

Shutdown IPCs in the SITOP PSU8600 Buffer Mode

TIA Portal V13 SP1, SITOP PSU8600, SIMATIC IPC,
SIMATIC S7-1500 Software Controller

<https://support.industry.siemens.com/cs/ww/en/view/109737962>

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1 Task

1.1 Overview

Introduction

A power failure/breakdown in the automation network usually has disastrous consequences. Without suitable power supply the network simply fails without saving the data and terminating sensitive software. This has the effect that system data gets lost, operating systems and software can get damaged. In addition, the plant may not be in a failsafe state, which may endanger people and the machinery.

The SITOP PSU8600 power supply offers a solution for this. Apart from the basic device with one or several outputs, there are also various additional modules for the expansion of the number of outputs (CNX8600) and for increasing the buffer time (BUF8600). With the help of the SITOP BUF8600 buffer modules, operation of the connected automation components can be guaranteed for a limited period of time during the power failure/breakdown. Thus the automation network remains functional. All nodes can reach the SITOP PSU8600 via its two Profinet ports in the network.

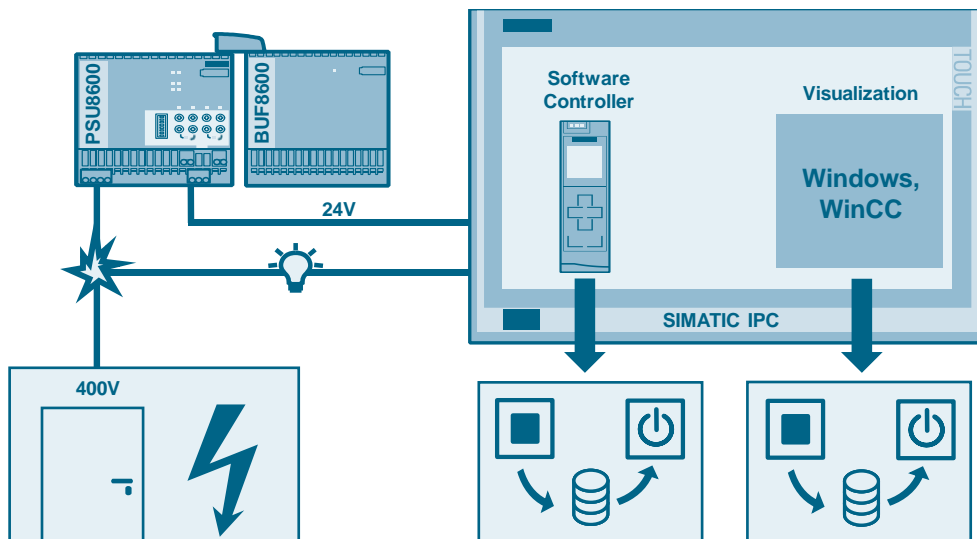
Overview of the automation task

A software controller is operated on Panel PCs and takes on the control of the automation plant. Plant-specific data is illustrated via an active visualization through the operating system on the panel PC. A SITOP PSU8600 will secure the power supply with a buffer module (maximum number per basic device is two).

Only a limited buffer time is available via the buffer module due to its capacity. This is why the state of the SITOP PSU8600 needs to be monitored. If there is a power failure, the IPC and the controller have to be terminated in a controlled way in order to prevent damages.

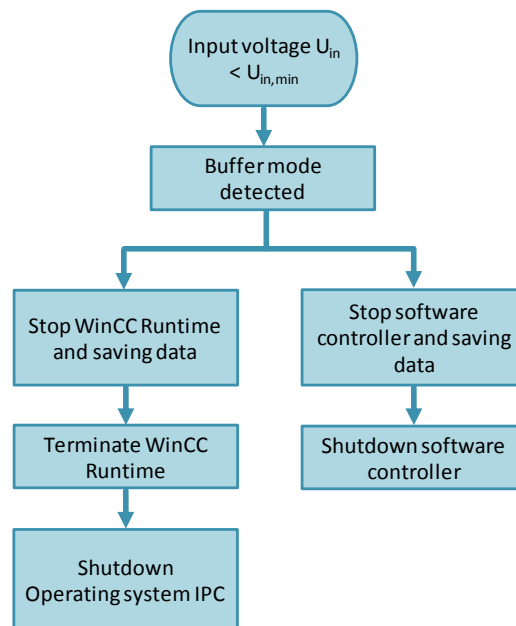
The figure below provides an overview of the automation task.

Figure 1-1



Description of the automation task

Figure 1-2



During runtime the software controller communicates via Profinet with the SITOP PSU8600 power supply. As soon as there is a voltage drop (limit $U_{in,min}$) on the input (input voltage $U_{in} < U_{in,min}$), it will go to buffer mode. The state is detected by the software controller. As soon as the charge of the BUF8600 buffer module is so low that a sufficient power supply of the IPCs can no longer be guaranteed, the controller shuts itself and the IPC down.

The process of the shutdown includes the stop of the WinCC Runtime and of the software controller as well as the subsequent saving of the data and the shutdown.

1.2 Scenarios

If there is a voltage drop on the input of the SITOP PSU8600, the buffer module takes on the power supply without interruption. There are different scenarios of power failure.

Two scenarios can be used as an example, to be able to understand the problems that may arise.

1. First-time power failure/breakdown

Prerequisite: Buffer module fully charged and IPC in normal mode (operating system booted up, controller and visualization active)

Input voltage $< U_{in,min}$ → shutdown of visualization, operating system and controller

2. Repeated power failure/breakdown

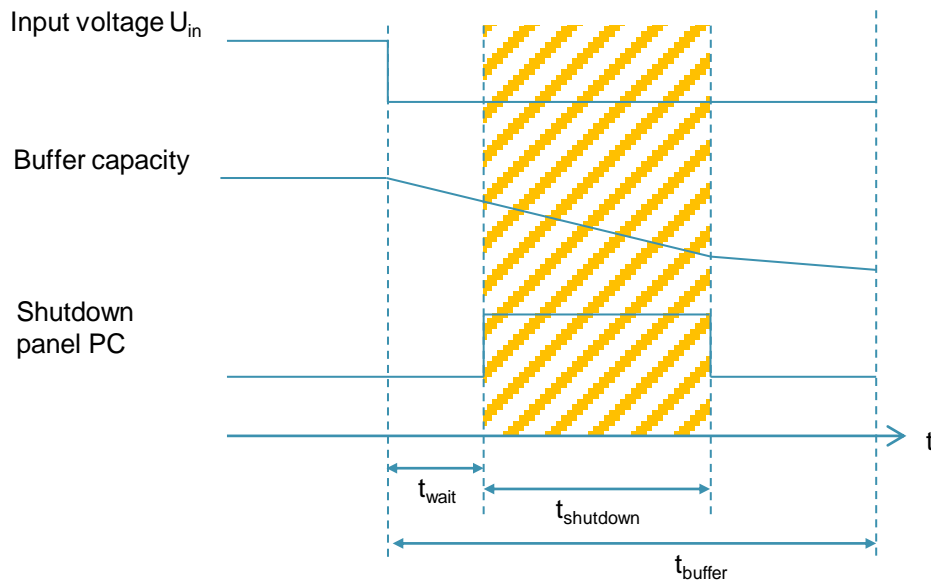
Prerequisite: Buffer module partly discharged and IPC is in boot up (operating system and controller have been started and are in boot-up process)

Input voltage = 400 V → boot up of operating system and controller → input voltage $< U_{in,min}$ → waiting for start-up process → shutdown of visualization, operating system and controller

1.2.1 Scenario 1 – first-time power failure

The input voltage on the SITOP PSU8600 has failed or dropped. The IPC is now supplied by the buffer module. If the critical time (t_{wait}) has been reached, meaning that the power supply on the output can no longer be guaranteed, all mode data is saved, the visualization will be terminated and the panel PC with controller is shut-down.

Figure 1-3



The controlled shutdown of the operating system of the panel PC and the software controller takes an overall $t_{shutdown}$ time. For this to proceed properly, the following has to apply $t_{shutdown} \leq t_{buffer}$.

The maximum buffer time t_{buffer} can be read via the characteristic of the charge current from the device module of the SITOP PSU8600 (see [References](#) in /9/ and /10/).

Alternatively, it can be estimated via the formula $t_{buffer} = I_{buffer\ module} / I_{L,max} * t_{buffer\ module}$. $I_{buffer\ module}$ and $t_{buffer\ module}$ are the specifications on the buffer module.

The maximum occurring charge current $I_{L,max}$ can be determined via the maximum consumption $P_{IPC,max}$ of the panel PC and the output voltage U_{out} applied. The formula for this is: $I_{L,max} = P_{IPC,max} / U_{out}$.

Note

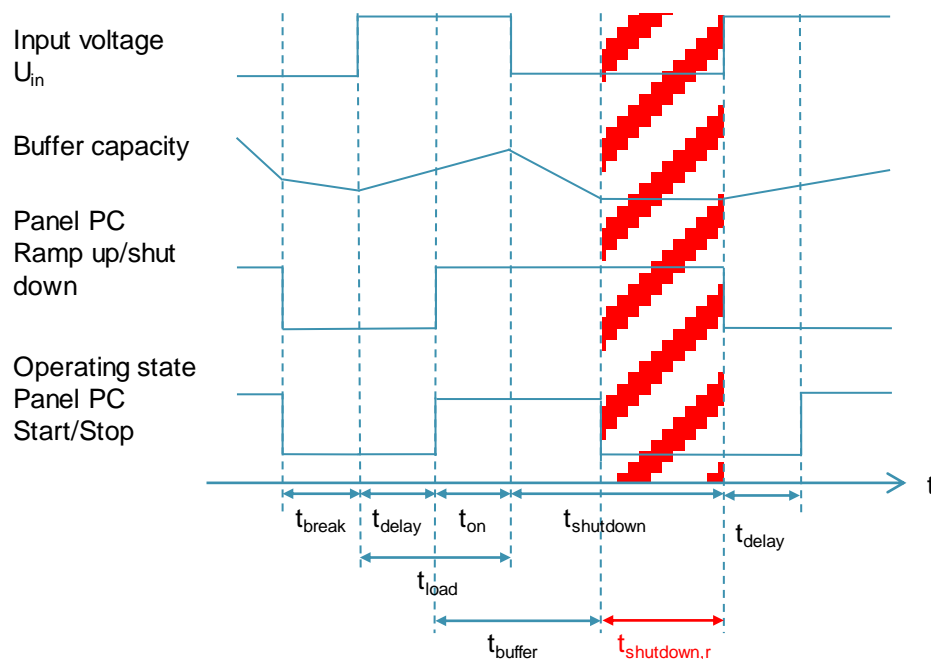
The energy consumption of the panel PC depends on the configuration in terms of hardware. This can be found in the appropriate manual of the panel PC.

If the capacity of a buffer module is not sufficient, an additional module can be used. There are different module versions (capacity).

1.2.2 Scenario 2 – repeated power failure after completion of scenario 1

After the first power failure the IPC was shutdown correctly and the input voltage is available again on the SITOP PSU8600. The output is provided with voltage again and the panel PC starts the startup t_{on} (a brief voltage interruption on output t_{delay} has to be configured in the hardware configuration of the SITOP PSU8600, since the IPC requires a voltage pulse to start the start-up process). After a while t_{break} the input voltage is available again, the buffer module is being charged (t_{load}). Shortly after that there a power failure/breakdown occurs again.

Figure 1-4



After finishing the startup of the IPC and the software controller, the software controller detects the insufficient buffer capacity and starts the shutdown process. In order to ensure a correct start up (t_{on}) and shutdown ($t_{shutdown}$) it is important in this case to provide for sufficient buffer capacity. Capacity increase can be realized via expansion with an additional buffer module.

Note For a correct start up and shutdown of the IPC make sure that the buffer modules are sufficiently charged.

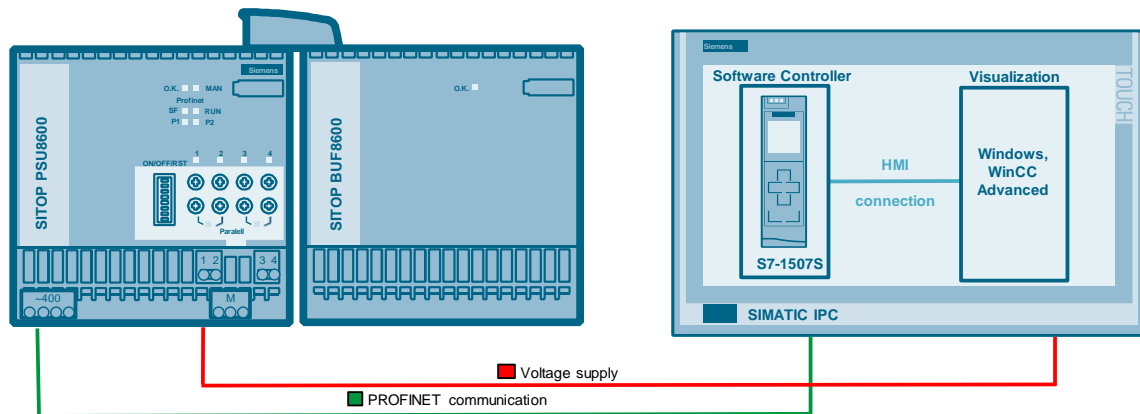
2 Solution

2.1 Overview

Schematic layout

The figure below shows a schematic overview of the most important components of the solution:

Figure 2-1



Configuration

For the application example the basic device SITOP PSU8600 40 A/4 x 10 A, and the SITOP BUF8600 10 s/40 A buffer module and an IPC477D 15" Touch PB is used as an example. The IPC is connected to the power supply on the output 1 of the basic device.

On the panel PC a SIMATIC S7-1507 Software Controller and a Windows operating system is installed. This is where the WinCC Runtime (RT) Advanced is installed which is used for the visualization of the SITOP PSU8600 parameters. The communication between the SITOP PSU8600 and the software controller is performed via Profinet connection.

Advantages

The solution presented here, offers you the following advantages:

- Routine for monitoring the state of the voltage supply.
- Ensures the safe shutdown of IPCs in buffer mode
- Prevention of data loss and software damage on panel PCs and software controller in the event of power failure

Topics not covered by this application

This application example does not contain a description of:

- Basics on software controllers (SIMATIC S7-1500 Software Controller)
- The configuration of IPCs
- TIA Portal basics
- WinCC (TIA Portal) basics for the development of visualizations
- Description of the functionalities of the SITOP PSU8600

Assumed knowledge

Basic knowledge of these topics is assumed.

- Programming of programmable logic software controllers
- Handling and commissioning of the SITOP PSU8600

2.2 Description of the core functionality

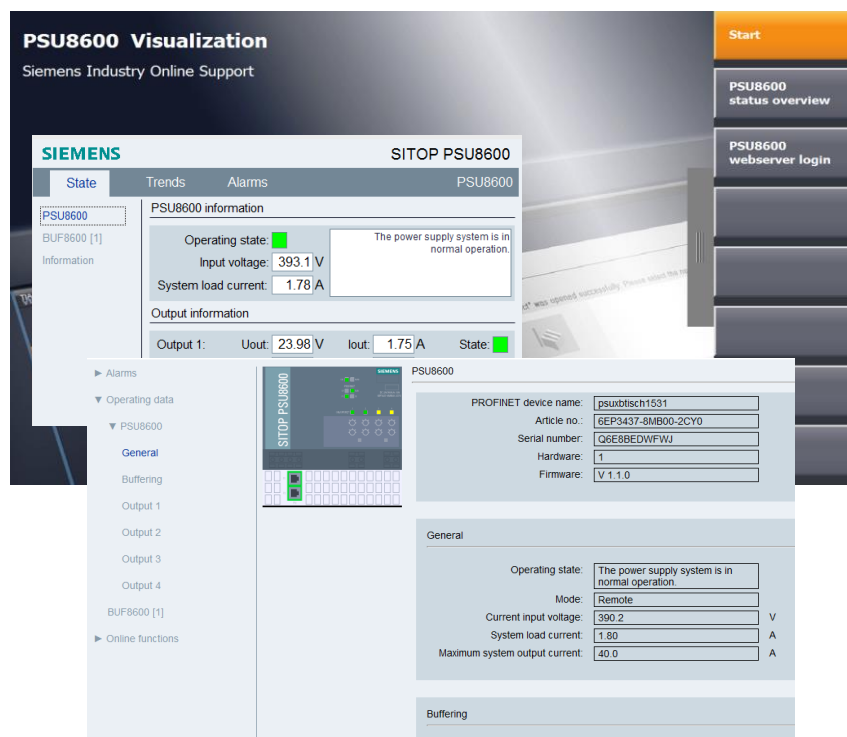
The application example shows how you can use the SITOP PSU8600 with buffer module BUF8600 as UPS of an IPC.

On the example you will be shown how you can implement a shutdown routine for the SIMATIC S7-1507 Software Controller and the IPC477D in buffer mode in a few steps. In doing so, the selected data of main and buffer module is monitored via the software controller.

It will also be discussed how you can set up a communication between a SITOP PSU8600 and an IPC with software controller and how you can visually display the data of the power supply system.

Overview and description of the user interface

Figure 2-2



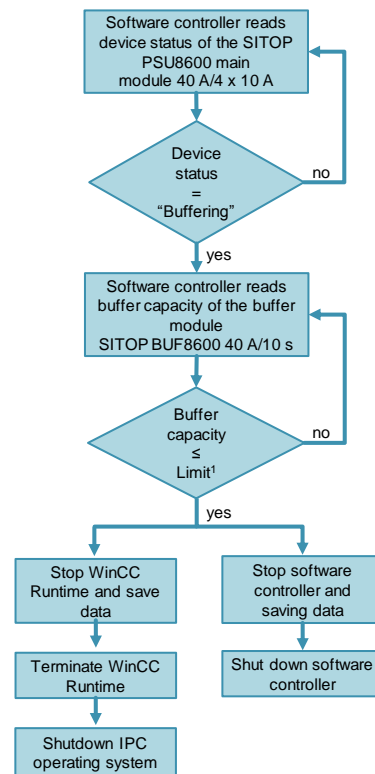
Through the handle on the right side of the screen, you can open the context menu. From there you can get an overview of the state of the SITOP PSU8600 and its additional modules.

To do this, log on to SITOP PSU8600 own web server or use the visualization via the faceplate.

In addition, there are various system functions available, as well a support area and language switching.

Sequence of the core functionality

Figure 2-3



(¹ Limit can be freely selected and depends on the connected IPC)

2.3 Hardware and software components

2.3.1 Validity

This application is valid for:

- SIMATIC STEP 7 V13 SP1 or higher
- SIMATIC WinCC Advanced and Runtime Advanced V13 SP1 or higher
- SIMATIC S7-1507 Software Controller with FW 1.8 or higher
- SITOP modules PSU8600 and BUF8600 firmware V1.1 and higher
- IPCs with at least 2 cores and compatibility with SIMATIC S7-1507 Software Controller

2.3.2 Components used

The application was created using the following components:

Hardware components

Table 2-1

| Component | Qty. | Article number | Note |
|--------------------------------------|------|--------------------|--|
| IPC477D 15" Touch PB | 1 | 6AV7240-7BL04-0KA0 | Other IPCs are also possible. Requirement: <ul style="list-style-type: none"> 24V supply CPU with at least two cores |
| Circuit breaker for motor protection | 1 | 3RV2011-1DA10 | Optional. |
| SITOP PSU8600 40 A/4 x 10 A | 1 | 6EP3437-8MB00-2CY0 | The modules SITOP PSU8600 20 A/4 x 10 A, 40 A and 20 A can also be used. |
| SITOP BUF8600 10 s/40 A | 1 | 6EP4295-8HB00-2XY0 | The module SITOP BUF8600 4s/40A can also be used. In this case, two modules should be used in order to have sufficient capacity available. |
| Scalance X108 | 1 | 108-0BA00-2AA3 | Any desired network switch that is suitable for automation networks can be used. |

Software components

Table 2-2

| Component | Qty. | Article number | Note |
|---|------|--------------------|---|
| SIMATIC WINCC ADVANCED V13 SP1 | 1 | 6AV2102-0AA03-0AA5 | |
| SIMATIC STEP 7 BASIC V13 SP1 | 1 | 6ES7822-0AA03-0YA5 | |
| DiagBase | 1 | 6AV7240-.....-.... | V1.5.1.0 - Download in entry ID 29316343 . |
| SIMATIC S7-1507 Software Controller | 1 | 6ES7672-7AC00-0YA0 | V1.8, there is the option to use other SIMATIC S7-1500 Software Controller. |
| Library with faceplate and communication blocks for SITOP PSU8600 | 1 | - | Download in entry ID 102379345 . |

Example files and projects

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

Table 2-3

| Component | Note |
|--|--|
| 109737962_Shutdown_IPC_PSU8600_in_Buffer_mode_PROJ.zip | This zip file contains the TIA example project. |
| 109737962_Shutdown_IPC_PSU8600_in_Buffer_mode_PDF_en.pdf | This document contains the basics and the documentation for the project. |
| Download page of the STIOP PSU8600 library – faceplate and communication blocks for the TIA Portal | Link to entry ID 102379345 |

3 Basics

3.1 Basics for operation the SIMATIC S7-1500 Software Controller on a IPC

In order to be able to operate a software controller on an IPC, the IPC has to have a computing unit with at least two computer cores. This is down to the fact that one computer is only used for the SIMATIC S7-1500 Software Controller and the other one for the Windows operating system.

In addition, a separate partition has to be created for the controller on the hard drive. It has to be made sure that the DiagBase program is suitable to the software controller version. This ensures the correct functionality of the S7-1500S. What version is required for what controller can be found in the appropriate manual.

Information on installation and handling of software controllers on IPCs can be found in the entries with entry ID [109478804](#) and [104943430](#).

The Profinet port X1 is used for the communication in the network by the IPC after installing the controller and X2. The project is loaded via port X2. When the IPC starts, the operating system and the software controller are started up in parallel.

3.2 Basics SITOP PSU8600 power supply

To start off with, the SITOP PSU8600 consists of the basic device. It is available with one or four outputs. If the number of outputs of the basic device is not enough, up to four additional expansion modules CNX8600 can be connected. The number of outputs is increased by four each.

In order to be able to maintain the power supply for as long as possible in the event of a power failure/breakdown, and to ensure a data backup, up to two buffer modules BUF8600 can be connected. They differ in their buffer capacity and thus their construction width. The specification is based on the time during which the buffer module can maintain the power supply with a load current of 40 A and a supply voltage of 24 V.

The different modules can be arranged individually next to each other on a DIN rail. The supply and communication is through the System Clip Link which is located on the top of the main module. The input voltage of the basic device is 400 V.

NOTICE

Material damage/soiling

The sockets on the top carry a voltage of up to max. 60 V and therefore should be provided with the protective covers included. This prevents material damages and unnecessary soiling.

For the communication in the network, the basic device has a Profinet interface that is equipped with two ports. The connection to a controller is from one of the two ports either directly, or through a network switch that is connected with the network of the controller.

Over the network, the parameters of the SITOP modules can be read out or controlled and subsequently visually displayed. For this purpose, the Siemens AG offers ready-made faceplate or communication blocks for various controllers and WinCC (TIA Portal) software. They can be found in the entry with entry ID [102379345](#).

Note

By changing the firmware of the SITOP PSU8600 from 1.0.0 to 1.1.0, the internal data structure has changed. Make sure to download the correct library.

The download page for the firmware update can be found in the entry with entry ID [102295547](#).

The basic device can be updated via direct connection from 1.0.0 to 1.1.0. The CNX and BUF modules can also be dragged up directly via network from 1.0.0 to 1.1.0.

The hardware settings of the outputs are done on the front side of the module. Use the TIA Portal for the configuration of the software. You have to slide the "REN" DIP switch to the right, in order to enable the remote access.

Note

If the outputs are switched off manually via buttons 1-4 on the front side, remote access is no longer possible. Switch the inputs on again by clicking the buttons again, to re-enable the remote access.

In order for the SITO PSU8600 to be configurable in the TIA Portal, it has to be added to the hardware product tree in the TIA Portal. To do this, use the appropriate hardware support package (HSP file). You can find it, together with the installation manual, in the entry with entry ID [102254062](#).

In addition, the SITOP PSU8600 offers a web server that can be enabled via the "WEN" DIP switch (for basic devices with product state (PS) 1 and firmware update 1.1.0 "FUNC"). Enabling takes place by moving to the position on the right.

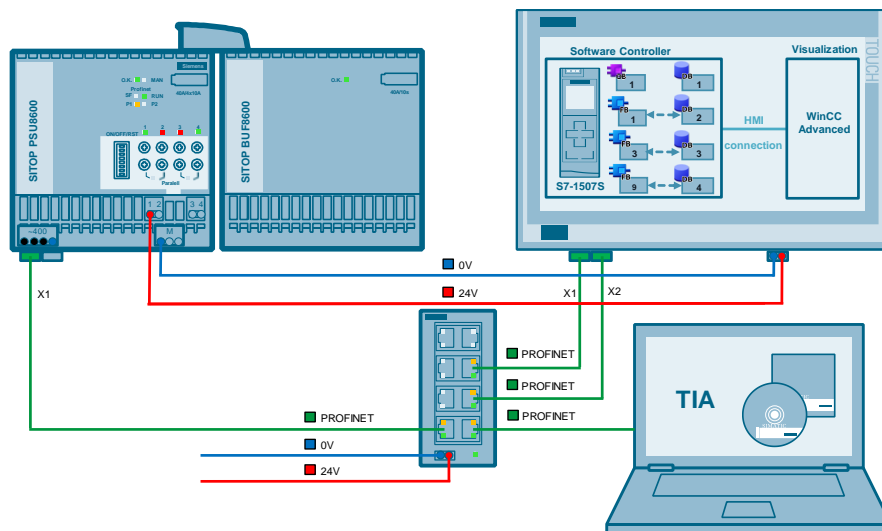
Further functions and information for the SITOP PSU8600 can be found in the respective manuals.

- Manual SITOP PSU8600 power supply - basic devices with four outputs, entry ID: [105867947](#)
- Manual SITOP PSU8600 power supply - basic devices with one output, entry ID: [109482936](#)

4 Mode of Operation

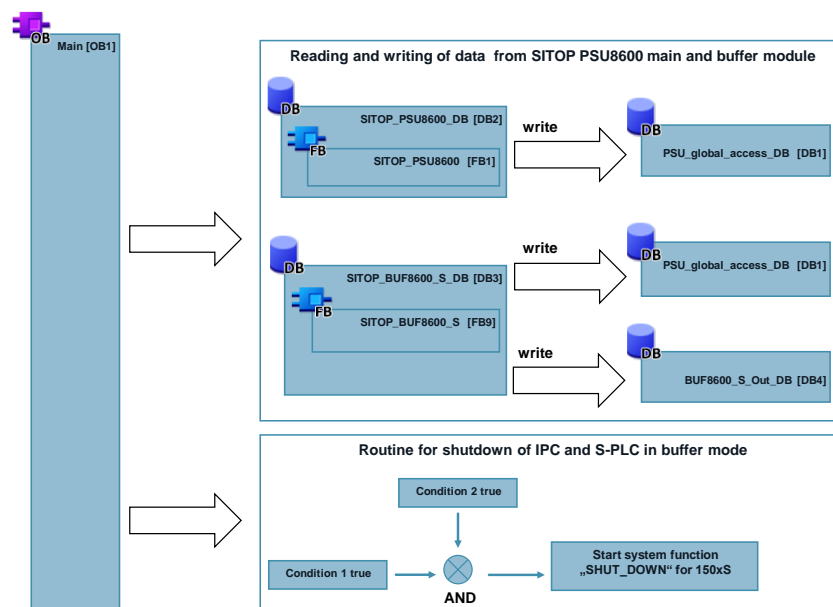
4.1 General overview

Figure 4-1



Program overview of software controller

Figure 4-2

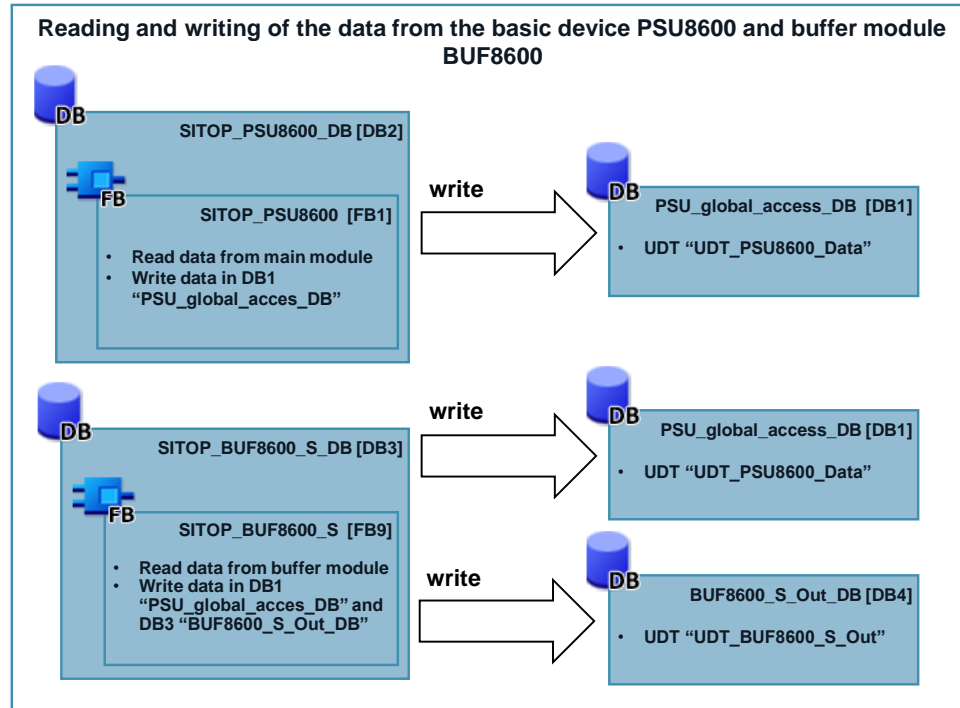


The controller program is divided in two program parts. In the first part, the current data of the basic device and the buffer module is read out and provided in a global data block. In the second part it is checked whether the conditions for a shutdown of the IPCs are true. If this is the case, the "SHUT_DOWN" system function will execute.

4.2 Program part 1 - reading data from basic device PSU8600 and buffer module BUF8600

4.2.1 General

Figure 4-3



The 1st part of the program is responsible for the reading out of data. For this, the communication blocks (see [References](#) in /5/) from the SITOP PSU8600- library are used.

Note

How to integrate the library is described in chapter [6.2](#).

4.2.2 Program details

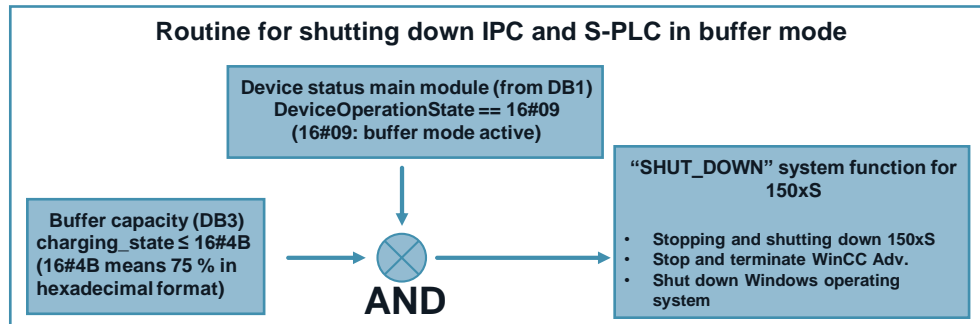
The data of module SITOP PSU8600 40 A/4 x 10 A is read out with the help of function block FB1 "SITOP_PSU8600". The data of the buffer module BUF8600 10 s/40 A is read out with the help of function block FB9 "SITOP_PSU8600_S". The data read out is made available to the DB1 "PSU_global_access_DB" data block. The DB1 includes the data structure (UDT_PSU8600_Data) of the maximum possible hardware configuration of the SITOP PSU8600.

The DB4 "BUF8600_S_Out data" block contains the specific parameters of the buffer module (data type "UDT_BUF8600_S_Out").

4.3 Program part 2 - shutting down the IPCs and software controllers in the event of buffer mode

4.3.1 General

Figure 4-4



The 2nd program part contains the shutdown process of the IPC and of the controller, when the SITOP PSU8600 is in buffer mode. By monitoring the device status of the SITOP PSU8600 and the charging state of the buffer module, it is decided through comparative operators whether a shutdown is required. For SIMATIC S7-1500 Software Controller, TIA Portal offers a system function that is called "SHUT_DOWN".

4.3.2 Program details

The device status is read out via the tag "DeviceOperationState" of DB1. In a power failure/breakdown the case the tag takes on value 16#09 as result. The charge status of the buffer module is read out via the "Charging_state" tag of DB3. If the charge state is lower than 75 % and the basic device in buffer mode, the "SHUT_DOWN" system function is enabled straight away. If it is higher and the buffer mode is active it will be waited until the limit value is reached.

Note

The limit value of 75 % is individually specified. It depends on the duration of how long the IPC takes to shut down and how long the IPC is to be operated after power failure.

With a SITOP BUF8600 10 s/40 A buffer module the IPC, used in the application case, can be provided with 24 V (at a consumption of 1.71 A) for approx. 4 min (t_{buffer}) after power failure/breakdown at 100 % charge state. The time can be estimated via the formula $t_{\text{buffer}} = 40 \text{ A} / 1.71 \text{ A} * 10 \text{ s}$.

The "SHUT_DOWN" system function becomes active, when the "EN" input is set (to 1). It includes various processes (MODE).

- MODE = 1:
 - S7-1500S and running Windows applications will be stopped
 - Remanent data will be saved
 - S7-1500S and Windows will be shut down
- MODE = 2:
 - S7-1500S will be stopped
 - Remanent data will be saved
 - S7-1500S will be restarted
- MODE = 3:
 - S7-1500S remains in "RUN" mode,
 - Windows applications will be stopped
 - Windows will be restarted

In the application example "MODE = 1" is used as basic/presetting.

Note

More details on the "SHUT_DOWN" system function can be found in the TIA Portal help which is located in the menu item help in "Show help". Enter the name of the system function as search term.

An application example on saving data via shutdown can be found in entry ID [109479727](#).

5 Configuration and Settings

5.1 Configuring the IPC

Table 5-1

| No. | Action |
|-----|---|
| 1. | Connect the IPC to any 24 V voltage supply. |
| 2. | Start the IPC. |
| 3. | Open DiagBase via "Windows start button > All programs > Siemens Automation > DiagBase > Management Explorer". |
| 4. | Click "? > About Management Explorer" in the menu in order to find out the installed product version of DiagBase. With the help of chapter Basics for operation the SIMATIC S7-1500 Software Controller on a IPC you can find out whether it has to be updated. |
| 5. | If the SIMATIC S7-1507 Software Controller is not yet installed on your PC, install it. The approach can also be found in the chapter mentioned in No. 4. |
| 6. | Subsequently shut down the IPC again. |

5.2 Configuring the SITOP PSU8600 with BUF8600

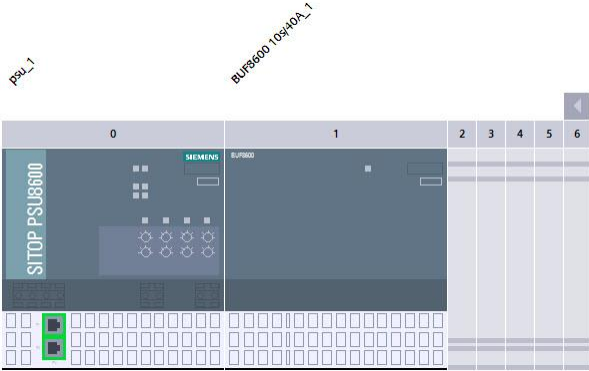
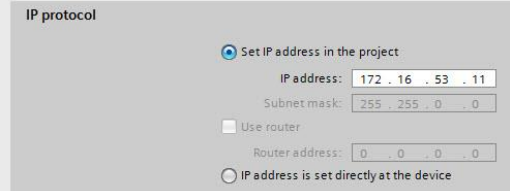
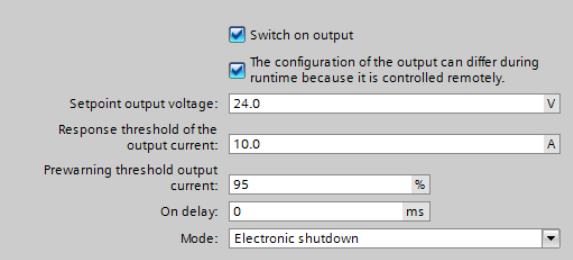
Table 5-2

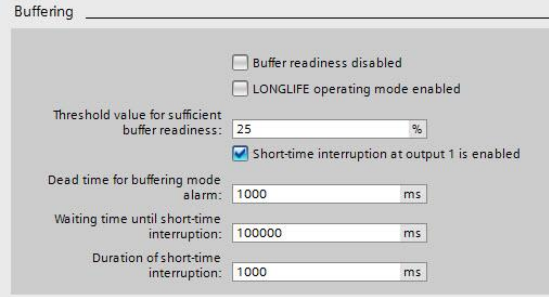
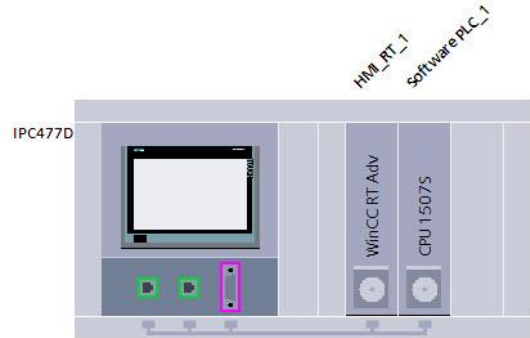
| No. | Action |
|-----|--|
| 7. | Place the basic device and the buffer module next to each other on the DIN rail. |
| 8. | Connect the modules with each other via the connector plugs/sockets on the top. Insert the included cover on the open connection on the top of the buffer module. |
| 9. | Enable the remote access via the "REN" (remote enable) DIP switch on the front side of the basic device by sliding it to the right. You can optionally enable the web server access via the "FUNC" DIP switch in the same way Note: For models with production state 2 and firmware 1.1.0 the name is "WEN" (web server enable). |
| 10. | Connect the 400 V voltage supply to the SITOP PSU8600 and make sure that the voltage supply is not yet switched active. |

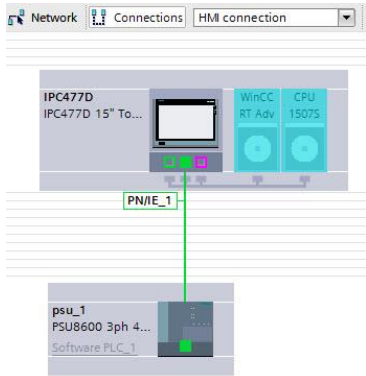
5.3 Configuring the hardware in the TIA Portal

Table 5-3

| No. | Action |
|-----|--|
| 11. | Start the TIA Portal and go to the project view. |
| 12. | Create a new project. |
| 13. | Download the current support package for the SITOP PSU8600 and install it. An instruction for can be found in chapter 3.2 . |
| 14. | Click "Devices and network" in the project navigation to open the network view. |
| 15. | Move the IPC477D with article no. 6AV7240-yBxxx-xxxx to the network view, using drag-and-drop via the hardware catalog "Industry PCs > SIMATIC Panel PC > IPC477D > IPC 477D 15" Touch > IPC 477D 15" Touch PB". |

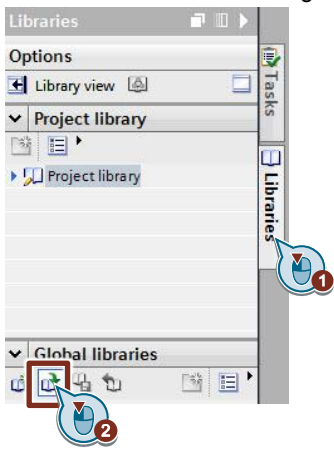
| No. | Action |
|-----|---|
| 16. | Move the basic device "PSU8600 3ph 40 A/4 x 10 A" with V1.1.0 to the network view via the hardware catalog "Power Supplies > SITOP PSU > PSU8600", using drag-and-drop. |
| 17. | Select the SITOP PSU8600 and go to the device view by double-clicking with the left mouse button. |
| 18. | <p>Move the "BUF8600 10 s/40 A" buffer module with V1.1.0 to the slot 1 via the hardware catalog "Power Supplies > SITOP PSU > PSU8600 > BUF8600", using drag-and-drop.</p>  |
| 19. | <p>Click the basic device and assign a free, valid IP address via the "Properties > Device interface > Ethernet addresses" tab.</p>  |
| 20. | <p>Enable output 1 and 4 via the menu "Properties > Device configuration > Output 1" or "... > Output 4". Specify 24 V as output voltage and an on delay of 0 ms, and the "Electronic shutdown" mode.</p>  |

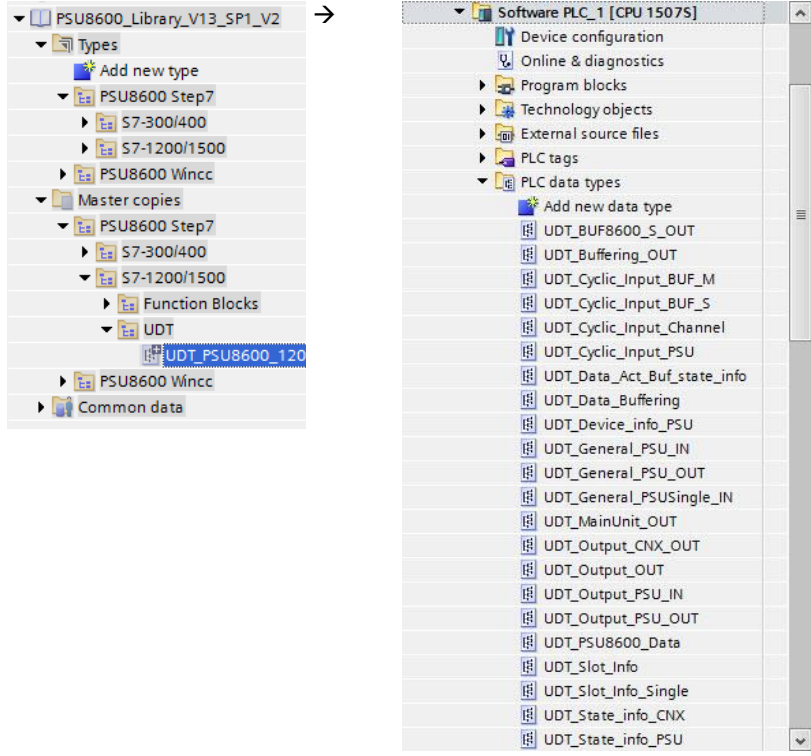
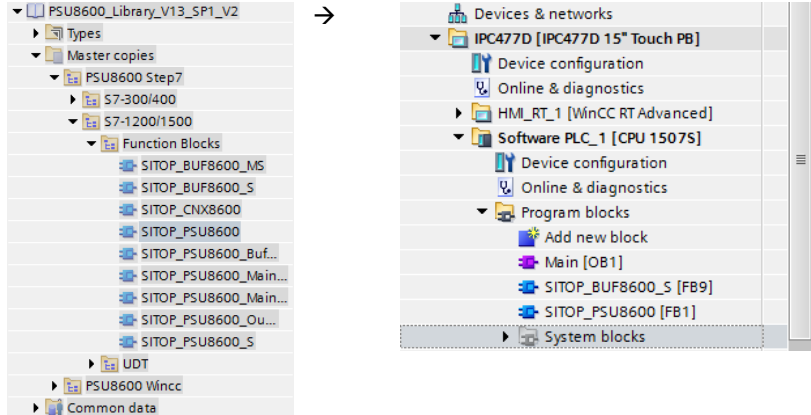
| No. | Action |
|-----|--|
| 21. | <p>Enable the brief interruption on output 1, so that the IPC will start up automatically once the voltage returns. Select the parameters as follows:</p> <ul style="list-style-type: none"> • Dead time for buffering mode alarm: 1000 ms • Waiting time until short-time interruption: 100000 ms • Duration for short-time interruption: 1000 ms  <p>Mode of Operation</p> <p>If the SITOP PSU8600 is in buffer mode, after 1s (dead time for alarm in buffer mode) a "buffering alarm" is triggered. The SITOP PSU8600 then waits 100s (also when the input voltage returns), until the brief interruption occurs on output 1 for 1 s (duration until brief interruption). If the input voltage remains missing for longer than 100 s, a brief interruption occurs.</p> <p>A more detailed description of the function and the parameters that can be set can be found in the manual of SITOP PSU8600 (see References in /9/ and /10/).</p> <p>Note</p> <p>The parameters have to be adjusted to consumers and application area.</p> |
| 22. | Go back to the network view and go to the IPC by double-clicking with the left mouse button in the appropriate device view. |
| 23. | <p>Move the "WinCC RT Advanced" from the "Hardware catalog > SIMATIC HMI application" to slot 3 using drag-and-drop.</p> <p>Repeat the step. Move the software controller in the hardware catalog "SIMATIC Controller Application > SIMATIC S7-1500 Software Controller > CPU 1507S" to the slot next to it.</p>  |
| 24. | Assign a free, valid IP address for controllers and Windows in the respective "Properties > Profinet onboard [X1]/[X2]" menu. The X1 port is required for the controller, the X2 port is used for the operating system. |

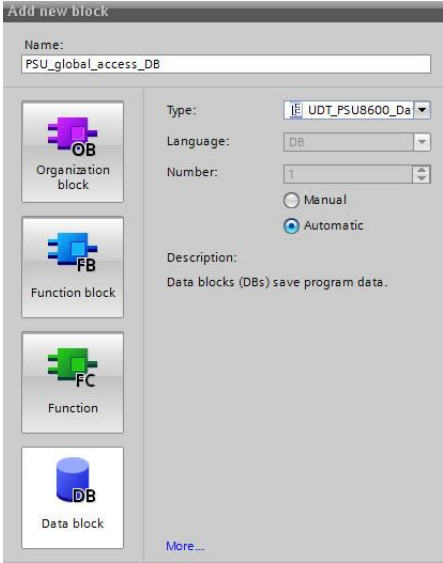
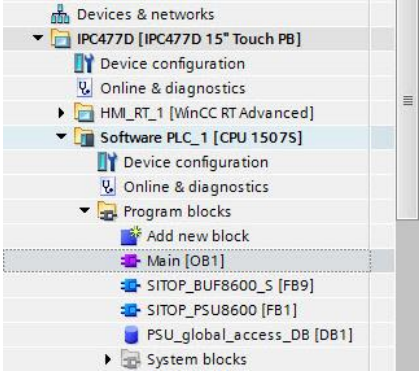
| No. | Action | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|-------------------------------|---------|----------------|-----------------------|-------------------------------------|--|--|------|----------------------|-------------------------------|---------|---------|------|--------|------------------|-----------------|------|---------|----------------|-----------------------|-------------------------------------|-----------|--|--|--|--|--|--|
| 25. | <p>In the network view click the "Connections" menu and create a HMI connection. To do this, click "WinCC RT Adv". Hold the mouse button down, slide the mouse pointer over "CPU 1507S" and let go. A connection has been automatically created.</p>  <p>The screenshot shows the 'Connections' tab in the TIA Portal. A green line connects the 'PN/IE_1' port of the 'IPC477D 15" To...' HMI to the 'CPU 1507S' of the 'psu_1 PSU8600 3ph 4...' PLC. Below the diagram is a table of connections.</p> <table><tr><th colspan="7">Connections</th></tr><tr><th>Name</th><th>Communication driver</th><th>HMI time synchronization mode</th><th>Station</th><th>Partner</th><th>Node</th><th>Online</th></tr><tr><td>HMI_Verbindung_1</td><td>SIMATIC S7 1500</td><td>None</td><td>IPC477D</td><td>Software PLC_1</td><td>CPU 1507S, Host in...</td><td><input checked="" type="checkbox"/></td></tr><tr><td colspan="7"><Add new></td></tr></table> | Connections | | | | | | | Name | Communication driver | HMI time synchronization mode | Station | Partner | Node | Online | HMI_Verbindung_1 | SIMATIC S7 1500 | None | IPC477D | Software PLC_1 | CPU 1507S, Host in... | <input checked="" type="checkbox"/> | <Add new> | | | | | | |
| Connections | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Name | Communication driver | HMI time synchronization mode | Station | Partner | Node | Online | | | | | | | | | | | | | | | | | | | | | | | |
| HMI_Verbindung_1 | SIMATIC S7 1500 | None | IPC477D | Software PLC_1 | CPU 1507S, Host in... | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | |
| <Add new> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

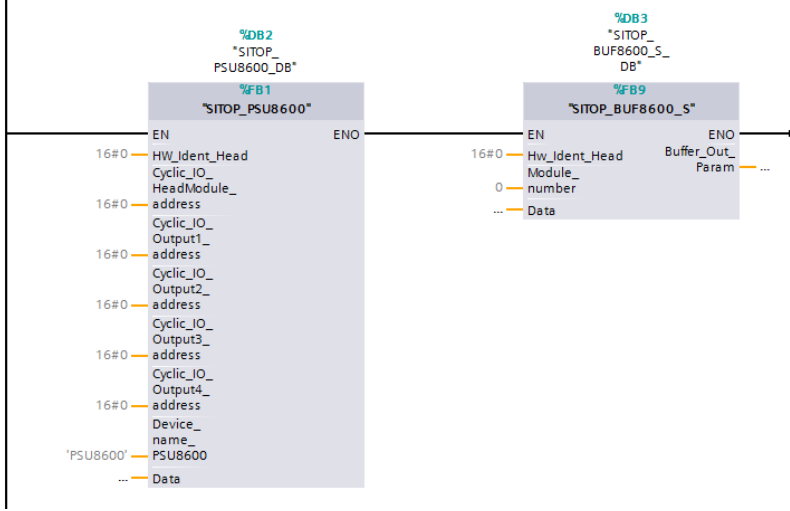
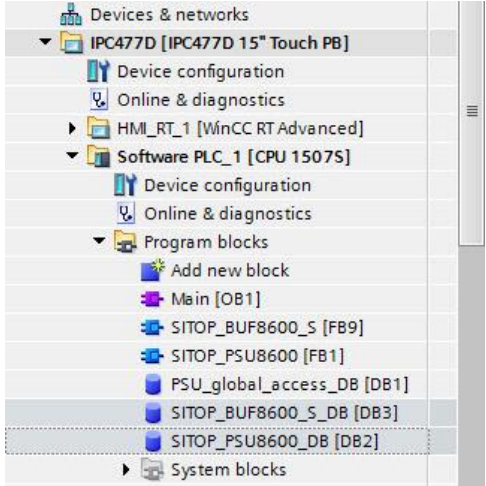
5.4 Configuring the program for SIMATIC S7-1507 Software Controller

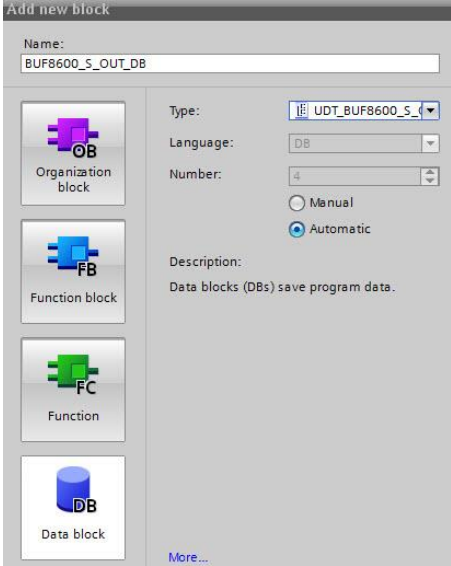
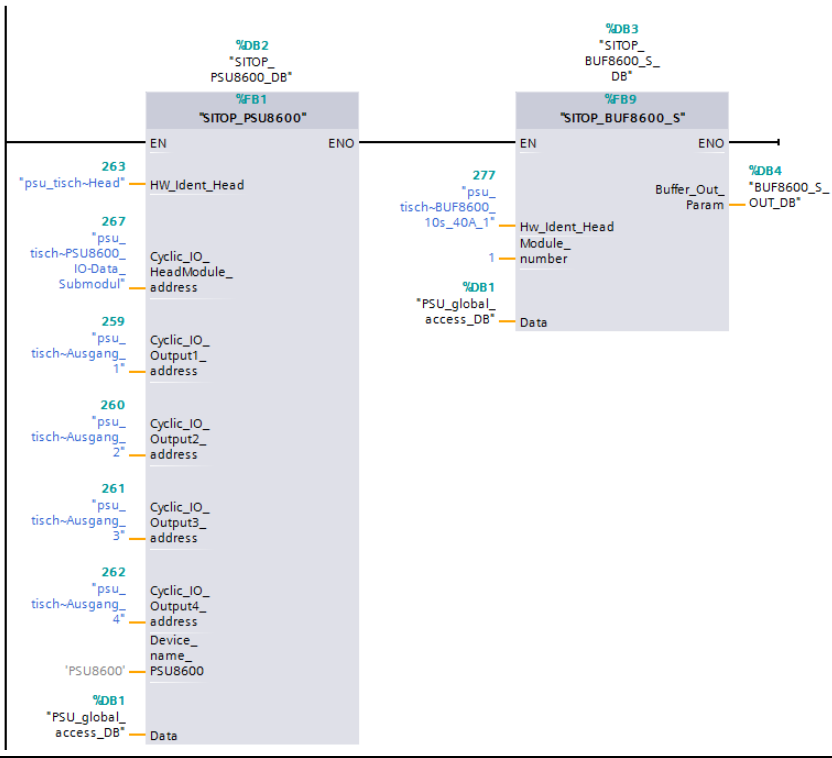
Table 5-4

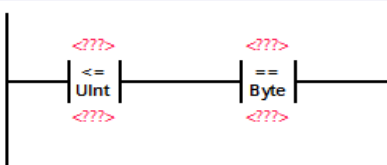
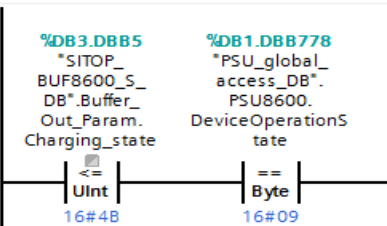
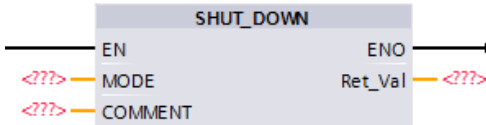
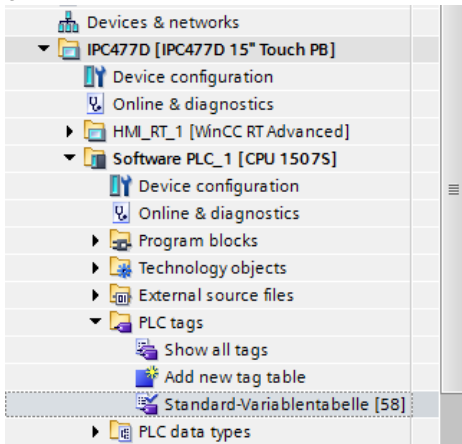
| No. | Action |
|-----|---|
| 1. | <p>Download the "102379345_SITOP_PSU8600_TIA_V13_SP1_FW1.1.0_LIB.zip" library for the faceplate and communication blocks of the SITOP PSU8600. You can find it in the entry with entry ID 102379345. Please note the firmware version of your SITOP PSU8600.</p> |
| 2. | Unzip the library into a folder of your choice. |
| 3. | <p>Go back to the TIA Portal and open the library in the library view via the "Libraries > Global libraries > Add global library" task card.</p>  <p>The screenshot shows the 'Libraries' view in the TIA Portal. The 'Global libraries' section is expanded, and the 'Add global library' task card is highlighted with a red box and a blue arrow labeled '2'. A blue arrow labeled '1' points to the 'Libraries' task card in the right-hand sidebar.</p> |

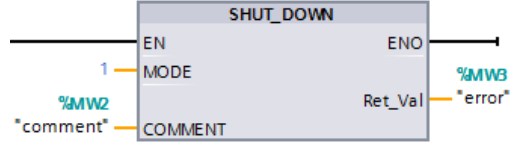
| No. | Action |
|-----|--|
| 4. | <p>Copy the PLC data types in "Copy templates > PSU8600 Step7 > S7-1200/1500 > UDT" from the library into the appropriate folder "Software PLC_1 > PLC data types" in the project navigation.</p>  <p>The screenshot shows two side-by-side project navigation trees. On the left, the 'PSU8600_Library_V13_SP1_V2' tree is expanded to 'Types' > 'PSU8600 Step7' > 'S7-1200/1500' > 'Function Blocks' > 'UDT', with 'UDT_PSU8600_120' selected. An arrow points to the right tree, which shows 'Software PLC_1 [CPU 1507S]' expanded to 'PLC data types'. A list of UDTs is shown, including 'UDT_BUF8600_S_OUT', 'UDT_Buffering_OUT', 'UDT_Cyclic_Input_BUF_M', 'UDT_Cyclic_Input_BUF_S', 'UDT_Cyclic_Input_Channel', 'UDT_Cyclic_Input_PSU', 'UDT_Data_Act_Buf_state_info', 'UDT_Data_Buffering', 'UDT_Device_info_PSU', 'UDT_General_PSU_IN', 'UDT_General_PSU_OUT', 'UDT_General_PSU_Single_IN', 'UDT_MainUnit_OUT', 'UDT_Output_CNx_OUT', 'UDT_Output_OUT', 'UDT_Output_PSU_IN', 'UDT_Output_PSU_OUT', 'UDT_PSU8600_Data', 'UDT_Slot_Info', 'UDT_Slot_Info_Single', 'UDT_State_info_CNx', and 'UDT_State_info_PSU'.</p> |
| 5. | <p>Copy the function blocks "SITOP_PSU8600" and "BUF8600_S" in "Copy templates > PSU8600 Step7 > S7-1200/1500 > Function Blocks" from the library into the appropriate folder "Software PLC_1 > Program blocks" in the project view.</p>  <p>The screenshot shows two side-by-side project navigation trees. On the left, the 'PSU8600_Library_V13_SP1_V2' tree is expanded to 'Types' > 'Master copies' > 'PSU8600 Step7' > 'S7-1200/1500' > 'Function Blocks'. A list of function blocks is shown, including 'SITOP_BUF8600_MS', 'SITOP_BUF8600_S', 'SITOP_CNx8600', 'SITOP_PSU8600', 'SITOP_PSU8600_Buf...', 'SITOP_PSU8600_Main...', 'SITOP_PSU8600_Main...', 'SITOP_PSU8600_Ou...', and 'SITOP_PSU8600_S'. An arrow points to the right tree, which shows 'Software PLC_1 [CPU 1507S]' expanded to 'Program blocks'. A list of blocks is shown, including 'SITOP_BUF8600_S [FB9]' and 'SITOP_PSU8600 [FB1]'. The 'System blocks' folder is also visible at the bottom.</p> |

| No. | Action |
|-----|---|
| 6. | <p>Create a new data block in the project view in "Software PLC1 > Program blocks > Add new block" with the name "PSU_global_access_DB". As type, select the data structure "UDT_PSU8600_Data".</p>  <p>Disable the optimized block access via the properties of the created data block (remove tick).</p> |
| 7. | <p>Open the OB1 in the project navigation via the "Software PLC1 > Program blocks" folder.</p>  |

| No. | Action |
|-----|--|
| 8. | <p>Move FB1 and FB9 into the network area using via drag-and-drop.</p> <p>▼ Block title: "Main Program Sweep (Cycle)"</p> <p>► Operation Block, which contains the shutdown programm. It exists a system function for S7-1200/...</p> <p>▼ Network 1: Read data PSU8600 main module and buffer module BUF8600_1</p> <p>► While the hardware configure the hardware addresses will be given automatically und saved in seperated system tags....</p>  <p>The appropriate data blocks (DB2 and DB3) are created automatically. Confirm it with "OK".</p>  |

| No. | Action |
|-----|---|
| 9. | <p>Create a new data block in the project view via "Software PLC1 > Program blocks > Add new block" with the name "BUF8600_S_Out_DB". As type, select the data structure "UDT_BUF8600_S_Out".</p>  |
| 10. | <p>Connect the inputs of the blocks in the OB1 with the appropriate environment variables of the SITOP PSU8600, as well as DB1 and DB4.</p> <p>▼ Block title: "Main Program Sweep (Cycle)"</p> <p>► Operation Block, which contains the shutdown program. It exists a system function for S7-1200/...</p> <p>▼ Network 1: Initialize PSU8600 main module and buffer module BUF8600_1</p> <p>► While the hardware configure the hardware addresses will be given automatically und saved in seperated system tags....</p>  |
| 11. | Create a new network via "Right click > Add network". |

| No. | Action |
|-----|---|
| 12. | <p>Move "<=" and "==" operator from the basic "Basic instructions > Comparator operations" tab of the "Instructions" task card into network 2.</p> <p>▼ Network 2: Shutdown case</p> <p>► ...</p>  |
| 13. | <p>Add the conditions "Charging_state <=16#4B" and "DeviceOperationState ==16#09". Select the tags (DB1,DB4) via the "???" field.</p> <p>▼ Network 2: Shutdown case</p> <p>► ...</p>  <p>Note: The limit value for the Charging_state can be freely selected. Note that the data type is specified in hex format.</p> |
| 14. | <p>Add the "SHUT_DOWN" block from the "Basic instructions > Program control operations" tab of the "Instructions" task card into the network.</p>  |
| 15. | <p>Open the "Default tag table" via "Software PLC1 > PLC tags" in the project navigation.</p>  |

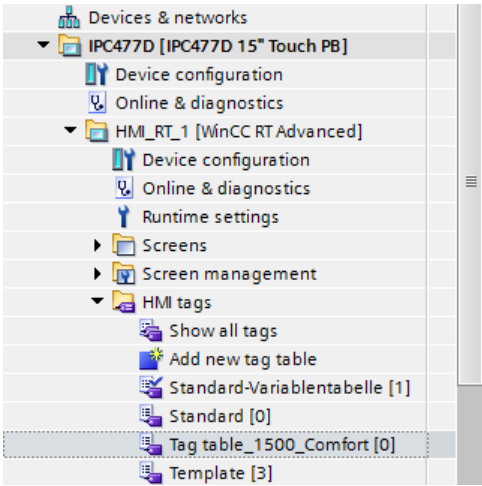









| No. | Action | | | | | | | | | | | | | | | | | | | | |
|----------------------------|---|----------------------------|---------|--|--|--|--------|-----------|---------|---|---------|-------|------|---|-------|------|------|---|-----------|--|--|
| 16. | <p>Recreate the tags "comment" (Data type: WChar, Address: %MW1) and "error" (Data type: Word, Address: %MW2) via "Add".</p> <table><tr><th colspan="4">Standard-Variablen-Tabelle</th></tr><tr><th></th><th>Name ▲</th><th>Data type</th><th>Address</th></tr><tr><td>1</td><td>comment</td><td>WChar</td><td>%MW1</td></tr><tr><td>2</td><td>error</td><td>Word</td><td>%MW2</td></tr><tr><td>3</td><td colspan="3"><Add new></td></tr></table> <p>Note:</p> <p>For MODE = 1 and MODE = 3 you can attach a reason ("comment" tag) for the restart. The reason is output in the Windows Event Log.</p> <p>A parameter "Ret_Val" ("error" tag) is provided on the output by the block that checks the functionality. The block provides a specific value.</p> <ul style="list-style-type: none">Ret_Val = 0: no errorRet_Val = 8090: The transferred value to MODE is not supported.Ret_Val = 80xy: Windows does not respond to the call of the instruction. | Standard-Variablen-Tabelle | | | | | Name ▲ | Data type | Address | 1 | comment | WChar | %MW1 | 2 | error | Word | %MW2 | 3 | <Add new> | | |
| Standard-Variablen-Tabelle | | | | | | | | | | | | | | | | | | | | | |
| | Name ▲ | Data type | Address | | | | | | | | | | | | | | | | | | |
| 1 | comment | WChar | %MW1 | | | | | | | | | | | | | | | | | | |
| 2 | error | Word | %MW2 | | | | | | | | | | | | | | | | | | |
| 3 | <Add new> | | | | | | | | | | | | | | | | | | | | |
| 17. | <p>Assign the "MODE" input with the value 1. Assign the "comment" tag to the "COMMENT" input, the "RET_VAL" output is assigned the "error" tag.</p>  | | | | | | | | | | | | | | | | | | | | |

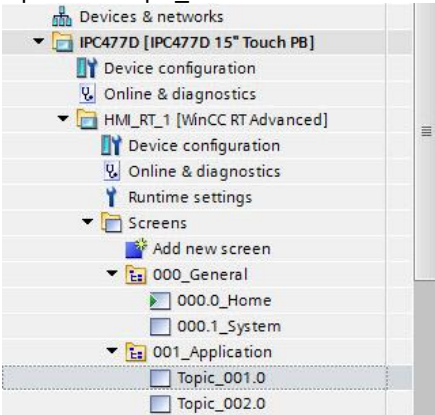
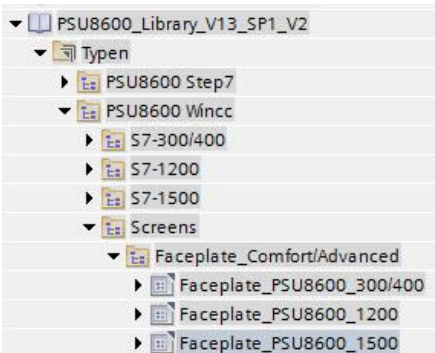
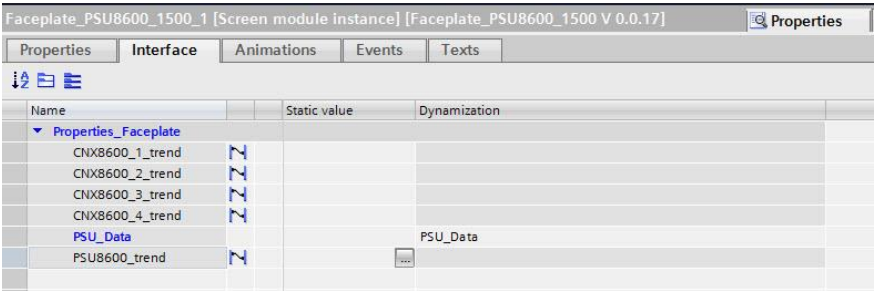
5.5 Configuring the software for the visualization with WinCC RT Advanced

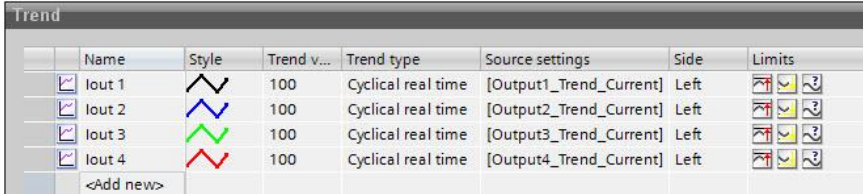
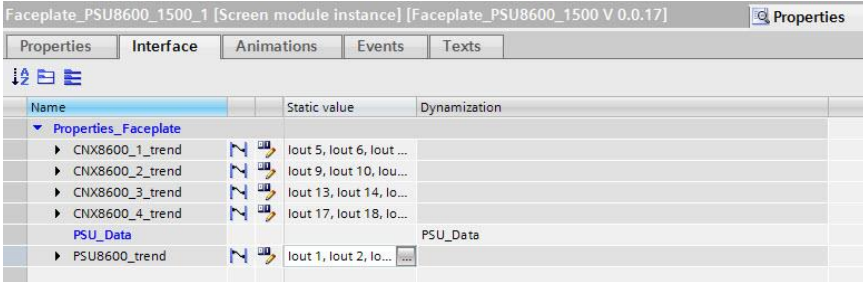
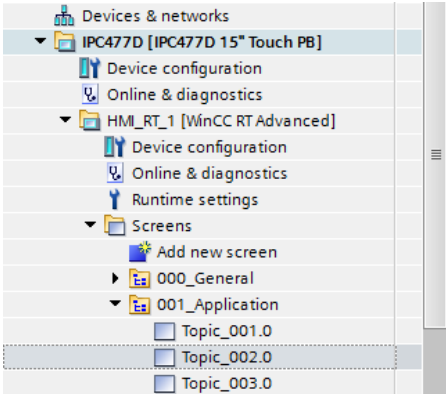
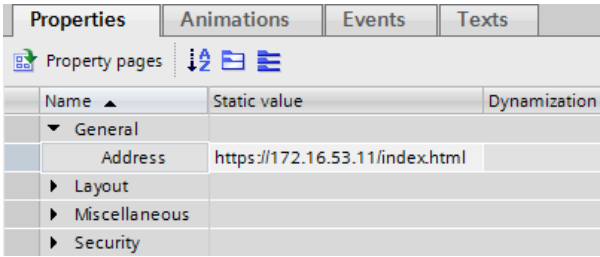
Note

This chapter shows the required connection of the PLC tags with the help of HMI tags. However, it will not discuss the commissioning of the SITOP PSU8600 faceplate. Information on this topic can be found in the documentation of the library see [References](#) in /5/).

Table 5-5

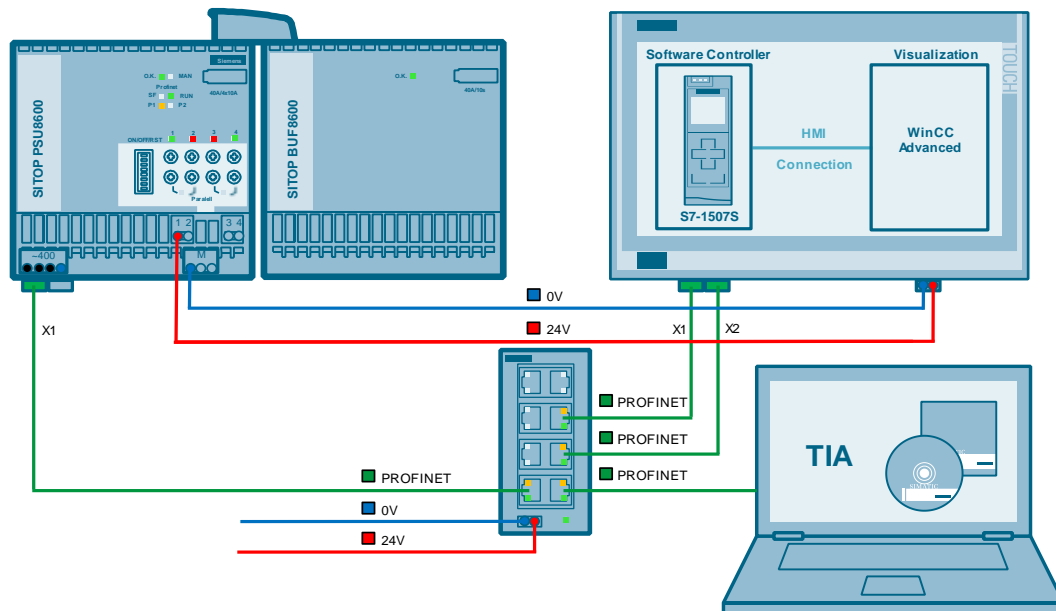
| No. | Action | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----------------------|-------------------|--------------------------|----------------|----------|---------|---|---------------|-----|------------------|----------------|------------|---|---------------|-----|------------------|----------------|------------|---|----------|----------------------|------------------|----------------|-------------|--|-----------|--|--|--|--|--|---------|-------------|-------------------|--------|----------------|---------|------------------|--|-------------------|--------|--------------------------|--|--|------------------|--|-------------------|--------|--------------------------|--|--|----|-------------|-------------------|--------|--------------------------|--|--|
| 1. | <p>Open the "Tag table_1500_Comfort" tag table of HMI Runtime in the project navigation via "HMI_RT_1 > HMI tags > Tag Table".</p>  The screenshot shows the project navigation tree in WinCC RT Advanced. The tree is expanded to show the 'HMI tags' folder under 'HMI_RT_1 [WinCC RT Advanced]'. The 'Tag table_1500_Comfort [0]' is highlighted with a dashed border. The tree structure is as follows: Devices & networks > IPC477D [IPC477D 15" Touch PB] > Device configuration > Online & diagnostics > HMI_RT_1 [WinCC RT Advanced] > Device configuration > Online & diagnostics > Runtime settings > Screens > Screen management > HMI tags > Show all tags > Add new tag table > Standard-Variablen-tabelle [1] > Standard [0] > Tag table_1500_Comfort [0] > Template [3]. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | <p>Create the following tags new via "Add":</p> <ul style="list-style-type: none">"alarm_history": Data type: Int, access type: Symbolic"alarm_pending": Data type: Int, access type: Symbolic"PSU_Data": Data type: PSU_DATA_1500 V0.0.9, Address: %DB1.X.0.0 <p>Enter your created "HMI_Connection_1" as connection. Connect the PLC tags "AlarmHistory" and "AlarmPending" from DB1 with the appropriate HMI tags.</p> <table><tr><th></th><th>Name ▲</th><th>Data type</th><th>Connection</th><th>PLC name</th><th>PLC tag</th></tr><tr><td></td><td>alarm_history</td><td>Int</td><td>HMI_Connection_1</td><td>Software PLC_1</td><td>PSU_global</td></tr><tr><td></td><td>alarm_pending</td><td>Int</td><td>HMI_Connection_1</td><td>Software PLC_1</td><td>PSU_global</td></tr><tr><td></td><td>PSU_Data</td><td>PSU8600_Data_1500...</td><td>HMI_Connection_1</td><td>Software PLC_1</td><td><Undefined></td></tr><tr><td></td><td><Add new></td><td></td><td></td><td></td><td></td></tr></table> <table><tr><th></th><th>Address</th><th>Access mode</th><th>Acquisition cy...</th><th>Logged</th><th>Source comment</th><th>Comment</th></tr><tr><td>l_access_DB.A...</td><td></td><td><symbolic access></td><td>500 ms</td><td><input type="checkbox"/></td><td></td><td></td></tr><tr><td>l_access_DB.A...</td><td></td><td><symbolic access></td><td>500 ms</td><td><input type="checkbox"/></td><td></td><td></td></tr><tr><td>l></td><td>%DB1.DBX0.0</td><td><absolute access></td><td>500 ms</td><td><input type="checkbox"/></td><td></td><td></td></tr></table> | | Name ▲ | Data type | Connection | PLC name | PLC tag |  | alarm_history | Int | HMI_Connection_1 | Software PLC_1 | PSU_global |  | alarm_pending | Int | HMI_Connection_1 | Software PLC_1 | PSU_global |  | PSU_Data | PSU8600_Data_1500... | HMI_Connection_1 | Software PLC_1 | <Undefined> | | <Add new> | | | | | | Address | Access mode | Acquisition cy... | Logged | Source comment | Comment | l_access_DB.A... | | <symbolic access> | 500 ms | <input type="checkbox"/> | | | l_access_DB.A... | | <symbolic access> | 500 ms | <input type="checkbox"/> | | | l> | %DB1.DBX0.0 | <absolute access> | 500 ms | <input type="checkbox"/> | | |
| | Name ▲ | Data type | Connection | PLC name | PLC tag | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | alarm_history | Int | HMI_Connection_1 | Software PLC_1 | PSU_global | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | alarm_pending | Int | HMI_Connection_1 | Software PLC_1 | PSU_global | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | PSU_Data | PSU8600_Data_1500... | HMI_Connection_1 | Software PLC_1 | <Undefined> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <Add new> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Address | Access mode | Acquisition cy... | Logged | Source comment | Comment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| l_access_DB.A... | | <symbolic access> | 500 ms | <input type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| l_access_DB.A... | | <symbolic access> | 500 ms | <input type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| l> | %DB1.DBX0.0 | <absolute access> | 500 ms | <input type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Action |
|-----|---|
| 3. | <p>Open the "Topic_001.0" screen in the "Screens > 001_Application" folder.</p>  |
| 4. | <p>Move the "Faceplate_PSU8600_1500" faceplate for the visualization of the SITOP PSU8600 parameters in "Types > PSU8600 WinCC > Screens > Faceplate_Comfort/Advanced", from the library in chapter 0 to the screen, using drag-and-drop.</p>  |
| 5. | <p>Click the added faceplate and link the HMI tag "PSU_Data" via "Properties > Interface" with the faceplate.</p>  |

| No. | Action |
|-----|---|
| 6. | <p>Connect the tags for the output currents of the basic device and the expansion modules (PSU_Data.Output1_Trend_Current – PSU_Data.Output20_Trend_Current) via "Properties > Interface" with the faceplate.</p> <p>Select 0.5 s as update time in "Source settings > Cyclical real time".</p>   |
| 7. | <p>Open the "Topic_002.0" screen in the "Screens > 001_Application" folder.</p>  |
| 8. | <p>Click the "HTML browser" control and adjust the access address via the properties tab "General > Address". Replace the "<ip address>" by the IP address of the SITOP PSU8600.</p>  |

6.1 Installing the hardware

Figure 6-1



| No. | Action |
|-----|---|
| 9. | Configure the IPC and the SITOP PSU8600 as described in chapter 5.1 and 0 . |
| 10. | Set the ON/OFF switch of the IPC to "off" and connect the IPC477D on output 1 of the SITOP PSU8600. |
| 11. | <p>Connect the mains plug with an external voltage supply.</p> <p>Note: The switch can also be connected to one of the outputs of the SITOP PSU8600. However, first of all the hardware configuration has to be loaded.</p> |
| 12. | <p>Connect the SITOP PSU8600, the network switch, the IPC447D, as well as the development computer via Profinet.</p> <p>Note: Connection without network Connect the Ethernet cable with the "X2" network connection of your IPC. Connect the other end with the network connection of your development computer. Connect the Ethernet cable with the "X1" network connection of the SITOP PSU8600. Connect the other end with the "X1" network connection of the IPC.</p> |
| 13. | Set the ON/OFF switch to position "on". |
| 14. | Switch on the input voltage of the SITOP PSU8600. |
| 15. | Start the development computer. |

6.2 Installing the software (download)

Table 6-2

| No. | Action |
|-----|--|
| 16. | Download the "109737962_Shutdown_IPC_PSU8600_in_Puffermode.zip" example project in entry ID 109737962 and unzip it in a folder of your choice. |
| 17. | Start the TIA Portal. |

6.3 Commissioning

Table 6-3

| No. | Action |
|-----|--|
| 18. | Open the "Shutdown_IPC_PSU8600_in_Puffermode" example project. |
| 19. | Click "Devices and network" in the project navigation to open the network view. |
| 20. | Go to the device view of the SITOP PSU8600 and the IPC by double-clicking the left mouse button. Adjust the IP address of the controller (CPU 1507S), WinCC (WinCC RT Adv) and SITOP PSU8600 (psu_1) via the "Properties > Device interface > Ethernet addresses" tab of the respective device. This is only necessary, if you want to use different IP addresses. |
| 21. | Then adjust the access address for the web server of the SITOP PSU8600. The instruction for it can be found in chapter 5.5 . |
| 22. | Compile the hardware configuration and download it into the devices. |
| 23. | Compile the program of the controller and the one for the visualization and download it into the devices. |

Note

If there are any errors when loading the hardware configuration with SITOP PSU8600, do a reset to factory settings.

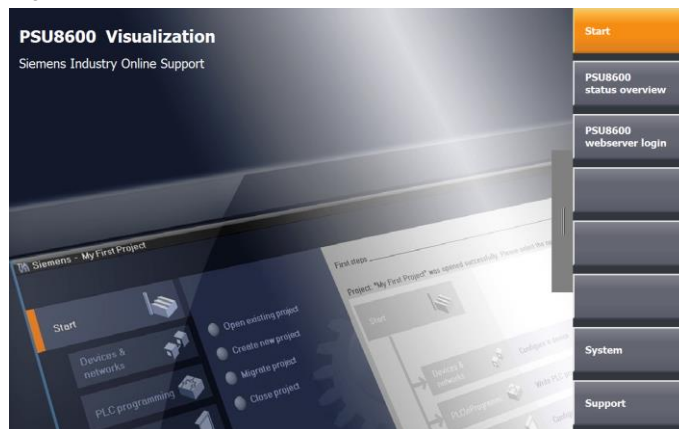
7 Operating the Application

The main function is automatically fulfilled by the software controller since the program is processed in OB1. This is why there is no description for the operation. Below, only the visualization is discussed which is included in the project of the application example.

7.1 Overview

Overview and description of the user interface

Figure 7-1



If you click the slide-in handle, the context menu appears on the right side of the screen. From there you get to the SITOP PSU8600 data selected for visualization via the "PSU8600 status overview".

The visualization and configuration of the data is also possible via the SITOP PSU8600-own web server. To do this, log on to the web server. Enabling and login are described in the appropriate manual. You can find it in chapter [References](#) in /9/.

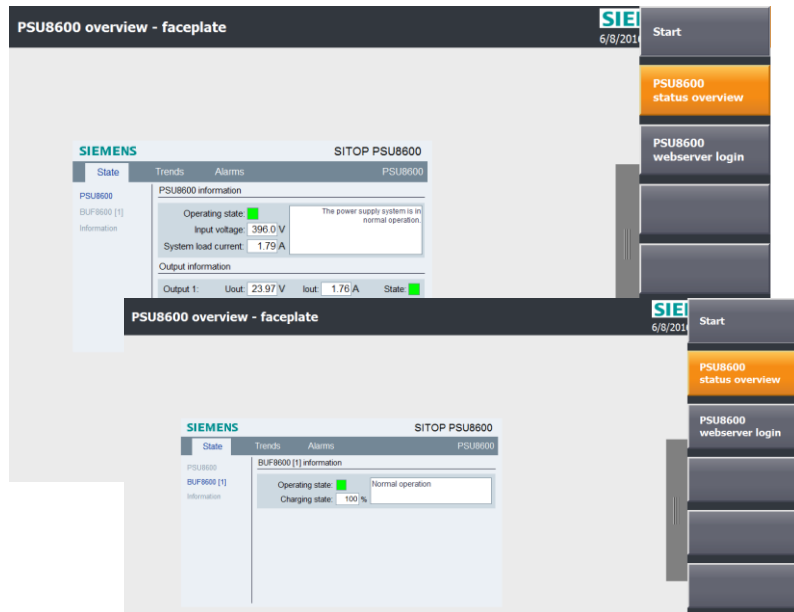
You can furthermore use various system functions or view information regarding the Siemens Industry Online Support.

In "System" several useful functions are shown which can be enabled by clicking the appropriate button (on-screen keyboard, task manager, transfer, stop Runtime, online, offline).

In the Support area you can find useful information regarding the Siemens Industry Online Support. The menu items on the left side include information on the FAQ, application examples, multimedia and forum areas.

7.2 SITOP PSU8600 status overview

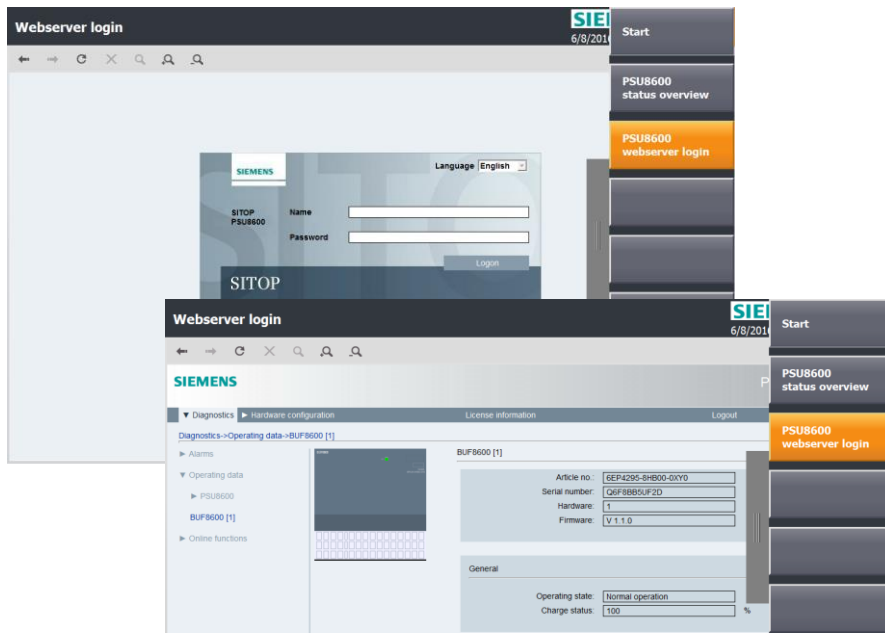
Figure 7-2



In the status overview the data of the current SITOP PSU8600 configuration is displayed via the faceplate from the library. In addition, the chronological sequence of the output currents can be viewed via the "Trends" menu. As an additional function, the internal alarm overview of the SITOP PSU8600 can be called via the "Alarms" menu item.

7.3 SITOP PSU8600 web server Login

Figure 7-3



The login window of the web server of the SITOP PSU8600 is called via the "HTML Browser" control. After successful login, the data of the SITOP PSU8600 can be visualized and controlled in a clear and comprehensible way.

Note

Provided you have not yet created a user, the standard login applies:
 User name: admin
 password: admin
 If the password was changed, please contact the administrator responsible.

Note the hardware configurations for the web server in chapter [3.2](#).
 The response of the web server is slowed down, due to the continuous access of the controller via OB1. Alternatively, the program can also be set in OB35 since it is only called in intervals.

8 References

Table 8-1

| | 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/109737962 |
| \4\ | Download page of the DiagBase software https://support.industry.siemens.com/cs/ww/en/view/29316343 |
| \5\ | Download page of the SITOP PSU8600 library – Faceplate and communication blocks for the TIA Portal https://support.industry.siemens.com/cs/ww/en/view/102379345 |
| \6\ | Application example "Guide for Migrating PC-based Controllers" https://support.industry.siemens.com/cs/ww/en/view/109478804 |
| \7\ | Manual SIMATIC S7-1500 Software Controller https://support.industry.siemens.com/cs/ww/en/view/104943430 |
| \8\ | Download page to the SITOP PSU8600 firmware update https://support.industry.siemens.com/cs/ww/en/view/102295547 |
| \9\ | Manual SITOP PSU8600 Manual - basic device with four outputs https://support.industry.siemens.com/cs/ww/en/view/105867947 |
| \10\ | Manual SITOP PSU8600 - basic device with one output https://support.industry.siemens.com/cs/ww/en/view/109482936 |
| \11\ | Download page for the Support Package of SITOP PSU8600 for TIA Portal https://support.industry.siemens.com/cs/ww/en/view/102254062 |
| \12\ | Application example "Using Recipe Functions for persistent Data with SIMATIC S7-1200 and S7-1500" https://support.industry.siemens.com/cs/ww/en/view/109479727 |
| \13\ | Application example "Reading out and Visualizing Energy Data of a SITOP PSU8600" https://support.industry.siemens.com/cs/ww/en/view/109738082 |

9 History

Table 9-1

| Version | Date | Modifications |
|---------|---------|--------------------|
| V1.0 | 08/2016 | First version |
| V1.1 | 09/2016 | Textual correction |
| V1.2 | 10/2017 | Textual correction |