Communication with S7-CPU via DALI Gateway

S7-1200, S7-1500, PROFINET, Gateway "multi PROFINET + DALI"

https://support.industry.siemens.com/cs/ww/en/view/109740160

Legal information

Use of application examples

Application examples illustrate the solution of automation tasks through an interaction of several components in the form of text, graphics and/or software modules. The application examples are a free service by Siemens AG and/or a subsidiary of Siemens AG ("Siemens"). They are non-binding and make no claim to completeness or functionality regarding configuration and equipment. The application examples merely offer help with typical tasks; they do not constitute customer-specific solutions. You yourself are responsible for the proper and safe operation of the products in accordance with applicable regulations and must also check the function of the respective application example and customize it for your system.

Siemens grants you the non-exclusive, non-sublicensable and non-transferable right to have the application examples used by technically trained personnel. Any change to the application examples is your responsibility. Sharing the application examples with third parties or copying the application examples or excerpts thereof is permitted only in combination with your own products. The application examples are not required to undergo the customary tests and quality inspections of a chargeable product; they may have functional and performance defects as well as errors. It is your responsibility to use them in such a manner that any malfunctions that may occur do not result in property damage or injury to persons.

Disclaimer of liability

Siemens shall not assume any liability, for any legal reason whatsoever, including, without limitation, liability for the usability, availability, completeness and freedom from defects of the application examples as well as for related information, configuration and performance data and any damage caused thereby. This shall not apply in cases of mandatory liability, for example under the German Product Liability Act, or in cases of intent, gross negligence, or culpable loss of life, bodily injury or damage to health, non-compliance with a guarantee, fraudulent non-disclosure of a defect, or culpable breach of material contractual obligations. Claims for damages arising from a breach of material contractual obligations shall however be limited to the foreseeable damage typical of the type of agreement, unless liability arises from intent or gross negligence or is based on loss of life, bodily injury or damage to health. The foregoing provisions do not imply any change in the burden of proof to your detriment. You shall indemnify Siemens against existing or future claims of third parties in this connection except where Siemens is mandatorily liable.

By using the application examples you acknowledge that Siemens cannot be held liable for any damage beyond the liability provisions described.

Other information

Siemens reserves the right to make changes to the application examples at any time without notice. In case of discrepancies between the suggestions in the application examples and other Siemens publications such as catalogs, the content of the other documentation shall have precedence.

The Siemens terms of use (https://support.industry.siemens.com) shall also apply.

Security information

Siemens provides products and solutions with Industrial Security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place. For additional information on industrial security measures that may be implemented, please visit https://www.siemens.com/industrialsecurity.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at: https://www.siemens.com/industrialsecurity.

Table of Contents

1 Task

1.1 Introduction

Gateways enable the communication between two networks that use different communication protocols.

DALI (Digital Addressable Lighting Interface) is a network protocol to control lighting devices in facility automation.

## 1.2 Overview of the automation task

The task is to create a communication connection between a SIMATIC CPU and a DALI device via a PROFINET (PN) interface using a DALI gateway.

Every device with a DALI interface can be individually controlled and changed in their intensity via DALI short addresses.

Via a two-way data exchange between a DALI gateway and a SIMATIC CPU, the state of devices or lamps (LEDs) can be queried or their states can be set.

The figure below provides an overview of the automation task.

Figure 1-1: Schematic diagram of the automation task
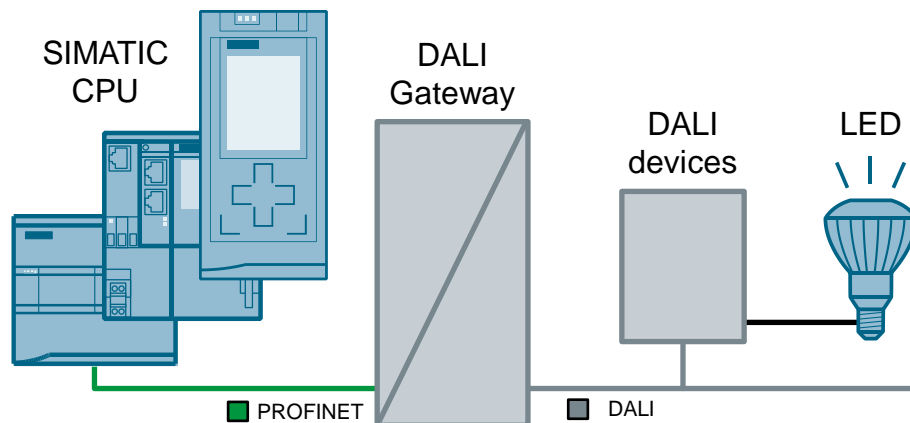
2 Solution

2.1 Overview

Schematic layout

An S7-1200 CPU is used in place of all SIMATIC controllers. The figure below shows the most important components for the communication between an S7-1200 CPU and the "multi PROFINET + DALI" gateway by MBS GmbH.

Figure 2-1: Schematic diagram of the solution with the components used
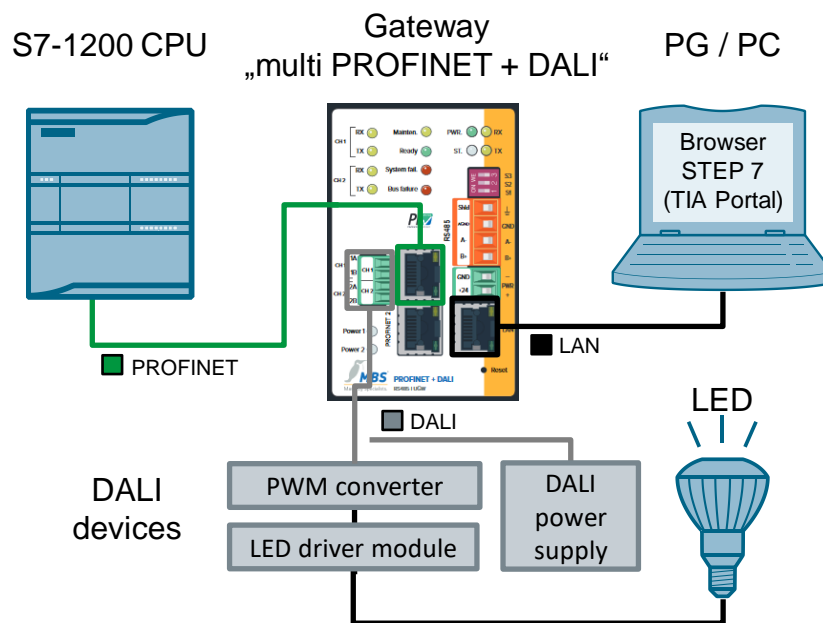
The gateway "multi PROFINET + DALI" enables the communication via PROFINET and DALI-Bus between a S7-1200 CPU and DALI devices.

In this case, the DALI devices consist of...

- DALI power supply
- PWM converter
- LED driver module

Correct communication is verified with a web server of the gateway "multi PROFINET + DALI" and a browser as well as a watch table from STEP 7 (TIA Portal).

The relevant interfaces of the gateway for this application example are represented in the following table:

Table 2-1: Gateway interfaces

Interface name	Communication medium	Network	Connected device
PROFINET 1 or PROFINET 2	Ethernet	PROFINET	SIMATIC CPU (S71200 CPU)
LAN	Ethernet	LAN	PG / PC
DALI	Two-wire line	DALI	PWM converter DALI power supply

Advantages

The solution presented here offers the following advantages:

- The application example can simply be adjusted to other controller families. The S7-1200 CPU is used here in place of all other SIMATIC PLCs with PROFINET IO interface. This makes the solution scalable for the respective application case.

- The application example can be simply adjusted for plant expansions. The configuration of the gateway is performed with a standard text editor or directly in the integrated web server of the gateway.

- Configuring and commissioning the gateways does not require any additional software. Standard tools such as internet browser and a simple text editor are sufficient. A special configuration tool for the gateway is not required.

Topics not covered by this application

- In the case of differences in the documentation on the topic of DALI, the documentation by MBS GmbH is always given priority.

- The present document does not replace the gateway manual.

- The present application example only gives an introduction into DALI communication with SIMATIC CPUs. More information about DALI gateways can be found in the gateway manual or directly by contacting MBS GmbH.

- The communication between the gateway and DALI devices is not part of this application example and is only included for completeness.

- Training, service and support for the gateway "multi PROFINET + DALI" are solely provided by MBS GmbH. Siemens AG does not conduct training sessions on the topic of DALI.

Required knowledge

- Basic knowledge of STEP 7 (TIA Portal) programming is assumed.
- Basic knowledge of PROFINET and DALI communication is assumed.

2.2 Description of core functionality

Configuration

The connection between S7-1200 CPU and gateway is handled via

- the configuration in STEP 7 (TIA Portal).
- Configuration files (cfg- and txt- files) (see Figure 33) referencing each other.

These files are loaded into the gateway by means of an integrated web server or edited directly.

Data types

This application example contains a STEP 7 project and a data record for the gateway, in which data of different data type is exchanged in both directions between an S7-1200 CPU and a gateway.

The following data types have been used and configured:

Table 2-2: Data types SIMATIC / gateway

SIMATIC (S7-1200 CPU)		Gateway		LED
switchLight (BOOL)	↔	BIT	↔	On / Off
setLevel (USINT)	↔	UINT8	↔	Brightness
setScene (USINT)	↔	UINT8	↔	Scene

Note	In case you have configured scenes, they can be controlled via the tag "setScene". To configure scenes, a DALI control unit is required.
	If no scenes are configured, the tag "setScene" (STEP 7 project) has no function.
	In this application example, scenes will not be discussed further.

2.3 Hardware and software components

This application example was created with the following components:

Hardware components

Table 2-3: Hardware components

Component	Qty.	Article number	Note
POWER MODUL PM1207	1	6EP1332-1SH71	Power supply Input: AC 120/230 V Output: 24 V DC/2.5 A
SIMATIC S7-1200 FW4.1	1	6ES7214-1AG40-0XB0	Alternatively, any other S7-1200 CPU (as of FW4.1) or S7-1500 CPU (as of FW1.7) can be used.
Compact Switch module	1	6GK7277-1AA00-0AA0	(optional) The switch is only required if S71200 and gateway shall be addressed simultaneously from the PG/PC (without "re-plugging").
Gateway "multi PROFINET + DALI" (RS485)	1	Manufacturer: MBS GmbH Operating system: Linux 2.6.34.7 #246 Software module: V2_04C Hardware module: 15.1.1	http://www.mbs-ugw.de/multi-profinet-dali-gateway-bersicht The respective versions are available on the page of the gateway web server in "Help>Device info". Alternatively: RS232
DALI-PWM converter 4-channel	1	Manufacturer: Mean Well DAP-04	-
DALI power supply PS 64mA	1	Manufacturer: Watt24 Article number: 30127305	-
LED driver	1	Manufacturer: Mean Well PWM-40-24	-
LED	1	Manufacturer: IDEC HW1P-5Q4	24V AC/DC

Software components

Table 2-4: Software components

Component	Qty.	Article number	Note
SIMATIC STEP 7 Basic (TIA Portal)	1	6ES7833-1FA15-..	-
GSDML-V2.31-MBS-MICRO3004-20150206	1	Manufacturer: MBS GmbH	Current GSDML files are available directly at MBS GmbH. In this example GSDMLV2.31 was used. The files are available in the folder "Additional Files - GSD" in the STEP 7 project. When opening the project, the GSD file is automatically installed.

Example files and projects

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

Table 2-5: Download files

Component	Note
109740160_DALI_DOC_V11_de.pdf	This document
109740160_DALI_S7_PROJ_V11.zip	This zip file contains the STEP 7 project.
109740160_DALI_Gateway_RestoreFile_V10.zip	This zip file contains the gateway data backup with the configuration files.

3 Mode of operation

3.1 Data points and signal course

The following figure represents the communication between an S7-1200 CPU and a DALI device. The communication can take place in both directions.

The figure shows a signal, that is generated in a S7-1200 CPU and transmitted to the gateway via PROFINET. The gateway converts the PROFINET signal into the DALI protocol and transmits the signal to the respective operating unit.

Each device interface (CPU, DALI), where the signal runs through, represents a data point. The gateway connects two different bus systems and therefore also has two data points (source data point and target data point).

For the DALI drivers and all other gateway drivers, the following applies for the definition of the data points:

Table 3-1: Definition of the data points

Type	Meaning
M	Integral value (binary data points, count value) that is only read by the gateway.
S	Integral value that can be read and written by the gateway.
X	Analog value (with decimals) that can only be read by the gateway.
Y	Analog value (with decimals) that can be read and written by the gateway.

A definition on the topic of "data points" is available in the gateway manual (\3\) in section 6 "Protocol Properties and Data Points".

Figure 31: Signal path S7-1200 CPU → DALI device
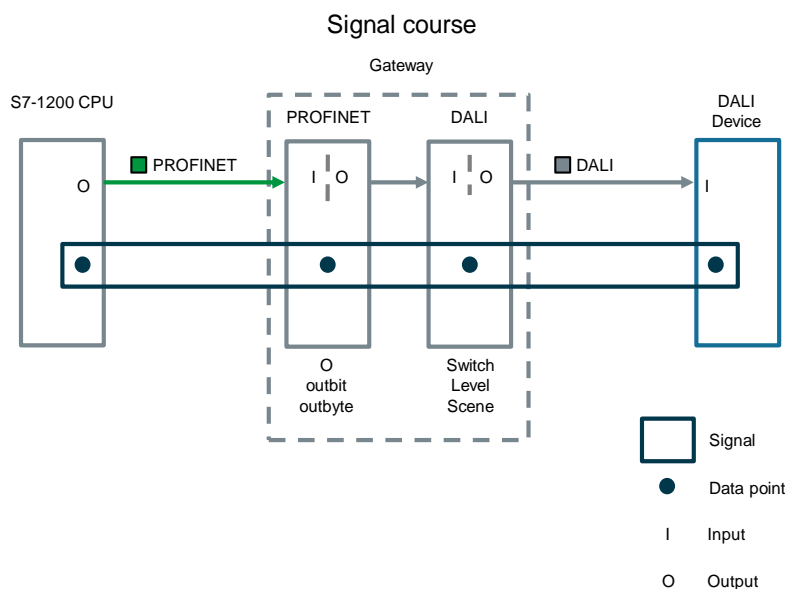
3.2 Process image: S7 CPU and gateway

The figure below shows all of the data used, as well as how the process image of the S7-1200 CPU is composed during the respective configuration with the gateway.

Please note that the input or output signal type always relates to the "perspective" of the respective device.

Figure 32: Composition of the process image in the S7 CPU
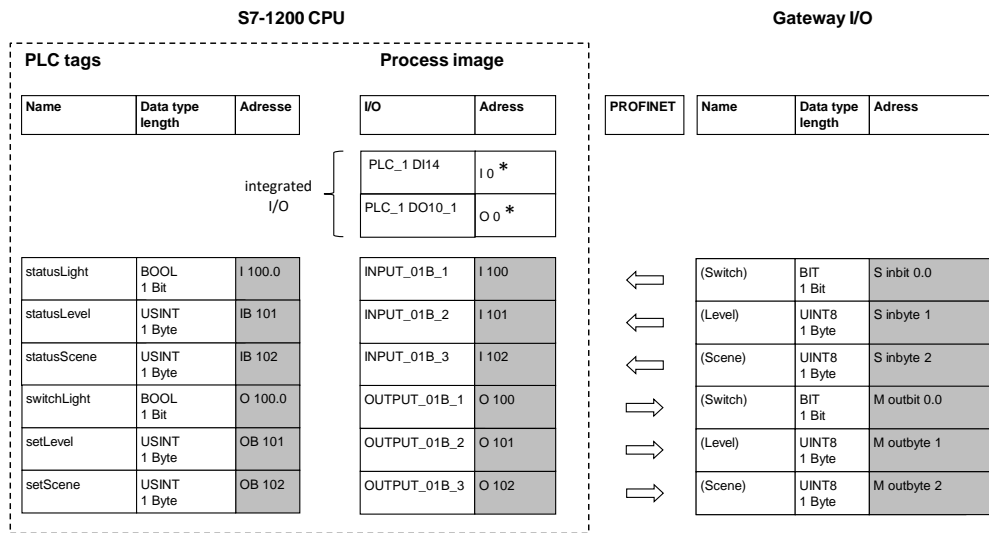
Note	*compact CPUs (for example, S7-1200) with integrated digital inputs and outputs: In STEP 7 (TIA Portal), the integrated digital inputs and outputs are automatically preassigned with the smallest address 0. Further modules/IOs are automatically assigned to the next free address. Here, the address space from 100 onward was deliberately selected in the process image. This makes it easier to recognize the connected tags between S7-1200 CPU and the gateway.

3.3 Connection of the gateway configuration files

The configuration of the gateways is performed via various configuration files (cfg, txt files). After programming has been completed in an editor (for example, Notepad++), these files are uploaded via the integrated web server in the gateway or are directly edited and activated in the integrated web server. In the gateway a configuration check is performed and possible errors are displayed.

Since the gateway supports various bus systems (PROFINET, DALI, BACnet...), there are different driver files with protocol information (fles with .cfg extension) and a file containing the definition of the data points (extension .txt).

A central component is the distribution file (dispatch.txt). It contains the assignments of the data points of the different protocols to each other.

The data points are programmed as objects. The exact meaning and structure of these files can be found in the manual to this gateway (\3\). The cfg and txt files of the gateway data backup also contain respective information as comment lines.

The complete configuration is available in the included gateway data backup "ugwbackup.tgz" in the "ugw > config" folder and the included comments (109740160_DALI_Gateway_RestoreFile_Vxx.zip).

Figure 33: Gateway configuration files
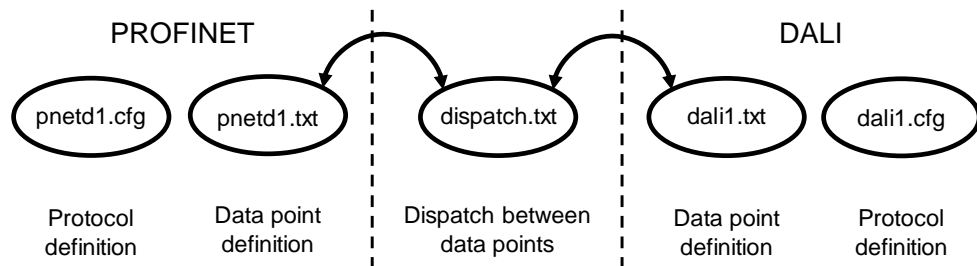
Table 3-2: Gateway configuration files

File	Content	Description
pnetd1.cfg	PROFINET protocol information	This file contains information and settings for the PROFINET network, including the I/O used there. In this case: Periphery configuration of the gateway in STEP 7 (TIA Portal)
pnetd1.txt	Definition of the PROFINET data points	It is defined here how and with which data type the data points are interpreted.
dispatch.txt	Assignment between DALI data points and PROFINET data points	This file describes the assignment of the data points on the PROFINET side (pnetd1.txt) and on the DALI side (dali1.txt).
dali1.txt	Definition of the DALI data points	This file contains the description of the individual data points on the DALI side.
dali1.cfg	DALI protocol information	This file contains information and settings on the DALI protocol.

Note	In the gateway configuration files, DALI objects are called "dali…" and PROFINET objects are called "pnetd…".

This application example describes how this data must be edited and adjusted so it can be used for data exchange (see chapter 4.4 Gateway: Editing configuration files). Along with this description, you receive data backup file with the preconfigured example files that you can adjust for your own application.

Note	In addition, there are the following configuration files that need to be loaded into the gateway but not edited: • driver.cfg • ugwc1.cfg • ugwc1.txt • gateway.cfg • ntp.cfg • plants.cfg These files are not described any further in this application. If you require further information, open these files or contact MBS GmbH.

4 Configuration and Settings

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

If you wish to adopt the example configuration of this application example without modifications, you can load the STEP 7 project directly into the S7-1200 CPU and the gateway configuration into the gateway (see chapter 5.3.1 Commissioning the gateway).
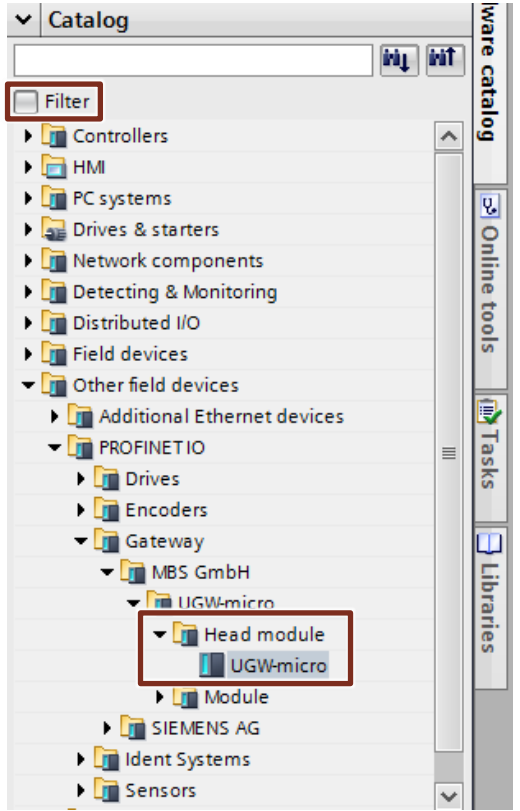
4.1 STEP 7 (TIA Portal) device configuration
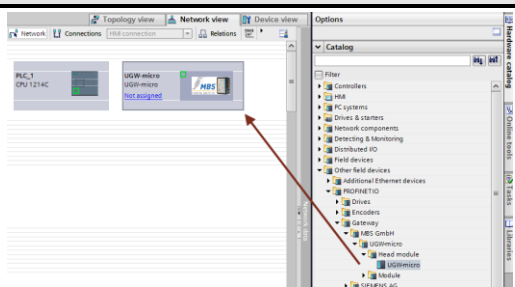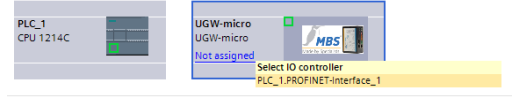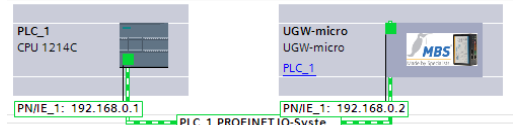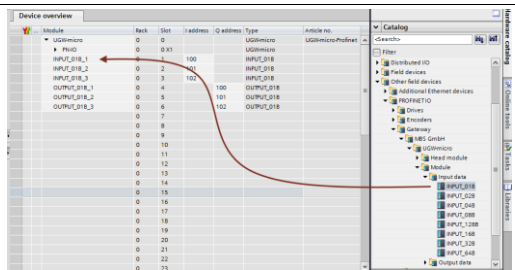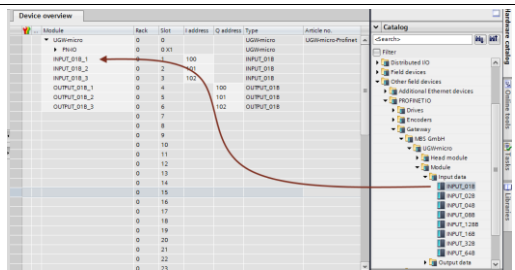
Note	Before you can perform the gateway configuration in STEP 7 (TIA Portal), you need to install the GSD file of the gateway. Unzip the "109740160_DALI_S7_CODE_Vxx.zip" file and open the STEP 7 project. The GSDML file will then be automatically installed.

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

No.	Action	Note
1.	Create a STEP 7 (TIA Portal) project and insert an S7-1200 CPU (S7-1214C C DC/DC/DC FW4.1).	-
2.	Open the "Network view" in "Devices & networks". Navigate to the Head module "UGW micro" in the hardware catalog. Please note the firmware version (V2.31).	

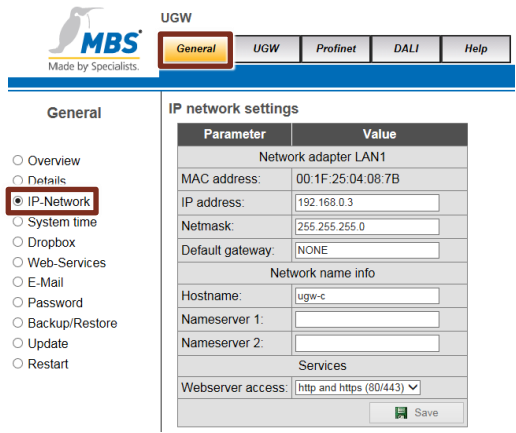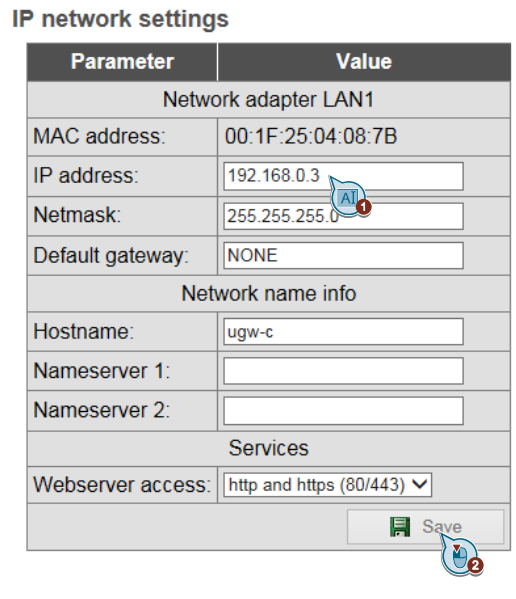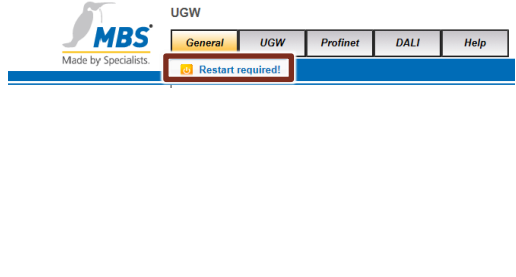| No.	Action	Note
3.	Use drag-and-drop to move "UGW micro" from the hardware catalog into the "Devices & networks" editor.	
4.	Click on "not assigned" of the UGW micro and select the interface of the inserted S7-1200 CPU ("PLC_1.PROFINET…").	
5.	Set the following IP addresses: S7-1200 CPU: 192.168.0.1 UGW-micro: 192.168.0.2	
6.	Double-click on the UGW micro to open its device view.	
7.	Open the hardware catalog and navigate to the input and output modules of the gateway. Equip the UGW micro with the required modules. Adjust the I/O addresses to the range from 100 onward.	
8.	Create a PLC tag table, for example "TagsUGW" as in the figure on the right.	
9.	Create the watch table, for example "WatchTableUGW" to monitor and control the tags.	

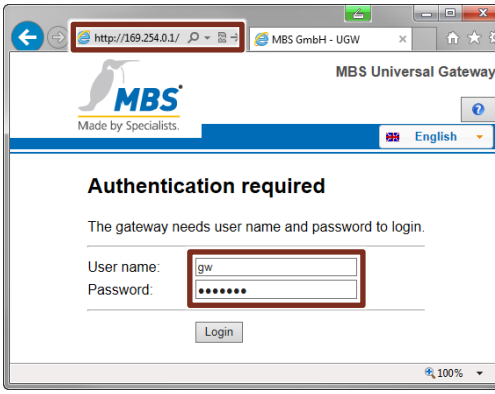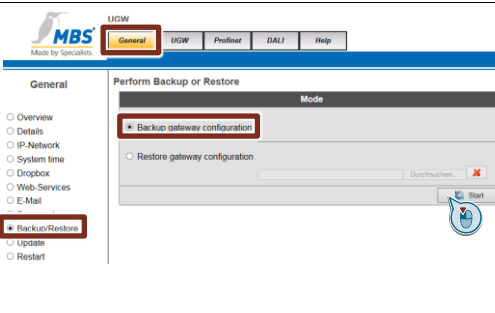| **Note**	A PLC program is not required for this simple example. All tags are monitored and controlled by means of the watch table. Since the tags directly access the process image, no system blocks are necessary (SFC, SFB).

4.2 Gateway: Setting the IP address

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

No.	Action	Note
1.	Start your preferred web browser and connect with the gateway web server.	Delivery state: IP address: 169.254.0.1 User name: gw Password: GATEWAY
2.	To set the IP address of the gateway's LAN interface, navigate to the menu option "General > IP network".	
3.	Change the IP address and save the settings by clicking on "Save". **Note** After saving, you need to re-connect to the gateway via the re-adjusted IP address. **Note** To successfully communicate with the gateway, the IP address of your PC needs to be in the same subnet. Adjust the IP address of your PC, if necessary.	
4.	After logging into the gateway again via the new IP address, a **complete system restart** needs to be performed. Click on the button "Restart required!", to restart the system. Restart the gateway with the option "Complete system restart", as described in chapter 4.7.	

4.3 Gateway: Data backup

Table 4-3: Performing a data backup of the gateway

No.	Action	Note
1.	Make sure that, • your PC is located in the same subnet as all of the involved components, • all of the components are connected with each other via LAN cable, • all of the components are connected to a power supply and switched on.	See chapter 5.2 Installing the hardware
2.	Start your preferred web browser and connect with the gateway web server. The default settings are: • IP address: 169.254.0.1 • User: "gw" • Password: "GATEWAY"	
3.	When required, save all gateway configuration files with the "Backup/Restore" menu to be able to restore the delivery state if needed (see UGW menu option "Help > Online help"). Navigate to the menu point "General > Backup/Restore > Backup gateway configuration" for the data backup. Click on "Start" and follow the menu navigation.	

4.4 Gateway: Editing configuration files

This chapter describes the gateway configuration files in detail.

You can edit the files directly in the integrated web server or download the files for editing with an editor (for example, Notepad++) and then upload them again to the gateway.
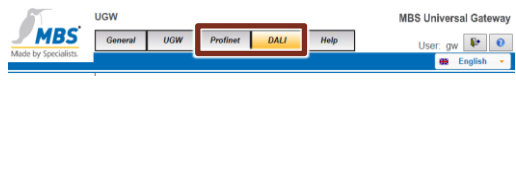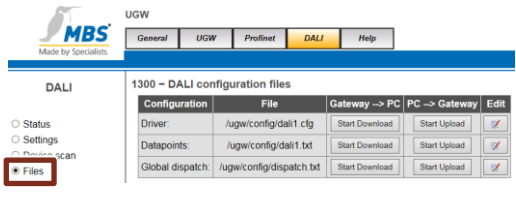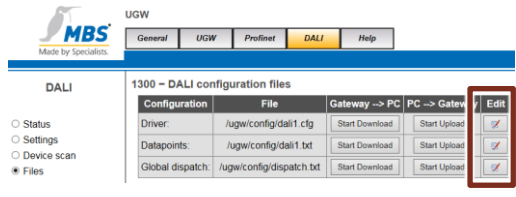
Instead of manually programming them, you can also use the automatic creation of the configuration files (see chapter 4.6 Gateway: Generating the configuration files automatically).
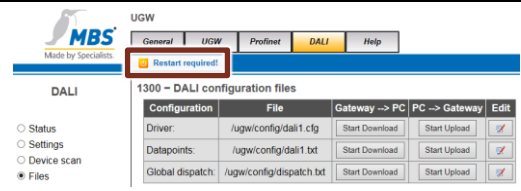
In chapter 3.3 Connection of the gateway configuration files , you find an overview of how the configuration files are connected.

4.4.1 Editing in the integrated web server

The following instruction describes the editing of the configuration files directly in the integrated web server of the gateway.

Table 4-4: Editing in the integrated web server

No.	Action	Note
1.	Select "DALI" in the top menu bar, in order to edit the configuration files for the DALI protocol. Alternatively: Select "Profinet" in the top menu bar, in order to edit the respective files of the PROFINET protocol.	
2.	Select "Files" in the menu bar on the left.	
3.	Click the edit icon of the configuration file to be processed.	
4.	A new window opens in which you can make the changes. Click on "Save" to save the changes.	

No.	Action	Note
5.	After saving, the window closes automatically and the message "Restart required!" appears. Restart the gateway, as described in chapter 4.7 .	

4.4.2 Configuration files

For the configuration of the gateway, the following files are edited and then loaded into the gateway via the integrated web server or they are directly edited in the integrated web server.

- pnetd1.cfg
- pnetd1.txt
- dali1.cfg
- dali1.txt
- dispatch.txt

4.4.3 Gateway file "dali1.cfg"

In the configuration file "dali1.cfg", the settings for the DALI protocol are made.

Table 4-5: Structure of the "dali1.cfg" gateway file

No.	Description	Note

1.	Perform the necessary configuration like, for example, baud rate.
	The default settings can usually be retained.
		...
		`[Dali]`
		`Baudrate     = 38400`
		`Databits     = 8`
		`Parity       = n`
		`Stopbits     = 1`
		`Handshake    = n`
		`CycleTime    = 1`
		`ResponseTime = 5`
		...

4.4.4 Gateway file **"dali1.txt"**

In the configuration file "dali1.txt", the data points for the DALI protocol and their properties are set.

Table 4-6: Structure of the "dali.txt" gateway file

No.	Description	Note

1.	The addresses of the DALI data points are structured as follows:
	
	`[<def> <channel-nr.> <type>`
	`<shortaddress> <value-type>]`
	
	`<def>`: Definition of data points, see [Table 3-1: Definition of the data points](#)
	
	`<channel-nr.>`: DALI channel (**1** or **2**)
	
	`<type>`: **Device, dev-group**
	
	`<shortaddress>`: Short address of the device (**0**..**63**), group address (**0**..**15**)
	
	`<value-type>`: **switch** (0=off, 1=on read/write switching state); **level** (0%..100% level read/write level (luminous flux)); **scene** (0..15 read/write scene)
	
	Each data point has different parameters: (`name, format, query,..`)
	
	The `name` can be selected freely.
	
	Further information on type, address, formats, and further parameters is available in the "dali1.txt" file in the data backup file in the "ugw > config" folder.
		`[M 1 failure]`
		`format = T:0`
		`query = pe`
		`name = DALI Channel-1 failure`
		
		`[M 0 failure]`
		`format = T:0`
		`query = pe`
		`name = DALI Hardware failure`
		
		`[S 1 device 0 switch]`
		`format = T:5`
		`query = pe`
		`name = (Switch) Channel:1`
		`Address:0`
		
		`[Y 1 device 0 level]`
		`format = T:5`
		`query = pe`
		`name = (Level) Channel:1 Address:0`
		
		`[S 1 device 0 scene]`
		`format = T:5`
		`query = pe`
		`name = (Scene) Channel:1 Address:0`

4.4.5 Gateway file "dispatch.txt"

In the "dispatch.txt" configuration file, the DALI data points and the PROFINET data points are assigned.

Table 4-7: Structure of the "dispatch.txt" gateway file

No.	Description	Note

1.	Syntax of a dispatch entry:
	
	`[<route source> <type source> <address>]`
	`  target = <route target> <type target> <address>`
	
	`<route source>`: Routing address of the source driver
	`<type source>`: Source driver name
	`<route target>`: Routing address of the target driver
	`<type target>`: Target driver name
	`<address>`: Data point address
	
	Note
	To be able to use a data point in the dispatch.txt, the data point previously needs to be declared in the driver specific *.txt file.
		`[1300 dali 1 device 0 switch]`
		`target=1190 pnetd inbit 0.0`
		
		`[1190 pnetd outbit 0.0]`
		`target=1300 dali 1 device 0 switch`
		
		`[1300 dali 1 device 0 level]`
		`target=1190 pnetd inbyte 1`
		
		`[1190 pnetd outbyte 1]`
		`target=1300 dali 1 device 0 level`
		
		`[1300 dali 1 device 0 scene]`
		`target=1190 pnetd inbyte 2`
		
		`[1190 pnetd outbyte 2]`
		`target=1300 dali 1 device 0 scene`

2.	You can find the routing address and the name of a certain driver under "General > Overview".	

4.4.6 Gateway file "pnetd1.txt"

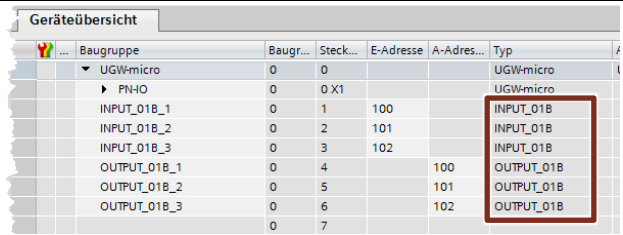In the configuration file "pnetd1.txt", the data points for the DALI protocol and their properties are set.

Table 4-8: Structure of the "pnetdt1.txt" gateway file

No.	Description	Note
| 1. | The addresses of the PROFINET data points are structured as follows:<br><br>`[<def> <type> <byte>.<bit>]`<br><br>`<def>`: Definition of data points, see [Table 3-1: Definition of the data points](#)<br><br>`<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)<br><br>`<byte>`: **0..339** ( nth byte in the input or output register)<br><br>`<bit>`: **0..7** (single bit within the nth byte)<br><br>Each data point has different parameters: (`name, format, query, writecache,..`)<br><br>The `name` can be selected freely.<br><br>The `format` specifies the respective data types of the gateway.<br><br>Further information on type, address, formats, and further parameters is available in the "pnetd1.txt" file in the data backup file in the "config" folder. | ```
[S inbit 0.0]
query = pe
format = BIT
name = (Switch) Channel:1
Address:0

[M outbit 0.0]
query = pe
format = BIT
name = (Switch) Channel:1
Address:0

[S inbyte 1]
query = pe
format = UINT8
name = (Level) Channel:1 Address:0

[M outbyte 1]
query = pe
format = UINT8
name = (Level) Channel:1 Address:0

[S inbyte 2]
query = pe
format = UINT8
name = (Scene) Channel:1 Address:0

[M outbyte 2]
query = pe
format = UINT8
name = (Scene) Channel:1 Address:0
``` |

4.4.7 Gateway file "pnetd1.cfg"

In the configuration file "pnetd1.cfg", the settings for the PROFINET device are made. During the configuration, it is necessary to ensure that the STEP 7 configuration and the configuration file of the gateway match exactly.

Table 4-9: Structure of the "pnetd1.cfg" gateway file

No.	Description	Note
1.	The device configuration of the gateway can be found in STEP 7 (TIA Portal).	
| 2. | The device configuration of the gateway is done line by line in the pnetd1.cfg configuration file, according to the device configuration in STEP 7 (TIA Portal).<br><br>Each device is referred to as module (Mod001, Mod002,..).<br><br>An example of how each module type is configured is available in the "pnetd1.cfg" file. | ```
Mod001 = ID:0x11   IN:1   OUT:0  # INPUT_01B_1
Mod002 = ID:0x11   IN:1   OUT:0  # INPUT_01B_2
Mod003 = ID:0x11   IN:1   OUT:0  # INPUT_01B_3

Mod004 = ID:0x21   IN:0   OUT:1  # OUTPUT_01B_1
Mod005 = ID:0x21   IN:0   OUT:1  # OUTPUT_01B_2
Mod006 = ID:0x21   IN:0   OUT:1  # OUTPUT_01B_3
``` |

Note	The following must be observed during the configuration: • All modules from "Mod001" onward must be uninterruptedly and continuously numbered. • The upper limit is 60 modules ("Mod060")

4.5   Gateway: Overview of the configuration

The following overview shows you the gateway configuration files.

dali1.txt

```
[S 1 device 0 switch]
format = T:5
query = pe
name = (Switch) Channel:1 Address:0
```

dispatch.txt

```
[1300 dali 1 device 0 switch]
target = 1190 pnetd inbit 0.0
...
[1190 pnetd outbit 0.0]
target = 1300 dali 1 device 0 switch
```

pnetd1.txt

```
[S inbit 0.0]
query = pe
format = BIT
name = Status Switch (Channel:1 Address:0)
...
[M outbit 0.0]
query = pe
format = BIT
name = Set Switch (Channel:1 Address:0)
```

pnetd1.cfg

```
Mod001 = ID:0x11  IN:1    OUT:0  # INPUT_01B_1
...
Mod004 = ID:0x21  IN:0    OUT:1  # OUTPUT_01B_1
```

4.6 Gateway: Generating the configuration files automatically

You also have the option to have the configuration files be generated automatically by the gateway. For this, all DALI participants must be at the DALI-bus and must be switched on.

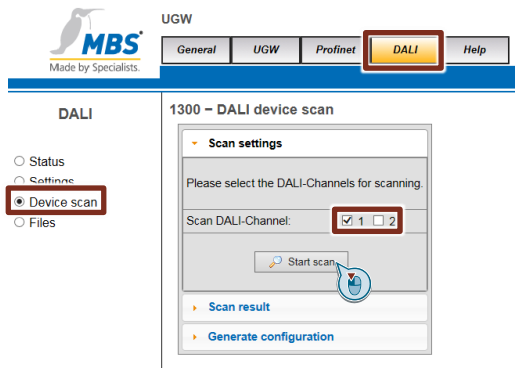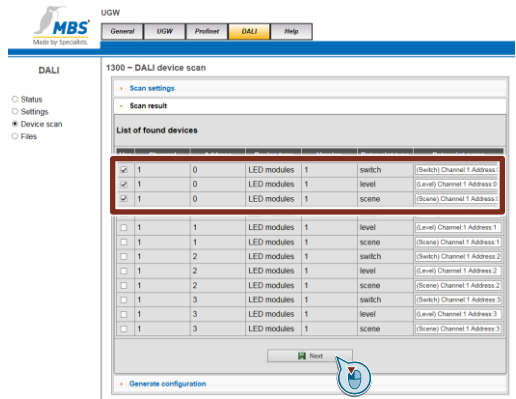We recommend generating the configuration files in this way.

Advantages

- You do not require any knowledge on the configuration data of the gateway.
- Generating a configuration automatically reduces possible errors that may occur during manual programming.

Note	An existing configuration in the gateway is overwritten during an automatic generation of the configuration files.

Table 4-10: Generating the gateway configuration files automatically

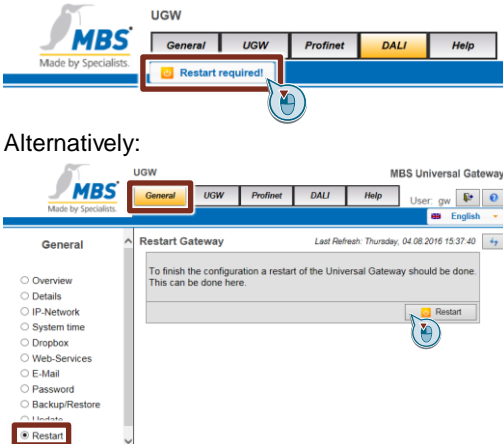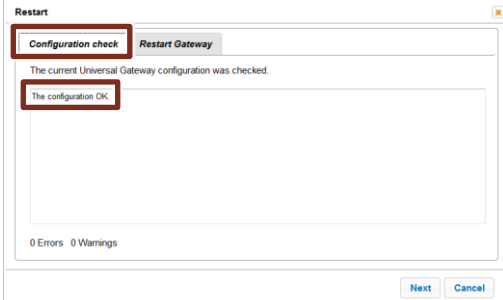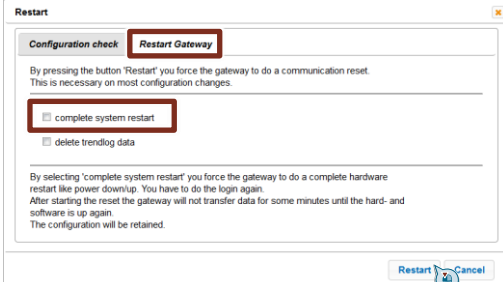| No.	Action	Note
1.	Click on the DALI register and on the option "Device scan". Select the DALI channel to be scanned (here channel 1). Click the "Start scan" button. The DALI bus is then scanned.	
2.	The program will automatically proceed to the menu option "Scan results". The found addresses correspond to the data points in the file dali1.txt. Select the addresses and the corresponding data point types that are to be configured automatically. Optionally, you can assign a user-defined name to the data points. Click on the "Next" button.	

No.	Action	Note
3.	Select "Generate complete configuration". Select "Generate PROFINET data point configuration" and click on "Generate".	
4.	As soon as the automatic configuration has been completed, a restart is required. Restart the gateway, as described in chapter 4.7 .	
5.	During the automatic configuration, the DALI data points (dali1.txt) and PROFINET data points (pnetd1.txt) were created and assigned to each other in the dispatch.txt file.	-
6.	The configuration files pnetd1.cfg and dali1.cfg must be created manually. Please refer to the corresponding points in chapter 4.2.	-

4.7 Gateway: Restart

Note	To activate the changes in the configuration files, you have to restart the gateway.
	If changes are made to the PROFINET driver file "pnet1.cfg", the gateway needs to be completely restarted (without power).

Table 4-11: Performing a restart of the gateway

No.	Action	Note
1.	Click on the button "Restart required!". Alternatively: For a restart of the gateway, navigate to the "General > Restart > Restart" menu option.	
2.	In the "Configuration check" register, the gateway will automatically verify the configuration files and displays errors and warnings and in which file in which line the cause can be found. Check the corresponding files. When the current configuration in the gateway is correct, click "Next".	
3.	Switch to the "Restart Gateway" tab. Optionally, you can select the "Complete system restart" option box to perform a complete system restart. Confirm the action by clicking on the "Restart" button and follow the menu navigation.	
4.	After the restart the changes made are activated. **Note** After a complete system restart, you need to log in to the gateway again.	-

Note	In the event of error messages after transferring the txt and cfg files to the gateway with the correct configurations, the comment lines (#...) might be the cause. In this case, the comment lines must be written in a separate line.

5 Installation and Commissioning

This chapter describes the steps necessary for commissioning the example.

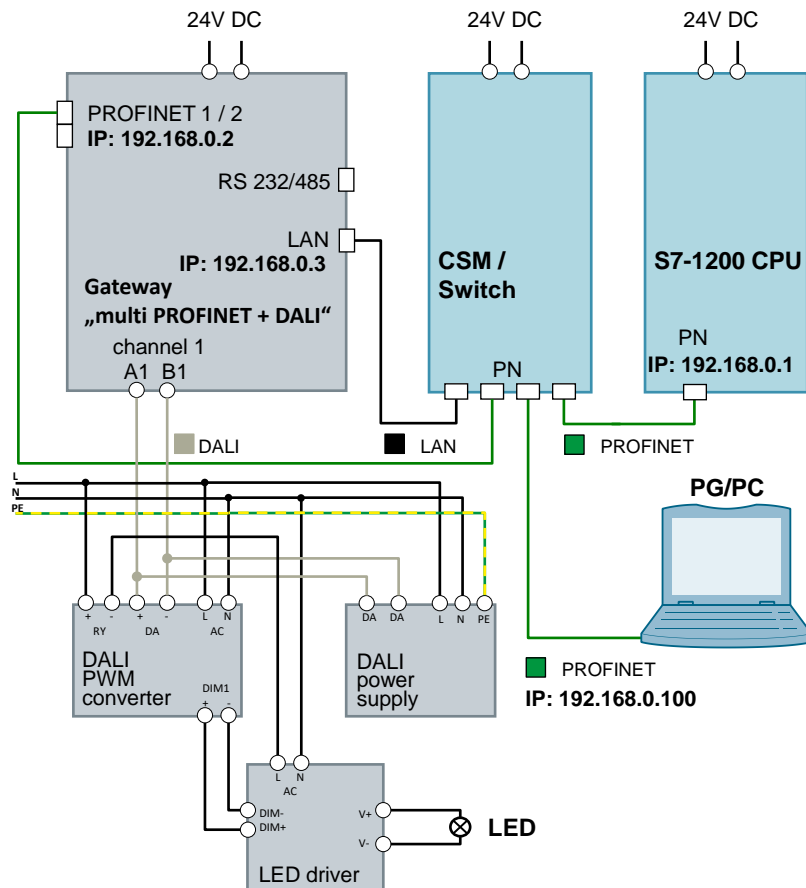| Note	The following setup guidelines must generally be followed
	• System manual "S7-1200 Automation System" • Gateway manual

5.1 Installing the software

Install the current version of STEP 7 (TIA Portal) on your PC.

5.2 Installing the hardware

5.2.1 Setup under laboratory conditions

For the function test of this application under laboratory conditions, the following setup, using a switch is the best option. Thus, all the following functions (see following advantages) can be operated simultaneously with a single PG/PC.

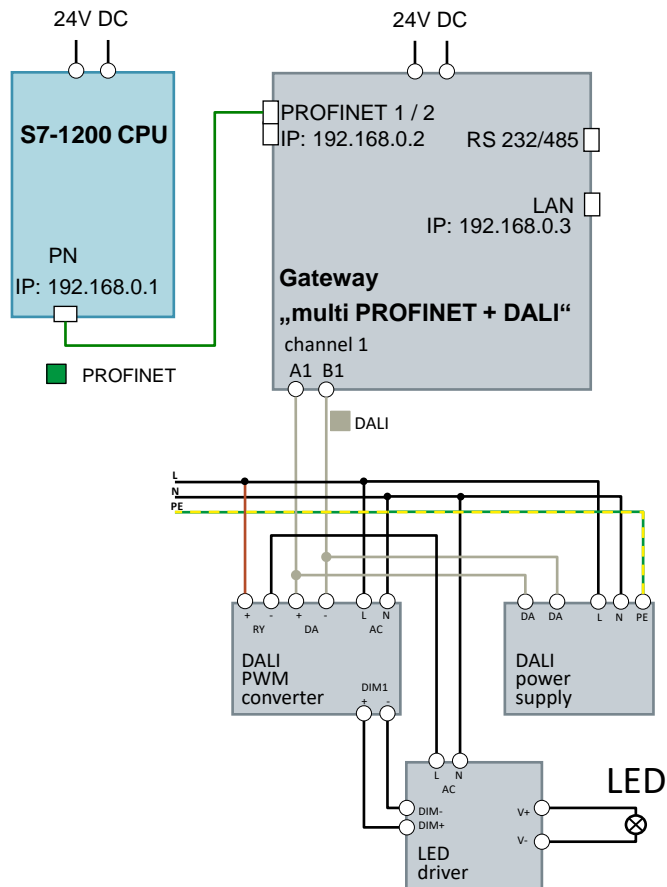Figure 5-1: Setup under "laboratory conditions"

The setup pf the DALI devices can be found in the manuals:

- "DALI PWM Signal Converter" (\4\)
- "DALI power supply" (\5\)
- "LED driver" (\6\)

5.2.2 Setup under plant conditions

Under "real" conditions, a SIMATIC controller is usually directly connected with a DALI gateway. The gateway is integrated here into a PROFINET network via both PROFINET interfaces and connected with the DALI bus via the DALI interface.

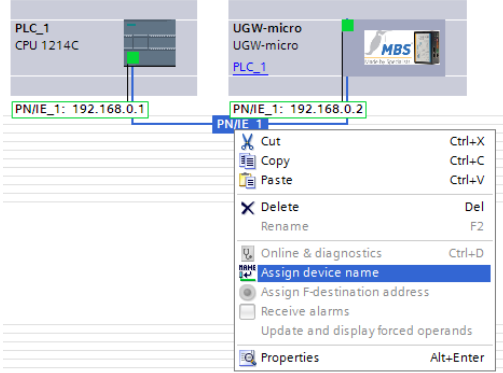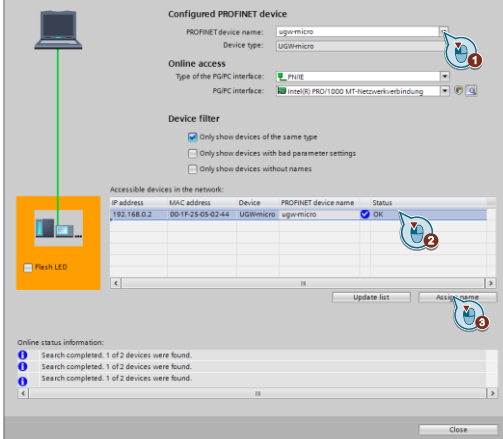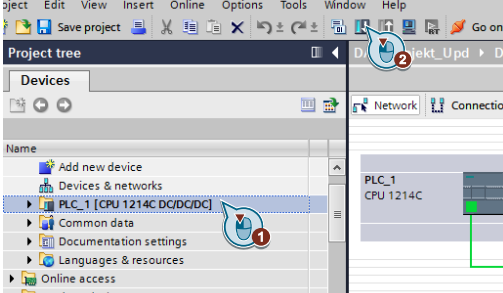Figure 5-2: Setup under plant conditions
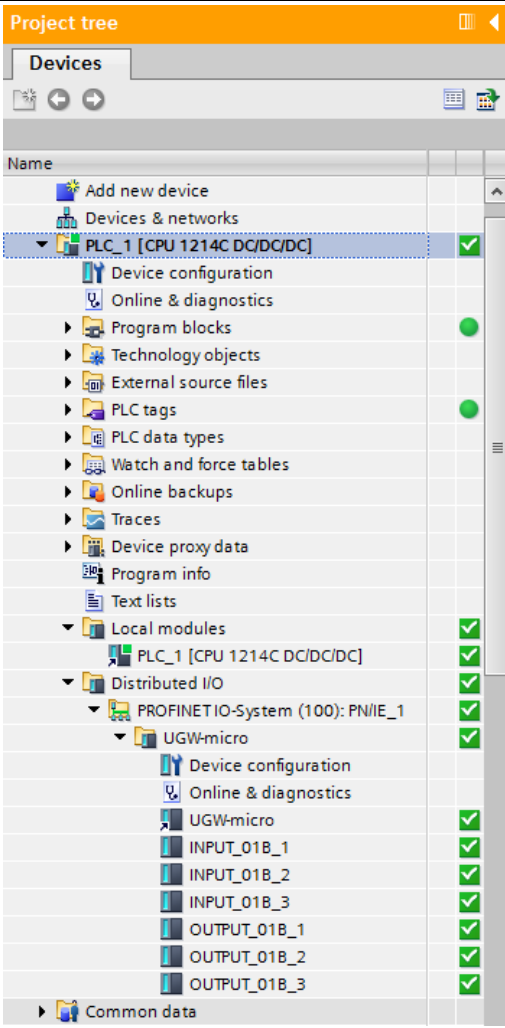

The setup of the DALI devices can be found in the manuals:

- "DALI PWM Signal Converter" (\4\)
- "DALI power supply" (\5\)
- "LED driver" (\6\)

5.3 Commissioning

This chapter describes the steps for loading the example project into the S71200 CPU and the example configuration into the gateway.

5.3.1 Commissioning the gateway

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

Standard setting (in the as-supplied state):

User name:	gw	IP address:	169.254.0.1
Password:	GATEWAY		

If this login does not work, read the gateway manual or contact MBS GmbH.

Table 5-1: Commissioning the gateway

No.	Action	Note
1.	Unzip the file "109740160_DALI_Gateway_RestoreFile_Vxx.zip" (e.g. with "7-Zip").	As a result, the file "ugwbackup.tgz" is output.
2.	Navigate to "General > Backup/Restore" and select the option box "Restore gateway configuration". Click on "Browse" and navigate to the file "ugwbackup.tgz".	
3.	Then you click on the "Start" button. The contained data are unpacked and directly loaded to the gateway. **The following files are overwritten in the gateway:** • dali1.cfg • dali1.txt • dispatch.txt • driver.cfg • gateway.cfg • ntp.cfg • pnetd1.cfg • pnetd1.txt • ugwc1.cfg • ugwc1.txt	

No.	Action	Note
4.	Confirm the following message with "OK". **Note** After restoring the data backup, the IP address setting in the gateway is overwritten (here 192.168.0.3).	**Backup/Restore** ✖ **Backup information** Created at: 05.08.2016 08:48:03 V2_04H Name: Location: IP address: 192.168.0.3 Filename: /tmp/restore.tgz **ATTENTION: If you restore the backup archive, the current configuration will be lost.** **Do you really wan't to restore the archive?** Ok Cancel
5.	To activate the restored configuration, a restart is required. Confirm the message with "Yes".	**Update** ✖ The gateway restore was successful. You have to restart the gateway to activate the configuration. Do you want to restart the gateway now? Yes Later

5.3.2 Commissioning the S7-1200 CPU
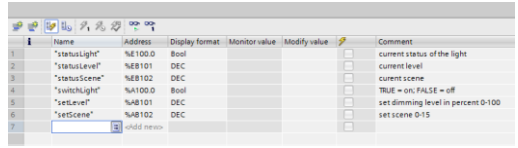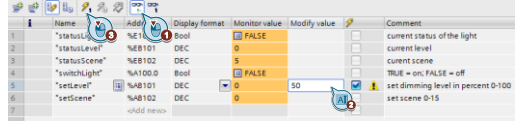
Table 5-2: Commissioning the S7-1200 CPU

No.	Action	Note
1.	Start the STEP 7 (TIA Portal) and open the project in the zipped file "109740160_DALI_S7_CODE_Vxx.zip".	-
2.	Open "Devices & Networks".	-
3.	Right-click on the connection and select "Assign device name".	
4.	Assign the device name to the S7-1200 CPU and the gateway using the "Assign name" button.	
5.	In the project navigation, select the S71200 CPU (here PLC_1) and click on the "Download to device" button.	
6.	Acknowledge the download dialogs and set the S7-1200 CPU to RUN mode. After the download, your PROFINET IP addresses were also assigned to the devices.	-

No.	Action	Note
7.	Select the S7-1200 (PLC_1) in project navigation and click on "Go online" in the menu bar. If everything has been configured and downloaded correctly, all icons are green.	

6 Operating the Application Example

All tags are controlled and monitored via the watch table, as no program is required in this example.

Table 6-1: Operating the Application Example

No.	Action	Note
1.	Open the watch and force table "WatchTableUGW" in STEP 7 (TIA Portal).	
2.	Click on the "Monitor all" button Define any control value (here 50% dimming) for the out tags and load them to the S7-1200 CPU.	
3.	The tag is controlled and the signal is transmitted to the DALI device via the DALI gateway. The LED lamp on the DALI bus lights up and glows with half its intensity (50%). Additionally, you can the feedback of the DALI device on the watch table.	

7 References

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/109740160
\3\	Product page with gateway data sheet, manual http://www.mbs-ugw.de/multi-micro-profinet-dali-bis-500-datenpunkte
\4\	DALI PWM Signal Converter http://www.meanwell.com/mw_search/DAP-04/DAP-04-spec.pdf
\5\	DALI Power Supply https://www.watt24.com/en/Lighting-electronics/DALI-controls/DALI-power-supplies/watt24-DALI-Stromversorgung-PS-64mA.html?&force_sid=a22f846ce49a4555d05a2310157b177d
\6\	LED Driver http://www.meanwell.com/mw_search/PWM-40/PWM-40-spec.pdf

8 Contact MBS GmbH

Figure 8-1: MBS GmbH

MBS GmbH

Römerstraße 15

D-47809 Krefeld

Phone: +49 2151 7294-0

Fax: +49 2151 7294-50

info@mbs-software.de

http://www.mbs-software.de/en

9 History

Table 9-1

Version	Date	Modifications
V1.0	09/2016	First version
V1.1	07/2019	Update TIA Portal V15.1