PSSu H PLC1 FS SN SD (M12) (-T)(-R)

PILZ
THE SPIRIT OF SAFETY

- Control system PSSuniversal PLC

Operating Manual-21939-EN-16

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SD means Secure Digital

1 Introduction

1.1 Validity of documentation

The documentation is valid for the product types:

- PSSu H PLC1 FS SN SD
- PSSu H PLC1 FS SN SD–T
- PSSu H PLC1 FS SN SD M12-T
- PSSu H PLC1 FS SN SD–R
- PSSu H PLC1 FS SN SD M12-R
- It is valid until new documentation is published.

Please also refer to the following documents:

- System Description PSS 4000
- PSSuniversal Installation Manual

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

1.1.1 Retaining the documentation

This documentation is intended for instruction and should be retained for future reference.

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 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.

2 Overview

2.1 Module features

The head module belongs to the performance class "Control system PSSu PLC". It can be used to connect a PSSu system to SafetyNET p or for non-safety-related applications it can be incorporated into a PROFINET project as an IO device.

The head module has the following features:

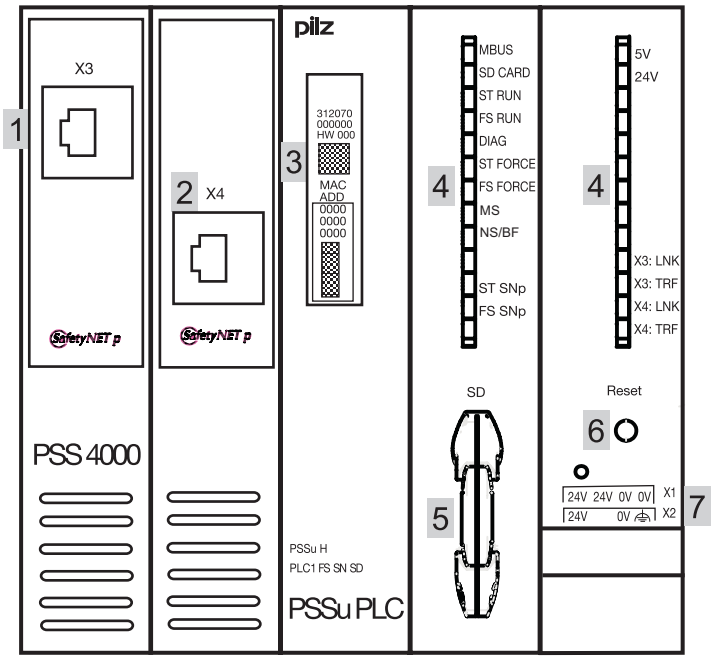
- 2 free switch ports for connection to SafetyNET p
- External connections:
  - Modbus/TCP
  - Raw UDP
  - Raw TCP
  - EtherNet/IP
  - PROFINET
- One FS resource and one ST resource
- SD card used to store the device project and the naming data
- Reset button
  - For warm reset
  - To transfer the naming data and/or device project from the SD card to the device memory
- Supply voltage
  - Integrated supply voltage for periphery supply and module supply
  - Module supply is buffered for 20 ms if the supply voltage is interrupted
  - Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- Status LEDs
- Supports FS and ST modules
- T-type:

  PSSu H PLC1 FS SN SD (M12)-T: For increased environmental requirements
- R-type:

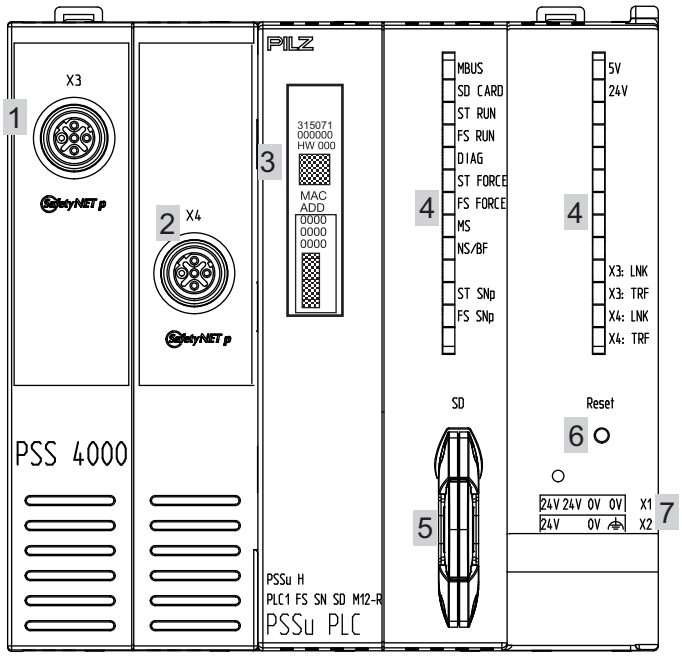
  PSSu H PLC1 FS SN SD (M12)-R: For railway applications

2.2 Front view

Front view of head modules with an RJ45 female connector



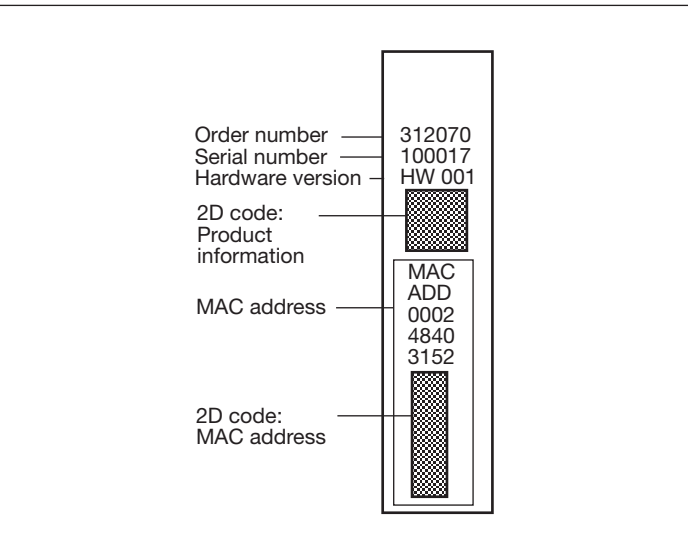
Front view of head modules with an M12 female connector



Legend

1 Ethernet Port
2 Ethernet Port
3 Labelling strip (see below for details)
4 Status LEDs
5 SD card
6 Reset pushbutton
7 Supply voltage connection (module and periphery supply)

The labelling strip contains the following information:



3 Safety

3.1 Intended use

The module is suitable for use in safety and non-safety-related applications, with and without **SafetyNET p** or in non-safety-related applications with PROFINET IO.

Please note that only head modules with a "BF"-LED are used with PROFINET IO.

The modules PSSu H PLC1 FS SN SD and PSSu H PLC1 FS SN SD-T may be used as a safety components in accordance with the Lifts Directive 95/16/EC in accordance with the requirements of EN 81-1/2:1998+A3:2009, EN 81-20:2015, EN 81-50:2015, EN 81-22:2014 and EN 115-1:2008+A1:2010.

The programmable safety system should be installed in a protected environment that meets at least the requirements of pollution degree 2. Example: Protected inside space or control cabinet with protection class IP54 and corresponding air conditioning.

The module PSSu H PLC1 FS SN SD (M12)-R is suitable for use where there are increased environmental requirements demanded by railway applications (see Technical details).

The module PSSu H PLC1 FS SN SD (M12)-T is suitable for use where there are increased environmental requirements (see Technical Details).

Intended use includes making the electrical installation EMC-compliant. Please refer to the guidelines stated in the "PSSuniversal Installation Manual". The module is designed for use in an industrial environment. It is not suitable for use in a domestic environment, as this can lead to interference.

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 manual
- Any use of the module that is not in accordance with the technical details.

NOTICE

Always use the latest version of PAS4000 for programming the head modules (download from www.pilz.de).

- Base type and T-type:
  at least version 1.3.1.
- R-type:
  at least version 1.5.0

3.2 Safety regulations

3.2.1 Safety assessment

Before using a device it is necessary to perform a safety assessment in accordance with the Machinery Directive.

Functional safety is guaranteed for the product as a single component. However, this does not guarantee the functional safety of the overall plant/machine. In order to achieve the required safety level for the overall plant/machine, define the safety requirements for the plant/machine and then define how these must be implemented from a technical and organisational standpoint.

3.2.2 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.

3.2.3 Warranty and liability

All claims to warranty and liability will be rendered invalid if

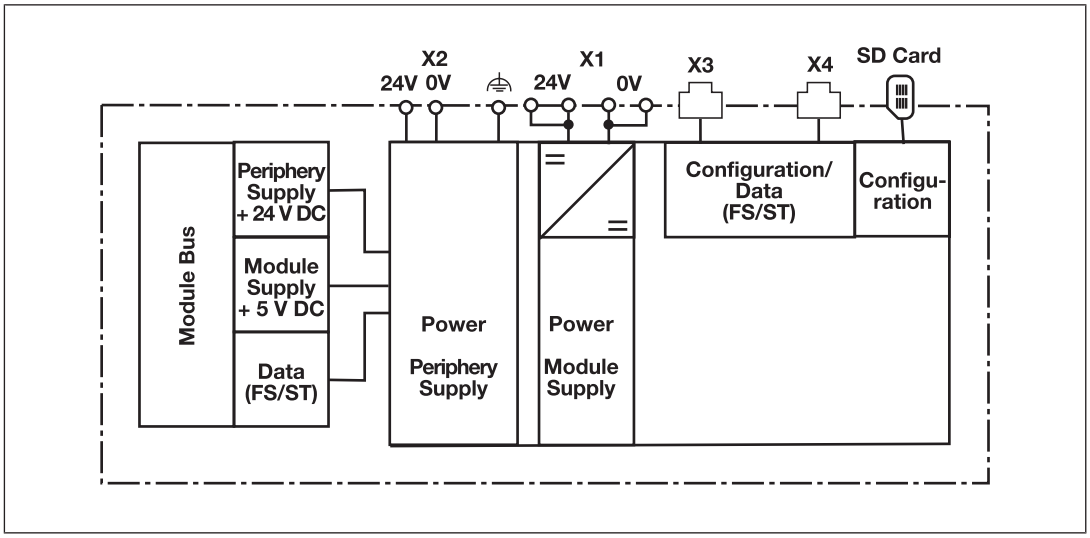
- The product was used contrary to the purpose for which it is intended,
- Damage can be attributed to not having followed the guidelines in the manual,
- Operating personnel are not suitably qualified,
- Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering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

3.2.4 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 Function description

4.1 Block diagram



4.2 Control system

The head module is a programmable logic controller (PLC), which can be used in safety-related and non-safety-related applications. The control system has memory areas for the operating system, the data and the device project with the user program.

The head module has a non-volatile memory for the non-volatile variables.

User programs can be created in IEC 61131 programming and/or Multi programming.

For safety-related applications, the processor section is designed with multi-channel diversity.

The control system communicates with the input and output modules via the local module bus and with the decentralised input and output modules via SafetyNET p or for non-safety-related applications as PROFINET IO-DEVICE. LEDs provide information on the status of the control system and indicate any errors.

NOTICE

The controller has the system section with Ethernet/IP Adapter as well as the PROFINET IO DEVICE system section. You can recognise this by the fact that the controller has a common status LED for PROFINET and Ethernet/IP. The status LED is labelled with "BF" for PROFINET and "NS" for Ethernet/IP.

Please note:

You can only use one of the two system sections on the head module; i.e. you can use the head module either as an Ethernet/IP Adapter in Ethernet/IP or as a PROFINET IO device in PROFINET.

4.3 Supply voltage

4.3.1 Function description

The product provides the module supply and periphery supply for the modules on the module bus:

- Module supply

  Supply voltage for subsequent module (right-hand side)

- Periphery supply

  Supply voltage for 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.

4.3.2 Current load capacity

Ensure you comply with the current load capacity of the module and periphery supply (see "Technical Details"). If the current load is higher, an additional supply voltage module is required to refresh the module supply and periphery supply.

- Module supply

  The current load is the total current consumption of all the electronic and compact modules.

  The module supply does not automatically switch off if values exceed or drop below their limits. However, the "5 V" LED will light and a message will be entered in the diagnostic list.

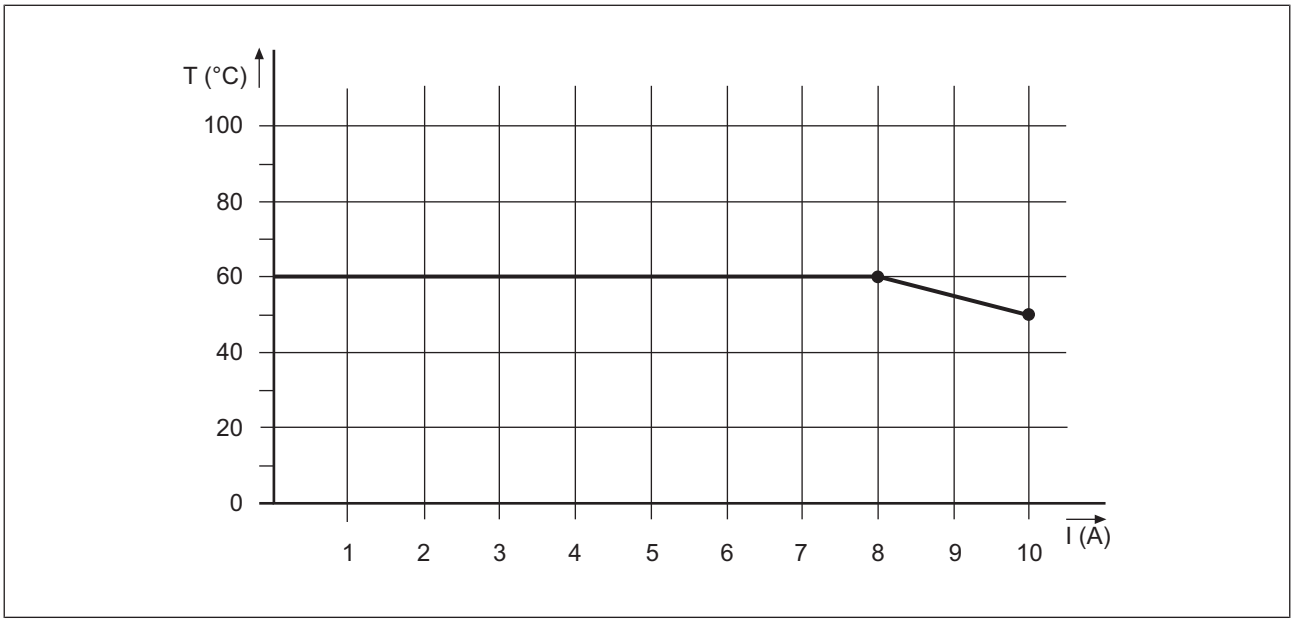
- Periphery supply

  The current load is the total current consumption of the sensors, actuators and test pulses supplied via the input/output modules.

  The periphery supply does not automatically switch off if values exceed or drop below their limits. However, the "24 V" LED will light and a message will be entered in the diagnostic list.

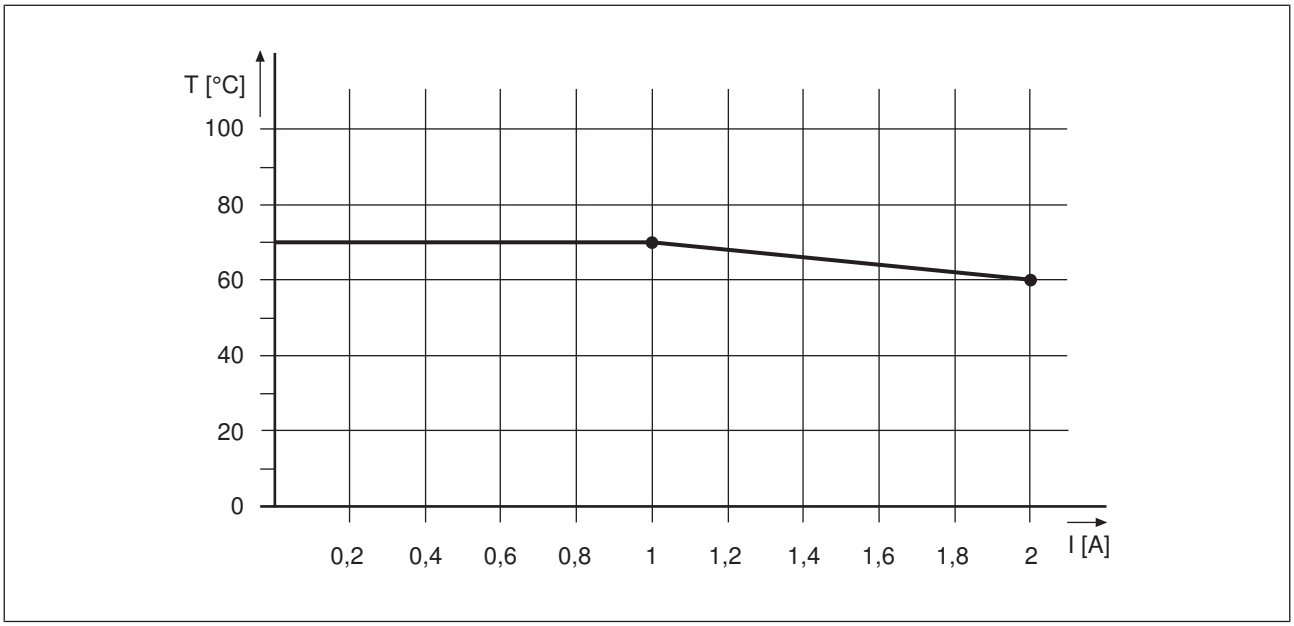
  Please refer to the derating diagrams.

PSSu H PLC1 FS SN SD: Derating diagram for periphery supply: Temperature T dependent on load current I



PSSu H PLC1 FS SN SD(-T)(-R): Derating diagram for periphery supply: Permitted ambient temperature T dependent on load current I

PSSu H PLC1 FS SN SD(-T)(-R): Derating diagram for infeed for module supply: Permitted ambient temperature T dependent on load current I



4.4 Integrated protection mechanisms

The module has the following protection mechanisms:

- Multi-channel diverse processor section
- Cyclical self tests
- Potentially isolated **SafetyNET p** interface
- Infeed for module supply
  - Polarity protection
  - Voltage monitoring
  - Transient voltage limitation
  - 20 ms voltage buffer if the supply voltage is interrupted
- Module supply
  - Short circuit-proof
- Periphery supply
  - Voltage monitoring (exceeding upper/lower limit)

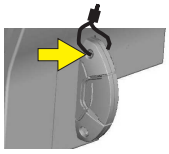
4.5 SD card

The SD card has the following functions:

- The SD card is used to store the naming data and the device project; see PSS 4000 System Description.
- The SD card is part of the safety concept on PSS 4000. If the SD card is missing or has been swapped, the next time the PSSu system is booted it will be unable to achieve the operating status "PSSu System in RUN condition without error". The SD card has a lock-

ing mechanism, which protects it from being removed from the card holder unintentionally. The SD card can also be sealed to protect it from manipulation, whether accidental or intentional.

Sealing the SD card for additional protection:



4.6 Reset button

The "Reset" pushbutton on the head module has various functions:

- Perform a warm reset for the PSSu system.

  The reset pushbutton can be used to perform a warm reset for the PSSu system.
- Transfer the naming data and/or device project from the SD card (deliberate operator action to transfer the naming data and/or device project from the SD card to the device memory).

INFORMATION

The warm reset and the transfer of the naming data and/or device project are described in the "PSS 4000 System Description". This is also where the general effects on the PSSu system are described in detail.

4.7 SafetyNET p

4.7.1 Connection to SafetyNET p

Functions

- The SafetyNET p interface enables safety-related and non-safety-related data transfer between the PSSu system and other network subscribers.
- The head module receives signals from other network subscribers; it processes these signals in the user program and passes them on to the connected input/output modules.
- The head module receives signals from the connected input/output modules; it processes these signals in the user program and passes them on to the other network subscribers.
- If a fault occurs, the module switches the connected failsafe outputs to a safe condition.

MAC address

- The MAC address is a factory-set default. It can found on the labelling strip on the front of the module.

INFORMATION

Further information on SafetyNET p can be found in the "PSS 4000 System Description".

4.8 External communication

For non-safety-related applications the following IP connections are supported:

- Modbus/TCP
- Raw UDP
- Raw TCP

For non-safety-related applications the following fieldbuses are supported:

- PROFINET
- EtherNet/IP

Detailed information is available in the "System description PSS 4000".

5 Installation

5.1 General installation guidelines

Please also refer to the PSSuniversal Installation Manual.

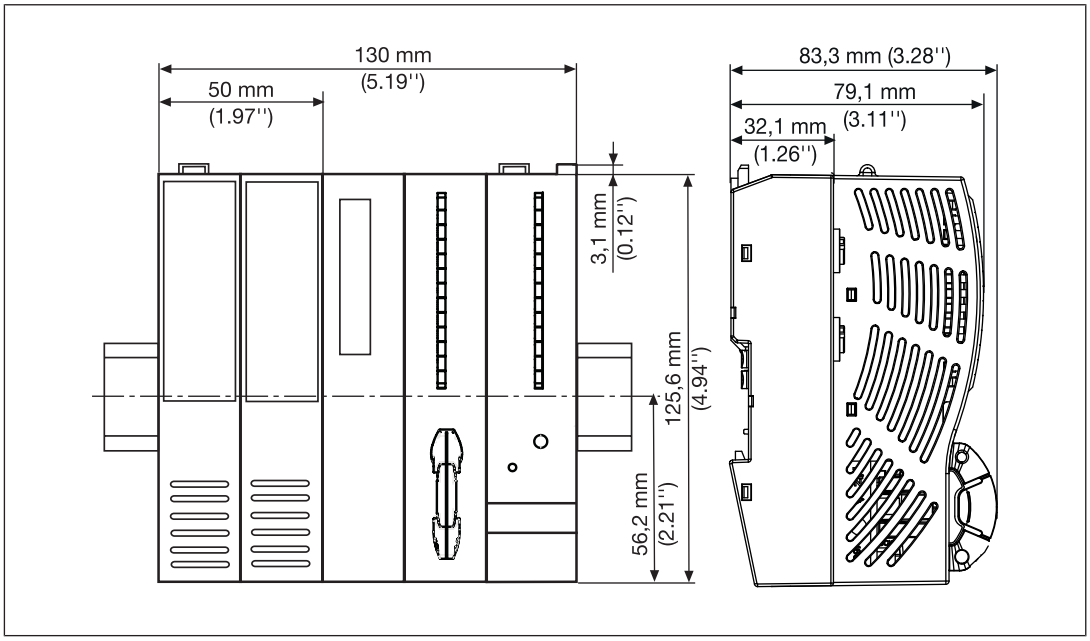
The description below assumes that the mounting rail is already installed.

NOTICE

Damage due to electrostatic discharge!

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.

5.2 Dimensions



5.3 Installing the head module

Prerequisite:

- The mounting rail must be installed.

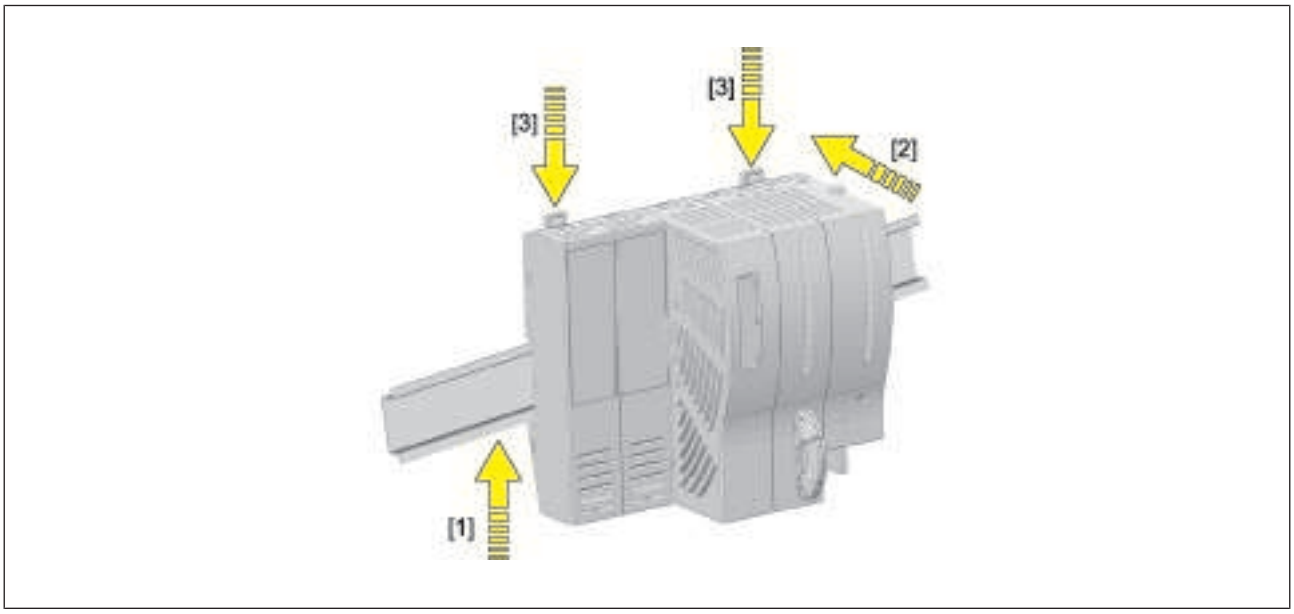
Please note:

- All contacts should be protected from contamination.

Procedure:

- Install an end bracket to the left of the head module or leave enough space for one.
- Slot the groove on the head module on to the mounting rail from below [1].
- Push the head module back as far as it will go [2].
- Make sure that the locking mechanisms [3] are pushed downwards, connecting the module firmly to the mounting rail.

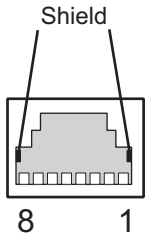
Schematic representation:



6 Interface assignment

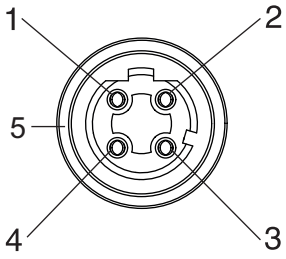
Further information on the Ethernet interface can be found in the system description PSS 4000.

Assignment of the interfaces on head modules with an RJ45 female connector

SafetyNET p	Assignment	
RJ45 female connector	1: TD+ 2: TD- 3: RD+ 4: n.c. 5: n.c. 6: RD- 7: n.c. 8: n.c.	

▶ n.c. = not connected

Assignment of the interfaces on head modules with an M12 female connector

SafetyNET p	Assignment	
4-pin M12 female connector D-coded	1: TD+ 2: RD+ 3: TD- 4 RD- 5: Connection to functional earth on the connector housing	

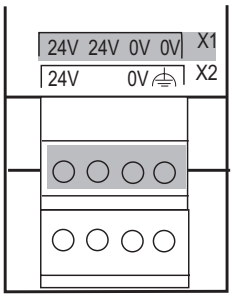
7 Wiring

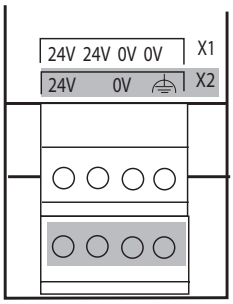
7.1 General wiring guidelines

Please note:

- The requirements of the supply voltages can be found in the chapter entitled "Technical Details".
- 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 external power supplies must comply with the current applicable standard EN 60950-1, EN 61140, EN 50178 or EN 61558-1.
- The maximum current load for the periphery supply on the module bus is 10 A. Please refer to the derating diagram in the chapter entitled "Function Description".
- Earth the 0 V supply on the periphery supply or monitor each supply group for earth faults.
- The connection of the 0 V supply to the central earth bar or earth fault monitor must be in accordance with relevant national regulations (e.g. EN 60204-1, NFPA 79:17-7, NEC: Article 250).
- Details of the minimum range for conductor cross sections on connection terminals can be found in the section entitled "Technical Details".
- Use copper wiring.

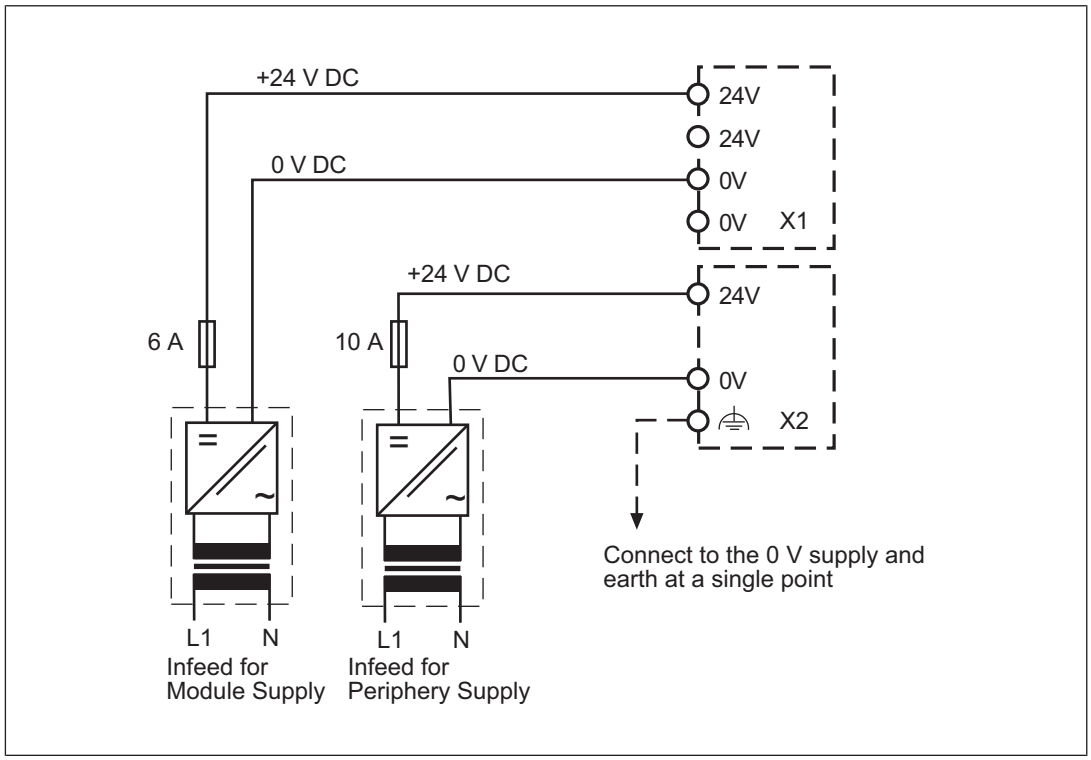
7.2 Terminal configuration

Module supply	Terminal configuration		X1
4-pin female connector	24V	+24 V infeed for module supply	
	0V	0 V infeed for module supply	

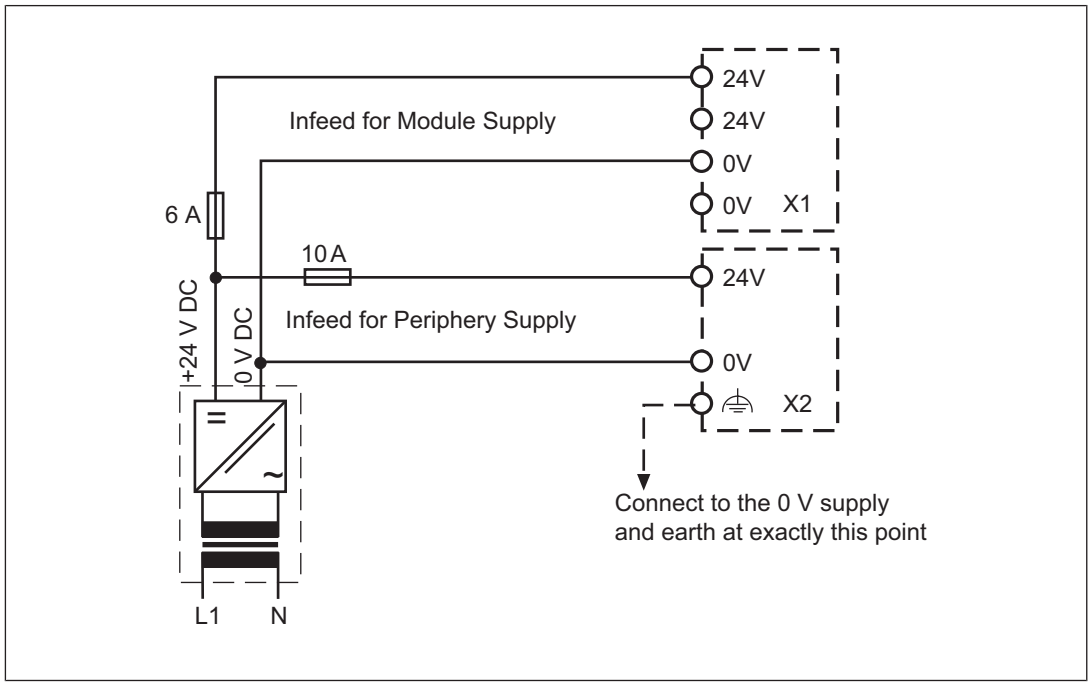
Periphery supply	Terminal configuration		X2
4-pin female connector	24V:	+24 V infeed for periphery supply	
	0V	0 V infeed for periphery supply	
	⏚	Functional earth	

7.3 Connecting the module

Separate power supplies for module supply and periphery supply:



Common power supply for module supply and periphery supply:



8 Operation

8.1 Messages

The PSSu system provides many options for diagnostics, fault detection and communication with other control systems.

Diagnostics for the PSSu system can be run via the

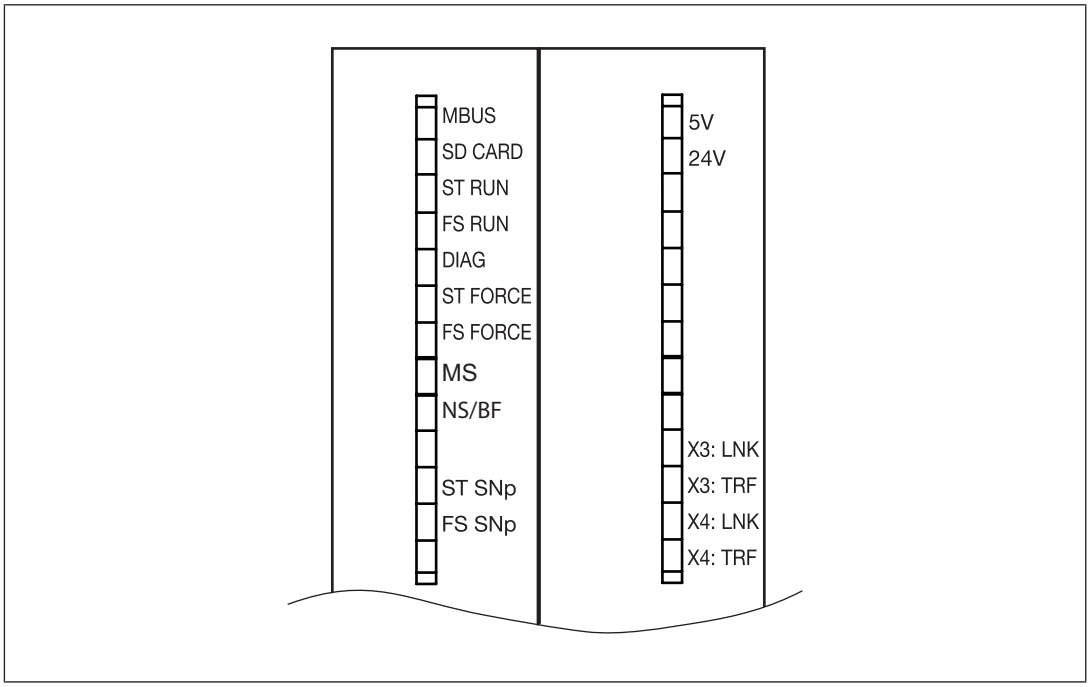
- LEDs on the head module,
- Diagnostic table and diagnostic log.

All errors and faults detected by the electronic or compact modules in a PSSu system are signalled to the head module and entered in the diagnostic table and diagnostic log. You can read the head module's diagnostic table and diagnostic log, e.g. using the PAS4000 or the combination of OPC Server and PSS 4000 Diag Control.

8.2 Display elements

The head module contains a number of status LEDs, which provide information on the status of various system sections.

LEDs on the PSSu H PLC1 FS SN SD:



Legend

- LED on
- LED flashes
- LED off

8.2.1 MBUS

The "MBUS" LED indicates the status of the FS and ST module bus.

Colour	Status	Meaning
- - -	●	No modules present
Green	☼	FS and ST module bus are operating without fault
Red	☼	Operating state "Safe condition of all FS outputs on the PSSu system" or Unable to locate at least one module (e.g. a module has been removed during operation, actual/ registered hardware does not match)
	◐	Operating state "FS module bus in a STOP condition with error: Major FS error"

8.2.2 SD CARD

The LED "SD CARD“ shows the status of the removable data medium and is used for device identification.

Colour	Status	Meaning
- - -	●	Supply voltage for module supply is missing
red		SD card is missing or SD card not recognised or SD card defective
		▸ "Bind device projects to devices" function: The device project needs a device with a certain device key, but this device key does not exist on the device. and/or ▸ "Bind device projects to SD cards" function: The device project is bound to an SD card, but this SD card is not inserted in the device.
Green		Naming data and device project on the PSSu system and SD card match
		Product type on the SD card does not match the head module or No device project on the SD card
Green-red		Naming data and device project on the PSSu system and SD card do not match
orange		Device identification activated by user

8.2.3 ST RUN

The "ST RUN" LED indicates the status of the ST resource.

Colour	Status	Meaning
- - -	●	ST resource has not been started or is in a STOP condition
Green		Operating state "ST resource in RUN condition without error": The ST resource tasks are running without error. The project is licensed.
		Operating state: "ST resource in RUN condition with error": - Task in TERMINATED condition or - Task in STOP condition At least one ST resource task is not running. The project is licensed.
Orange		Operating state "ST resource in RUN condition without error": The ST resource tasks are running without error. The project is unlicensed.
		Operating state: "ST resource in RUN condition with error": - Task in TERMINATED condition or - Task in STOP condition At least one ST resource task is not running. The project is unlicensed.

8.2.4 FS RUN

The "FS RUN" LED shows the status of the FS resource.

Colour	Status	Meaning
- - -	●	FS resource has not been started or is in a STOP condition
Green		Operating state "FS resource in RUN condition without error": The FS resource tasks are running without error. The project is licensed.
		Operating state: "FS resource in RUN condition with error": - Task in TERMINATED condition or - Task in STOP condition At least one FS resource task is not running. The project is licensed.
Orange		Operating state "FS resource in RUN condition without error": The FS resource tasks are running without error. The project is unlicensed.
		Operating state: "FS resource in RUN condition with error": - Task in TERMINATED condition or - Task in STOP condition At least one FS resource task is not running. The project is unlicensed.

8.2.5 DIAG

The "DIAG" LED indicates whether there is a fault on a system section of the PSSu system/ PSS67 device. Precise evaluation can be made via the diagnostic list.

Colour	State	Meaning
- - -	●	No system section is started, module supply is missing.
green	☼	No message of "Error" or "Warning" severity is present for the device.
	◐	Device diagnostic list and device diagnostic log are being prepared
red	☼	A message of "Error" severity is present for at least one system section (see diagnostic list).
	◐	A major FS error is present for at least one FS system section (see diagnostic list).
orange	☼	A message of at least "Warning" severity is present for the device (see diagnostic list).
Red - green	◐	Start of "deliberate operator action" (function of reset button)

8.2.6 ST FORCE

The “ST FORCE” LED indicates the status of forcing and online changes on the ST resource.

Colour	Status	Meaning
- - -	●	On the ST resource, forcing is inactive and there is no online change active
Yellow	☼	On the ST resource, forcing is active and/or there is at least one online change active

8.2.7 FS FORCE

The “FS FORCE” LED indicates the status of forcing and online changes on the FS resource.

Colour	Status	Meaning
- - -	●	On the FS resource, forcing is inactive and there is no online change active
yellow	☼	On the FS resource, forcing is active and/or there is at least one online change active

8.2.8 MS

The "MS" LED displays the module status in accordance with the EtherNet/IP specification.

Colour	Status	Meaning
- - -	●	No supply voltage or device inactive or device not configured
Green	☼	No message of "Error" or "Warning" severity is present for the device.
Red	☼	A message of "Error" severity is present for at least one system section or a major FS error is present for at least one FS system section (see diagnostic list).
	◐	At least one message of "Warning" severity is present for the device, no message of "Error" severity is present and no invalid data is being downloaded to the scanner.

8.2.9 NS/BF

The "NS" LED displays the network status in accordance with the EtherNet/IP specification.

Colour	Status	Meaning
- - -	●	No data traffic or EtherNet/IP not configured or no IP address configured
Green		Network connection is available and EtherNet/IP communication is ok
		No network connection
Red		Connection timeout

The LED "BF" shows the bus status in accordance with the PROFINET IO specification.

Colour	Status	Meaning
- - -	●	The PROFINET IO Device is deactivated; i.e. no virtual PROFINET IO modules are configured.
green		The PROFINET IO Device is in "Operational" state, data exchange possible
red		No connection to PROFINET IO Controller
		Connection to PROFINET IO Controller available, no data exchange due to faulty parameter settings

8.2.10 ST SNp

The "ST SNp" LED indicates the status of the non-safety-related system section ST-SafetyNET p RTFN.

Colour	Status	Meaning
- - -	●	System section ST SafetyNET p RTFN has not been started
Green		Operating state "ST SafetyNET p RTFN in RUN condition without error"
		Operating state "ST SafetyNET p RTFN in RUN condition with minor error"
Red		Operating state "ST SafetyNET p RTFN in STOP condition with error: Major FS+ST error"
		

8.2.11 FS SNp

The "FS SNp" LED indicates the status of the safety-related system section FS-SafetyNET p RTFN.

Colour	Status	Meaning
- - -	●	System section FS SafetyNET p RTFN has not been started
Green		Operating state "FS SafetyNET p RTFN in RUN condition without error"
		Operating status "FS SafetyNET p RTFN in RUN condition with minor error"
Red		Operating state "FS SafetyNET p RTFN in STOP condition with error: Major FS error"
		Operating state "FS SafetyNET p RTFN in STOP condition with error: Major FS+ST error

8.2.12 5V, 24V

The "5 V" LED shows the status of the module supply.

Colour	Status	Meaning
- - -	●	No supply voltage for module supply or supply voltage is faulty
Green		Module supply is available on the module bus

The "24 V" LED shows the status of the periphery supply.

Colour	Status	Meaning
- - -	●	No supply voltage for periphery supply or supply voltage is faulty
Green		Periphery supply is available on the module bus

8.2.13 X3: LNK, X3: TRF, X4: LNK, X4: TRF

These status LEDs are the display elements for the interfaces (X3 and X4). Both interfaces are assigned two LEDs each. Various operating and fault states are displayed via the LEDs.

X3: LNK, X4: LNK

Colour	Status	Meaning
---		No network connection
Green		Network connection is error-free

X3: TRF, X4: TRF

Colour	Status	Meaning
---		No data traffic
Yellow		Data traffic is error-free

9 Technical Details

General	312070	314070	314071
Certifications	CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed	CE, EAC (Eurasian), TÜV, cULus Listed	CE, TÜV
Application range	Standard/failsafe	Standard/failsafe	Standard/failsafe
System sections	**312070**	**314070**	**314071**
ST resource	yes	yes	yes
FS resource	yes	yes	yes
ST module bus	yes	yes	yes
FS module bus	yes	yes	yes
ST SNp interface	yes	yes	yes
FS SNp interface	yes	yes	yes
PROFIBUS-DP Slave	No	No	No
PROFINET IO DEVICE	yes	yes	yes
IP connections	yes	yes	yes
EtherNet/IP (TM) adapter	yes	yes	yes
Diagnostic Server	No	No	No
OPC Server	No	No	No
Programming	**312070**	**314070**	**314071**
IEC 61131 programming	yes	yes	yes
Multi programming	yes	yes	yes
Non-volatile variables	yes	yes	yes
Electrical data	**312070**	**314070**	**314071**
Supply voltage			
for	Module supply	Module supply	Module supply
Voltage	24 V	24 V	24 V
Kind	DC	DC	DC
Voltage tolerance	-30 %/+25 %	-30 %/+25 %	-30 %/+25 %
Max. continuous current that the external power supply must provide	1 A	1 A	1 A
Output of external power supply (DC)	16 W	16 W	16 W
Supply voltage			
for	Periphery supply	Periphery supply	Periphery supply
Voltage	24 V	24 V	24 V
Kind	DC	DC	DC
Voltage tolerance	-30 %/+25 %	-30 %/+25 %	-30 %/+25 %
Max. continuous current that the external power supply must provide	10 A	10 A	10 A

Electrical data	312070	314070	314071
Internal supply voltage (module supply)			
Output voltage	int. system	int. system	int. system
Voltage	5 V	5 V	5 V
Kind	DC	DC	DC
Voltage tolerance	-2 %/+3 %	-2 %/+3 %	-2 %/+3 %
Current load capacity	2 A	2 A	2 A
Buffer in the case of supply interruptions in accordance with	EN 61131-2, EN 61496-1	EN 61131-2, EN 61496-1	EN 61131-2, EN 61496-1
Short circuit-proof	yes	yes	yes
CPU	**312070**	**314070**	**314071**
Real-time clock for time and date functions			
Resolution	1 s	1 s	1 s
Deviation	+/- 10s/day	+/- 10s/day	+/- 10s/day
Buffer time	10 days	10 days	10 days
Max. number of FS tasks	9	9	9
Max. number of ST tasks	9	9	9
Max. number of variables with elementary data types on the FS resource	10.000	10.000	10.000
Max. number of variables with elementary data types on the ST resource	10.000	10.000	10.000
Min. cycle time of FS tasks	6 ms	6 ms	6 ms
Min. cycle time of ST tasks	2 ms	2 ms	2 ms
Working memory (RAM)	128 MB	128 MB	128 MB
Memory for the user program per resource	4 MB	4 MB	4 MB
Non-volatile FS memory	382 kB	382 kB	382 kB
Non-volatile ST memory	128 kB	128 kB	128 kB
Removable data medium	**312070**	**314070**	**314071**
Type	SD card	SD card	SD card
SafetyNET p interface	**312070**	**314070**	**314071**
Number	2	2	2
IP address (automatically off)	169.254.X.Y	169.254.X.Y	169.254.X.Y
Connection	RJ45	RJ45	M12
Transmission rates	100 MBit/s	100 MBit/s	100 MBit/s
Set via	Automatic	Automatic	Automatic
Max. number of ST-Tx and ST-Rx connections	64	64	64

SafetyNET p interface	312070	314070	314071
Max. number of FS-Tx and FS-Rx connections	64	64	64
Cycle time (t_SNp RTFN)	2 ... 60 000 ms	2 ... 60 000 ms	2 ... 60 000 ms
Max. number of variables with elementary ST data types	5000	5000	5000
Max. number of variables with elementary FS data types	4000	4000	4000
PROFINET interface	**312070**	**314070**	**314071**
Input device	1.440 Byte	1.440 Byte	1.440 Byte
Output	1.440 Byte	1.440 Byte	1.440 Byte
Transmission rates	100 MBit/s	100 MBit/s	100 MBit/s
Transmission rate select-able via	Automatic	Automatic	Automatic
Certification	PNO	PNO	PNO
Manufacturer's ID	092Fh	092Fh	092Fh
Connection	RJ45	RJ45	M12
Device type	Slave	Slave	Slave
Cycle time (t_ExtCo)	4 ... 512 ms	4 ... 512 ms	4 ... 512 ms
Modbus/TCP	**312070**	**314070**	**314071**
Cycle time (t_ExtCo)	2 ... 2 000 000 ms	2 ... 2 000 000 ms	2 ... 2 000 000 ms
EtherNet/IP (TM) adapter	**312070**	**314070**	**314071**
Cycle time (tExtCo)	4...655 000 ms	4...655 000 ms	4...655 000 ms
Manufacturer's ID	181	181	181
Product ID	1	1	1
EDS file	00B5000C00010100.eds	00B5000C00010100.eds	00B5000C00010100.eds
Device type	Adapter	Adapter	Adapter
Cycle time (RPI)	4...655 000 ms	4...655 000 ms	4...655 000 ms
Maximum data length	508 Byte	508 Byte	508 Byte
Maximum number of I/O connections	1	1	1
Raw UDP	**312070**	**314070**	**314071**
Memory size	8 Kbyte	8 Kbyte	8 Kbyte
Cycle time (t_ExtCo)	2 ... 2 000 000 ms	2 ... 2 000 000 ms	2 ... 2 000 000 ms
Environmental data	**312070**	**314070**	**314071**
Climatic suitability	EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78	EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78	EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78
Ambient temperature			
Temperature range	0 - 60 °C	-40 - 70 °C	-40 - 70 °C
Storage temperature			
Temperature range	-25 - 70 °C	-40 - 70 °C	-40 - 70 °C

Environmental data	312070	314070	314071
Climatic suitability			
In accordance with the standard	EN 60068-2-78	EN 60068-2-78	EN 60068-2-78
Humidity	93 % r. h. at 40 °C	93 % r. h. at 40 °C	93 % r. h. at 40 °C
Condensation during operation	Not permitted	Short-term	Short-term
Max. operating height above sea level	2000 m	5000 m	5000 m
EMC	EN 61131-2 (Zone B)	EN 61131-2 (Zone B)	EN 61131-2 (Zone B)
Vibration			
In accordance with the standard	EN 60068-2-6	EN 60068-2-6	EN 60068-2-6
Frequency	8,4 - 150 Hz	8,4 - 150 Hz	8,4 - 150 Hz
Acceleration	1g	1g	1g
Broadband noise			
In accordance with the standard	–	EN 60068-2-64	EN 60068-2-64
Frequency	–	5 - 500 Hz	5 - 500 Hz
Acceleration	–	1,9grms	1,9grms
Shock stress			
In accordance with the standard	EN 60068-2-27	EN 60068-2-27	EN 60068-2-27
Number of shocks	6	6	6
Acceleration	15g	15g	15g
Duration	11 ms	11 ms	11 ms
In accordance with the standard	EN 60068-2-27	EN 60068-2-27	EN 60068-2-27
Number of shocks	1000	1000	1000
Acceleration	10g	10g	10g
Duration	16 ms	16 ms	16 ms
Airgap creepage			
In accordance with the standard	EN 60664-1, EN 61131-2	EN 60664-1, EN 61131-2	EN 60664-1, EN 61131-2
Overvoltage category	II	II	II
Pollution degree	2	2	2
Protection type			
Housing	IP20	IP20	IP20
Mounting area (e.g. control cabinet)	IP54	IP54	IP54
Potential isolation	**312070**	**314070**	**314071**
Potential isolation between	Periphery supply and module supply	Periphery supply and module supply	Periphery supply and module supply
Type of potential isolation	Functional insulation	Functional insulation	Functional insulation
Rated surge voltage	2500 V	2500 V	2500 V
Potential isolation between	Periphery supply and system voltage	Periphery supply and system voltage	Periphery supply and system voltage
Type of potential isolation	Functional insulation	Functional insulation	Functional insulation

Potential isolation	312070	314070	314071
Rated surge voltage	2500 V	2500 V	2500 V
Mechanical data	**312070**	**314070**	**314071**
Material			
Bottom	PC	PC	PC
Connection type	Spring-loaded terminal, screw terminal	Spring-loaded terminal, screw terminal	Spring-loaded terminal, screw terminal
Mounting type	plug-in	plug-in	plug-in
Conductor cross section with screw terminals			
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG	0,25 - 2,5 mm², 24 - 12 AWG	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG	0,25 - 1 mm², 24 - 16 AWG	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,2 - 1,5 mm², 24 - 16 AWG	0,2 - 1,5 mm², 24 - 16 AWG	0,2 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm	0,5 Nm	0,5 Nm
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG	0,2 - 2,5 mm², 24 - 12 AWG	0,2 - 2,5 mm², 24 - 12 AWG
Stripping length with spring-loaded terminals	9 mm	9 mm	9 mm
Dimensions			
Height	125,6 mm	125,6 mm	125,6 mm
Width	130 mm	130 mm	130 mm
Depth	83,7 mm	83,7 mm	83,7 mm
Weight	365 g	378 g	370 g

Technical details 315070 315071

General	315070	315071
Certifications	CE, TÜV	CE, TÜV
Application range	Standard/failsafe	Standard/failsafe
System sections	**315070**	**315071**
ST resource	yes	yes
FS resource	yes	yes
ST module bus	yes	yes
FS module bus	yes	yes
ST SNp interface	yes	yes
FS SNp interface	yes	yes
PROFIBUS-DP Slave	No	No
PROFINET IO DEVICE	yes	yes
IP connections	yes	yes

System sections	315070	315071
EtherNet/IP (TM) adapter	**yes**	**yes**
Diagnostic Server	**No**	**No**
OPC Server	**No**	**No**
Programming	**315070**	**315071**
IEC 61131 programming	**yes**	**yes**
Multi programming	**yes**	**yes**
Non-volatile variables	**yes**	**yes**
Electrical data	**315070**	**315071**
Supply voltage		
for	**Module supply**	**Module supply**
Voltage	**24 V**	**24 V**
Kind	**DC**	**DC**
Voltage tolerance	**-30 %/+25 %**	**-30 %/+25 %**
Max. continuous current that the external power supply must provide	**1 A**	**1 A**
Output of external power supply (DC)	**16 W**	**16 W**
Supply voltage		
for	**Periphery supply**	**Periphery supply**
Voltage	**24 V**	**24 V**
Kind	**DC**	**DC**
Voltage tolerance	**-30 %/+25 %**	**-30 %/+25 %**
Max. continuous current that the external power supply must provide	**10 A**	**10 A**
Internal supply voltage (module supply)		
Output voltage	**int. system**	**int. system**
Voltage	**5 V**	**5 V**
Kind	**DC**	**DC**
Voltage tolerance	**-2 %/+3 %**	**-2 %/+3 %**
Current load capacity	**2 A**	**2 A**
Short circuit-proof	**yes**	**yes**
CPU	**315070**	**315071**
Real-time clock for time and date functions		
Resolution	**1 s**	**1 s**
Deviation	**+/- 10s/day**	**+/- 10s/day**
Buffer time	**10 days**	**10 days**
Max. number of FS tasks	**9**	**9**
Max. number of ST tasks	**9**	**9**
Max. number of variables with elementary data types on the FS resource	**10.000**	**10.000**

CPU	315070	315071
Max. number of variables with elementary data types on the ST resource	10.000	10.000
Min. cycle time of FS tasks	6 ms	6 ms
Min. cycle time of ST tasks	2 ms	2 ms
Working memory (RAM)	128 MB	128 MB
Memory for the user program per resource	4 MB	4 MB
Non-volatile FS memory	382 kB	382 kB
Non-volatile ST memory	128 kB	128 kB
Removable data medium	**315070**	**315071**
Type	SD card	SD card
SafetyNET p interface	**315070**	**315071**
Number	2	2
IP address (automatically off)	169.254.X.Y	169.254.X.Y
Connection	RJ45	M12
Transmission rates	100 MBit/s	100 MBit/s
Set via	Automatic	Automatic
Max. number of ST-Tx and ST-Rx connections	64	64
Max. number of FS-Tx and FS-Rx connections	64	64
Cycle time (t_SNp RTFN)	2 ... 60 000 ms	2 ... 60 000 ms
Max. number of variables with elementary ST data types	5000	5000
Max. number of variables with elementary FS data types	4000	4000
PROFINET interface	**315070**	**315071**
Input device	1.440 Byte	1.440 Byte
Output	1.440 Byte	1.440 Byte
Transmission rates	100 MBit/s	100 MBit/s
Transmission rate selectable via	Automatic	Automatic
Certification	PNO	PNO
Manufacturer's ID	092Fh	092Fh
Connection	RJ45	M12
Device type	Slave	Slave
Cycle time (t_ExtCo)	4 ... 512 ms	4 ... 512 ms
Modbus/TCP	**315070**	**315071**
Cycle time (t_ExtCo)	2 ... 2 000 000 ms	2 ... 2 000 000 ms
EtherNet/IP (TM) adapter	**315070**	**315071**
Cycle time (tExtCo)	4...655 000 ms	4...655 000 ms
Manufacturer's ID	181	181
Product ID	1	1
EDS file	00B5000C00010100.eds	00B5000C00010100.eds
Device type	Adapter	Adapter

EtherNet/IP (TM) adapter	315070	315071
Cycle time (RPI)	**4...655 000 ms**	**4...655 000 ms**
Maximum data length	**508 Byte**	**508 Byte**
Maximum number of I/O connections	**1**	**1**
Raw UDP	**315070**	**315071**
Memory size	**8 Kbyte**	**8 Kbyte**
Cycle time (t_ExtCo)	**2 ... 2 000 000 ms**	**2 ... 2 000 000 ms**
Environmental data	**315070**	**315071**
Application site		
In accordance with the standard	**EN 50125-3**	**EN 50125-3**
Application site	**Track area (1 m - 3 m)**	**Track area (1 m - 3 m)**
In accordance with the standard	**EN 61373**	**EN 61373**
Application site	**Category 1, Class A + B**	**Category 1, Class A + B**
Climatic suitability	**EN 50155, EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78**	**EN 50155, 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 50155**	**EN 50155**
Temperature range	**-40 - 70 °C**	**-40 - 70 °C**
In accordance with the standard	**EN 50125-1**	**EN 50125-1**
Temperature range	**-40 ... +70 °C**	**-40 ... +70 °C**
In accordance with the standard	**EN 50125-3**	**EN 50125-3**
Temperature range	**-40 ... +70 °C**	**-40 ... +70 °C**
Storage temperature		
Temperature range	**-40 - 70 °C**	**-40 - 70 °C**
Condensation during operation	**Short-term**	**Short-term**
Max. operating height above sea level	**2000 m**	**2000 m**
EMC	**EN 50121-3-2, EN 50121-4**	**EN 50121-3-2, EN 50121-4**
Broadband noise		
In accordance with the standard	**EN 61373**	**EN 61373**
Frequency	**5 ... 150 Hz**	**5 ... 150 Hz**
Acceleration	**0,572 g RMS**	**0,572 g RMS**
In accordance with the standard	**EN 50125-3**	**EN 50125-3**
Frequency	**5 - 2.000 Hz**	**5 - 2.000 Hz**
Acceleration	**0,23g RMS**	**0,23g RMS**
Shock stress		
In accordance with the standard	**EN 50125-3**	**EN 50125-3**
Number of shocks	**6**	**6**
Acceleration	**2 g**	**2 g**
Duration	**11 ms**	**11 ms**
In accordance with the standard	**EN 61373**	**EN 61373**
Number of shocks	**6**	**6**
Acceleration	**5 g**	**5 g**
Duration	**30 ms**	**30 ms**

Environmental data	315070	315071
Supply interruptions		
In accordance with the standard	**EN 50155**	**EN 50155**
Class	**S2, C1, C2**	**S2, C1, C2**
Airgap creepage		
In accordance with the standard	**EN 50124-1**	**EN 50124-1**
Overvoltage category	**OV2**	**OV2**
Pollution degree	**PD2**	**PD2**
Protection type		
In accordance with the standard	**EN 60529**	**EN 60529**
Housing	**IP20**	**IP20**
Mounting area (e.g. control cabinet)	**IP54**	**IP54**
Potential isolation	**315070**	**315071**
Potential isolation between	**Periphery supply and module supply**	**Periphery supply and module supply**
Type of potential isolation	**Functional insulation**	**Functional insulation**
Rated surge voltage	**2500 V**	**2500 V**
Potential isolation between	**Periphery supply and system voltage**	**Periphery supply and system voltage**
Type of potential isolation	**Functional insulation**	**Functional insulation**
Rated surge voltage	**2500 V**	**2500 V**
Mechanical data	**315070**	**315071**
Material		
Bottom	**PC**	**PC**
Connection type	**Spring-loaded terminal, screw terminal**	**Spring-loaded terminal, screw terminal**
Mounting type	**plug-in**	**plug-in**
Conductor cross section with screw terminals		
1 core flexible	**0,25 - 2,5 mm², 24 - 12 AWG**	**0,25 - 2,5 mm², 24 - 12 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,25 - 1 mm², 24 - 16 AWG**	**0,25 - 1 mm², 24 - 16 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 1,5 mm², 24 - 16 AWG**	**0,2 - 1,5 mm², 24 - 16 AWG**
Torque setting with screw terminals	**0,5 Nm**	**0,5 Nm**
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	**0,2 - 2,5 mm², 24 - 12 AWG**	**0,2 - 2,5 mm², 24 - 12 AWG**
Stripping length with spring-loaded terminals	**9 mm**	**9 mm**
Dimensions		
Height	**125,6 mm**	**125,6 mm**
Width	**130 mm**	**130 mm**
Depth	**83,7 mm**	**83,7 mm**

Mechanical data	315070	315071
Weight	350 g	370 g

Where standards are undated, the 2015-04 latest editions shall apply.

9.1 Safety characteristic data

NOTICE

You must comply with the safety characteristic data in order to achieve the required safety level for your plant/machine.

Order no.	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL	EN 62061 PFH_D [1/h]	IEC 61511 SIL	IEC 61511 PFD	EN ISO 13849-1: 2015 T_M [year]
312 070, 314 070, 315 070	PL e	Cat. 4	SIL CL 3	4,14E-09	SIL 3	3,51E-05	20
314 071, 315 071	PL e	Cat. 4	SIL CL 3	4,18E-09	SIL 3	3,54E-05	20

If the module is operated at an ambient temperature above 60° C, the values stated in the table for PFH_D and PFD will need to be doubled when a safety function is calculated.

All the units used within a safety function must be considered when calculating the safety characteristic data.

INFORMATION

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

10 Order reference

10.1 Product

Product type	Features	Order no.
PSSu H PLC1 FS SN SD	Head module with SafetyNET p, base type	312 070
PSSu H PLC1 FS SN SD-T	Head module with SafetyNET p, T-type	314 070
PSSu H PLC1 FS SN SD M12-T	Head module with SafetyNET p, M12 female connector T-type	314 071
PSSu H PLC1 FS SN SD-R	Head module with SafetyNET p, R-type	315 070
PSSu H PLC1 FS SN SD M12-R	Head module with SafetyNET p, M12 female connector R-type	315 071

10.2 Accessories

Cable

Product type	Features	Order no.
SafetyNET p Cable	SafetyNET p cable, standard, 4-core, sold by the metre, minimum purchase 10 m	380 000
M12 con., straight, male, 4-pin, D	Connector, M12, 4-pin, D-coded	380 316
Stripping tool	Assembly tool for SafetyNET p cable	380 070

Terminals

Product type	Features	Order no.
PSSu A Con 1/4 S	2 x screw terminals	313 110
PSSu A Con 2/8 C	2 x spring-loaded terminals	313 111