

S20 digital output module 16 outputs

R911335976
Edition 03

Data sheet S20-DO-16/3

16 digital outputs 500 mA
24 V DC
2-, 3-conductor technology

11 / 2025



1 Description

The module is designed for use within an S20 station.

It is used to output digital signals.

The outputs are protected against short circuit and overload.

Features

- 16 digital outputs
- 24 V DC, 500 mA
- Connection of actuators in 2- and 3-conductor technology
- Minimum update time of $< 100 \mu\text{s}$
- Device rating plate stored

Valid from index AC1.



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	Maximum outputs power consumption when inductive loads are switched off.....	7
6	Internal circuit diagram	7
7	For your safety	8
7.1	Intended use.....	8
7.2	Qualification of users	8
7.3	Electrical safety	8
7.4	Installation	8
7.5	Applications with UL approval	8
8	Terminal point assignment	9
9	Connection example	9
10	Local diagnostic and status indicators	10
11	Process data.....	11
12	Parameter, diagnostics and information (PDI).....	12
12.1	PDI objects	12
12.2	Retentive storage	12
13	Standard objects	13
13.1	Objects for identification (device rating plate).....	13
13.2	Miscellaneous standard objects.....	14
13.3	Diagnostics state (0018hex: DiagState)	15
13.4	Handling diagnostic messages (0019hex: ResetDiag)	16
14	Application objects	17
14.1	Substitute value behavior (FF8Dhex: PD Output Substitute Configuration)	17
14.2	Message "Actuator supply not present" (FF8Fhex: DiagOut)	17
15	Device descriptions	18

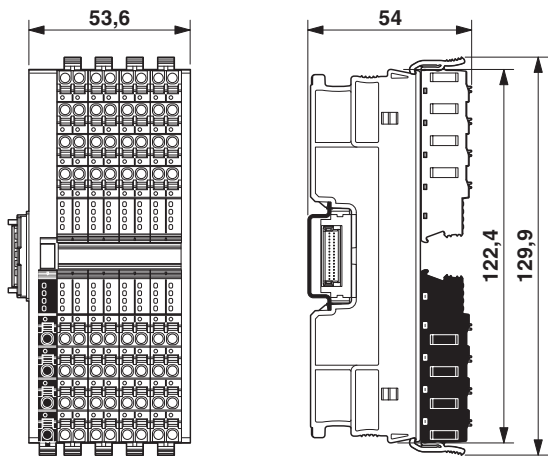
3 Ordering data

Description	Type	MNR	Pcs./Pkt.
S20 digital output module 16 outputs	S20-DO-16/3	R911172534	1
Accessories	Type	MNR	Pcs./Pkt.
S20 bus base module	S20-BS	R911172540	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	53.6 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	Housing: light gray (RAL 7035)
Weight	234 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)
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 (up to index AB1) max. 60 mA (from index AC1)

Supply for digital output modules (U_O)

Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	min. 14 mA (without actuators) max. 8 A (provide external protection)
Surge protection	electronic (35 V, 0.5 s)
Reverse polarity protection	parallel diode; with external 5 A fuse (only for commissioning)

Supply for digital output modules (U₀)

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.

Loads over 8 A are not permitted.

Power dissipation

Maximum power dissipation for nominal condition	1.15 W
---	--------

Digital outputs

Number of outputs	16
Connection method	Push-in connection
Connection technology	3-conductor
Nominal output voltage	24 V DC
Output current per channel	max. 500 mA
Output current of the device	max. 8 A (provide external protection)
Nominal load, ohmic	max. 12 W (48 Ω, with nominal voltage)
Nominal load, inductive	max. 12 VA (1.2 H, 48 Ω, with nominal voltage)
Nominal load, lamp	max. 12 W (at nominal voltage)
Load min.	10 kΩ
Energy consumption	see diagram
Limitation of the voltage induced on circuit interruption	-25.8 V ... -15 V
Output voltage when switched off	max. 1 V
Output current when switched off	max. 300 μA
Signal delay	max. 100 μs (when switched on) max. 100 μs (when switched off, with at least 50 mA load current)
Switching frequency	max. 10000 per second (with at least 50 mA load current) max. 1 per second (with inductive load) max. 16 per second (with nominal lamp load)



The specified switching frequency is limited by the device hardware. The switching frequency that can actually be achieved depends on the update time of the overall system, including the cycle times of the controller, network, etc.

Short-circuit protection, overload protection of the outputs	electronic
Behavior with overload	Shutdown with automatic restart
Behavior with inductive overload	Output can be destroyed
Reverse voltage resistance to short pulses	limited protection up to 0.5 A for 1 s

NOTICE Damage to the electronics

In the event of an incorrectly applied external voltage (reverse voltage) at one of the outputs, the channel that has been exposed to the reverse voltage can be destroyed and further outputs may unintentionally be set.

Overcurrent shut-down	as of 0.7 A
Output current with ground connection interrupt when switched off	< 1 mA
Process data update	< 100 μs

Input and output address area

Input address area	0 Byte
Output address area	2 Byte

Configuration and parameter data in a PROFIBUS system

Required parameter data	1 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 IEC 61000-6-2**

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

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

Approvals

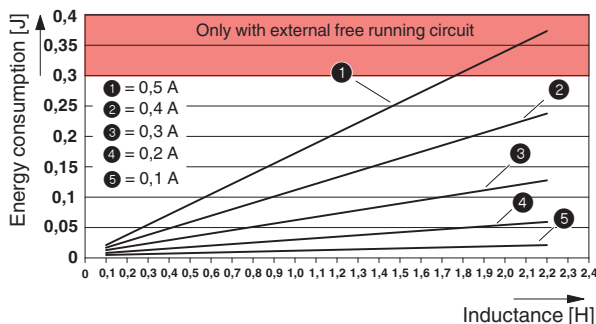
For the current approvals, please visit www.boschrexroth.com/electrics.

5 Maximum outputs power consumption when inductive loads are switched off

NOTICE Electronics may be damaged when overloaded

When you use an external freewheel limit, the free-wheeling voltage to a maximum of -15 V. The external freewheel limit has no function with a higher negative voltage.

Fig. 1 Maximum outputs power consumption when inductive loads are switched off

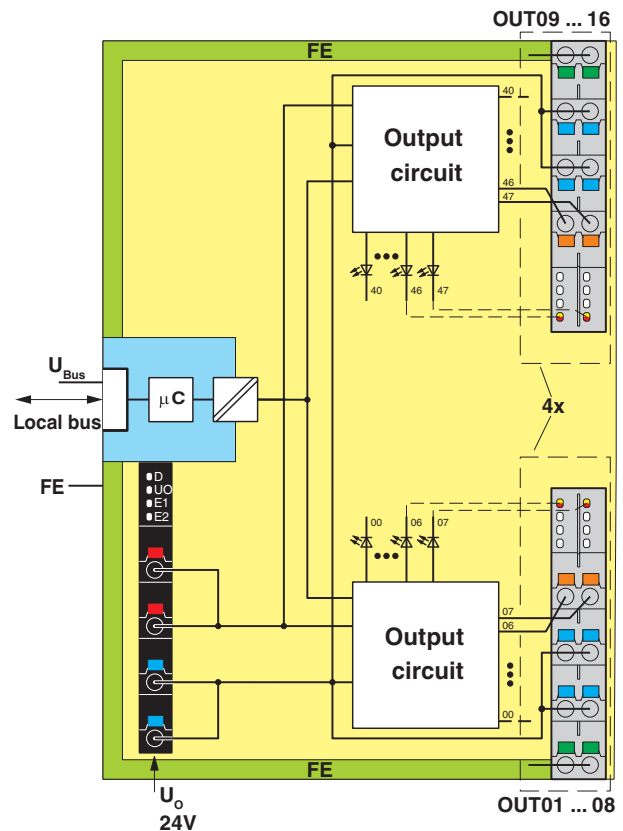


The diagram shows the maximum power that can be fed back for every switch-off operation in the respective output groups (outputs 1 to 4, 5 to 8, 9 to 12, 13 to 16) when an inductive load is switched off without an external freewheel.

The current data refers to the ohmic DC voltage component of the inductive load.

6 Internal circuit diagram

Fig. 2 Internal wiring of the terminal points



Key:

Local bus

FE



Local bus

Functional ground

Microcontroller

Electrical isolation for data or power supply

Output configuration

LED

Electrically isolated areas

7 For your safety

7.1 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.

7.2 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.

7.3 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.

7.4 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.

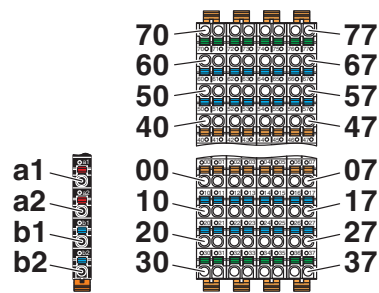
- Relieve strain in the connected cables.

7.5 Applications with UL approval

- Use copper conductors only.

8 Terminal point assignment

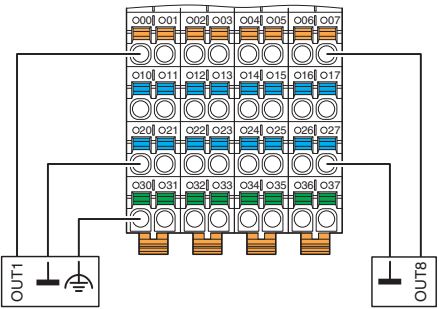
Fig. 3 Terminal point assignment



Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U _O)	Supply for digital output modules (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)
Digital outputs			
00 ... 07	Orange	OUT01 ... OUT08	Digital outputs 1 ... 8
40 ... 47	Orange	OUT09 ... OUT16	Digital outputs 9 ... 16
10 ... 17, 50 ... 57	Blue	GND	Reference potential for all channels
20 ... 27, 60 ... 67	Blue	GND	Reference potential for all channels
30 ... 37, 70 ... 77	Green	FE	Functional ground FG

9 Connection example

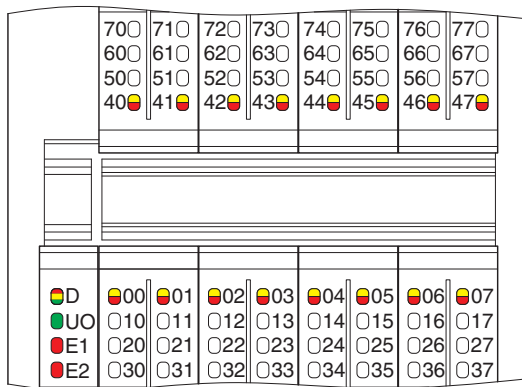
Fig. 4 Connection in 3- and 2-conductor technology



10 Local diagnostic and status indicators

From index AC1

Fig. 5 Local diagnostic and status indicators



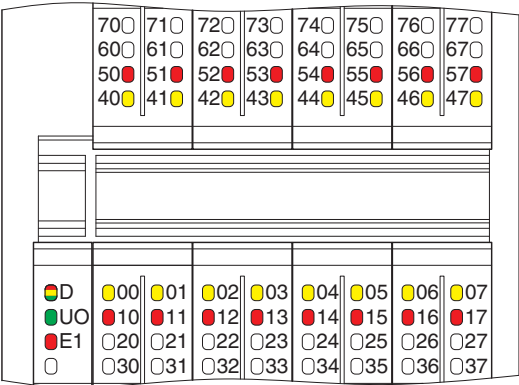
Channel errors are errors that can be associated with a channel.

I/O errors are errors that affect the entire module.

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	Red flashing	The device is ready for operation but there is no connection to the previously existing device.
		Power down	Off	Device is in (power) reset.
U ₀	Green	U _{Output}	On	Supply for digital output modules present.
			Off	Supply for digital output modules is not present.
E1	Red	I/O error	On	I/O error present.
			Off	No I/O error.
E2	Red	Channel error	On	Channel error present.
			Off	Channel error not present.
00 ... 07, 40 ... 47	Red/ yellow	Diagnostics/ status of the output	Red on	Short-circuit/overload of the output.
			Yellow on	Output is set.
			Off	No error, output is not set.

Deviating behavior up to index AB1

Fig. 6 Local diagnostic and status indicators



Designation	Color	Meaning	State	Description
E1	Red	I/O error	On	Breakdown or overload/short-circuit of an output.
			Off	No I/O error.
00 ... 07, 40 ... 47	Yellow	Output status	On	Output is set.
			Off	Output is not set.
10 ... 17, 5 0 ... 57	Red	Diagnostics of the output	On	Short-circuit/overload of the output.
			Off	No short-circuit/overload of the output.

11 Process data

OUT process data

Byte	0							
Bit	7	6	5	4	3	2	1	0
Signal	OUT 08	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01
Terminal point	07	06	05	04	03	02	01	00

Byte	1							
Bit	7	6	5	4	3	2	1	0
Signal	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10	OUT 09
Terminal point	47	46	45	44	43	42	41	40

12 Parameter, diagnostics and information (PDI)

12.1 PDI objects

The module has PDI objects. They are used to map parameters, diagnostic data, and information about the module. The PDI objects can be read and/or written acyclically.

In IndraWorks, these parameters are displayed in the configurator.

You can find out how to access the PDI objects in the documentation for the bus coupler or the controller used.

The PDI objects created in the module are described in the following sections.

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

The following applies to all tables below:

Abbreviation	Meaning
Length in bytes	Maximum length of the elements in bytes
R	Read
W	Write
[x]	Number of elements in an array or record



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.

12.2 Retentive storage

S20 modules can have retentively (non-volatily) and volatily stored parameters.

Retentively stored parameters retain their values even after the module voltage is reset.

For writeable parameters, the following tables indicate whether they are stored retentively or volatily.

A write operation to the module memory is only triggered if the value of at least one retentive parameter has been changed.

Due to the storage technology used, parameters that are stored retentively only allow a certain number of write access operations (typ. 100,000 to 1,000,000 times). **They are not suitable for being changed cyclically.**

NOTICE Damage to the Flash memory during cyclic write access

The flash memory is only designed for a limited number of write access operations.

- Make sure that write access operations are not performed too often and, in particular, are not performed cyclically.
- Note this behavior when programming function blocks.
- For systems with initial parameterization (e.g., PROFINET), avoid parameterization from the application program.

13 Standard objects

13.1 Objects for identification (device rating plate)



You can only access these objects via subindex 00, i.e., you access the entire object in each case.

If an object contains several elements, the content is listed in the table in a structured way, e.g. hardware version divided into date and version.

From index AC1

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning	Contents
Manufacturer						
0001	VendorName	Visible String	32	R	Vendor name	Bosch Rexroth AG
0002	VendorID	Visible String	7	R	Vendor ID	006034
0012	VendorURL	Visible String	58	R	Vendor URL	http://www.boschrexroth.com
Module - general						
0004	DeviceFamily	Visible String	16	R	Device family	I/O digital OUT
0006	ProductFamily	Visible String	32	R	Product family	IndraControl S20
000E	CommProfile	Visible String	4	R	Communication profile	633
000F	DeviceProfile	Visible String	5	R	Device profile	0010
0011	ProfileVersion	Record [2] of Visible Strings	32	R	Profile version	2011-12-07; Basic - Profile V2.0
0017	Language	Record [2] of Visible Strings	14	R	Language	en-us; English
Module - special						
0005	Capabilities	Visible String	8	R	Capabilities	Nothing
0007	ProductName	Visible String	32	R	Product name	S20-DO-16/3
0008	SerialNo	Visible String	22	R	Serial number	xx xx xx xx xx xx xx x (e. g., 7602012346BC125)
0009	ProductText	Visible String	58	R	Product text	16 digital outputs
000A	OrderNumber	Visible String	32	R	Item No.	R911172534
000B	HardwareVersion	Record [2] of Visible Strings	22	R	Hardware version	e.g., 2020-04-26; AA1
000C	FirmwareVersion	Record [2] of Visible Strings	22	R	Firmware version	e.g., 2017-12-31; 1.00
000D	PChVersion	Record [2] of Visible Strings	17	R	PDI version	2010-01-08; V1.00
0037	DeviceType	Octet string	8	R	Device type	00 40 00 02 00 00 00 D1 _{hex}
003A	VersionCount	Array [4] of UINT16	8	R	Version counter	e. g., 0007 0001 0001 0001 _{hex}
Use of the device						
These parameters are stored retentively. They are retained when the voltage is reset.						
0014	Location	Visible String	58	R/W	Location	Can be completed by the user.
0015	EquipmentIdent	Visible String	58	R/W	Equipment identifier	Can be completed by the user.
0016	ApplDeviceAddr	UINT16	2	R/W	Application-specific device address	Can be completed by the user.

13.2 Miscellaneous standard objects

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning/contents	Retentive storage	
Diagnostics objects							
0018	DiagState	Record [6]	58	R	Diagnostic state		*
0019	ResetDiag	UINT8	1	R/W	Handling diagnostic messages	No	*
Objects for process data management							
0026	PDOOUT	Octet string	2	R	OUT 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.

Read off all information via subindex 00 to receive all information on an error number. Access to individual elements of the object is not permitted.

From index AC1

0018 _{hex} : Diagnostics state (read)				
Subindex/ element	Data type	Length in bytes	Meaning	Contents
0	Record [6]	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/mod- ule	00 _{hex} No error
				01 _{hex} Channel 1 (OUT01)
				
				10 _{hex} Channel 16 (OUT16)
				FF _{hex} Entire device
4	UINT16	2	Error code	See table below
5	UINT8	1	Additional information	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.



Once the cause of the fault has been removed, the message is automatically reset.

Error and status of the local diagnostics and status indicators

Element	2	3	4	6	LED				
Error	Priority	Channel/ group/ module	Error code	Text					
	hex	hex	hex		D	U ₀	E1	E2	xx
No error	00	00	0000	Status OK	●	●	○	○	○
Short-circuit/overload of an output	02	##	2344	Overload / short circuit DO##, terminal point \$\$	●	●	○	●	●
Failure of the supply for digital output modules (U ₀) (Actuator supply not present)	01	FF	3422	Missing I/O supply U ₀ , terminal point a1/a2, b1/b2	✱	○	●	○	○

##

Channel number

\$\$

Terminal point number

○

Off

●

On

xx LED

xx

●

Diagnostics of the output

00 ... 07, 40 ... 47

●

Green on

●

Red on

✱

Flashing green/yellow

 "Actuator supply not present" is then signaled using object 0018_{hex} and LED E1 if you have configured a setting stipulating that the error should be sent to the controller (see object FF8F_{hex}).

Deviating behavior up to index AB1

Error and status of the local diagnostics and status indicators

Element	2	3	4				
Error	Priority	Channel/group/module	Error code	LED			
	hex	hex	hex	D	U _O	E1	xx
No error	00	00	0000	●	●	○	○
Short-circuit/overload of an output	02	00	2344	●	●	●	●
Failure of the supply for digital output modules (U _O) (Actuator supply not present)	01	FF	3422	● or ✨	○	○	○

xx LED Diagnostics of the output

xx 10 ... 17, 50 ... 57

○ Off

● On



Green on



Red on



Flashing green/yellow

The behavior of LED D during an "Actuator supply not present" error depends on whether you have switched error reporting via the FF8F_{hex} object on or off.

Parameterization in FF8F _{hex}	D LED
Do not report error to the controller	●
Report error to the controller	✨

13.4 Handling diagnostic messages (0019_{hex}: ResetDiag)

You can use this object to specify how the module should handle diagnostic messages.

Handling diagnostic messages	
Code (hex)	Meaning
00	Permit all diagnostic messages (default)
02	Delete all diagnostic messages that are still pending
06	Delete all diagnostic messages and do not permit new ones
Other	Reserved

14 Application objects

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning/contents	Retentive storage
FF8D	PD Output Substitute Configuration	UINT8	1	R/W	Substitute value behavior	Yes
FF8F	DiagOut	UINT8	1	R/W	Message “Actuator supply not present”	Yes

14.1 Substitute value behavior (FF8D_{hex}: PD Output Substitute Configuration)

With this object, you parameterize the behavior of the module so that an application reset can be detected if necessary.

Substitute value behavior	
Code (hex)	Meaning
00	Set outputs to 0 (default)
01	Hold last value

14.2 Message “Actuator supply not present” (FF8F_{hex}: DiagOut)

With this object, you parameterize whether the “Actuator supply missing” error is reported to the controller or not.

Message “Actuator supply not present”	
Code (hex)	Meaning
00	Do not report error to the controller (default)
01	Report error to the controller

From index AC1

If you parameterize the module so that the error is not reported to the controller, the corresponding indicator in LED E1 (red on) is suppressed. The behavior of the LED D is not affected.

Deviating behavior up to index AB1

If you parameterize the module so that the error is not reported to the controller, the corresponding indicator in LED D (flashing green/yellow) is suppressed and the LED lights up green.

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*DO*16*3-DA03-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.