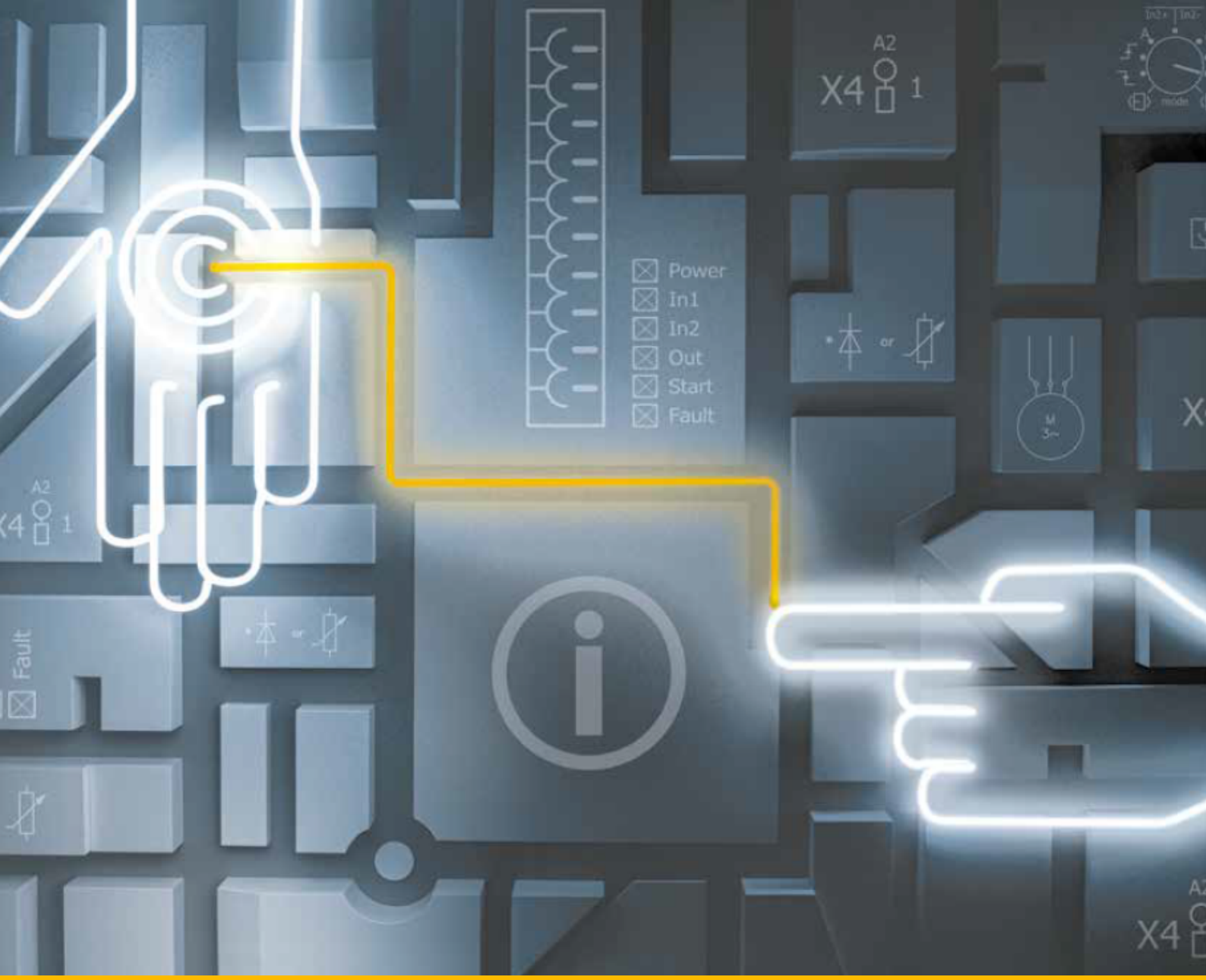


PSS u2 PS1 -R

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1006251-EN-01

- PSS u2 in the automation system PSS 4000

This document is the original document.

Where unavoidable, for reasons of readability, the masculine form has been selected when formulating this document. We do assure you that all persons are regarded without discrimination and on an equal basis.

1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PSS u2 PS1 -R from Version HW 1.0, FW 1.03 .

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

1.2 Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document should be retained for future reference.

1.3 Terminology

PSS u2 system

System from a PSS u2 head module and PSS u2 electronic modules.

PSS u2 in the automation system PSS 4000

PSS u2 system with control functionality that can be used in the automation system PSS 4000. A PSS u2 system is a 2nd generation device in the automation system PSS 4000.

The configuration is performed in the tool PAS4000.

1.4 Definition of symbols

Information that is particularly important is identified as follows:

DANGER!

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.

WARNING!

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.

CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.

NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.

INFORMATION

This gives advice on applications and provides information on special features.

1.5 Third-party manufacturer licence information

This product includes Open Source software with various licenses.

Further information is available in the document "Third-party manufacturer licence information PSS u2 PS1 -R" (document number 1006670) at .www.pilz.com.

2 Overview

Module structure:

A module consists of

- the main voltage supply,
- a terminal block with cage clamp terminals

The main voltage supply module is attached to the head module along the rail of the head module. The terminal block is plugged into the main voltage supply module and is used to connect the voltage supply.

Details of the terminal blocks that can be used are available under "Intended Use".

2.1 Module features

Use of the product PSS u2 PS1 -R:

Module to supply the PSS u2 system in the automation system PSS 4000

The product has the following features:

- Infeed for module supply (supplies head modules and subsequent modules)
- Infeed for periphery supply
- Monitoring for undervoltage/overvoltage/overload of the periphery supply
- Monitoring of the module supply
- Status LED for the module

2.2 Front view

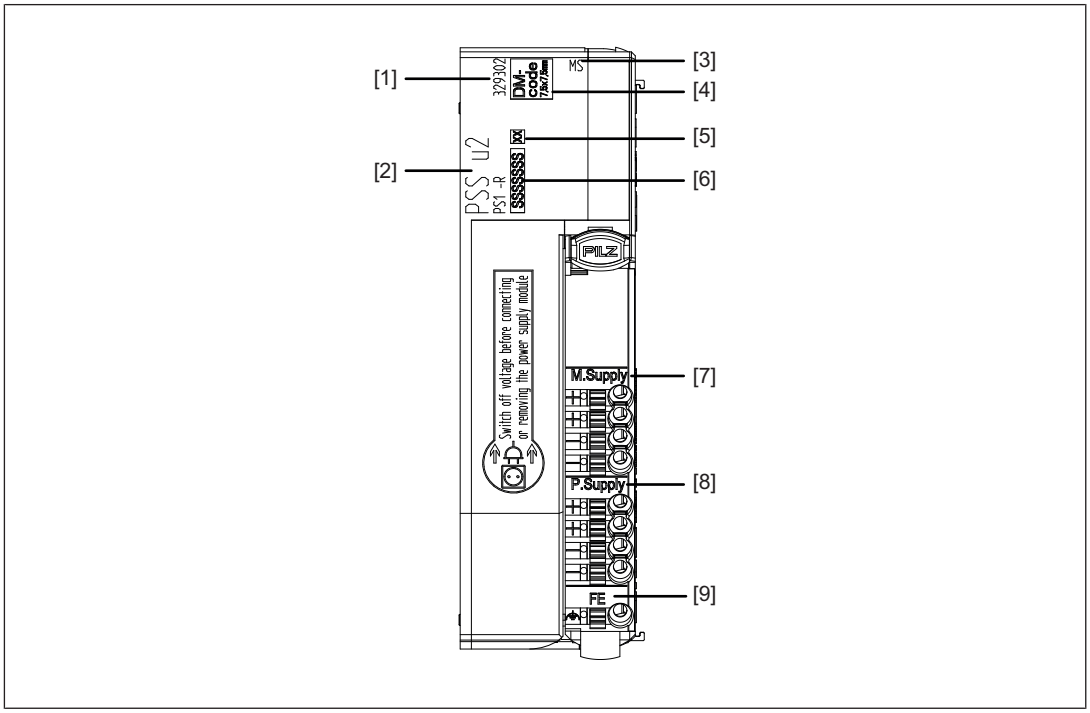


Fig.: Front view PSS u2 PS1 -R

Legend

[1]	Product name
[2]	Order number
[3]	Module status, see Display elements and messages [29]
[4]	2D code product information
[5]	Hardware version
[6]	Serial number
[7]	Module supply
[8]	Periphery supply
[9]	Functional earth

3 Safety

3.1 Intended use

The module may be used for railway applications in the following PSS u2 system (see Terminology [📖 5]):

- PSS u2 in the automation system PSS 4000 (generation 2)

The module PSS u2 PS1 -R is used to voltage supply for the head module and the modules.

The module PSS u2 PS1 -R may only be used in the PSS u2 system.

Intended use includes making the electrical installation EMC-compliant. The module is intended for use in railway applications. Interference may occur if used in other areas.

The following is deemed improper use in particular:

- Any component, technical or electrical modification to the module,
- Use of the module outside the areas described in this operating manual,
- Any use of the module that is not in accordance with the technical details.
- Interference voltage on the supply lines

  The user must employ additional measures on the voltage supply inputs to ensure compliance with the limit values for the conducted noise emission in accordance with EN 50121-4:2016 + A1:2019. Compliance with the limit values is achieved by connecting a noise suppression filter between the external power supply and the voltage supply inputs if, for example, a type FN2070-3-.. mains filter from Schaffner is used, or a noise suppression filter with comparable properties.

The module PSS u2 PS1 -R may be used in conjunction with the following terminal block:

- 9-pin terminal block

With reference to the standard IEC 61131-2 the values stated in the technical details for ambient temperature are reduced at heights >2000 m operating height above sea level (see Supplementary data [📖 34]).

3.2 Application conditions in accordance with EN 50124-1:2017

- Rated surge voltage outdoors = 3100 V (section 8.2.2.2)

  The main supply voltage module does not meet these requirements. The plant operator must ensure that appropriate protective measures are implemented.
- Rated surge voltage indoors = 2200 V (section 8.2.2.3)

  The main supply voltage module does not meet these requirements. The plant operator must ensure that appropriate protective measures are implemented.

3.3 System requirements (PSS u2 in automation system PSS 4000)

INFORMATION

The module is supported by

- PAS4000, from Version 1.25.0
  - We recommend that you always use the latest version (download from www.pilz.com).

3.4 Safety regulations

3.4.1 Additional documents that apply

Please read and take note of the following documents:

- Installation Manual PSS u2 in the automation system PSS 4000 (1006253)
- System Description PSS 4000 (1001467)
- Product Modifications PSS 4000 (1001740)

When using railway applications, please note also:

- System description Safety architectures for railway applications (1006614)

You will need to be conversant with the information in these documents in order to fully understand this operating manual.

3.4.2 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by competent persons.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of the state of the art and the applicable national, European and international laws, directives and standards.

It is the company's responsibility only to employ personnel who

- Are familiar with the basic regulations concerning health and safety / accident prevention,
- Have read and understood the information provided in the section entitled Safety
- Have a good knowledge of the generic and specialist standards applicable to the specific application.

3.4.3 Warranty and liability

All claims to warranty and liability will be rendered invalid if

- The product was used contrary to the purpose for which it is intended,
- Damage can be attributed to not having followed the guidelines in the manual,
- Operating personnel are not suitably qualified,
- Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

3.4.4 Disposal

- In safety-related applications, please comply with the mission time T_M in the safety-related characteristic data.
- When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

4 Security

To secure plants, systems, machines and networks against cyberthreats it is necessary to implement (and continuously maintain) an overall industrial security concept that is state of the art.
Perform a risk assessment in accordance with VDI/VDE 2182 or IEC 62443-3-2 and plan the security measures with care. If necessary, seek advice from Pilz Customer Support.

4.1 Security (PSS u2 in the automation system PSS 4000)

Further information on Security can be found in the system description PSS 4000 (1001467).

5 Function description

5.1 Block diagram

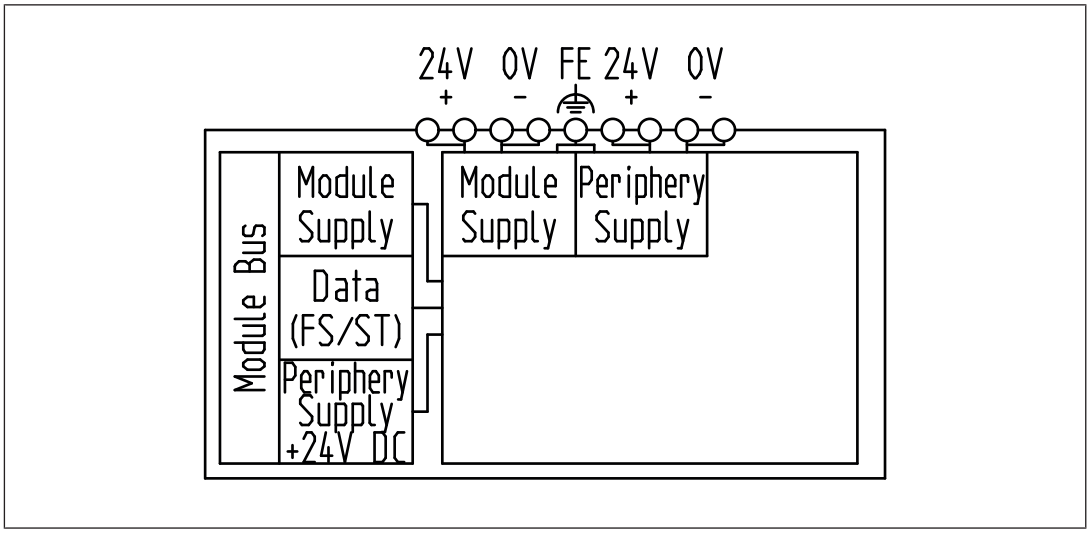


Fig.: Block diagram-PSS u2 PS1 -R

5.2 Supply voltage

- Module supply
  - supplies voltage to the head module
  - supplies voltage to downstream modules (right-hand side)
- Periphery supply
  - supplies voltage to the sensors, actuators and test pulses

When the supply voltage is fed in separately, the module supply and periphery supply are galvanically isolated. If galvanic isolation is not required, a common power supply may be used for the periphery supply and module supply.

The module status is shown via the LED MS, see Display elements and messages [29].

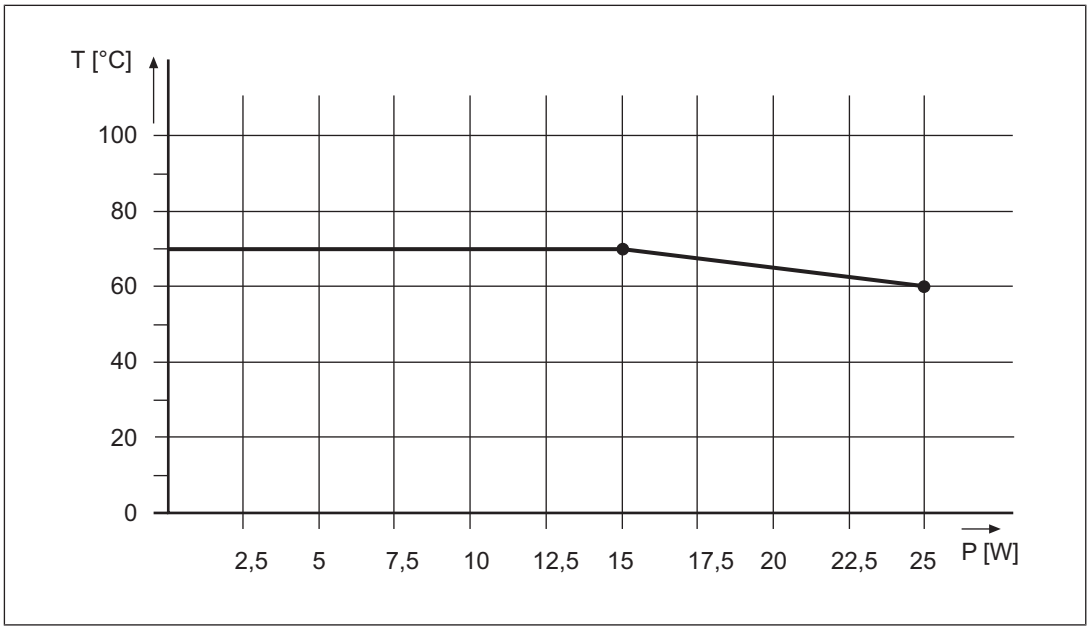
5.2.1 Output power of module supply

However, please note

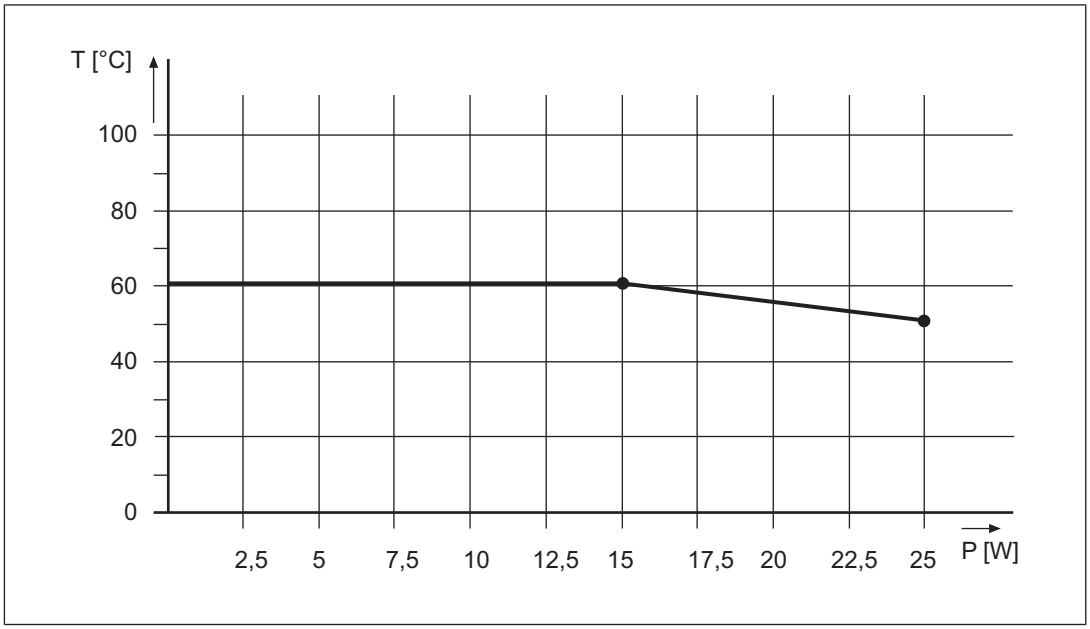
- the maximum output power of the module supply (see Technical details [📖 31]).
- The total power consumption of the electronic modules and head module must not be higher than the max. output power of the main supply voltage module (see Module's technical details).
- The module supply is provided exclusively by the main supply voltage module.
- The module supply cannot be refreshed.
- The module supply does not automatically switch off if the max. output power is exceeded.
- The module supply's consumption is displayed when a PSS u2 system is configured.

Please refer to the **module supply's derating diagrams**.

Derating diagram for infeed for module supply: Permitted ambient temperature T dependent on power P.
Installation: Mounting position on the *mounting rail is horizontal* (see Installation Manual PSS u2 in the automation system PSS 4000)



Derating diagram for infeed for module supply: Permitted ambient temperature T dependent on power P.
Installation: Mounting position on the *mounting rail is vertical*, head module is assembled on top (see Installation Manual PSS u2 in the automation system PSS 4000)



5.2.2 Current load capacity of periphery supply

However, please note

- the maximum current load capacity of the periphery supply (see Technical details [📖 31]).
- The current load capacity of the periphery supply is the sum of the current consumption of the sensors and actuators that are supplied via the input/output modules.
- If the total current consumption is higher than the current load capacity of the main supply voltage module, then the periphery supply must be refreshed using a periphery supply voltage module, in order to avoid overload.
- The periphery supply does not switch off automatically if the maximum current load capacity is exceeded.
- The periphery supply's consumption is displayed when a PSS u2 system is configured.

5.3 Integrated protection mechanisms

The module has the following protection mechanisms:

- Temperature monitoring
- Module supply
  - Polarity protection
  - Voltage monitoring
  - Transient voltage limitation
- Periphery supply
  - Polarity protection
  - Voltage monitoring
    The periphery supply switches off if the level drops below 14 V.
    The resulting diagnostic message can be switched off in the configuration tool PAS4000 in the ***Module features***.
    Select ***Suppress message about missing periphery supply.***

6 I/O data of the module (PSS u2 in the automation system PSS 4000)

When the electronic module for PSS u2 is used in the automation system PSS 4000, the data described below are available.

6.1 Available I/O data in the I/O mapping

Data access is via pre-defined I/O data types:

I/O data name	I/O data type	Data element: Data type	Meaning
PSPDiagnostics	ST_I_PSP_DIAG	Status: ARRAY[0..1] OF BOOL	Status bits of the periphery supply (Bit 0 and Bit 1) 00: not relevant 01: Undervoltage detected 10: Periphery supply within the permitted range 11: Overvoltage detected
		SwitchedOn: BOOL	Switched on bit 0: Periphery supply switched off 1: Periphery supply switched on
		Overcurrent: BOOL	Overcurrent bit 0: No overcurrent 1: Overcurrent detected
		ExtSupplyDetected: BOOL	External supply bit 0: No external supply on the backplane 1: External supply detected on the backplane
		VoltageOK: BOOL	Voltage tolerance bit 0: Periphery supply is outside the voltage tolerance 1: Periphery supply is within the voltage tolerance

6.2 Other I/O data

In addition to the I/O data available via I/O mapping, it is possible to access further I/O data in the user program:

- Valid bit of the date *PSPDiagnostics*

In the Multi programming, access is via the PSS 4000 system control block "Valid".

In IEC 61131 programming, access is via the variable extension "WITH VALID".

7 Installation

7.1 General installation guidelines

CAUTION!

Risk of material damage

Electrostatic discharge can damage components.

– Ensure against discharge before touching the product, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

CAUTION!

Risk of material damage

The incorrect ambient temperature during assembly/dismantling can lead to material damage.

– Comply with the permitted ambient temperature for assembly/dismantling: -20°C … +45°C

7.1.1 Dimensions

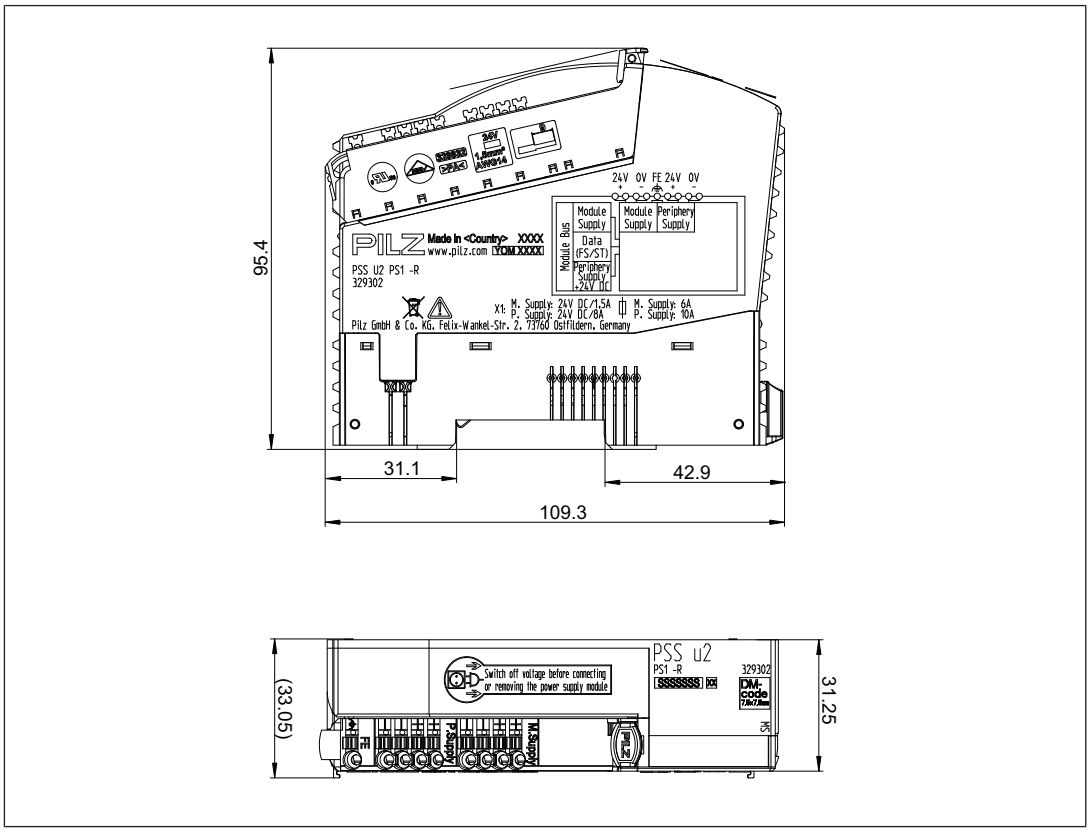


Fig.: Dimensions PSS u2 PS1 -R

7.2 Insert and remove main voltage supply module

Please note:

- Backplane must be installed first.
- The protective plate is removed from the main voltage supply module and it is fixed on the last backplane.
- At least the first electronic module must not be installed on the backplane.
- Main voltage supply modules may only be plugged or unplugged if the terminal block has been removed first.
- The mechanics of the main voltage supply modules are designed for 20 plug in/out cycles.

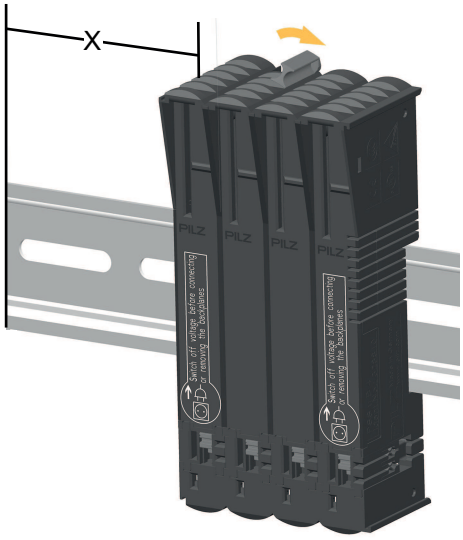
7.3 Install backplane

CAUTION!

Risk of material damage

– Connect or remove the backplane only when the supply voltage is switched off.

– Switch off the supply voltage, before you connect or remove the backplane.

1. Insert the backplane on to the mounting rail. Leave enough distance [X] to the left to enable the head module plus the main supply voltage module to be installed. This distance will depend on the width of the head module plus main supply voltage module. The mounting rail interlock must be in the open position, to the left. 2. Turn the mounting rail interlock to the right to lock the backplane on to the mounting rail.	

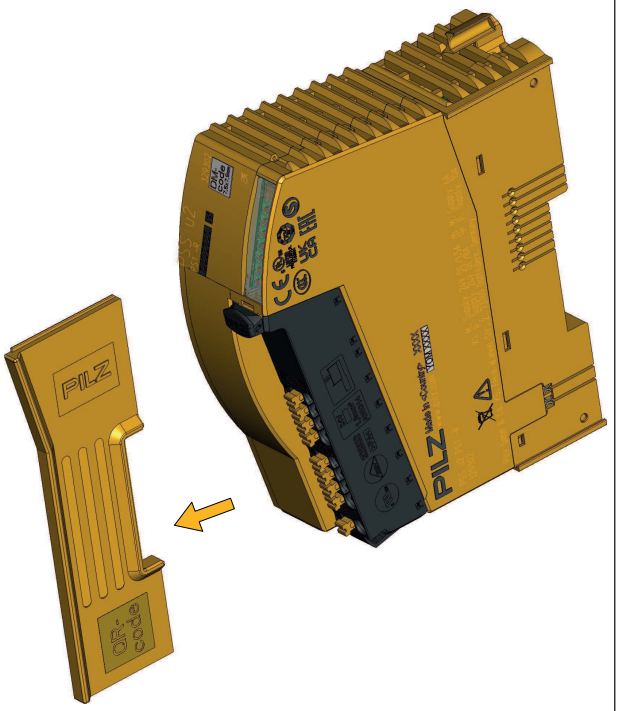
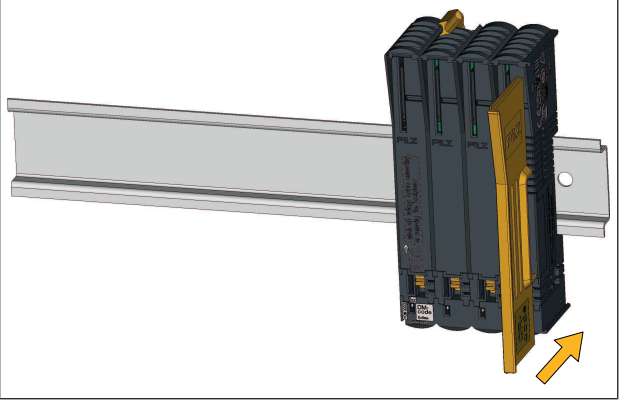
7.4 Install protective plate

CAUTION!

Risk of material damage

Electrostatic discharge can damage components.

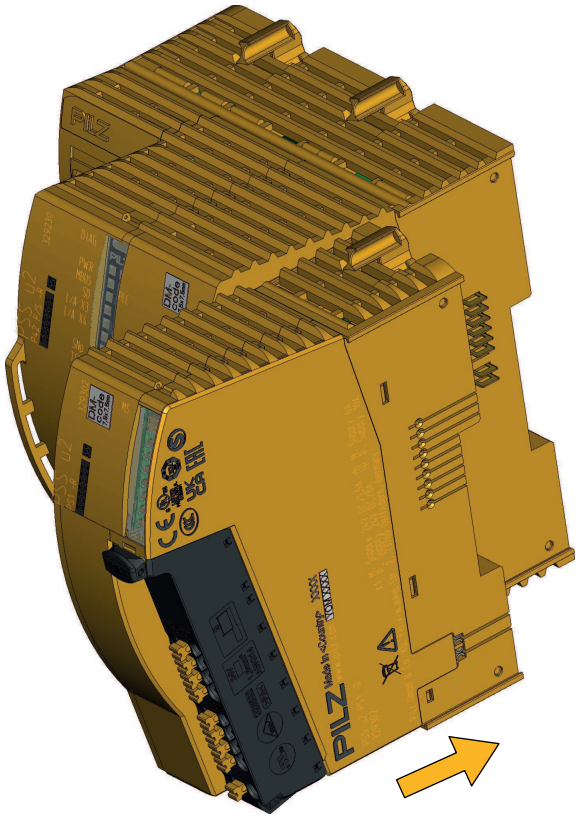
– Ensure that the yellow cover plate is fitted at the end of the back-plane block. The yellow cover plate is an integral part of the main supply voltage module PSS u2 PS1 -R.

1. Remove the yellow cover plate from the main supply voltage module.	
2. Attach the yellow ESD cover plate to the last backplane.	

7.5 Insert main supply voltage module next to head module

Prerequisite

The terminal block is not wired.

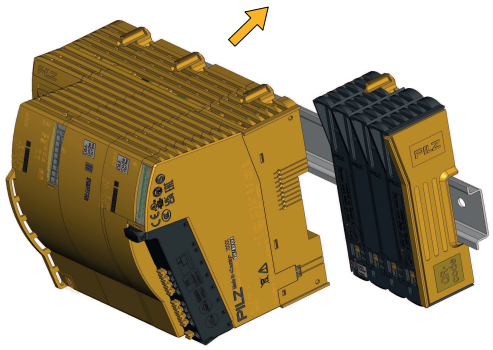
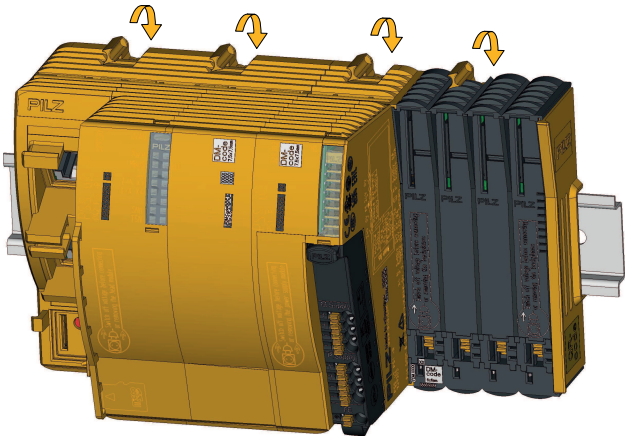
1. From above, guide the main supply voltage module towards the right-hand side of the head module. .	

7.6 Install head module plus main voltage supply module

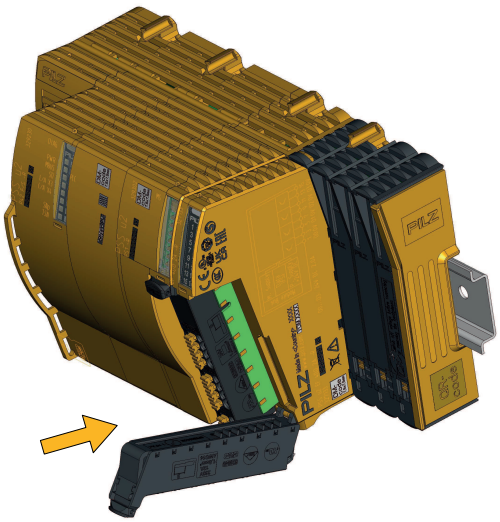
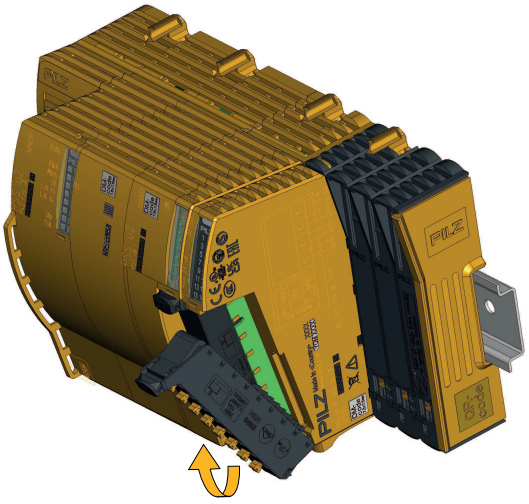
Prerequisite

The mounting rail must be installed.

The backplane is installed and the cover plate is installed.

1. Plug the head module plus main supply voltage module on to the mounting rail. Note: The mounting rail interlock must be in the open position, to the left.	
2. Rotate the mounting rail interlocks to the right to lock the head module plus main supply voltage module on the mounting rail.	

7.7 Insert terminal block

1. Insert the terminal block into the suspension lug on the module.	
2. Swivel the terminal block upwards until you hear it click into place.	

8 Wiring

8.1 General wiring guidelines

Please note:

- The requirements of the supply voltages can be found under "Technical details [📖 31]".
- Protective separation must be ensured for the external power supplies that generate the supply voltages. Failure to do so could result in electric shock.
- The supply voltages must be extra low voltages with safe electrical separation (PELV or SELV). The external power supplies must comply with EN 62368-1 and EN 61010-2-210.
- Please note that the normative requirements with a power failure of the supply voltage for module supply are fulfilled when using buffered external power supplies for creating the supply voltage.
- Connect the supply voltage correctly polarised.
- The maximum current load on the backplane for the periphery supply is 8 A.
- Earth the 0 V supply on the periphery supply or monitor each supply group for earth faults.
- The connection of the 0 V supply net to the central earth bar or earth fault monitoring must be in accordance with relevant national regulations (e.g. EN 60204-1).
- The minimum range for conductor cross sections on connection terminals can be found in chapter Connection mechanism for terminal blocks [📖 26].
- Use copper wiring.

8.1.1 Connection mechanism for terminal blocks

Please note:

- The minimum cable cross section for field connection terminals on the terminal blocks is 0.15 mm^2 (AWG26).
- The maximum cable cross section for field connection terminals on the terminal blocks is 1.5 mm^2 with ferrules (AWG14)
- Use copper wiring.

Procedure:

- Use a flat head screwdriver.
- Strip the wire back 9 mm.
- Feed the stripped cable as far as it will go into the opening for the spring-loaded terminal.
- Check that the cable is firmly seated.

8.2 Terminal configuration

8.2.1 Connecting the module

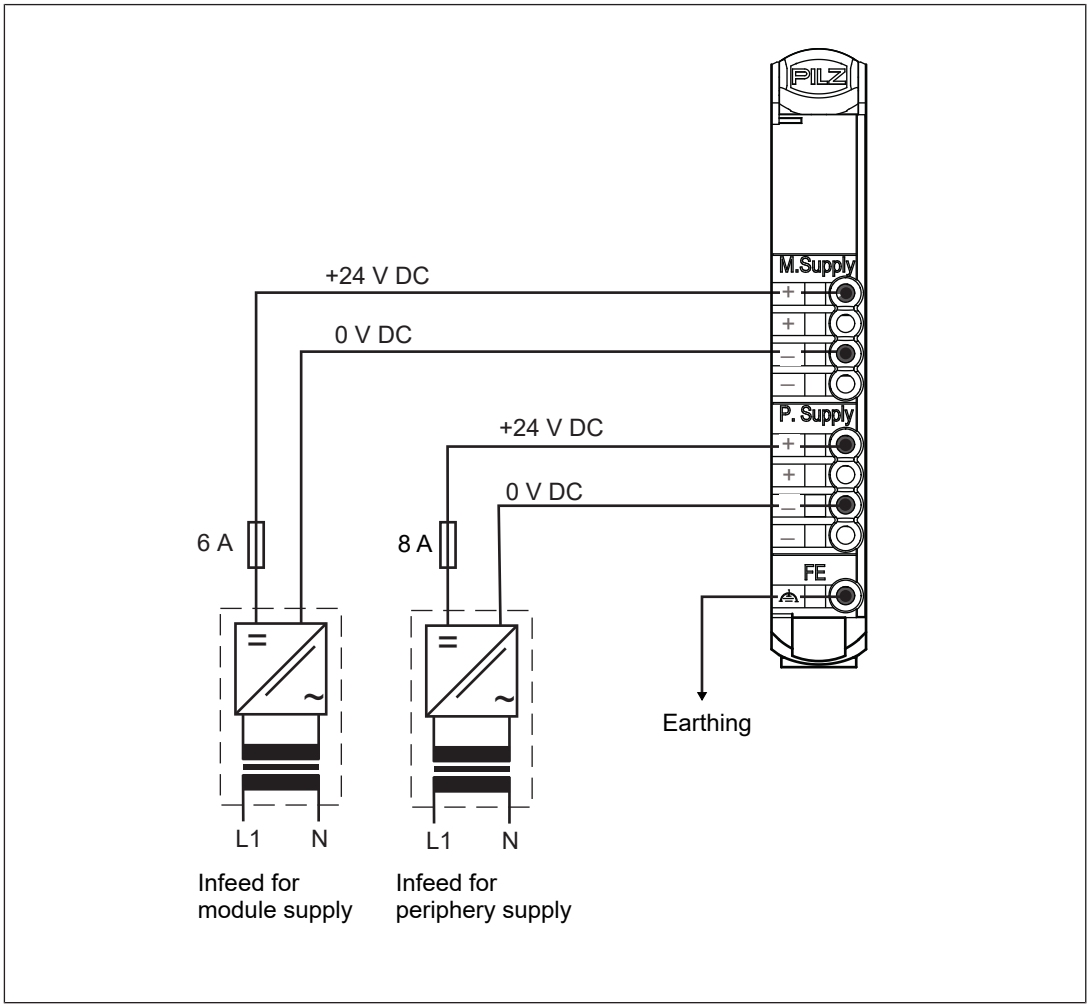


Fig.: Separate power supplies for module supply and periphery supply

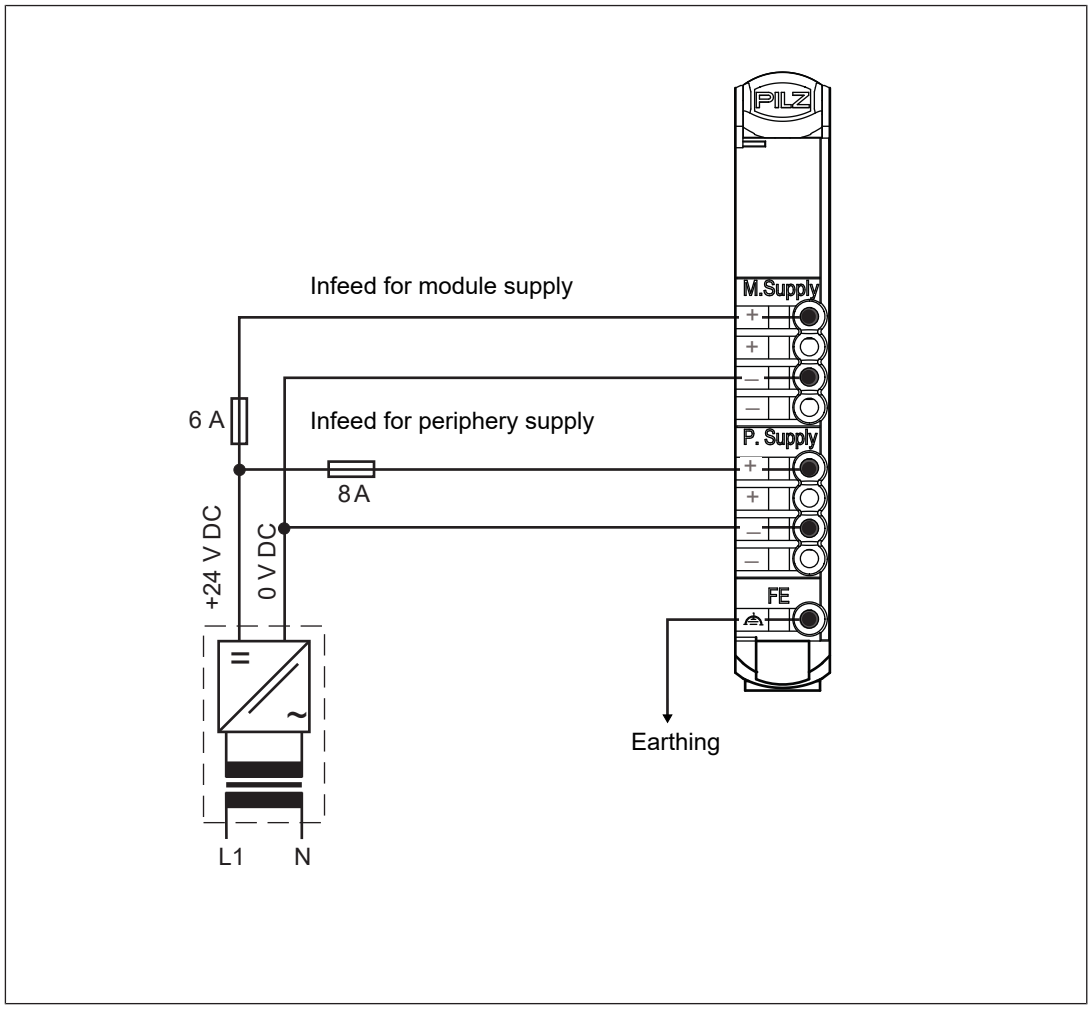


Fig.: Common power supply for module supply and periphery supply

Use the following fuses:

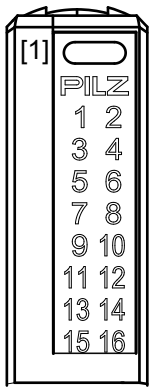
Module supply: max. 6 A characteristic B/C

Periphery supply: max. 8 A characteristic B/C

9 Operation

The status of the module is displayed via the "Module status" LED; this is signalled to the head module and any error is entered in the head module's diagnostic log.

9.1 Display elements and messages



Legend

[1] Module status display

The module can detect the following errors:

LED [1] MS	Colour LED [1]	Meaning	Further information
●	--	Module not ready for operation	
✳	Green	Module ready for operation	
✳	Green	Module in operation	
✳	Red	▸ Periphery supply error (undervoltage/overvoltage/overload)[1] ▸ Error in the module supply (undervoltage) ▸ Overtemperature[2]	See module's diagnostic log
✳	Red	Internal errors	See module's diagnostic log

Legend

✳ LED on

✳ LED flashes

● LED off

[1] With the voltage supply module it is possible to suppress the diagnostic messages that are displayed with undervoltage of the periphery supply or when the infeed of the periphery supply is missing. When the diagnostic messages are suppressed, the red flashing of the module status LED is also suppressed.

- In the configuration tool PAS4000, in the properties of the module on the in the ***PSS u2 system*** tab, activate the option ***Suppress message about missing periphery supply***.

[2] There are two levels of overtemperature.

- Too warm:

  If the module temperature exceeds a threshold value, then:

  – a warning is sent to the head module.

  If the temperature drops back below the threshold value, the module sends an all-clear.

- Too hot:

  If the module temperature exceeds another threshold value, then:

  – an error message is sent to the head module.

  After the "too hot" message has been received, if the temperature drops back below the "too warm" threshold value, the module will switch to an error-free state.

10 Technical details

General	
Certifications	**CE, TÜV**
Application range	**Standard**
Module's device code	**2C02h**
Number of ST input bits	**6**
Number of ST status bits	**6**
Electrical data	
Supply voltage	
for	**Module supply**
Voltage	**24 V**
Kind	**DC**
Voltage tolerance	**-30 %/+25 %**
Output of external power supply (DC)	**31 W**
Output of external power supply (DC) at no load	**3 W**
Max. output power	**25 W**
Residual ripple DC	**5 %**
Buffer time	**5 ms**
Supply voltage	
for	**Periphery supply**
Voltage	**24 V**
Kind	**DC**
Voltage tolerance	**-30 %/+25 %**
Current load capacity at UB	**8 A**
Output of external power supply (DC)	**192 W**
Output of external power supply (DC) at no load	**0,5 W**
Residual ripple DC	**5 %**
Potential isolation	**Yes**
Internal supply voltage (module supply)	
Module's power consumption	**2,5 W**
Environmental data	
Application site	
in accordance with the standard	**EN 50125-3**
Application site	**Track area (1 m - 3 m)**
Climatic suitability	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78**
Ambient temperature	
in accordance with the standard	**EN 60068-2-14**
Temperature range	**-40 - 70 °C**
Storage temperature	
in accordance with the standard	**EN 60068-2-1/-2**
Temperature range	**-40 - 70 °C**

Environmental data	
Climatic suitability	
in accordance with the standard	**EN 50125-3**
Humidity	**95 % r. h. at 40 °C**
Condensation during operation	**EN 60068-2-30**
Max. operating height above SL	**5000 m**
EMC	**EN 50121-4, EN 61000-6-2, EN 61000-6-4, EN 61131-2 (Zone B)**
Broadband noise	
in accordance with the standard	**EN 60068-2-64**
Frequency	**5 - 2.000 Hz**
Acceleration	**2,3 m/s² eff.**
Shock stress	
in accordance with the standard	**EN 60068-2-27**
Number of shocks	**6**
Acceleration	**20 m/s²**
Duration	**11 ms**
Airgap creepage	
in accordance with the standard	**EN 61131-2**
Overvoltage category	**II**
Pollution degree	**2**
in accordance with the standard	**EN 50124-1**
Overvoltage category	**OV2**
Pollution degree	**PD2**
Protection type	
in accordance with the standard	**EN 60529**
Housing	**IP20**
Terminals	**IP20**
Mounting area (e.g. control cabinet)	**IP51**
Potential isolation	
Potential isolation between	**Supply voltage for module supply and periphery supply**
Type of potential isolation	**Functional insulation**
Rated surge voltage in operating heights up to max. 2000 m	**2000 V**
Rated surge voltage in operating heights up to max. 5000 m	**1500 V**
Potential isolation between	**Supply voltage for module supply and module supply**
Type of potential isolation	**Functional insulation**
Rated surge voltage in operating heights up to max. 2000 m	**2000 V**
Rated surge voltage in operating heights up to max. 5000 m	**1500 V**
Potential isolation between	**Periphery supply and module supply**
Type of potential isolation	**Functional insulation**

Potential isolation	
Rated surge voltage in operating heights up to max. 2000 m	**2000 V**
Rated surge voltage in operating heights up to max. 5000 m	**1500 V**
Mechanical data	
Material	
Housing	**PC**
Connection type	**Spring-loaded terminal**
Mounting type	**plug-in**
Dimensions	
Height	**109,3 mm**
Width	**31,3 mm**
Depth	**95,4 mm**
Weight	**138 g**

Where standards are undated, the 2022-01 latest editions shall apply.

11 Supplementary data

11.1 Permitted operating height

The values stated in the technical details apply to the use of the device in operating heights up to max. 2000 m above SL. When used at higher levels, restrictions of the ambient temperature (standard IEC 61131-2) must be taken into account.

Operating height above SL [m]	Multiplication factors for the devices' ambient temperature
0 … 2000	1.0
3000	0.9
4000	0.8
5000	0.7

12 Order reference

12.1 Product

Product type	Features	Order no.
PSS u2 PS1 -R	Main voltage supply module for PSS u2 head module for connecting module supply and periphery supply, connection for functional earth, potential isolation, for increased environmental requirements and railway applications	329302

12.2 Accessories

Terminal block

Product type	Features	Order no.
PSS u2 T 9	Terminal block 9-pin for main voltage supply PSS u2 PSx	328832

Label holder for terminal block

Product type	Features	Order no.
PSS u2 A LC T3 (10 pcs.)	Label holder for terminal block 61 x 11.5 mm, scope of delivery: 10 pieces	328912

Labelling bracket

Product type	Features	Order no.
PSS u2 A LC E1 (10 pcs.)	Label holder for electronic module 23.5 x 10.5 mm, scope of delivery: 10 pieces	328910
PSS u2 A LC E2 (10 pcs.)	Label holder for electronic module 103 x 10.5 mm, scope of delivery: 10 pieces	328911
PSS u2 A LA E1 (10 pcs.)	Labelling strips for electronic module 23.5 x 10.5 mm (10 x DIN A4 sheet)	328913
PSS u2 A LA E2 (10 pcs.)	Labelling strips for electronic module 103 x 10.5 mm (10 x DIN A4 sheet)	328914

Support

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