytes)
UNTIL NOT #Busy AND #Done
END_REPEAT;
```

Example 2: Writing of serial number SN1 into device order sheet

Note: Datatype **String** in TIA Portal contains two additional bytes, which represent the length of the string. To avoid these two bytes being sent use the function 'Strg_TO_Chars' to convert the String to a byte array as shown below:

PLC parameters table:

Name	Data type	Default value
serial	String	
bytesWritten	UInt	
serialAsByteArray	Array[0..64] of Byte	
Busy	Bool	
Error	Bool	
Status	DWord	
Done	Bool	

Sourcecode:

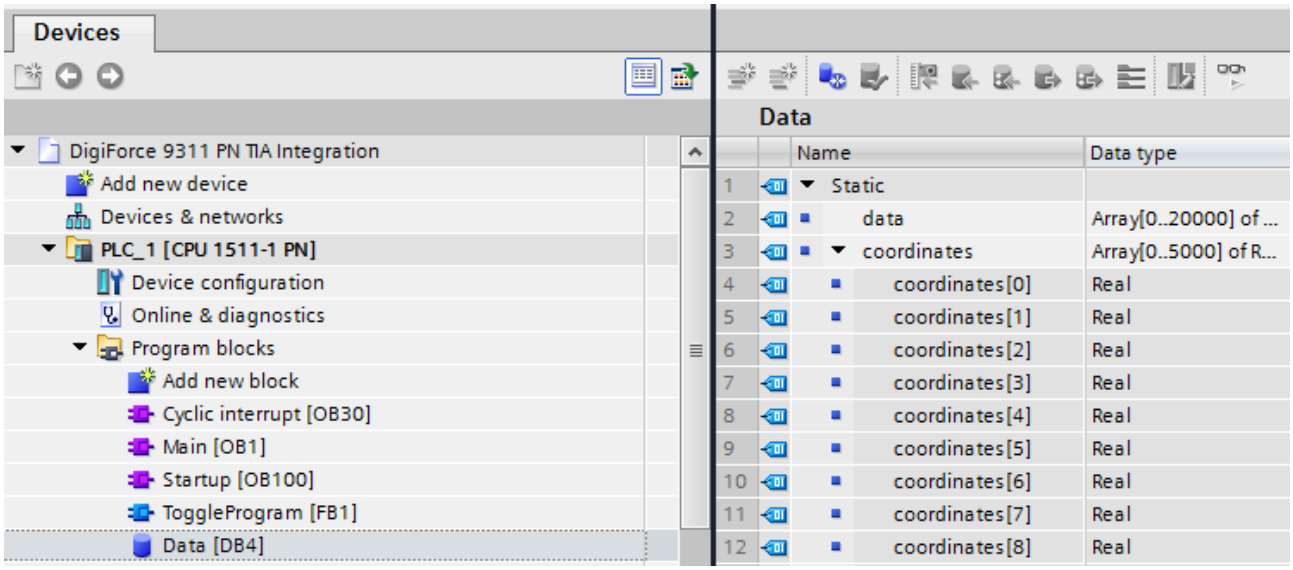
```
#serial := 'SN123456789';

Strg_TO_Chars(Strg:= #serial,                    // Serial as String
              pChars:= 0,                        // Position in serialAsByteArray
              Cnt => #bytesWritten,              // Number of Bytes have been written to serialAsByteArray
              Chars:= #serialAsByteArray);

REPEAT
   "WRREC_DB"(REQ := TRUE,
              ID := 268,                         // HW-ID General Setup (see introduction of 'Further examples')
              INDEX := 65,                       // Index 65: Order sheet - Serial number 1
              LEN := INT_TO_UINT(LEN(#serial)),  // Length of serial
              DONE => #Done,                     // Write done
              BUSY => #Busy,                     // Write not completed yet
              ERROR => #Error,                   // Error
              STATUS => #Status,                 // State
              RECORD := #serialAsByteArray);
UNTIL NOT #Busy AND #Done
END_REPEAT;
```

5.2 Retrieving of measurement results

This example shows you how to read the X-Coordinates of the current curve.

PLC parameters table:

4		Temp	
5		Valid	Bool
6		Done	Bool
7		Busy	Bool
8		Error	Bool
9		Status	DWord
10		i	Int
11		lastIndex	DWord
12		lenRead	UInt
13		measVal	DWord
14		tmp	DWord



Sourcecode:

```
REPEAT
    "WRREC_DB"(REQ := TRUE,                    // Write access to index 10 to prepare the curve
               ID := 352,                      // Hardware-ID  (see introduction of 'Further examples')
               INDEX := 10,                    // Index
               LEN := 2,                       // Length in bytes to write
               DONE => #Done,
               BUSY => #Busy,
               ERROR => #Error,
               STATUS => #Status,
               RECORD := "Data".data);         // Any 2 bytes to prepare the curve
UNTIL NOT #Busy AND #Done
END_REPEAT;

IF #Error = TRUE OR #Status <> 0 THEN
  RETURN;                                      // If write failed -> return
END_IF;
```

```
REPEAT
    "RDREC_DB"(REQ := TRUE,                          // Read the number of curve values
               ID := 352,                            // Hardware-ID (see introduction of 'Further examples')
               INDEX := 10,                          // Index
               MLEN := 4,                            // Max. length to read
               VALID => #Valid,
               BUSY => #Busy,
               ERROR => #Error,
               STATUS => #Status,
               LEN => #lenRead,                      // Number of bytes read
               RECORD := #lastIndex);                // Number of values in the curve - 1
UNTIL NOT #Busy
END_REPEAT;

#lastIndex := SHR(IN := #lastIndex, N := 16);       // upto and including DIGIFORCE® 9311 field bus
                                                    firmware FW-2018.1.0 we have to use DWord to get
                                                    U16 Types from DIGIFORCE® 9311 and shift left the
                                                    result by 2 bytes

IF #Error = TRUE OR #Status <> 0 OR #lenRead <> 2
OR #lastIndex = 0 THEN                              // If read failed -> return
    RETURN;
END_IF;
REPEAT
    "RDREC_DB"(REQ := TRUE,
               ID := 352,                           // Read access to read out curve coordinates
               INDEX := 11,                         // Hardware-ID (see introduction of 'Further examples')
               MLEN := 20000,                       // Index
               VALID => #Valid,                     // Max. length to read
               BUSY => #Busy,
               ERROR => #Error,
               STATUS => #Status,
               LEN => #lenRead,
               RECORD := "Data".data);              // Number of bytes read
UNTIL NOT #Busy                                     // Array to store the read coordinates
END_REPEAT;

IF #Error = TRUE OR #Status <> 0 OR #lenRead < 4
THEN                                                // If read failed -> return
    RETURN;
END_IF;

FOR #i := 0 TO DWORD_TO_INT(#lenRead - 1) BY 4
DO                                                  // Write bytes to DWORD and convert to Real
    #measVal := 0;
    #tmp := BYTE_TO_DWORD("Data".data[#i]);
    #measVal := #measVal + SHL(IN := #tmp, N := 24);    // Shift left the value by 24 bit
    #tmp := BYTE_TO_DWORD("Data".data[#i + 1]);
    #measVal := #measVal + SHL(IN := #tmp, N := 16);    // Shift left the value by 16 bit
    #tmp := "Data".data[#i + 2];
    #measVal := #measVal + SHL(IN := #tmp, N := 8);     // Shift left the value by 8 bit
    #measVal := #measVal + "Data".data[#i + 3];
    "Data".coordinates[#i / 4] :=                   // Convert to Real and store in MeasValues[] Array
DWORD_TO_REAL(#measVal);
END_FOR;
```

5.3 Changing of window limits

This example shows you how to enable Evaluation Window 1 and set its coordinates.

Note: You have to write all four window limits and then confirm them with index 15. It is not possible to change only one single limit, e.g. xMax.

PLC parameters tables:

Name	Data type	Default value
Temp		
data	Array[0..18] of Byte	
Valid	Bool	
Done	Bool	
Status	DWord	
Busy	Bool	
Error	Bool	
lenRead	UInt	
xMin	Real	
xMax	Real	
yMin	Real	
yMax	Real	
event	Byte	
onOff	UInt	

Sourcecode:

```
#onOff := 1;                    // Activate Window 1
#event := 1;                    // Acknowledgement for indices 11, 12, 13,14

#xMin := 1.5;                   // Xmin coorrdinate of window 1
#xMax := 3.0;                   // Xmax coorrdinate of window 1
#yMin := 2.5;                   // Ymin coorrdinate of window 1
#yMax := 4.0;                   // Ymax coorrdinate of window 1

REPEAT
   "WRREC_DB"(REQ := TRUE,
         ID := 286,             //  HW-ID for Evaluation Window 1 (see introduction of 'Further examples')
         INDEX := 10,           // Index 10: switch on window 1
         LEN := 2,              // Length of UINT16
         DONE => #Done,         // Write done
         BUSY => #Busy,         // Write not completed yet
         ERROR => #Error,       // Error
         STATUS => #Status,     // State
         RECORD := #onOff);
UNTIL NOT #Busy AND #Done
END_REPEAT;

REPEAT
   "WRREC_DB"(REQ := TRUE,
         ID := 286,             // 286: HW-ID for Evaluation Window 1 (see introduction of 'Further examples')
         INDEX := 11,           // Index 11: Window 1 limit Xmin
         LEN := 4,              // Length of UINT16
         DONE => #Done,         // Write done
         BUSY => #Busy,         // Write not completed yet
```

```
            ERROR => #Error,          // Error
            STATUS => #Status,        // State
            RECORD := #xMin);
UNTIL NOT #Busy AND #Done
END_REPEAT;

REPEAT
   "WRREC_DB"(REQ := TRUE,
            ID := 286,                // HW-ID for Evaluation Window 1 (see introduction of 'Further examples')
            INDEX := 12,              // Index 12: Window 1 limit Xmax
            LEN := 4,                 // Length of Real
            DONE => #Done,            // Write done
            BUSY => #Busy,            // Write not completed yet
            ERROR => #Error,          // Error
            STATUS => #Status,        // State
            RECORD := #xMax);
UNTIL NOT #Busy AND #Done
END_REPEAT;

REPEAT
   "WRREC_DB"(REQ := TRUE,
            ID := 286,                // HW-ID for Evaluation Window 1 (see introduction of 'Further examples')
            INDEX := 13,              // Index 13: Window 1 limit Ymin
            LEN := 4,                 // Length of Real
            DONE => #Done,            // Write done
            BUSY => #Busy,            // Write not completed yet
            ERROR => #Error,          // Error
            STATUS => #Status,        // State
            RECORD := #yMin) ;
UNTIL NOT #Busy AND #Done
END_REPEAT;

REPEAT
   "WRREC_DB"(REQ := TRUE,
            ID := 286,                // HW-ID for Evaluation Window 1 (see introduction of 'Further examples')
            INDEX := 14,              // Index 14: Window 1 limit Ymax
            LEN := 4,                 // Length of Real
            DONE => #Done,            // Write done
            BUSY => #Busy,            // Write not completed yet
            ERROR => #Error,          // Error
            STATUS => #Status,        // State
            RECORD := #yMax);
UNTIL NOT #Busy AND #Done
END_REPEAT;

REPEAT
   "WRREC_DB"(REQ := TRUE,
            ID := 286,                //  HW-ID for Evaluation Window 1 (see introduction of 'Further examples')
            INDEX := 15,              // Index 15: adopt values entered into indices 11, 12, 13,14
            LEN := 1,                 // Length of Real
            DONE => #Done,            // Write done
            BUSY => #Busy,            // Write not completed yet
            ERROR => #Error,          // Error
            STATUS => #Status,        // State
            RECORD := #event);
UNTIL NOT #Busy AND #Done
END_REPEAT;
```