

S20 bus coupler for PROFIBUS DP

R911342760
Edition 03

Data sheet S20-PB-BK

PROFIBUS DP controller board
modular extensions possible using S20 modules

11 / 2023



1 Description

The bus coupler is intended for use within a PROFIBUS network and represents the link to the S20 system.

Up to 63 S20 devices can be connected to the bus coupler.

A corresponding GSD file is available for integrating the S20 station into the programming system.

This file can be downloaded at www.boschrexroth.com/electrics.



This data sheet is only valid in association with the application description for the S20 system, material number R911335988.



Make sure you always use the latest documentation.

It can be downloaded under www.boschrexroth.com/electrics.

Features

- PROFIBUS connection via 9-pos. D-SUB socket
- Electrical isolation between PROFIBUS interface and logic
- Rotary coding switches for setting the PROFIBUS address
- DP/V1 for class 1 and class 2 masters
- PROFIBUS data transmission speed of 9.6 kbps to 12 Mbps
- Dynamic configuration is supported
- I&M functions
- The typical cycle time of the S20 system bus is around 10 μ s

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3 Ordering data

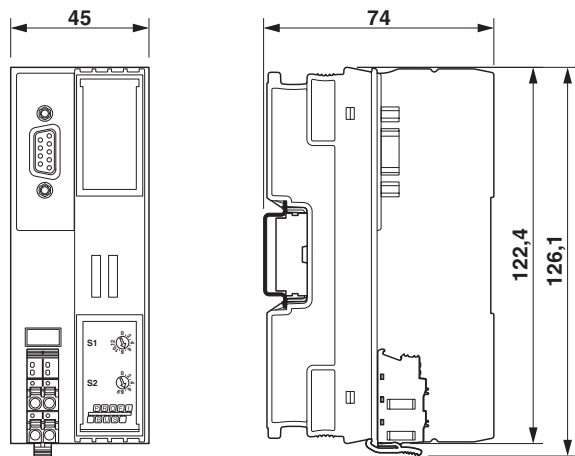
Description	Type	MNR	Pcs./Pkt.
S20 bus coupler for PROFIBUS DP	S20-PB-BK	R911173247	1
Accessories	Type	MNR	Pcs./Pkt.
S20 bus base module	S20-BS-BK	R911173392	5
Documentation	Type	MNR	Pcs./Pkt.
Application description Diagnostic and firmware functions of the bus coupler S20-PB-BK	DOK-CONTRL-S20*PB*BK**- AP..-EN-P	R911343914	1
Application description S20: System and Installation	DOK-CONTRL- S20*SYS*INS-AP..-EN-P	R911335988	1
Application description S20: Error Messages	DOK-CONTRL- S20*DIAG*ER-AP..-EN-P	R911344826	1

Additional ordering data

For additional ordering data (accessories), please refer to the product catalog at www.boschrexroth.com/electrics.

4 Technical data

Dimensions (nominal sizes in mm)



Width	45 mm
Height	126.1 mm
Depth	74 mm
Note on dimensions	The depth applies when a TH 35-7.5 DIN rail is used (in accordance with EN 60715).

General data

Color	Housing: light grey (RAL 7035)
Weight	175 g (with connector and bus base module)
Ambient temperature (operation)	-25 °C ... 60 °C (Mounting position: wall mounting on horizontal DIN rail) -25 °C ... 55 °C (Mounting position: any)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Overvoltage category	II (IEC 60664-1, EN 60664-1)
Degree of pollution	2 (IEC 60664-1, EN 60664-1)
Mounting type	DIN rail mounting
Mounting position	any (observe temperature derating)

Connection data: S20 connector

Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm ² ... 1.5 mm ²
Conductor cross section, flexible	0.2 mm ² ... 1.5 mm ²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm



Observe the specifications for the conductor cross sections in the application description for the S20 system, material number R911335988.

Interface: PROFIBUS DP

Number of interfaces	1
Connection method	D-SUB-9 female connector
Transmission speed	9.6 kbps ... 12 Mbps

Interface: Local bus

Number of interfaces	1
Connection method	Bus base module
Transmission speed	100 Mbps

Interface: Service

Number of interfaces	1
Connection method	Micro USB type B

System limits of the bus coupler

Number of local bus devices that can be connected	max. 63
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NOTICE Electronics may be damaged when overloaded

Observe the logic current consumption of each device when configuring anS20 station. It is specified in every module-specific data sheet. The current consumption can differ depending on the individual module. The permissible number of devices that can be connected therefore depends on the specific station structure.

Feed-in of the communications power U_L (the local bus supply (U_{Bus}) is generated from U_L)

Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	typ. 101 mA (without I/Os and $U_L = 24$ V) max. 567 mA (with 2 A at U_{Bus} for the I/Os and $U_L = 24$ V)
Power consumption	typ. 2.5 W (without I/Os) max. 13.7 W (2.0 A on U_{Bus} , $U_L = 24$ V)
Surge protection	electronic
Reverse polarity protection	electronic

NOTICE Electronics may be damaged when overloaded

Provide external fuses for the 24 V U_L area. If you are using an external fuse, the power supply unit must be able to supply four times the nominal current of the fuse. This ensures that it trips in the event of an error.

Supply of the local bus (U_{Bus})

Supply voltage	5 V DC (via bus base module)
Power supply unit	2 A

Electrical isolation/isolation of the voltage areas

Test section	Test voltage
PROFIBUS interface / 24 V communications voltage (U_L) feed-in	500 V AC, 50 Hz, 1 min.
PROFIBUS interface / functional ground	500 V AC, 50 Hz, 1 min.
24 V communications voltage (U_L) feed-in / functional ground	500 V AC, 50 Hz, 1 min.

Mechanical tests

Vibration resistance in accordance with EN 60068-2-6/IEC 60068-2-6	5g
Shock in accordance with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock in accordance with EN 60068-2-27/IEC 60068-2-27	10g

Conformance with EMC Directive 2014/30/EU**Immunity test in accordance with EN 61000-6-2/IEC 61000-6-2**

Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B, 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3/IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) EN 61000-4-4/IEC 61000-4-4	Criterion B, 2 kV
Transient overvoltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B; DC supply lines: ± 0.5 kV/ ± 1.0 kV (symmetrical/asymmetrical), fieldbus cable shielding: ± 1.0 kV
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A, Test voltage 10 V

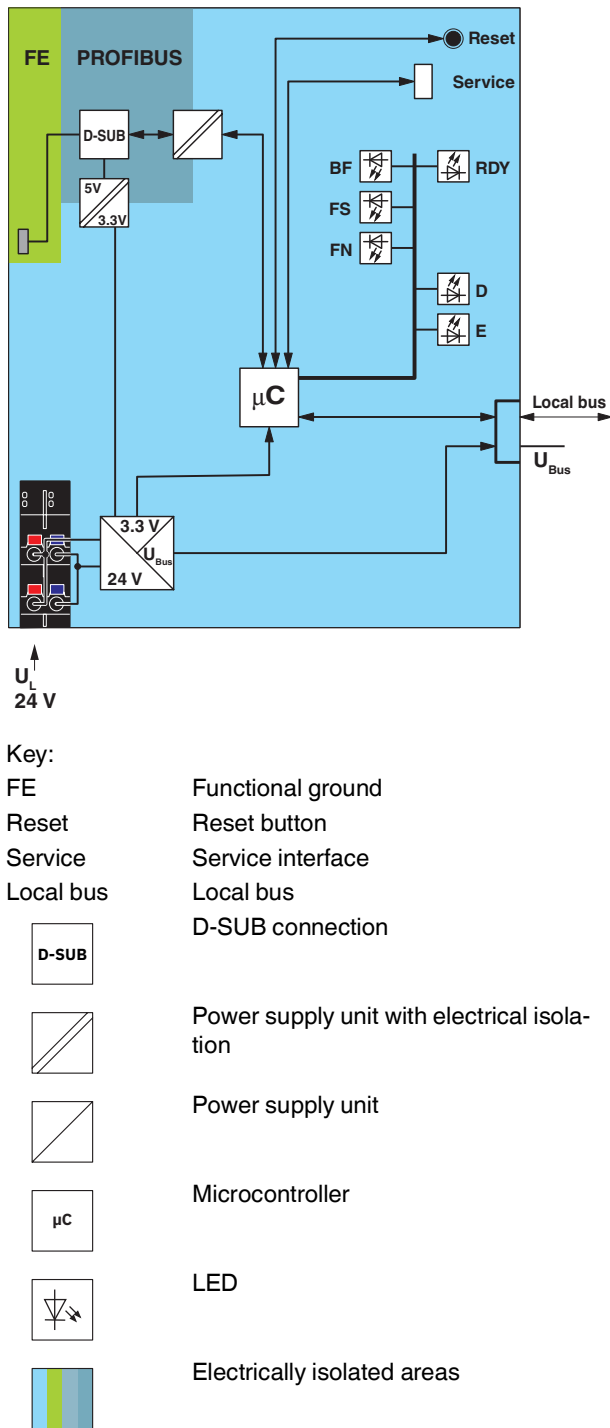
Noise emission test in accordance with EN 61000-6-3/IEC 61000-6-3 Class B

Approvals

For the current approvals, please visit www.boschrexroth.com/electrics.

5 Internal circuit diagram

Fig. 1 Internal wiring of the terminal points



6 For your safety

6.1 Intended use

Only use S20 modules in accordance with the information in this data sheet and in the application description for the S20 system, material number R911335988.

If the equipment is used in a manner not specified, the protection provided by the equipment may be impaired.

6.2 Qualification of users

The use of products described in this data sheet is oriented exclusively to electrically skilled persons or persons instructed by them. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.

6.3 Electrical safety



WARNING loss of electrical safety

If used incorrectly, device safety may be impaired.

During installation, startup, and operation, observe the notes in this data sheet and the specifications in the application description for the S20 system, material number R911335988.

6.4 Installation

Only install the S20 modules in a control cabinet or junction box.

NOTICE Fire hazard

- The device must be installed in the final protective housing, which provides sufficient resistance to mechanical strain and protection against the spreading of fire in accordance with the standards UL/IEC/EN 61010-1 and UL/IEC/EN 61010-2-201.
- The supply and external circuits intended to be connected to this device shall be galvanically separated from the mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV (Class III) circuits of UL/CSA/IEC/EN 61010-1, UL/CSA/IEC/EN 61010-2-201.

NOTICE Damage to contacts or malfunction

Physical overloads can result in damage to the terminal points.

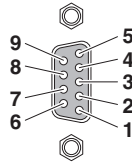
- Relieve strain in the connected cables.

7 Connection of PROFIBUS and power supply

7.1 Connecting PROFIBUS

Connect PROFIBUS to the bus coupler via a 9-pos. D-SUB connector.

Fig. 2 D-SUB connector pin assignment



Pin	Assignment
1	Reserved
2	Reserved
3	RxD/TxD-P (receive/transmit data +), cable B
4	CNTR-P (control signal for repeater), direction control
5	DGND (reference potential to 5 V)
6	VP (+5 V supply voltage for termination resistors)
7	Reserved
8	RxD/TxD-N (receive/transmit data -), cable A
9	Reserved

7.2 Mains termination resistors

Since PROFIBUS DP is a serial bus system in a line or tree structure, the individual branches must be terminated using a termination resistor. The bus coupler does not have a resistor of this type. For further information, please refer to your PROFIBUS documentation.

Appropriate PROFIBUS plugs with termination resistors that can be connected can be found at www.boschrexroth.com.

7.3 Connecting the supply voltage - terminal point assignment

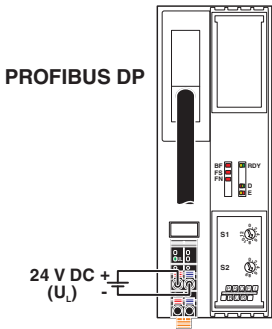
Fig. 3 Terminal point assignment



Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U _L)	Communications power feed-in (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)

8 Connection example

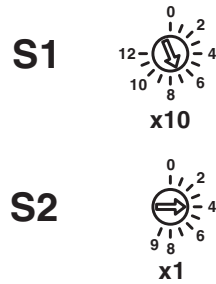
Fig. 4 Connection of the cables



9 Configuration via rotary encoding switch

The address is set using two rotary encoding switches. Switch S1 is used to set the position in tens (x10) and S2 is used to set the position in units (x1). Addresses can be set between 0 and 126. The figure shows the address setting 74.

Fig. 5 (ADDRESS) rotary encoding switches



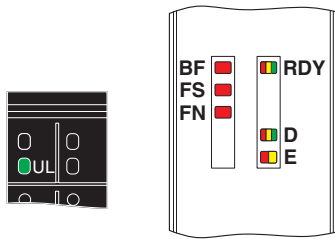
10 Parameter data



During configuration, please note that connected digital input/output modules also use parameter data from PROFIBUS. Please refer to the GSD file for the parameter data length.

11 Local diagnostic and status indicators

Fig. 6 Local diagnostic and status indicators



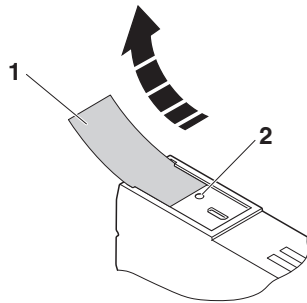
Designation	Color	Meaning	State	Description
UL	Green	U _{Logic}	On	Communications power supply present.
			Off	Communications power supply not present.
BF	Red	Communication error (Bus Fault)	On	No communication on PROFIBUS
			Off	No error
FS	Red	Failure Select	On	If FS is on, FN indicates the error type
			Off	If FS is not on, FN indicates the error number
FN	Red	Failure Number	Flashing	The number of flashing pulses indicates the error type or the error number, depending on whether FS is on or not
			Off	No error
RDY	Green/ yellow/ red	Ready	Green on	Device is ready for operation.
			Flashing green/yellow	Communications power undervoltage or surge voltage
				Overtemperature
			Yellow on	Firmware/bus coupler is booting
			Flashing yellow	Firmware update is being performed.
			Flashing yellow/red	Firmware update has failed. Check the firmware file and the settings.
			Flashing red	Firmware update error; wrong or faulty firmware loaded; restart the device.
			Red on	Rotary encoding switches are set to an invalid/reserved position.
			Off	Device is not ready for operation.

Designation	Color	Meaning	State	Description
D	Red/ yellow/ green	Diagnostics of local bus communication		
		Run	Green on	The station is ready to operate; communication within the station is OK. All data is valid. An error has not occurred.
		Active	Flashing green	The station is ready to operate. Communication within the station is ok. The data are not valid. The controller or higher-level network is not providing valid data. The module is not malfunctioning.
		Ready	Yellow on	The station is ready to operate. No data are being exchanged.
			Flashing yellow	Access via DTM in I/O check mode
			Flashing yellow/red	Local bus error during active I/O check
			Flashing red	Local bus error on startup
				Possible causes:
				The configuration cannot be generated. Information from one device is missing.
				Chip version of a device is <V1.1
				The desired and actual configuration are different
				No local bus device connected
				The maximum number of local bus devices is exceeded.
			Red on	The station is ready for operation but has lost connection to at least one device.
				Possible causes:
				Communication error
				Local bus device has been removed or configured device is missing.
				Reset at a local bus device
				Serious device error at a local bus device (local bus device can no longer be reached)
		Power down	Off	Device is in (power) reset.
E	Yel- low/ red	Error	Yellow on	I/O warning at a local bus device
			Red on	I/O error at a local bus device
			Off	No I/O messages present.

12 Reset button

The reset button is located beneath the top marking label on the bus coupler.

Fig. 7 Reset button



1 Marking field

2 Reset button

The reset button has the following function:

- Restarting the bus coupler

Restart the bus coupler by pressing the reset button during ongoing operation.

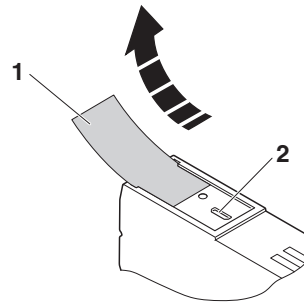
The outputs of the station are set to the parameterized substitute values.

The process image of the inputs is not re-read.

13 Service interface

The service interface is located beneath the top marking field on the bus coupler.

Fig. 8 Service interface



1 Marking field

2 Service interface

The service interface can be used to connect the bus coupler to a PC via USB.

NOTICE Damage to the USB interface

In PCs, the USB ports are usually not electrically isolated from the rest of the hardware. This does not cause any problems for USB devices that do not have their own reference ground. However, if you connect grounded devices (e.g., the bus coupler), ground loops with undesired compensating currents may occur. These compensating currents can impair data transmission and, in extreme cases, destroy the interfaces.

Recommendation:

Connect the USB interface of the bus coupler to your PC in such a way that it is electrically isolated.

To do this, use a USB isolator.

14 Substitute value behavior

If PROFIBUS communication fails or an error occurs in the local bus, all outputs of the station are set to the substitute values previously parameterized on the module.



For the possible substitute values of a module, please refer to the relevant module-specific data sheet.

15 Firmware functions

Function	S20-PB-BK	R-IL PB BK DI8 DO4/CN-PAC
	From index AB1	
Total amount of process data		
- IN and OUT	488 bytes, maximum	488 bytes, maximum
- IN	244 bytes, maximum	244 bytes, maximum
- OUT	244 bytes, maximum	244 bytes, maximum
Amount of process data for alignable I/O terminals		
- IN and OUT	488 bytes, maximum	486 bytes, maximum
- IN	244 bytes, maximum	243 bytes, maximum
- OUT	244 bytes, maximum	243 bytes, maximum
Amount of parameter data		
- Total	244 bytes, maximum	244 bytes, maximum
- For alignable I/O terminals	233 bytes, maximum	230 bytes, maximum
Amount of configuration data		
- Total	244 bytes, maximum	244 bytes, maximum
- For alignable I/O terminals	244 bytes, maximum	239 bytes, maximum
Other		
Number of PCP devices	–	max. 16
Supports DP/V1 read and write (acyclic communication), Class 1 and Class 2 master	yes	yes
Communication with PCP modules via "normal" process data (DP/V0)	–	yes
Transmission invoke ID	–	yes
Parameterization of several I/Os via dialog boxes in the configuration tool	yes	yes
Dynamic configuration (reserving I/Os in the PLC)	yes	yes
Specification of fail-safe values via the configuration tool	yes	yes
Byte rotation for the R-IB IL 24 DI 16-PAC and R-IB IL 24 DO 16-PAC	–	yes
Byte rotation for the R-IB IL 24 DI 32-PAC and R-IB IL 24 DO 32-PAC	–	yes
Operation in the event of module failure in the local bus	yes	yes
Acknowledgment of local bus stops via the application program	yes	yes
Acknowledging bus stops either automatically or via the application program	automatic	yes
Diagnostics in bus coupler format	yes	yes
Channel-specific diagnostics	yes	yes
Diagnostics in identification format	yes	yes
Diagnostics as status PDU	yes	yes
Stop behavior can be set via parameter telegram	yes	yes
I&M functions	yes	yes
PROFIsafe support	yes	yes
IO-Link call	no	yes
Selection of the diagnostic format in the configuration tool	no	yes



For more detailed information on the bus coupler functions described, please refer to the corresponding documentation.

DOK-CONTRL-
S20*PB*BK**-DA03-EN-P

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