S20 analog input module 4 inputs

R911342766
Edition 03

Data sheet S20-AI-4-U

4 analog inputs
0 - 10 V, ± 10 V, 0 - 5 V, ± 5 V
2-, 3-, 4-conductor technology

04 / 2026

1 Description

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

Features

- 4 analog, bipolar input channels for the connection of voltage signals
- Connection of sensors in 2-, 3-, and 4-conductor technology
- Voltage ranges: 0 V ... 10 V, ±10 V, 0 V ... 5 V, ±5 V
- Simultaneous scanning of all channels by means of simultaneous sampling
- High crosstalk attenuation between the channels, thanks to separate signal paths
- Particularly robust against electromagnetic interference
- Device rating plate stored

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

3 Ordering data

Description	Type	MNR	Pcs./Pkt.
S20 analog input module 4 inputs	S20-AI-4-U	R911173256	1

Accessories	Type	MNR	Pcs./Pkt.
S20 bus base module, narrow	S20-BS-S	R911173203	5
S20 Shield set	S20-SHIELD-SET	R911173030	1
Shield connection clamps, for shield on busbars, for conductor diameters ≤ 5 mm, contact resistance < 1 mΩ	S20-SHIELD-SK5	R911173282	10
Shield connection clamps, for shield on busbars, for conductor diameters ≤ 14 mm, contact resistance < 1 mΩ	S20-SHIELD-SK14	R911173286	10
PEN conductor busbar, 3x10 mm, length: 1000 mm	S20-SHIELD-NLS	R911173283	1

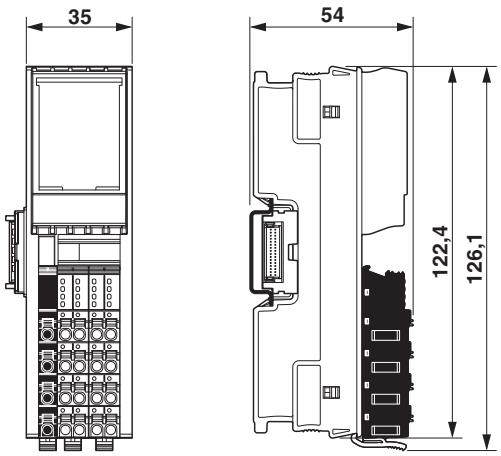
Documentation	Type	MNR	Pcs./Pkt.
Application description S20: System and Installation	DOK-CONTRL- S20*SYS*INS-AP..-EN-P	R911335988	1
Application description S20: Error Messages	DOK-CONTRL- S20*DIAG*ER-AP..-EN-P	R911344826	1

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	126.1 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	145 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 mm² ... 1.5 mm²
Conductor cross-section, flexible	0.2 mm² ... 1.5 mm²
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: 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	typ. 120 mA (up to index AD1) typ. 53 mA (from index AE1) max. 150 mA (up to index AD1) max. 60 mA (from index AE1)

Supply for analog modules (U_A)	
Supply voltage	24 V DC (I/O supply and sensor supply)
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	typ. 38 mA (I_{iS} = 0 mA, up to index AD1) typ. 34 mA (I_{iS} = 0 mA, from index AE1) max. 45 mA (I_{iS} = 0 mA, up to index AD1) max. 38 mA (I_{iS} = 4 x 20 mA, from index AE1) typ. 238 mA (I_{iS} = 4 x 50 mA (full load), up to index AD1) typ. 234 mA (I_{iS} = 4 x 50 mA (full load), from index AE1) max. 245 mA (I_{iS} = 4 x 50 mA (full load), up to index AD1) max. 238 mA (I_{iS} = 4 x 50 mA (full load), from index AE1)
Surge protection	electronic (35 V, 0.5 s)

Supply for analog modules (U_A)	
Reverse polarity protection	up to index AB1: polarity protection diode starting at index AD1: parallel diode; with external 5 A fuse (for startup only)
Transient protection	Suppressor diode

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.

Sensor supply U_{IS}	
Supply voltage	24 V DC (from U_A)
Current consumption	max. 50 mA (per channel)
Short-circuit protection	PTC resistor

Power dissipation	
Maximum power dissipation for nominal condition	1.85 W

Analog inputs	
Number of inputs	4
Description of the input	Differential inputs, voltage
Connection method	Push-in connection
Connection technology	2-, 3-, 4-conductor, shielded, twisted pair
Voltage input signal	0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V
A/D converter resolution	16 bit
A/D conversion time	31.25 µs
Measured value representation	16 bits (15 bits + sign bit)
Data formats	IB IL
Process data update	160 µs
Input filter	30 Hz, 12 kHz and mean value generation (can be parameterized)
Tolerance, relative	typ. 0.1 % (of measuring range final value for active mean value generation and 30 Hz filter) see tables for tolerance values
Tolerance, absolute	see tables for tolerance values
Input resistance of voltage input	268 kΩ (typical)
Limit frequency (3 dB)	30 Hz 12 kHz
Common mode voltage range	-50 V DC ... 50 V DC
Transient protection of inputs	Suppressor diode
Overload protection of the inputs	±30 V DC, maximum

Input and output address area	
Input address area	8 Byte
Output address area	0 Byte

Configuration and parameter data in a PROFIBUS system	
Required parameter data	7 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}) / analog inputs	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) / analog inputs	500 V AC, 50 Hz, 1 min
24 V supply (I/O) / functional ground	500 V AC, 50 Hz, 1 min
Analog inputs / 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	up to index AB1: Criterion B, DC supply lines: ±0.5 kV/±1.0 kV (symmetrical/asymmetrical), ±1.0 kV to shielded I/O cables from index AD1: Criterion B, DC supply lines: ±3.0 kV/±1.0 kV (symmetrical/asymmetrical), ±1.0 kV to shielded I/O cables
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 Tolerance data

The following applies for tolerance values:

The data is valid for nominal operation (U_A= 24 V in the default configuration (unless documented otherwise).

Default configuration: Filter with 30 Hz, 16-sample mean value, IB IL format.

160 µs update time (12 kHz filter, 32-sample mean value)

Tolerances at T_A = +25°C				
Measuring range	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±50 mV	±80 mV	±0.5 %	±0,8 %

160 µs update time, default (30 Hz filter, 16-sample average value)

Tolerances at T_A = +25°C				
Measuring range	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±10 mV	±30 mV	±0.10 %	±0.30 %

Typical data contains offset error, gain error, and linearity error in the respective default setting.

All tolerances indicated as a percentage are related to the positive measuring range final value.

Please also observe the values for temperature drift and the tolerances under influences of electromagnetic interferences.

Tolerance and temperature response at T_A = -25 °C ... +60 °C		
Measuring range	Drift	
	Typical	Maximum
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±100 ppm/K	±150 ppm/K

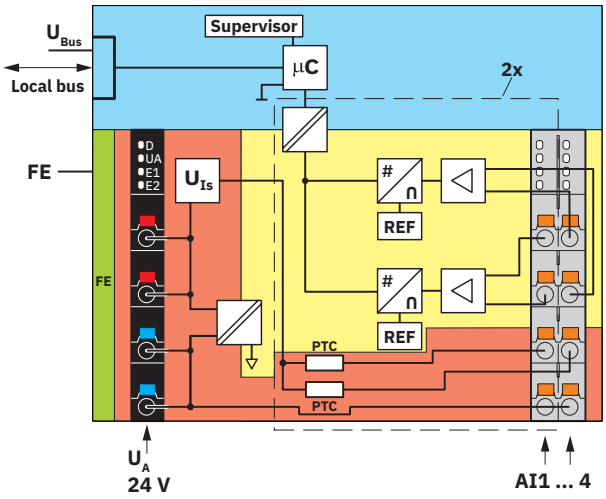
The drift values refer to the relevant measuring range final value.

Additional tolerances influenced by electromagnetic interference		
Electromagnetic fields	IEC 61000-4-3	< ±0.1 %
Fast transients (burst)	IEC 61000-4-4	< ±0.1 %
Conducted interference	IEC 61000-4-6	< ±0.1 %

Additional tolerances may occur due to the influence of high-frequency electromagnetic interference caused by wireless transmission systems in the immediate vicinity. The specified values refer to nominal operation. The components are directly exposed to interference without the use of additional shielding measures (e.g., steel cabinet).
The tolerances specified above can be reduced through additional shielding for the I/O module (e.g., use of a shielded control box/control cabinet, etc.).

6 Internal circuit diagram

Fig. 1 Internal wiring of the terminal points



Key:

Local bus	Local bus
FE	Functional ground
Supervisor	Hardware monitoring
µC	Microcontroller
	Electrical isolation for data or power supply
# ∩	Analog/digital converter
◁	Input amplifier
REF	Reference voltage source
	Analog I/O reference ground
	Logic reference ground
	Reference ground of sensor supply U_{iS}
	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.

Mount and install the device in such a way that the disconnecting device can be operated without restriction.

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

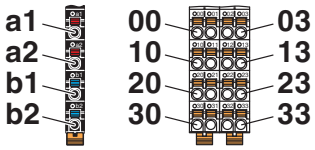
Information:

To install the device in accordance with UL/CSA/IEC standard, the following notes must be observed.

– Minimum temperature rating of the cables to be connected to the field wiring terminals:
  105 °C, AWG 24 ... 16
– 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_A)	Supply for analog modules (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)
Analog inputs			
00 ... 03	Orange	U1+ ... U4+	Positive voltage connection for channel 1 ... 4
10 ... 13	Orange	U1- ... U4-	Negative voltage connection for channel 1 ... 4
20 ... 23	Orange	$U_{iS}1$ ... $U_{iS}4$	24 V sensor supply for channel 1 ... 4
30 ... 33	Orange	GND	Reference potential of sensor supply

9 Connection examples

Fig. 3 Connector for voltage measurement

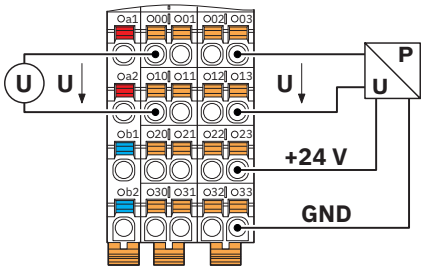
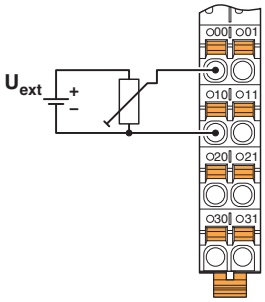
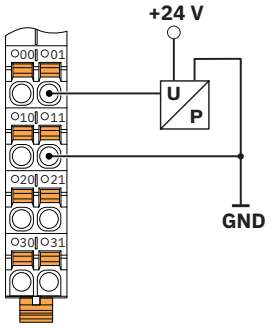


Fig. 4 Connection of potentiometric position sensors



The values of potentiometric position sensors can be acquired with voltage measurement. Supply the potentiometer via an external power supply unit (U_{ext} = 10 V).

Fig. 5 Differential voltage input with active 3-conductor transmitter



10 Connection notes

Observe the connection notes by the sensor manufacturer.

Shielding

Always connect the analog sensors using shielded, twisted pair cables.

In environments with high levels of interference, unshielded cables may cause values to be outside the specified tolerance limits.

For installation in a control cabinet: Connect the cable shield to the functional ground at a suitable point immediately after entry into the control cabinet. Route the cable in the control cabinet in a shielded manner.

If a closed control cabinet is not available, connect the shield to a shield bus.

For the best possible connection directly in front of the module, use the S20 SHIELD-SET shield connection set (R911173030) in combination with the S20-SHIELD-NLS busbar (R911173283).

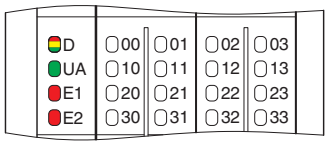
For more information on shielding, please refer to the application description for the S20 system, material number R911335988.

Strain relief

Do not use the shield contact as a strain relief. Carry out the shielding and the strain relief separately.

11 Local diagnostic and status indicators

Fig. 6 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.
UA	Green	U_{Analog}	On	Supply for analog modules (U_A) present.
			Off	Supply for analog modules (U_A) not present.
E1	Red	Supply voltage error	On	Supply for analog modules (U_A) is faulty.
			Off	Supply for analog modules (U_A) is OK.
E2	Red	Error	On	I/O or channel error has occurred.
			Off	No error

Error code and status of the E1 and E2 LEDs

Error	LED E1	LED E2
No error	off	off
Underrange	off	on
Overrange	off	on
Supply voltage faulty (supply for analog modules (U_A))	on	on
Parameter table invalid	off	on
Device error	off	on
Flash format error	off	on

The error that can actually be reported depends on the measuring range. For additional information please refer to the tables with significant measured values in various formats.

12 Process data

The module uses four words of IN process data.
Each channel is mapped to a word.

IN process data

Input process data			
Word	**0**	**...**	**3**
Channel	1	...	4
Assignment	Measured value	...	Measured value

Measured values

The measured values are depicted in IB IL format.
The measured value is displayed in 16 bit format.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value															

In the IB IL format a diagnostic code is mapped to the input data in the event of an error.

Code (hex)	Cause
8001	Measuring range exceeded (overrange)
8004	Measured value invalid or no valid measured value available
8020	Supply voltage faulty (supply for analog modules (U_A))
8040	Device faulty
8080	Below measuring range (underrange)

13 Significant values

The table is valid from index AC1.

Input data		0 V ... 10 V	±10 V	0 V ... 5 V	±5 V
hex	dec	V	V	V	V
8001	Overrange	> +10.837	> +10.837	> +5.419	> +5.419
7F00	32512	+10.837	+10.837	+5.419	+5.419
7530	30000	+10.0	+10.0	+5.0	+5.0
0001	1	+333.33 µV	+333.33 µV	+166.67 µV	+166.67 µV
0000	0	≤ 0	0	≤ 0	0
FFFF	-1		-333.33 µV		-166.67 µV
FDA7	-601	-200 mV			
FED3	-301			-100 mV	
8AD0	-30000		-10.0		-5.0
8100	-32512		-10.837		-5.419
8080	Underrange	< -200 mV	< -10.837	< -100 mV	< -5.419

The maximum measured value is $7F00_{hex}$.

Depending on the measuring range, the minimum measured value is either 0000_{hex} or 8100_{hex}.

14 Parameter, diagnostics and information (PDI)

14.1 PDI objects

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 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.

14.2 Retentive storage

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

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

When the parameterization is reset (via object $002D_{hex}$), certain retentively stored parameters are reset to their default settings. You can find out which parameters are reset in the description for object $002D_{hex}$.

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

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.**

NOTE: 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.

15 Standard objects

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

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning/contents		Retentive storage	
0005	Capabilities	Visible String	8	R	Capabilities	Energ_0		
0037	DeviceType	Octet string	8	R	Device type	0020 0008 0000 $00A5_{hex}$		
Diagnostics objects								
0018	DiagState	Record [6]	21	R	Diagnostic state			*
0019	ResetDiag	UINT8	1	R/W	Handling diagnostic messages		No	*
Objects for process data management								
0025	PDIN	Octet string	8	R	Input process data The structure corresponds to the representation in the "Process data" section.			
0026	PDOUT	Octet string	8	R	OUT process data, not applicable			
Objects for device management								
002D	ResetParam	UINT8	1	R/W	Reset parameterization		No	*
002E	CheckSum	UINT32	4	R	Checksum			*

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.

15.1 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.

A detailed description of the object is to be found in the application description for the S20 system, material number R911335988.

Error and status of the local diagnostics and status indicators

Element	**2**	**3**	**4**	**6**				
Error	**Priority**	**Channel/ group/ module**	**Error code**	**Text**	**LED**			
	hex	**hex**	**hex**		**D**	**UA**	**E1**	**E2**
No error	00	00	0000	Status OK	◐	●	○	○
Supply voltage faulty (supply for analog modules (U_A))	01	FF	5160	Supply fail	☼	○	●	●
Device error	01	FF	6301	CS FLASH	◐	●	○	●
Flash format error	01	FF	6302	FO FLASH	◐	●	○	●
Parameter table invalid	01	FF	6320	Invalid para	◐	●	○	●
Overrange	02	01 ... 04	8910	Overrange	◐	●	○	●
Underrange	02	01 ... 04	8920	Underrange	◐	●	○	●

Key

Priority	00_{hex}	No error
	01_{hex}	Error
	02_{hex}	Warning
Channel/group/ module	00_{hex}	No error
	01_{hex}	Channel 1
	:	:
	04_{hex}	Channel 4
	FF_{hex}	Entire device
LED	○	Off
	●	On
	◐	Green on
	☼	Flashing green/yellow

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

15.2 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

15.3 Reset parameterization ($002D_{hex}$: ResetParam)

From of index AB1.

Use this object to reset the parameters of the parameter table (object 0080_{hex}) to the delivery state (default values).

To reset the parameters, value 01_{hex} must be transferred during write access. All other values are invalid and will be acknowledged with an error.

15.4 Checksum ($002E_{hex}$: CheckSum)

From of index AB1.

The module calculates the checksum for all retentively stored PDI objects (without 0014_{hex} to 0016_{hex}).
As long as the checksum does not change, the PDI objects of the module are not saved again.

16 Application objects

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning/contents	Retentive storage
0080	ParaTable	Array [6] of UINT16	12	R/W	Parameter table	Yes
0082	Measured Value Float	Array [4] of Records	24	R	Measured values in the extended float format	
0083	PD Min	Array [4] of INT16	8	R	Minimum process data value	
0084	PD Max	Array [4] of INT16	8	R	Maximum process data value	

16.1 Parameter table (0080_{hex}: ParaTable)

Parameterize the module using this object.

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

After a reset, the module operates with the last retentively stored data. In the delivery state, the module works with the default data (default setting).

0080_{hex}: Parameter table (read, write)				
Subindex	**Data type**	**Length in bytes**	**Meaning**	**Default value**
0	Array [6] of UINT16	12	Read/write all elements	See subindices
1	UINT16	2	Parameterization of channel 1	0000_{hex}
:	:	:	:	:
4	UINT16	2	Parameterization of channel 4	0000_{hex}
5	UINT16	2	Data format	0000_{hex}
6	UINT16	2	Reserved	0000_{hex}

Parameterization channel 1 ... channel 4

Parameterization word

15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	Filter	0	0	Mean value		0	0	0	0	Measuring range			

Filter	**Code (bin)**	**Code (hex)**
30 Hz (default)	**0**	**0**
12 kHz	1	1

Mean value	**Code (bin)**	**Code (hex)**
16-sample (default)	**00**	**0**
No mean value	01	1
4-sample	10	2
32-sample	11	3

Measuring range	**Code (bin)**	**Code (hex)**
0 V ... 10 V (default)	**0000**	**0**
-10 V ... +10 V	0001	1
0 V ... 5 V	0010	2
-5 V ... +5 V	0011	3
Channel inactive	1111	F
Reserved	Other	

Parameterize unused channels as “Channel inactive”.

Data format

15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	0	0	0	Data format		0	0	0	0	0	0	0	0

Data format	**Code (bin)**	**Code (hex)**
IB IL (default)	**00**	**0**
Reserved	Other	

Set all reserved bits to 0.

16.2 Measured value in extended float format (0082_{hex}: Measured Value Float)

You can read the IN process data with the 0025_{hex} object.

The 0082_{hex} object is also available.

This object provides the measured value in the highest internal accuracy of the terminal in the float format.

0082_{hex}: Measured value in extended float format (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Array [4] of Records	24	Read all elements
1	Record [3]	6	Measured value for channel 1
:	:	:	:
4	Record [3]	6	Measured value channel 4

Measured value channel 1 ... channel 4

Element	**Data type**	**Length in bytes**	**Meaning**
1	FLOAT32	4	Measured value in float format according to IEEE 754
2	UINT8	1	Status
3	UINT8	1	Unit

Structure of the float format according to IEEE 754 in the bit representation:

VEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM

V 1 sign bit, 0: positive, 1: negative
E 8 bits exponent with offset $7F_{hex}$
M 23 bits mantissa

Example values for conversion from floating point to hexadecimal representation:

Floating point	**Hexadecimal representation**
1.0	3F 80 00 00
10.0	41 20 00 00
1.03965528	3F 85 13 6D
-1.0	BF 80 00 00

Extended Float Format

Extended Float Format is a specially defined format. It consists of the measured value in float format, a status, and a unit.

Status is necessary because the float format defines no patterns providing information on the status of the numerical value.

The status corresponds to the LSB of the diagnostic code in IB IL format (e.g., overrange: status = 01, diagnostic code = 8001_{hex}). If status = 0, the measured value is valid.

Unit	**Code**
Volt (V)	58 ($3A_{hex}$)

Status	**Code**
Measured value is valid	00_{hex}
Measured value invalid	Other

16.3 Minimum process data value (0083_{hex}: PD Min)

Object 0083_{hex} can be used to read the minimum IN process data values.

The values are initialized after each parameterization. The highest value is assigned for the minimum process data value.

PD Min = $7FFF\ 7FFF\ 7FFF\ 7FFF_{hex}$

On every analog conversion, the PD Min value is compared with the current measured values and overwritten if necessary.

0083_{hex}: Minimum process data value (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Array [4] of INT16	8	Read all elements
1	INT16	2	Minimum process data value channel 1
:	:	:	:
4	INT16	2	Minimum process data value channel 4

16.4 Maximum process data value (0084_{hex}: PD Max)

Object 0084_{hex} can be used to read the maximum IN process data values.

The values are initialized after each parameterization. The lowest value is assigned for the maximum process data value.

PD Max = $8000\ 8000\ 8000\ 8000_{hex}$

On every analog conversion, the PD Max value is compared with the current measured values and overwritten if necessary.

0084_{hex}: Maximum process data value (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Array [4] of INT16	8	Read all elements
1	INT16	2	Maximum process data value channel 1
:	:	:	:
4	INT16	2	Maximum process data value channel 4

17 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.

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