MOELLER

Hardware and Engineering

PS 4-141-MM1
PS 4-151-MM1

04/99 AWB 27-1266 GB
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See modifications list on page II

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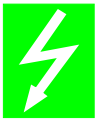

Caution!

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 27-1266 GB

Edition date	Page	Description	New	Modification	Omitted
04/99	gen.	Sucosoft S 30-S4			×
		AWB 27-1185/1186			×
	5	Hardware and software requirements		×	
	45	Slave address		×	
	65	First instructions		×	
	65	Copying programs on Flash memory			×
	81	EMC: RFI, Surge		×	

Contents

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About this Manual

Documentation for the PS4-150

The Documentation for the PS4-141-MM1 and PS4-151-MM1 (referred to below as PS4) is subdivided into four manuals with the following topics:

- Hardware and engineering
- User interface for the programming software
- Programming
- Training guide

Hardware and engineering manual
The "Hardware and engineering" manual explains how to install and configure the PLC and the settings that can be made on the PLC.

How to configure and set the PLC parameters in the topology configurator of the Sucosoft S 40 programming software is described in the "Software configuration" chapter.

The "Slave addressing" chapter defines the general syntax rules for addressing the stations in a Suconet K network.

The "Tests/commissioning/diagnostics" chapter provides an overview of the possible error and diagnostic messages and their significance.

Manual for user interface for the programming software
The PS4-150 is programmed using version 3.0 or higher of the Sucosoft S 40 programming software (Windows, IEC 1131).

The user interface for the software is described in the manual AWB 2700-1305 GB.

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Programming manual
Information on programming the PS4-150 is contained in the “Language elements of the PS4-150/-200/-300 and PS416” manual (AWB 2700-1306 GB).

Training guide
The Training guide AWB 27-1307 GB uses practical examples to illustrate the key functions of the Sucosoft S 40 software.

Symbols

The symbols in this manual have the following meaning:

Draws your attention to interesting tips and additional information

Warning!
Warns of the possibility of damage. The product, anything in the immediate vicinity and data may be damaged.

Caution!
Warns of the possibility of severe damage. The product, anything in the immediate vicinity and data may be severely damaged or totally destroyed. There is also a risk of injury or even death.

▶ Indicates handling instructions

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1 PS 4-150 Compact PLCs

Hardware and software requirements

To program the PS4-150 you need a PC (IBM or IBM-compatible) with

- a Pentium processor
- a Windows 95, Windows 98 or Windows NT 4.0[1)] operating system
- 16 MB RAM (32 MB recommended)
- 3.5″disk drive/1.44 MByte and CD-ROM drive
- Hard disk with at least 50 MB free space; a temporary directory called C:\{_PS4_}.TMP is created and then deleted again during installation. This requires at least 250 KB free on drive C:
- Serial COM port
- Parallel printer port (LPT)
- VGA graphics card
- ZB 4-303-KB1 programming cable (connecting cable between the PC and PS4-150)

1) (Sucosoft 3.x is the last version supported by Windows 3.1x)

Features

The main features of the PS4-141-MM1 and PS4-151-MM1 compact PLCs are as follows:

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Table 1: Features of the compact PLCs

PS4-141-MM1	**PS4-151-MM1**
24 V DC power supply	115 to 230 V AC power supply
16 digital inputs 24 V DC	16 digital inputs 2 4V DC
14 digital outputs 24 V DC	8 relay outputs
2 analog inputs	2 analog inputs
1 analog output	1 analog output

Setup

Figure 1 and 2 provide an overview of the controls and indicators of the programmable controllers as well as the device connections.

Warning!
Always ground yourself before touching the PLC to protect the components against electrostatic discharge.

Legend for Figure 1:
① 24 V DC power supply
② High-speed counter input, 3 kHz
③ 16 digital inputs 24 V DC
④ Alarm input
⑤ Plug-in screw terminal
⑥ Status LEDs for digital inputs
⑦ 14 digital outputs 24 V DC/0.5 A; short-circuit-proof and overload-proof
2 analog inputs U_0, U_I (0 to 10 V)
1 analog output U_{10} (0 to 10 V)
24 V DC power supply for outputs
⑧ Status LEDs for digital outputs
⑨ Suconet K interface
⑩ Setpoint potentiometers P1, P2
⑪ Switch S1 for bus terminating resistors
⑫ Programming device interface (PRG)
⑬ Memory module (optional)
⑭ Status LEDs for PLC

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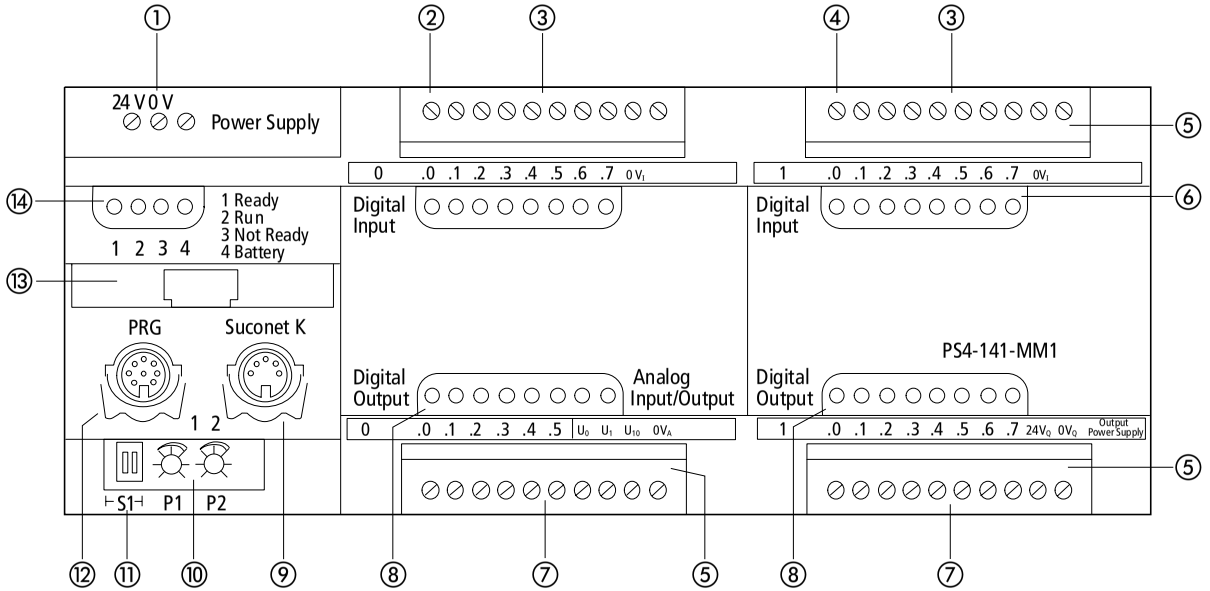

Figure 1: Setup of the PS4-141-MM1

Legend for Figure 2:

① 115 to 230 V AC power supply
② High-speed counter input, 3 kHz
③ 16 digital inputs 24 V DC
24 V DC auxiliary power source for internal inputs
④ Alarm input
⑤ Plug-in screw terminal
⑥ Status LEDs for digital inputs
⑦ 8 relay outputs (normally open) 24 V DC or 230 V AC
2 analog inputs U_0, U_1 (0 to 10 V)
1 analog output U_{10} (0 to 10 V)
⑧ Status LEDs for digital outputs
⑨ Suconet K interface
⑩ Setpoint potentiometers P1, P2
⑪ Switch S1 for bus terminating resistors
⑫ Programming device interface (PRG)
⑬ Memory module (optional)
⑭ Status LEDs for PLC

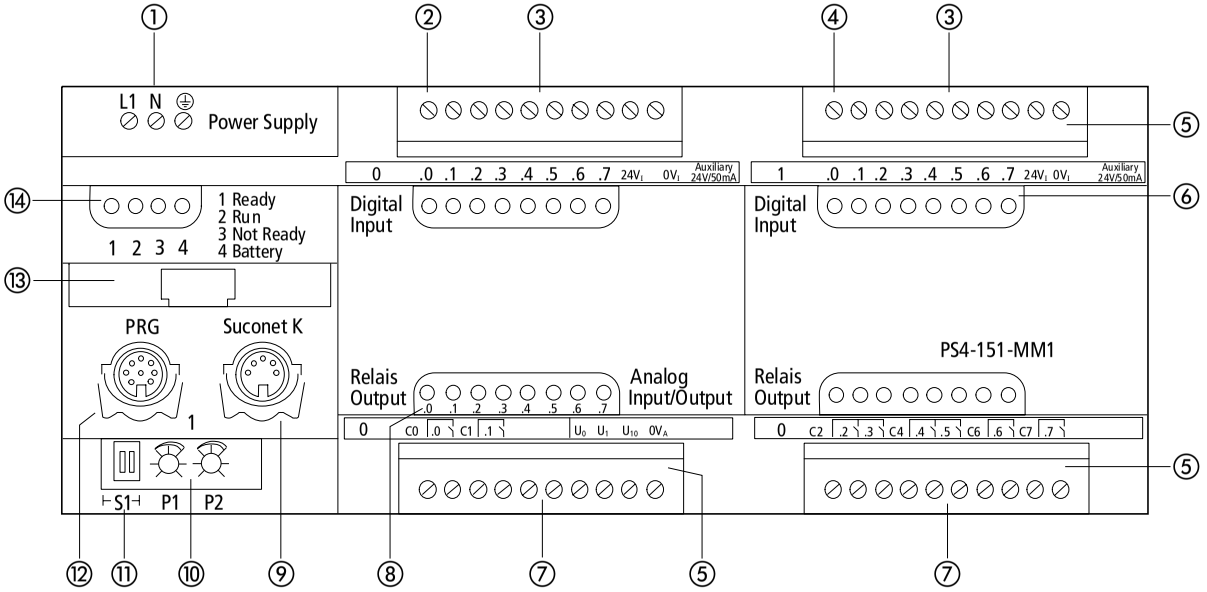

Figure 2: Setup of the PS4-151-MM1

Elements

The element numbers ① to ⑭ described in detail below refer to Figures 1 and Table 2.

① **Power supply unit**
The PS4-141-MM1 is operated with a rated voltage of 24 V DC. The power supply connection is protected against polarity reversal. The 24 V connection enables the PLC in the control cabinet to be supplied with voltages to industrial standard (IEC).

The PS4-151-MM1 is operated with a rated voltage of 115 to 230 V AC. An external power unit, involving entailing additional costs, is not required. In addition, the PLC can be used more easily in machines and plants destined for export, as no conversion measures are necessary.

② **High-speed counter input**
You can count pulses of up to 3 kHz via the digital input I 0.0, irrespective of the cycle time. The up counter is capable of processing square-wave pulses with a mark-to-space ratio of 1.

③ **Digital inputs**
Both the PLCs have 16 digital inputs. They are potentially isolated from the CPU. The inputs are designed for 24 V DC. The input delay of 0.1 ms ensures short response times (e.g. for direct I/O scans and alarm evaluations).

The inputs of the PS4-141-MM1 can be supplied with power separately.

The PS4-151-MM1 has two auxiliary power sources (24 V DC) for supplying the inputs. They supply a total of 100 mA. 30 mA can be drawn from one auxiliary, for example, and 70 mA from the other.

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④ **Alarm input**
The digital input I 1.0 allows a fast response to events fast, irrespective of the cycle time. You can use either the rising or the falling edge to evaluate these events.

⑥ **Status LEDs for digital inputs**
The physical states of the inputs are indicated by means of light-emitting diodes (LEDs).

⑦ **Digital/analog outputs, analog inputs**
Digital outputs:
The PS4-141-MM1 has 14 24 V/0.5 A digital outputs. They are potentially isolated from the CPU and protected against short-circuits and overloading. Outputs Q 0.6 and Q 0.7 can only be used as LEDs. Up to four outputs can be connected in parallel.

The PS4-151-MM1 has 8 relay outputs, which are also potentially isolated from the CPU. The outputs are isolated in six groups (four groups of one and two groups of two). They are capable of withstanding loads of up to 2 A, in other words high loads can be switched directly.

Inputs I 0.0 to I 0.7 and outputs Q 0.0 to Q 0.5 (of the PS4-141-MM1) or Q 0.0 to Q 0.7 (of the PS4-151-MM1) can be addressed either in bit or byte format with I/O commands
(see chapter 5 “Slave addressing”).

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All the inputs and outputs are wired via plug-in screw terminals.

Analog inputs/outputs:
Both the controllers have two analog inputs and one analog output. The signal range is 0 to 10 V. The resolution of the inputs is 10 bits (1024 increments), while that of the output is 12 bits (4096 increments).

The section called “Power supply” in the “Engineering” chapter contains a connection diagram of the analog inputs and outputs.

⑧ **Status LEDs for outputs**
The logical states of the outputs are indicated by means of light-emitting diodes (LEDs).

⑨ **Suconet K interface**
The RS 485 interface is potentially isolated from the CPU. It has the following functions:

Networking Suconet K stations (e.g. external modules EM4...)

Data exchange with partner devices that have a serial port (printers, terminals, etc.). This communication interface is used for process data acquisition, visualization, etc. Data for process control must not be exchanged here.

Programming networks for several PLCs via a PC (see section “Programming with Suconet K” in the “Operation” chapter).

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⑩ **Setpoint potentiometers**
You can set the two setpoint potentiometers P1 and P2 externally, in other words direct adjustment without the need for a programming device. The resolution is 10 bits (1024 increments).

⑪ **Switch S1 for bus terminating resistors**
You can set the bus terminating resistors for the first and last physical stations with switch S1.

⑫ **Programming device interface (PRG)**
The RS 232 interface is potentially isolated from the CPU. It has the following functions:

Programming the PLC via the PC

Data exchange with partner devices provided with a serial interface (printers, terminals etc.). This communication interface is used for process data acquisition, visualization, etc. Data for process control must not be exchanged here.

⑬ **Memory modules**
The PS4-150 has an internal, battery-backed, 32 Kbyte RAM. This RAM is subdivided into a data memory and a user program memory.

Up to 24 Kbytes are available for the user program. This allocation is dynamic: if the data memory requires more than 8 Kbytes, the size of the user program memory is reduced accordingly.

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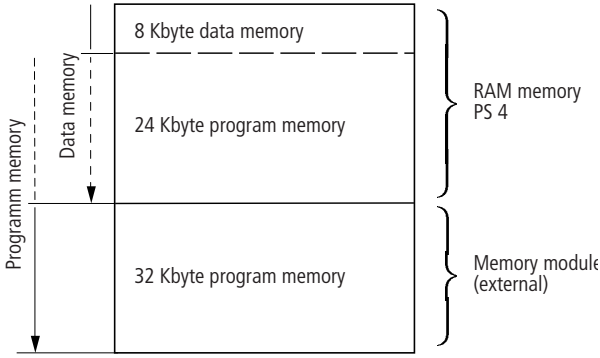

Figure 3: Dynamic memory allocation

The storage capacity of the internal RAM can be expanded with plug-in memory modules. The available modules are as follows:

The 32 Kbyte RAM module expands the user program memory. Up to 56 Kbytes can then be allocated to this memory.

The 128 Kbytes flash module is subdivided into a 64 Kbyte backup memory (the user program is stored without being reset in the event of a voltage failure) and a 64 Kbyte memory for recipe data, for example.

The 160 Kbytes combination module integrates all the features of the other two memory modules.

⑭ **Status LEDs for PLC**
The PLC states are indicated by means of the "Ready", "Run", "Not Ready" and "Battery" LEDs (see chapter entitled "Tests/startup/diagnostics").

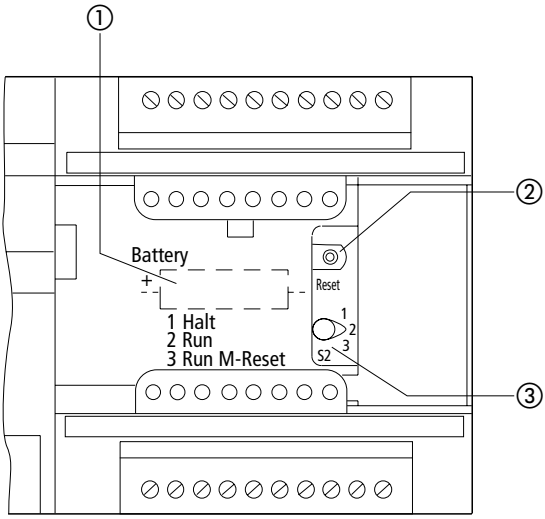

Figure 4: Controls and LEDs on the PS 4-150 (with the housing flap open)

① Back-up battery
② Reset button
③ Operating mode selector switch

① Back-up battery
The battery backs up the internal RAM and the real-time clock.

Warning!
The power supply must be switched on when you replace the back-up battery, otherwise programs and data will be lost.

②, ③ **Operating mode selector switch/reset button**

The operating mode selector switch is used to select the “Halt” (stop), “Run” and “Run M reset” operating modes. The selected mode is activated when you press the reset button. The operating states are described in detail in the “Operation” chapter.

Real-time clock

The PLCs are equipped with a battery-backed realtime clock. It facilitates time-controlled switching of machines and plants.

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2 Engineering

Electromagnetic compatibility (EMC)

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

Connections

Screened data and signal cables

- ▶ Route screened data and signal cables on the left and the right of the device along the shortest possible distance and connect the screen braid to the ground terminal using a low-impedance connection and large contact areas (See Fig. 5, item ①).
- ▶ Connect the screen braid with the metal sleeve of the plug connector (DIN plugs) ③.
- ▶ Insulate the end of the screen braid as close as possible to the signal cable entry ②.

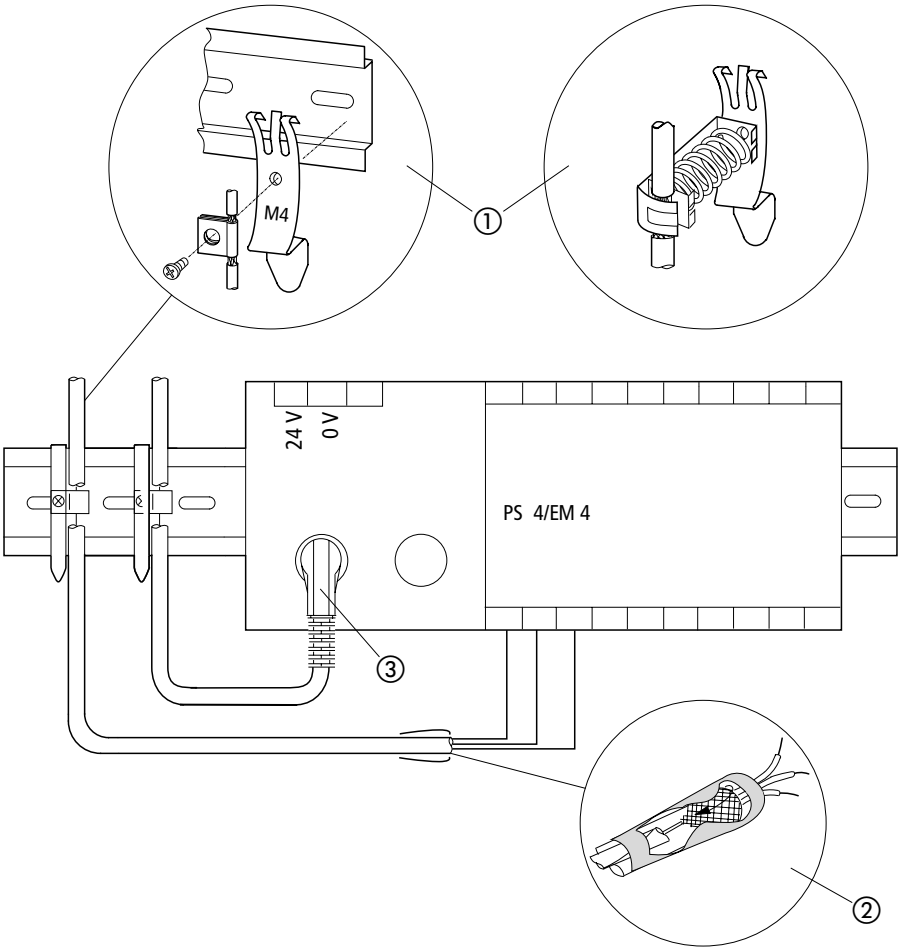

Figure 5: Screen connection to reference potential surface (here for PS 4-141-MM1, likewise for PS 4-151-MM1)

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Overview

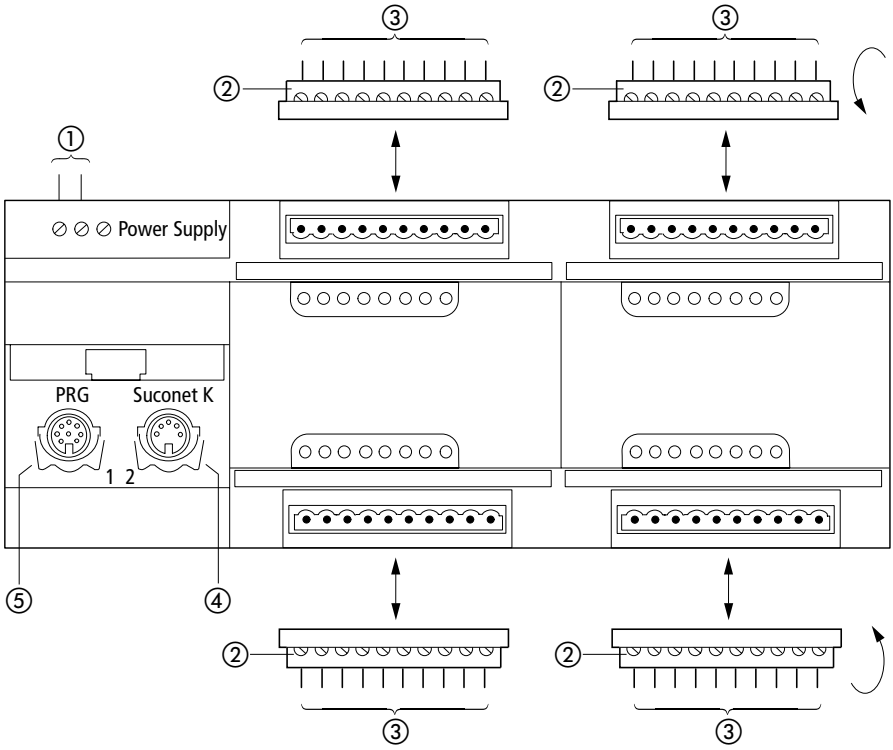

Figure 6: Connection overview

① Screw terminals:
24 V DC power supply for PS4-141-MM1,
115 to 230 V AC power supply for PS4-151-MM1
Conductor cross-sections:
Flexible with ferrule 0.22 to 25 mm²
Solid 0.22 to 2.5 mm²

② Plug-in screw terminal

③ Conductor cross-sections:
Flexible with ferrule 0.22 to 1.5 mm²
Solid 0.22 to 2.5 mm²

④ Suconet K interface (RS 485)

⑤ Programming device interface (RS 232)

Programming device interface

Pin assignment

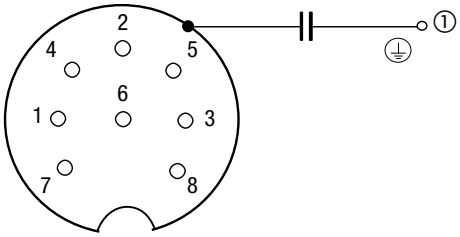

Figure 7: Pin assignment of the programming device (PRG) interface (left-hand socket, top view)

① The socket in the housing is connected via a capacitor to the earth terminal of the PS4-150 power supply.

PIN 1	Not assigned
PIN 2	RxD
PIN 3	0 V of interface
PIN 4	Not assigned
PIN 5	TxD
PIN 6 – 8	Not assigned

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Connecting the Programming device (PC)

▶ Connect the PC to the PRG interface (left-hand socket) of the PS 4-150 using the ZB 4-303-KB1:

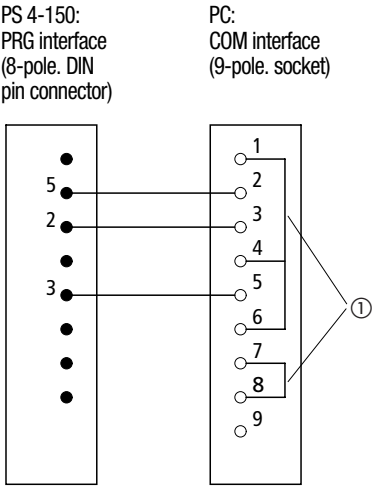

Figure 8: Pin assignment of the ZB 4-303-KB1 programming cable

① Jumpers

Warning!
In order to avoid Potential equalization currents between the PLC and PC, devices attached to the PRG and Suconet K sockets must have the same earth potential. If the potentials differ, the PC interface may be destroyed.

If identical earth potentials cannot be achieved, either connect the PC via an isolating transformer or use a laptop with an internal storage battery.

Suconet K interface

Pin assignment

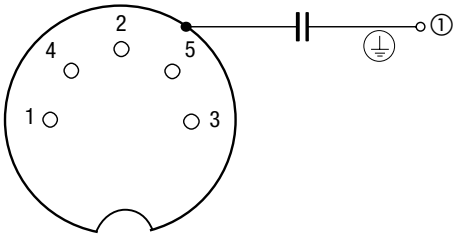

Figure 9: Pin assignment of the Suconet K interface (right-hand socket, top view)

① The socket in the housing is connected via a capacitor to the earth terminal of the PS4-150 power supply.

PIN 1	RS 485 data cable, Suconet K (TB/RB)
PIN 2	100 Ω potential equalization RS 485
PIN 3	Assigned internally
PIN 4	RS 485 data cable, Suconet K (TA/RAE)
PIN 5	Assigned internally

Connection to the Suconet K field bus

▶ Use the bus cable KPG 1-PS3 to connect additional Suconet K stations (PS4, EM4) to the compact PLC.

5-pole DIN plug (pins)	5-pole DIN plug (pins)
1	1
4	5

▶ Connect the screen of the Suconet K data cable both to the potential equalization bar and to the housing of the plug connector.

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Setting the bus terminating resistors

▶ Set the bus terminating resistors on the module for the first and last physical stations on a line. The two S1 switches must be in the “ON” position for this purpose. These switches must set to the “OFF” position for all other bus stations.

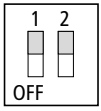

Figure 10: Bus terminating resistors active

The two S1 switches must be set to the same position, in order for the PLC to function correctly.

Arrangement of the control cabinet

The arrangement of the components in the control cabinet has a significant influence on the smooth running of the machine or plant. When planning, designing and installing a device, ensure that the power section and the control section are separated from one another. The power section includes:

Contactors
Coupling modules
Transformers
Frequency inverters
Current converters
DC power supply units

In order to effectively eliminate electromagnetic interference, we recommend subdividing the control cabinet into sections according to the different power and interference levels. Simple partitions are often sufficient to reduce interference in small control cabinets.

Ventilation

A minimum clearance of 5 cm (2″) must be allowed between the components and the ventilation slots in the housing, in order to ensure that the PS4-150 is adequately ventilated. The values specified in the technical data (see Appendix) must be observed.

Device arrangement

The PS4-150 must be installed horizontally in the control cabinet.

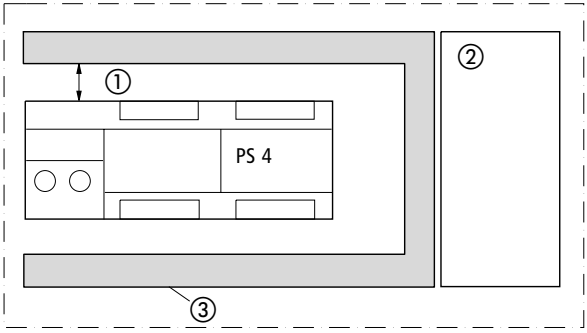

Figure 11: Horizontal installation

① At least 5 cm (2″) clearance
② Power section
③ Cable duct

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Power supply

The next few pages show the relevant circuit diagrams:

Figure 12:
Separate power supply for the PS4-141-MM1 and the digital inputs, with a separate power supply for the outputs with earthed operation.

Figure 13:
Common power supply for the analog transmitter and actuator, with a separate power supply for the PS4-141-MM1.

Figure 14:
Wiring for a 230 V AC power supply for the PS4-151-MM1, relay contacts with different potentials, 230 V AC and 24 V DC; 24 V DC inputs via an external power supply unit.

An insulation monitoring device must be installed if the supply voltage is not earthed (EN 60204, Part 1 and VDE 0100, Part 725). The 24 V DC power supply must be a safety extra-low voltage to IEC 364-4-41 for potential-free operation.

Legend for Figure 12:

① Main switch
② Circuit-breaker for power supply units
③ Power supply unit with screen winding for supplying the system
④ Power supply unit for supplying the inputs
⑤ Power supply unit for supplying the outputs
⑥ Miniature circuit-breakers
⑦ Connect top-hat rail with PE; connect top-hat rail with low-impedance connection to mounting plate.

1) with unearthed control circuits install an additional insulation monitoring device (DIN EN 60 204, Part 1, and VDE 0100, Part 725).

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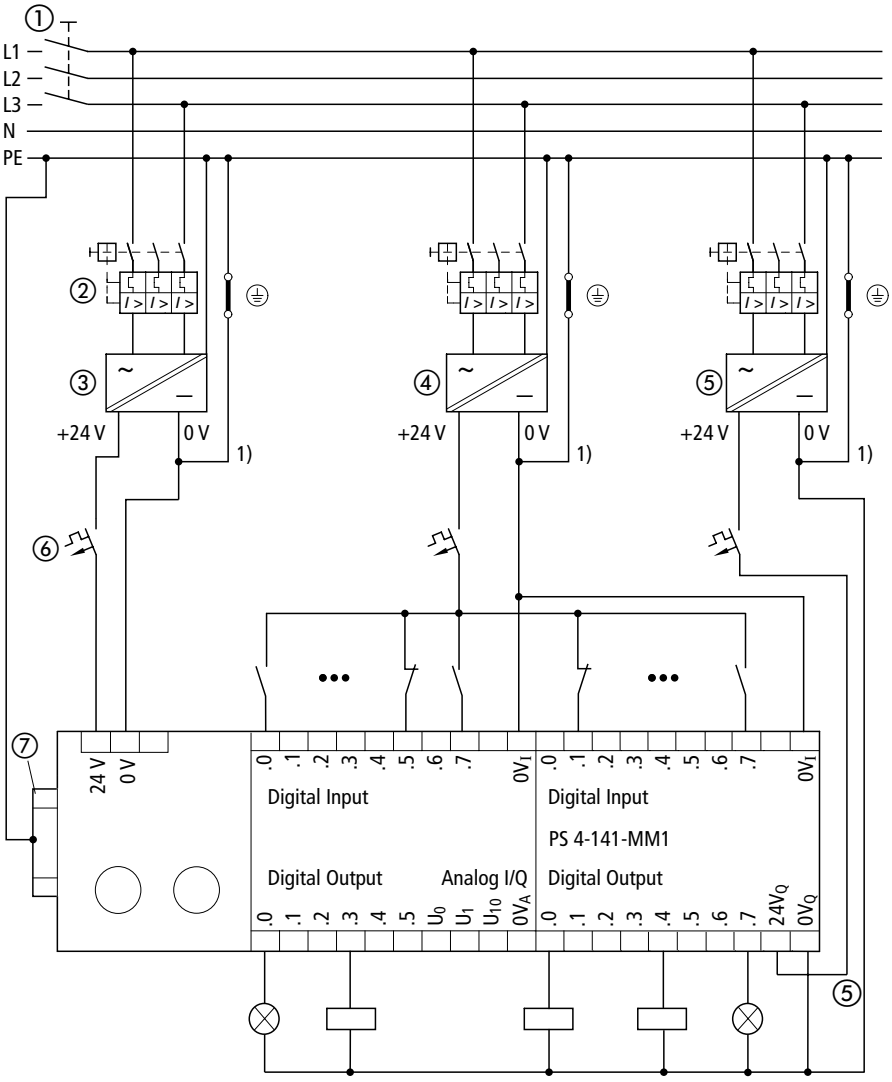

Figure 12: Separate power supply for the PS4-141-MM1 and the digital inputs, with a separate power supply for the outputs in earthed operation

Legend for Figure 13:

① Main switch
② Circuit-breaker for control transformer
③ Power supply unit with screen winding
④ Miniature circuit-breaker
⑤ Power supply unit for supplying analog transmitter and actuator
⑥ Analog transmitter
⑦ Actuator
⑧ Twin-level terminal block
⑨ Terminal with PE connection
⑩ Connect top-hat rail to PE; top-hat rail low-impedance connection to the mounting plate.

1) With unearthed control circuits use an insulation monitoring device (DIN EN 60 204, Part 1, and VDE 0100, Part 725).

Maintain a clearance of at least 30 cm (12″) between the analog cable and the power supply cables.
Do not lay the 0 V of the analog signals together with the 0 V of the PS4-150 and the 0 V of the digital inputs/outputs.
Ensure that the analog actuators and transmitters are potentially isolated. If potential isolation is not sufficient, the manufacturers of the analog transmitters and actuators can provide suitable filters.

The analog transmitter and the actuator have identical connections on the PS4-151-MM1.

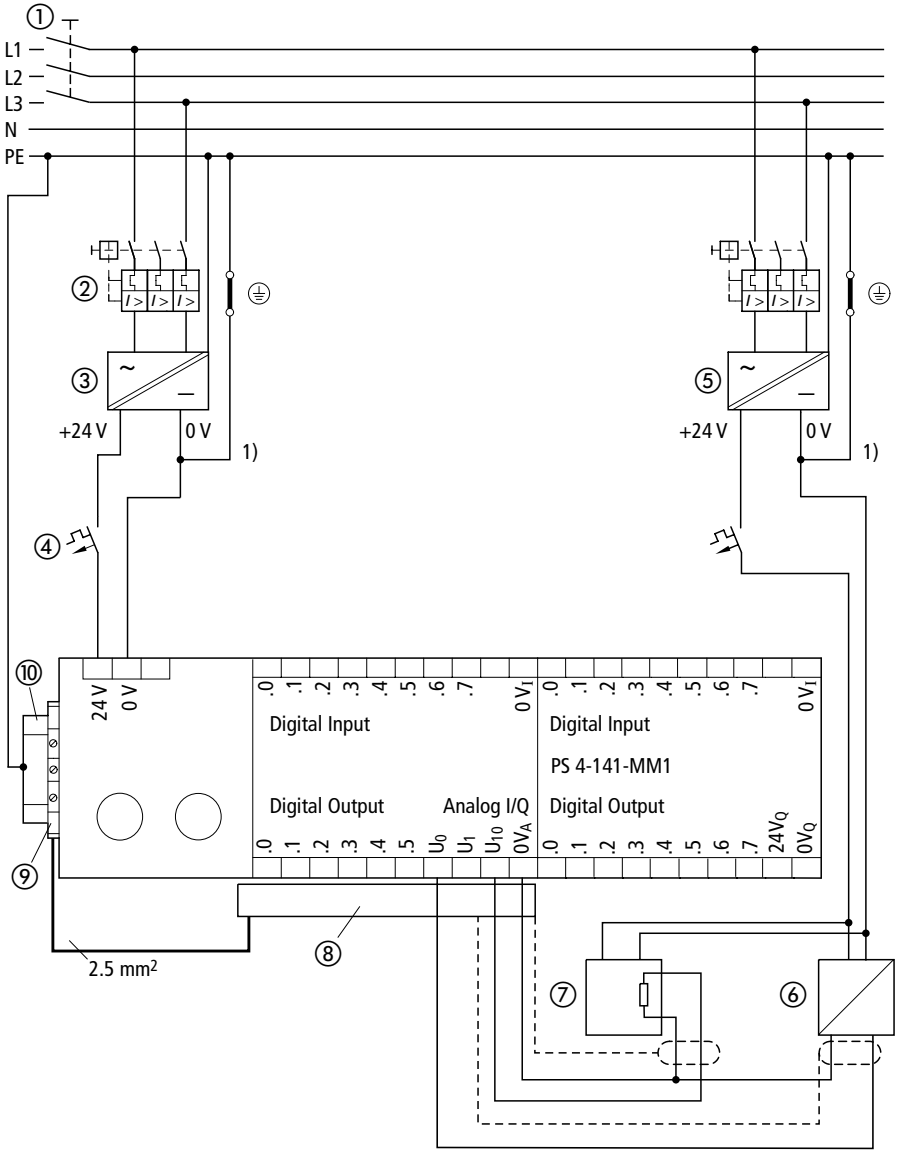

Figure 13: Common power supply for the analog transmitter and actuator, with a separate power supply for the PS4-141-MM1

Legend for Figure 14:

① Main switch
② Miniature circuit-breaker
③ Proximity switches
④ 230 V AC relay outputs must be connected to the same phase (e.g. L1) (max. potential difference 25 0V AC)
⑤ 4 A fast fuse for protecting relay contacts
⑥ Terminal with PE connection
⑦ Connect top-hat rail with PE; connect top-hat rail with low-impedance connection to mounting plate.

1) DIN EN 60 204, Part 1 stipulates the use of a control transformer.

2) With unearthed control circuits use an insulation monitoring device (DIN EN 60 204, Part 1, and VDE 0100, Part 725).

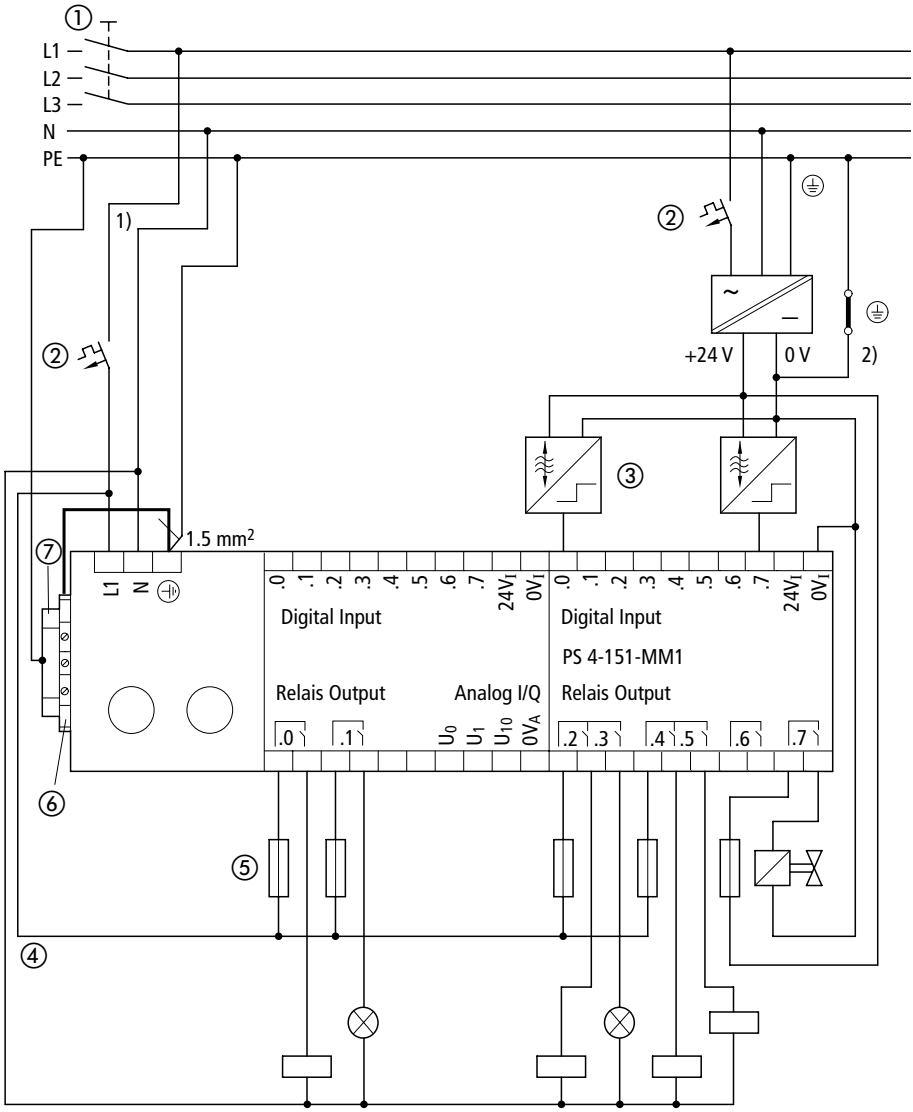

Figure 14: Wiring for a 230 V AC power supply of the device, relay contacts with different potentials: 230 V AC and 24 V DC; 24 V DC inputs via an external power supply unit

Interference protection

Cabling and wiring

Cables come under the following categories:

Power cables (e.g. cables carrying heavy current or cables to current converters, contactors or solenoid valves)

Control and signal cables
(e.g. digital input cables)

Measuring and signal cables
(e.g. field bus cables)

Power, control and signal cables must always be laid as far apart from one another as possible, in order to prevent capacitive and inductive interference. If separate cabling is not possible, the cables that represent the potential source of interference must be screened without fail.

Ensure that the cabling both inside and outside the control cabinet is laid correctly, in order to keep interference to a minimum:

- Avoid long, parallel cable sections with different power ratings.
- Always lay AC cables separately from DC cables.

  Observe the following minimum clearances:

  At least 10 cm (4″) between power cables and signal cables.At least 30 cm (12″) between power cables and data/analog cables.
- Make sure that the supply and return cables belonging to each circuit are laid together. The opposing direction of current flow means that the sum of all the currents is zero, so that any fields which are produced are compensated.

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① Cover
② Communication cables
③ Cable duct
④ Measuring cables, analog cables
⑤ Control cables
⑥ Power cables
⑦ Continuous partition

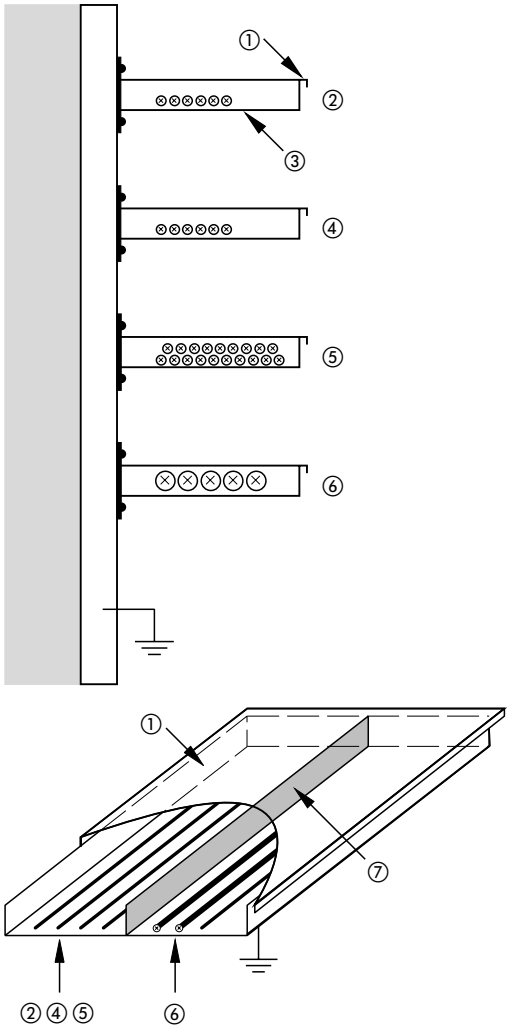

Figure 15: Separate ducts for power and signal cables

Suppressor circuits for interference sources

▶ All suppressor circuits must be installed as close as possible to the interference sources (contactors, relays, valves).

Suppressor circuits should be provided for all switched inductances.

Screening

▶ Use screened cables for the programming device interface (PRG) and the Suconet K interface of the PS4-150.

General rule: the lower the coupling impedance, the better the screening effect. The screen is then able to carry high discharge currents.

If you use the Suconet K or PRG interface, connect the screen of the cable to the housing of the plug connector. The housing of the socket is connected via a capacitor to the earth terminal of the power supply.

Lightning protection

External lightning protection

All cables which are laid between two different buildings must be screened. Metal conduits are recommended for this purpose. Protective elements against overvoltage, such as varistors or other types of lightning arrester, should be used for signal cables. The cables must be protected at the point at which they enter the building, or at the latest at the control cabinet.

Internal lightning protection

Internal lightning protection includes all measures that reduce the effects of the lightning current and its electrical and magnetic fields on the metal installations and electrical systems inside a building. These measures comprise:

- Lightning protection potential equalization
- Screening
- Overvoltage protection devices

Further information on this subject is provided in the TB 27-001-GB manual from Moeller entitled “Electromagnetic Compatibility (EMC) of Automation Systems”.

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3 Mounting

Mounting on a top-hat rail

Proceed as follows to mount the PLC on a top-hat rail:

- ▶ Place the module on the top-hat rail so that the top edge of the rail latches into the groove.
- ▶ Insert a screwdriver ① into the slot of the sliding clip and lever the clip down ②.
- ▶ Press the module onto the top-hat rail ③.
- ▶ Release the sliding clip. It will then snap into position behind the top-hat rail.
- ▶ Check that the module is seated firmly.

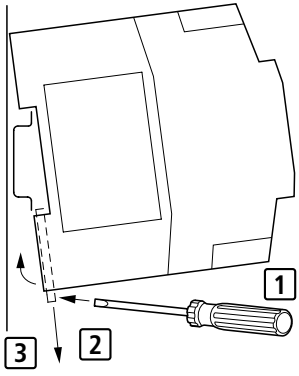

Figure 16: Mounting on a top-hat rail

Mounting on feet

Proceed as follows to mount the PLC on feet:

- ▶ Press in the feet so that they snap into position ①.
- ▶ Check that the PLC is seated correctly. The lug must latch in the hole ②.
- ▶ Fasten the feet to the mounting plate with M4 screws ③.

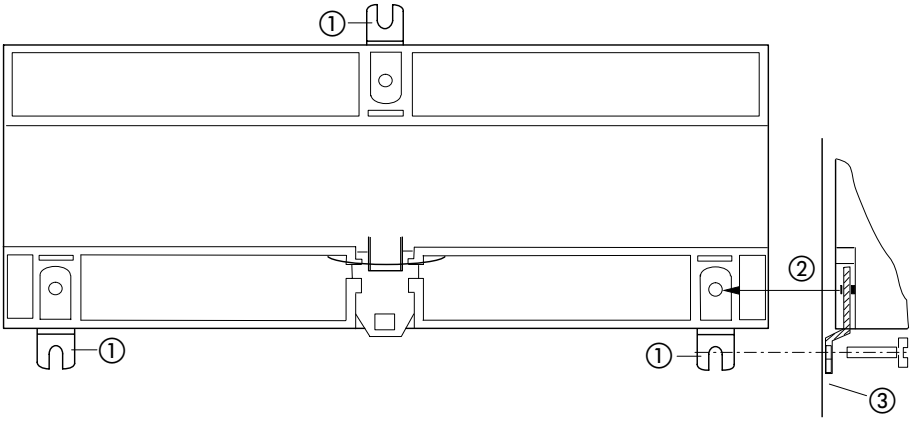

Figure 17: Mounting on feet

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4 Software configuration

General

You can configure the PLCs and all the other components you need for your application with the Sucosoft S 40 Topology Configurator. These components are as follows:

Master PLC

Network stations (slaves for expanding the remote I/O or intelligent slaves)

Local expansion modules (LE4-...)

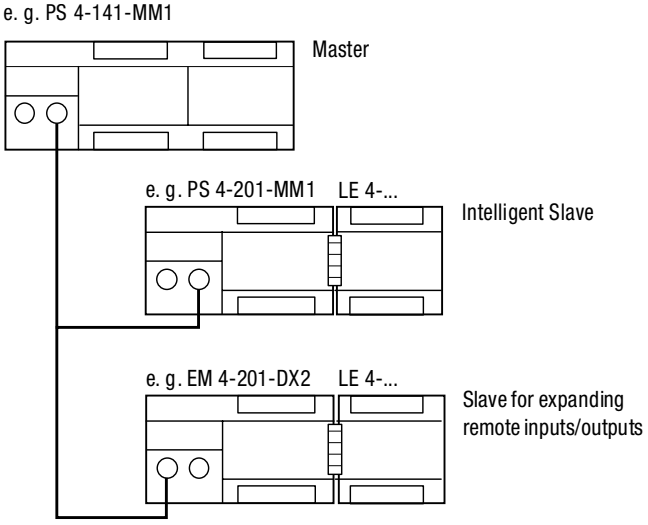

Figure 18: Components of a topology configuration

The procedure for configuring a topology is described below with the aid of an example.

Topology configuration procedure

Each Suconet K line in an automation system is assigned to a master. All the stations on the master line are slaves. A configuration must be defined for every station with its own CPU, i.e. for the master itself and for all intelligent slaves.

Configuration of the master

The master configuration defines the slaves that are connected to the master line. The slaves must be classified according to whether they have their own CPU (intelligent slaves) or not (slaves for expanding the remote I/O):

With **intelligent slaves** (e.g. PS4-201-MM1), the configuration of the master only defines the device itself, and not any local expansion modules that are connected to it (LE 4...).

With **slaves for expanding the remote I/O**, the connected local expansion modules (modules 1 to 6) must be specified as “network stations” in the master configuration file in addition to the base module (module 0).

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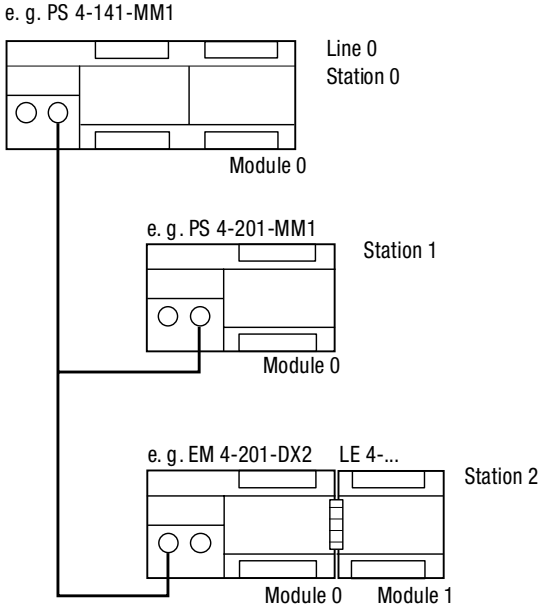

Figure 19: Master configuration

If Suconet K1 stations have local expansion modules, you need only specify the base module (module 0) as a “network station” in the master configuration file. The local expansion modules are not configured.

Configuration of the intelligent slave

All the local components of the intelligent slave are configured in the configuration file for this slave. Their line and station numbers are always 0. The modules are numbered sequentially.

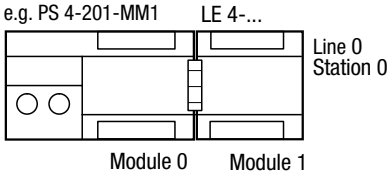

Figure 20: Slave configuration

Configuration of the slaves for expanding the remote I/O

The slaves for expanding the remote I/O are configured in the master configuration file.

Configuring and parameterizing stations

The configuration steps for the PS4-150 PLCs described here differ according to the functions the stations must perform:

Master

Intelligent slave

SCO

"SCO" stands for serial communication. This mode enables the PS4-150 to exchange serial data with a partner device via its Suconet K interface.

The table below shows how the various types of station can be configured and parameterized, depending on their functions. The fields which are not self-explanatory are subsequently described in more detail.

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Table 2: Station configuration and parameters

	Master	**Intelligent slave**		**SCO**
		(m)	(s)	
Line	0	1	0	–
Station	0	1 to 8	0	–
Module	0	0	0	–

(m) = Configuration on master side
(s) = Configuration on slave side

Table 3: Station parameters

	Master	**Intelligent slave**		**SCO**
		(m)	(s)	
Bus status	Master	–	Slave	SCO
Baud rate (Kbaud	187./375	–	–	0.3 to 19.2
Protocol	Suconet K/K1 (K1: 187.5 Kbaud only)	–	–	Start bit Stop bit Data bit Parity
Slave address	–	–	2 to 9	–
CRC	Optional for slaves	Optional via master	–	–
Input data (receive bytes)	–	a	c	–
Output data (send bytes)	–	b	d	–
Remote control	–	–	Optional	–

a – d = See description of input/output data below

Line: Number of the network line to which a station is connected. The master is always connected to line 0 and the slaves to line 1

Station: Number of the station connected to a line

Module: Number of the module belonging to a station

Baud rate: Select 375 kBaud as the data transfer rate if only Suconet K stations are connected to the Suconet K line. The internal plausibility checks of Sucosoft S 40 will set the baud rate of the line automatically to 187.5 kBaud as soon as Suconet K1 stations are configured.

The following baud rates are available for serial communication via the SCO chip: 300, 600, 1200, 2400, 4800, 9600, 19200 baud.

Protocol: The following interface parameters can be defined for exchanging data serially with a partner device via the Suconet K interface. These settings must be identical to those on the partner device.

Table 4: Interface parameter settings for serial communication via the RS 485 interface

Start bit	Stop bit	Data bit	Parity
1	1	8	–
1	1	8	Even
1	1	8	Odd
1	2	8	–

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Slave address:	The station address must be entered here in order to configure an intelligent slave. The station address is always 1 higher than the station number (e.g. slave 1 has address 2).
CRC:	Method of enhancing data transmission integrity. You should activate CRC (ON) if you attach greater importance to data integrity than to short response times.
Remote control:	If this parameter is active (ON), the intelligent slave always has the same status as the master. If the master changes from the “Halt” (stop) state to the “Run” state, for example, or vice versa, the intelligent slave changes its state accordingly. The operating mode selector switch of the intelligent slave must not be set to “Halt” (stop), however.
Input data, master side (a):	Number of bytes which the master must receive from the intelligent slave. This number must be identical to the number of output bytes (d) defined in the configuration of the intelligent slave.
Output data, master side (b):	Number of bytes which the master must send to the intelligent slave. This number must be identical to the number of input bytes (c) defined in the configuration of the intelligent slave.
Input data, slave side (c):	Number of bytes which the intelligent slave must receive from the master. This number must be identical to the number of output bytes (b) defined in the configuration of the master.
Output data, slave side (d):	Number of bytes which the intelligent slave must send to the master. This number must be identical to the number of input bytes (a) defined in the configuration of the master.

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Limit values for send and receive bytes

The Suconet K protocol allows data with a variable length to be transferred cyclically, whereby the number of bytes is dependent on the settings for the master and the intelligent slave (see below). The data length for communication with the slaves for expanding the remote I/O is defined by the slave type. In the case of intelligent slaves, on the other hand, you can specify the number of send and receive bytes yourself. The following limit values must not be exceeded, however:

Table 5: Limit values for send and receive bytes for the PS4-150

Send/receive bytes	Master	Slave
Max. no. of send bytes (output)	128	78
Max. no. of receive bytes (input)	128	78
Max. no. of send and receive bytes (output/input)	128	78

The maximum number of receive bytes (input bytes) also includes the diagnostics bytes of the stations and of any local expansion modules which are connected to the same line.

Defining input/output data

- First of all you must decide how many bytes an intelligent slave is to send to the master and specify this number as the “Input data” parameter in the configuration on the master side. When you later define the configuration on the slave side, you must specify the same number for the “Output data” parameter.
- Now decide how many bytes the master is to send to the intelligent slave and specify this number as the “Output data” parameter in the configuration on the master side. When you later define the configuration on the slave side, you must specify the same number for the “Input data” parameter.

Configuration example

This example requires device configurations for the master (device A) and the intelligent slaves (devices B and C).

Note that intelligent slaves are configured twice - once in the master's configuration and once in the slave's own configuration.

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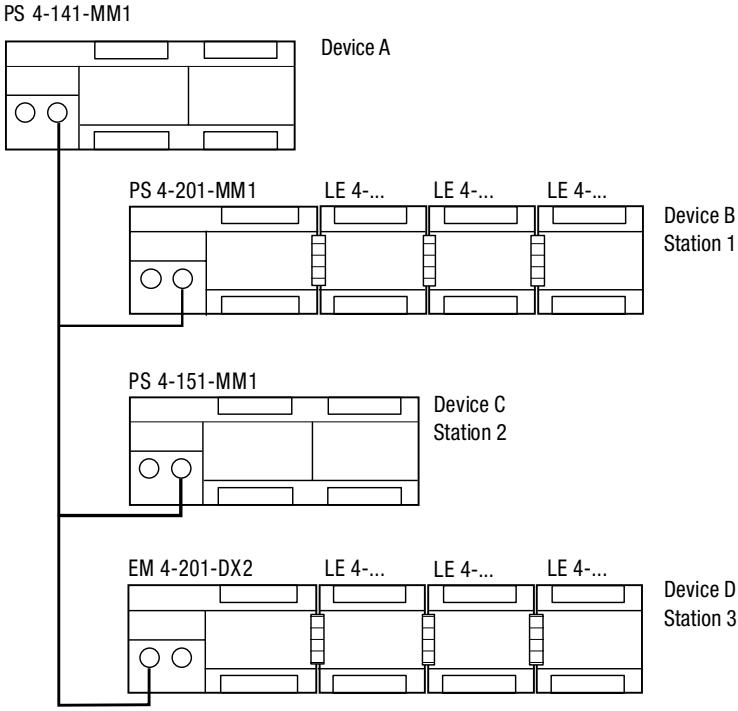

Figure 21: Configuration example

Master: Device A
Intelligent slaves: Devices B and C
Slave for expanding the remote I/O: D

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The stations shown in the configuration example are configured as follows:

Configuration of device A

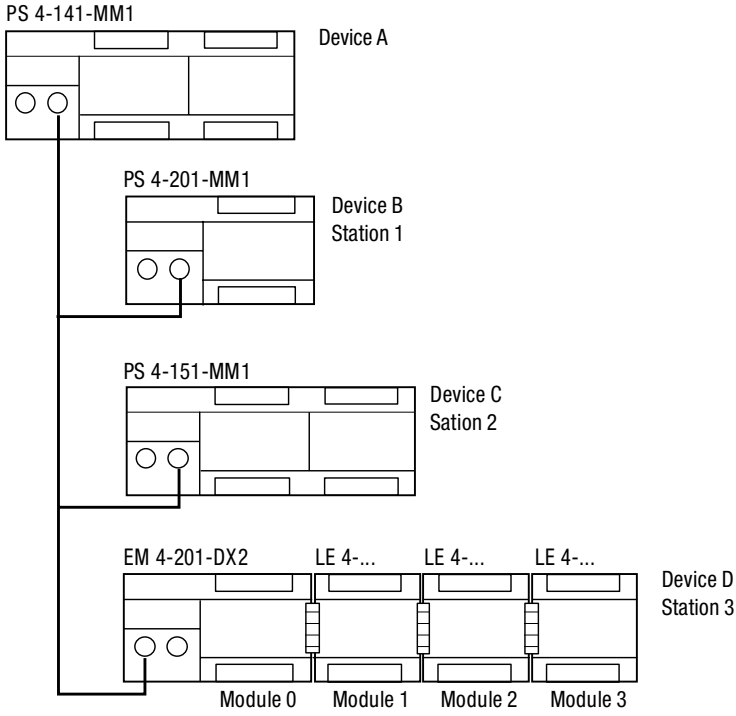

Figure 22: Configuration of device A

Table 6: Configuration of device A

Device	Type	Line	Station	Module	Parameter
A	PS4-141-MM1	0	0	0	Bus status: master Baud rate: 375 Kbd CRC status for slaves 1 to 3: OFF
B	PS4-201-MM1	1	1	0	Input data: 20 Output data: 10
C	PS4-151-MM1	1	2	0	Input data: 40 Output data: 38
D	EM4-201-DX2	1	3	0	–
	1st LE4	1	3	1	
	2nd LE4	1	3	2	
	3rd LE4	1	3	3	

Configuration of device B

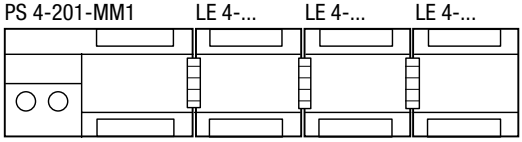

Figure 23: Configuration of device B

Table 7: Configuration of device B

Device	Type	Line	Station	Module	Parameter
B	PS4-201-MM1	0	0	0	Bus status: slave Slave address: 2 Input data: 10 Output data: 20 Remote control: OFF
	1st LE4	0	0	1	–
	2nd LE4	0	0	2	
	3rd LE4	0	0	3	

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Configuration of device C

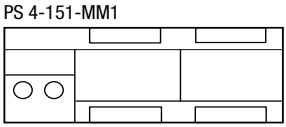

Figure 24: Configuration of device C

Table 8: Configuration of device C

Device	Type	Line	Station	Module	Parameter
C	PS4-151-MM1	0	0	0	Bus status: slave Slave address: 3 Input data: 38 Output data: 40 Remote control: OFF

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5 Slave Addressing

Slaves for expanding remote I/O

The PS4-150 master PLC and the slaves for expanding the remote I/O can communicate with one another using the Suconet K/K1 protocol. The protocol is selected by the master automatically according to the capabilities of the slaves. It is not necessary to parameterize the send or receive data length in the Topology Configurator. Suconet K/K1 selects the appropriate telegram length and automatically addresses the relevant data ranges in your application.

You can thus access remote input/output operands just as easily as local operands.

Table 9: Operand addressing of the slaves for expanding remote I/O

Communication data					
Operands	**Line**	**Station**	**Module**	**Words/bytes**	**Bits**
I/Q	0, 1 (0 = master)	1 to 8 (0 = master)	0 to 6	0, 1, 2, ...(byte) 0, 2, 4, ...(word)	0 to 7
IB/QB IAB/ QAB ICB					_
IW/QW IAW/ QAW/ ICW					
Status/diagnosis					
IS	0, 1 (0 = master)	1 to 8 (0 = master)	0 to 6	0, 1, 2, ...(byte)	0 to 7
ISB					

The RD/SD syntax must be used for certain types of slaves for expanding the I/O, instead of the I/Q syntax described here. Please refer to the table in the Appendix for the correct addressing for each station type.

The general syntax rule is as follows:

```
Operand-data type-line-station-module-byte-bit
```

Example
You wish to scan the inputs of slaves 1 and 2 marked in the diagram below.

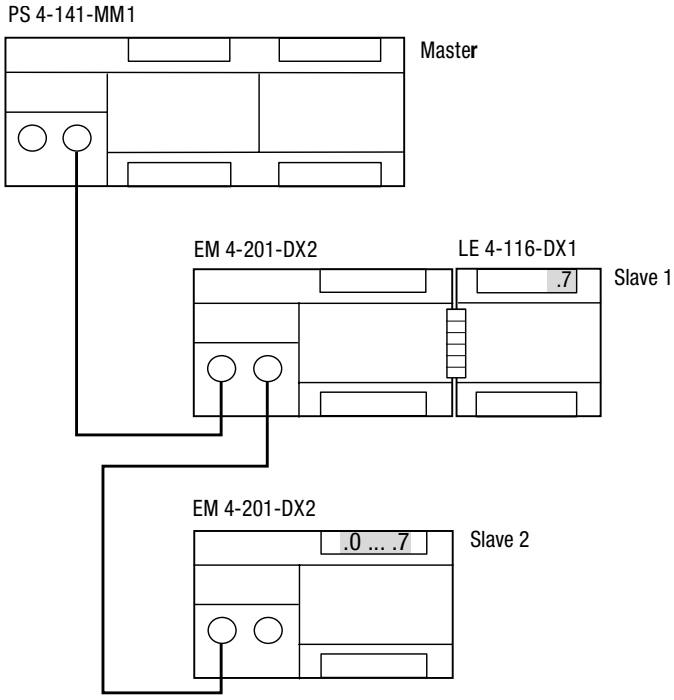

Figure 25: Configuration example for scanning the inputs of remote slaves

You can derive the syntax for scanning the inputs from the configuration.

Table 10: Syntax for addressing the slaves for expanding remote I/O

IL program in ...	Data flow	Operand	Data type	Line	Station	Module	Byte/ word	Bits	Syntax S 40
...Master	Master ↑ Slave 1	I	Bits	1	1	1	0	7	LD %I1.1.1.0.7
	Master ↑ Slave 2	IB	Byte	1	2	0	0	–	LD %IB1.2.0.0

Intelligent slaves

When the master and an intelligent slave communicate with one another, the application program determines which data is exchanged. You cannot access the input/output operands directly. You must therefore address the communication data using the RD/SD syntax.

The table below shows the operands which are available when the PS4-150 master PLC is running with intelligent slaves.

Table 11: Operand addressing of intelligent slaves

Communication data					
Operands	**Line**	**Station**	**Module**	**Words/bytes**	**Bits**
RD/SD	0, 1 (0 = master)	1 to 8 (0 = master)	0 to 6	0, 1, 2, ...(byte) 0, 2, 4, ...(word)	0 to 7
RDB/SDB					–
RDW/SDW					
Status/diagnosis					
IS	0, 1 (0 = master)	1 to 8 (0 = master)	0 to 6	0, 1, 2, ...(byte)	0 to 7
ISB					

RD = Receive Data; defined receive data
SD = Send Data; defined send data

The general syntax rule is as follows:

```
Operand-data type-line-station-module-byte-bit
```

Example
The PS4-150 (master) exchanges word data with an intelligent slave. You can define the number of send and receive bytes when you parameterize the stations in the Sucosoft S 40 Topology Configurator (see chapter 4, “Software Configuration”).

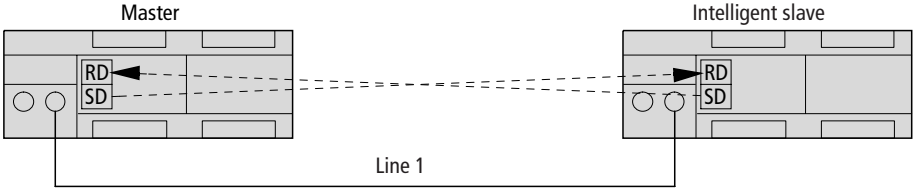

Figure 26: Configuration example for sending and receiving communication data to/from an intelligent slave

You can derive the syntax for sending and receiving the data from the configuration.

Table 12: Syntax for addressing intelligent slaves (data type: word)

IL program in ...	Data flow	Operand	Data type	Line	Station	Module	Byte/ word	Bits	Syntax S 40
...Master	Master ← Slave Master → Slave	RDW/ SDW	Word	1	1	0	0	–	RDW1.1.0.0/ SDW1.1.0.0
...Slave	Slave ← Master Slave → Master	SDW/ RDW	Word	0	0	0	0	–	SDW0.0.0.0/ RDW0.0.0.0

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6 Operation

Power-up behaviour

After the power supply is switched on, the PS4-150 carries out its own system tests. The PLC then switches to the “Ready” or “Run” status if no hardware errors have been found.

The system test consists of the following routines:

- Memory test
- User program test

The results of the test are indicated by the “Ready”, “Run” and “Not Ready” LEDs. If the test is successful, these LEDs light up briefly when the power supply is switched on; if not, they blink.

The PLC's status depends on how the operating mode selector switch is set (see Table 13).

Shutdown behaviour

The power supply unit of the PLC detects when the power supply is switched off. Voltage dips of ≤ 10 ms can be bridged by the power supply unit. If a longer voltage dip occurs, the internal 5 V supply remains stable for at least a further 5 ms. This time is used by the microcontroller to save all the data required for a restart in the memory ranges provided for this purpose.

Operating states of the PLC

The PLC can be switched to the following operating states: “Run”, “Ready”, “Not Ready”.

Communication with the PC is possible in all three operating states. This allows, for example, the current status of the PLC and the real-time clock to be read at any time.

Ready

The “Ready” status has the following characteristics:

There is a user program in the PLC;

The user program is not running;

The outputs are reset and disabled.

The PLC is switched to the “Ready” status:

If the “Reset” button is pressed when the operating mode selector switch is set to “Halt” (stop);

After the power supply is switched on, if the operating mode selector switch is set to “Halt” (stop);

By means of the programming software on the PC;

In slave mode, if the master switches to the “Halt” (stop) status and you have set the “remote control” function to ON in the Sucosoft Topology Configurator (see AWB 2700-1305 GB, chapter 5);

If the tab of the memory module is pulled out.

Run

"Run" status means that the user program is running cyclically.

The PLC is switched to the "Run" status:

- If the "Reset" button is pressed when the operating mode selector switch is set to "Run" or "Run M-Reset";
- After the power supply is switched on, if the operating mode selector switch is set to "Run" or "Run M-Reset";
- By means of the programming software on the PC.

Not Ready

The user program does not run in "Not Ready" status.

The PLC is switched to the "Not Ready" status:

- If there is no program in the PLC;
- As a result of a hardware error;
- As a result of a serious error in the user program (e.g. cycle time violation)

Once the error has been rectified, you can cancel the "Not Ready" status as follows:

- By pressing the "Reset" button; if the operating mode selector switch is set to "Run M-Reset", the PLC will be switched to the "Run" status;
- By switching the power supply off and then on again; if the operating mode selector switch is set to "Run M-Reset", the PLC will be switched to the "Run" status;
- By means of the programming software on the PC.

Overview

Table 13: Overview of operating states

Position of operating mode selector switch	PLC status before action	Action		PLC status after action (DSW = diagnostic status word)
		Press Reset button	Switch power supply off/on	
1 (Halt/stop)	Run	×	–	Ready
	Ready	×	–	Ready; DSW acknowledged[1)]
	Not Ready	×	–	Ready; DSW acknowledged[1)]
	Run	–	×	Ready, after remaining cycle processed[1)]
	Ready	–	×	Ready[1)]
	Not Ready	–	×	Not Ready
		–	–	DSW (diagnosis)
		–	–	DSW (Error)
2 (Run)	Run	×	–	DSW acknowledged
	Ready	×	–	Run (acc. to system parameter setup)[1) 2)]
	Not Ready	×	–	Via “Ready” to “Run” (acc. to setup)[1)]
	Run	–	×	Run (with start condition)[1)], after remaining cycle processed
	Ready	–	×	Run (acc. to system parameter setup)[1) 2)]
	Not Ready	–	×	Via “Ready” to “Run” (acc. to system parameter setup)[1)]
3 (Run M-Reset)	Run	×	–	DSW acknowledged
	Ready	×	–	Run (cold start)[1)]
	Not Ready	×	–	Run (cold start)[1)]
	Run	–	×	Run (cold start)[1)]
	Ready	–	×	Run (cold start)[1)]
	Not Ready	–	×	Run (cold start)[1)]

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Legend for Table 13:

1) If the programs in the memory module and the RAM of the PLC are not the same, the program in the memory module will be copied to the RAM.
2) After the user program has been transferred to the PLC or after the memory module has been booted, the PLC is switched to “Not Ready” if the start condition in the system parameter setup has been set to “Halt” (stop), i.e. a cold start is required.

Whenever the PLC is started by switching on the power supply, by pressing the “Reset” button or by means of the PC, the backup program is compared with the program in the RAM. If the programs are not the same, the program in the memory module (backup) is copied to the RAM.

If the user program in the memory module is defective, it is updated, providing the user program in the RAM is valid. An update is also carried out every time the user program is transferred from the PC to the PLC.

Start behaviour

The PLC can be either cold-started or warm-started.

Cold start

A cold start causes all the data fields (flag ranges, inputs/outputs, function block parameters) to be reset. The user program is executed from the beginning.

A cold start can be initiated as follows:

By pressing the “Reset” button if the operating mode selector switch is set to “Run M-Reset”, providing the PLC is currently in the “Ready” or “Not Ready” status;

By switching on the power supply if the operating mode selector switch is set to “Run M-Reset”;

By means of the programming software on the PC, providing the PLC is currently in the “Ready” or “Not Ready” status.

A cold start can also be initiated via the system parameters if the operating mode selector switch is set to “Run”. For this activate the Cold Start option in Behaviour after Not Ready in the Parameters dialog.

A cold start is essential after a new user program has been transferred to the PLC.

Warm start

A warm start causes the user program to be continued from the point at which it was interrupted to the end of the cycle. The outputs and the communication data are set to “0” for the remainder of this cycle. The PLC is then initialized and the program is executed cyclically. Retentive data fields remain stored.

The setting of retentive marker ranges is described in the manual “Sucosoft S 40 User Interface” (AWB 2700-1305 GB, chapter 7).

A warm start can be initiated as follows:

By pressing the “Reset” button if the operating mode selector switch is set to “Run”, providing the PLC is currently in the “Ready” status;

By switching on the power supply if the operating mode selector switch is set to “Run”, providing the PLC contains a battery in perfect condition;

By means of the programming software on the PC, providing the PLC is currently in the “Ready” status.

A warm start can also be initiated via the system parameters if the operating mode selector switch is set to “Run”. For this activate the Warm Start option in Behaviour after Not Ready in the Parameters dialog.

Warning!
If you initiate a warm start via the system parameters, your data may lose its consistency.

Program transfer

If the user program does not contain any syntax errors, the compiler in the programming device (PC) translates it into a code that can be understood and executed by the CPU. You must then load the user program into the RAM of the CPU using the Transfer menu. The microprocessor executes the program there in the “Run” status.

PC → PLC

When a program is transferred from the PC to the PLC, the PS4-150 must be in the “Ready” or “Not Ready” status. The setting of the operation mode selector switch on the operator console is not important.

▶ Transfer the program to the PLC; refer to the manual “Sucosoft S 40 User Interface” (AWB 2700-1305 GB, chapter 8).

Please refer to the section entitled “Network Programming” for details of how to transfer the user program to the PLC with Suconet K.

If the operating mode selector switch is set to “Halt” (stop), the LEDs for “Ready” and “Not Ready” will light up while the program is being transferred. They confirm that the data transfer between the PS4-150 and the PC is successful.

PC → PLC and memory module

▶ Plug the memory module into the PLC (the PLC must be switched off).

▶ Then connect the PLC to the power supply. The PLC must be switched to “Ready” or “Not Ready”.

▶ Transfer the program from the PC to the PLC. The program is now loaded in both the PLC and the memory module.

Starting the PLC with a program stored in the memory module

The procedure for starting a user program in the memory module is as follows:

- ▶ Switch off the PLC and fit the memory module into it and close the tab. The setting of the operate mode selector switch is not important.
- ▶ Switch on the PLC. The program in the memory module is then copied to the PS4-150 and the PLC is started up according to the set starting conditions (see Table 13).

Programming with Suconet K

It is possible to program several different stations on a PC with Suconet K, and to run test and commissioning functions. This access mode is available for all stations which are connected to line 1 of the master PLC. If one of these stations (e. g. LE4-501-BS1) opens another line, you will not be able to access the stations connected to it (see broken line in figure below). For further information on this topic refer to the manual “Sucosoft S 40 User Interface” (AWB 2700-1305 GB, chapter 8).

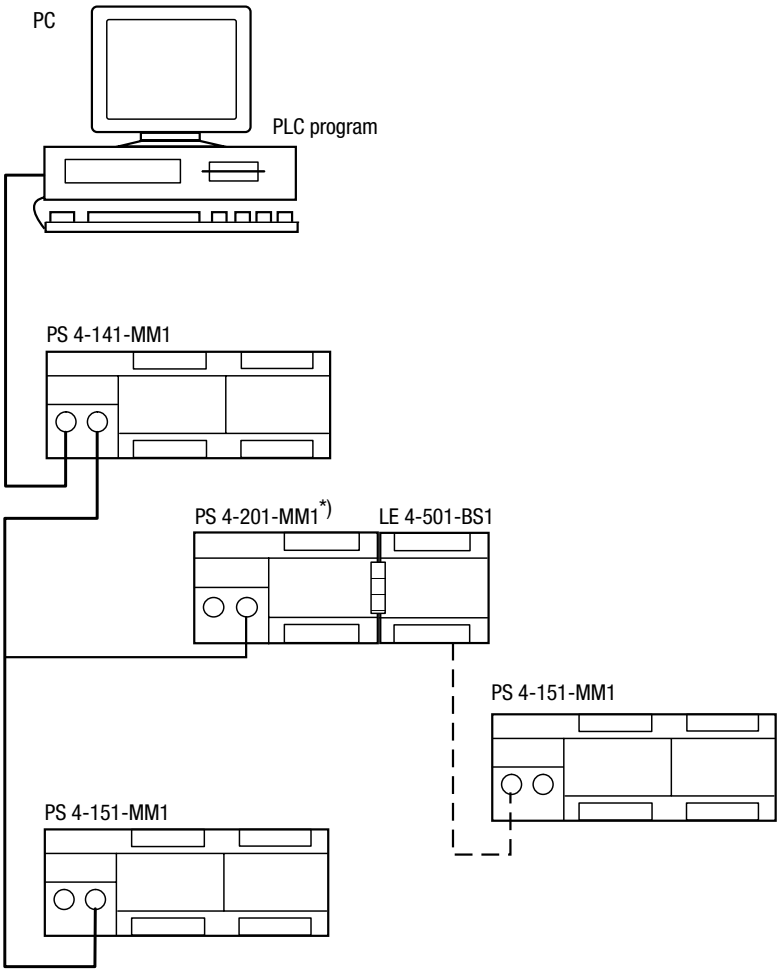

Figure 27: Programming a network

① Programming cable

② Suconet K line 1

*) Programming on the PS4-201-MM1 is possible with Version 05 or higher.

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7 Test/Commissioning/Diagnostics

Status LEDs

The coloured LEDs allow fast and simple diagnoses of the PLC functions. The status of the inputs/ outputs are also easy to monitor.

Table 14: Meaning of the LEDs

LED	Status	Meaning
Ready	Off	–
	On (yellow)	Self-test successfully completed and CPU ready to start
	Blinking (3 seconds)	Suconet K error
Run	Off	Program in “Halt” (stop) status
	On (yellow)	User program running
Not Ready	Off	CPU, user program error-free
	On (red)	No user program or user program incorrect CPU error Serious error in user program
Battery	Off	Battery in perfect condition
	On (red)	Battery fault[1)]
Status of inputs	Off	Input not activated
	On (green)	Input activated
Status of outputs	Off	Output not activated
	On (green)	Output activated

[1)] **Caution**
Data may be lost if the battery does not supply sufficient power. Always replace the battery with the power supply switched on!

Diagnostics

The status information is scanned hierarchically via the diagnostics status word and the diagnostics byte of a station as well as via the diagnostics bytes of any local expansion modules which are connected to the same line.

Diagnostics status word

The diagnostics status word provides an overview of the various error messages. It consists of 16 bits. The diagnostics bits are subdivided into two categories:

Category D (diagnostics):	bits 0 to 7
Category E (error):	bits 8 to 15

The diagnostics bits in category D have an indication function. They can be indicated if the PLC is in the “Run” or “Ready” status.

The diagnostics bits in category E cause the PLC to be switched to the “Not Ready” status.

The diagnostics bits are displayed in the System Diagnostics window of Sucosoft S 40 (see manual “Sucosoft S 40” User Interface AWB 2700-1305 GB, chapter 8).

Diagnostics bytes of the Suconet K stations

It is possible to scan the diagnostics bytes of the individual stations and of any local expansion modules that are connected to the same line, in order to narrow down the information contained in the diagnostics status word. You only have read access to these bytes.

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Each station and each local expansion module on the Suconet K line has its own status information. This information refers to the specific type of Suconet station or local expansion module, i.e. it differs according to the station type.

There is a group signal containing status information for every station on the Suconet K1 line. This information refers to the basic unit and to any local expansion modules (LE) which are connected to the same line.

The status information indicates, for example, whether:

- The device ID is incorrect
- The device has been disconnected as a Suconet station
- There is a short-circuit at the digital output of the station, etc.

The status information and its meaning are described in connection with the individual Suconet stations and the local expansion modules.

Message byte

The message byte contains information about the status of the PLC, mapping data relating to the network stations, the PLC start procedure, etc. You only have read access to the message byte.

For further information on message byte, refer to the "PLC_Message" function block description in the manual "Language elements for the PS4-150/-200/-300 and PS416" (AWB 2700-1306 GB).

Appendix

Accessories

Designation	Type	Description/application
Programming cable	ZB4-303-KB1	Adapter for programming the PS4-150 with a PC
Memory module	ZB4-160-SM1	32 Kbyte RAM module for expanding the user program memory and 128 Kbyte flash EPROM
Memory module	ZB4-032-SR1	32 Kbyte RAM module for expanding the user program memory
Memory module	ZB4-128-SF1	128 Kbyte flash EPROM
Screw terminal	ZB4-110-KL1	Screw terminal for input/output level
Twin-level terminal block	ZB4-122-ML1	Twin-level terminal block for distributing potential, e.g. for connecting 3-pole proximity switches to a PLC or a local expansion module.
Hinged labelling flap	ZB4-101-GZ1	Flap for labelling inputs/outputs (PS4, EM4, LE4)
Feet	ZB4-101-GF1	Feet for screwing the PS4 onto a mounting plate
Back-up battery	ZB4-600-BT1	Battery for backing up the RAM of the PS4-150
Simulator	ZB4-108-ES1	Simulator for digital inputs
Data cable	KPG1-PS3	Cable between the PS4-150 and a slave; length: 0.5 m
T adapter	TBA3.1	For connecting a station to the Suconet K/K1 line
Data plug connector	S1-PS3	5-pole DIN plug connector for the RS 485 interface of the PS4-150
Cable	LT309.096	Cable, 2×0.5 mm^2, screened and twisted for making your own Suconet K cable
Screen terminal	ZB4-102-KS1	Screen earth for Suconet

Slave addressing **Receive data**

Slave	Byte 1	Byte 2	Byte 3	...	Last byte	Data type
EM4-111-DR1	IBx.y.0.0					Bit, byte
EM4-101-DD1/88	IBx.y.0.0					Bit, byte
EM4-101-DD1/106	IBx.y.0.0	IBx.y.0.1				Bit, byte
EM4-101-AA1 **V 01**	IABx.y.0.0	IABx.y.0.1	IABx.y.0.2	...	IABx.y.0.5	Byte
EM4-101-AA1 **V 02**						
AA1B64 (8 bits/SBI)	IABx.y.0.0	IABx.y.0.1	IABx.y.0.2	...	IABx.y.0.5	Byte
AA1W33 (12 bits/SBI)	IAWx.y.0.0		IAWx.y.0.2		IAWx.y.0.4	Word
EM4-101-AA2						
AA2B84	IABx.y.0.0	IABx.y.0.1	IABx.y.0.2	...	IABx.y.0.7	Byte
AA2W84	IAWx.y.0.0		IAWx.y.0.2	...	IAWx.y.0.14	Word
EM4-201-DX1	IBx.y.0.0	IBx.y.0.1				Bit, byte
EM4-201-DX2	IBx.y.0.0	IBx.y.0.1				Bit, byte, word
PS4-1x1, passive	IBx.y.0.0	–	IABx.y.0.0		IABx.y.0.1	(Bit), byte
PS4-1x1, active	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Bit, byte
PS4-141-MM1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.77	Bit, byte, word
PS4-151-MM1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.77	Bit, byte, word
PS4-201-MM1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.77	Bit, byte, word
PS4-341-MM1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.119	Bit, byte, word
PS4-401-MM1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Byte, word
PS4-401-MM2	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.83	Bit, byte, word
PS316 (SBI)/306	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Bit, byte, word
EPC335	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Bit, byte, word
PS3-DC	IBx.y.0.0	IBx.y.0.1	IABx.y.0.0	...	IABx.y.0.3	(Bit), byte
PS3-AC	IBx.y.0.0	IBx.y.0.1	IABx.y.0.0	...	IABx.y.0.3	(Bit), byte
PS3-8	IBx.y.0.0	IBx.y.0.1				Bit, byte
LE4-501-BS1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.77	Bit, byte, word
CM4-501-FS1	IBx.y.0.0	RDBx.y.0.1	RDBx.y.0.1	...	RDBx.y.0.5	Bit, byte

Slave	Byte 1	Byte 2	Byte 3	...	Last byte	Data type
SBI-AMD3	RDBx.y.0.0	RDBxBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Byte, word
SBI-AMX	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Byte, word
SIS type 80D0	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Bit, byte, word
to						
SIS type 80EF	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Bit, byte, word
A4-220.1	RDBx.y.0.0	RDBx.y.0.1				Byte, word
A5-220.1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Byte, word
VTP0-H-Tx	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Byte, word
VTP1/2-H-T6	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.17	Byte, word
ZB4-501-UM2	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.23	Bit, byte, word
RMQ16I	IBx.y.0.0	IBx.y.0.1				Bit, byte
RBI1.1	RDBx.y.0.0	RDBx.y.0.1	RDBx.y.0.2	...	RDBx.y.0.6	Bit, byte

x = line, y = station

Send data

Slave	Byte 1	Byte 2	Byte 3	...	Last byte	Data type
EM4-111-DR1	QBx.y.0.0					Bit, byte
EM4-101-DD1/88	QBx.y.0.0					Bit, byte
EM4-101-DD1/106	QBx.y.0.0	QBx.y.0.1				Bit, byte
EM4-101-AA1 **V 01**	QABx.y.0.0	QABx.y.0.1	QABx.y.0.2	–	QABx.y.0.4	Byte
EM4-101-AA1 **V 02**						
AA1B64 (8 bits/SBI)	QABx.y.0.0	QABx.y.0.1	QABx.y.0.2	–	QABx.y.0.4	Byte
AA1W33 (12 bits/SBI)	QAWx.y.0.0		QAWx.y.0.2		QAWx.y.0.4	Word
EM4-101-AA2						
AA2B84	QABx.y.0.0	QABx.y.0.1	QABx.y.0.2	–	QABx.y.0.3	Byte
AA2W84	QAWx.y.0.0		QAWx.y.0.2	...	QAWx.y.0.6	Word
EM4-201-DX1	QBx.y.0.0	QBx.y.0.1				Bit, byte
EM4-201-DX2	QBx.y.0.0	QBx.y.0.1				Bit, byte, word

Slave	Byte 1	Byte 2	Byte 3	...	Last byte	Data type
PS4-1x1, passive	QBx.y.0.0	–	–		–	(Bit), byte
PS4-1x1, active	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Bit, byte
PS4-141-MM1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.77	Bit, byte, word
PS4-151-MM1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.77	Bit, byte, word
PS4-201-MM1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.77	Bit, byte, word
PS4-341-MM1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.119	Bit, byte, word
PS4-401-MM1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Byte, word
PS4-401-MM2	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.83	Bit, byte, word
PS316 (SBI)/306	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Bit, byte, word
EPC335	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Bit, byte, word
PS3-DC	QBx.y.0.0	QBx.y.0.1	QABx.y.0.0			(Bit), byte
PS3-AC	QBx.y.0.0	QBx.y.0.1	QABx.y.0.0			(Bit), byte
PS3-8	QBx.y.0.0	QBx.y.0.1				Bit, byte
LE4-501-BS1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.77	Bit, byte, word
CM4-501-FS1	QBx.y.0.0	SDBx.y.0.1	SDBx.y.0.1	...	SDBx.y.0.5	Bit, byte
SBI-AMD3	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Byte, word
SBI-AMX	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Byte, word
SIS type 80D0	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Bit, byte, word
to						
SIS type 80EF	SDBx.y.0.0	RDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Bit, byte, word
A4-220.1	SDBx.y.0.0	SDBx.y.0.1				Byte, word
A5-220.1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Byte, word
VTP0-H-Tx	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.5	Byte, word
VTP1/2-H-T6	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.17	Byte, word
ZB4-501-UM2	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDBx.y.0.23	Bit, byte, word
RMQ16I	QBx.y.0.0	QBx.y.0.1				Bit, byte
RBI1.1	SDBx.y.0.0	SDBx.y.0.1	SDBx.y.0.2	...	SDB x.y.0.5	Bit, byte

x = line, y = station

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Technical Data

General	
Standards	EN 61 131-2, EN 50 178
Ambient temperature	0 to 55°C
Storage temperature	–20 to 70°C
Vibration resistance	1 g/0 to 150 Hz
Shock resistance	15 g/11 ms
Vibration	Constant 1 g, f = 0 to 150 Hz
EMC	See Page 81
Programming interface	RS 232, length of programming cable < 3 m
Network interface	RS 485
Bus	Suconet K
Data cable length	600 m/300 m
Transfer rate	187.5 kBit/s to 375 kBit/s
Operating mode	Master/slave
Degree of protection	IP 20
Rated insulation voltage U_i	600 V AC
Real-time clock	Yes
Accuracy of real-time clock	6.1 min/year (battery-backed)
Battery (life)	Normally 5 years
Expandable (remotely)	Up to 8 stations
User and data memory (internal)	32 Kbytes
Memory modules (external)	32 Kbyte RAM or 128 Kbyte flash EPROM or 32 Kbyte RAM and 128 Kbyte flash EPROM
Normally cycle time for 1 K instructions (bits, bytes)	5 ms
No. of inputs (central)	16
No. of outputs (central)	14 for PS4-141-MM1 8 for PS4-151-MM1
Max. no. of inputs/outputs (remote)	680, addressable via any Suconet line
Weight	Approx. 700 g

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Power supply PS4-141-MM1	
Rated voltage U_e	24 V DC
Permissible range	20.4...28.8 V DC
Residual ripple of input voltage	< 5 %
Reverse polarity protection	Yes
Rated current I_e	Normally 300 mA
Inrush current and duration	4 A < 5 ms
Power consumption	Approx. 6.5 W
Power dissipation (complete device)	Approx. 6.5 W
Bridging of voltage dips	
Duration of dip	10 ms
Repetition rate	1 s
Error indication	Yes (LEDs)
Protection class	1
Isolation	Yes
Terminals	Screw terminals
Conductor cross-section	
Flexible with ferrule	0.22...2.5 mm^2
Single core	0.22...2.5 mm^2
Rated insulation voltage	600 V AC
Power supply PS4-151-MM1	
Rated voltage U_e	115 to 230 V AC
Permissible range	98 to 264 V AC
Rated frequency Fn	47 to 63 Hz
Reverse polarity protection	Yes
Rated current I_e	Normally 150 mA
Inrush current	< 12 A for 230 V
Power consumption	Approx. 12 W
Bridging of voltage dips	
Duration of dip	10 ms
Repetition rate	1 s

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Error indication	Yes (LEDs)
Protection class	1
Isolation	Yes
Terminals	Screw terminals
Conductor cross-section	
Flexible with ferrule	0.22...2.5 mm²
Single core	0.22...2.5 mm²
Rated insulation voltage	1500 V AC
Inputs	
No. of inputs	16
Rated voltage U_e	24 V DC
For “0” signal	≤ 5 V DC (limit value type 1)
For “1” signal	≥ 15V DC (limit value type 1)
Max. ripple	< 5 %
Rated current I_e	
For “1” signal	Normally 6 mA for 24 V DC
Max. delay time	
From “0” to “1”	Max. 100 µs
From “1” to “0”	Max. 100 µs
Isolation	Yes
Isolation between inputs	No
Input status indication	Yes (LEDs)
Terminals	Plug-in screw terminals
Conductor cross-section	
Flexible with ferrules	0.22...1.5 mm²
Single core	0.22...2.5 mm²
High-speed counter input (I0.0)	
Clock frequency	3 kHz
Pulse shape	Square
Pulse duration	50 %
Edge duration	≤ 3 %

Alarm input (I1.0)	
Analog inputs	
No.	2
Signal range	0 V to 10 V
Total error	Normally 0.8 % of final value
No. of conversions	1 × per cycle
Input resistance	20 kΩ
Connection type of signal transmitter	Two-wire connection to transmitter
Digital representation of input signal	10 bits (1024 increments)
Setpoint potentiometers	
No.	2
Value range	10 bits (1024 increments)
Adjustment	With screwdriver
Outputs PS4-141-MM1	
No. of outputs	14
Rated voltage U_e	24 V DC
Permissible range	20.4...28.8 V DC
Reverse polarity protection	Yes
Max. ripple	≤ 5 %
Isolation	
In groups	No
Rated current I_e	
For “1” signal	0,.5 A DC for 24 V DC
Lamp load	4 W without series resistor
Utilization factor g	1
Relative duty factor	100 %
Parallel connection of outputs	
No. of outputs	4
Total maximum current	2 A
Total minimum current	250 mA
Residual current with “0” signal	Approx. 140 µA

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Short-circuit protection	Yes, without manual reset
Max. short-circuit tripping current	2.5 A over 3 ms per output
Off delay	Normally 100 µs
Limiting of breaking voltage	
With inductive loads	Yes, –21 V (with U_N = 24 V DC)
Switching rate per hour	
With time constant t ≤ 72 ms	4800
With time constant t ≤ 15 ms	18000
Output status indication	Yes (LEDs)
Terminals	Plug-in screw terminals
Conductor cross-section	
Flexible with ferrules	0.22...1.5 mm²
Single core	0.22...2.5 mm²
Analog output	
No.	1
Bit resolution	12 (4096 increments)
Total error	Normally 0.4 % of final value
Output variables	0 to 10 V DC
Connection type	Two-wire connection
Outputs PS4-151-MM1	
No. of outputs	8
Contacts	Make contacts
Isolation in groups	Yes 4 floating outputs and 4 outputs in 2 groups of 2
Contact suppressor circuit	None
Minimum contact voltage	> 12 V
Minimum contact current	> 100 mA
Minimum load	> 1.2 W
Utilization factor g	1
Relative duty factor	100 %

Closing time	10 ms
Opening time	10 ms
Lifespan (mechanical)	20 000 000 switching cycles
Switching current (resistive load)	
2 A/230 V AC	300 000 switching operations
2 A/24 V DC	900 000 switching operations
Switching current (inductive load)	
1 A/230 V AC (AC 11)	300 000 switching operations
1 A/24 V DC	100 000 switching operations
Short-circuit protection	No, relay contacts must be protected externally with fast fuses (max. 4 A).
Creepage distances and clearances (relays)	Group C 250 V AC to VDE 0110
Test voltage	4 kV
Output status indication	Yes (LEDs)
Terminals	Plug-in screw terminals
Conductor cross-section	
Flexible with ferrules	0.22...1.5 mm^2
Single core	0.22...2.5 mm^2
Terminals	Plug-in screw terminals
Analog output	
No.	1
Bit resolution	12 (4096 increments)
Total error	Normally 0.4 % of final value
Signal range	0 to 10 V DC
Connection type	Two-wire connection

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General specifications on electromagnetic compatibility (EMC) of automation equipment			
Emission	EN 55 011/22 Class A		
Noise 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	EN 61 000-4-5~*	Digital I/O, asymmetrical DC supply, asymmetrical DC supply, symmetrical AC supply, asymmetrical AC supply, symmetrical	0.5 kV 1 kV 0.5 kV 2 kV 1 kV
Line-conducted interference	EN 61 000-4-6	AM	10 V

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