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3VA Molded Case Circuit Breakers

Totally Integrated Power – SENTRON

Communication Manual

Edition July/2014

Answers for infrastructure and cities.

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Protection devices
3VA molded case circuit breaker communication

System Manual

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Legal information

Warning notice system

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Order number: 3ZW1012-0VA20-0BC0
℗ 09/2014 Subject to change

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Introduction

1

Users of power supply systems for industrial applications, infrastructure and buildings are setting ever higher standards of the flexibility, transparency and communication capability offered by these systems. Intelligent switching devices are networked via communication systems and play an important role in industrial production and building management.

The standards expected of molded case circuit breakers in terms of their electrical and mechanical properties, their adaptability and cost effectiveness coupled with the ongoing trends in favor of rationalization and automation have greatly accelerated advances in the design of molded case circuit breakers over recent years.

In order to allow continuous monitoring of installations and achieve optimum metering of power supply and consumption with efficient process integration, it is important to consider two factors, i.e. the design of the required measuring points and early planning of the power distribution components which need to be monitored.

The following information is important to this process:

- Structure of the power distribution system
- Components of the power supply system
- Position of components in the power distribution system
- Allocation of power demands according to planned usage scenarios

For different levels and power distribution components, it is important to take into account the measurements and signals/feedback required during operation as well as various other requirements with respect to:

- Critical areas of the process
- Availability of loads
- Billing data (plausibility, contract monitoring, cost center management)
- Transparency for operation (measured variables, status)
- Capacity utilization (current metering)

Content and target readers of this manual

This communication manual will help you to configure your installation in a systematic way and enable you to monitor it effectively. Example applications are used in order to explain proper usage of communication-capable 3VA molded case circuit breakers.

The manual is aimed at the following target readers:

- Persons involved in installation of the plant, such as
  - configuring engineers
  - technologists
  - application programmers
- (System) commissioning engineers
- Service and maintenance personnel
- Plant operators including users of power monitoring software such as powermanager

Please note that only information technology aspects of 3VA molded case circuit breakers are described in this manual.
For information pertaining to electrical engineering, safety features and other details, please refer to the following documents:

- Manual "3VA molded case circuit breakers"
  http://support.automation.siemens.com/WW/view/de/90318775/0/en
- Manual "7KM PAC PROFIBUS DP, 7KM PAC Switched Ethernet PROFINET communication and expansion modules
  http://support.automation.siemens.com/WW/view/en/26504372
- Operating instructions for the following equipment:
  - COM800/COM100 breaker data server
    http://support.automation.siemens.com/WW/view/en/80601362
  - 3VA molded case circuit breakers with all ETUs
    http://support.automation.siemens.com/WW/view/en/80595722
  - EFB300 external function box
    http://support.automation.siemens.com/WW/view/en/80600828
  - COM060 communication module
    http://support.automation.siemens.com/WW/view/en/80600984
  - RCD820 residual current devices
    http://support.automation.siemens.com/WW/view/en/91495016
  - Draw-out socket http://support.automation.siemens.com/WW/view/en/80597324
  - DSP800 display
  - TD500 test device
    http://support.automation.siemens.com/WW/view/en/80600753
- Operating instructions for 7KM PAC PROFIBUS DP, 7KM PAC Switched Ethernet PROFINET communication and expansion modules

- Documentation "Getting Started" with instructions on how to use the power management software powermanager
  http://support.automation.siemens.com/WW/view/en/55336527
- Online help of powerconfig

The documents are available under the link to the 3VA documentation
http://support.automation.siemens.com/WW/view/en/54137334/130000.

Structure of the manual

The manual is divided into the following chapters:

- Chapter 2 - System description (Page 15)

  This chapter presents an overview of the components of the communication system of 3VA molded case circuit breakers.
- Chapter 3 - Functions (Page 33)

  This chapter explains the functionality and data provided by 3VA molded case circuit breakers.
- Chapter 4 - Example applications (Page 79)

  This chapter presents possible applications for 3VA molded case circuit breakers.
- Chapter 5 - Connection, commissioning, operation (Page 89)

  This chapter describes how individual components can be used and configured to operate with other components.
- Chapter 6 - Addressing via Modbus TCP (Page 185)

  The methods by which 3VA molded case circuit breakers are addressed via COM800 / COM100 breaker data servers using Modbus TCP tools are explained in this chapter.
- Chapter 7 - Commissioning and service software: powerconfig (Page 187)

  This chapter provides instructions for working with powerconfig.
- Chapter 8 - Servicing and maintenance (Page 203)

  Information on how to update the firmware, replace communication-capable 3VA molded case circuit breakers and handle exceptional situations is provided in this chapter.

Navigation around the manual

The following guides to accessing information are provided:

- Table of contents
- Section "Structure of the manual"
- Index

See also

http://support.automation.siemens.com/WW/view/en/54137334/133300

General information

When using communication-capable 3VA molded case circuit breakers, please observe the following information:

Safety-relevant information

Information supplied by the 3VA molded case circuit breaker must not be used for safety-related purposes.
Safety-relevant information must be acquired directly at the 3VA molded case circuit breaker. For example, testing for safe isolation from the supply must be conducted directly at the 3VA molded case circuit breaker.

IT security

For its portfolio of automation and drive products, Siemens offers IT security mechanisms to support secure operation of the installation/machine. Siemens is continually developing its products in order to enhance their IT security. We therefore recommend that you regularly check our online support service for product updates and make sure that you are using the latest version releases. For further information, go to: http://support.automation.siemens.com. On this website, you can register for subscription to a product-specific newsletter.

In order to ensure secure operation of an installation/machine, it is essential to integrate the automation components into a state-of-the-art, holistic IT security concept for the entire installation/machine. For further information, go to: http://www.siemens.com/industrialsecurity.

Non-Siemens products used in the installation must also be taken into account.

Technical specifications

The technical specifications stated in this manual present an overview of different components. The obligatory features of each individual component are published in PRODIS http://support.automation.siemens.com.

System description

2

Communication-capable 3VA molded case circuit breakers are presented in this chapter. You will find out about the components that 3VA molded case circuit breakers require in order to communicate, how these components are interconnected and what properties they have.

The advantages of optimum integration of 3VA molded case circuit breakers into a software or communication system are as follows:

- Acquisition of breaker status
- Remote parameterization
- Monitoring of capacity utilization
- Acquisition of consumption and performance data
- Local signaling via the EFB300 external function box
- Local visualization of 3VA molded case circuit breakers

A 3VA molded case circuit breaker can utilize all these functions only if a COM060 communication module is installed in the 3VA breaker and connected to a COM800 breaker data server for up to eight breakers or a COM100 for one breaker.

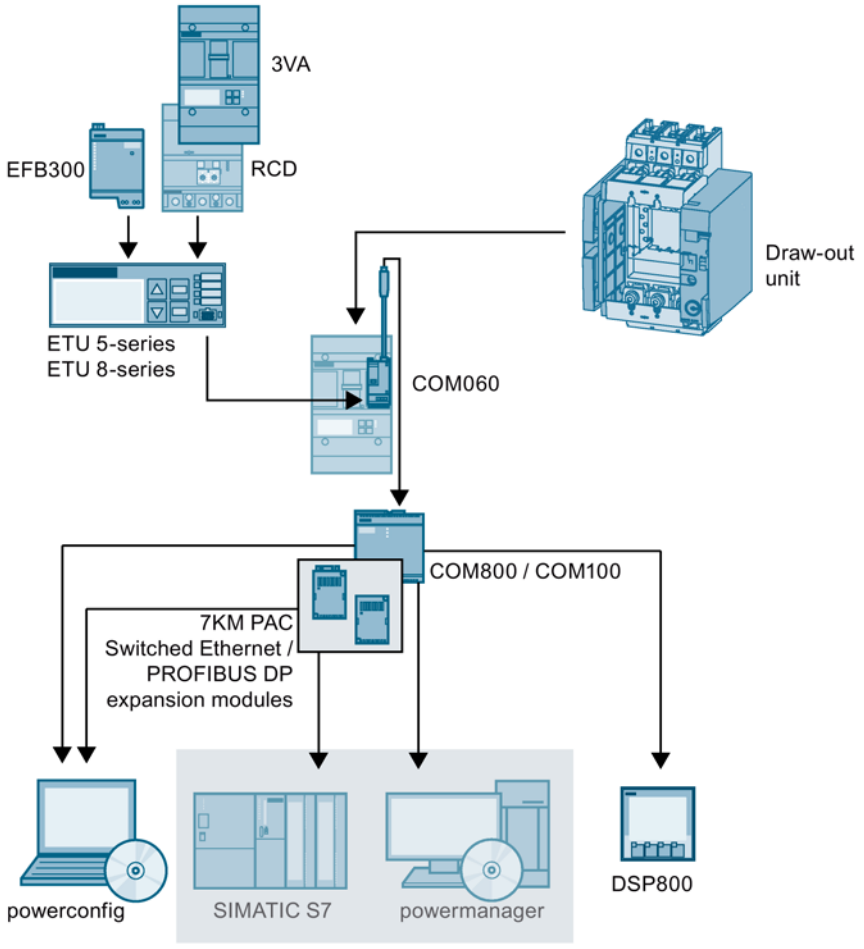
Communication capability of the 3VA molded case circuit breaker

The following components combine with the 3VA molded case circuit breaker to create a communication system:

- Electronic trip unit (ETU)
- COM800 / COM100 breaker data server
- COM060 communication module
- Draw-out unit with communication interface
- RCD820 residual current device (RCD)
- EFB300 external function box (EFB)
- DSP800 display
- powerconfig

The diagram below presents the components which render a 3VA molded case circuit breaker capable of communication.

Communication system architecture for 3VA



The central components of communication-capable 3VA molded case circuit breakers are the electronic trip units ETU 5-series or 8-series. The protection functions afforded by ETUs are described in the 3VA manual.

In this communication manual, these components are referred to merely as data suppliers or command receivers. The references at
http://support.automation.siemens.com/WW/view/en/90318775
will direct you to more detailed information about individual components. Typical communication partners are:

- SIMATIC S7
- powermanager

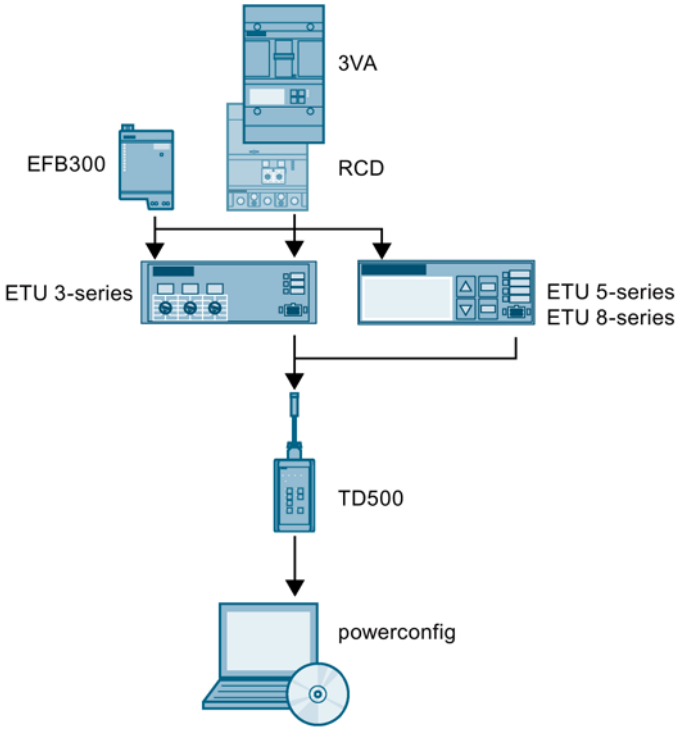
While reference is frequently made to these systems, they are not an integral part of the 3VA communication system.

2.1 Access to the 3VA molded case circuit breaker via TD500

The following devices can be used to test and commission 3VA molded case circuit breakers and to archive their settings:

- Electronic trip units (ETU)
- RCD820 residual current device (RCD)
- EFB300 external function box (EFB)
- TD500 test device
- powerconfig

The diagram below shows the 3VA molded case circuit breaker components required for this purpose.



2.2 COM800 / COM100 breaker data server

The COM800/COM100 breaker data servers can be used to integrate communication-capable 3VA molded case circuit breakers, i.e. those with ETU 5-series and 8-series, into communication networks of various types.

- The COM800 breaker data server supports a maximum of eight 3VA molded case circuit breakers
- The COM100 breaker data server supports one 3VA molded case circuit breaker

3VA molded case circuit breakers can be connected to higher-level communication networks by the following methods:

- Direct Ethernet connection to Modbus TCP
- 7KM PAC PROFIBUS DP expansion module to PROFIBUS DPV1 / V2
- 7KM PAC Switched Ethernet PROFINET expansion module to PROFINET IO and PROFIenergy

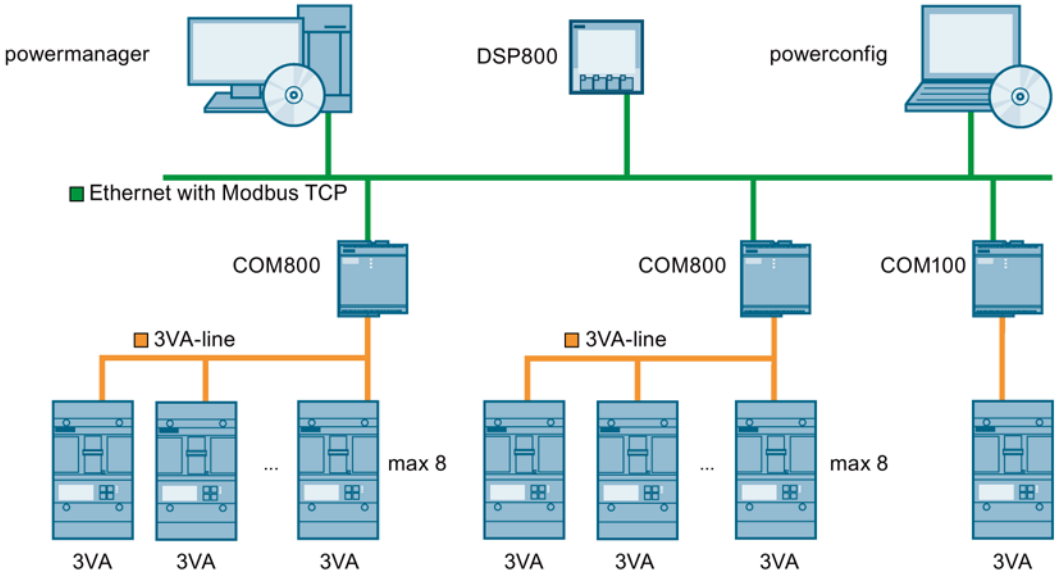
3VA molded case circuit breakers are typically linked to the power monitoring software powermanager or the automation concept TIA (Totally Integrated Automation) via a communication network.

3VA molded case circuit breakers can also be connected to the commissioning and service software powerconfig.

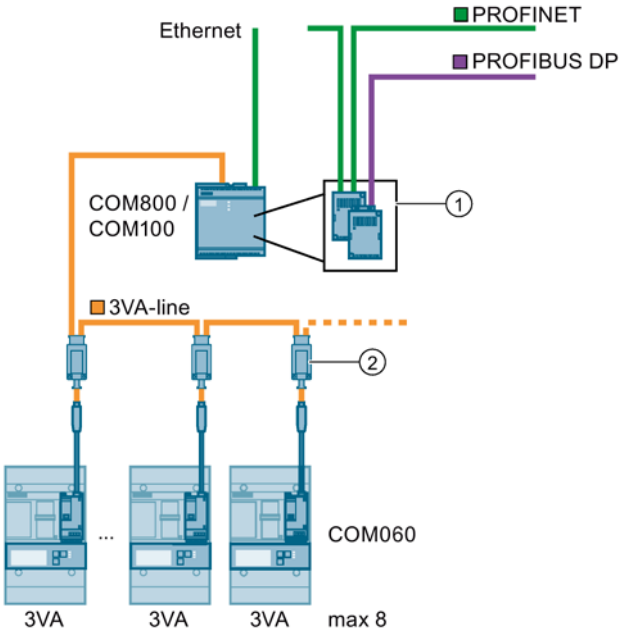
The 3VA molded case circuit breakers can also be linked to many non-Siemens systems through such communication networks.

Furthermore, local visualization on the DSP800 display can be implemented with the COM800/COM100 breaker data server.

Example: Configuration of the COM800/COM100 breaker data server with a 3VA-line of three 3VA molded case circuit breakers and with connection to the power monitoring software powermanager (left), to the DSP800 (center) and to the commissioning and service software powerconfig (right).



To establish a communication link, the COM800 or COM100 breaker data server is connected via the 3VA-line to the COM060 communication module of the relevant circuit breaker.



① 7KM PAC expansion modules
② T-connector

From a 24 V DC supply, the COM800/COM100 breaker data server supplies power to all the connected 3VA molded case circuit breakers and the following components:

- COM060 communication module
- ETUs 5-series and 8-series
- Position signaling switch for draw-out socket
- 7KM PAC PROFIBUS DP expansion module
- 7KM PAC Switched Ethernet PROFINET expansion module
- Direct Ethernet connection to Modbus TCP

See also

DSP800 display (Page 23)

Connection, commissioning, operation (Page 89)

2.2.1 Area of application

The COM800/COM100 breaker data server can be used to link 3VA molded case circuit breakers to:

- Power monitoring software powermanager
- Industrial automation systems
- Building automation systems
- Parameterization and breaker condition evaluation via communication link
- Maintenance systems

2.2.2 Features

Working in conjunction with the connected 3VA molded case circuit breakers with ETUs 5-series and 8-series, the COM800/COM100 breaker data server supplies the following information about the power distribution system:

- Condition of the 3VA molded case circuit breaker
- Tripping history with time stamp, cause of trip and number of trip events for breakers with ETUs 5-series and 8-series
- Minimum and maximum values of measured variables
- Limit-value monitoring for measured variables in the 3VA molded case circuit breakers
- Load curves with power demands, e.g. 15-minute demands
- Energy values such as active energy (kWh) and reactive energy (kvar)
- Power supply to connected 3VA molded case circuit breakers

2.3 Communication with ETUs

Electronic trip units allow detailed setting of protection parameters from a central location. They record measured variables and maintenance information in order to support power and installation monitoring.

The electronic trip units (ETU) provide the following protection functions:

- Overload protection L ("L" = long-time delay)
- Short-circuit protection S ("S" = short-time delay) for time-selective response in case of a short-circuit
- Instantaneous short-circuit release I ("I" = Instantaneous)
- Protection of the neutral conductor against overload and short-circuit ("N" = neutral)
- Protection against residual currents to ground ("G" = Ground fault)

2.3.1 Area of application

Communication-capable ETUs are deployed for any application which requires the following functions:

- Diverse protection functions
- Fine adjustment of protection functions
- Metering functions
- Communication of the actual condition and history of the molded case circuit breaker

2.3.2 Features

Electronic trip units offer the following features:

- Display of absolute setting values, e.g. amperes, to allow detailed, flexible but simple setting of protection parameters
- Complete measurement of the current in the phases L1, L2 and L3, with N and currents to ground optional
- Integrated, precise Rogowski coils in all ETU variants
- Measurement of current with an accuracy of 1% at 0.2 to 1.2 I_n with ETUs 8-series
- Ground fault protection by precise computation of residual currents through vector sum calculation of phase and neutral conductor currents
- Evaluation of the current measurement values and constant comparison with the tripping limits
- Metering function, measurement of current and voltage, with calculation of power and energy values in the ETUs 8-series

2.4 EFB300 external function box

The EFB300 external function box provides digital outputs and inputs.

The functions of these inputs and outputs can be programmed with the commissioning and service software powerconfig.

2.4.1 Area of application

3VA molded case circuit breakers equipped with the electronic trip unit systems ETU 3-series, ETU 5-series and ETU 8-series can be optionally upgraded with an EFB300 external function box.

The EFB300 external function box is used to output a wide range of electrical signals that indicate various states of the 3VA molded case circuit breaker. These signals can be connected to transmitters, e.g. lights, adjacent contact blocks or to signal acquisition devices of control systems.

The EFB300 external function box can be used in conjunction with ETUs. It can be installed together with the 3VA molded case circuit breaker in the control cabinet or accessories cabinet.

2.4.2 Features

Below is a list of the possible events that can be selected by parameterization for output as electrical signals via the digital outputs of the EFB300:

- All trip causes differentiated according to LSING, RCD
- Overload alarms AL1 and AL2
- Pre-trip alarm from overload protection system
- Temperature alarm from ETU
- Output of an energy pulse (S0 signal) (with ETUs 8-series only)
- Load shedding
- Load acceptance
- Zone-selective interlocking ZSI

The digital input can be used to

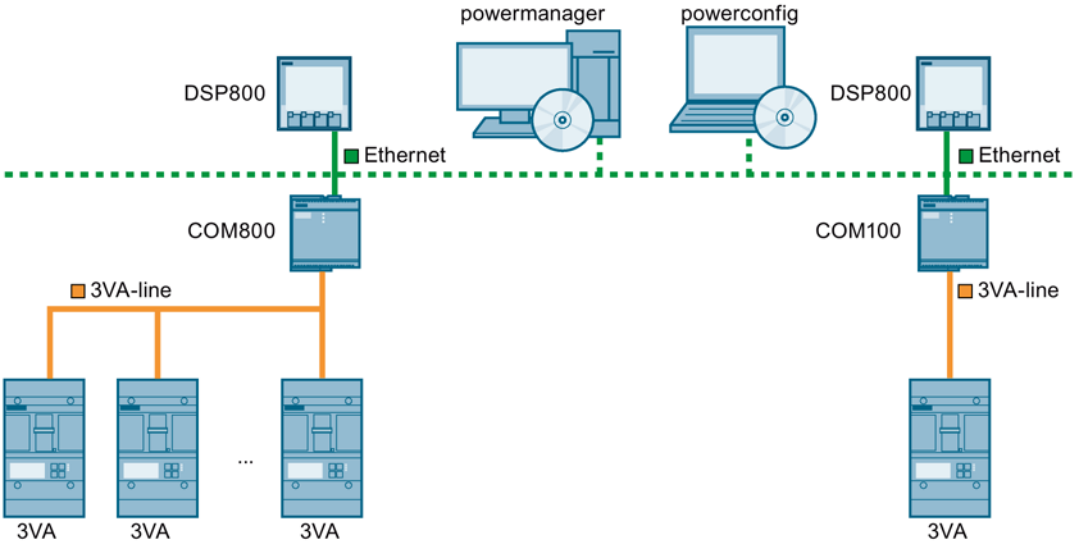
- acknowledge output signals and reset them
- acquire an electrical signal from the environment and use it for communication purposes

The EFB300 external function box is supplied with 24 V DC and acts as a power supply for the connected ETU. This allows the ETU to remain operational even when a 3VA molded case circuit breaker has tripped.

2.5 DSP800 display

Visualization directly at the switchboard

The COM800/COM100 breaker data server can be combined with the DSP800 display to visualize switching states, measured variables and the parameter settings of the connected 3VA molded case circuit breakers. Information is visualized using preprogrammed menus and does not require software development. DSP800 display (Page 129)



The DSP800 display is used to show the following variables of 3VA molded case circuit breakers:

- Measured variables such as current, voltage and energy values
- Circuit breaker states
- Settings of circuit breaker protection parameters

2.5.1 Area of application

The DSP800 display is deployed for any application which requires local visualization (i.e. directly at the switchboard) without additional software support.

The data of switchboards that are difficult to access can be read off safely from this display.

The DSP800 display can communicate directly via Ethernet or IP communication with the COM800/COM100 breaker data server. The DSP800 can function as a display while communicating simultaneously with the COM800/COM100 breaker data server.

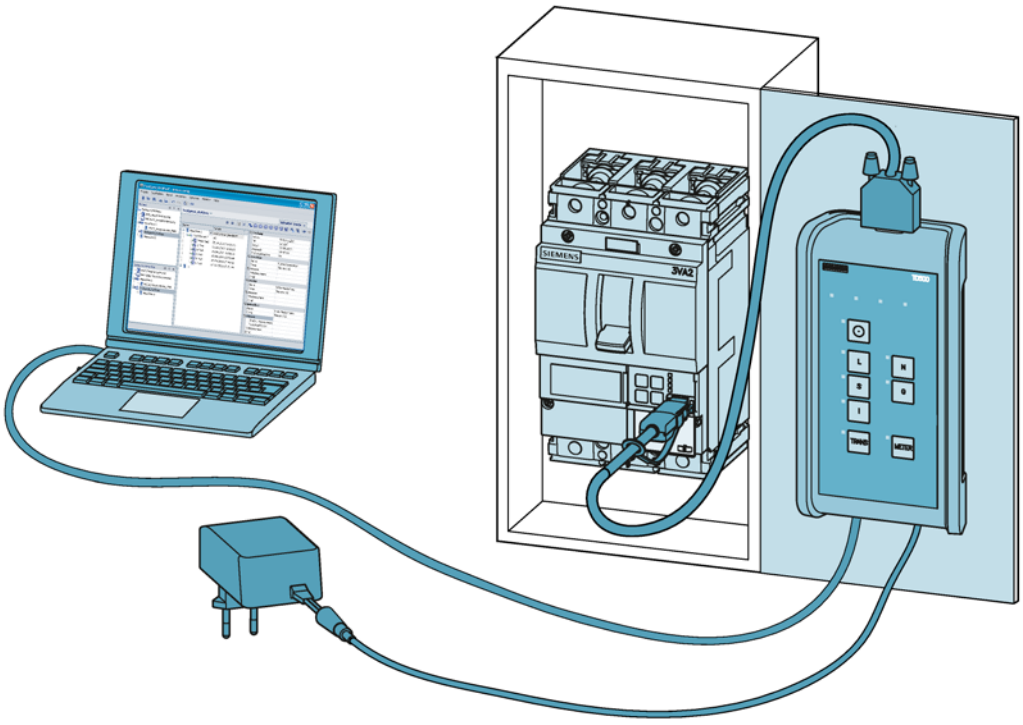
2.5.2 Features

The DSP800 display is used to monitor up to eight 3VA molded case circuit breakers with ETUs 5-series and 8-series and has the following features:

- Display
  - Status of 3VA molded case circuit breaker
  - Current values
  - Voltage, power and energy variables (with ETUs 8-series)
  - Protection parameter settings
- Backlit LCD (W x H = 92 x 92 mm) that is easy to read thanks to
  - high resolution
  - inverse display
- Simple installation
  - door cutout sized 92 x 92 mm
  - secured by clips
  - easy to network via RJ45 ports and Ethernet patch cable

2.6 TD500 test device

Using the mobile TD500 test device during the commissioning process, you can check that the system components connected to your 3VA molded case circuit breaker are functioning properly and correctly connected. The system behaves as it would in normal productive operation. The molded case circuit breaker trips when the set delay times expire and signals all alarms and tripped signals from connected components.



The TD500 test device is connected to the PC via a USB cable and is powered by the 24 V power pack (USB cable and power pack are supplied with the unit). A cable with plug-in connection supplied with the unit allows the test device to function as an interface to the ETU of the 3VA molded case circuit breaker. The test results can be evaluated, archived and stored as a file in ".csv" format with the commissioning and service software powerconfig. The setting parameters of the 3VA molded case circuit breaker can also be read out and changed.

2.6.1 Area of application

The TD500 test device can be deployed in conjunction with ETUs 3-series, 5-series and 8-series.

2.6.2 Features

The device tests all tripping functions of the 3VA molded case circuit breaker

- L = Overload protection
- S = Short-time delayed short-circuit protection
- I = Instantaneous short-circuit protection
- N = Neutral conductor protection
- G = Ground fault protection
- TRANS = Testing of energy transformers that supply ETUs
- METER = Testing of current metering function

The test device can also be used in conjunction with the commissioning and service software powerconfig to document the circuit breaker. Key data are as follows:

- Device type, e.g. article and serial number
- Plant and location identifiers
- Equipment used
- Parameter settings, particularly for ETUs 3-series
- Tests performed and test results

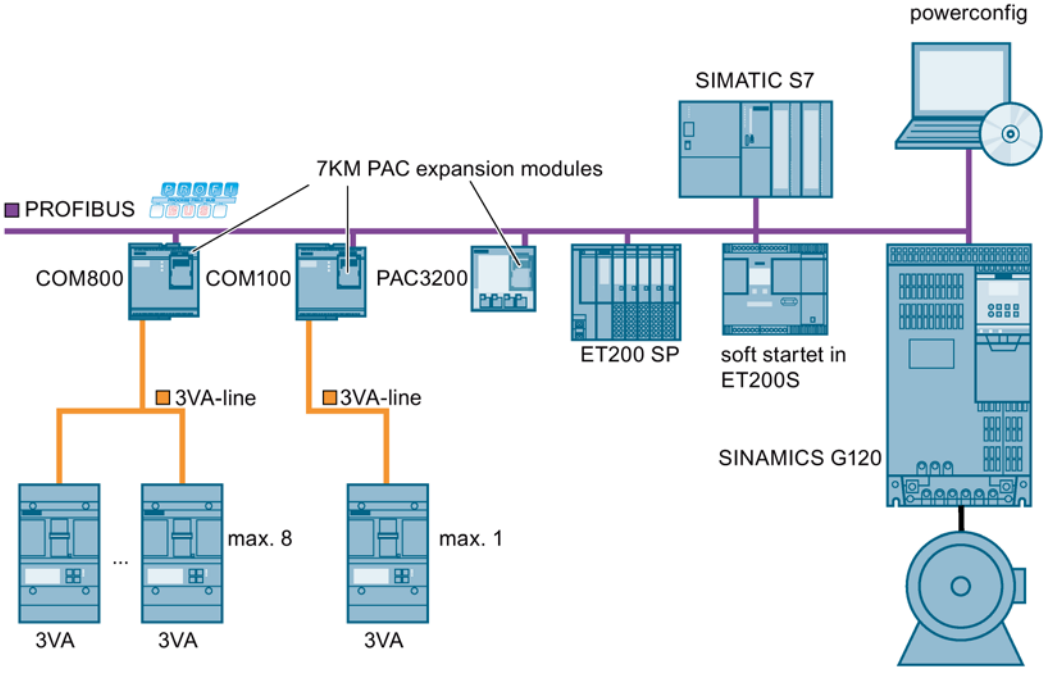
The TD500 test device is supplied with 24 V DC and acts as a power supply for the connected ETU. This allows the ETU to remain operational even when a 3VA molded case circuit breaker has tripped.

2.7 7KM PAC PROFIBUS DP expansion module

3VA molded case circuit breakers connected to a COM800/COM100 breaker data server and equipped with a 7KM PAC PROFIBUS DP expansion module can be integrated into TIA (Totally Integrated Automation) via PROFIBUS DP.

The 3VA molded case circuit breaker supplies the status and electrical measured variables for the automation system, the control-based power management system powerrate as well as I&C systems like the SIMATIC WinCC SCADA system.

Using the 7KM PAC PROFIBUS DP expansion module and the commissioning and service software powerconfig, it is possible to parameterize and diagnose 3VA molded case circuit breakers via PROFIBUS DP.



The 7KM PAC PROFIBUS DP expansion module is used to connect COM800/COM100 breaker data servers, and the 3VA molded case circuit breakers connected to them, to PROFIBUS DPV1.

You can find further information about the 7KM PAC PROFIBUS DP expansion module at: http://www.profibus.com

2.7.1 Area of application

The 7KM PAC PROFIBUS DP expansion module is primarily deployed in industrial automation systems in conjunction with SIMATIC or SIMOTION controllers and in drive systems like SINAMICS.

2.7.2 Features

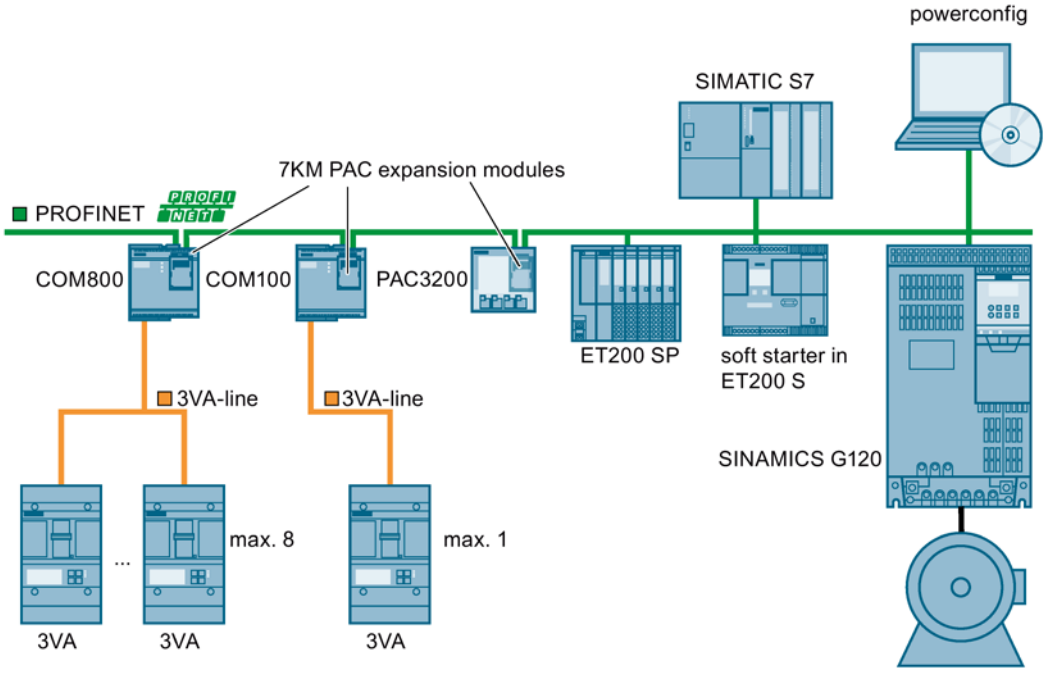
The 7KM PAC PROFIBUS DP expansion module offers the following features:

- Communication based on the PROFIBUS DP master-slave principle:
  The 7KM PAC PROFIBUS DP expansion module provides the status and measured variables of the 3VA molded case circuit breaker for the PROFIBUS DP master.
- The 7KM PAC PROFIBUS DP expansion module receives information (e.g. commands) from the PROFIBUS DP master, and transfers this information to the 3VA molded case circuit breaker.
- Function: PROFIBUS DP slave
- Communication with class 1 and class 2 masters
- Cyclic data transfer
- Acyclic data transfer
- Specific GSD file for the 3VA molded case circuit breaker, allowing correct integration of the breaker into the control system
- Automatic detection of the baud rate
- Time synchronization of the COM800/COM100 via PROFIBUS DPV2
- Setting of the PROFIBUS address:
  - With parameterization software
  - Via PROFIBUS, e.g. with TIA portal
- Generation of diagnostic interrupts and process interrupts
- Status display via LED
- Galvanic isolation between the 3VA molded case circuit breaker and PROFIBUS
- No external supply voltage required

2.8 7KM PAC Switched Ethernet PROFINET expansion module

3VA molded case circuit breakers connected to a COM800/COM100 breaker data server and equipped with a 7KM PAC Switched Ethernet PROFINET expansion module can be integrated into TIA (Totally Integrated Automation) via PROFINET.

The 3VA molded case circuit breaker supplies the status and electrical measured variables for the automation system, the control-based power management system powerrate as well as I&C systems like the SIMATIC WinCC SCADA system. The commissioning and service software powerconfig can also be connected to 3VA molded case circuit breakers via this network configuration.



The appropriate components, e.g. of SIMATIC NET, must be used to create the PROFINET network. http://support.automation.siemens.com/WW/view/en/37432205/133200

The 7KM PAC Switched Ethernet PROFINET expansion module is used to connect COM800/COM100 breaker data servers to Switched Ethernet PROFINET via PROFINET IO, PROFIenergy and Modbus TCP.

2.8.1 Area of application

Typical applications for the 7KM PAC Switched Ethernet PROFINET expansion module are as follows:

- Industrial automation systems with exacting real-time requirements, primarily in conjunction with SIMATIC, SIMOTION and drive systems such as SINAMICS
- When a number of COM800/COM100 breaker data servers and 7KM PAC3200 / 7KM PAC4200 modules are installed in one switchboard installation, the network can be implemented in the form of a cable-saving linear structure with the help of the Ethernet switch integrated in the module.

2.8.2 Features

Automation networking

- Integrated Ethernet switch that reduces cabling requirements
- Optimum use of the process image of a controller thanks to the selection of individual basic types
- Simple engineering with SIMATIC TIA Portal or other programming systems thanks to the use of GDSML files
- Integration into time synchronization system
- When the 7KM PAC Switched Ethernet PROFINET expansion module is installed, all 3VA molded case circuit breaker communication functions described above can be utilized. It is then possible to make use of the powermanager and powerconfig software.
- Direct communication with SIMATIC, SIMOTION and SINAMICS via PROFINET IRT thanks to integrated, real-time Ethernet switch
- Measured variables of the 3VA molded case circuit breaker are supplied by the "Common Application Profile" PROFIenergy developed by the PROFINET user organization (PNO).

2.9 powerconfig

The commissioning and service software powerconfig for communication-capable devices belongs to the SENTRON product range.

powerconfig performs the following functions in relation to 3VA molded case circuit breakers:

- Parameterization of ETUs 5-series and 8-series and other 3VA components
- Commissioning of 3VA molded case circuit breakers
- Function-testing of 3VA molded case circuit breakers in conjunction with TD500 test device
- Readout of measured variables such as energy, current, voltage and power from 3VA molded case circuit breakers
- Readout or reset of minimum and maximum values from 3VA molded case circuit breakers
- Statistical analysis of 3VA molded case circuit breakers
- Diagnosis of 3VA molded case circuit breakers
- Archiving of settings in digital form or as a printout
- Firmware updating

The PC on which powerconfig is installed is connected to the 3VA molded case circuit breaker by means of the COM800/COM100 breaker data server (optionally with modules) or the TD500 test device. A TD500 test device is required in order to function-test 3VA molded case circuit breakers.

2.9.1 Area of application

- Simplified, rational parameterization of SENTRON devices
- Parameterization, documentation, operation and monitoring of 3VA, 3WL, 3VL circuit breakers, 7KM PAC3100 / 3200 / 4200 and ATC5300 measuring devices via various communication interfaces
- Monitoring and, when necessary, diagnosis of the low-voltage power distribution switchboard for the purpose of maintenance and servicing

2.9.2 Features

The commissioning and service software powerconfig has the following features:

- Clear presentation of the available parameters including validity testing of the inputs
- Display of the available device statuses and measured variables in standardized views
- Project-oriented storage of device data
- Consistent operation and usability
- Support for various device communication interfaces (e.g. Modbus TCP, PROFIBUS, PROFINET and USB depending on the SENTRON device used)
- Supported languages: English and German
- Readout and storage of device recordings (device-dependent)
- Updating of device firmware and loading of language packs (device-dependent)
- No programming knowledge required for operation

Functions

3

As energy, operating and investment costs steadily increase, it is important for operators to keep track of actual power consumption and the status of the power distribution system. A 3VA molded case circuit breaker will require certain communication functions depending on how it is deployed and on the applications into which it is integrated.

For greater clarity, these communication functions can be assigned to one or several types of application:

1. **Process control**

   Operative part of a production process, building or infrastructure

2. **Power management**

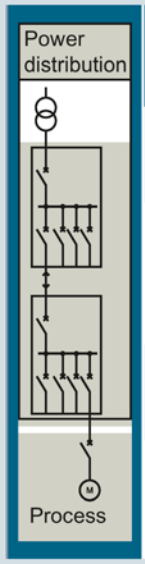
   Acquisition, transparency and control of energy flows in a power distribution system

3. **Operations management**

   Measures to provide and secure the electricity supply in a plant, especially when maintenance or servicing is in progress

4. **Commissioning**

   Measures implemented at a power distribution system, from installation to handover to the operator



Tasks	Life phases			Communication-based functions
	Engineering & installation	Operation	Maintenance	
Commissioning	- Set protection parameters - Document completed tests			- Set protection parameters - Transfer measured values - Control circuit breakers - Monitor states - Record operational events - Log faults - Archive test results - Document settings
Operations management		- Fault management - Service management - Maintenance management	- Optimize settings - Document changes/ modifications - Evaluate causes of tripping - Analyze statistics - Isolate switchgear sections	
Power management		- Make power flows transparent - Allocate costs - Prevent peak loads		
Process control		- Monitor plant utilization - Monitor equipment - Commission or decommission equipment - Record energy costs		

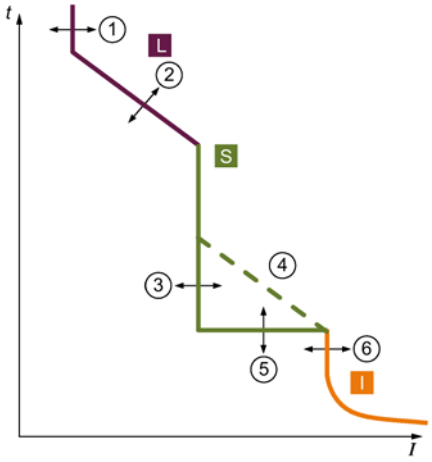
3.1 Parameterizing 3VA molded case circuit breakers

With ETUs 3-series, 5-series and 8-series, protection parameters can be set on the ETU itself. You will find more information in the manual "3VA molded case circuit breakers" http://support.automation.siemens.com/WW/view/de/90318775/0/en.

The primary function of 3VA molded case circuit breakers is to protect against overload, short circuits and ground faults. The tripping characteristics are graphically represented in the current-time diagram.

All protection functions of the trip units work independently of one another.

All information pertaining to the status of the 3VA molded case circuit breaker can be accessed by users when the appropriate software and communication system are available.



① Response threshold of the long-time delayed protection
② Delay of the long-time delayed protection
③ Response threshold of the short-time delayed protection
④ I^2t characteristic ON/OFF of the short-time delayed protection
⑤ Delay of the short-time delayed protection
⑥ Response threshold of the instantaneous protection
L Overload range
S Short-time delayed short-circuit protection
I Instantaneous short-circuit protection

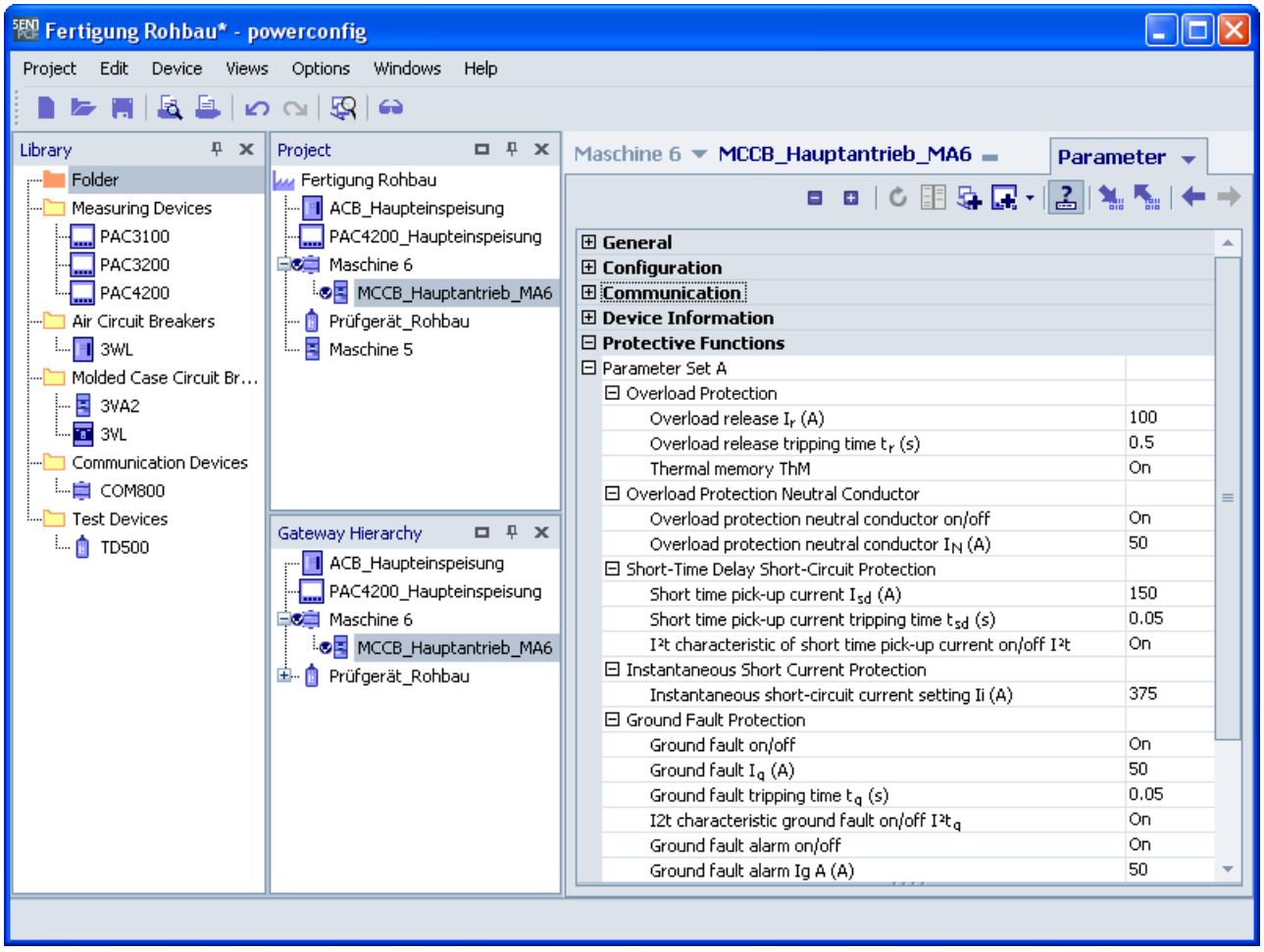
In addition to the protection functions for phases, others are also provided:

- Protection of the neutral conductor
- Protection against residual current
- Protection against overtemperature

The protection parameters of 3VA molded case circuit breakers can be read out via a communication link. Protection parameters can be archived and documented at the end of the commissioning process.

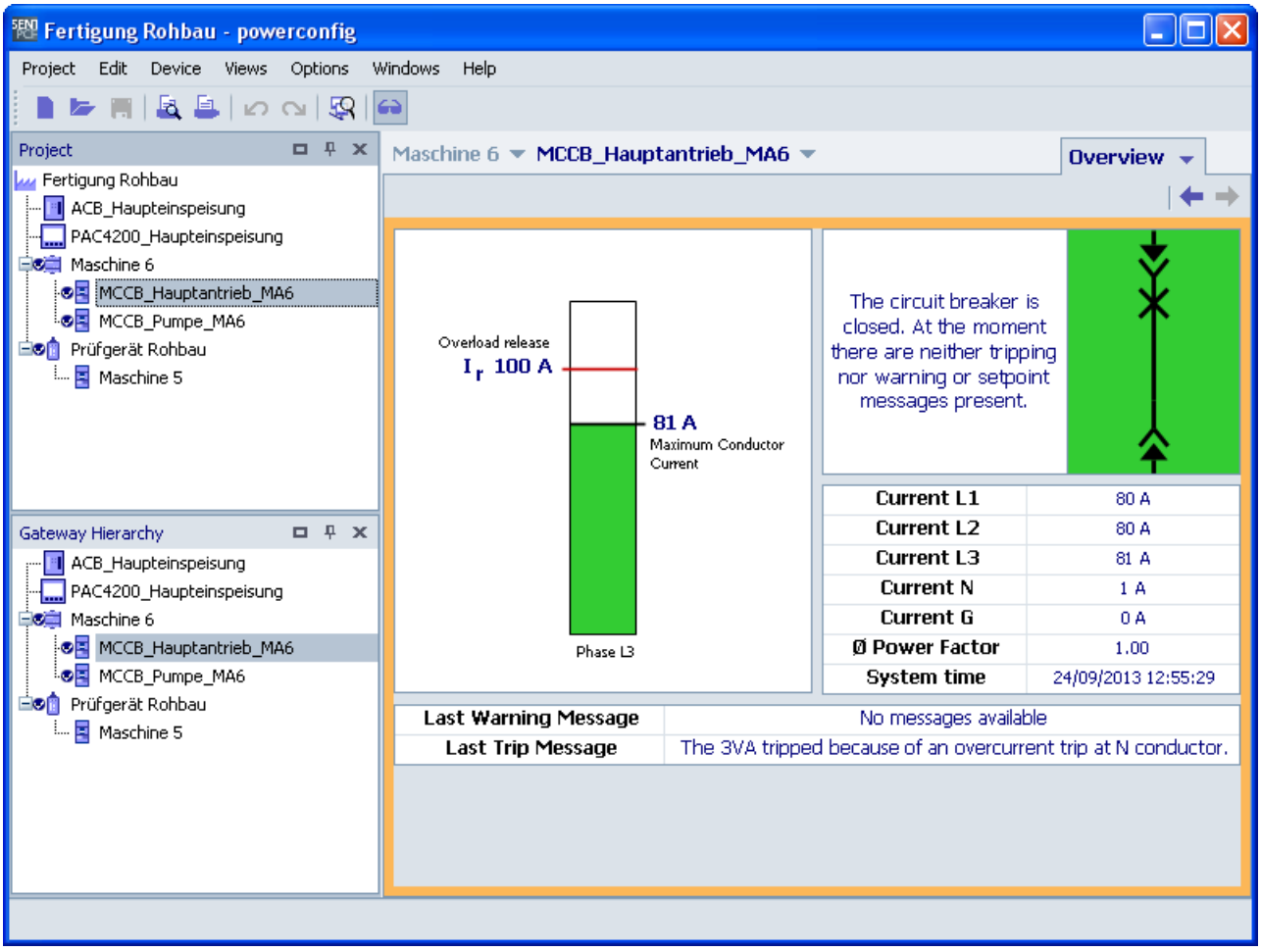
With ETUs 5-series and 8-series, parameters can also be set using the powerconfig software.

The screenshot below shows the setting options in powerconfig http://support.automation.siemens.com/WW/view/en/63452759:



3.2 Displaying the status of the 3VA molded case circuit breaker

The switching state of the 3VA molded case circuit breaker is an important item of information that the circuit breaker supplies. Information about the switching state is required for various purposes, i.e. for process control, power monitoring, operations management and commissioning. The switching state is transmitted via all communication channels and also displayed in powerconfig.



See also

Available database (Page 63)

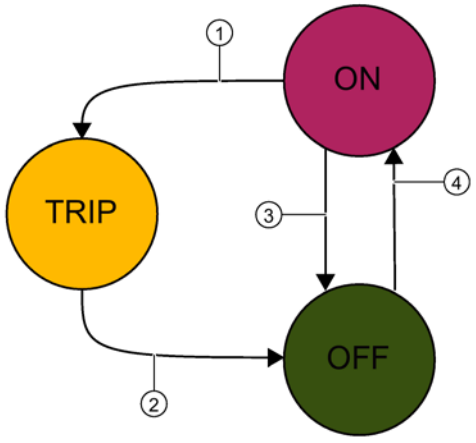
Displaying the status of the 3VA molded case circuit breaker (Page 36)

3.2.1 Switching 3VA molded case circuit breakers

The 3VA molded case circuit breaker can also be switched via a communication link. The diagram below illustrates the possible switching states and the transitions between them.

A 3VA molded case circuit breaker can assume one of three switching states:

- ON: Current can flow
- OFF: Main contacts have been opened by a normal switching operation
- TRIP: Main contacts have been opened by protective trip or test function



①	- Protective trip - Test function - Shunt trip - Undervoltage release	③	- Motor operator - Manual
②	- Motor operator - Manual	④	- Motor operator - Manual

The switching states of 3VA molded case circuit breakers are detected by the COM060 communication module. The switching state information is communicated to the higher-level system or DSP800 via the COM800/COM100 breaker data server and displayed on the DSP800.

3.2.2 Displaying switching state

The breaker status is the most important information about a circuit breaker that is made available by the communication-capable 3VA molded case circuit breaker.

In addition to the three switching states ON / OFF / TRIP , there is further important accompanying information which influences the behavior and the status of the 3VA molded case circuit breaker, such as:

Name	Access	ETU 8-series	ETU 5-series	COM800 / COM100	COM060	EFB300	DO[1]	RCD	Register address
Status of 3VA molded case circuit breaker	R			□	✓		□		0x00D9
Status of circuit breaker profile	R	✓	✓						0x00DA
Protection function status	R	✓	✓						0x00D2
Breaker status and diagnostic data	R	✓	✓	□					0x00CB
Metering function status	R	✓							0x00D5
Alarm status	R	✓	✓						0x0102
Limit violation status	R	✓	✓	□					0x0100
Status of draw-out unit	R						✓		0x5175
EFB inputs and outputs	R	✓	✓			✓			0x516C
RCD status	R	□	□					✓	0x517B

[1] Draw-out unit

✓ Supplies information

□ Requirement for availability of information

R Read access (read)

- **System time**

Name	Description	Access	Register address
System time ST*)	Value range of system time	RW	0x0098

RW - Read and write access (read and write)

ST- System time

*) The system time and time stamp use the same format based on 2 x U32
1. U32: Number of seconds since 1st January 1970, without leap seconds.
This corresponds to UNIX time.
2. U32: Fractions of current second, i.e. 2^{-32} seconds or about 4 millions of a second.

- **Protection function status**
  - Overload current in phases
  - Overload current in neutral conductor
  - Overtemperature alarm
  - Protection function with trip capability
  - ETU mode (normal ETU mode, in bootloader mode, protection function inactive)
  - Metering function defective
  - Electronic trip unit ETU defective
- **Status of metering function**
  - Voltage unbalance in excess of threshold value
  - Current unbalance in excess of threshold value
  - Reference conditions for measured value accuracy outside permissible range
- **Alarm status**
  - Pre-trip alarm for overload
  - Alarm level 1 for overload
  - Alarm level 2 for overload
  - Ground fault protection alarm
  - Overtemperature alarm
  - Alarm to indicate violation of load shedding upper threshold limit
  - Alarm to indicate violation of load shedding lower threshold limit
  - Alarm to indicate internal ETU fault instead of EFB alarm

- **Temperatures**

  in the switchboard, i.e. in COM800/COM100

  – **Instantaneous values**

Name	Description	IEC	Unit	Access	ETU 8**	ETU 5**	COM800 / COM100	COM 060	Register address
Temperature in COM800/ COM100 breaker data server	Temperature at breaker data server	$T_{CB\ COM}$	°C	R			✓		0x4006

✓ - Supplies information

□ - Requirement for availability of information

R - Read access (read)

  – **Maximum values**

Name	Description	IEC	Unit	Access	ETU 8**	ETU 5**	COM800 / COM100	COM 060	Register address
Maximum temperature in COM800/ COM100 breaker data server	Maximum temperature in breaker data server	$T_{CB\ COM\ MAX}$	°C	R			✓	✓	0x401A

✓ - Supplies information

□ - Requirement for availability of information

  – **Minimum values**

Name	Description	IEC	Unit	Access	ETU 8**	ETU 5**	COM800 / COM100	COM 060	Register address
Minimum temperature in COM800/ COM100 breaker data server	Minimum temperature in breaker data server	$T_{CB\ COM\ MIN}$	°C	R			✓		0x4032

✓ - Supplies information

□ - Requirement for availability of information

R - Read access (read)

- **Limit violation status**
  - Limit violation 0
  - Limit violation 1
  - Limit violation 2
  - Limit violation 3
  - Limit violation 4
  - Limit violation 5
  - Limit violation 6
  - Limit violation 7
  - Limit violation 8
  - Limit violation 9
  - Breaker status
  - Ready-to-close signal available
  - Undervoltage release charged
  - Overload alarm present
  - Write protection
  - Status of the free user input
  - Reason for last trip (remains active until trip has been acknowledged)
  - Load shedding alarm
- **Trip counter**
  - Number of residual current trips
  - Number of temperature trips
  - Number of blocking protection trips
  - Number of G trips
  - Number of I trips
  - Number of L trips
  - Number of N trips
  - Number of phase failure trips
  - Number of all trips

- **Maintenance information**
  - Mechanical switching cycles
  - Operating hours counter

In any application in which a 3VA molded case circuit breaker is frequently switched in normal operation or by protection functions, the switching operation statistics supply important information.

The switching operation statistics are important for managing maintenance routines which can be implemented cost effectively when the number of trips and causes of tripping can be taken into account.

Name	Unit	Access	ETU 8-series	ETU 5-series	COM800 / COM100	COM060	Register address
Number of all trips		R	✓	✓			0x00E8
Number of residual current trips		R	✓	✓			0x00E2
Number of temperature trips		R	✓	✓			0x00E0
Number of G trips		R	✓	✓			0x00DF
Number of I trips		R	✓	✓			0x00DB
Number of L trips		R	✓	✓			0x00DD
Number of N trips		R	✓	✓			0x00DE
Number of S trips		R	✓	✓			0x00DC
Mechanical switching cycles		R				✓	0x00F8
Operating hours counter	h	R	✓	✓			0x00E9
Operating hours counter COM800	s	R			✓		0x4BFE

✓ - Supplies information

□ - Requirement for availability of information

R - read; read access

See also

Switching 3VA molded case circuit breakers (Page 37)

3.2.3 Displaying draw-out status

The 3VA molded case circuit breaker can be installed as a draw-out version. The position of the 3VA molded case circuit breaker can be detected and the feedback information evaluated for other purposes.

If the 3VA molded case circuit breaker is moved by means of a crank handle into one of the following positions in the draw-out socket, the appropriate position signaling switch outputs an electrical signal that can be utilized for other purposes in the customer's installation:

- CONNECT:

  The molded case circuit breaker is connected to the main circuit.

- TEST:

  In the TEST position, the main contacts of the 3VA molded case circuit breaker are not connected to the main circuit, but only to the auxiliary circuit. It is therefore possible to verify that the auxiliary circuit is functioning properly when the main circuit is open.

- DISCONNECT:

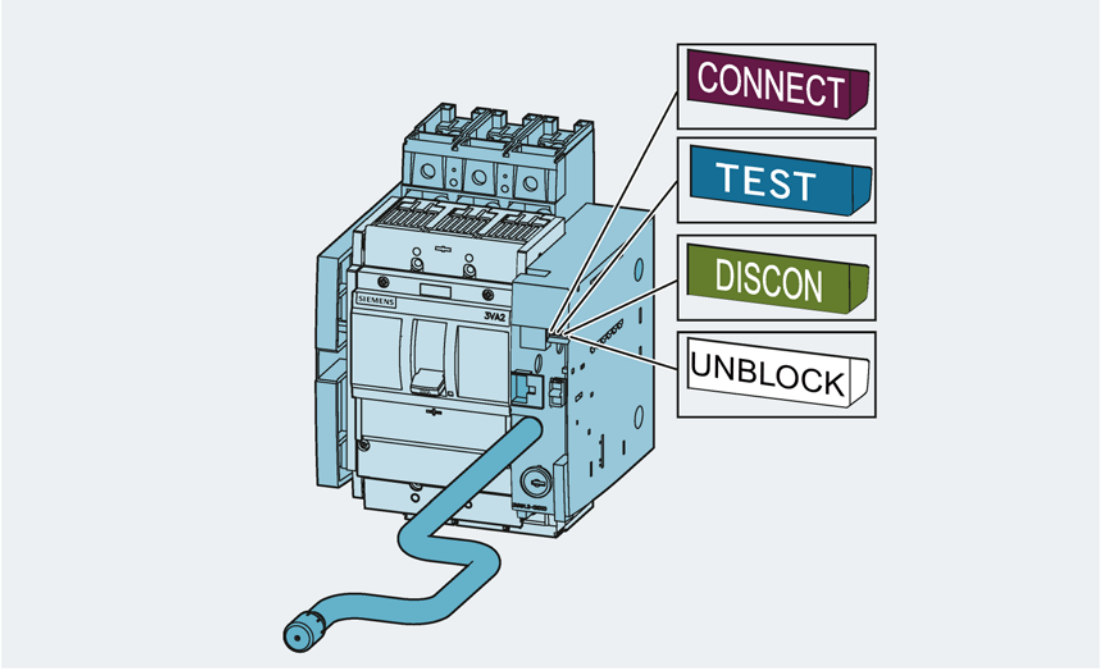
  The 3VA molded case circuit breaker is not connected to the main circuit or to the auxiliary circuit.

- UNBLOCK:

  The 3VA molded case circuit breaker is not in any of the positions defined above and can be moved by means of the crank handle.

  In the UNBLOCK state, the 3VA molded case circuit breaker is always switched off (contacts are open) or in the "TRIP" position (contacts are open). The molded case circuit breaker cannot be switched on from the UNBLOCK state.

Depending on the position of the 3VA molded case circuit breaker, the outputs of the position signaling switches assume one of the following states:



3.3 Test functions

The test functions simulate the protection functions of the ETUs of the 3VA molded case circuit breaker. Regular testing of these functions is recommended. You can find further information in Chapter "Regular inspection" of the manual "3VA molded case circuit breakers".

The TD500 test device is used to test L, S, I, N and G tripping and proper functioning of the transformers.

The test results can be analyzed and archived with powerconfig.

Correct signaling of trips at the EFB300 external function box can also be tested (see chapter EFB300 external function box (Page 120)).

For further information, please refer to chapter TD500 test device (Page 139).

3.4 Acquiring and communicating measured variables

Metering functions are absolutely essential to the implementation of precise process control, operations management and power management. The measured variables relevant to a particular application depend on whether the 3VA molded case circuit breaker is installed in the infeed, the subdistribution board or directly in the process.

The measurable variables of 3VA molded case circuit breakers are summarized in the following table:

				ETUs		Display		Communication
				5-series	8-series	Display in ETU	DSP800	COM800 / COM100 via COM060
Current	Phase and neutral conductor currents	I_1, I_2, I_3, I_N	A	■	■	👁	👁	👁
	Residual current to ground	I_g	A	■	■	👁	👁	👁
	Phase with highest load		A	■	■	👁	👁	👁
	Mean value over the three phase currents	$I_{LAVG}(I_1 + I_2 + I_3)/3$	A	■	■	--	👁	👁
	Asymmetry of the phase currents	I_{nba}	%	■	■	--	👁	👁
	THD of the 3 phases	$THDI_1$, $THDI_2$, $THDI_3$	%	--	■	--	👁	👁
Voltage	Phase voltages incl. mean value	U_1, U_2, U_3, U_{phavg}	V	--	■	👁	👁	👁
	Voltages to N conductor incl. mean value	U_{1N}, U_{2N}, U_{3N}, U_{Navg}	V	--	■	--	👁	👁
	Asymmetry of the voltages		%	--	■	--	👁	👁
	THD phase/phase and phase/N	$THDI_1$, $THDI_2$, $THDI_3$	%	--	■	--	👁	👁
Power	Active power, total and per phase	P_1, P_2, P_3, P_{tot}	kW	--	■	👁 (P_{tot})	👁	👁
	Apparent power, total and per phase	S_1, S_2, S_3, S_{tot}	kVA	--	■	--	👁	👁
	Reactive power, total and per phase	Q_1, Q_2, Q_3, Q_{tot}	kVAr	--	■	👁 (Q_{tot})	👁	👁
	Fundamental power factor	PF_1, PF_2, PF_3, PF_{avg}		--	■	👁 (PF_{avg})	👁	👁
Energy	Active energy, infeed and feedback	E_p	kWh	--	■	👁	👁	👁
	Reactive energy, infeed and feedback	E_q	kVArh	--	■	--	👁	👁
	Apparent energy	E_s	kVAh	--	■	--	👁	👁
Frequency	Present frequency	f	Hz	--	■	👁	👁	👁
Maximum pointer function	Min/max current, voltage, power	with time stamp		--	--	--	--	👁

👁 Value can be read
■ Provided by
-- Not available

Measuring accuracy

The variables in the individual categories are measured with the following accuracy:

Category	Supplementary condition	Accuracy	Accuracy class acc. to IEC 61557-12
Current (ETU 8-series)	0.2 x I_N to 1.2 x I_N	1 % *)	
Current (ETU 5-series)	0.2 x I_N to 1.2 x I_N	10 % *)	
Voltage	80 V ≤ U_{LN} ≤ 800 V	1 % *)	
THD current	Up to 19th harmonic 0.2 x I_N to 1.2 x I_N	5 % *)	
THD voltage	Up to 19th harmonic 80 V ≤ U_{LN} ≤ 800 V	5 % *)	
Active power			Class 2
Reactive power	0.2 x I_n to 1.2 x I_N	2 %	
Power factor	0.2 x I_N to 1.2 x I_N	0.05 absolute	
Active energy	≥ 50 kWh		Class 2
Reactive energy	0.2 x I_N to 1.2 x I_N	2 %	
Frequency	80 V ≤ U_{LN}	0.1 %	

*) of the actual value

The measured variables of 3VA molded case circuit breakers can be used to acquire, monitor and meter power-related characteristics in a low-voltage distribution system to the specified level of accuracy.

They are less suitable for open-loop and closed-loop control applications.

3.4.1 Current variables

Current measurements provide important information about capacity utilization and loading of the power distribution system.

The ETUs 5-series and 8-series supply the following current variables:

- Phase currents I_{L1}, I_{L2}, I_{L3}
- Neutral conductor current I_N
- Ground fault current I_G
- Maximum phase current; current in phase under highest load I_{L123}
- Average current $I_{øL123}$
- Current unbalance

The maximum and minimum values of the current variables are also supplied. If time synchronization is configured, the maximum and minimum values are time-stamped.

Instantaneous values

Name	Description	IEC	Unit	Access	Register address
Current L1	Current in phase L1	I_{L1}	A	R	0x0002
Current L2	Current in phase L2	I_{L2}	A	R	0x0004
Current L3	Current in phase L3	I_{L3}	A	R	0x0006
3-phase average current	3-phase average value of currents in phases	$I_{L\ AVG}$	A	R	0x0012
Neutral conductor current	Current in a neutral conductor. Value of the current in the neutral conductor of a power distribution system.	I_N	A	R	0x0008
Ground fault current	Current between a live conductor and ground	I_{GF}	A	R	0x000A
Current unbalance	Current unbalance calculated from the absolute value of the amplitudes and the three-phase angles of the current	I_{nba}	%	R	0x0014
Highest phase current	Current of phase under highest load	$I_{L123max}$	A	R	0x0018
Phase with the highest current	Phase with the highest current	L1, L2, L3		R	0x0016

R - read access (read)

Maximum values

Name	Description	IEC	Unit	Access	Register address
Maximum current L1	Maximum value of the current in phase L1	$I_{L1\ max}$	A	R	0x0200
Maximum current L2	Maximum value of the current in phase L2	$I_{L2\ max}$	A	R	0x0206
Maximum current L3	Maximum value of the current in phase L3	$I_{L3\ max}$	A	R	0x020C
Maximum 3-phase average current	Maximum of the 3-phase average value of currents in the phases	$I_{\{L\}\ AVG\ max}$	A	R	0x0230
Maximum neutral conductor current	Maximum value of current in neutral conductor.	$I_{N\ max}$	A	R	0x0212
Maximum ground fault current	Maximum current between a live conductor and ground	$I_{GF\ max}$	A	R	0x0218
Maximum current unbalance	Maximum value of the current unbalance	$I_{nba\ max}$	%	R	0x0236

R - read access (read)

Minimum values

Name	Description	IEC	Unit	Access	Register address
Minimum current L1	Minimum value of the current in phase L1	$I_{L1\ min}$	A	R	0x0400
Minimum current L2	Minimum value of the current in phase L2	$I_{L2\ min}$	A	R	0x0406
Minimum current L3	Minimum value of the current in phase L3	$I_{L3\ min}$	A	R	0x040C
Minimum 3-phase average current	Minimum value of the 3-phase average value of currents in the phases	$I_{\{L\}\ AVG\ min}$	A	R	0x0430
Minimum neutral conductor current	Minimum value of current in neutral conductor.	$I_{N\ min}$	A	R	0x0412
Minimum ground fault current	Minimum current between a live conductor and ground.	$I_{GF\ min}$	A	R	0x0418
Minimum current unbalance	Minimum value of the current unbalance	$I_{nba\ min}$	%	R	0x0436

R - read access (read)

3.4.2 Voltage variables

To ensure fault-free operation of all electrical loads, they must be supplied with voltage that is maintained within narrow tolerance levels. For this reason, the voltage variables at the infeed and directly at the load are relevant.

The ETUs 8-series supply the following voltage variables:

- U_{L12}, U_{L23}, U_{L31}, U_{L1-N}, U_{L2-N}, U_{L3-N}
- Average voltage U_{Ln}, U_{Ln-N}
- Voltage unbalance U_{nb}. ….

The voltages and measured variables derived from them such as power and energy, for example, are acquired solely by ETUs 8-series.

3.4.2.1 Voltage variables L-N

Instantaneous values

Name	Description	IEC	Unit	Access	Register address
Voltage L1-N	Value of voltage between phase L1 and the neutral conductor	U_{L1-N}	V	R	0x001A
Voltage L2-N	Value of voltage between phase L2 and the neutral conductor	U_{L2-N}	V	R	0x001C
Voltage L3-N	Value of voltage between phase L3 and the neutral conductor	U_{L3-N}	V	R	0x001E
3-phase average voltage L-N	3-phase average value of the voltage between the phases and the neutral conductor	$U_{L-N\ AVG}$	V	R	0x0026

R - read access (read)

Maximum values

Name	Description	IEC	Unit	Access	Register address
Maximum voltage L1-N	Maximum value of voltage between phase L1 and the neutral conductor	$U_{L1-N\ max}$	V	R	0x023C
Maximum voltage L2-N	Maximum value of voltage between phase L2 and the neutral conductor	$U_{L2-N\ max}$	V	R	0x0242
Maximum voltage L3-N	Maximum value of voltage between phase L3 and the neutral conductor	$U_{L3-N\ max}$	V	R	0x0248
Maximum 3-phase average voltage L-N	Maximum 3-phase average value of the voltage between the phases and the neutral conductor	$U_{L-N\ AVG\ max}$	V	R	0x0260

R - read access (read)

Minimum values

Name	Description	IEC	Unit	Access	Register address
Minimum voltage L1-N	Minimum value of voltage between phase L1 and the neutral conductor	$U_{L1-N\ min}$	V	R	0x043C
Minimum voltage L2-N	Minimum value of voltage between phase L2 and the neutral conductor	$U_{L2-N\ min}$	V	R	0x0442
Minimum voltage L3-N	Minimum value of voltage between phase L3 and the neutral conductor	$U_{L3-N\ min}$	V	R	0x0448
Minimum 3-phase average voltage L-N	Minimum 3-phase average value of the voltage between the phases and the neutral conductor	$U_{L-N\ AVG\ min}$	V	R	0x0460

R - read access (read)

3.4.2.2 Voltage variables L-L

Instantaneous values

Name	Description	IEC	Unit	Access	Register address
Voltage L1-L2	Value of the voltage between phases L1 and L2	U_{L1-L2}	V	R	0x0020
Voltage L2-L3	Value of the voltage between phases L2 and L3	U_{L2-L3}	V	R	0x0022
Voltage L3-L1	Value of the voltage between phases L3 and L1	U_{L3-L1}	V	R	0x0024
3-phase average voltage L-L	3-phase average value of the phase voltages	$U_{L-L\ AVG}$	V	R	0x0028
Voltage unbalance	Voltage unbalance calculated from the absolute value of the amplitudes and the three-phase angles of the voltages	Unba	%	R	0x002A

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Access	Register address
Maximum voltage L1-L2	Maximum value of the voltage between phases L1 and L2	$U_{L1-L2\ max}$	V	R	0x024E
Maximum voltage L2-L3	Maximum value of the voltage between phases L2 and L3	$U_{L2-L3\ max}$	V	R	0x0254
Maximum voltage L3-L1	Maximum value of the voltage between phases L3 and L1	$U_{L3-L1\ max}$	V	R	0x025A
Maximum 3-phase average voltage L-L	Maximum 3-phase average value of the phase voltages	$U_{L-L\ AVG\ max}$	V	R	0x0266
Maximum voltage unbalance	Maximum value of the voltage unbalance	$Unba_{\ max}$	%	R	0x026C

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Access	Register address
Minimum voltage L1-L2	Minimum value of the voltage between phases L1 and L2	$U_{L1-L2\ min}$	V	R	0x044E
Minimum voltage L2-L3	Minimum value of the voltage between phases L2 and L3	$U_{L2-L3\ min}$	V	R	0x0454
Minimum voltage L3-L1	Minimum value of the voltage between phases L3 and L1	$U_{L3-L1\ min}$	V	R	0x045A
Minimum 3-phase average voltage L-L	Minimum 3-phase average value of the phase voltages	$U_{L-L\ AVG\ min}$	V	R	0x0466
Minimum voltage unbalance	Minimum value of the voltage unbalance	$Unba_{\ min}$	%	R	0x046C

R - read; Read access

3.4.3 Measuring power

With 3VA molded case circuit breakers, the power demand of the connected loads is measured without the installation of additional measuring equipment. The measurement results are made available to process control, power monitoring or power management systems.

ETUs 8-series supply the following measured variables for this purpose:

- Power values P_{L1}, P_{L2}, P_{L3}, P, Q_{totL1}, Q_{totL2}, Q_{totL3}, Q_{tot}, S_{L1}, S_{L2}, S_{L3}, S_{tot}
- Average imported and exported P, Q_{tot} of last and present measuring interval and the apparent power S of the last and present measuring interval
- Power factors LF_{L1}, LF_{L2}, LF_{L3}, LF

3.4.3.1 Active power

Actual measured values

Instantaneous values

Name	Description	IEC	Unit	Access	Register address
Active power L1	Active power in phase L1 as import (+) or export (-)	$\pm P_{L1}$	W	R	0x0030
Active power L2	Active power in phase L2 as import (+) or export (-)	$\pm P_{L2}$	W	R	0x0032
Active power L3	Active power in phase L3 as import (+) or export (-)	$\pm P_{L3}$	W	R	0x0034
Total active power	Total active power in phases as import (+) or export (-)	±P	W	R	0x0036

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Access	Register address
Maximum active power L1	Maximum value of active power in phase L1	$I_{L1\ max}$	A	R	0x0278
Maximum active power L2	Maximum value of active power in phase L2	$I_{L2\ max}$	A	R	0x027E
Maximum active power L3	Maximum value of active power in phase L3	$I_{L3\ max}$	A	R	0x0284
Maximum total active power	Maximum value of the total active power in the 3-phase system	$\pm P_{max}$	W	R	0x028A

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Access	Register address
Minimum active power L1	Minimum value of active power in phase L1	$\pm P_{L1\ min}$	W	R	0x0478
Minimum active power L2	Minimum value of active power in phase L2	$\pm P_{L2\ min}$	W	R	0x047E
Minimum active power L3	Minimum value of active power in phase L3	$\pm P_{L3\ min}$	W	R	0x0484
Minimum total active power	Minimum value of the total active power in the 3-phase system	$\pm P_{min}$	W	R	0x048A

R - read; Read access

Present measuring interval

Name	Description	IEC	Unit	Access	Register address
Active power import in the present period	Cumulated active power import in the present period	P	W	R	0x442A
Active power export in the present period	Cumulated active power export in the present period	P	W	R	0x442E
Maximum active power in the present period	Maximum active power in the present period	P_{max}	W	R	0x4436
Minimum active power in the present period	Minimum active power in the present period	P_{min}	W	R	0x4438

R - read; Read access

Last measuring interval

Name	Description	IEC	Unit	Access	Register address
Active power import in last period	Cumulated active power import in the last period	P	W	R	0x4412
Active power export in the last period	Cumulated active power export in the last period	P	W	R	0x4416
Maximum active power in the last period	Maximum active power in the last period	P_{max}	W	R	0x441E
Minimum active power in the last period	Minimum active power in the last period	P_{min}	W	R	0x4420

R - read; Read access

3.4.3.2 Reactive power

Actual measured values

Instantaneous values

Name	Description	IEC	Unit	Value range	Access	Register address
Total reactive power Q_{tot} L1	Total reactive power in phase L1 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L1}$	var	[0;1807000]	R	0x0040
Total reactive power Q_{tot} L2	Total reactive power in phase L2 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L2}$	var	[0;1807000]	R	0x0042
Total reactive power Q_{tot} L3	Total reactive power in phase L3 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L3}$	var	[0;1807000]	R	0x0044
Total reactive power Q_{tot}	Total reactive power Q_{tot} in the phases from fundamental and harmonics referred to the load counting system	Q_{tot}	var	[0;5421000]	R	0x0046

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Value range	Access	Register address
Maximum total reactive power Q_{tot} L1	Maximum value of the total reactive power in phase L1 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L1\ max}$	var	[0;1807000]	R	0x02A8
Maximum total reactive power Q_{tot} L2	Maximum value of the total reactive power in phase L2 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L2\ max}$	var	[0;1807000]	R	0x02AE
Maximum total reactive power Q_{tot} L3	Maximum value of the total reactive power in phase L3 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L3\ max}$	var	[0;1807000]	R	0x02B4
Maximum total reactive power Q_{tot}	Maximum value of the total reactive power of the fundamental and harmonics in the 3-phase system, measured according to Q_{tot}	$Q_{tot\ max}$	var	[0;5421000]	R	0x02BA

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Value range	Access	Register address
Minimum total reactive power Q_{tot} L1	Minimum value of the total reactive power in phase L1 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L1\ min}$	var	[0;1807000]	R	0x04A8
Minimum total reactive power Q_{tot} L2	Minimum value of the total reactive power in phase L2 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L2\ min}$	var	[0;1807000]	R	0x04AE
Minimum total reactive power Q_{tot} L3	Minimum value of the total reactive power in phase L3 referred to the load counting system, fundamental, and harmonics	$Q_{tot\ L3\ min}$	var	[0;1807000]	R	0x04B4
Minimum total reactive power Q_{tot}	Minimum value of the total reactive power of the fundamental and harmonics in the 3-phase system, measured according to Q_{tot}	$Q_{tot\ min}$	var	[0;5421000]	R	0x04BA

R - read; Read access

Present measuring interval

Name	Description	IEC	Unit	Value range	Access	Register address
Reactive power import in the present period	Cumulated reactive power import Q_{tot} in the present period	Q_{tot}	var	[0;5421000]	R	0x442C
Reactive power export in the present period	Cumulated reactive power export Q_{tot} in the present period	Q_{tot}	var	[0;5421000]	R	0x4430
Maximum reactive power in the present period	Maximum reactive power Q_{tot} in the present period	$Q_{tot\ max}$	var	[0;5421000]	R	0x443A
Minimum reactive power in the present period	Minimum reactive power Q_{tot} in the present period	$Q_{tot\ min}$	var	[0;5421000]	R	0x443C

R - read; Read access

Last measuring interval

Name	Description	IEC	Unit	Value range	Access	Register address
Reactive power import in the last period	Cumulated reactive power import Q_{tot} in the present period	Q_{tot}	var	[0;5421000]	R	0x442C
Reactive power export in the last period	Cumulated reactive power export Q_{tot} in the last period	Q_{tot}	var	[0;5421000]	R	0x4418
Maximum reactive power in the last period	Maximum reactive power Q_{tot} in the last period	$Q_{tot\ max}$	var	[0;5421000]	R	0x4422
Minimum reactive power in the last period	Minimum reactive power Q_{tot} in the last period	$Q_{tot\ min}$	var	[0;5421000]	R	0x4424

R - read; Read access

3.4.3.3 Apparent power

Actual measured values

Instantaneous values

Name	Description	IEC	Unit	Value range	Access	Register address
Apparent power L1	Apparent power in phase L1	S_{L1}	VA	[0;1807000]	R	0x0038
Apparent power L2	Apparent power in phase L2	S_{L2}	VA	[0;1807000]	R	0x003A
Apparent power L3	Apparent power in phase L3	S_{L3}	VA	[0;1807000]	R	0x003C
Total apparent power	Total apparent power in the phases	S	VA	[0;5421000]	R	0x003E

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Value range	Access	Register address
Maximum apparent power L1	Maximum value of the apparent power in phase L1	$S_{L1\ max}$	VA	[0;1807000]	R	0x0290
Maximum apparent power L2	Maximum value of the apparent power in phase L2	$S_{L2\ max}$	VA	[0;1807000]	R	0x0296
Maximum apparent power L3	Maximum value of the apparent power in phase L3	$S_{L3\ max}$	VA	[0;1807000]	R	0x029C
Maximum total apparent power	Maximum value of the total apparent power in the 3-phase system	S_{max}	VA	[0;5421000]	R	0x02A2

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Value range	Access	Register address
Minimum apparent power L1	Minimum value of apparent power in phase L1	$S_{L1\ min}$	VA	[0;1807000]	R	0x0490
Minimum apparent power L2	Minimum value of apparent power in phase L2	$S_{L2\ min}$	VA	[0;1807000]	R	0x0496
Minimum apparent power L3	Minimum value of apparent power in phase L3	$S_{L3\ min}$	VA	[0;1807000]	R	0x049C
Minimum total apparent power	Minimum value of the total apparent power in the 3-phase system	S_{min}	VA	[0;5421000]	R	0x04A2

R - read; Read access

Present measuring interval

Name	Description	IEC	Unit	Value range	Access	Register address
Apparent power in the present period	Cumulated apparent power in the present period	S	VA	[0;5421000]	R	0x4428
Maximum apparent power in the present period	Maximum apparent power in the present period	S	VA	[0;5421000]	R	0x4432
Minimum apparent power in the present period	Minimum apparent power in the present period	S	VA	[0;5421000]	R	0x4434

R - read; Read access

Last measuring interval

Name	Description	IEC	Unit	Value range	Access	Register address
Apparent power in the last period	Cumulated apparent power in the last period		VA	[0;5421000]	R	0x4410
Maximum apparent power in the last period	Maximum apparent power in the last period		VA	[0;5421000]	R	0x441A
Minimum apparent power in the last period	Minimum apparent power in the last period		VA	[0;5421000]	R	0x441C

R - read; Read access

3.4.3.4 Power factors

Instantaneous values

Name	Description	IEC	Unit	Value range	Access	Register address
Power factor L1	Power factor (arithmetic) in phase L1	PF_{L1}		[0;1]	R	0x0050
Power factor L2	Power factor (arithmetic) in phase L2	PF_{L2}		[0;1]	R	0x0052
Power factor L3	Power factor (arithmetic) in phase L3	PF_{L3}		[0;1]	R	0x0054
Total power factor	Total power factor	PF		[0;1]	R	0x0056

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Value range	Access	Register address
Maximum power factor L1	Maximum value of the power factor (arithmetic) in phase L1	$PF_{L1\ max}$		[0;1]	R	0x02D8
Maximum power factor L2	Maximum value of the power factor (arithmetic) in phase L2	$PF_{L2\ max}$		[0;1]	R	0x02DE
Maximum power factor L3	Maximum value of the power factor (arithmetic) in phase L2	$PF_{L3\ max}$		[0;1]	R	0x02E4
Maximum total power factor	Maximum total power factor	PF_{max}		[0;1]	R	0x02EA

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Value range	Access	Register address
Minimum power factor L1	Minimum value of the power factor (arithmetic) in phase L1	$PF_{L1\ min}$		[0;1]	R	0x04D8
Minimum power factor L2	Minimum value of the power factor (arithmetic) in phase L2	$PF_{L2\ min}$		[0;1]	R	0x04DE
Minimum power factor L3	Minimum value of the power factor (arithmetic) in phase L2	$PF_{L3\ min}$		[0;1]	R	0x04E4
Minimum total power factor	Minimum total power factor	PF_{min}		[0;1]	R	0x04EA

R - read; Read access

3.4.4 Measuring energy

With 3VA molded case circuit breakers, the energy flow through the connected loads is measured without the installation of additional measuring equipment. The measurement results are made available to power monitoring or power management systems.

ETUs 8-series supply the following measured variables for this purpose:

- Imported and exported active energy
- Imported and exported reactive energy
- Apparent energy

3.4.4.1 Energy variables

	Description	IEC	Unit	Value range	Access	Register address
Active energy	Active energy import	Ea_{imp}	kWh	[0;131900000]	RW	0x007A
	Active energy export	Ea_{exp}	kWh	[0;131900000]	RW	0x007E
Reactive energy	Reactive energy import	Er_{imp}	kvarh	[0;131900000]	RW	0x0082
	Reactive energy export	Er_{exp}	kvarh	[0;131900000]	RW	0x0086
Apparent energy	Apparent energy	E_{ap}	kVAh	[0;131900000]	RW	0x008A

RW - read / write; Read and write access

3.4.5 Measuring frequency and distortion

With 3VA molded case circuit breakers, the frequency and distortion of the connected loads is measured without the installation of additional measuring equipment. The measurement results are made available to the operations management system for monitoring purposes.

ETUs 8-series supply the following measured variables for this purpose:

- Actual, minimum and maximum frequency
- Current distortion THD current L1, THD current L2, THD current L3
- Voltage distortion THD L1-N, TH L2-N, THD L3-N, TH L1-L2, THD L2-L3, THD L3-L1

3.4.5.1 Frequency variables

	Name	Description	IEC	Unit	Value range	Access	Register address
Instantaneous values	Line frequency	Line frequency value	f	Hz	[45;65]	R	0x002E
Maximum values	Maximum line frequency	Maximum value of the line frequency	f_{max}	Hz	[45;65]	R	0x0272
Minimum values	Minimum line frequency	Minimum value of the line frequency	f_{min}	Hz	[45;65]	R	0x0472

R - read; Read access

3.4.5.2 Harmonic distortion

THD current

	Name	Description	IEC	Unit	Value range	Access	Register address
Instantaneous values	THD current L1	Harmonic content (Total Harmonic Distortion) of the current in phase L1 referred to the fundamental	$THDI_{L1}$	%	[0;100]	R	0x005E
	THD current L2	Harmonic content of the current in phase L2 referred to the fundamental	$THDI_{L2}$	%	[0;100]	R	0x0060
	THD current L3	Harmonic content of the current in phase L3 referred to the fundamental	$THDI_{L3}$	%	[0;100]	R	0x0062
Maximum values	Maximum THD current L1	Maximum harmonic content of the current in phase L1 referred to the fundamental	$THDI_{L1\ max}$	%	[0;100]	R	0x0302
	Maximum THD current L2	Maximum harmonic content of the current in phase L2 referred to the fundamental	$THDI_{L2\ max}$	%	[0;100]	R	0x0308
	Maximum THD current L3	Maximum harmonic content of the current in phase L3 referred to the fundamental	$THDI_{L3\ max}$	%	[0;100]	R	0x030E

R - read; Read access

THD voltage L-N

Instantaneous values

Name	Description	IEC	Unit	Value range	Access	Register address
THD voltage L1	Harmonic content of the voltage between phase L1 and the neutral conductor referred to the fundamental	$THDU_{L1}$	%	[0;100]	R	0x0064
THD voltage L2	Harmonic content of the voltage between phase L2 and the neutral conductor referred to the fundamental	$THDU_{L2}$	%	[0;100]	R	0x0066
THD voltage L3	Harmonic content of the voltage between phase L3 and the neutral conductor referred to the fundamental	$THDU_{L3}$	%	[0;100]	R	0x0068

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Value range	Access	Register address
Maximum THD voltage L1	Maximum harmonic content of the voltage between phase L1 and the neutral conductor referred to the fundamental	$THD_{\{UL1\}\ max}$	%	[0;100]	R	0x0314
Maximum THD voltage L2	Maximum harmonic content of the voltage between phase L2 and the neutral conductor referred to the fundamental	$THD_{\{UL2\}\ max}$	%	[0;100]	R	0x031A
Maximum THD voltage L3	Maximum harmonic content of the voltage between phase L3 and the neutral conductor referred to the fundamental	$THD_{\{UL3\}\ max}$	%	[0;100]	R	0x0320

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Value range	Access	Register address
Minimum THD voltage L1	Minimum harmonic content of the voltage between phase L1 and the neutral conductor referred to the fundamental	$THD_{\{UL1\}\ min}$	%	[0;100]	R	0x0514
Minimum THD voltage L2	Minimum harmonic content of the voltage between phase L2 and the neutral conductor referred to the fundamental	$THD_{\{UL2\}\ min}$	%	[0;100]	R	0x051A
Minimum THD voltage L3	Minimum harmonic content of the voltage between phase L3 and the neutral conductor referred to the fundamental	$THD_{\{UL3\}\ min}$	%	[0;100]	R	0x0520

R - read; Read access

THD voltage L-N

Instantaneous values

Name	Description	IEC	Unit	Value range	Access	Register address
THD voltage L1-L2	Harmonic content of the voltage between phases L1 and L2 referred to the fundamental	$THDU_{L1-L2}$	%	[0;100]	R	0x006A
THD voltage L2-L3	Harmonic content of the voltage between phases L2 and L3 referred to the fundamental	$THDU_{L2-L3}$	%	[0;100]	R	0x006C
THD voltage L3-L1	Harmonic content of the voltage between phases L3 and L1 referred to the fundamental	$THDU_{L3-L1}$	%	[0;100]	R	0x006E

R - read; Read access

Maximum values

Name	Description	IEC	Unit	Value range	Access	Register address
Maximum voltage L1-N	Maximum value of voltage between phase L1 and the neutral conductor	$U_{L1-N\ max}$	V	[0;478]	R	0x023C
Maximum voltage L2-N	Maximum value of voltage between phase L2 and the neutral conductor	$U_{L2-N\ max}$	V	[0;478]	R	0x0242
Maximum voltage L3-N	Maximum value of voltage between phase L3 and the neutral conductor	$U_{L3-N\ max}$	V	[0;478]	R	0x0248

R - read; Read access

Minimum values

Name	Description	IEC	Unit	Value range	Access	Register address
Minimum THD voltage L1-L2	Minimum harmonic content of the voltage between phases L1 and L2 referred to the fundamental	$THD_{\{UL1-L2\}\ min}$	%	[0;100]	R	0x0526
Minimum THD voltage L2-L3	Minimum harmonic content of the voltage between phases L2 and L3 referred to the fundamental	$THD_{\{UL2-L3\}\ min}$	%	[0;100]	R	0x052C
Minimum THD voltage L3-L1	Minimum harmonic content of the voltage between phases L3 and L1 referred to the fundamental	$THD_{\{UL3-L1\}\ min}$	%	[0;100]	R	0x0532

R - read; Read access

3.5 Messages

The 3VA molded case circuit breaker provides 3 kinds of message:

1. **Operational messages** document events which might occur during normal operation. These include:
   - When protective tripping occurs, the trip cause and, if appropriate, the phase which initiated the trip are recorded.
   - Switching operations: A message is generated every time the circuit breaker is switched on or off.
   - Limit or threshold violations: Up to 10 different limit values can be monitored by the user. The limit values can refer to different measured variables depending on the type of ETU used. Hysteresis, delay time, greater/less than and category can be programmed for each limit value.
   - Changes to the configuration at the 3VA-line are always logged. Recording of operator action messages can be controlled via 4 areas. System messages are always recorded.
2. **Operator action messages** document operator actions by the user at the 3VA molded case circuit breaker system.
3. **System messages** document events which cause a significant change to the 3VA molded case circuit breaker system.

These events are stored retentively and fail-safe in the 3VA molded case circuit breaker system. At an appropriate time (even after power supply recovery), the events can be read out via the commissioning and service software powerconfig or (in future) via the power monitoring software powermanager or a process control system. System messages can be analyzed by the user.

The extent to which events are recorded can be controlled via powerconfig so that message recording can be tailored to specific requirements (see Chapter "Parameterizing 3VA molded case circuit breakers (Page 197)")

The categories Information, Warning and Alarm can also be selected.

For additional information, please refer to Chapter "Understanding status transitions (Page 206)".

3.6 Available database

Units of information such as status information or measured variables are made available in suitable data formats by products in the SENTRON range. These units are:

Abbreviation	Description
U8	unsigned 8-bit
U16	unsigned 16-bit
U32	unsigned 32-bit
FP32	floating point 32-bit
FP64	floating point 64-bit
TS	time stamp
ST	system time

Individual units of information are identified by register addresses. A register is 16 bits in size. If a unit of information is larger than 16 bits, it will require more than one register.

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x0002	2	Current L1	FP32	Breaker address		R
0x0004	2	Current L2	FP32	Breaker address		R
0x0006	2	Current L3	FP32	Breaker address		R
0x0008	2	Neutral conductor current	FP32	Breaker address		R
0x000A	2	Ground fault current	FP32	Breaker address		R
0x0012	2	3-phase average current	FP32	Breaker address		R
0x0014	2	Current unbalance	FP32	Breaker address		R
0x0016	1	Phase with the highest current	U16	Breaker address	[0;3]	R
0x0018	2	Maximum phase current	FP32	Breaker address		R
0x001A	2	Voltage L1-N	FP32	Breaker address		R
0x001C	2	Voltage L2-N	FP32	Breaker address		R
0x001E	2	Voltage L3-N	FP32	Breaker address		R
0x0020	2	Voltage L1-L2	FP32	Breaker address		R
0x0022	2	Voltage L2-L3	FP32	Breaker address		R
0x0024	2	Voltage L3-L1	FP32	Breaker address		R
0x0026	2	3-phase average voltage L-N	FP32	Breaker address		R
0x0028	2	3-phase average voltage L-L	FP32	Breaker address		R
0x002A	2	Voltage unbalance	FP32	Breaker address		R
0x002E	2	Line frequency	FP32	Breaker address		R
0x0030	2	Active power L1	FP32	Breaker address		R
0x0032	2	Active power L2	FP32	Breaker address		R
0x0034	2	Active power L3	FP32	Breaker address		R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x0036	2	Total active power	FP32	Breaker address		R
0x0038	2	Apparent power L1	FP32	Breaker address		R
0x003A	2	Apparent power L2	FP32	Breaker address		R
0x003C	2	Apparent power L3	FP32	Breaker address		R
0x003E	2	Total apparent power	FP32	Breaker address		R
0x0040	2	Total reactive power Q_{tot} L1	FP32	Breaker address		R
0x0042	2	Total reactive power Q_{tot} L2	FP32	Breaker address		R
0x0044	2	Total reactive power Q_{tot} L3	FP32	Breaker address		R
0x0046	2	Total reactive power Q_{tot}	FP32	Breaker address		R
0x0050	2	Power factor L1	FP32	Breaker address		R
0x0052	2	Power factor L2	FP32	Breaker address		R
0x0054	2	Power factor L3	FP32	Breaker address		R
0x0056	2	Total power factor	FP32	Breaker address		R
0x005E	2	THD current L1	FP32	Breaker address		R
0x0060	2	THD current L2	FP32	Breaker address		R
0x0062	2	THD current L3	FP32	Breaker address		R
0x0064	2	THD voltage L1	FP32	Breaker address		R
0x0066	2	THD voltage L2	FP32	Breaker address		R
0x0068	2	THD voltage L3	FP32	Breaker address		R
0x006A	2	THD voltage L1-L2	FP32	Breaker address		R
0x006C	2	THD voltage L2-L3	FP32	Breaker address		R
0x006E	2	THD voltage L3-L1	FP32	Breaker address		R
0x007A	4	Active energy import	FP64	Breaker address		R
0x007E	4	Active energy export	FP64	Breaker address		R
0x0082	4	Reactive energy import	FP64	Breaker address		R
0x0086	4	Reactive energy export	FP64	Breaker address		R
0x0098	4	System time	U32 + U32	COM800 / COM100	ST (not used)	RW
0x00C6	1	Write protection	U8	COM800 / COM100	[0;1]	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x00CB	1	Breaker status and diagnostic data	U16	Breaker address	Bit 0: Molded case circuit breaker installed Bit 1: Molded case circuit breaker is part of breaker configuration Bit 2: Reserved Bit 3: Reserved Bit 4: Reserved Bit 5: Reserved Bit 6: Reserved Bit 7: Reserved Bit 8*: Reserved Bit 9*: Limit violation Bit 10*: Reserved Bit 11: Reserved Bit 12: Reserved Bit 13: Reserved Bit 14: Reserved Bit 15: Reserved * not used	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x00CE	2	Status / Diagnosis	U32	COM800 / COM100	Bit 0: Relevant parameter change Bit 1: Reserved Bit 2: Module slot 1 - firmware update Bit 3: Firmware data block available Bit 4: Bootloader update Bit 5: Reserved Bit 6: Reserved Bit 7: Reserved Bit 8: Reserved Bit 9: Limit has been violated Bit 10: Reserved Bit 11: Device restarted Bit 12: Reserved Bit 13: Reserved Bit 14: Reserved Bit 15: Reserved Bit 16: Module slot 1 Bit 17: Reserved Bit 18: Reserved Bit 19: Reserved Bit 20: Reserved Bit 21: Reserved Bit 22: Reserved Bit 23: Master mode Bit 24: SNTP server synchronization message frame Bit 25: Reserved Bit 26: Reserved Bit 27: Reserved Bit 28: Date and time of device Bit 29: Update mode Bit 30: Write protection Bit 31: Reserved	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x00D2	2	Protection function status	U32	Breaker address	Bit 0: System error Bit 1: Overload Bit 2: Overload N Bit 3: Reserved Bit 4: Reserved Bit 5: Reserved Bit 6: Reserved Bit 7: Overtemperature Bit 8: Reserved Bit 9: Application active Bit 10: Reserved Bit 11: Reserved Bit 12: Reserved Bit 13: Reserved Bit +15: ETU mode Bit 16: ETU test active Bit 17: Reserved Bit 18: No calibration data Bit 19: Current transformer wire break Bit 20: Application error Bit 21: Bootloader error Bit 22: Device Parameter Set error Bit 23: Production data faulty or non-existent Bit 24: Rotary coding switch fault Bit 25: Connection error metering function Bit 26: EEPROM defective Bit 27: DPS defaults in use Bit 28: Reserved Bit 29: Reserved Bit 30: Reserved Bit 31: Reserved	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x00D5	2	Status of metering function	U32	Breaker address	Bit 0: Reserved Bit 1: Reserved Bit 2: Reserved Bit 3: Reserved Bit 4: Reserved Bit 5: Reserved Bit 6: Reserved Bit 7: Reserved Bit 8: Voltage unbalance in excess of threshold value Bit 9: Application active Bit 10: ETU fault Bit 11: Calibrated Bit 12: Record curve shape Bit 13: Curve shape recording triggered Bit 14: ETU mode Bit 15: Faulty memory full Bit 16: Reserved Bit 17: Reserved Bit 18: Reserved Bit 19: Reserved Bit 20: Reserved Bit 21: Reserved Bit 22: Reserved Bit 23: Reserved Bit 24: Reserved Bit 25: Reserved Bit 26: Reserved Bit 27: Current unbalance in excess of threshold value Bit 28: Measuring range exceeded Bit 29: Reference conditions for measured value accuracy outside permissible range The accuracy of measured values can be outside the permissible tolerances stated in the operating instructions. Bit 30: Reserved	R
0x00D7	2	COM060 status	U32	Breaker address	[0;4294967295]	R
0x00D9	1	Status of 3VA molded case circuit breaker	U8	Breaker address	[0;255]	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x00DA	1	Status of circuit breaker profile	U16	Breaker address	Bit 0: Limit reached Bit 1: An alarm is currently active Bit 2: Write protection Bit 3: Status of the free user input Bit 4: Reason for last trip Bit 5: Load shedding alarm Bit 6: Breaker position Bit 7: Breaker status Bit 8: Ready-to-close signal available Bit 9: Undervoltage release charged Bit 10: Spring energy store is compressed Bit 11: Overload alarm present	R
0x00DB	1	Number of I trips	U16	Breaker address	[0;255]	R
0x00DC	1	Number of S trips	U16	Breaker address	[0;255]	R
0x00DD	1	Number of L trips	U16	Breaker address	[0;255]	R
0x00DE	1	Number of N trips	U16	Breaker address	[0;255]	R
0x00DF	1	Number of G trips	U16	Breaker address	[0;255]	R
0x00E0	2	Number of temperature trips	FP32	Breaker address		R
0x00E2	1	Number of residual current trips	U16	Breaker address	[0;255]	R
0x00E4	1	Number of phase failure trips	U16	Breaker address	[0;255]	R
0x00E6	1	Wear	U16	Breaker address	[0;255]	R
0x00E8	1	Number of all trips	U16	Breaker address	[0;65535]	R
0x00E9	2	Operating hours counter	U32	Breaker address	[0;4294967295]	R
0x00F3	1	Main contact status	U8	Breaker address	[0;3]	R
0x00F8	2	Mechanical switching cycles	U32	Breaker address	[0;4294967295]	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x0100	2	Limit violation status	U32	Breaker address	Bit 0: Limit violation 0 Bit 1: Limit violation 1 Bit 2: Limit violation 2 Bit 3: Limit violation 3 Bit 4: Limit violation 4 Bit 5: Limit violation 5 Bit 6: Limit violation 6 Bit 7: Limit violation 7 Bit 8: Limit violation 8 Bit 9: Limit violation 9 Bit 10: Reserved Bit 11: Reserved Bit 12: Reserved	R
0x0102	2	Alarm status	U32	Breaker address	[0;4294967295]	R
0x0200	6	Maximum current L1	FP32+TS *)	Breaker address		R
0x0206	6	Maximum current L2	FP32+TS *)	Breaker address		R
0x020C	6	Maximum current L3	FP32+TS *)	Breaker address		R
0x0212	6	Maximum neutral conductor current	FP32+TS	Breaker address		R
0x0218	6	Maximum ground fault current	FP32+TS	Breaker address		R
0x0230	6	Maximum 3-phase average current	FP32+TS	Breaker address		R
0x0236	6	Maximum current unbalance	FP32+TS	Breaker address		R
0x023C	6	Maximum voltage L1-N	FP32+TS	Breaker address		R
0x0242	6	Maximum voltage L2-N	FP32+TS	Breaker address		R
0x0248	6	Maximum voltage L3-N	FP32+TS	Breaker address		R
0x024E	6	Maximum voltage L1-L2	FP32+TS	Breaker address		R
0x0254	6	Maximum voltage L2-L3	FP32+TS	Breaker address		R
0x025A	6	Maximum voltage L3-L1	FP32+TS	Breaker address		R
0x0260	6	Maximum 3-phase average voltage L-N	FP32+TS	Breaker address		R
0x0266	6	Maximum 3-phase average voltage L-L	FP32+TS	Breaker address		R
0x026C	6	Maximum voltage unbalance	FP32+TS	Breaker address		R
0x0272	6	Maximum line frequency	FP32+TS	Breaker address		R
0x0278	6	Maximum active power L1	FP32+TS	Breaker address		R
0x027E	6	Maximum active power L2	FP32+TS	Breaker address		R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x0284	6	Maximum active power L3	FP32+TS	Breaker address		R
0x028A	6	Maximum total active power	FP32+TS	Breaker address		R
0x0290	6	Maximum apparent power L1	FP32+TS	Breaker address		R
0x0296	6	Maximum apparent power L2	FP32+TS	Breaker address		R
0x029C	6	Maximum apparent power L3	FP32+TS	Breaker address		R
0x02A2	6	Maximum total apparent power	FP32+TS	Breaker address		R
0x02A8	6	Maximum total reactive power Q_{tot} L1	FP32+TS	Breaker address		R
0x02AE	6	Maximum total reactive power Q_{tot} L2	FP32+TS	Breaker address		R
0x02B4	6	Maximum total reactive power Q_{tot} L3	FP32+TS	Breaker address		R
0x02BA	6	Maximum total reactive power Q_{tot}	FP32+TS	Breaker address		R
0x02D8	6	Maximum power factor L1	FP32+TS	Breaker address		R
0x02DE	6	Maximum power factor L2	FP32+TS	Breaker address		R
0x02E4	6	Maximum power factor L3	FP32+TS	Breaker address		R
0x02EA	6	Maximum total power factor	FP32+TS	Breaker address		R
0x0302	6	Maximum THD current L1	FP32+TS	Breaker address		R
0x0308	6	Maximum THD current L2	FP32+TS	Breaker address		R
0x030E	6	Maximum THD current L3	FP32+TS	Breaker address		R
0x0314	6	Maximum THD voltage L1	FP32+TS	Breaker address		R
0x031A	6	Maximum THD voltage L2	FP32+TS	Breaker address		R
0x0320	6	Maximum THD voltage L3	FP32+TS	Breaker address		R
0x0326	6	Maximum THD voltage L1-L2	FP32+TS	Breaker address		R
0x032C	6	Maximum THD voltage L2-L3	FP32+TS	Breaker address		R
0x0332	6	Maximum THD voltage L3-L1	FP32+TS	Breaker address		R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x0400	6	Minimum current L1	FP32+TS	Breaker address		R
0x0406	6	Minimum current L2	FP32+TS	Breaker address		R
0x040C	6	Minimum current L3	FP32+TS	Breaker address		R
0x0412	6	Minimum neutral conductor current	FP32+TS	Breaker address		R
0x0418	6	Minimum ground fault current	FP32+TS	Breaker address		R
0x0430	6	Minimum 3-phase average current	FP32+TS	Breaker address		R
0x0436	6	Minimum current unbalance	FP32+TS	Breaker address		R
0x043C	6	Minimum voltage L1-N	FP32+TS	Breaker address		R
0x0442	6	Minimum voltage L2-N	FP32+TS	Breaker address		R
0x0448	6	Minimum voltage L3-N	FP32+TS	Breaker address		R
0x044E	6	Minimum voltage L1-L2	FP32+TS	Breaker address		R
0x0454	6	Minimum voltage L2-L3	FP32+TS	Breaker address		R
0x045A	6	Minimum voltage L3-L1	FP32+TS	Breaker address		R
0x0460	6	Minimum 3-phase average voltage L-N	FP32+TS	Breaker address		R
0x0466	6	Minimum 3-phase average voltage L-L	FP32+TS	Breaker address		R
0x046C	6	Minimum voltage unbalance	FP32+TS	Breaker address		R
0x0472	6	Minimum line frequency	FP32+TS	Breaker address		R
0x0478	6	Minimum active power L1	FP32+TS	Breaker address		R
0x047E	6	Minimum active power L2	FP32+TS	Breaker address		R
0x0484	6	Minimum active power L3	FP32+TS	Breaker address		R
0x048A	6	Minimum total active power	FP32+TS	Breaker address		R
0x0490	6	Minimum apparent power L1	FP32+TS	Breaker address		R
0x0496	6	Minimum apparent power L2	FP32+TS	Breaker address		R
0x049C	6	Minimum apparent power L3	FP32+TS	Breaker address		R
0x04A2	6	Minimum total apparent power	FP32+TS	Breaker address		R
0x04A8	6	Minimum total reactive power Q_{tot} L1	FP32+TS	Breaker address		R
0x04AE	6	Minimum total reactive power Q_{tot} L2	FP32+TS	Breaker address		R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x04B4	6	Minimum total reactive power Q_{tot} L3	FP32+TS	Breaker address		R
0x04BA	6	Minimum total reactive power Q_{tot}	FP32+TS	Breaker address		R
0x04D8	6	Minimum power factor L1	FP32+TS	Breaker address		R
0x04DE	6	Minimum power factor L2	FP32+TS	Breaker address		R
0x04E4	6	Minimum power factor L3	FP32+TS	Breaker address		R
0x04EA	6	Minimum total power factor	FP32+TS	Breaker address		R
0x0502	6	Minimum THD current L1	FP32+TS	Breaker address		R
0x0508	6	Minimum THD current L2	FP32+TS	Breaker address		R
0x050E	6	Minimum THD current L3	FP32+TS	Breaker address		R
0x0514	6	Minimum THD voltage L1	FP32+TS	Breaker address		R
0x051A	6	Minimum THD voltage L2	FP32+TS	Breaker address		R
0x0520	6	Minimum THD voltage L3	FP32+TS	Breaker address		R
0x0526	6	Minimum THD voltage L1-L2	FP32+TS	Breaker address		R
0x052C	6	Minimum THD voltage L2-L3	FP32+TS	Breaker address		R
0x0532	6	Minimum THD voltage L3-L1	FP32+TS	Breaker address		R
0x4006	2	Temperature in COM800	FP32	COM800 / COM100		R
0x401A	6	Maximum temperature in COM800 / COM100	FP32+TS	COM800 / COM100		R
0x4032	6	Minimum temperature in COM800 / COM100	FP32+TS	COM800 / COM100		R
0x4074	2	ID of last entry in message archive	U32	COM800 / COM100 / breaker address	[0;4294967295]	R
0x4076	2	ID of last entry in switching cycle archive	U32	Breaker address	[0;0]	R
0x4078	2	ID of last entry in trip archive	U32	Breaker address	[0;127]	R
0x4268	2	COM800 supply voltage	FP32	COM800 / COM100		R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x426A	2	COM060 supply voltage	FP32	COM800 / COM100		R
0x426C	6	COM800 maximum supply voltage	FP32+TS	COM800 / COM100		R
0x4272	6	COM060 maximum supply voltage	FP32+TS	COM800 / COM100		R
0x4278	6	COM800 minimum supply voltage	FP32+TS	COM800 / COM100		R
0x427E	6	COM060 minimum supply voltage	FP32+TS	COM800 / COM100		R
0x4284	1	Undervoltage diagnosis	U16	COM800 / COM100	On request	R
0x4400	4	Time stamp of the last period	TS	Breaker address		R
0x4404	2	Actual length of the last period	U32	Breaker address	[0;3600000]	R
0x4406	2	Mean apparent power in the last period	FP32	Breaker address		R
0x4408	2	Mean active power import in the last period	FP32	Breaker address		R
0x440A	2	Mean reactive power import in the last period	FP32	Breaker address		R
0x440C	2	Mean active power export in the last period	FP32	Breaker address		R
0x440E	2	Mean reactive power export in the last period	FP32	Breaker address		R
0x4410	2	Apparent power in the last period	FP32	Breaker address		R
0x4412	2	Active power import in last period	FP32	Breaker address		R
0x4414	2	Reactive power import in the last period	FP32	Breaker address		R
0x4416	2	Active power export in the last period	FP32	Breaker address		R
0x4418	2	Reactive power export in the last period	FP32	Breaker address		R
0x441A	2	Maximum apparent power in the last period	FP32	Breaker address		R
0x441C	2	Minimum apparent power in the last period	FP32	Breaker address		R
0x441E	2	Maximum active power in the last period	FP32	Breaker address		R
0x4420	2	Minimum active power in the last period	FP32	Breaker address		R
0x4422	2	Maximum reactive power in the last period	FP32	Breaker address		R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x4424	2	Minimum reactive power in the last period	FP32	Breaker address		R
0x4426	2	Time since the start of the present period	U32	Breaker address	[0;3600]	R
0x4428	2	Apparent power export in the present period	FP32	Breaker address		R
0x442A	2	Active power import in the present period	FP32	Breaker address		R
0x442C	2	Reactive power import in the present period	FP32	Breaker address		R
0x442E	2	Active power export in the present period	FP32	Breaker address		R
0x4430	2	Reactive power export in the present period	FP32	Breaker address		R
0x4432	2	Maximum apparent power in the present period	FP32	Breaker address		R
0x4434	2	Minimum apparent power in the present period	FP32	Breaker address		R
0x4436	2	Maximum active power in the present period	FP32	Breaker address		R
0x4438	2	Minimum active power in the present period	FP32	Breaker address		R
0x443A	2	Maximum reactive power in the present period	FP32	Breaker address		R
0x443C	2	Minimum reactive power in the present period	FP32	Breaker address		R
0x4BFE	2	Operating hours counter	U32	COM800 / COM100	[0;999999999]	R
0x4C00	2	Change counter	U32	COM800 / COM100	[0;4294967295]	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x516C	1	EFB inputs and outputs	U16	Breaker address	Bit 0: ZSI input signal Bit 1: Digital input Bit 2: Confirmation by user Bit 3: Test mode Bit 4: Fault Bit 5: Reserved (must be 1) Bit 6: ZSI output signal Bit 7: Digital output 0 Bit 8: Digital output 1 Bit 9: Digital output 2 Bit 10: Digital output 3 Bit 11: Reserved (must be 0) Bit 12: Reserved (must be 0) Bit 13: Reserved	R
0x5175	1	Status of draw-out socket	U16	Breaker address	Bit 0: Wire break (connection) Bit 1: Unknown (connection) Bit 2: Open (connection) Bit 3: Closed (connection) Bit 4: Wire break (test) Bit 5: Unknown (test) Bit 6: Open (test) Bit 7: Closed (test) Bit 8: Wire break (interruption) Bit 9: Unknown (interruption) Bit 10: Open (interruption) Bit 11: Closed (interruption) Bit 12: Reserved Bit 13: Reserved Bit 14: Reserved Bit 15: Reserved	R

Register address	Number of registers	Name	Format	Breaker address / COM800 / COM100	Value range	Access
0x517B	1	RCD status	U16	Breaker address	Bit 0: Alarm level 1 for residual current Bit 1: Alarm level 2 for residual current Bit 2: Reserved Bit 3: Reserved Bit 4: Maglatch unlatched Bit 5: Fault Bit 6: Reserved Bit 7: Reserved Bit 8: Reserved Bit 9: Tripped Bit 10: Test trip via trip button on device Bit 11: Test trip via electrical contact Bit 12: Test trip via communication channel Bit 13: Reserved Bit 14: Reserved Bit 15: Reserved	R
0xF9E1	1	Status of 3VA-line	U16	COM800 / COM100	Bit 0: Configuration is set Bit 1: Configuration is valid Bit 2: At least one known breaker cannot be accessed Bit 3: At least one known breaker is connected Bit 4: Too many breakers connected	R

*) The system time and time stamp use the same format based on 2 x U32

1. U32: Number of seconds since 1st January 1970, without leap seconds. This corresponds to UNIX time
2. U32: Fractions of current second, i.e. 2^{-32} seconds or about 4 millions of a second.

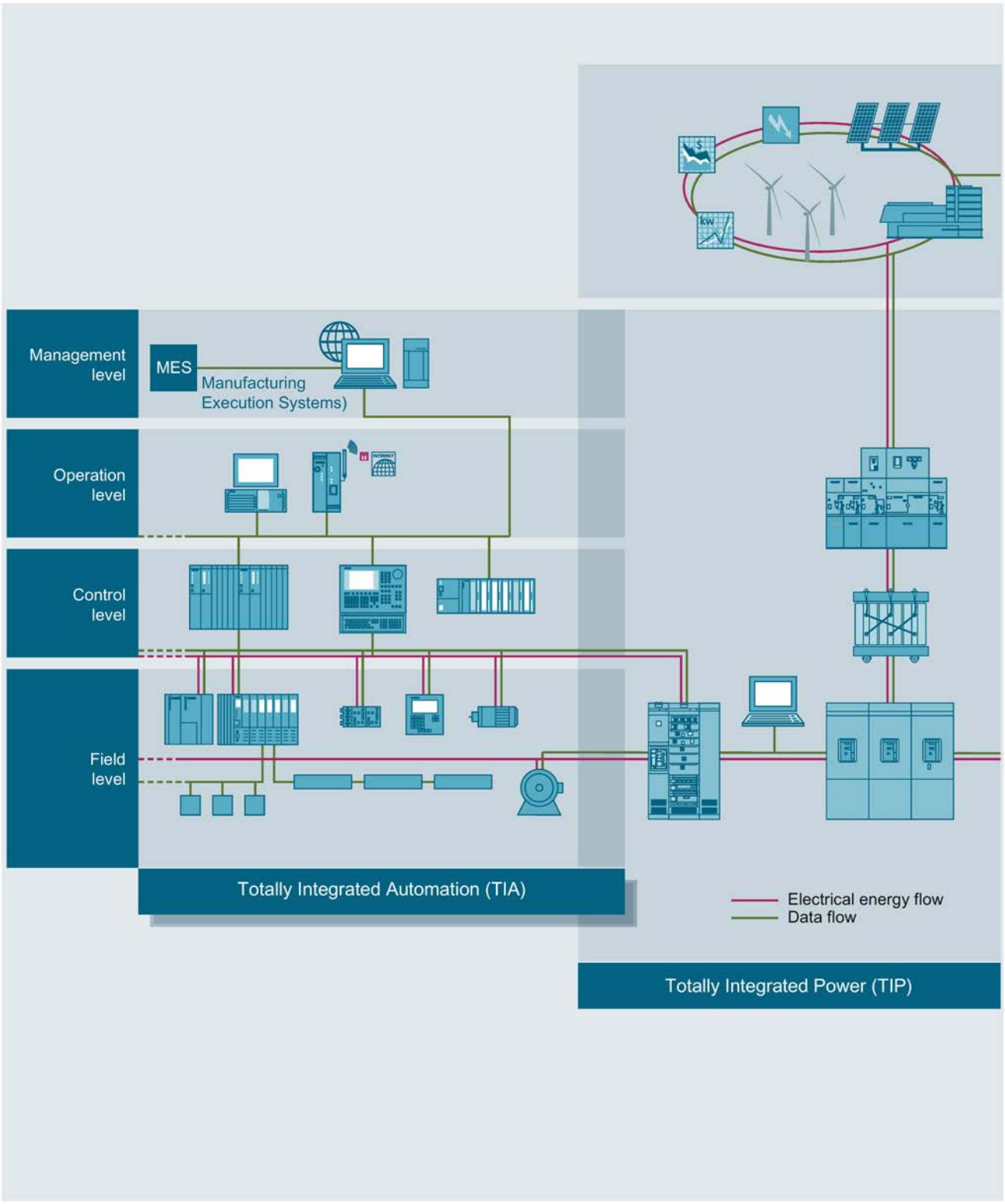
Application examples

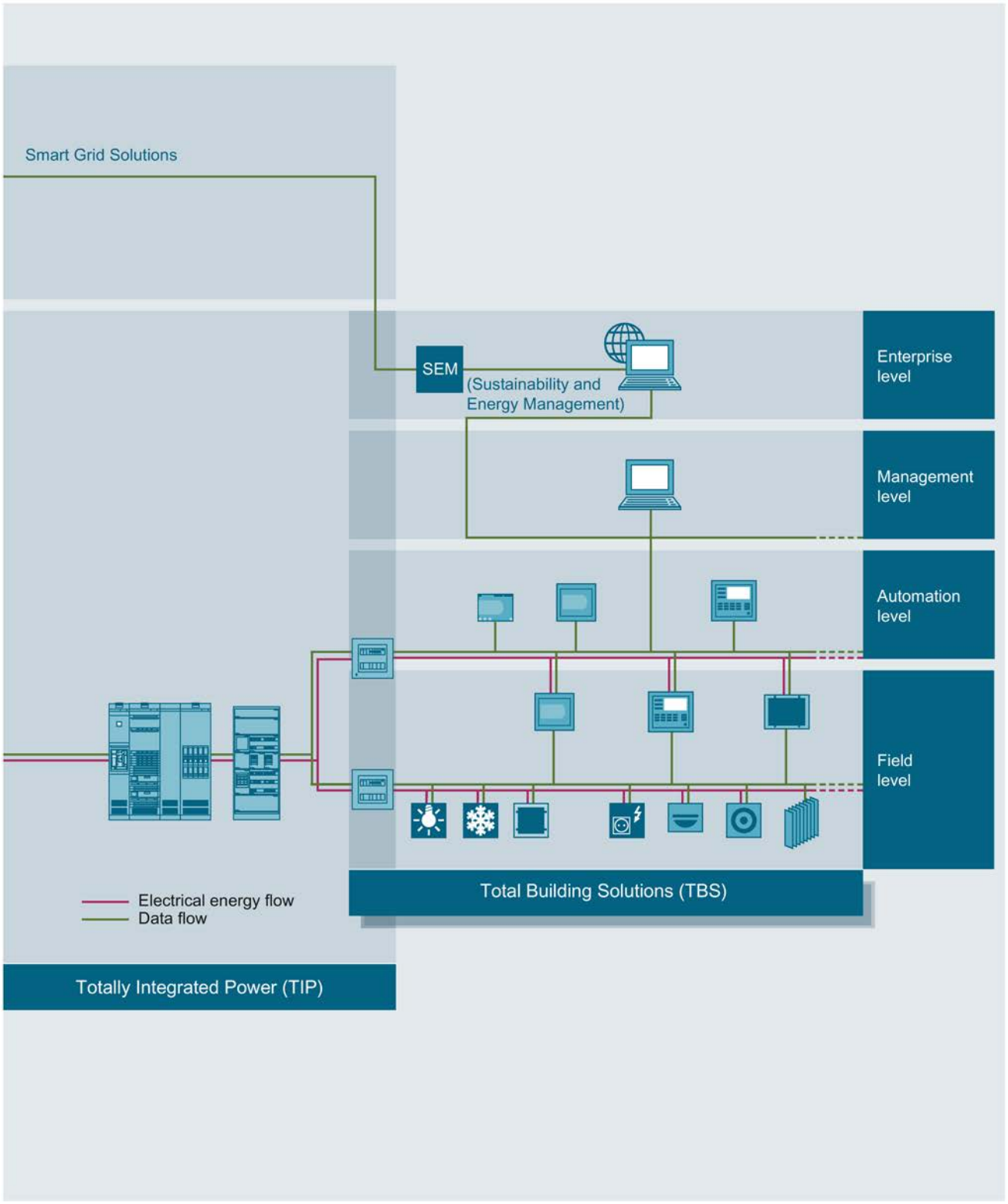
4

The power distribution network can be integrated into the production or building automation system or implemented as a separate, autonomous information system via communication. The following application scenarios will be analyzed in this chapter:

- **T**otally **I**ntegrated **A**utomation (TIA) for production plants
- **T**otal **B**uilding **S**olutions (TBS) for utility buildings
- **T**otally **I**ntegrated **P**ower (TIP) for the power distribution systems of the two applications mentioned above
- Power management with powermanager

In addition to coordinated power distribution equipment in all phases and levels, TIP also offers a standardized information and communication structure.


Management level
MES
Manufacturing Execution Systems)
Operation level
Control level
Field level
Totally Integrated Automation (TIA)
Electrical energy flow
Data flow
Totally Integrated Power (TIP)


Smart Grid Solutions
SEM
(Sustainability and
Energy Management)
Enterprise
level
Management
level
Automation
level
Field
level
Electrical energy flow
Data flow
Total Building Solutions (TBS)
Totally Integrated Power (TIP)

3VA molded case circuit breakers with ETUs 5-series and 8-series use communication systems to deliver important information in power distribution systems.

The following information is available for power and line monitoring:

- Actual measured values
- Status and maintenance information

These large volumes of information can be used for the following applications:

- Power monitoring, e.g. cost center management
- Process and factory automation
- Building management
- Maintenance management, with diagnostics and fault localization

Commissioning and maintenance

Examples of information that can be retrieved when commissioning or maintenance is in progress:

- Setting values for protection parameters
- Test functions
- Status and diagnostic information
- Trip history and operational events

Siemens offers the software application powerconfig (Page 31) for commissioning and maintenance.

powerconfig is a parameterization, testing and commissioning application designed for use with the following circuit breakers and measuring devices:

- Communication-capable 3VA molded case circuit breakers with appropriate ETUs
- 3WL air circuit breakers with appropriate ETUs
- 3VL molded case circuit breakers with appropriate ETUs
- 7KM PAC4200 measuring device
- 7KM PAC3200 measuring device
- 7KM PAC3100 measuring device

powerconfig is supplied free of charge on a DVD shipped with the device or can be downloaded from the Service & Support Portal .

To be able to connect with a device, powerconfig requires a Windows-based PC*) and one of the communication networks described in Chapter System description (Page 15) .

*) For an exact specification of requirements, please refer to the latest product information in the Service & Support Portal.

For additional information about powerconfig, please refer to chapter powerconfig (Page 31).

See also

http://support.automation.siemens.com/WW/view/en/63452759

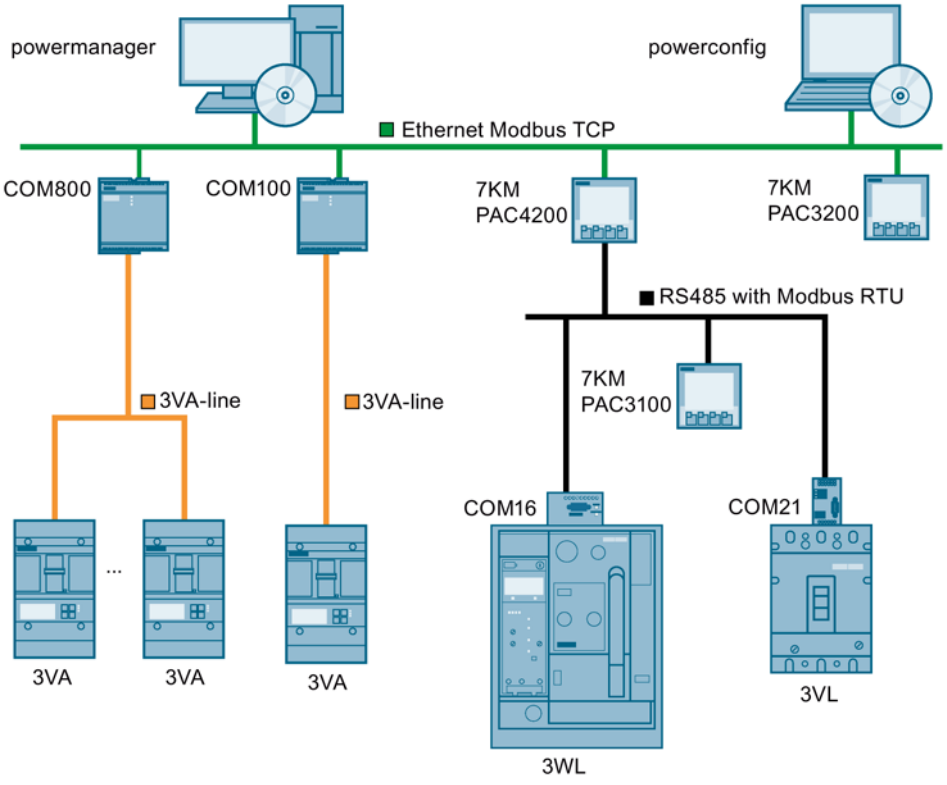
4.1 Power monitoring with powermanager

Siemens has developed the powermanager software for power and line monitoring

Identifying cost-cutting potential

The powermanager power monitoring software processes and monitors the measured data obtained from 7KT/7KM PAC measuring devices and communication-capable 3WL/ 3VA / 3VL circuit breakers. Potential energy savings can easily be identified thanks to the transparency of the energy flows.

The entire SENTRON portfolio with power monitoring software, measuring devices and circuit breakers has been certified by the TÜV Rheinland for its suitability to support a power management system in accordance with ISO 50001.



4.1.1 Application

The power monitoring software "powermanager" is used to acquire, monitor, evaluate, display and archive power data from 7KM PAC1500, 7KM PAC3100, 7KM PAC3200, 7KM PAC4200 measuring devices, 3WL, 3VL and 3VA circuit breakers and any Modbus-enabled measuring devices.

powermanager offers the following power monitoring functions:

- Tree view of the customer's system (project tree)
- Measured value display with pre-defined user views
- Alarm management
- Demand curve
- Reporting, different report types, e.g. cost center report
- Load monitoring
- Reaction plans
- Power peak analysis
- Support of distributed estates (systems)
- Archiving system
- User administration

Pre-defined standard

powermanager is delivered with standard projects. Pre-defined settings make it possible to use the software immediately without the need to configure the system.

4.1.2 Device integration

powermanager supports the following devices:

- **7KT PAC1500 measuring device**

  The device has an integrated optical interface (IrDA). It can be connected to powermanager via any Modbus gateway.

- **7KM PAC3100 measuring device (firmware version 1.0 and higher)**

  The device can be connected to powermanager via the gateway functionality of the 7KM PAC4200 measuring device or any Modbus gateway.

- **7KM PAC3200 measuring device (firmware version 2.0.x and higher)**

  The device can be connected directly to powermanager via the integral Ethernet interface using Modbus TCP.

- **7KM PAC4200 measuring device (firmware version 1.2 and higher)**

  The device can be connected directly to powermanager via the integral Ethernet interface using Modbus TCP.

- **3VA molded case circuit breaker**

  The device is directly connected to powermanager via the COM800 / COM100 breaker data server and the integral Ethernet interface using Modbus TCP.

- **3VL COM21 molded case circuit breaker**

  The device can be connected to powermanager via the gateway functionality of the 7KM PAC4200 measuring device or any gateway.

- **3WL COM16 air circuit breaker**

  The device can be connected to powermanager via the gateway functionality of the 7KM PAC4200 measuring device or any gateway.

Other devices

Any Modbus-enabled measuring devices can be directly connected to powermanager via Ethernet (Modbus TCP).

4.1.3 Multi-language capability

powermanager V3.0 or higher comes with support for four languages:

- German
- English
- Spanish
- Portuguese

Windows, dialogs and the designations of measured variables used in the standard version are displayed in these languages.

An experimental version can be downloaded directly from the Internet:
http://support.automation.siemens.com/WW/view/en/51591062

4.2 Automation technology

Solutions for the process and manufacturing industries with Totally Integrated Automation (TIA)

Totally Integrated Automation, the industrial automation solution developed by Siemens, supports the efficient automation of a broad range of processes. Standardized interfaces, in particular communication interfaces, help to ensure effective interaction between all components.

A salient feature of the process and manufacturing industries is their high power consumption. The integration of power data and the status of the power distribution network into existing systems is therefore a logical step forward.

Communication via PROFIBUS DP

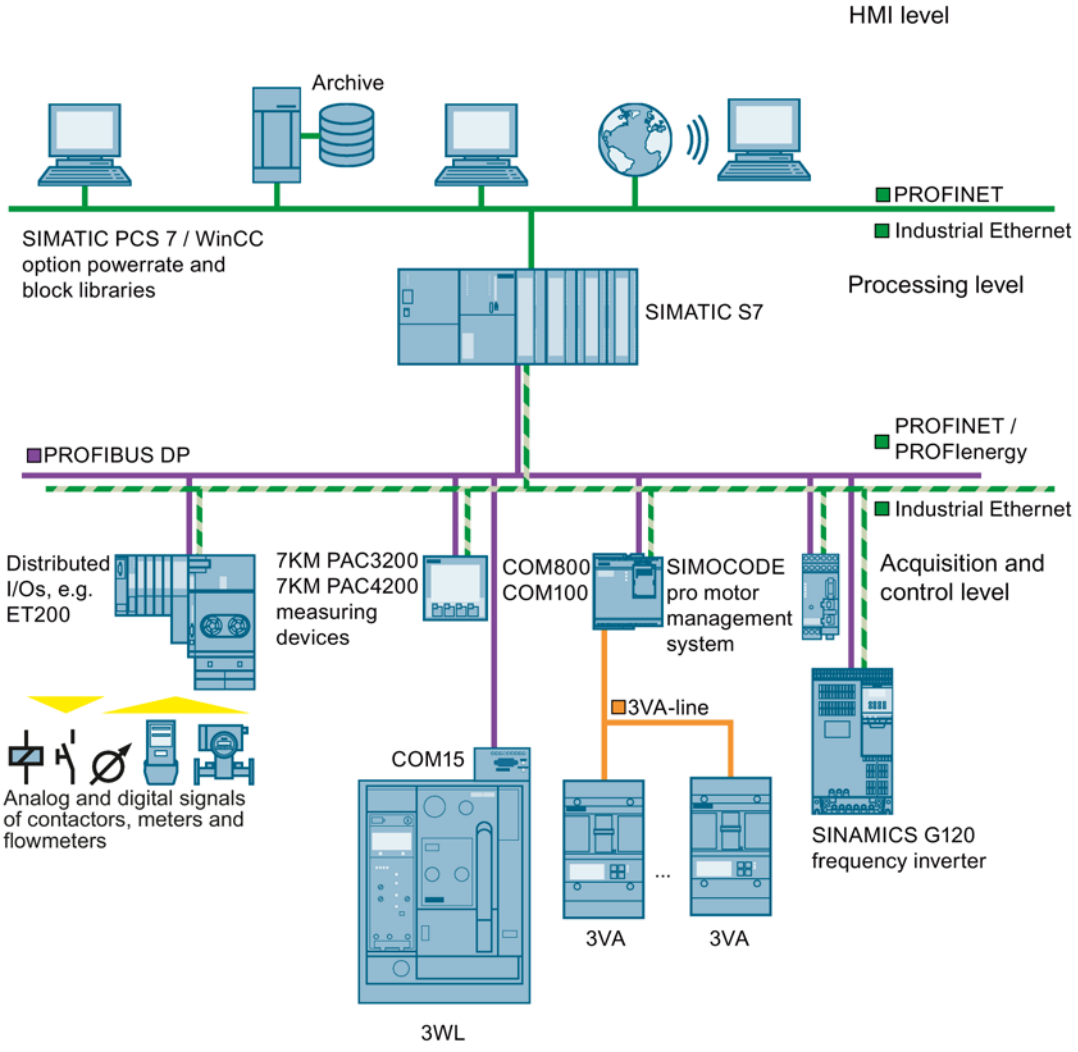
PROFIBUS DP enables integration of a wide range of devices:

- Protection devices such as circuit breakers for power distribution equipment and loads
- Equipment for the open-loop and closed-loop control of electricity, such as frequency converters, motor management systems and soft starters
- Equipment for measuring power:
  - electrical measured variables: via 7KM PAC3200/4200 measuring devices
  - non-electrical measured variables: via analog/digital converters

PROFINET and PROFIenergy

An increasing number of devices in automation technology offer PROFINET. A 7KM PAC Switched Ethernet PROFINET expansion module is also available for 3VA molded case circuit breakers and 7KM PAC3200 and 7KM PAC4200 measuring devices.

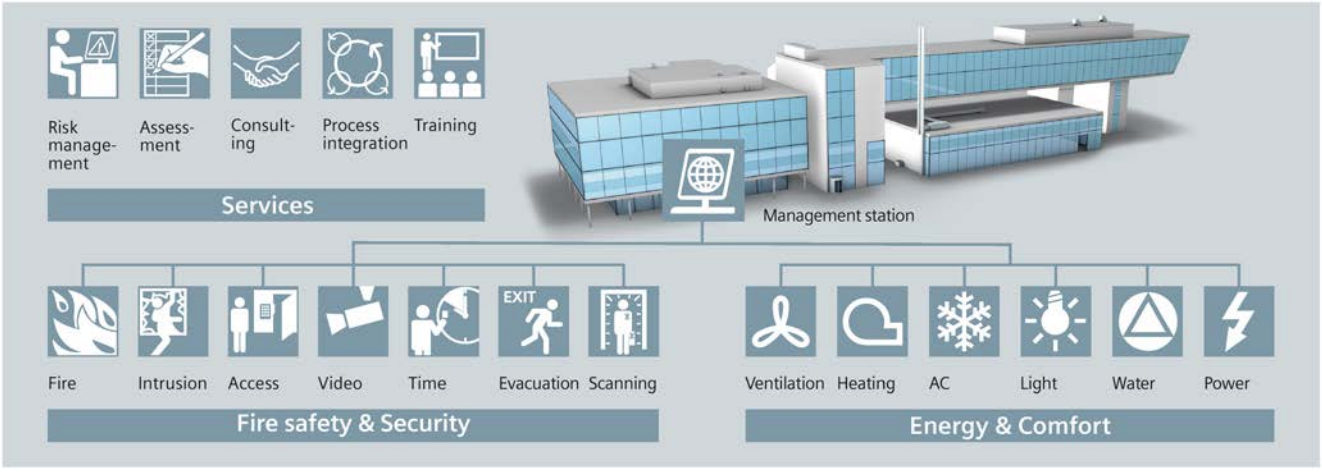
PROFIenergy is a "Common Application Profile" developed by Profibus International. PROFIenergy makes it possible to retrieve power data via a standardized interface.



4.3 Building automation

Intelligent buildings with Total Building Solutions

Modern buildings need to satisfy many different criteria. Building services with integrated disciplines such as building automation, fire safety, security, lighting, and low-voltage power distribution form the core of a total building solution. The objective of a total building solution is to achieve optimum integration of these disciplines in order to make buildings safer, more comfortable, more economical and more efficient.



3VA molded case circuit breakers are particularly helpful in meeting power consumption and comfort targets and should be incorporated via a communication interface into the building automation system of the total building solution design.

Connection, commissioning, operation 5

This chapter describes in detail how a communication network of 3VA molded case circuit breakers can be created.

5.1 Application planning

The following issues need to be clarified before a communication network can be set up in a power distribution system:

- Installation location
- Supply voltage and grounding system
- Heat loss calculation
- Climatic operating environments
- Communication network planning

This chapter gives instructions on how to plan communication networks and explains what factors need to be taken into account in order to make optimum use of the communication capability of 3VA molded case circuit breakers.

5.1.1 Installation locations

To be able to make full use of all the communication functions provided by 3VA molded case circuit breakers, it is first important to plan the precise installation location of the components in the power distribution system. To ensure that sufficient space is available for individual components and their connections, this chapter provides an overview of space requirements and gives recommendations as to how components should be installed.

Note

DIN rail

DIN rail type DIN EN 60715 - TH35 – 7.5 / TH 35 – 15 is required to install the COM800/ COM100 breaker data server and the EFB300 external function box on a standard rail.

COM800 / COM100 breaker data server

The following space requirements must be calculated for the COM800 / COM100 breaker data server:

- Width 90 mm
- Height 114 mm
- Depth 34 mm without and 56 mm with 7KM expansion module

Space must also be provided above the COM800 / COM100 breaker data server for:

- the connections
- the Ethernet connector
- the 24 V supply
- the connector for the 3VA-line

You can find additional information in Chapters Connecting PROFIBUS DP (Page 146) and Connecting Switched Ethernet PROFINET (Page 168).

EFB300 external function box

The following space requirements must be calculated for the EFB300 external function box:

- Width 70 mm
- Height 117 mm incl. connections
- Depth 33 mm

The external function box can also be mounted directly on a wall. You can find additional information in the operating instructions for the EFB300 external function box.
http://support.automation.siemens.com/WW/view/en/80600828

COM060 communication module

The COM060 communication module is installed in the right-hand accessories compartment of the 3VA molded case circuit breaker. The communication module occupies four slots which are then no longer available for other accessories. The ambient conditions for the 3VA molded case circuit breaker are not altered as a result of installing the COM060 communication module.

DSP800 display

The DSP800 display is intended for installation in permanently installed switching panels and control cabinets within closed rooms.

Mounting position:

The display is best viewed at an angle from below.

Note

The DSP800 display requires installation of a COM800 or COM100 breaker data server.

TD500 test device

The TD500 test device can be attached by a magnet holder to a steel plate (e.g. in the switchboard door).

Please note the following:

- The connecting cable (1.5 m) supplied with the device determines the cable length between the TD500 test device and the 3VA molded case circuit breaker.
- TD500 must be supplied by the plug-in power pack shipped with the device.
- TD500 is operated by buttons which must be accessible.
- TD500 can be connected to the PC by means of a USB cable (1.5 m).

Note

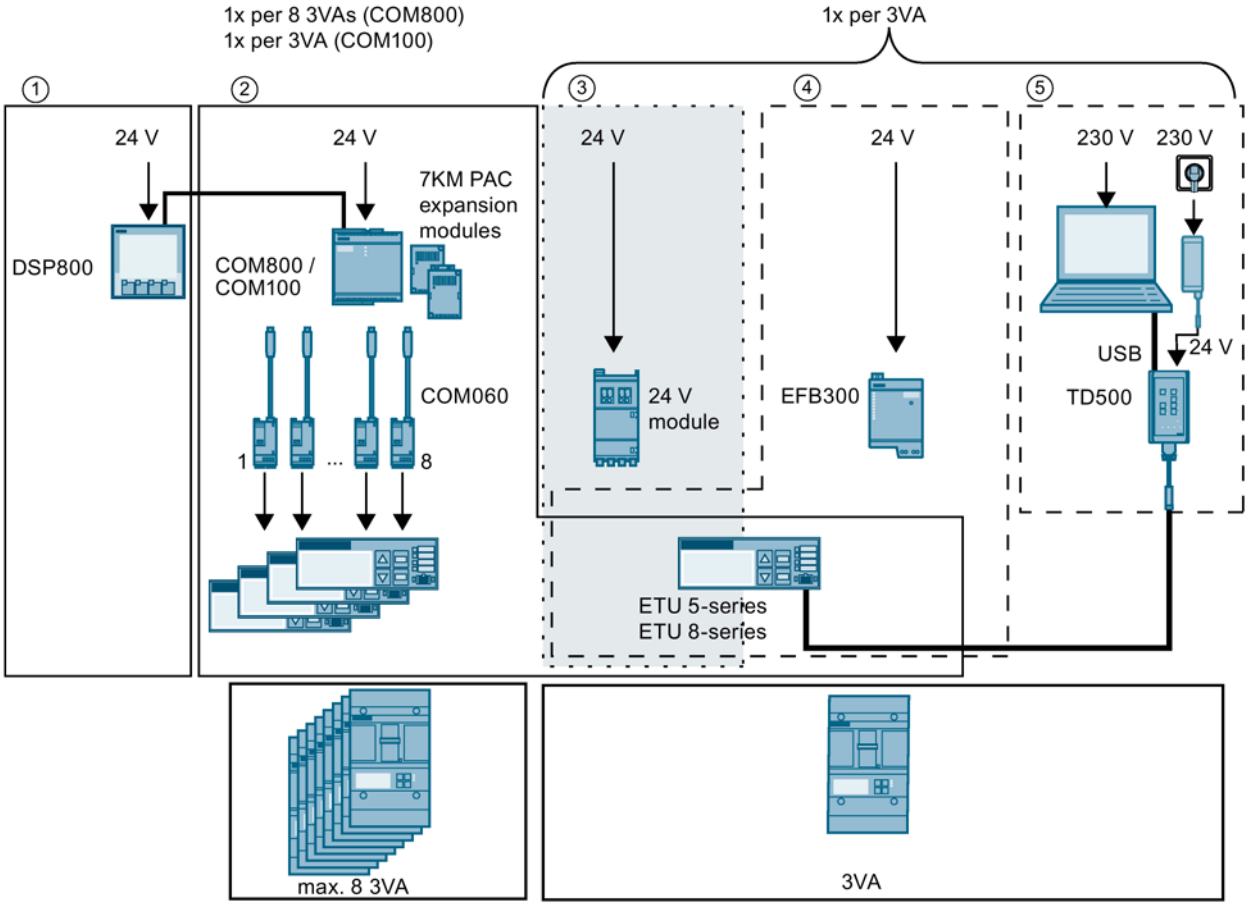
The TD500 may only be connected to and operated with a 3VA molded case circuit breaker that is disconnected from the power supply.

5.1.2 Supply voltages and grounding system

The 3VA molded case circuit breaker can be supplied with voltage from various sources depending on the required scope of functions.

The ETU protection function is supplied from the main circuit.

Status, control, test, metering and communications functions as well as the LCD must be connected to an additional auxiliary power supply. This ensures that these functions will be available even when the main circuit is de-energized.



	Function	Supply via	Voltage	Tolerance	Protection class	Current max.	Making current	Power losses
①	Local display via DSP	DSP800	24 V DC	20 %	SELV/ PELV	90 mA		2.2 W
②	Measurement and communication & local display and operation	COM800 breaker data server	24 V DC	± 20 %	SELV / PELV	1120 mA	2000 mA	27 W
		COM100 breaker data server	24 V DC	± 20 %	SELV / PELV	350 mA		7.5 W
③	Measurement with local display and operation	24 V module	24 V DC	± 20 %	SELV / PELV	100 mA		2.5 W
④	Switching of digital inputs / outputs & measurement with local display and operation	EFB300 external function box	24 V DC	± 20 %	SELV / PELV	80 mA		2.0 W
⑤	Testing	TD500 test device	230 V AC	± 3 %				2.5 W

DC Direct current

The DC supply must comply with the requirements defined in IEC 61558 or Class 2 according to UL 1310. The residual ripple must be limited to < 250 mVpp. We therefore recommend use of a power supply from the SITOP product range.

5.1.3 Heat loss calculation

In order to calculate the total heat loss, the heat losses of each individual component installed must be added up. The heat losses of other components in the switchboard must also be included in the calculation.

5.1.4 Ambient conditions

The electronic components of the 3VA molded case circuit breaker can operate in the following ambient conditions:

Ambient conditions		
Operating temperature	[° C]	-25 .. +70
Storage temperature	[° C]	-40 .. +80
Relative humidity		95 %
Altitude		For altitudes of ≤ 2000 m above sea level without restriction to ratings.

5.1.5 Communication network planning

The 3VA molded case circuit breaker combined with the COM800 / COM100 breaker data server and optional communication modules is a:

- Modbus TCP slave
- PROFINET IO device

i.e. an IP network for Modbus TCP and PROFINET IO must be planned.

The network planning, particularly of the free IP addresses, must be completed before the COM800 / COM100 breaker data server and the optional communication modules are commissioned.

The IP address of the DSP800, the assigned COM800 / COM100 and the IP address of the PC with powerconfig must be taken into account when planning a network with DSP800.

An example of simple IP address assignment is:

- PC with powerconfig 192.168.0.1
- COM800 or COM100 192.168.0.2
- DSP800 192.168.0.3

For all devices

- Subnet mask 255.255.255.0 or 255.255.0.0; i.e. the "0"s mark the relevant positions for the device address.
- Gateway 0. 0. 0.0

When the PROFIBUS DP protocol is used, it is only necessary to specify the network address. The baud rate and character frame are automatically detected or predefined.

Further information

You can find further information about PROFIBUS and PROFINET at:

- PROFIBUS and PROFINET documentation from PI International
  http://www.profibus.com
- PROFIenergy profile
  http://www.profibus.com/nc/downloads/downloads/commonapplication-profile-profienergy/display
- SIMATIC NET "PROFIBUS Network Manual"
- Modbus-IDA.org "MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1a"
- MODBUS.org "MODBUS over Serial Line Specification & Implementation Guide V1.02"

You can find the latest guides at:

- Ethernet: http://support.automation.siemens.com/WW/view/en/27069465
- PROFIBUS: http://support.automation.siemens.com/WW/view/en/35222591

The communication infrastructure is already defined in many cases and must be applied appropriately to the 3VA molded case circuit breakers.

5.2 COM800 / COM100 breaker data server

The COM800 / COM100 breaker data server provides the following functions:

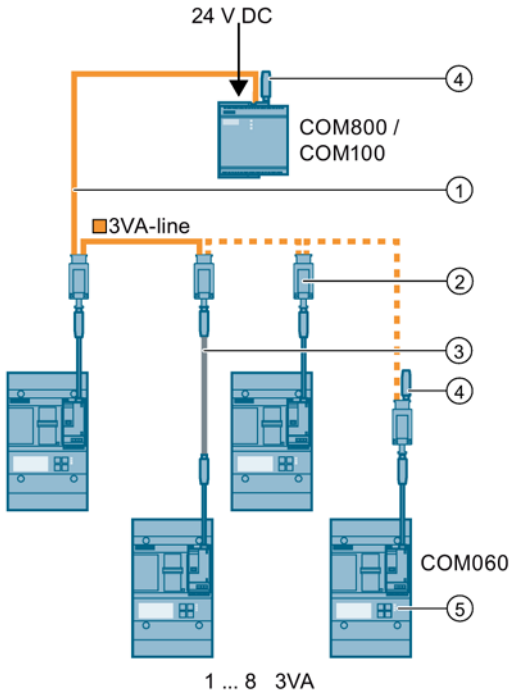
- Parameterization and diagnosis of the COM800 / COM100 breaker data server itself
- Communication with the power monitoring system powermanager V3.x or other software available on the market
- Configuration of the COM800 / COM100 breaker data server and the connected 3VA molded case circuit breakers with the powerconfig software
- Communication with the DSP800 display
- Updating of firmware of the COM800 / COM100 breaker data server, the connected COM060 and the PROFIBUS DPV1 expansion module with powerconfig (see Firmware update (Page 203))

This chapter gives instructions on how to connect up and use the COM800 / COM100 breaker data server. For information about installation, please refer to the Operating Instructions http://support.automation.siemens.com/WW/view/en/80601362.

5.2.1 Connecting

5.2.1.1 Connecting the 24 V supply

The 24 V DC supply is connected to the COM800 / COM100 breaker data server via terminal X1. The 24 V DC supply also feeds the connected 3VA molded case circuit breakers.



① 3VA-line
② T-connector
③ COM060 extension cable
④ Terminating resistor
⑤ 3VA molded case circuit breaker

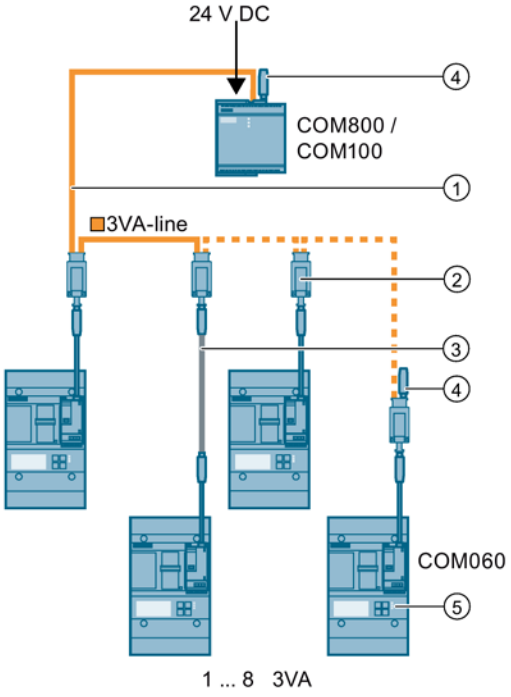
Note

The total length of all cables must not exceed 20 m.

The functional ground must be connected to terminal X1 of the COM800 / COM100 breaker data server (if possible, at the same potential as the shield of the communication network).

5.2.1.2 Connecting the 3VA-line

The COM800 / COM100 breaker data server is equipped with two terminals for making the 3VA-line connection.



① Pre-assembled connecting cable T-connector
② T-connector
③ Pre-assembled connecting cable for extending the COM060-to-T-connector spur line connection
④ Terminating resistors

A connection can also be optionally equipped with a 3VA-line terminating resistor.

Note

The total length of all cables must not exceed **20 m**.

The 3VA-line comprises up to 8 connecting cables, up to 8 T-connectors and 2 terminating resistors to allow connection of up to 8 3VA molded case circuit breakers with the COM800 breaker data server.

For a COM100 breaker data server, the 3VA-line consists of a connecting cable, a T-connector and two terminating resistors.

The T-connectors link two connecting cables to a COM060 communication module. A terminating resistor must be installed at each end of the 3VA-line.

5.2.1.3 Ethernet connection

The COM800 / COM100 breaker data server is equipped with an Ethernet interface with the following properties:

- Transmission rates 10 / 100 Mbit/s
- RJ45 socket on the top of the device for RJ45 connector with EIA/TIA T568B assignment
- Cable type 100Base-TX (CAT5)

  The Ethernet cable must be grounded for data transmission according to the Fast Ethernet standard. You can find information on grounding in Chapter Connection.
- Autonegotiation
- MDI-X auto crossover
- Communication over Modbus TCP

NOTICE
Interference with other network nodes due to incorrect network settings
Incorrect network settings can adversely affect or interfere with the functions of other network nodes The network settings for Ethernet are defined by the system administrator and must be set accordingly on the device.
If the settings are not known, the (Ethernet) cable must not be connected.

Autonegotiation

Autonegotiation is a method used by network communication peers to automatically negotiate the highest possible transmission rate. If the communication partner does not support autonegotiation, the COM800 / COM100 breaker data server adjusts automatically to the transmission rate of the communication partner.

5.2.1.4 Connecting the module interface

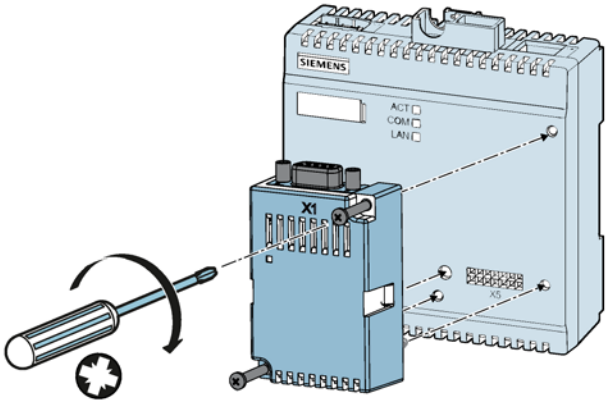
Either the 7KM PAC PROFIBUS DP or the 7KM PAC Switched Ethernet PROFINET expansion module can be installed in the COM800 / COM100 breaker data server.

Install the expansion module before you commission the COM800 breaker data server.

Observe the ESD guidelines.

NOTICE
Defective connector at the 7KM PAC expansion module Dirty or bent pins can affect the function of the connectors. The connectors can be destroyed. Ensure the following: • There are no metal parts between the pins. • There are no metal parts stuck to the pins. • Do not bend the pins. • Do not touch the pins. • Keep the pins clean

Connecting the module to the module interface



1. Ensure safe isolation from supply.
2. Make sure that you do not transfer any static charges to the device. Discharge the static electricity from your body before you touch the device.
3. Handle the 7KM PAC expansion module by its plastic housing only.
4. Attach the 7KM PAC expansion module to the COM800 / COM100. The guide pins will ensure that the 7KM expansion module is plugged in correctly.
5. Tighten the screws of the 7KM PAC expansion module to a torque of 0.5 Nm.

5.2.2 Operator controls and displays

The COM800 / COM100 breaker data server is equipped with the following operator controls:

- LED display
- Write-protect switch

This chapter provides a guide to use of the operator controls.

5.2.2.1 LED display

The COM800 / COM100 breaker data server has three LEDs for signaling status information.



① LED display

The following table provides an overview of possible LED states:

LED		Meaning	Description
☐	COM	Off	No communication
	COM	Green Flashing (2 Hz)	Connection established to 3VA-line [1]
	COM	Red Flashing (2 Hz)	The actual 3VA-line does not match the configured 3VA-line [2]
	COM	On	Communication with 3VA OK
☐	ACT	Off	No power supply
	ACT	Flashing (2 Hz)	Device powering up. Restricted operation [3]
	ACT	On	In operation
	COM + ACT	Flashing (2 Hz)	Identify (15 s)
☐	LAN	Off	No communication via integrated Ethernet interface
	LAN	Flashing (2 Hz)	Connector ok, but no communication
	LAN	On	Communication via integrated Ethernet interface
	COM + ACT + LAN	Flashing (2 Hz)	Exceptional situation which cannot be remedied by user [4]
☐	COM + ACT + LAN	Off	COM800/COM100 not functioning [5]

1) If the state persists for longer than 10 s, it is an indication of a communication error on the 3VA-line.

Measures

- Check whether all plug-in connections are correctly inserted.
- Check whether both terminating resistors are correctly inserted.
- Check whether more than the maximum permissible number of 3VA molded case circuit breakers (COM800: 8; COM100: 1) are connected to the COM800 / COM100 breaker data server.

2) The actual 3VA-line does not match the configured 3VA-line, for example, more or fewer 3VA molded case circuit breakers than the configured number are connected.

Measures:

- Check whether all configured 3VA molded case circuit breakers are connected
- Check whether other 3VA molded case circuit breakers that have not been configured are connected

You can view the target configuration in powerconfig.

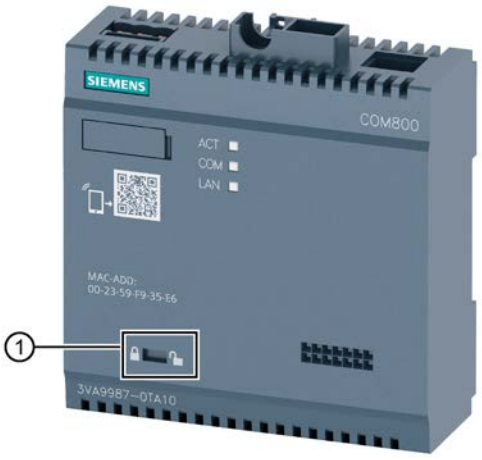
3) ACT also flashes green when a firmware update is in progress. If ACT flashes continuously, it is recommended to update the firmware of the COM800 / COM100. powerconfig can be used to investigate the cause of the fault and restore the device to its normal operating condition.

4) Please contact technical support.

5) No power supply or more than 8 3VA molded case circuit breakers connected.

5.2.2.2 Write-protect switch

The COM800 / COM100 breaker data server is equipped with a write-protect slide switch.



① Write-protect switch

When write protection is activated, configuration settings cannot be made via the communication system, e.g. by powerconfig. It is still possible to change warning and alarm limits and to control outputs.

The user is notified in powerconfig about any actions which have been rejected as a result of the write protection.

Write protection activated	Write protection deactivated	Function
	■	Configuration via communication channel
	■	Firmware update
■	■	Read out configuration
■	■	Read measured values and load profiles
■	■	Change limits
	■	Change digital outputs
■	■	Time synchronization

In order to prevent unauthorized manipulation of settings, it must be ensured that the COM800 / COM100 breaker data server is not accessible when the write protection is activated.

5.2.3 Commissioning

5.2.3.1 First commissioning

The COM800 / COM100 breaker data server can only be commissioned by means of powerconfig. The breaker data server can be accessed from powerconfig using the function "Search for Accessible Devices (F11)" on the condition that a communication link has been established via Ethernet or the plugged-in communication module.

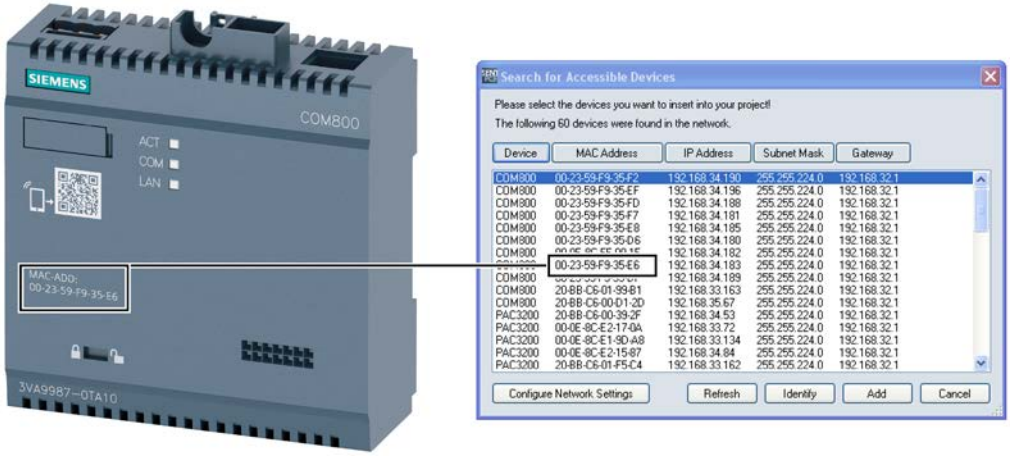
The COM800 / COM100 breaker data server can be clearly identified by the MAC address printed on the device and the MAC address in the screen dialog.

Select the COM800 / COM100 breaker data server with powerconfig

When the icon "Search for Accessible Devices" is selected, all COM800 / COM100 breaker data servers that can be accessed via the communication network are displayed. For further information, please refer to Chapter Commissioning and service software: powerconfig (Page 187).

The breaker data server can be identified by:

- the device type
- the MAC address printed on the device
- an optical identification command using the ACT LED



After the COM800 / COM100 had been identified, the button "Change network settings" must be selected to alter network settings in accordance with the planned network.

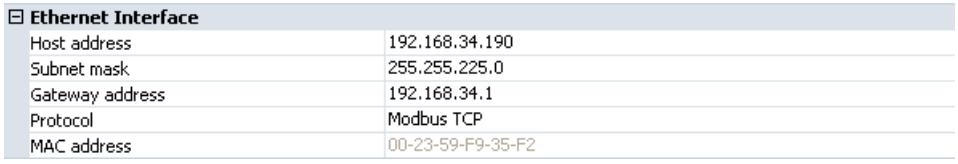
The COM800 / COM100 breaker data server can then be added to the project with the "Add" button.

See also

Communication network planning (Page 94)

5.2.3.2 Configuring from the device library

If a COM800 / COM100 breaker data server is inserted in the project from the device library, the network settings must be made in the view Parameters > Ethernet Interface.



Ethernet Interface	
Host address	192.168.34.190
Subnet mask	255.255.225.0
Gateway address	192.168.34.1
Protocol	Modbus TCP
MAC address	00-23-59-F9-35-F2

These settings are:

- IP address of the COM800 / COM100 breaker data server

- The subnet mask which marks the relevant positions of the IP address for the device with "0".

- It is also possible to enter the gateway address of a computer that can set up a connection from the network defined in the field "Subnet Mask" to another network (e.g. a router).

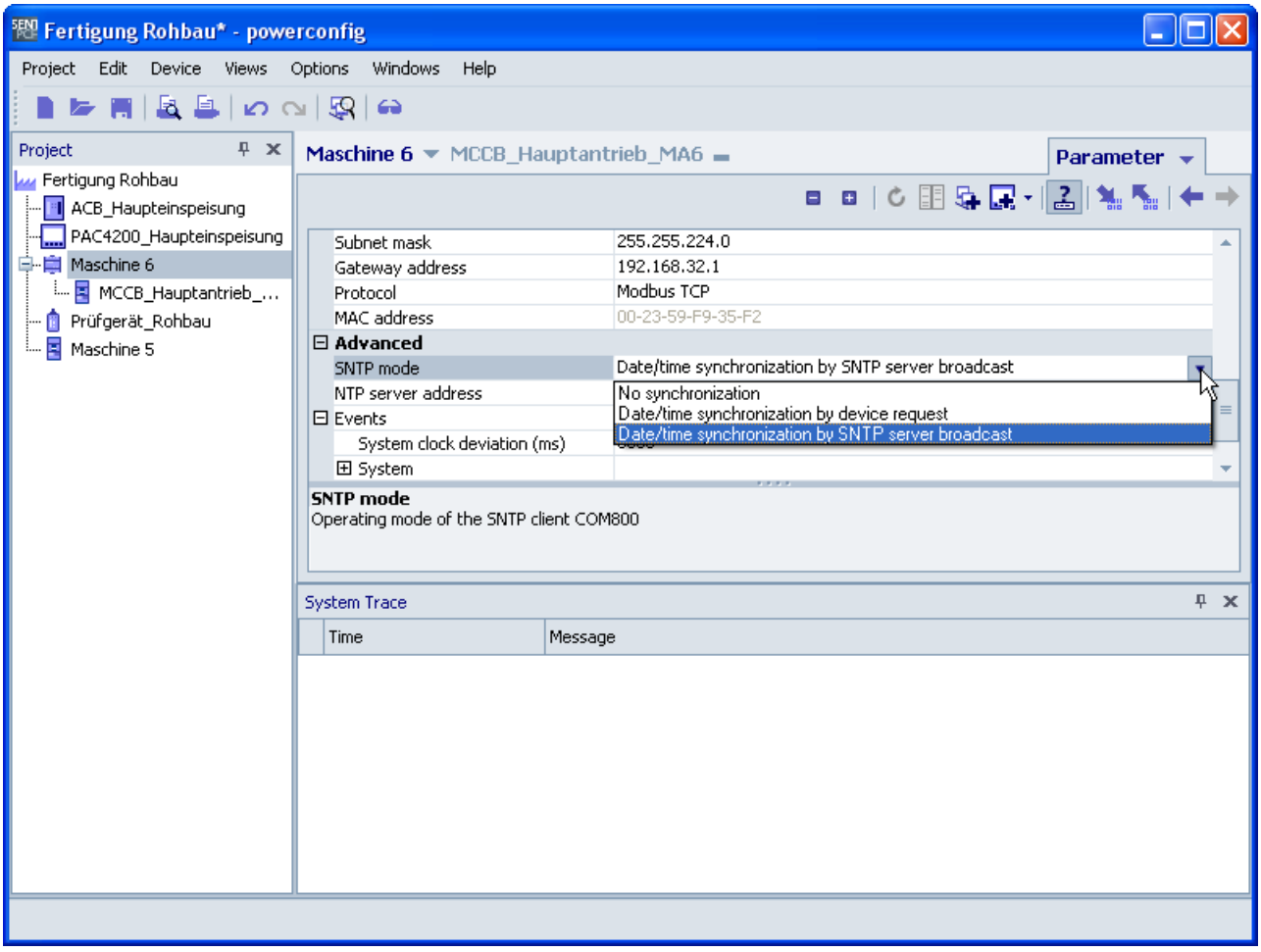
Parameterize time synchronization

The COM800 / COM100 breaker data server features a time function which is accurate to the second. The time of day can be set by the following methods:

- Set via powerconfig:

  Menu Device > Date and Time Settings

- Parameterize an SNTP server that will supply time information:



Note

The time of day must be corrected after a power failure.

- Synchronization via PROFIBUS DP or PROFINET IO

  Synchronization is configured via PROFIBUS DP and PROFINET IO.

  Commissioning and service software: powerconfig (Page 187)

  First commissioning (Page 104)

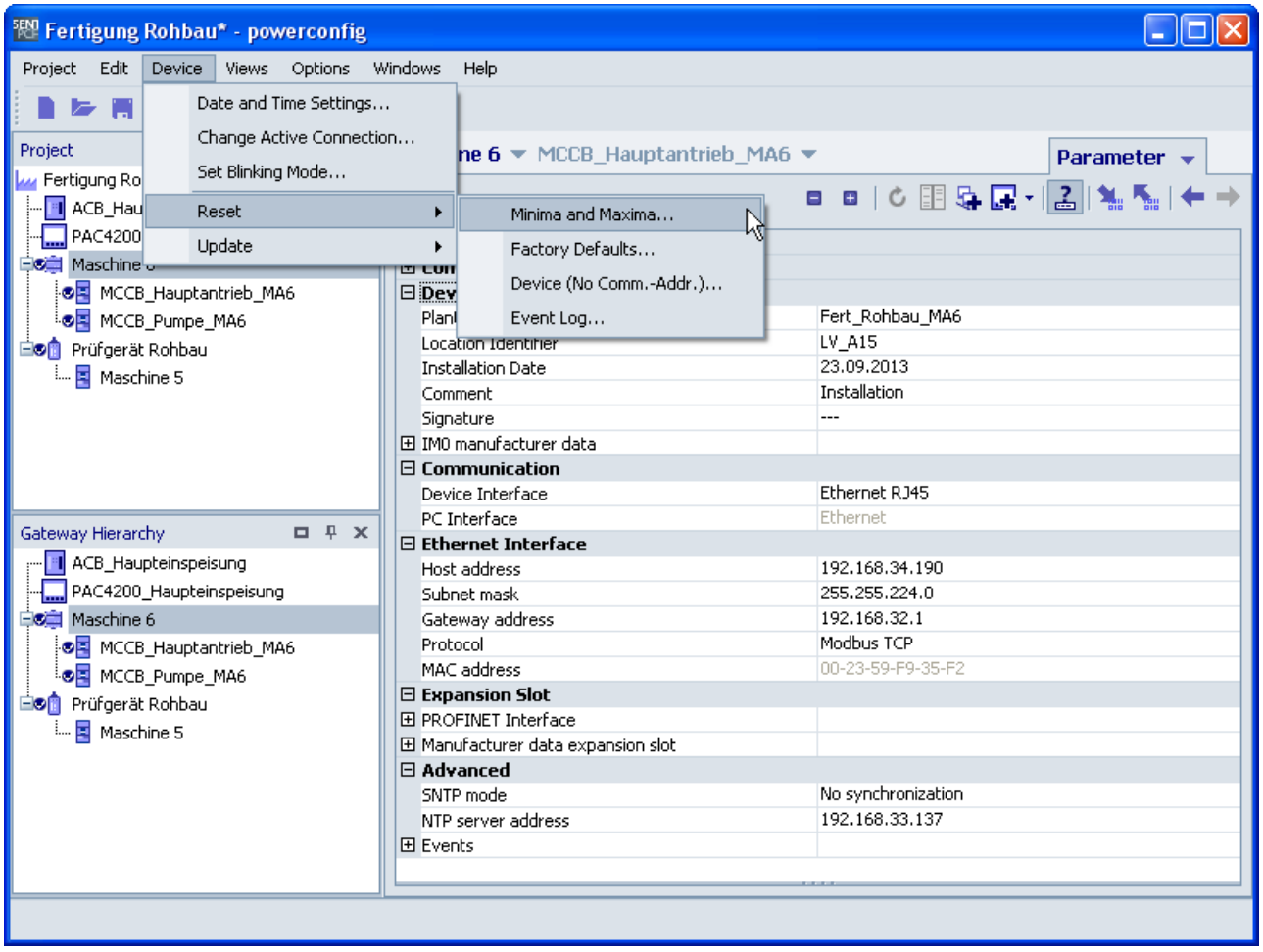
  Power monitoring with powermanager (Page 83)

  PROFIBUS DP (Page 153)

PROFINET IO (Page 174)

5.2.3.3 Resetting

A communication link must have been established via Ethernet before the COM800 / COM100 breaker data server can be reset. The COM800 / COM100 breaker data server must also be selected in the project. Parameters can then be reset via the reset commands in the "Device" menu or the shortcut menu. If the communication parameters are reset, it is impossible to communicate with the device until the network settings are entered again.

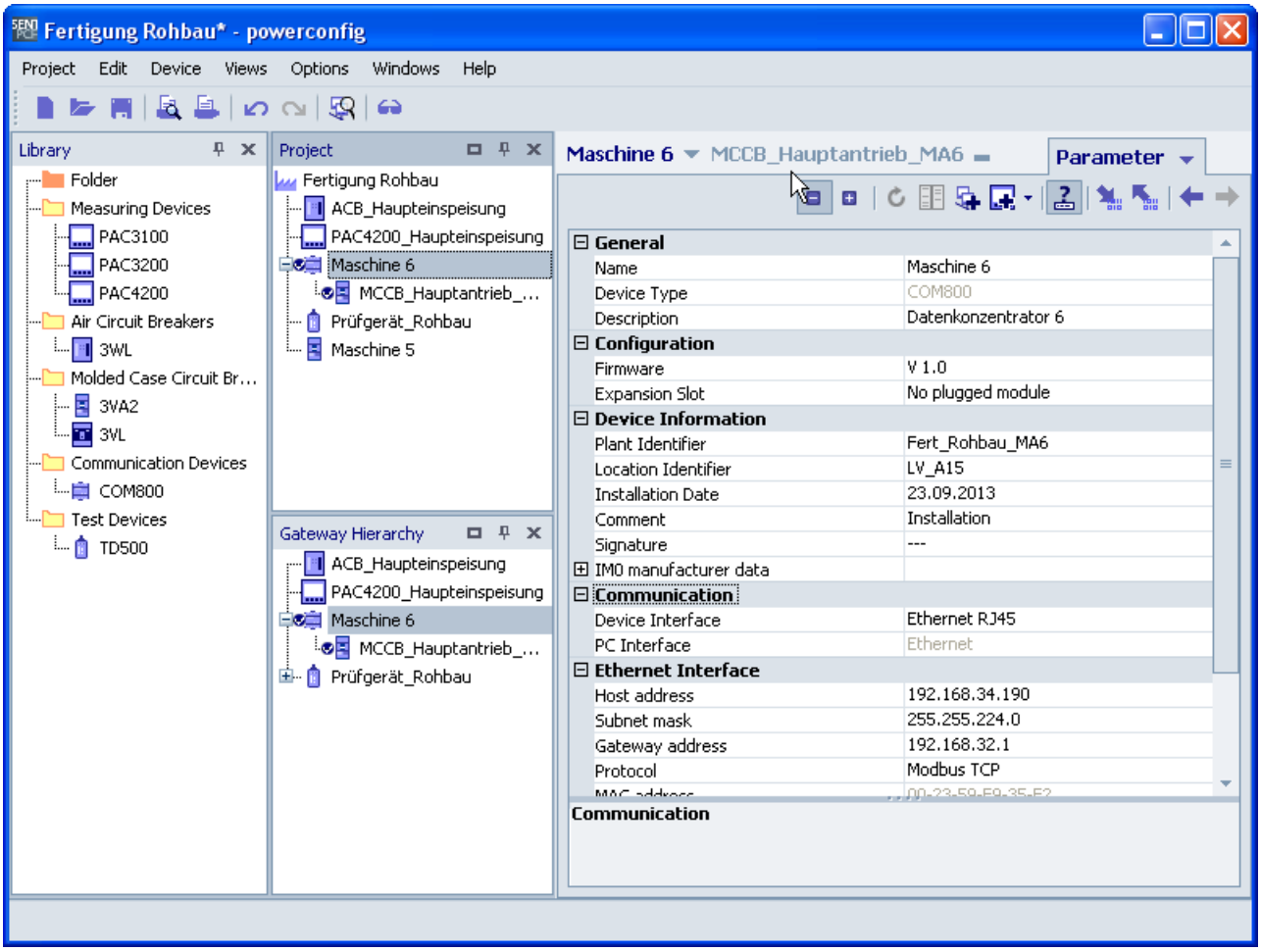


The COM800 / COM100 breaker data server can then be treated as if it were being commissioned for the first time (see Chapter First commissioning (Page 104)).

5.2.3.4 Commissioning a 3VA connected to COM800 / COM100

Select the COM800 / COM100 breaker data server from the project

Precondition: An IP address has already been assigned to the COM800 / COM100 breaker data server (e.g. during first commissioning (Page 104)).



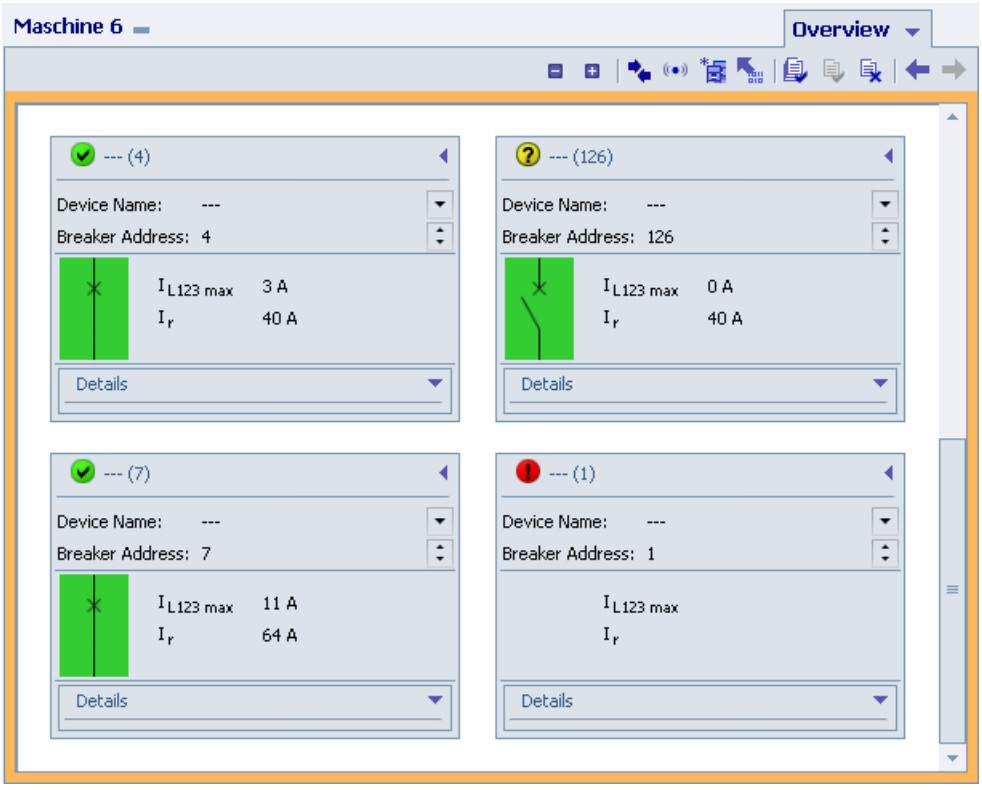
If the COM800 / COM100 breaker data server has not been added using the command "Search for Accessible Devices", it must be dragged out of the library and dropped in the project. The view "Parameters" opens when this is done. You can find additional information in Chapter Parameterizing 3VA molded case circuit breakers (Page 197)

Automatic selection of 3VA molded case circuit breakers

Click on the icon in order to establish a communication link with the selected COM800 / COM100 breaker data server.

The COM800 / COM100 breaker data server automatically displays the 3VA molded case circuit breakers connected to it via the 3VA-line.

Use powerconfig to make 3VA molded case circuit breakers capable of communication

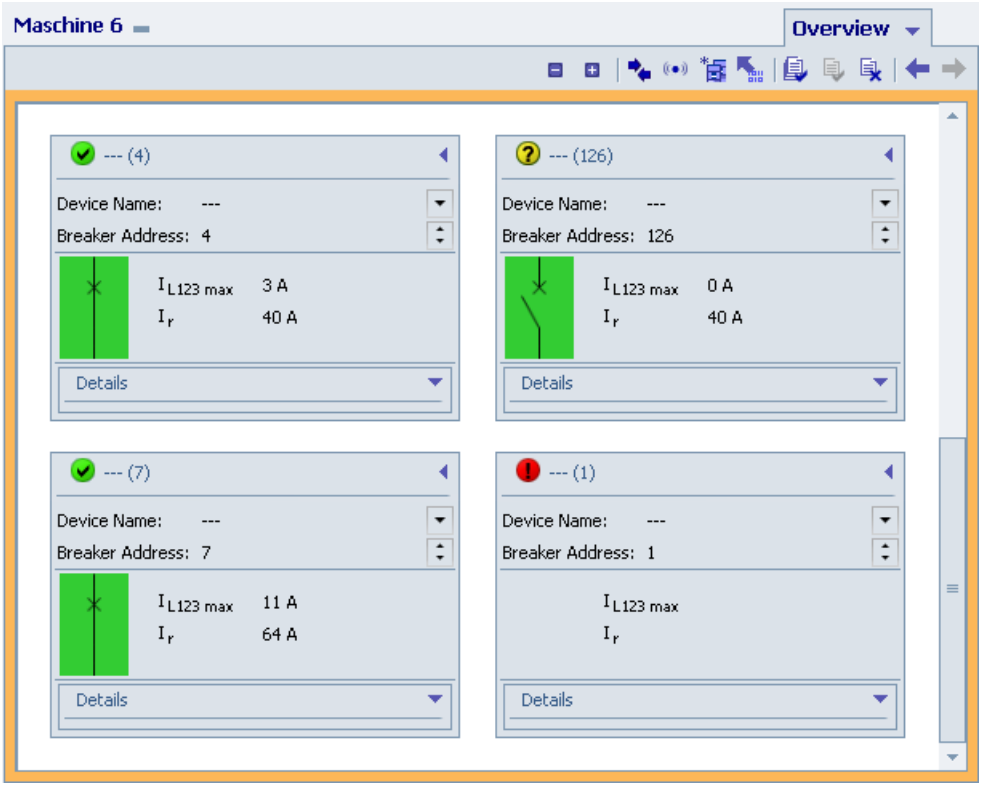


The following paragraph describes the correct procedure for connecting a new 3VA molded case circuit breaker:

Assign a breaker address

Every 3VA molded case circuit breaker connected to the COM800 / COM100 breaker data server is automatically detected and displayed with ? on the screen.

A breaker address can be assigned to the 3VA molded case circuit breaker when it is in this state.



A breaker address is assigned to each 3VA molded case circuit breaker so that it can be identified by higher-level systems and used for other purposes.

The 3VA breakers are permanently transferred to the COM800 / COM100 configuration with ✓. The COM800 / COM100 breaker data server can then monitor the accessibility of the 3VA molded case circuit breaker and signal any deviations from the correct status.

A click on icon transfers the 3VA to the powerconfig project.

A click on icon can initiate flashing of the ACT+COM LED on the ETU in order to identify the 3VA. This confirms that the 3VA is clearly identified in the communication system via the IP address of the COM800 / COM100 and the breaker address.

The protection parameters set for the 3VA as well as the configuration can either be transferred to powerconfig with the icon or the protection parameters and the desired configuration can be set in powerconfig and then loaded to the 3VA at an appropriate time by means of this icon.

It is advisable to assign an identity to the 3VA molded case circuit breaker in the form of

- a device name in powerconfig

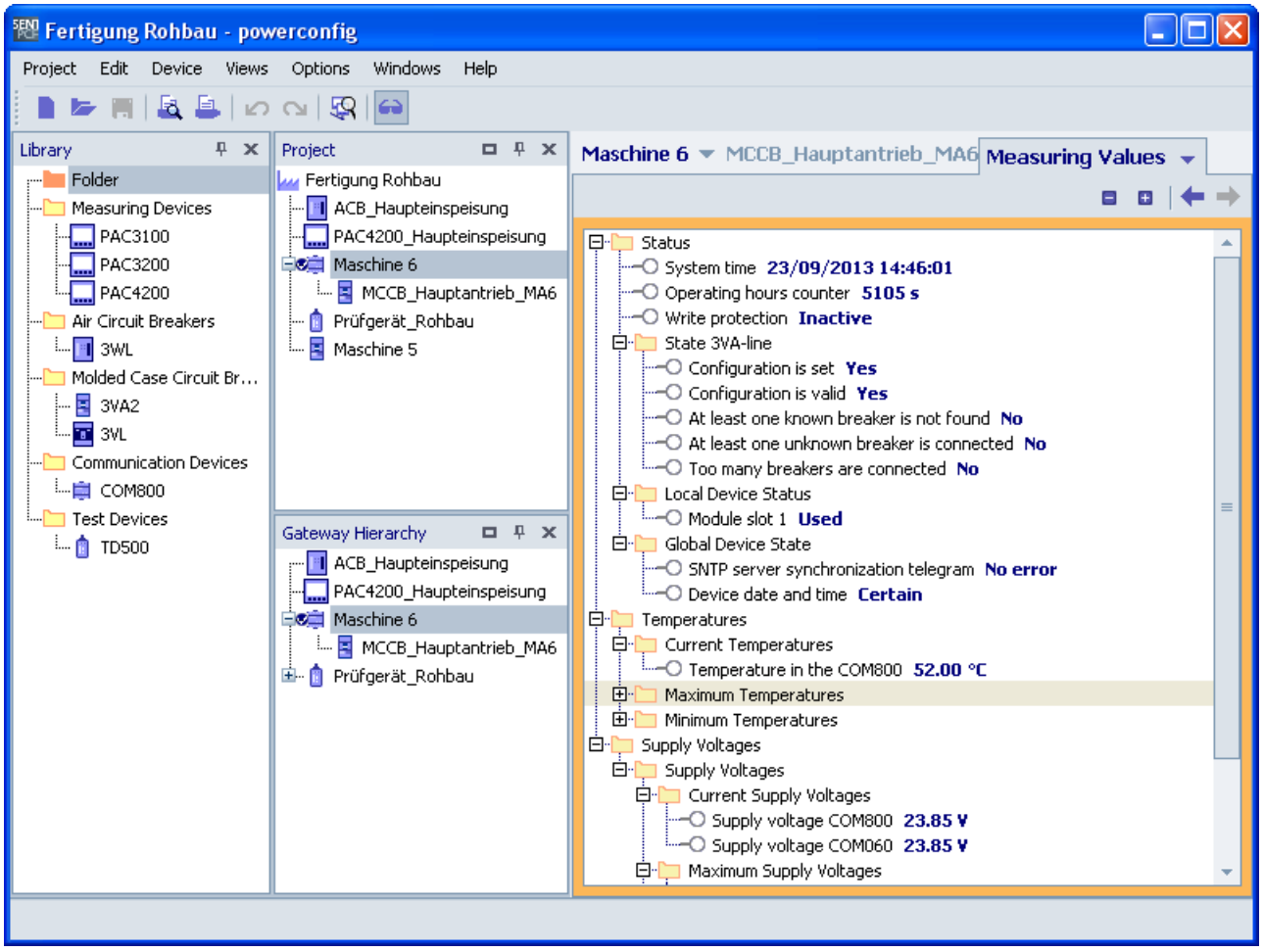
- a plant and location identifier in the breaker.

5.2.4 Operation

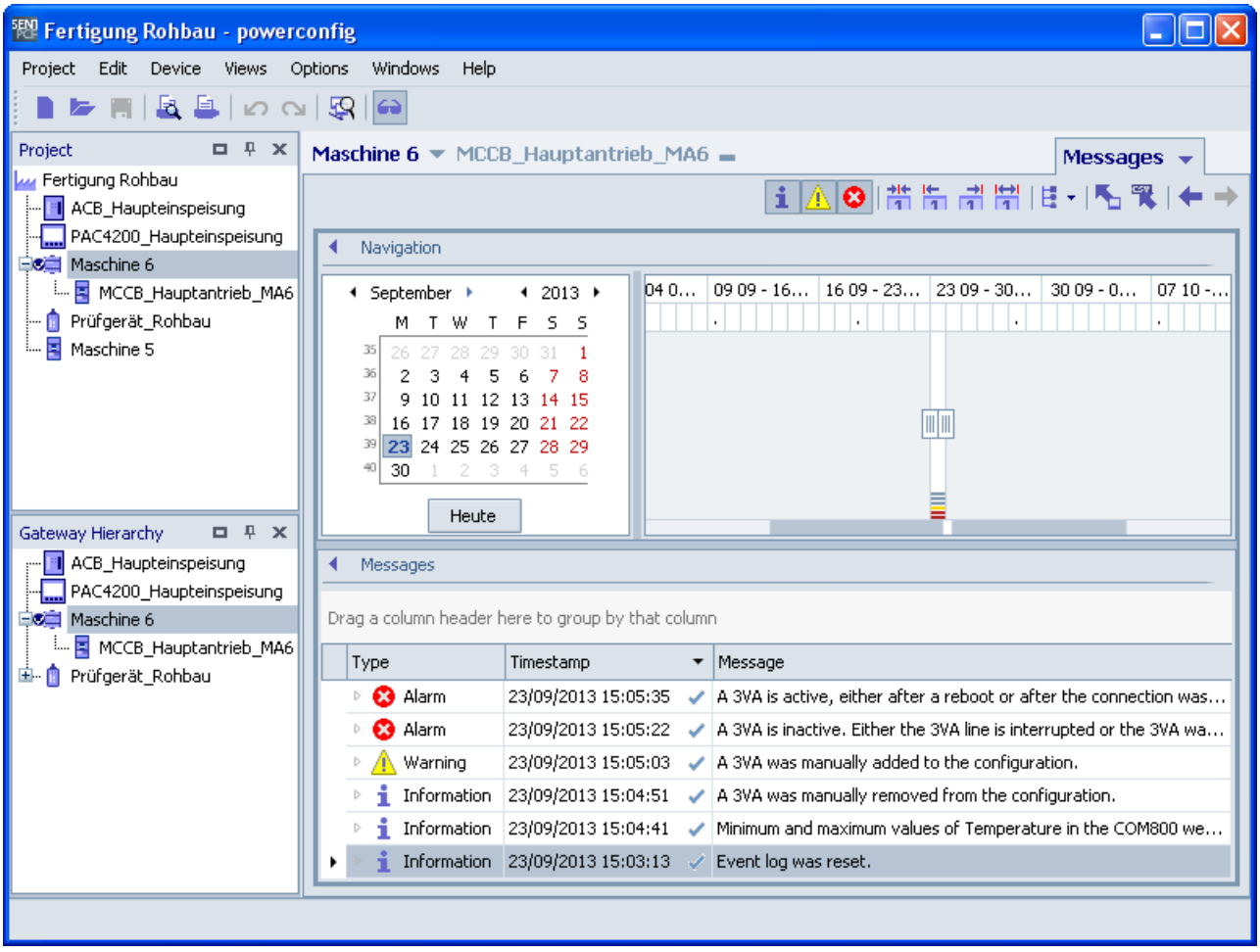
The COM800 / COM100 breaker data server makes the database (see Chapter Available database (Page 63)) of 3VA molded case circuit breakers available to the communication interfaces. See also Chapter Application examples (Page 79).

The relevant functions are:

- Commission and maintain the power distribution system. Refer to Chapter Commissioning and service software: powerconfig (Page 187).
- Display, archive and monitor states and measured variables of the connected 3VA molded case circuit breakers in applications. Refer to Chapter Application examples (Page 79).
- Evaluate maintenance and operating data.



- In order to obtain the operating data of the COM800 / COM100 breaker data server and the connected 3VA breakers, the component must be selected in the project and a communication link established using icon .



The COM800 / COM100 breaker data server collects the events pertaining to the connected 3VA molded case circuit breakers and lists them in an event log:

Events which can be logged

Operational events (see Chapter Messages (Page 62)) or operator action and system messages (see Chapter Understanding status transitions (Page 206)) can be logged.

All these events can be read out of the COM800 / COM100 with powerconfig during operation, analyzed by the user and saved as a file in format ".csv" by means of icon .

The event log can also be cleared with menu commands Device > Reset > Event Log.

See also

Acquiring and communicating measured variables (Page 45)

5.3 COM060 communication module and draw-out unit

This chapter gives instructions on how to connect up and use the COM060 communication module. For information about installation, please refer to the operating instructions.

5.3.1 Connecting

5.3.1.1 Connection of supply voltage

The COM060 communication module is supplied with power by the COM800 / COM100 breaker data server via the 3VA-line.

5.3.1.2 Connecting the 3VA-line

The COM060 communication module is connected by its connecting cable to a T-connector of the 3VA-line.

For further information, please refer to Chapter Connecting the 3VA-line (Page 98).

5.3.2 Commissioning

5.3.2.1 First commissioning

The COM060 communication module is commissioned in conjunction with the COM800 / COM100 breaker data server. Refer to Chapter Commissioning (Page 104).

5.3.2.2 Resetting

If a COM060 communication module (typically including a 3VA molded case circuit breaker) is operated on a different COM800 / COM100 breaker data server, it must be ensured that the breaker address does not collide with a pre-existing breaker address.

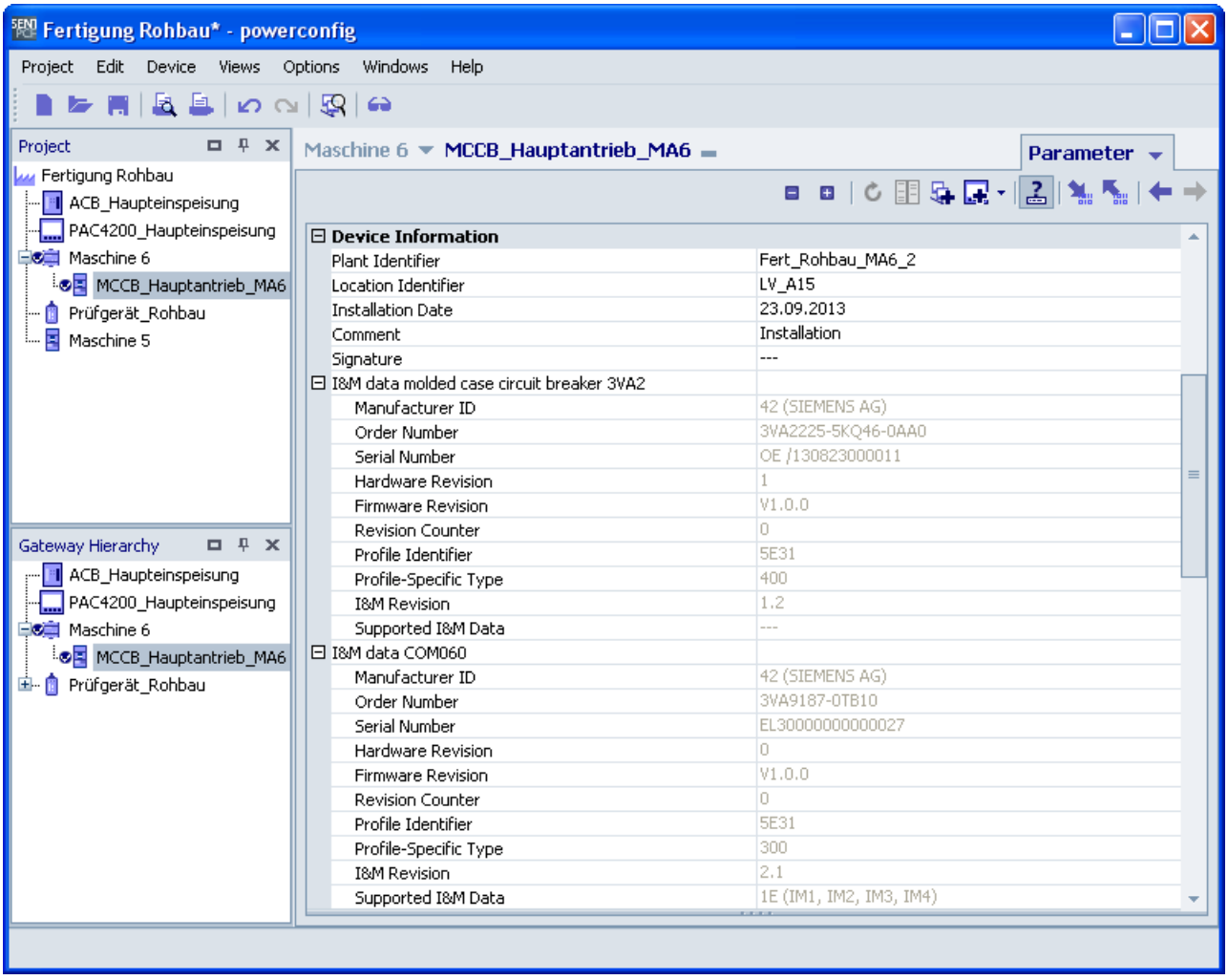
A COM060 communication module can be operated on a different breaker data server. Instructions on how to exchange a 3VA molded case circuit breaker can be found in Chapter Replacing the 3VA molded case circuit breaker connected to a COM800 / COM100 (Page 205)

5.3.2.3 Commissioning with powerconfig

The COM060 communication module does not require separate settings.

5.3.3 Operation

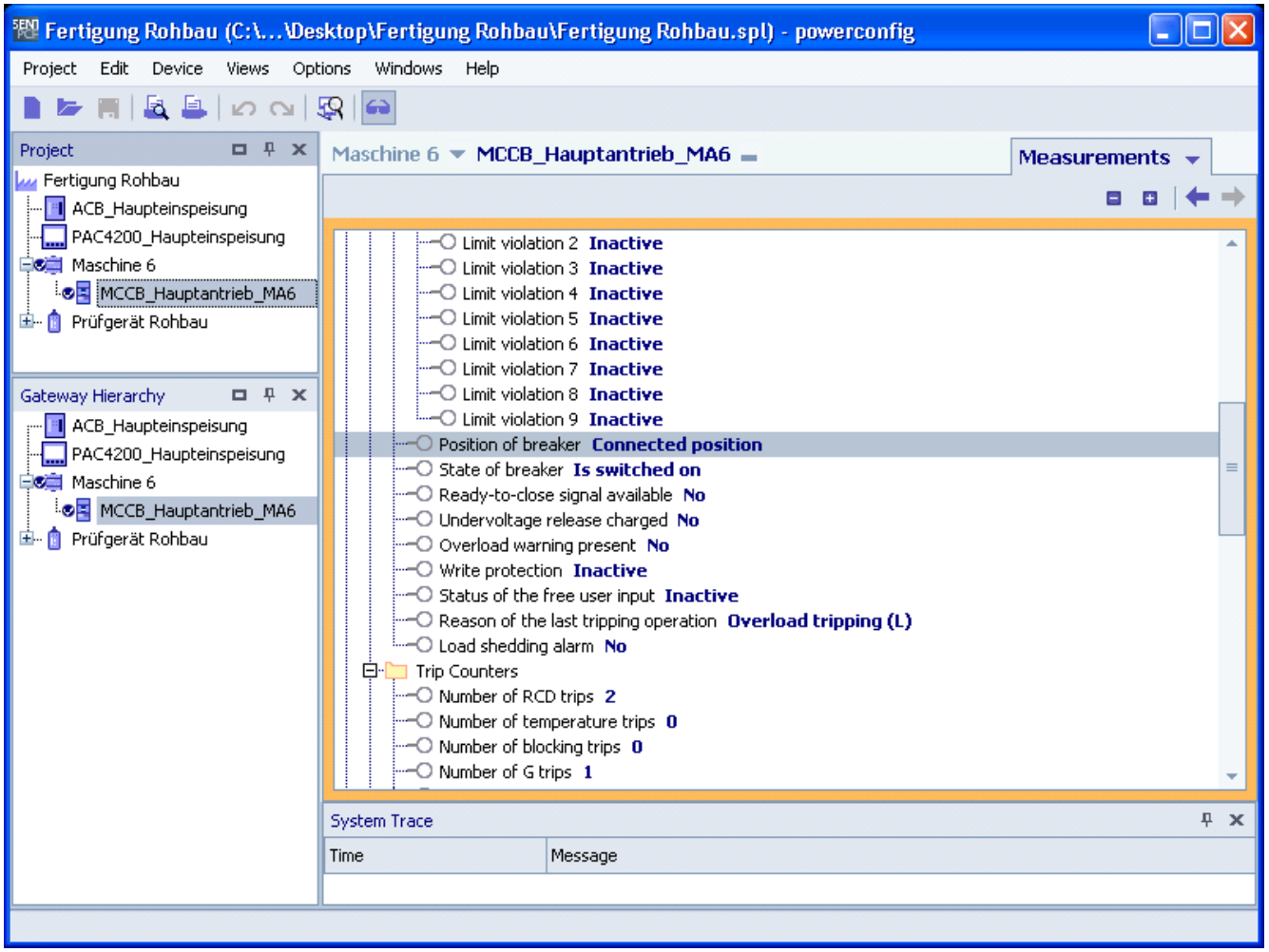
The COM060 communication module transfers all data of the 3VA molded case circuit breaker.



5.3.3.1 Position in draw-out unit

The position of the 3VA molded case circuit breaker in the draw-out unit can generally be interrogated as a Modbus register by any application. This is often done using powerconfig during commissioning and maintenance.

See also View → Measured Variables → Operation (Page 119)



5.4 Communication with ETUs 5-series and 8-series

The electronic trip units of the 3VA molded case circuit breaker can be accessed via 2 communication channels:

1. Via the TD500 test device (see Chapter TD500 test device (Page 139)), for temporary actions, e.g. with powerconfig (see Chapter Commissioning and service software: powerconfig (Page 187))
2. Via COM800 / COM100 (see Chapter COM800 / COM100 breaker data server (Page 96)) and COM060 (see Chapter COM060 communication module and draw-out unit (Page 113), for permanent communication as described in this chapter

5.4.1 Connecting

5.4.1.1 Connection of supply voltage

For their protection functions, the ETUs 5-series and 8-series are supplied with power from the main circuit. ETUs 5-series and 8-series require a 24 V supply for their metering, display and communication functions. This supply can be provided by:

- the COM800 / COM100 breaker data server (typically for communication-capable 3VA molded case circuit breakers)
- the EFB300 external function box
- the 24 V module if only a metering function with display on the ETU is needed but no communication is required

It is permissible to supply the ETU from the TD500 test device only when the molded case circuit breaker is switched off.

5.4.1.2 Connecting the ETUs 5-series and 8-series for communication

The ETUs 5-series and 8-series are connected to a PC by means of the following components:

- COM060 communication module (see Chapter COM060 communication module and draw-out unit (Page 113)) connected to COM800 / COM100 breaker data server (see Chapter COM800 / COM100 breaker data server (Page 96))
- Communication network or TD500 test device (see Chapter TD500 test device (Page 139))

5.4.2 Commissioning

5.4.2.1 First commissioning

The ETUs are set to maximum protection (i.e. minimum setting parameters) when they are delivered. Parameters can be set via the ETUs.

5.4.2.2 Resetting

It is not possible to completely reset all settings on ETUs.

5.4.2.3 Commissioning with powerconfig

The ETUs 5-series and 8-series can be commissioned locally via the buttons on the LCD. You can find further information in Chapter "Electronic trip unit" of the manual for 3VA molded case circuit breakers.

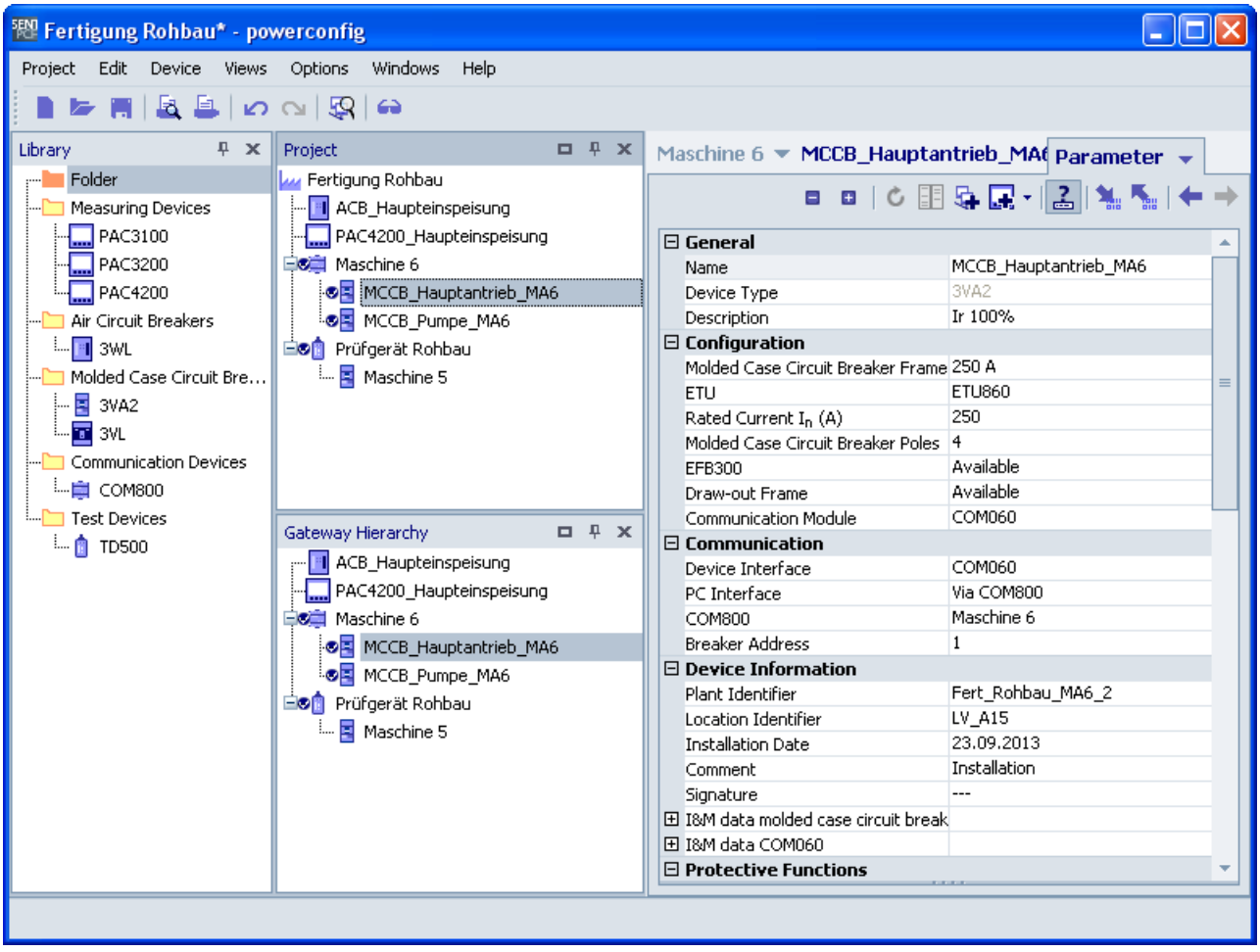
It is significantly more convenient to commission an ETU with powerconfig because the properties listed below can be adjusted or read out of the 3VA molded case circuit breakers and then modified. In some cases, they can be downloaded to the 3VA molded case circuit breakers again:

- Configuration with order number, size, rated current, number of poles and equipment
- Protection parameters of the 3VA molded case circuit breaker

The following settings can be made:

- Options used, e.g. EFB300, RCD and their parameters
- Communication interfaces
- Identification of the 3VA molded case circuit breaker in the system
- Protection parameters
- Behavior of the 3VA molded case circuit breaker within the system, e.g. load monitoring and ZSI
- Metering function (energy flow)
- Limit values (current and voltage unbalance)
- Behavior of the 3VA molded case circuit breaker with respect to the user, e.g. event logging function

A description of suitable ETUs for specific applications, their protection settings and operating principles can be found in Chapter "Protection system" of the manual for 3VA molded case circuit breakers. 3VA molded case circuit breakers can be commissioned correctly only if these aspects are understood.

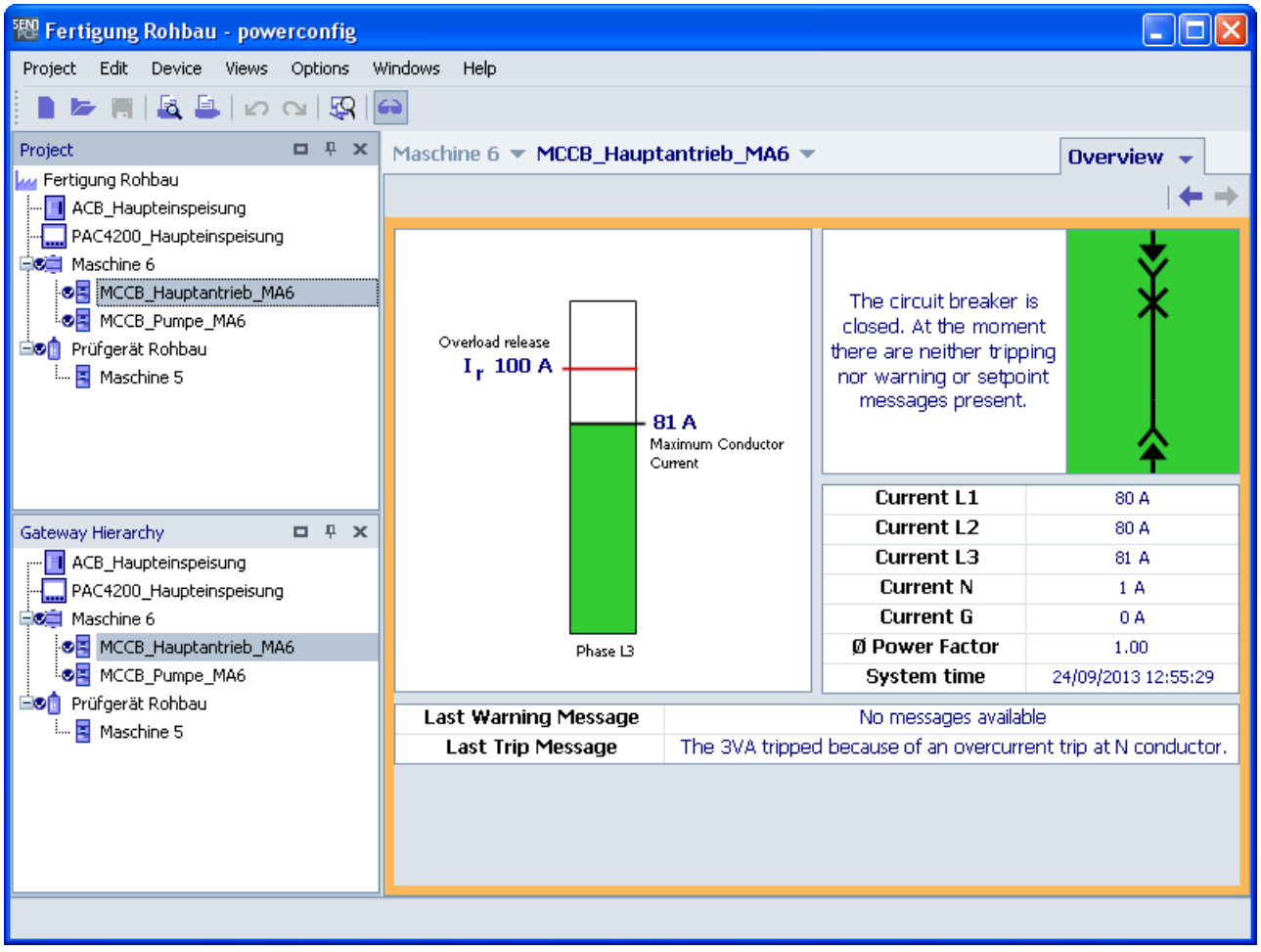


See also

Commissioning and service software: powerconfig (Page 187)

5.4.3 Operation

The screenshot below provides an overview of the information delivered by the ETU860:



An overview of measured variables and further details about them can be found in Chapter "Acquiring and communicating measured variables (Page 45) ".

Status information is specified in sufficient detail in powerconfig.

See also

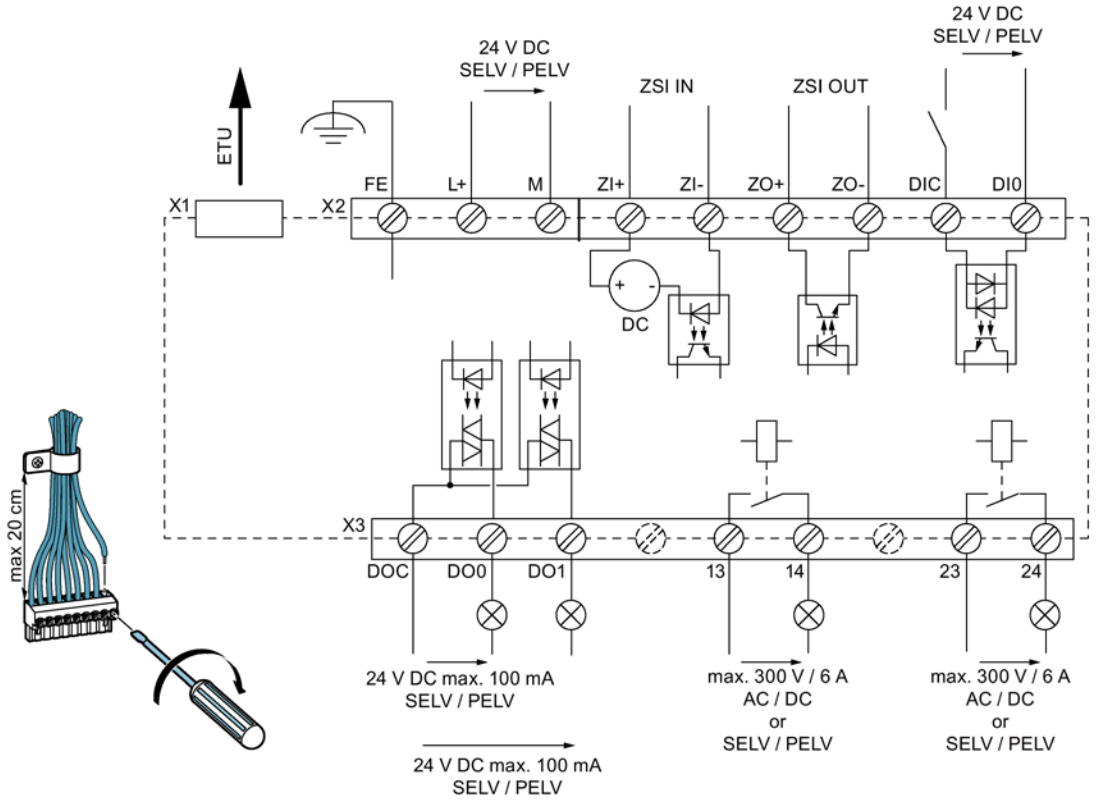
Available database (Page 63)

5.5 EFB300 external function box

This chapter gives instructions on how to connect up and use the EFB300 external function box. For information about installation, please refer to the operating instructions on the Internet at http://support.automation.siemens.com/WW/view/en/80600828/0/en.

5.5.1 Connecting

5.5.1.1 Connecting the 24 V supply

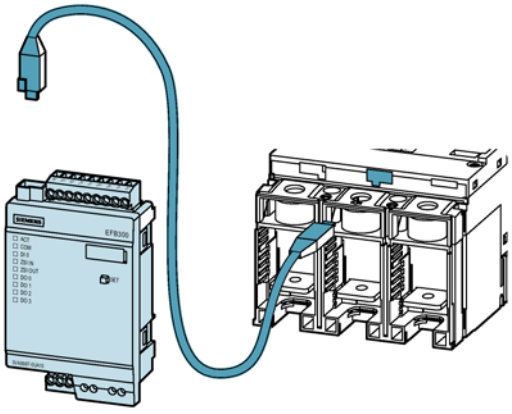


5.5.1.2 Connection of the EFB300 external function box

The EFB300 is connected to the ETU by means of the plug-in cable (1.5 m) supplied with the device.

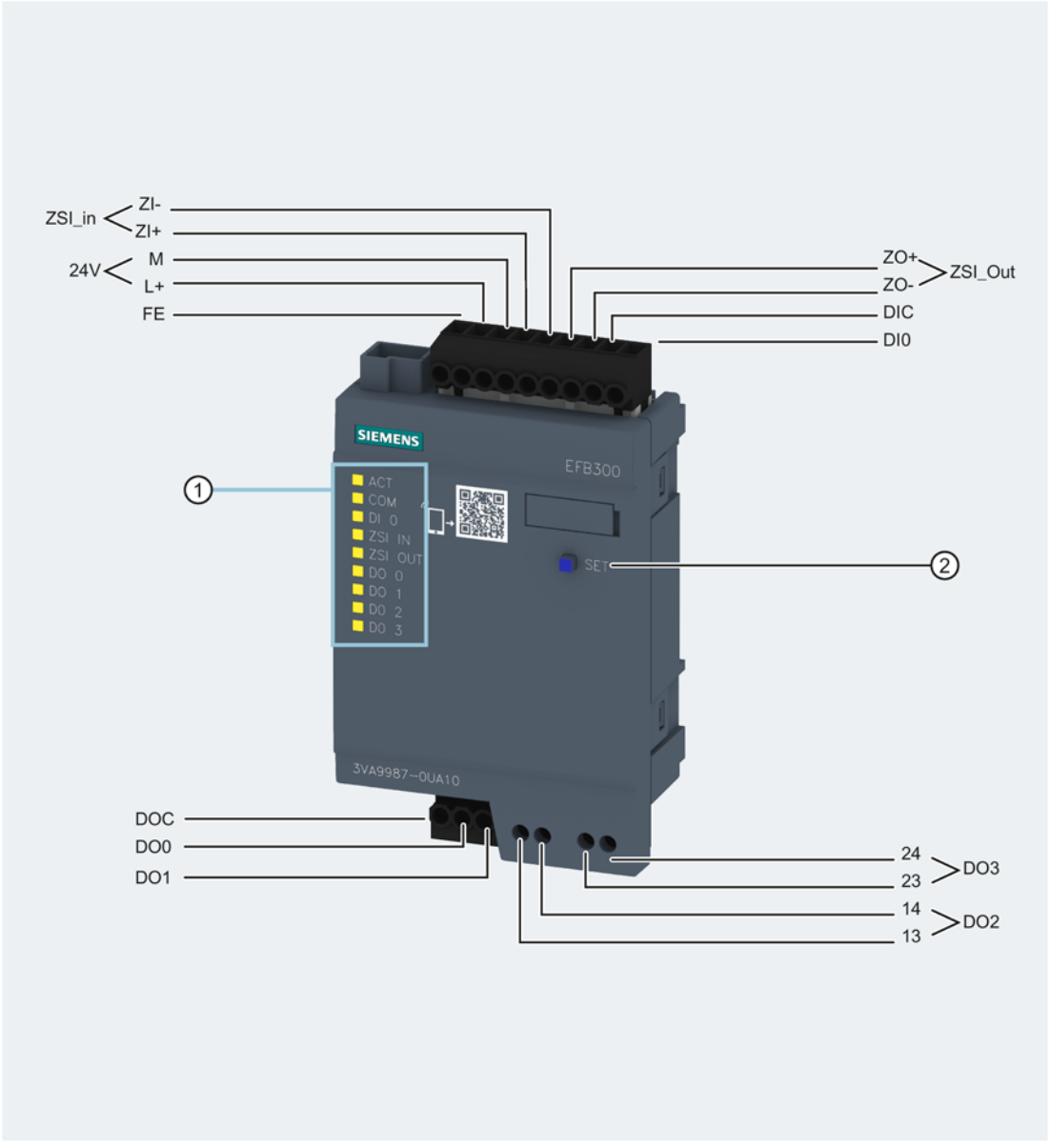
The following lengths of cable for connecting the EFB300 to the 3VA are optionally available.

- 3.0 m (without RCD)
- 3.0 m for 3VA with EFB and RCD820



5.5.2 Operator controls

5.5.2.1 LED displays



① LED displays

② <SET> button

LED		Meaning	Description
☐	ACT	Off	EFB300 not active
☀	ACT	On	EFB300 ready
☐	COM	Off	No communication link with ETU
☀	COM	Flashing (2 Hz)	Establishing communication link with ETU
☀	COM	On	Communication link with ETU established
☐	DI 0	Off	Input not activated
☀	DI 0	On	Input activated
☐	ZSI IN	Off	ZSI function not activated
☀	ZSI IN	On	ZSI function activated
☐	ZSI OUT	Off	No ZSI Out signal transmitted
☀	ZSI OUT	On	ZSI Out signal transmitted
☐	DO 0	Off	No valid reason for trip signal
☀	DO 0	On	Active trip signal
☐	DO 1	Off	No valid reason for trip signal
☀	DO 1	On	Active trip signal
☐	DO 2	Off	No valid reason for trip signal
☀	DO 2	On	Active trip signal
☐	DO 3	Off	No valid reason for trip signal
☀	DO 3	On	Active trip signal

☀ Steady illumination

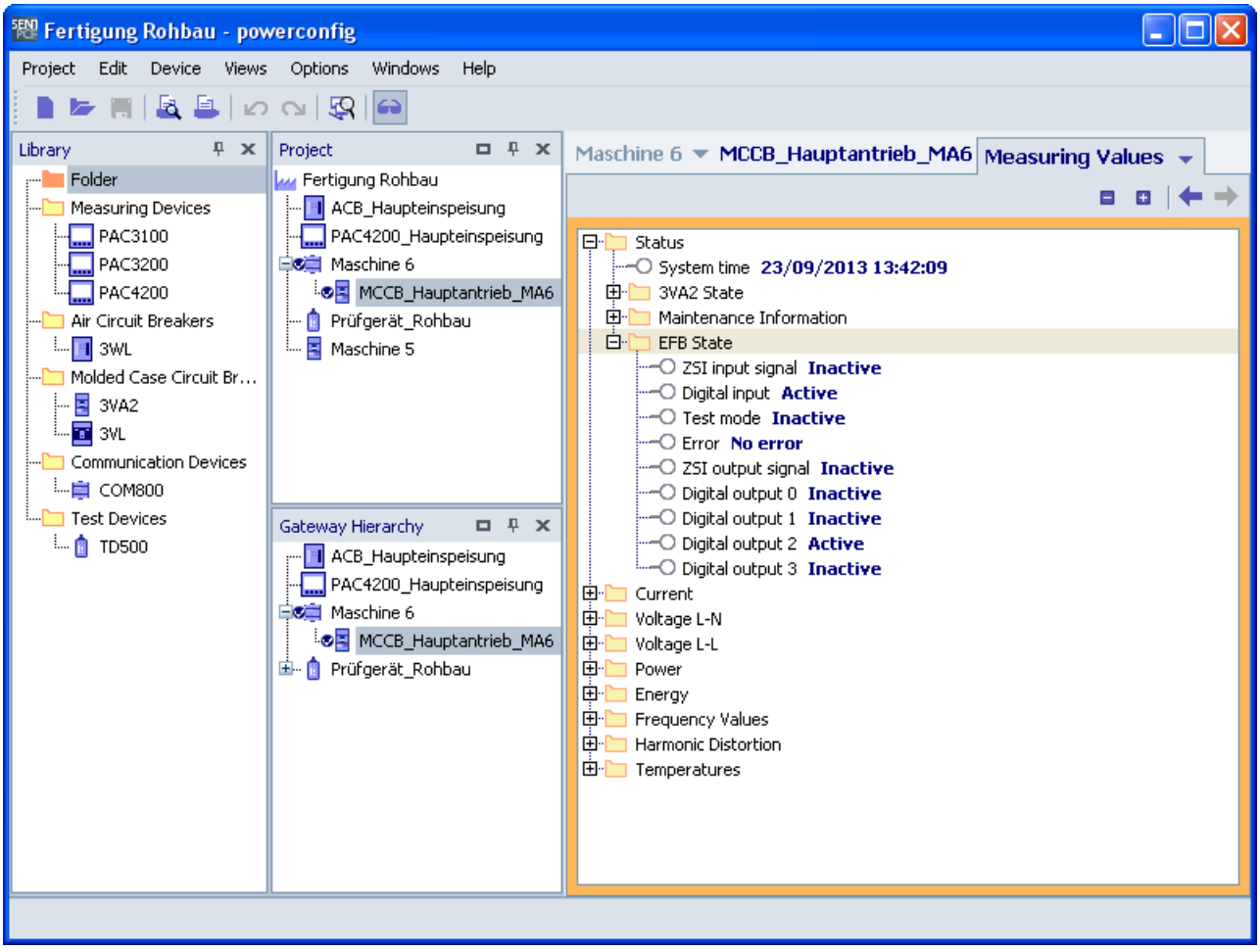
☀ Flashing

☐ Off

The user can start a self-test by pressing the <SET> button. For further information, refer to Chapter "External function box" in the manual.

The states of the signals of the EFB300 external function box are also displayed by powerconfig:

Menu View > Measured Variables > Status Information > EFB Status



5.5.3 Commissioning

5.5.3.1 First commissioning

All the digital outputs of the EFB300 are deactivated in the delivery state, i.e. the EFB300 external function box must be commissioned using powerconfig.

As soon as the EFB300 external function box is connected to the ETU and to a power supply, it can be accessed via powerconfig and the ETU. Various different communication options must be selected depending on the ETU in use. You can find additional information in Chapter EFB300 external function box (Page 22)

5.5.3.2 Resetting

The parameter settings for the functions of the EFB300 external function box can be changed individually for alternative uses.

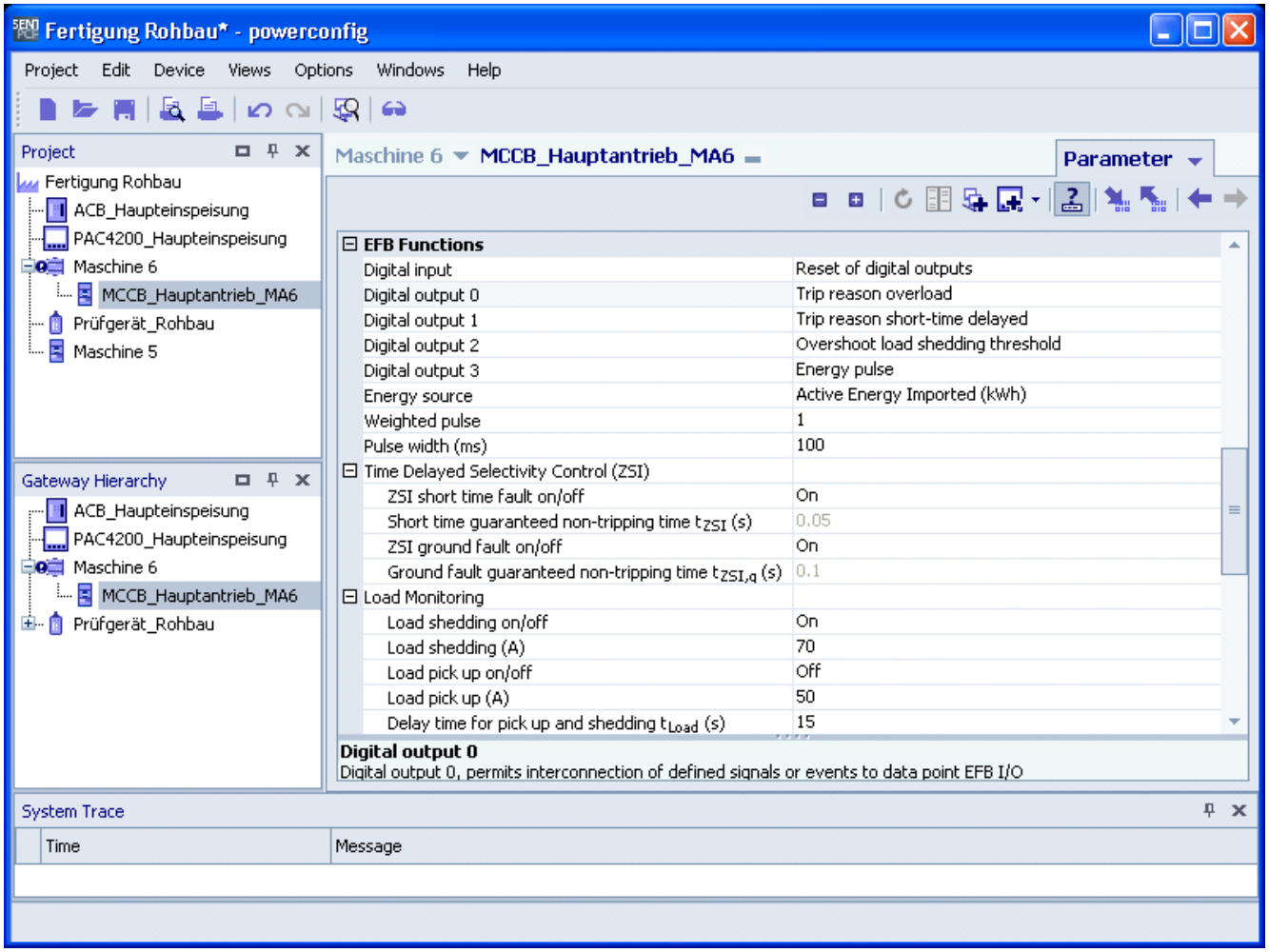
5.5.3.3 Commissioning with powerconfig

A detailed description of the EFB300 external function box can be found in Chapter "EFB300 external function box" in the manual. You will find information about individual parameters and their functions or operating principles in this chapter.

The table below provides an overview of the signals and functions of the EFB300 external function box according to the type of ETU in use.

		ETU 3-series						ETU 5-series				ETU 8-series			
		ETU320 LI		ETU330 LIG		ETU350 LSI		ETU550 LSI		ETU560 LSIG		ETU850 LSI		ETU860 LSIG	
Number of poles		3	4	3	4	3	4	3	4	3	4	3	4	3	4
Trip reason overload		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Trip reason short-time delayed short-circuit						■	■	■	■	■	■	■	■	■	■
Trip reason instantaneous short circuit		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Trip reason overload at neutral conductor			■		■		■		■		■		■		■
Trip reason ground fault				■	■					■	■			■	■
Trip reason RCD		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Trip reason overtemperature		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Alarm level 1 for overload		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Alarm level 2 for overload		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pre-trip alarm for overload		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Temperature alarm		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Alarm to indicate internal ETU fault		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Violation of load shedding lower threshold limit		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Violation of load shedding upper threshold limit		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Energy pulse												■	■	■	■
Energy source	Apparent energy (kVAh)											■	■	■	■
	Active energy (kWh) import											■	■	■	■
	Active energy (kWh) export											■	■	■	■
	Reactive energy (kvarh) import											■	■	■	■
	Reactive energy (kvarh) export											■	■	■	■
Weight per pulse in kWh, kVAh, kVArh, kvarh	1 … 1000 (increment 1 in kWh, kVAh or kVArh)											■	■	■	■
Pulse width in ms	30 … 500 ms (increment 10 ms)											■	■	■	■
Time-delayed Zone Selective Interlocking ZSI			■	■	■	■	■	■	■	■	■	■	■	■	■
Load monitoring		■	■	■	■	■	■	■	■	■	■	■	■	■	■

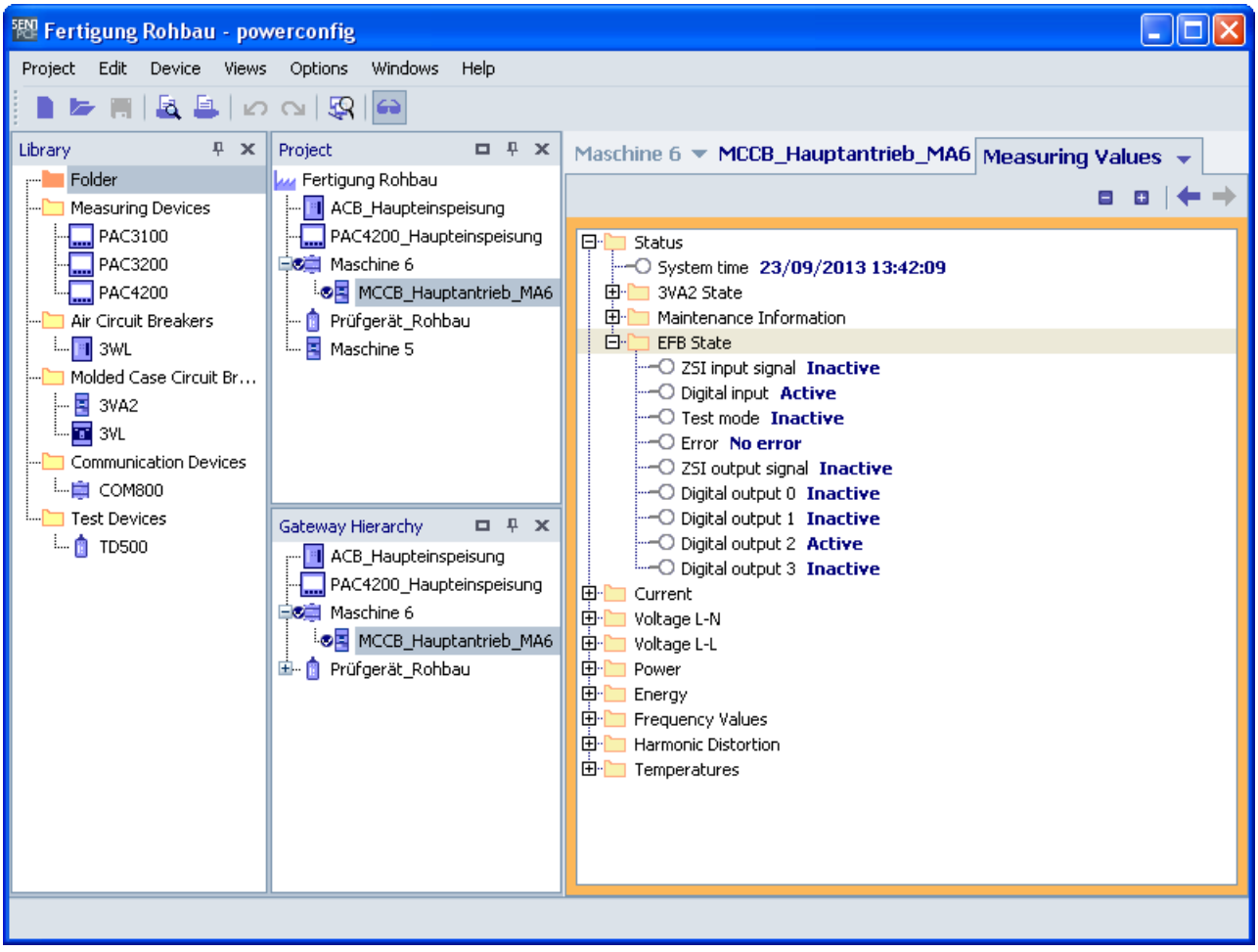
The EFB300 external function box must be configured with powerconfig as described below:



The EFB300 must be defined as an installed device in the 3VA molded case circuit breaker. The functions of the individual digital inputs and outputs can then be specified.

5.5.4 Operation

The EFB300 external function box uses digital signals to communicate with the environment of the 3VA molded case circuit breaker. powerconfig can be used to monitor the states of these signals.



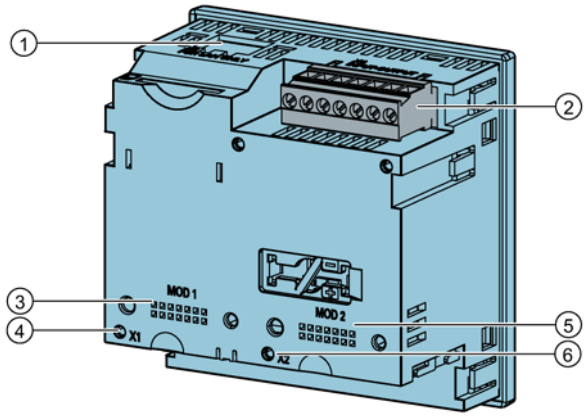
5.6 DSP800 display

The DSP800 display shows the data for up to 8 3VA molded case circuit breakers with ETUs 5-series and 8-series.

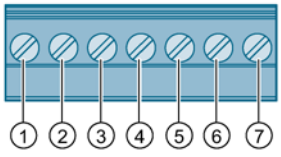
5.6.1 Connecting

5.6.1.1 Connecting the 24 V supply

The 24 V supply is connected via terminals.



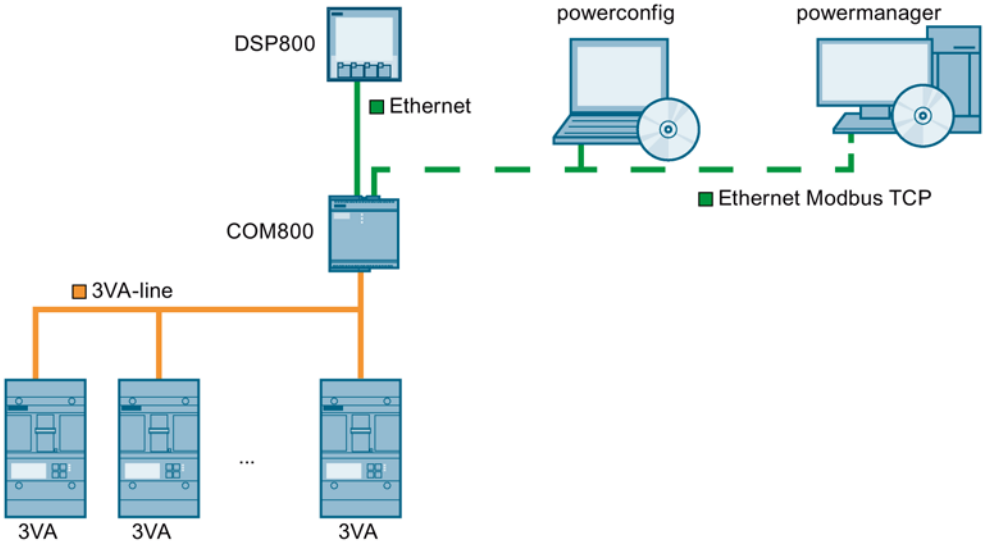
① RJ45 (LAN)
② 24 V supply & functional ground
③ Unused
④ Unused
⑤ Unused
⑥ Unused



Pin	Label	Assignment
①		Not assigned
②		Not assigned
③	L+	24 V DC +/- 20 %
④	M	Ground
⑤	L+	24 V DC +/- 20 %
⑥	M	Ground
⑦	⏚	Functional ground

5.6.1.2 Connection to COM800 / COM100 via Ethernet

The DSP800 display is connected via the COM800 breaker data server to a total of eight 3VA molded case circuit breakers and via the COM100 breaker data server to one 3VA circuit breaker. The communication link is provided by an RJ45 patch cable connected between the Ethernet interface and the LAN interface of the DSP800.



Using a standard Ethernet network, the breaker can communicate via the COM800 / COM100 breaker data server, e.g. with powerconfig or powermanager, in parallel with its communication with the DSP800.
Communication via PROFIBUS DP or PROFINET is also possible.

5.6.2 Operator controls

The DSP800 display is operated by means of 4 keys (F1 to F4).



By means of these keys it is possible to select individual menus or menu items.

Buttons	Function keys	Description
	F1	Exit current menu
	F2	Move selection cursor up
	F3	Move selection cursor down
	F1	Go to detail menu
	F4	Go to selection menu
	F4	Select current view
	F4	Change to write mode
	F2	Raise current value by 1
	F3	Reduce current value by 1
	F4	Mark selected element
	F2	Move selection to right

5.6.3 Display

The DSP800 is a graphical LC display of size 74 x 58 mm.

A menu title, breaker identification, menu and submenu numbers appear at the top of the display.

The main area of the display shows a menu hierarchy as well as items of information about individual 3VA molded case circuit breakers.
Individual units of information such as states and measured values are displayed in the center.
At the bottom of the display, the function which can currently be performed by a function key is displayed above the relevant key.



You will find information about the menu hierarchy and the transitions between the individual views in Chapter "Home menu (Page 136)".

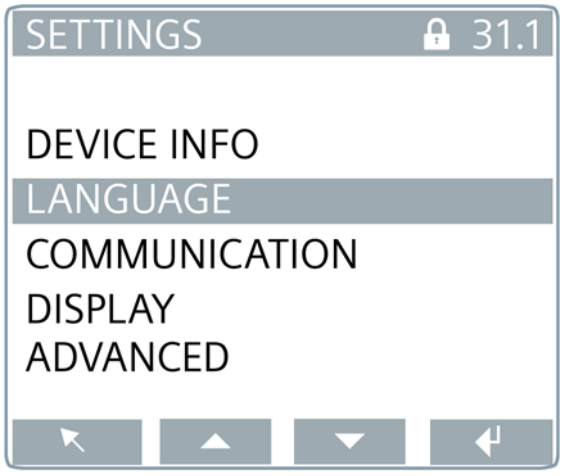
See also

Operation (Page 136)

5.6.4 Commissioning

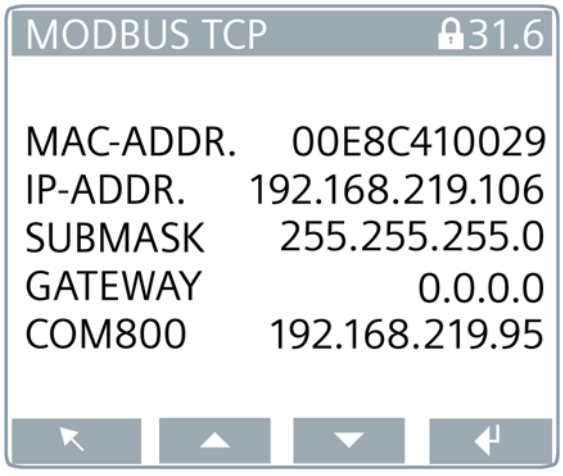
5.6.4.1 First commissioning

After the DSP800 display has powered up, the user interface language is English.



The DSP800 will need to be adapted depending on the intended application:

- Language setting
- Phase designation
- Adaptation to operating environment
- Input of communication parameters for the network environment and the connected COM800 / COM100 breaker data server



The following settings are possible or visible:

Address	Format	Description
MAC address		Read only
IP address		Must be unique within subnet.
Subnet		0 must be entered in positions that have address relevancy.
Gateway		Where known, otherwise 0.0.0
COM800/COM100 IP address		The address must be coordinated with other communication partners.

All properties of the DSP800 can be viewed in menu "Device Info". The data displayed by the DSP800 also includes a QR code.

This QR code directs you to address
https://mall.industry.siemens.com/goos/WelcomePage.aspx?articleNumber=3VA9987-0TD10&language=EN
at which you will find all relevant information about the DSP800 display including, for example, manuals, FAQs, etc.

5.6.4.2 Resetting

The DSP800 display can be reset in menu "Settings Advanced".

A password can be set in order to protect the DSP800 reset functions against unauthorized access. If password protection is activated, the correct password must be entered in order to reset the display.

It is possible to restore all the factory settings of the DSP800.

Alternatively, it is possible to restrict the reset operation to the communication settings in cases where, for example, the DSP800 is to be used in a different communication environment.

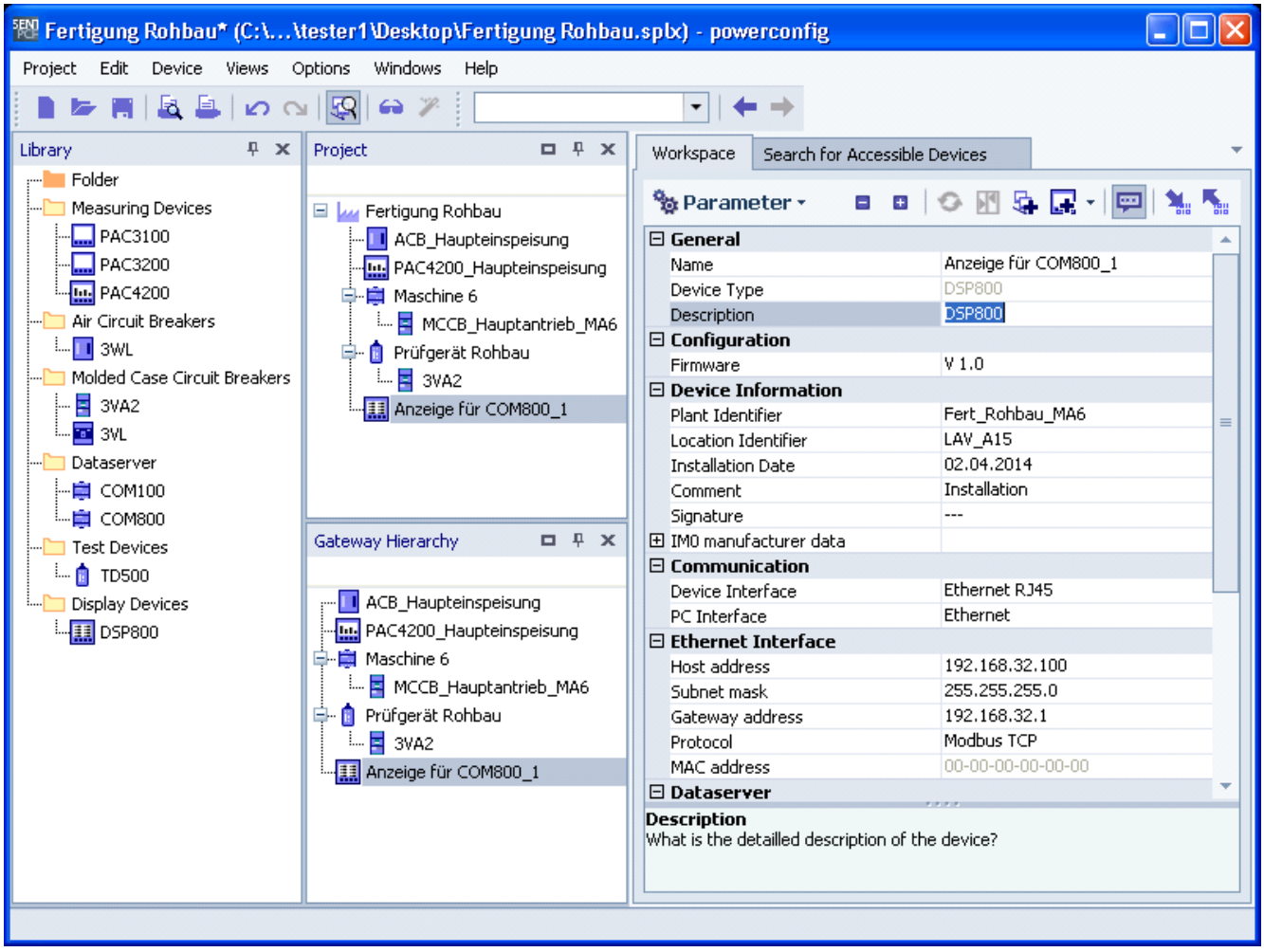
5.6.4.3 Commissioning with powerconfig

The DSP800 display can be commissioned with powerconfig.

The DSP800 is detected by means of the "Search for Accessible Devices (F11)" function and can be selected for parameterization.
When the "Identify" function is selected, the screen of the DSP800 starts to flash for identification.
It is possible to enter the same settings in powerconfig as those set directly on the DSP800 unit (see Chapter "First commissioning (Page 133)").

The "Search for Accessible Devices (F11)" function can also be used to set the IP address and the subnet mask. In order to activate the changes, the inputs must be downloaded to the DSP800 with command "Apply Changes".

The "Create Devices" function is used to transfer the DSP800 to powerconfig.



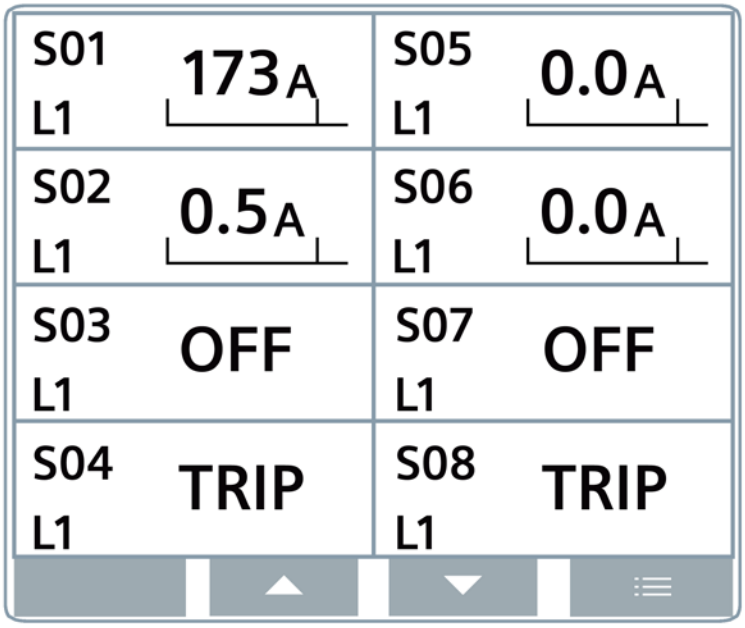
The DSP800 detects the assigned COM800 / COM100 breaker data server on the basis of the set IP address.
The IP addresses of the DSP800 display and the COM800 / COM100 breaker data server must be unique and set in the same subnet.

5.6.5 Operation

As soon as a communication link is established between the DSP800 display and the COM800 / COM100 breaker data server, the status of the active 3VA molded case circuit breakers is displayed in the main menu of the DSP800 (see Chapter Displaying switching state (Page 38)) .

5.6.5.1 Home menu

When the 3VA molded case circuit breaker is switched on, the breaker name and the current in the phase under the highest load are displayed.



The last three letters of the plant identifier are used as the breaker name if these have been assigned with powerconfig. The 3VA molded case circuit breakers are otherwise sorted in order of breaker addresses.

Note

When the DSP800 is used, it is advisable to assign plant identifiers in which the last 3 characters are different to individual 3VA molded case circuit breakers. The last 3 characters are displayed in the home menu and the breaker selection view.

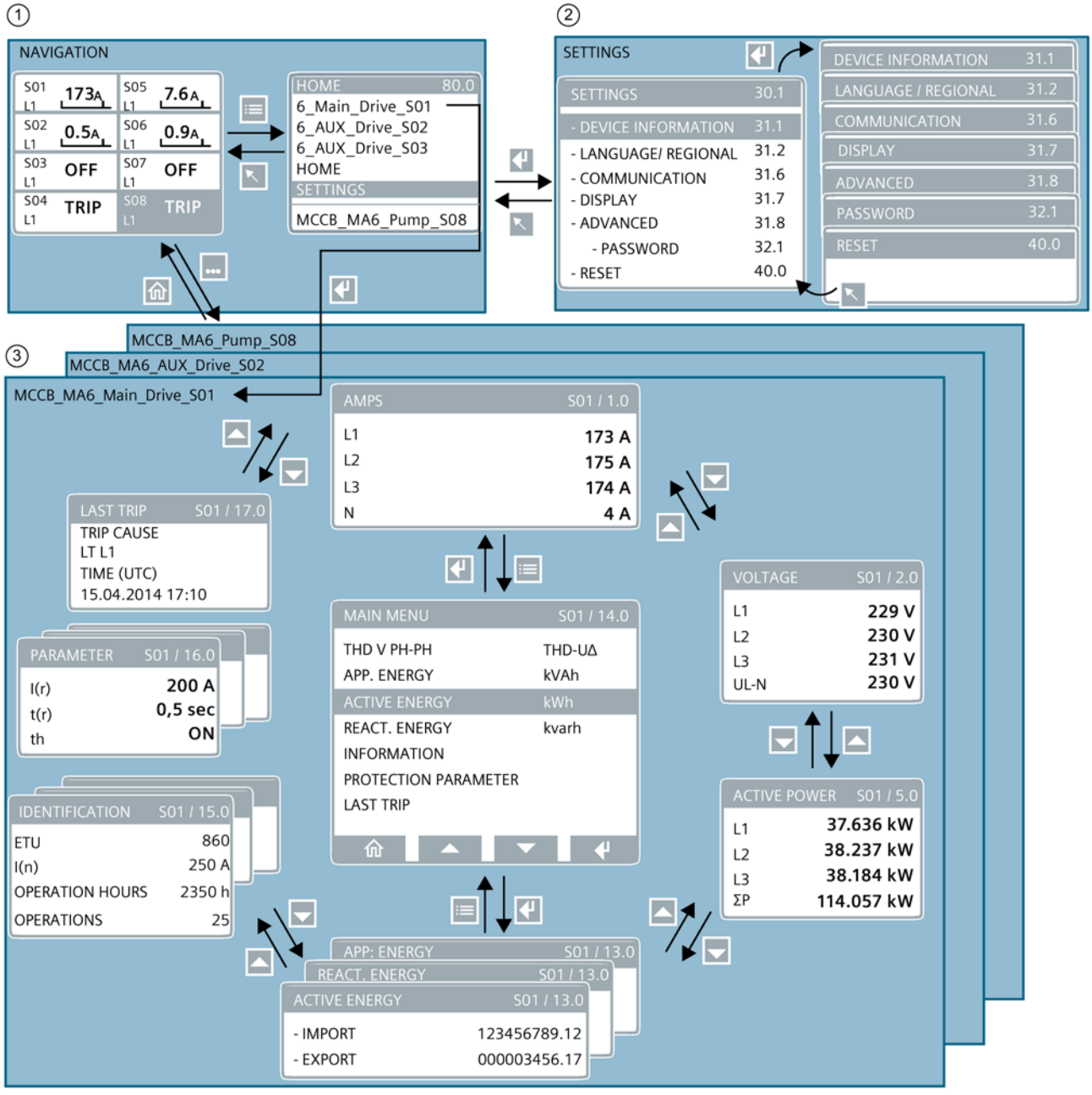
If no plant identifiers have been assigned to the 3VA molded case circuit breakers, they are displayed in the home menu in order of breaker addresses and, in the breaker selection view, with the last 16 characters of the serial number. The serial number can be read out in powerconfig (View > 3VA > Parameters > Device Information > I&M Data COM060). The serial number is also printed on the label attached to the COM060.

If the 3VA molded case circuit breaker has tripped or is switched off, the word "Tripped" or "Off" is displayed.

5.6.5.2 Navigation in the DSP800

When a 3VA molded case circuit breaker is selected, further information about the breaker is displayed. Starting from the home menu, it is possible to display various levels of detailed information about individual breakers.

The diagram below shows the information made available by the DSP800 and the options for navigation within and between menus.



Key elements of the DSP800 display are

1. The overview in the home menu and breaker selection
2. The settings for language, communication, display and reset options
3. The information circle for each connected 3VA molded case circuit breaker

The information circle contains the measured variables of the relevant 3VA molded case circuit breaker and its identification. This includes information supplied by the manufacturer (Siemens) and by the user.

In addition, the protection parameter settings are displayed as well as the cause of the last trip of the relevant 3VA molded case circuit breaker.

5.7 TD500 test device

Using the mobile TD500 test device during the commissioning process, you can check that all system components connected to your 3VA molded case circuit breaker are functioning properly and correctly connected. It is possible to simulate various trip causes. The 3VA molded case circuit breaker responds as if the emergency were real – it trips in accordance with the set protection parameters and transmits all alarm and trip signals to the connected components.

The TD500 test device can be used as a mobile, hand-held test device and in conjunction with a PC. The TD500 test device is powered by the 24 V power pack supplied with the unit and is optionally connected to the PC via a USB cable.

The TD500 test device employs powerconfig as an interface to the 3VA molded case circuit breaker. powerconfig is able to archive all the protection parameters that were set during testing.

The TD500 can also be used to parameterize the EFB300, even when it is connected to ETUs 3-series. Furthermore, the parameters of the 3VA molded case circuit breaker and those of the ETUs 3-series can be read out and documented using the TD500.

The ETUs 5-series and 8-series can also be parameterized by means of the TD500.

5.7.1 Connecting

⚠ CAUTION

Personal injury, malfunctions and false test results

Failure to connect the TD500 test device to the molded case circuit breaker according to the sequence of steps specified below can result in personal injury, malfunctions and false test results.

Disconnect the molded case circuit breaker from the power supply before you connect the TD500 test device.

Connect up the test device in exactly the sequence described below.

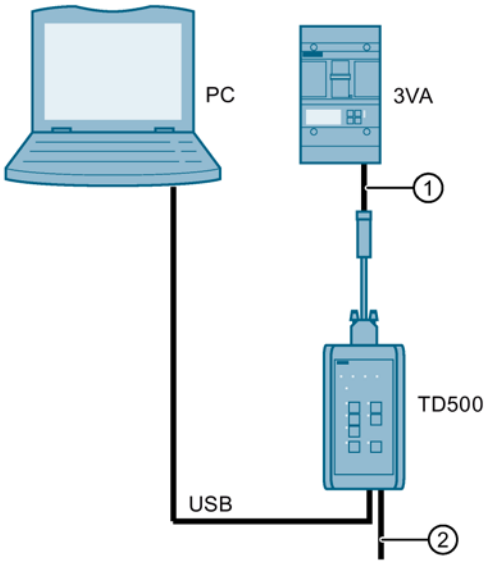
Before any tests can be performed, the TD500 test device must be connected to the 3VA molded case circuit breaker by the connecting cable. The test device must be supplied by a power supply unit during testing.

For further information about the TD500 test device, refer to Chapter "Test devices" of the manual for 3VA molded case circuit breakers.

Note

The TD500 test device may only be used to test a 3VA molded case circuit breaker that has been disconnected from the power supply.

5.7.1.1 PC connection

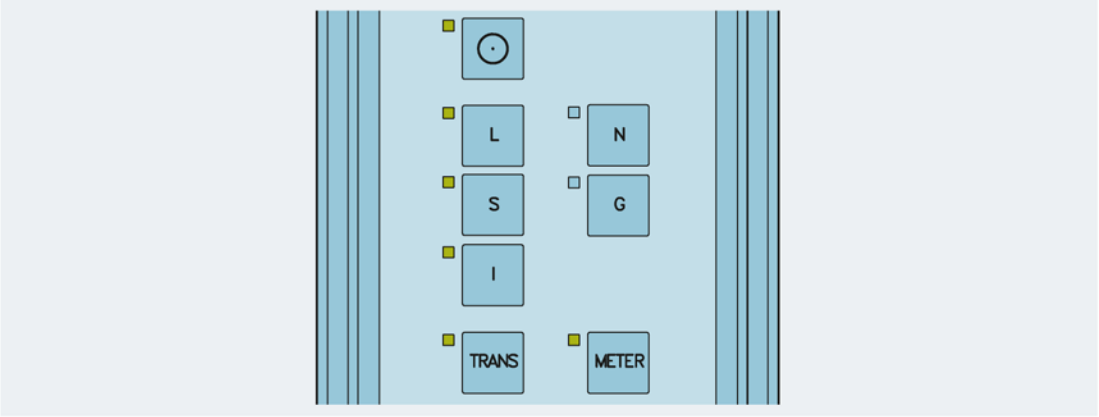


① TD500-to-ETU connector
② Connecting cable for power supply unit

5.7.2 Operator controls

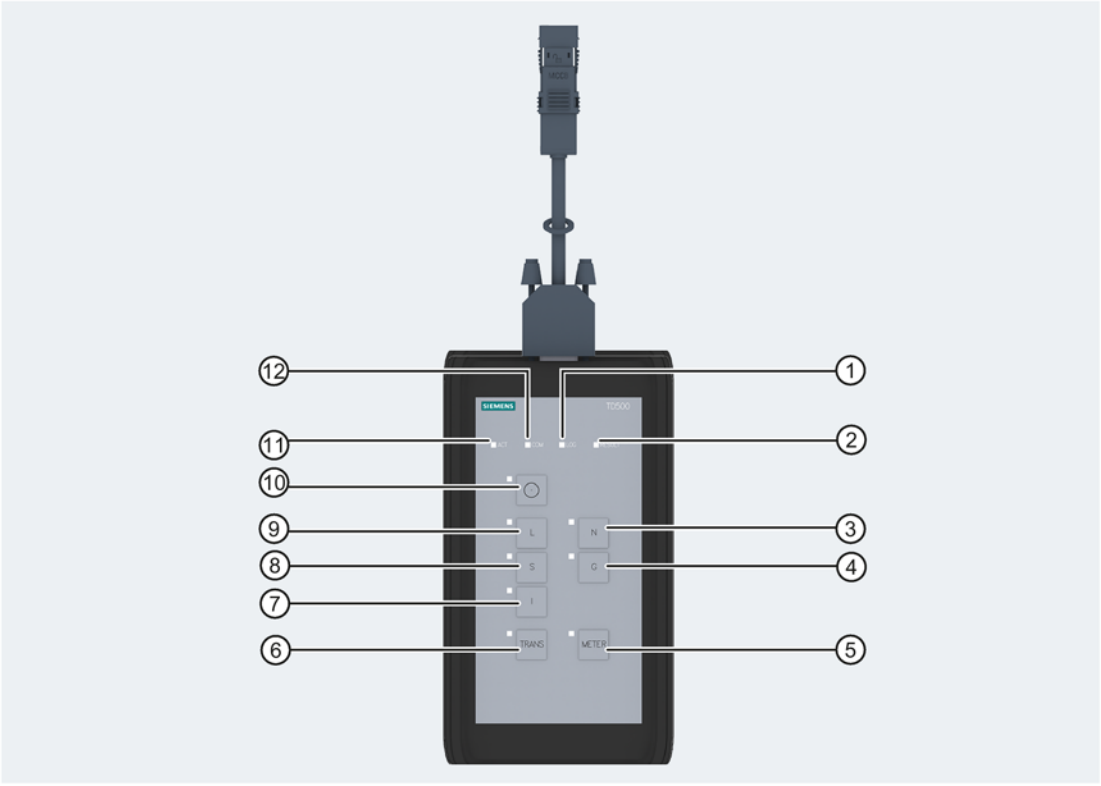
The pushbuttons will indicate which tests are possible. These differ according to the type of ETU connected and its settings. The relevant test is carried out when the appropriate pushbutton is pressed.

Example: In this example, the L, S and I releases, the transformers (TRANS) and the current meter (METER) can be tested on the connected ETU:



You can find further information in Chapter "Test devices" of the manual for 3VA molded case circuit breakers.

5.7.2.1 LED displays



① LED "LOG" (available memory status)
② LED "RESULT"
③ Pushbutton for neutral trip test N
④ Pushbutton for ground fault trip test G
⑤ Pushbutton for meter test (current measurement display)
⑥ Pushbutton for transformer test
⑦ Pushbutton for instantaneous short-circuit trip test I
⑧ Pushbutton for short-time delayed short-circuit test S
⑨ Pushbutton for overload trip test L
⑩ Pushbutton for ETU Power ON/OFF
⑪ LED "ACT" (status operating mode: ON = unit is ready)
⑫ LED "COM" (communication status)

For an exact description of the meaning of individual LEDs, refer to the table below:

LED		Meaning	Description
☐	ACT	Off	TD500 switched off
☀	ACT	On	TD500 ready
☐	COM	Off	No communication link with ETU
☀	COM	Flashing (2 Hz)	- Establishing communication link with ETU - Communications error - TD500 not ready
☀	COM	On	Communication link established with ETU
☐	LOG	Off	No free memory space The TD500 device can continue to be used, but the results of the trip tests will no longer be stored on the TD500. The device is still capable of executing all test functions.
☀	LOG	Flashing (2 Hz)	Available memory space < 25 % The TD500 device can continue to be used without restriction, but there is only enough memory space available to store a few test results. In order to ensure safe storage of test results, save the existing results to a PC and delete the contents of the TD500 memory using powerconfig.
☀	LOG	On	Free memory space ≥ 25 % The TD500 device can continue to be used without restriction.
☐	RESULT	Off	No test has been carried out and no test result has been recorded.
☀	RESULT	Flashing red (2 Hz)	It has not been possible to establish whether or not the molded case circuit breaker is functioning correctly.
☀	RESULT	On	No faults have been detected.

5.7.3 Commissioning

5.7.3.1 First commissioning

When the TD500 test device is connected to the PC by means of the supplied USB cable, it will be detected automatically by powerconfig. No settings need to be made in advance.

5.7.3.2 Resetting

The TD500 test device can store a total of 100 test operations. The available memory space is indicated by the "LOG" LED.

To erase the memory contents:

Select the relevant TD500 in powerconfig and navigate to menu item "Reset test log" via the "Device" menu

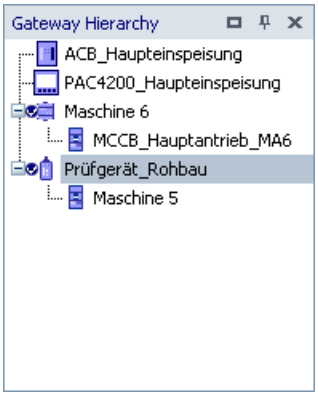
5.7.4 Operation

5.7.4.1 Execute a test with TD500

You can find information about autonomous test procedures using the TD500 test device in Chapter "The TD500 test device" of the manual for 3VA molded case circuit breakers.

5.7.4.2 Test with TD500 and powerconfig

1. Disconnect the 3VA molded case circuit breaker from the power supply.
2. Connect the TD500 test device to the PC (see Chapter Connecting (Page 139)).
3. Connect the TD500 test device to the 3VA molded case circuit breaker and make sure that the required voltage is connected via the power supply unit (see Chapter Connecting (Page 139)).
4. Drag the 3VA molded case circuit breaker from the library in the gateway hierarchy and drop it under the TD500 test device.



5. Select the TD500 test device and then select button  to open the view "Breaker tests".

6. Click on icon  in order to synchronize the TD500 test device with powerconfig. powerconfig displays all the supported tests for the relevant ETU.
7. Activate the tests by selecting icons L, to ME .

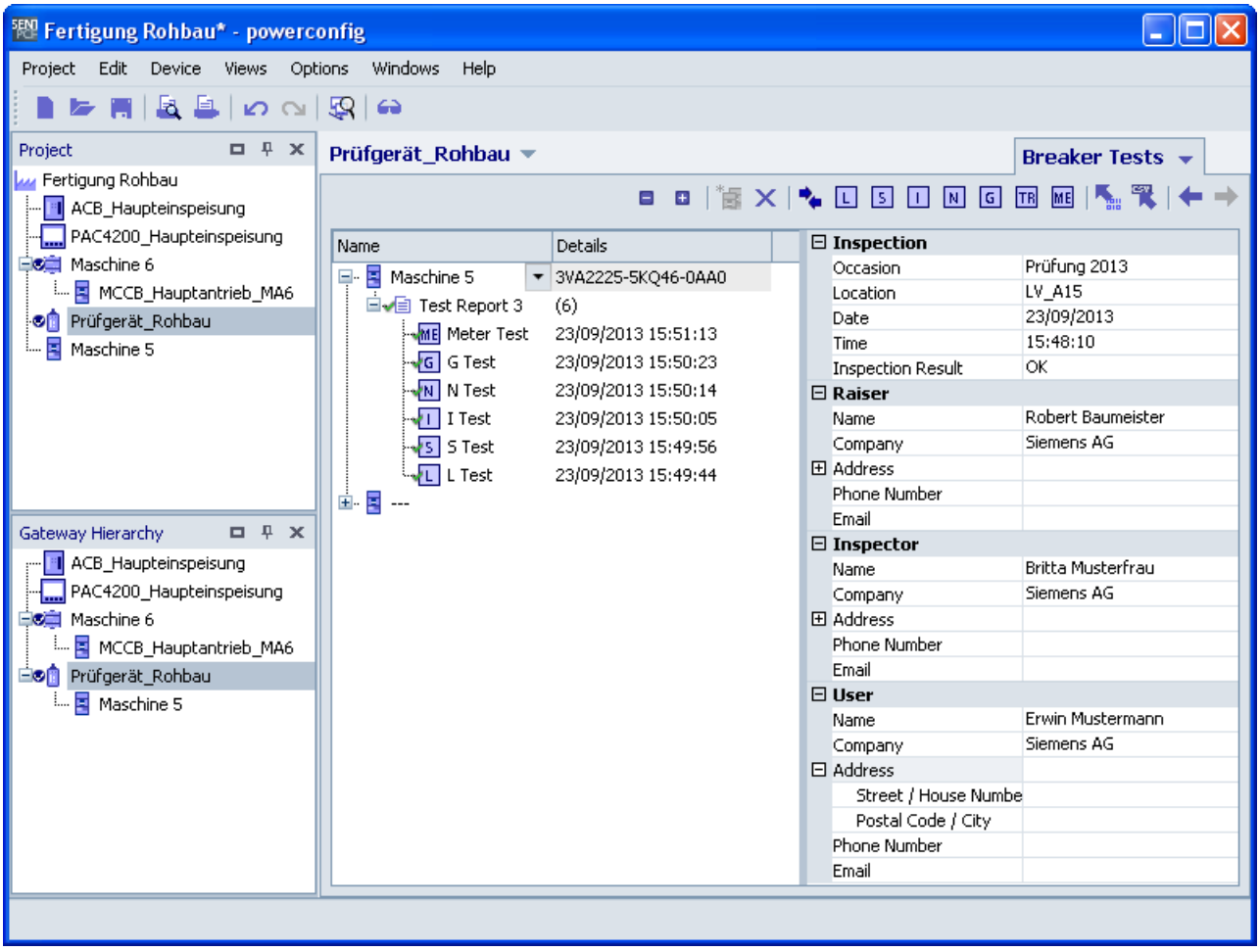
8. Load the test data to the PC by selecting icon  .

5.7.4.3 Evaluate tests with powerconfig

Test results can be evaluated by the method described below:

Display tested 3VA molded case circuit breakers

The individual results of tests carried out on a 3VA molded case circuit breaker are displayed in the form of test reports.



Archive test data

1. Load the test data to the PC (powerconfig) by selecting icon .
2. Check the test data.

- A test report contains:
  - Detailed test results in the 3VA (Ok, fault, aborted + accompanying values)
  - All valid parameter settings at the time of testing
  - Description (name, tester, etc.) - this information can be edited

Test data are thus archived in the project.

You can print out individual test reports by selecting icon .

Transfer test reports to the project as 3VA configuration

- Individual test reports can be transferred to the project as a 3VA configuration.
- Icon  can be selected to save test reports as a file in ".csv" format.
- 3VA configurations can be edited further (e.g. copied, duplicated or compared) in powerconfig after they have been transferred.

Delete test data

- A TD500 test device inserted in the project can be deleted again via the powerconfig menu Device > Reset test log.

  → All test data of the TD500 are then deleted.
- Individual test reports can also be deleted from the TD500 test device.

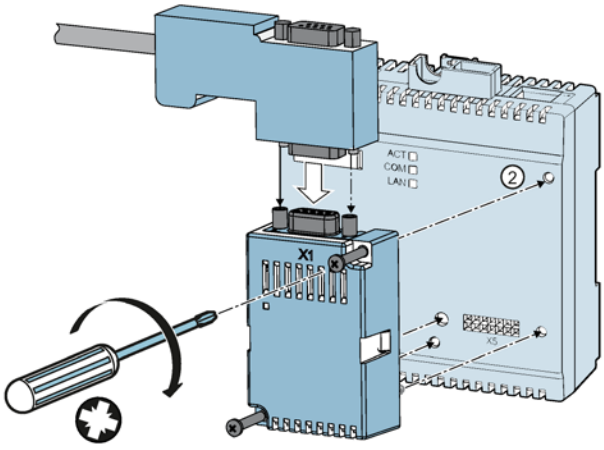
5.8 7KM PAC PROFIBUS DP expansion module

5.8.1 Connecting

5.8.1.1 Connecting the 24 V supply

The COM800 / COM100 breaker data server supplies power to the 7KM PAC PROFIBUS DP expansion module.

5.8.1.2 Connecting PROFIBUS DP



1. Ensure safe isolation from supply.
2. Make sure that you do not transfer any static charges to the device. Discharge the static electricity from your body before you touch the device.
3. Handle the 7KM PAC PROFIBUS DP expansion module by its plastic housing only.
4. Attach the 7KM PAC PROFIBUS DP expansion module to the COM800. The guide pins will ensure that the 7KM PROFIBUS DP is attached in the correct position.
5. Tighten the screws of the 7KM PAC PROFIBUS DP expansion module to a torque of 0.5 Nm.
6. Plug the sub D connector into the sub D socket.
7. Screw the sub D connector into place.
8. Provide sufficient mechanical strain relief for the PROFIBUS cable. Ground the shield of the cable in the immediate vicinity of the device using a grounding clamp.
9. Ground the shield of the cable at both ends.

Note

Terminating resistor

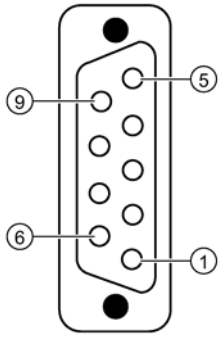
When using the 7KM PAC PROFIBUS DP expansion module, make sure that terminating resistors are correctly connected.

Please note:

- The specifications in the "PROFIBUS RS485-IS User and Installation Guideline"
- The "SIMATIC NET PROFIBUS Network Manual"

Pin assignment for the PROFIBUS DP connection

The 7KM PAC PROFIBUS DP expansion module uses a 9-pin sub D socket.



Pin	Designation	Meaning	Range
1	NC	Not assigned	–
2	NC	Not assigned	–
3	RxD / TxD-P	Receive/transmit data P	ANSI TIA/EIA-485-A [1]
4	Control-P (RTS)	Control signal	TTL
5	DGND	PROFIBUS data reference potential	GND
6	VP	Power supply output [2]	5 VEXT / 10mA
7	NC	Not assigned	–
8	RxD / TxD-N	Receive/transmit data N	ANSI TIA/EIA-485-A [1]
9	NC	Not assigned	–

5.8.2 Operator controls

5.8.2.1 LED display

The LED display indicates the communication status.

LED	Status	Description	Measures
white	Off	No voltage connected to the 7KM PAC PROFIBUS DP expansion module	1. Check whether the 7KM PAC PROFIBUS DP expansion module is correctly plugged into the COM800 / COM100 breaker data server. 2. Switch on the power supply to the COM800 / COM100 breaker data server.
green	flashing (2 Hz)	PROFIBUS DP communications are OK. Data exchange with class 2 master.	–
green	On	PROFIBUS DP communications are OK. Data exchange with class 1 master.	–
red	flashing (2 Hz)	Parameter assignment error: • The slave has not been parameterized or has been wrongly parameterized. • An incorrect station address has been assigned. • An incorrect GSDML file has been used.	1. Check the communication and the parameter assignments. 2. Check the PROFIBUS address. 3. Check whether the GSD file matches the firmware version and the hardware version of the expansion module.
red	On	Bus fault. Communication is not possible. No PROFIBUS DP communication with a class 1 or class 2 master.	7KM PAC PROFIBUS DP expansion module: 1. Use powerconfig to set a valid PROFIBUS address. 2. Check the bus installation. 3. Check whether the bus connector is correctly inserted. 4. Check whether the bus cable to the PROFIBUS DP master is interrupted or disconnected.
orange	flashing (2 Hz)	Hardware fault on the expansion module or the COM800 / COM100 breaker data server, e.g.: • 12 V too weak or further internal faults	Replace the module and/or the COM800 / COM100 breaker data server.
orange	On	Communication fault between the module and the COM800 / COM100 breaker data server.	Check whether the COM800 / COM100 breaker data server is functioning correctly.
		The LED lights up for just a short time (e.g. during initialization) The LED turns green when communication has been restored.	The usual diagnostics options on the master, e.g., error OB8x, are available for use.
		The LED lights up orange for a prolonged period: An internal fault has occurred.	Restart the device. Replace the module and/or the COM800 / COM100 breaker data server.
green, red, orange	flashing (2 Hz)	A firmware update is in progress.	Do not abort the firmware update! The update will take between 8 and 13 minutes.

5.8.3 Commissioning

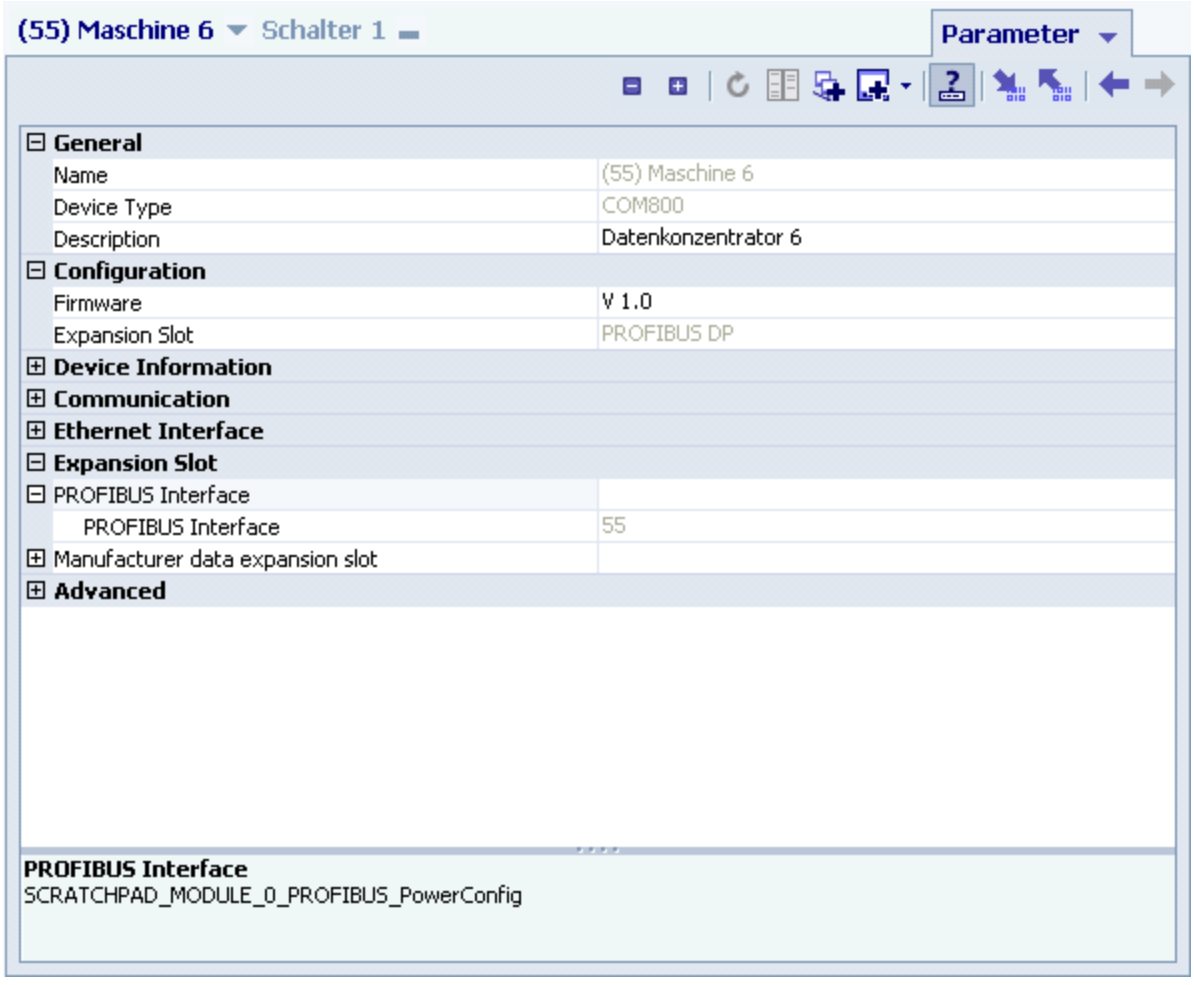
5.8.3.1 First commissioning

Factory settings of the 7KM PAC PROFIBUS DP expansion module

Parameter	Value
Address	126
Baud rate in bit/s	Automatic recognition
Type of connected device	Automatic recognition

With these factory settings, the 3VA molded case circuit breaker can be accessed via PROFIBUS from STEP 7, the TIA portal and powerconfig.

To activate the PROFIBUS DPV1 expansion module on the COM800 / COM100 breaker data server, the module must be selected at the expansion slot.



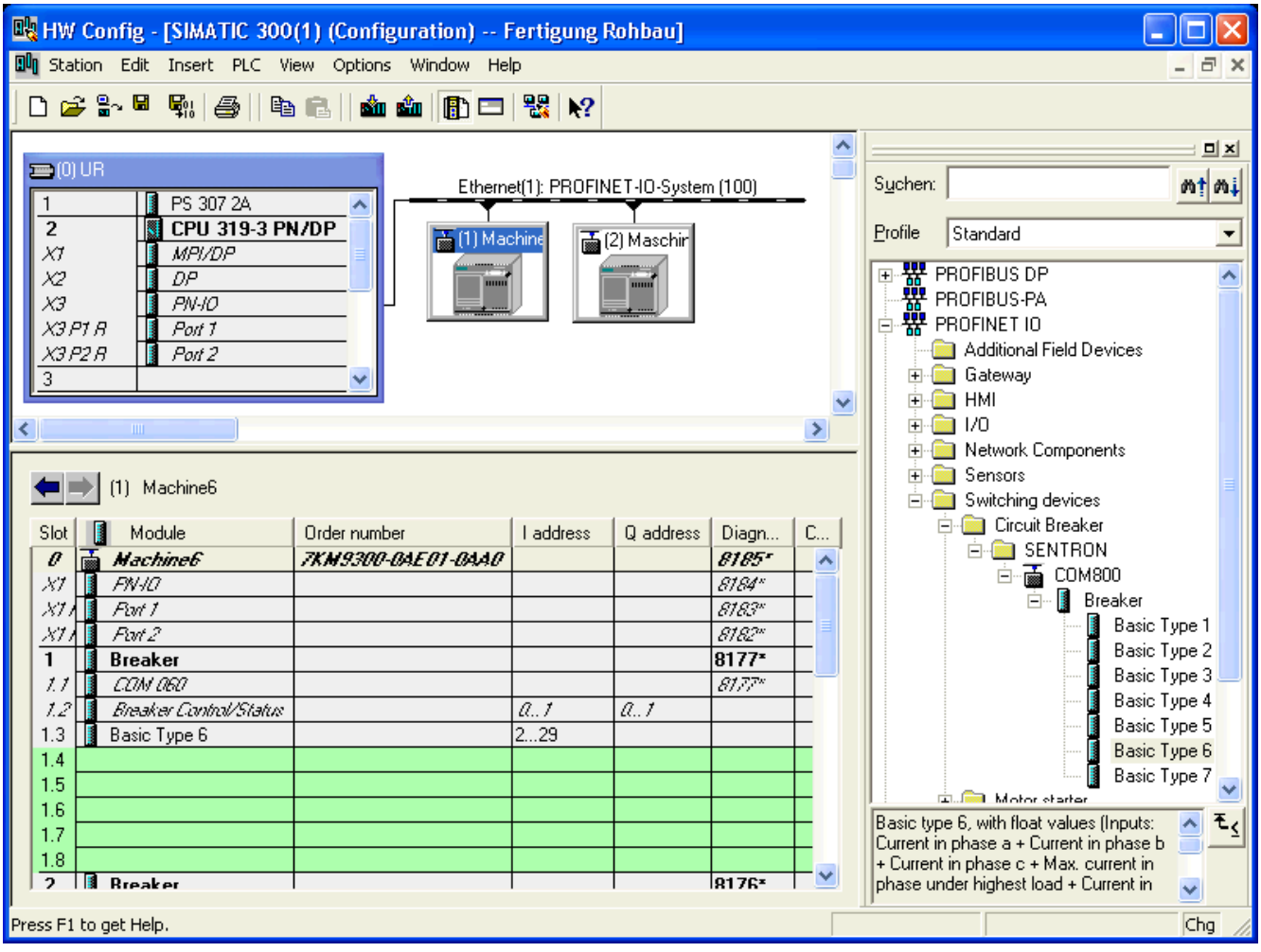
Changing the address of the 7KM PAC PROFIBUS DP expansion module

Each device requires a unique address in the range between 1 and 125. The address is stored in the 7KM PAC PROFIBUS DP expansion module. Address 126 is used for commissioning purposes only. It must not be used for data communication.

Change the address of each device before you begin transferring data. You can change the address:

- With powerconfig via the Ethernet interface
- With the PROFIBUS configuring software, e.g., STEP 7
- Via the PROFIBUS interface by means of a PROFIBUS DP class 2 master

If a 7KM PAC PROFIBUS DP expansion module is used, the PROFIBUS address must be set.



The PROFIBUS address can also be assigned via PROFIBUS, e.g. using STEP 7.

5.8.3.2 Resetting

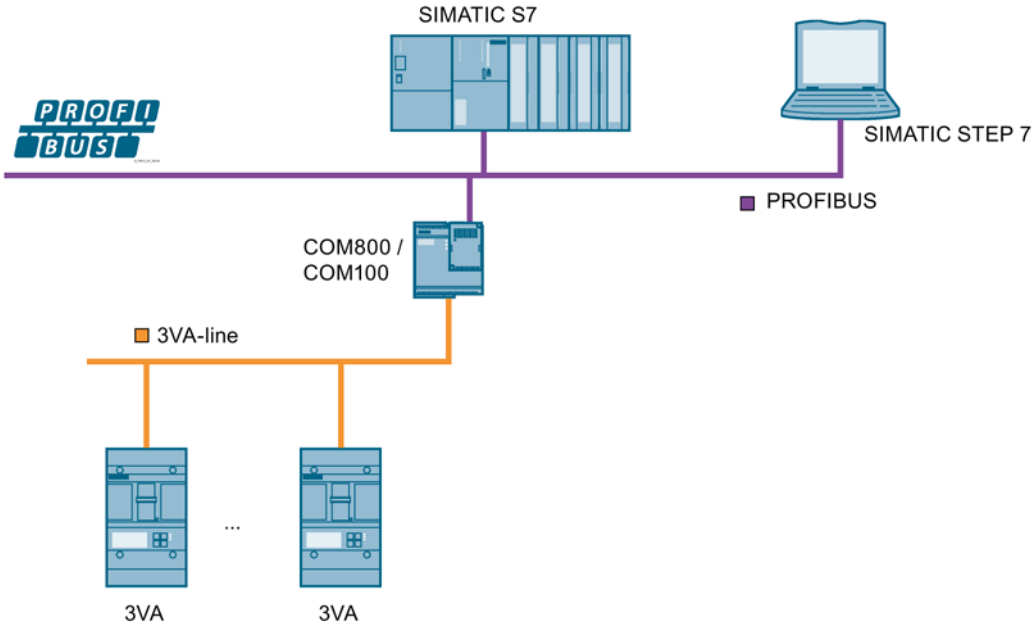
Reset is accomplished by assigning a new PROFIBUS address.

Either the address of the expansion tool must be reset to 126 or the set address must be known.

5.8.3.3 Commissioning

Configuration scenario

In the SIMATIC environment, 3VA molded case circuit breakers can be integrated via PROFIBUS by means of STEP 7 and the device-specific GSD file.



Note

Configuration with other tools

Configuration tools developed by other manufacturers can also be used.

Configuring with the GSD file

The GSD file forms the basis for the configuration of a device. Each PROFIBUS device has a PROFIBUS identification number and a GSD file created for a specific 3VA molded case circuit breaker.

The GSD file for PROFIBUS is a text file in ASCII format and defines the following for a 3VA molded case circuit breaker:

- Individual data structures (basic types)
- Characteristics
- Control data
- Status information

The basic types provide the following data and make them available to the PROFIBUS DP class 1 master:

- Measured variables

Naming convention of the PROFIBUS GSD file

The name of the GSD file contains the following information:

Fields	Meaning
1	"GSDML"
2	Version number of the GSD file in Vx.y format
3	Name of the manufacturer
4	Name of the device family
5	Issue date of the GSDML file in the format: YYYYMMDD
6	Optional issue time of the GSDML file in the format: hhmmss hh = 00 to 24.
7	Extension of the file name "XML"

Assignment of a PROFIBUS GSD file to a device and firmware version of the expansion module

- Current version of the GSD file
  You can find the current version of the GSD file in the Service & Support Portal http://www.siemens.com/automation/service&support. Save the GSD file on your PC for future use.

Further information

You can find further information about using the 7KM PAC PROFIBUS DP expansion module in Chapter PROFIBUS DP (Page 153) and in the manual for the 7KM PAC PROFIBUS DP expansion module http://support.automation.siemens.com/WW/view/en/26504372.

See also

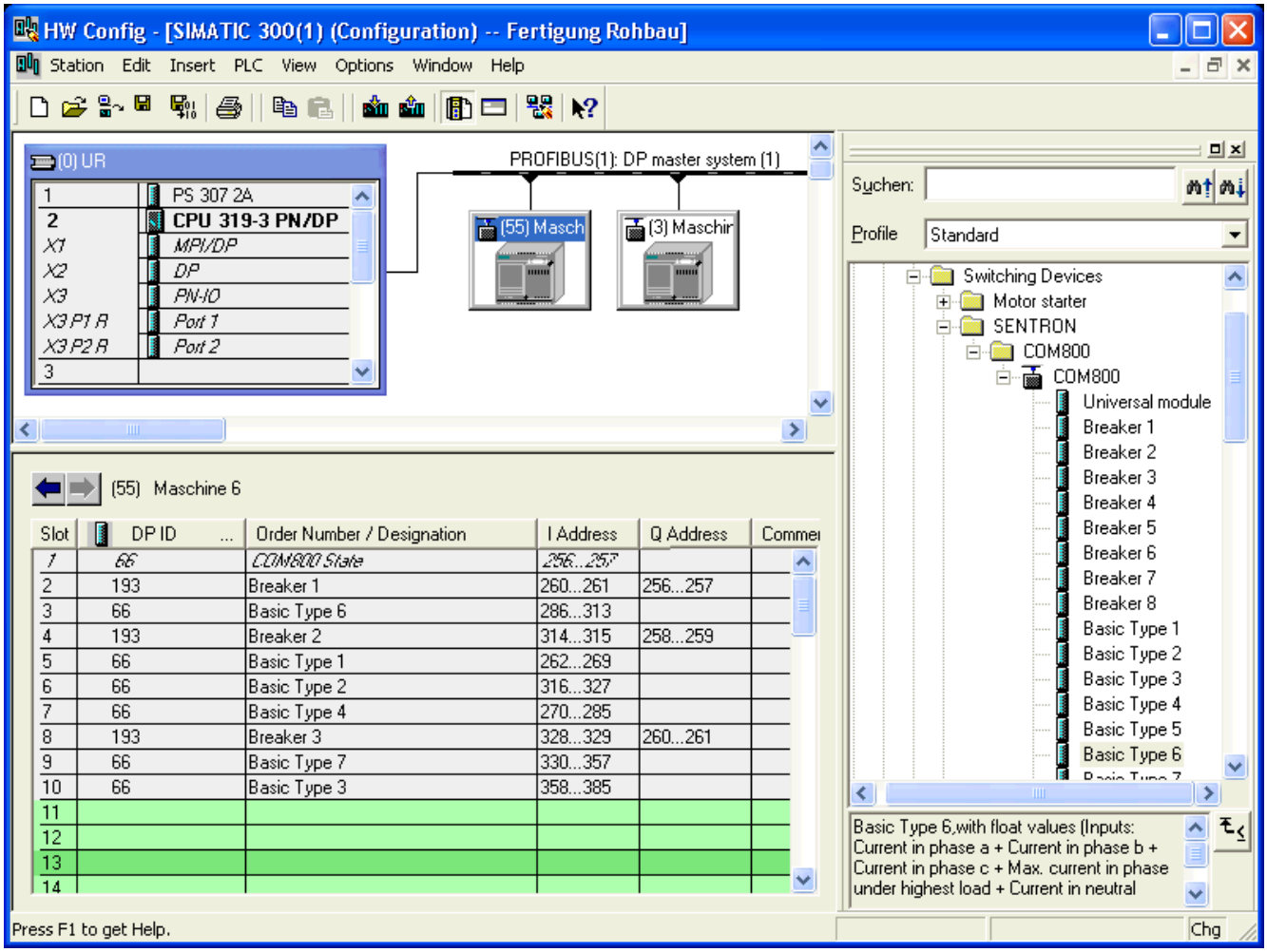
http://support.automation.siemens.com/WW/view/en/84054777

5.8.3.4 PROFIBUS DP

The COM800 breaker data server represents a total of eight 3VA molded case circuit breakers in a single PROFIBUS DPV1 slave, while the COM100 breaker data server represents only one 3VA breaker.

The configuration of the COM800 / COM100 breaker data server with the 3VA molded case circuit breakers is modeled as a modular device. Individual components can be addressed as slots and therefore have their own I&M data.

The component sequence is depicted in the screenshot below:



- COM800 / COM100 breaker data server
- 3VA molded case circuit breakers (= breakers 1 to 8)
  - Basic types 1 to 7
  - Control and status bytes (are inserted when the 3VA is created)

Only 3VA molded case circuit breakers with a breaker address between 1 and 8 can be addressed via PROFIBUS DP. PROFIBUS DP cannot address 3VA molded case circuit breakers with a breaker address of > 8.

When the COM800 / COM100 breaker data server is set up, it is possible to choose whether

- power-up should take place when the target configuration does not match the ACTUAL configuration
- diagnostic interrupts should be employed
- process interrupts should be employed

In addition, the energy values of the 3VA molded case circuit breakers with ETUs 8-series can be read out by means of acyclic data exchange. See also Chapter Acyclic communication via PROFIBUS DP (Page 161).

5.8.4 Operation

There are three possible methods to communicate with 3VA molded case circuit breakers via PROFIBUS DP during operation:

- Cyclic
- Acyclic
- Interrupts and diagnosis

For further information go to http://support.automation.siemens.com/WW/view/en/26504372.

5.8.4.1 Cyclic communication via PROFIBUS DP

Cyclic communication permits continuous transfer of data, such as status and measured values, from the 3VA molded case circuit breaker. Switching and reset commands can be executed by means of simple binary operations.

The basic types, control bytes and status bytes conform to the following specifications:

Profiles for Low Voltage Switchgear Devices (LVSG) Technical Specification for PROFINET IO and PROFIBUS Version 1.32 - Date January 2013 Order No.: 3.122

The basic types are made available in the GSD file for configuring the PROFIBUS DP master.

Binary status information is created automatically when each circuit breaker is set up.

If one of the basic types 1, 2 or 3 is inserted immediately after the status information, the combination complies with the "Profiles for Low Voltage Switchgear Devices (LVSG) Technical Specification for PROFINET IO and PROFIBUS Version 1.32 - Date January 2013 Order No.: 3.122" which is also supported by 3WL and 3VL circuit breakers.

Status bytes

The following status bytes are available for each 3VA molded case circuit breaker:

Byte	Bit	Value	Information about 3VA molded case circuit breaker	ETU 8-series	ETU 5-series	DO[1]	SEO
0	0, 1	0	Disconnected position	■	■	✓	–
		1	Connected position				
		2	Test position				
		3	Not available				
	2, 3	0	Not ready	■	■	■	■
		1	Off				
		2	On				
		3	Has tripped				
	4	1	Reserved	–	–	–	–
	5	1	Reserved				
	6	1	Spring energy store is compressed	■	■	■	✓
	7	1	Overload alarm present	✓	✓	–	–
1	0	1	Reserved				
	1	1	Reserved				
	2	1	Write protection activated	■	■	–	–
	3	1	Reserved				
	4, 5, 6	0 … 7	Reason for last trip	✓	✓	–	–
		0	No tripping operation or last tripping operation acknowledged				
		1	Overload tripping (L)				
		2	Instantaneous short circuit (I)				
		3	Short-time delayed short circuit (sd)				
		4	Ground fault (G)				
		5	Tripping operation as a result of extended protection function				
		6	Overload in neutral conductor (N)				
		7	Reserved				
	7	1	Load shedding alarm	✓	✓	–	–

[1] Draw-out unit
✓ Relevant for
■ Available
- Not applicable

Availability via PROFIBUS DP of 3VA molded case circuit breakers linked to COM800 / COM100

The following status bytes of the COM800 / COM100 breaker data server signal the availability or non-availability of 3VA molded case circuit breakers linked to the breaker data server:

Byte	Bit	Value	3VA molded case circuit breaker with breaker address
0	0 … 7	1	Available
	0	1	1
	1	1	2
	2	1	3
	3	1	4
	4	1	5
	5	1	6
	6	1	7
	7	1	8
1	0 … 7	1	Not available
	0	1	1
	1	1	2
	2	1	3
	3	1	4
	4	1	5
	5	1	6
	6	1	7
	7	1	8

Basic types 1 to 3

The cyclic IO data of 3VA molded case circuit breakers are grouped into seven different basic types. Each basic type supplies key items of information about a 3VA molded case circuit breaker in a level of detail and data format which vary according to the basic type.

The basic types are made available in the GSD file for configuring the PROFIBUS DP master.

Basic type 1 (LVSG format 1)

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 1	Current in phase L_1	U16	A	✓	✓
2 … 3	Current in phase L_2	U16	A	✓	✓
4 … 5	Current in phase L_3	U16	A	✓	✓
6 … 7	Current in phase under highest load	U16	A	✓	✓

✓ Relevant for

Basic type 2 (LVSG format 2)

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 1	Current in phase L_1	U16	A	✓	✓
2 … 3	Current in phase L_2	U16	A	✓	✓
4 … 5	Current in phase L_3	U16	A	✓	✓
6 … 7	Current in phase under highest load	U16	A	✓	✓
8 … 9	Current in neutral conductor	U16	A	✓	✓
10 … 11	Active energy import in 3 phases	U16	MWh	✓	–

✓ Relevant for

\- Not applicable

Basic type 3 (LVSG format 3)

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 1	Current in phase L_1	U16	A	✓	✓
2 … 3	Current in phase L_2	U16	A	✓	✓
4 … 5	Current in phase L_3	U16	A	✓	✓
6 … 7	Maximum current in phase under highest load	U16	A	✓	✓
8 … 9	Current in neutral conductor	U16	A	✓	✓
10 … 11	Voltage L_1-L_2	U16	V	✓	–
12 … 13	Voltage L_2-L_3	U16	V	✓	–
14 … 15	Voltage L_3-L_1	U16	V	✓	–
16 … 17	Voltage L_1-N	U16	V	✓	–
18 … 19	Voltage L_2-N	U16	V	✓	–
20 … 21	Voltage L_3-N	U16	V	✓	–
22 … 23	Average power factor in 3 phases	U16	Factor 1000 of the actual value	✓	–
24 … 25	Active energy import in 3 phases	U16	MWh	✓	–
26 … 27	Apparent power Σ in 3 phases	U16	kVA	✓	–

✓ Relevant for
- Not applicable

Basic types 4 to 7

Measured variables are made available in FLOAT32 format so that the data can be processed more simply and with a higher resolution in modern data processing systems and controllers.

Basic type 4

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Current in phase under highest load	FLOAT32	A	✓	✓

✓ Relevant for

Basic type 5

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Current in phase under highest load	FLOAT32	A	✓	✓
16 … 19	Current in neutral conductor	FLOAT32	A	✓	✓
20 … 23	Active energy import in 3 phases	FLOAT32	kWh	✓	–

✓ Relevant for
- Not applicable

Basic type 6

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Maximum current in phase under highest load	FLOAT32	A	✓	✓
16 … 19	Current in neutral conductor	FLOAT32	A	✓	✓
20 … 23	Active power in 3 phases	FLOAT32	W	✓	–
24 … 27	Reactive power in 3 phases	FLOAT32	var	✓	–

✓ Relevant for
- Not applicable

Basic type 7

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Current in phase under highest load	FLOAT32	A	✓	✓
16 … 19	Current in neutral conductor	FLOAT32	A	✓	–
20 … 23	Active energy import in 3 phases	FLOAT32	kWh	✓	–
24 … 27	Average power factor in 3 phases	FLOAT32		✓	–

✓ Relevant for
- Not applicable

Control bytes

The following control bytes are available for each 3VA molded case circuit breaker:

Byte	Bit	Value	Activated function of the 3VA molded case circuit breaker
0	0,1	0 … 3	Switch the 3VA molded case circuit breaker
		0	Not defined (no action)
		1	Not currently available (switch off)
		2	Not currently available (switch on)
		3	Not currently available (switch on)
	2	1	Reset: Last trip reason
	3	1	Reserved
	4	1	Reserved
	5	1	Reserved
	6	1	Reserved
	7	1	Reserved
1	0,1	0	Reserved
		1	Reserved
		2	Reserved
		3	Reserved
	2	1	Delete tripping and event recording
	3	1	Reset minimum / maximum values
	4	1	Reserved
	5	1	Reserved
	6	1	Acknowledge maintenance information
	7	1	Reserved

5.8.4.2 Acyclic communication via PROFIBUS DP

Using acyclic data exchange, it is possible on occasions to fetch large volumes of data such as energy values from the 3VA molded case circuit breaker.

Reading data records DS205 and DS255

With 3VA molded case circuit breakers, data record DS205 is read using the CALL mechanism in a similar manner to the I&M data of DS255.

Note

Further information

You can find further information about the CALL mechanism in IEC 61158-6, Chapter 6, and the "PROFIBUS Profile Guideline Part 1: Identification & Maintenance Functions".

Energy counter DS205

The DP master can use data record DS205 to read the energy counters of the 3VA molded case circuit breakers connected to the COM800 / COM100 breaker data server. The energy values are available in double float format:

Byte	Number of bits	Format	Description
0	32	Struct	Header
4	32	Unsigned long	Reserved
8	16	Unsigned short	Reserved
10	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 1
18	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 1
26	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 1
34	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 2
42	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 2
50	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 2
58	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 3
66	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 3
74	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 3
82	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 4
90	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 4
98	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 4
106	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 5
114	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 5
122	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 5
130	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 6
138	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 6
146	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 6
154	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 7
162	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 7
170	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 7
178	64	Double float	Active energy import: 3VA molded case circuit breaker with breaker address 8
186	64	Double float	Reactive energy import: 3VA molded case circuit breaker with breaker address 8
194	64	Double float	Apparent energy: 3VA molded case circuit breaker with breaker address 8
Total 202			

Data record DS205 addresses the COM800 / COM100 breaker data server directly.

I&M device identification DS255

Data record DS255 contains the I&M data for the addressed component:

- COM800 / COM100 breaker data server
- 3VA molded case circuit breaker with breaker address 1
- …
- 3VA molded case circuit breaker with breaker address 8

The record contains either device identification data or manufacturer information:

- I&M 0 (identification)

The record contains either maintenance data or device information:

- I&M 1 (plant identifier / location identifier)
- I&M 2 (installation date)
- I&M 3 (supplementary information)

Device identification data and maintenance data / device information are supplied in data record DS255.

5.8.4.3 Interrupt and diagnosis concept with PROFIBUS DP

The purpose of diagnostic and process interrupts is to notify the DP master of sporadically occurring events. DP masters (such as SIMATIC S7) feature interrupt mechanisms designed to transfer standardized information to the user (program).

3VA molded case circuit breakers can output diagnostic functions compliant with PROFIBUS DPV0 and diagnostic and process interrupts compliant with PROFIBUS DPV1.

Communication between the breaker data server with DP (= DP slave) expansion module and the PROFIBUS master, e.g. SIMATIC S7 or PC, is based on the protocol sequences defined for PROFIBUS.

The data described below is made available to users through local interfaces.

In the SIMATIC environment, process interrupts are signaled via OB40 and diagnostic interrupts via OB82. Interrupt data can be read by means of SFB 54.

Diagnostic data for PROFIBUS DP V0

Position	Contents	Bit	Value	Contents	
Byte 0	Station status			Contents and values according to PROFIBUS Profile Guidelines Chapter 5.4	Slave diagnostics in accordance with standard
Byte 1					
Byte 2					
Byte 3	Master address				
Byte 4	Identification number (high)				
Byte 5	Identification number (low)				
Byte 6	Header		Type + length		
Byte 7	Status type		1		
Byte 8	Slot number		0 = Module		
			1 = COM800 2...x*)		
Byte 9	Specifier		1 = Incoming		
			2 = Outgoing		
Byte 10	User data 1	Bit0 … 6	d.c.	Reserved	Device-specific diagnostic message
		Bit7	1	Diagnostic data available	
Byte 11	User data 2	Bit0	1	Communication with 3VA not yet ready	
		Bit1	1	Communication with 3VA not possible	
		Bit2	d.c.	Reserved	
		Bit3	1	Internal fault (CRC error)	
		Bit4	d.c.	Reserved	
		Bit5	1	Internal fault (frame error)	
		Bit6	1	Internal fault (timeout)	
		Bit7	1	C3VA and module firmware versions do not match. → Firmware needs to be updated.	
Byte 12	User data 3	Bit0	1	Voltage out of range	
		Bit1	1	Current out of range	
		Bit2	1	Pulse frequency too high	
		Bit3	1	Limit violation	
		Bit4 … 7	d.c.	Reserved	
Byte 13	User data 4	Bit0	1	Digital outputs not remotely controllable	
		Bit1	d.c.	Reserved	
		Bit2	1	Energy counter write operation failed	
		Bit3	1	Write operation rejected due to write protection	
		Bit4	d.c.	Reserved	
		Bit5	1	Internal communication error	
		Bit6	1	Internal communication error	
		Bit7	1	Internal communication error	

* Slot number of the breaker. See STEP 7 HW configuration

Diagnostic interrupt according to PROFIBUS DP V1

Position	Contents	Bit	Value	Contents	
Byte 0	Station status			Contents and values according to PROFIBUS Profile Guidelines	Slave diagnostics in accordance with standard
Byte 1					
Byte 2					
Byte 3	Master address				
Byte 4	Identification number (high)				
Byte 5	Identification number (low)				
Byte 6	Header		Type + length		
Byte 7	Interrupt type		1		
Byte 8	Slot number		0 = Module 1 = COM800 2...x *)		
Byte 9	Specifier		1 = Incoming 2 = Outgoing		
Byte 10	Interrupt data 1	Bit0	1	Communication with COM not yet ready	Diagnostic interrupt
		Bit1	1	Communication with COM not possible	
		Bit2	d.c.	Reserved	
		Bit3	1	Internal fault (CRC error)	
		Bit4	d.c.	Reserved	
		Bit5		Internal fault (frame error)	
		Bit6	1	Internal fault (timeout)	
		Bit7	1	COM and module firmware versions do not match. → Firmware needs to be updated.	
Byte 11	Interrupt data 2	Bit0	d.c.	Voltage out of range	
Byte 12	Interrupt data 3	Bit0	1	Digital outputs not remotely controllable	
		Bit1	d.c.	Reserved	
		Bit2	1	Energy counter write operation failed	
		Bit3	1	Write operation rejected due to write protection	
		Bit4	d.c.	Reserved	
		Bit5	1	Internal communication error	
		Bit6	1	Internal communication error	
		Bit7	1	Internal communication error	

* Slot number of the breaker. See STEP 7 HW configuration

Process interrupt according to PROFIBUS DP

Position	Contents	Bit	Value	Contents	
Byte 0	Station status			Contents and values according to PROFIBUS Profile Guidelines	Slave diagnostics in accordance with standard
Byte 1					
Byte 2					
Byte 3	Master address				
Byte 4	Identification number (high)				
Byte 5	Identification number (low)				
Byte 6	Header		6 = Without limit value setting 10 = With limit value setting		
Byte 7	Interrupt type		2		
Byte 8	Slot number		0 = Module 1 = COM800 2...x *)		
Byte 9	Specifier		1 = Incoming 2 = Outgoing		
Byte 10	Interrupt data 1	Bit0	1	Voltage out of range	Hardware interrupt
		Bit1	1	Current out of range	
		Bit2	1	Pulse frequency too high	
		Bit3	d.c.	Limit violation combination See bytes 12 to 15 for details	
		Bit4 ... 7	d.c.	Reserved	
Byte 11	Interrupt data 2		d.c.	Reserved	
Byte 12	Interrupt data 3	Bit0	1	Limit violation combination	
		Bit1	1	Status combination 1	
		Bit2	1	Status combination 2	
		Bit3	1	Status combination 3	
		Bit4	1	Status combination 2	
		Bit5 ... 7	d.c.	Reserved	
Byte 13	Interrupt data 4		d.c.	Reserved	
Byte 14	Interrupt data 5	Bit0	1	Limit violation 8	
		Bit1	1	Limit violation 9	
		Bit2	1	Limit violation 10	
		Bit3	1	Limit violation 11	
		Bit4 ... 7	d.c.	Reserved	
Byte 15	Interrupt data 6	Bit0	1	Limit violation 0	
		Bit1	1	Limit violation 1	
		Bit2	1	Limit violation 2	
		Bit3	1	Limit violation 3	
		Bit4	1	Limit violation 4	
		Bit5	1	Limit violation 5	
		Bit6	1	Limit violation 6	
		Bit7	1	Limit violation 7	

* Slot number of the breaker. See STEP 7 HW configuration

5.9 7KM PAC Switched Ethernet PROFINET expansion module

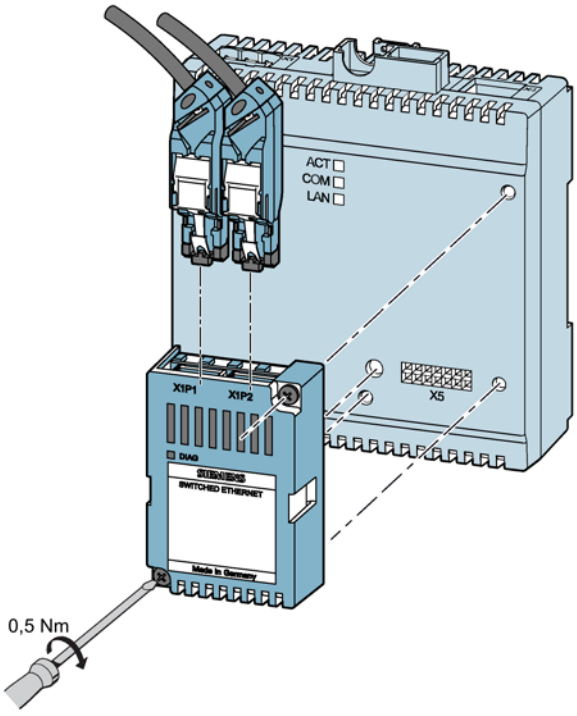
The 7KM PAC Switched Ethernet PROFINET expansion module is used to connect COM800 / COM100 breaker data servers to Switched Ethernet PROFINET via PROFINET IO, PROFIenergy and Modbus TCP.

5.9.1 Connecting

5.9.1.1 Connecting the 24 V supply

The COM800 / COM100 breaker data server supplies power to the 7KM PAC Switched Ethernet PROFINET expansion module.

5.9.1.2 Connecting Switched Ethernet PROFINET



1. Ensure safe isolation from supply.
2. Make sure that you do not transfer any static charges to the device. Discharge the static electricity from your body before you touch the device.
3. Handle the 7KM PAC Switched Ethernet PROFINET expansion module by its plastic housing only.
4. Attach the 7KM PAC Switched Ethernet PROFINET expansion module to the COM800 / COM100. The guide pins will ensure that the 7KM Switched Ethernet PROFINET expansion module is attached in the correct position. Tighten the screws of the 7KM PAC Switched Ethernet PROFINET expansion module to a torque of 0.5 Nm.
5. Plug the RJ 45 connectors into the RJ 45 sockets.
6. Provide sufficient mechanical strain relief for the Ethernet cable. Ground the shield of the cable in the immediate vicinity of the device using a grounding clamp.
7. Ground the shield of the cable at both ends.

5.9.2 Operator controls

5.9.2.1 LED display

The LED display indicates the communication status.

LED		Status	Description	Measures
☐	white	Off	No voltage connected to the expansion module 7KM PAC Switched Ethernet PROFINET	1. Check that the 7KM PAC Switched Ethernet PROFINET expansion module is correctly plugged into the COM800 / COM100 breaker data server. 2. Switch on the power supply to the COM800 / COM100 breaker data server.
	green	flashing (2 Hz)	PROFINET IO communication is OK. Data exchange with the PROFINET IO supervisor	–
	green	On	PROFINET IO communication is OK. Cyclic data exchange with the PROFINET IO controller	–
	red	flashing (2 Hz)	Parameter assignment error: • The device has not been parameterized or has been wrongly parameterized. • An incorrect station address has been assigned. • An incorrect GSDML file has been used. The red LED does not go off until a controller is connected to the network.	1. Check the communication and the parameter assignments. 2. Check the station name and the IP address of the module. 3. Check whether the GSDML file matches the firmware version and the hardware version of the expansion module.
	red	On	No PROFINET IO communication with a PROFINET IO controller or a PROFINET IO supervisor	7KM PAC Switched Ethernet PROFINET expansion module: 1. Check the bus terminator. 2. Use powerconfig to set a valid station name. 3. If necessary, correct the IP settings. 4. Check whether the bus connector is correctly inserted. 5. Check whether the bus cable to the PROFINET IO controller is interrupted or disconnected.
	orange	flashing (2 Hz)	Hardware fault on the expansion module or the COM800 / COM100 breaker data server, e.g.: • 12 V too weak or not present • SRAM fault • Flash fault • EEPROM fault	Replace the module and/or the COM800 / COM100 breaker data server.
	orange	On	Communication fault between the module and the COM800 / COM100 breaker data server.	Check whether the COM800 / COM100 breaker data server is functioning correctly.
			The LED lights up for just a short time (e.g. during initialization) The LED turns green when communication has been restored.	The usual diagnostics options on the master, e.g., error OB8x, are available for use.
			The LED lights up orange for a prolonged period: An internal fault has occurred.	Restart the device. Replace the module and/or the COM800 / COM100 breaker data server.
	green, red, orange	flashing (2 Hz)	A firmware update is in progress.	Do not abort the firmware update! The update will take between 8 and 13 minutes.

5.9.3 Commissioning

5.9.3.1 First commissioning

When the 7KM PAC Switched Ethernet PROFINET expansion module is set to its factory values, three MAC addresses are preset. Additional values can be set by the user during commissioning.

The following values can be set during commissioning:

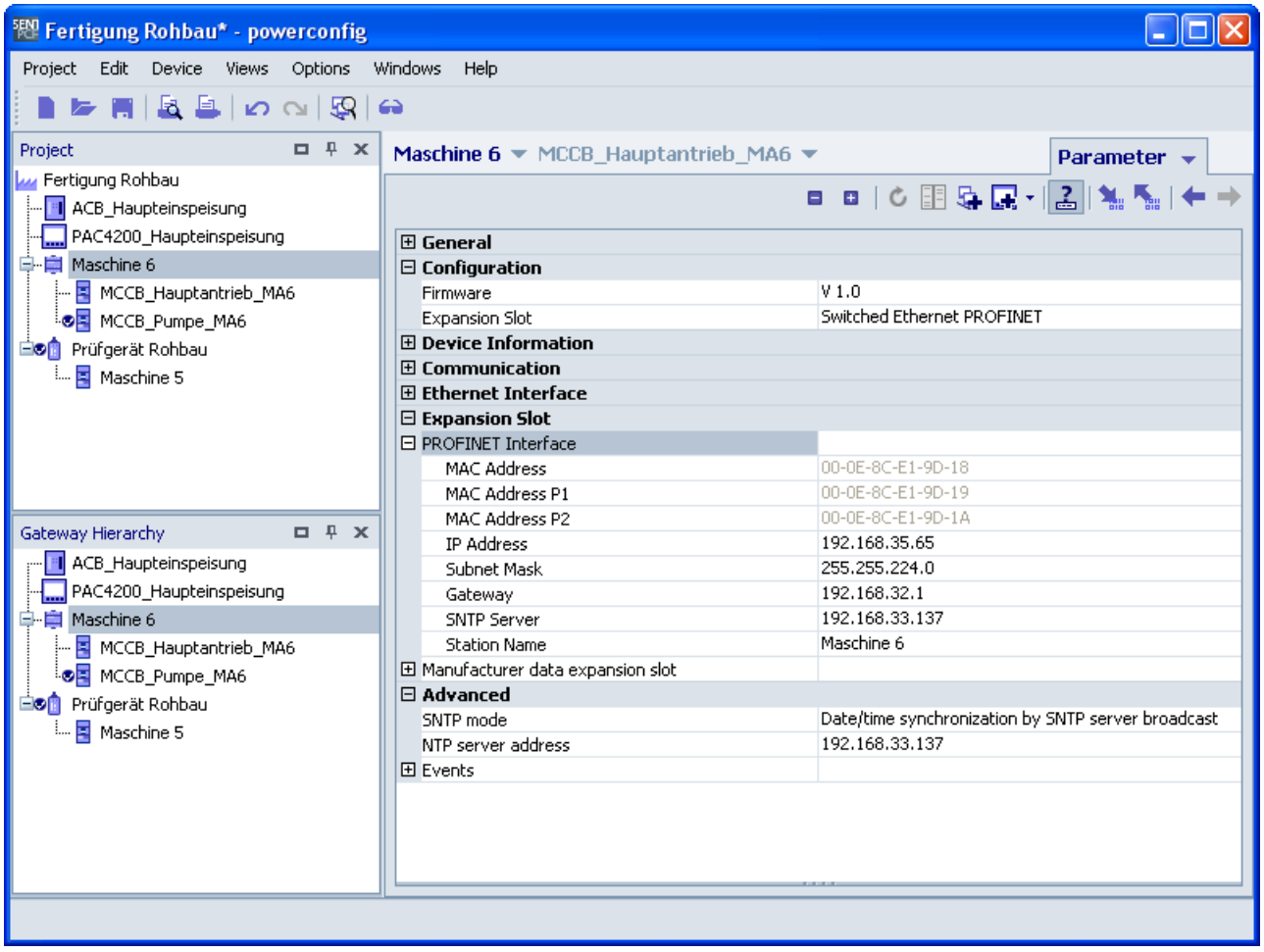
- IP address
- Subnet mask
- Station name for PROFINET

If the 7KM PAC Switched Ethernet PROFINET expansion module is used exclusively for PROFINET, only the station name that is unique throughout the network must be assigned by means of the PROFINET configuring tool, e.g. TIA Portal.

The 7KM PAC Switched Ethernet PROFINET expansion module in the same subnet can be addressed by one of the following configuration programs via one of the three MAC addresses:

- STEP 7
- TIA Portal
- powerconfig

Example of address parameters (in powerconfig):



The 7KM PAC Switched Ethernet PROFINET expansion module requires PROFINET-compliant addressing information.

Change the address of the 7KM PAC Switched Ethernet PROFINET expansion module:

In order to change addresses, it is necessary to know the IP address or conduct a search for the 7KM PAC Switched Ethernet PROFINET expansion module in the same subnet using icon .

The 7KM PAC Switched Ethernet PROFINET expansion module can be completely parameterized with STEP 7 as well as with powerconfig.

5.9.3.2 Resetting

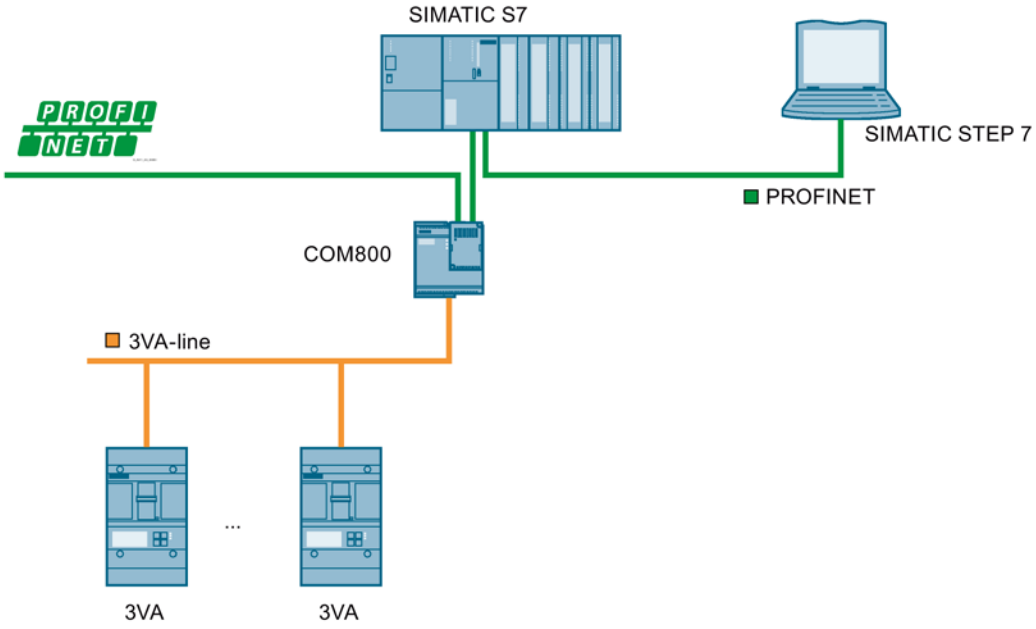
The IP addresses and subnet mask of the 7KM PAC Switched Ethernet PROFINET expansion module can be changed as often as required.

The 7KM PAC Switched Ethernet PROFINET expansion module is reset when the addresses are changed.

5.9.3.3 Commissioning

Configuration scenario

In the SIMATIC environment, 3VA molded case circuit breakers can be integrated via PROFINET by means of STEP 7 or TIA Portal and the device-specific GSDL file.



Note

Configuration with other tools

Configuration tools developed by other manufacturers can also be used.

Configuring with the GSDML file

The GSDML file forms the basis for the configuration of a device. Each PROFINET device has a PROFINET identification number and a GSDML file created for a specific 3VA molded case circuit breaker.

The GSDML file provides the following information for communication purposes:

- Individual data structures (basic types)
- Characteristics
- Control data
- Status information

The basic types provide the following data and make them available to the PROFINET IO controller:

- Measured variables

Note

Current version of the GSDML file

You can find the current version of the GSDML file at
http://support.automation.siemens.com/WW/view/en/59840946.
Save the GSDML file on your PC for future use.

Further information

You can find further information about using the 7KM PAC Switched Ethernet PROFINET expansion module in the manual for the 7KM PAC Switched Ethernet PROFINET expansion module.

http://support.automation.siemens.com/WW/view/en/26504372

See also

PROFINET IO (Page 174)

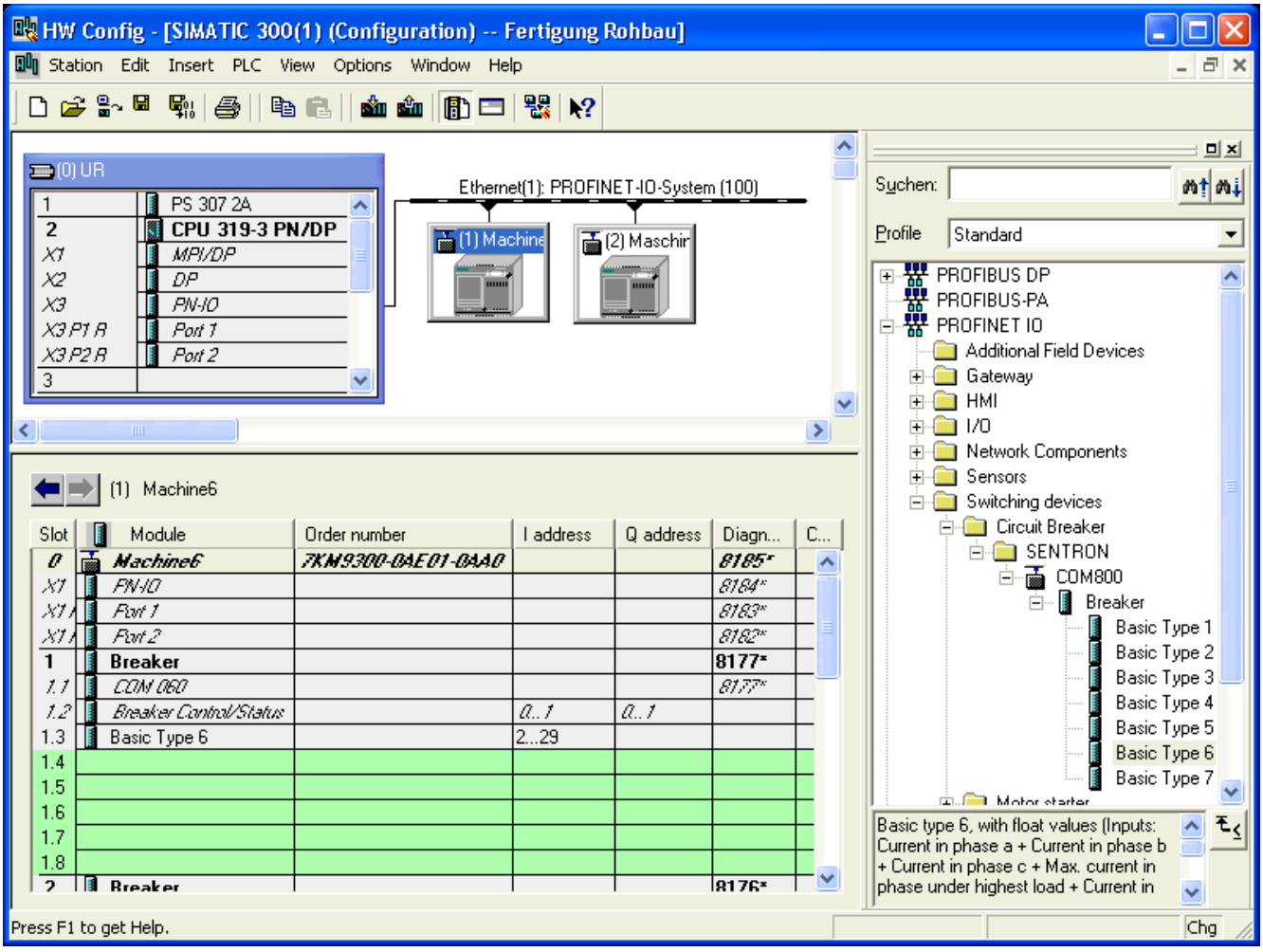
http://www.siemens.com/automation/service&support

5.9.3.4 PROFINET IO

The COM800 breaker data server represents a total of eight 3VA molded case circuit breakers in one PROFINET device.

The COM100 breaker data server represents a single 3VA molded case circuit breaker in one PROFINET device.

The configuration of the COM800 / COM100 breaker data server with the 3VA molded case circuit breakers is modeled as a modular device. Individual components can be addressed as subslots and therefore have their own I&M data.



The following modules are mapped as slots and subslots in the GSDML file:

- COM800 / COM100 breaker data server
- 3VA molded case circuit breakers (= breakers 1 to 8)
  - Basic types 1 to 7
  - Control and status bytes

Only 3VA molded case circuit breakers with a breaker address between 1 and 8 can be addressed via PROFINET IO. PROFINET IO cannot address 3VA molded case circuit breakers with a breaker address of > 8.

With PROFINET IO it is possible to place a breaker in each of the 8 slots. The slot number corresponds to the real breaker address.

Up to 6 basic types (= subslots) can be placed within one slot.

No more than 240 bytes of input data (i.e. status bytes and basic types) may be used in total for all 8 breakers.

The measured variables of individual 3VA molded case circuit breakers can also be read via the Common Application Profile PROFIenergy. Refer to Chapter PROFIenergy (Page 181).

5.9.4 Operation

There are two possible methods to communicate with 3VA molded case circuit breakers via PROFINET during operation:

- Cyclic
- PROFIenergy

5.9.4.1 Cyclic communication via PROFINET IO

Cyclic communication permits continuous transfer of data, such as status and measured values, from the 3VA molded case circuit breaker. Switching and reset commands can be executed by means of simple binary operations.

The basic types, control bytes and status bytes conform to the following specifications:

Profiles for Low Voltage Switchgear Devices (LVSG) Technical Specification for PROFINET IO and PROFIBUS Version 1.32 - Date January 2013 Order No.: 3.122

Binary status information is created automatically when each circuit breaker is set up.

If one of the basic types 1, 2 or 3 is inserted immediately after the status information, the combination complies with the "Profiles for Low Voltage Switchgear Devices (LVSG) Technical Specification for PROFINET IO and PROFIBUS Version 1.32 - Date January 2013 Order No.: 3.122" which is also supported by 3WL and 3VL circuit breakers.

Status bytes

The following status bytes are available for each 3VA molded case circuit breaker:

Byte	Bit	Value	Information about 3VA molded case circuit breaker	ETU 8-series	ETU 5-series	DO[1]	SEO
0	0, 1	0	Disconnected position	■	■	✓	–
		1	Connected position				
		2	Test position				
		3	Not available				
	2, 3	0	Not ready	■	■	■	■
		1	Off				
		2	On				
		3	Has tripped				
	4	1	Reserved	–	–	–	–
	5	1	Reserved				
	6	1	Spring energy store is compressed	■	■	■	✓
	7	1	Overload alarm present	✓	✓	–	–
1	0	1	Reserved				
	1	1	Reserved				
	2	1	Write protection activated	■	■	–	–
	3	1	Reserved				
	4, 5, 6	0 … 7	Reason for last trip	✓	✓	–	–
		0	No tripping operation or last tripping operation acknowledged				
		1	Overload tripping (L)				
		2	Instantaneous short circuit (I)				
		3	Short-time delayed short circuit (sd)				
		4	Ground fault (G)				
		5	Tripping operation as a result of extended protection function				
		6	Overload in neutral conductor (N)				
		7	Reserved				
	7	1	Load shedding alarm	✓	✓	–	–

[1] Draw-out unit
✓ Relevant for
■ Available
- Not applicable

Basic types 1 to 3

The cyclic IO data of 3VA molded case circuit breakers are grouped into seven different basic types. Each basic type supplies key items of information about a 3VA molded case circuit breaker in a level of detail and data format which vary according to the basic type.

The basic types are made available in the GSDML file for configuring the PROFINET IO controller.

Basic type 1 (LVSG format 1)

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 1	Current in phase L_1	U16	A	✓	✓
2 … 3	Current in phase L_2	U16	A	✓	✓
4 … 5	Current in phase L_3	U16	A	✓	✓
6 … 7	Current in phase under highest load	U16	A	✓	✓

✓ Relevant for

Basic type 2 (LVSG format 2)

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 1	Current in phase L_1	U16	A	✓	✓
2 … 3	Current in phase L_2	U16	A	✓	✓
4 … 5	Current in phase L_3	U16	A	✓	✓
6 … 7	Current in phase under highest load	U16	A	✓	✓
8 … 9	Current in neutral conductor	U16	A	✓	✓
10 … 11	Active energy import in 3 phases	U16	MWh	✓	–

✓ Relevant for

\- Not applicable

Basic type 3 (LVSG format 3)

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 1	Current in phase L_1	U16	A	✓	✓
2 … 3	Current in phase L_2	U16	A	✓	✓
4 … 5	Current in phase L_3	U16	A	✓	✓
6 … 7	Maximum current in phase under highest load	U16	A	✓	✓
8 … 9	Current in neutral conductor	U16	A	✓	✓
10 … 11	Voltage L_1-L_2	U16	V	✓	–
12 … 13	Voltage L_2-L_3	U16	V	✓	–
14 … 15	Voltage L_3-L_1	U16	V	✓	–
16 … 17	Voltage L_1-N	U16	V	✓	–
18 … 19	Voltage L_2-N	U16	V	✓	–
20 … 21	Voltage L_3-N	U16	V	✓	–
22 … 23	Average power factor in 3 phases	U16	Factor 1000 of the actual value	✓	–
24 … 25	Active energy import in 3 phases	U16	MWh	✓	–
26 … 27	Apparent power Σ in 3 phases	U16	kVA	✓	–

✓ Relevant for
- Not applicable

Basic types 4 to 7

Measured variables are made available in FLOAT32 format so that the data can be processed more simply and with a higher resolution in modern data processing systems and controllers.

Basic type 4

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Current in phase under highest load	FLOAT32	A	✓	✓

✓ Relevant for

Basic type 5

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Current in phase under highest load	FLOAT32	A	✓	✓
16 … 19	Current in neutral conductor	FLOAT32	A	✓	✓
20 … 23	Active energy import in 3 phases	FLOAT32	kWh	✓	–

✓ Relevant for
- Not applicable

Basic type 6

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Maximum current in phase under highest load	FLOAT32	A	✓	✓
16 … 19	Current in neutral conductor	FLOAT32	A	✓	✓
20 … 23	Active power in 3 phases	FLOAT32	W	✓	–
24 … 27	Reactive power in 3 phases	FLOAT32	var	✓	–

✓ Relevant for
- Not applicable

Basic type 7

Byte	Data content	Format	Unit	ETU 8-series	ETU 5-series
0 … 3	Current in phase L_1	FLOAT32	A	✓	✓
4 … 7	Current in phase L_2	FLOAT32	A	✓	✓
8 … 11	Current in phase L_3	FLOAT32	A	✓	✓
12 … 15	Current in phase under highest load	FLOAT32	A	✓	✓
16 … 19	Current in neutral conductor	FLOAT32	A	✓	–
20 … 23	Active energy import in 3 phases	FLOAT32	kWh	✓	–
24 … 27	Average power factor in 3 phases	FLOAT32		✓	–

✓ Relevant for
- Not applicable

Control bytes

The following control bytes are available for each 3VA molded case circuit breaker:

Byte	Bit	Value	Activated function of the 3VA molded case circuit breaker
0	0,1	0 … 3	Switch the 3VA molded case circuit breaker
		0	Not defined (no action)
		1	Not currently available (switch off)
		2	Not currently available (switch on)
		3	Not currently available (switch on)
	2	1	Reset: Last trip reason
	3	1	Reserved
	4	1	Reserved
	5	1	Reserved
	6	1	Reserved
	7	1	Reserved
1	0,1	0	Reserved
		1	Reserved
		2	Reserved
		3	Reserved
	2	1	Delete tripping and event recording
	3	1	Reset minimum / maximum values
	4	1	Reserved
	5	1	Reserved
	6	1	Acknowledge maintenance information
	7	1	Reserved

5.9.4.2 PROFIenergy

The 7KM PAC Switched Ethernet PROFINET expansion module is capable of reading out and addressing the measured variables of all 3VA molded case circuit breakers connected to the COM800 / COM100 breaker data server. The PROFIenergy "Common Application Profile" from Profibus International and the "Query_Measurement" service are used for this purpose.

The currently available version of the Common Application Profile PROFIenergy is version 1.1. (Technical Specification for PROFINET Version 1.1 – Date: August 2012 Order No.: 3.802).

According to this profile, measured variables can be read out with the following functions:

- IDENTIFY
- QUERY MEASUREMENT LIST
- QUERY MEASUREMENT VALUES

3VA molded case circuit breakers are addressed on the basis of the breaker address (identical to slot address) (see Chapter PROFINET IO (Page 174)).

Measurement ID	Name	Accuracy Domain	Accuracy Class	In Get List
1	voltage PH-N L1	2	12	✓
2	voltage PH-N L2	2	12	✓
3	voltage PH-N L3	2	12	✓
4	voltage PH-PH L1-L2	2	12	✓
5	voltage PH-PH L2-L3	2	12	✓
6	voltage PH-PH L3-L1	2	12	✓
7	current L1	2	12	✓
8	current L2	2	12	✓
9	current L3	2	12	✓
10	apparent power L1	2	13	
11	apparent power L2	2	13	
12	apparent power L3	2	13	
13	active power L1	2	13	
14	active power L2	2	13	
15	active power L3	2	13	
16	reactive power L1 (Qn)	2	13	
17	reactive power L2 (Qn)	2	13	
18	reactive power L3 (Qn)	2	13	
19	power factor L1	1	12	
20	power factor L2	1	12	
21	power factor L3	1	12	
22				
30	frequency	2	4	
31	average voltage PH-N	2	12	
32	average voltage PH-PH	2	12	
33	average current	2	12	

Measurement ID	Name	Accuracy Domain	Accuracy Class	In Get List
34	collective active power	2	13	
35	collective reactive power (Qn)	2	13	✓
36	collective apparent power	2	13	✓
37	collective power factor	2	13	✓
38				
40	max. voltage PH-N L1	2	12	
41	max. voltage PH-N L2	2	12	
42	max. voltage PH-N L3	2	12	
43	max. voltage PH-PH L1-L2	2	12	
44	max. voltage PH-PH L2-L3	2	12	
45	max. voltage PH-PH L3-L1	2	12	
46	max. current L1	2	12	
47	max. current L2	2	12	
48	max. current L3	2	12	
49	max. apparent power L1	2	13	
50	max. apparent power L2	2	13	
51	max. apparent power L3	2	13	
52	max. active power L1	2	13	
53	max. active power L2	2	13	
54	max. active power L3	2	13	
55	max. reactive power L1 (Qn)	2	13	
56	max. reactive power L2 (Qn)	2	13	
57	max. reactive power L3 (Qn)	2	13	
58	max. power factor L1	1	12	
59	max. power factor L2	1	12	
60	max. power factor L3	1	12	
61	max. frequency	2	4	
62	max. average voltage PH-N	2	12	
63	max. average voltage PH-PH	2	12	
64	max. average current	2	12	
65	max. collective active power	2	13	
66	max. collective reactive power (Qn)	2	13	
67	max. collective apparent power	2	13	
68	max. collective power factor	2	13	
69				
70	min. voltage PH-N L1	2	12	
71	min. voltage PH-N L2	2	12	
72	min. voltage PH-N L3	2	12	
73	min. voltage PH-PH L1-L2	2	12	
74	min. voltage PH-PH L2-L3	2	12	
75	min. voltage PH-PH L3-L1	2	12	

Measurement ID	Name	Accuracy Domain	Accuracy Class	In Get List
76	min. current L1	2	12	
77	min. current L2	2	12	
78	min. current L3	2	12	
79	min. apparent power L1	2	13	
80	min. apparent power L2	2	13	
81	min. apparent power L3	2	13	
82	min. active power L1	2	13	
83	min. active power L2	2	13	
84	min. active power L3	2	13	
85	min. reactive power L1 (Qn)	2	13	
86	min. reactive power L2 (Qn)	2	13	
87	min. reactive power L3 (Qn)	2	13	
88	min. power factor L1	1	12	
89	min. power factor L2	1	12	
90	min. power factor L3	1	12	
91	min. frequency	2	4	
92	min. average voltage PH-N	2	12	
93	min. average voltage PH-PH	2	12	
94	min. average current	2	12	
95	min. collective active power	2	13	
96	min. collective reactive power (Qn)	2	13	
97	min. collective apparent power	2	13	
98	min. collective power factor	2	13	
99 … 149				
189				
190	cumulated apparent power act. period	2	13	
191	cumulated active power import act. period	2	13	
192	cumulated reactive power import act. period	2	13	
193	cumulated active power export act. period	2	13	
194	cumulated reactive power export act. period	2	13	
195	max. value active power act. period	2	13	
196	min. value active power act. period	2	13	
197	max. value reactive power act. period	2	13	
198	min. value reactive power act. period	2	13	

Measurement ID	Name	Accuracy Domain	Accuracy Class	In Get List
199				
200	active energy import (float format)	2	13	
201	active energy export (float format)	2	13	
202	reactive energy import (float format)	2	13	
203	reactive energy export (float format)	2	13	
204	apparent energy (float format)	2	13	
210	active energy import (Double format)	2	13	
211	active energy import (Double format)	2	13	
212	reactive energy import (Double format)	2	13	
213	reactive energy export (Double format)	2	13	
214	apparent energy (Double format)	2	13	

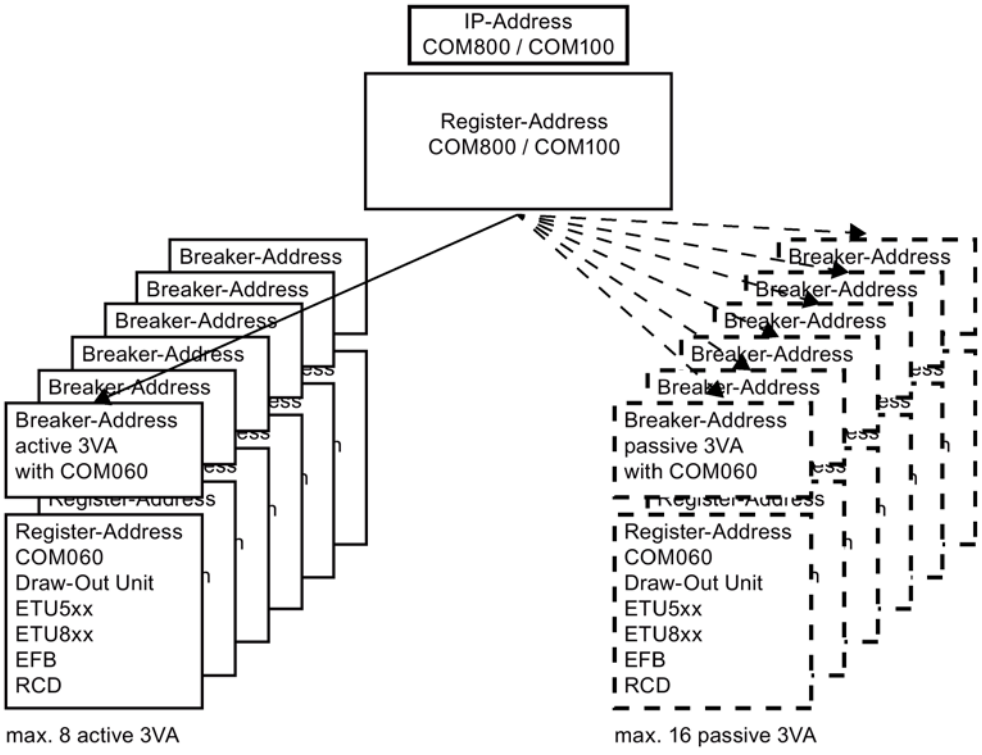
See also

Addressing via Modbus TCP (Page 185)

Addressing via Modbus TCP

6

The COM800 breaker data server represents a maximum of eight active 3VA molded case circuit breakers out of a total of 16 images in Modbus TCP via subaddresses and Modbus registers. The COM100 breaker data server provides the same service for one active 3VA molded case circuit breaker and a total of two images.



The breaker address is used as a Modbus TCP subaddress. The Modbus TCP subaddress of the breaker data server itself is FF (Hex).

Addresses are accessed using the Modbus TCP protocol in accordance with the "Messaging on TCP/IP Implementation Guide V1.0b" and "MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b".

Read operations are conducted using FC 0x04 (function codes).

The register addresses for data points in individual components are described in Chapter 3, particularly Chapter 3.6.

See also

7KM PAC PROFIBUS DP expansion module (Page 146)

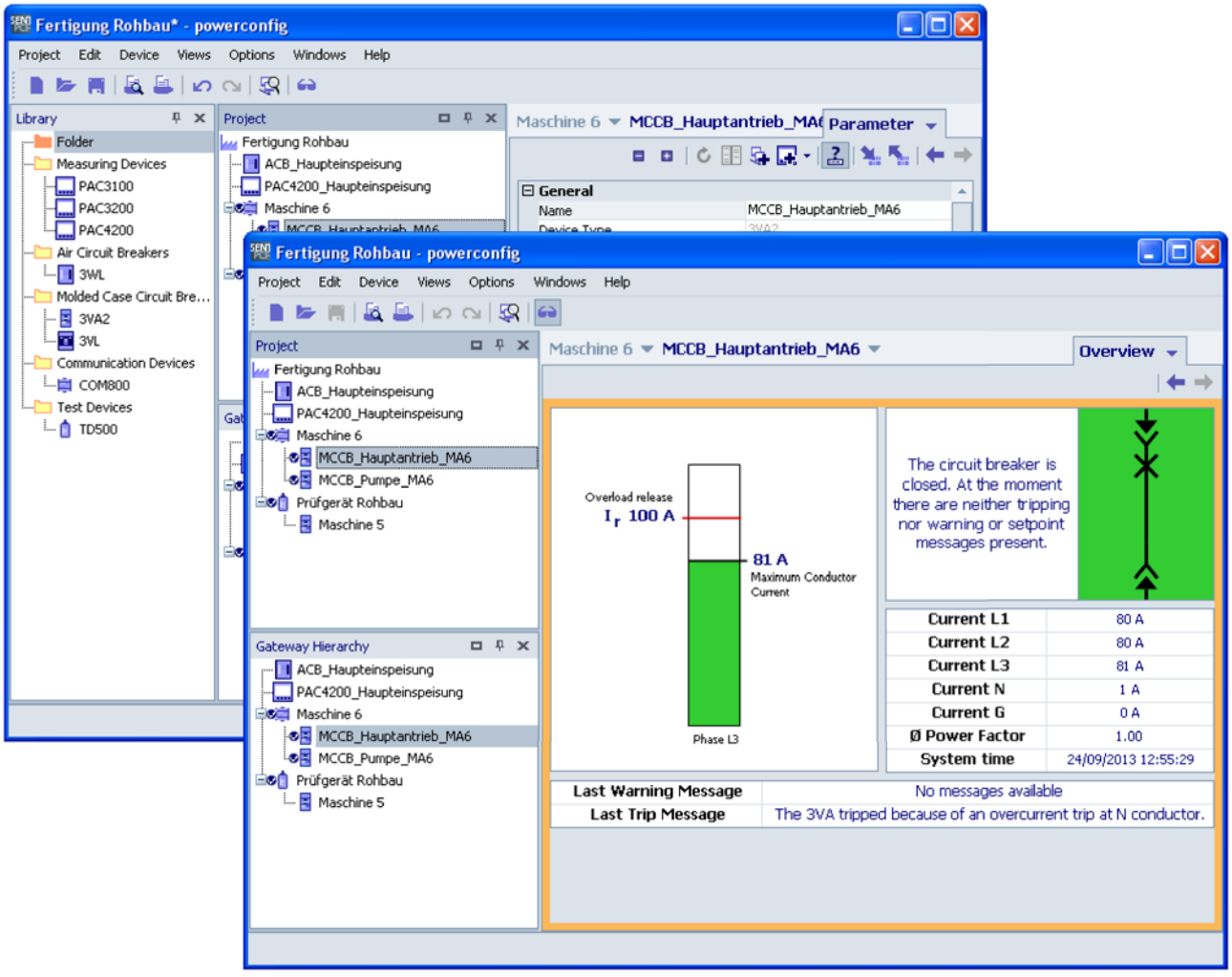
7KM PAC Switched Ethernet PROFINET expansion module (Page 167)

Commissioning and service software: powerconfig 7

7.1 Description

powerconfig is a commissioning and service software application for communication-capable measuring devices and circuit breakers from the SENTRON product family. Its main functions are as follows:

- powerconfig facilitates parameterization of the devices, resulting in considerable time savings, particularly when several devices have to be set up.
- With powerconfig, the 3VA, 3WL, 3VL circuit breakers and the 7KM PAC3100 / 320 / 4200 measuring devices can be parameterized, documented, operated and analyzed using various communication interfaces.
- 3VA molded case circuit breakers can be function-tested with powerconfig and the TD500 test device.
- powerconfig can be used to archive settings electronically and as printouts.



7.1.1 Delivery

powerconfig can be downloaded from the Service & Support Portal http://support.automation.siemens.com/WW/view/de/63452759.

In a few cases it is necessary to install the Microsoft.NET V4.0 Framework on the PC.

See also

http://www.siemens.com/lvmobile/powerconfig

7.1.2 System requirements

The latest version of powerconfig should always be used. You can find the latest version of powerconfig in the Service & Support Portal http://www.siemens.com/lvmobile/powerconfig.

Use of powerconfig requires one of the following system environments:

- Microsoft Windows

  powerconfig can run under the following Windows versions:

  – Microsoft Windows XP SP3 (32-bit)
  – Microsoft Windows 2008 Server (32-bit)
  – Microsoft Windows 7 Professional SP1 (32-bit / 64-bit)
  – Microsoft Windows 7 Ultimate SP1 (32-bit / 64-bit)
  – Microsoft Windows 8.1 (64Bit)
  – Framework Microsoft .NET V4.0

  powerconfig can also be used in conjunction with

- STEP 7, V5.5 SP1 or higher (optional)
- STEP 7 V13 (TIA Portal)
- PG/PC PROFIBUS interface (optional)

System requirements may change. They are described in the Readme file for the relevant version and can be checked in the Service & Support Portal http://support.automation.siemens.com/WW/view/de/22951684/133100.

7.1.3 PC network settings

Settings for the search for accessible devices

The communication settings for the search must be entered in the view "Search for Accessible Devices" (icon).

To perform the search via Ethernet, it is necessary to select the network adapter on the PC via which the devices can be accessed. Furthermore, the following ports (incoming and outgoing) must be enabled for the UDP protocol:

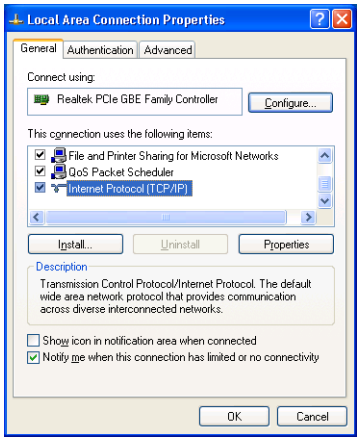
- 17009
- 17008

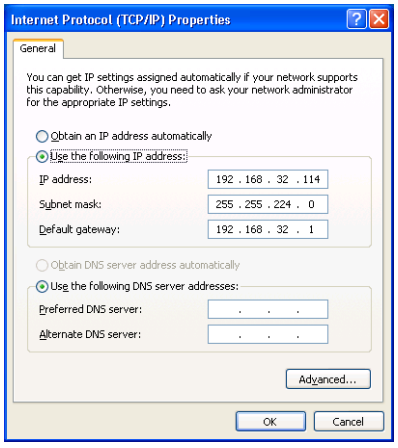
See below: Setting firewall rules

To perform a serial search, the COM ports of the PC which are to be searched must be selected.

Settings for operation (online view) of devices

To allow the detected devices to be operated via Ethernet, data exchange with the Ethernet interface of the PC using version 4 of the Internet protocol (TCP/IPv4) must be set up. In Windows 7 the properties of interfaces are configured in menus "Control Panel\Network and Internet\Network and Sharing Center".





The settings for the IP address and subnet mask must be entered in accordance with the rules for assigning network IP addresses in a PC and the devices.

It is also important to ensure that the following ports are enabled for the TCP protocol:

- 502 (communication via Modbus TCP)
- 17001 (communication via SEABUS)
- 17002 (only PAC4200 for gateway function with expansion slot 1)
- 17003 (only PAC4200 for gateway function with expansion slot 2)

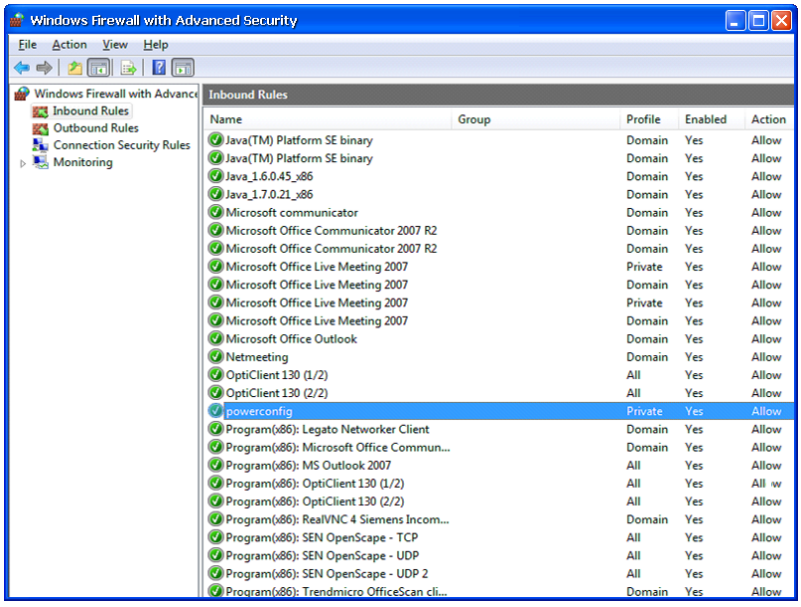
The following incoming UDP port must be enabled for firmware updates:

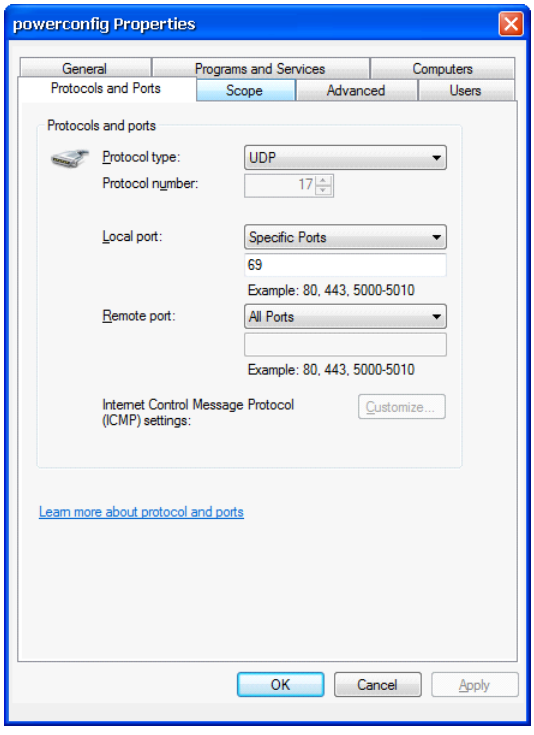
- 69 Required only for PAC3200 firmware update via powerconfig

Setting firewall rules

Firewall rules are set as follows in Windows 7:

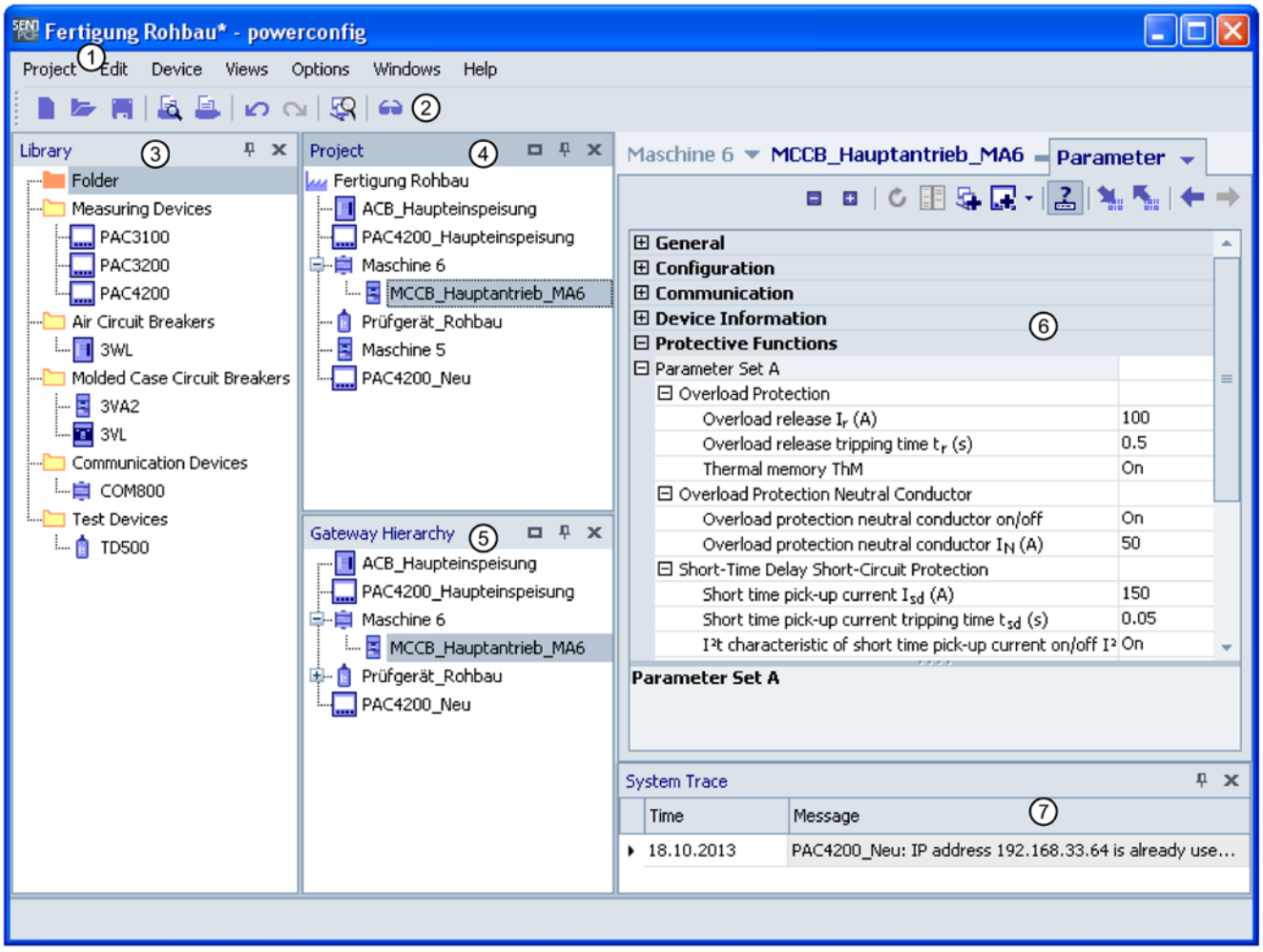
Control Panel\All Control Panel Items\Windows Firewall\Advanced Settings.





7.2 User interface

The user interface of powerconfig is clearly structured to meet specific user requirements. It consists of the familiar standard Windows functions and system-specific operator control elements.



① **Application frame**

The application frame includes powerconfig with various windows. Windows can be shown or hidden to suit individual requirements.

Note:
Settings which have not yet been stored are signaled by a "*" at the end of the project name in the title bar. Changes should be stored from time to time.

② **Toolbar**

In addition to functions like "Create New Project" or "Open Project" that are normally available in Windows, the toolbar also contains powerconfig-specific icons such as "Search for Accessible Devices" or "Activate Online View".

③ **Library**

The library contains the SENTRON devices supported by powerconfig as well as a folder as a structure element. The user can create a project from these elements.

④ **Project**

The project represents the layout of equipment in an installation and acts as an orientation guide to the powerconfig user. Examples of an equipment layout are "Buildings" – "Main distribution systems" – "Subdistribution boards" etc. or production areas. The project can be created from the library in offline mode. Alternatively, devices detected by the "Search for Accessible Devices" function can be inserted into the project. It is also possible to insert 3VA molded case circuit breakers detected via the COM800 / COM100 into the project.

⑤ **Gateway hierarchy**

The gateway hierarchy determines the communication structure in the installation. Devices that can be accessed directly from powerconfig are on the highest (left-hand) level. Devices that are accessible via a gateway are on the right-hand levels. Typical gateways are: PAC4200 for devices with RS485 (Modbus RTU) such as, for example, PAC3100 or 3WL with COM16- COM800 / COM100 for 3VA molded case circuit breakers or TD500 for 3VA molded case circuit breakers.

⑥ **Working area**

The working area shows the views and editing options for the device selected in the project.

- Device properties are displayed and set in the "Parameters" view. These include, for example, the protection parameters for 3VA molded case circuit breakers.
- The "Overview" view shows the primary functions of the device.
- The "Measuring Values" view shows a detailed summary of the variables currently measured at the device.

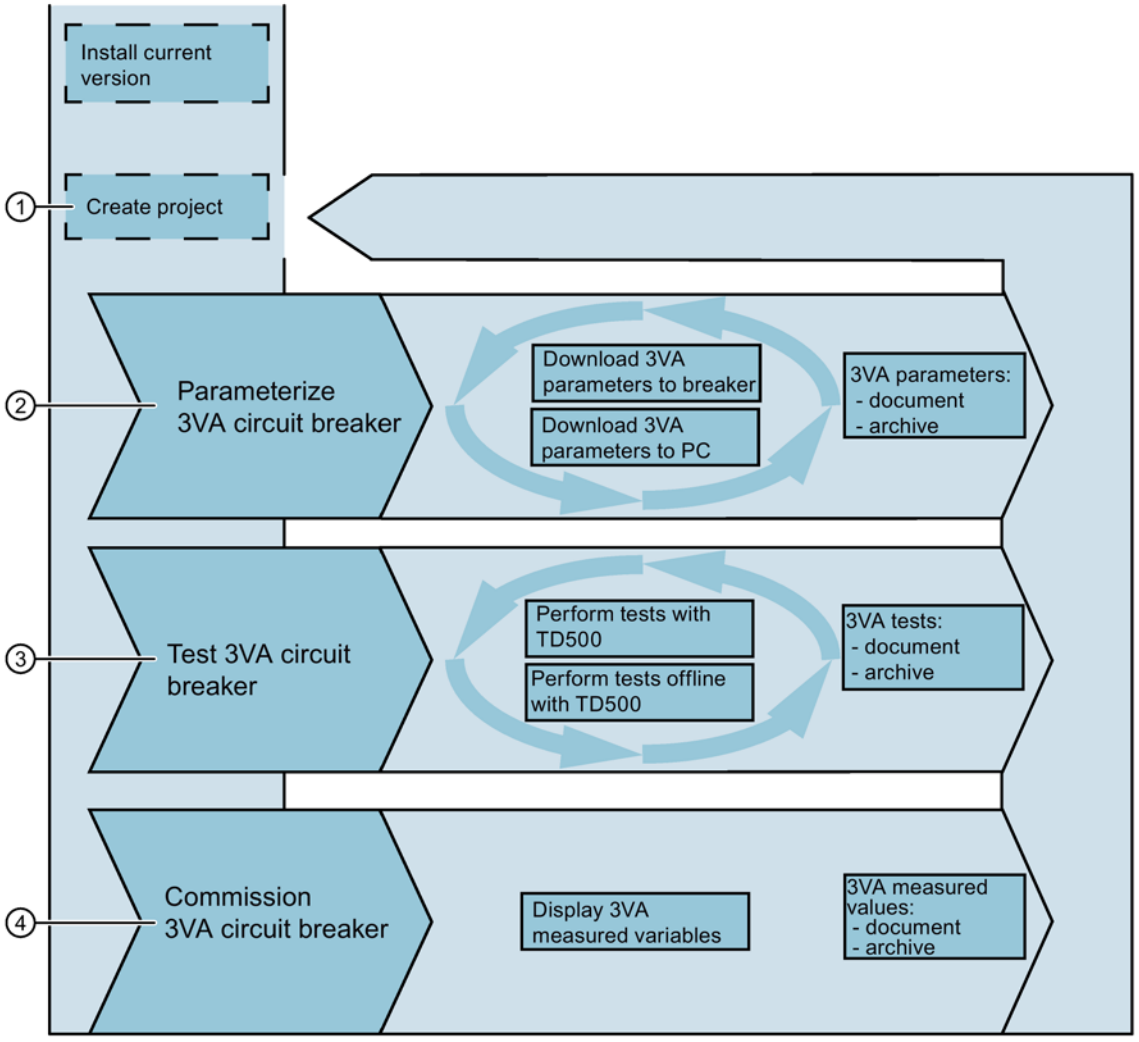
In addition to these, there are also further views which reflect the functional scope of the relevant devices.

⑦ **System log**

The system log displays the key actions carried out by powerconfig. It is possible to determine the causes of conflicts or other anomalies on the basis of information provided in this log.

7.3 Application types

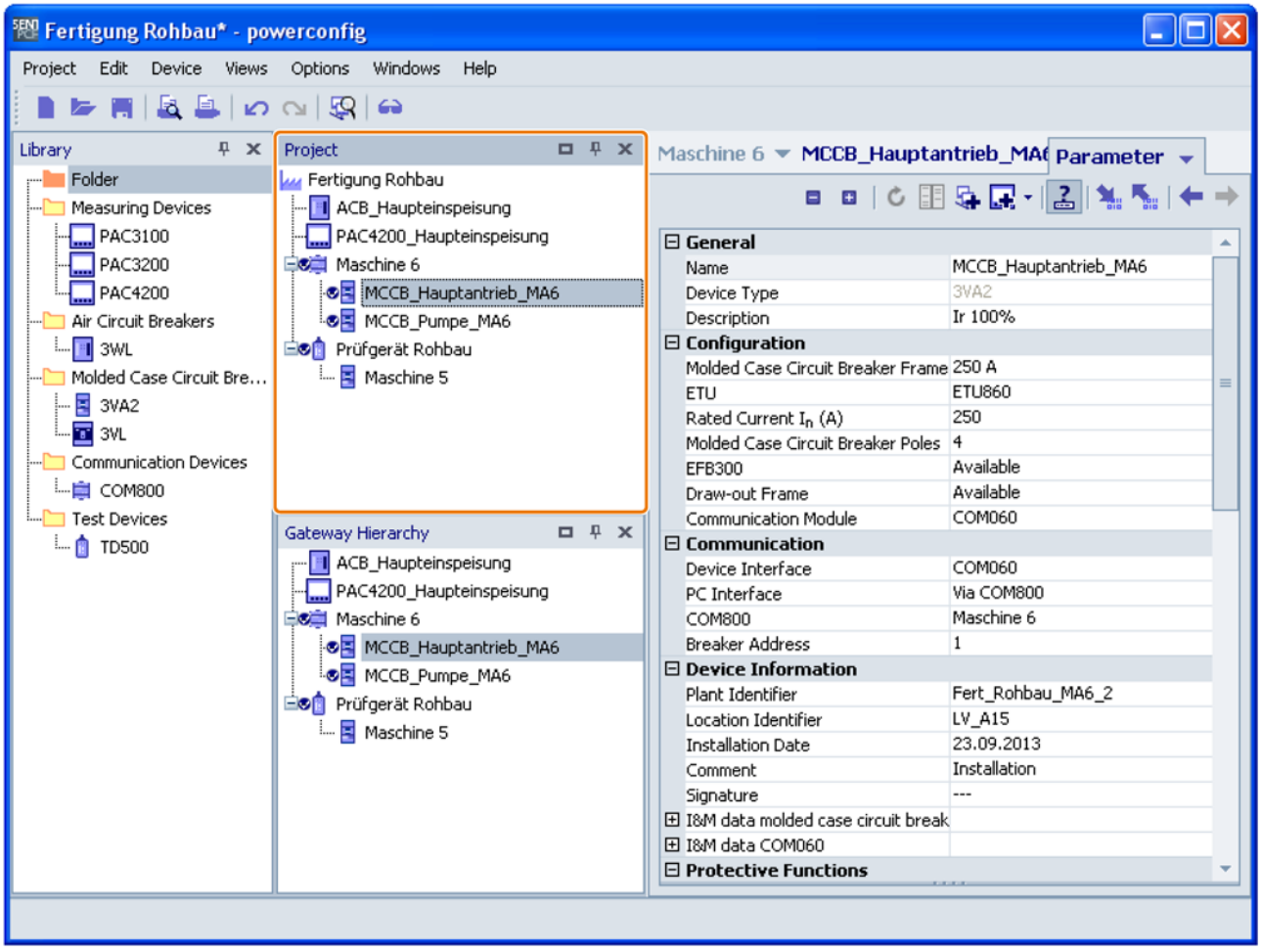
The working sequence recommended for powerconfig is depicted below:



① Project management (Page 195)
② Parameterizing 3VA molded case circuit breakers (Page 197)
③ Testing 3VA molded case circuit breakers (Page 198)
④ Commissioning of 3VA molded case circuit breakers (Page 199)

7.3.1 Project management

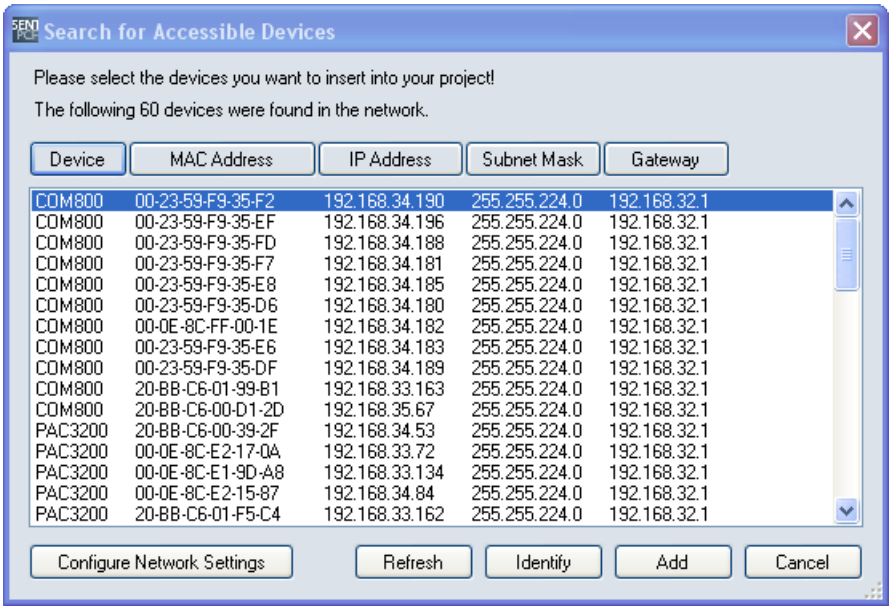
3VA molded case circuit breakers and, in some cases, other devices supported by powerconfig are combined in powerconfig to form a project if they are related to one another from a technical, organizational or some other perspective.



Devices are arranged in the gateway hierarchy according to their communication hierarchy.

A 3VA molded case circuit breaker can be inserted into a project by a variety of different methods:

- Copy the COM800 / COM100 breaker data server from the library into the project.
- Search for a COM800 / COM100 breaker data server online and "add" it to the project.



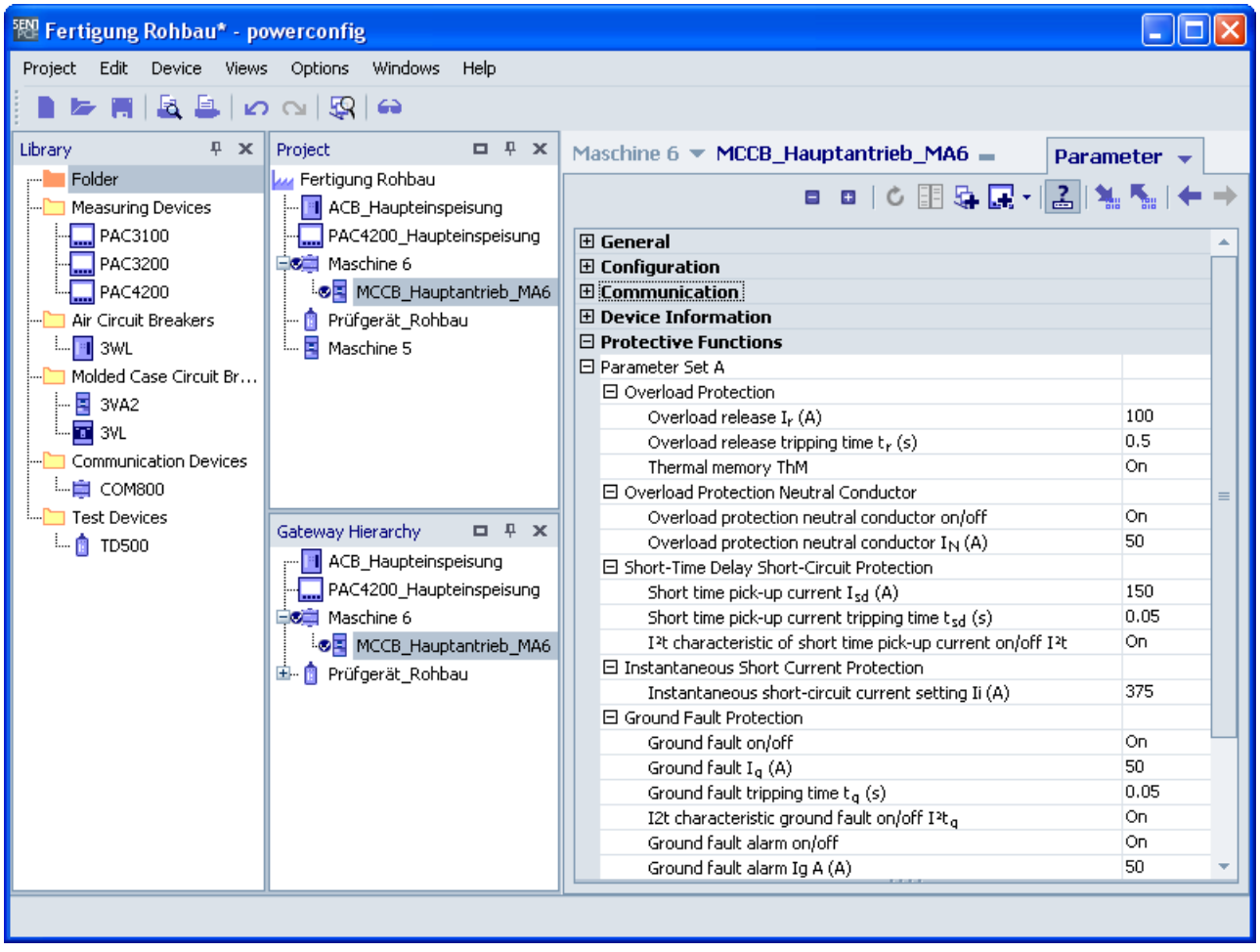
- Insert a COM800 / COM100 from a different project into the current project.

7.3.2 Parameterizing 3VA molded case circuit breakers

If a project has been created and possibly contains existing devices, the devices can be optimally adapted via parameterization to perform a specific function in the installation.

3VA molded case circuit breakers can be parameterized with powerconfig by two different methods:

- Configure the 3VA molded case circuit breaker in the project in offline mode and then download parameters to the device using icon
- Use icon to download parameterized 3VA molded case circuit breakers to the PC and continue editing them on the PC. Any changes to parameter settings can be downloaded to the 3VA molded case circuit breaker again.

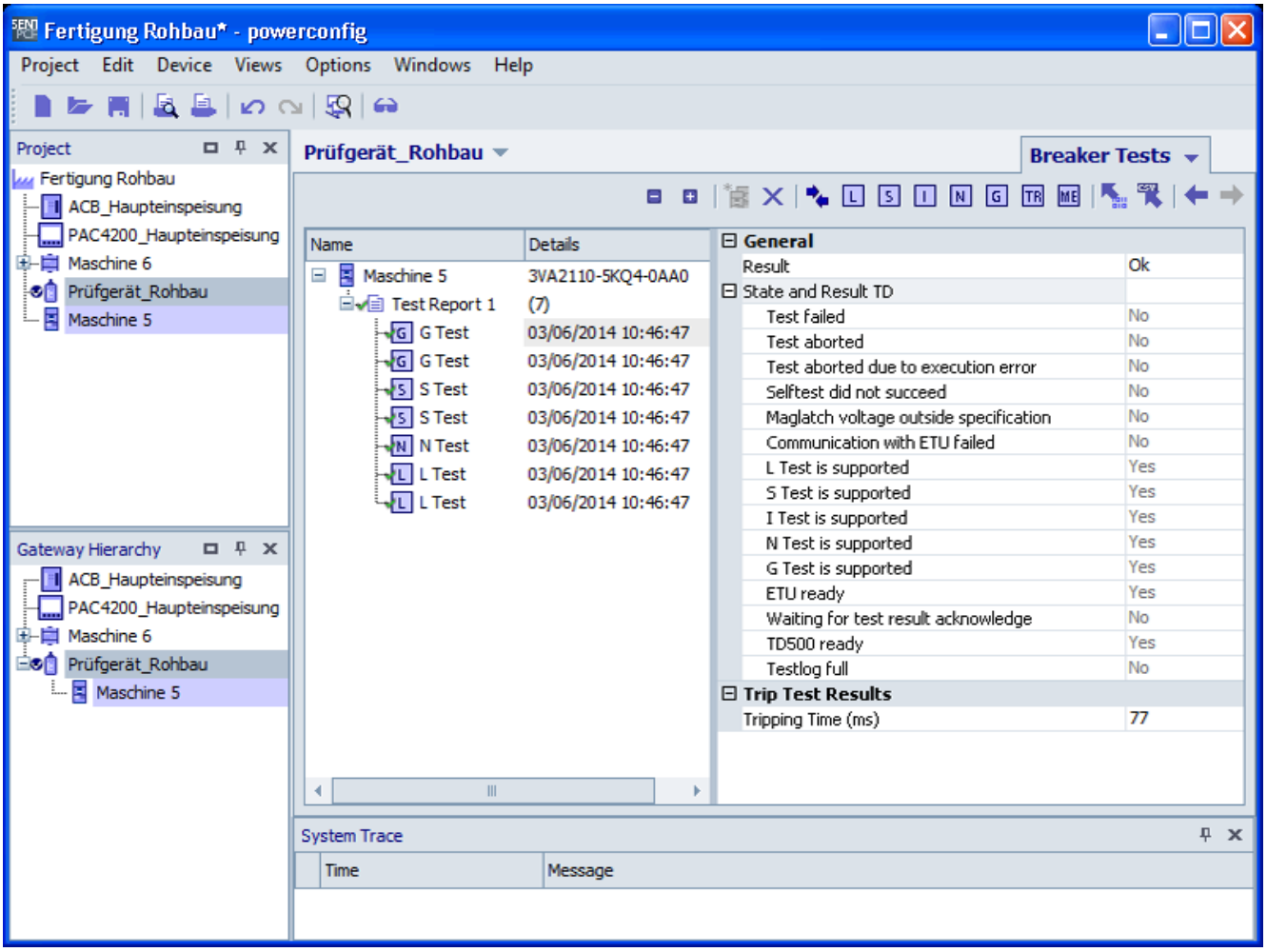


7.3.3 Testing 3VA molded case circuit breakers

If the devices have been parameterized (and already installed in some cases), it is advisable to disconnect the 3VA molded case circuit breakers from the power supply for testing and then to archive the test results.

There are several methods by which 3VA molded case circuit breakers can be tested:

- Carry out a test in offline mode using the TD500 test device and then evaluate the test results in powerconfig.
- Carry out a test in online mode using the TD500 test device and powerconfig.



For further information about testing, please refer to Chapter "TD500 test device (Page 139)".

7.3.4 Commissioning of 3VA molded case circuit breakers

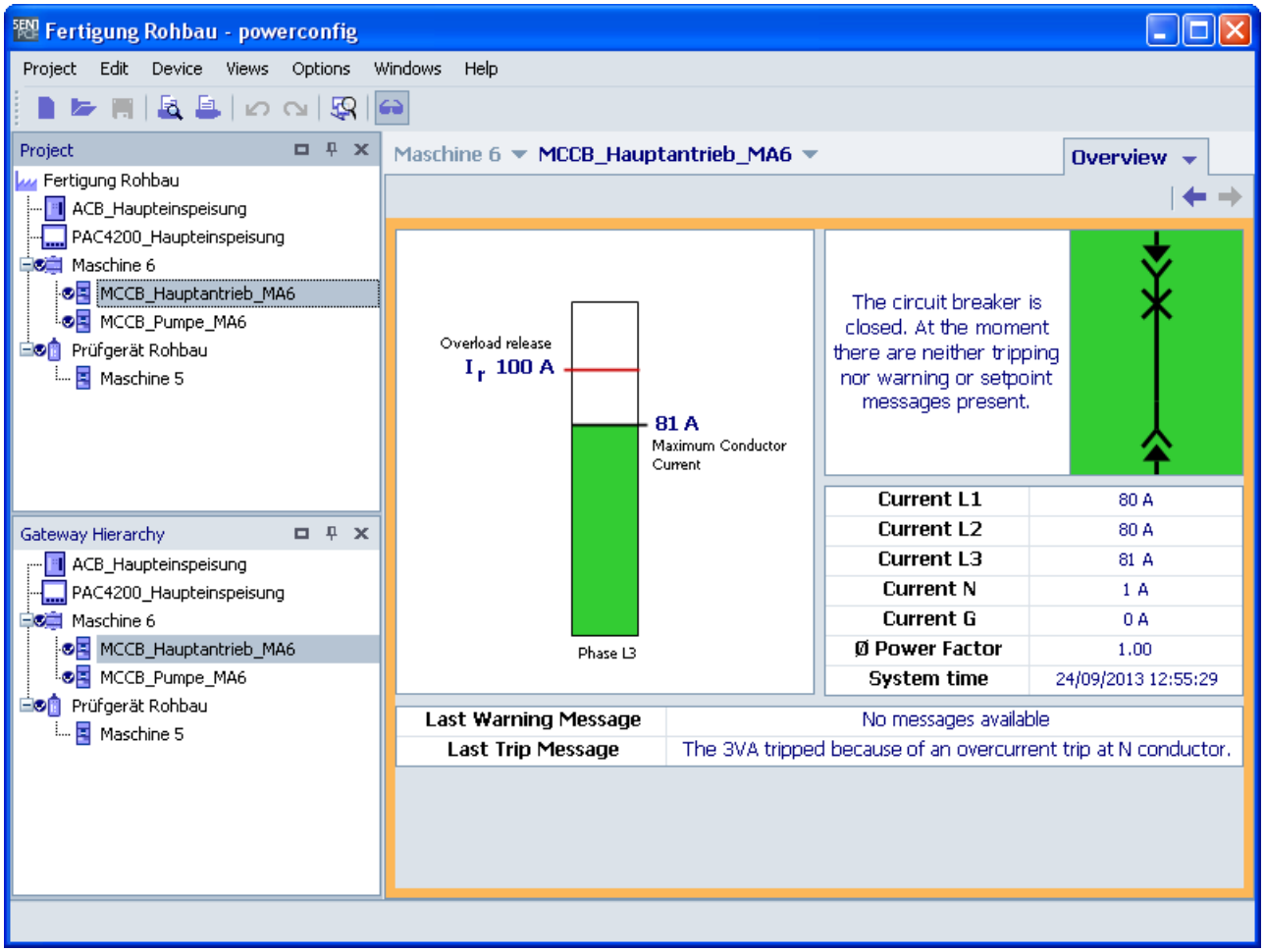
After the devices have been parameterized and tested, the installation can be commissioned.

In order to support commissioning of 3VA molded case circuit breakers, powerconfig provides online views which supply varying depths of information (details) to suit individual requirements.

Online views are activated with the icon "Activate Online View" after the relevant device has been selected in the project.

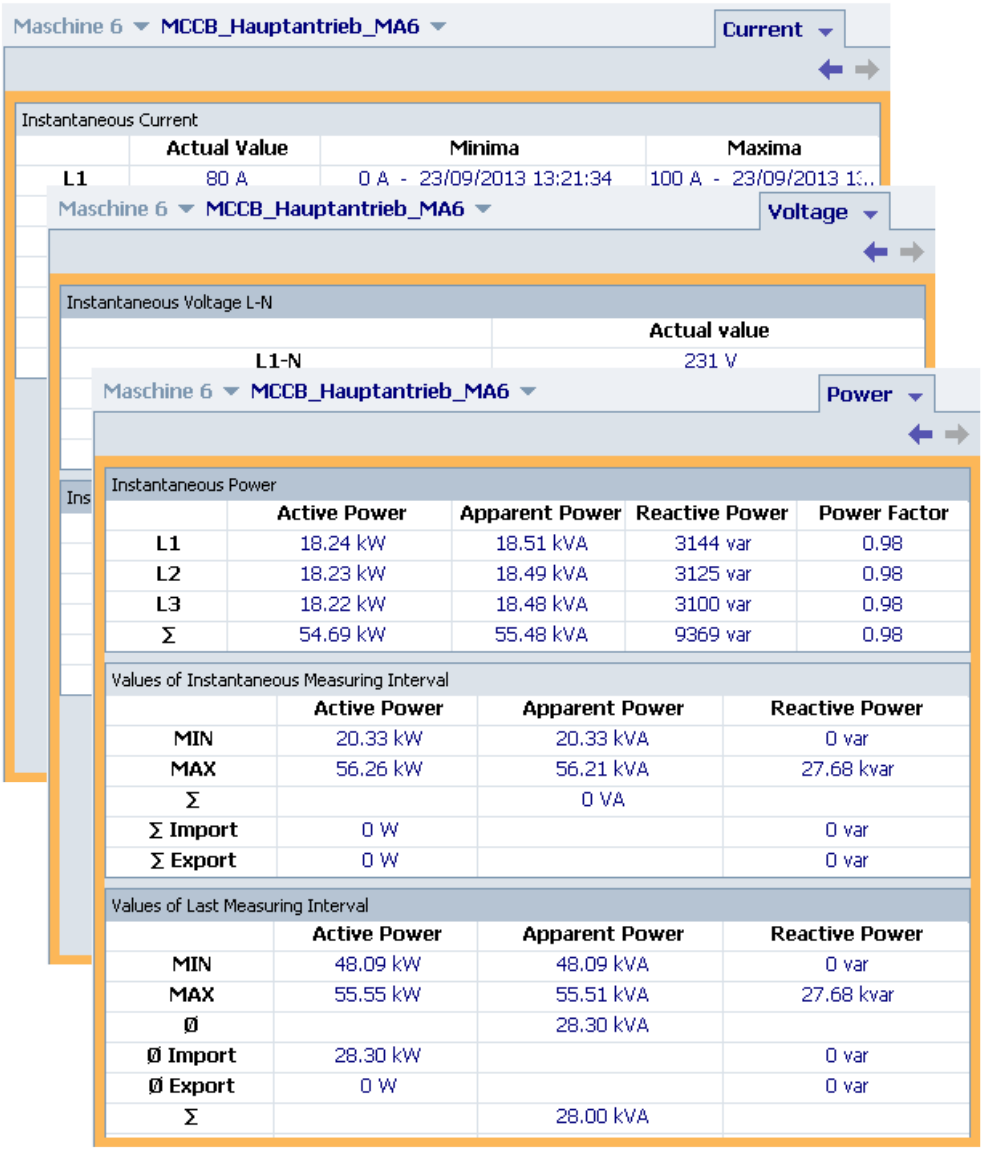
- Overview

  The overview displays key information about a 3VA molded case circuit breaker when it is in operation.



- Voltage, current and power overviews

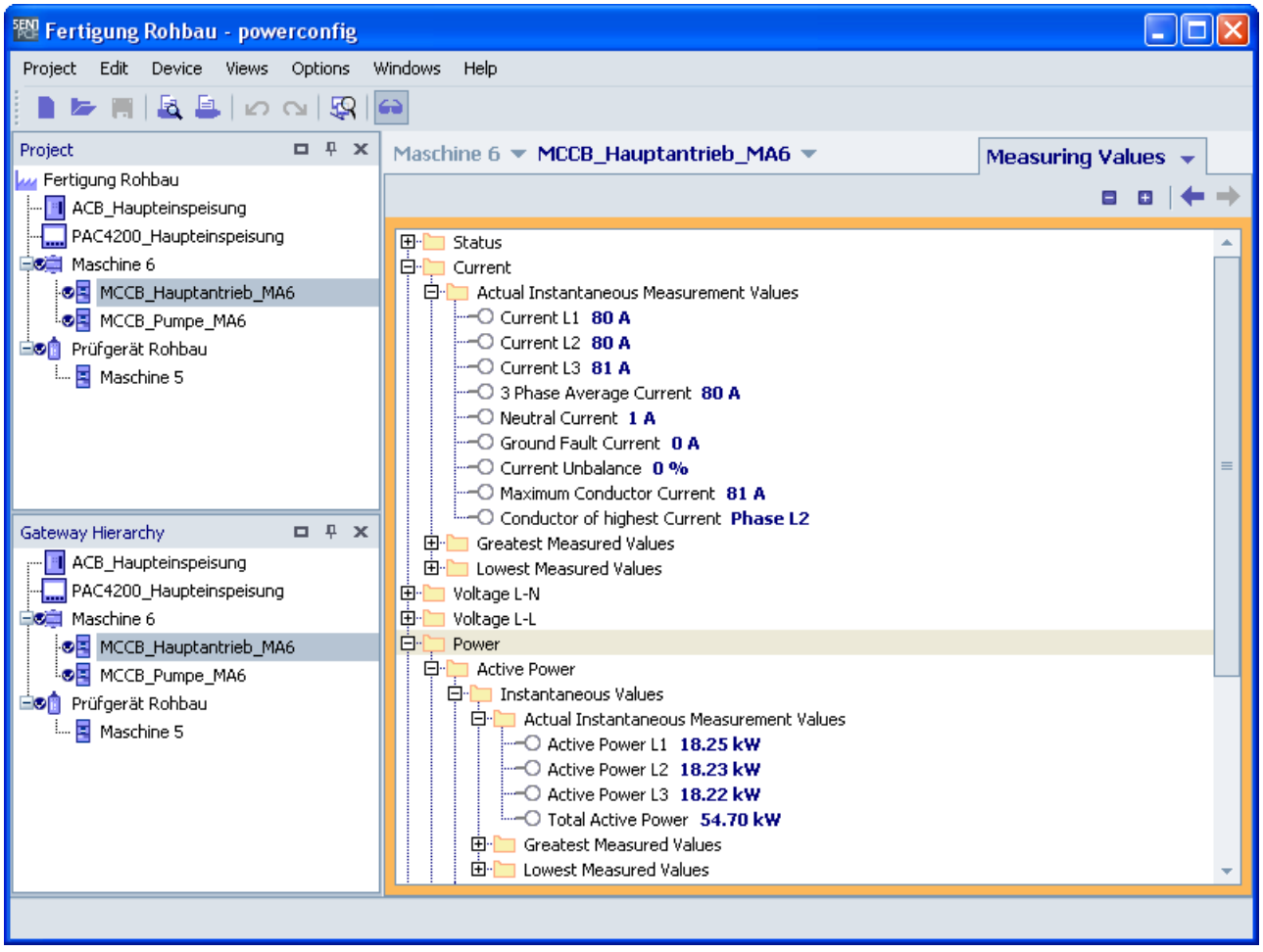
  Depending on the content viewed, overviews display all information about a 3VA molded case circuit breaker pertaining to the relevant subject.



- Measured variables and states

  The view "Measuring values" displays all the states and measured variables of a 3VA molded case circuit breaker.

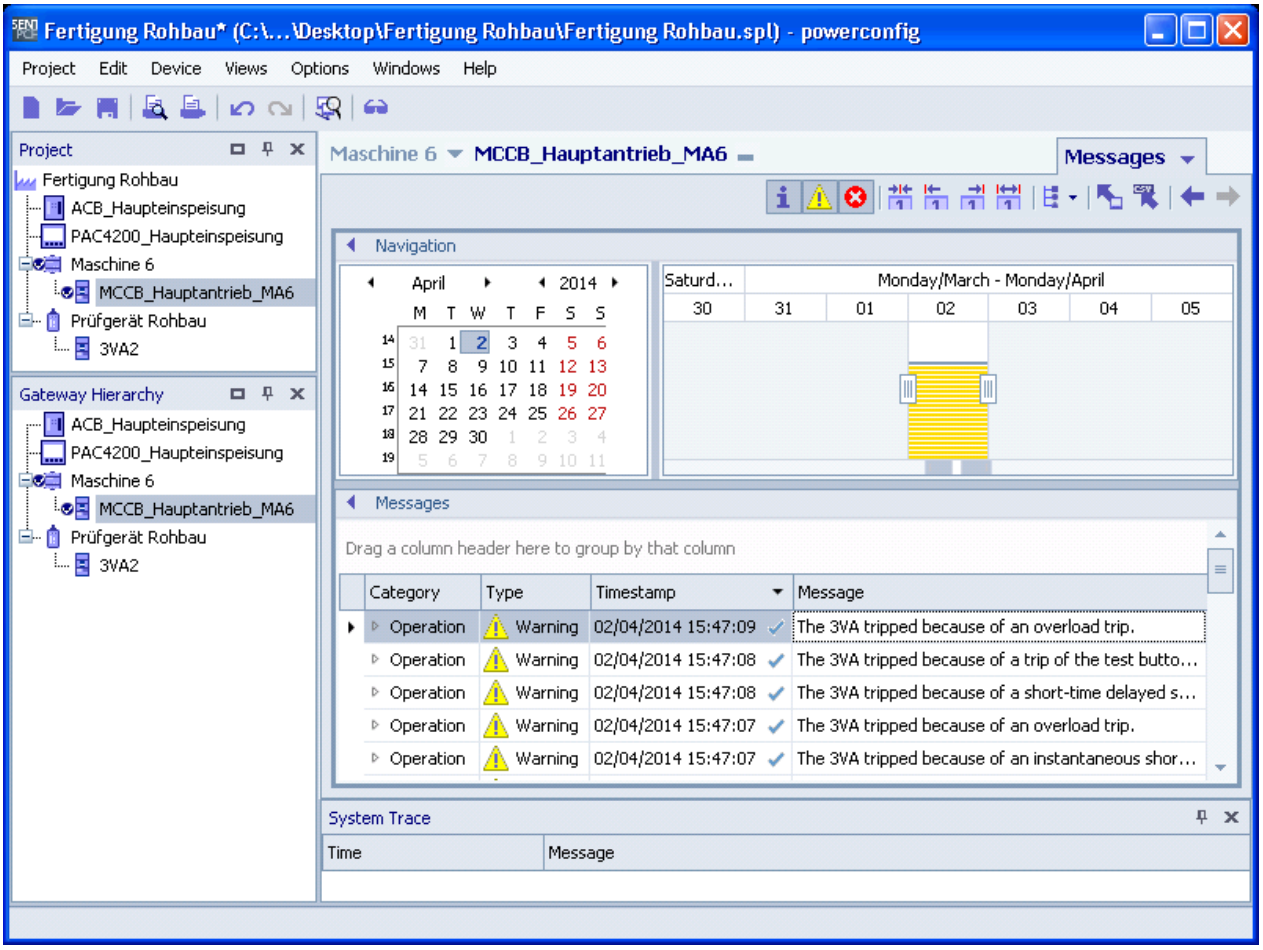
  The information is grouped according to subject in a tree structure.



- Messages

  3VA molded case circuit breakers and COM800 / COM100 breaker data servers store events (Chapter "Messages (Page 62)") and processes (Chapter "Understanding status transitions (Page 206)").

  If the COM800 / COM100 breaker data servers are parameterized with a time synchronization function, the events and processes are displayed with a time stamp.



All messages or events are downloaded to powerconfig by the selected COM800 / COM100 breaker data server.

Messages can be selected and then analyzed selectively on the basis of

- categories
- types
- time ranges

If the COM800 / COM100 breaker data server is not time-synchronized, it is not possible to select messages according to a time range.

Messages can be archived in a file in ".csv" format.

The message buffer of the COM800 / COM100 breaker data server can be reset, i.e. its contents erased.

Service and maintenance

8

8.1 Firmware update

The firmware of individual electronic components can be updated. This is particularly helpful in ensuring smooth interoperation between different electronic or software components.

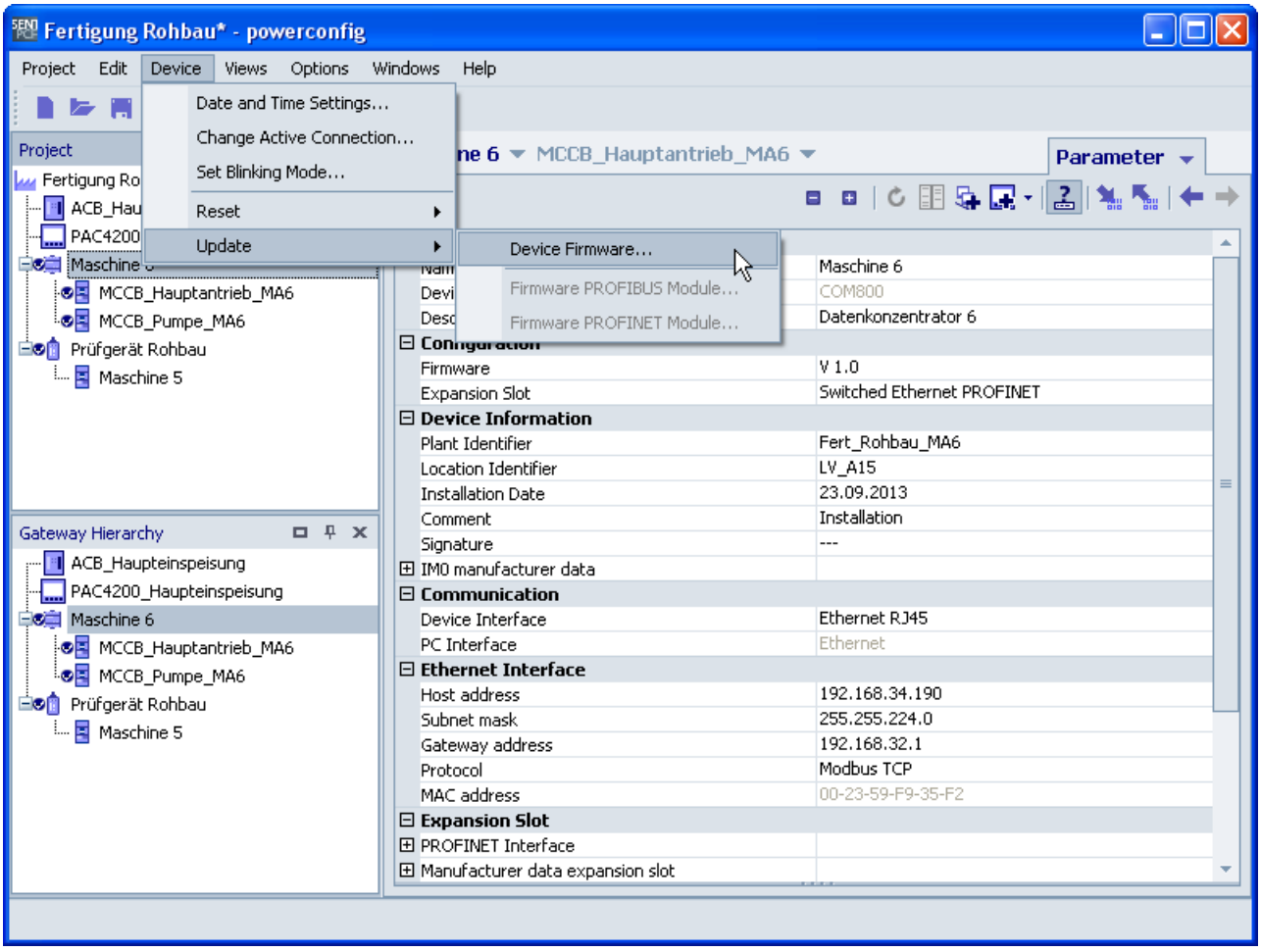
Note

Backup of device parameters

It is urgently recommended that device parameters are backed up on the PC before a firmware update is carried out.

Using menu commands Device > Update in powerconfig, it is possible to update the firmware of the following devices:

- COM800 / COM100 breaker data server via device interface Ethernet RJ45
- COM060 communication module via device interface Ethernet RJ45
- 7KM PAC PROFIBUS DP expansion module via device interface of COM800 / COM100 Ethernet RJ45
- 7KM PAC Switched Ethernet PROFINET expansion module via device interface Switched Ethernet PROFINET
- TD500 test device via USB interface



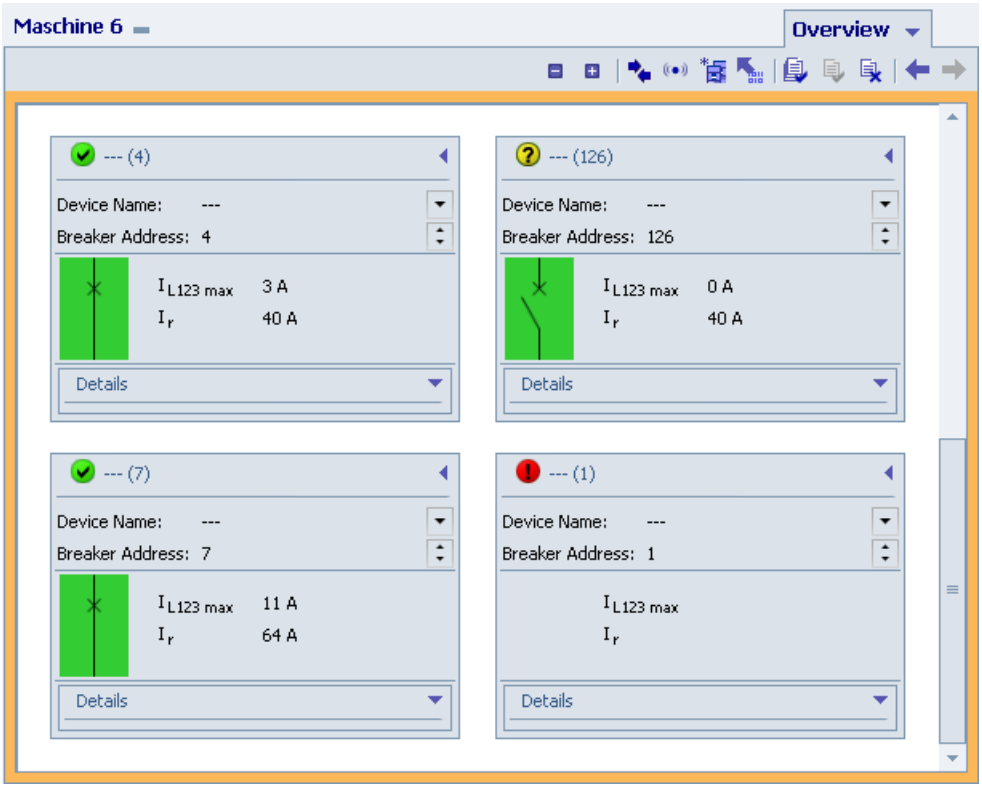
Note

It is important to ensure that no other communication partner is active while the firmware of the COM800 / COM100 or COM060 is being updated. The user must take appropriate measures. If several connections are still active when the update process commences, powerconfig will output an appropriate warning and refuse to carry out the update process.

8.2 Replacing the 3VA molded case circuit breaker connected to a COM800 / COM100

3VA molded case circuit breakers wear naturally as a result of switching and tripping operations. It may be necessary to replace a worn 3VA molded case circuit breaker.

A circuit breaker which is no longer accessible via the 3VA-line changes its status in the "Overview" in powerconfig from "Active" to "Passive". The circuit breaker image remains visible with the parameters displayed.



The correct procedure for replacing a 3VA molded case circuit breaker in the 3VA-line and therefore at the COM800 / COM100 breaker data server is described below:

1. Back up the database of the 3VA molded case circuit breaker to be replaced:
   - Set up a project for the 3VA molded case circuit breaker to be replaced if it is not already contained in the project.
   - Use icon to download the data of the 3VA molded case circuit breaker to the PC.
   - Replace the circuit breaker complete with the COM060. With powerconfig V3.2 and later, it is possible to explicitly delete the image of a 3VA (COM060).
2. Change the address of the old 3VA molded case circuit breaker so that the existing address can be used for the new circuit breaker:
   - Make a note of the existing breaker address.
   - Change the address of the old circuit breaker to a free address or to breaker address **126**.

3. Disconnect the COM800 / COM100 from the power supply.
   - Disconnect the old 3VA molded case circuit breaker from the 3VA-line by removing the COM060 cable.
   - Dismantle the old 3VA molded case circuit breaker.
   - Install the new 3VA molded case circuit breaker.
   - Connect the new 3VA molded case circuit breaker by means of the spur line to the T-connector of the 3VA-line.
4. Reconnect the power supply to the COM800 / COM100 breaker data server.

   → The new 3VA molded case circuit breaker will be detected as 126, see Chapter "Commissioning a 3VA connected to COM800 / COM100 (Page 108)").
5. Commission the new 3VA molded case circuit breaker:
   - Assign the breaker address of the old 3VA molded case circuit breaker to the new one and activate the modified configuration by selecting the relevant icon. See view "Overview for COM800 / COM100"
   - Download the parameters of the old 3VA molded case circuit breaker to the new one by selecting icon  .

     Particular attention must be paid to the protection parameters, and metering and communication functions during recommissioning.

     The protection parameter settings always depend on the required protection levels and on the protective device itself. This must be taken into account when the protection parameters are transferred:

     When a 3VA molded case circuit breaker is replaced by a unit of exactly the same type, it is permissible to transfer the protection parameters of the old device to the new one.

     When a 3VA molded case circuit breaker is replaced by a unit of a different type, the protection parameter settings must be changed accordingly, see Chapter "Commissioning a 3VA connected to COM800 / COM100 (Page 108)".
6. Test the communication link with the communication partner:
   - SIMATIC S7: Use STEP 7 to check the status of the DP slave or the PROFINET IO device.
   - powermanager: Check the communication status and value updates.

8.3 Understanding status transitions

Events are logged in the communication system of the 3VA molded case circuit breaker. These can be evaluated to better understand transitions between operating states as well as user actions and faults.

The events logged in a communication system of the 3VA molded case circuit breaker can be read out with powerconfig.

Category	Messages	Possible user measures
Changes to 3VA configuration of the COM800 / COM100 breaker data server		
Operator action message	The configuration of the 3VA molded case circuit breakers connected to the 3VA-line has been declared valid. Deviations are detected.	None because user action.
Operator action message	The 3VA molded case circuit breaker has been removed from the configuration by an operator action.	None because user action.
Operator action message	The 3VA molded case circuit breaker has been added to the configuration by an operator action.	None because user action.
Changes in operating state of the COM800 / COM100 breaker data server		
System message	Communication has been established.	None, for information only.
System message	COM800 / COM100 has been switched on.	None, for information only.
System message	Time synchronization from SNTP server has failed.	Check whether the SNTP server can be accessed via the communication network. If it cannot, restore the communication link.
Changes to the COM800 / COM100 breaker data server		
Operator action message	[Minimum and maximum values of [measured variable] have been reset].	None because user action.
Operator action message	[All minimum and maximum values have been reset] ([measured variable = 0]).	None because user action.
Operator action message	Event memory has been restarted after a reset.	None, because previous messages have been deleted.
Parameter message	Overload release Ir (A) has been changed.	None because user action.
Operator action message	COM800 / COM100 has been reset to the delivery state.	None because user action.
Operator action message	COM800 / COM100 has been reset to the delivery state except for the communication settings.	None because user action.
Operator action message	The time was set on xx.xx.2014.	None because user action.
Changes to operating state of the COM800 / COM100 breaker data server		
System message	COM800 / COM100 has been switched on.	None, for information only.
Power supply disturbances		
System message	Power supply at risk.	Check supply voltage, take measures to protect supply if necessary. It is possible that more than the maximum permissible number of 3VA molded case circuit breakers is connected to the COM800 / C100 breaker data server.
System message	3VA power supply at risk.	It is possible that more than 8 3VA molded case circuit breakers are connected to the COM800 / C100 breaker data server.
System message	Power supply interrupted.	Determine the reason for the interruption to the power supply. Take protective measures if necessary.
System message	3VA power supply has been interrupted.	Too many 3VA molded case circuit breakers are connected OR the 3VA-line cable is defective OR a COM060 communication module in a 3VA molded case circuit breaker is defective.
Firmware update messages		
System message	A 3VA has a more recent firmware version than the COM800 / COM100.	Update the firmware of the COM800 / COM100.
Operator action message	Firmware update mode has been activated for the COM060 or COM800 / COM100.	Wait for the firmware update process to complete.
Operator action message	Firmware update mode has been aborted for the COM060 or COM800 / COM100.	Repeat the firmware update process.
Operator action message	The firmware of the COM060 or COM800 / COM100 has been updated from [old version] to [new version].	None, for information only.

8.4 What to do in the event of communication faults

When faults develop in the communication link between an external communication partner and a 3VA molded case circuit breaker with COM060 communication module, proceed as follows:

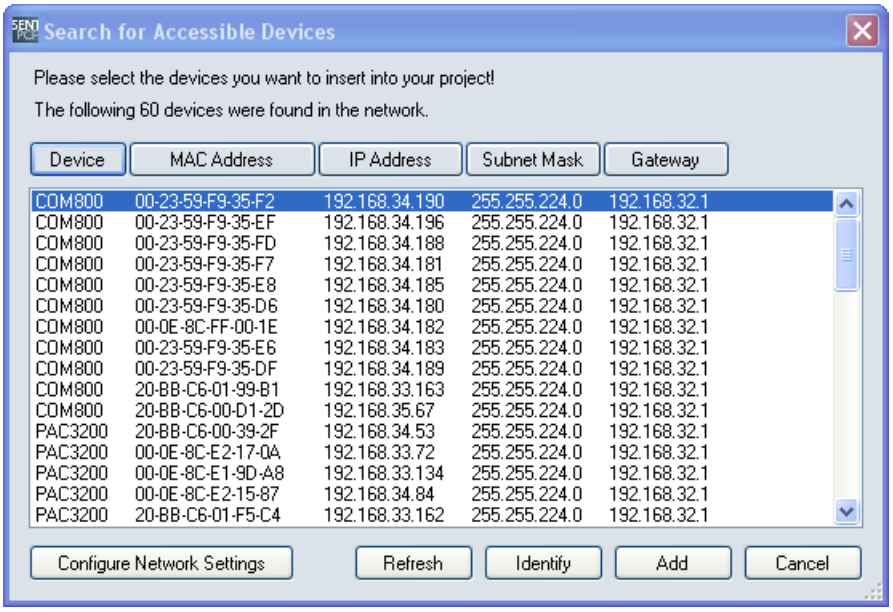
Read the external communication capability signaled by the LEDs:

- "LAN" on COM800 / COM100 breaker data server, see Chapter "LED display (Page 101)".
- "DIAG" on 7KM PAC PROFIBUS DP expansion module, see Chapter "LED display (Page 148)".
- "DIAG" on 7KM PAC Switched Ethernet PROFINET expansion module, see Chapter "LED display (Page 169)".

If faults still persist between the communication partner (e.g. powermanager) and the COM800 / COM100 breaker data server, a check should first be performed to determine whether the COM800 / COM100 breaker data server is generally accessible.

Proceed as follows to verify that the COM800 / COM100 breaker data server is configured in the same subnet:

1. Check whether the settings required to search for accessible devices have been entered, see Chapter "PC network settings (Page 189)".
2. Use the icon "Search for devices" to search for accessible devices.



→ The COM800 / COM100 breaker data server is displayed with its MAC address and possibly an IP address, subnet mask and gateway in the dialog box.

3. Use the Identify function to initiate flashing of the LEDs on the COM800 / COM100 breaker data server so that it can be clearly identified.

If the communication partner is configured in a different IP subnet, the appropriate interface settings to allow access to this IP subnet must also have been entered, see Chapter "PC network settings (Page 189)".

If these checks do not lead to a positive result, the communication link between the COM800 / COM100 breaker data server and the connected 3VA molded case circuit breakers must be checked.

Signaling of communication faults

The ETUs 5-series and 8-series are equipped with a "COM" LED which lights up green when the ETU is connected to the COM800 / COM100 breaker data server via the COM060 communication module.



It is possible to check the communication link to the 3VA molded case circuit breakers on the COM800 / COM100 breaker data server, see Chapter "Operator controls and displays (Page 101)").

If the ETUs and / or the COM800 / COM100 breaker data server are signaling communication faults, the relevant messages can be read out in powerconfig in order to determine the fault cause, see Chapter "Understanding status transitions (Page 206)".

See also

Operator controls and displays (Page 101)

Appendix

A

A.1 Standards and specifications

A.1.1 3VA molded case circuit breaker

Description

Table A- 1 Series 3VA1 and 3VA2 molded case circuit breakers conform to the following international standards

Standard		Title
CISPR11	Class A	Limits and methods of measurement of radio interference suppression of equipment in industrial environments.
	Class B	Limits and methods of measurement of radio interference suppression of equipment in domestic environments.
IEC 60260-1		
IEC 60664-1		
IEC 60068-2-1		
IEC 60068-2-1 "Ab"		
IEC 60068-2-2		
IEC 60068-2-2 "Bd"		
IEC 60068-2-27 "Ea"		
IEC 60068-2-30		
IEC 60068-2-30 "Db"		
IEC 60068-2-52		
IEC 60068-2-6		
IEC 60068-2-6 "Fc"		
IEC 60228 Class 1		Solid conductors
IEC 60228 Class 2		Stranded conductors
IEC 60228 Class 5		Flexible conductors
IEC 60228 Class 6		Very flexible conductors (more flexibility than Class 5)
IEC 60269-1		
IEC 60364-4-41		
IEC 60472-1 / DIN EN 60947-1 (VDE 0600-100)		Low-voltage switchgear and controlgear – General rules
IEC 90529		
IEC 60634-5-53		
IEC / EN 60947-1		

Standard	Title
IEC / EN 60947-1, Annex Q	
IEC / EN 60947-1, Annex S	Digital inputs and/or digital outputs contained in switchgear and controlgear
IEC / EN 60947-2 Edition 4.1, 05.2009	Low-voltage switchgear and controlgear - Part 2: Circuit-Breakers
IEC 60947-2, paragraph 4.7.4	
IEC / EN 60947-2, Annex A	
IEC / EN 60947-2 A1	
IEC / EN 60947-2, Annex B	Circuit-breakers incorporating residual current protection
IEC / EN 60947-2, Annex F 1)	Additional tests for circuit-breakers with electronic over-current protection
IEC / EN 60947-2, Annex H	"Test sequence for circuit-breakers for IT systems" "Circuit breakers for IT systems"
IEC / EN 60947-2, Annex J	Electromagnetic compatibility (EMC): Requirements and test methods for circuit-breakers
IEC / EN 60947-2, Annex K	
IEC / EN 60947-2, Annex N	Electromagnetic compatibility (EMC): Additional requirements and test methods for devices not covered by annexes B, F and M
IEC / EN 60947-3 / DIN EN 80947-3 (VDE 0660-107)	Low-voltage switchgear and controlgear – Switches, disconnectors, switch-disconnectors and fuse-combination units
IEC 60947-4-1 / DIN EN 60947-4-1 (VDE 0660-102)	Low-voltage switchgear and controlgear: Contactors and motor-starters
IEC 60947-6	Transfer switching equipment
IEC / EN 61000-4-2	Electrostatic discharge immunity test
IEC / EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
IEC / EN 61000-4-4	Electrical fast transient/burst immunity test
IEC / EN 61000-4-5	Surge immunity test
IEC / EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61557-12, Class 1	
IEC 61557-12, Class 2	
UL489 Annex SE	"Firmware analysis for safety-relevant applications in electronic trip units"
EN 16001	
DIN EN 60947-2 (VDE 0660-101) April 2010, Section 2.3, page 12	
VDE 0100-T410	
	RoHS Directive 2002/95/EC (Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment).

1) Versions of 3VA molded case circuit breakers with electronic trip units which are designed for loading by frequency converters and whose phase effects on the system (harmonic

current in the load current) far exceed the test criteria for circuit breakers as defined by IEC / EN 60947-2 (Annex F; F 4.1) are available on request.

3VA molded case circuit breakers conform to the following national standards

For a list of the national standards with which 3VA molded case circuit breakers comply, please go to: http://support.automation.siemens.com/WW/view/en/54137334/134200.

A.1.2 PROFIBUS / PROFINET expansion modules

Table A- 2 PROFIBUS / PROFINET expansion modules conform to the following international standards

Standard	Title
IEC 60603-7	Connectors for electronic equipment - Part 7: Detail specification for 8-way, shielded, free and fixed connectors
IEC 61158-2:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 2: Physical layer specification and service definition"
IEC 61158-3:2003	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 3: Data link service definition"
EC 61158-4:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 4: Data link protocol specification"
IEC 61158-5:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 5: Application layer service definition"
IEC 61158-6:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 6: Application layer protocol specification"
IEC 61784-1:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 6: Application layer protocol specification"
IEC 61784-1:2004	PROFIBUS and PROFINET standard

A.1.3 Ethernet interface COM800 / COM100

Table A- 3 Ethernet interface COM800 / COM100

Standard	Title
Number	1
Version	RJ45 (8P8C)
Suitable cable types	100Base-TX (CAT5) Grounding of cable required
Transfer rates	10 / 100 Mbit/s Autonegotiation and Auto-MDX (Medium Dependent Interface)

A.2 List of abbreviations

AC	Alternating Current	Alternating current
COM	3AV data server	Breaker data server
DC	Direct Current	Direct current
DO	Draw-out unit	Draw-out unit
DSP	Display	Display unit suitable for mounting in control panel
EFB	External Function Box	External function box
ETU	Electronic Trip Unit	Electronic trip unit
G	Ground Fault	Ground-fault protection
GSD	General Station Description	Description of PROFINET DP field devices
GSDML	General Station Description Markup Language	Language for describing PROFINET IO field devices
I	Instantaneous	Instantaneous short-circuit protection
I- / O-	Input / Output	Data input / data output
IP	Internet Protocol	Internet protocol
L	Long Time Delay	Overload protection
LI	Overload protection (L) and instantaneous short-circuit protection (I)	Overload protection (L) and instantaneous short-circuit protection (I)
LIG	Overload protection (L), instantaneous short-circuit protection (I) and ground-fault protection (G)	Overload protection (L), instantaneous short-circuit protection (I) and ground-fault protection (G)
LIN	Overload protection (L), instantaneous short-circuit protection (I) and neutral-conductor protection (N)	Overload protection (L), instantaneous short-circuit protection (I) and neutral-conductor protection (N)
LSI	Overload protection (L), short-time delayed short-circuit protection (S) and instantaneous short-circuit protection (I)	Overload protection (L), short-time delayed short-circuit protection (S) and instantaneous short-circuit protection (I)
LSIN	Overload protection (L), short-time delayed short-circuit protection (S), instantaneous short-circuit protection (I) and neutral-conductor protection (N)	Overload protection (L), short-time delayed short-circuit protection (S), instantaneous short-circuit protection (I) and neutral-conductor protection (N)

LSING	Overload protection (L), short-time delayed short-circuit protection (S), instantaneous short-circuit protection (I) and ground-fault protection (N)	Overload protection (L), short-time delayed short-circuit protection (S), instantaneous short-circuit protection (I) and ground-fault protection (G)
MAC	Media Access Control Interface	Physical access point of a device to Ethernet
MCCB	Molded Case Circuit Breaker	Molded case circuit breaker
MDI	Medium Dependent Interface	Medium-dependent interface. Part of transceiver of a network device
Modbus	Modicon Bus	Simple communications protocol used on various transmission media
N	Neutral	Neutral conductor protection
PG	Programming device	Programming device
PNO	PROFIBUS and PROFINET International (PI)	PROFIBUS User Organization
RCD	Residual Current Device	Residual current device
RS485	Serial data transfer	Differential, serial data transfer
RTU	Remote Terminal Unit	Remote (communication) terminal unit
S	Short Time Delay	Delayed short-circuit protection
SEO	Stored Energy Operator	Motor operator capable of synchronization
SNTP	Simple Network Time Protocol	Simple network time protocol
TCP	Transmission Control Protocol	Transmission control protocol
TD500	Test device 500	Test device
THD	Total Harmonic Distortion	Total harmonic distortion
ZSI	Zone Selective Interlocking	Zone selective interlocking

Measured variables

Ea_{imp}	Imported active energy
Ea_{exp}	Exported active energy
Er_{imp}	Imported reactive energy
Er_{exp}	Exported reactive energy
E_{ap}	Apparent energy
I_{L1}, I_{L2}, I_{L3}	Phase currents
I_N	Neutral conductor current
I_G	Ground fault current
I_{L123}	Maximum phase current in phases L1, L2, L3
$I_{L\ AVG}$	3-phase average current
I_{nba}	Current unbalance
$I_{L123max}$	Highest phase current
LF_{L1}, LF_{L2}, LF_{L3}	Power factor in phases L1, L2, L3
L_{1-N} ...	Value of voltage between phase L1 and the neutral conductor
P_{L1}, P_{L2}, P_{L3}	Active power in phases L1, L2, L3
$I_{øL123}$	Average current
Q_{tot}	Total reactive power
S_{L1}, S_{L2}, S_{L3}	Apparent power in phases L1, L2, L3
S_{tot}	Apparent power
U_{L12} ...	Voltage
U_{Ln}, U_{Ln-N}	Average voltage
U_{nb}	Voltage unbalance

A.3 Comprehensive support from A to Z

A.3.1 Comprehensive support from A to Z

For more information, please see the following links:

Useful links

Table A- 4 Product information

Website	The website provides rapid and targeted information on our pioneering products and systems.	http://www.siemens.com/lowvoltage
Newsletter	Constantly updated information on the subject of low-voltage power distribution.	http://www.siemens.com/lowvoltage/newsletter

Table A- 5 Product information / product and system selection

Information and Download Center	• Current catalogs • Customer magazines • Brochures • Demonstration software • Promotion packages	http://www.siemens.com/lowvoltage/infomaterial

Table A- 6 Product and system selection

Industry Mall	Platform for e-business and product information. 24/7 access to a comprehensive information and ordering platform for our complete low-voltage controls and distribution portfolio, including: • Selection tools • Product and system configurators • Availability check • Order tracking	http://www.siemens.com/lowvoltage/mall

Table A- 7 Product documentation

Service & Support Portal	Comprehensive technical information from the planning phase through configuration to operation. Around the clock. 365 days a year. • Product data sheets • Manuals / operating instructions • Certificates • Characteristic curves • Downloads • FAQs	http://www.siemens.com/lowvoltage/support
CAx DVD	Configuration-relevant CAx data on SENTRON is available on DVD: • Commercial and technical product master data • 2D dimension drawings • Isometric illustrations • 3D models • Product data sheets • Tender specifications	http://www.siemens.com/lowvoltage/mall Order number: E86060-D1000-A207-A6-6300
Image Database	Free downloads in several different versions are available from the image database: • All current product photos • 2D dimension drawings • Isometric illustrations • 3D models • Device circuit diagrams • Symbols	http://www.siemens.com/lowvoltage/picturedb

Table A- 8 Product training

SITRAIN Portal	Comprehensive training program to expand your knowledge about our products, systems, and engineering tools	http://www.siemens.com/lowvoltage/training

A.4 References

A.4.1 References

Profiles for Low Voltage Switchgear Devices (LVSG) Technical Specification for PROFINET IO and PROFIBUS
Version 1.32 - Date January 2013 Order No.: 3.122

Common Application Profile PROFIenergy
Version 1.1 (Technical Specification for PROFINET Version 1.1 – Date: August 2012 Order No.: 3.802).

Glossary

100BaseT

Fast Ethernet standard (100 Mbit/s) for data transmission on twisted-pair cables.

10BaseT

Standard for the transmission of 10 Mbit/s Ethernet on twisted-pair cables.

Active RS 485 terminating element

Independent terminating resistor for bus segments with transmission rates of between 9.6 kbit/s and 12 Mbit/s. The resistor is supplied with power independently of the bus nodes.

AUTO

Method of remote operation of the motor operators via control cables, e.g. PLC.

Autonegotiation

Ability of a device to automatically detect the fastest possible transmission rate, and to send and receive at this rate.

AWG

American Wire Gauge (AWG) is a specification for wire diameters that is mainly used in North America.

Baud rate

See transmission rate

Breaking capacity

The breaking capacity is the rms value of the current at a specific cos ϕ (power factor) and a specific voltage which can be safely interrupted by a switching device or fuse under prescribed conditions. The rms value of the symmetrical component applies in the case of alternating current.

Bus

Communication system to which all nodes are connected and which has two defined ends. In the case of Profibus, the bus is a two-wire line (copper cable) or a fiber optic conductor.

Bus connector

Physical connection between a node and the bus cable.

Bus segment (Profibus DP)

Each bus segment has a minimum of two nodes, at least one of which is the DP master.

Bus system

All nodes physically connected to a bus cable form a bus system.

Configuring

The configuring process involves the input of device-specific parameters using, for example, STEP 7 or powerconfig.

Demand period

Period to which the calculation of the power demand refers. A demand period is typically 15, 30, or 60 minutes long.

A distinction is made between the actual period and the instantaneous period. The actual period is the last completed period. The instantaneous period is the period still in progress and has not yet been completed.

DIN rail

Metal rail of a standard type compliant with EN 50 022.

Network components such as OLMs, repeaters, etc. are snap-mounted on DIN rails.

DP master

Within the DP system, the DP master conducts communication with the DP slaves in accordance with a defined algorithm. For this purpose, the DP master employs the functions defined for PROFIBUS-DP in order to communicate with the DP slaves.

DP slave

The DP slave can be addressed by DP masters. The DP slave makes specified functions (I/O data, diagnostics, etc.) available to DP masters.

Equipotential bonding

Electrical connection (equipotential bonding conductor) which brings the exposed conductive parts of electronic equipment and external conductive parts to an equal or approximately equal potential. This prevents disruptive or dangerous voltages between these conductive parts.

Ethernet switch

An Ethernet switch connects network segments within an Ethernet network. The Ethernet switch ensures that data are transferred directly to their destination. For this purpose, the Ethernet switch accesses the hardware addresses of the connected devices.

Firmware

Device operating software. The firmware is stored in the device's electronic components.

I^2t characteristic

The I^2t characteristic is a curve which represents the minimum or maximum values of I^2t in relation to breaking times as a function of the prospective current under defined operating conditions.

I^2t value

The I^2t value is the thermal value of a prospective or a limited short-circuit current (let-through current).

IP address value range

The IP address comprises 4 decimal numbers ranging from 0 to 255 that are separated by a dot, e.g. 141.80.0.16

Let-through current

The let-through current I_D is the maximum instantaneous current value during the breaking time of a switching device or fuse. Limited short-circuit currents occur if the switching device reduces the amplitude of the short-circuit current due to, for example, resistance, switching delay and peak arc voltage. The let-through current of a device such as a current-limiting fuse or a current-limiting molded case circuit breaker determines the thermal load (I^2t value) imposed on equipment connected downstream of the device (current limiting).

Load profile memory

Device data memory for storing performance data, including associated identifying characteristics such as a time stamp.

LOCK

Local, manual operating mode of motor operators.

MAC address

MAC addresses are hardware addresses for identifying network nodes. A MAC address comprises six bytes in hexadecimal notation that are separated by hyphens.

Making capacity

The making capacity is the value of the prospective making current which the switching device can safely conduct at the instant of closing under prescribed conditions for a specific circuit.

For molded case circuit breakers, the making capacity is expressed as the maximum possible instantaneous value of the potential prospective current at the input terminals for the specified voltage.

MANUAL

Local, manual operating mode of motor operators.

Master

When a master is in possession of the token, it is permitted to send data to other nodes or to request data from them (= active node).

Master-slave principle

Bus accessing principle with which only one node at a time is the master and all other nodes are slaves.

MDI-X auto crossover

Ability of the interface to detect the send and receive lines of the connected device autonomously and adjust to them. This prevents malfunctions resulting from mismatching send and receive lines. Both crossed and uncrossed cables can be used.

Node

Device which can send and/or receive data on the bus, e.g., a DP master or a DP slave. For this purpose, the node must have a unique PROFIBUS address.

PROFIBUS

PROcess Field BUS, a bit-serial fieldbus system standardized in IEC 61158-2 as "type 3". This standard prescribes functional, electrical and mechanical properties.

PROFIBUS is a bus system that networks PROFIBUS-compatible automation systems and field devices at the cell and field level. PROFIBUS is compatible with protocols such as DP (= decentralized peripherals), FMS (= fieldbus message specification) or PA (process automation).

PROFIBUS address

Each bus node must have a unique PROFIBUS address.

PCs and programming devices have PROFIBUS address "0".

DP masters and DP slaves use a PROFIBUS address between 1 and 125.

PROFIBUS DP

PROFIBUS bus system with the DP protocol. DP stands for the German equivalent of distributed I/O. The main task of PROFIBUS DP is to manage the fast, cyclic data exchange between the central DP master and the I/O devices.

PROFINET

PROFINET (Process Field Network) is the open industrial Ethernet standard developed by Profibus & Profinet International (PI) for automation applications. Profinet utilizes TCP/IP and IT standards, is real-time Ethernet-capable and supports the integration of fieldbus systems.

Protective characteristic

The protective characteristic is determined by the rated operational current and the setting and tripping values of the circuit breaker.

Rated breaking capacity

The rated breaking capacity is the maximum current that can be interrupted by a switching device under certain conditions.

Rated frequency

Design frequency for a switching device and reference value for other characteristics of the device.

Rated making capacity

The rated making capacity is the maximum current that a switching device can conduct at the instant of closing in accordance with the utilization category at the relevant rated operational voltage.

Rated operational voltage

The rated operational voltage U_e of a switching device, e.g. a molded case circuit breaker, is the voltage which serves as a reference to state other characteristics of the device. The maximum rated operational voltage must never be higher than the rated insulation voltage.

With multi-phase circuits, the specified voltage is generally the phase-to-phase voltage.

Rated residual current

The rated residual current $I_{\Delta n}$ is the fault (residual) current for which residual current-operated circuit breakers are designed. The residual current rating is declared on the rating plate of the device.

Rated service short-circuit breaking capacity

The rated service short-circuit breaking capacity I_{cs} is the short-circuit current determined by the operational voltage that a molded case circuit breaker is capable of interrupting repeatedly (test sequence 0 - C0 - CO, formerly P - 2). After a molded case circuit breaker has interrupted a short circuit, it can continue to carry the rated operational current despite increased self-heating and will trip again in the event of a short circuit.

Rated short-time current

Permissible rms value of the AC component of the prospective short-circuit current which the switching device is capable of conducting for a specific time period, e.g. from 0.05 s to 1 s (thermal short-circuit strength).

Rated uninterrupted current

The rated uninterrupted current I_U of a switching device, e.g. a molded case circuit breaker, is a current that the device can conduct in uninterrupted operation (for weeks, months or years). This current is specified by the manufacturer.

Rating

The rating is the power that a switching device is capable of switching at the associated rated operational voltage in accordance with the utilization category, e.g. power contactor utilization category AC-3:37 kW at 400 V.

Reference potential

Potential is the reference point of the relevant circuits from which voltages are calculated and/or measured.

Relationship between IP address and gateway address

The IP address and the gateway address may differ only in the positions that are set to "0" in the subnet mask.

Example:

You have entered: 255.255.255.0 for the subnet mask; 141.30.0.5 for the IP address and 141.30.128.254 for the gateway address. In this example, the IP address and the gateway address must be identical except for the value of the 4th decimal number. But in this example, the 3rd decimal number is also different.

For this example, therefore, you must make one of the following changes:

Change the subnet mask to: 255.255.0.0 or

the IP address to: 141.30.128.5 or

the gateway address to: 141.30.0.254

Relationship between IP address and subnet mask

The first decimal number of the IP address (from the left) determines the structure of the subnet mask with respect to the number of "1" values (binary) as shown below ("x" is the host address):

First decimal number of IP address Subnet mask

0 to 127 255.x.x.x

128 to 191 255.255.x.x

192 to 223 255.255.255.x

Note:

You can also enter a value between 224 and 255 as the first decimal number of the IP address. This is not recommended, however, because this address range is reserved for other functions and some configuration tools (such as STEP 7) do not check values in this range.

Remote control

Or AUTO; method of remote operation of the motor operators via control cables, e.g. PLC.

RJ45

Symmetrical connector for data lines that is also known as a Western connector or a Western plug. This is a widely used plug connector in telephone and ISDN technology which is used in LAN installations in the office environment.

RMS

The root mean square of a signal which varies over time, e.g. of the oscillation of a voltage or current in power supply systems.

RS 485

Asynchronous data transmission procedure for PROFIBUS DP in accordance with ANSI TIA/EIA-RS485-A.

RS 485 repeater

Device for amplifying bus signals and for linking bus segments over large distances.

Segment

The bus cable between two terminating resistors forms a segment.

Up to 32 bus nodes can be connected to a single segment. RS 485 repeaters or diagnostic repeaters, for example, can be used to link segments.

Short circuit

Connection with a negligibly low impedance between two points of different potential in an electric circuit. The short-circuit current is a multiple of the rated operating current. Short circuits can cause thermal or mechanical damage to switching devices and other parts of an electrical installation.

Short-circuit strength

This is the resistivity of a switching device in the closed state, along with its components (e.g. releases), or a complete switchgear, to the electrodynamic and thermal stresses which arise in the event of a short circuit.

The characteristic for the dynamic stress is the rated peak withstand current, which is the maximum instantaneous value of the short-circuit current.

The characteristic for the thermal stress of the short-circuit current is the root-mean-square value of the short-circuit current throughout its duration.

Slave

A slave can only exchange data after being requested to by the master.

All DP slaves such as ET 200S, ET 200X, ET 200M etc. are typical examples of slaves.

Subnet mask value range

The subnet mask comprises 4 decimal numbers ranging from 0 to 255 that are separated by a dot, e.g. 255.255.0.0

The 4 decimal numbers of the subnet mask in their binary representation must comprise a contiguous sequence of "1" values on the left and a contiguous sequence of "0" values on the right.

The "1" values determine the network number within the IP address. The "0" values are the host address within the IP address.

Example:

Correct values:

255.255.0.0 decimal = 11111111.11111111.00000000.00000000 binary

255.255.128.0 decimal = 11111111.11111111.10000000.00000000 binary

255.254.0.0 decimal = 11111111.11111110.00000000.00000000 binary

Incorrect value:

255.255.1.0 decimal = 11111111.11111111.00000001.00000000 binary

TCP/IP

Transport Control Protocol / Internet Protocol, the de-facto standard; protocol for worldwide communication over Ethernet.

Terminator

Terminating resistor for bus segments with transmission rates of between 9.6 kbit/s and 12 Mbit/s. The resistor is supplied with power independently of the bus nodes.

Transmission rate

This states the rate of transmission of bits per second. PROFIBUS is capable of transmission rates of between 9.6 kbit/s and 12 Mbit/s.

Tripping current of overload release

The current value at which a trip unit trips within a specified time.

Tripping current, ground fault

When the ground fault current reaches or exceeds this limit value, the ground-fault release, for example, of a molded case circuit breaker, is tripped.

Tripping current, instantaneous

When this current limit is exceeded, the circuit breaker trips instantaneously.

Tripping current, overload

When this uninterrupted current limit is exceeded within a predefined time period, the circuit breaker trips (inverse-time delayed tripping!).

Tripping current, short-time delayed

When this current limit is exceeded, the circuit breaker trips after a predefined time delay.

Tripping time

Period of time from the instant of commencement of trip command output to the moment at which the command becomes irrevocable (timing concept for the tripping of circuit breakers).

Twisted-pair

Data cable with twisted-wire pairs; the twist in the wire pairs provides good transmission properties and prevents electromagnetic interference. Twisted-pair cables are available in different qualities for different transmission rates.

Value range for gateway address

The address comprises 4 decimal numbers ranging from 0 to 255 that are separated by a dot, e.g. 141.80.0.1

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3ZW1012-0VA20-0BB0
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