WOODWARD

High**PRO**TEC

HighPROTEC

Quick Start Guide

Version: 3.6
English
(Revision: C, 2018)

Original document

Original operating manual

Woodward Kempen GmbH

Krefelder Weg 47 • D–47906 Kempen (Germany)

Postfach 10 07 55 (P.O.Box) • D–47884 Kempen (Germany)

Telephone: +49 (0) 21 52 145 1

Table of contents

HighPROTEC

1 Introduction

The goal of this description is to guide the user quickly through the essential steps required for commissioning a HighPROTEC protection device.

This document serves as a first introduction for:

- Engineers in the protection field,

- commissioning engineers,

- people dealing with setting, testing and maintenance of protection and control devices,

- as well as trained personnel for electrical installations and power stations.

This document is roughly divided into the following parts:

- The "Quick Start – Smart view" chapter describes what is necessary to establish a connection between a HighPROTEC protection device and the operating software Smart view.

  Since operating a HighPROTEC device via HMI can be quite cumbersome this chapter is recommended for all user types, in particular commissioning engineers.

- The "Quick Start – HighPROTEC" chapter with all its sub-chapters, comprising several step-by-steps tutorials. These introduce you to the basic concepts, with the main priority set to operations using the HMI (panel) of the protection device.

  This chapter is of particular interest for users who want to configure and/or operate a HighPROTEC protection device.

- The "Good to Know" chapter is a collection of tips and hints. With these, we hope to help with some of the questions and problems that the Woodward Support is often asked.

- The "How to Configure a Protection Device" chapter is a list of aspects which must generally be taken into account during the commissioning of a HighPROTEC protection device, with the main priority set to the use of *Smart view* as configuration software. Please understand that we cannot guarantee for its completeness, nor can it be a detailed step-by-step description, because the configuration and commissioning of a protection device depends on your particular application needs. Therefore this chapter cannot be more than a set of friendly reminders, targeted at commissioning engineers.

Of course, this three-fold concept has the consequence that some special topics, e. g. switchgear devices (circuit breakers) appear in each of these parts. We therefore recommend that beginners read this document in its entirety.

> This description is not a replacement for the complete manual. For wiring instructions and complete descriptions of the protective functions, please consult the Technical Manual.

No part of this manual is allowed to be reproduced or passed on to others in any form, unless *Woodward* have approved in writing.

Any repair work carried out on the device requires skilled and competent personnel who need to be well aware especially of the local safety regulations and have the necessary

experience for working on electronic protection devices and power installations (provided by evidence).

CAUTION!

! We prepared this information carefully, with focus on "a general use", and intentionally as a valuable help. But this is still a showcase: Settings might not fit your application needs, activities might be dangerous regarding to your application.

NOTICE!

! It is, in particular, not intended (and absolutely not possible) to give any explicit advice with respect to protection settings required for your application. If you feel unsure about how to configure the protection device, feel free to contact the Customer Support of Woodward.

Please understand that **you have to** take care of the following:

- Prepare your local application for safety aspects before you start working with this document.
- Transfer all examples given in this document to fit your needs.

We cannot take over any responsibility for any unwanted effect.

We require that managing your application follows all applicable local and international rules, guidelines and directives, and that all your activities are committed to what is generally expected from professional work.

Information Concerning Liability and Warranty

Woodward does not accept any liability for damage resulting from conversions or changes carried out on the device or planning (projecting) work, parameter setting or adjustment changes done by the customer.

The warranty expires after a device has been opened by others than *Woodward* specialists.

Warranty and liability conditions stated in *Woodward* General Terms and Conditions are not supplemented by the above mentioned explanations.

1.1 Important Definitions

The types of messages shown below serve the safety of life and limb as well as for the appropriate operating life of the device.

DANGER!
DANGER indicates an immediately dangerous situation that will result in death or serious injury if it is not avoided.

WARNING!
WARNING indicates a hazardous situation that can result in death or serious injury if it is not avoided.

CAUTION!
CAUTION indicates a possibly hazardous situation that can result in minor or moderate injuries if it is not avoided.

NOTICE!
NOTICE is used to address practices not related to personal injury.

This symbol indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

Proper Use of the Device and of This Manual

WARNING!
FOLLOW INSTRUCTIONS
Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

WARNING!

PROPER USE

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (1) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (2) invalidate product certifications or listings.

The programmable devices subject to this manual are designed for protection and also control of power installations and operational devices that are fed by voltage sources with a fixed frequency, i.e. fixed at 50 or 60 Hertz. They are not intended for use with Variable Frequency Drives. The devices are further designed for installation in low-voltage (LV) compartments of medium voltage (MV) switchgear panels or in de-centralized protection panels. The programming and parameterization has to meet all requirements of the protection concept (of the equipment that is to be protected). You must ensure that the device will properly recognize and manage (e. g. switch off the circuit breaker) on the basis of your programming and parameterization all operational conditions (failures). The proper use requires a backup protection by an additional protective device. Before starting any operation and after any modification of the programming (parameterization) test make a documentary proof that your programming and parameterization meets the requirements of your protection concept.

The Self-Supervision Contact (Life-Contact) has to be wired with the substation automation system in order to supervise and monitor the state of health of the programmable protective device. It is very important that an alarm annunciation is driven from the programmable protective device self-supervision contact (Life-Contact) that requires immediate attention when tripped. The alarm indicates that the protective device is no longer protecting the circuit and the system should be serviced.

Typical applications for this product family/device line are for instance:

- Feeder protection
- Mains protection
- Machine protection
- Transformer Protection
- Generator Protection

Any usage beyond these applications the devices are not designed for. This applies also to the use as a partly completed machinery. The manufacturer cannot be held liable for any resulting damage, the user alone bears the risk for this. As to the appropriate use of the device: The technical data and tolerances specified by *Woodward* have to be met.

> **Out-of-date documentation?**
>
> This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, please visit the download section of our website.
>
> Please check the web site of Woodward for the latest revision of this Technical Manual and if there is an Errata Sheet with updated information.
>
> - Visit the company website (══▷ www.woodward.com) and search for the documents you are interested in. (The ID of every document is printed on its cover page.)
> - Alternatively, every HighPROTEC device has a QR code printed on it. Scan this code, and you are taken to an online directory that contains all relevant documents in the most recent version.

Important Information

⚠	**WARNING!**
	In line with the customer's requirement the devices are combined in a modular way (in compliance with the order code). The terminal assignment of the device can be found on the top of the device (wiring diagram).

<table>
<tr><td colspan="2" align="center">CAUTION!</td></tr>
</table>

!

Electrostatic Discharge Awareness

All electronic equipment is electro static-sensitive, some components more than others. To protect these components from electro static damage, you must take special precautions to minimize or eliminate electrostatic discharges. Follow these precautions when working with or near the control.

1. Before doing maintenance on the electronic control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).

2. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.

3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.

4. Do not remove any printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:

- Verify the safe isolation from supply. All connectors have to be unplugged.
- Do not touch any part of the PCB except the edges.
- Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
- When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

To prevent damage to electronic components caused by improper handling, read and observe the precautions in the *Woodward* manual 82715, "Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules".

Woodward reserves the right to update any portion of this publication at any time. Information provided by *Woodward* is believed to be correct and reliable. However, no responsibility is assumed by *Woodward* unless otherwise expressly undertaken.

2   Quick Start – Operating Software Smart view

Installation of Smart view

Smart view is the setting and operation software for Woodward protective devices.

It is available on the product DVD that is part of the delivery of the protective device. The setup program "Smartview_SE_Install.exe" is contained in the "*Smart view* SE" folder of the product DVD.

In addition, the *Smart view* setup can also be retrieved from this Woodward download area: ⟹ wwdmanuals.com/smart_view

- Start the setup program and follow the steps displayed by the setup wizard.

- After the software has been successfully installed it can be launched via: Start → Programs → Woodward → Smart view SE → Smart view

Setup of the Connection PC – Protective Device

Smart view can receive data from the protective device only after the connection has been set up. This needs to be done only once.

The following pages present an overview of the connection setup for the various types of protective devices.

A detailed description can be found in the *Smart view* manual, which is available as a separate document on the product DVD, but can also be accessed directly from the Smart view Help menu.

Optional Accessories

The type of cable required for the connection is dependent on the type of protective device. The cables are not part of the product delivery, but can be ordered separately from Woodward.

|		
USB cable, for protective devices with USB front connector.	*Null Modem cable*, for protective devices with RS232 front connector.	*USB/Serial adaptor*, for protective devices with RS232 front connector and PC without RS232 connector.
Woodward article:	Woodward article:	Woodward article:
5450-1946	**COMRS232Nullm**	**USB2RS232ADAP**

Connect a Protective Device to a PC via USB

USB cable

Woodward article:

5450-1946
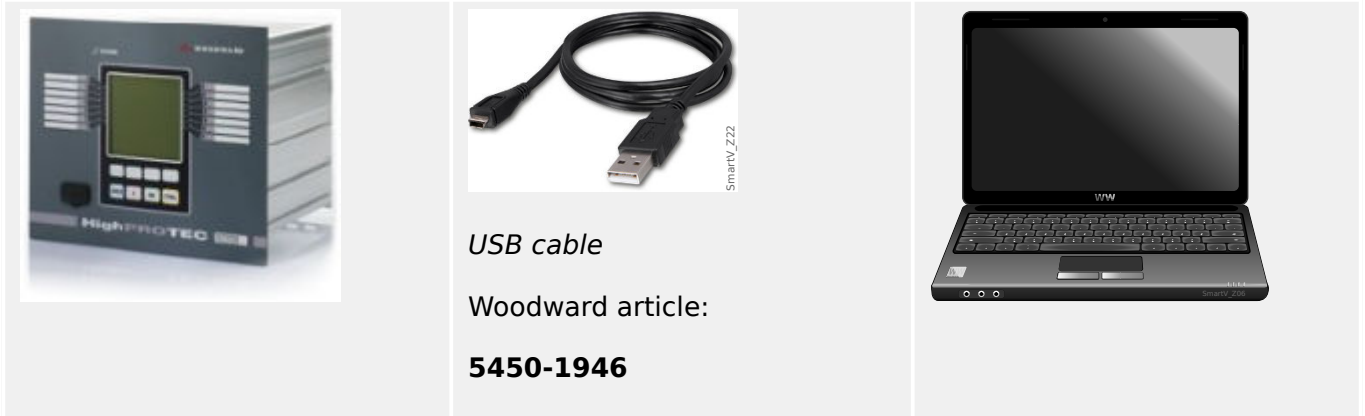
- Use the USB cable to connect the PC with the **switched on** protective device.

- Start *Smart view*.

- In the "Settings" menu select the menu item "Device Connection…"
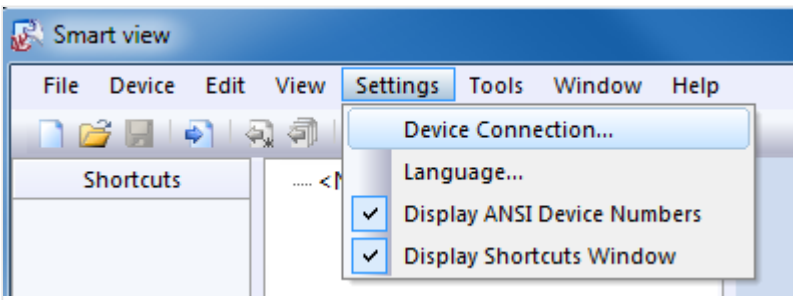
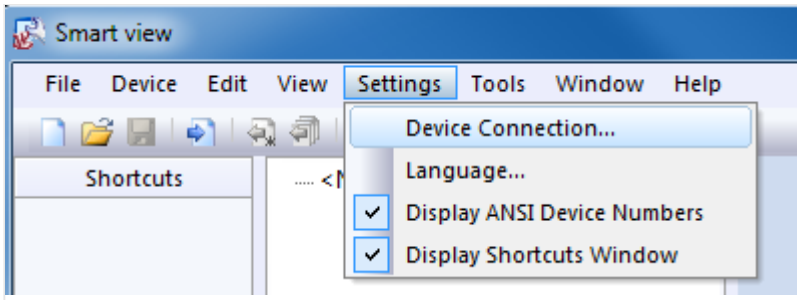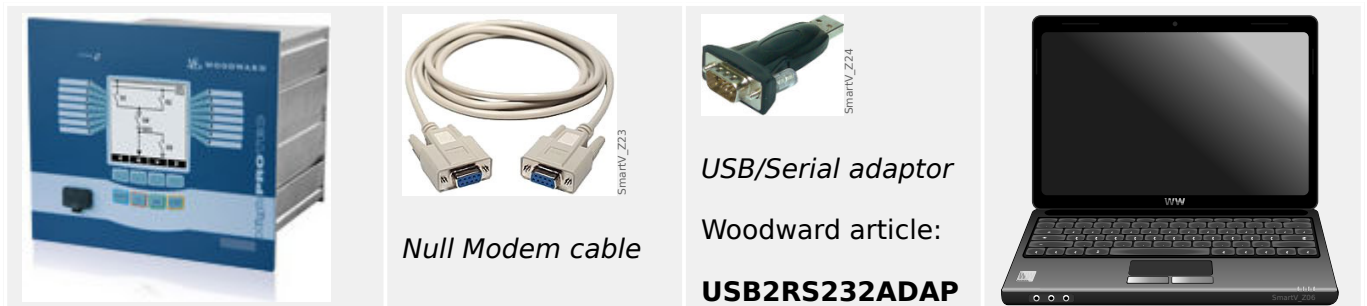- Select "USB Connection" in the dialog. Then you can pick the connected USB device from a selection list.
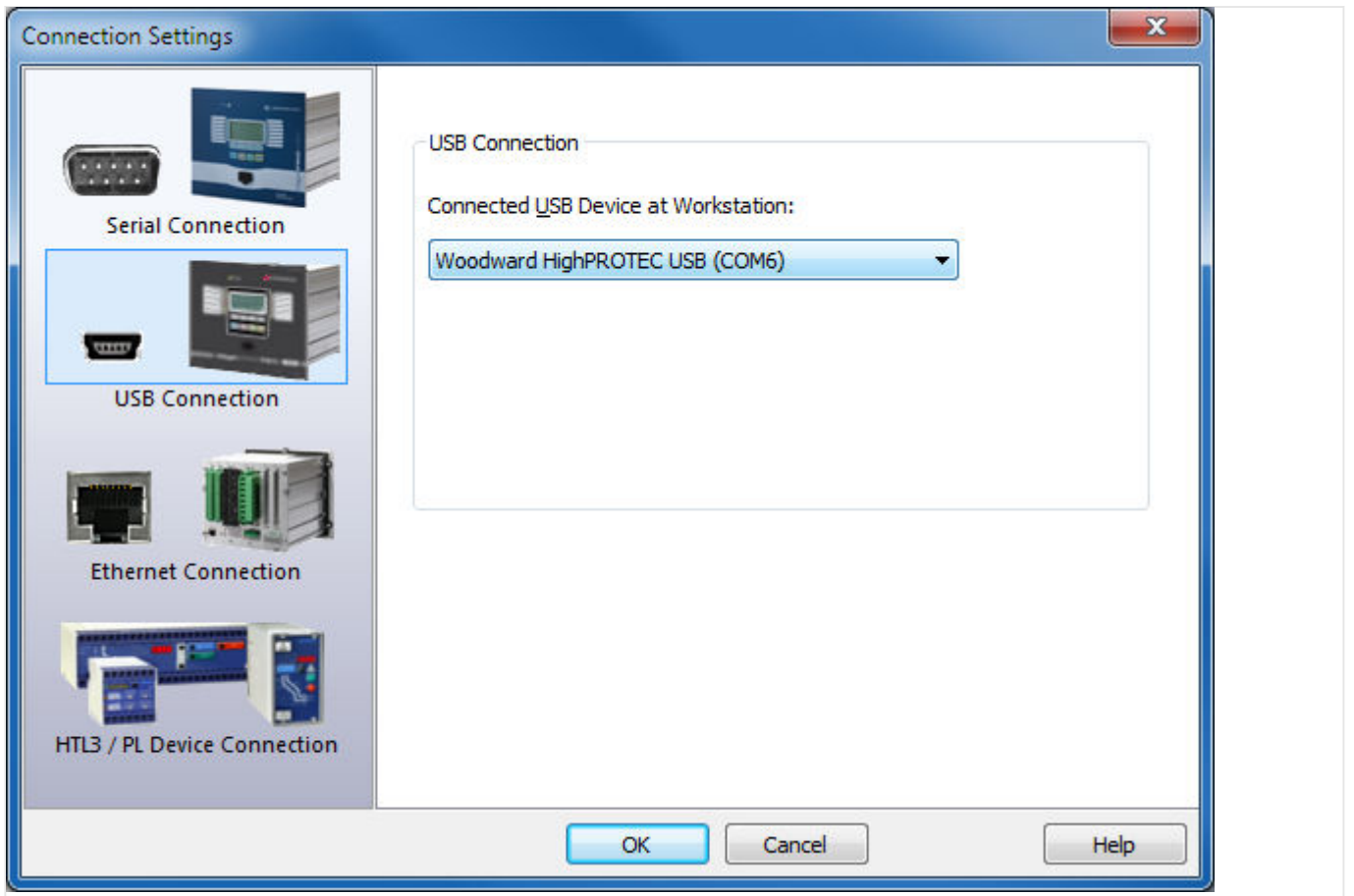
- If this connection is established for the first time you will see a special confirmation dialog. Click "Yes" to confirm.

⇨ **Finished** – The connection has been set up.

Connect a Protective Device to a PC via Serial RS232 Connector

Null Modem cable

Woodward article:

COMRS232Nullm

- Use the Null Modem cable to connect the PC with the **switched on** protective device.

- Start *Smart view*.

- In the "Settings" menu select the menu item "Device Connection…"

- Select "Serial Connection" in the dialog. Then you can pick the particular COM port to which the protective device is connected from the selection list.
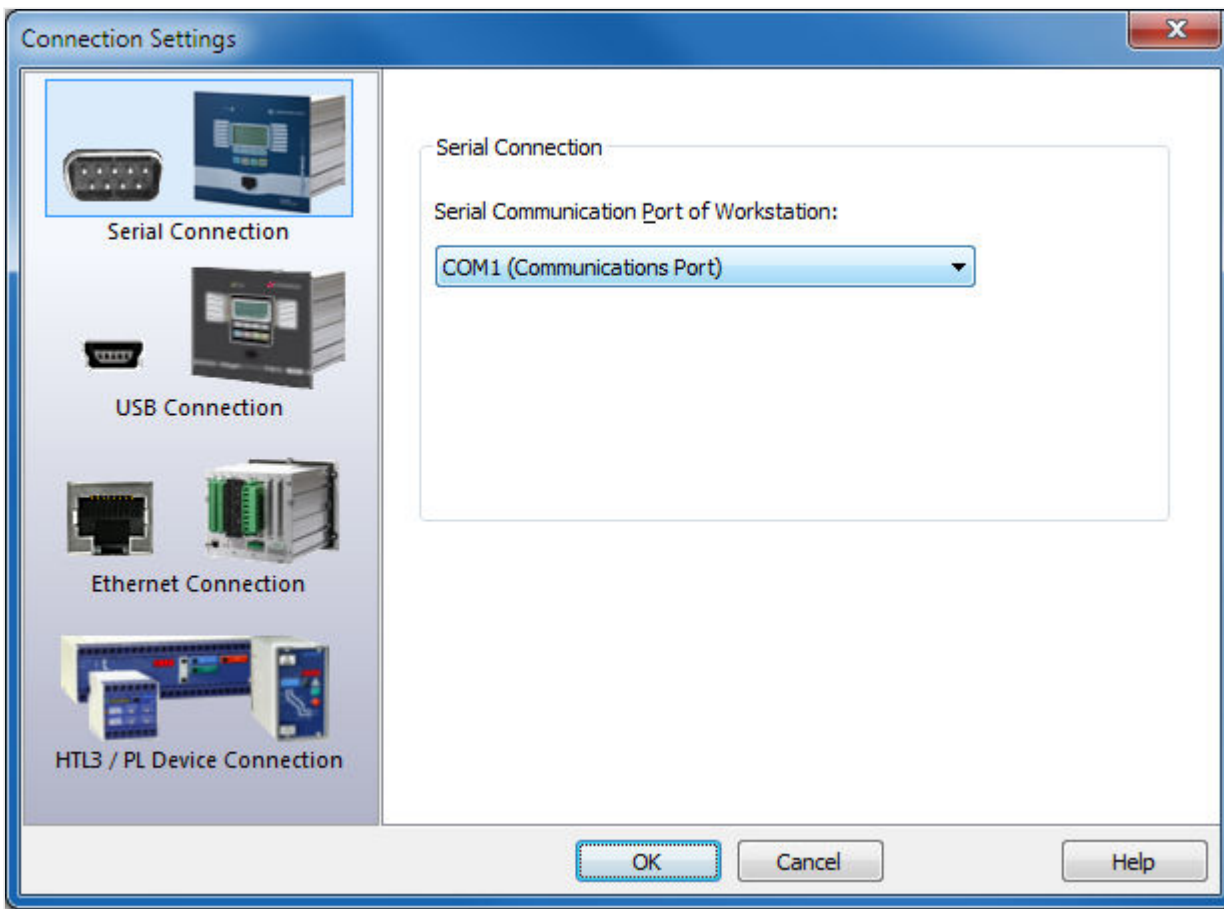
- If this connection is established for the first time you will see a special confirmation dialog. Click "Yes" to confirm.

⇨ **Finished** – The connection has been set up.

Connect a Protective Device to a PC without a Serial RS232 Connector
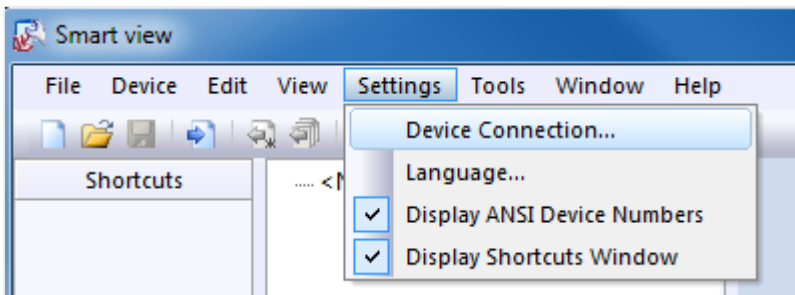

*Null Modem cable*

USB/Serial adaptor

Woodward article:

USB2RS232ADAP

	Woodward article: **COMRS232Nullm**		

- Connect the USB/Serial adaptor with a free USB connector of the PC.

- Connect the adaptor with the Null Modem cable and the Null Modem cable with the **switched on** protective device.

- Start *Smart view*.

- In the "Settings" menu select the menu item "Device Connection…"

- Select "Serial Connection" in the dialog. Then you can pick the particular COM port to which the protective device is connected from the selection list.
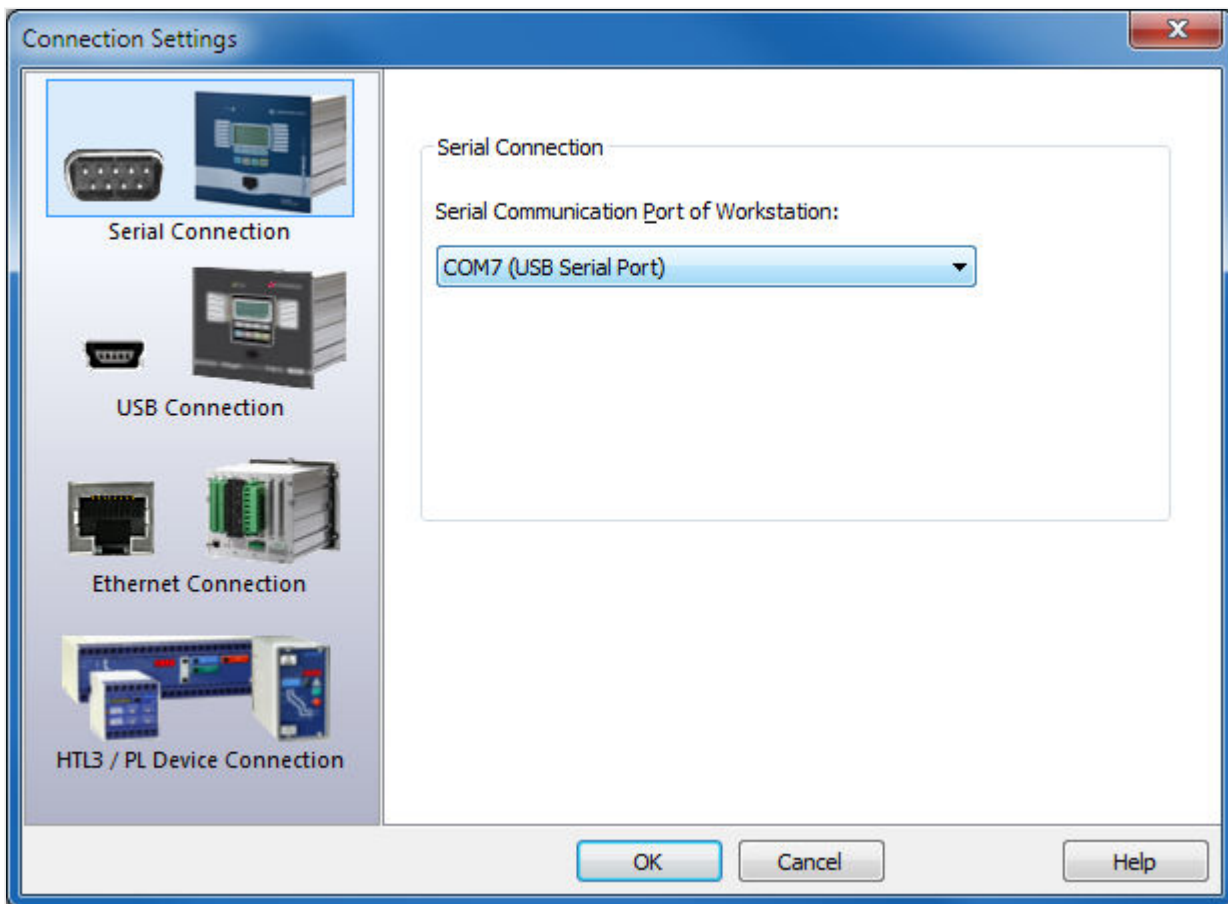
- If this connection is established for the first time you will see a special confirmation dialog. Click "Yes" to confirm.

⇨ **Finished** – The connection has been set up.

Connect a Protective Device to a PC via Ethernet (TCP/IP)

It is only possible to establish an Ethernet TCP/IP connection if the protective device features an Ethernet connector.

- Set (or check) the TCP/IP parameters on the HMI panel of the protective device. These are accessed via the following menu path:

  [Device Para / TCP/IP / TCP/IP config]

  First, set »*TCP/IP*« = "active".

  Then set the »*IP address*«, »*Subnet mask*« and the »*Default gateway*«. (The values shown below are only an example.)
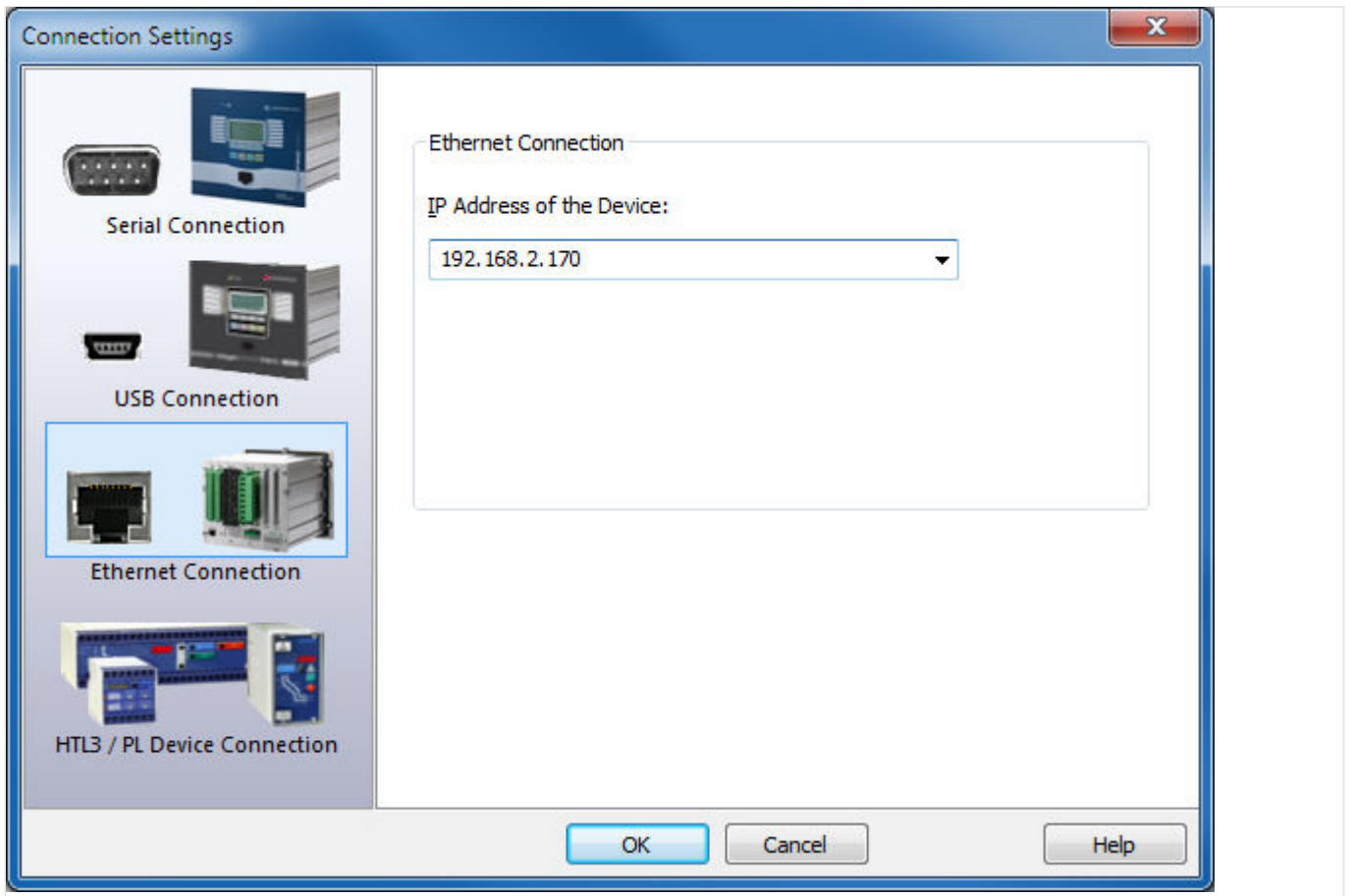
  The values to be entered are dependent on the individual TCP/IP network where the protective device is connected. If in doubt, ask your network administrator.
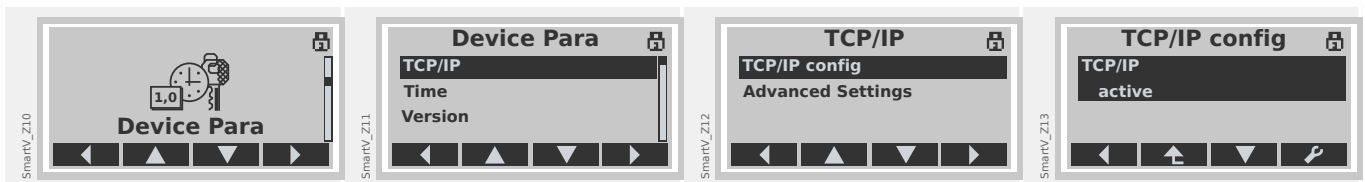
- Start *Smart view*.

- In the "Settings" menu select the menu item "Device Connection…"
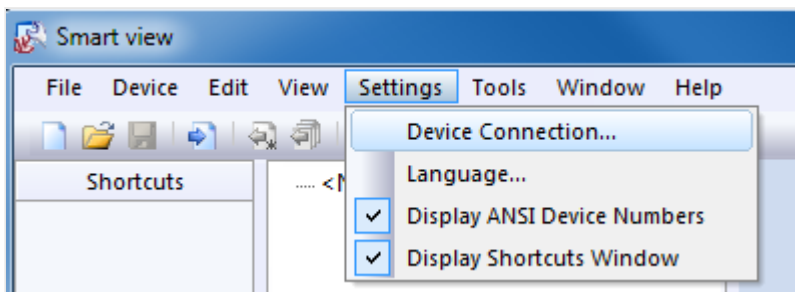
- Select "Ethernet Connection" in the dialog. Then enter the TCP/IP address of the protective device into the input field.

- If this connection is established for the first time you will see a special confirmation dialog. Click "Yes" to confirm.

⇨ **Finished** – The connection has been set up.

Receive Settings from the Protective Device

After the connection has been set up it is possible to receive information from the protective device.

- After a click on the menu item "Device" → "Receive Data from Device" data is retrieved from the protective device.
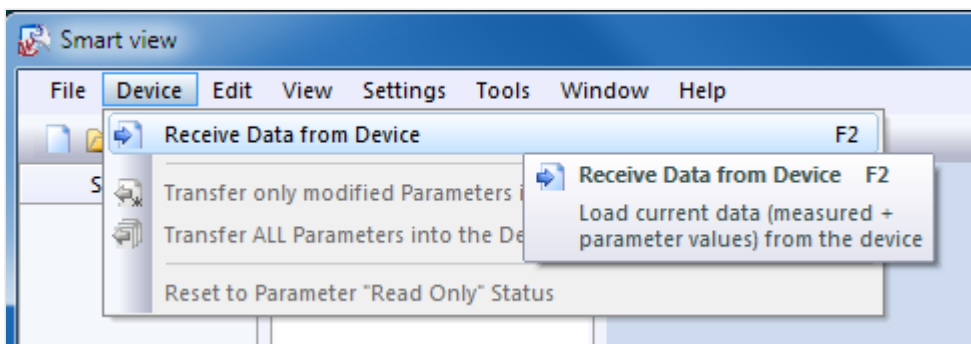

- Smart view establishes a connection with the protective device, reads data from it and displays these values in form of a tree structure.
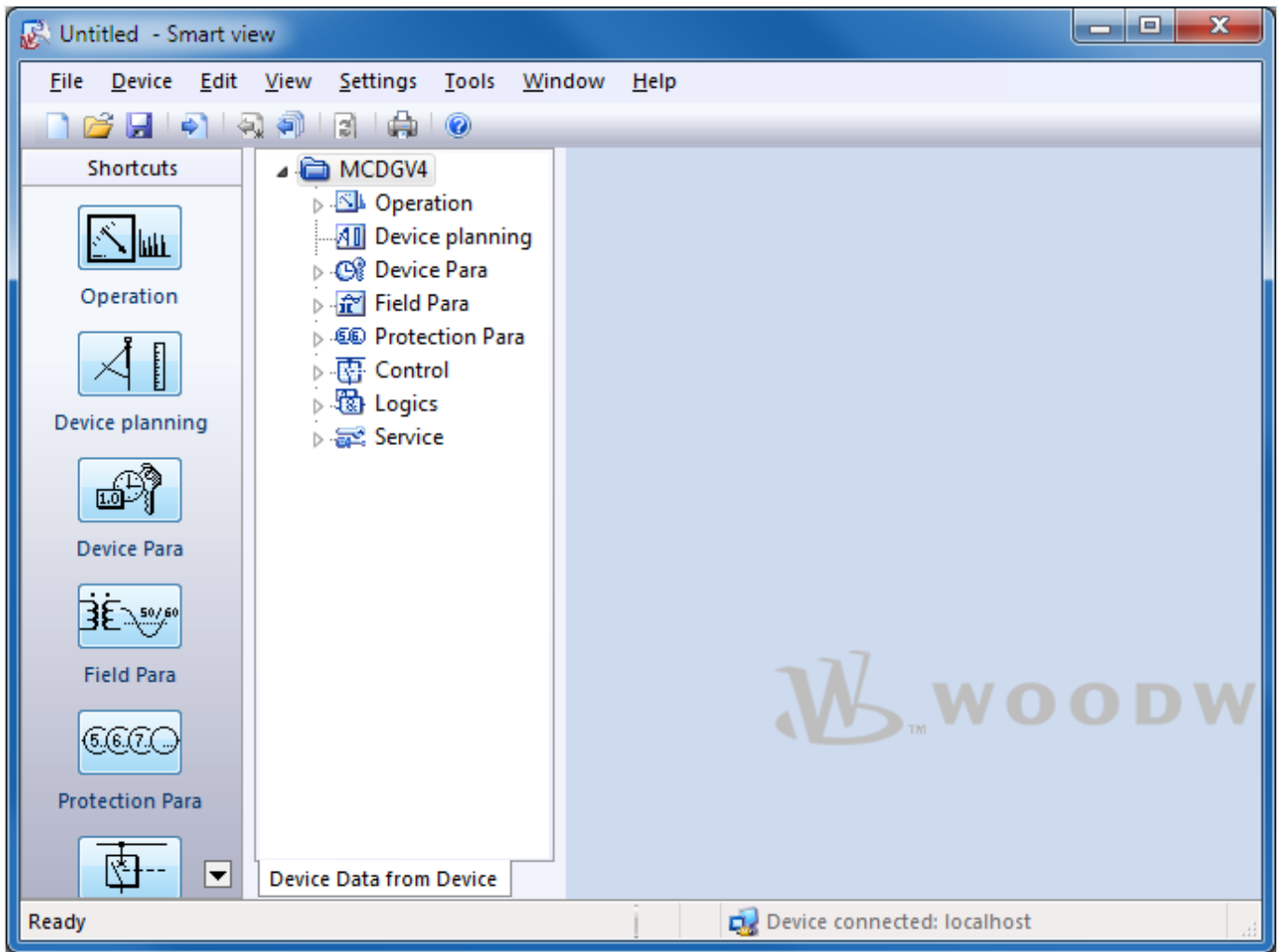
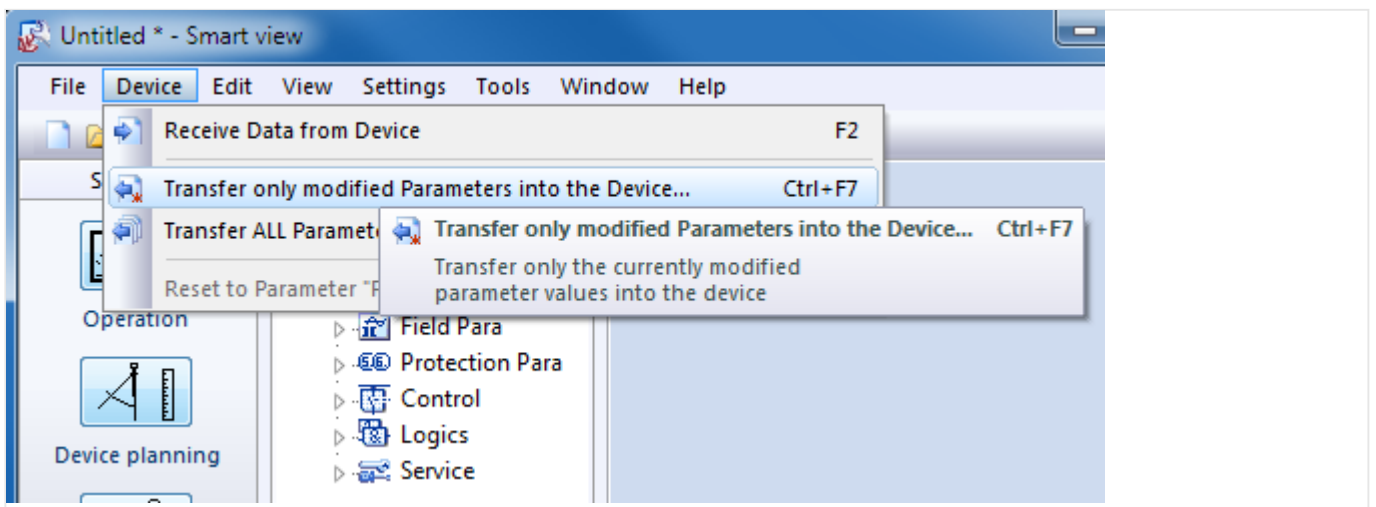**Change Settings in the Protective Device**

- **Step 1**: Change the setting values:

  A protection module that is required can be configured only after it has been activated. To do this, access the module in the [Device planning] menu branch of the tree structure and change the value of the »Mode« parameter from "-" (= "do not use") to "use".
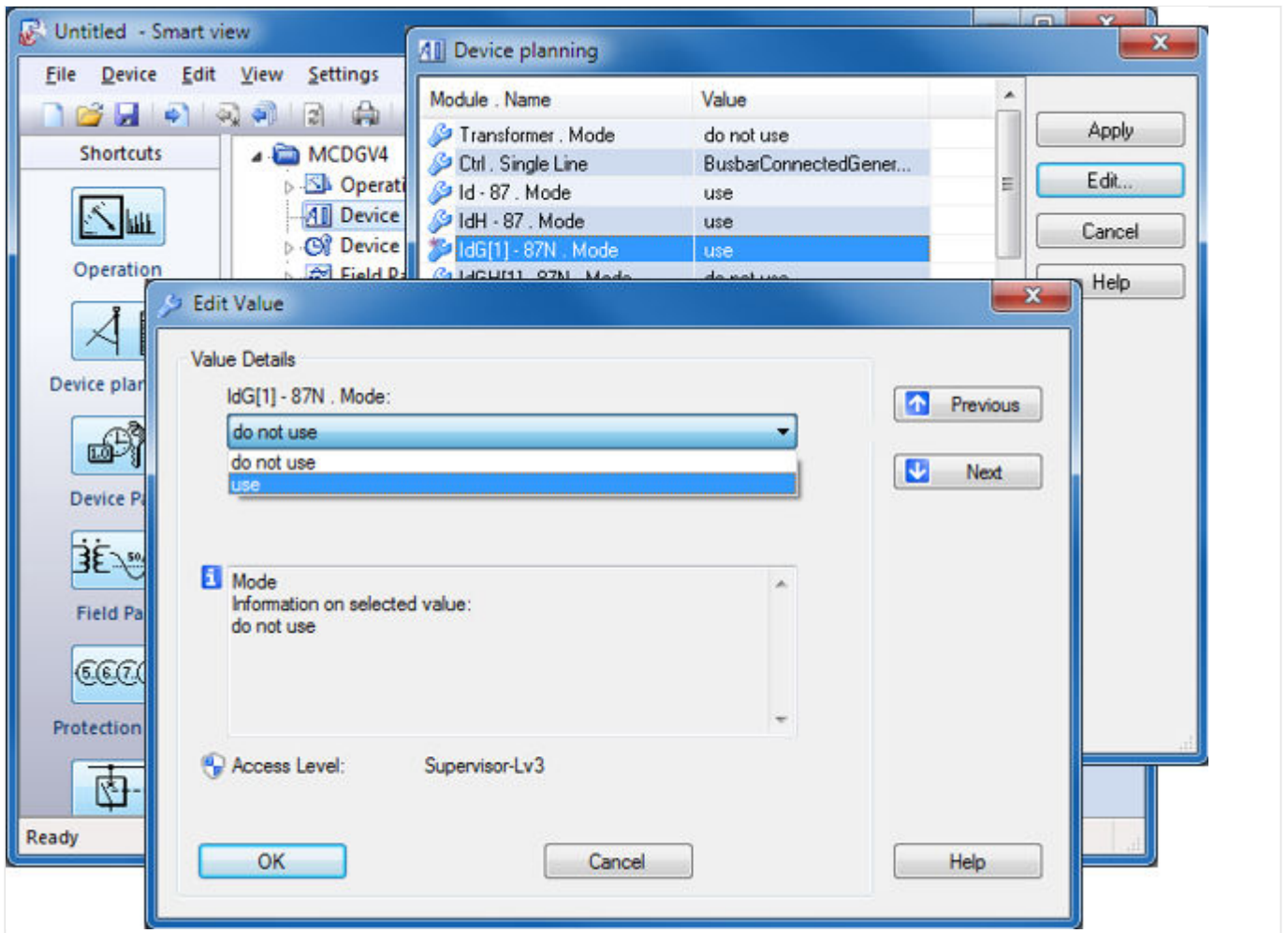
- **Step 2**: Transfer the changes:

  The changed values are used only after they have been transferred to the protective device: Click the menu item "Device" → "Transfer only modified Parameters into the Device…".

- This transfer of the changes involves entering the password of the protective device. After it has been correctly entered the changes are sent to the device (and the device activates the new settings).

NOTICE!

Note that the standard password "1234" does not represent any serious security level. It is strongly recommended to modify it.

2.1   Operation via Smart view

Although it is easy and convenient to operate a HighPROTEC protection device using the panel, as described in the previous chapters, a full configuration session with many settings to be made would be a quite cumbersome activity. For numerous operations, the preferred way is to connect a PC with an operating software to the protection device, so that everything can be done using computer mouse and keyboard and the large computer monitor gives a far better overview about the available menu branches, than is possible with the device's built-in display.

Woodward offers an operating software named *Smart view*. It offers convenient ways to do all configuration work, reading and evaluating statistical data and measuring values, fault analysis via event and fault recorder, and much more. A detailed Technical Manual is available as a separate document.

Setting up the Connection PC - Device

The HighPROTEC protection device features a USB connector (of type " Mini B"), and moreover, some variants (depending on the ordered communication features) can have an Ethernet interface. Either can be used for establishing a connection to the PC. Of course, connecting to the USB port requires an appropriate cable, and the PC has to be sufficiently close to the protection device. An Ethernet/TCP/IP connection can also be made from afar, but it requires that some basic settings (IP address, subnet mask, default gateway) have already been made in the menu branch [Device Para / TCP/IP].

Apart from plugging in the required cables, there are essentially two steps to be done for establishing a connection:

1. In *Smart view*, click on *[Settings → Connection Settings]*, then select the type of connection to be used for the device.

   ⇨ After this, the connection has not been established yet, therefore you should not be confused by the " Not connected" message in the status line (see figure below).

2. Click on *[Device → Receive Data from Device]* (or, alternatively, press *[F2]* on your keyboard, or click on the small icon with the blue arrow pointing rightward).

   ⇨ *Smart view* should now retrieve the complete menu tree, including all setting values and run-time data. After that, you should see a menu tree with the same top-level categories, as we have already described for the panel of the device (see ⇨ "3.1 Menu Structure").
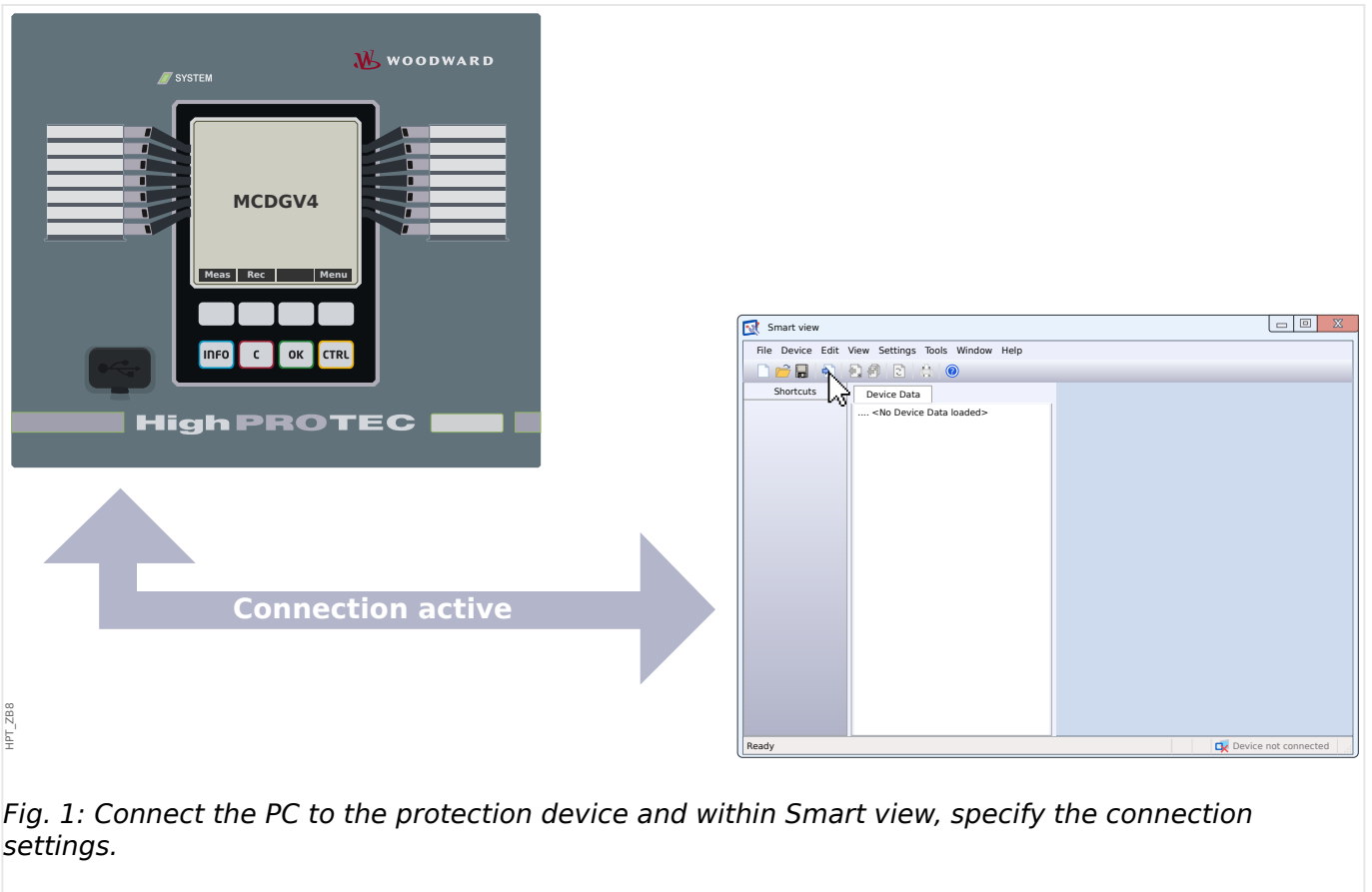
Fig. 1: Connect the PC to the protection device and within Smart view, specify the connection settings.

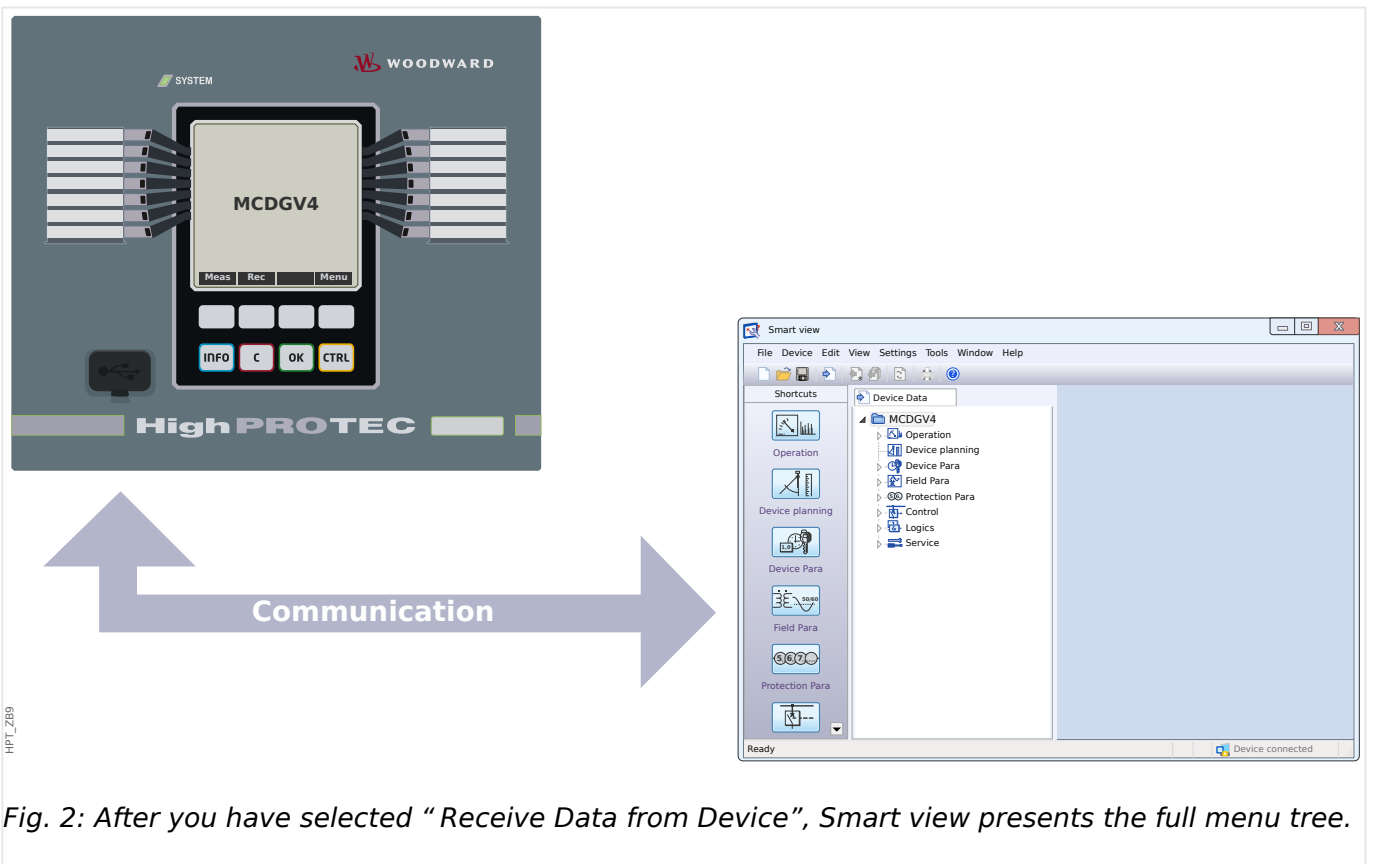Fig. 2: After you have selected "Receive Data from Device", Smart view presents the full menu tree.
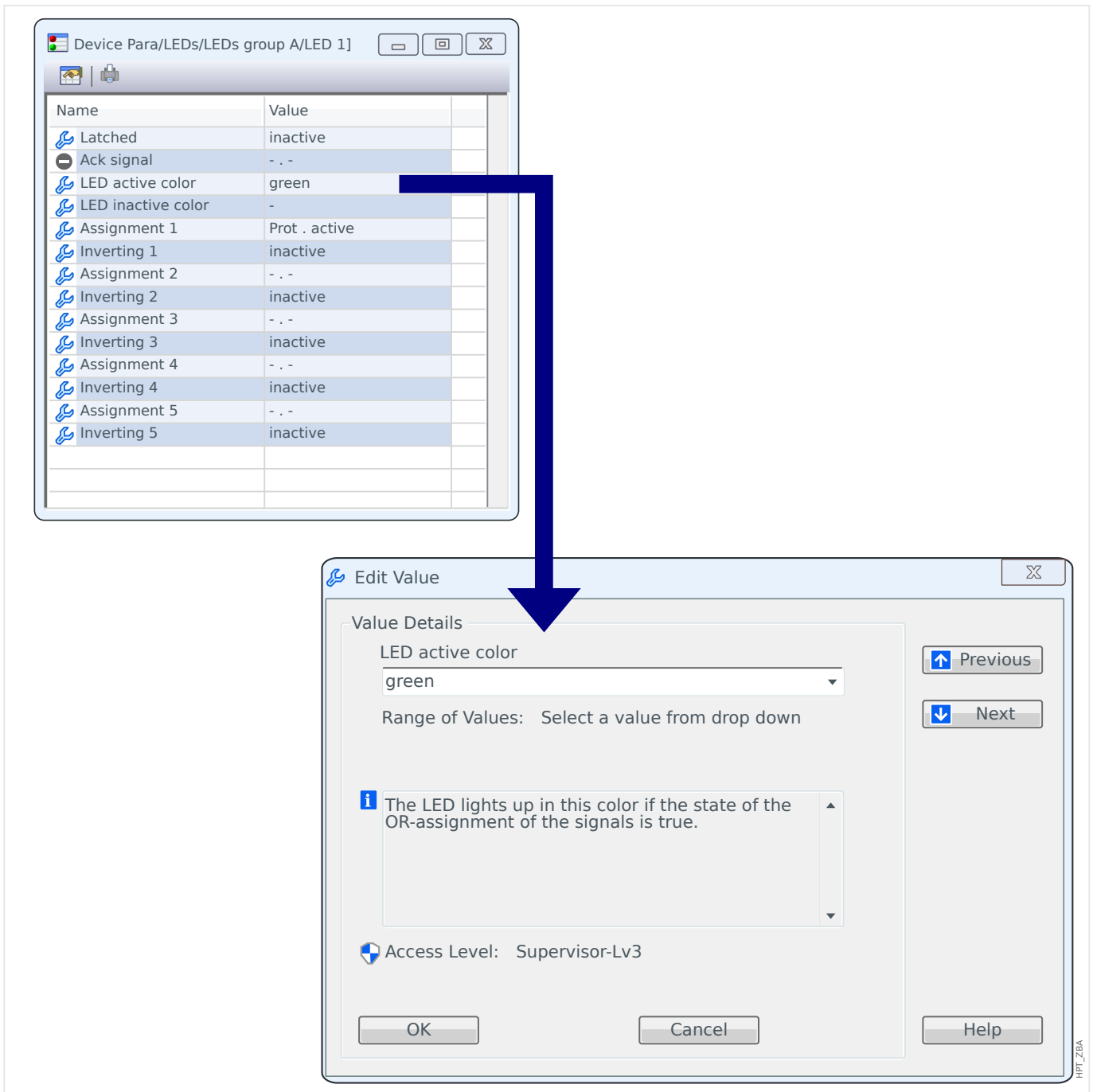
> **NOTICE!**
>
> **!**
>
> If you have never connected to this particular protection device in this firmware version (release) before then *Smart view* will probably tell you that a so-called " device model" is required. This is a set of files which define the menu tree and all parameters, including factory defaults and setting ranges. The device model is needed by *Smart view* for showing the menu tree correctly.
>
> Fortunately, this does not mean any additional problem for the user: Although it is possible to install device models independently, as a separate installation activity (which enables to have a look at the menu and parameters without a connection), the most convenient way is probably to simply accept the offer that *Smart view* automatically makes, and let *Smart view* retrieve the device model directly from the connected device. This additional download takes only a few seconds and needs to be done only once. (The device model gets installed on the PC hard drive and is available immediately for all future connections with this device.)

After the menu tree has been made available within *Smart view*, all further activities like e. g. changing a setting value are straight-forward (and do probably not need a lot of detailed explanations): You can expand the (sub-)menu branches of any menu branch (click on the small triangle next to the menu item, or a double-click on the item name), until you reach the required bottom-level item. For example, for the menu item [Device Para / LEDs / LEDs group A / LED 1]:

Device Para/LEDs/LEDs group A/LED 1]		
Name	Value	
Latched	inactive	
Ack signal	- . -	
LED active color	green	
LED inactive color	-	
Assignment 1	Prot . active	
Inverting 1	inactive	
Assignment 2	- . -	
Inverting 2	inactive	
Assignment 3	- . -	
Inverting 3	inactive	
Assignment 4	- . -	
Inverting 4	inactive	
Assignment 5	- . -	
Inverting 5	inactive	

Edit Value

Value Details

LED active color

green

Range of Values: Select a value from drop down

The LED lights up in this color if the state of the OR-assignment of the signals is true.

Access Level: Supervisor-Lv3

[OK]   [Cancel]   [Help]

[↑ Previous]   [↓ Next]

A double-click opens a small dialog window, which lists all settings in this menu item, and a double-click on a setting opens another dialog that allows for modifying the settings value.

Note, however, that any changes can become effective only if they get transferred (from *Smart view*) into the device:

1. Click on *[Device → Transfer only modified Parameters into the Device]* (or, alternatively, press *[Ctrl]+[F7]* on your keyboard, or click on the small icon with the blue arrow pointing leftward).

1. Alternatively, you can select *[Device → Transfer ALL Parameters into the Device]* (which corresponds to pressing *[F7]* on your keyboard, or click on the small icon with many sheets of paper and the blue arrow pointing leftward).

2. You are asked for the corresponding password, unless the required access level (in this case: "Supervisor-Lv3") is still open.

⇨ The settings are transferred into the device and, unless any validity or consistency problems are detected, are being activated.

⇨ Note that *Smart view* might also ask you whether you want to create a settings file containing your values, so that you are able to (re-)load all settings at a later time.
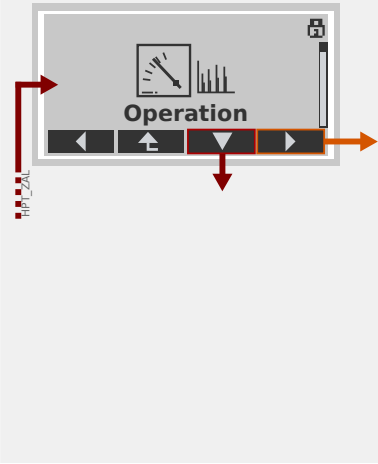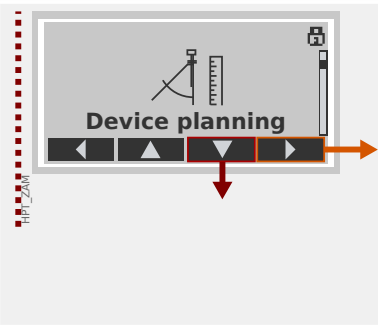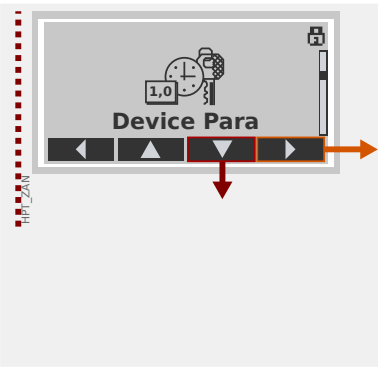
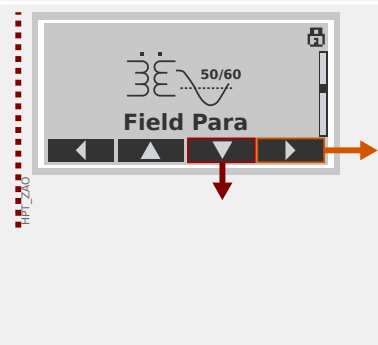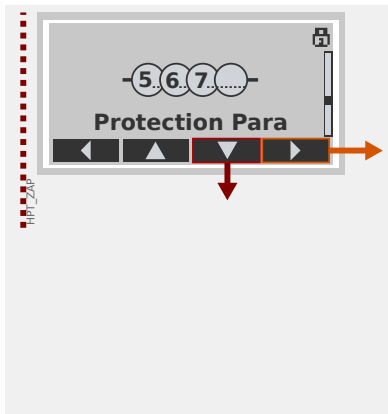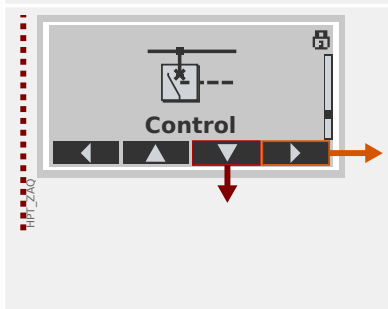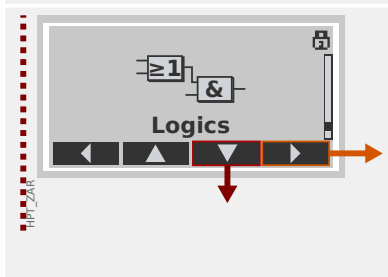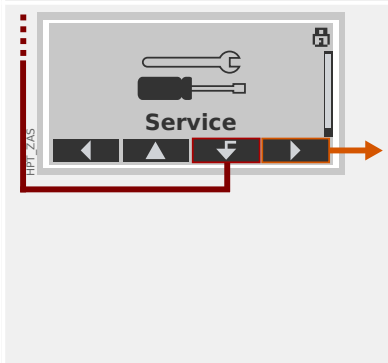> ### CAUTION!
>
> ❗ Clicking *[Save]* does **not** activate changed values (even though the asterisk tokens might disappear). The *[Save]* menu (and button) does nothing more than saving your changes to a *.HptPara file. Remember to always also transfer the parameters to the connected device if you want to activate your changes.

3 Quick Start – HighPROTEC

3.1 Menu Structure

The menu structure offers the following top-level menu entries. You enter a menu branch with Softkey ▶. Softkeys ▲ and ▼ let you navigate to the previous or next one.

	Operation Here you can find run-time data. • Measured Values • Statistics • Status Display • Counter and RevData • Fault recorder, Event recorder, Disturbance recorder • Self Supervision • Acknowledge, reset
	Device planning This will usually be your first step during commissioning: Activate the elements that you need, deactivate elements that are not needed. Select the protocol for (SCADA) communication with the substation.
	Device Parameters This menu branch features all settings that are directly related to the device, for example: • Digital inputs and outputs • LEDs • Settings for the Recorders • Communication settings
	Field settings Usually the second commissioning step: Configure the properties of the field, for example: • Nominal frequency, voltage, current • CT and VT ratios • VT connection type (Phase to Ground, Phase to Phase)

	Protection Parameter All protection settings, which are related to a specific protection function, can be found here. For each protection function, the settings are grouped into the following setting types: • Global Protection Parameter • Set 1 ... Set 4 • PSet-Switch (Switching Parameter Set)
	Control Settings for switchgear devices. • The HighPROTEC devices named "MR..." can control 1 switchgear device. • The HighPROTEC devices named "MC..." can control up to 6 switchgear devices.
	Programmable Logic • Up to 80 logic equations • 4 selectable gates • 4 inputs, 4 outputs • timer and memory functions
	Service This menu branch is primarily needed for testing purposes. For example: • Force / disarm outputs • Force / disarm analog input and outputs • Use the internal signal/fault generator • Reboot the protection device

3.2 Navigation via Softkeys

1. Enter Main Menu:

The buttons located directly underneath the display have a context-dependent meaning. The function of each key can be seen from the label that is shown on the bottom row of the display, directly above the key. Since these keys have a functionality defined by the currently active software module they are called "Softkeys" (although the key itself, on which the user presses with his/her finger, is a "normal" key, i. e. part of the hardware of the device).
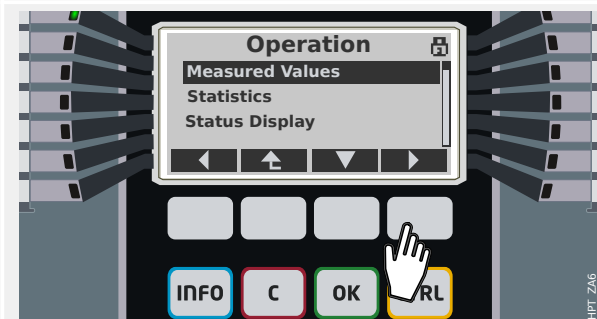
In the situation shown left, pressing the Softkey labeled "Menu" takes you into the main menu.

2. Enter Menu Branch Operation:

Once the "Menu" Softkey has been pressed every Softkey gets a new function, which is displayed via arrow symbols.

The arrow symbol "▶" means "Enter" here. Therefore pressing the respective Softkey lets you enter the menu branch "Operation".

3. Enter Measured Values:

Let us assume for example that you intend to check the measured values, in particular the phase voltages. After you have entered the "Operation" menu several submenu items are displayed.

In general you have to press the Softkeys "▲" (Up) and "▼" (Down) repeatedly until the desired submenu item is highlighted. Then pressing the "▶" (Enter) Softkey enters the selected submenu (in this case: Measured Values).
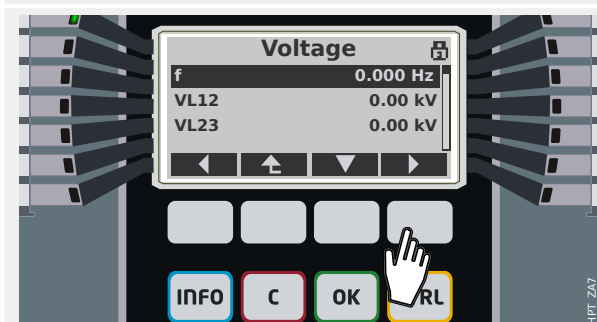
4. Check Measured Voltages:

After you have entered the sub-menu Voltage (in the same way) all voltage-related measuring values are displayed as a list.

If there are more entries than fit on the display you can use the Softkeys "▲" (Up) and "▼" (Down) to scroll upwards or downwards the list.

Pressing the Softkey "◀" (Left) repeatedly takes you back the menu branch (one level with each press), until you finally come back to the main menu.

	Note, however, that there is also a configurable timeout: After some time of inactivity the device automatically returns to the main menu.

3.3   Softkey Symbols

The following symbols can be used to label the function of a Softkey:

Softkey	Meaning
▲	Via Softkey »up« you can scroll upwards. You go to the prior menu point/one parameter up by scrolling upwards.
▼	Via Softkey »down« you can scroll downwards. You go to the next menu point/one parameter down by scrolling downwards.
◀	Via Softkey »left« you will go one step back. You can leave the submenu. You go back to the previous page of menu tree.
▶	Via Softkey »right« you can enter the selected submenu.
⬆	Via Softkey »Top of list« you jump directly to the top of a list.
⬇	Via Softkey »Bottom of list« you jump directly to the end of a list.
+	Via Softkey »+« the currently selected digit is incremented. (Continuous pressure: fast repeat).
−	Via Softkey »−« the currently selected digit is decremented. (Continuous pressure: fast repeat).
←	Via Softkey »left« you select the digit left to the previously selected one.
→	Via Softkey »right« you select the digit right to the previously selected one.
🔧	Via the »Wrench« symbol you can change the selected parameter (i. e. enter the parameter setting mode).
⚷	Via the »Key« symbol you are asked for password authorization, then you can change the selected parameter.
✕	Via Softkey »delete« the selected data is deleted.
⤓	Fast forward scrolling is possible via Softkey »Fast forward«.
⤒	Fast backward scrolling is possible via Softkey »Fast backward«.

3.4 Entering a Password

Most activities require you to enter a predefined password. Several access-levels exist, and each of these can be given a specific password. (See the Technical Manual for details.) The factory default for all these passwords is "**1234**".
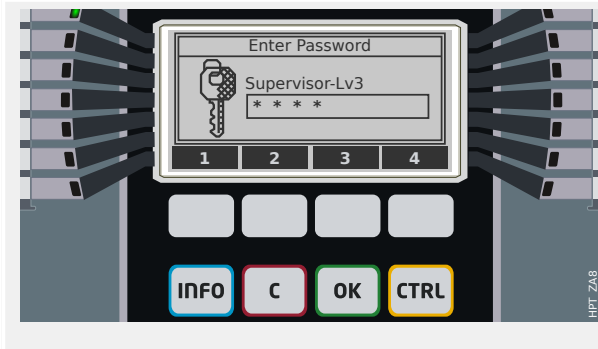
Password Entry:

Each Softkey is now labeled with a digit in the range 1...4.

Use the Softkeys to enter the required password. On the display, every typed-in digit is represented by an asterisk "*".

Finally press the *[OK]* key.

For new versions of the protection device, there is a special "Reference Manual" available (in addition to the Technical Manual). It lists all settings and signals available with the device with their default values and properties. (For older versions of the protection device, the parameter tables were part of the Technical Manual.) And as already said above, the access level specifies which password is required for changing the respective setting value.

If, however, it is preferred to not have to enter a password for a parameter change, it is possible to define a blank password for the respective access level. But be aware that this can be a potential security risk.

3.5　　Function Keys

Below the Softkeys, there are four keys with fixed labels:

- *[INFO]* ("information", see also ⤇ "3.6 "INFO" key – Check LED Assignments"),

- *[C]* ("clear", see also ⤇ "3.8 "C" key – Acknowledge (Reset) Latched Signals, Output Relays, Trip Commands"),

- *[OK]* (see also ⤇ "3.7 Parameter Changes – "OK" key",

- *[CTRL]* ("control", see also ⤇ "3.9 "CTRL" key – Control Switchgear Devices").

3.6 "INFO" key – Check LED Assignments

By pressing the *[INFO]* key you get immediate information about the active LED assignments.

Press the *[INFO]* key once to see the assignments of all LEDs that are positioned left to the display.

Press the *[INFO]* key again to see the assignments of all LEDs that are positioned on the right side of the display (unless it is a device with "B1" housing – only "B2" housings feature two LED columns).
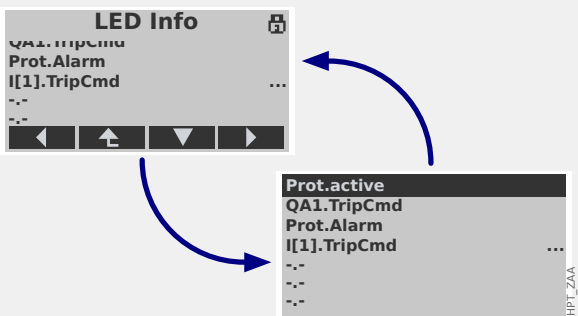
- Each LED assignment is listed in one line of text per LED, so that you get 7 lines for the 7 LEDs in a column.

- Devices with a small display feature only a maximum of 7 lines, which means there is not enough room for all assignments plus heading plus Softkey assignments. Therefore these small displays toggle every second between two layouts, one with visible heading and Softkey assignments (covering some of the LED-related lines), and the other with heading and Softkeys being hidden.

- Devices with a big display do not need this toggling, because the display has enough room for displaying everything.

- For each LED, only the first assignment is shown (or "**-.-**" if there is none). If there is more than one signal assigned to an LED, this is indicated by 3 dots at the right margin: "**...**"

- Such multiple assignments can be checked by highlighting the respective line and pressing the "▶" (Enter) Softkey.
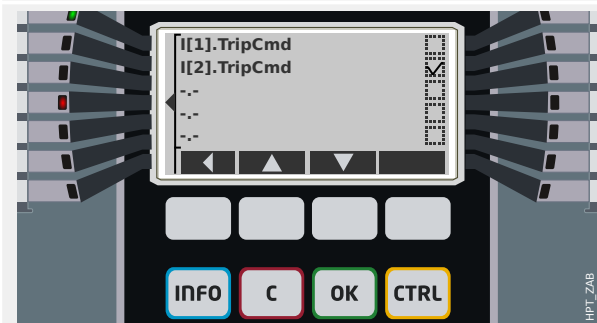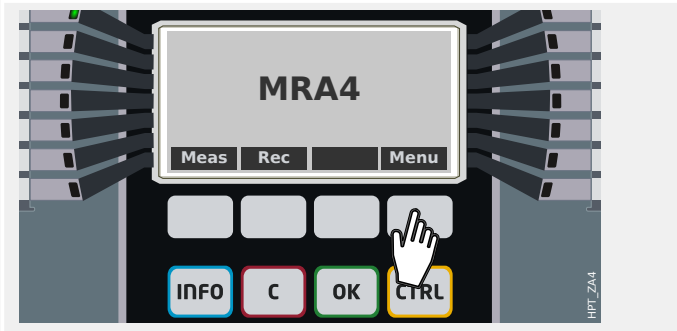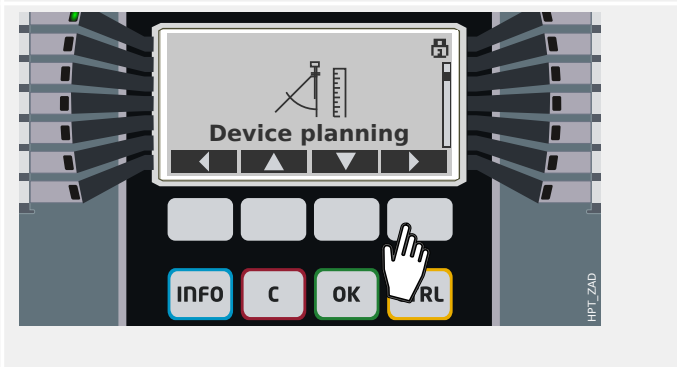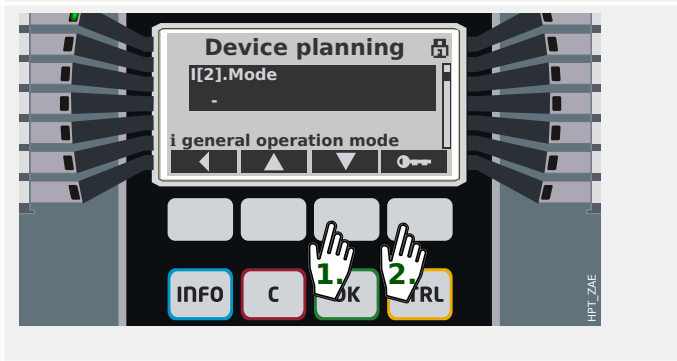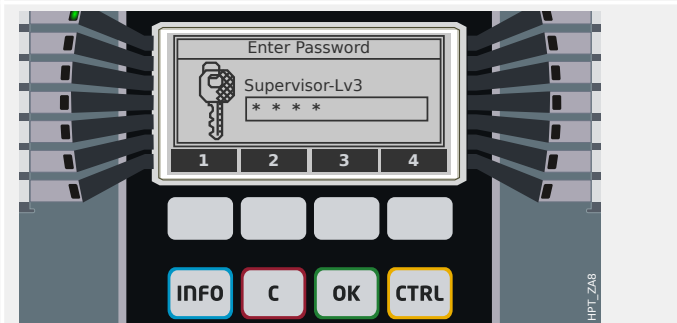
This takes you a new screen, which is dedicated to only one LED.

Press the Softkeys "▲" (Up) or "▼" (Down) to select the previous or next LED, respectively.

A (ticked "☑" / unticked "☐") checkbox next to each assigned signal indicates whether or not the signal is currently active. (In the example shown to the left, the signal »I[2] . TripCmd« is active, so that LED4, to which the signal is assigned, is lit.)

3.7   Parameter Changes – "OK" key

Whenever setting values are being modified the *[OK]* key is used to make the device accept the new value. But note that for modifying one value, the *[OK]* key must be pressed twice: When pressing *[OK]* for the first time, the new value is stored temporarily. Only after it has been pressed for a second time, the new value gets active.

For example, let us assume we want to modify the value of *»I[2] . Mode«*.

This setting can be found in the Device planning menu branch (which can be seen, for example, in the Reference Manual, or one simply knows that this menu branch collects all Device Planning parameters). The purpose of the parameter is to activate (or deactivate) the protection function »I[2]« (i. e. the 2nd stage of the Overcurrent protection).

Enter the Device planning menu branch.

Then press the "▼" (Down) Softkey repeatedly, until the required setting can be seen in the display.

Remark: Directly above the Softkey assignments, there is a line starting with "**i**". It shows a description of the currently selected parameter.

Then press the "Key" Softkey to enter the Edit Mode for this particular setting.

You are asked for the password. Settings in the Device planning menu branch require the Supervisor access level.

Type in the digits for the password using the Softkeys "1" … "4", then press the *[OK]* key.

Press "▼" (Down) repeatedly again, until the required value, for instance: "non directional", is highlighted.

Then press the [OK] key, so that this new value gets stored (temporarily). (Or, alternatively, press the [C] key to cancel the modification.)

Note that the new value is only stored internally, but not active yet.

That first [OK] pressing that you have just done brings you back to the screen showing the selected parameter, »I[2] . Mode«.

However, some things have changed now:

- Now the new value "non directional" is shown.

- An asterisk character "*" next to the parameter indicates that there are temporary changes for it. In addition, another asterisk next to the heading line indicates that parameter changes exist that have not yet been accepted and activated by the device. (The "*" remains there, even if one navigates to some other menu branch.)

- In the top right corner of the display, an open lock symbol indicates that the entered password is still effective, i. e. the respective access level is open.

Press [OK] again. (In principle, this can also be done later, i. e. after some more parameter changes and when being in another menu branch.)

A confirmation dialog asks you to explicitly accept your changes. Press the corresponding Softkey for "yes" (or "no" to cancel).

The protection device performs a validity check, and after this, it uses the new setting (unless it detects a validity problem or incosistency with respect to the new value).

If the validity check should fail, i. e. the protection device detects some validity problem or incosistency with respect to the new value(s) then this is indicated by a big "**?**" character that appears instead of the "*" in the heading line. In this case the protection device refuses to activate the new value(s), and you are expected to re-edit the values.

A second example: Let us assume that we have activated the protection function »I[2]«, i. e. we set »I[2] . Mode« = "non directional", as described in the previous example.

Now, as an example for a numerical parameter, we want to set the value of the overcurrent threshold »I[2] . I>«.

The menu path for this parameter is: [Protection Para / Set / I-Prot / I[2]].

(Just like with the previous example, this menu path can be looked up in the Reference Manual. However, we are strongly convinced that a menu path like this is straight-forward, so that there should be no need to look it up.)

Enter the submenu [Set] the same way: Press "▲" (Up) or "▼" (Down) repeatedly, until "Set" can be seen in the display, then press "►" (Enter).
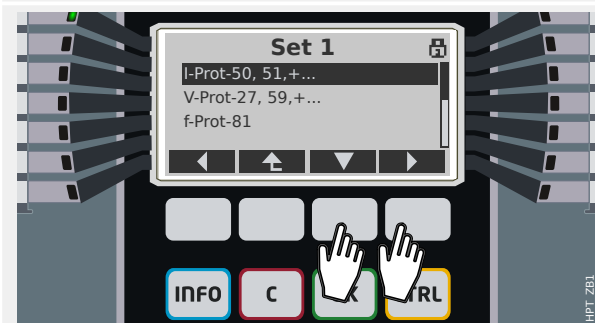
Then enter the [I-Prot] sub-menu.
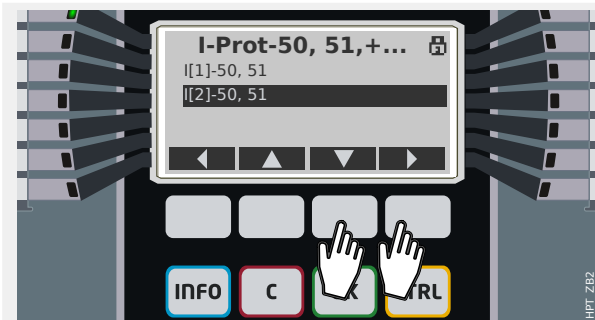
Finally enter the [I[2]] sub-menu.
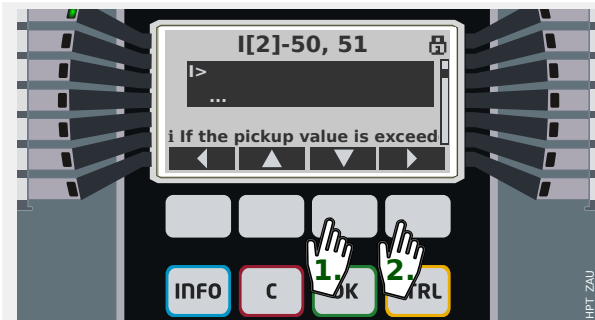
Press "▲" (Up) or "▼" (Down) repeatedly, until the parameter »I[2] . I>« can be seen in the display, then press "►" (Enter).
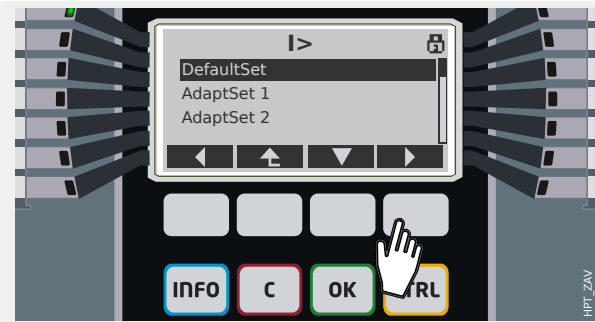
This particular parameter supports Adaptive Sets. (See ⤷ "4 Adaptive Parameter Sets" for information, and the Technical Manual for a detailed description.)

Select the Set which you want to modify. As a general rule, one always starts with the Default Set, regardless whether it is intended to also use Adaptive Sets or not.
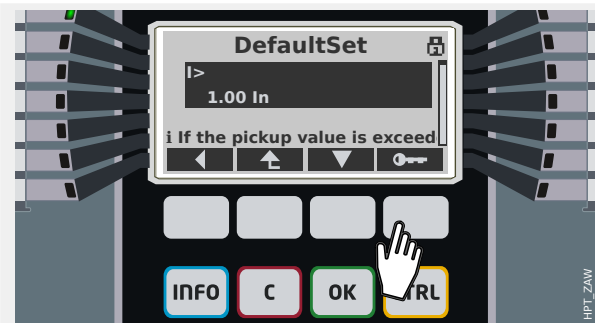
The previous setting value is shown. As in the previous example, you enter the Edit Mode by pressing the "Key" Softkey.

You are asked for the password. This parameter requires the access level "Prot-Lv2".

Type in the digits for the password using the Softkeys "1" … "4", then press the *[OK]* key.
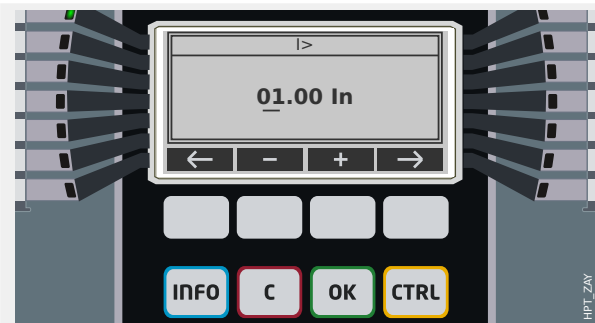
Since this is a number value you see a special numeric editing dialog: A flashing cursor is underlining one of the digits, and with the Softkeys "+" or "−" you can increase or decrease the digit, respectively. (Strictly speaking, you add or subtract 10^n every time you press "+" or "−".) The Softkeys "←" (Left) or "→" (Right) move the cursor one decimal place to the left or right, respectively.

Finally press the *[OK]* key, so that this new value gets stored (temporarily). (Or, alternatively, press the *[C]* key to cancel the modification.)

Note that again, the new value is only stored internally, but not active yet.
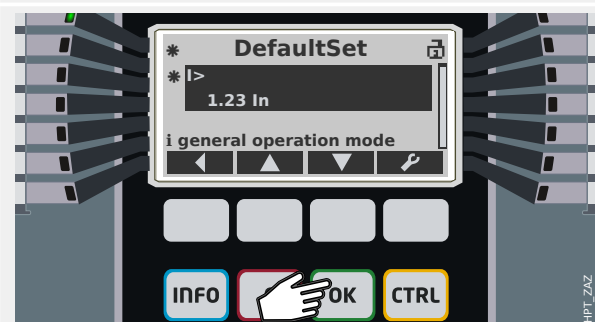
That first *[OK]* pressing that you have just done brings you back to the screen showing the selected parameter, *»I[2] . I>«*.

- However, the new value "1.23 In" is now shown.
- The two asterisk characters "*" indicate that there are temporary changes, just like in the previous example.
- In the top right corner of the display, an open lock symbol indicates that the entered

	password is still effective, i. e. the respective access level is open. Press *[OK]* again. A confirmation dialog asks you to explicitly accept your changes. Press the corresponding Softkey for "yes" (or "no" to cancel). The protection device performs a validity check, and after this, it uses the new setting (unless it detects a validity problem or incosistency with respect to the new value).

3.8 "C" key – Acknowledge (Reset) Latched Signals, Output Relays, Trip Commands

Standard Behavior

The [Acknowledge] menu allows to "acknowledge" (i. e. reset) latched signals, output relays and/or trip commands. This menu branch can be accessed the usual way, but there is also a short-cut: The "C" key takes you there directly.

(However, it is also possible to simply press the "C" key for a "long time", (ca. 1 second), which causes an immediate acknowledgment, see below.)

Use the Softkeys "▲" (Up) or "▼" (Down) to select those categories of objects that you want to acknowledge (reset):

- *»Sys . Ack BO LED Scd TCmd«*: Reset the binary output relays, LEDs, SCADA and the TripCommand
- *»Sys . Ack LED«*: Reset all (acknowledgeable) LEDs
- *»Sys . Ack BO«*: Reset all (acknowledgeable) binary output relays
- *»Qxx . Ack TripCmd«*: Acknowledge (reset) a previously given trip command (here: trip issued to switchgear "Qxx").
- *»SSV . Ack System LED «*: Acknowledge (reset) the System-LED if it is reporting an error by flashing red/green. (You can look up error messages in the Troubleshooting Guide.)

Then press the "Key" Softkey to enter the acknowledgment of your choice.

Remark: The switchgear name »Qxx« is only an example; the available set of switchgear devices and their designations are dependent on your particular application and on the settings made in the single-line, see ⤇ "5.2.12 Switchgear Configuration 2", ⤇ "3.11 Single-Line Diagrams". If the single-line defines more than one trippable circuit breakers then each is listed here.
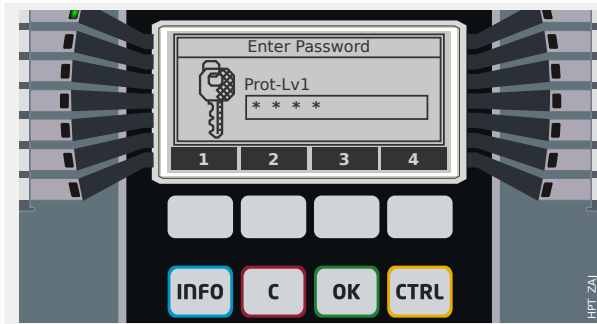
Similar to the modification of a setting (see ⇨ "3.7 Parameter Changes – "OK" key") you are asked for the password (this time, however, level "Prot-Lv1" is sufficient).

Whether there are different passwords for the various access levels, or only one, or even none, depends on the security policy of your company. See the Technical Manual for details.

After the correct password has been entered (as you might remember, this input always ends with pressing the *[OK]* key) there is a final confirmation dialog.

After pressing the "yes" Softkey the selected objects are acknowledged (reset).

"One Button Acknowledge"

As of Release 3.4, there is a very short and convenient method for acknowledging a pre-defined choice of objects. This is available with a "long keypress" (for ca. 1 second) of the *[C]* key.

The set of objects to be acknowledged must be activated during commissioning, by setting the parameter [Device Para / Acknowledge] *»Ack via »C« key«* to an appropriate value. (The available choices are essentially the same as mentioned above.)

> Whenever the LEDs are acknowledged an LED test is also executed: All LEDs flash in red color for a second, then flash in green color for a second.

3.9 "CTRL" key – Control Switchgear Devices
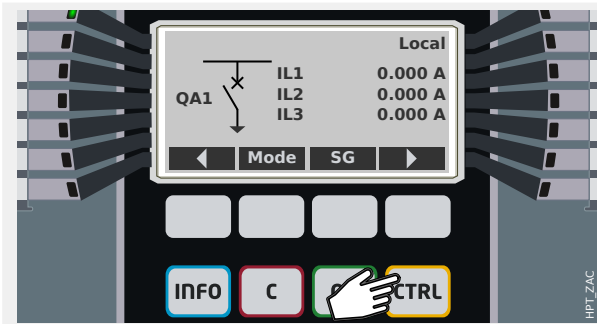
By pressing the *[CTRL]* key you enter a screen showing the single line, and you have direct access to related control functions.

Remark: The switchgear name »QA1« is only an example; the available set of switchgear devices and their designations are dependent on your particular application.

A switching operation can be executed if the swiching authority (which is displayed in the top right corner) is set to either "Local" or "Local and Remote".

Remark: Note that this single line screen as well as the two Softkeys "General Settings" and "SG" are also accessible via the main menu:

- The menu path [Control / Control Page] gives access to this single line page.
- The menu path [Control / General Settings] accesses the same menu branch as the Softkey "Mode".
- The menu path [Control / SG] accesses the same menu branch as the Softkey "SG".
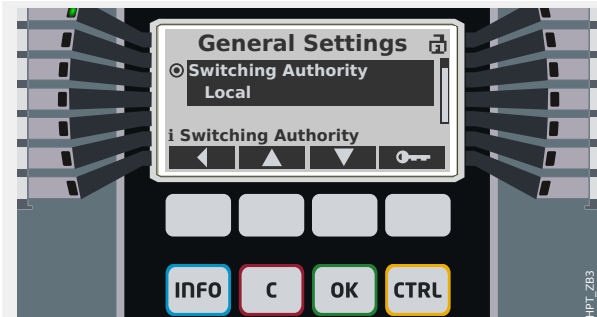
As an example, we want to execute a switching operation now. Therefore we check the switching authority first and enter the menu branch [Control / General Settings] (e.g. by pressing the Softkey "Mode").

Within this menu branch, you can do several switchgear-related settings, in particular (re-)define the switching authority.

(All settings are made exactly the same way as described in ⤷ "3.7 Parameter Changes – "OK" key", therefore this procedure is not repeated here.)

For the *»Switching Authority«* setting the following options are available:

- "None": No (local or remote) control function. (This setting does not affect a protection trip.)
- "Local": Control only via the buttons at the panel (HMI).
- "Remote": Control only via SCADA, digital inputs or internal signals.

- "Local and Remote": Control via HMI buttons, SCADA, digital inputs, or internal signals.

When the single-line is being displayed, the Softkey "SG" takes you to a screen that lists all connected switchgear devices.

(For HighPROTEC devices of type »MC…«, up to 6 switchgear devices are supported. A device of type »MR…« can control one switchgear device.)

After selecting a switchgear device, the Softkey "▶" (Enter) takes you to the menu that is dedicated to the selected switchgear device. There you can make various settings, e.g. control times, position indicators, external ON/OFF commands, interlockings.
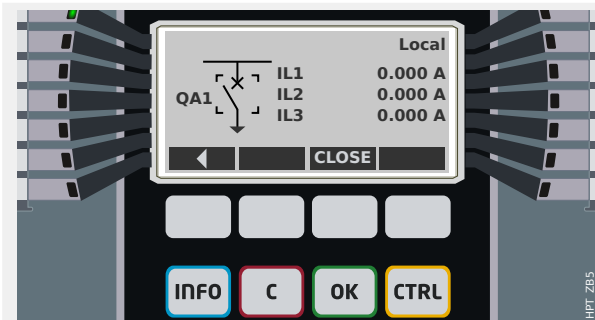
When the single-line is being displayed, the Softkey "▶" (Enter) takes you to an enhanced single line (after you have entered the password for access level "Control-Lv1"). The switchgear device is highlighted by small markers (and in case of several implemented switchgear devices, the Softkey "Select" is visible, which allows you to select another one).

If the switching authority permits local switching there are Softkeys "OPEN" and "CLOSE" which allow for executing a switching operation. (Note that usually, i. e. with correct position status indication from the switchgear device, only one of these two Softkeys is visible: If, for instance, a particular switchgear device is already open, only the "CLOSE" is visible.)
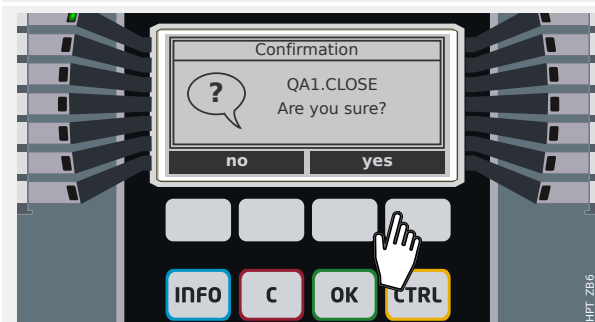
After pressing the "CLOSE" Softkey you get a confirmation dialog, just the same way as you have already seen for parameter changes.
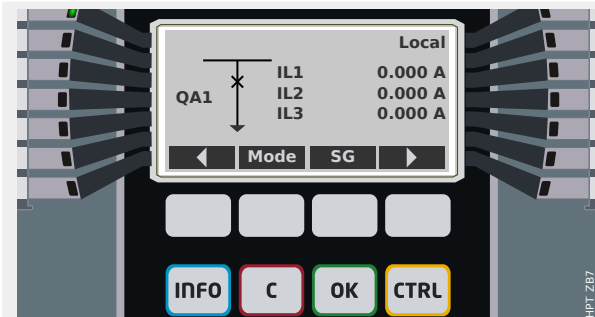
The new position of the switchgear device is shown on the display (as soon as it has been reached according to the feedback of the position indication, or after the configured switching time has elapsed).

Moreover, the functionality of the Softkeys changes so that the new permitted switching operations are available.

3.10 Assisting Tokens

Asterisk (Star)
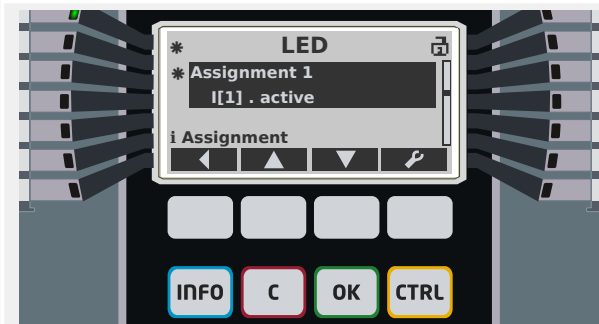
Name	Value
Latched	inactive
Ack signal	- . -
LED active color	red
LED inactive color	-
Assignment 1	I[1] . active
Inverting 1	inactive
Assignment 2	- . -
Inverting 2	inactive
Assignment 3	- . -
Inverting 3	inactive
Assignment 4	- . -
Inverting 4	inactive
Assignment 5	- . -
Inverting 5	inactive

Device Para/LEDs/LEDs group A/LED 1]

The **asterisk (star)** has already been mentioned in ⇨ "3.7 Parameter Changes – "OK" key".

This character "*" next to the parameter indicates that there are temporary changes for it.

On the device display, there is another asterisk next to the heading line indicates that parameter changes exist which have not yet been accepted and activated by the device.

In *Smart view*, there is also a comparable bold red "*" token next to the corresponding menu item in the menu tree. It indicates that parameter changes exist which have not yet been transferred to the device.

Inconsistency Token (Question Mark)

The **question mark** token, either in the heading of the display or as a bold red sign within the *Smart view* dialog, indicates that a validity or consistency problem has been detected.

In such a case, it is not possible to save the settings as a file.

Moreover, the protection device refuses to accept and activate the setting values.

An example for such a consistency problem can be as follows: It is possible to set one of the LEDs (the first LED in Group A, for instance) such that it is lit if a particular protection function (*I[1]*, for example) is active. This is achieved by the following setting:

[Device Para / LEDs / LEDs group A / LED 1] *»Assignment 1«* = "I[1] . active".

In principle, there is nothing wrong with this setting; it is the same setting that is also shown above, as an example for the asterisk token. But if it happens that the assigned protection function is intentionally disabled (setting [Device planning] *»Mode«* = "-") then this is an obvious consistency problem, and the LED assignment is not accepted.

Unused Setting Token
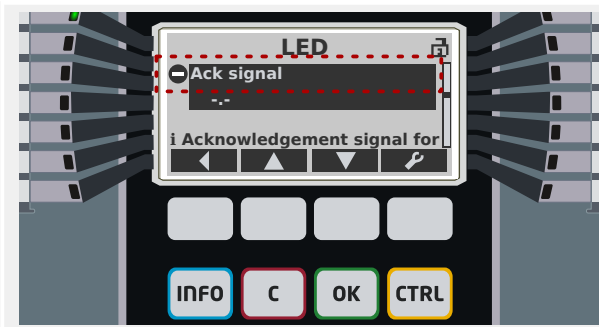
The **circled dash** "⊖" token indicates a parameter that is currently not used or not relevant.

In the example shown left, the LED is set to be non-latching: *»Latched«* = "inactive". Therefore it does not make sense to have a setting for the acknowledgment (reset) of this LED, so that the parameter *»Ack signal«* is marked as irrelevant.

Info Token

The **information** token "**i**" has already been mentioned in ⇨ "3.7 Parameter Changes – "OK" key". It appears as part of a setting dialog (on the device display in a dedicated line of text, directly above the Softkey assignments, or as a text frame within a *Smart view* setting dialog window). It indicates the detailed description of the parameter in question.
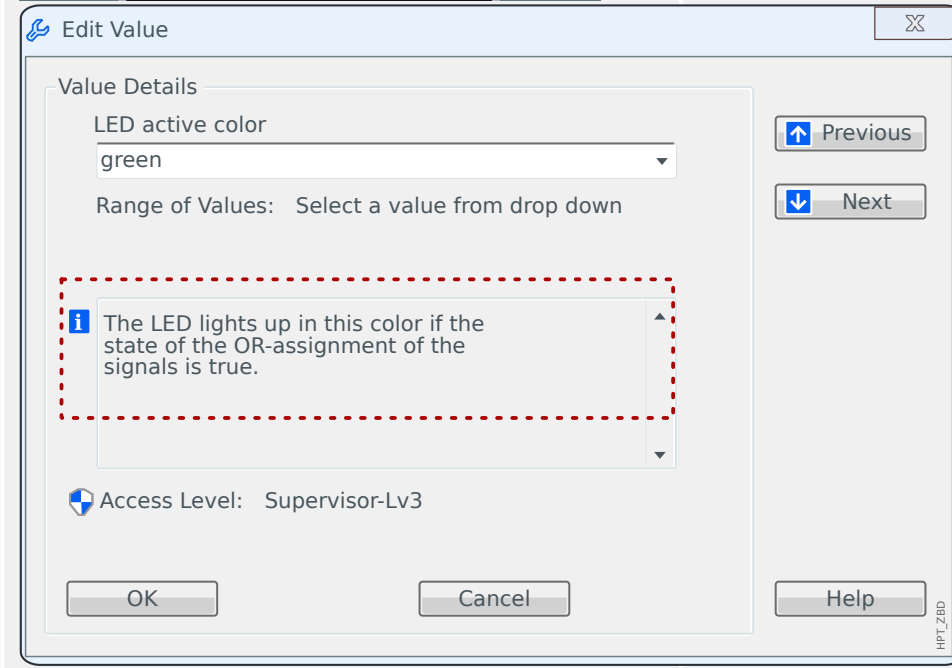
3.11 Single-Line Diagrams

The single-line diagram is displayed after the *[CTRL]* has been pressed, see ⌦ "3.9 "CTRL" key – Control Switchgear Devices". It can be replaced by another one, so that you are able to adapt it to your application. The following is important to know in this context:

> When *Smart view* saves the current configuration to a "*.HptPara"-file the currently active single-line diagram is always included. Vice versa, if you load an HptPara file and transfer it to the protection device the single line diagram contained therein gets displayed.
>
> But it is important to note that the other way round is **not** possible: There is no way to retrieve the currently active single-line diagram (in editable form) from the protection device, nor is it possible to export it from the HptPara file. As a consequence, it is strongly recommended to archive all the files that you have come across, not only the original file from which you started, but also all files that you created as individually modified single-line diagrams. There is a dedicated "*.HptPage" file format that keeps a single-line diagram – the so-called "page" – for later re-use.

Remark: The default single-line that the protection device displays after a factory reset can be found as an HptPage file on the product CD that has been part of the delivery. Alternatively, it can be downloaded from the web-address that is printed as a QR-code on a sticker fastened on the device. In most cases you can use it as a template and adapt it to your individual needs.

The software to be used for editing an HptPage file is named *Page Editor*. It is a stand-alone application which is installed along with the *Smart view* installation. It is possible to launch it the usual way, (for example) via the Windows Start button. But if you have *Smart view* already running it is probably more convenient to use the menu item *[Tools → Page Editor]*.

Please refer to the *Page Editor Manual* for a description of what can be done within the *Page Editor*. Although this manual is quite short these topics are out of scope of this "Quick Start" description. The *Page Editor Manual* can be simply opened by calling the *Page Editor* menu item *[Help → Help]* (or pressing the *[F1]* key).

After you have saved your own HptPage file you transfer it to the protection device as follows:

1. In *Smart view*, open the menu item [Device planning].

2. A double-click on the entry *»Ctrl . Single Line«*, "①" in the diagram below, opens the editing dialog (as already described earlier, see e. g. ⌦ "3.7 Parameter Changes – "OK" key").

3. Click on the button Single-line Diagram... ("②" in the diagram below).

   ⇨ This opens a file-select dialog.

4. Select your HptPage file.

   ⇨ The editing dialog displays the selected file (filename without "HptPage" extension, plus preview. If you have successfully passed the "Compatibility Check" of the *Page Editor* your new single-line should be o.k. so that the field Single-line Error Messages is blank.

5. Click Apply to close the editing dialog ("③" in the diagram below).

⇨ The parameter *»Ctrl . Single Line«* is now marked as "modified" (see the list of token in ⤷ "3.10 Assisting Tokens").

6. Just as with any parameter change, the final step is to transfer the modifcations to the protection device (keys *[F7]* or *[Ctrl]+[F7]*, or menu items *[Device → Transfer ALL Parameters into the Device]*, *[Device → Transfer only modified Parameters into the Device]*, see ⤷ "2.1 Operation via Smart view").
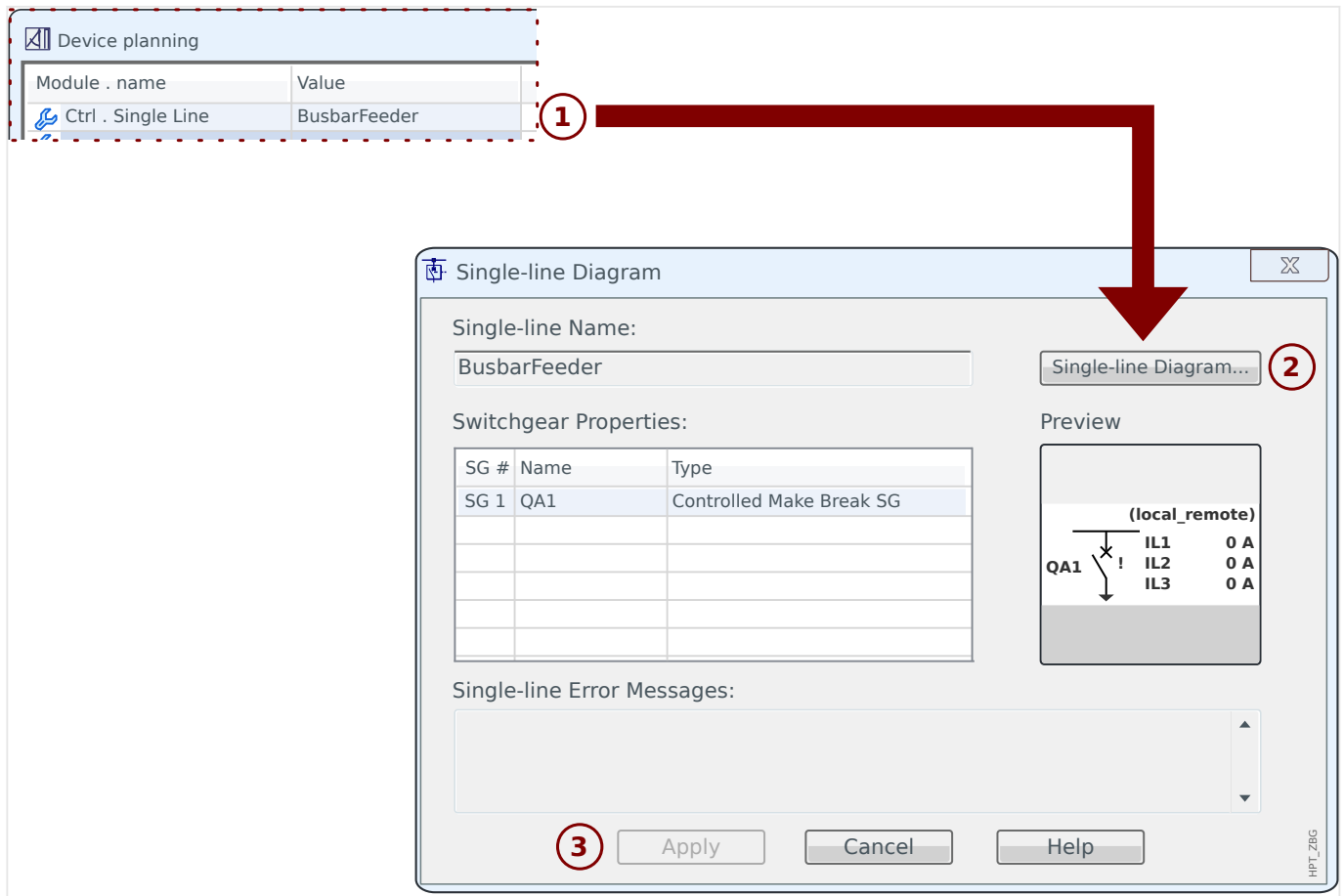
4 Good to Know for Commissioning

Return to the Main Menu

At the panel, you can always press the Softkey "◄" (Left) repeatedly to get to the main menu.

Validity / Consistency Check

Any parameter change automatically starts a check for logical dependencies (validity and consistency check). If the device detects a problem the settings are marked by a quotation mark "**?**"; in this case the device refuses to save and to activate the settings.

Check Internal Status

Keep in mind that the menu path [Operation / Status Display], together with all its sub-menu items, gives an immediate overview of all available statuses and signals (for all active modules).

So, whenever the HighPROTEC protection device behaves in an unexpected manner, this is generally the first starting point for checking whether the status of every signal is as expected.

Reset

Keep in mind that there is a difference between "acknowledging" a latched signal (described here), and **resetting** counters and states.

- The menu path [Operation / Acknowledge] (by default also accessible via the "C" key) allows to "acknowledge" certain latched signals (LEDs, output relays, SCADA, TripCommand).

- The menu path [Operation / Reset] collects reset commands for all resettable counters and values that are not within the set of "acknowledgable" data.

  So, if you are looking for a way to reset e. g. the Lockout of a Breaker Failure, you should enter this menu branch (for this particular example, the appropriate reset command is: [Operation / Reset] *»CBF . Res Lockout«*).

Passwords Forgotten

If the passwords have been lost the protection device can be set to use the default password "**1234**":

1. Press the »C« key during a cold restart.

   ⇨ A Reset dialog appears.

2. From this Reset dialog, select »Reset all passwords«.

   ⇨ There is a confirmation dialog, asking »Reset all passwords?«

3. Confirm with »Yes«.

   ⇨ The device starts using the standard password »**1234**«.

NOTICE!

!

For technical reasons, this Reset dialog is available **only in English** language (independent of the regional language being used later, after the device has started).

Note furthermore that the dialog might not appear at all because it has been intentionally disabled, or the option to reset all passwords has been disabled. (See the "Security Settings" chapter in the Technical Manual for details.)

In general, it is not advisable to keep the standard password »**1234**« permanently, because it apparently does not offer any serious safety. While setting a new password (via [Device Para / Security] »*Password*«), keep in mind that every password is always composed from only the digits 1, 2, 3, 4.

Change Device Language

At any time you can change the language that the protection device uses (on its panel). This language setting is independent of the language that *Smart view* uses.

1. Enter the menu item [Device Para / HMI].

2. Modify the parameter »*Menu language*«. Available values are: English, German, Russian, Polish, French, Portuguese, Spanish, Romanian.

   ⇨ After entering the appropriate password (access level "Supervisor-Lv3") and accepting the confirmation dialog the language changes according to the new setting.

Within *Smart view*, the language is altered via the menu item *[Settings → Language…]*. This becomes active only after a restart of *Smart view*.

Basic Commissioning Steps

Make sure that all voltages are switched off and all equipment is "dead"! Take care of all applicable national and international installation and safety regulations for working at electrical power installations, and make sure that you have also read and understood the "Commissioning" chapter in the Technical Manual.

Make the essential wiring connections, especially CTs and/or VTs, analog and digital inputs and relay outputs, and protective and functional grounding (earth). (Protective grounding/ earth to be connected at the housing, functional grounding/earth at terminal number 1 (labeled "FE") of the auxiliary power supply (slot 1).

The set of terminals that is available for each slot is shown on an adhesive label that is glued to the housing of the protection device. In case this is no longer visible (because the protection device has been built into a cabinet in a way such that the label is covered) you can consult the separately available "Wiring Diagrams" document.

Before powering on the auxiliary power supply (with the system still being "dead"!), it must be guaranteed that the grounding has been done correctly. Then make all the required settings, in particular the Field Parameters (connected CTs and VTs and all the other connected external equipment), and the Device Parameters (settings for analog and digital inputs and outputs relays, LEDs, etc). Then make all the protection settings as required for your application, and do not forget about the control (switchgear) settings.

Perform all required tests carefully, in particular the signal and control circuits, check the correct rating and burden of the CTs, the function of the transformer fuses and the required communication lines and settings.

The protection function tests must include the following:

- Check whether activation/tripping is saved in the event recorder, and whether tripping is saved in the fault and disturbance recorder.

- Check whether all signals and messages are correctly generated.

- Check whether all general and temporary blockings (parameterized and/or via digital input) work properly.

Note that all immediate types of acknowledgments (resets) include an LED test, i. e. all LEDs flash in red color for a second, then flash in green color for a second. Information about acknowledgments can be found in the "Acknowledgments" chapter of the Technical Manual, for the basic principles see ⤷ "3.8 "C" key – Acknowledge (Reset) Latched Signals, Output Relays, Trip Commands".

Prior to the initial operation of the protection device all tripping times and values shown in the adjustment list have to be confirmed by a secondary test.

Field Parameters

The menu branch [Field Para] collects settings that are related to external (field / application) properties rather than to the operation of the protection device itself. In this category there are, for example, the properties of the CT and VT that are connected to the protection device.

The following is important to know with respect to the VT settings:

- [Field Para / VT] *»VT sec«*: This is the nominal voltage of the Voltage Transformers at the secondary side. It is always defined as the "line-to-line" voltage.

- [Field Para / VT] *»VT con«*: This parameter has to be set ("Phase to Phase" or "Phase to Ground", depending on the application) in order to ensure the correct assignment of the voltage measurement channels in the device.

Overcurrent Protection (Modules I[n])

> There are several instances (stages) of the Overcurrent Protection module, but all of these are identically structured. This means it is the responsibility of the commissioning engineer to set thresholds and timer values such that – for example – the second instance »I[2]« works like a second overcurrent stage »I>>«.
>
> Moreover, it can be configured for each instance separately whether it shall work in directional or non-directional mode. This is done with the parameter [Device planning] *»I[n] . Mode«*, which can be set to "non directional", "forward" or "reverse".
>
> It is, however, interesting to know that the direction determination is **not** implemented as a part of the *I[n]* modules. It is part of the module *Prot* ("Module General Protection"), which acts in this case as a "helping hand" doing the direction determination for all *I[n]* modules. This fact does not have an impact on configuration work, but it is good to know that some results of directional decisions are signaled by *Prot*, for example signals such as »I dir fwd«, »I dir rev«, »IG calc dir fwd«, … (All these state signals can be found in menu branch [Operation / Status Display x / Prot].)

Sensitive Ground (Earth) Current

The Sensitive Ground Current must be activated by the following setting: [Protection Para / Set x / I-Prot / IG[n]] »*IG Source*« = "sensitive measurement"

Since the default setting of this parameter is "calculated" this must be adapted, otherwise the threshold setting »*IGs>*« is not available.

Voltage Protection (Modules V[n])

There are several instances (stages) of the Voltage Protection module, but all of these are generic and identically structured; in particular, these are **not** "specialized" to either overvoltage or undervoltage protection.

You can specify for each instance (independently) during commissioning whether it shall work as overvoltage or undervoltage protection. This is done with the parameter [Device planning] »*V[n] . Mode*«, which can be set to "V>" (overvoltage) or "V<" (undervoltage).

All other settings that are part of this instance are then adapted accordingly. For example, the threshold value »*V[n] . V>*« is visible only if the instance is working in overvoltage mode. If it is in undervoltage mode then »*V[n] . V>*« is automatically disabled, and »*V[n] . V<*« gets visible instead.

Therefore a HighPROTEC protection device does not use a specific name like "V<", "V<<" or "V>", "V>>" for the voltage protection; it uses the generic module names *V[1]*, *V[2]*, etc.

Usually the parameter [Protection Para / Set x / V-Prot / V[n]] »*Measuring Mode*« should be set according to the Field Parameter setting »*VT con*«. However, the following can be good to know:

If »*VT con*« = "Phase to Phase" then »*Measuring Mode*« is fixed to "Phase to Phase". (Even if »*Measuring Mode*« is accidentally set differently this setting is silently ignored.)

The nominal voltage Vn is defined as follows:

$$Vn = VT\ sec$$

If »*VT con*« = "Phase to Ground" then the user has the choice to set »*Measuring Mode*« either to "Phase to Ground" or "Phase to Phase".

In case of »*Measuring Mode*« = "Phase to Ground", the nominal voltage Vn is defined as follows:

$$Vn = VT\ sec\,/\,\sqrt{3}$$

In case of »*Measuring Mode*« = "Phase to Phase", the nominal voltage Vn is defined as follows:

$$Vn = VT\ sec$$

Residual Voltage Protection (Modules VG[n])

The residual voltage can be measured via auxiliary windings da-dn (e-n) in a broken delta connection.

The calculation of the residual voltage is only possible if phase to neutral voltages are applied to the measuring inputs of the protection device.

Direction Determination

Direction determination is available only for protection devices that are able to measure phase currents **and** voltages.

If direction determination is available then it is a feature of the module *Prot* ("Module General Protection", see ⮡ "4 Overcurrent Protection (Modules I[n])").

> It is important to know that the general convention for all HighPROTEC protection devices is that "forward" direction always points towards the main object to be protected. For example, this means for a generator protection device that a "forward" fault is **not** in direction towards the power system, it is rather in direction towards the generator.

Adaptive Parameter Sets

By means of Adaptive Parameter Sets you can modify dynamically setting values within a protection module.

NOTICE!

Adaptive Parameter Sets are available only for a few protection modules (essentially only the overcurrent protection modules).

From the practical point of view, there is one essential difference to the ordinary parameters sets: Switching to another parameter set affects **all** protection functions at once. This can increase your commissioning and testing efforts considerably if you "only" want to modify the behavior of one particular protection function.

Contrast to this, Adaptive Parameter Sets are "local", i. e. they are effective only within the protection function where they had been activated. (See below how to do this.)

You can assign a digital signal to any of the parameters [Protection Para / Global Prot Para / I-Prot / "module"] »AdaptSet 1«, …, »AdaptSet 4«. ("module" means the name of a protection module that features Adaptive Parameter Sets, for example: [I[1]]).

These four assignment parameters are always "Global Parameters" (i. e. within the menu branch [Protection Para / Global Prot Para]). For example, let us make the following assignment: »AdaptSet 1« = "V[1] . Alarm", see the upper dialog window ① in the diagram below.

With this assignment, the *Smart view* dialog window for the "Setting Group Parameters", for example the menu branch [Protection Para / Set 1 / I-Prot / I[1]], is getting enhanced by an additional column ②, as shown in the bottom dialog window in the diagram below.
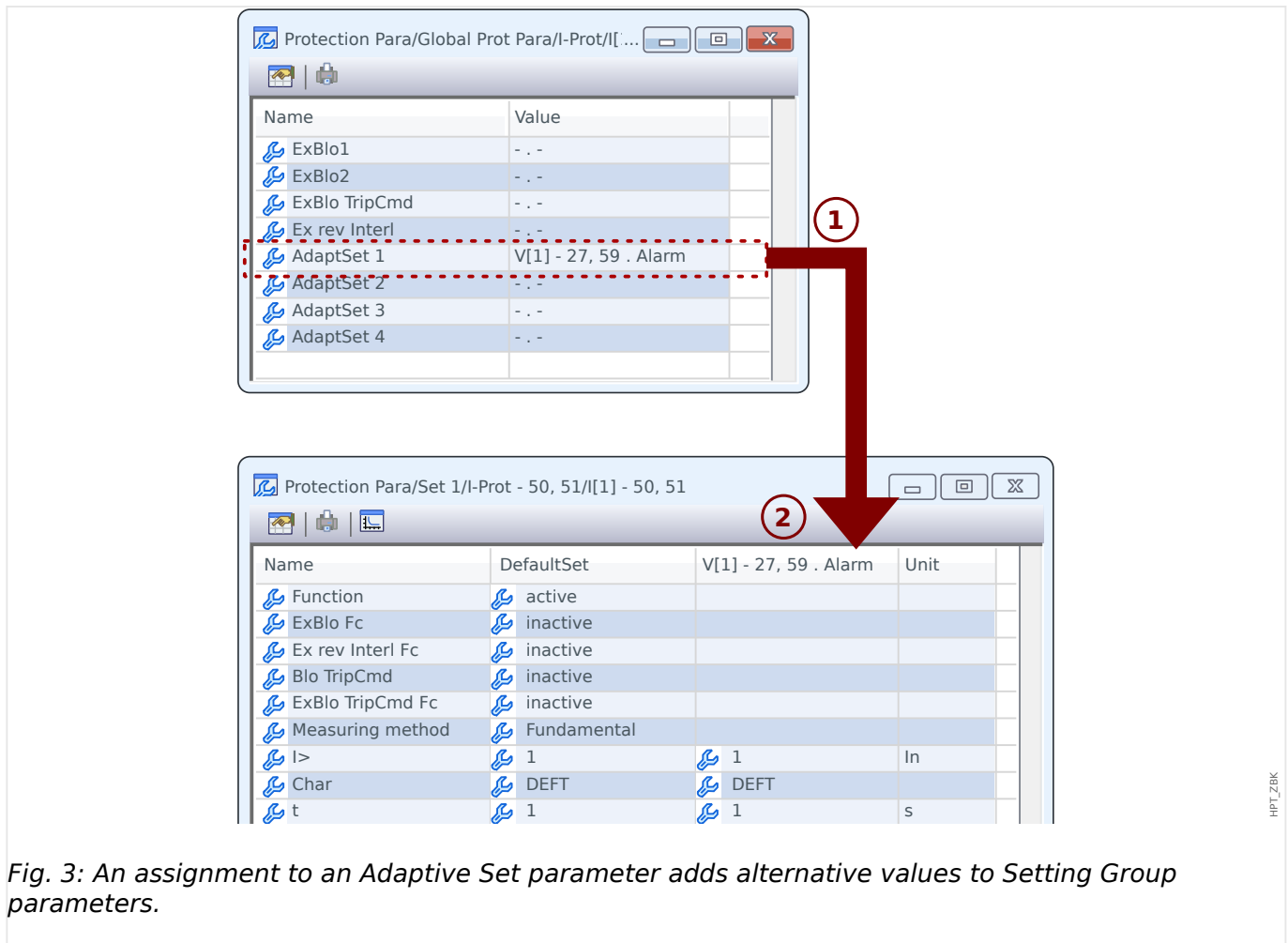
Fig. 3: An assignment to an Adaptive Set parameter adds alternative values to Setting Group parameters.

By this Adaptive Set assignment, most Setting Group Parameters receive an additional, alternative value. At first this new value is identical to the DefaultSet value, but it can be edited the same way. (Double-click it and modify it according to your needs.)

The idea is simple: The protection parameters use the alternative *»AdaptSet 1«* value as soon as the assigned signal "V[1] . Alarm" becomes true.

Since there are four normal setting groups, and each of these can have up to four Adaptive Sets plus the DefaultSet, this means that parameters supporting Adaptive Sets can have up to 20 different setting values.

Application Examples for Adaptive Parameter Sets

- AR: auto-reclosing with 2 shots

    ◦ 1st shot DEFT characteristic, normal tripping stage

    ◦ 2nd shot INV characteristic, sensitive tripping stage

- CLPU: cold load pickup

    ◦ Motor start, de-sensibilize current protection

- SOTF: switch on to fault

    ◦ De-sensibilize current protection

- ANSI 51C: voltage controlled over current

◦ Generator, motor, de-sensibilize current protection

Digital Inputs

It is **not** possible to assign a function to a Digital Input! Instead, it is the other way round: You assign the status (signal) of a Digital Input to the input parameter of a particular module.

If, for instance, it is required to block the *Prot[1]* overcurrent protection module as soon as there is a signal at the Digital Input "DI1" of the power supply card (terminal number 6 of slot X1) then the following setting can be used:

[Protection Para / Global Prot Para / I-Prot / I[1]] *»ExBlo1«* = "DI Slot X1 . DI 1"

Binary Outputs

If binary outputs are configured with the setting *»Latched«* = "active", they will always keep (return into) their position, even if there has been an interruption of the power supply.

This means that resetting a binary output that has latched a signal always require an explicit acknowledgment activity (see ⇨ "3.8 "C" key – Acknowledge (Reset) Latched Signals, Output Relays, Trip Commands" and – for details – Chapter "Acknowledgment" in the Technical Manual).

Load Reference Arrow System

- It is common practice to either use the "Load Reference Arrow System" for loads (consumed energy) and the "Generator Reference System" for generators (generated energy).

- All HighPROTEC protection devices (except generator protection devices) use exclusively the "**Load Reference Arrow System**". Generator protection devices are working based on the "**Generator Reference System**".

- This applies to directions and phase angles. The phase angle is defined as the angle between the current phasor and the voltage phasor.

- Current and voltage arrows are to be counted positive in the direction of the arrow.

Trip Commands

The protection device monitors the object to be protected, and if any serious fault should occur, it is expected to issue a trip command.

Most protection functions feature an »Alarm«, a »Trip« and a »TripCmd«.

- An »Alarm« signal is issued by a protection function that detects a particular type of fault. If the protection function distinguishes between several fault types (e. g. phase-specific faults) then a respective »Alarm« signal exists for each.

  Every »Alarm« signal gets routed (internally) to the general protection module »Prot«, which in turn issues a signal »Prot . Alarm«.

  In other words, the signal »Prot . Alarm« is a collective signal; if it has the state "True" this represents the message "some protection function has detected a fault". (The same is true of the respective phase-selective signals.)

- Moreover, every »Alarm« triggers a »Trip« (in general: after a dedicated timer stage has elapsed).

  The »Trip« triggers a general trip signal »Prot . Trip« (just the same way as the »Prot . Alarm« is triggered). So, if »Prot . Trip« = "True" this represents the message "some protection function has detected a fault that persists for a time longer than tolerable". (And again, the same for the phase-selective signals.)

- Finally, the protection function issues not only the »Alarm«, but also the trip command (»TripCmd«), but only under the condition that trip commands are not blocked.

  (There are various methods to intentionally block trip commands. For example, a general blocking of the trip commands of all protection functions can be achieved by setting [Protection Para / Global Prot Para / Prot] »Blo TripCmd« = "active". See the full Technical Manual for details.)

- It is important to know that the trip command of a protection function does **not** necessarily open a circuit breaker! Every connected switchgear is represented by a module. This module has a trip command of its own, which can send an open command to the assigned output relay, to open the circuit breaker.

  Therefore one additional setting is essential to establish the relationship between the protection function's trip command and the switchgear's trip command: There is a so-called "Trip Manager" (which is simply synonymous for the switchgear-specific menu paths [Control / SG / SG[x] / Trip Manager]); besides some breaker-specific settings (switching times, latching, etc.) you can find there a lot of setting parameters named »Off Cmdn«, and to each of these you can assign one protection function's trip command. Then, if any of the assigned protection trip commands is issued the switchgear's trip command is issued, so that after all, the respective circuit breaker opens.
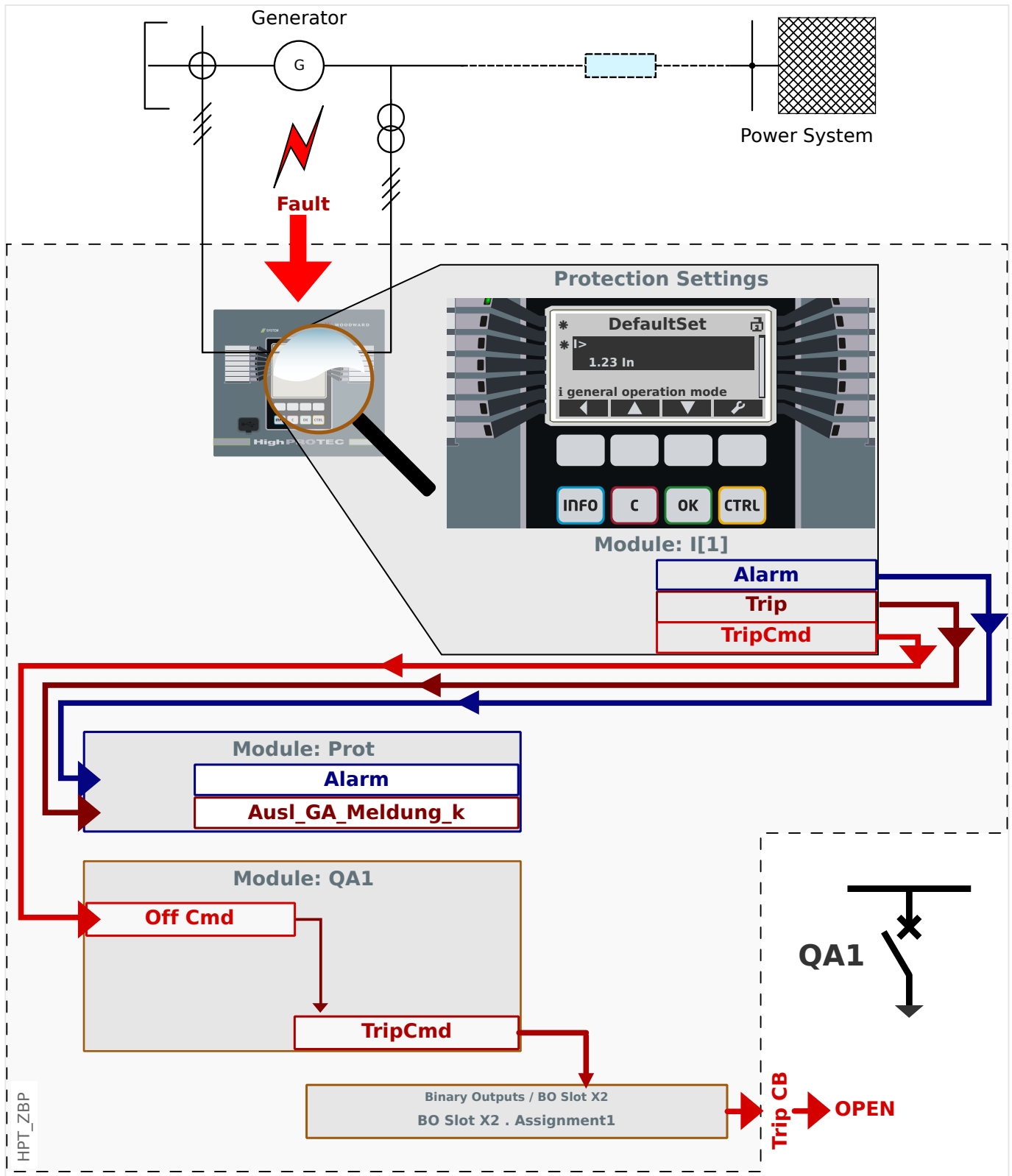
Let us take a simple, non-directional phase overcurrent protection as an example (see diagram above), e. g. the module *I[1]*.

This module monitors the phase current flow according to criteria that had been specified by setting various parameter values during commissioning. If a fault occurs (according to these defined criteria) the *I[1]* instance issues various output signals, especially a trip signal (»Trip«) and, after some trip delay timer has elapsed, a trip command (»TripCmd«). (Of course, we assume for now that there is no active blocking, neither for the *I[1]* instance nor for its trip command.)

The »I[1] . Trip« signal is always reported to a protection master module, named *Prot*. This is very important to keep in mind, because if the *Prot* module should be blocked – which can be useful for testing purposes – then absolutely no protection function is able to issue a trip command, this master protection module will block them all!

Moreover, the »I[1] . TripCmd« signal can become effective only if it has been assigned to a switchgear device. Usually one of the switchgear devices is a circuit breaker, which has to be opened. The set of switchgear devices and their designations is defined using the *Page Editor*, see ⤷ "3.11 Single-Line Diagrams". The properties of the switchgear device (switching times, latching of the respective output relay, etc.) must be set within the respective switchgear module, for example within the menu path [Control / SG / SG[1] / General Settings].

Then, in the menu path [Control / SG / SG[1] / Trip Manager], there are many setting parameters named *»Off Cmd1«*, *»Off Cmd2«*, …, all with identical functionality: The trip command from the protection module, must be assigned to one of these, for instance:

*»SG[1] . Off Cmd1«* = »I[1] . TripCmd«.

When *»SG[1] . Off Cmd1«* becomes active, the switchgear module *SG[1]* issues its own trip command »SG[1] . TripCmd«.

This trip command must be assigned to an output relay, that actually does the switching operation. So, let us assume that slot 2 of the protection device is fitted with a binary output module, so that we can use output relay number 1 for this purpose. Then the correct assignment to be made during commissioning is: [Device Para / Binary Outputs / BO Slot X2 / BO 1] *Assignment 1«* = "SG[1] . TripCmd"

Documents

All relevant documents describing the protection device are contained on the DVD that is delivered with the device. Nevertheless it is recommended to check from time to time whether updated or corrected versions have been made available online.

There are two ways of accessing the documents via internet:

- Visit the company website (⟹ www.woodward.com) and search for the documents you are interested in. (The ID of every document is printed on its cover page.)

- There is, however, a more convenient way: Every device has a QR code printed on it. Scan this code, and you are taken to an online directory that contains all relevant documents in the most recent version.

Notice: One of the documents that is included on the DVD and available online is named "Front_Foil_Label / HighPROTEC_Inserts". This is is a template file that allows to label the LEDs in a proper way.

You can print this out on a transparent foil and fasten it on the front plate of the device.

HighPROTEC

5 How to Configure a Protection Device

It is recommended to use the *Smart view* operation software for all setting activities that are beyond changing only a few values. See the basic description (⇨ "2.1 Operation via Smart view") about how to establish a connection. A detailed description can be found in the *Smart view* manual.

> It is strongly recommended to archive all the "*.HptPara" configuration files that you have come across, both in the state before your modifications and the modified one.
>
> The [File] menu of *Smart view* offers the usual menu items for handling HptPara files (Create New Parameter File, Open Existing Parameter File, Save,…).

CAUTION!

However, clicking *[Save]* does **not** activate changed values (even though the asterisk tokens might disappear). The *[Save]* menu (and button) does nothing more than saving your changes to a *.HptPara file. Remember to always also transfer the parameters to the connected device if you want to activate your changes.

5.1 Configuration File

An `HptPara` file is always related to a device model (see also the "Notice" in ⮑▷ "2.1 Operation via Smart view"). Therefore you have two alternative principles for the creation of a new configuration file:

- Creating a `*.HptPara` offline, i. e. without being connected to a protection device. In this case *Smart view* opens selection dialogs, asking you to specify the exact device and typecode for which the configuration shall be made, see diagram below. (The "typecode" defines the particular device variant, including housing and communication options.)

  In the typecode dialog, it is possible to double-click every specification line (or highlight it and click the Edit button) and adapt the entry to your particular device. Alternatively, you can also click the "pencil" button and directly type in the letters and digits of your device's typecode.

  You can find the typecode printed as "CAT No." on the adhesive label that is glued to the housing of the protection device. Moreover, as of Release 3.4, you can also check the parameter value of [Device Para / Version] *»CAT No.«*.

  And finally, you can use the *Smart view* menu [File → Properties] to open a window that displays various information, including the typecode.

- Creating a `*.HptPara` while being connected to a particular device. In this case *Smart view* defines all settings for this particular device, and immediately after having retrieved the data from the device *Smart view* asks you whether you want to save them into a new `HptPara` file. (Of course it is possible to re-use the `HptPara` file later for another protection device, provided the variant and firmware version (release) are identical.)
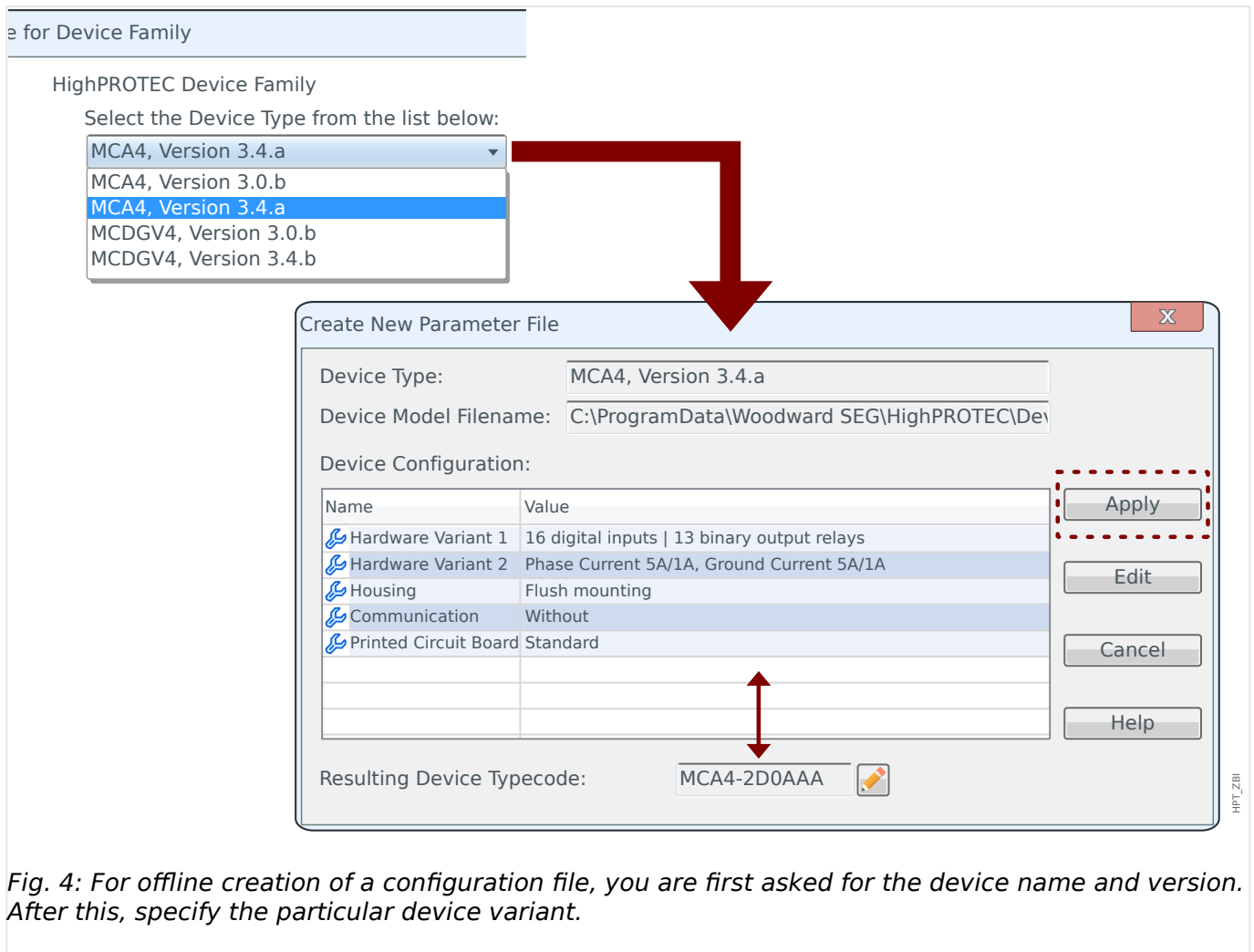
Fig. 4: For offline creation of a configuration file, you are first asked for the device name and version. After this, specify the particular device variant.

Modify Device Configuration (Typecode)

If one tries to transfer an HptPara file to a connected device which differs in its typecode (for example: "MCDGV4-2A0ATA" HptPara ⇒ MCDGV4-2A0AAA) then *Smart view* refuses to do so with a "**Type mismatch!**" error message telling you that the typecodes are not the same.

In this case you can convert the settings to the typecode of the connected device. (This does not work for different HighPROTEC devices!)

Select the *Smart view* menu [Edit → Modify Device Configuration (Typecode)] to open the device variant dialog, which is essentially the same as described above (⇨ Fig. 4). Here you can specify the target typecode (which should be the typecode of the connected device, of course).
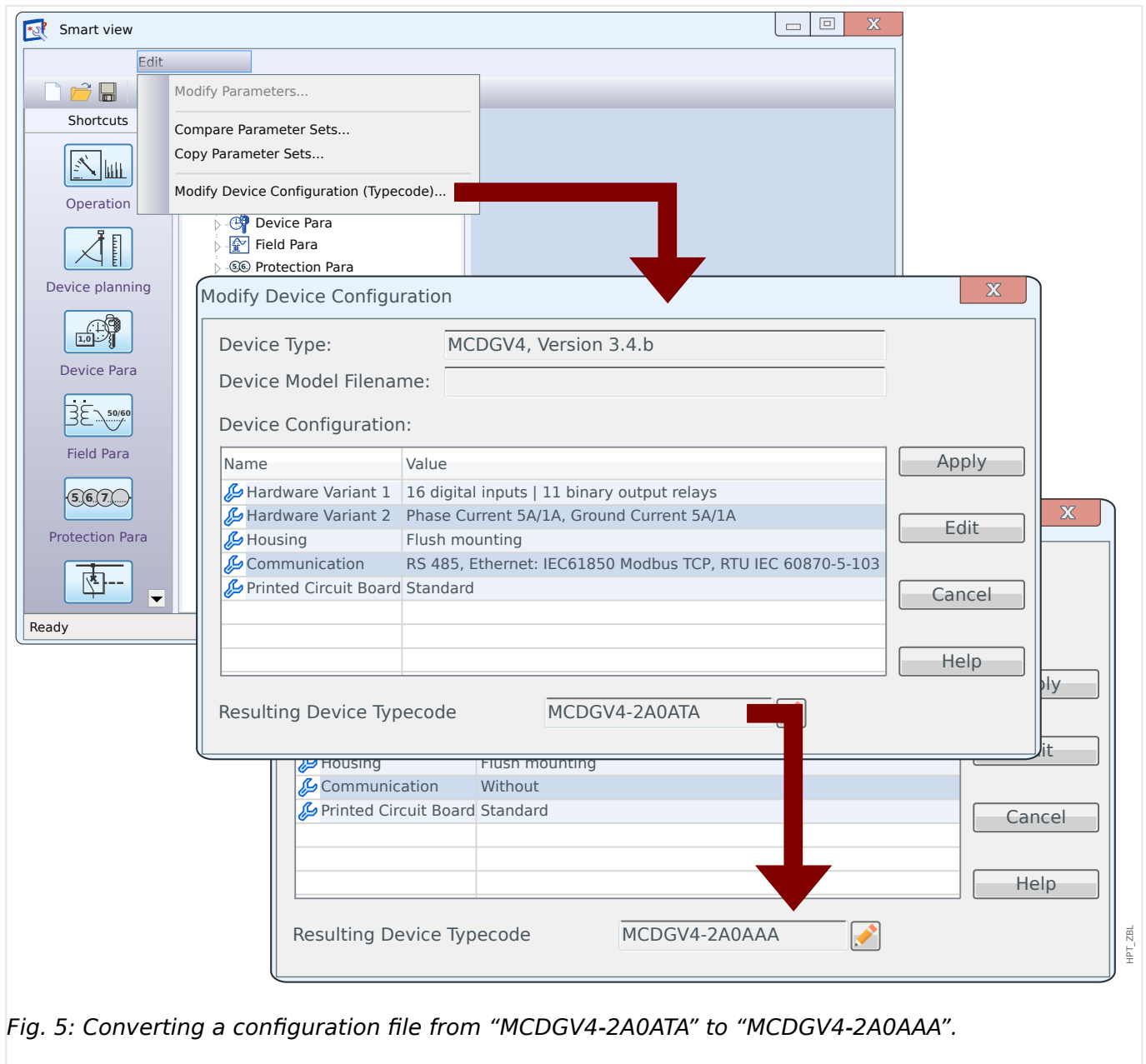
Fig. 5: Converting a configuration file from "MCDGV4-2A0ATA" to "MCDGV4-2A0AAA".

Note that after pressing the Apply button, it takes *Smart view* some time to perform various validity and consistency checks. For a quite simple conversion, as shown in the example above, the checks should not find any problems, so that it is possible to transfer the configuration to the connected device, as already described (see ⮡▷ "2.1 Operation via Smart view").

The more differences exist between the source and target typecodes, the more likely it is that consistency problems are found, which are then marked by asterisk tokens, as described in ⮡▷ "3.10 Assisting Tokens". These must be corrected manually, before the settings can be transferred to the device. Even without serious consistency problems, it is strictly recommended to always have a look at the resulting settings: In the example above, the conversion goes from a device **with** communication to a target device **without** any communication features; of course, this is rather simple.

In the vice versa case, however, if the conversion goes from a device **without** communication to a target device **with** any communication features, it is impossible to expect sensible communication values from a non-communication source. So, after all, you should never trust an automatic conversion! Always have a look yourself before you go live with the settings.

Upgrade Firmware Version

A comparable problem arises if one tries to transfer an `HptPara` file to a connected device which differs in its firmware version: *Smart view* refuses the transfer with an "**Invalid Parameter file!**" error message.

In this case you can convert the settings to the firmware version of the connected device.

NOTICE!

The conversion does not work for different HighPROTEC devices, nor does it work from a new firmware to an older version! In other words, it is only possible to "upgrade" a device.

Select the *Smart view* menu [File → Save As...] to open the normal "Save As" dialog. As you can see, the "file type" shown at the bottom of the dialog is not only "`*.HptPara`", but the version number is also part of it. Now you can expand the "file type" selection list, it offers all versions for which a device model has been previously installed (see also the Notice about device models in ⌐▷ "2.1 Setting up the Connection PC - Device"). Adapt the file name according to your target device and click Save.
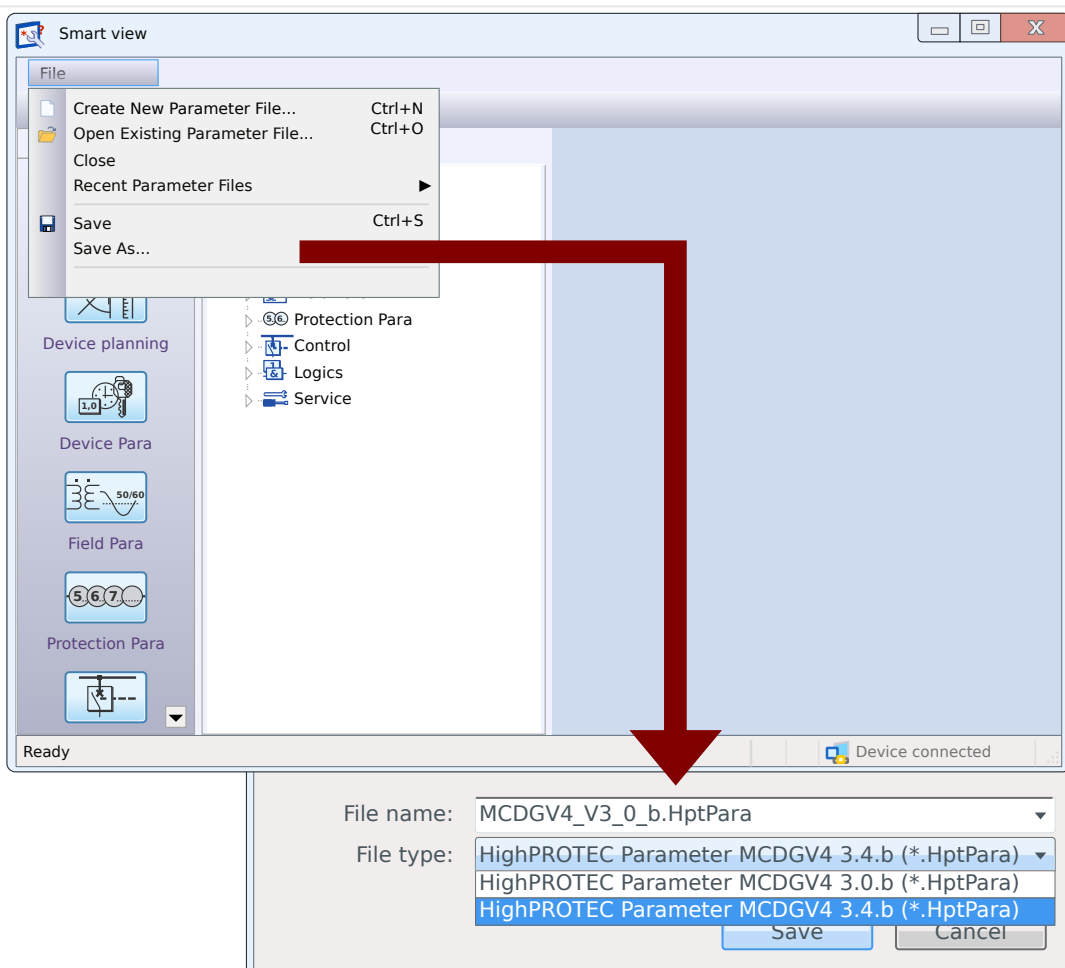

Fig. 6: Converting a configuration file for the MCDGV4 from version "3.0.b" to "3.4.b".

There is a confirmation dialog, asking whether you want to convert between different versions, and finally, there is a summary about successfully converted, added and deleted settings.
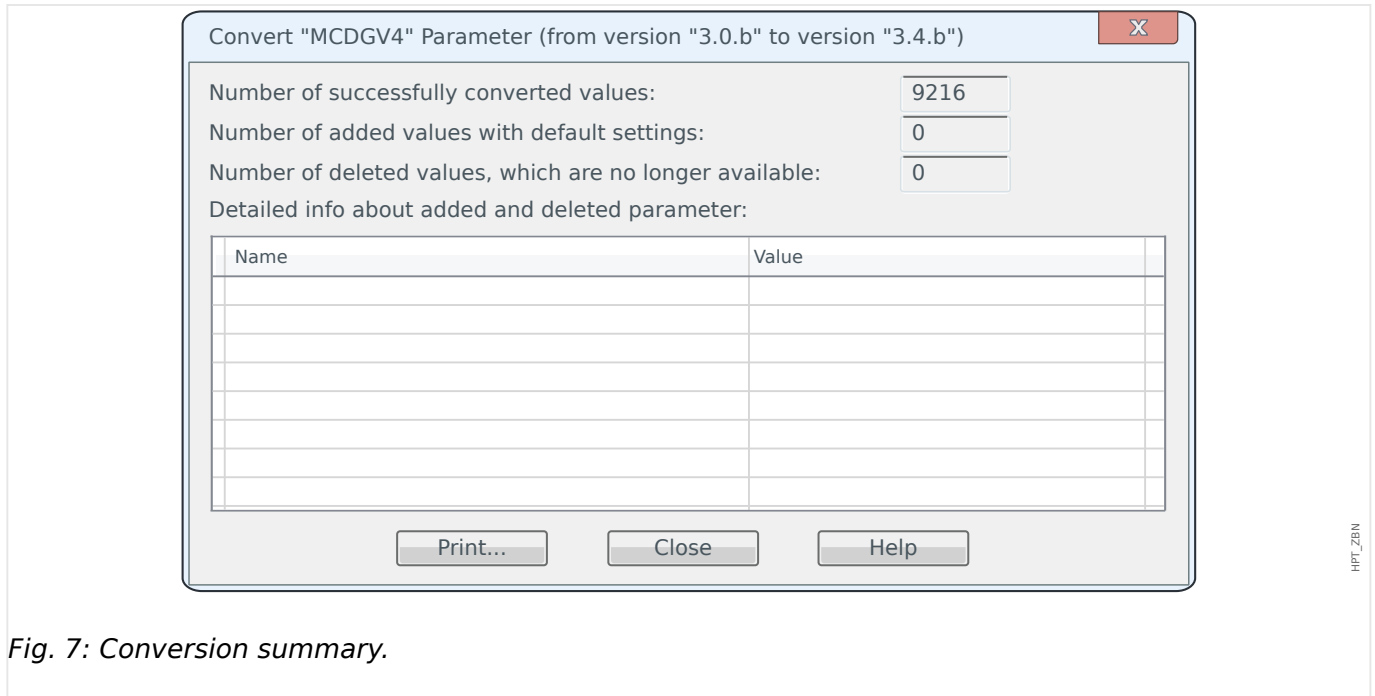
Convert "MCDGV4" Parameter (from version "3.0.b" to version "3.4.b")   X

Number of successfully converted values:	9216
Number of added values with default settings:	0
Number of deleted values, which are no longer available:	0

Detailed info about added and deleted parameter:

Name	Value

Print...   Close   Help

Fig. 7: Conversion summary.

Just like with a typecode conversion (⇨ "5.1 Modify Device Configuration (Typecode)"), *Smart view* performs various validity and consistency checks and reports any problems.

The bigger the difference is between the versions, the more settings will have to be added (or deleted), and it becomes likely that consistency problems are found, which are then marked by asterisk tokens, as described in ⇨ "3.10 Assisting Tokens". All settings problems must be corrected carefully, before they can be transferred to the device. Since new firmware versions come with new features, the conversion can do nothing about this but simply adding the respective new settings with only their default values. These defaults usually set the new feature "inactive", which might or might not match your application needs. So, after all, you should never trust an automatic conversion! Always have a look yourself before you go live with the settings.

5.2 Configuration Steps

5.2.1 Display Language

Enter the menu [Device Para / HMI] and set the parameter *»Menu language«* to any of the supported languages according to your preferences.

This defines the language that the protection device uses on its panel.

> **NOTICE!**
>
> This does not switch the language that *Smart view* uses for displaying the settings. This has to be set via the *Smart view* menu [Settings → Language]. Note that changing this requires a restart of *Smart view*.

5.2.2 Device Planning

Enter the menu [Device planning] and activate or disable all the modules and protection functions that are required for your application.

In the Device planning dialog, double-click every required module and set it to "use". Modules that are not required should be set to "-".

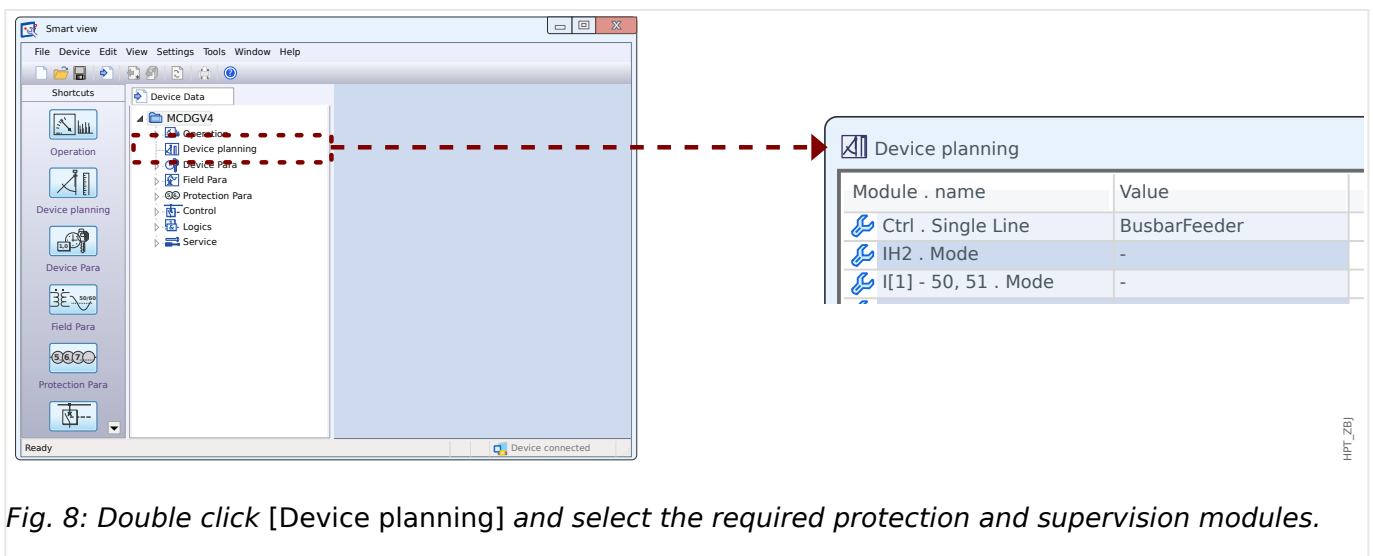This defines the functional range of the protection device.

Fig. 8: Double click [Device planning] *and select the required protection and supervision modules.*

5.2.3 Measurement Display

Enter the menu [Device Para / Measurem Display / General Settings] and set the parameter *»Scaling«* to either "Per unit values", "Primary values" or "Secondary values".

This defines how the measured values shall be displayed.

5.2.4 Digital Inputs

Enter the menu [Device Para / Digital Inputs] and all sub-menu items therein (depending on your hardware, i. e. which slot are fitted with digital inputs), for example [Device Para / Digital Inputs / DI Slot X1 / Group 1]. Set the parameter »Nom voltage« to either "24 VDC", "48 VDC", "60 VDC", "110 VDC", "230 VDC", "110 VAC", "230 VAC".

This defines the nominal voltage of the binary input.

In the same way set and/or check the other settings, »Inverting x« and »Debouncing time x«

This defines the whether the binary input shall be inverted, and which time interval shall be used for the input signal to avoid misinterpretation due to bouncing effects.

5.2.5 Output Relays (Binary Outputs)

Enter the menu [Device Para / Binary Outputs] and all sub-menu items therein (depending on your hardware, i. e. which slots are fitted with output relays), for example [Device Para / Binary Outputs / BO Slot X2 / BO 1].

Set the parameters for the operating mode, hold and delay times, latching, the acknowledgment signal (if »Latched« is set to "active"), and for up to 7 binary output signals, you can assign a digital output signal to the output relay (parameters »Assignment 1«, …, »Assignment 7«) and decide about »Inverting x« for this signal.

This defines which signals shall be indicated by output relays. If any of the 7 assigned signals becomes true, the output relay becomes either active (if »Inverting« = "inactive"), or vice versa (if »Inverting« = "active").

5.2.6 LED Assignment

Enter the menu [Device Para / LEDs / LEDs group A] for the LEDs grouped in a column left to the display, and in the same way, [Device Para / LEDs / LEDs group B] (if available for your device).

Set the parameters for latching, the acknowledgment signal (if »Latched« is set to "active"), the active and inactive LED color and flashing mode, and for up to 5 binary output signals, you can assign the signal to the LED (parameters »Assignment 1«, …, »Assignment 5«) and decide about »Inverting x« for this signal.

This defines which signals shall be made visible by LEDs. If any of the 5 assigned signals becomes true, the LED is lit in the active color, otherwise it is lit in the inactive color. (Both colors may also be set to "-", which means the LED is off.)

5.2.7 Field Parameters

Enter the menu [Field Para], including all available sub-menus, and set all parameters that define the field (i. e. the "surrounding") of the protection device.

In particular, take care of the following settings:

- [Field Para / General Settings] »*Phase Sequence*« selects the phase sequence ("ABC" or "ACB").

- [Field Para / General Settings] »*f*« selects the nominal frequency ("50" or "60").

- [Field Para / VT] »*VT con*« selects the type of phase voltages ("Phase to Phase", i. e. delta connection, or "Phase to Ground", i. e. star connection).

- [Field Para / VT] »*VT pri*« sets the nominal primary voltage Vn. Note that this is always the phase-to-phase voltage (independent of the connection type).

- [Field Para / VT] »*VT sec*« sets the nominal secondary voltage Vn. Note that this is always the phase-to-phase voltage V LL (independent of the connection type).

Note that Synchrocheck is a protection module of its own; if you want to use it you have to activate it in the project settings ([Device planning] »*Sync . Mode*« = "use"); more information about the Synchrocheck: ⮑▷ "5.2.10 Synchrocheck Settings".

- [Field Para / CT] »*CT pri*« sets the nominal current on the primary side of the current transformers.

- [Field Para / CT] »*CT sec*« sets the nominal current on the secondary side of the current transformers.

For protection devices with two CT inputs (e. g. generator or transformer protection devices) the settings have to be made for all inputs, of course.

For protection devices with CT **and** VT inputs, the menu [Field Para / Direction] features settings related to direction determination, for example:

- [Field Para / Direction] »*Phase MTA*« sets the maximum torque angle (angle between phase current and reference voltage in case of a short circuit).

- [Field Para / Direction] »*IG calc dir ctrl*«, or »*IG meas dir ctrl*«: These options are used as operating quantities for direction detection.

- [Field Para / Direction] »*Ground MTA*« sets the neutral point treatment (ground maximum torque angle, i. e. angle between chosen operating quantity and chosen reference quantity in case of a ground fault).

    ○ isolated grid, sin(-90°): »*Ground MTA*« = 180°

    ○ compensated grid, cos(180°): »*Ground MTA*« = 270°

    ○ solidly earthed: »*Ground MTA*« = 170°

    ○ impedance earthed: »*Ground MTA*« = 110°

5.2.8 Blocking Parameters

It is an important principle that every protection module can be separately blocked. There are usually the following blocking parameters part of every protection module:

- *»ExBlo1«*, *»ExBlo2«*: These are setting parameters to which a binary signal can be assigned. The complete protection module is blocked if any of the assigned signals becomes true ("active").

  ⇒ There is no LED indication of the blocking. The protection module does not issue a trip, there is no fault recording, etc.

- *»ExBlo TripCmd«*: This is a setting parameter to which a binary signal can be assigned. The protection module remains active if the assigned signal becomes true, only the trip command is blocked.

  ⇒ There is an LED indication of the blocking, the fault recording works o.k., etc. But there is no trip command.

- *»Blo TripCmd«*: This parameter is simply set to "active" or "inactive", no digital signals are assigned. If it is set to "active" then the trip command is blocked, but the protection module remains active.

  ⇒ There is an LED indication of the blocking, the fault recording works o.k., etc. But there is no trip command.

However, all these blockings can be functional only if the blocking functionality has been explicitly allowed for the particular protection module. This is done by the setting *»ExBlo Fc«* = "active". If it is set to "inactive" then all blockings are ignored for this protection module, i. e. the module stays operational all the time.

5.2.9   Protection Parameters

Protection settings can be either "Global Parameters" (within the menu branch [Protection Para / Global Prot Para]), or "Setting Group Parameters" (within the four menu branches [Protection Para / Set 1], ..., [Protection Para / Set 4]).

> **NOTICE!**
>
> ❗ By using Adaptive Parameter Sets you can react to special situations with great flexibility, because Adaptive Parameter Sets do not affect all protection functions at once, but only one particular protection function. For more information, see ⇨ "4 Adaptive Parameter Sets".

The Global Parameters are essentially the settings for blocking protection modules (see also above). Note, however, that it is not sufficient to assign a signal to e. g. *»ExBlo1«*. It is also necessary to enable the blocking feature (for every module that shall use it). This enabling setting is not a Global Parameter, but a Setting Group Parameter.

The Setting Group Parameters actually specify the behavior of all protection modules. Every Setting Group Parameter exists in every parameter set, i. e. four times. The parameter [Protection Para / PSet-Switch] *»PSet-Switch«* defines which parameter set the device uses. Since switching to another parameter set makes all protection function use another set of setting values you can react very flexibly to different situations that your application might assume.

The *»PSet-Switch«* parameter can be either set explicitly to any of the parameter sets "PS1", ..., "PS4", or it can be set to "PSS via Inp fct" (switching triggered by digital input signals, that have been assigned to [Protection Para / PSet-Switch] *»PS1: activated by«*, ..., *»PS4: activated by«*), or it can be set to "PSS via Scada" (switching triggered by SCADA).

The already mentioned parameter [Protection Para / Set x / I-Prot / I[1]] *»ExBlo Fc«* is one example for a Setting Group Parameter: It enables blocking of the overcurrent protection module *I[1]*.

Since this parameter is part of the overcurrent protection module *I[1]*, we often denote it as *»I[1] . ExBlo Fc«*, instead of always writing down the full menu path. And the functionality of this parameter is to enable blocking of *I[1]*. **Only if** this parameter (in the currently active parameter set) has the value "active" **and** the digital signal assigned to *»I[1] . ExBlo1«* (or the one assigned to *»I[1] . ExBlo2«*) is "active" then the overcurrent protection stage *I[1]* gets blocked.

5.2.10 Synchrocheck Settings

For proper operation of the Synchrocheck module, settings have to be made in three different menu branches:

- In [Device planning], make sure that *»Sync . Mode«* is set to "use".

- In [Protection Para / Global Prot Para / Intercon-Prot / Sync], there are several settings to be checked. In particular, assign a close request signal to *»Sync . CBCloseInitiate«*, for example the signal "QA1 . Sync ON request" (with "QA1" being only an example, the switchgear designation can be defined using the *Page Editor* application, see ⤷ "3.11 Single-Line Diagrams").

- In [Protection Para / Set 1 / Intercon-Prot / Sync / Mode / Times], check the time-related parameters, then select the synchronization mode:

  - *»Sync . SyncMode«* = „System2System" – synchro-check between two systems, stand-alone, no breaker info needed, or

  - *»Sync . SyncMode«* = „Generator2System" – synchronizing a generator to a system, breaker close initiate needed.

- In [Protection Para / Set 1 / Intercon-Prot / Sync / DeadLiveVLevels], check the voltage thresholds that are used as synchronization criteria. In the same way, check the settings in [Protection Para / Set 1 / Intercon-Prot / Sync / Conditions]. Finally, in [Protection Para / Set 1 / Intercon-Prot / Sync / Override], specify whether overriding shall be "active" or "inactive".

- In [Control / SG / QA1 / Synchron Switchg], set *»QA1 . Synchronism«* to "Sync . Ready to Close", so that the switchgear "QA1" gets a "closing allowed" signal from the Synchrocheck module.

5.2.11 Trip Manager and Switchgear Configuration 1

Enter the menu [Control / SG / Qxx / Trip Manager] for every switchgear device "Qxx" that is available for your protection device. (Remark: The designations "Qxx" depend on the settings that you have made in the single-line, see ⤷ "3.11 Single-Line Diagrams".)

Set the parameters for latching, the acknowledgment signal (if *»Latched«* is set to "active") and all the other settings that are relevant for your application. In particular, assign the trip commands of the required protection functions to any of the parameters *»Off Cmd1«*, *»Off Cmd2«*, ...

This way you specify all the trip commands that shall lead to a trip of the circuit breaker "Qxx".

Enter the menu for the binary output (i. e. the output relay) that shall be used with the circuit breaker "Qxx" and assign the trip command »Qxx . TripCmd« to the respective output relay. This is depending on your hardware configuration, of course; the setting might be, for example: [Device Para / Binary Outputs / BO Slot X2 / BO 1] »Assignment 1« = "Qxx . TripCmd"

The trip command becomes active, in the sense that it triggers an output relay. This is absolutely essential is any protection function shall open a circuit breaker.

Remark: For information about trip commands, see also ⇨ "4 Trip Commands". For information about binary outputs, see also ⇨ "5.2.5 Output Relays (Binary Outputs)". For detailed information about anything, see the Technical Manual.

5.2.12 Switchgear Configuration 2

The single-line diagram (see ⇨ "3.9 "CTRL" key – Control Switchgear Devices", ⇨ "4 Trip Commands", ⇨ "3.11 Single-Line Diagrams") shows the switchgear devices and their positions in a graphical manner: Any change of the position is reflected by a change of the corresponding symbol of the switchgear. This, however, is only possible if the position of each switchgear is reported to the protection device by means of an auxiliary contact. The protection device has to "know" which digital input (⇨ "5.2.4 Digital Inputs") is related to which switchgear device.

> ⓘ Note that the designation of every switchgear device is also defined in the single-line, see ⇨ "3.11 Single-Line Diagrams". Not only does the graphical representation depend on this setting, but also all the menu items related to the switchgear are renamed accordingly.
>
> This means that instead of the firmware-based menu items [SG[1]], [SG[2]], … the protection device shows the switchgear names from the single-line, e. g. [QA1], [QA2], …
>
> For the examples throughout this document, we use something like "Qxx" as the switchgear name.

[1.] Hardware (wiring) work:

At first the switchgear positioning indicators have to be connected to the digital inputs of the protection device.

For detection of their positions all switchgear devices feature Aux contacts ("Aux ON" and "Aux OFF").

In any case, the "Aux ON" **must** be wired.

The "Aux OFF" contact is strongly recommended to be wired, too, because otherwise, it would not be possible to detect intermediate and disturbed positions.

This results in an assignment of position indicators to the connected digital inputs, which is then configured in the settings of the protection device.

[2.] Configuration work:

For every switchgear device "Qx", enter the menu branch [Control / SG / Qx / Pos Indicatrs Wirng] and set the parameters »Aux ON« and »Aux OFF« to the connected digital inputs.

(Remark: The designations "Qx" depend on the settings that you have made in the single-line, see ⮩ "3.11 Single-Line Diagrams".)

For example, if the digital input number 1 of slot number 1 receives an "active" signal as soon as the switchgear is in "ON" position, then set »*Aux ON*« = "DI Slot X1 . DI 1".

And if the digital input number 2 of slot number 1 receives an "active" signal as soon as the switchgear is in "OFF" position, then set »*Aux OFF*« = "DI Slot X1 . DI 2".

These inputs "Aux ON" and "Aux OFF" are monitored also with respect to time: If it takes a switchgear device more time to operate than is acceptable (or if the "Aux ON/OFF" signals contradict each other) then the protection device assumes that it is disturbed. (This is signaled via the output signal [Operation / Status Display / Control / Qx] »Pos Disturb«.) Of course, the protection device needs to know for each switchgear devices what the acceptable times are.

For every switchgear device "Qx", enter the menu branch [Control / SG / Qx / General Settings] and set the time »*t-Move ON*« to move to the ON position, and the time »*t-Move OFF*« to move to the OFF position.

Have a look at the other settings in the menu branch [Control / SG / Qx / General Settings], too. Depending on the switchgear type it can be necessary to set these as well.

HighPROTEC

Index

We appreciate your comments about the content of our publications.

Send comments to: kemp.doc@woodward.com

Please reference publication DOK-QS-HPT-2

https://wss.woodward.com/manuals/Library/Protection_Relays/HighPROTEC/Quick_Start_Guide