

## **OPERATION MANUAL**

#### 2511 PROFINET Integration into TIA Portal PRELIMINARY

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Valid from: **30.05.2022** Applies to: **2511-VXXX**  Manufacturer:<br/>bursterpräzisionsmesstechnik gmbh & co kgTalstr. 1 - 5P.O. Box 143276593 Gernsbach76587 GernsbachGermanyGermany

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# BATTERY MEASURING MODULE 2511 PROFINET

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#### 1. Introduction

This quick start guide describes an approach how you can configure the 2511 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.



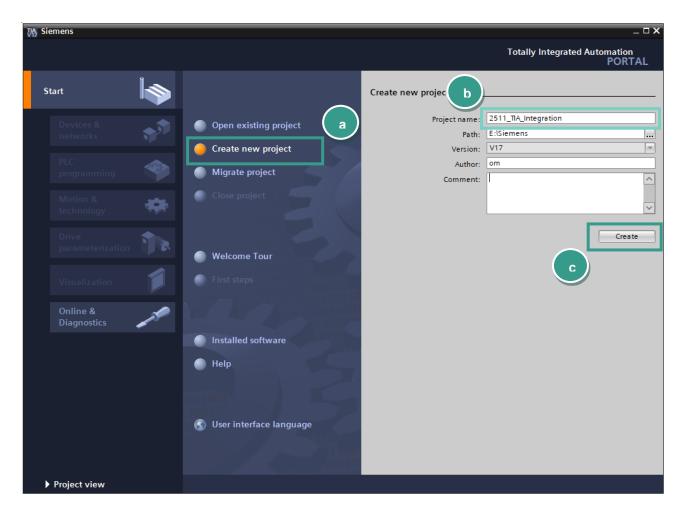
## NOTE

Please also note that you will have to use the 2511 PROFINET manual to get futher information about input and output parameters (cyclic as well acyclic data transfer).



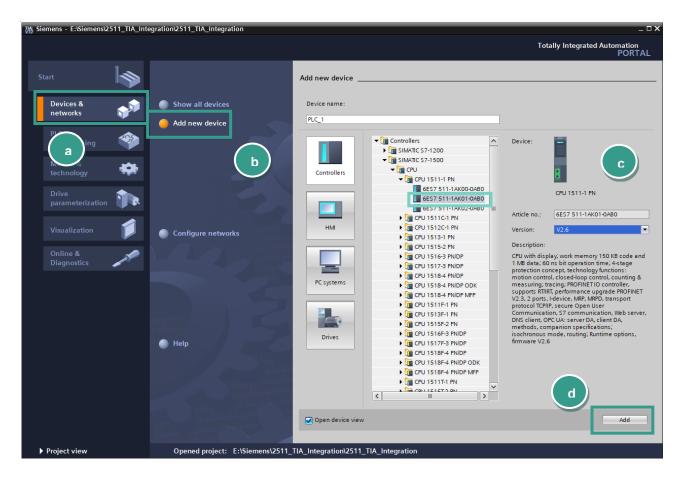
#### 2. Creating new project

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



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



#### 3. Installation of GSDML files

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- **Note:** Please make sure that your GSDML file is compatible to the field bus firmware in the 2511. The latest GSDML file is available for download on <u>www.burster.com/en/download-area</u>. 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)

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	Name Addres	s	7		•	<add new=""></add>					

Navigate to your 2511 GSDML directory (a)(you will find the GSD files on <u>www.burster.com/en/download-area</u> select the GSDML file (b) and click *Install* (c)

Manage general station description files 🛛 🗙 🗙								
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Source path:	:\Embedded\2511BE	8\firmware\src\@	SSDM					
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#### 4. Creation of network connections

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

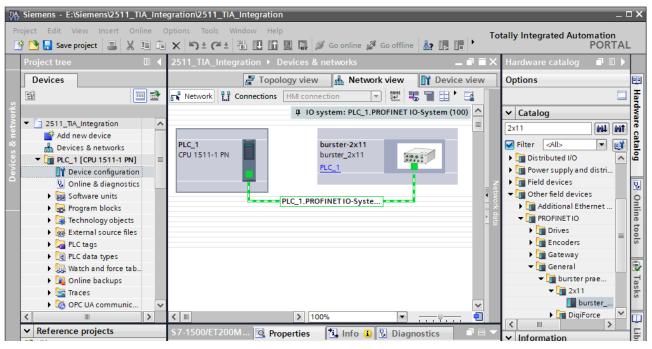
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	Ethernet addresses V ( III	> > Information V							
Portal view	/ 🛗 Devices & ne	ject 2511_TIA_Integration was							

• Now select the **burster\_2x11** device in the catalog and drag & drop it into the working area (a):

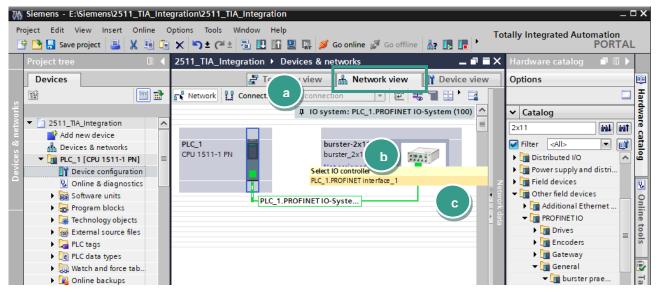
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		▼ PROFINETinterface [X1]			
		General Article no.: 2x11-Vxx			
		Ethernet addresses		~	
	<ul> <li>Portal view</li> <li>Overview</li> </ul>	v 🛗 Devices & ne			



• Select an Ethernet port on the S7 and hold the left mouse button down to connect the S7 with 2511:



• If device is not automatically assigned, change now to **Network view** (a) to assign a controller to the 2511. Click on the link "Not assigned" (b) of 2x11 and select your controller (c):



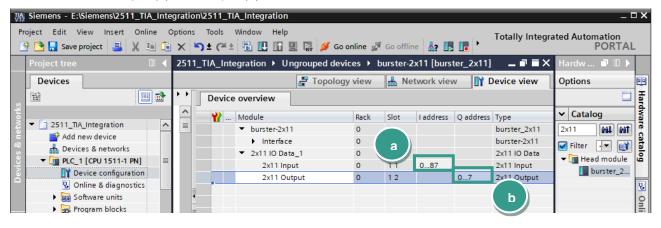
**Note:** Check if devices also connected physically to the right ports. You find the port number assignment directly on the device front side.

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• Next, click on the *burster-2x11* device (a) and then switch to **Device view** (b)

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	Technology objects	2 🛱 👻 🛅 PROFINET	0							

• Make a note of Input (a) and Output (b) addresses



#### 5. Create a sample program

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In this section, you will learn how to create a simple program to start a measurement process and read the measurement value from 2511. You will need to refer to section *PROFINET data protocol* of the **2511 ProfiNet Interface Manual** to understand the meaning of input and output bytes.

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

Project tree			egration ► U		-				_ # = ×	Hardw .	PORTA ∎ □ ►
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Online & diagnostics											
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Program blocks											
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Main [OB1]											
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External source files											
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- 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):

Add new block			×
Name:			
Cyclic interrupt			
		С	
a Organization block	<ul> <li>Program cycle</li> <li>Startup</li> <li>Time delay interrupt</li> <li>Cyclic interrupt</li> <li>Hardware interrupt</li> <li>Time error interrupt</li> <li>Diagnostic error interrupt</li> </ul>	Language: Number: Cyclic time (µs):	SCL 30 Manual Automatic 1000000 Enter a value between 50
FB	Pull or plug of modules	Description:	60000000.
	Rack or station failure		' OB allows you to start
Function block	Programming error	programs at perio	dic intervals, cyclic program execution.
	IO access error	The intervals can l	be defined in this dialog or
	💶 Time of day 🍋 MC-Interpolator	in the properties o	of the OB.
	MC-Interpolator		
-FC	MC-PreServo		
Function	MC-PostServo		
	Synchronous Cycle		
	Status		
	Update		
DB	- Profile		
Data block		more	
		morem	
<ul> <li>Additional inform</li> <li>Add new and open</li> </ul>	nation		OK Cancel

• Declare 3 new variables in\_cell\_voltage, out\_meas\_start and in\_ready under PLC Tags:

Project Edit View Insert Online Options Tools Window Help 🜁 🎦 🖬 Save project 昌 🐰 🗐 🗊 🗙 🏹 🛨 🍽 🖫 🔃 🖺 🖳 🖉 🕼 🖉 Go online 🖉 Go offline 🎎 🖫 🕼 🧏 🚽 💷 <										
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6 -		PLC	tags							
🗧 🔻 📋 2511_TIA_Integration			Name	Tag table	Data type	Address	Retain	Acces	Writa	Visibl
🗧 📑 Add new device		1 🕣	in_cell_voltage	Default tag table	Real	%ID14				
🗄 Devices & networks		2 🕣	out_meas_start	Default tag table	Bool	%Q0.0				
PLC_1 [CPU 1511-1 PN]		3 🕣	in_ready	Default tag table	Bool	%10.0				
2 Device configuration		4	<add new=""></add>		•			<b>v</b>	<b>V</b>	<b>V</b>

**Note:** Please use your note from Chapter *Creation of network connections* of Input and Output addresses, as they can be differtent in your PLC. Alternatively check them in the Device view  $\rightarrow$  Device overview of the 2511. The meaning of the addresses is described in *2511 Profinet Interface Manual.* 



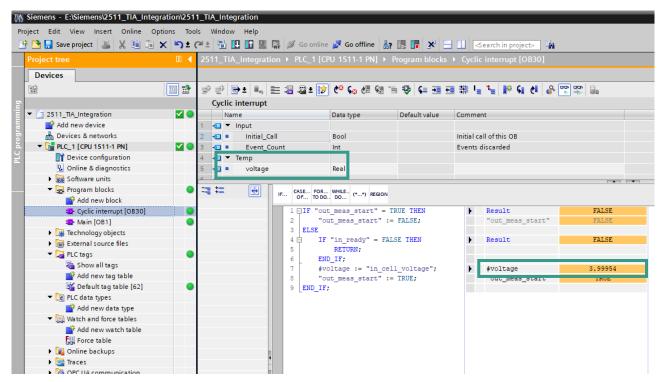
• Then type in the following source code in the code field of the new block:

```
IF "out_meas_start" = TRUE THEN
    "out_meas_start" := FALSE;
ELSE
    IF "in_ready" = FALSE THEN
        RETURN;
    END_IF;
#voltage := "in_cell_voltage";
    "out_meas_start" := TRUE;
END_IF;
```

```
// is the output bit 'measuremet start set'
// then reset ist
// is devide ready
// if not, return
```

// read and strore voltage value
// start a new measurement

**Note:** You only need the '**voltage**' variable if your PLC supports debug mode, so you can watch the measured voltage directly in the source code, like this:



Before you load the project into the CPU you have to set the IP address 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) for your PLC:

PLC_1 [CPU 1	511-1 PN]					<b>Q</b> Properties	L Info	<ol> <li>Diagnostics</li> </ol>		•
General	IO tags	System	constants	Texts						
<ul> <li>PROFINET inte General Ethernet a Time synch Operating</li> <li>Advanced Web serve Hardware Startup Cycle Communicat</li> </ul>	formation ion & Maintena erface [X1] addresses hronization mode options er access identifier ion load clock memory		Ethemet addr Interface n IP protocol	etworked	with Subnet:	Add news	in the proje ess: 192 ask: 255	. 168 . 110 . 33 . 255 . 255 . 0	•	<ul> <li>III</li> </ul>
General Alarm sett Web server Display User interface	5		PROFINET			_		set directly at the device e name automatically		•

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):

Extended download to	o device		_				×	
	Configured access	nodes of "PLC_1"						
	Device	Device type	Slot	Interface type	Address	Subnet		
	PLC_1	CPU 1511-1 PN	1 X1	PN/IE	192.168.110.33	PN/IE_1		
	Type of the PG/PC interface:					•	]	
		PG/PC inte	rface:	Realtek PCIe G	BE Family Controller		1 🕐 🔯	
	C	onnection to interface/si	ubnet:	Direct at slot '1		•	1 🕤	
		1st gat	terver.				)   💮	
		i st gat	ie way.				JV	
	Select target device	e:			Show all compatible	devices	•	
	Device	Device type	Interfa		dress	Target device		
	PLC_1	CPU 1511-1 PN	PN/IE	193	PLC_1			
		-	PN/IE	Acc	Access address			
8								
Flash LED								
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						<u>S</u> tart	search	
Online status informatio	n:			(	Display only error n	nessages		
<ol> <li>Scan completed. 1</li> </ol>	compatible devices of	3 accessible devices for	und.				^	
🗹 Scan and information	on retrieval completed							
retrieving device in	formation						=	
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					Load	<u>C</u> á	ncel	



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## BATTERY MEASURING MODULE 2511 PROFINET

• To watch the measurement value, go to **Watch and force tables** → **Add new watch table** (a) and add the variable **in\_cell\_voltage** to the table (b):

Siemens - E:\Siemens\2511_TIA_Integration\2511_TIA_Integration									
Project Edit View Insert Online Options Tools Window Help									
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	🥩 🛃 🕼 🦻 🗤 🦻 📴								
6u	i Home ress	Display format Monitor value Modify value							
📫 Add new data type 💦 🔊	1 "in_cell_voltage" 🔳 %ID14	Floating-poin 💌							
🗧 💌 🛄 Watch and force tables 🛛 🖉 🖉	2 <a>Add new&gt;</a>								
Add new watch table									
E Force table									
Watch table_1									

• Now click on "Go online" (a) and then "Monitor all" (b) to watch the value of in\_cell\_voltage

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PLC pr	dd new data t ▼ (◯ Watch and force ta Add new watc			ERROR STOP ASK
	Force table      Watch table_1      Online backups      Traces      OPC UA communi		Measurement value of cell voltage.	de selector: RUN Libraries

#### 6. Further Examples

In the followed examples, a *Hardware-ID* is used to access a certain slot. To find this, please select a **burster-2x11** 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. *BusCoupler Data extended* and select **Properties**:

2511_TIA_Integration  ► Ungrouped devices  ► bur	ster-2x11 [burster_2x	11]			_	∎≡×
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	<u>^</u>	🔐 Module		Rack	Slot	I addre
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3.22		Interview	rface	0	0 X1	
ange 211		▼ 2x11 K	Data_1	0	1	
N.		2x1	1 Input	0	11	087
	•	2x1	1 Output	0	12	
<b>•</b>						
	~					
< Ⅲ > 100% ▼	· · · · · · · · · · · · · · · ·	<	1111			>
2x11 IO Data_1 [2x11 IO Data]		Properties	🗓 Info 追 🗓	Diagnostic	s	∎ = ▼
General IO tags System constants T	exts					
Show hardware system constant 💌						
Name	Туре	Hardware identi.	Used by	Comment		
burster-2x11~2x11_IO_Data_1	Hw_SubModule	263	PLC_1			
burster-2x11~2x11_IO_Data_1~2x11_Input	Hw_SubModule	264	PLC_1			
burster-2x11~2x11_IO_Data_1~2x11_Output	Hw_SubModule	265	PLC_1			

#### • You will see the hardware identifier in the tab System constants:

2511_	_TIA_Ir	ntegration 🕨 Ungrouped	I devices →	burste	r-2x11 [bu	rster_2x11	1]			_ 7	
						<b>.</b>	Topology view	Network	: view 🛛 🚺 🕻	Device vie	ew
	Device	e overview									
	<b>''</b>	Module	Rack	Slot	I address	Q address	Туре	Article no.	F	irmware	C.
		<ul> <li>burster-2x11</li> </ul>	0	0			burster_2x11	2x11-Vxxx			
-		Interface	0	0 X1			burster-2x11				
۶.		<ul> <li>2x11 IO Data_1</li> </ul>	0	1			2x11 IO Data				
-		2x11 Input	0	11	087		2x11 Input				
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P	burste	r-2x11~2x11_IO_Data_1		Hv	v_SubModule	e _	263	PLC_1			
P	burste	r-2x11~2x11_IO_Data_1~2x1	I_Input	Hv	v_SubModule	e	264	PLC_1			
,a	burste	r-2x11~2x11_IO_Data_1~2x1	I_Output	Hv	v_SubModule	•	265	PLC_1			

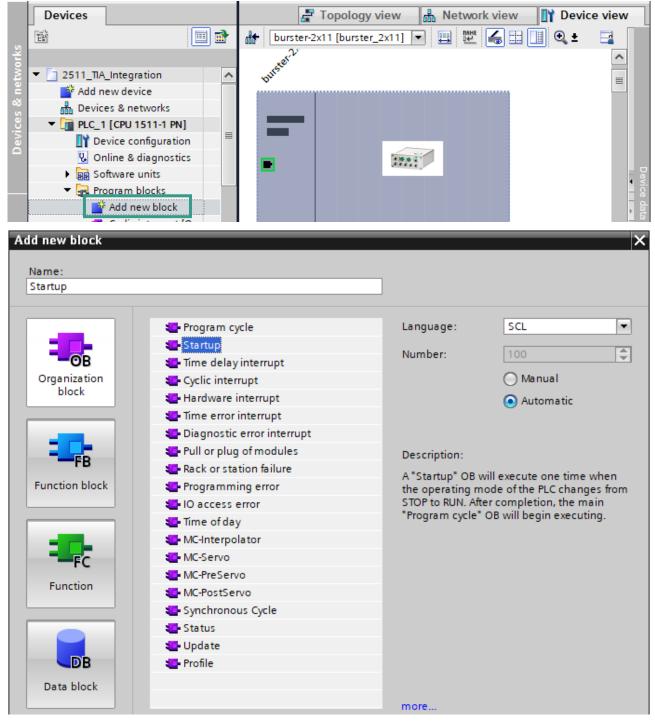


#### 6.1. Reading of 'string' data types

Example 1: Reading the serial number of the digital board of 2511

In this example, we perform a read access on index 11 to get the serial number of 2511. For these acyclic operations, you will need an instance of a RDREC block.

Add a Startup block to the Program blocks using Add new block:



• Add variables to the Startup block:

	Project tree	•		ı )	PLC_	1 [CPU 1511-1 PN] → Pr	rogram blocks 🔸 S	tartup [OB100]	_₽≣>	×
	Devices									
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2				Sta	rtup					
Ē	Device configuration	^	-		Name		Data type	Default value	Comment	
am	Online & diagnostics		4	-00	▼ Te	mp			1	^
160	Software units		5		•	Valid	Bool			
E.	🔻 🔂 Program blocks		6	-00	•	Busy	Bool			
FC	💣 Add new block		7	-00	•	Error	Bool			
	💶 Cyclic interrupt [O		8	-00	•	Status	DWord			
	💶 Main [OB1]		9	-00	•	Done	Bool			
	🔁 Startup [OB100]		10	-00	•	LenRead	UInt			
	🥃 Data_block_1 [DB1]		11	-00	• •	Serial	Array[019] of Byte			~

#### • Then add a new **Data block**:

Add new block				×
Name:				
Data_block_1				
	Type:	🧧 Global DB 💌		
OB	Language:	DB		
Organization block	Number:	1		
		🔿 Manual		
		<ul> <li>Automatic</li> </ul>		
FB	Description:			
Function block	Data blocks (DBs) s	ave program data.		
FC				
Function				
Data block				
	more			
> Additional informa	tion			
Add new and open			ОК	Cancel

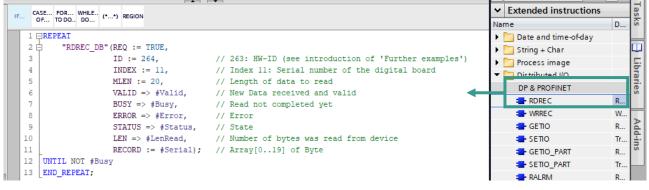
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• In addition, insert the variable **device\_serial** into this new block:

Project tree			PL	C_1	I [CPU 1511-1 PN] → P	rogram blocks 🕨 D	ata_block_1 [D	B1] _ i	×∎ י
Devices									
1 I I I I I I I I I I I I I I I I I I I		ø	1	<b>)</b> (	🔩 🋃 🚞 🚏 Keepa	ctual values 🛛 🔒 Sn	apshot 🖷 🖳	•	
			Da	ta_	_block_1				
🔻 🔙 Program blocks	^	-	-	Na	me	Data type	Start value	Retain	Acce
📫 Add new block		1		•	Static				
📲 Cyclic interrupt [O		2		•	device_serial	String			<b></b>
📲 Main [OB1]		3			<add new=""></add>				
Startup [OB100]							-		
j Data_block_1 [DB1]									

• Drag & Drop the **RDREC** instruction into the editor field and use the following source code to get the serial number from the device:



#### Source code:

REPEAT	
"RDREC_DB"(REQ:=TRUE,	
ID:=264,	// 264: HW-ID (see introduction of 'Further examples')
INDEX:=11,	// Index 11: Serial number of the digital board
MLEN:=20,	// Length 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:= #serial);	// Array[019] of Byte
UNTIL NOT #Busy	
END_REPEAT;	
<b>IF</b> #Error = <b>T</b> RUE <b>OR</b> #Status	
<b>RETURN</b> ;	
END IF;	
,	
Chars_TO_Strg(Chars:=#serial	, // Convert to string
pChars:=0,	
Cnt:=19,	
Strg=>"Data_block_1"	".device_serial);

• Add now the variable to your **Watch table** and set the PLC into the **RUN** mode:

251	1_TL	A_Integration   PLO	C_1 [CPU 1511-1	PN] 🕨 Watch and	l force tables 🔸	Watch table_1			
<b>*</b>	2	1Å 📝 🗓 🖋 1 🗞	🖉 👺 🖺						
_	i	Name	Address	Display format	Monitor value	Modify value	9	Comment	
1		"in_cell_voltage"	%ID14	Floating-point nu	0.58885				
2		"Data_block_1" 🔳		String 💌	'649810'				
3			<add new=""></add>						

**Note:** Datatype **String** in TIA Portal contains two additional bytes, which represent the length of the string. To cut off these two bytes, use the function '*Chars\_TO\_Strg*' to convert the byte array to a String data type.



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#### BATTERY MEASURING MODULE 2511 PROFINET

#### 6.2. Read and Write of 'real' data types

Example 2: Set and Get the Limit Rdc – Lower Value

This example shows you how to write and read the Lower Limit  $\mathsf{Rdc}$  in  $[m\Omega]$ 

• Add the needed variables to the parameters table:

25	11_	TIA	▲_Integration   PLC_1 [CP	U 1511-1 PN] 🕨 Pi	rogram blocks	Startup [OB100]
2	1	2	🕽 ± 🐛 🖿 🖀 🖀 ± 😥	e° 🐝 🖑 🖷 🗎	⊉ ⊊ 표 표	# 노 노 씨 씨 씨 말 약 🛍
	Sta	artu	ip			
		Na	me	Data type	Default value	Comment
4	-00	•	Temp			
5		•	Valid	Bool		
6		•	Busy	Bool		
7		•	Error	Bool		
8	-00	•	Status	DWord		
9		•	Done	Bool		
10	-00	•	LenRead	UInt		
11	-00	•	Limit_Rdc_Low_To_Set	Real		

• Add the variable Limit\_Rdc\_Low\_Read to a data block as shown in the example 1 above

25	11_	_TI/	A_Integration   PLC_1	[CPU 1	511-1 PN] 🕨	Program blo	cks 🕨 Data_	_block_1 [DB	1]		
2	1	8	🐛 🋃 🧮 🚏 Keep ac	tual valu	es 🔒 Sna	apshot 🖳 🖳	, Copy snapsł	nots to start val	ues 💦	🖳 Load	start values a
	Da	ta_	block_1								
		Na	me	Data typ	e	Start value	Retain	Accessible f	Writa	Visible in	Setpoint
1		-	Static								
2	-		Limit_Rdc_Low_Read	Real		0.0		<b></b>			
З	æ	•	device_serial	String		н				<b></b>	

• Use the following source code to write the value 0.525 as Limit A Lower Value and then read it back:

```
# Limit Rdc Low To Set := 0.525;
REPEAT
   "WRREC DB"(REQ := TRUE,
                                                            // Write access
          ID := 264,
                                                            // Hardware-ID (see section 'Further examples')
          INDEX := 33,
                                                            // Index 33 to set the Lower Limit Rdc
          LEN := 4,
                                                            // Length in bytes to write
          DONE => #Done,
          BUSY => #Busy,
          ERROR => #Error,
          STATUS => #Status,
          RECORD := # Limit Rdc Low To Set);
UNTIL NOT #Busy AND #Done
END REPEAT;
IF #Error = TRUE OR #Status <> 0 THEN
                                                            // If write failed \rightarrow return
 RETURN:
END IF;
REPEAT
   "RDREC DB"(REQ := TRUE,
                                                            // Read access
                                                            // Hardware-ID (see 'Further examples')
          ID := 264,
          INDEX := 33,
                                                            // Index 33 to read the Lower Limit Rdc
```

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MLEN := 4,
VALID => #Valid,
BUSY => #Busy,
ERROR => #Error,
STATUS => #Status,
$LEN \Rightarrow #lenRead,$
RECORD := "Data block 1".
Limit Rdc Low Read);
UNTIL NOT #Busy

**END\_REPEAT;** 

// Number of bytes read // Lower Limit Rdc

// Max. length of bytes to read

 Check that the value of the variable Limit\_Rdc\_Low\_Read is identical to the value of Limit\_Rdc\_Low\_To\_Set:

2511_TIA_Integration → PLC_1 [CPU 1511-1 PN] → Watch and force tables → Watch table_1
---

<i>≇ ≇ № </i>							
	i	Name	Address	Display format	Monitor value	Modify value	4
1		"in_cell_voltage"	%ID14	Floating-point nu	0.54332		
2		"Data_block_1".device_serial		String			
3		"Data_block_1".Limit_Rdc_Low_Read		Floating-point nu	0.525		