III.ERANSKINA: KOMUNIKAZIOA

Communication with S7 CPU via KNX Gateway

S7-1200, S7-1500, PROFINET, "Triple-X PROFINET + KNX" Universal Gateway

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1 Task

1.1 Introduction

Gateways enable communication between two networks/bus systems that use different communications protocols.

KNX is a fieldbus for building automation. Technically, KNX is the successor to the European Installation Bus (EIB), adding communication mechanisms and transmission media.

The functionality of a KNX system can be extended by integrating an S7 CPU into a KNX system via a gateway. An S7 CPU enables the use of various functions and statements for creating a control program and processing data.

The “LGF (Library of general functions)” for STEP 7 (TIA Portal) and S7-1200 / S7-1500 additionally provides complementary functions such as an astronomical clock, weekly timer, FIFO and many more (see \4\).

1.2 Overview of the automation task

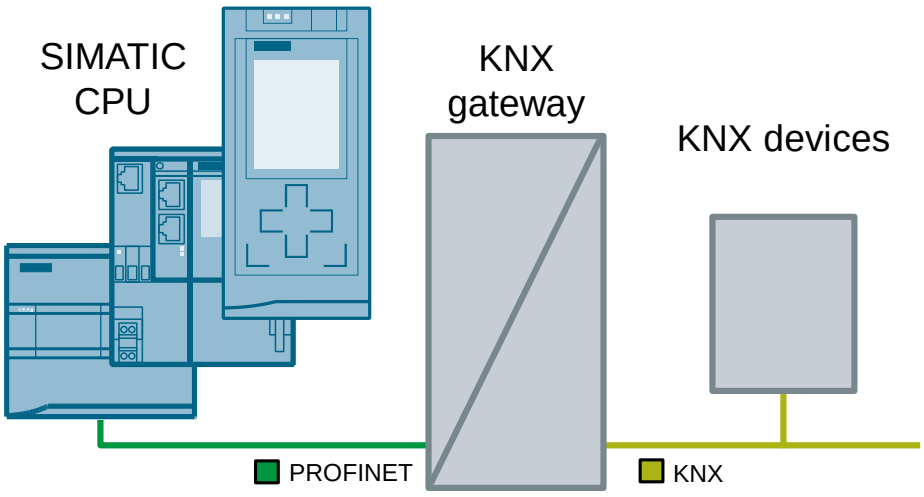
The task is to establish, using a KNX gateway, a communication connection between an S7 CPU via PROFINET (PN) and a KNX device via the KNX bus.

Each KNX device has a physical address (PA) via which the device can be accessed. The individual functions of a KNX device are addressed by group addresses (GA).

Through bidirectional data exchange between a KNX gateway and an S7 CPU, signals of a KNX device are to be processed in the S7 CPU or KNX devices are to be controlled using the S7 CPU.

The figure below provides an overview of the automation task.

Figure 1-1: Block diagram of the automation task



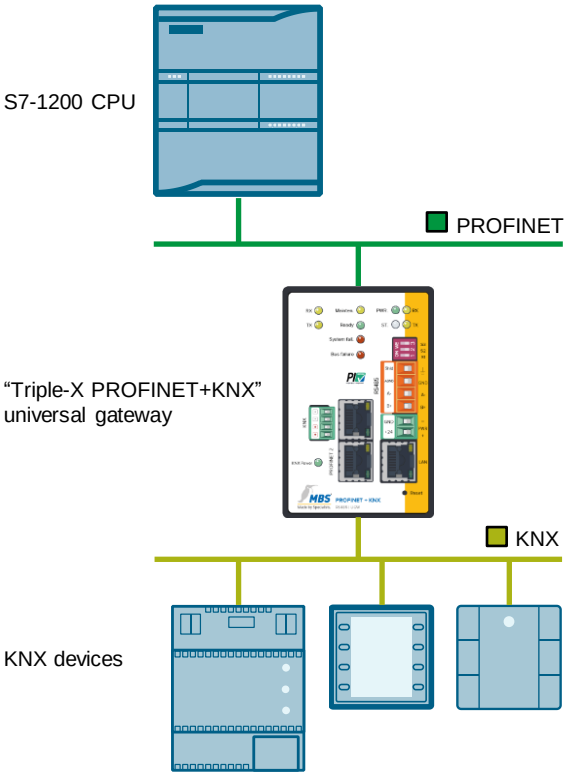
2 Solution

2.1 Overview

Diagrammatic representation

Representing all SIMATIC controllers, this solution uses an S7-1200 CPU. The diagrammatic representation below shows the most important components for communication between an S7-1200 CPU and a KNX network using the “Triple-X PROFINET + KNX” universal gateway from MBS GmbH.

Figure 2-1: Block diagram of the solution with the components used



The “Triple-X PROFINET + KNX” universal gateway enables communication between an S7-1200 CPU and KNX devices via PROFINET and the KNX bus.

In this example, the KNX devices consist of:

- KNX wall switch triple
- KNX room control unit
- KNX power supply[1]

Correct communication is verified with the KNX devices and a STEP 7 (TIA Portal) watch table.

[1] An external KNX power supply is necessary for operating a KNX network and is no communication node in the network.

The following table shows the relevant interfaces of the gateway for this application example:

Table 2-1: Gateway interfaces

Interface label	Communication medium	Network	Connected device
PROFINET 1 or PROFINET 2	Ethernet	PROFINET	SIMATIC CPU (S7-1200 CPU)
LAN	Ethernet	LAN	PG / PC
KNX	Twisted pair cable	KNX	KNX devices (incl. KNX power supply)

Advantages

The solution presented here offers the following advantages:

- Easy adaptation to other controller families. Representing all other SIMATIC controllers with a PROFINET IO interface, this solution uses the S7-1200 CPU.
- Easy adaptation when expanding plants. The gateway is configured directly in the gateway's integrated web server.
- Integration of the gateway as a PROFINET IO device via a GSD file.
- Gateway as distributed I/O with up to 340 bytes of input and 340 bytes of output.
- Up to 2500 data points possible for communication between PROFINET and KNX.

Scope

- This document does not replace the gateway manual. If there are any differences in the documentation, the documentation provided by MBS GmbH always takes precedence.
- This application example only describes how to get started with KNX communication with SIMATIC CPUs using a KNX gateway. For more information about the KNX gateway, please refer to the gateway manual or directly contact MBS GmbH.
- Configuring the KNX devices using the ETS[2] software and communication between the gateway and the KNX devices are not part of this application example.
- Sales, distribution, training, service and support for the "Triple-X PROFINET + KNX" universal gateway are provided exclusively by MBS GmbH.

Required knowledge

- Basic knowledge of STEP 7 (TIA Portal) programming and project engineering
- Basic knowledge of PROFINET communication and configuration
- Basic knowledge of the ETS software, KNX communication and KNX group addresses

[2] Engineering Tool Software (ETS) for programming nodes and assigning group addresses in a KNX network.

2.2 Description of the core functionality

Configuration

The connection between the S7-1200 CPU and the gateway is configured via

- the configuration of the gateway as distributed I/O in STEP 7 (TIA Portal).
- configuration files of the gateway (cfg and txt files) (see Figure 3-3) that reference each other.

The configuration files are downloaded to the gateway using the integrated web server or directly edited.

Configuring and programming the gateway requires no ETS software. The gateway can access existing data points (group addresses) in the KNX network and provide its own data points locally on the gateway.

The assignment of the devices' group addresses and physical addresses is not part of this description. For more information, please refer to the supplied ETS5 sample project. The gateway's physical address (KNX) is set using the "eib1.cfg" configuration file (see 4.4.3).

Function and data types

This application example contains a STEP 7 project and a data record for the gateway, where data of different data types is exchanged between an S7-1200 CPU and KNX devices in both directions via the gateway. A decimal value is transferred from the S7-1200 CPU to the KNX control room unit's display and a status LED of the KNX wall switch is controlled via a binary signal. Conversely, the value of the integrated temperature sensor and a configurable decimal value are transferred from the KNX room control unit. Using the KNX wall switch, a boolean variable is set/reset in the S7-1200 CPU.

The following data types are used and parameterized:

Table 2-2: SIMATIC / gateway data types

SIMATIC (S7-1200 CPU)		Gateway			KNX
		PROFINET	KNX		
BOOL	↔	BIT	UINT1	↔	DPT-1
INT	↔	SINT16	SINT16	↔	DPT-7
REAL	←	FLOAT32	SFLOAT	←	DPT-9

2.3 Hardware and software components

This application example was created with the following components:

Hardware components

Table 2-3: Hardware components

Component	No.	Article number	Note
POWER MODULE PM1207	1	6EP1332-1SH71	Power supply input: 120/230 V AC output: 24 V DC/2.5 A
SIMATIC S7-1214C DC/DC/DC FW4.2	1	6ES7214-1AG40-0XB0	Alternatively, any other S7-1200 CPU (FW4.1 or higher) or S7-1500 CPU (FW1.7 or higher) can be used.
Compact Switch Module	1	6GK7277-1AA00-0AA0	(optional) The switch is only required if you want to simultaneously access (without “replugging”) the S7-1200 and the gateway from the PG/PC.
“Triple-X PROFINET + KNX” universal gateway (RS485)	1	Manufacturer: MBS GmbH Operating system: Linux 2.6.34.7 #267 Software module: V2_05W Hardware module: 15.1.1	http://www.mbs-solutions.de/profinet-knx For the versions on the left, visit the gateway web server’s page, “Help > Device info”. Alternative: RS232
Siemens Gamma KNX room control unit	1	5WG1227-2AB11	Operating and installation instructions https://support.industry.siemens.com/cs/ww/en/view/76776544
Siemens Gamma KNX wall switch triple	1	5WG1223-2DB13	-
Siemens Gamma KNX bus coupling unit	1	5WG1117-2AB12	-
Siemens Gamma KNX power supply	1	5WG1125-1AB01	
Siemens Gamma KNX USB interface	1	5WG1148-1AB12	Optional. Interface for programming the KNX devices.

Software components

Table 2-4: Software components

Component	No.	Article number	Note
SIMATIC STEP 7 Professional V15.1 (TIA Portal)	1	6ES7822-1..05-..	-
GSDML-V2.31-MBS-MICRO3004-20150206	1	Manufacturer: MBS GmbH	The latest GSDML files are available directly from MBS GmbH. The GSDMLV2.31 file was used in this example. The files are available in the “AdditionalFiles – GSD” folder in the STEP 7 project. When opening the project, the GSD file is installed automatically.
ETS5 Demo	1	https://www.knx.org/knx-en/software/ets/download/index.php	Maximum of 5 KNX devices per project.

Sample files and projects

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

Table 2-5: Download files

Component	Note
109739689_KNX_DOC_V11_en.pdf	This document
109739689_KNX_S7_PROJ_V11.zip	This .zip file contains the “MBS_KNX” STEP 7 project.
109739689_KNX_Gateway_RestoreFile_V11.zip	This zip file contains the “ugwbackup.tgz” gateway data backup with the configuration files.
109739689_KNX_ETS5_PROJ_V11.zip	This .zip file contains the ETS5 project.

3 Mode of Operation

The data between the two bus systems, PROFINET and KNX, is exchanged between the drivers (PROFINET, KNX) in the gateway via data point mapping.

The data points are described in the pnetd1.txt and eib1.txt configuration files and mapped to each other in the dispatch.txt dispatch file.

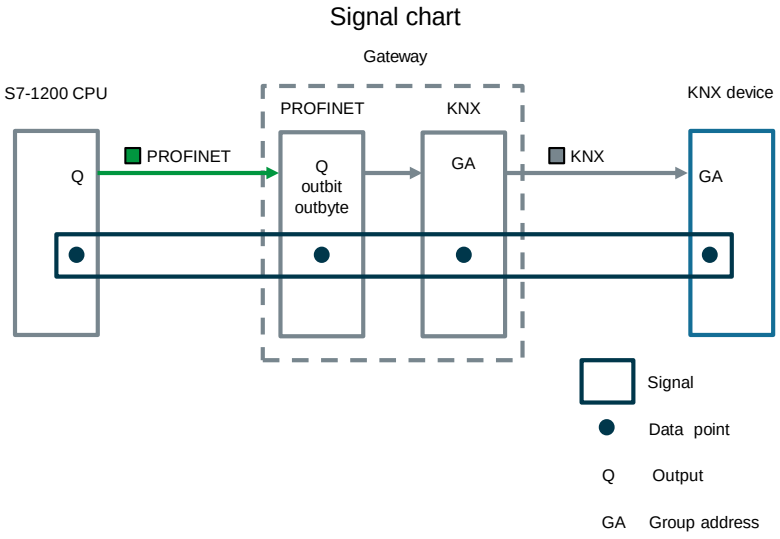
For each data point, the format specifies how the driver should interpret the data at the data point address.

3.1 Data points and signal chart

Each interface of a device (CPU, KNX) that is used to transfer data represents a data point. As the gateway connects two different bus systems, it has two data points – the source data point and the target data point.

The example in the following figure shows a signal that is generated in the S7-1200 CPU and transmitted to the gateway via PROFINET. The gateway converts the PROFINET signal to a KNX telegram and sends it to the appropriate group address of the KNX device. In the same way, a signal can also be transmitted from a KNX device to the S7-1200 CPU.

Figure 3-1: S7-1200 CPU → KNX device – signal chart



For the KNX driver and all other gateway drivers, the following types apply to the definition of the data types:

Table 3-1: Definition of the data point types

Type	Meaning
M	Integer value (binary data points, counts) that can only be read by the gateway.
S	Integer value that can be read and written by the gateway.
X	Analog value (with decimal places) that can only be read by the gateway.
Y	Analog value (with decimal places) that can be read and written by the gateway.

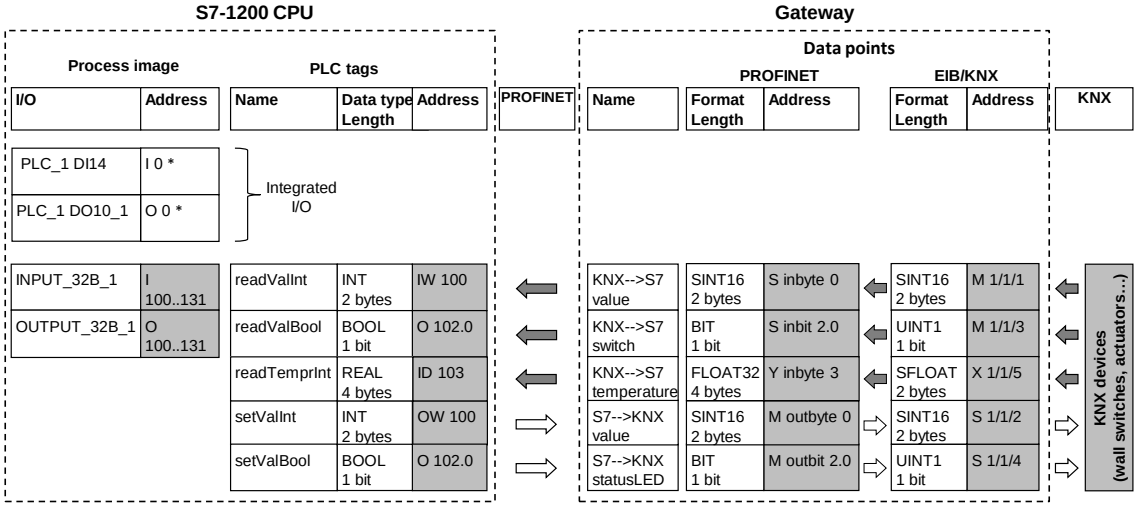
For a definition of “data points”, please refer to the gateway manual (\3\), section 6 “Protocol properties and data points”.

3.2 Data point mapping

The following figure shows all of the data used and the process image of the S7-1200 CPU for the configuration with the gateway.

Please note: The input or output signal type always refers to the “perspective” of the respective device.

Figure 3-2: Interaction between the process image of the S7 CPU and the data points in the gateway



Note

*Compact CPUs (e.g., S7-1200) with integrated digital inputs and outputs:

In STEP 7 (TIA Portal), the smallest address 0 is automatically assigned to the integrated digital inputs and outputs.
Other modules / I/O are automatically assigned to the next available address.

Here, the address space starting with 100 was selected in the process image. This makes it easier to identify the connected tags between the S7-1200 CPU and the gateway.

3.3 Correlation of the gateway configuration files

The gateway is configured using various configuration files (cfg, txt files). Once programming is complete, these files are uploaded in a text editor (for example, Notepad++) using the integrated web server in the gateway or directly edited and enabled in the integrated web server. A configuration check is performed in the gateway and any errors are displayed.

As the gateway supports different bus systems (PROFINET, KNX, BACnet…), there are different driver files with protocol information (files with the .cfg extension) and a file with the definition of the data points (.txt extension).

The dispatch file (dispatch.txt) is an integral part. It contains the mapping of the data points of the different protocols to each other.

The data points are programmed as objects. For the exact meaning and structure of these files, please refer to the gateway manual (\3\). The gateway data backup cfg and txt files also contain this information as comment lines.

For the complete configuration, please refer to the supplied “ugwbackup.tgz” gateway data backup in the “ugw > config” folder and the included comments (109740160_KNX_Gateway_RestoreFile_Vxx.zip).

Figure 3-3: Gateway configuration files

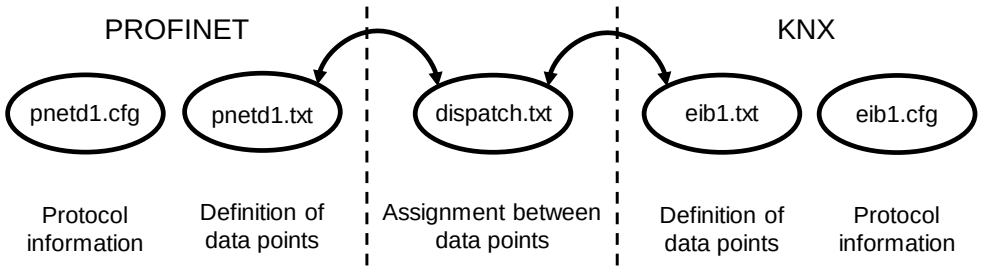


Table 3-2: Gateway configuration files

File	Contents	Description
pnetd1.cfg	PROFINET protocol information	This file contains information and settings for the PROFINET network, including the I/O used in the network. Here: I/O configuration of the gateway in STEP 7 (TIA Portal)
pnetd1.txt	Definition of the PROFINET data points	Defines how and with which data type the data points are interpreted.
dispatch.txt	Assignment between KNX data points and PROFINET data points	This file describes the assignment of the data points between the PROFINET side (pnetd1.txt) and the KNX side (eib1.txt).
eib1.txt	Defines the KNX data points	This file contains the description of the individual data points on the KNX side.
eib1.cfg	KNX protocol information	This file contains information and settings for the KNX protocol.

Note In the gateway configuration files, KNX objects are identified by “eib…” and PROFINET objects are identified by “pnetd…”.

This application example describes how to edit and customize these files so that they can be used for data exchange (see Chapter 4.4 Gateway: Editing configuration files). Along with this description, you are provided with a data backup file with the ready-to-use sample files that you can customize for your own application.

Note In addition, the following configuration files exist that need to be downloaded to the gateway but not edited:

- driver.cfg
- ugwc1.cfg
- ugwc1.txt
- gateway.cfg
- ntp.cfg
- plants.cfg

These files are not described in greater detail in this application. If you require more information, please contact MBS GmbH.

4 Configuration and Project Engineering

This chapter describes the configuration in STEP 7 (TIA Portal) and the programming of the gateway configuration files.

If you want to use the sample configuration of this application example without any changes, you can download the STEP 7 project directly to the S7-1200 CPU and the gateway configuration to the gateway (see Chapter 5.3.1 Commissioning the gateway).

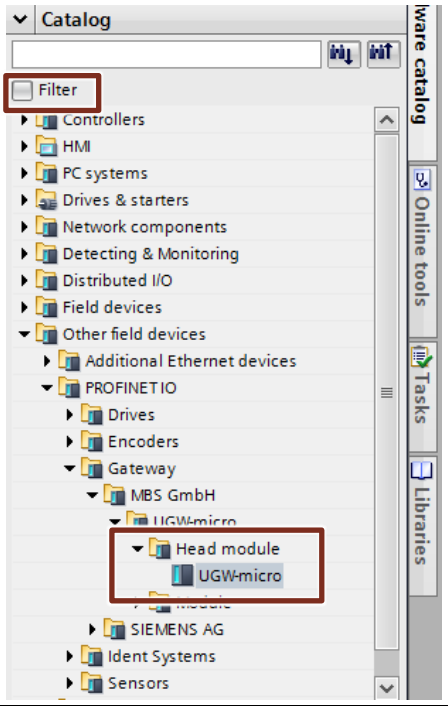
4.1 STEP 7 (TIA Portal) device configuration

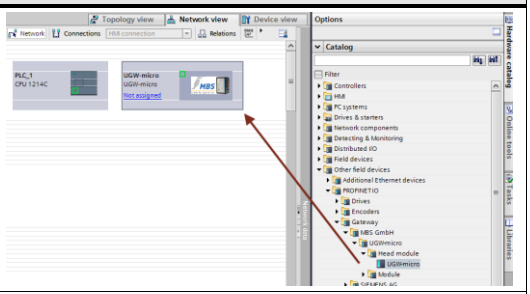
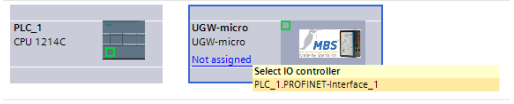
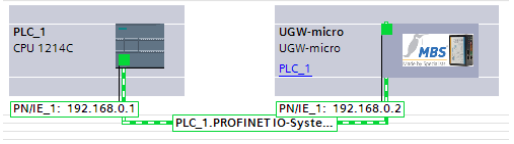
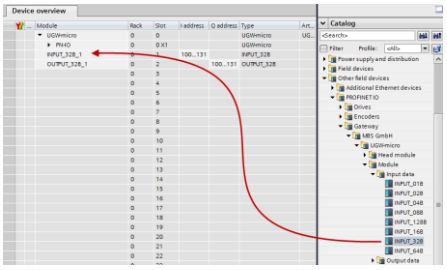
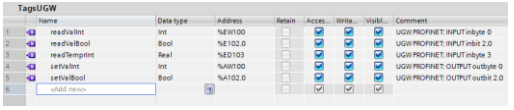
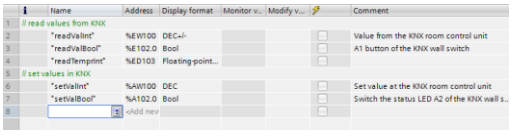
Note

Before you can configure the gateway in STEP 7 (TIA Portal), you must install the gateway's GSD file. The GSD file can be found on the gateway's web user interface, "Profinet > GSDML file". \6\ provides a description of how to install a GSD file in TIA Portal.

When you open the supplied "MBS_KNX" STEP 7 project, the GSD file is installed automatically, see 5.3.2 Commissioning the S7-1200 CPU.

Table 4-1: Device configuration in STEP 7 (TIA Portal)

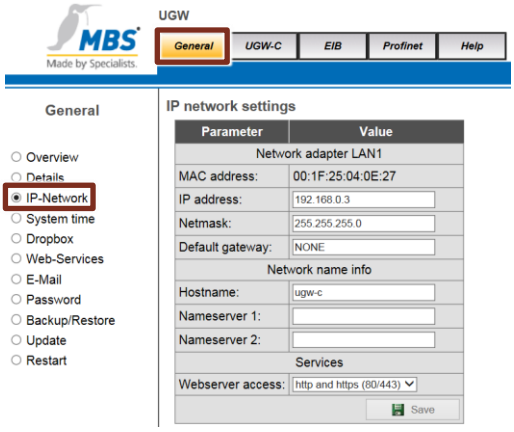
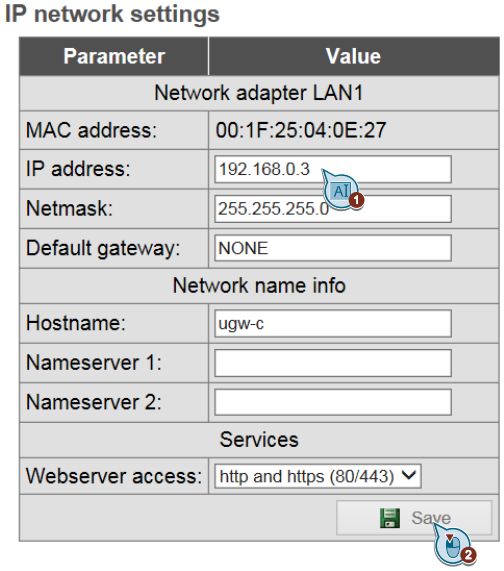
No.	Action	Comment
1.	Create a STEP 7 (TIA Portal) project and insert an S7-1200 CPU (S7-1214C DC/DC/DC FW4.2).	Requirement: You have STEP 7 (TIA Portal) V15.1 or higher installed on your computer.
2.	In "Devices & networks", open the "Network view". In the hardware catalog, navigate to "Head module", "UGW-micro". Make sure that the firmware version (V2.31) is correct.	

No.	Action	Comment
3.	Use drag and drop to move the “UGW-micro” from the hardware catalog to the “Devices & networks” editor.	
4.	Click “Not assigned”) for the UGW-micro and select the interface of the S7-1200 CPU used (“PLC_1.PROFINET…”).	
5.	Set the following PROFINET IP address: S7-1200 CPU: 192.168.0.1 UGW-micro: 192.168.0.2	
6.	Double-click the UGW-micro to open the UGW-micro device view.	
7.	Open the hardware catalog and navigate to the gateway’s input/output modules. Equip the UGW-micro with the required modules. Change the I/Q addresses to the range starting with 100.	
8.	Create a PLC tag table, for example “TagsUGW”, as shown in the figure on the right.	
9.	Create the watch table, for example “WatchTableUGW”, to monitor and modify the tags.	

Note As the tags directly access the process image, no system blocks (SFC, SFB) are necessary.

4.2 Gateway: Setting the LAN IP address

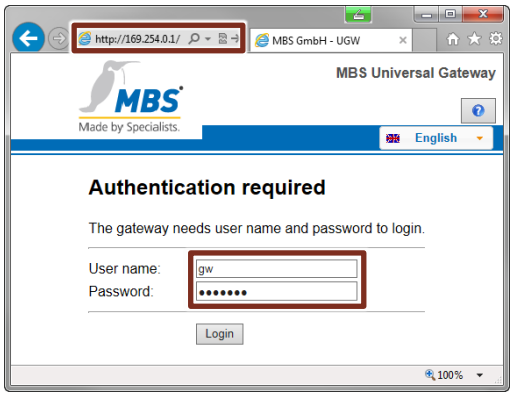
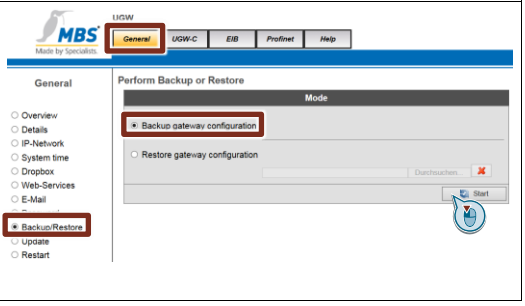
Table 4-2: Setting the IP address of the gateway

No.	Action	Comment
1.	Make sure that • your computer is in the same subnet as all the components involved, • all the components are connected using LAN cables, • all the components are connected to a power supply and turned on.	See Chapter 5.2 Installing the hardware
2.	Start your preferred web browser and connect to the gateway web server.	Factory default: IP address: 169.254.0.1 User name: gw Password: GATEWAY
3.	Select “General > IP-Network” to set the IP address of the gateway’s LAN interface.	
4.	1. Change the IP address. 2. Select “Save” to save the setting. **Note** After saving, you need to reconnect to the gateway using the new IP address you have just set. **Note** For successful communication with the gateway, the IP address of your PC must be in the same subnet. If necessary, change the IP address of your PC.	

No.	Action	Comment
5.	When you have logged back on to the gateway using the new IP address, a **complete system restart** is required. Click the “Restart required!” button to perform a restart. Use the “complete system restart” option to restart the gateway as described in Chapter 4.6.	

4.3 Gateway: Data backup

Table 4-3: Perform the gateway data backup

No.	Action	Comment
1.	Make sure that • your computer is in the same subnet as all the components involved, • all the components are connected using LAN cables, • all the components are connected to a power supply and turned on.	See Chapter 5.2 Installing the hardware
2.	Start your preferred web browser and connect to the gateway web server. Default settings: • IP address: 169.254.0.1 • User: “gw” • Password: “GATEWAY”	
3.	If necessary, back up all gateway configuration files using the “Backup/Restore” menu that allows you to restore the default settings if necessary (see the “Help > Online help” UGW menu item). To back up data, navigate to “General > Backup/Restore > Backup gateway configuration”. Click “Start” and follow the menu prompts.	

4.4 Gateway: Editing configuration files

This chapter provides a detailed description of the structure and editing of the gateway configuration files.

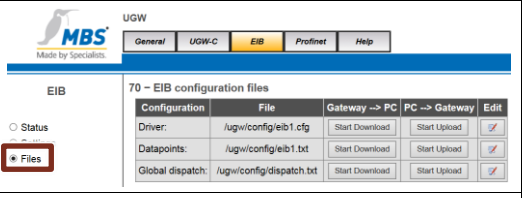
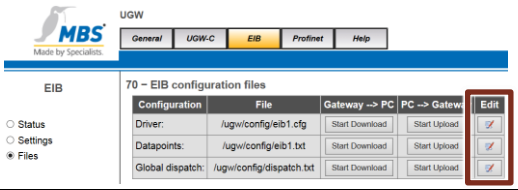
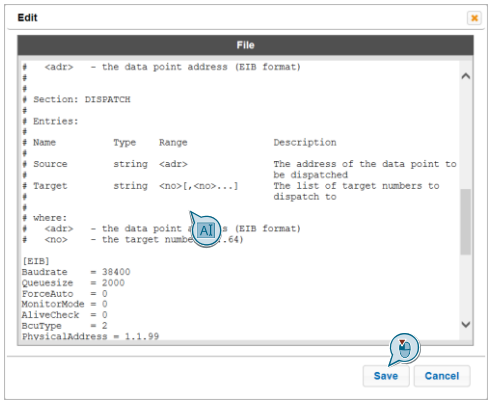
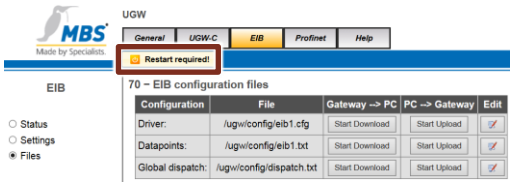
You can edit the files directly in the integrated web server or download the files, edit them with a text editor (for example, Notepad++) and then upload them back to the gateway.

Chapter 3.3 Correlation of the gateway configuration files provides you with an overview of how the configuration files correlate.

4.4.1 Editing in the integrated web server

The following instructions describe how to edit the configuration files directly in the integrated web server.

Table 4-4: Editing in the integrated web server

No.	Action	Comment
1.	From the top menu bar, select “EIB” to edit the configuration files for the KNX protocol. Alternative: From the top menu bar, select “Profinet” to edit the files of the PROFINET protocol.	
2.	From the left menu bar, select “Files”.	
3.	Click the Edit icon of the configuration file you want to edit.	
4.	A new window opens where you can make the changes. Click “Save” to save the changes.	
5.	After saving, the window closes automatically and the “Restart required!” message appears. Restart the gateway as described in Chapter 4.6.	

4.4.2 Configuration files

For the configuration of the gateway, the following files are edited and then downloaded to the gateway using the integrated web server or directly edited in the integrated web server.

- pnetd1.cfg
- pnetd1.txt
- eib1.cfg
- eib1.txt
- dispatch.txt

4.4.3 “eib1.cfg” gateway file

The KNX protocol settings are made in the “eib1.cfg” configuration file.

Table 4-5: Structure of the “eib1.cfg” gateway file

No.	Description	Comment

1.	Make the necessary parameter settings such as the physical address in the KNX network (`PhysicalAddress`). The physical address must be freely available in the KNX network. You can also keep the default setting. For a detailed description of the individual parameters, please refer to the “eib1.cfg” file’s comment.	…
		`[EIB]`
		`Baudrate = 38400`
		`Queuesize = 2000`
		`ForceAuto = 0`
		`MonitorMode = 0`
		`AliveCheck = 0`
		`BcuType = 2`
		`PhysicalAddress = 1.1.99`
		…

4.4.4 “eib1.txt” gateway file

The data points of the KNX protocol and their properties are defined in the “eib1.txt” configuration file.

Table 4-6: Structure of the “eib1.txt” gateway file

No.	Description	Comment
1.	The KNX data points have the following structure: [<**def**> <**group address**>] name = <**name**> format = <**format**> <**def**>:For the definition of data points, see Table 3-1: Definition of the data point types <**group address**>: Two- or three-digit KNX group address. Two-digit: <maj>/<min> Three-digit: <maj>/<mid>/<ext> <maj>: 0-31 <min>: 0-2047 <mid>: 0-7 <ext>: 0-255 <**name**>: Optional; you can specify plain text for the data point. <**format**>: Protocol-dependent properties of the data point such as the data point for interpreting the information stored at the address. If necessary, more parameters can be added to the format, for example the poll rate (here: P:10 for read value every 10 seconds): format = <format> [F:<fact>] [P:<poll>][U:<upd>] [I:<opt>] [L:<loc>] [H:<prio>] [R:<addr>] [D:<dly>] For more driver-specific information such as type, address, formats and other parameters, please refer to the online documentation provided by MBS at the following link: http://wiki.mbs-software.info/doku.php?id=eib_knx	[M failure] name = EIB Failure [M 1/1/1] name = KNX-->S7 value format = SINT16 [S 1/1/2] name = S7-->KNX value format = SINT16 [M 1/1/3] name = KNX-->S7 switch format = UINT1 [S 1/1/4] name = S7-->KNX statusLED format = UINT1 [X 1/1/5] name = KNX-->S7 temperature format = SFLOAT P:10

Note For the driver to be provided with current values for all data points when starting up the gateway, all data points defined in the driver must have the read flag set on the ETS side.

4.4.5 “pnetd1.txt” gateway file

The data points of the PROFINET protocol and their properties are defined in the “pnetd1.txt” configuration file.

Table 4-7: Structure of the “pnetd1.txt” gateway file

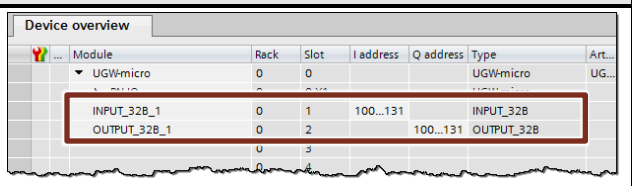
No.	Description	Comment

1.	The addresses of the PROFINET data points have the following structure:
	
	`[<def> <type> <byte>.<bit>]`
	`name = <name>`
	`format = <format>`
	
	<**def**>: For the definition of data points, see Table 3-1: Definition of the data point types
	
	<**type**>:
	inbyte: Byte value that can be read by the controller
	inbit: Single bit that can be read by the controller
	outbyte: Byte value that can be written by the controller
	outbit: Single bit that can be written by the controller
	
	<**byte**>: **0..339** (nth byte in the input/output register)
	
	<**bit**>: **0..7** (single bit within the nth byte)
	
	<name>: Optional; you can specify plain text for the data point.
	<format>: Protocol-dependent properties of the data point such as the data point for interpreting the information stored at the address.
	If necessary, more parameters can be added to the format, for example a poll rate (P:x):
	`format = <format> [F:<fact>] [P:<poll>][U:<upd>] [I:<opt>] [L:<loc>] [H:<prio>] [R:<addr>] [D:<dly>]`
	
	For more driver-specific information such as type, address, formats and other parameters, please refer to the online documentation provided by MBS at the following link or the “pnetd1.txt” file:
	http://wiki.mbs-software.info/doku.php?id=profinet_io-device
		`#--------------------------------`
		`# STATUS`
		`#--------------------------------`
		`[M failure]`
		`name = profinet communication state 0=ok / 1=fail`
		`format = BIT`
		
		`#--------------------------------`
		`# INPUT BUFFER (max 340 bytes)`
		`#--------------------------------`
		`[S inbyte 0]`
		`name = KNX-->S7 16-bit dec`
		`format = SINT16`
		
		`[S inbit 2.0]`
		`name = KNX-->S7 1-bit`
		`format = BIT`
		
		`[Y inbyte 3]`
		`name = KNX-->S7 temperature`
		`format = FLOAT32`
		
		`#--------------------------------`
		`# OUTPUT BUFFER (max 340 bytes)`
		`#--------------------------------`
		`[M outbyte 0]`
		`name = S7-->KNX 16-bit dec`
		`format = SINT16`
		
		`[M outbit 2.0]`
		`name = S7-->KNX 1-bit`
		`format = BIT`

4.4.6 “pnetd1.cfg” gateway file

The PROFINET device settings are made in the “pnetd1.cfg” configuration file. When configuring, make sure that the STEP 7 configuration and the gateway’s configuration file match exactly.

Table 4-8: Structure of the “pnetd1.cfg” gateway file

No.	Description	Comment
1.	The device configuration of the gateway can be found in STEP 7 (TIA Portal).	
2.	In the pnetd1.cfg configuration file, the device configuration of the gateway is programmed line by line according to the device configuration in STEP 7 (TIA Portal). Each device is referred to as a module (`Mod001, Mod002,..`). For an example of how to parameterize each module type, please refer to the “pnetd1.cfg” file.	`Mod001 = ID:0x16 IN:32 OUT:0 #INPUT_32B` `Mod002 = ID:0x26 IN:0 OUT:32 #OUTPUT_32B`

Note

When configuring, please note the following:

- All modules following “Mod001” must be numbered consecutively and without gaps.
- Upper limit: 60 modules (“Mod060”)
- The configuration is not applied until a power cycle (turn off and back on) of the gateway is complete.

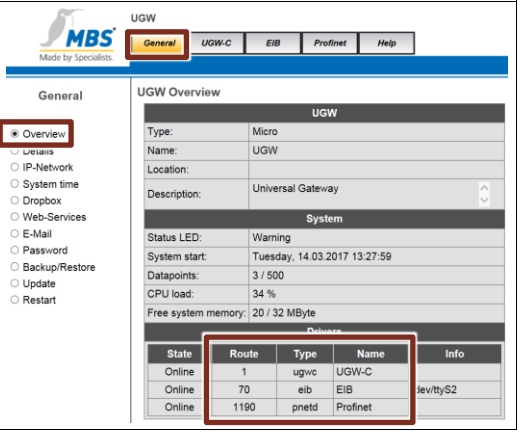
4.4.7 “dispatch.txt” gateway file

The assignment between KNX data points and PROFINET data points is made in the “dispatch.txt” configuration file.

Table 4-9: Structure of the “dispatch.txt” gateway file

No.	Description	Comment

1.	Syntax of a dispatch entry:
	`[<route source> <type source> <address>]`
	`target = <route target> <type target> <address>`
	
	`<route source>`: Source driver routing address
	`<type source>`: Source driver name
	`<route target>`: Target driver routing address
	`<type target>`: Target driver name
	`<address>`: Data point address
	
	Note
	For a data point to be used in the dispatch.txt file, the data point must have previously been declared in the driver-specific *.txt files.
		`# S7 --> KNX`
		`[1190 pnetd outbyte 0]`
		`target = 70 eib 1/1/2`
		
		`[1190 pnetd outbit 2.0]`
		`target = 70 eib 1/1/4`
		
		`# KNX --> S7`
		`[70 eib 1/1/1]`
		`target = 1190 pnetd inbyte 0`
		
		`[70 eib 1/1/3]`
		`target = 1190 pnetd inbit 2.0`
		
		`[70 eib 1/1/5]`
		`target = 1190 pnetd inbyte 3`

2.	For a driver’s routing address and name, go to “General > Overview”.	

Note In the dispatch file, you can use formulas for calculating data points. For more information about this and the dispatch mechanism, please refer to Links & Literature, \5\.

4.5 Gateway: Overview of the configuration

The following overview shows you the correlation of the gateway configuration files.

eib1.txt

```
[M 1/1/3]
name    = KNX→S7 switch
format  = UINT1

[S 1/1/2]
name    = S7→KNX value
format  = UINT1
```

dispatch.txt

```
# S7 → KNX
[1190 pnetd outbyte 0]
  target = 70 eib 1/1/2
…
# KNX → S7
[70 eib 1/1/3]
  target = 1190 pnetd inbit 2.0
```

pnetd1.txt

```
[M outbyte 0]
name    = S7→KNX value
format  = SINT16
…
[S inbit 2.0]
name    = KNX→S7 switch
format  = BIT
```

pnetd1.cfg

```
Mod001 = ID:0x16  IN:32   OUT:0   # INPUT_32B
Mod002 = ID:0x26  IN:0    OUT:32  # OUTPUT_32B
```

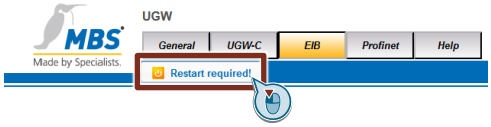
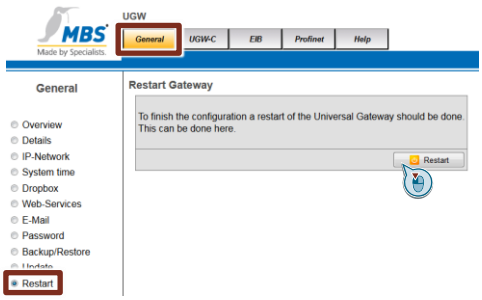
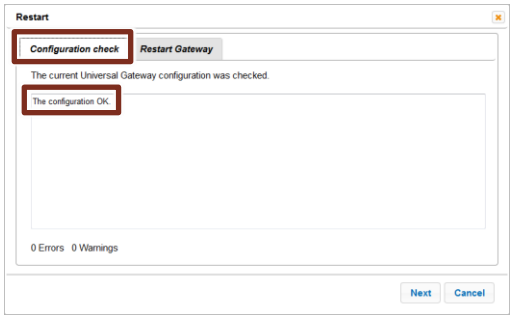
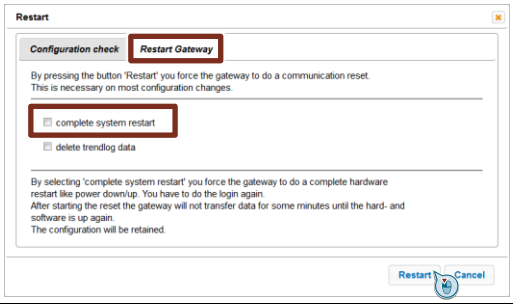
4.6 Gateway: Restart

Note

For changes of the configuration files to be activated, restart the gateway.

If changes are made in the “pnet1.cfg” PROFINET driver file, a complete restart (de-energized) of the gateway is required.

Table 4-10: Restarting the gateway

No.	Action	Comment
1.	Click the “Restart required!” button. Alternative: To restart the gateway, navigate to the “General > Restart > Restart” menu item.	 Alternative: 
2.	The gateway automatically checks the configuration files and, in the “Configuration check” tab, displays errors and warnings and the specific file and line where the cause can be found. Check the appropriate files/lines. If the current configuration in the gateway is correct, click “Next”.	
3.	Go to the “Restart Gateway” tab. Optionally, you can check the “complete system restart” check box to perform a complete system restart. Click the “Restart” button to confirm the action and follow the menu prompts.	
4.	After the restart, the changes made are activated. **Note** After a complete system restart, you have to log back on to the gateway.	-

5 Installation and Commissioning

This chapter describes the steps necessary to start up the example.

Note Always follow the below installation guidelines:

- “S7-1200 Programmable Controller” System Manual
- Gateway manual

5.1 Installing the software

Install the latest version of STEP 7 (TIA Portal) on your computer.

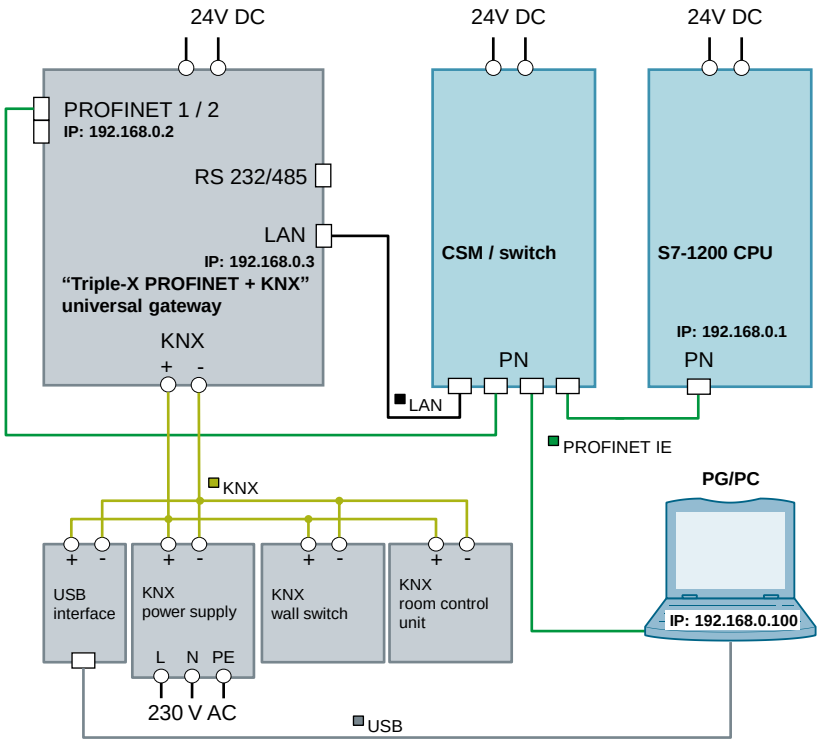
No additional software is needed for configuring the “Triple-X PROFINET+KNX” universal gateway. It is configured using the integrated web server.

5.2 Installing the hardware

5.2.1 Installation under laboratory conditions

For the function test of this application under laboratory conditions, the following installation using a switch is suitable. It allows you to simultaneously execute all of the below functions (see the following advantages) with a single PG/PC.

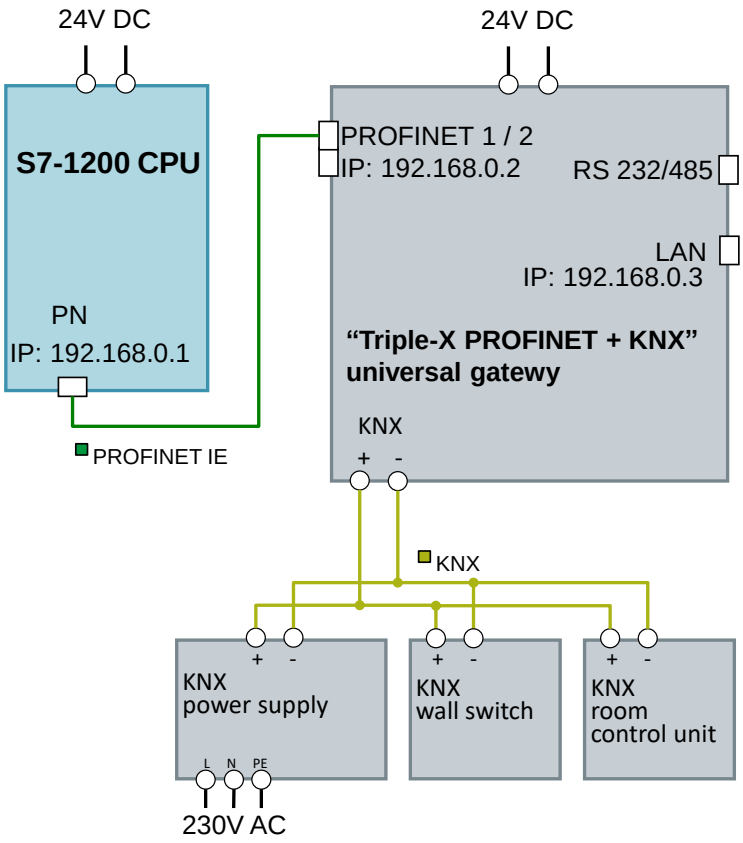
Figure 5-1: Installation under “laboratory conditions”



5.2.2 Installation under plant conditions

Under “real” conditions, a SIMATIC controller is normally directly connected to a KNX gateway. The gateway is integrated into a PROFINET network via the two PROFINET interfaces and connected to the KNX network via the KNX interface.

Figure 5-2: Installation under plant conditions



5.3 Commissioning

This chapter describes the steps for downloading the sample project to the S7-1200 CPU and the sample configuration to the gateway.

5.3.1 Commissioning the gateway

Note

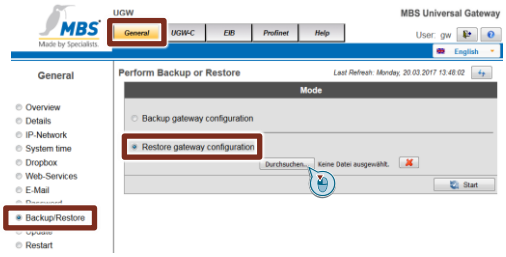
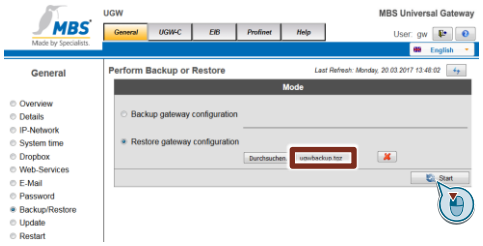
For some actions in the gateway web server, you need a user name and password.

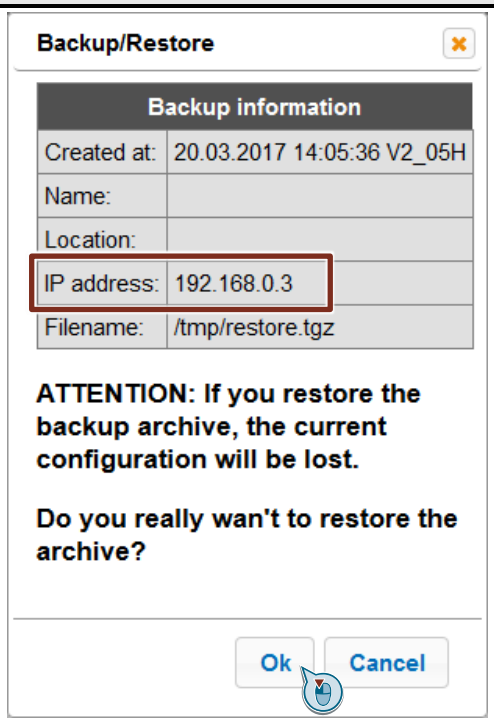
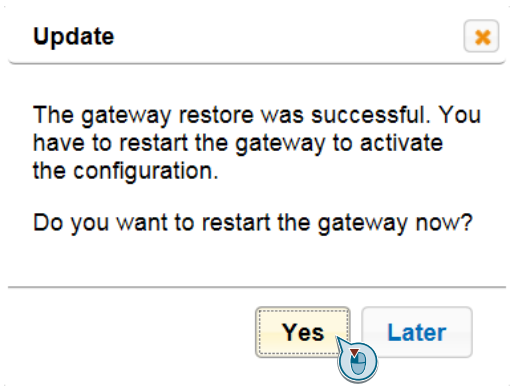
Default setting (as-supplied state):

User name: gw IP address: 169.254.0.1
Password: GATEWAY

If this login does not work, please refer to the gateway manual or contact MBS GmbH.

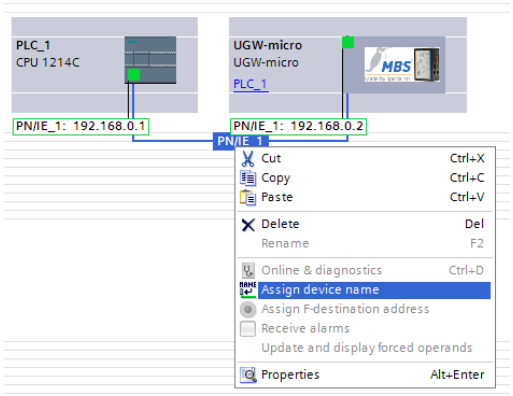
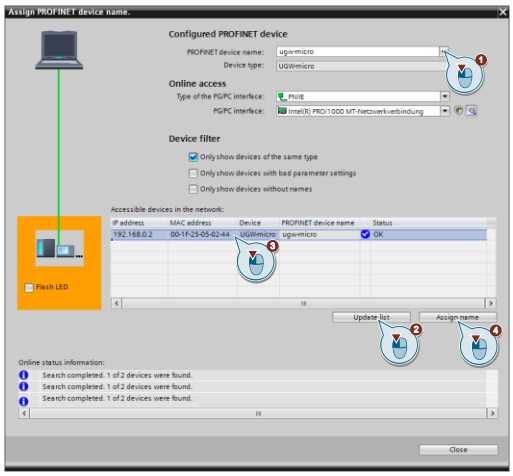
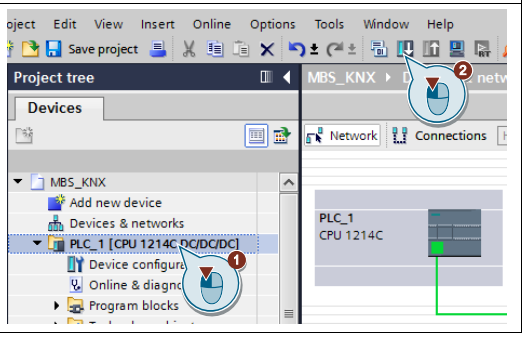
Table 5-1: Commissioning the gateway

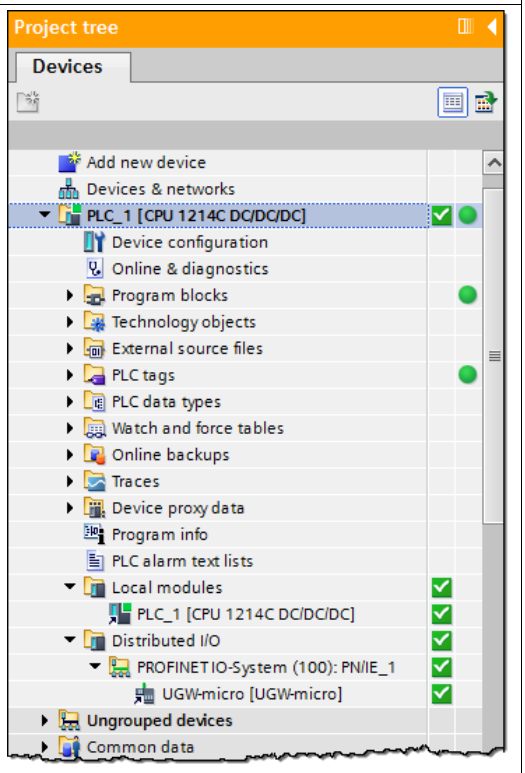
No.	Action	Comment
1.	Unzip the “109740160_KNX_Gateway_RestoreFile_Vxx.zip” file (e.g., using “7-Zip”).	You get the “ugwbackup.tgz” file.
2.	Start your preferred web browser and connect to the gateway web server.	Factory default: IP address: 169.254.0.1 User name: gw Password: GATEWAY
3.	Navigate to “General > Backup/Restore” and check the “Restore gateway configuration” check box. Click “Browse…” and navigate to the “ugwbackup.tgz” file.	
4.	Then click the “Start” button. The contained data is unzipped and downloaded directly to the gateway. **The following files are overwritten in the gateway:** • eib1.cfg • eib1.txt • dispatch.txt • driver.cfg • gateway.cfg • ntp.cfg • pnetd1.cfg • pnetd1.txt • ugwc1.cfg • ugwc1.txt	

No.	Action	Comment
5.	Click “OK” to confirm the following message. **Note** Restoring the data backup overwrites the gateway’s IP address setting (here: 192.168.0.3).	
6.	Enabling the restored configuration requires a restart. Select “Yes” to confirm the message.	

5.3.2 Commissioning the S7-1200 CPU

Table 5-2: Commissioning the S7-1200 CPU

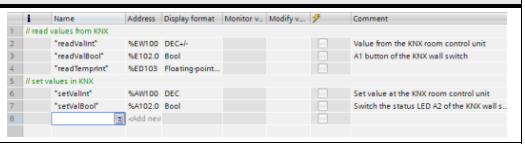
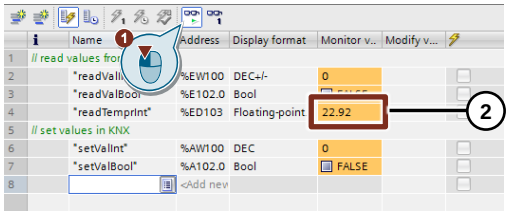
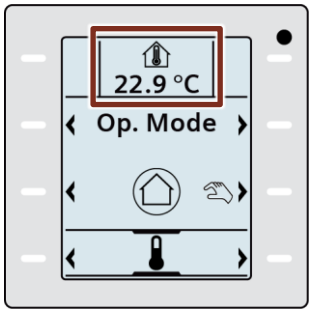
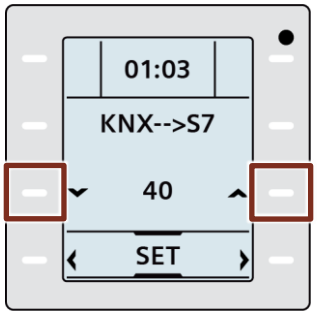
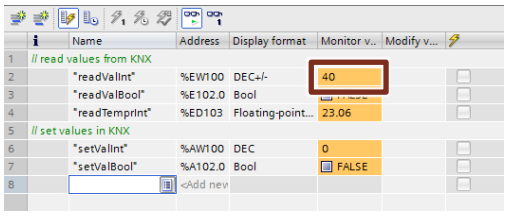
No.	Action	Comment
1.	Start STEP 7 (TIA Portal) and open the “MBS_KNX” STEP 7 project from the “109740160_KNX_S7_PROJ_Vxx.zip” file. **Note** The gateway’s GSD file is installed automatically.	Requirement: You have STEP 7 (TIA Portal) V14 or higher installed on your computer.
2.	Open “Devices & networks”.	-
3.	Right-click the connection and select “Assign device name”.	
4.	Assign the PROFINET device name to the S7-1200 CPU and the gateway. 1. Select the device name you want to assign. 2. Click “Update List”. The suitable device type is automatically found in the network and displayed in the list. 3. From the list, select the device to which you want to assign the selected name. 4. Click “Assign name”.	
5.	1. In the project tree, select the S7-1200 CPU (here: PLC_1). 2. In the menu bar, click the “Download to device” button.	

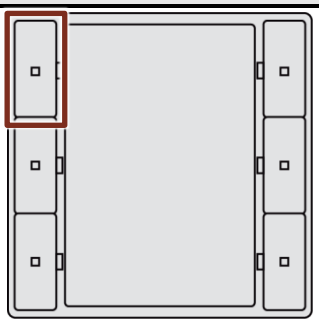
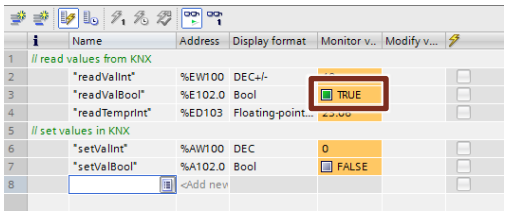
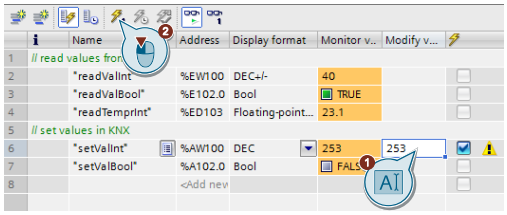
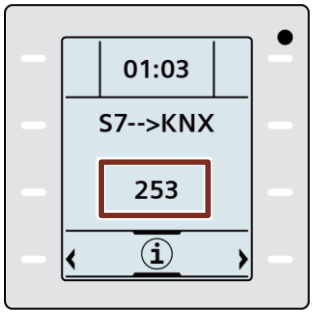
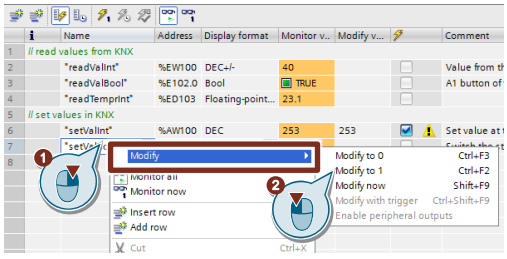
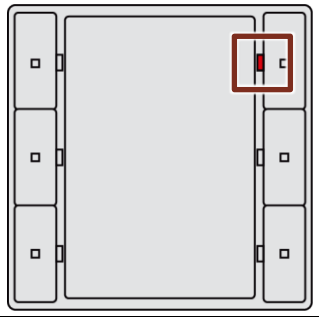
No.	Action	Comment
6.	Acknowledge the download dialogs and set the S7-1200 CPU to RUN. After the download, the devices have also been assigned their PROFINET IP addresses.	-
7.	In the project tree, select the S7-1200 (PLC_1) and in the menu bar, click “Go online”. If everything was parameterized and downloaded correctly, all icons are green.	

6 Operation of the Application Example

You can verify communication between the S7-1200 and the KNX devices using the watch table in TIA Portal and the functions of the KNX devices.

Table 6-1: Monitoring and modifying tags using the watch table

No.	Action	Comment
1.	In STEP 7 (TIA Portal), open the "WatchTableUGW" watch table.	
2.	1. Click the "Monitor all" button. 2. Monitor the room temperature of the KNX room control unit.	
3.	Compare the room temperature from the watch table with the display in the KNX room control unit.	
4.	On the KNX room control unit, navigate to the "SET" function named "KNX→S7" and set a new value.	
5.	In the watch table, monitor the value change of the "readValInt" tag.	

No.	Action	Comment
6.	On the KNX wall switch triple, press A1.	
7.	In the watch table, monitor the value change of the “readValBool” tag.	
8.	1. Enter a new value for the “setValInt” tag. 2. Click the button to modify the value.	
9.	On the KNX room control unit, navigate to the “i” function named “S7→KNX” and monitor the value change.	
10.	1. Right-click the “setValBool” tag. 2. In “Modify”, select the “Modify to 1” function.	
11.	On the KNX switch, monitor the switching of status LED A2.	

7 Links & Literature

Table 7-1: Links

	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Download page of the entry https://support.industry.siemens.com/cs/ww/en/view/109739689
\3\	Product page with gateway data sheet, manual http://www.mbs-solutions.de/profinet-knx
\4\	Library of general functions (LGF) for STEP 7 (TIA Portal) and S7-1200 / S7-1500 https://support.industry.siemens.com/cs/ww/en/view/109479728
\5\	Dispatch mechanism of the gateway http://wiki.mbs-software.info/doku.php?id=the_dispatch-mechanism
\6\	How do you install a GSD file in STEP 7 (TIA Portal)? https://support.industry.siemens.com/cs/ww/en/view/109738401

8 MBS GmbH – Contact

Figure 8-1: MBS GmbH

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9 History

Table 9-1

Version	Date	Modifications
V1.0	06/2017	First version
V1.1	07/2019	Update TIA Portal V15.1