rexroth
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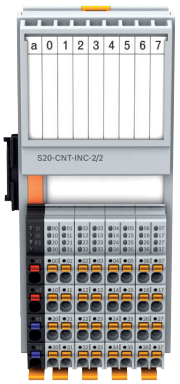
S20 special function module 2 CNT inputs, 2 INC inputs

R911335986
Edition 04

Data sheet S20-CNT-INC-2/2



2 counter inputs
2 incremental encoder inputs
300 kHz
32 bits

12 / 2021

1 Description

The module is designed for use within an S20 station. On the one hand, it is used to acquire fast pulse sequences from sensors, and on the other hand to detect positions using incremental encoders.
The module combines two counter inputs for the evaluation of fast counter pulses and two incremental encoder inputs for position detection.

Features

- 2 channels, selectable for each channel: counter function or position detection using incremental encoder
- Maximum input frequency: 300 kHz (one channel wired) or 100 kHz (both channels wired)
- 32-bit counter (up and down)
- Output control according to two limit values
- Counter: counting (source) is controlled via a control input (gate)
- Counter: single or periodic counting
- Incremental encoder acquisition: Acquisition of digital signals from symmetrical and asymmetrical incremental encoders
- Incremental encoder acquisition: evaluation of linear or rotary axes
- Device rating plate stored

Valid from index -AB1.

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 special function module 2 counter inputs, 2 incremental encoder inputs	S20-CNT-INC-2/2	R911172539	1

Accessories	Type	MNR	Pcs./Pkt.
S20 bus base module	S20-BS	R911172540	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

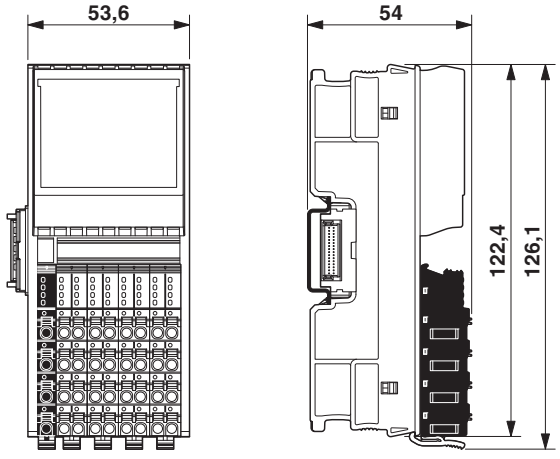
Documentation	Type	MNR	Pcs./Pkt.
Application description S20: System and Installation	DOK-CONTRL- S20*SYS*INS-AP..-EN-P	R911335988	1
Application description S20 function module S20-CNT-INC-2/2	DOK-CONTRL- S20*CNT*INC-AP..-EN-P	R911335990	1
Application description S20: Error Messages	DOK-CONTRL- S20*DIAG*ER-AP..-EN-P	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	126.1 mm
Depth	54 mm
Note on dimensions	The depth is valid when a TH 35-7,5 DIN rail is used (according to EN 60715).

General data	
Color	light grey RAL 7035
Weight	205 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 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. 100 mA max. 120 mA
Power consumption	typ. 0.5 W max. 0.6 W

Feed-in of supply voltage (U_I)	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	typ. 50.5 mA (own current consumption; without wiring of the terminal points) max. 2.5 A (dependent on the encoder or sensor type used and the load on the digital output.)
Power consumption	typ. 1.2 W max. 60 W (of which 1.6 W internal losses)
Surge protection	electronic (35 V, 0.5 s)
Reverse polarity protection	parallel diode; with external 5 A fuse (only for commissioning)

Feed-in of supply voltage (U_I)	
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.

Counter input for 24 V signals	
Number of inputs	2 (S1, S2)
Connection method	Push-in connection
Description of the input	EN 61131-2, type 3
Resolution	32 bits
Input frequency	max. 300 kHz (1 channel wired) max. 100 kHz (more than one channel wired or Z signal monitoring via the firmware)
Input voltage	24 V DC
Nominal input current	2.5 mA (per channel)
Input voltage range "0" signal	-3 V DC ... 5 V DC
Input voltage range "1" signal	11 V DC ... 30 V DC
Permissible cable length	< 30 m

Incremental encoder inputs	
Number of inputs	2 (A1, /A1, B1, /B1, Z1, /Z1; A2, /A2, B2, /B2, Z2, /Z2)
Connection method	Push-in connection
Encoder signals	Symmetrical and asymmetrical encoders
Permissible cable length	< 30 m

Encoder types	
Symmetrical incremental encoders	
Number	max. 2 (A, /A, B, /B, (Z, /Z))
Type of connection of signals	Push-in connection
Signal voltage level	Differential signal (signal – inverted signal) ±0.5 V, minimum; ±6 V, maximum
Input frequency	max. 300 kHz (1 channel wired) max. 100 kHz (more than one channel wired or Z signal monitoring via the firmware)
Encoder supply voltage	5 V DC
Common mode voltage range signal - ground	-10 V ... 13.2 V
Asymmetrical incremental encoder	
Number	max. 2 (A, B, (Z))
Type of connection of signals	Push-in connection
Signal voltage level	Low ≤ 2.5 V, high ≥ 3.5 V (up to 27 V, maximum)
Input frequency	max. 300 kHz (1 channel wired) max. 100 kHz (more than one channel wired or Z signal monitoring via the firmware)

Encoder supply	
5 V encoder supply	
Number	2 (U_{E1}, U_{E2})
Nominal output voltage	5 V DC
Voltage range	5 V DC ... 5.5 V DC
Current carrying capacity	max. 250 mA
Short-circuit protection	electronic
24 V encoder supply	
Number	2 (U_{S1}, U_{S2})
Nominal output voltage	24 V DC
Voltage range	19.2 V DC ... 30 V DC
Current carrying capacity	typ. 500 mA
Short-circuit protection	electronic

Digital inputs	
Number of inputs	8 (CNT: G1, G2, Dir1, Dir2; INC: Ref1, Ref2, L1, L2)
Connection method	Push-in connection ()
Connection technology	1-conductor (optional 2, 3-conductor)
Description of the input	EN 61131-2, type 3
Nominal input voltage	24 V DC
Nominal input current	2.5 mA (per channel)
Max. sensor current per channel	500 mA
Input voltage range "0" signal	-3 V DC ... 5 V DC
Input voltage range "1" signal	11 V DC ... 30 V DC
Permissible conductor length to the sensor	30 m
Short-circuit protection	electronic per channel
Overload protection	electronic per channel

Digital outputs	
Number of outputs	2 (Out1, Out2)
Connection method	Push-in connection
Connection technology	1-conductor
Nominal output voltage	24 V DC
Maximum output current per channel	500 mA
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)
Short-circuit protection	yes
Overload protection	yes

Input and output address area	
Input address area	28 Byte
Output address area	28 Byte

Configuration and parameter data in a PROFIBUS system	
Required parameter data	115 Byte
Required configuration data	7 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 acc. with EN 60068-2-6/ IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock according to EN 60068-2-27/ IEC 60068-2-27	10g

Conformance with EMC Directive 2014/30/EU	
Noise immunity test in accordance with EN 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/±0.5 kV (symmetrical/asymmetrical)
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test according to EN 61000-6-3	Class B

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

5 Additional tables

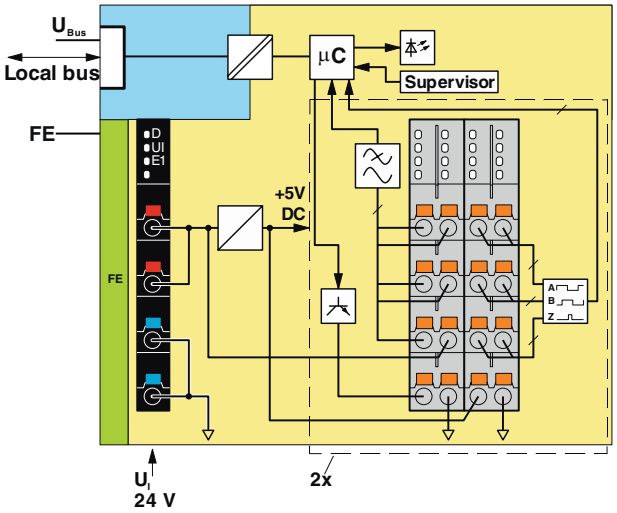
Maximum input frequencies depending on the wiring

The maximum input frequency that can be used for operation depends on the wiring of the channels and whether the Z signal, in the case of a linear axis, is to be monitored via the firmware or not.

Condition	Maximum frequency
1 channel wired	300 kHz
More than one channel wired	100 kHz
Z signal monitoring via the firmware	100 kHz

6 Internal circuit diagram

Fig. 1 Internal wiring of the terminal points



Key:

FE	Functional ground
µC	Microcontroller
Supervisor	Hardware monitoring
	Electrical isolation
	Power supply unit
	Transistor
	Low pass filter
	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.

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

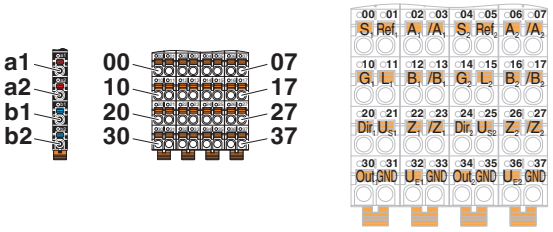
Only install the S20 modules in a control cabinet or junction box.

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. 2 Terminal point assignment



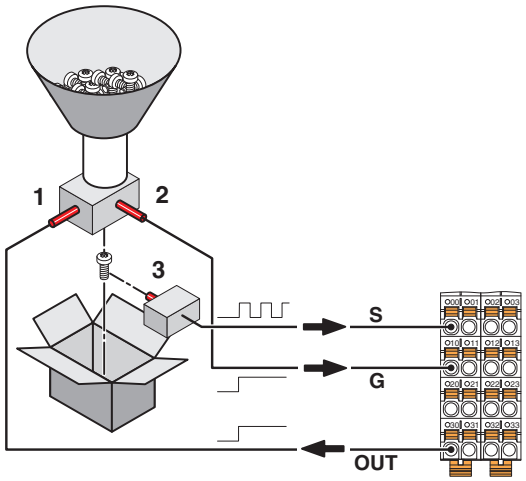
Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_I)	Feed-in sensor/encoder supply (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)
Connector 2 (counter 1) / connector 4 (counter 2)			
00/04	Orange	S1/S2	Source 1/2, counter input for counter 1/2
10/14	Orange	G1/G2	Gate 1/2, control input for counter 1/2 (default)
20/24	Orange	Dir1/ Dir2	Direction 1/2, counting direction default for counter 1/2 (optional: stop input for counter 1/2)
30/34	Orange	Out1/ Out2	Output for counter 1/2 (default) or incremental encoder 1/2
01/05	Orange	Ref1/ Ref2	Reference 1/2, home position switch input for incremental encoder 1/2
11/15	Orange	L1/L2	Latch input for incremental encoder 1/2
21/25	Orange	U_{S1}/ U_{S2}	+24 V DC sensor voltage, to supply the counter sensor, can also be used to supply the incremental encoder
31/35	Orange	GND	Reference potential of the I/O supply

Terminal point	Color	Assignment	
Connector 3 (incremental encoder 1) / connector 5 (incremental encoder 2)			
02/06	Orange	A1/A2	Track A, incremental encoder 1/2
12/16	Orange	B1/B2	Track B, incremental encoder 1/2
22/26	Orange	Z1/Z2	Track Z, incremental encoder 1/2
32/36	Orange	U_{E1}/ U_{E2}	+5 V DC encoder supply for incremental encoder 1/2
03/07	Orange	/A1 / / A2	Track A inverted, incremental encoder 1/2
13/17	Orange	/B1 / / B2	Track B inverted, incremental encoder 1/2
23/27	Orange	/Z1 / /Z2	Track Z inverted, incremental encoder 1/2
33/37	Orange	GND	Reference potential of the I/O supply

9 Connection examples

Counter

Fig. 3 Counter connections for counting piece goods

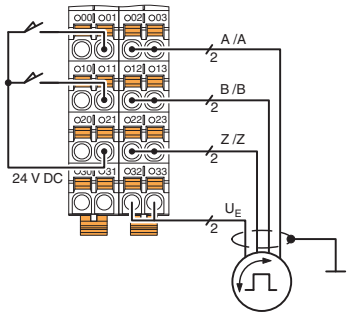


The example shows a typical wiring for counting screws.

Use shielded cables and connect the grounding rail with PE to ensure error-free counting.

Incremental encoder

Fig. 4 Quadrature encoder with 5 V supply



The example shows typical wiring with a symmetrical 5 V encoder and the two latch and reference input signals.

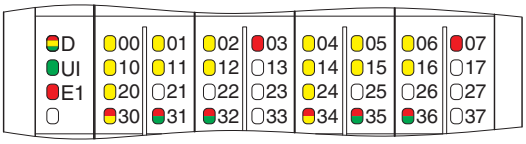
Use a shielded cable and connect it to ground potential when you connect the quadrature encoder.

Unused terminal points can be used as an option.

Terminal points S, G and Dir can be used for counter functions only.

10 Local diagnostic and status indicators

Fig. 5 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 superordinate network is not delivering valid data. There is no error on the module.
		Device application not active	Flashing green/yellow	The device is ready for operation, communication within the station is OK. Output data **cannot** be outputted and/or input data **cannot** be read. There is a fault on the periphery side of the module..
		Ready	Yellow on	The device is ready for operation but did not detect a valid cycle after power-up.
		Connected	Flashing yellow	The device is not (yet) part of the active configuration.
		Reset	Red on	The device is ready for operation but has lost the connection to the bus head.
		Not connected	Flashing red	The device is ready for operation but there is no connection to the previously existing device.
		Power down	Off	Device is in (power) reset.
UI	Green	U_{Input}	On	Sensor/encoder supply present
			Off	Sensor/encoder supply not present
E1	Red	I/O error	On	I/O error present.
				Possible causes:
				Short circuit/overload of the sensor supply.
				Short-circuit/overload of an output.
				An encoder error has occurred.
			Flashing red	I/O error present.
				Possible causes:
				Short-circuit/overload of the encoder supply.
			Off	No I/O error.

Designation	Color	Meaning	State	Description
Connector 2 (counter 1) / connector 4 (counter 2)				
00/04	Yellow	Status of counter input 1/2 (S1/S2, source 1/2)	On	Input is set.
			Off	Input is not set.
10/14	Yellow	Status of counter input 1/2 (G1/G2, gate 1/2)	On	Input is set.
			Off	Input is not set.
20/24	Yellow	Status of counting direction input 1/2 (Dir1/Dir2, direction 1/2)	On	Input is set.
			Off	Input is not set.
30/34	Red/ yellow	Status of output 1/2	Yellow on	Output is set.
			Red on	Short-circuit/overload of the output.
			Off	Output is not set.
01/05	Yellow	Status of reference switch input 1/2 (Ref1/Ref2, reference 1/2)	On	Input is set.
			Off	Input is not set.
11/15	Yellow	Status of latch input 1/2 (L1/L2, latch 1/2)	On	Input is set.
			Off	Input is not set.
31/35	Red/ green	Status of sensor supply 1/2 (U_{S1}/U_{S2})	Green on	Sensor supply is OK.
			Red on	Short circuit/overload of the sensor supply.
			Off	Sensor supply not present.
Connector 3 (incremental encoder 1) / connector 5 (incremental encoder 2)				
02/06	Yellow	Positive direction of rotation (UP)	On	Module counting upwards.
			Off and 12/ 16 off	Standstill or the corresponding INC channel is not parameterized.
12/16	Yellow	Negative direction of rotation (DN)	On	Module counting downwards.
			Off and 02/ 06 off	Standstill or the corresponding INC channel is not parameterized.
32/36	Red/ green	Status of the 5 V sensor supply (U_{E1}/ U_{E2})	Green on	Encoder supply is OK.
			Red on	Short-circuit/overload of the encoder supply.
			Off	Encoder supply not present.
03/07	Red	Encoder error	On	An encoder error has occurred.
			Off	No encoder error has occurred.

11 Process data

The module uses 14 words of IN process data and 14 words of OUT process data.

You can control the application via the OUT process data (e. g., start counter, reference encoder, set outputs).

Input process data contains general states of the module, states of the channels, and the corresponding counter and latch values.

Please refer to the application description for the module for the assignment of the process data words, material number R911335989.

12 Parameter, diagnostics and information (PDI)

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

In IndraWorks, these parameters are displayed in the configurator.

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

For comprehensive information on all the objects created on the module, please refer to the application description for the module, material number R911335990.

The module is delivered with a default configuration, which allows you to start it up without any parameterization. The incremental encoder interfaces are disabled in this default configuration.

13 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*CNT*INC-DA04-EN-P

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