rexroth
A Bosch Company

S20 analog input module

R911386074
Edition 03

Data sheet S20-SGI-2

2 analog input channels for strain gauges
Connection of load cells, force transducers, etc.
4- or 6-conductor technology

10 / 2022

1 Description

The module is designed for use within an S20 station. Used to evaluate strain gauges that may be located in weighing cells or load cells, for example.
You can connect the strain gauges using 6- or 4-conductor technology.

Features

- 2 high-precision inputs for strain gauges
- Measuring ranges adjusted with nominal characteristic values upon delivery
- Manual entry of characteristic values
- Process data update can be parameterized in increments between 200 µs and 100 ms
- Path adjustment in the process environment
- 2-point adjustment
- Connection of strain gauges in 6- and 4-conductor technology
- Advanced wire-break detection
- Sensor supply of up to 115 mA (8 load cells with 350 Ω per channel)
- Per channel: low-resistance, floating N/O contact
- The channels are parameterized independently of one another via the bus system
- Tara device

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	S20-SGI-2	R911174629	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

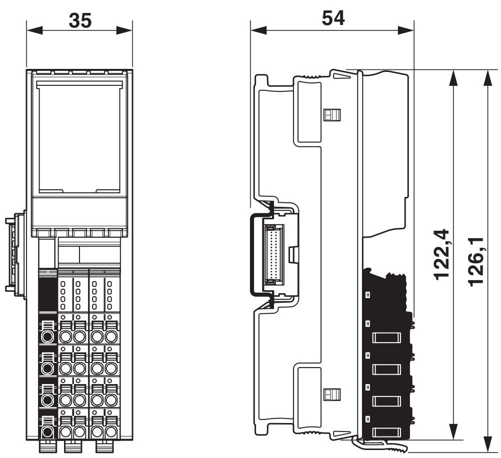
Documentation	Type	MNR	Pcs./Pkt.
Application description S20: System and Installation	DOK-CONTRL- S20*SYS*INS-AP..-EN-P	R911335988	1
Application description S20: Error Messages	DOK-CONTRL- S20*DIAG*ER-AP..-EN-P	R911344826	1

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	light grey RAL 7035
Weight	150 g (with connectors and bus base module)
Operating mode	Process data mode with 6 words
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)
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

☞ 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. 65 mA max. 75 mA
Power consumption	typ. 325 mW max. 375 mW

Supply for analog modules (U_A)	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	typ. 15 mA (with no load, no weighing cell) typ. 25 mA (with typical load: 1 weighing cell with 350 Ω, only one channel loaded) typ. 55 mA (with maximum load: 8 weighing cells with 350 Ω, only one channel loaded) typ. 110 mA (with maximum load: 8 weighing cells with 350 Ω per channel)

Supply for analog modules (U_A)	
Power consumption	typ. 360 mW (with no load, no weighing cell) typ. 600 mW (with typical load: 1 weighing cell with 350 Ω, only one channel loaded) typ. 1.3 W (with maximum load: 8 weighing cells with 350 Ω, only one channel loaded) typ. 2.6 W (with maximum load: 8 weighing cells with 350 Ω per channel)
Surge protection	Suppressor diode
Reverse polarity protection	Polarity protection diode

Power consumption	
Power consumption	typ. 1.5 W (entire device) max. 3 W (entire device)

Voltage output	
Number of outputs	2
Impedance	> 43 Ω (per channel)
Output voltage	typ. 5 V
Output current	max. 115 mA (per channel)
Short-circuit protection of the voltage outputs	Yes, at least 1 minute through temperature monitoring

Floating N/O contact	
Quantity	2 (K_{a1}-K_{b1}, K_{a2}-K_{b2})
Nominal voltage	max. 24 V DC
Nominal current	max. 250 mA
Short-circuit protection	no
Contact resistance	< 1 Ω (typical) < 3 Ω (maximum)
Typical response time	typ. 0.2 ms (opening) typ. 2 ms (close)

Input channels for strain gauge	
Number of inputs	2
Connection technology	6 or 4-wire, twisted pair shielded cable
Characteristics	can be parameterized: 350 µV/V ... 6500 µV/V
Bridge difference U_d	Measuring range specified by selecting the characteristic -35 mV ... +35 mV
Bridge voltage U_0	5 V
Wire-break detection	$+U_V$, $-U_v$, $+U_0$, $-U_0$ (typical drift of 5 ppm/K) $+U_V$, $-U_v$, $+U_0$, $-U_0$, $+U_d$, $-U_d$ (advanced; typical drift of 50 ppm/K)
Measured value representation	32 bits
Process data update	can be parameterized: 200 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 12.5 ms, 20 ms, 50 ms, 100 ms
A/D converter resolution	24 bit
Filtering	None or mean-value generation over 4, 16, or 32 measured values
Step response (0–99%)	1 ms (200 µs, no mean-value generation)

Input and output address area	
Input address area	12 Byte
Output address area	12 Byte

Configuration and parameter data in a PROFIBUS system	
Required parameter data	48 Byte
Required configuration data	7 Byte

Electrical isolation/isolation of the voltage areas	
Test section	**Test voltage**
Logic	500 V AC, 50 Hz, 1 min.
24 V supply (I/O)	500 V AC, 50 Hz, 1 min.
Analog inputs	500 V AC, 50 Hz, 1 min.
N/O contact K_{a1} - K_{b1}	500 V AC, 50 Hz, 1 min.
N/O contact K_{a2} - K_{b2}	500 V AC, 50 Hz, 1 min.
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/unsymmetrical), ±1.0 kV to shielded I/O cables
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 Additional tables

5.1 Tolerance specifications

Fig. 1 Typical deviation in % in relation to the nominal characteristic value

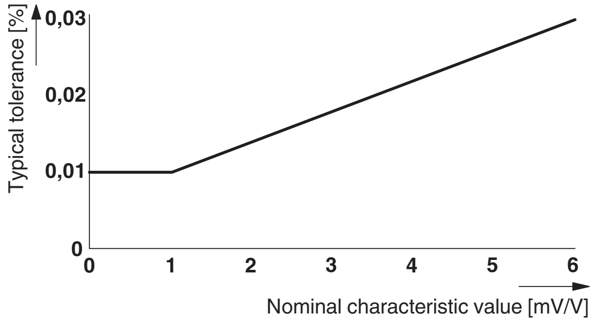
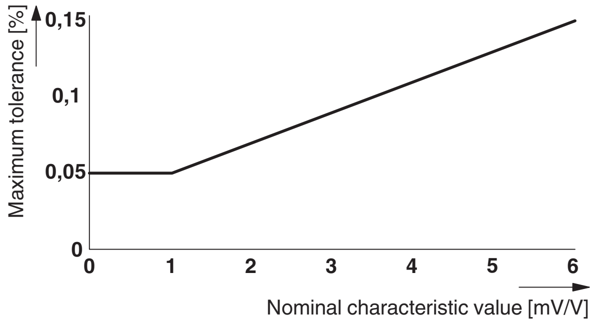


Fig. 2 Relative deviation in % in relation to the nominal characteristic value



The typical values contain the typical offset error, gain error, and linearity error in the respective parameterization in relation to the nominal characteristic value.

The data is valid for nominal operation (preferred mounting position, $U_A = 24$ V).

The maximum tolerance values represent the worst case measurement inaccuracy. Besides the maximum offset error, the gain error and the linearity error, the maximum tolerance values also comprise the longtime drift as well as the maximum tolerances of the test and calibration equipment.

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

Additional tolerances influenced by electromagnetic fields	
Type of electromagnetic interference	**Typical deviation in % in relation to the nominal characteristic value**
Electromagnetic fields; field strength 10 V/m in accordance with EN 61000-4-3/ IEC 61000-4-3	< ±1.3 %
Conducted disturbances, Class 3 (10 V test voltage) in accordance with EN 61000-4-6/ IEC 61000-4-6	< ±0.3 %
Fast transients (burst) up to an interference voltage of ±2.2 kV in acc. with EN 61000–4–4 / IEC 61000–4–4	< ±0.2 %

The values refer to nominal operation with default settings.

Temperature and drift response (T_A = -25°C ... +60°C)		
	Relative drift in ppm/K in relation to the nominal characteristic value	
	typical	**maximum**
Wire-break detection ($+U_V$, GND U_V, $+U_0$, $-U_0$)	5 ppm/K	15 ppm/K
Advanced wire-break detection ($+U_V$, GND U_V, $+U_0$, $-U_0$, $+U_d$, $-U_d$)	50 ppm/K	150 ppm/K

The typical value contains the typical offset and gain drift in the respective parameterization in the temperature range from -25°C up to +60°C in relation to the nominal characteristic value.

The data is valid for nominal operation (preferred mounting position, $U_A = 24$ V).

The maximum tolerance values represent the worst case measurement inaccuracy. Besides maximum offset and gain drift, they also comprise longtime drift as well as the maximum tolerances of the test and calibration equipment.

Observe the parameterization for a 4-conductor connection: In addition to the effects from the cable, you must also take an increased drift due to the evaluation into consideration. This drift can typically reach 250 ppm/K or more.

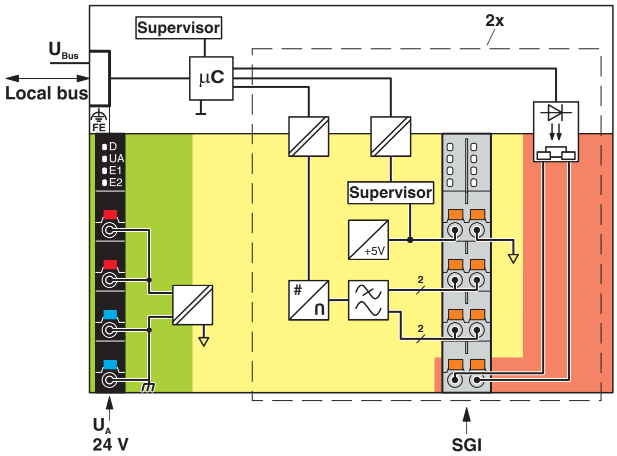
5.2 Cut-off frequencies and step responses

The table below specifies the times for step responses and cut-off frequencies depending on the settings for conversion time and mean-value generation.

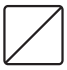
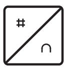
Conversion time	Limit frequency (-3 dB)	Step response from 0% to 100% (typical) for mean-value generation			
		without	4-sample	16-sample	32-sample
		in ms			
200 µs	1.2 kHz	1	1.8	4.2	7.4
500 µs	600 Hz	2	4	10	18
1 ms	300 Hz	3	7	19	35
2 ms	150 Hz	6	14	38	70
5 ms	50 Hz	15	35	95	175
10 ms	30 Hz	30	70	190	350
12.5 ms	20 Hz	40	90	240	440
20 ms	15 Hz	60	140	380	700
50 ms	5 Hz	150	350	950	1750
100 ms	3 Hz	300	700	1900	3500

6 Internal circuit diagram

Fig. 3 Internal wiring of the terminal points



Key:

	Microcontroller
	Electrical isolation for data or power supply
	Power supply unit
	Hardware monitoring
	Analog/digital converter
	Low pass filter
	Electrically isolated areas
	PhotoMOS relays
	Noiseless ground
	Reference ground for I/O voltage
	Reference ground for analog voltage

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.

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

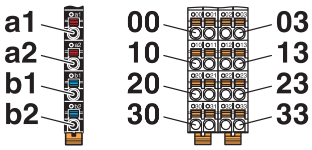
Only install the S20 modules in a control cabinet or junction box.

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)

8 Terminal point assignment

Fig. 4 *Terminal point assignment*



Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_A)	Supply voltage feed-in (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)
Channel 1			
00	Orange	$+U_{V1}$	Jumper supply (U_{V1})
01	Orange	$-U_{V1}$	
10	Orange	$+U_{01}$	Jumper voltage U_{01}
11	Orange	$-U_{01}$	
20	Orange	$+U_{d1}$	Jumper difference U_{d1}
21	Orange	$-U_{d1}$	
30	Orange	K_{a1}	N/O contact channel 1
31	Orange	K_{b1}	
Channel 2			
02	Orange	$+U_{V2}$	Jumper supply (U_{V2})
03	Orange	$-U_{V2}$	
12	Orange	$+U_{02}$	Jumper voltage U_{02}
13	Orange	$-U_{02}$	
22	Orange	$+U_{d2}$	Jumper difference U_{d2}
23	Orange	$-U_{d2}$	
32	Orange	K_{a2}	N/O contact channel 2
33	Orange	K_{b2}	

9 Connection notes

Connecting the strain gauges

Connect the strain gauges using shielded twisted pair cables.

Connecting the shield

Only connect the shield at one point, preferably near the module.

If the shield is permanently affixed to the sensor, isolate the shield on the module side!

For the best possible connection of the shielding directly in front of the module, use the shield set S20-SHIELD-SET.

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

Unused channels

Unused channels that are parameterized as active indicate a wire break diagnosis. The error bit in the status word is set.

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

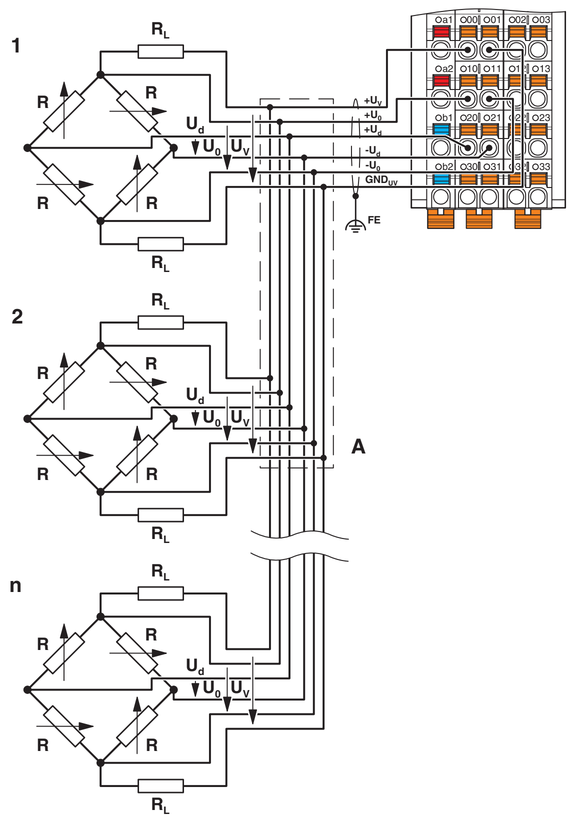
To not receive an error message, you can parameterize unused channels as inactive ("Channel activation" parameter, object 0280_{hex}).

10 Connection examples

10.1 6-conductor connection (several strain gauge load cells per channel)

Each channel can supply a current of up to 115 mA. For example, 8 load cells with a basic resistance of 350 Ω can therefore be connected in parallel for each channel.

Fig. 5 Connection of several strain gauges in 6-conductor technology



Key:

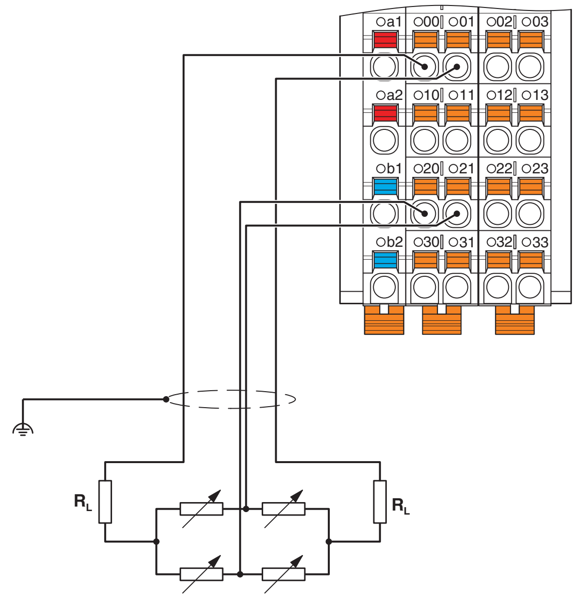
1 ... n	Stretch gauges
A	Load center
R_L:	Cable resistance

Configure the channel with the 6-conductor connection by setting the “Number of wires” parameter to 06 (object $029B_{hex}$). This corresponds to the default setting for the object.

After changing the configuration, perform an offset adjustment in the process environment.

10.2 4-conductor connection

Fig. 6 Connection of strain gauges in 4-conductor technology



You can connect strain gauges to Channel 1 and Channel 2 using 4-conductor technology.

The temperature and long-term drift compensation of the connecting cable is omitted in the case of the 4-conductor technology.

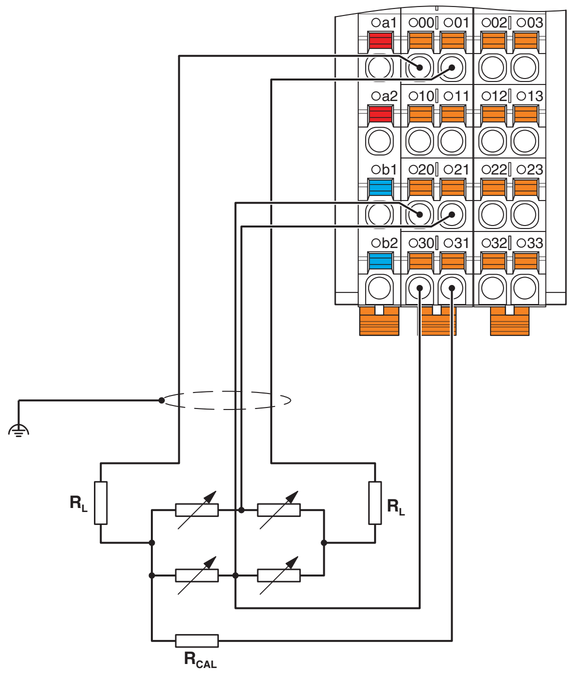
Configure the channel with the 4-conductor connection by setting the “Number of wires” parameter to 04 (object $029B_{hex}$).

After changing the configuration, perform an offset adjustment in the process environment.

10.3 4-conductor connection with a shunt resistor

The following figure shows the connection of a resistive pressure sensor with an 80% calibration. This sensor is typically used for injection molding of plastics.

Fig. 7 Connection of strain gauge in 4-conductor technology with shunt resistor



Key:

R_L: Cable resistance

You can connect strain gauges to Channel 1 and Channel 2 using 4-conductor technology.

The temperature and long-term drift compensation of the connecting cable is omitted in the case of the 4-conductor technology.

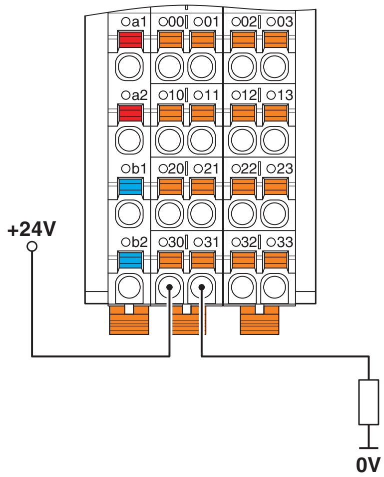
Configure the channel with the 4-conductor connection by setting the “Number of wires” parameter to 04 (object $029B_{hex}$).

After changing the configuration, perform an offset adjustment in the process environment.

10.4 Connection of a load to the N/O contact

The figure below shows the connection of a load to N/O contact K_a-K_b.

Fig. 8 Connection of a load to N/O contact K_a-K_b



Note the maximum data of the circuit breaker.

- 24 V DC, 250 mA
- No short-circuit protection
- Surge protection by means of TVS diode parallel to the switch contact

The N/O contact is implemented as a semiconductor element (see “Internal basic circuit diagram”).

11 N/O contact K_a-K_b

11.1 Control of the N/O contacts

The N/O contacts can be controlled in various ways:

- Control N/O contacts via process data
- Control N/O contacts via "Control contact" (object $028F_{hex}$)
- Control N/O contacts by selecting switching thresholds (objects 0289_{hex}, $028A_{hex}$)

Control N/O contacts via process data

Proceed as follows to control the N/O contact via process data:

- Parameterize the switch using the object 0288_{hex}, switch parameterization.
  Select "N/O contact can be controlled via process data".
- Control the switch via the process data bit "N/O contact".

Control N/O contact via switch parameterization (object 0288_{hex})

You can control the N/O contact via the PDI object 0288_{hex} using acyclic services.

For more detailed information, please refer to the section “Switching parameterization (0288_{hex}: SGI_SwitchBehaviour)".

Please note that the switching times depend on the response times as well as the set bus cycle time.

Control N/O contacts by selecting switching thresholds (objects 0289_{hex} or $028A_{hex}$)

Here, the module automatically controls the N/O contact depending on the current measured value. This function can be used to automatically start or stop a weighing process, for example.

For more detailed information, please refer to the section “Switching parameterization (0288_{hex}: SGI_SwitchBehaviour)".

Please note that the typical switching time depends on the parameterized conversion time (see example in the table to the right).

11.2 Behavior of the N/O contacts

The response times of the N/O contacts depend on the selected bus cycle time, the value of the load, the type of load (R, L or C), the supply, and the temperature. In particular, capacitive loads increase the switching times.

Load at K_a-K_b at 24 V switching	Typical response time in ms	
	Close	Opening
100 Ω	2	0.2
2 kΩ	2	0.2
2 kΩ II 10 nF	2	0.2
2 kΩ II 220 nF	2	3
2 kΩ II 10 µF	2	75
2 kΩ + 3.3 mH	2	0.2

II Parallel connection
\+ Serial connection

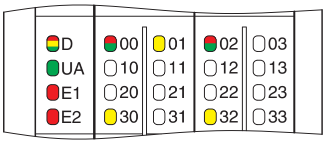
Typical switching times for control via switching thresholds

Example:

	Response time	Conversion time	Step response	Typical switching time
Enable	2 ms	200 µs	1 ms	3.2 ms
	2 ms	10 ms	30 ms	42 ms
Disable	0.2 ms	200 µs	1 ms	1.4 ms
	0.2 ms	10 ms	30 ms	40.2 ms

12 Local diagnostic and status indicators

Fig. 9 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.
UA	Green	U_{Analog}	On	Power supply is present for the periphery.
			Off	No power supply is present for the periphery.
E1	Red	Device error	On	Supply error (all channels affected) Parameter table invalid
			Off	No error
E2	Red	I/O error or channel error	On	A peripheral fault is present. Possible causes: wire break, bridge supply is faulty
			Off	No error
00, 02	Red/ green	Channel status	Green on	Channel OK
			Red on	Wire break, bridge supply not present
			Off	Channel deactivated
30, 32	Yellow	PhotoMOS relays	On	Closed
			Off	Open

You can specify the type of wire-break detection you want to use via the “Advanced wire-break detection” parameter (object $028B_{hex}$).

A wire break is detected according to the following table:

Diagnostics	Wire-break detection (typical drift of 5 ppm/K)	Advanced wire-break detection (typical drift of 50 ppm/K)
No sensor connected	Yes	Yes
Cable break (all cables severed)	Yes	Yes
$+U_V$	Yes	Yes
$-U_V$	Yes	Yes
$+U_0$	Yes	Yes
$-U_0$	Yes	Yes
$+U_d$	No	Yes
$-U_d$	No	Yes

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

☞ If you are operating a channel in 4-conductor operation and have parameterized this accordingly, the bridge voltage U_0 will be evaluated internally. In this case, a wire break will not be detected.
(“Number of cables” parameter, object $029B_{hex}$, = 04)

You can also use the advanced wire-break detection function to check cables $+U_d$ and $-U_d$ in 4-conductor operation.

13 Process data

The module uses six words of IN process data and six words of OUT process data.

Output process data						
Output word	**0**	**1**	**2**	**3**	**4**	**5**
Assignment	Control word	Control word	Not relevant			
	Channel 1	Channel 2				
Signal	CW_IN01	CW_IN02				

Input process data						
Input word	**0**	**1**	**2**	**3**	**4**	**5**
Assignment	Status word	Status word	Measured value		Measured value	
	Channel 1	Channel 2	Channel 1		Channel 2	
Signal	SW_IN01	SW_IN02	IN01		IN02	

13.1 OUT process data

Channel 1 is controlled via control word CW_IN01, Channel 2 via CW_IN02.

The remaining output words are not evaluated.

CW_IN01, CW_IN02															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Res.	N/O contact	Reset_Tara	Tare	Reset_Min	Res.	Reset_Max	Res.			Adjustment	Zero point	Res.			

Meaning of the bits

Designation	Value	Meaning	Note
Res.		Reserved	
N/O contact	0	Open N/O contact K_a-K_b	This bit is only significant if the switch is set to "N/O contact can be controlled via process data" (object 0288_{hex}). If the N/O contact can be controlled via process data, the bit is continuously mapped to the contact.
	1	Close N/O contact K_a-K_b	
The following bits are edge-controlled. When a transition from 0 to 1 occurs, the associated function is executed once. The corresponding status bit is set for confirmation. It is not reset until the control bit changes to 0.			
Tare	0 → 1	Set current weight as tare weight	If the Tare and Reset_Tare bits are set, the Tare bit has priority. The tare weight is the difference between the total weight (gross weight) and the net weight of the sample. See section “Zero point, adjustment, and tare”.
Reset_Tara	0 → 1	Reset tare weight	
Reset_Min	0 → 1	Delete minimum value	
Reset_Max	0 → 1	Delete maximum value	
Adjustment	0 → 1	Adjusting	Only use these bits for initial startup or after establishing a new connection or replacing the weighing cells. See section “Zero point, adjustment, and tare”.
Zero point	0 → 1	Determine zero point	

The Tare, Adjustment, and Zero point bits may not all be set at the same time. If you set these bits at the same time, no action is executed.

13.2 IN process data

The status information and the measured values are transmitted via the IN process data.

13.2.1 Status words for channel 1 and channel 2

SW_IN01, SW_IN02															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Error	N/O contact	Reset_ Tara	Tare	Reset_ Min	Res.	Reset_ Max	Res.			Adjust-ment	Zero point	Res.	NET	-0-	><

Meaning of the bits

Designation	Value	Meaning
Res.		Reserved
Error	0	No error has occurred.
	1	An error has occurred. See section “Diagnostic codes in the process data”.
N/O contact	0	N/O contact K_a-K_b is open.
	1	N/O contact K_a-K_b is closed.
Reset_Tara	0 → 1	Tare weight has been reset
Tare	0 → 1	Current weight has been set as tare weight
Reset_Min	0 → 1	The minimum value has been deleted.
Reset_Max	0 → 1	The maximum value has been deleted.
Adjustment	0 → 1	The adjustment has been made.
Zero point	0 → 1	The zero point has been determined.
NET	0	The measured weight corresponds to the gross weight.
	1	The measured weight corresponds to the net weight.
-0-: zero point range	0	The measured value is not in the zero point range.
	1	The measured value is in the zero point range.
><: stop range	0	The measured value is not in the stop range.
	1	The measured value is in the stop range.

13.2.2 Measured values

The measured values for channel 1 are mapped as signal IN01 in the IN process data words 2 and 3.

The measured values for channel 2 are mapped as signal IN02 in the IN process data words 4 and 5.

Every measurement value is represented in 32 bits. The data type is Integer32.

If the error bit is set in the status word, diagnostic codes are displayed in the input data.

Connection between process data value and measurement value

The measured value is represented in 32 bits.

Enter at least the nominal load and the nominal characteristic value to parameterize the module.

The module shows the current measured value in the process data to three decimal places.

☞ Note that the nominal load is indicated without units. The resolution in the process data is 1/1000. This means that if the nominal load, for example, corresponds to a value in kg, the process data value is indicated in g. This also applies for t and kg, l and ml, etc.

Example:

Settings		
Nominal load	=	50 kg
Nominal characteristic value	=	2.2 mV/V

A weight of 34.567 kg is present on the connected weighing cell.

The process data value is 34567_{dec} = 0008707_{hex}.

13.2.3 Diagnostic codes in the process data

In the event of an error, a diagnostic code is mapped to the input data instead of the measured value.

Code (hex)	Cause	"Error" bit in the status word
8000 0001	Measuring range exceeded (overrange)	Set (= 1)
8000 0002	Wire break	Set (= 1)
8000 0003	Short-circuit	Set (= 1)
8000 0004	Measured value is invalid	Not set (= 0)
8000 0020	Faulty supply voltage	Set (= 1)
8000 0040	Device faulty	Not set (= 0)
8000 0080	Below measuring range (underrange)	Set (= 1)

14 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.

15 Standard objects

15.1 Objects for identification (device rating plate)

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	20	R	Device family	I/O function module
0006	ProductFamily	Visible String	1	32	R	Product family	IndraControl S20
000E	CommProfile	Visible String	1	4	R	Communication profile	634
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	FwUpdt0
0007	ProductName	Visible String	1	32	R	Product name	S20-SGI-2
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	2 channel strain gauge module
000A	OrderNumber	Visible String	1	32	R	Item No.	R911174629
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; 5	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 20 00 0C 00 00 00 AB_{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	59	R/W	Location	Can be completed by the user.
0015	EquipmentIdent	Visible String	1	59	R/W	Equipment identifier	Can be completed by the user.
0016	ApplDeviceAddr	UINT16	1	2	R/W	Application-specific device address	Can be completed by the user.

15.2 Miscellaneous standard objects

Index (hex)	Object name	Data type	A	L	Rights	Meaning/contents	
Diagnostics objects							
0018	DiagState	Record	6	40	R	Diagnostic state	*
0019	ResetDiag	UINT8	1	1	R/W	Handling diagnostic messages	*
Objects for process data management							
0025	PDIN	Octet string	1	12	R	Input process data The structure corresponds to the representation in the "Process data" section.	
0026	PDOUT	Octet string	1	12	R	OUT process data The structure corresponds to the representation in the “Process data” section.	
Objects for device management							
0029	ParamSetWrite-Control	UINT8	1	1	R/W	Parameter set write control	*
002A	ConflictDictionary				R	Conflict dictionary	*
002D	ResetParam	UINT8	1	1	R/W	Reset parameterization	*
002E	CheckSum	UINT32	1	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.

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

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

0018_{hex}: Diagnostics state (read)					
Subindex	**Data type**	**Length in bytes**	**Meaning**	**Contents**	
0	Record	40	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
				01_{hex}	Channel 1
				02_{hex}	Channel 2
				FF_{hex}	Entire device
4	UINT16	2	Error code	See table below	
5	UINT8	1	More follows	00_{hex}	
6	Visible String	33	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

Subindex	**2**	**3**	**4**	**6**						
Error	**Pri-ority**	**Chan-nel/ group/ module**	**Error code**	**Text**	**LED**					
	hex	**hex**	**hex**		**D**	**UA**	**E1**	**E2**	**00**	**02**
No error	00	00	0000	Status OK	◐	◐	○	○	◐	◐
Supply voltage fault (supply voltage feed U_A)	01	FF	5112	Supply fail	☼	○	◑	○	◑	◑
Short-circuit	01	01	2140	Short circuit error	◐	◐	○	◑	◑	X
		02							X	◑
Wire break	01	01	7710	Open circuit error	◐	◐	○	◑	◑	X
		02							X	◑
Measuring range over-range	02	01	8910	Overrange	◐	◐	○	○	◑	X
		02							X	◑
Measuring range under-range	02	01	8920	Underrange	◐	◐	○	○	◑	X
		02							X	◑

○	Off	◐	Green on
●	On	◑	Red on
X	The LED is not affected by this error.	☼	Flashing green/red

Measuring range overrange	Process data value has exceeded the positive limit value of $7FFFFF00_{hex}$ = 2147483392_{dec}.
Measuring range underrange	Process data value has exceeded the negative limit value of 80000100_{hex} = -2147483392_{dec}.
Wire break	The message is only displayed if advanced open circuit detection is active.
Short-circuit	Short circuit between terminal point -U_{V1} and GND or -U_{V2} and GND

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

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

This object is stored remanently.

0019_{hex}: Handling diagnostic messages (read, write)				
Subindex	**Data type**	**Length in bytes**	**Code (hex)**	**Meaning**
0	UINT8	1	**00 (default)**	Permit all diagnostic messages
			01	Delete diagnostic archive (object $E801_{hex}$)
			02	Delete and acknowledge all diagnostic messages that are still pending
			03	Delete and acknowledge all diagnostic messages and reset the error counter
			06	Delete and acknowledge all diagnostic messages and do not permit new diagnostic messages
			Other	Reserved

15.4 Parameter record write control (0029_{hex}: ParamSetWriteControl)

This object is used to control block parameterization.

0029_{hex}: Parameter record write control (read/write)				
Subindex	**Data type**	**Length in bytes**	**Code (hex)**	**Meaning**
0	UINT8	1	00	Termination of block parameterization
			01	Initiation of block parameterization

Block parameterization serves to enable the joint transfer of interdependent parameters.

If you attempt to parameterize dependent parameters individually, this may result in the error message “Dependency of other parameter not taken into consideration”. Block parameterization should be used in this case.

The plausibility check for the parameterization data is disabled during block parameterization, the data is only stored temporarily. However, the data length and subindex are checked.

The plausibility check is only performed when block parameterization is terminated with data item 00_{hex}.

If the check was completed with no errors, the temporarily stored parameterization data is applied and stored in the Flash memory.

If errors were detected in the temporarily stored parameterization data, the service is acknowledged negatively.
The exact cause of the error can be read in object $002A_{hex}$. The error codes are indicated by object 0080_{hex}.

Not all startup objects have to be written.

The following actions are carried out when the parameter contents are modified:

Write control changes from 00_{hex} to 01_{hex}: initiation of block parameterization

- Block parameterization is initiated
- Conflict dictionary is reset

Write control changes from 01_{hex} to 00_{hex}: termination of block parameterization

- Block parameterization is terminated
- Individual parameterization is active
- Parameterization is checked for compatibility

Parameters are compatible:
- The parameter contents are accepted.
- Write access to the write control parameter is acknowledged positively.

Parameters are not compatible:
- The old contents of all the parameters required for block parameterization remain in effect.
- The conflict dictionary is updated.
- Write access to the write control parameter is acknowledged negatively.

Error code in the event of negative acknowledgment:

Code (hex)	Additional code (hex)	Meaning	Corrective
0801	0040	Dependent values were not taken into consideration.	Check the parameterization.

The block parameterization is permanently stored in the device description files for the module. This means that whenever the module is parameterized using a tool, the block parameterization is automatically launched at the start of parameterization and terminated at the end of parameterization.

To use block parameterization without tools, proceed in the following sequence:

- Initiate block parameterization by writing the value 01_{hex} to object 0029_{hex}.
- Write the startup parameters that you want to change to the corresponding objects.
- Terminate block parameterization by writing the value 00_{hex} to object 0029_{hex}.

15.5 Conflict dictionary ($002A_{hex}$: ConflictDictionary)

This object contains the indices and error messages (additional code) for the parameters involved in the conflict.

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

This object is used to reset the module to the default settings.

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.

Then the default settings of the channels are loaded and all the user-set parameters are reset.

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

The data of the startup objects is verified with this checksum. The checksum only changes if an object relevant for startup has been changed. The checksum is therefore suitable for comparing the parameterization.

16 Application objects

Notes on the following table:

Structure of objects

All objects listed are structured as follows:

Index $02xx_{hex}$	
Subindex	**Meaning/contents**
00	Read and/or write complete information (depending on privileges)
01	Channel 1
02	Channel 2

Length

L Length of the object in bytes
This specifies the entire length of the object, i.e. when accessing via sub-index 00.
When accessing via sub-index 01 or 02, the length of the object is half that of the specified length.

Parameter value ranges and presets

The permissible value range for each object is indicated under "Value range". No values other than these are permitted.

The default values are in bold format.

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

Values from the "Array of Bool" data type are read out or written as a byte field during acyclic access.

Index (hex)	Object name	Data type	L	Meaning	Value range	Rights	
Startup parameters (stored remanently)							
0280	SGI_ChannelUsed	Array of BOOL	2	Channel activation	**0: channel inactive** 1: channel active	R/W	*
0281	SGI_NominalCharacteristicValue	Array of UINT16	4	Nominal characteristic value	Unit: µV/V 350 ... 6500 Default: **2000** (=2 mV/V)	R/W	*
0282	SGI_NominalLoad	Array of UINT16	4	Nominal load	1 ... 65535; **100**	R/W	*
0283	SGI_ConversionTime	Array of UINT32	8	Conversion time	Unit: µs 200, 500, **1000**, 2000, 5000, 10000, 12500, 20000, 50000, 100000	R/W	*
0284	SGI_Filter	Array of UINT8	2	Filter type	0: No filter **1: Mean value** 2: Dynamic attenuation	R/W	*
0285	SGI_MeanValue	Array of UINT8	2	Mean value step	4, **16**, 32	R/W	*
0287	SGI_AdjustmentValue	Array of INT32	8	Adjustment value	Value in process data format 80000100_{hex} ... $7FFFFF00_{hex}$ (-2147483392_{dec} ... 2147483392_{dec}) Default: **80000**	R/W	
0288	SGI_SwitchingBehaviour	Array of UINT8	2	Switch parameterization	0 ... 6; **0** See object description	R/W	*
0289	SGI_LowerSwitchingThreshold	Array of INT32	8	Lower switching threshold	Value in process data format 80000100_{hex} ... $7FFFFF00_{hex}$ (-2147483392_{dec} ... 2147483392_{dec}) Default: **10000**	R/W	
028A	SGI_UpperSwitchingThreshold	Array of INT32	8	Upper switching threshold	Value in process data format 80000100_{hex} ... $7FFFFF00_{hex}$ (-2147483392_{dec} ... 2147483392_{dec}) Default: **90000**	R/W	
028B	SGI_AdvancedOpenCircuitDetection	Array of BOOL	2	Advanced wire-break detection	**0_{hex}: Inactive** 1_{hex}: Active	R/W	

Index (hex)	Object name	Data type	L	Meaning	Value range	Rights	
0299	SGI_ZeroPointRange	Array of FLOAT	8	Zero point range	>0.0 Default: **0.25%** Not permissible: $FFFFFFFF_{hex}$, $7F800000_{hex}$, $FF800000_{hex}$	R/W	*
029A	SGI_RestRange	Array of FLOAT	8	Rest range	>0.0 Default: **0.5%** Not permissible: $FFFFFFFF_{hex}$, $7F800000_{hex}$, $FF800000_{hex}$	R/W	*
029B	SGI_NumberOfWires	Array of UINT8	2	Number of wires	04,**06**	R/W	*
No startup parameters (not stored remanently)							
028C	SGI_ControlZeroPoint	Array of UINT8	2	Control zero point	**00: No action** 01: Set measurement value as zero point 02: Delete zero point The zero point is stored **retentively**. See section “Zero point, adjustment, and tare”.	W	
028D	SGI_ControlAdjust	Array of UINT8	2	Control adjust	**00: No action** 01: Convert measurement value to adjustment value 02: Delete adjustment The adjustment value is stored **retentively**. See section “Zero point, adjustment, and tare”.	W	
028E	SGI_ControlTara	Array of UINT8	2	Tare control	**00: No action** 01: Set measurement value as tare 02: Delete tare The tare weight is stored **temporarily**. See section “Zero point, adjustment, and tare”.	W	
028F	SGI_ControlContact	Array of UINT8	2	Control contact	**00: No action** 01: Close N/O contact (depending on object 0288_{hex}) 02: Open N/O contact	W	
0293	SGI_StatusWord	Array of UINT16	4	Status	Status word from process data	R	
0294	SGI_MeasuredValue	Array of INT32	8	Measurement value in process data format	Value in process data format 80000100_{hex} ... $7FFFFF00_{hex}$ (-2147483392_{dec} ... 2147483392_{dec})	R	
0295	SGI_MeasuredValue-Float	Array of Records	12	Measured value in extended float format	4 bytes for float, 1 byte for status, 1 byte for unit	R	*
0296	SGI_MinValue	Array of INT32	8	Minimum value in process data format	Value in process data format 80000100_{hex} ... $7FFFFF00_{hex}$ (-2147483392_{dec} ... 2147483392_{dec})	R	
0297	SGI_MaxValue	Array of INT32	8	Maximum value in process data format	Value in process data format 80000100_{hex} ... $7FFFFF00_{hex}$ (-2147483392_{dec} ... 2147483392_{dec})	R	
0298	SGI_PathAdjustValues	Array of FLOAT	24	Path adjustment values	Zero point value, adjustment factor, tare	R	

16.1 Channel activation (0280_{hex}: SGI_ChannelUsed)

You can use this object to parameterize unused channels as inactive. These channels will then no longer indicate an error.

Unused channel	Parameterized as active	Parameterized as inactive
Diagnostic code in the process data	Wire break (8000 0002_{hex})	Invalid measured value (8000 0004_{hex})
Error bit in the status word	Set (= 1)	Not set
"Diagnostic state" object (0018_{hex})	Wire break (Error code 7710_{hex})	No error (Error code 0000_{hex})

16.2 Nominal characteristic value (0281_{hex}: SGI_NominalCharacteristicValue)

Use this object to set the nominal characteristic value of the connected sensor.

You can either take the nominal characteristic value from the sensor calibration certificate or determine it via adjustment (see the section "Adjustment").

16.3 Nominal load (0282_{hex}: SGI_NominalLoad)

Use this object to set the nominal load of the connected sensor.

☞ Note that the nominal load is indicated without units. The resolution in the process data is 1/1000. This means that if the nominal load, for example, corresponds to a value in kg, the process data value is indicated in g. This also applies for t and kg, l and ml, etc.

Example: If you weigh a nominal load of 500 kg, enter 500 as the nominal load. The process data value for this load is 500,000. With the resolution of 1/1000, this is 500,000 g = 500 kg.

16.4 Conversion time (0283_{hex}: SGI_ConversionTime)

Use this object to configure the channel conversion time.

16.5 Filter type (0284$_{hex}$: SGI_Filter)

Parameterize the filter using this object.

The following options are available:

- No filter
- Mean-value
- Dynamic attenuation

Mean-value:

After every conversion, the measured value is saved in a mean-value memory via which the mean value is generated.
You can set the size of the memory using the mean value step (object 0285$_{hex}$).
E.g., for a 16-sample mean value, the mean value is generated using the last 16 measured values.

Dynamic attenuation:

Small changes to the measured value are greatly attenuated.
Significant changes are attenuated to a lesser extent, so that the measured value follows the input signal more quickly.
In this case, the mean value step (object 0285$_{hex}$) has no significance.

16.6 Mean value step (0285$_{hex}$: SGI_MeanValue)

You can use this object to set how many measured values you want to use to derive a mean value.

The object is only significant if you have set the filter type to Mean value.

16.7 Switch parameterization (0288$_{hex}$: SGI_SwitchingBehaviour)

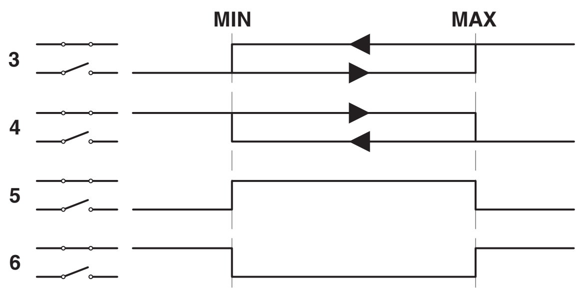
Parameterize the switching behavior of the N/O contact for every channel using this object.

Value range:

Code	Meaning
0	N/O contact cannot be controlled
1	N/O contact can be controlled via process data
2	N/O contacts can be controlled via “Control contact” object (028F$_{hex}$)
3	Close in the event of upper switching threshold overrange and open in the event of lower switching threshold underrange
4	Open in the event of upper switching threshold overrange and close in the event of lower switching threshold underrange
5	Close when within the lower and upper switching threshold
6	Open when within the lower and upper switching threshold

If you are controlling the N/O contacts via the switching thresholds, set the switching thresholds via the parameter "Lower switching threshold" (object 0289$_{hex}$) and "Upper switching threshold" (object 028A$_{hex}$).

Fig. 10 Switching behavior



3 ... 6	Switching behavior
MIN	Lower switching threshold
MAX	Upper switching threshold

16.8 Measured value in extended float format (0295_{hex}: SGI_MeasuredValueFloat)

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 low byte of the diagnostic code in the process data (e.g., overrange: status = 01, diagnostic code = 8000 0001_{hex}). If Status = 00, the measured value is valid.

Record structure:

Element	Data type	Length in bytes	Meaning
1	Float	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

Unit	Code
Percentage (%)	57 (39_{hex})
Kilograms (kg)	61 ($3D_{hex}$)

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

16.9 Zero point range (0299_{hex}: SGI_ZeroPointRange)

Use this object to set the zero point range relative to the nominal load.

When the measured value reaches or falls below the preset value, the Zero point status bit is set in the process data.

Example:

Nominal load	200 kg
SGI_ZeroPointRange	0.25 %
Zero point range	0.25 % of 200 kg = 0.5 kg

As long as the measured value falls in the range of ±0.5 kg, the Zero point status bit is set in the process data.

16.10 Rest range ($029A_{hex}$: SGI_RestRange)

Use this object to set the rest range relative to the nominal load.

When the measured value reaches or falls below the preset value, the Rest status bit is set in the process data.

Example:

Nominal load	200 kg
SGI_RestRange	0.5 %
Rest range	0.5 % of 200 kg = 1 kg

As long as the measured value is in the range of ±1 kg, the Rest status bit is set in the process data.

16.11 Number of wires ($029B_{hex}$: SGI_NumberOfWires)

Use this object to set whether your sensor is connected using 4-conductor or 6-conductor technology.

☞ After changing the configuration, perform an offset adjustment in the process environment.

17 Adjustment

17.1 Theoretical adjustment

For the theoretical adjustment, specify the nominal characteristic value from the sensor calibration certificate in the Nominal characteristic value object (0281_{hex}).

Once you have entered the nominal characteristic value, a theoretical calibration runs automatically. The gain in the module is adapted accordingly.

17.2 Manual 2-point adjustment

Example:

The accuracy of the platform scale can be increased by making an adjustment.

The current measured value is referenced to the adjustment value entered, thereby adapting the slope of the characteristic curve.

- Install a platform weighing cell with the technical data indicated in the following table.
- Enter the values in the corresponding objects.

Technical data		PDI object		
		Index (hex)	**Meaning**	**Value to be entered (dec)**
Nominal characteristic value	2.21 mV/V	0281	Nominal characteristic value	2210
Nominal load	10 kg	0282	Nominal load	10

- After the first startup, set the current measured value as the zero point. Do this by entering the value 01_{hex}, Set measured value to zero point, in the object Control zero point ($028C_{hex}$).

This sets the offset due to the basic mechanical structure to zero.

In the example, the adjustment weight on hand is supposed to be 8 kg.

- Enter the adjustment weight in the corresponding object.

Technical data		PDI object		
		Index (hex)	**Meaning**	**Value to be entered (dec)**
Adjustment weight	8 kg	0287	Adjustment value	8000

- Place the adjustment weight on the platform scale.
- Enter the value 01_{hex}, Convert measured value to adjustment value, in the object Control adjustment ($028D_{hex}$).

The current measured value is referenced to the adjustment value entered, thereby adapting the slope of the characteristic curve.

18 Zero point, adjustment, and tare

18.1 Using the values

Zero point and adjustment

The zero point and the adjustment value only need to be determined every now and then, or even just once.

When installing the system, determine the zero point of the measuring system.
If possible in your system, you can also perform an adjustment.

Both the zero point and the adjustment value are stored **retentively**. That is why these values do not need to be repeatedly determined.

Cyclic recalibration in particular is not required and can result in damage to the Flash memory.

It is only necessary for you to determine these values again if you have changed the system, e.g., by replacing weighing cells.

Tare

The tare weight is the difference between the total weight (gross weight) and the net weight of the sample.

To obtain the net weight of a sample, determine the tare weight at the start of a measurement.

The tare weight is stored **temporarily** in the main memory.

If necessary, you can repeat this process as often as required.

18.2 Storing the values

Flash memory: Retentive storage

The zero point and adjustment value are stored retentively (permanently and in a non-volatile way) in the Flash memory.

Due to the storage technology used, parameters that are stored retentively can only be written a certain number of times (approx. 10000 times for the S20-SGI-2). **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. Therefore make sure that write access operations are not performed too often and, in particular, are not performed cyclically.

Observe this behavior when programming function blocks.

Main memory: Temporary storage

The tare weight is stored temporarily (in a volatile way) in the main memory.

18.3 Setting a measured value as the zero point

There are two ways in which you can set a measured value as the zero point:

- Output process data bit 4 (Determine zero point)
- Object 028C$_{hex}$ (Control zero point)

In both cases the measured value is stored **retentively** in the Flash memory as the zero point.

18.4 Converting a measured value to the adjustment value

There are two ways in which you can define a measured value as the adjustment value:

- Output process data bit 5 (Adjustment)
- Object 028D$_{hex}$ (Control adjustment)

In both cases the measured value is converted to the adjustment value and is stored **retentively** in the Flash memory.

18.5 Setting a measured value as the tare weight

There are two ways in which you can define a measured value as the tare weight:

- Output process data bit 12 (Set current weight as tare weight)
- Object 028E$_{hex}$ (Control tare)

In both cases the measured value is stored **temporarily** as the tare weight in the main memory.

19 Example: Parameters and process data

		PDI object		Resolution, ratio	Value range	Value (dec)	Unit as per example
		Code (hex)	Name				
Nominal characteris-tic value	2.21 mV/V	0281	SGI_Nominal CharacteristicValue	1/1000	350 ... 6500	2210	µV/V
Nominal load	10 kg	0282	SGI_NominalLoad	1/1	1 ... 65535	10	kg
Adjustment weight	8 kg	0287	SGI_Adjustment Value	1/1000	-2,147,483,392 ... 2,147,483,392	8000	g
Process data							
Sample to be weighed	7.23 kg			1/1000	–2,147,483,648 ... 2,147,483,647	7230	g

20 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*SGI*2**-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

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