MOELLER

Hardware and Engineering

PS 416-CPU-x00
Central Unit

PS 416-POW-4x0
Power Supply Card

PS 416-BGT-4xx
Rack

02/98 AWB 27-1208 GB

3rd edition 02/98

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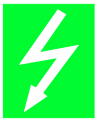


Caution!

Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that the device cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA) of the device concerned.
- Only suitably qualified personnel may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60 364-4-41 or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60 204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause uncontrolled operation or restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.

List of revisions to AWB 27-1208-GB

Edition	Page	Revision	new	Rev.	n. a.
02/98		PS 416-CPU-200/-300	×		

Contents

02/98 AWB 27-1208-GB

02/98 AWB 27-1208-GB

About This Manual

The rack, power supply card and the central processing unit form the basis of the PS 416 system. Their tasks and functions are described in this manual.

There are various cards which you can integrate in the modular system, depending on the requirements. The functions of these cards are described in separate manuals.

The communication between the stations in a networked system is carried out via network cards. These are the PS 416-CPU-300/-400 or the Suconet K PS 416-NET-400 card if the stations are linked via Suconet K. These cards manage the access to local or remote input/output cards. This function is explained in the “Suconet K Interface” manual (AWB 27-1210-GB).

The Sucosoft S 40 programming software is used for programming and configuration and is also described in a separate documentation.

02/98 AWB 27-1208-GB

PS 416 System

Contents

02/98 AWB 27-1208-GB

02/98 AWB 27-1208-GB

1 System Description

Setup

The PS 416 is a modular programmable controller. The rack with an internal bus system for signal transfer and slots for the connections of cards form the basic unit. Interference-free supply cards supply the system with a stabilised voltage. A central processing unit with universal functions manages the access to local and/or remote input/output cards or enables an application process to be run separately in the same rack. Various cards can be used for detecting digital, analog and counter signals.

Networking and communication are implemented via standard interfaces or standard bus protocols. The Moeller Suconet K bus protocol is used as a system bus for connecting remote inputs/outputs or an expander rack. The Sucosoft S 40 software package forms the user interface for user-friendly programming, testing and commissioning.

Hardware/software requirements

A P S416 system has the following minimum requirements:

Table 1: Hardware and software requirements

Sucosoft for PS 416-CPU-223[1)]: for PS 416-CPU-200/-300: for PS 416-CPU 400:	 Operating system from version 1.32 S 30-S 316-D/-GB/-F from version 2.31 Operating system from version 2.0 S 40-D/-GB/-F from version 2.0 Operating system from version 1.0 S 40-D/-GB/-F from version 1.0
Rack	PS 416-BGT-400/410/420 or 421 with potential equalisation bar PS 416-ZBX-401/402/403
Power supply units	PS 416-POW-400/410/420
Central processing unit	PS 416-CPU-200/300/400 PS 416-CPU-223[1]
Programming cable or interface converter	PS 416-ZBK-210 (PRG/RS 232) UM 1.5 (PRG/RS 485)

1) Hardware and engineering of the PS 416-CPU-223 see AWB 27-1243-GB

The central unit is supplied without an operating system. Sucosoft S 40 is required for loading the operating system or a bootable memory card with a loaded operating system. The prrogramming, test and commissioning of the P S416 are described in the relevant Sucosoft S 40 manuals.

Components

The PS 416 automation system consists of the following components:

Basic elements

PS 416-BGT-4...rack

PS 416-POW-4x0 power supply card

PS 416-CPU-200/-300/-400/-223 central processing unit

02/98 AWB 27-1208-GB

Standard cards

Digital input/output cards
PS 416-INP-400/401
PS 416-OUT-400/410

Analogue input/output cards
PS 416-AIO-400/PS 416-AIN-400

PS 416-CNT-200 counter card

Networking/communications cards

PS 416-NET-210 Suconet K card
(only with PS 416-CPU-223 central unit)

PS 416-NET-400 Suconet K card

PS 416-NET-230 PROFIBUS card

PS 416-NET-220 Interbus S card

PS 416-COM-200 Communications card

PS 416-COM-200 Communications card

The basic elements, such as rack, power supply and the central unit are described in this manual.

The hardware and programming of the PS 416-CPU-223 are described in the AWB 27-1243-GB.

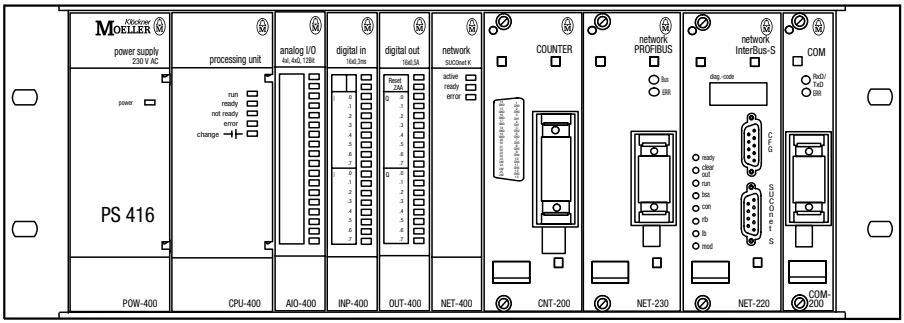


Figure 1: PS 416 automation system

02/98 AWB 27-1208-GB

2 Configuration

Networks for different applications can be created with the Suconet K system bus. The network stations are configured according to their functions. The following functions are possible:

Master ①

Slaves for the expansion of the remote inputs/ outputs:

Expander rack ②
Expansion module ③
Intelligent slaves ④

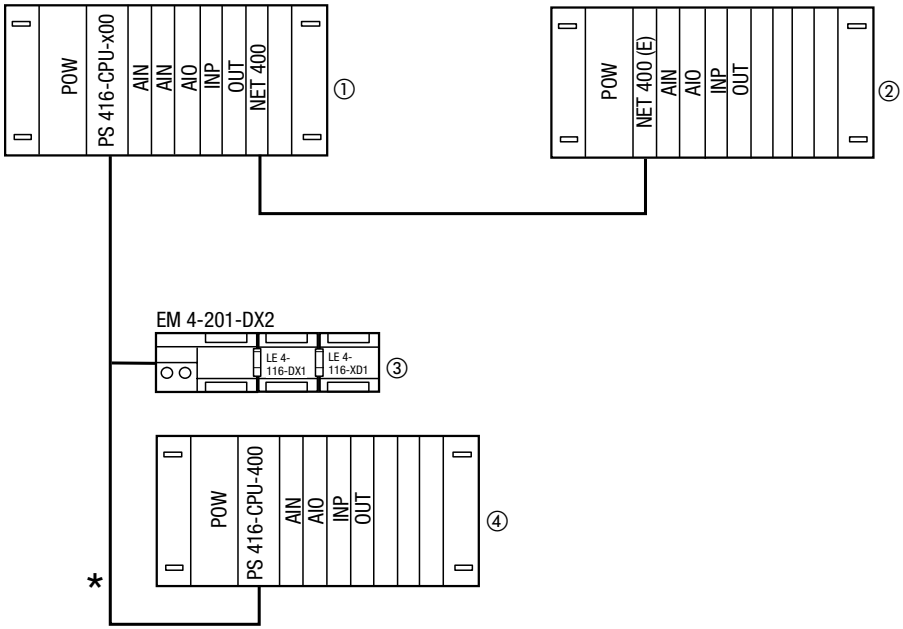


Figure 2: Device configuration with Suconet K

*) This network line is not possible with the PS 416-CPU-200.

Master

The master manages the access to the remote input/ output cards. A master is any card that manages a network line. In a PS 416 system the PS 416-CPU-300/-400 and/or PS 416-NET-400 can be implemented as master. Both cards have a Suconet K interface. The configuration of the operating mode and the stations is carried out in the Sucosoft S 40 Topology Configurator.

A PS 416-CPU-300/-400 central unit can manage up to nine bus lines. One line is integrated on the card, whilst other lines can be formed using the PS 416-NET-400 card.

A P S416-CPU-200 central unit can manage up to eight bus lines, using the PS 416-NET-400 network card to connect each line.

The current requirements must be calculated in all cases for the number of bus lines to be used.

Up to 30 stations can be connected to each line. The number depends on the memory requirements of each station in the communication memory of the master.

02/98 AWB 27-1208-GB

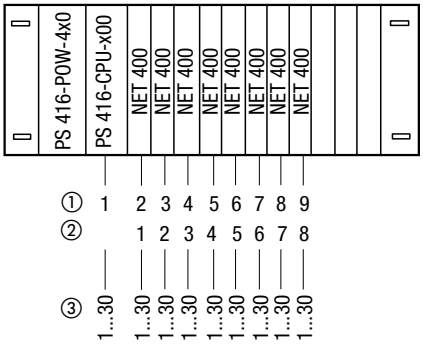


Figure 3: Maximum expansion

① Lines with PS 416-CPU-300/-400

② Lines with PS 416-CPU-200

③ Stations

Slaves for remote I/O expansion

Slaves for remote I/O expansion have no individual central unit. They provide the master their data if requested but cannot communicate with the master. The number of data bytes which the slaves occupy in the communication memory of the master is predefined. This therefore does not have to be specified in the configuration.

The slaves are addressed in a 5-point notation based on the spatial configuration of the stations. The stations are configured in the Topology Configurator of Sucosoft S 40. Expander racks or expansion modules are used as slaves for the remote expansion of the inputs/outputs.

Expander racks

The remote expansion of the inputs/outputs in a PS 416 system is implemented with racks which do not have a CPU (expander racks). The required configuration parameters of the local inputs/outputs of these racks are sent to the PS 416-NET-400 card via the master.

The address set on the card must comply with the address set in the Sucosoft Topology Configurator. You will find detailed information on the PS 416-NET-400 card in the Suconet K Interface manual, AWB 27-1210-GB.

The PS 416 automation system can process up to 30 expander racks on one line. Up to nine/eight lines (depending on the CPU) can be managed on each basic unit. The total permissible number of cards that can be used on the rack depends on the total current consumption of the individual cards and the power supply card used (current consumption calculation). The standard cards can be used as components of the expander rack. The communication is carried out via Suconet K. The following settings are possible depending on the application at hand:

Table 2: Application criteria

Baud rate (Kbaud)	CRC16 check	max. bus length[1)]	Data saving
187.5	no	600 m	good
187.5	yes	600 m	very good
375	no	300 m	good
375	yes	300 m	very good

1) These bus lengths can only be implemented with the cable listed under Accessories in the appendix.

784 bytes of memory are available for the communication with all connected stations of a line on the PS 416-CPU-300/-400. The following table shows the memory assignment of the cards to be used.

Table 3: Memory assignment of the cards of an expander rack

Card	Input byte	Output byte
PS 416-INP-400/401	2	–
PS 416-OUT-400/410	–	2/1
PS 416-AIN-400	16	–
PS 416-AIO-400	8	8
PS 416-CNT-200	12	–

Expansion modules

Expansion modules of the EM... compact series are usually used for the expansion of remote inputs/ outputs. They do not have their own central unit.

Intelligent slaves

Intelligent slaves have their own central unit and are thus able to process their own user program. The communication between the master and intelligent slaves is carried out in both directions. The number of send and receive data bytes for intelligent slaves must be defined in the Sucosoft S 40 Topology Configurator. The memory size depends on the type of slave.

The following components can be used as intelligent slaves:

Table 4: Data exchange memory of intelligent slaves

Components	**Usable memory**[1)]
PS 416-CPU-300/-400	784 bytes
PS 416-NET-400	1492 bytes
PS 4-101-DD1 PS 4-111-DR1/DR5	6 bytes Master → Slave 7 bytes Slave → Master
PS 4-201-MM1 PS 4-141-MM1 PS 4-151-MM1	Total I/O 78 bytes
PS 4-401-MM2	168 bytes

1) The available memory size depends on the number of connected slaves on a line. The values stated in the table apply with the maximum utilization of the line.

The station is addressed by the user program in bit, byte, word or double word format depending on the station. The operations with the possible operands and function blocks are described in the Sucosoft S 40 programming software.

3 Engineering

Electromagnetic compatibility (EMC)

Observe the engineering instructions in the manual "EMC Engineering Guidelines for Automation Systems" (AWB 27-1287-GB)

Reaction times

The shortest reaction time can be implemented with local cards that are addressed by the central unit via the internal bus. Only the program cycle time and the input/output delays of the cards determine the reaction time.

If remote stations are connected via Suconet K, the reaction time depends on the number of stations on the line, the data volume and the data transfer rate.

Further information on the calculation of the reaction time is given in the Appendix.

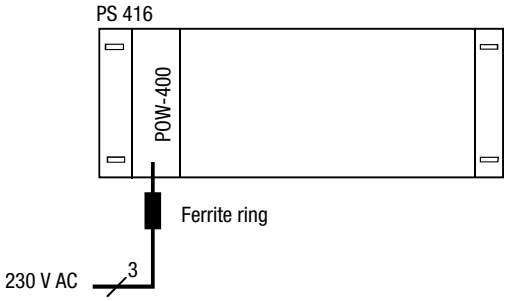
Interference immunity

The PS 416 system is designed for industrial applications.

Provide the supply cable of the power supply card with a ferrite ring. Mounting should be carried out as close to the card as possible. No further connections to other devices may be implemented beyond this point.

The ferrite ring is not delivered with the cards.
Please order separately:
Type PS 416-ZBX-405

The following figure shows the use of the ferrite ring, using the PS 416-POW-400 as an example:



Ensure that all signal cables of communications and analog cards are laid separately from power and control cables in order to prevent interference.

Radiated interference

Interference is either caused by radiation or via electromagentic fields or by static discharges.

Interference signals coming from **electromagnetic fields** can affect signal cables. This can be prevented by screening these cables. The screen braid here intercepts the interference potential. The screen discharge to earth is implemented via high-frequency, low-impedance connections. The screen earth should be located as close as possible to the most sensitive location of the system, e. g. on the inputs of the cards. A potential equalisation bar can therefore be fitted on the racks of the PS 416 system (see Appendix). The screen must not be interrupted so that the conductive plugs and mounting components which do not belong to the signal circuit on the card are connected with the screen. They are earthed via the protective conductor on the rack which is connected with the central reference point. Installation notes, see chapter “Racks”.

02/98 AWB 27-1208-GB

Static discharges may cause a system fault via conductive components which do not belong to the operating circuit (e. g. plugs, switches, mounting components). All freely accessible components which are not covered by a flap or covering are electrically connected to the rack. The guide rails of the card are provided with contact springs. Ensure that these contact elements function correctly.

Note
Ensure that you are free of electrostatic charge when working with operating elements and components that are covered. This especially applies to the battery, the memory card and the operating switches of the CPU.

Line-conducted interference

Line-conducted interference may be due to galvanic, capacitive and inductive coupling. All cards of the PS 416 system have appropriate suppressor elements which ensure the correct functioning of the cards according to the relevant interference class. The engineering of the system should not involve any switchgear with higher interference levels. Interference sources of this kind must be eliminated via an appropriate installation or suppressor elements.

02/98 AWB 27-1208-GB

PS 416-BGT-4.. Racks

Contents

02/98 AWB 27-1208-GB

1 Racks

Task

The PS 416-BGT-4.. racks are used for the assembly of PS 416 programmable controllers.

The racks house mechanically and electrically house the individual cards. They provide protection against mechanical and electromagnetic interference. An internal bus is used for the power supply and the signal exchange between the cards. An integrated monitoring element monitors the 5 V system voltage and the bus activity and generates an Enable signal (ENA) for the cards.

System description

Fully mounted devices for installation on a mounting plate are available in three different sizes as well as a rack for front installation. The following table shows the mounting type and the number of the freely available slots in the individual racks.

Table 5: Type overview of racks

Type	Installation type	Number of free slots
PS 416-BGT-400	Mounting plate	9
PS 416-BGT-410	Mounting plate	13
PS 416-BGT-420	Mounting plate	19
PS 416-BGT-421	Front mounting	19

Setup

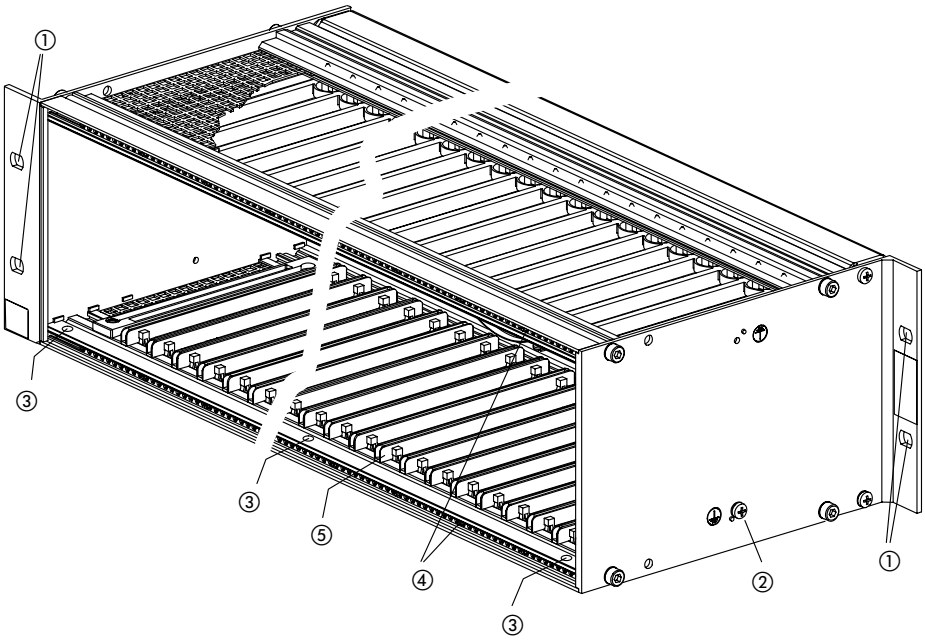


Figure 4: Setup of the racks for mounting plate installation (left) and front mounting (right)

① Fixing holes for mounting/installation of the rack
② Protective earth connection (PE)
③ Fixing holes for the potential equalisation bar
④ Fast-release lock for fixing the card
⑤ Rails for inserting the card

Potential equalisation bar

A suitable potential equalisation bar is supplied with each rack as an accessory. The bar is used for connecting the cable screens to the protective earth. Table 6 shows an overview of potential equalisation bars for the individual racks.

Table 6: Type overview potential equalisation bars

Racks	Potential equalisation bar
PS 416-BGT-400	PS 416-ZBX-403
PS 416-BGT-410	PS 416-ZBX-402
PS 416-BGT-420, PS 416-BGT-421	PS 416-ZBX-401

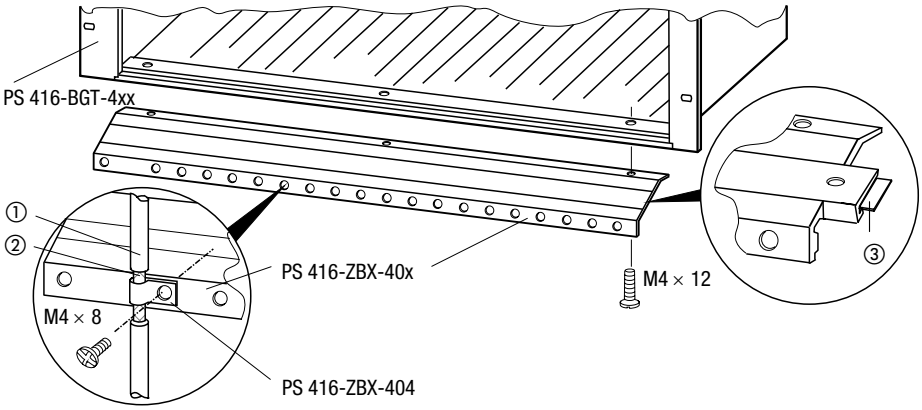


Figure 5: Setup and mounting of the potential equalisation bar

① Cable
② Screen
③ Marking strip

02/98 AWB 27-1208-GB

2 Engineering

All racks can be used as a basic unit (with central unit) or as an expander rack (without central unit).

Each rack must be fitted with a power supply card which must always be fitted in the left "POW" slot. The other slots can be used as required.

Coupling the racks

The coupling between the basic unit and expander rack is carried out via the Suconet K field bus. The internal bus in the basic unit is operated by the central unit, in the expander by the PS 416-NET-400 Suconet K card. You will find a detailed description of coupling with PS 416-NET-400 in the “Suconet K interface” manual AWB 27-1210-GB.

Assignment of the rack

All card types can be used in a rack.

The PS 416-NET-400 card is used in the expander rack for coupling to the basic unit and for controlling the internal bus. Only standard cards must be used in an expander rack:

Digital input/output cards

Analogue input/output cards

Counter card

Figure 6 shows the possible assignments of the rack for the individual cards.

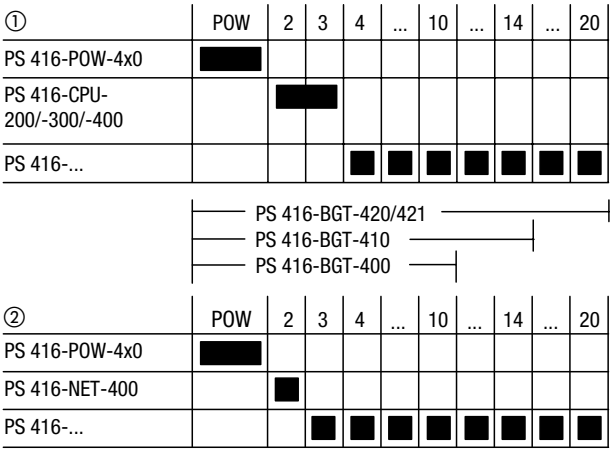


Figure 6: Slot assignment in the basic unit ① and the expander rack ②

1 slot = 4 space units (1 space unit = 5.08 mm)

02/98 AWB 27-1208-GB

3 Installation

The PS 416-BGT-400/410/420 racks are directly installed on a mounting plate in a control cabinet. The PS 416-BGT-421 rack can be installed via the mounting brackets on the front in a 19-inch mounting rail system or swing frame.

Use type M6×25 screws for installing the rack on the mounting plate or for front installation.

Fixing the potential equalisation bar

▶ Fix the equalisation bar with three M4×12 screws on the bottom of the rack before mounting.

Connecting the protective earth

The protective earth (PE) can be connected on the side of each rack.

▶ Connect the protective earth via the M4×4 screw (see also section “Interference immunity”).

Fitting/removing cards

Note
Only fit or remove the cards with the PLC switched off.
Voltage peaks on the bus connector may otherwise cause interference or may damage the controller or the card.

Installation

- ▶ Fit the cards into the rack:

  the PS 416-POW-4x0 power supply card into the “POW” slot,

  the PS 416-CPU-200/-300/-400 central unit into the slots 2 and 3, the Suconet K card into the slot 2,

  all other cards into any available slot.
- ▶ Insert the card into the rack until you hear the spring lug snap into position.
- ▶ Wire the card. Refer to the “Hardware and Engineering” manual for the card concerned.

Removing

- ▶ Open the front cover.
- ▶ Remove the cables.
- ▶ Unlock the spring lug by pressing the lever (see arrow in Figure 7).
- ▶ Pull the card forward towards you.

02/98 AWB 27-1208-GB

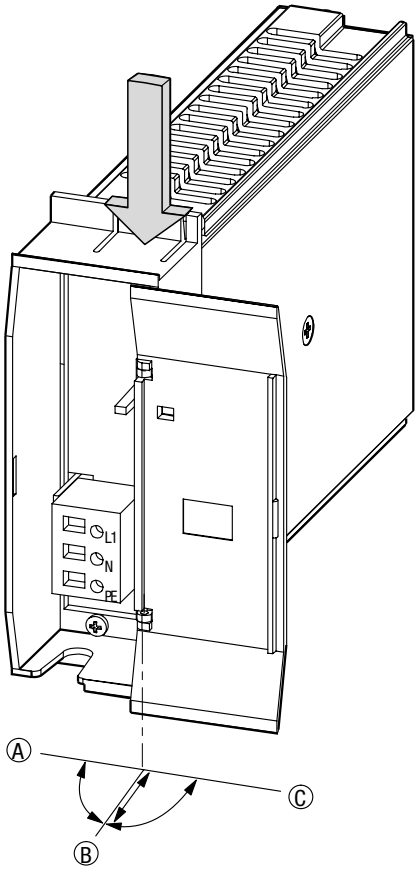


Figure 7: Installing/removing cards. The PS 416-POW-400 power supply card as an example

4 Operation

Monitoring

During operation, the rack monitors the 5 V system voltage. The function cards are disabled if the system voltage falls below the permissible minimum of 4.75 V.

The rack also monitors the control of the internal bus by the central unit (basic unit) or the PS 416-NET-400 Suconet K card (expander rack).

The voltage is switched off and the function cards are disabled if no activity is on the bus for approx. 100 ms. In both cases all outputs are reset.

02/98 AWB 27-1208-GB

PS 416-POW-400/410/420
Power Supply Cards

Contents

02/98 AWB 27-1208-GB

1 Power Supply Card

Task

The PS 416-POW-4x0 power supply card generates the 5 V stabilised system voltage required for the operation of the PS 416 automation system from the connected mains supply. The power supply card also monitors the power supply for voltage failures.

Setup

The PS 416-POW-4x0 power supply card can be operated in all racks of the PS 416 automation system.

02/98 AWB 27-1208-GB

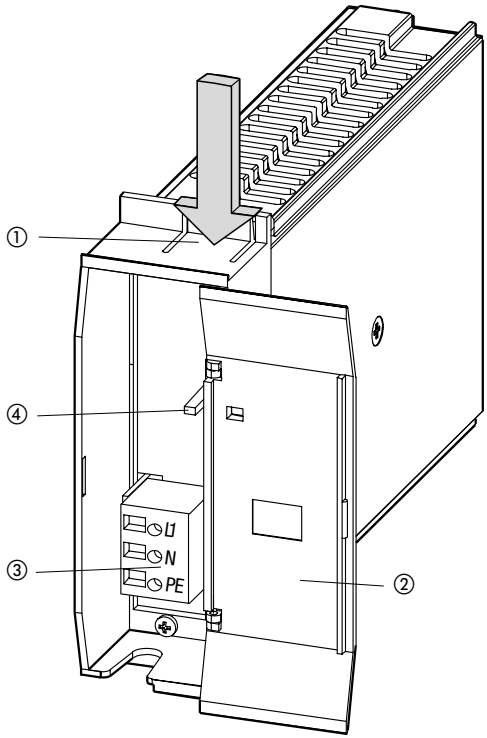


Figure 8: Setup of the PS 416-POW-400 and PS 416-POW-420 cards

① Spring lug

② Front cover

③ Screw terminal for power supply

PS 416-POW-400	L1/N:	230 V AC
PS 416-POW-420	L1/N:	115 V AC
PS 416-POW-400/420	PE:	protective earth

④ LED for mains supply

02/98 AWB 27-1208-GB

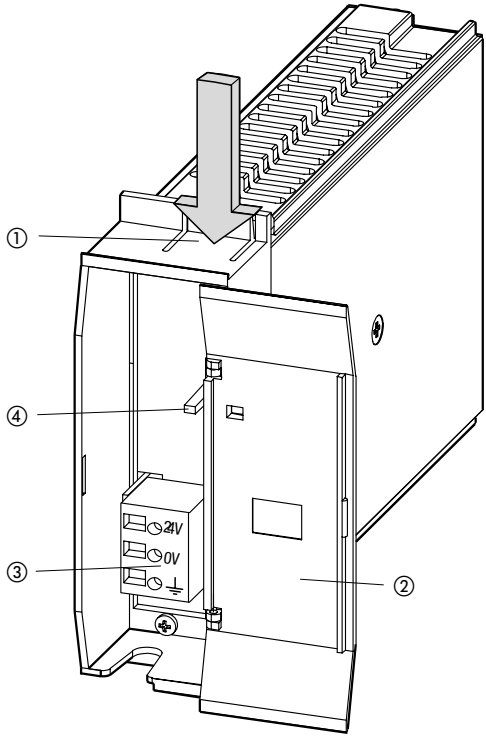


Figure 9: Setup of the PS 416-POW-410 card

① Spring lug

② Front cover

③ Screw terminal for power supply
24 V/0 V: 24 V DC
PE: protective earth

④ LED for mains supply

2 Engineering

Ensure that the relevant safety regulations and accident prevention requirements (EN, IEC regulations) are observed if required.

With 24 V supplies the low voltages must be isolated electrically. Only power supply units produced according to IEC 364-4-41 must be used.

Emergency-stop devices according to EN 60204/IEC 204 must be functional in all operating modes of the controller. Unlocking the Emergency-stop device must not cause an uncontrolled or undefined restart.

Please observe the technical data of the PS 416-POW-4x0 card (see Appendix) when engineering.

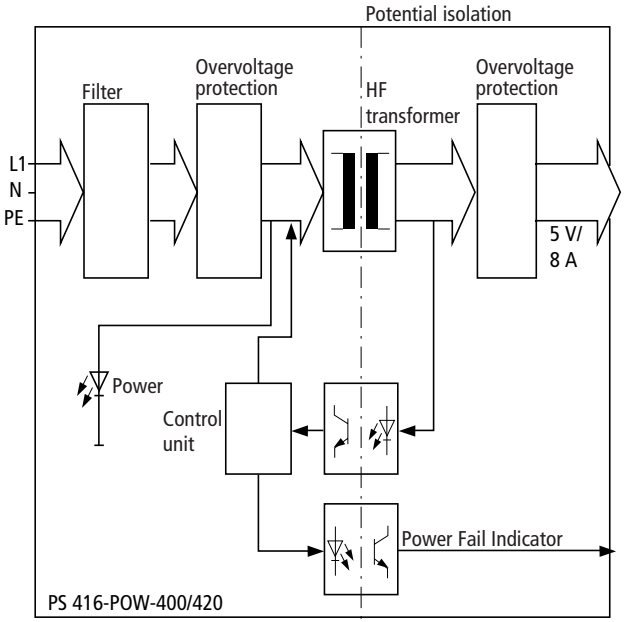


Figure 10: Block diagram for the PS 416-POW-4x0 power supply card

Number of power supply cards

Each rack requires one power supply card. The fitting of several power supply cards on one rack is not possible.

Mains filter

A mains filter is not required due to filter measures already integrated.

02/98 AWB 27-1208-GB

Connection assignment

The card is connected to the mains supply via a 3-pole screw terminal which is located behind the front cover.

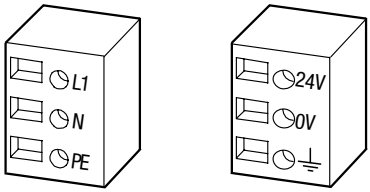


Figure 11: Terminal for mains supply

Left: Terminal block for a voltage of
230 V AC (PS 416-POW-400)
115 V AC (PS 416-POW-420)
Right: Terminal block for a voltage of
24 V DC (PS 416-POW-410)

Table 7: Meaning of the connections

PS 416-POW-...	Connection	Meaning
... 400	L1, N PE	Rated voltage 230 V AC, single phase, 195 to 264 V AC/47 to 400 Hz Rated current max. 0.5 A Protective conductor
... 410	24 V, 0 V ⏚	Rated voltage 24 V DC, 19.2 to 30 V DC Rated current approx. 3 A Protective conductor
... 420	L1, N PE	Rated voltage 115 V AC, single phase, 98 to 132 V AC/47 to 400 Hz Rated current approx. 1 A Protective conductor

Wiring
PS 416-POW-400/-420

Figure 12 shows the direct connection of the mains supply to the PS 416-POW-400/420 power supply cards.

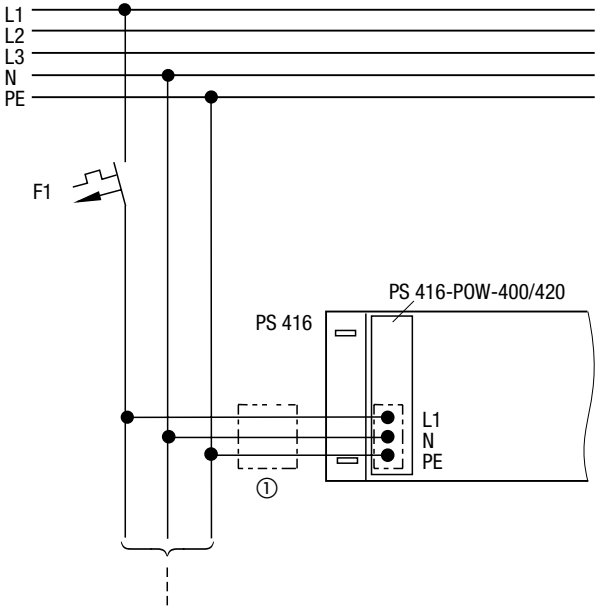


Figure 12: Direct connection of the mains supply 230 V or 115 V AC

① PS 416-ZBX-405 ferrite ring
Mounting see “Cabling” on page 49.
The ferrite ring is not supplied with the card.
Please order separately.

With applications which must meet the EN 60204-1 requirements the connection is carried out via a control transformer. Figure 13 shows the external wiring of the P S416-POW-400/420 power supply cards with earthed operation, figure 14 with unearthed operation.

02/98 AWB 27-1208-GB

An isolation monitoring device must be implemented with unearthed mains supply (EN 60 204-1).

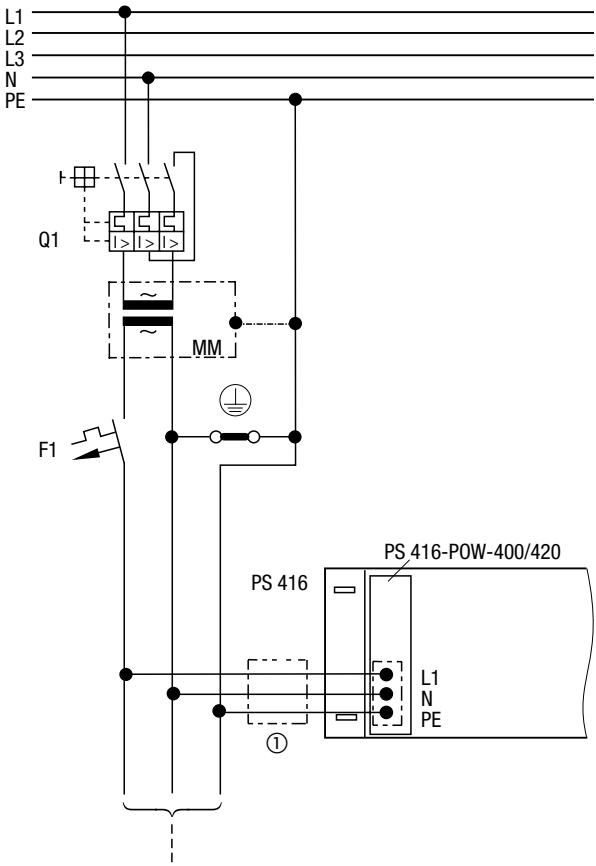


Figure 13: Connection of the mains supply 230 or 115 V AC via control transformer with earthed operation

① PS 416-ZBX-405 ferrite ring
Mounting see “Cabling” on page 49.
The ferrite ring is not supplied with the card.
Please order separately.

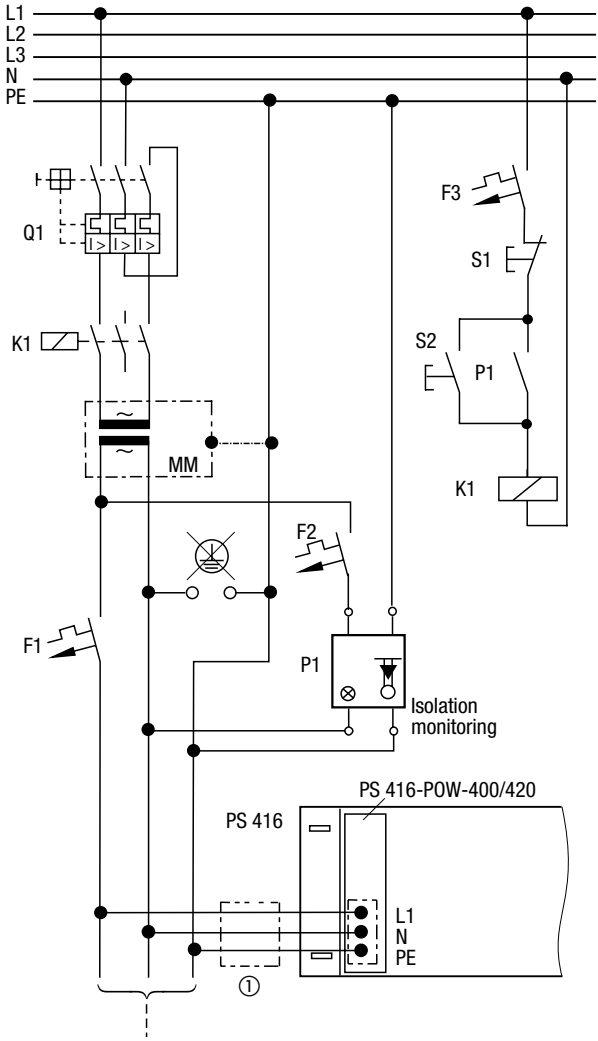


Figure 14: Connection of the mains supply 230 or 115 V AC via control transformer with unearthed operation

① PS 416-ZBX-405 ferrite ring
Mounting see “Cabling” on page 49.
The ferrite ring is not supplied with the card.
Please order separately.

02/98 AWB 27-1208-GB

Wiring PS 416-POW-410

Figure 15 shows the external wiring of the PS 416-POW-410 power supply card with earthed operation; figure 16 with unearthed operation.

An isolation monitoring device must be implemented with unearthed mains supply (EN 60 204-1).

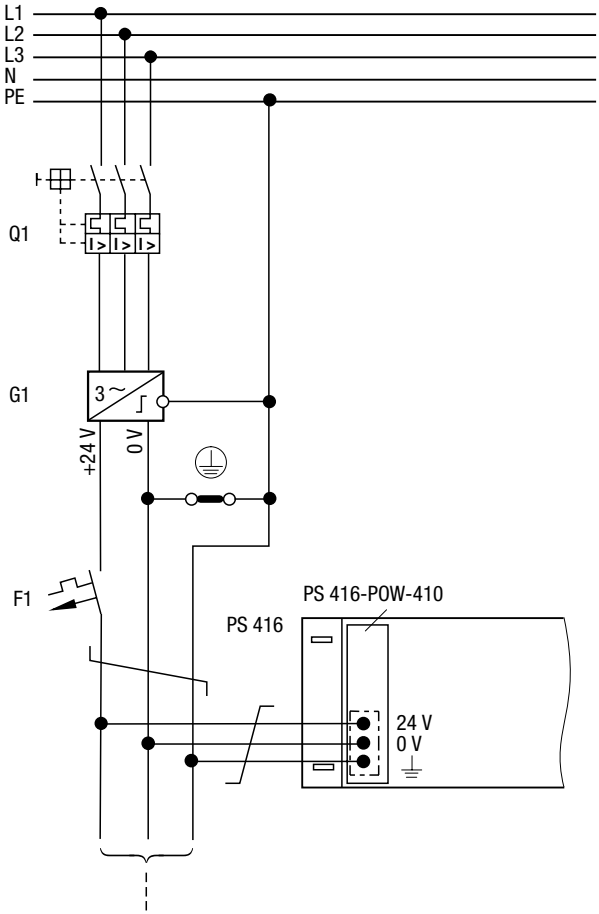


Figure 15: Connection of the 24 V DC mains supply, earthed operation

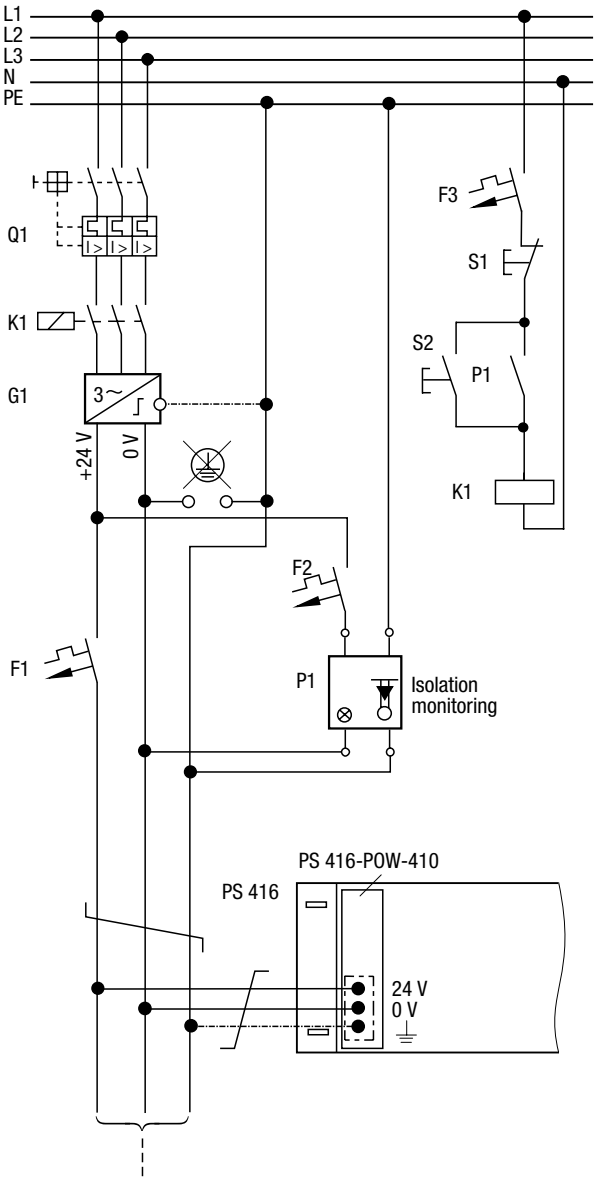


Figure 16: Connection of the 24 V DC mains supply, unearthed operation

02/98 AWB 27-1208-GB

Cabling

Use a 3-core cable (with protective conductor) for the connection of the mains supply.The core cross-section must not exceed 1.5 mm^2 (solid or flexible).

- ▶ Connect twisted mains cables and with a sufficient distance to power cables in order to prevent inductive interference.
- ▶ Fit ferrite rings to the voltage supply cables of the AC power supply cards PS 416-POW-400 and PS 416-POW-420. Fit these ferrite rings as close to the card as possible directly underneath the potential equalisation bar.

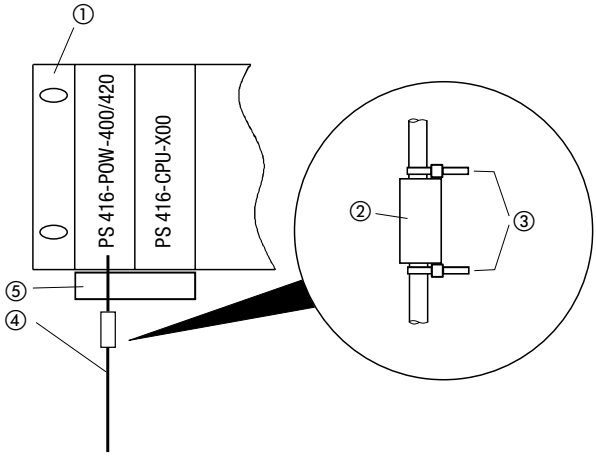


Figure 17: Mounting the ferrite ring on the PS 416-POW-400 und P S416-POW-420 cards

① Rack
② Ferrite ring
③ Cable binder
④ Supply cable
⑤ Potential equalisation bar

3 Installation

Connecting the mains supply

Observe the following safety instructions before connecting the power supply card!

Caution
Ensure that the mains connection cables are de-energized before connecting them to the power supply card. Always connect the protective earth conductor. A protective conductor that is not connected may be dangerous to persons and machine/system!

- ▶ Connect the protective conductor and the mains supply cables to the 3-pole terminal block of the power supply card. Ensure that the polarity is correct.
- ▶ Secure the connection by the integrated screws.

Note
Only operate the card with the permissible rated voltage (see Technical data), otherwise the card may be destroyed!

- ▶ Re-check the wiring before switching on the supply!

4 Operation

Function of the card

The power supply card generates the 5 V DC stabilised system voltage once the mains supply is switched on. The regulated voltage is potentially isolated from the mains supply. The card operates as a switched mode power supply unit in compliance with protection class 1. The output current is 1.5 to 8 A (PS 416-POW-400/420) and 1.5 to 10 A (PS 416-POW-410). The voltage output of the card is short-circuit and idle-proof.

During operation the card monitors the connected mains supply. The card generates a warning signal (PFI = Power Fail Indication) for the central unit in the event of a mains supply failure that lasts more than 13 ms. This signal initiates a data backup in the retentive memory of the central unit.

02/98 AWB 27-1208-GB

5 Diagnostics

The LED on the front is lit if the connected supply is active.

If the LED is not lit, check whether:

the mains supply is switched on

the fuse for the supply voltage has blown

the wiring is correct.

If the LED indicates that the mains supply is present, and the system voltage is missing, this may be due to the following:

the power supply card is not fitted properly in the rack.

▶ Switch off the mains supply and insert the card until you hear the card snap into position.

the card has a short-circuit or fault

▶ Switch off the mains supply.

▶ Contact your Moeller sales office.

The system voltage is not directly indicated via a LED. If none of the LED on all the cards (except power supply card) fitted in the rack are lit and the mains supply is correctly applied to the power supply card, the system voltage is missing.

PS 416-CPU-200/-300/-400
Central Unit

Contents

02/98 AWB 27-1208-GB

02/98 AWB 27-1208-GB

1 Central Unit

Task

The central unit controls and monitors the automation process. It stores and processes the user program and manages the data exchange with the connected slaves. The central unit is provided with the required interfaces for communication, programming and data exchange.

Setup

The central unit consists of two printed circuit boards and occupies two slots in the rack (= 8 space units).

PS 416-CPU-200

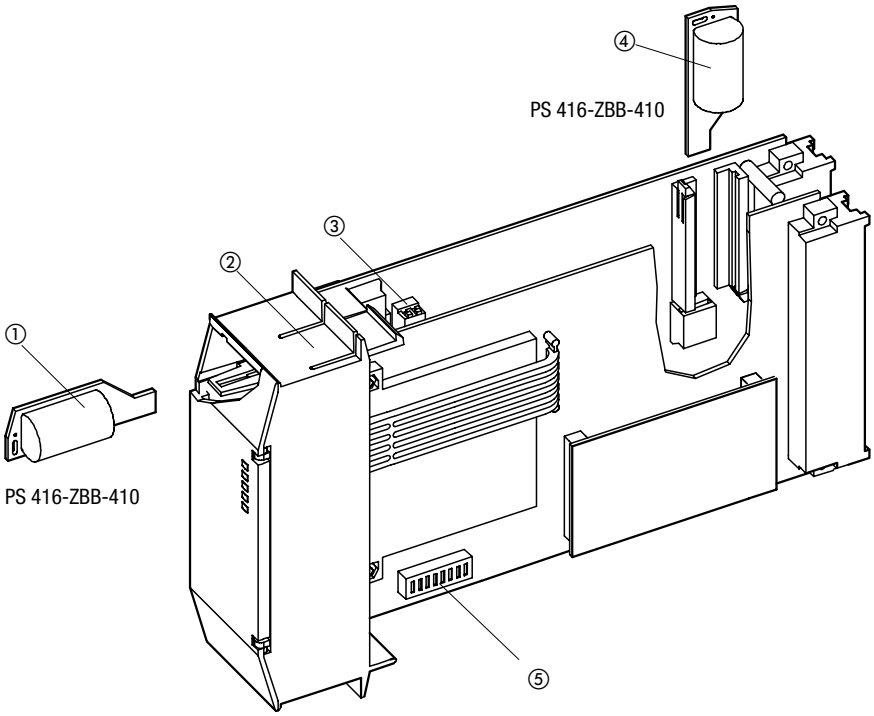


Figure 18: Setup of the PS 416-CPU-200

① Plug-in backup battery (on the front)
② Spring lug
③ Switch for bus terminating resistors (PRG: RS 485)
④ Plug-in reserve battery (internal)
⑤ Address switch (PRG)

① **Plug-in backup battery (on the front);**
for saving the data if the operating voltage fails (see sections “Installation”, “Operation”).

② **Spring lug: Push down before removing**

③ **Switch for bus terminating resistors (PRG: RS 485);**
for activating/de-activating the bus terminating resistors if the PRG interface is operated in RS 485 mode (see section “Hardware configuration”).

④ **Plug-in reserve battery (internal);**
used as fail-safe battery of the backup battery (see sections “Installation”, “Operation”).

⑤ **Address switch (PRG);**
for setting the station address under which the central unit is addressed by the programming device if the interface is operated in the RS 485 mode (see section “Hardware configuration”).

Maximum capacity of the **user memory**:
PS 416-CPU-200 256 Kbyte

The operating system has a permanently reserved memory range.

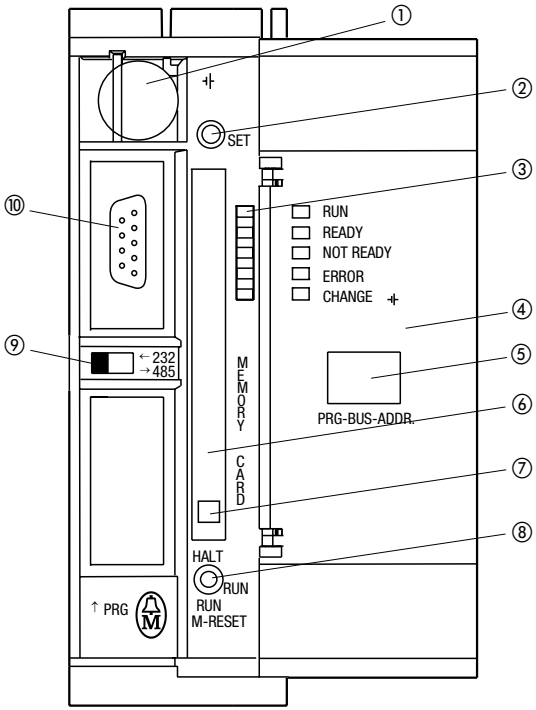


Figure 19: Setup of the PS 416-CPU-200 central unit (front view)

① Plug-in backup battery
② Multi-function button
③ LED display
④ Front cover
⑤ Space for marking strip
⑥ Socket for memory card
⑦ Eject button for memory card
⑧ Operating mode selector switch
⑨ Selector switch for PRG interface (RS 232/RS 485)
⑩ PRG interface

02/98 AWB 27-1208-GB

② **Multi-function button;**
enables several system functions in conjunction with the operating mode selector switch
(see section “Operation”).

③ **LED display;**
indicates the states of the CPU (see section “Test/ Commissioning/Diagnostics”).

④ **Space for marking strip;**
the currently set PRG bus address can be written here (see “Hardware configuration”).

⑤ **Socket for memory card;**
can be used for different functions. Fitting/removing is described in section “Installation”, the function is described in section “Operation”.

⑥ **Eject button for memory card;**
pressing this button ejects the memory card.

⑦ **Operating mode selector switch;**
defines the start behaviour of the central unit
(see section “Operation”).

⑧ **Selector switch for PRG interface (RS 232/RS 485);**
with this switch you control whether the connection to the programming device is carried out via a point-to-point connection (RS 232) or in the RS 485 mode
(see section “Hardware configuration”).

⑨ **PRG interface;**
for the connection to a programming device
(see chapter “Engineering”).

PS 416-CPU-300/-400

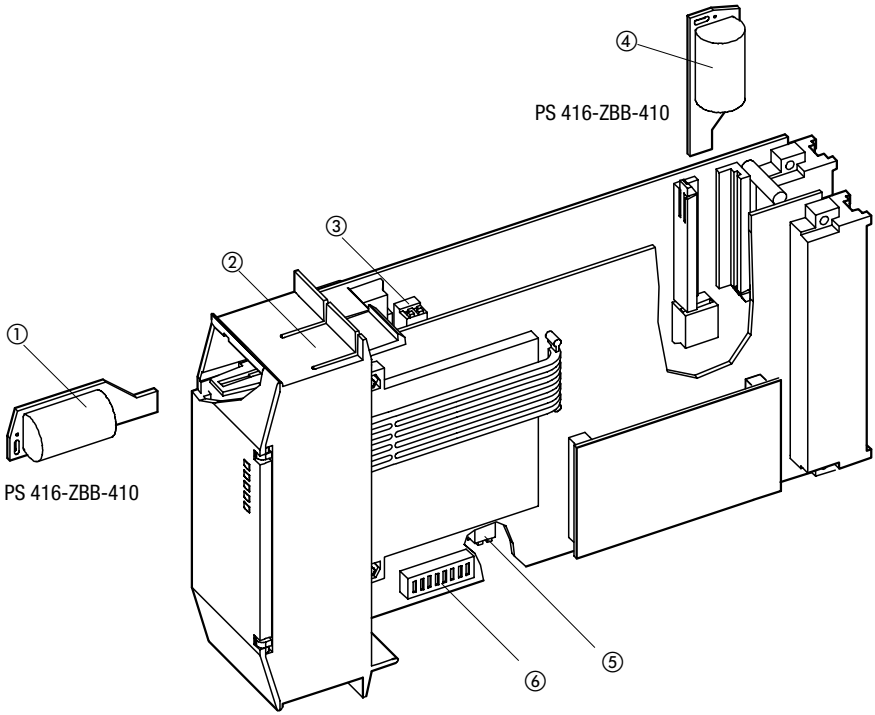


Figure 20: Setup of the PS 416-CPU-300/-400 central unit

① Plug-in backup battery (front)
② Spring lug
③ Switch for bus terminating resistors (PRG: RS 485)
④ Plug-in reserve battery (internal)
⑤ Switch for bus terminating resistors (SB: RS 485)
⑥ Address switch (PRG)

02/98 AWB 27-1208-GB

① **Plug-in backup battery (on the front);**
for saving the data if the operating voltage fails (see sections “Installation”, “Operation”).

② **Spring lug: Push down before removing**

③ **Switch for bus terminating resistors (PRG: RS 485);**
for activating/de-activating the bus terminating resistors if the PRG interface is operated in RS 485 mode (see section “Hardware configuration”).

④ **Plug-in reserve battery (internal);**
used as fail-safe battery of the backup battery (see sections “Installation”, “Operation”).

⑤ **Switch for bus terminating resistors (SBI: RS 485);**
for activating/de-activating the bus terminating resistors if the SBI interface is operated in RS 485 mode (see section “Hardware configuration”).

⑥ **Address switch (PRG);**
for setting the station address under which the central unit is addressed by the programming device if the interface is operated in the RS 485 mode (see section “Hardware configuration”).

Maximum capacity of the **user memory**:

PS 416-CPU-300	512 Kbyte
PS 416-CPU-400	1 MByte

The operating system has a permanently reserved memory range.

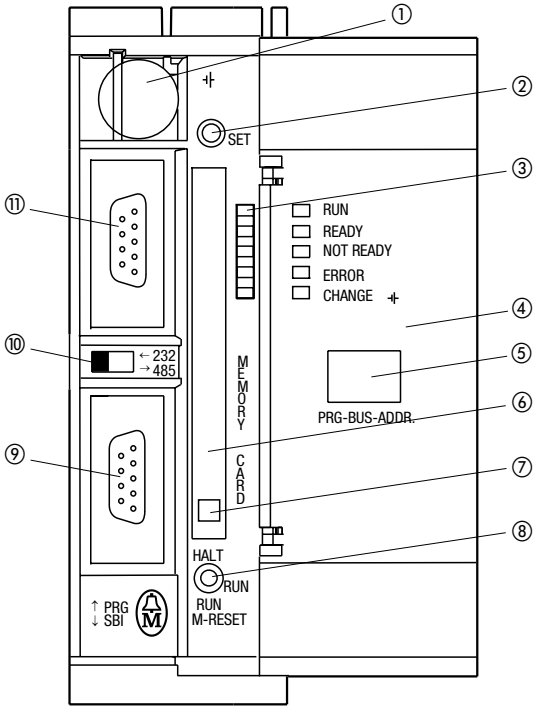


Figure 21: Setup of the PS 416-CPU-300/-400 central unit (front view)

① Plug-in backup battery
② Multi-function button
③ LED display
④ Front cover
⑤ Space for marking strip
⑥ Socket for memory card
⑦ Eject button for memory card
⑧ Operating mode selector switch
⑨ SBI-Interface
⑩ Selector switch for PRG interface (RS 232/RS 485)
⑪ PRG interface

02/98 AWB 27-1208-GB

② **Multi-function button;**
enables several system functions in conjunction with the operating mode selector switch
(see section “Operation”).

③ **LED display;**
indicates the states of the CPU (see section “Test/ Commissioning/Diagnostics”).

⑤ **Space for marking strip;**
the currently set PRG bus address can be written here (see “Hardware configuration”).

⑥ **Socket for memory card;**
can be used for different functions. Fitting/removing is described in section “Installation”, the function is described in section “Operation”.

⑦ **Eject button for memory card;**
pressing this button ejects the memory card.

⑧ **Operating mode selector switch;**
defines the start behaviour of the central unit
(see section “Operation”).

⑨ **SBI Interface;**
for connecting to the Suconet K/K1 fieldbus (see section "“Engineering” on page 69). A DTE unit can be connected here in Transparent mode.

⑩ **Selector switch for PRG interface (RS 232/RS 485);**
with this switch you control whether the connection to the programming device is carried out via a point-to-point connection (RS 232) or in the RS 485 mode
(see section “Hardware configuration”).

⑪ **PRG interface;**
for the connection to a programming device
(see chapter “Engineering”).

02/98 AWB 27-1208-GB

Slot

The slots 2 and 3 are provided for the central unit.

Power supply

The central unit is supplied by the power supply unit in the rack. Power consumption, see Technical data in the Appendix.

Interfaces

PS 416-CPU-200
A programming (PRG) interface is located on the front of the card. It is isolated for increased interference immunity.

PS 416-CPU-300/-400
Two interfaces are provided on the front of the card for programming and networking. They are isolated for increased interference immunity.

PRG interface

The central unit is connected to the programming device via the PRG interface. The PRG interface can be set as an RS 232/RS 485 interface according to the application at hand (see section “Hardware configuration”).

PRG interface/RS 232

A point-to-point connection with the programming device (PRG) is possible via the RS 232 interface. Transfer security is restricted due to possible direct coupling with the earth potential so that faults may occur with high transfer speeds. The parameters for the transfer rate (baud rate) are set via the connection window in the Test and Commissioning tool of

Sucosoft S 40. 9600 bit/s is recommended as a standard value.

A prepared cable is offered as connection cable in the Accessories.

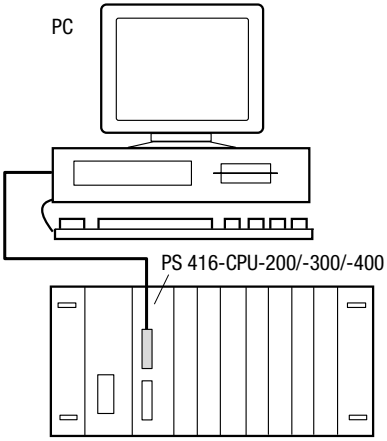


Figure 22: Point-to-point connection

Interface parameters:
The parameters required for operating the interface are set directly in the Connection List window of the Sucosoft S 40 test and commissioning tool. For this the required PLC is selected and opened via Device → Interface Parameters in the Interface Settings dialog box.

The data format is defined with:
Data bit = 8
Parity = none
Stop bit = 1

02/98 AWB 27-1208-GB

Possible settings are: 2400, 4800, 9600 19200, 38400 and 57600 bit/s. If the CPU is started via a cold start, the PRG is automatically connected with the selected baud rate and transfers the new parameters. If no communication is posible with these parameters, the connection is aborted and the CPU must be restarted with new values.

A delay function can be implemented and set in milliseconds. This can be used for adaptions to poor connections, such as signal delays occurring during remote diagnostics via modem.

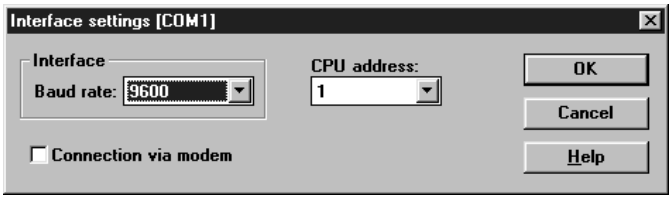


Figure 23: Setting parameters of the COM1 interface

PRG interface/RS 485

Longer distances can be bridged between the programming device and the PS 416 controller when using the RS 485 mode of the PRG interface (see Technical data in the Appendix).

In this case the interface converter U M1.5 must be connected in series in order to create a connection between the RS 485 interface on the CPU and the RS 485 interface of the programming device.

If the RS 485 interface cable is lengthened, the UM1.5 interface converter must be provided a separate 5 V DC power supply.

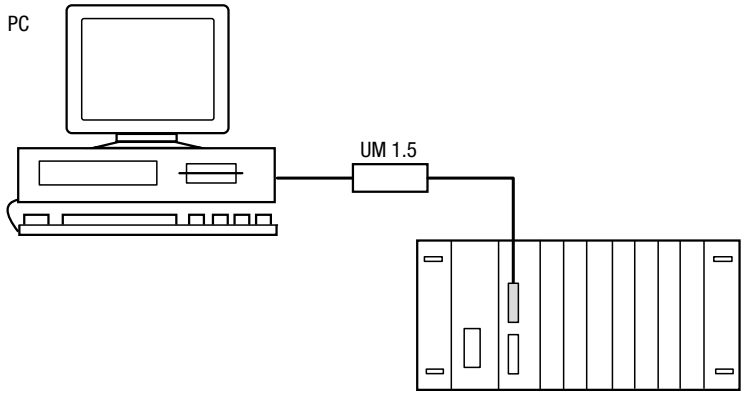


Figure 24: Connection between programming device and PS 416 controller in RS 485 mode

Pin assignment

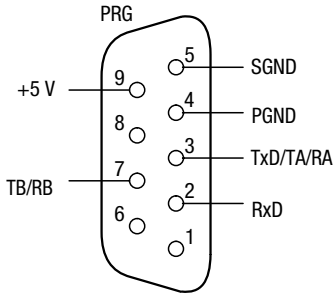


Figure 25: Programming interface, top view

02/98 AWB 27-1208-GB

The table shows the meaning of the signals depending on the selected interface.

Note
Pin 9 is assigned to the + 5V internal power supply and Pin 5 is assigned to ground (internal chassis). These pins must not be connected otherwise this will destroy the card.

Table 8: Meaning of signals

Pin	RS 232	RS 485	Function
1	–	–	–
2	RxD	–	Receive data
3	TxD	TA/RA	Send data Send/receive data
4	–	PGND	Potential ground over 100 Ω
5	SGND	SGND	Signal ground for interface converter UM 1.5
6	–	–	–
7	–	TB/RB	Send/receive data
8	–	–	–
9	–	+5 V	Voltage for interface converter UM 1.5

Wiring

PRG interface/RS 232:

The following figure shows how the PRG interface/ RS 232 on the CPU is connected with the RS 232 interface of the programming device.

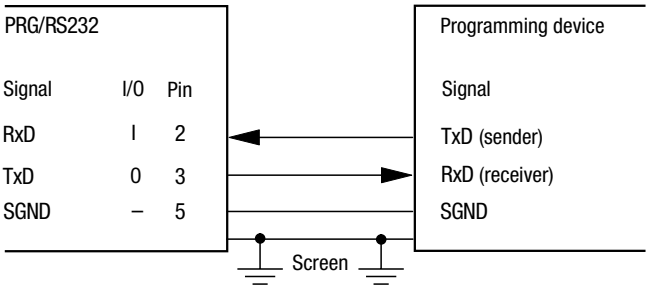


Figure 26: Wiring of the central unit and programming device via PRG/RS 232

PRG interface/RS 485:

If the PRG interface on the central unit is used as a RS 485 interface, the UM 1.5 interface converter must be used in the connection between the RS 485 interface and the RS 232 interface of the programming device.

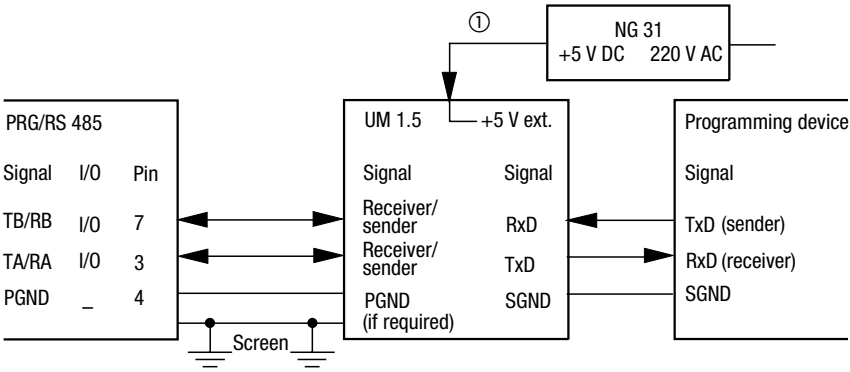


Figure 27: Wiring of the central unit and the programming device via PRG/RS 485

① Required for lengthening the RS 485 interface

02/98 AWB 27-1208-GB

SBI interface (only PS 416-CPU-300/-400)

The communication with the Suconet K stations or data terminal units is carried out via the SBI interface of the central unit. Transparent or Suconet K mode can be set for the SBI interface (see Hardware configuration), depending on the application at hand.

Suconet K mode

In the Suconet K mode the central unit is operated as a station of a Suconet K line. The station type (master/slave) is defined in the Sucosoft S 40 Topology Configurator. The central unit can also connect expander racks when operating as a master. You will find further information in the Suconet K interface manual (AWB 27-1210-GB) or in the relevant manuals for the remote expansion modules.

Transparent mode

This operating mode provides a serial interface for the point-to-point communication with a data terminal unit. The communication is carried out via the COM function block which is integrated in the central unit and can be called up via Sucosoft S40.

The signal level conversion for other interfaces must be carried out with appropriate converters. The UM 1.5 converter is available for an RS 485/RS 232 coupling. The addressing of the interface by the software is described in section “Operation”.

Pin assignment

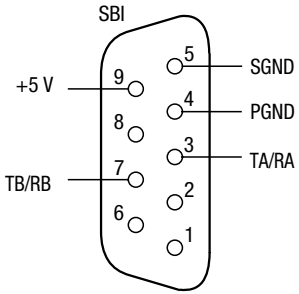


Figure 28: SBI interface, top view

Table 9: Meaning of signals

Pin	RS 485	Function
1	–	–
2	–	–
3	TA/RA	Send/receive data
4	PGND	Potential ground over 100 Ω
5	SGND	Signal ground for UM 1.5 interface converter
6	–	–
7	TB/RB	Send/receive data
8	–	–
9	+5 V	Voltage for UM 1.5 interface converter

Wiring

Figure 26 and 27 show the usual wiring between the SBI interface on the central unit and the R S485 interface of a Suconet K station or the RS 232 interface of a data terminal unit (RS 232).

02/98 AWB 27-1208-GB

Note
Pin 9 is assigned to the + 5V internal power supply and Pin 5 is assigned to ground (internal chassis). These pins must not be connected otherwise this will destroy the card.

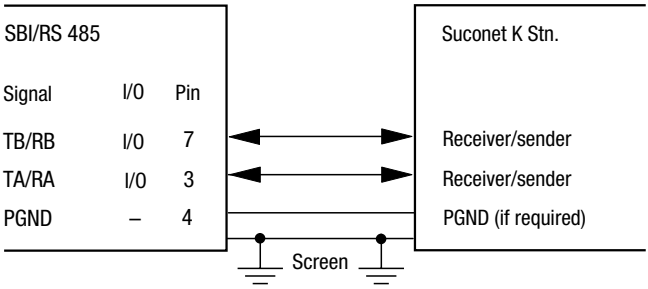


Figure 29: Wiring of central unit and Suconet K station via SBI/RS 485

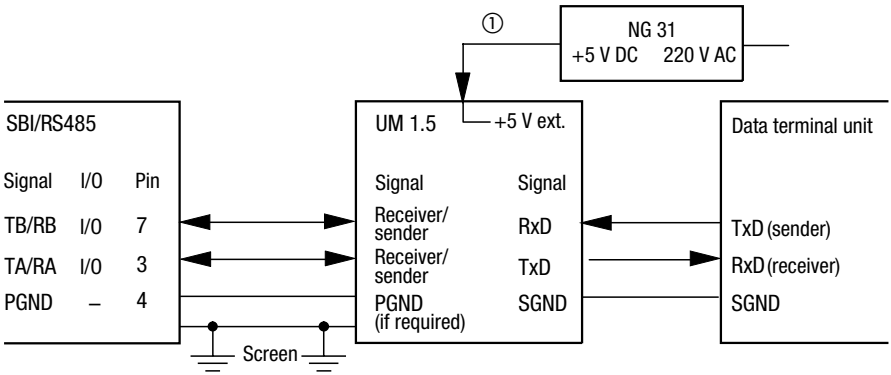


Figure 30: Wiring of central unit and data terminal unit via SBI/RS 485

① Required for lengthening the RS 485 interface

Screening/potential equalisation

▶ Connect the screen of the data cables with the potential equalisation bar in order to prevent interference (for mounting instructions see chapter “Interference immunity”).

Potential equalisation must be provided between the two cards when using R S485 interfaces if the potential difference is greater than 7 V. In this case use a data cable with at least one additional line. This potential equalisation line is to be connected with the PGND connection (pin 4).

Take into account the current carrying capacity of the additional cables.

02/98 AWB 27-1208-GB

Setting the PRG address

The default address of the programming device interface is set to 1. The interface can be connected with the programming device (PRG) if you have configured an appropriate communication relation in Sucosoft S40.

Proceed as follows if you wish to use an address for addressing the programming device:

- ▶ Set the address via the address switch (see coding table).
- ▶ Write the set address on the supplied label and stick it on the back of the front cover.

Enter the same address in the Sucosoft S 40 programming software as you have set via the DIP switch on the CPU.

Table 10: Address coding

Address	Switch							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0
6	0	1	1	0	0	0	0	0
7	1	1	1	0	0	0	0	0
8	0	0	0	1	0	0	0	0
9	1	0	0	1	0	0	0	0
10	0	1	0	1	0	0	0	0
11	1	1	0	1	0	0	0	0
12	0	0	1	1	0	0	0	0
13	1	0	1	1	0	0	0	0
14	0	1	1	1	0	0	0	0
15	1	1	1	1	0	0	0	0
16	0	0	0	0	1	0	0	0
17	1	0	0	0	1	0	0	0
18	0	1	0	0	1	0	0	0
19	1	1	0	0	1	0	0	0
20	0	0	1	0	1	0	0	0
21	1	0	1	0	1	0	0	0
22	0	1	1	0	1	0	0	0
23	1	1	1	0	1	0	0	0
24	0	0	0	1	1	0	0	0
25	1	0	0	1	1	0	0	0
26	0	1	0	1	1	0	0	0
27	1	1	0	1	1	0	0	0
28	0	0	1	1	1	0	0	0
29	1	0	1	1	1	0	0	0
30	0	1	1	1	1	0	0	0
31	1	1	1	1	1	0	0	0

02/98 AWB 27-1208-GB

Example

The switch for a CPU with the address 4 is set as follows:

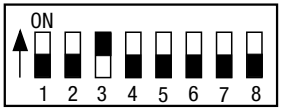


Figure 31: Switch position for address 4

Selecting the PRG interface

Set the selector switch for the PRG interface as follows:

- ▶ Push the switch to the left to connect the controller directly with the PRG (RS 232).
- ▶ Push the switch to the right to connect the controller with the PRG via an interface (RS 485).

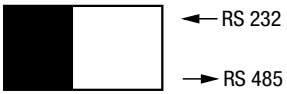


Figure 32: Selector switch in RS 232 setting

Switching on the PRG terminating resistors

In the RS 485 mode the terminating resistors on the CPU must be switched on (ON). In all other cases the bus terminating resistors must be inactive (OFF).

▶ Set the poles 1 and 2 of the switch for bus terminating resistors to position ON.

Figure 33: Activated bus terminating resistors

Note
Both poles must always be in the same position in order to ensure the correct functioning of the card.

02/98 AWB 27-1208-GB

Selecting SBI interface
(PS 416-CPU-300/-400 only)

Set the address and the baud rate in the Sucosoft S 40 Topology Configurator. The following baud rates are available:

Suconet K mode: 187.5/375 Kbaud

Transparent mode:
300/600/1200/2400/4800/9600/19200 bit/s

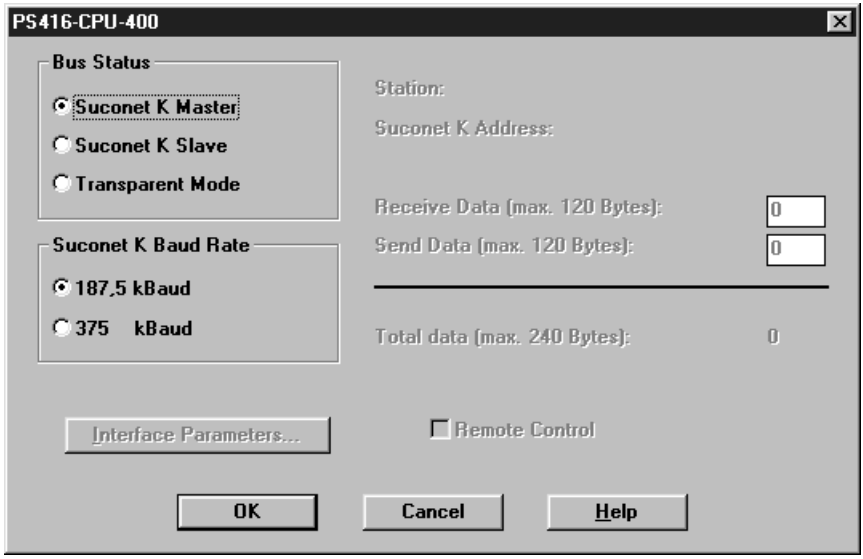


Figure 34: Setting the baud rate in Suconet K mode

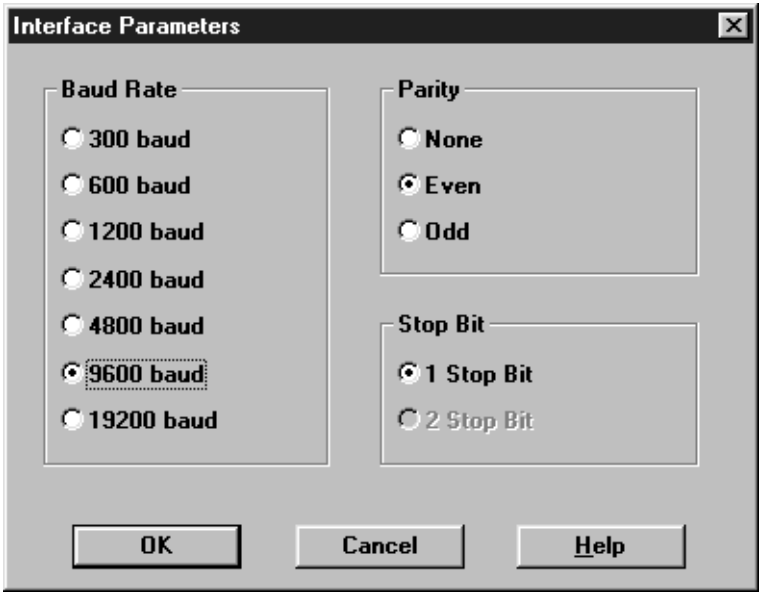


Figure 35: Setting the baud rate in Transparent mode

02/98 AWB 27-1208-GB

Switching on the SBI terminating resistors (PS 416-CPU-300/-400 only)

The terminating resistors of the physically first and last bus station must be switched on (ON) when the SBI is run in Suconet K mode. In all other cases the bus terminating resistors must be inactive (OFF).

Set the poles 1 and 2 of the switch for the bus terminating resistors to position ON.

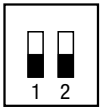


Figure 36: Activated bus terminating resistors

Note
Both poles of the switch must always be in the same position in order to ensure correct functioning of the card.

02/98 AWB 27-1208-GB

4 Installation

ESD measures

Before touching operating elements, interfaces and/or data connectors during the installation, make sure that you are free of electrostatic charge by touching a surface with a good earth (control cabinet, device frame).

Ensure the following during normal operation ("RUN" mode):

the front covers should be closed

the front covers should be snapped into position

Fitting the backup battery

Proceed as follows to fit the backup battery:

- ▶ Open the front cover
- ▶ Insert the battery into the space provided until the retaining clip snaps into position
- ▶ Close the front cover

Changing the backup battery

Note
Ensure that a reserve battery is present before changing the battery in order to prevent data loss. The reserve battery must be changed every five years.

It is always possible to change the battery with the operating voltage switched on. If the battery is changed with the operating voltage switched off, the voltage must only be switched on with the battery fitted; otherwise a cold start is initiated and all programs and data are lost.

- ▶ Open the front cover
- ▶ Push the retaining clip downwards
- ▶ Remove the battery
- ▶ Insert the new battery into the space provided until the retaining clip snaps into position
- ▶ Close the front cover

Fitting/removing the memory card

Fitting

- ▶ Insert the memory card into the socket until the eject button appears.

Correct mounting is ensured by a mechanical lock.

02/98 AWB 27-1208-GB

Removing

▶ Press the eject button and remove the memory card.

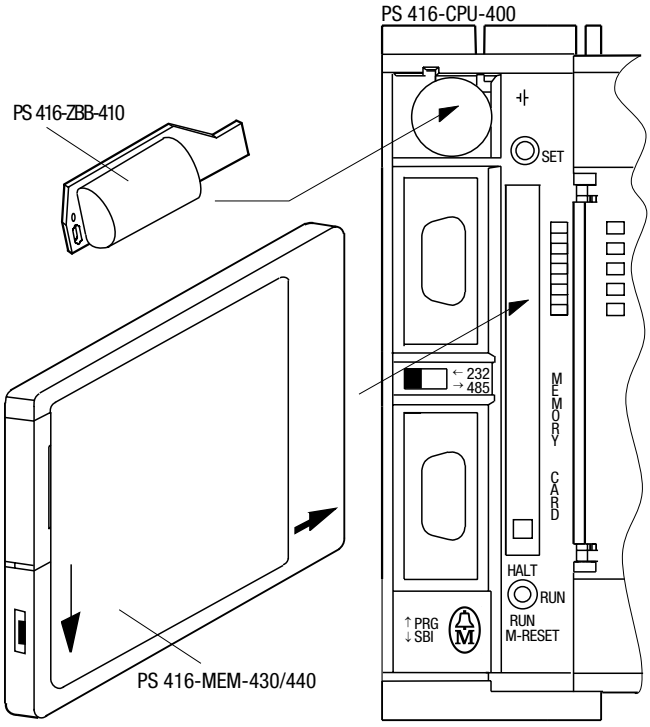


Figure 37: Fitting/removing the memory card and backup battery

Changing the reserve battery

The reserve battery is not discharged during normal operation and has a very long lifespan. The battery must be changed every five years since the central unit is not provided with a monitoring device for the battery.

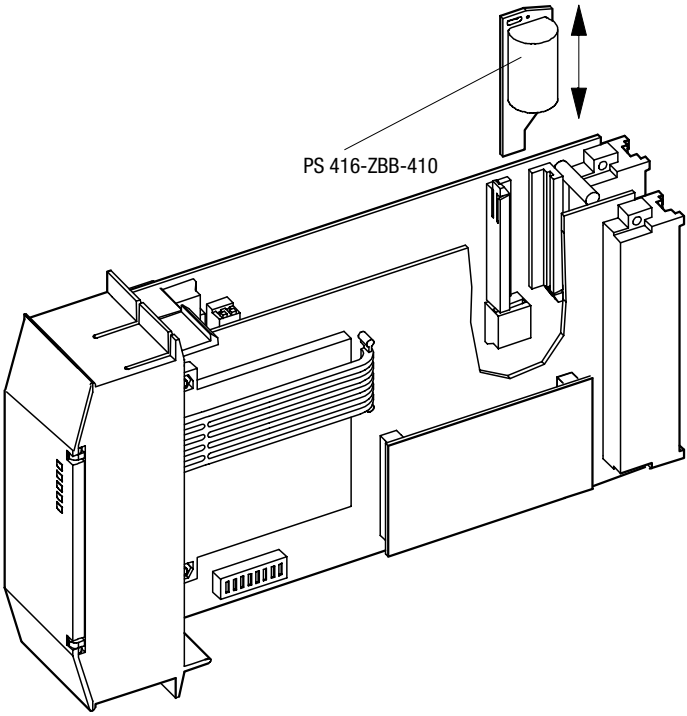


Figure 38: Fitting/removing the reserve battery

02/98 AWB 27-1208-GB

Changing the MC battery

Proceed as follows to change the MC battery on the memory card :

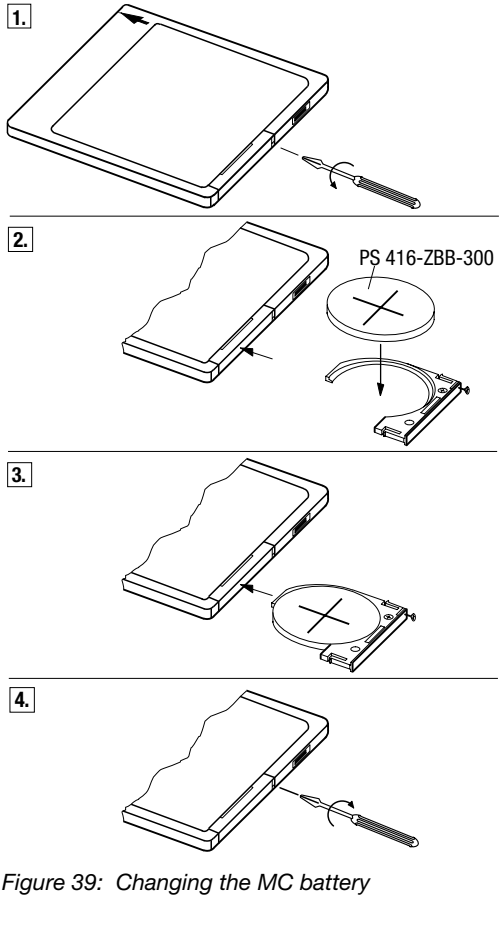


Figure 39: Changing the MC battery

02/98 AWB 27-1208-GB

5 Operation

ESD measures

Before touching operating elements, interfaces and/or data connectors during the installation, make sure that you are free of electrostatic charge by touching a surface with a good earth (control cabinet, device frame).

Ensure the following during normal operation ("RUN" mode):

the front covers should be closed

the front covers should be snapped into position

PS 416-CPU-200

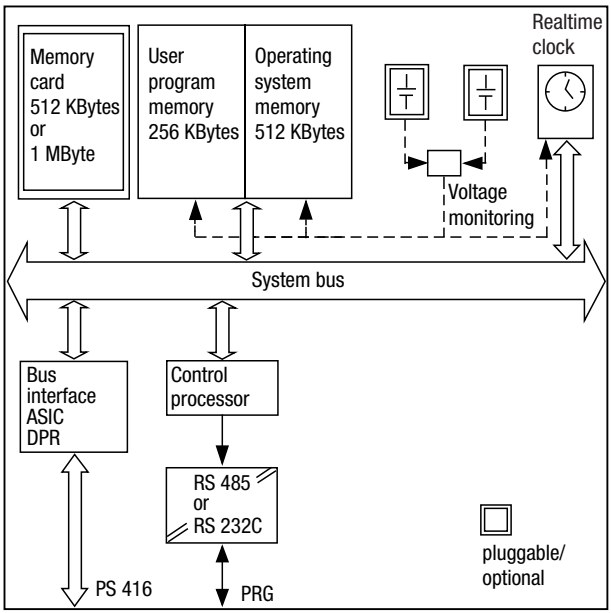


Figure 40: Block diagram of the PS 416-CPU-200

The PS 416-CPU-200 contains the following elements required for the operation of the PS 416 automation system:

- Control processor for program processing
- Memory elements for operating system, programs and data
- Real-time clock
- Interface to parallel bus and bit bus
- Batteries for data backup in the event of voltage drops
- Monitoring device for battery function

02/98 AWB 27-1208-GB

PS 416-CPU-300

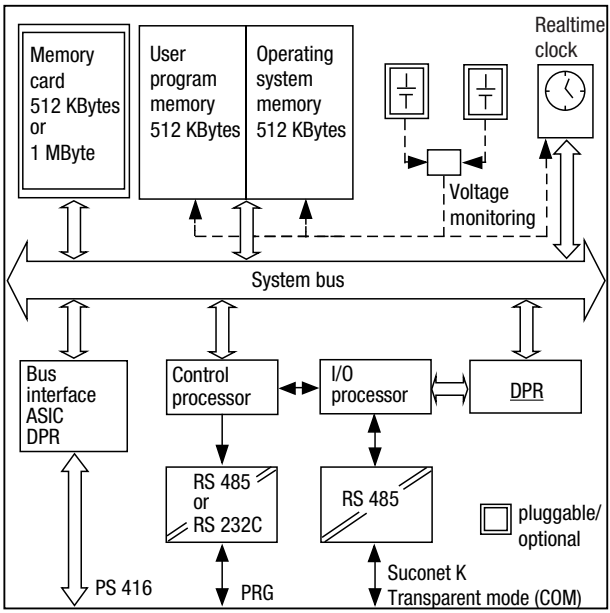


Figure 41: Block diagram of the PS 416-CPU-300

PS 416-CPU-400

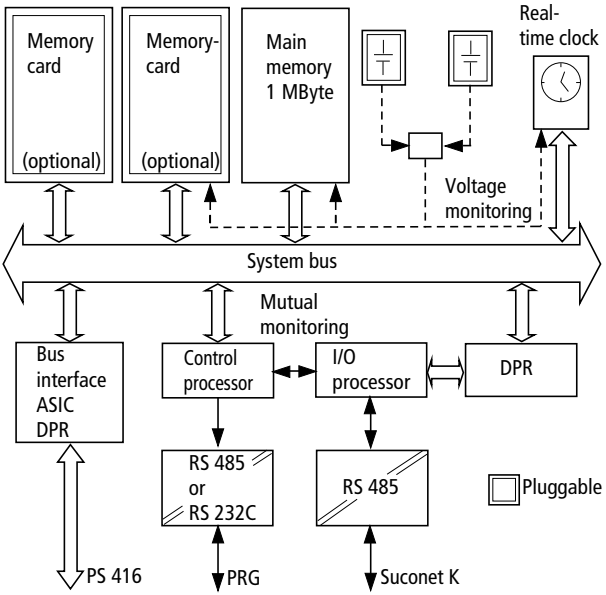


Figure 42: Block diagram PS 416-CPU-400

The PS 416-CPU-300/-400 contains the following elements required for the operation of the PS 416 automation system:

- Control processor for the program processing
- Memory elements for operating system, programs and data
- Real-time clock
- Interface to parallel bus and bit bus
- Batteries for data backup in the event of voltage drops
- Monitoring device for battery function
- Programming interface

02/98 AWB 27-1208-GB

Communication interface (Suconet K/ Transparent mode <COM> selectable) via interface processor.

Memory card as backup memory for user programs and operating system).

Memory elements

The card is provided with a main memory for storing the operating system, programs and data. This main memory is divided into two ranges:

Range for the operating system (fixed)

Range for the user program and data

The maximum memory for user programs and data is:

PS 416-CPU-200	256 Kbyte
PS 416-CPU-300	512 Kbyte
PS 416-CPU-400	1 MByte

User programs and data are backed up by two independent, pluggable batteries, offering optimum data security. Mounting and operating behaviour are described in chapters “Installation” on page 87, “Operation” on page 93 and “Test/Commissioning/ Diagnostics” on page 105.

Backup battery

Backup batteries are not part of the central unit, and the user must fit suitable batteries in the unit. Only Moeller battery modules must be used. The entire main memory of the CPU is protected by a backup battery against data loss in the event of power failure. The charge status of the front backup battery is indicated by an LED on the central unit (Front backup battery: see Figure 37 on page 89). A reserve battery is activated should a backup battery fail. The charge

state of the reserve battery is not monitored (reserve backup battery: see Figure 38 on pag e90). The reserve backup battery should therefore be changed every 5 years.

Memory card

The memory card can be used as an optional backup medium, data memory or as transportable backup memory for the operating system or the user program. The card is a standard PCMCIA type 1 memory card. Two memory technologies with different memory capacities which can be used depending on the application are provided:

As SRAM (volatile memory which loses its data in the event of a battery failure)

As Flash for Backup (non-volatile memory).

Only use the memory cards mentioned under “Accessories”. Contact your Moeller sales office if you require more memory.

Note
Ensure that you are free of electrostatic charge before fitting the memory card.

You will find further details on the installation and operating behaviour of the memory card in the sections “Installation”, “Operation” and “Diagnostics”.

02/98 AWB 27-1208-GB

Function

The user program is started once all required activities are processed in the system section. Fixed and event-driven system activities which are taken from the system pulse interrupt program processing. A consistent process image is maintained between the creation of the input and output image in the user program cycle. This gives the impression that inputs/ outputs are operated in parallel. The following system activities define the process:

System pulse (TS)

The system pulse is 1 ms and forms the basis for all system activities.

General system activities (TA)

General system activities occur each 19 ms for monitoring the following system components:

Operating elements of the CPU
Memory card
Watchdog for Suconet K, S, operating system
Watchdog for power supply unit (ENA signal)

Program system activities (TP)

Program system activities occur each 10 ms for monitoring the following system components:

Communication interfaces
Indicated interrupts
Suconet P system task
Watchdog user program (parameters can be set).

Interrupts (I)

The controller reacts by interrupt request on rare but urgent events. The PS 416 then interrupts the running program and initiates special routines. Interrupts occur at any time and are processed immediately or are only indicated and processed with the next program system routines. The following system components are interrupt capable:

Table 11: Interrupt capable system components

Components	Status
PRG interface	Indicating
Power fail (PFI)	Immediately
ENA signal	Immediately

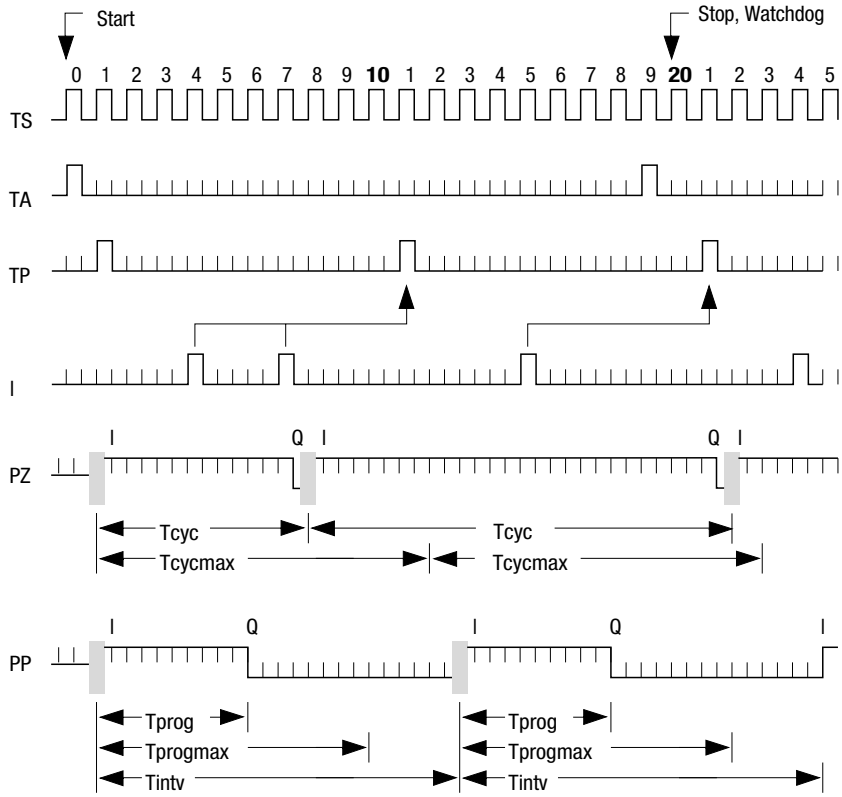


Figure 43: Time diagram of the system routine activities

I = Interrupt

PP = Program, periodically

PC = Program, cyclically

TA = General system activity

TP = Program system activity

TS = System pulse

Tintv = Interval time

Tprog = Program time

Tprogmax = Max. program time (parameters can be set)

Tcycl = Program cycle time

Tcyclmax = Max.program cycle time (parameters can be set)

Program organisation
Status indication
Online processing
Starting program timer (Tcykmax, Tprogmax, Tintv)

Note
The cycle time of a minimum program lasts at most 0.5 ms. Short-time d.c. voltage drops of 3 ms (hot start) are not indicated and must thus be taken into account when calculating the minimum program cycle time.

Startup behaviour

The position of the operating mode selector switch defines the startup behaviour of the central unit.

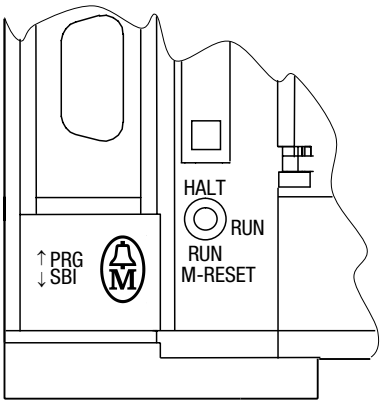


Figure 44: Operating mode selector switch

The startup behaviour can be initiated by the following events:

- Switching on the voltage
- Pressing the SET button
- PRG start command

The startup can be either a cold start or a warm start.

Device cold start

All variables are set to the initial value.

The program processing starts with the first instruction.

Device warm start

The interrupted program cycle with the saved process data of the interrupt is terminated.

Normal program processing is resumed.

Stop of the user program

A user program can be set to HALT via the programming device or the operating mode selector switch.

Switch the operating mode selector switch to HALT.

Press the SET button.

Restart behaviour

The switch position of the operating mode selector switch defines the restart behaviour of the CPU and permits some system functions in conjunction with the SET button. The PRG access is possible in all positions but the actions possible depend on the position of the operating mode selector switch.

Table 12: System functions depending on the position of the operating mode selector switch

Function	Device status	SET button	Switch position		
			HLT	RUN	RUN M-RESET
Device cold start	READY	Yes	–	–	×
Device warm start	READY	Yes	–	×	–
Stop program	RUN	Yes	×	–	–
Halt on return of voltage	OFF	No	×	–	–
Acknowledge errors	NOT READY	Yes	×	–	–
Reset diagnostic status word	READY	Yes	×	–	–
Reset diagnostic status word	RUN	Yes	–	×	×
PRG interface 9600 baud	Optional	Yes, 5 sec.	Optional	Optional	Optional

After an error has occured, the restart behaviour depends on the configuration which you define in the "Program Code Generation" tool of Sucosoft S 40 (see Sucosoft S 40 User Interface (AWB 27-1305-GB)). Possible settings are:

No restart

Warm start

Cold start

02/98 AWB 27-1208-GB

6 Test/Commissioning/Diagnostics

LED display

The following system states are possible and are indicated via LEDs:

Table 13: LEDs of the system states

Device status	RUN	READY	NOT-READY	ERROR	CHANGE
Self test, load OS	Off	Off	Flashes	Off	Off
No OS loaded	Flashes	Flashes	Flashes	Flashes	Off
Error detected	Off	Off	On	Off	Off
Ready for operation	Off	On	Off	Off	Off
Operation running	On	Off	Off	Off	Off
No master CPU	Off	Flashes	Off	Off	Off
Collective error message	Off	Off	Off	On	Off
Battery empty	Don't care	Don't care	Don't care	Don't care	On

OS = Operating System

Self test

After the operating voltage is switched on, internal system tests are carried out, the hardware configuration and the status of the operating system are determined. This device status is also present if an operating system is loaded.

Loading the operating system

The operating system can be loaded from the programming device or via a self-booting memory card. The loading of the operating system from the programming device is described in see Sucosoft S 40 User Interface manual (AWB 27-1305-GB).

The memory card is loaded automatically after the system test if there is no operating sytem loaded in the main memory. This action finishes with the READY message or NOT-READY if an error occurs.

If a program is saved as well, the action can be finished with RUN if the start attribute is set to AUTOSTART.

A new operating system can be loaded from the memory card as follows:

Note
All programs and data are deleted from the CPU memory!

Table 14: Loading the operating system (OS) from the memory card

Action	Device status
Stop pogram	READY
Operating mode selection HALT	READY
Press SET button and keep pressed	READY
Fit memory card with new OS	NOT-READY flashing
Release SET button	NOT-READY flashing[1)]
Wait for load operation of the OS	READY

1) The load operation takes approx. 12 flash cycles

If the action is completed with NOT-READY, repeat the process with an error-free memory card.

Loading the user program

The user program can be loaded from the programming device into the PLC main memory (RAM) or onto the memory card. The program stored on the memory card can be loaded in the same way as the operating system. The load operation is identical (see above).

Note
If there is a self-booting operating system on the memory card as well as the program, this is also loaded. All the data in the working memory is deleted.

02/98 AWB 27-1208-GB

The following start attributes can be set before loading the user program onto the memory card:

AUTOSTART: The program is started automatically after being loaded.

LOAD: The program is loaded and not started. The startup behaviour is not set for active. A program start is only possible via the PRG programming device.

NOT-SET: The program is not loaded after the operating system is loaded.

Error messages

The device status “Error” is active if errors occur after the system test or during the program run time. These may be:

Memory errors

Battery dead/faulty

Voltage failure/drop

Card error

Software error

The individual errors are combined in the Diagnostic status word that can be scanned in the Sucosoft S 40 “Test & Commissioning” menu. The errors are divided into two different catagories. Depending on the category concerned, the errors will cause the program to be aborted or an error message to be indicated. Further information on this is provided in the Sucosoft S 40 User Interface manual (AWB 27-1305-GB).

Acknowledging errors on NOT-READY

Errors that cause a NOT-READY program abort can be acknowledged as follows:

- ▶ Set the operating mode selector switch to HALT.
- ▶ Press the SET button.

Clearing the diagnostic status word

The diagnostic status word can be cleared when the CPU is either in “ready” or “run”.

“ready” status:

- ▶ Set the operating mode selector switch to HALT.
- ▶ Press the SET button.

“run” status:

- ▶ Set the operating mode selector switch to RUN or RUN M-RESET.
- ▶ Press the SET button.

Saving data after a battery failure

The CHANGE LED indicates the failure of the front backup battery. In this device status the reserve battery takes over data security. The discharged backup battery should be changed as quickly as possible so as not to load the reserve battery unduly.

Proceed as follows according to how the cards are fitted:

No memory card fitted:

- ▶ Change the backup battery as described in the section “Installation”.
- ▶ Acknowledge the signal by pressing the SET button.

Memory card fitted:

If the LED does not go out after the backup battery has been changed and the signal acknowledged, the battery for the memory card (MC battery) has discharged.

▶ Change the MC battery (see section “Installation”).

Always fit the memory card as a flash EEPROM memory in order to avoid loss of data. The SRAM card should only be used for commissioning.

Checking the connection between PLC and PRG

Check the following points if a connection between the PLC and the PRG cannot be established.

Does the address setting of the interface match the address in the communications configuration?

Is the operating mode set (RS 232/485) correct for the connection?

With RS 485: Is an UM 1.5 interface converter being used?

With RS 232: Is a correctly wired cable being used?

Is the correct COM interface selected in the Communications Configurator?

Is the selected COM interface assigned twice (mouse, printer, modem ...)?

Is the card power supply correct?

See section “Engineering” for information on “Address setting” and “Operating mode”.

Proceed as follows if none of the points mentioned above are relevant:

- ▶ Check the connection cable
- ▶ Exit Sucosoft S 40 and restart the PC (cold start)
- ▶ Press the SET button for 5 seconds in order to reset the PRG baud rate to 9600 baud and re-activate the “Connect” function.

02/98 AWB 27-1208-GB

7 Direct Communication with Data Terminal Units via the COM Function Block

This chapter only applies to PS 416-CPU-300/400.

The SBI interface on the CPU is used for direct communication in Transparent mode with data terminal units. The interface is addressed via the COM function block. The send and receive jobs are controlled in the user program of the PS 416. The status of the function block is indicated in the user program via status and error variables.

The information required for operation (operating parameters) is stored in the card. “Transparent mode 1” is provided for connections to computers or intelligent systems.

Structure of the COM function block

The COM function block has the following structure:

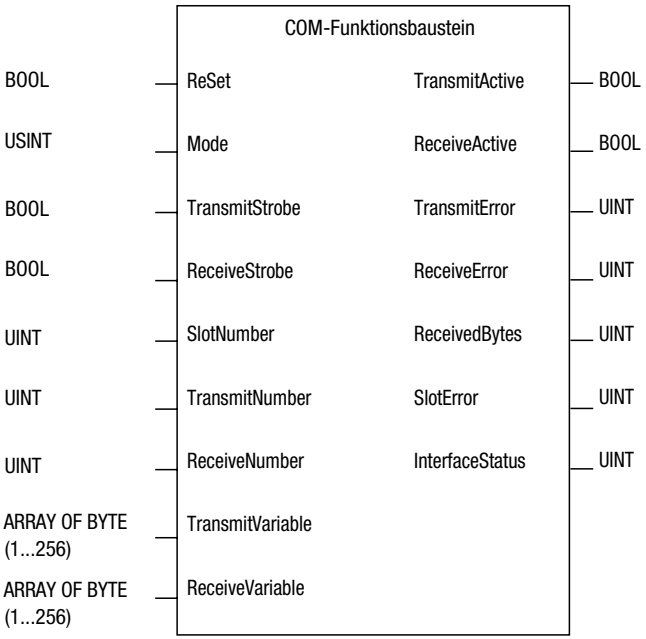


Figure 45: Structure of the COM function block

02/98 AWB 27-1208-GB

Inputs of the COM function block

Table 15: Overview of function block inputs

Name	Data type	Meaning
ReSet	BOOL	Signal status 1 aborts all transmit and receive activities.
Mode	USINT	Operating mode 1 = Transparent mode 1
TransmitStrobe	BOOL	A send job is started with a rising edge.
ReceiveStrobe	BOOL	A receive job is started with a rising edge.
SlotNumber	UINT	Slot of the assigned card (for central unit always 0)
TransmitNumber	UINT	Number of data bytes to be sent (256 bytes)
ReceiveNumber	UINT	Number of data bytes to be received (256 bytes)
TransmitVariable	ARRAY OF BYTE	Variable to be transmitted
ReceiveVariable	ARRAY OF BYTE	Variable in which the received data block is to be saved.

Outputs of the COM function block

Table 16: Overview of the function block outputs

Name	Data type	Meaning
TransmitActive (TACT)	BOOL	Function block processing send job when signal status 1.
ReceiveActive	BOOL	Function block processing receive job when signal status 1.
TransmitError	UINT	Coding of warnings and error messages with a send job.
ReceiveError	UINT	Coding of warnings and error messages with a receive job.
ReceivedBytes	UINT	Number of data bytes received in Transparent mode 1.
InterfaceStatus	UINT	Indicates the operating status of the card and the fitted modules.
SlotError	UINT	Indicates whether a COM card is fitted in the addressed slot.

Addressing the COM function block

The invocation of the COM function block and the addressing of its inputs/outputs is carried out in the user program. The steps required for this are carried out in the Sucosoft S 40 programming software and are illustrated by the following example. For more information see the Sucosoft S 40 Language Elements reference manual (AWB 27-1306-GB).

Function block instantiation

Instantiation:	Name:COM
Invocation:	cal Name (inputs, outputs)
As Operand:	Name.input
	Name.output

Only one COM function block must be instantiated for each CPU.

02/98 AWB 27-1208-GB

Example
Device configuration

String	Rack/stn.	Slot/module	Type	Index	Parameter
0	0	0	PS 416-INP/OUT-400	–	Highest input address: IB10 Highest output address: QB10
0	0	2	PS 416-CPU-300/400	–	Bus status: master Station address: 1 Protocol: Transparent mode Baud rate: 9600 baud Parity: even Data format: 8 bits Stop bit: 1 stop bit

Declaring variables

```
PROGRAM com_test
VAR
tra_strobe AT %I0.0.0.0.0 : BOOL ; (*Transmit Strobe*)
rec_strobe AT %I0.0.0.0.1 : BOOL ; (*Receive Strobe*)
show_tract AT %Q0.0.0.0.2 : BOOL ;(*Indication Transmit
Active*)
show_react AT %Q0.0.0.0.3 : BOOL ; (*Indication Receive
Active*)
show_rec1 AT %QB0.0.0.1 : BYTE ; (*Indication Receive byte1*)
show_rec2 AT %QB0.0.0.2 : BYTE ; (*Indication Receive byte2*)
reset AT %I0.0.0.0.7 : BOOL ; (*Reset*)
com_no AT %IB0.0.0.1 : BYTE ; (*No. of Send/Receive data*)
tra_value AT %IB0.0.0.2 : BYTE ; (*Send value*)
rec_value : UINT ; (*Current number receive data*)
tra_array : ARRAY [1..256] OF BYTE ; (*Send buffer*)
rec_array : ARRAY [1..256] OF BYTE ; (*Receive buffer*)
tra_error : UINT ; (*Transmit Error*)
rec_error : UINT ; (*Receive Error*)
com_status : UINT ; (*Communication status*)
slot_error : UINT ; (*Slot Error*)
com_tst : COM ; (*COM function block*)
END_VAR
```

Addressing the function block in the user program

```
(*Test program for COM function block*)
```

```
(*Load Send data*)
ld com_no
st tra_array[1]
BYTE_TO_UINT
st com_tst.TransmitNumber
st com_tst.ReceiveNumber
ld tra_value
st tra_array[2]
(*Invoke function*)
CAL com_tst(
ReSet :=reset,
Mode :=1,
TransmitStrobe :=tra_strobe,
ReceiveStrobe :=rec_strobe,
SlotNumber :=0,
TransmitNumber :=,
ReceiveNumber :=,
TransmitVariable :=tra_array,
ReceiveVariable :=rec_array
|
show_tract :=TransmitActive,
show_react :=ReceiveActive,
tra_error :=TransmitError,
rec_error :=ReceiveError,
rec_value :=ReceivedBytes,
com_status :=InterfaceStatus,
slot_error :=SlotError)
(*Indicate error and status*)
ld tra_error
ld rec_error
ld com_status
ld slot_error
(*Indicate Receive data*)
ld rec_array[1]
st show_rec1
ld rec_array[2]
st show_rec2
END_PROGRAM
```


02/98 AWB 27-1208-GB

Refreshing inputs/ outputs

In order to maintain a “close contact” as possible with the interface, the COM function block should be invoked once in every cycle.

A multiple invocation is also possible for time-critical data transfers although this should be avoided in order to ensure simple programming and a constant cycle time.

The outputs are refreshed with every invocation of the COM function block. Inputs are only read in when there is a rising edge on the strobe inputs. A “0” should be set at the Strobe input used in the next user program cycle directly after the start of a job on the “TransmitStrobe”, “ReceiveStrobe” function block inputs, and after the acknowledgement signal on the function block outputs “TransmitActive”/ “ReceiveActive”.

A new job cannot be started until the COM function block is invoked with the signal status “0” at the strobe input used.

Reset behaviour

The COM function block is restored to its initial status when the ReSet input is “1”. All jobs that have been processed up to this point are aborted. All the outputs are reset. An aborted job is acknowledged in the error words “TransmitError”/”ReceiveError” with the job abort signal 0800 hex. See “Aborting a job” for information on the validity of the receive buffer data.

Startup behaviour

After the power supply is switched on, the interface is ready for operation when the “run” or “ready” LEDs are lit.

Data transfer

The interface can only be operated in half-duplex mode due to the RS 485 drivers. If in a program cycle the start is simultaneous, first the send job and then the receive job are executed.

The COM function block combines both jobs into one and does not acknowledge job completion (TransmitActive/ReceiveActive = 0) until both jobs have been executed. This means that you can combine both types of job logically to each other.

Transparent mode 1

The Transparent mode is generally used to exchange data blocks between the PS 416 and intelligent data terminals such as PCs or host computers. The data transfer is transparent, i. e. the data is transferred without being interpreted.

Binary data in blocks of a fixed length is received and sent via the serial interface. The length of the send block is set via the “TransmitNumber” function block input parameters and the length of the received data block via the “ReceiveNumber” parameters. The mode is selected via mode = 1.

Data block length

The data block length specifies how many data bytes are to be sent and/or received. The block length of the send data is normally set via the "TransmitNumber" parameter on the COM function block.

The length of the receive data block is set via the ReceiveNumber parameter on the COM function block. This causes the function block to stay in "receive mode" (ReceiveActive = 1) until the number of bytes set on the ReceiveNumber block input have been received.

The number of currently received characters is indicated on the "ReceivedBytes" block output. Only this number of characters from the first element in the receive array is overwritten with new data. The Rest array may contain old data. If the array should not contain old data, it must be deleted before a new receive job is invoked.

Setting COM function block parameters

The following parameters must be set on the COM function block:

Mode := 1
SlotNumber := 0
TransmitVariable := (Array of byte for send data)
ReceiveVariable := (Array of byte for receive data)
TransmitNumber := (Length of send data block)
ReceiveNumber := (Length of receive data block)

Starting a job

A job is started by generating a rising edge on the appropriate Strobe input (TransmitStrobe/ ReceiveStrobe). The input parameters are accepted with the next invocation of the COM function block, and a plausibility test is carried out. Invalid parameters are indicated on the “TransmitError” or “ReceiveError” function block outputs.

The Strobe input is edge-triggered. A subsequent job can only be started if the input has been “0” for at least one program cycle. The ReSet signal must be “0”.

Sending data

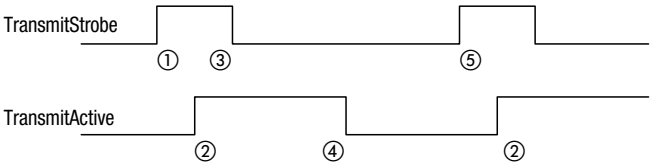


Figure 46: Sending data

① The COM function block is invoked and accepts the “1” signal on its TransmitStrobe input. It reads all function block parameter inputs and carries out a plausibility check.

② The COM function block acknowledges the sent job with TransmitActive = 1 if hardware and parameter settings are error-free. The data is then sent.

③ The COM function block is invoked with the “0” signal on the TransmitStrobe input after the acknowledgement is complete. This is a pre-requisite for a subsequent send job.

④ The data block was sent and therefore the job is completed. The COM function block indicates this when it is invoked by resetting the TransmitActive flag.

⑤ A new send job can be started if there are no errors (TransmitError = 0). Proceed as per ①.

02/98 AWB 27-1208-GB

Receiving data

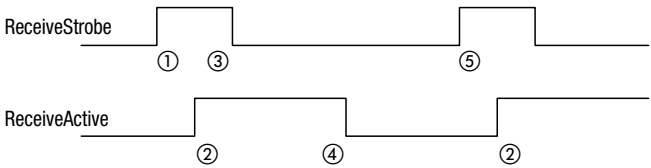


Figure 47: Receiving data

① The COM function block is invoked and accepts a rising edge on its ReceiveStrobe input. It reads all function block parameter inputs and carries out a plausibility check.

② The COM function block acknowledges the receive job with ReceiveActive = 1 if hardware and parameter settings are error-free. It can now receive the data.

③ The COM function block is invoked with the “0” signal on the ReceiveStrobe input after the acknowledgement is complete. This is a pre-requisite for a subsequent receive job.

④ The data block was received in Transparent mode 1 in the expected length and the job is therefore completed. The COM function block indicates this when it is invoked by resetting the ReceiveActive flag.

⑤ A new receive job can be started if there are no errors (ReceiveError = 0). Proceed as per ①.

Monitoring a job

If a job has been started, it should be permanently monitored until a positive or negative result is obtained. The following block function outputs are provided:

TransmitActive/ReceiveActive: the ACTIVE flags are “1” for as long as a job is being processed. Only when all data has been sent or received are the “TransmitActive” or “ReceiveActive” flags reset to “0” accordingly.

TransmitError/ReceiveError/SlotError/ InterfaceStatus:

The COM function block must always be cyclically monitored for any possible error messages or warnings. If a message is output, the appropriate response must be initiated in the user program. The meaning of the error codes is described in the section “Error messages”.

ReceivedBytes: the number of data bytes that have already been received can be read on this output if a receive job has been started.

Aborting a job

If a job is not completed within a specified time, it can be aborted via a “1” signal on the ReSet input. This signal aborts both receive and send jobs. The receive buffer data is treated according to the status of the ReceiveStrobe input.

02/98 AWB 27-1208-GB

ReceiveStrobe = 0

Data that has already been received is not transferred to the receive array defined on the "ReceiveVariable" function block input.

ReceiveStrobe = 1

Data that has already been received is transferred to the receive array defined on the "ReceiveVariable" function block.

The time should be controlled via a timer in the user program. The causes of an abort may be:

The communication partner is sending less data than defined in the COM function block (ReceivedBytes < ReceiveNumber).

The communication partner is no longer ready to send or receive data.

The COM function block acknowledges an abort with "TransmitActive"/"ReceiveActive" = 0 and "TransmitError"/"ReceiveError" = 800 H.

Received data is not transferred in the receive array defined by the "ReceiveVariable" input until the entire block has been received and the "ReceiveActive" function block output is = 0, or if the ReceiveStrobe = 1 in the event of a RESET.

Test and commissioning

The interface is ready for operation after the power supply is switched on and the “run” and “ready” LEDs are lit. In order for a data transfer to be possible, the interface parameters must correspond with those of the data terminal unit and the data cable must be connected correctly. The “InterfaceStatus” output indicates a correct interface setting after the first “TransmitStrobe” or “ReceiveStrobe” signal.

The interface must only be assigned to one COM function block.

The data transfer of the interface and the connected data terminal unit is controlled via the coresponding COM function block invocation with the central unit in RUN mode.

Testing the user program

IL status display

The status display of the CIM function block is the same as for other function blocks. The states of the function block inputs/outputs and the operands are indicated dynamicllay on screen positions concerned.

Error diagnostics

The communication interface offers diagnostic options via the “InterfaceStatus”, “SlotError”, “TransmitError” and “ReceiveError” function block outputs.

02/98 AWB 27-1208-GB

InterfaceStatus

This function block output provides information on the status of the interface.

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
			COM	PAR	SPM 2	SPM 1	SPM 0						IFM 2	IFM 1	IFM 0

Table 17: Indication mode for the interface status

Bit no.	Type	Status	Meaning
0 1 2	IFM 0 IFM 1 IFM 2	0 0 0	RS 485 interface present
8 9 10	SPM 0 SPM 1 SPM 2	0 0 0	None
11	PAR	0 1	PS 416-CPU-400 correctly configured PS 416-CPU-400 incorrectly configured
12	COM	0 1	PS 416-CPU-400 ready for operation PS 416-CPU-400 incorrectly configured

SlotError

This function block output indicates whether the slot address selected is valid.

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
														TYP	SLN

Table 18: Indication mode for slot assignment

Bit no.	Type	Status	Meaning
0	SLN	0 1	The slot number specified is valid The slot number specified is not valid
1	Type	0 1	A card with a COM function is located in the slot specified A card with a COM function is not located in the slot specified

The “InterfaceStatus” and “SlotError” function block outputs only need to be checked after the first send or receive job since their status does not change during operation.

Error messages

The “TransmitError” and “ReceiveError” outputs of the COM function block indicate the error messages shown in the following table:

Table 19: Error messages on the COM function block

Function block output	Code	Meaning
TransmitError		
Send job	TER	Coding of warnings and error messages with a send job (in HEX format):
	0000	No error occurred
Job not executed	0001	Incorrect mode setting
	0002	Hardware error on communications card, interface module faulty or with incorrect ID
	0004	Interface parameters of the communications card not loaded or memory module faulty
	0020	“TransmitVariable” or “TransmitNumber” inputs incorrectly set
	8000	Communications card is still in startup phase
Job abort	0008	1. DSR and/or DCD inactive (only with RS 232.2) 2. Interface module not present
	0800	Send job on COM function block aborted after Reset
	2000	No configuration in the card

02/98 AWB 27-1208-GB

Function block output	Code	Meaning
Warnings	0040	The data format is 8 bits but 7 bits selected as sent parameters
ReceiveError		
Receive job	RER	Coding of error messages and warnings with a receive job (in HEX format)
	0000	No error occurred
Job not executed	0001	Incorrect mode setting
	0002	Hardware error on communications card, interface module faulty or with incorrect ID
	0004	Interface parameters of communications card not loaded
	0020	"ReceiveVariable" or "ReceiveNumber" function block inputs incorrectly set
	8000	Communications card is still in startup phase
Job abort	0008	1. DSR and/or DCD inactive (only with RS 232.2) 2. Interface module not present
	0080	Internal system error or PS 416-COM-200 faulty
	0100	1. A receive and a sent job were set in half-duplex mode at the same time 2. Full-duplex operation with IFM 485 is not possible
	0800	Receive job aborted after Reset on COM function block
Warnings	0040	The received data format is 8 bits but 7 bits was selected as receive setting, or: There is a parity or stop bit error with receive jobs
	0200	In Transparent mode 2 more data bytes were received as set on the "ReceiveNumber" input
	0400	1. Characters/data still being sent after job completed 2. Characters/data received without job

02/98 AWB 27-1208-GB

Appendix

Contents

02/98 AWB 27-1208-GB

Appendix

Calculating reaction times

The reaction time is the time difference between the occurrence of an input signal, the transfer via the bus to the master, the program processing, the return via the bus and the sending of the ouput signal.

The reaction time is therefore the sum of all times that depend on the Suconet operating mode selected, the bus stations used and the program cycle time. Since several asynchronous processes and interrelated processes are involved here, changing values must be expected. The following best case and worst case are therefore provided as limit values:

Factors for bus/program cycles

Table 20: Factors for bus/program cycles

	Best Case (b)	Worst Case (w)
Suconet (FB)	2	4
Program (FP)	1	2

FB = Bus factor
FP = Program factor

System/data times

Table 21: System/data times

	without CRC		with CRC	
Factor	187.5 Kbaud	375 Kbaud	187.5 Kbaud	375 Kbaud
FS	1.65	1.42	1.65	1.42
FD	0.078	0.048	0.19	0.162

TS = System time (ms)
TD = Data time (ms)

The cycle time can be approximated using the following equations:

$$T_{react(best)} = FB_b \times \sum_{i=1}^{n} (TS + TD\,(SD_i + RD_i)) + FP_b \times T_{prog}$$

$$T_{react(worst)} = FB_w \times \sum_{i=1}^{n} (TS + TD\,(SD_i + RD_i)) + FP_w \times T_{prog}$$

n	=	Number of slaves
SD_i	=	Number of send data bytes (output byte)*)
RD_i	=	Number of receive data bytes (input byte)*)
TS	=	System time
TD	=	Data time
FB_b	=	FactorBus best
FP_b	=	FactorProgram best
FB_w	=	FactorBus worst
FP_w	=	FactorProgram worst
T_{prog}	=	Program time

*) see Table 23 in Appendix

The number of data bytes that are exchanged with the different stations via Suconet should also be taken into account for the cycle time calculation (see also Table 23).

02/98 AWB 27-1208-GB

Example

The following cards are located in the expansion rack:

Table 22: Number of input/output bytes per card

Type	Input byte	Output byte
1 × 416-INP-400	2	–
1 × 416-OUT-400	–	2
1 × 416-AIO-400	8	8
1 × 416-CNT-200	12	–
Total	22 + 10 = 32	

With six expansion racks fitted with the above cards, a program cycle time of 25 ms and a transfer rate of 375 Kbaud the reaction times (T_{react}) are:

$T_{react(best)} = 2 \times 6\,(1.42 + 0.048\,(22+10)) + 1 \times 25 = 60$ ms

$T_{react(worst)} = 4 \times 6\,(1.42 + 0.048\,(22+10)) + 2 \times 25 = 121$ ms

Suconet K/K1 stations

Table 23: Number of input/output bytes per Suconet K/K1 station

Station	Input byte	Output byte
A 4-220.1	11	6
CM 4-501-FS1	7	6
CM 4-504-GS1	max. 120	max. 120
CM 4-505-GS1	max. 120	max. 120
DE 4-NET-K	12	12
EBE 295.1	7	6
EM 4-101-AA1	7	8
EM 4-101-AA1 B63	7	8
EM 4-101-AA1 B64	7	8
EM 4-101-AA1 W31	7	8
EM 4-101-AA1 W33	7	8
EM 4-101-AA2 B84	9	4
EM 4-101-AA2 W84	17	8
EM 4-101-DD1/88	2	1
EM 4-101-DD1/106	2	1
EM 4-101-TX1	16	–
EM 4-111-DR1	2	1
EM 4-201-DX1	7	6
EM 4-201-DX2	2	0
EPC 335.1	7	6
EPC 335.1-..	max. 120	max. 120
LE 4-104-XP1	0	1
LE 4-108-XD1	0	1
LE 4-108-XR1	0	1
LE 4-116-DD1	1	1
LE 4-116-DX1	2	0
LE 4-116-XD1	0	2
LE 4-206-AA1	8	4
LE 4-212-AA1	16	8
LE 4-308-HX1	1	–
LE 4-308-XH1	–	1
LE 4-501-BS1	78 byte (total I/O)	

02/98 AWB 27-1208-GB

Station	Input byte	Output byte
LE 4-622-CX1	6	–
MI 4-...-...	78	78
PS 3-8	2	2
PS 3-AC	7	6
PS 3-DC	7	6
PS 306	7	6
PS 4-101-DD1	7	6
PS 4-111-DR1	7	6
PS 4-141-MM1	78 byte (total I/O)	
PS 4-151-MM1	78 byte (total I/O)	
PS 4-201-MM1	max. 78 I/O	
PS 4-401-MM1 (Suconet K1)	7	6
PS 4-401-MM2 (Suconet K)	max. 84 I	max. 84 O
PS 416-AIN-400	16	0
PS 416-AIO-400	8	8
PS 416-CNT-200	12	0
PS 416-CPU-300/-400 (Suconet K Slave)	variable, max. 120	variable, max. 120
PS 416-INP-400/-401	2	–
PS 416-NET-400 (Suconet K Slave)	variable, max. 120	variable, max. 120
PS 416-NET-400 (E) (Master in remote rack)	120*)	120*)
PS 416-OUT-400	–	2
PS 416-OUT-410	–	1
RBI 1.1	7	6
RMQ-16I	2	1
SBI AMD3	7	6
SBI-AMX	7	6
SIS, all types	7	6
VTPx-H-T1	11	6
ZB 4-501-TC1	36	36

*) depending on the cards fitted in the expander rack; by master configured separately

Technical data

General	
Regulations	EN 61131-2, EN 50178
Ambient temperature	0 °C ... +55 °C
Storage temperature	–25 °C ... +70 °C
Shock	2 shocks with sinusoidal wave 11 ms duration 15 g peak value
Impact resistance	15 g/11 ms
Vibration	1 g, f = 10-150 Hz
EMC	see Table on Page 139
Degree of protection	IP 20 (inherent)
Humidity class	RH 1
Connection terminals	Screw terminal
Connection cross section	
flexible with ferrule	0.5 ... 1.5 mm^2
solid	0.5 ... 1.5 mm^2

PS 416-BGT-4.. rack	
Weight	
PS 416-BGT-400	approx. 1.70 kg
PS 416-BGT-410	approx. 2.30 kg
PS 416-BGT-420	approx. 3.05 kg
PS 416-BGT-421	approx. 3.05 kg
Current consumption (own requirement)	max. 0.5 A
Power supply (internal)	5 V DC
Heat dissipation	2.5 W

Power supply cards	
General	
Inrush current limitation	yes
Degree of efficiency	min. 75 %
Protection class	1
Polarity reversal protection	yes
Mains overvoltage protection	yes
Idle-proof	yes
Short-circuit proof	yes
Bridging of voltage dips	>10 ms
Repetition rate	1 s
Potential isolation	yes
Space requirement in rack	2 slots, 8 space units
Weight	735 g
Output voltage	5 V DC

02/98 AWB 27-1208-GB

PS 416-POW-400	
Rated voltage U_e	230 V AC
Permissible range	195 ... 264 V
Rated frequency F_u	47 ... 440 Hz
Inrush current	up to 50 A, 2 ms
Rated current I_e	0.5 A
Switch frequency	66 kHz
Power factor	0.8
Test voltage	2.5 kV DC
Rated isolation voltage	1500 V AC
Power consumption	56 W
Heat dissipation	14 W
Output current	1.5 ... 8 A

PS 416-POW-410	
Rated voltage U_e	24 V DC
Permissible range	19.2 ... 30 V
Input voltage ripple	< 5%
Inrush current	up to 45 A, 2 ms
Rated current I_e	3 A
Switch frequency	70 kHz
Power factor	1
Test voltage	850 V DC
Rated isolation voltage	600 V AC
Power consumption	70 W
Heat dissipation	18 W
Output current	1.5 ... 10 A

PS 416-POW-420	
Rated voltage U_e	115 V AC
Permissible range	98 ... 132 V
Rated frequency F_u	47 ... 440 Hz
Inrush current	up to 50 A, 2 ms
Rated current I_e	1 A
Switch frequency	66 kHz
Power factor	0.8
Test voltage	2.5 kV DC
Rated isolation voltage	1500 V AC
Power consumption	56 W
Heat dissipation	14 W
Output current	1.5 ... 8 A

Central units	
General	
Current consumption	approx. 1.5 A
Heat dissipation	7.5 W
Weight	approx. 375 g
Space requirement	2 slots, 8 space units
Voltage supply	5 V DC
Status indication	5 LED run ready not ready error change ⊣⊢
PRG interface (RS 232/RS 485)	
Baud rates	2,4; 4,8; 9,6; 19,2 Kbit/s
Cable length RS 485	max. 600 m
Cable length RS 232C	max. 10 m
Number of stations RS 485	max. 30
Number of stations RS 232C	1
Terminal design	9pole SUB-D data connector (female)
Memory Card Flash	512 KByte/1 MByte
Memory Card SRAM	512 KByte/1 MByte
Memory for operating system	permanently reserved
PS 416-CPU-200	
Available user memory	256 KByte
Battery backup time of memory with power supply switched off	min. 1 year
PS 416-CPU-300	
Available user memory	512 KByte
PS 416-CPU-400	
Available user memory	1 MByte

02/98 AWB 27-1208-GB

PS 416-CPU-300/-400	
Battery backup time of memory with power supply switched off	min. 0.5 years
SBI interface (Suconet K)	
Transfer rate	187.5/375 KBit/s
Cable lengths	600/300 m
Number of stations	max. 30
Terminal design	9pole SUB-D data connector (female)
SBI interface (Transparent mode)	
Transfer rate	300, 600, 1200, 2400, 4800, 9600, 19200 Bit/s
Cable length	max. 1200 m
Number of stations	1
Terminal design	9pole SUB-D data connector (female)

General EMC specifications for automation equipment			
Emmission	EN 55 011/22 Class A		
Immunity			
ESD	EN 61 000-4-2	Contact discharge Air discharge	4 kV 8 kV
RFI	EN 61 000-4-3	AM/PM	10 V/m
Burst	EN 61 000-4-4	Mains/digital I/O Analog I/O, fieldbus	2 kV 1 kV
Surge	ENV 50 142	Digital I/O, asymetrical Mains DC, symetrical Mains DC, symmetrical Mains AC, asymetrical Mains AC, symetrical	0,5 kV 1 kV 0.5 kV 2 kV 1 kV
Immunity to conducted interference	ENV 50 141	AM	10 V

Accessories

Cable	
PS 416-ZBK-210	RS 232C programming cable, prepared
Batteries	
PS 416-ZBB-300	Spare battery for memory card SRAM
PS 416-ZBB-410	Battery module for SRAM backup
Memory	
PS 416-MEM-430	SRAM memory card (512 Kbyte)
PS 416-MEM-431	SRAM memory card (1 Mbyte)
PS 416-MEM-440	Flash EPROM memory card (512 Kbyte)
PS 416-MEM-441	Flash EPROM memory card (1 Mbyte)
Plug connectors	
PS 416-ZBS-410	9-pole Sub-D data plug connector (male)
PS 416-ZBS-411	9-pole Sub-D data plug connector (female)
PS 416-ZBS-412	9-pole SUB-D adapter (female/female)
Cable	
LT309.096	Suconet K data cable 100 m, 2 x 0.5 mm^2
Components	
PS 416-ZBX-401	Potential equalisation bar for PS 416-BGT-42x
PS 416-ZBX-402	Potential equalisation bar for PS 416-BGT-410
PS 416-ZBX-403	Potential equalisation bar for PS 416-BGT-400
PS 416-ZBX-404	Clamps for potential equalisation bar
PS 416-ZBX-405	Ferrite ring
PS 416-ZBX-410	T-connector for networking
UM 1.5	RS 232C/RS 485 interface converter

Order numbers and prices see valid price sheet

02/98 AWB 27-1208-GB

Index

02/98 AWB 27-1208-GB

02/98 AWB 27-1208-GB

R

S

02/98 AWB 27-1208-GB

MOELLER

Beilage zu ... AWB27-1208-D, -GB
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		Mitsubishi	**Glyn**
V 3.11	416M_306.OSF	×	–[2)]
V 3.11	416M_307.OSF	×	×
≧ V 4.0	≧ 416M_401.OSF	×	–[3)]
≧ V4.24	≧ 416M_409.OSF	×	×

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BTS = Identification du système d'exploitation –
BTS = Identificazione del sistema operativo –
BTS = Identificación del sistema operativo

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