rexroth
A Bosch Company

IndraControl
S20-PWM-4-T
Function Module with 4 PWM Outputs

Data Sheet

R911376281
Edition 03

1 Description

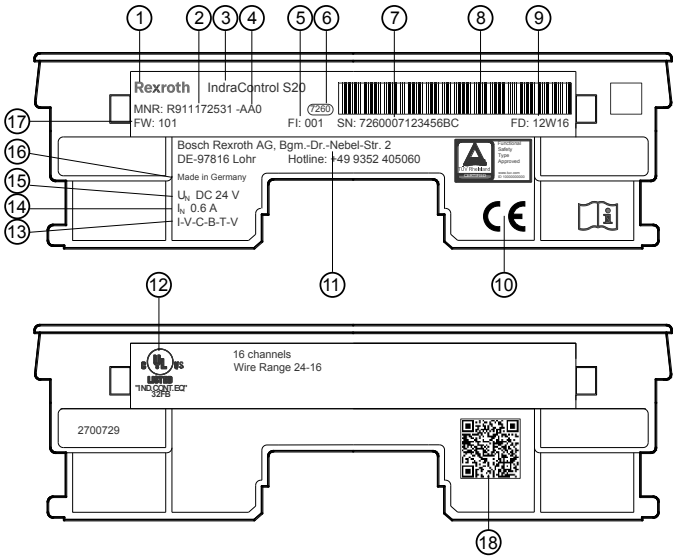
Front view

The module is designed to be used in an IndraControl S20 station.
The module is used to control up to four proportional valves without displacement transducer via pulse width modulation (PWM). Characteristics:

- 4 PWM outputs
- 24 V DC, 2.7 A per valve; total current of 6.4 A
- Maximum output frequency PWM 500 Hz, in the mode "direct PWM" 5 kHz
- Connection of valves in 2-wire technology
- Saved device type plate
- Diagnostic displays and status displays

This data sheet is only valid if used with the application descriptions "IndraControl S20-PWM-4-T", part number R911376949 and "IndraControl S20: System and Installation", part number R911335988.

Product identification and type plate



1 Word mark
2 Part number
3 Device name
4 State of revision
5 Functional index
6 Plant number
7 Serial number
8 Serial number as barcode
9 Date of manufacture (yyWww)
10 CE conformity marking
11 Company address
12 Underwriters Laboratories Inc. mark
13 Check digit
14 Nominal current
15 Nominal voltage
16 Manufacturing country
17 Software release
18 QR code

Exemplary type plate

2 Ordering data

Module	Type Part number
Rexroth IndraControl S20 Function Module 4 PWM outputs	S20-PWM-4-T R911173461
Rexroth IndraControl S20 Bus Base Module	S20-BS-S R911173203
Shield connection set①	S20-SHIELD-SET, R911173030
Plug set for S20-PWM-4-T	S20-CNS 2S-O/D/UI/E1/E2, R911173804
Shield terminal with shield support on bus bars: Diameter of 5 mm Diameter of 14 mm Bus bar: 10 mm × 3 mm, 1 m long	 S20-SHIELD-SK5, R911173282 S20-SHIELD-SK14, R911173286 S20-SHIELD-NLS, R911173283
Documentation	**Part number**
Rexroth IndraControl S20-PWM-4-T 4 PWM outputs	R911376949

① The shield connection set includes two shield bus clamps and two SK5 shield terminals

3 Technical data

Dimensions and weight	
Width	35 mm
Height	126 mm
Depth	54 mm The depth applies when using one mounting rail TH 35-7,5 (acc. to EN 60715)
Weight	100 g
Logic supply	
Logic voltage U_B	5 V DC (via bus base module)
Current consumption from U_{Bus}	Typically 250 mA, maximum 300 mA
Power consumption from U_{Bus}	Typically 1.25 W, maximum 1.5 W
Voltage supply and current consumption The following specifications include the values acc. to EN 61131-2	
Infeed	24 V DC
Maximum voltage range allowed	19.2 V DC to 30.0 V DC (incl. all tolerances and ripple)

Current consumption from UI for S20-PWM-4-T	Intrinsic current 400 mA max.
Power consumption from UI (only intrinsic current)	9.6 W max.
Reverse voltage protection of the supply voltage	Field effect transistor (FET) in GND path
Fuse protection	Internal protective fuse, 4 A
Transient protection	Yes, via suppressor diodes

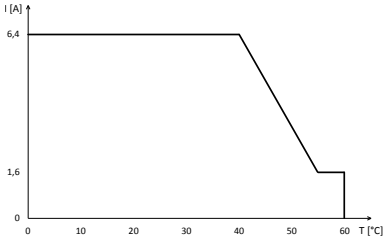
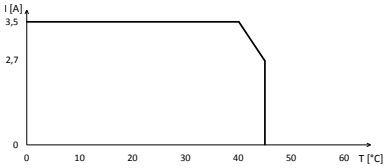
Upon the first operation, protect the module with a fuse of 2 A. If all modules are correctly connected to the system, replace the fuse of 2 A with a fuse of 4 A. On the output side of the module, up to 6.4. A can be applied.

NOTICE

Electronic damage due to faulty protection.
Protect the module externally. The power supply unit has to be able to provide the quadruple nominal current of the protective fuse to ensure that the fuse triggers reliably in case of an error.

NOTICE

Electronic damage due to polarity reversal or due to a nominal current that is too low
The power supply unit has to be able to deliver the quadruple nominal current of the protective fuse to ensure that the fuse reliably triggers in case of an error.

PWM outputs	
Number of outputs for S20-PWM-4-T	4
Connection method	Push-in technology
Nominal voltage output	24 V DC
Maximum output current per channel	2.7 A
Maximum output current per device for S20-PWM-4-T	6.4 A, protected externally
Derating	Maximum output current: 1.6 A per channel
Derating diagram	
Derating	Maximum output current: 2.7 A per channel
Derating diagram	
Output frequency	50 Hz to 500 Hz (function: Valve control) 50 Hz to 5000 Hz (function: Direct PWM)
Note: A faulty output connection can destroy the outputs.	

Electrical isolation and isolation of the voltage ranges	
5 V supply (logic) to 24 V supply (periphery)	845 V AC, 50 Hz, 1 min
5 V supply (logic) to the functional earth	845 V AC, 50 Hz, 1 min
24 V supply (periphery) to the functional earth	No isolation between 24V GND and the functional earth

4 Ambient conditions

Ambient conditions	
Ambient temperature (Operation)	Up to 2000 m: -25 °C to +60 °C 2,000 m to 3,000 m: -25 °C to +55 °C
Ambient temperature (Storage, transport)	-40 °C to 85 °C
Permitted air humidity (Operation, storage and transport)	5 % to 95 % (acc. to DIN EN 61131-2) No condensation
Operating altitude	Up to 3,000 m above sea level
Degree of protection	IP20 acc. to DIN EN 60 529
Protection class	III, DIN EN 61010-2-201
Overvoltage category	2
Contamination level	2, no condensation allowed
Mechanical tests	

Vibration resistance acc. to DIN EN 60068-2-6	Oscillations, sinusoidal in all three axes 5 Hz - 9 Hz with 3.5 mm amplitude 9 Hz -150 Hz with 5 g peak acceleration
Shock test acc. to DIN EN 60068-2-27	Shock stress: Shock resistance in all three axes 11 ms semi-sinusoidal 30 g
Broadband noise acc. to DIN EN 60068-2-64	5-20-150 Hz with 0.572 g, 5 h per axis

NOTICE

Defective product due to gases jeopardizing functions

Due to the risk of corrosion, avoid sulphurous gases (e.g. sulphur dioxide (SO_2) and hydrogen suphide (H_2S)). The product is not resistant against these gases.

NOTICE

Failure of the product due to contaminated air

- The ambient air must not contain acids, alkaline solutions, corrosive agents, salts, metal vapors and other electrically conductive contaminants in high concentrations
- The devices to be installed into the housing and installation compartments must at least comply with the degree of protection IP 54 according to DIN EN 60529.
- The device shall be provided in a suitable fire enclosure in the end-use application.

NOTICE

Component failure due to overheating

To avoid overheating and a trouble-free operation of the control, ambient air has to circulate. Also refer to the chapter "Installation notes".

☞ This is a product that corresponds to the limit values of the emitted interference of class A (industrial environments), but not of class B (residential area and small enterprises).
When using the product in residential areas or small enterprises, the operator has to take actions to prevent radio interferences (also refer to DIN EN 55022).

5 Standards

This product has been developed according to the current German edition of the standards at the time of product development.

Standards used

Standard	Description	Edition
DIN EN 60204-1	Electrical equipment of machines	2007
DIN EN 61131-2	Programmable logic controllers Equipment and test requirements	2008
DIN EN 60529	Degrees of protection (including housings and installation compartments)	2014
DIN EN 61010-2-201	Safety requirements for electrical equipment for measurement, control and laboratory use	2014
UL 61010-2-201	Safety requirements for electrical equipment for measurement, control and laboratory use	2014

CE marking – Declaration of conformity

CE

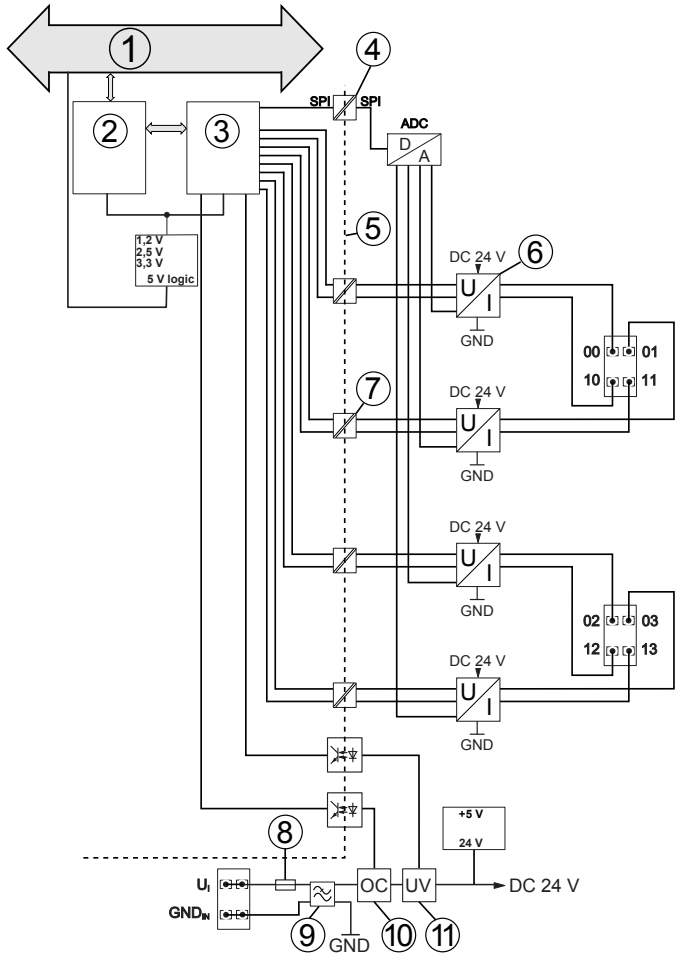
The electronic product described in the present data sheet complies with the requirements and the target of the following EU directive and with the following harmonized European standards:
EMC directive 2014/30/EC
The electronic product described in the present data sheet complies with the following requirements:

Standard	Description	Edition
DIN EN 61000-6-4	Electromagnetic compatibility (EMC) Part 6-4: Generic standards – Emission standard for industrial environments	September 2011
DIN EN 61000-6-2	Electromagnetic compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments	March 2006

☞ **Loss of CE conformity due to modifications at the device**

CE marking applies only to the device upon delivery. After modifying the device, verify the CE conformity.

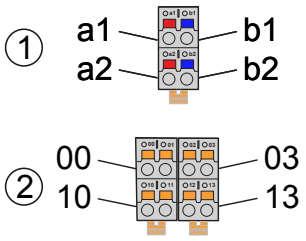
6 Internal schematic diagram



① S20 local bus with supply voltage
② Local bus FPGA
③ Microprocessor
④ Electrical isolation with SPI driver
⑤ Electrical isolation
⑥ Half bridge
⑦ Electrical isolation with gate driver
⑧ Protective fuse
⑨ Input filter
⑩ Overcurrent detection
⑪ Undervoltage detection

Internal wiring of the clamping points

7 Clamping point assignment



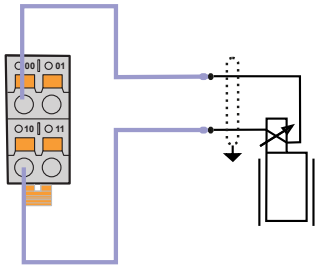
① Voltage supply
② PWM output

Clamping point	Color	Assignment	
Feeding the supply voltage			
a1, a2	Red	24 V DC (UI)	Supply of module and output stage (bridged internally)
b1, b2	Blue	GND	Reference potential against U_I (internally bridged)
Channel 1			
00	Orange	M+	Magnet connection 1
10	Orange	M-	Magnet connection 2
Channel 2			
01	Orange	M+	Magnet connection 1
11	Orange	M-	Magnet connection 2
Channel 3			
02	Orange	M+	Magnet connection 1
12	Orange	M-	Magnet connection 2
Channel 4			
03	Orange	M+	Magnet connection 1
13	Orange	M-	Magnet connection 2

8 Connection data

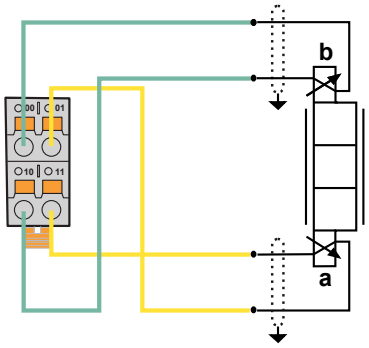
General data	
Plug name	S20 plug
Connection method	Spring-cage connection in direct plug-in technology
Conductor cross-section either rigid or flexible	0.5 mm^2 to 1.5 mm^2
Conductor cross-section (AWG)	20 to 16
Interface of the S20 local bus	
Connection method	Bus base module
Transmission rate	100 MBit/s

9 Connection examples



① Sensor

Connection example of valves with one magnet. The shield has to be always connected to the shield set. The shield set has to be connected to the top-hat rail.



① Sensor

Connection example of valves with two magnets. The shield has to be always connected to the shield set. The shield set has to be connected to the top-hat rail.

- Always connect the valve cables with shielded cables twisted in pairs. With unshielded cables, tolerance limits can be exceeded easily.
- Connect the shielding via one of the intended rails. The cable shield may not be connected to the valve.
- Generally, the following applies to the potential equalization in automation systems:
  - Shielded valve cables may only be connected directly to the ground potential at one point. This impedes potential equalization currents via the valve cables.
  - Integrate the shielding concept for valve cables and the system concept if necessary. It is reasonable to use a central functional earth shielding connection at the control cabinet input

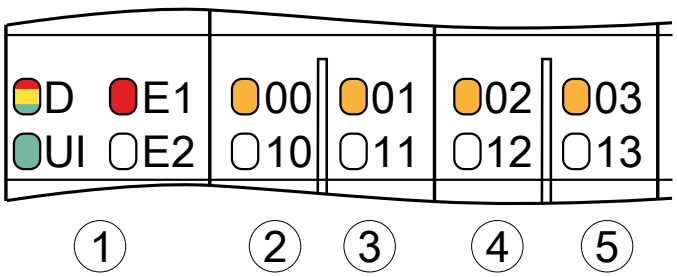
10 Installation notes

- Generally, the following applies to the potential equalization in automation systems:
  - Shielding connection for S20 modules:
    Bosch Rexroth recommends the IndraControl S20 shielding connection set "S20-SHIELD-SET" for S20 modules to connect the shielding, part no. R911173030
  - For more information on the shielding concept, refer to the application description of the system "IndraControl S20: System and installation" part number R911335988
- Do not wire cables parallel to motor cables or other strong interference sources to avoid coupling of interferences
- The LED displays may not be hidden
- Use strain reliefs for all cables
- Keep the maximum distance possible from interference sources
- Provide minimum distances for sufficient cooling. Refer to the operating instructions of the "IndraControl XM21, XM22 Controls", part no. R911340667. In case of a multiple-line design, the supply air has to be measured under each line and its limit value has to be observed. For information on the ambient temperature, refer to "4 Ambient conditions" on page 3.
- The installation position is the wall mounting on a horizontal mounting rail
- Additionally, provide sufficient distance for mounting, demounting, plugs and cables
- Use only cables approved for temperatures of at least +60°C. In case of ambient temperatures above +55 C, use cables approved for temperatures of at least +75°C
- For more information on mounting, demounting and connecting lines, refer to the application description "IndraControl S20: System and Installation", part no. R911335988

Explaining the signal alert symbol on the device

The symbol with the exclamation mark in the triangle on the device indicates important notes present in the operating instruction/data sheet that must be observed to determine the type of potential **Danger** and to identify the actions required to avoid that **Danger**. Furthermore, if your health is at risk, e.g. due to an electric shock.

11 Local status displays and diagnostic displays



① Voltage supply
② Status, command value, channel 1
③ Status, command value, channel 2
④ Status, command value, channel 3
⑤ Status, command value, channel 4

Local status displays and diagnostic displays

Name	LED color	Meaning	LED state	Description
D	Red/yellow/ green	**Diagnostics of the local bus communication**		
		Power down	Off	Devices in (power) reset
		Not connected, reset	Flashing red	Device is operating, but no connection to the device in front
		Reset	Red on	Application reset Device is operating, but no connection yet to the device in front. Application in reset
		Ready	Yellow on	Device is operating and there is a connection to the device in front. The device has not yet detected any valid cycle after “Power on”
		Connected	Flashing yellow	Valid data cycles are detected. However, the device is not (yet) part of the current configuration
		Device application not ready	Green/yellow alternating	Valid data cycles are detected. The master application sets the user data to valid. However, the slave application did not set the user data to valid or it cannot output the user data (e.g. periphery error)
		Run	Green on	Valid data cycles are detected. All data is valid
UI	Green	U_{Input}	On	Feeding supply of valves is present
			Off	Feeding supply of valves is not present
E1	Red	Group error	On	▶ Supply U_I is not present ▶ The parameter table is invalid ▶ Communication error with the internal data memory ▶ Calibration data incorrect The module reports a detailed diagnostics in the standard object, diagnostic state (0018hex: DiagState)
			Off	There is no malfunction
Channels from PWM 1 to PWM 4				
00 to 03	Orange	Status, command values	On	Command value reached, magnet controlled
			Flashing	Command value is approached
			Off	Magnet is not controlled

☞ For more information on the local diagnostic and status displays, refer to the application description of the system IndraControl S20, part number R911335988.

12 Process data

For information on the assignment of process data words, refer to the application description of the module, S20-PWM-4-T, part number R911376949.

13 Parameters, diagnostics and information (PDI)

Parameter data and diagnostic data as well as other information is transferred via the PDI channel. In IndraWorks, these parameters are displayed in the configurator.

☞ For information on the PDI and on all objects created on the module, refer to the application description of the system IndraControl S20, part number R911342260.

Upon delivery, the module is provided with a default configuration to commission the module without parameterization.

14 Device description files

The device is described in device description files. To download the device description files, go to **www.boschrexroth.com ▶ Products ▶ Electric Drives and Controls ▶ I/O ▶ IP 20IP 20IndraControl S20 (IP 20)** in the download range of the bus coupler used.

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