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# SINAMICS G120C: Speed Control with S7-1200 via USS

SINAMICS G120C / V1.0 /

<https://support.industry.siemens.com/cs/ww/en/view/109764624>

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# 1 Task

**NOTICE** This reference only can be used in China and India.

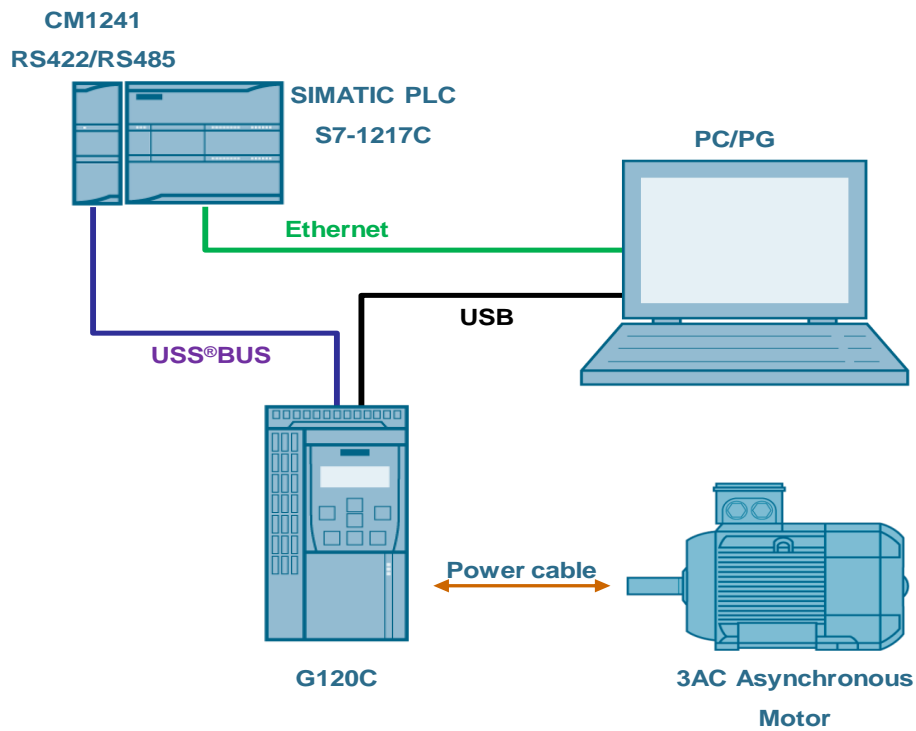
## Introduction

SINAMICS G120C drives are able to exchange data via the RS485 interface and via USS with a SIMATIC S7-1200 controller.

## Overview of the automation task

The figure below provides an overview of the automation task.

Figure 1-1: Overview of the automation task

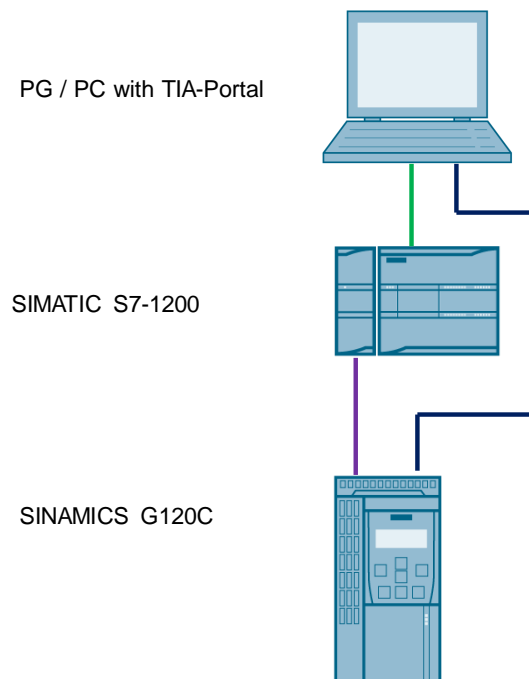


## 2 Solution

### Schema Display

The following figure displays the most important components of the solution:

Figure 2-1: Overview of the most important components



### Delimitation

This application does not include a description of

- SINAMICS G120C version
- BOP-2 operation of SINAMICS G120C

Basic knowledge of these topics is assumed.

### Required knowledge

Basic knowledge on TIA Portal is assumed.

## 2.1 Hardware and Software Components

### 2.1.1 Validity

This application example is valid for

- TIA Portal V15 Professional
- S7-1200 CPU V4.1
- SINAMICS G120C USS V4.7.6

### 2.1.2 Used Components

The application was generated with the following components:

#### Hardware components

Table 2-1: Hardware components

Component	No.	Article number	Note
SIMATIC S7-1200 1217C DC/DC/DC	1	6ES7 217-1AG40-0XB0	V4.1
CM1241 RS422/RS485	1	6ES7 241-1CH32-0XB0	V2.1
SINAMICS G120C	1	6SL3210-1KE15-8UB1	V4.7.6

#### Standard software components

Table 2-2: Standard software components

Component	No.	Article number	Note
TIA Portal Professional	1	6AV2103-0AA05-0AA7	V15
Startdrive	1	6SL3072-4FA02-0XA0	V15

#### Sample files and projects

The following list includes all files and projects that are used in this example.

Table 2-3: Sample files and projects

Component	Note
109764624_G120C_USS-communication_PROJ_V10	Project file
109764624_G120C_USS-communication_DOC_V10_en.pdf	Reference document

## 3 Basics of USS introduction

The USS protocol uses a master/slave network for communication via a serial bus. The mater (SIMATIC controller) sends the message to the selected slave (SINAMICS G120C). A slave cannot send without having received a request for sending. Direct information transmission between the slaves is not possible. USS communication takes place in half duplex operation.

### 3.1 Implementation with SIMATIC S7-1200

Use the following system instructions:

- USS\_PORT  
To process communication via the USS network
- USS\_DRV  
To prepare the send data and evaluate the response data

These system instructions can be found in the *Instructions* task card,

Figure 3-1: USS instructions for S7-1200

Communication		
Name	Description	Version
<ul style="list-style-type: none"> <li>S7 communication <ul style="list-style-type: none"> <li>GET</li> <li>PUT</li> </ul> </li> <li>Open user communication <ul style="list-style-type: none"> <li>TSEND_C</li> <li>TRCV_C</li> <li>TMAIL_C</li> <li>Others</li> </ul> </li> <li>WEB Server <ul style="list-style-type: none"> <li>WWW</li> </ul> </li> <li>Others <ul style="list-style-type: none"> <li>MODBUS TCP</li> </ul> </li> <li>Communication processor <ul style="list-style-type: none"> <li>PtP Communication</li> <li>USS communication</li> <li>MODBUS (RTU)</li> <li>Point-to-point</li> <li>USS <ul style="list-style-type: none"> <li>USS_PORT</li> <li>USS_DRV</li> <li>USS_RPM</li> <li>USS_WPM</li> </ul> </li> </ul> </li> <li>MODBUS</li> <li>GPRComm: CP1242-7</li> <li>TeleService</li> </ul>	<ul style="list-style-type: none"> <li>Read data from a remote CPU</li> <li>Write data to a remote CPU</li> <li>Establishing a connection and sending data</li> <li>Establishing a connection and receiving data</li> <li>Send e-mail</li> <li>Synchronizing user-defined web pages</li> <li>MODBUS TCP</li> <li>PtP Communication</li> <li>USS communication</li> <li>MODBUS (RTU)</li> <li>Point-to-point</li> <li>USS <ul style="list-style-type: none"> <li>Edit communication via USS network</li> <li>Swap data with drive</li> <li>Readout parameters from the drive</li> <li>Change parameters in the drive</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>V1.3</li> <li>V1.3</li> <li>V1.3</li> <li>V4.1</li> <li>V3.0</li> <li>V3.0</li> <li>V3.0</li> <li>V1.1</li> <li>V1.1</li> <li>V4.2</li> <li>V2.4</li> <li>V3.1</li> <li>V3.1</li> <li>V1.0</li> <li>V1.1</li> <li>V1.1</li> <li>V1.1</li> <li>V2.2</li> <li>V1.3</li> <li>V1.9</li> </ul>

## 3.2 USS system instructions

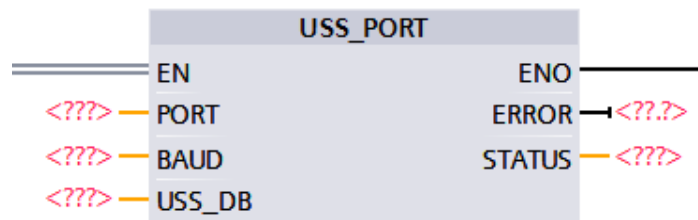
### 3.2.1 USS\_PORT (S7-1200)

#### Description

The *USS\_PORT* instruction handles communication over the USS network. In the program, use one *USS\_PORT* instruction per PtP communications port to control the transmission.

All USS instructions that are assigned to the same USS network and same PtP communications port must use the same instance data block.

Figure 3-2: *USS\_PORT* system instruction



#### Parameters

The following table shows the parameters of the *USS\_PORT*

Table 3-1: Parameter list of *USS\_PORT*

Parameter	Declaration	Data type	Memory area	Description
PORT	Input	PORT	D,L or constant	PtP communication port identifier. Constant that can be referenced within the <i>Constants</i> tab of the default tag table.
BAUD	Input	DINT	I,Q,M,D,L or constant	Baud rate for USS communication. For example: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200
USS_DB	InOut	USS_BASE	D	Reference to the instance DB of the <i>USS_DRIVE</i> instruction.
ERROR	Output	BOOL	I,Q,M,D,L	ERROR is set to TRUE if an error occurs.
STATUS	Output	WORD	I,Q,M,D,L	Status value of the request. Additional information is available in the <i>USS_Extended_Error</i> tag for some status codes.

**NOTE** The input value used in this application will be described in chapter [3.4](#).



### 3.2.2 USS\_DRV (S7-1200)

#### Description

The *USS\_DRV* instruction exchanges data with the drive. A separate instruction must be used for each drive, but all USS instructions assigned to the same USS network and same PtP communications module must use the same instance data block. You must create the DB name when you call the first *USS\_DRV* instruction.

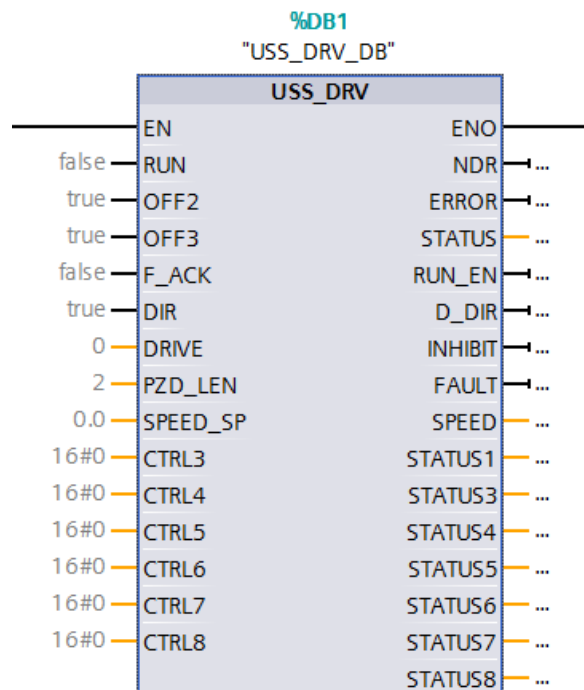
When the *USS\_DRV* instruction is executed the first time, the drive indicated by the USS address (parameter *DRIVE*) is initialized in the instance DB. After this initialization, subsequent *USS\_PORT* instructions can start communication with the drive at this drive number.

You can control the drive direction of rotation using either the *DIR* (BOOL) input or using the sign (positive or negative) at the *SPEED\_SP* (REAL) input. The following table explains how these inputs work together to determine the drive direction, assuming the motor is wired for forward rotation.

Table 3-2: Drive direction

SPEED_SP	DIR	Direction of rotation of drive
Value > 0	0	Reverse
Value > 0	1	Forward
Value < 0	0	Forward
Value < 0	1	Reverse

Figure 3-3: *USS\_DRV* system instruction



## Parameters

The following table shows the parameters of the *USS\_DRV* instruction:

Table 3-3: Parameter list of *USS\_DRV*

Parameter	Declaration	Data type	Memory area	Description
RUN	Input	BOOL	I,Q,M,D,L or constant	Drive start, On/OFF1
OFF2	Input	BOOL	I,Q,M,D,L or constant	Coast stop
OFF3	Input	BOOL	I,Q,M,D,L or constant	Fast stop
F_ACK	Input	BOOL	I,Q,M,D,L or constant	Fault acknowledge
DIR	Input	BOOL	I,Q,M,D,L or constant	Drive direction
DRIVE	Input	USINT	I,Q,M,D,L or constant	Drive address
PZD_LEN	Input	USINT	I,Q,M,D,L or constant	Word length
SPEED_SP	Input	REAL	I,Q,M,D,L or constant	Speed setpoint
NDR	Output	BOOL	I,Q,M,D,L	New data ready
ERROR	Output	BOOL	I,Q,M,D,L	Error occurred
STATUS	Output	WORD	I,Q,M,D,L	Status value of the request
RUN_EN	Output	BOOL	I,Q,M,D,L	Run enabled
D_DIR	Output	BOOL	I,Q,M,D,L	Drive direction
INHIBIT	Output	BOOL	I,Q,M,D,L	Drive inhibited
FAULT	Output	BOOL	I,Q,M,D,L	Drive fault
SPEED	Output	REAL	I,Q,M,D,L	Drive actual speed

### NOTE

The input value used in this application will be described in chapter [3.4](#).

### 3.3 Details of G120C USS function

#### 3.3.1 Control word 1 (STW1)

Table 3-4: Control word 1 (STW1)

Bit	Significance	Explanation	Signal interconnection in the inverter
0	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The inverter switches off the motor at standstill.	p0840[0]=r2090.0
	0 → 1 = ON	The inverter goes into the "ready" state. If, in addition bit 3 = 1, then the inverter switches on the motor.	
1	0 = OFF2	Switch off the motor immediately, the motor then coasts down to a standstill	p0844[0]=r2090.1
	1 = No OFF2	The motor can be switched on (ON command).	
2	0 = Quick stop (OFF3)	Quick stop: The motor brakes with the OFF3 ramp-down time p1135 down to standstill.	p0848[0]=r2090.2
	1 = No quick stop (OFF3)	The motor can be switched on (ON command)	
3	0 = Inhibit operation	Immediately switch-off motor (cancel pulses).	p0852[0]=r2090.3
	1 = Enable operation	Switch-on motor (pulses can be enabled).	
4	0 = Disable RFG	The inverter immediately sets its ramp-function generator output to 0.	p1140[0]= r2090.4
	1 = Do not disable RFG	The ramp-function generator can be enabled.	
5	0 = Stop RFG	The output of the ramp-function generator stops at the actual value.	p1141[0]=r2090.3
	1 = Enable RFG	The output of the ramp-function generator follows the setpoint.	
6	0 = Inhibit setpoint	The inverter brakes the motor with the ramp-down time p1121 of the ramp-function generator	p1142[0]=r2090.6
	1 = Enable setpoint	Motor accelerates with the ramp-up time p1120 to the setpoint.	
7	0 → 1 = Acknowledge faults	Acknowledge fault. If the ON command is still active, the inverter switches to the "switching on inhibited" state.	p2103[0]=r2090.7
8,9	Reserved		
10	0 = No control via PLC	Inverter ignores the process data from the fieldbus.	p0854[0]=r2090.10
	1 = Control via PLC	Control via fieldbus, inverter accepts the process data from the fieldbus.	
11	1 = Direction reversal	Invert setpoint in the inverter.	p1113[0]=r2090.11
12	Reserved		
13	1 = MOP up	Increase the setpoint saved in the motorized potentiometer.	p1035[0]=r2090.13

Bit	Significance	Explanation	Signal interconnection in the inverter
14	1 = MOP down	Reduce the setpoint saved in the motorized potentiometer	p1036[0]=r2090.14
15	Reserved		

### 3.3.2 Status word 1 (ZSW1)

Table 3-5: Status word 1 (ZSW1)

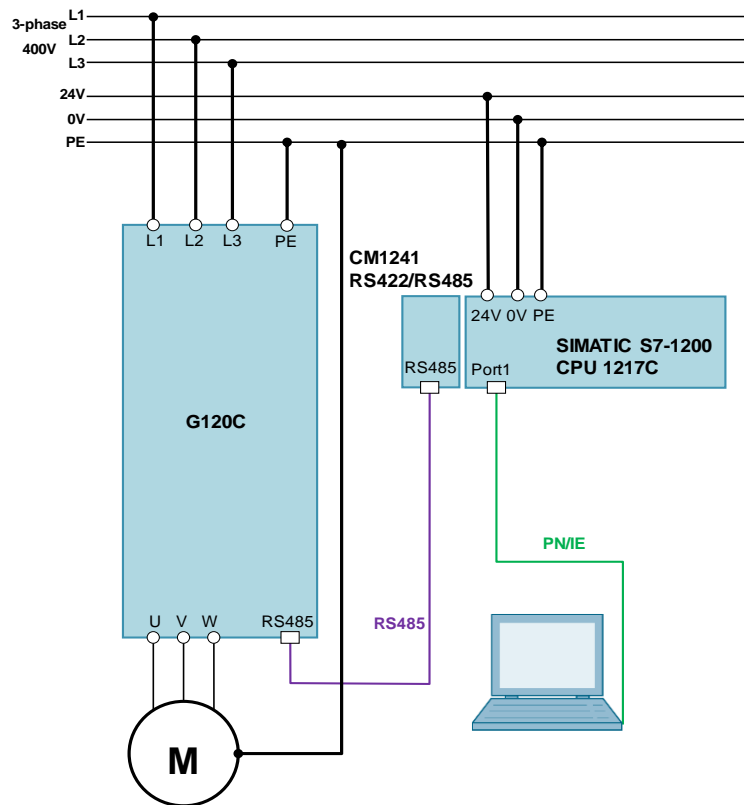
Bit	Significance	Remarks	Signal interconnection in the inverter
0	1 = Ready for switching on	Power supply switched on; electronics initialized; pulses locked.	p2080[0]=r0899.0
1	1 = Ready	Motor is switched on (ON/OFF = 1), no fault is active. With the command "Enable operation" (STW1.3), the inverter switches on the motor.	p2080[1]=r0899.1
2	1 = Operation enabled	Motor follows setpoint. See control word 1, bit 3.	p2080[2]=r0899.2
3	1 = Fault active	The inverter has a fault. Acknowledge fault using STW1.7.	p2080[3]=r2139.3
4	1 = OFF2 inactive	Coast down to standstill is not active.	p2080[4]=r0899.4
5	1 = OFF3 inactive	Quick stop is not active.	p2080[5]=r0899.5
6	1 = Switching on inhibited active	It is only possible to switch on the motor after an OFF1 followed by ON.	p2080[6]=r0899.6
7	1 = Alarm active	Motor remains switched on; no acknowledgement is necessary.	p2080[7]=r2139.7
8	1 = Speed deviation within the tolerance range	Setpoint / actual value deviation within the tolerance range.	p2080[8]=r2197.7
9	1 = Master control requested	The automation system is requested to accept the inverter control.	p2080[9]=r0899.0
10	1 = Comparison speed reached or exceeded	Speed is greater than or equal to the corresponding maximum speed.	p2080[0]=r2199.1
11	1 = Torque limit not reached	Comparison value for current or torque has been fallen below.	p2080[11]=r0056.13 /r1407.7
12	Reserved		p2080[12]=r0899.12
13	0 = Alarm, motor over temperature	--	p2080[13]=r2135.14
14	1 = Motor rotates clockwise	Internal inverter actual value > 0	p2080[14]=r2197.3
	0 = Motor rotates counterclockwise	Internal inverter actual value < 0	
15	0 = Alarm, inverter thermal overload		p2080[15]=r2135.15

### 3.4 Installation

The figure below shows the hardware configuration of the application:

<b>CAUTION</b>	<b>Wrong wiring can damage the drive!</b> In this application, the three phase 400V power supply is used. It is a must for you to check the supply voltage; otherwise, the drive can be damaged!
----------------	---

Figure 3-4



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Figure 3-2: USS communication between CM1241 and G120C

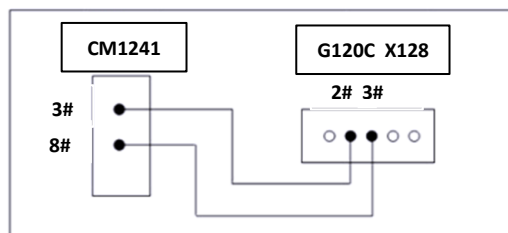
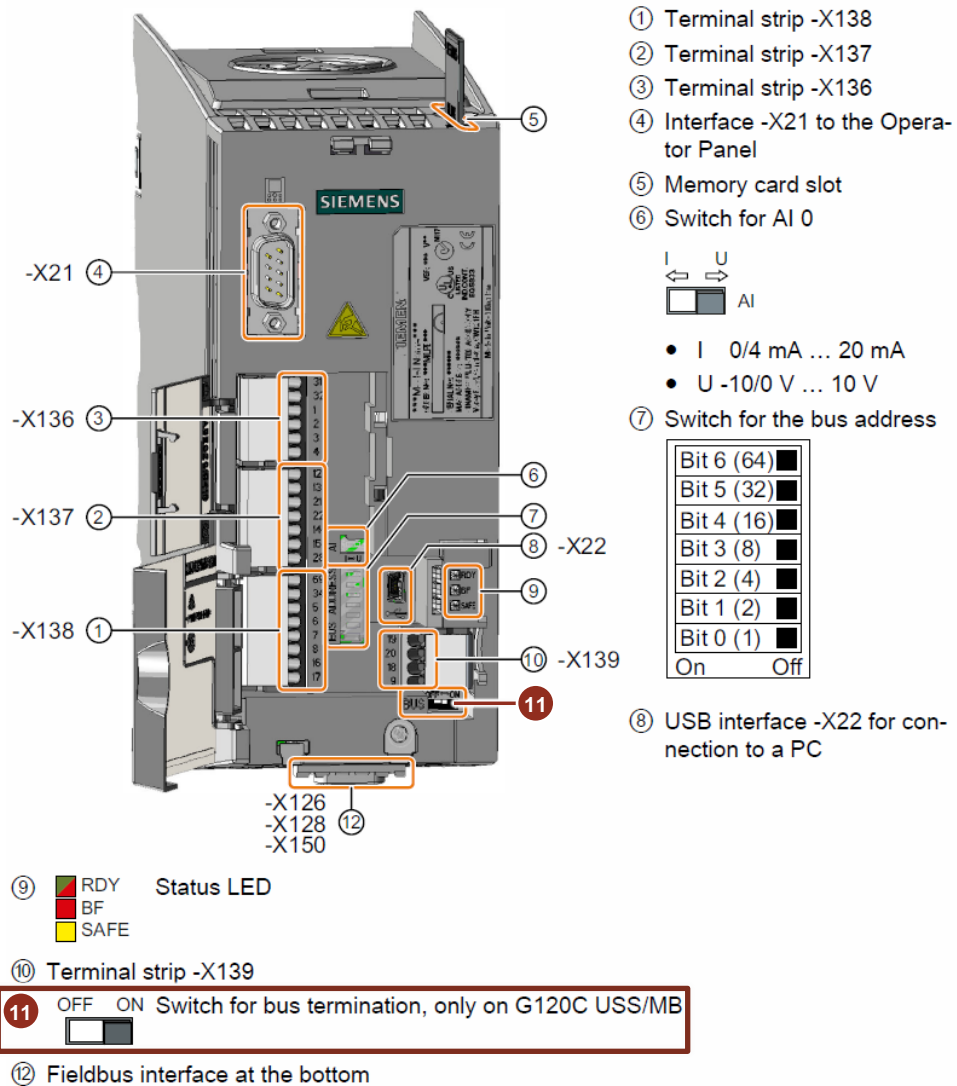


Figure 3-4: Position of the terminal bus switch (Frame sizes FSAA ... FSC)

To access the interfaces at the front of the Control Unit, you must lift the Operator Panel (if one is being used) and open the front doors.

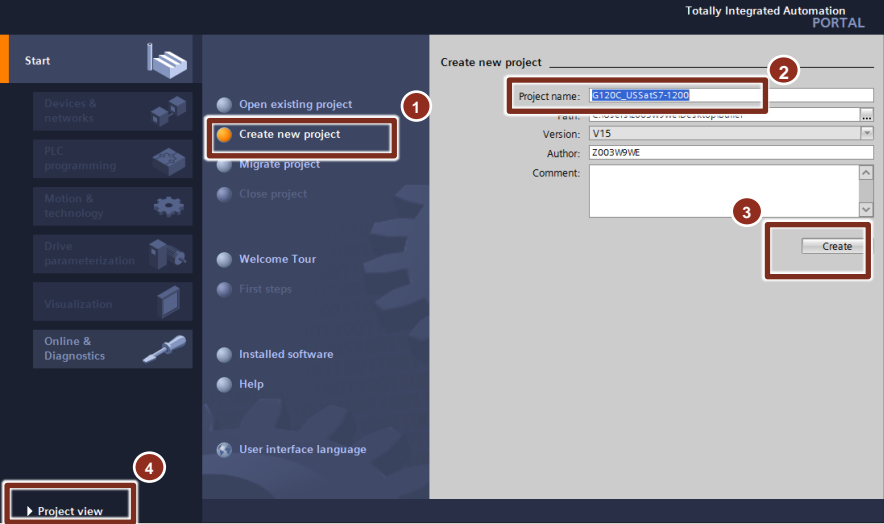
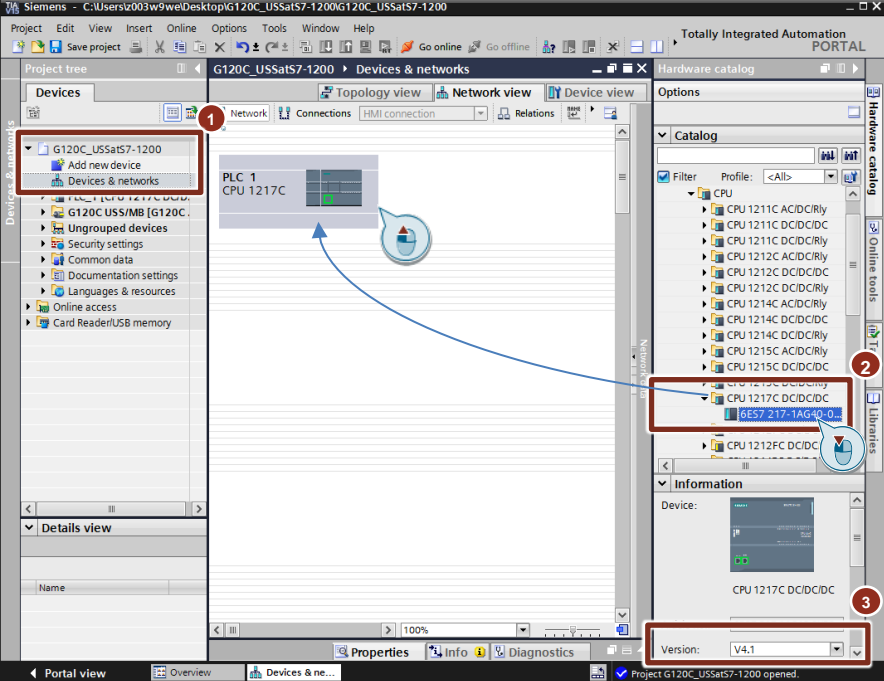


**NOTE** The position of the bus termination switch for the frame sizes FSD – FSF can be found in the G120C manual [\[3\]](#).

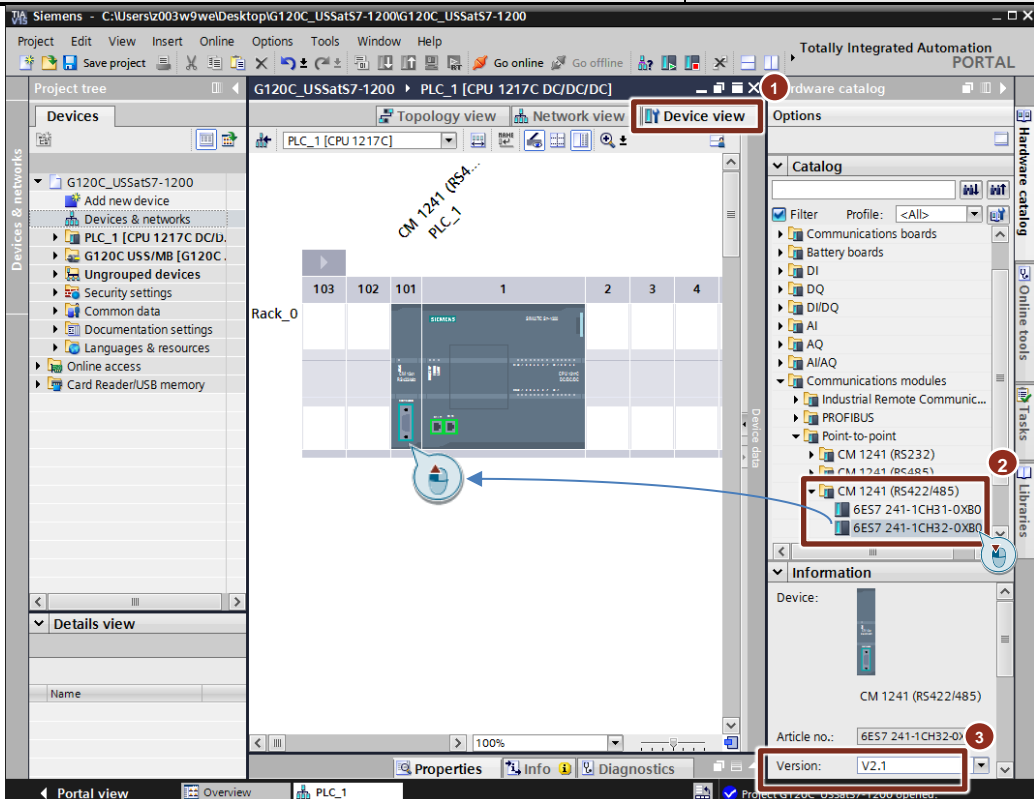
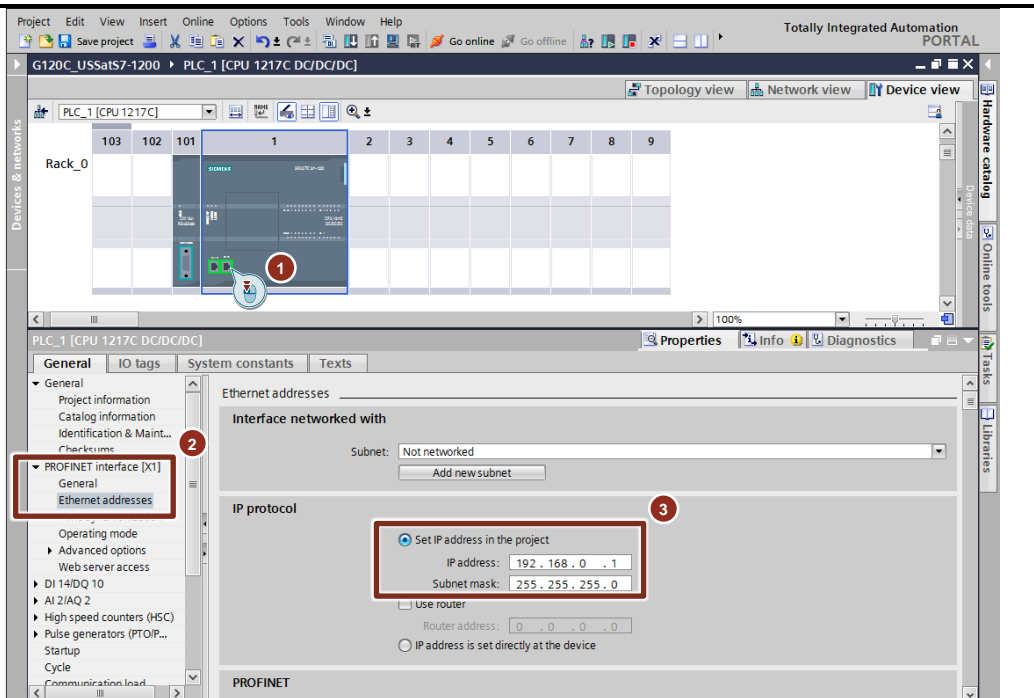
# 4 Configuration

## 4.1 Configure PLC project

Table 4-1 Creation of new project and configuration of the PLC

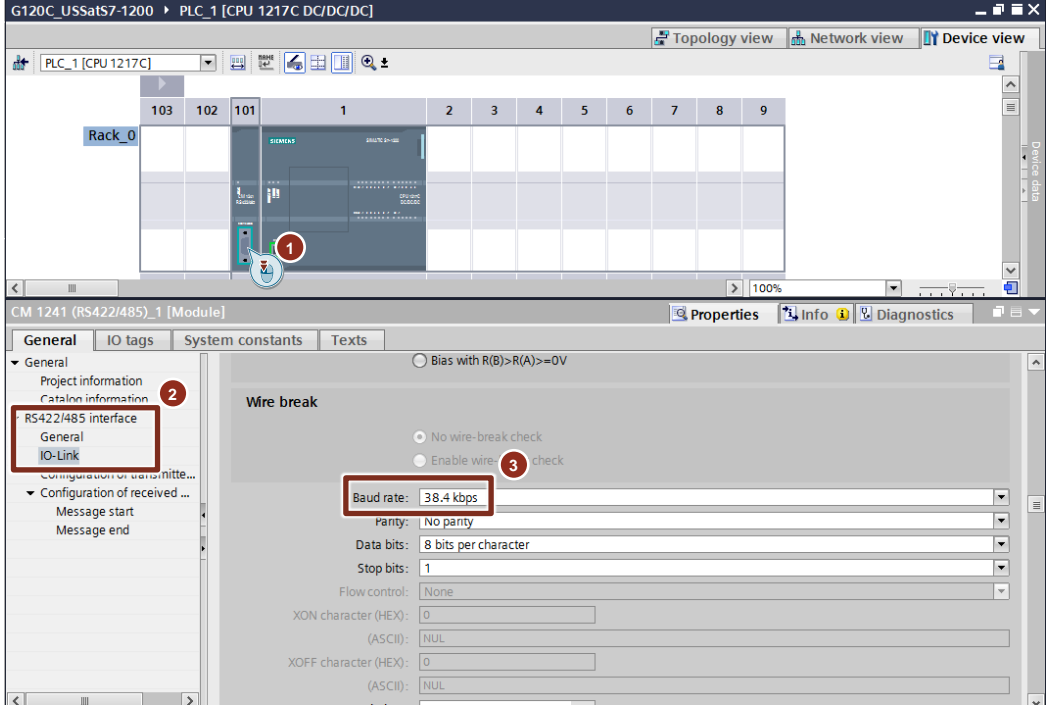
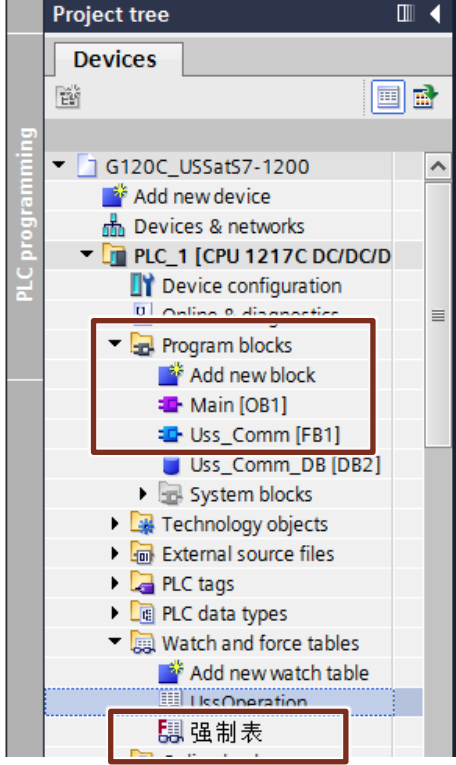
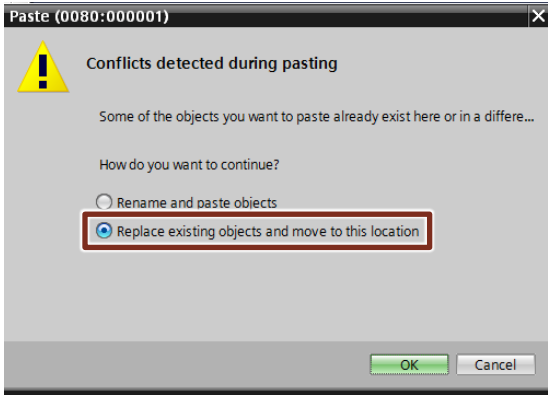
No.	Picture	Remarks
1		<ol style="list-style-type: none"> <li>1. Open TIA Portal V15 in your PC and then click “Create new project”.</li> <li>2. Assign the new project a name “G120C_USSatS7-1200”.</li> <li>3. Click “Create” to finish the creation of a new project.</li> <li>4. Click “Project view” to change to project view.</li> </ol>
2		<ol style="list-style-type: none"> <li>1. In the project tree, go to Devices &amp; Network view.</li> <li>2. In the Hardware catalog task card, locate the SIMATIC S7-1217 DC/DC/DC and use drag and drop to move it to the graphic area of the Network view. In this area and in the project tree, it will be created as PLC_1.</li> <li>3. Select the CPU with a version = 4.1 (S7-1200).</li> </ol>

## 4 Configuration

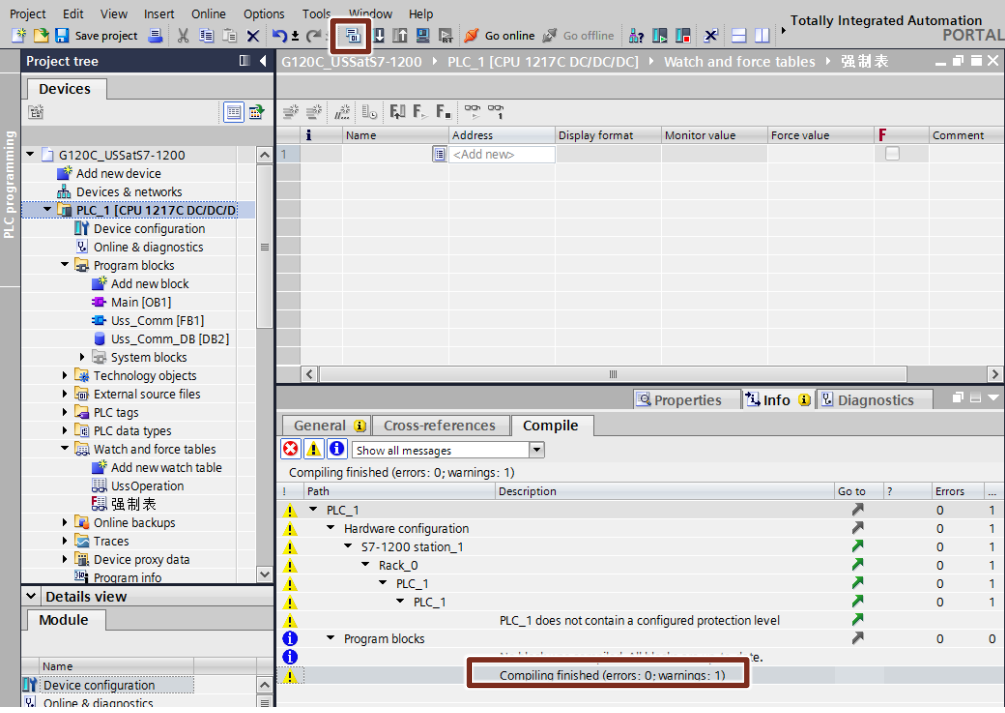
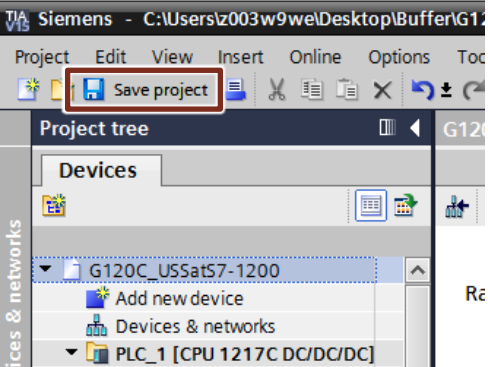
No.	Picture	Remarks
3		<p>1. In the graphic area, select the SIMATIC controller and go to the Device view.</p> <p>2. In the Hardware catalog task card, locate the</p> <ul style="list-style-type: none"> <li>• CM1241 (RS422/RS485) communication module, version = 2.1, for the CPU 1217C</li> </ul> <p>And use drag and drop to move it to an allowed slot next to the CUP in the graphic area of the Network view.</p>
4		<p>If necessary, change the Ethernet address. To do this, double-click the CPU to open its properties.</p>



## 4 Configuration

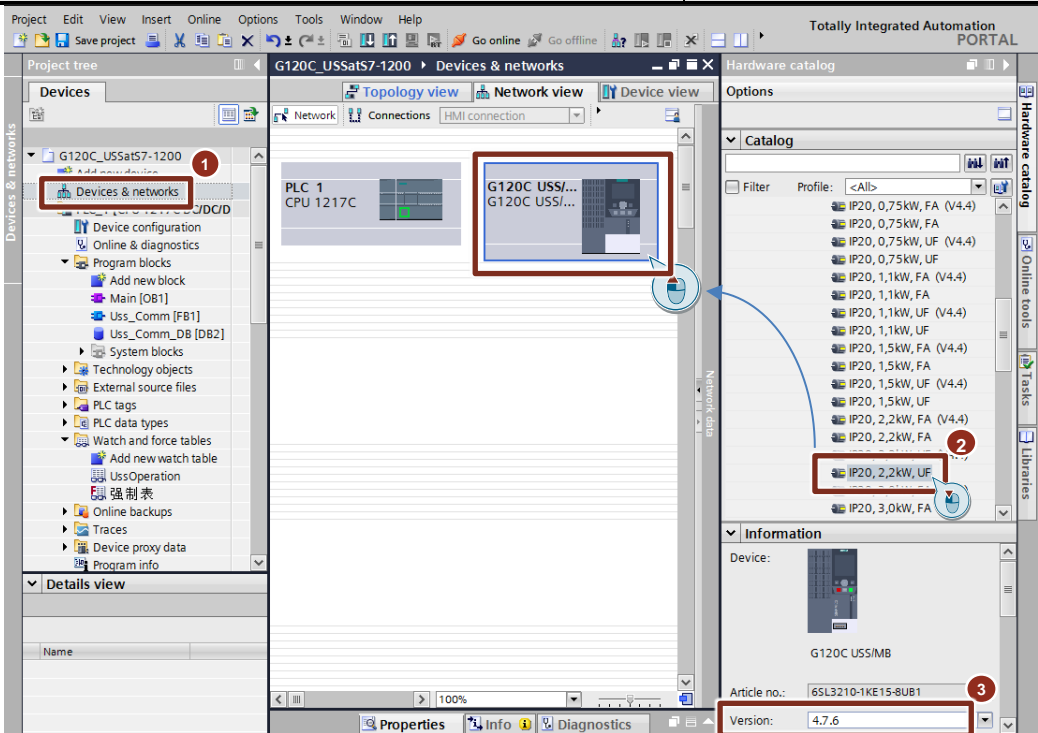
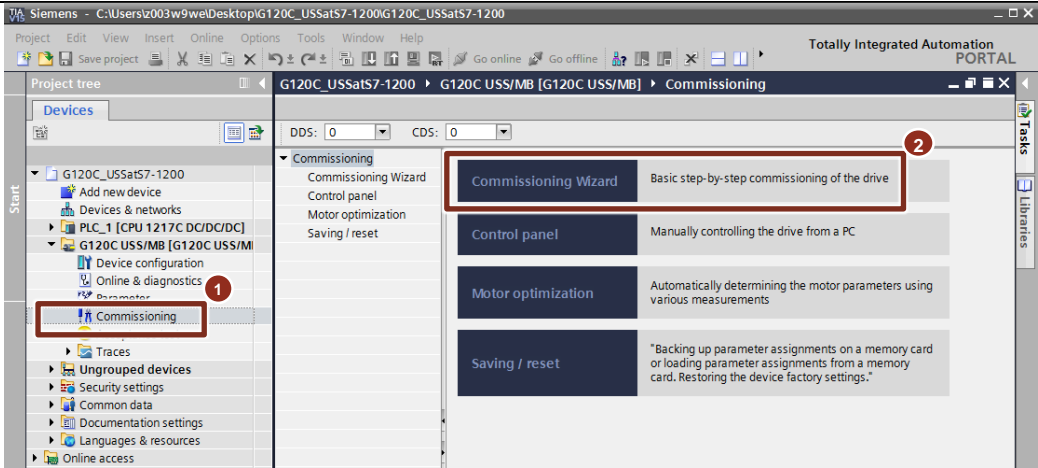
No.	Picture	Remarks
5		<p>1. In the <b>Device view</b> double click on the CM1241 to configure the property.</p> <p>2. Go to the <b>IO-Link</b> in the <b>RS422/485 interface</b> card.</p> <p>3. Change the <b>Baud rate</b> to 38.4kbps.</p>
6		 <p>1. Create your user program or –if you want to use the supplied sample program – copy the following objects from the sample program to your new project.</p> <p>2. For the copy operation, you can open both TIA projects at the same time. In the dialog regarding conflicts when copying, select <b>Replace existing objects and move to this location</b>.</p>

## 4 Configuration

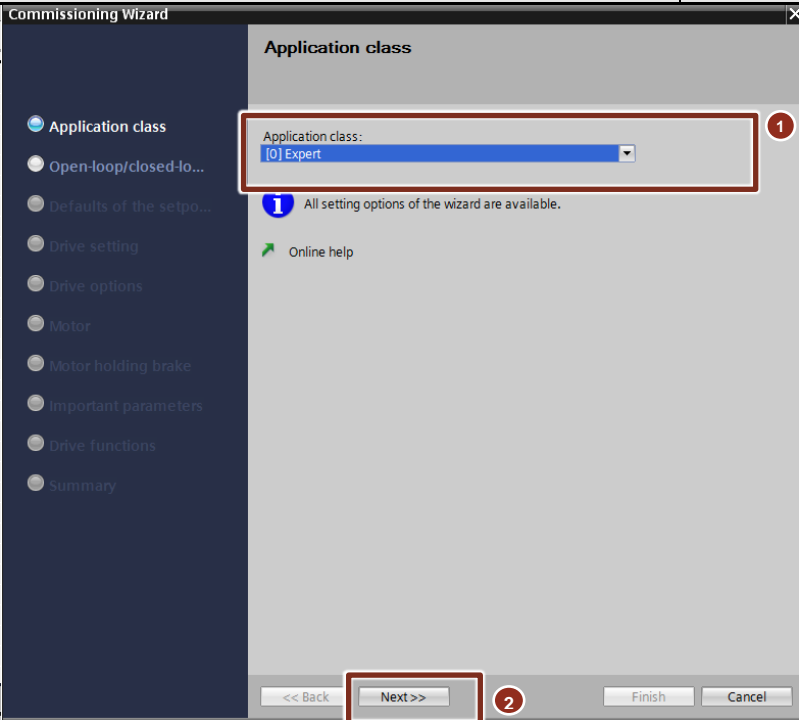
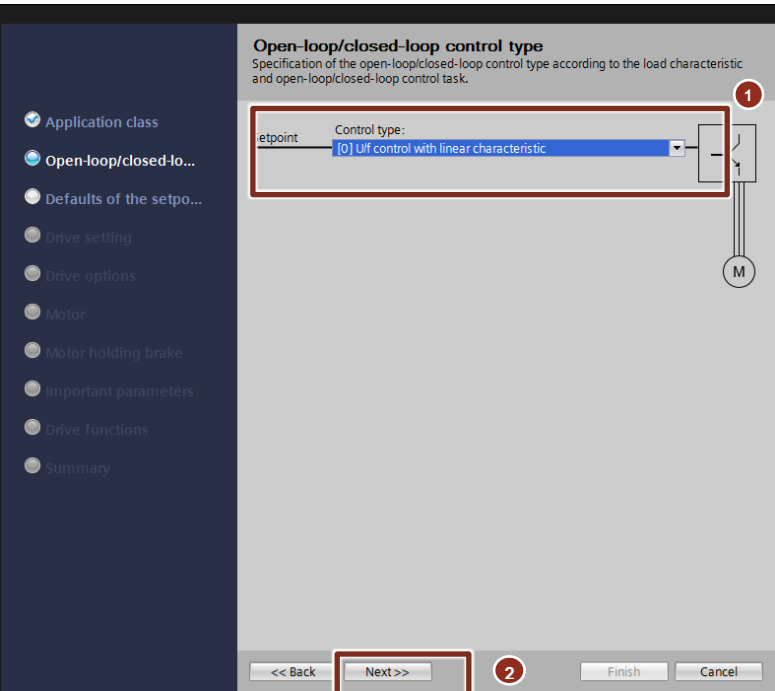
No.	Picture	Remarks																																																
7	 <p>The screenshot shows the SIMATIC Manager interface. The 'Project tree' on the left shows the project structure: G120C_USSatS7-1200 &gt; PLC_1 [CPU 1217C DC/DC/D]. The 'Compile' window is active, showing a table of compilation results:</p> <table border="1"> <thead> <tr> <th>Path</th> <th>Description</th> <th>Go to</th> <th>?</th> <th>Errors</th> <th>...</th> </tr> </thead> <tbody> <tr> <td>PLC_1</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>  Hardware configuration</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>    S7-1200 station_1</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>      Rack_0</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>        PLC_1</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>          PLC_1</td> <td>PLC_1 does not contain a configured protection level</td> <td></td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>  Program blocks</td> <td></td> <td></td> <td></td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>A red box highlights the message: <b>Compiling finished (errors: 0; warnings: 1)</b>.</p>	Path	Description	Go to	?	Errors	...	PLC_1				0	1	Hardware configuration				0	1	S7-1200 station_1				0	1	Rack_0				0	1	PLC_1				0	1	PLC_1	PLC_1 does not contain a configured protection level			0	1	Program blocks				0	0	<p>Compile the PLC_1 device in order to detect possible errors.</p>
Path	Description	Go to	?	Errors	...																																													
PLC_1				0	1																																													
Hardware configuration				0	1																																													
S7-1200 station_1				0	1																																													
Rack_0				0	1																																													
PLC_1				0	1																																													
PLC_1	PLC_1 does not contain a configured protection level			0	1																																													
Program blocks				0	0																																													
8	 <p>The screenshot shows the SIMATIC Manager interface. The 'Save project' button in the menu bar is highlighted with a red box. The 'Project tree' on the left shows the project structure: G120C_USSatS7-1200 &gt; PLC_1 [CPU 1217C DC/DC/D].</p>	<p>Save the project.</p>																																																

## 4.2 G120C configuration

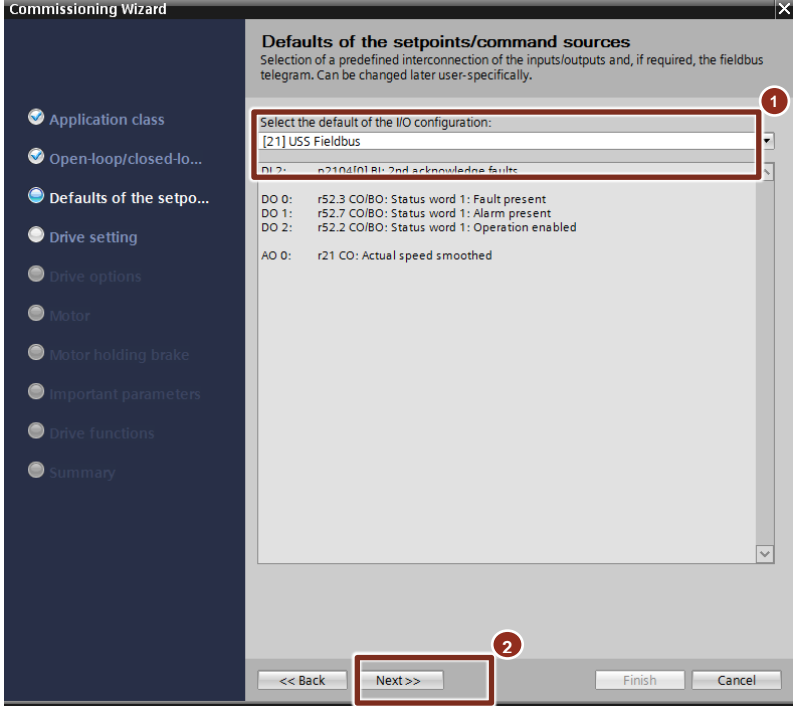
Table 4-2 Quick Commissioning via Startdrive in TIA Portal V15

No.	Description	Remarks
1		<ol style="list-style-type: none"> <li>In the project tree, go to <b>Devices &amp; networks</b> and select the <b>Network view</b>.</li> <li>In the <b>Hardware catalog</b> task card, locate the <b>G120C USS IP20, 2.2kW UF</b> and use drag and drop to move it to the graphic area of the <b>Network view</b>. In this area, it will be created as <b>G120C USS/MB</b>.</li> <li>Select the drive with a version = <b>4.7.6</b>.</li> </ol>
2		<ol style="list-style-type: none"> <li>In the project tree, go to the <b>Commissioning</b> under <b>G120C USS/MB</b>.</li> <li>Click the <b>Commissioning Wizard</b> function to open <b>Commissioning Wizard</b> dialog.</li> </ol>

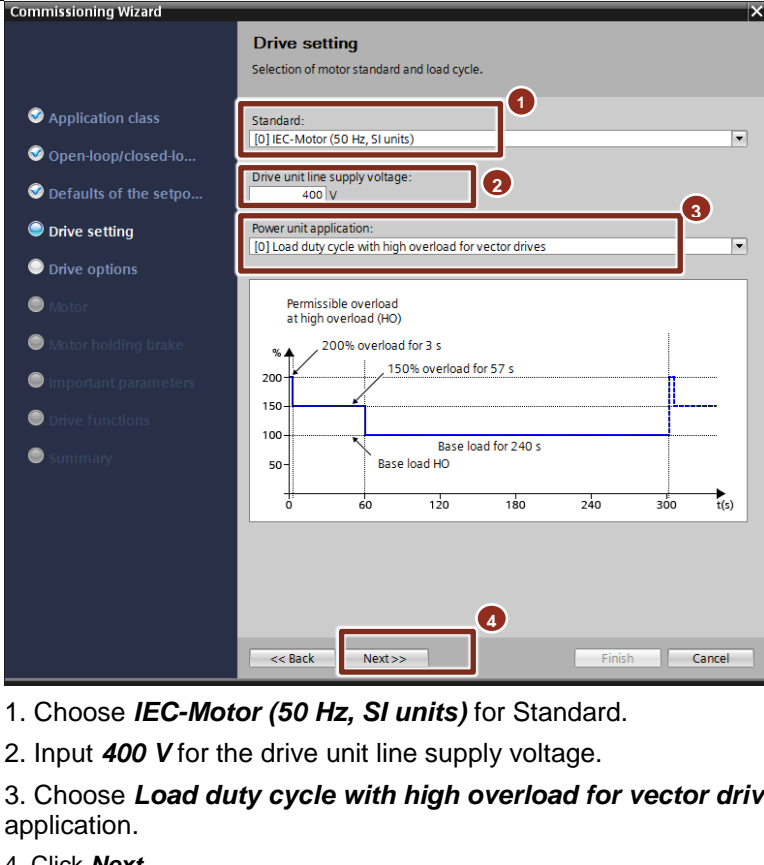
## 4 Configuration

No.	Description	Remarks
3	 <p>1. Choose <b>Expert</b> at the <b>Application class</b> card.</p> <p>2. Click <b>Next</b>.</p> <p><b>NOTICE:</b> This application also can be finished in “Standard Drive Control” or “Dynamic Drive Control” application class</p>	
4	 <p>1. Choose <b>U/f control with linear characteristic</b> at the <b>Open-loop/close-loop control type</b> card.</p> <p>2. Click <b>Next</b>.</p>	

## 4 Configuration

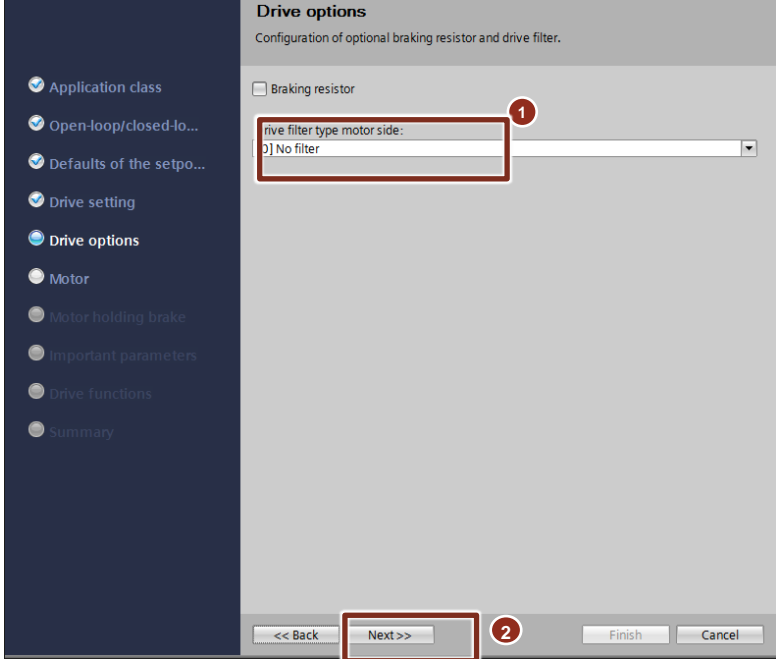
No.	Description	Remarks
5		

1. Choose **USS Fieldbus** at the **Defaults of the setpoints/command sources** card.
2. Click **Next**.

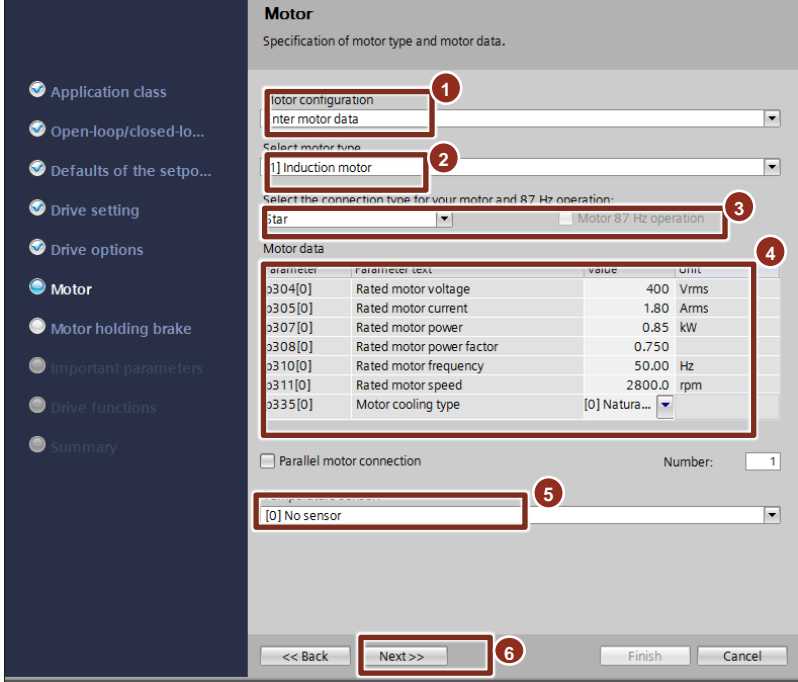
6		
---	--	--

1. Choose **IEC-Motor (50 Hz, SI units)** for Standard.
2. Input **400 V** for the drive unit line supply voltage.
3. Choose **Load duty cycle with high overload for vector drives** for the power unit application.
4. Click **Next**.

## 4 Configuration

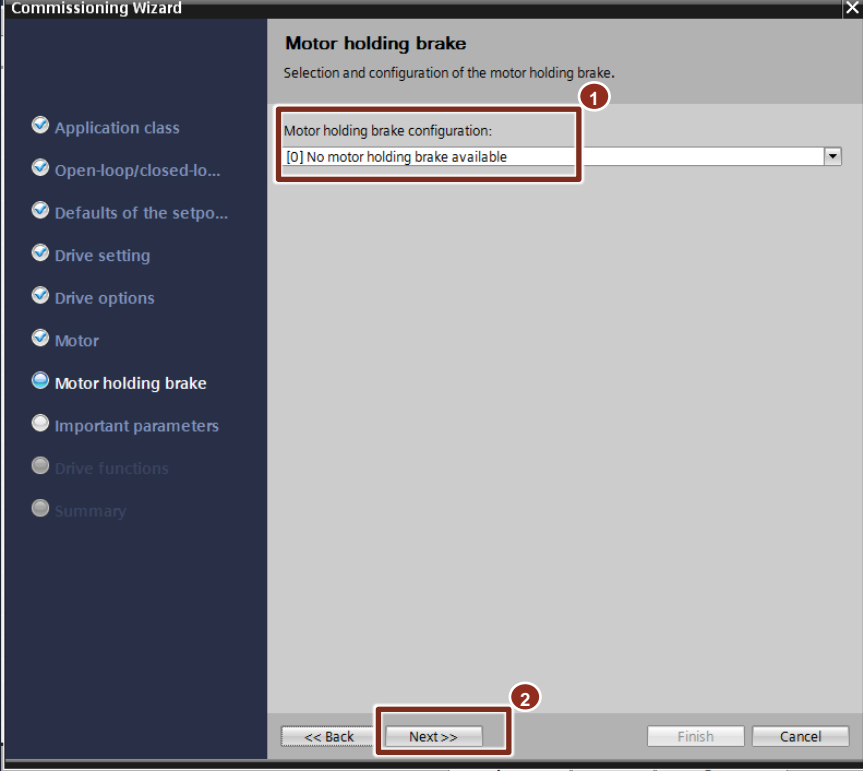
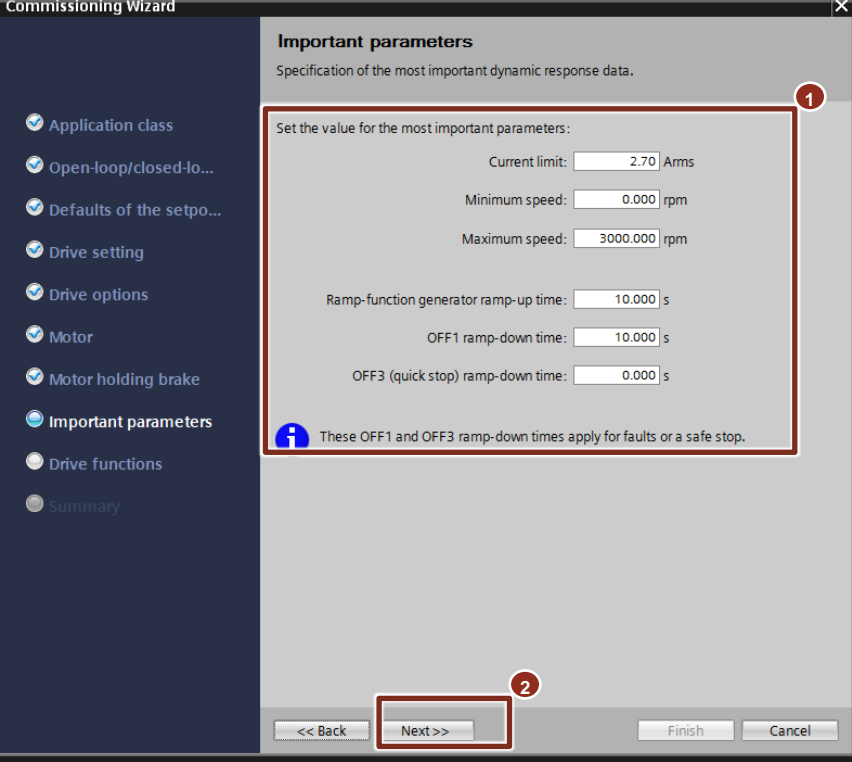
No.	Description	Remarks
7	 <p><b>Drive options</b> Configuration of optional braking resistor and drive filter.</p> <p><input type="checkbox"/> Braking resistor</p> <p>drive filter type motor side: [0] No filter</p> <p>&lt;&lt; Back   <b>Next &gt;&gt;</b>   Finish   Cancel</p>	

1. Choose **No filter** at the Drive options card.
2. Click **Next**.

8	 <p><b>Motor</b> Specification of motor type and motor data.</p> <p>Motor configuration Enter motor data</p> <p>Select motor type [1] Induction motor</p> <p>Select the connection type for your motor and 87 Hz operation: Star   Motor 87 Hz operation</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Parameter text</th> <th>Value</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>3304[0]</td> <td>Rated motor voltage</td> <td>400</td> <td>Vrms</td> </tr> <tr> <td>3305[0]</td> <td>Rated motor current</td> <td>1.80</td> <td>Arms</td> </tr> <tr> <td>3307[0]</td> <td>Rated motor power</td> <td>0.85</td> <td>kW</td> </tr> <tr> <td>3308[0]</td> <td>Rated motor power factor</td> <td>0.750</td> <td></td> </tr> <tr> <td>3310[0]</td> <td>Rated motor frequency</td> <td>50.00</td> <td>Hz</td> </tr> <tr> <td>3311[0]</td> <td>Rated motor speed</td> <td>2800.0</td> <td>rpm</td> </tr> <tr> <td>3335[0]</td> <td>Motor cooling type</td> <td>[0] Natura...</td> <td></td> </tr> </tbody> </table> <p><input type="checkbox"/> Parallel motor connection   Number: 1</p> <p>Temperature sensor: [0] No sensor</p> <p>&lt;&lt; Back   <b>Next &gt;&gt;</b>   Finish   Cancel</p>	Parameter	Parameter text	Value	Unit	3304[0]	Rated motor voltage	400	Vrms	3305[0]	Rated motor current	1.80	Arms	3307[0]	Rated motor power	0.85	kW	3308[0]	Rated motor power factor	0.750		3310[0]	Rated motor frequency	50.00	Hz	3311[0]	Rated motor speed	2800.0	rpm	3335[0]	Motor cooling type	[0] Natura...		
Parameter	Parameter text	Value	Unit																															
3304[0]	Rated motor voltage	400	Vrms																															
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3310[0]	Rated motor frequency	50.00	Hz																															
3311[0]	Rated motor speed	2800.0	rpm																															
3335[0]	Motor cooling type	[0] Natura...																																

1. Choose **Enter motor data** for the Motor configuration.
2. Choose **Induction motor** for the motor type.
3. Choose **Star** for the connection type.
4. Input the required motor data accordingly.
5. Choose **No sensor** for the temperature sensor.
6. Click **Next**.

## 4 Configuration

No.	Description	Remarks
9		
10		

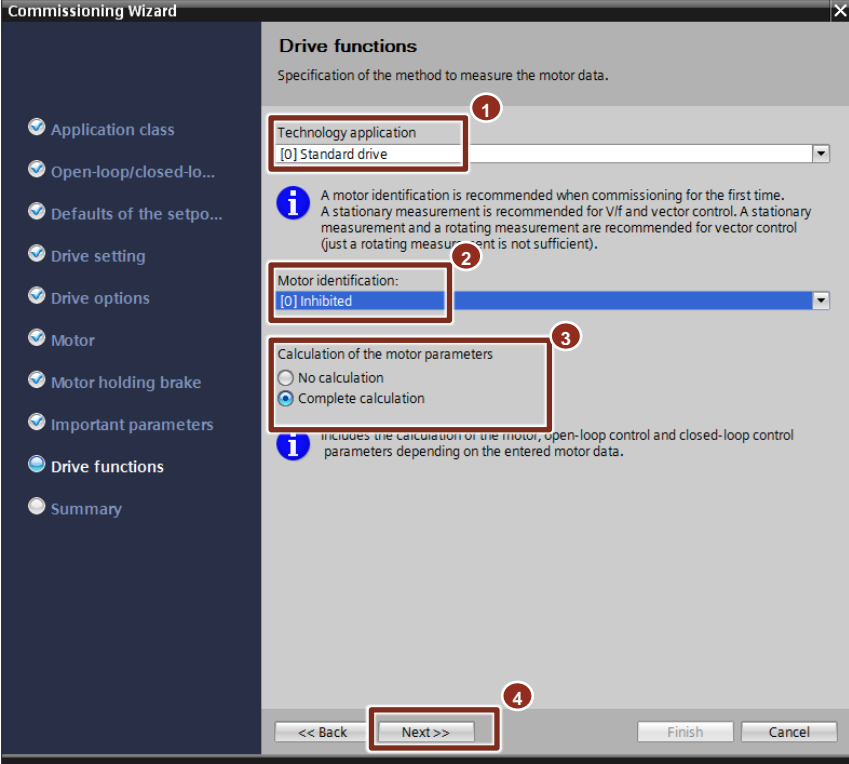
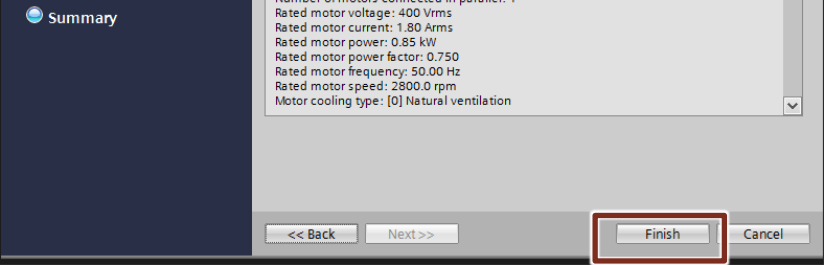
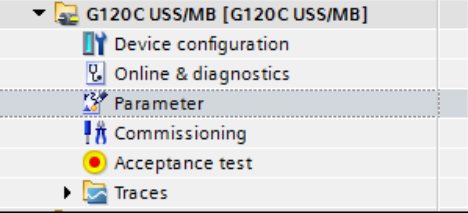
1. Choose **No motor holding brake available** at the **motor holding brake** card.

2. Click **Next**.

1. Input important parameters accordingly at the important parameters card.

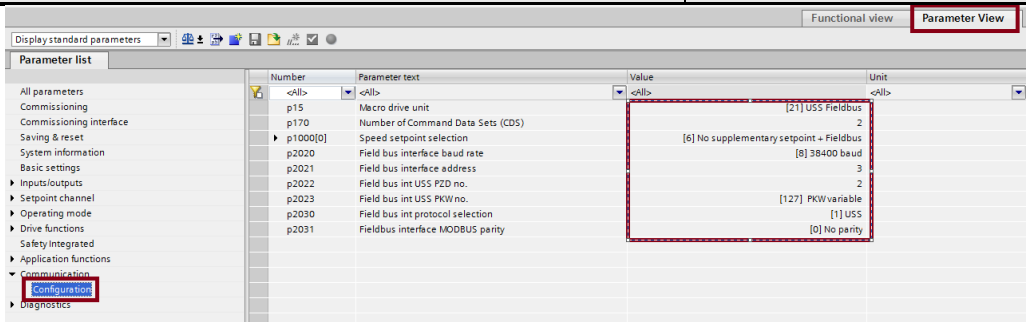
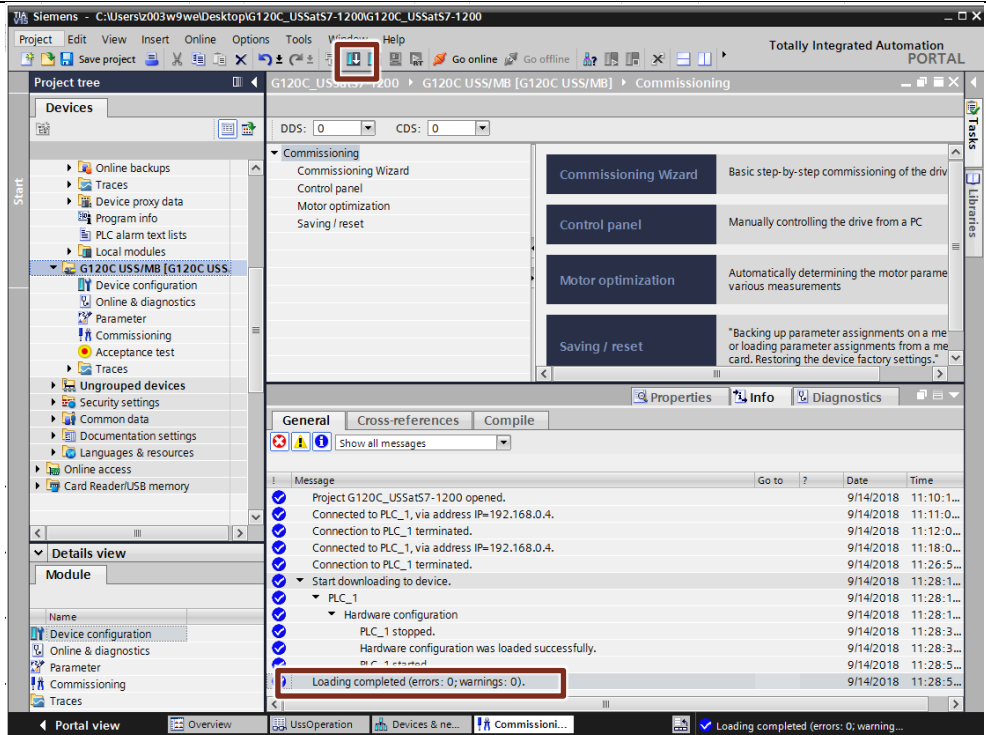
2. Click **Next**.

## 4 Configuration

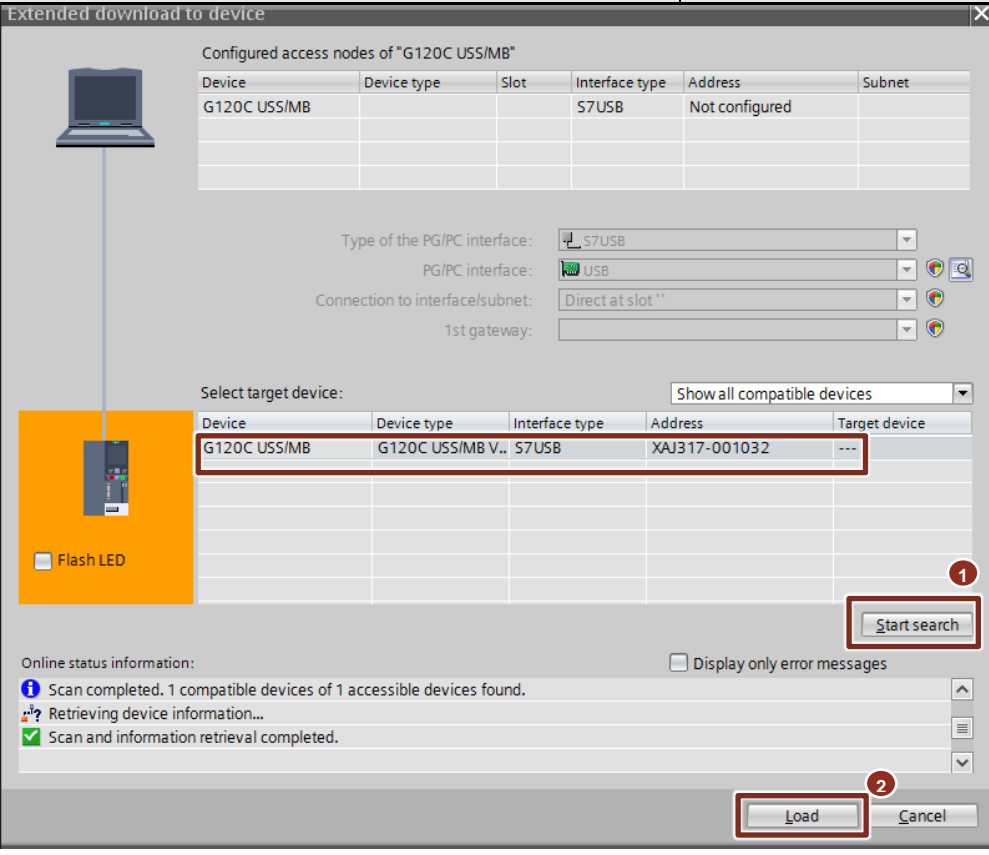
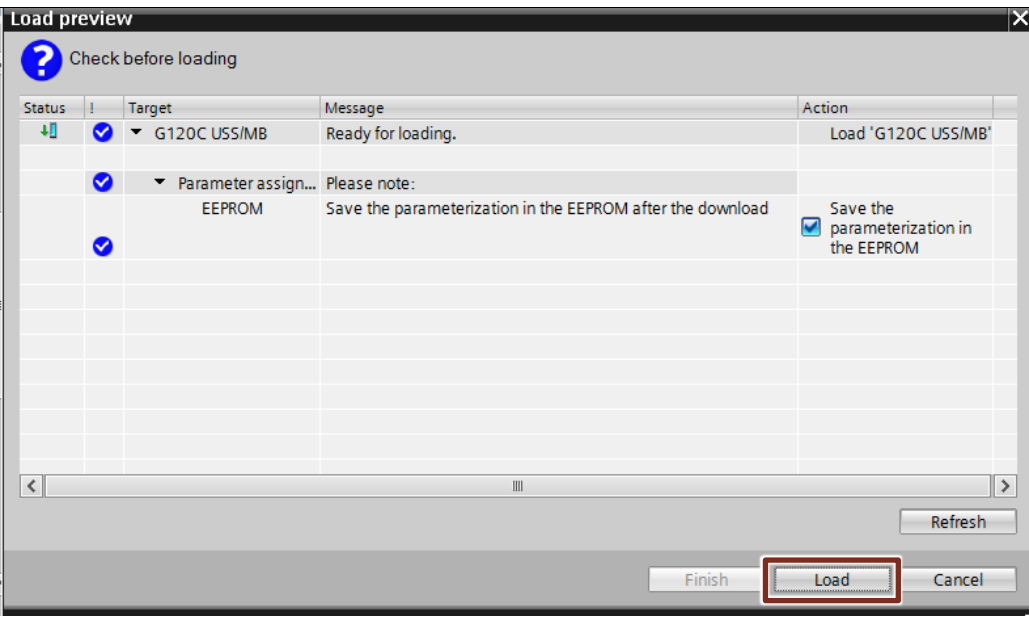
No.	Description	Remarks
11		
12		<p>Click <b>Finish</b>.</p>
13		<p>Double click the <b>Parameter</b>.</p>



## 4 Configuration

No.	Description	Remarks
14	 <p>Switch to parameter view. Click the configuration option of the communication command. Modify the related communication parameters.</p>	
15	 <p><b>Download</b> the configuration to the drive.</p>	

## 4 Configuration

No.	Description	Remarks																						
16	 <p>Configured access nodes of *G120C USS/MB*</p> <table border="1"> <thead> <tr> <th>Device</th> <th>Device type</th> <th>Slot</th> <th>Interface type</th> <th>Address</th> <th>Subnet</th> </tr> </thead> <tbody> <tr> <td>G120C USS/MB</td> <td></td> <td></td> <td>S7USB</td> <td>Not configured</td> <td></td> </tr> </tbody> </table> <p>Type of the PG/PC interface: S7USB          PG/PC interface: USB          Connection to interface/subnet: Direct at slot ''          1st gateway:</p> <p>Select target device: Show all compatible devices</p> <table border="1"> <thead> <tr> <th>Device</th> <th>Device type</th> <th>Interface type</th> <th>Address</th> <th>Target device</th> </tr> </thead> <tbody> <tr> <td>G120C USS/MB</td> <td>G120C USS/MB V..</td> <td>S7USB</td> <td>XAJ317-001032</td> <td>---</td> </tr> </tbody> </table> <p>Flash LED <input type="checkbox"/></p> <p>Online status information: <input type="checkbox"/> Display only error messages</p> <ul style="list-style-type: none"> <li>Scan completed. 1 compatible devices of 1 accessible devices found.</li> <li>Retrieving device information...</li> <li>Scan and information retrieval completed.</li> </ul> <p>Start search (1)</p> <p>Load (2) Cancel</p>	Device	Device type	Slot	Interface type	Address	Subnet	G120C USS/MB			S7USB	Not configured		Device	Device type	Interface type	Address	Target device	G120C USS/MB	G120C USS/MB V..	S7USB	XAJ317-001032	---	
Device	Device type	Slot	Interface type	Address	Subnet																			
G120C USS/MB			S7USB	Not configured																				
Device	Device type	Interface type	Address	Target device																				
G120C USS/MB	G120C USS/MB V..	S7USB	XAJ317-001032	---																				
17	 <p>Check before loading</p> <table border="1"> <thead> <tr> <th>Status</th> <th>!</th> <th>Target</th> <th>Message</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>↓</td> <td>✓</td> <td>G120C USS/MB</td> <td>Ready for loading.</td> <td>Load 'G120C USS/MB'</td> </tr> <tr> <td></td> <td>✓</td> <td>Parameter assign...</td> <td>Please note:</td> <td></td> </tr> <tr> <td></td> <td>✓</td> <td>EEPROM</td> <td>Save the parameterization in the EEPROM after the download</td> <td><input checked="" type="checkbox"/> Save the parameterization in the EEPROM</td> </tr> </tbody> </table> <p>Refresh</p> <p>Finish Load (circled) Cancel</p>	Status	!	Target	Message	Action	↓	✓	G120C USS/MB	Ready for loading.	Load 'G120C USS/MB'		✓	Parameter assign...	Please note:			✓	EEPROM	Save the parameterization in the EEPROM after the download	<input checked="" type="checkbox"/> Save the parameterization in the EEPROM			
Status	!	Target	Message	Action																				
↓	✓	G120C USS/MB	Ready for loading.	Load 'G120C USS/MB'																				
	✓	Parameter assign...	Please note:																					
	✓	EEPROM	Save the parameterization in the EEPROM after the download	<input checked="" type="checkbox"/> Save the parameterization in the EEPROM																				

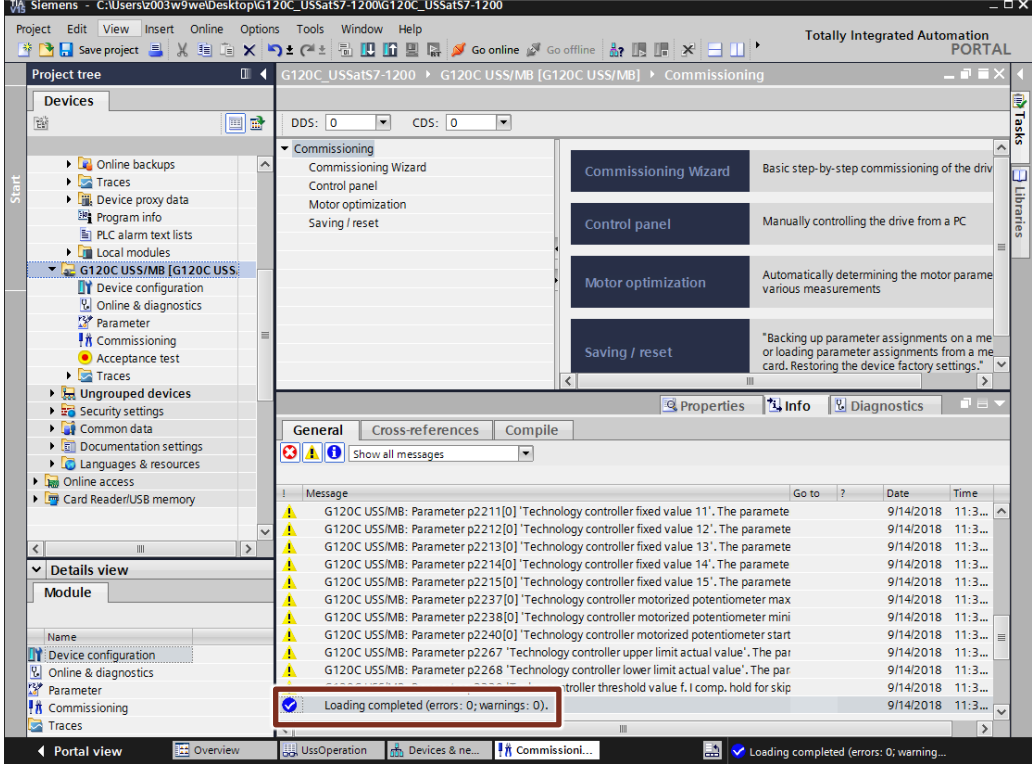
1. Connect the G120C with the USB cable to the PG.

2. Click **Start search** and the connected G120C is showed in the table.

3. Click **Load**.

Click **Load** to load the configuration to the drive.

## 4 Configuration

No.	Description	Remarks
18	 <p>The screenshot shows the Siemens Totally Integrated Automation PORTAL interface. The project tree on the left is expanded to 'G120C USS/MB [G120C USS/MB]'. The main window displays the 'Commissioning Wizard' with options: 'Commissioning Wizard', 'Control panel', 'Motor optimization', and 'Saving / reset'. Below the wizard, a message log shows several warning messages for parameter loading, followed by a checked message: 'Loading completed (errors: 0; warnings: 0)'. The status bar at the bottom indicates 'Loading completed (errors: 0; warning...'.</p>	<p>Loading finish.</p>

### 4.3 Program PLC logic

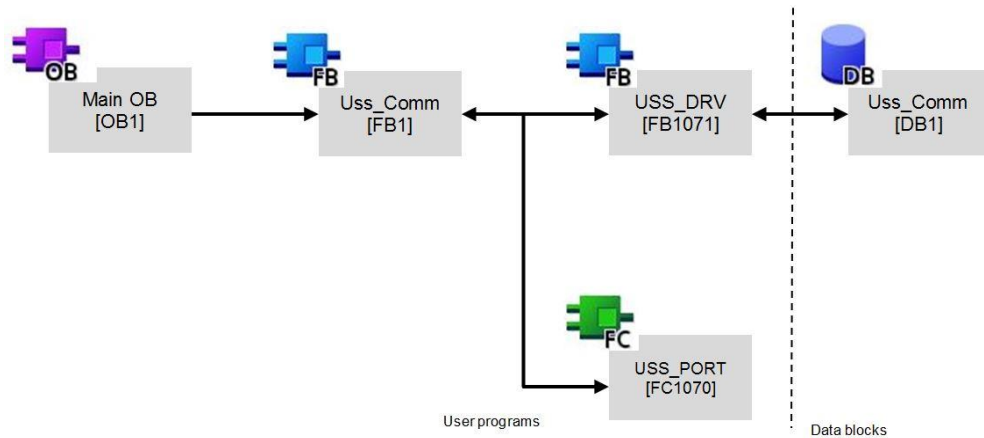
In this application example, the SINAMICS G120C drive is controlled by S7-1217 CPU via USS communication. To achieve this control, the following instructions have been added to the program:

- USS\_DRV(FB1071)
- USS\_PORT(FC1070)

This FB and FC are called in the "Uss\_Comm"(FB1) function block.

The figure 4-1 shows the program structure.

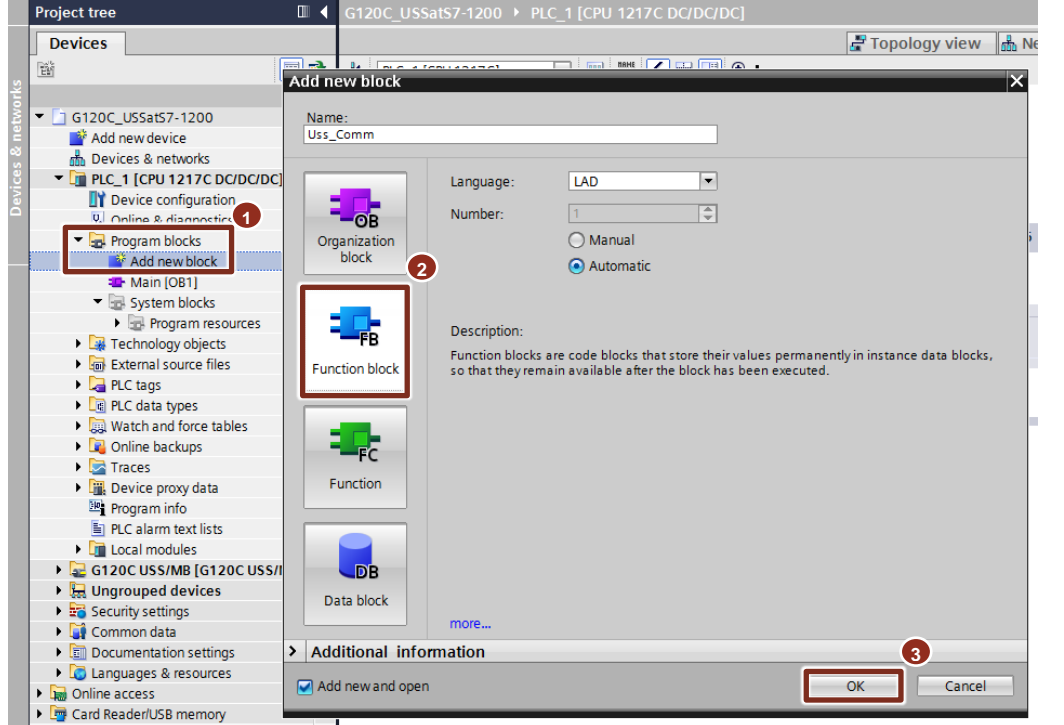
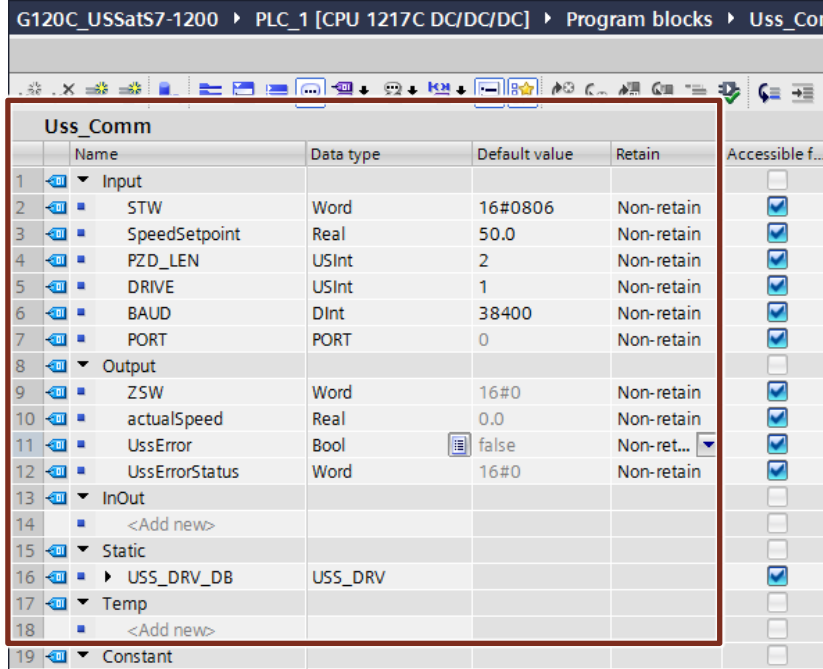
Figure 4-1 program structure



## 4 Configuration

And in the Table 4-3 is about the PLC programming.

Table 4-3 PLC Program

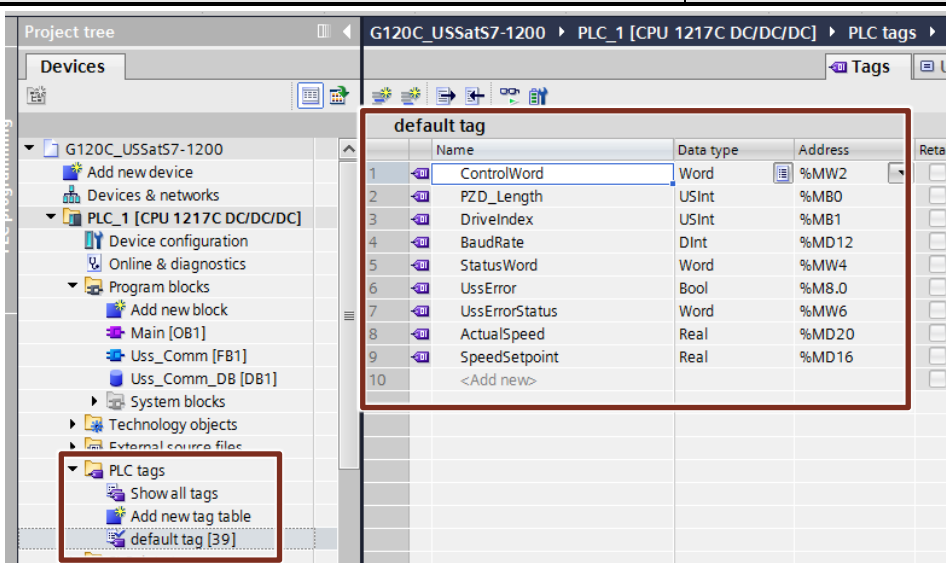
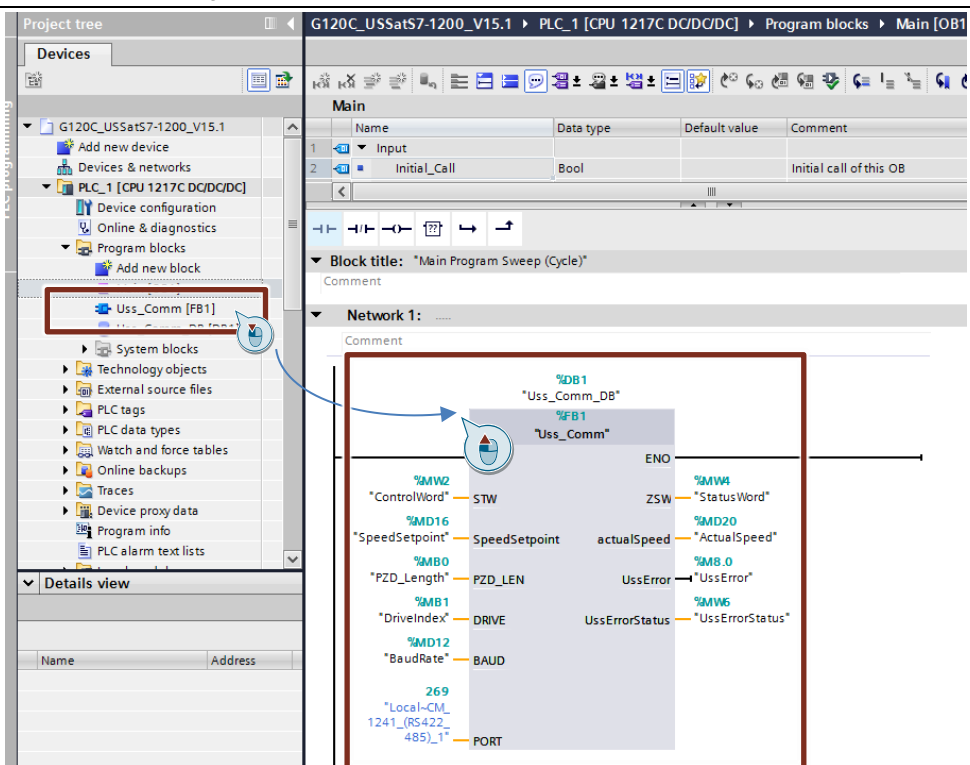
No.	Picture	Description																																																																																																				
1		<p>1. Double-click <b>Add new block</b> in the program blocks.</p> <p>2. Select to create a new FB and give a name as <b>Uss_Comm</b>.</p> <p>3. Click <b>OK</b>.</p>																																																																																																				
2	 <table border="1" data-bbox="308 1288 1133 1859"> <thead> <tr> <th>Name</th> <th>Data type</th> <th>Default value</th> <th>Retain</th> <th>Accessible f...</th> </tr> </thead> <tbody> <tr> <td>Input</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1 STW</td> <td>Word</td> <td>16#0806</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>2 SpeedSetpoint</td> <td>Real</td> <td>50.0</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>3 PZD_LEN</td> <td>USInt</td> <td>2</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>4 DRIVE</td> <td>USInt</td> <td>1</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>5 BAUD</td> <td>DInt</td> <td>38400</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>6 PORT</td> <td>PORT</td> <td>0</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Output</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>9 ZSW</td> <td>Word</td> <td>16#0</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>10 actualSpeed</td> <td>Real</td> <td>0.0</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>11 UssError</td> <td>Bool</td> <td>false</td> <td>Non-ret...</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>12 UssErrorStatus</td> <td>Word</td> <td>16#0</td> <td>Non-retain</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>InOut</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>14 &lt;Add new&gt;</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Static</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>16 USS_DRV_DB</td> <td>USS_DRV</td> <td></td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Temp</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>17 &lt;Add new&gt;</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Constant</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Name	Data type	Default value	Retain	Accessible f...	Input					1 STW	Word	16#0806	Non-retain	<input checked="" type="checkbox"/>	2 SpeedSetpoint	Real	50.0	Non-retain	<input checked="" type="checkbox"/>	3 PZD_LEN	USInt	2	Non-retain	<input checked="" type="checkbox"/>	4 DRIVE	USInt	1	Non-retain	<input checked="" type="checkbox"/>	5 BAUD	DInt	38400	Non-retain	<input checked="" type="checkbox"/>	6 PORT	PORT	0	Non-retain	<input checked="" type="checkbox"/>	Output					9 ZSW	Word	16#0	Non-retain	<input checked="" type="checkbox"/>	10 actualSpeed	Real	0.0	Non-retain	<input checked="" type="checkbox"/>	11 UssError	Bool	false	Non-ret...	<input checked="" type="checkbox"/>	12 UssErrorStatus	Word	16#0	Non-retain	<input checked="" type="checkbox"/>	InOut					14 <Add new>					Static					16 USS_DRV_DB	USS_DRV			<input checked="" type="checkbox"/>	Temp					17 <Add new>					Constant					<p>Define the variants in the <b>Uss_Comm[FB1]</b> as picture.</p>
Name	Data type	Default value	Retain	Accessible f...																																																																																																		
Input																																																																																																						
1 STW	Word	16#0806	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
2 SpeedSetpoint	Real	50.0	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
3 PZD_LEN	USInt	2	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
4 DRIVE	USInt	1	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
5 BAUD	DInt	38400	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
6 PORT	PORT	0	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
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11 UssError	Bool	false	Non-ret...	<input checked="" type="checkbox"/>																																																																																																		
12 UssErrorStatus	Word	16#0	Non-retain	<input checked="" type="checkbox"/>																																																																																																		
InOut																																																																																																						
14 <Add new>																																																																																																						
Static																																																																																																						
16 USS_DRV_DB	USS_DRV			<input checked="" type="checkbox"/>																																																																																																		
Temp																																																																																																						
17 <Add new>																																																																																																						
Constant																																																																																																						



## 4 Configuration

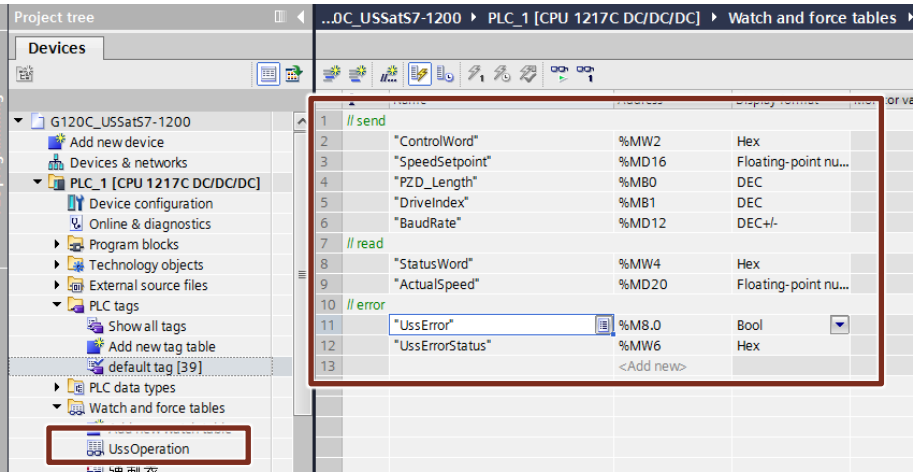
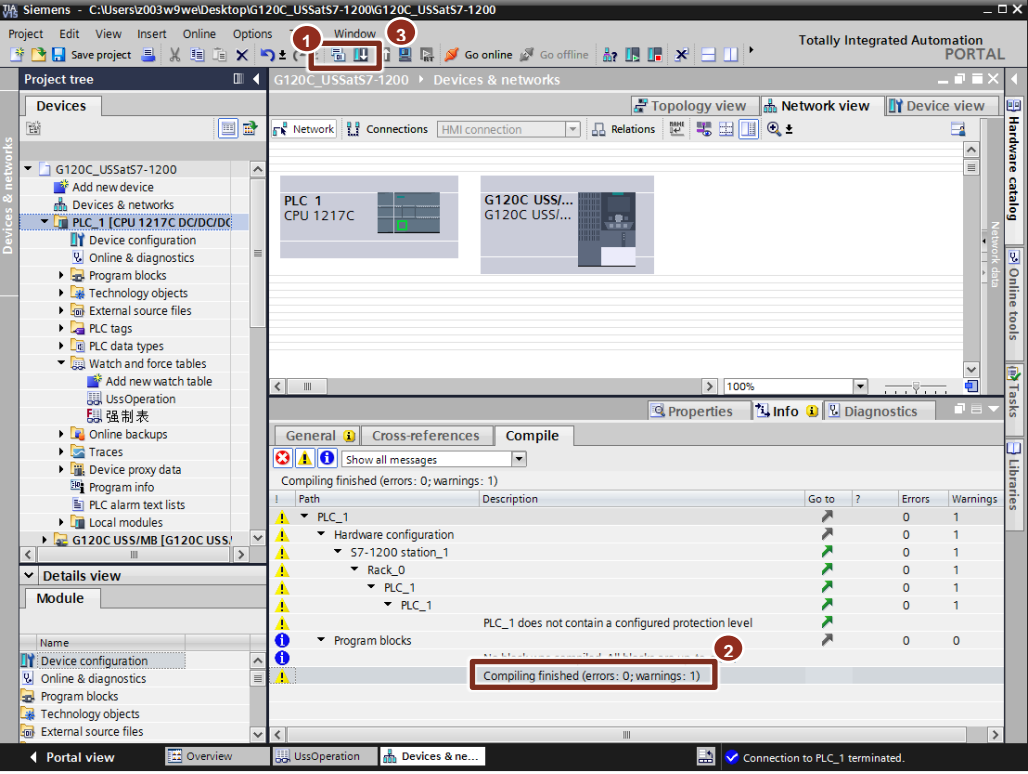
No.	Picture	Description
5		<p>Configure the <b>USS_PORT</b> block as picture.</p>
6		<p>Configure the <b>USS_DRV</b> block as picture.</p>

## 4 Configuration

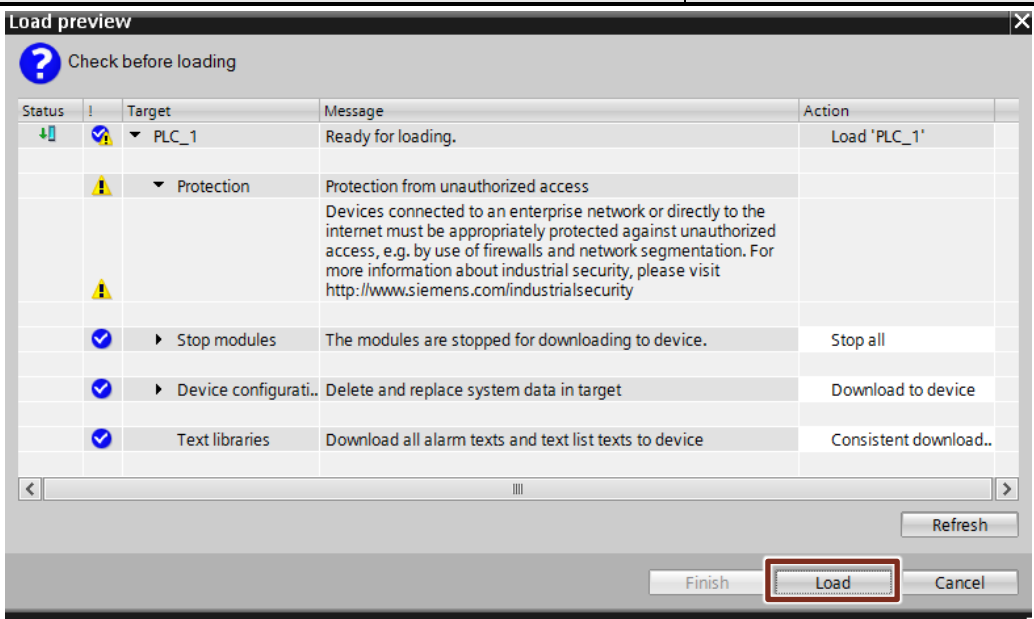
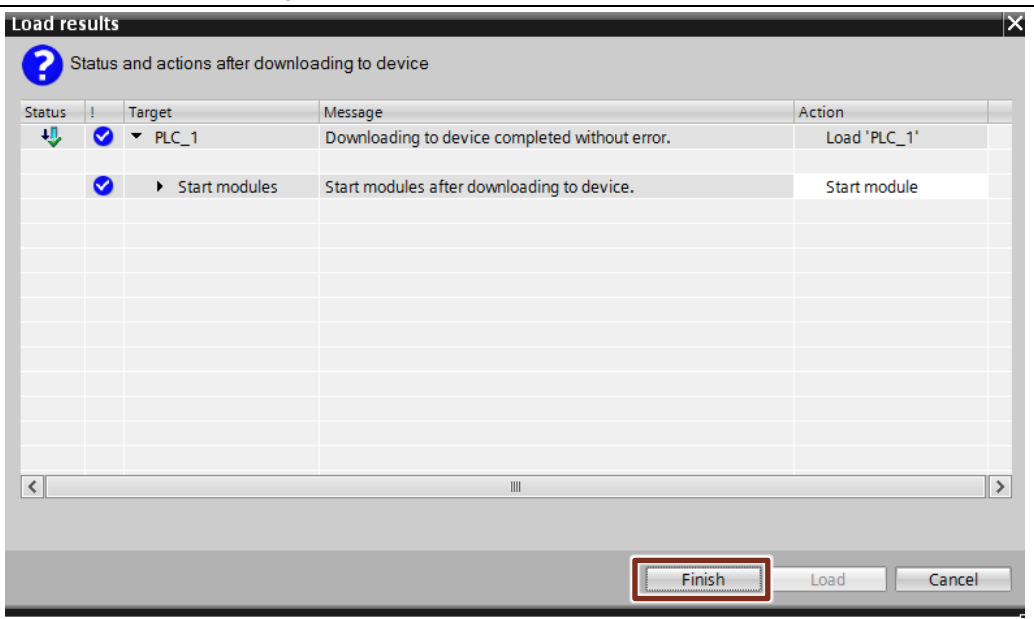
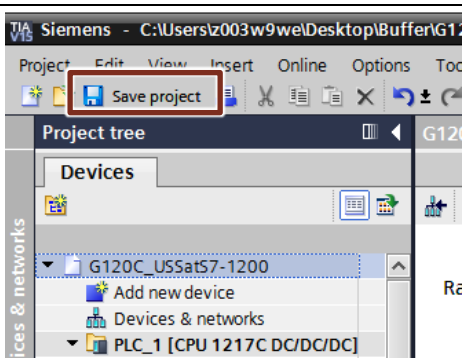
No.	Picture	Description																																												
7	 <table border="1" data-bbox="670 369 1220 660"> <thead> <tr> <th></th> <th>Name</th> <th>Data type</th> <th>Address</th> </tr> </thead> <tbody> <tr><td>1</td><td>ControlWord</td><td>Word</td><td>%MW2</td></tr> <tr><td>2</td><td>PZD_Length</td><td>USInt</td><td>%MB0</td></tr> <tr><td>3</td><td>DriveIndex</td><td>USInt</td><td>%MB1</td></tr> <tr><td>4</td><td>BaudRate</td><td>DInt</td><td>%MD12</td></tr> <tr><td>5</td><td>StatusWord</td><td>Word</td><td>%MW4</td></tr> <tr><td>6</td><td>UssError</td><td>Bool</td><td>%M8.0</td></tr> <tr><td>7</td><td>UssErrorStatus</td><td>Word</td><td>%MW6</td></tr> <tr><td>8</td><td>ActualSpeed</td><td>Real</td><td>%MD20</td></tr> <tr><td>9</td><td>SpeedSetpoint</td><td>Real</td><td>%MD16</td></tr> <tr><td>10</td><td>&lt;Add new&gt;</td><td></td><td></td></tr> </tbody> </table>		Name	Data type	Address	1	ControlWord	Word	%MW2	2	PZD_Length	USInt	%MB0	3	DriveIndex	USInt	%MB1	4	BaudRate	DInt	%MD12	5	StatusWord	Word	%MW4	6	UssError	Bool	%M8.0	7	UssErrorStatus	Word	%MW6	8	ActualSpeed	Real	%MD20	9	SpeedSetpoint	Real	%MD16	10	<Add new>			<p>1. Open the <b>default tag</b> of the PLC tags in the Project tree.</p> <p>2. Define default tags as picture.</p>
	Name	Data type	Address																																											
1	ControlWord	Word	%MW2																																											
2	PZD_Length	USInt	%MB0																																											
3	DriveIndex	USInt	%MB1																																											
4	BaudRate	DInt	%MD12																																											
5	StatusWord	Word	%MW4																																											
6	UssError	Bool	%M8.0																																											
7	UssErrorStatus	Word	%MW6																																											
8	ActualSpeed	Real	%MD20																																											
9	SpeedSetpoint	Real	%MD16																																											
10	<Add new>																																													
8		<p>Drag the <b>Uss_Comm[FB1]</b> from program block into <b>Main[OB1]</b> and configure the block as picture.</p>																																												



## 4 Configuration

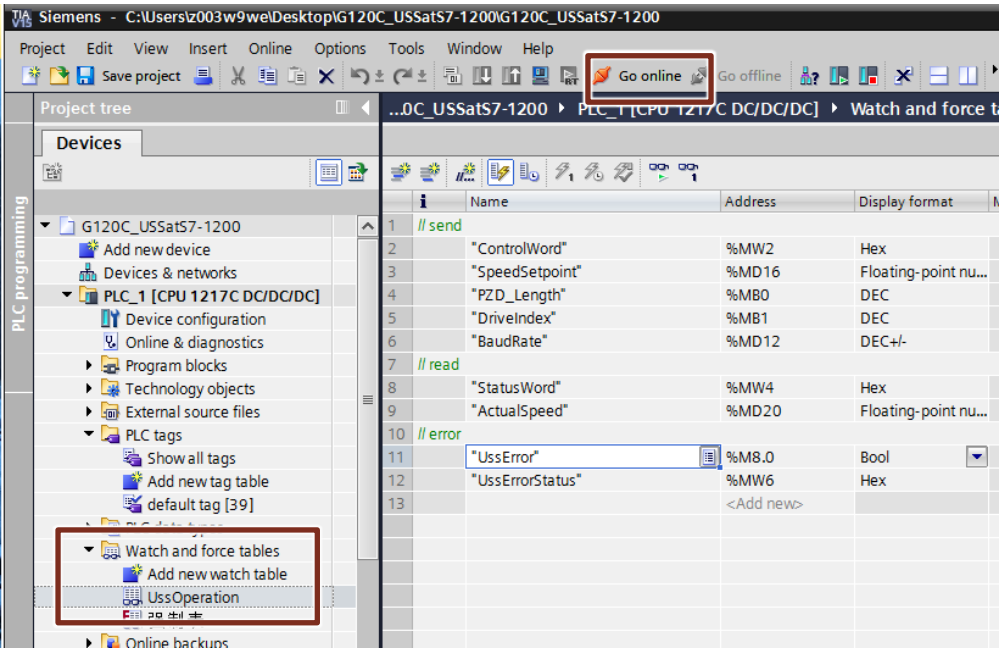
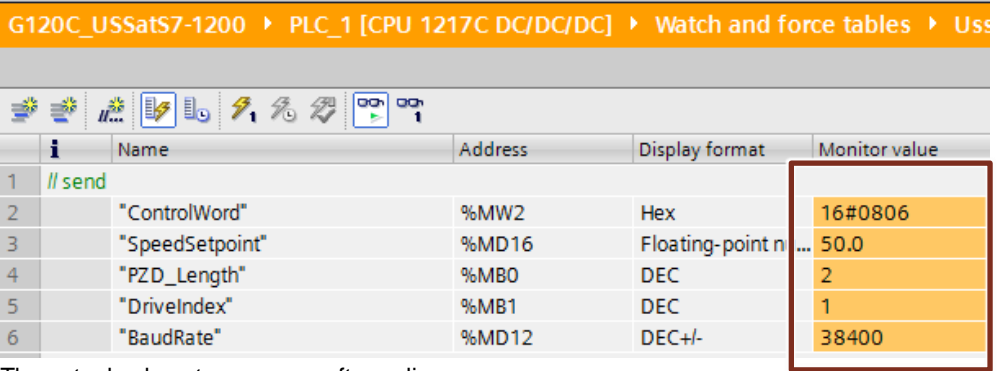
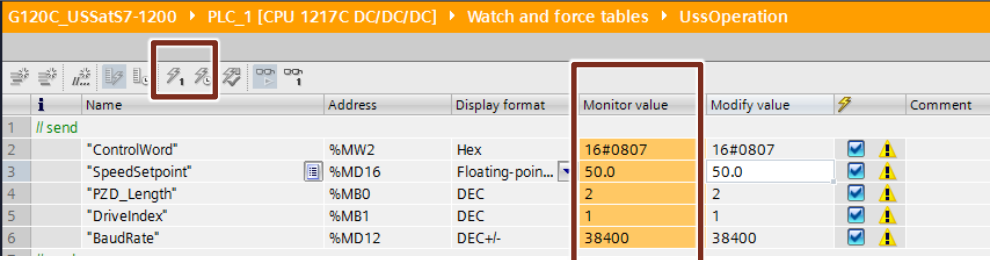
No.	Picture	Description
9		<p>Create watch table and configure it.</p>
10		<ol style="list-style-type: none"> <li>1. <b>Compile</b> the program.</li> <li>2. Compiling finished.</li> <li>3. Click <b>download</b>.</li> </ol>

## 4 Configuration

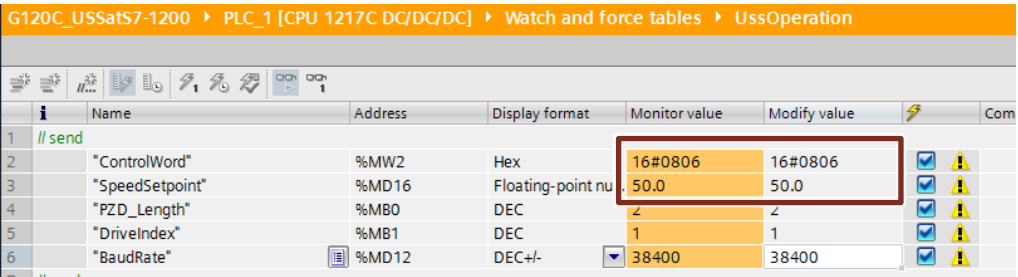
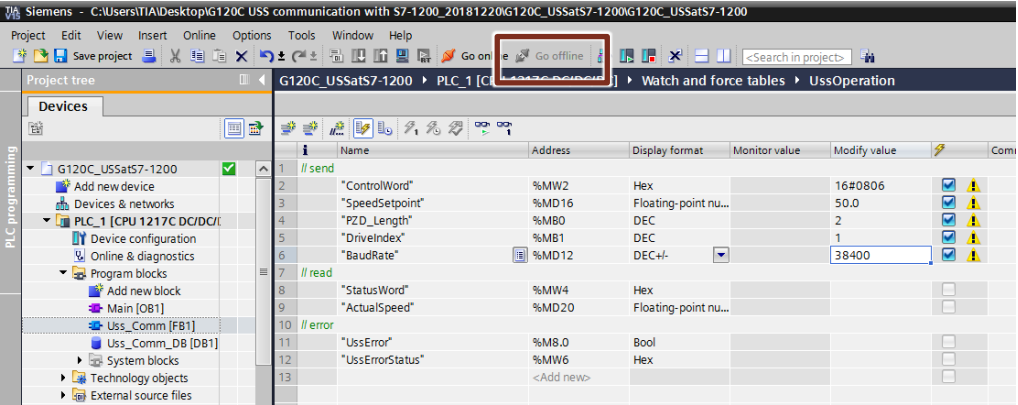
No.	Picture	Description
11		<p>Click <b>Load</b> to load the program into PLC.</p>
12		<p>Click <b>Finish</b>.</p>
13		<p>Save the project.</p>

## 4.4 Operation

Table 4-4 Operation

No.	Picture	Description																																										
1	 <p>The screenshot shows the SIMATIC Manager interface. The 'Go online' button is highlighted in the top toolbar. In the project tree on the left, the 'UssOperation' tag is selected under 'Watch and force tables'.</p>	<ol style="list-style-type: none"> <li>Go to the UssOperation.</li> <li>Click Go online.</li> </ol>																																										
2	 <p>The screenshot shows the 'Watch and force tables' window. The table below shows the actual values for the variables, which are highlighted in orange.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Address</th> <th>Display format</th> <th>Monitor value</th> </tr> </thead> <tbody> <tr> <td>// send</td> <td></td> <td></td> <td></td> </tr> <tr> <td>"ControlWord"</td> <td>%MW2</td> <td>Hex</td> <td>16#0806</td> </tr> <tr> <td>"SpeedSetpoint"</td> <td>%MD16</td> <td>Floating-point n ...</td> <td>50.0</td> </tr> <tr> <td>"PZD_Length"</td> <td>%MB0</td> <td>DEC</td> <td>2</td> </tr> <tr> <td>"DriveIndex"</td> <td>%MB1</td> <td>DEC</td> <td>1</td> </tr> <tr> <td>"BaudRate"</td> <td>%MD12</td> <td>DEC+/-</td> <td>38400</td> </tr> </tbody> </table>	Name	Address	Display format	Monitor value	// send				"ControlWord"	%MW2	Hex	16#0806	"SpeedSetpoint"	%MD16	Floating-point n ...	50.0	"PZD_Length"	%MB0	DEC	2	"DriveIndex"	%MB1	DEC	1	"BaudRate"	%MD12	DEC+/-	38400	<p>The actual values turn orange after online.</p>														
Name	Address	Display format	Monitor value																																									
// send																																												
"ControlWord"	%MW2	Hex	16#0806																																									
"SpeedSetpoint"	%MD16	Floating-point n ...	50.0																																									
"PZD_Length"	%MB0	DEC	2																																									
"DriveIndex"	%MB1	DEC	1																																									
"BaudRate"	%MD12	DEC+/-	38400																																									
3	 <p>The screenshot shows the 'Watch and force tables' window with the 'Modify value' column visible. The table below shows the configuration steps for the variables.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Address</th> <th>Display format</th> <th>Monitor value</th> <th>Modify value</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>// send</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>"ControlWord"</td> <td>%MW2</td> <td>Hex</td> <td>16#0807</td> <td>16#0807</td> <td><input checked="" type="checkbox"/> </td> </tr> <tr> <td>"SpeedSetpoint"</td> <td>%MD16</td> <td>Floating-poin...</td> <td>50.0</td> <td>50.0</td> <td><input checked="" type="checkbox"/> </td> </tr> <tr> <td>"PZD_Length"</td> <td>%MB0</td> <td>DEC</td> <td>2</td> <td>2</td> <td><input checked="" type="checkbox"/> </td> </tr> <tr> <td>"DriveIndex"</td> <td>%MB1</td> <td>DEC</td> <td>1</td> <td>1</td> <td><input checked="" type="checkbox"/> </td> </tr> <tr> <td>"BaudRate"</td> <td>%MD12</td> <td>DEC+/-</td> <td>38400</td> <td>38400</td> <td><input checked="" type="checkbox"/> </td> </tr> </tbody> </table>	Name	Address	Display format	Monitor value	Modify value	Comment	// send						"ControlWord"	%MW2	Hex	16#0807	16#0807	<input checked="" type="checkbox"/>	"SpeedSetpoint"	%MD16	Floating-poin...	50.0	50.0	<input checked="" type="checkbox"/>	"PZD_Length"	%MB0	DEC	2	2	<input checked="" type="checkbox"/>	"DriveIndex"	%MB1	DEC	1	1	<input checked="" type="checkbox"/>	"BaudRate"	%MD12	DEC+/-	38400	38400	<input checked="" type="checkbox"/>	<ol style="list-style-type: none"> <li>Configure the <b>PZD_Length</b> to 2 and the <b>DriveIndex</b> to 1.</li> <li>Configure the <b>ControlWord</b> as 16#0807 to set the off1 on.</li> <li>Configure the <b>speedSetpoint</b> to 50.0 then the motor start to run.</li> <li>Click <b>Modify all selected values once and now</b> for activate the values.</li> </ol>
Name	Address	Display format	Monitor value	Modify value	Comment																																							
// send																																												
"ControlWord"	%MW2	Hex	16#0807	16#0807	<input checked="" type="checkbox"/>																																							
"SpeedSetpoint"	%MD16	Floating-poin...	50.0	50.0	<input checked="" type="checkbox"/>																																							
"PZD_Length"	%MB0	DEC	2	2	<input checked="" type="checkbox"/>																																							
"DriveIndex"	%MB1	DEC	1	1	<input checked="" type="checkbox"/>																																							
"BaudRate"	%MD12	DEC+/-	38400	38400	<input checked="" type="checkbox"/>																																							

## 4 Configuration

No.	Picture	Description																																			
4	 <table border="1"> <thead> <tr> <th>Name</th> <th>Address</th> <th>Display format</th> <th>Monitor value</th> <th>Modify value</th> </tr> </thead> <tbody> <tr> <td>// send</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>"ControlWord"</td> <td>%MW2</td> <td>Hex</td> <td>16#0806</td> <td>16#0806</td> </tr> <tr> <td>"SpeedSetpoint"</td> <td>%MD16</td> <td>Floating-point nu...</td> <td>50.0</td> <td>50.0</td> </tr> <tr> <td>"PZD_Length"</td> <td>%MB0</td> <td>DEC</td> <td>2</td> <td>2</td> </tr> <tr> <td>"DriveIndex"</td> <td>%MB1</td> <td>DEC</td> <td>1</td> <td>1</td> </tr> <tr> <td>"BaudRate"</td> <td>%MD12</td> <td>DEC+/-</td> <td>38400</td> <td>38400</td> </tr> </tbody> </table>	Name	Address	Display format	Monitor value	Modify value	// send					"ControlWord"	%MW2	Hex	16#0806	16#0806	"SpeedSetpoint"	%MD16	Floating-point nu...	50.0	50.0	"PZD_Length"	%MB0	DEC	2	2	"DriveIndex"	%MB1	DEC	1	1	"BaudRate"	%MD12	DEC+/-	38400	38400	Configure the <b>ControlWord</b> back to 16#0806 to disable off1 and the motor stop running.
Name	Address	Display format	Monitor value	Modify value																																	
// send																																					
"ControlWord"	%MW2	Hex	16#0806	16#0806																																	
"SpeedSetpoint"	%MD16	Floating-point nu...	50.0	50.0																																	
"PZD_Length"	%MB0	DEC	2	2																																	
"DriveIndex"	%MB1	DEC	1	1																																	
"BaudRate"	%MD12	DEC+/-	38400	38400																																	
5		Click <b>Go offline</b> .																																			

## 5 Related literature

Table 5-1 Reference documents

	Topic
\1\	Siemens Industry Online Support <a href="http://support.industry.siemens.com">http://support.industry.siemens.com</a>
\2\	Download page of this entry <a href="https://support.industry.siemens.com/cs/ww/en/view/109764624">https://support.industry.siemens.com/cs/ww/en/view/109764624</a>
\3\	Simple speed control of a V20 with S7-1200/1500 using the USS protocol <a href="https://support.industry.siemens.com/cs/ww/en/view/109480894">https://support.industry.siemens.com/cs/ww/en/view/109480894</a>
\4\	G120C manual FW 4.7.10 <a href="https://support.industry.siemens.com/cs/ww/en/view/109757226">https://support.industry.siemens.com/cs/ww/en/view/109757226</a>

## 6 Contact

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## 7 History

Table 7-1

Version	Date	Modifications
V1.0	02/2019	First version