

S20 digital input module 32 inputs

R911346614
Edition 02

Data sheet S20-DI-32/1-S

32 digital inputs
24 V DC
1-conductor technology

10 / 2022



1 Description

The module is designed for use within an S20 station. It is used to acquire digital signals.

You can adjust the filter times of the inputs to increase noise immunity.

Filter times of 100 μ s enable you to implement a counter function with a maximum input frequency of 5 kHz in the application.

Features

- 32 digital inputs in accordance with EN 61131-2 type 1 and type 3
- 24 V DC, 2.4 mA
- Connection of sensors in 1-conductor technology
- Minimum update time of < 100 μ s
- Filter times can be adjusted in three increments: < 100 μ s, 1000 μ s or 3000 μ s
- Maximum input frequency: 5 kHz
- Device rating plate stored

Valid from index AB1.



The deviating behavior of the modules with an earlier index is documented in the corresponding points.



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.

| | | |
|----------|--|----|
| 2 | Table of contents | |
| 1 | Description | 1 |
| 2 | Table of contents | 2 |
| 3 | Ordering data | 3 |
| 4 | Technical data | 3 |
| 5 | Internal circuit diagram | 6 |
| 6 | For your safety | 6 |
| | 6.1 Intended use | 6 |
| | 6.2 Qualification of users | 6 |
| | 6.3 Electrical safety | 6 |
| | 6.4 Installation | 6 |
| 7 | UL note | 6 |
| 8 | Terminal point assignment..... | 7 |
| 9 | Connection example..... | 7 |
| 10 | Local diagnostic and status indicators | 8 |
| 11 | Process data..... | 9 |
| 12 | Parameter, diagnostics and information (PDI) | 9 |
| 13 | Standard objects | 10 |
| | 13.1 Objects for identification (device rating plate)..... | 10 |
| | 13.2 Miscellaneous standard objects | 11 |
| | 13.3 Diagnostics state (0018hex: DiagState)..... | 12 |
| 14 | Application objects | 13 |
| 15 | Device descriptions | 13 |

3 Ordering data

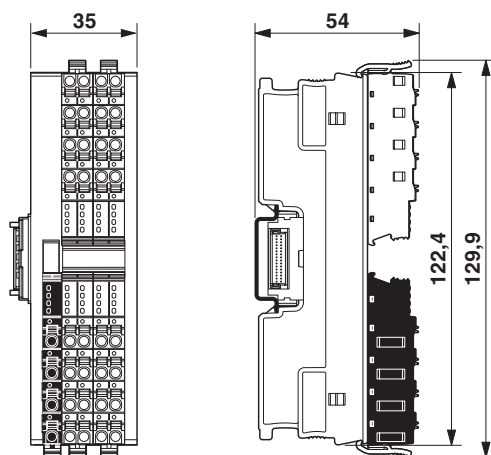
| Description | Type | MNR | Pcs./Pkt. |
|---|--------------------------------------|------------|-----------|
| S20 digital input module 32 inputs | S20-DI-32/1-S | R911173747 | 1 |
| Accessories | Type | MNR | Pcs./Pkt. |
| S20 bus base module, narrow | S20-BS-S | R911173203 | 5 |
| Documentation | Type | MNR | Pcs./Pkt. |
| 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 | 35 mm |
| Height | 129.9 mm |
| Depth | 54 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 | light grey RAL 7035 |
| Weight | 159 g (with connectors and bus base module) |
| Ambient temperature (operation) | -25 °C ... 60 °C |
| 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) |

General data

| | |
|----------------------|---------------------------------------|
| 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 (no 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 |
| Note | Observe the specifications for the conductor cross sections in the application description for the S20 system, material number R911335988. |

Interface: Local bus

| | |
|----------------------|-----------------|
| Number of interfaces | 2 |
| Connection method | Bus base module |
| Transmission speed | 100 Mbps |

Supply of the local bus (U_{Bus})

| | |
|---------------------|---|
| Supply voltage | 5 V DC (via bus base module) |
| Current consumption | max. 120 mA (Index AA1) max. 60 mA (from index AB1) |
| Power consumption | max. 600 mW (Index AA1) max. 300 mW (from index AB1) |

Supply for digital input modules (U_I)

| | |
|-----------------------------|--|
| Supply voltage | 24 V DC |
| Supply voltage range | 19.2 V DC ... 30 V DC (including all tolerances, including ripple) |
| Current consumption | max. 50 mA |
| Power consumption | typ. 960 mW max. 1.2 W |
| Surge protection | electronic (35 V, 0.5 s) |
| Reverse polarity protection | parallel diode; with external 5 A fuse (only for commissioning) |
| Protection | max. 8 A (polarity reversal protection up to 5 A) |

NOTICE Damage to the electronics

Provide external protection for the module to ensure reverse polarity protection. If you use a fuse, the power supply unit must be capable of supplying four times the nominal current of the fuse. This ensures that the fuse trips reliably in the event of a fault.



When using the module for the first time, protect it with a 5 A fuse. When all modules in the system are correctly connected, the 5 A fuse can be replaced with an 8 A fuse. After that, you can load the module up to 8 A.

Digital inputs

| | |
|--|---|
| Number of inputs | 32 |
| Connection method | Push-in connection |
| Connection technology | 1-conductor |
| Description of the input | EN 61131-2 types 1 and 3 |
| Nominal input voltage | 24 V DC |
| Nominal input current | 2.4 mA |
| Current flow | linear until nominal current is reached, then constantly approx. 2.4 mA |
| Input voltage range "0" signal | -3 V DC ... 5 V DC |
| Input voltage range "1" signal | 11 V DC ... 30 V DC |
| Input filter time | 3000 µs (Default), 1000 µs, < 100 µs |
| Process data update | < 100 µs |
| Polarity reversal protection of the inputs | parallel diode (30 V, 5 s) |

Input and output address area

| | |
|---------------------|--------|
| Input address area | 4 Byte |
| Output address area | 0 Byte |

Configuration and parameter data in a PROFIBUS system

| | |
|-----------------------------|--------|
| Required parameter data | 3 Byte |
| Required configuration data | 6 Byte |

Electrical isolation/isolation of the voltage areas

| Test section | Test voltage |
|--|-------------------------|
| 5 V supply of the local bus (U_{BUS}) / 24 V supply (I/Os) | 500 V AC, 50 Hz, 1 min. |
| 5 V supply of the local bus (U_{BUS}) / functional ground | 500 V AC, 50 Hz, 1 min. |
| 24 V supply (I/O) / 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) |
| 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

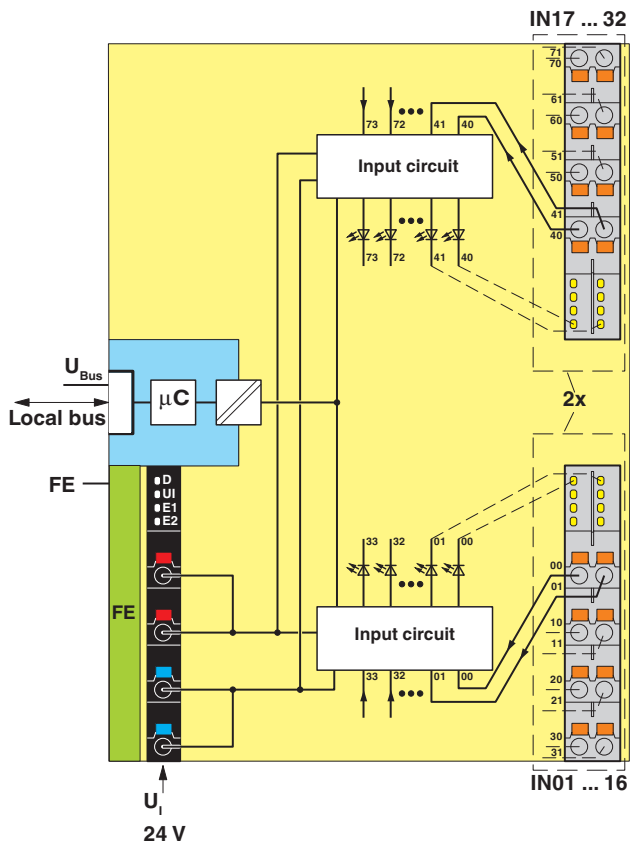
Class B

Approvals

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

5 Internal circuit diagram

Fig. 1 Internal wiring of the terminal points



Key:

- Local bus Local bus
- FE Functional ground
- Microcontroller
- Electrical isolation
- Input circuit
- LED
- Electrically isolated areas

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.

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.

The enclosure must meet the requirements regarding the protection against spread of fire according to the following standards:

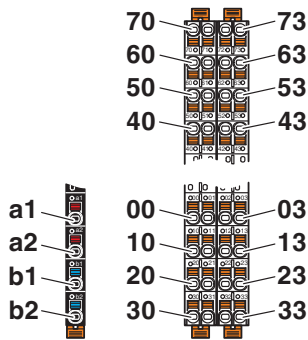
- EN 61010-1/IEC 61010-1
- UL 61010-1 (for applications with UL approval)

7 UL note

- Use copper conductors only.

8 Terminal point assignment

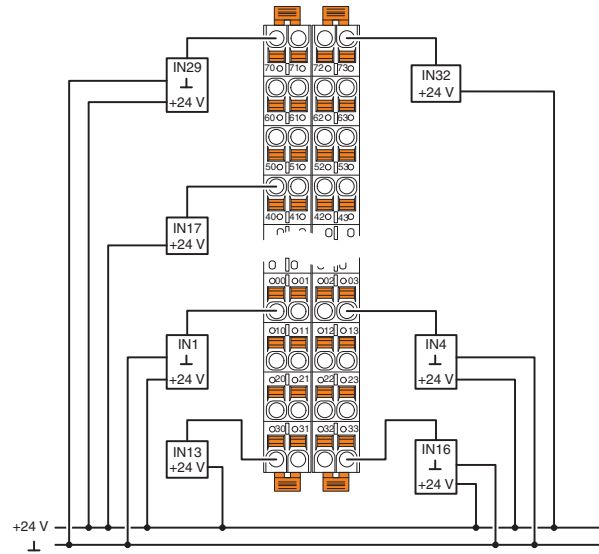
Fig. 2 Terminal point assignment



| Terminal point | Color | Assignment | |
|-----------------------------|--------|---------------------------|--|
| Supply voltage input | | | |
| a1, a2 | Red | 24 V DC (U _I) | Supply for digital input modules (bridged internally) |
| b1, b2 | Blue | GND | Reference potential of the supply voltage (bridged internally) |
| Digital inputs | | | |
| 00 ... 03 | Orange | IN01 ... IN04 | Digital inputs 1 ... 4 |
| 10 ... 13 | Orange | IN05 ... IN08 | Digital inputs 5 ... 8 |
| 20 ... 23 | Orange | IN09 ... IN12 | Digital outputs 9 ... 12 |
| 30 ... 33 | Orange | IN13 ... IN16 | Digital inputs 13 ... 16 |
| 40 ... 43 | Orange | IN17 ... IN20 | Digital inputs 17 ... 20 |
| 50 ... 53 | Orange | IN21 ... IN24 | Digital inputs 21 ... 24 |
| 60 ... 63 | Orange | IN25 ... IN28 | Digital inputs 25 ... 28 |
| 70 ... 73 | Orange | IN29 ... IN32 | Digital inputs 29 ... 32 |

9 Connection example

Fig. 3 Example of a connection of sensors when using external busbars

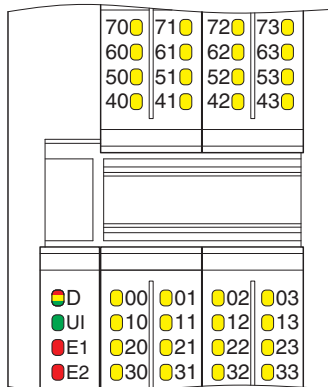


Ensure that GND of the sensors and GND for U_I have the same potential.

10 Local diagnostic and status indicators

From index AB1

Fig. 4 Local diagnostic and status indicators



| Designation | Color | Meaning | State | Description | |
|-------------|--------------------------|--|---------------------------|---|--|
| D | Red/ yellow/ green | Diagnostics of local bus communication | | | |
| | | Run | Green on | The device is ready for operation, communication within the station is OK. All data is valid. An error has not occurred. | |
| | | Active | Flashing green | The device is ready to operate, communication within the station is OK. The data is not valid. The controller or higher-level network is not delivering valid data. There is no error on the module. | |
| | | Device application not active | Flashing green/ yellow | The device is ready for operation, communication within the station is OK. Output data cannot be outputted and/or input data cannot be read. There is a fault on the periphery side of the module.. | |
| | | Ready | Yellow on | The device is ready for operation but did not detect a valid cycle after power-up. | |
| | | Connected | Flashing yellow | The device is not (yet) part of the active configuration. | |
| | | Reset | Red on | The device is ready for operation but has lost the connection to the bus head. | |
| | | Not connected | Flashing red | The device is ready for operation but there is no connection to the previously existing device. | |
| | | Power down | Off | Device is in (power) reset. | |
| UI | Green | U _{Input} | On | Supply for digital input modules (U _I) is present. | |
| | | | Off | Supply for digital input modules (U _I) is not present. | |
| E1 | Red | Supply voltage error | On | Feed-in for digital input modules (U _I) is faulty. | |
| | | | Off | Feed-in for digital input modules (U _I) is OK. | |
| E2 | Red | Internal device error | On | There is an internal device error. | |
| | | | Off | There is no internal device error. | |
| 00 ... 73 | Yellow | Status of the inputs | On | Input is set. | |
| | | | Off | Input is not set. | |

Deviating behavior for index AA1

The LEDs E1 and E2 are not present.

11 Process data

The process data is mapped in Motorola format (Big Endian).

IN process data

| Byte | 0 | | | | | | | |
|----------------|------|------|------|------|------|------|------|------|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Signal | IN08 | IN07 | IN06 | IN05 | IN04 | IN03 | IN02 | IN01 |
| Terminal point | 13 | 12 | 11 | 10 | 03 | 02 | 01 | 00 |

| Byte | 1 | | | | | | | |
|----------------|------|------|------|------|------|------|------|------|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Signal | IN16 | IN15 | IN14 | IN13 | IN12 | IN11 | IN10 | IN09 |
| Terminal point | 33 | 32 | 31 | 30 | 23 | 22 | 21 | 20 |

| Byte | 2 | | | | | | | |
|----------------|------|------|------|------|------|------|------|------|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Signal | IN24 | IN23 | IN22 | IN21 | IN20 | IN19 | IN18 | IN17 |
| Terminal point | 53 | 52 | 51 | 50 | 43 | 42 | 41 | 40 |

| Byte | 3 | | | | | | | |
|----------------|------|------|------|------|------|------|------|------|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Signal | IN32 | IN31 | IN30 | IN29 | IN28 | IN27 | IN26 | IN25 |
| Terminal point | 73 | 72 | 71 | 70 | 63 | 62 | 61 | 60 |

12 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted as objects via the PDI channel of the S20 station.

In IndraWorks, these parameters are displayed in the configurator.

The standard and application objects stored in the module are described in the following section.

The following applies to all tables below:

For an explanation of the data types, please refer to the application description for the S20 system, material number R911335988.

| Abbreviation | Meaning |
|--------------|---------------------------------|
| A | Number of elements |
| L | Length of the elements in bytes |
| R | Read |
| W | Write |



Each visible string is terminated with a null terminator (00_{hex}). The length of a visible-string-type element is therefore at least one byte larger than the number of user data items.

If the number of user data items plus null terminator is smaller than the specified length of the element, the visible string will be populated with a null character (00_{hex}).



For detailed information on PDI objects, please refer to the application description for the S20 system, material number R911335988.

13 Standard objects

13.1 Objects for identification (device rating plate)

From index AB1

| Index (hex) | Object name | Data type | A | L | Rights | Meaning | Contents |
|--------------------------|-----------------|---------------------------|---|--------|--------|-------------------------------------|---|
| Manufacturer | | | | | | | |
| 0001 | VendorName | Visible String | 1 | 32 | R | Vendor name | Bosch Rexroth AG |
| 0002 | VendorID | Visible String | 1 | 7 | R | Vendor ID | 006034 |
| 0012 | VendorURL | Visible String | 1 | 58 | R | Vendor URL | http://www.boschrexroth.com |
| Module - general | | | | | | | |
| 0004 | DeviceFamily | Visible String | 1 | 16 | R | Device family | I/O digital IN |
| 0006 | ProductFamily | Visible String | 1 | 32 | R | Product family | IndraControl S20 |
| 000E | CommProfile | Visible String | 1 | 4 | R | Communication profile | 633 |
| 000F | DeviceProfile | Visible String | 1 | 5 | R | Device profile | 0010 |
| 0011 | ProfileVersion | Record of Visible Strings | 2 | 11; 21 | R | Profile version | 2011-12-07; Basic - Profile V2.0 |
| 0017 | Language | Record of Visible Strings | 2 | 6; 8 | R | Language | en-us; English |
| Module - special | | | | | | | |
| 0005 | Capabilities | Visible String | 1 | 8 | R | Capabilities | Nothing |
| 0007 | ProductName | Visible String | 1 | 32 | R | Product name | S20-DI-32/1-S |
| 0008 | SerialNo | Visible String | 1 | 22 | R | Serial number | xx xx xx xx xx xx xx x (e. g., 7602012346BC125) |
| 0009 | ProductText | Visible String | 1 | 58 | R | Product text | 32 digital input channels |
| 000A | OrderNumber | Visible String | 1 | 32 | R | Item No. | R911173747 |
| 000B | HardwareVersion | Record of Visible Strings | 2 | 11; 11 | R | Hardware version | e.g., 2020-04-26; AA1 |
| 000C | FirmwareVersion | Record of Visible Strings | 2 | 11; 11 | R | Firmware version | e.g., 2017-12-31; 1.00 |
| 000D | PChVersion | Record of Visible Strings | 2 | 11; 6 | R | PDI version | e. g., 2010-06-21; V1.00 |
| 0037 | DeviceType | Octet string | 1 | 8 | R | Device type | 00 80 00 04 00 00 0D 03 _{hex} |
| 003A | VersionCount | Array of UINT16 | 4 | 4 * 2 | R | Version counter | e.g., 0007 0001 0001 0001 _{hex} |
| Use of the device | | | | | | | |
| 0014 | Location | Visible String | 1 | 58 | R/W | Location | Can be completed by the user. |
| 0015 | EquipmentIdent | Visible String | 1 | 58 | R/W | Equipment identifier | Can be completed by the user. |
| 0016 | AppIDeviceAddr | UINT16 | 1 | 2 | R/W | Application-specific device address | Can be completed by the user. |

Deviating behavior for index AA1

| Index (hex) | Object name | Data type | A | L | Rights | Meaning | Contents |
|-------------------------|-----------------|---------------------------|---|-----------|--------|------------------|---|
| Manufacturer | | | | | | | |
| 0001 | VendorName | Visible String | 1 | 17 | R | Vendor name | Bosch Rexroth AG |
| 0012 | VendorURL | Visible String | 1 | 28 | R | Vendor URL | http://www.boschrexroth.com |
| Module - general | | | | | | | |
| 0006 | ProductFamily | Visible String | 1 | 17 | R | Product family | IndraControl S20 |
| 0011 | ProfileVersion | Record of Visible Strings | 2 | 11; 20 | R | Profile version | 2011-12-07; Basis - Profil V2.0 |
| 003A | VersionCount | Array of UINT16 | 4 | 4 * 2 | R | Version counter | e.g., 0007 0001 0000 0000 _{hex} |
| Module - special | | | | | | | |
| 0007 | ProductName | Visible String | 1 | 14 | R | Product name | S20-DI-32/1-S |
| 0008 | SerialNo | Visible String | 1 | 16 | R | Serial number | xx xx xx xx xx xx xx x (e. g., 7602012346BC125) |
| 0009 | ProductText | Visible String | 1 | 26 | R | Product text | 32 digital input channels |
| 000A | OrderNumber | Visible String | 1 | 11 | R | Item No. | R911173747 |
| 000B | HardwareVersion | Record of Visible Strings | 2 | 11; 4 | R | Hardware version | e.g., 2020-04-26; AA1 |
| 000C | FirmwareVersion | Record of Visible Strings | 2 | 11; 3 | R | Firmware version | 0000-00-00; -- |

13.2 Miscellaneous standard objects

| Index (hex) | Object name | Data type | A | L | Rights | Meaning/contents |
|--|-------------|--------------|---|----|--------|--|
| Diagnostics objects | | | | | | |
| 0018 | DiagState | Record | 6 | 58 | R | Diagnostic state * |
| Objects for process data management | | | | | | |
| 0025 | PDIN | Octet string | 1 | 4 | R | Input process data The structure corresponds to the representation in the "Process data" section. |

The objects identified with * in the last column are described in more detail in the following sections.


The description of the other objects is to be found in the application description for the S20 system, material number R911335988.


13.3 Diagnostics state (0018_{hex}: DiagState)

This object is used for a structured message of an error.

From index AB1

| 0018 _{hex} : Diagnostics state (read) | | | | | |
|--|----------------|-----------------|----------------------|----------------------------------|--------------------|
| Subindex | Data type | Length in bytes | Meaning | Contents | |
| 0 | Record | 58 | Diagnostic state | Complete diagnostics information | |
| 1 | UINT16 | 2 | Error number | 0 ... 65535 _{dec} | |
| 2 | UINT8 | 1 | Priority | 00 _{hex} | No error |
| | | | | 01 _{hex} | Error |
| | | | | 02 _{hex} | Warning |
| | | | | 81 _{hex} | Error removed |
| | | | | 82 _{hex} | Warning eliminated |
| 3 | UINT8 | 1 | Channel/group/module | 00 _{hex} | No error |
| | | | | FF _{hex} | Entire device |
| 4 | UINT16 | 2 | Error code | See table below | |
| 5 | UINT8 | 1 | More follows | 00 _{hex} | |
| 6 | Visible String | 51 | Text | See table below | |

 The message with priority 81_{hex} or 82_{hex} is a one-off, internal message to the bus coupler. The bus coupler transfers this error message to the error mechanisms of the higher-level system.

 After the error has been eliminated, it is automatically reset.

Error and status of the local diagnostics and status indicators

| Subindex | 2 | 3 | 4 | 6 | LED | | | |
|---|---------------|-----------------------------------|---------------|--|-----|----|----|----|
| Error | Pri- ority | Chan- nel/ group/ module | Error code | Text | D | UI | E1 | E2 |
| | hex | hex | hex | | | | | |
| No error | 00 | 00 | 0000 | Status OK | ● | ● | ○ | ○ |
| Failure of the supply for digital input modules (U _I) | 01 | FF | 3412 | Missing I/O supply UI, terminal point a1/a2, b1/b2 | ✱ | ○ | ● | ○ |

○ Off
● On

● Green on
✱ Flashing green/yellow

Deviating behavior for index AA1

The LEDs E1 and E2 are not present.

The error codes are identical to those in index AB1.

Error text is not specified.

14 Application objects

In the case of valid parameters, the parameterization is stored in the module permanently.

| Index (hex) | Object name | Data type | A | L | Rights | Meaning/contents |
|-------------|--------------|-----------|---|---|--------|------------------|
| FF8F | Input_Filter | UINT8 | 1 | 1 | R/W | Filter time |

Filter time (FF8F_{hex}: Input_Filter)

You parameterize the filter time of the module with this object.

| FF8F _{hex} : Input_Filter (read, write) | | | | |
|--|-----------|-----------------|-----------------------------|----------|
| Subindex | Data type | Length in bytes | Contents | |
| 0 | UINT8 | 1 | 00 _{hex} (Default) | 3000 µs |
| | | | 01 _{hex} | 1000 µs |
| | | | 02 _{hex} | < 100 µs |

15 Device descriptions

The device is described in the device description files. These files are available for download at www.boschrexroth.com/electrics in the download area of the bus coupler used.

DOK-CONTRL-
S20*DI32*1S-DA02-EN-P

Bosch Rexroth AG
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr a.Main
Germany
Tel. +49 9352 18 0
Fax +49 9352 18 8400
www.boschrexroth.com/electrics

All rights reserved. No part of this document may be reproduced or stored, processed, duplicated, or circulated using electronic systems, in any form or by any means, without the prior written authorization of Bosch Rexroth AG, Electric Drives and Controls. Violations shall give rise to claims for damages. The data specified above only serve to describe the product. They do not indicate any specific condition or suitability for a certain application. It must be remembered that our products are subject to natural wear and ageing.