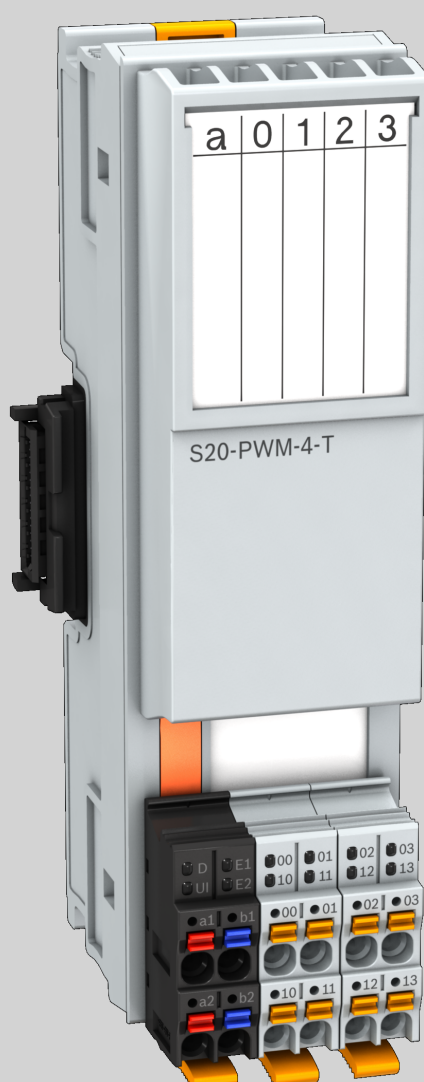


IndraControl S20-PWM-4-T

PWM Module with 4 Outputs

Application Description
R911376949

Edition 02



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

Type of Documentation Application Description

Document Typecode DOK-CONTRL-S20*PWM2/4T-AP02-EN-P

Internal File Reference RS-ca6ade444b8e652c0a347ea5018724e1-2-en-US-4

Change Record

Edition	Release Date	Note
Edition 01	2018-01	First edition
Edition 02	2018-10	"PWM module with 2 outputs" removed

Copyright

© Bosch Rexroth AG 2018

All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Liability

The specified data is intended for product description purposes only and shall not be deemed to be a guaranteed characteristic unless expressly stipulated in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.

Editorial Department

Development Automation Systems Control Platform StKu (MaKo, SyKe/MePe)

Table of Contents

	Page
1 Using safety instructions.....	3
1.1 Structure of the safety instructions.....	3
1.2 Explaining signal words and safety alert symbol.....	3
1.3 Symbols used.....	4
1.4 Explaining the signal alert symbol on the device.....	4
2 Functional description of the PWM module.....	5
2.1 S20-PWM-4-T.....	5
2.2 PWM outputs.....	5
2.2.1 Characteristics of PWM outputs.....	5
2.2.2 Output currents.....	6
2.2.3 Diagnostics and substitute value behavior of the PWM outputs.....	6
2.2.4 No Sercos-synchronous operation.....	7
2.3 Controlled system.....	7
3 Process data.....	11
3.1 Output process data.....	11
3.1.1 Command.....	11
3.1.2 Command value.....	13
3.2 Input process data.....	14
3.2.1 Status.....	14
3.2.2 Actual current value.....	16
4 Parameters, diagnostics and information.....	17
4.1 Standard objects.....	17
4.1.1 Objects for identification (device type plate).....	17
4.1.2 Object for multilingualism.....	19
4.1.3 Objects for diagnostics.....	19
4.1.4 Objects for process data management for S20-PWM-4-T.....	22
4.2 Application objects	23
4.2.1 Overview.....	23
4.2.2 Object "Parameter for PWM output".....	23
5 Commissioning.....	35
5.1 Use case.....	35
5.1.1 Parameterizing the valves with IndraWorks Engineering.....	35
5.1.2 Declaration part.....	38
5.1.3 Calls.....	38
6 Service and support.....	39
Index.....	41

1 Using safety instructions

1.1 Structure of the safety instructions

The safety instructions are structured as follows:

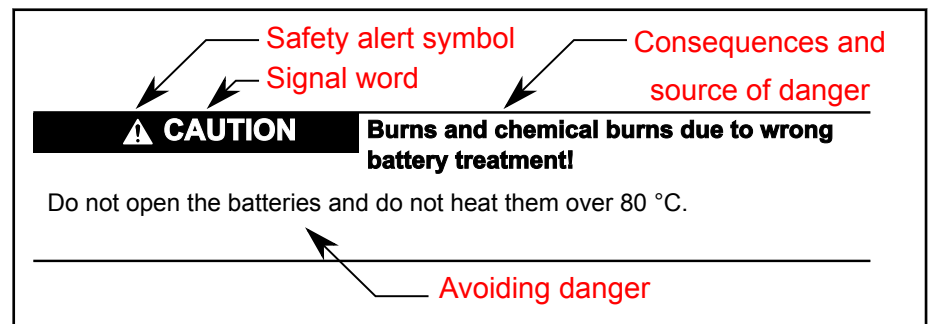


Fig. 1-1: Structure of the safety instructions

1.2 Explaining signal words and safety alert symbol

The safety instructions in this documentation contain specific signal words (danger, warning, caution, notice) and, if necessary, a safety alert symbol (according to ANSI Z535.6-2006).

The signal word draws attention to the safety instruction and indicates the risk potential.

The safety alert symbol (triangular safety reflector with exclamation marks), preceding the signal words Danger, Warning, Caution indicates hazards for persons.

⚠ DANGER

In case of non-compliance with this safety instruction, death or serious injury **will** occur.

⚠ WARNING

In case of non-compliance with this safety instruction, death or serious injury **can** occur.

⚠ CAUTION

In case of non-compliance with this safety instruction, minor or moderate injury can occur.

NOTICE

In case of non-compliance with this safety instruction, material damage can occur.

Using safety instructions

1.3 Symbols used

Pointers are displayed as follows:



This is a note.

Tips are displayed as follows:



This is a tip.

1.4 Explaining the signal alert symbol on the device



If this symbol is on your device, you have to observe the documentation on the device. The respective documentation informs on the type of hazard as well as the steps required to avoid this hazard.

2 Functional description of the PWM module

For the technical data of the PWM modules ¹⁾ including its terminal point assignment and meaning of the diagnostic and status displays, refer to the data sheet, part number R911376281. For the data sheet, go to the media directory under www.boschrexroth.com (**Products** ► **Electric Drives and Controls** ► **CAD and documentation** ► **Documentation**).

The module S20-PWM-4-T is intended to be used in an IndraControl S20 station. The module is used to control up to four valves.

2.1 S20-PWM-4-T

Different valve types can be configured. The following list shows the maximum configuration.

- Four Rexroth proportional valves with one magnet
- Four Rexroth directional control valves with one magnet
- Four manufacturer-independent proportional valves with one magnet and customized settings
- Two Rexroth proportional valves with two magnets
- Two manufacturer-independent proportional valves with two magnets and customized settings
- Control with four valve amplifiers with specified frequency to control valves with one magnet
- Control with two valve amplifiers with specified frequency to control valves with two magnets

When using Rexroth proportional valves or directional control valves, valve-specific parameter sets are accessed. Further settings can be made via the description file to adjust the valve response to the environmental conditions. When using third-party proportional valves, valve-specific parameters can be set via a description file. To control valve amplifiers, use the operating mode "Static PWM".

The module can be commissioned with the default parameterization. In this case, all outputs are disabled.

There are two options to parameterize:

1. Via an engineering tool, such as Bosch Rexroth IndraWorks
2. By writing on the configuration register via the service channel

Bosch Rexroth recommends the engineering tool "IndraWorks".

2.2 PWM outputs

2.2.1 Characteristics of PWM outputs

- Four universal PWM outputs to control four valves with one magnet
- Four universal PWM outputs to control two valves with two magnets
- Four PWM outputs with consistent frequency
- Total current of 6.4 A
- Maximum output current of 2.7 A per channel (only at channel 1 or 2 and at channel 3 or 4).

¹⁾ PWM = Pulse width modulation

Functional description of the PWM module

- Automatic settings for output currents for Bosch Rexroth valves
- Resolution of PWM 16 bit counter
- Connection in 2-wire technique
- Substitute value behavior can be set upon bus failure
- Wire break detection
- PWM outputs can be enabled and disabled individually

2.2.2 Output currents

NOTICE

Destruction of the output stage by exceeding the maximum output current of 2.7 A per channel.

Avoid to exceed the maximum output current at channel side.

NOTICE

Destruction of the module exceeding the maximum sum current of 6.4 A.

Avoid to exceed the maximum sum current of the module.

The maximum permitted output current for a Bosch Rexroth valve is automatically set via valve-specific parameters. Valve type and valve are set via the device description file.

For customized valves, the maximum current permitted in the valve has to be set using a devices description file.



If the sum current configured is higher than the maximum sum current permitted, a configuration error results.

2.2.3 Diagnostics and substitute value behavior of the PWM outputs

Undervoltage at the 24 V supply input

The module is supplied with +24 V. This voltage supply is checked permanently. If the voltage supply falls below -15 V, a diagnostic message is issued and the PWM outputs are disabled. Also refer to the fault code 3421, [chapter "Error messages" on page 20](#).

Short-circuit or overload at 24 V supply

The module supply is +24 V and it is protected with an 4 A fuse (not self-healing) against short circuit or overload. The current consumption of the module is monitored. If the sum current exceeds a specific threshold value, a diagnostic message is issued and the PWM outputs are disabled. Also refer to the fault code 2137, [chapter "Error messages" on page 20](#).

Watchdog error

If there is a watchdog error, the output stages are disconnected from power. A diagnostic message is issued after system restart. Also refer to the fault code 6010, [chapter "Error messages" on page 20](#).

Error in the parameter table

The error "Parameter table" is issued under the following conditions:

- Selection of an unsupported valve

Functional description of the PWM module

- Range violation of the ramp time for the 4-quadrant ramp or for the single ramp
- The customized command value-frequency characteristics is neither increasing nor falling continuously
- The curve of the characteristic chart is neither increasing nor falling continuously
- The parameterized valves exceed the maximum permitted sum current of 6.4 A for S20-PWM-4-T

Also refer to the fault code 6320, [chapter "Error messages" on page 20](#).

Short-circuit or overload at channel x (x = 1, 2, 3 or 4)

If there is a short circuit or an overload in an output stage, the PWM outputs are disabled. Also refer to the fault code 2340, [chapter "Error messages" on page 20](#).

Wire break at channel x (x = 1, 2, 3 or 4)

The current flow in the valve is permanently monitored if the current is controlled. If the difference between current command value and actual current value exceeds 2.5 %, it is considered to be a wire break and a diagnostic message is issued. Also refer to the fault codes 7701, 7702, 7703 and 7704, [chapter "Error messages" on page 20](#). The wire break is only detected if the respective channel is active.

Internal software error

Also refer to the fault code 2340, [chapter "Error messages" on page 20](#).

Communication error "Flash"

The channel-related calibrating data of the AD converter is saved in the internal flash of the microprocessor. If there is a communication error when retrieving data from the flash or if the checksum is incorrect, the diagnostics "Communication error Flash" is issued. Also refer to the fault code 7630, [chapter "Error messages" on page 20](#).

Interruption of field bus or S20 bus

A substitute value behavior can be parameterized for the error case "Interruption field bus" or "Interruption S20 bus". In case of an error, the substitute value is transmitted as command value in the process input data. The behavior and the substitute value is determined via the object "Parameter for PWM output" (0080hex). Also refer to the fault code 8111, [chapter "Error messages" on page 20](#).

2.2.4 No Sercos-synchronous operation

A Sercos-synchronous operation is not intended for the PWM outputs. The S20 PWM module immediately forwards the current command values for internal processing. The command values are processed further with the cyclically detected actual current values and a PWM signal is generated and output at the outputs.

2.3 Controlled system

The following figure shows the schematic diagram of a controlled system of the module S20-PWM-4-T for one channel.

Functional description of the PWM module

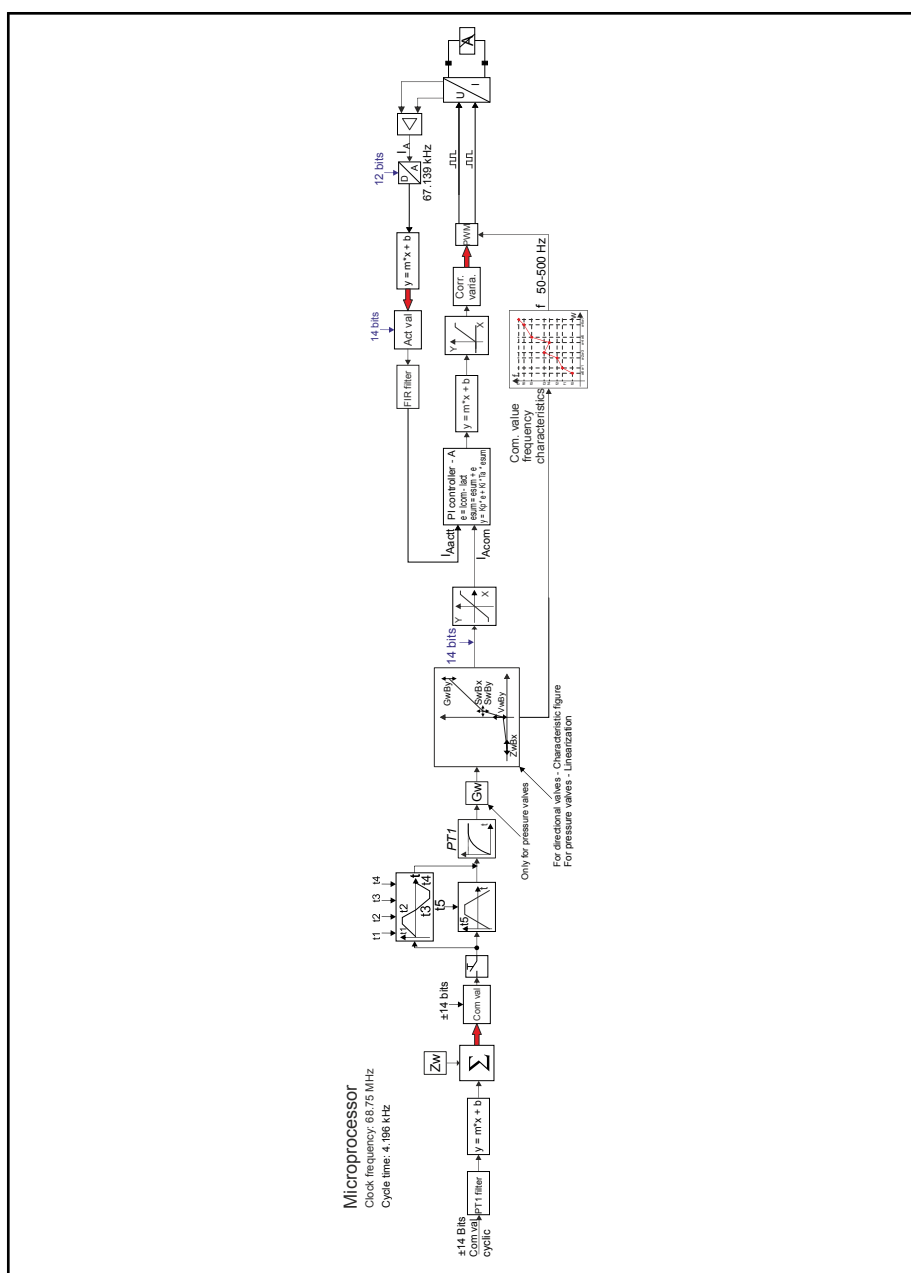


Fig. 2-1: Block diagram for one channel

The following figure shows the schematic diagram of a controlled system of the module S20-PWM-4-T for two channels using one valve with two magnets.

Functional description of the PWM module

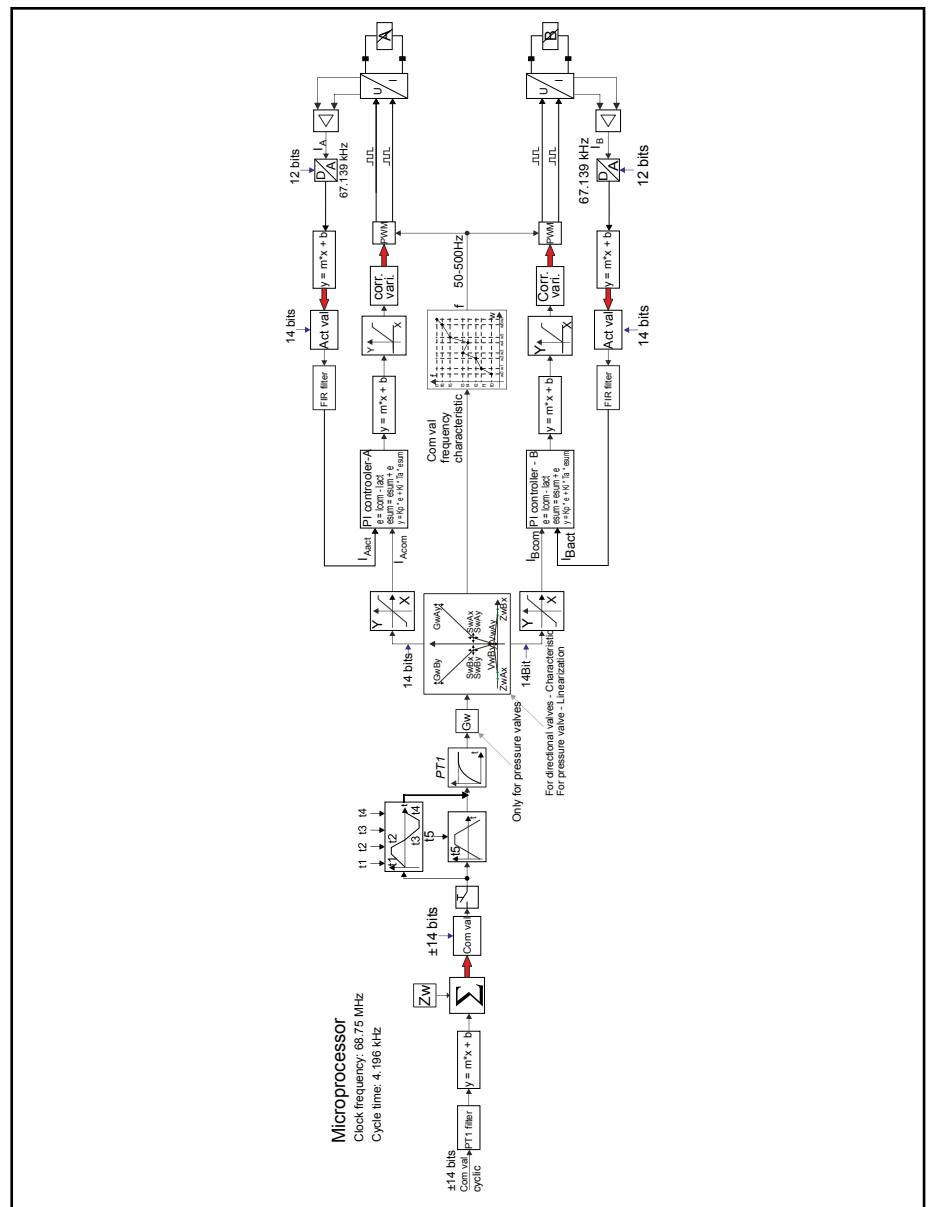


Fig. 2-2: Block diagram for two channels

3 Process data

The module assigns six words of output process data and six words of input process data.

The following data is transferred in the output process data:

- Four words of command value
- Four times three bits of control data

The following data is transferred in the input process data:

- Four words of actual value
- Four times four bits of status data

Data between the S20 master and the slave is exchanged in each S20 cycle. The S20 cycle is the data exchange cycle between the S20 slave and the S20 master (e.g.: S20 S3 BK+).

3.1 Output process data

The output process data assigns a total of six words.

MSB				LSB	
Word 0	Word 1	Word 2	Word 3	Word 4	Word 5
Command	Command value	Command value	Command	Command value	Command value
	Channel 1	Channel 2		Channel 3	Channel 4

Tab. 3-1: Output process data

3.1.1 Command

Two words are used as command to control the module. One nibble (4 bits) each is used to control a channel.

Control of channel 1 and channel 2

Bit	Channel	Level	State names	Description
0	CH1	0	Disabling the valve	Enabling the valve
		1	Enabling the valve	
1		0	Disabling the ramp function	Enabling the ramp
		1	Enabling the ramp function	
2		0	Single ramp	Switching between the 4-quadrant ramp and the single ramp
		1	4-quadrant ramp	
3		---	---	Reserved

Process data

Bit	Channel	Level	State names	Description
4	CH2	0	Disabling the valve	Enabling the valve
		1	Enabling the valve	
5		0	Disabling the ramp function	Enabling the ramp
		1	Enabling the ramp function	
6		0	Single ramp	Switching between the 4-quadrant ramp and the single ramp
		1	4-quadrant ramp	
7		---	---	Reserved
8	---	---	Reserved	Reserved
...				
15				

Tab. 3-2: Control of channel 1 and channel 2

Control of channel 3 and channel 4

Bit	Channel	Level	State names	Description
0	CH3	0	Disabling the valve	Enabling the valve
		1	Enabling the valve	
1		0	Disabling the ramp function	Enabling the ramp
		1	Enabling the ramp function	
2		0	Single ramp	Switching between the 4-quadrant ramp and the single ramp
		1	4-quadrant ramp	
3		---	---	Reserved
4	CH4	0	Disabling the valve	Enabling the valve
		1	Enabling the valve	
5		0	Disabling the ramp function	Enabling the ramp
		1	Enabling the ramp function	
6		0	Single ramp	Switching between the 4-quadrant ramp and the single ramp
		1	4-quadrant ramp	
7		---	---	Reserved
8	---	---	Reserved	Reserved
...				
15				

Tab. 3-3: Control of channel 3 and channel 4

Enabling the valve – Bit 0 or bit 4

The bit is used to enable or disable the valve. The bit is interpreted differently with regard to the configured valve type. If a proportional valve is configured

as valve type, the respective output stage is enabled and the specified cyclic command value is approached. If "Static PWM" is selected as valve type, the respective output stage is enabled and the frequency specified at the output via the description file is output. Theo (DutyCycle) of the output signal is specified via the cyclic command value.

Enabling the ramp – Bit 1 or bit 5

The bit is used to enable or disable the ramp function. The bit "Enabling the ramp" is only used when using proportional valves.

Switching between the 4-quadrant ramp and the single ramp – Bit 2 or bit 6

The bit is used to enable or disable the 4-quadrant ramp. It is only used when using proportional valves. This bit is ignored if the "static PWM" is configured.

3.1.2 Command value

The command value is always specified per mille.

One word can be assigned to each channel as command value specification. Depending on the configured valve type, the command values are interpreted differently and have a different value range. If a valve type is configured as proportional valve, the command value measures the flow passing through the valve.

Example:

Interpreting the command value specification

If the maximum valve current is $I_{MAX} = 2.5 \text{ A}$, an average coil current of 2.0 A results if the command value specified is 800 (corresponds to 80.0%).

If "Static PWM" is selected as valve type, the command value is interpreted as DutyCycle of the output signal.

Valve type	Decimal		Percent or percent DutyCycle (DC) if the static PWM is configured	
	Min.	Max.	min	max
Rexroth – directional valve with 1 solenoid	0	1000	0%	100%
Rexroth – directional valve with 2 solenoids	-1000	1000	-100%	100%
Rexroth – pressure control valve with 1 solenoid	0	1000	0%	100%
User defined – proportional valve user defined with 1 solenoid	0	1000	0%	100%
User defined – proportional valve user defined with 2 solenoids	-1000	1000	-100%	100%
Direct PWM – 1 output	0	1000	0% DC	100% DC
Direct PWM – 2 outputs	-1000	1000	-100% DC	100% DC

Tab. 3-4: Value range of the command value

Process data

Assigning command values for valves with two magnets



- A valve with two magnets may only be connected as follows:
- Magnet B at channel 1 (positive command value) and magnet A at channel 2 (negative command value)
 - Magnet B at channel 3 (positive command value) and magnet A at channel 4 (negative command value)

3.2 Input process data

The input process data assigns a total of six words.

MSB			LSB		
Word 0	Word 1	Word 2	Word 3	Word 4	Word 5
Status	Actual current value Channel 1	Actual current value Channel 2	Status	Actual current value Channel 3	Actual current value Channel 4

Tab. 3-5: Input process data

3.2.1 Status

Two words are used as status. One nibble (4 bits) each is used for the status of a channel

Status of channel 1 and channel 2

Bit	Channel	Level	State names	Description
0	CH1	0	Valve not active	Status of valve
		1	Valve active	
1		0	Command value reached	Status, command value
		1	Command value is approached	
2		0	No error	Status error
		1	Errors	
3		0	No warning	Status warning
		1	Warning	

Process data

Bit	Channel	Level	State names	Description
4	CH2	0	Valve not active	Status of valve
		1	Valve active	
5		0	Command value reached	Status, command value
		1	Command value is approached	
6		0	No error	Status error
		1	Errors	
7		0	No warning	Status warning
		1	Warning	
8	---	---	Reserved	Reserved
...				
15				

Tab. 3-6: Status of channel 1 and channel 2

Status of channel 3 and channel 4

Bit	Channel	Level	State names	Description
0	CH3	0	Valve not active	Status of valve
		1	Valve active	
1		0	Command value reached	Status, command value
		1	Command value is approached	
2		0	No error	Status error
		1	Errors	
3		0	No warning	Status warning
		1	Warning	
4	CH4	0	Valve not active	Status of valve
		1	Valve active	
5		0	Command value reached	Status, command value
		1	Command value is approached	
6		0	No error	Status error
		1	Errors	
7		0	No warning	Status warning
		1	Warning	
8	---	---	Reserved	Reserved
...				
15				

Tab. 3-7: Status of channel 3 and channel 4

Process data

Status of valve – Bit 0 or bit 4

The bit "Status valve" indicates the current valve status. The bit "Status valve" is only used when using proportional valves. If a "Static PWM" is configured, the bit "Status valve" provides the status "Zero".

Status of command value – Bit 1 or bit 5

The bit "Status command value" indicates the current status of the ramp function. As long as a command value is approached, the bit "Status command values" is logic one. The bit "Status command value" is only used when using proportional valves. If a "static PWM" is configured, this bit provides the status "Zero".

Status error – Bit 2 or bit 6

The bit "Status error" indicates the current error status.

Status warning – Bit 3 or bit 7

The bit "Status warning" shows the channel-related warnings.

3.2.2 Actual current value

The Actual current value is always specified per mille. One word is assigned to each channel as actual current value feedback. The command values are interpreted differently with regard to the configured valve type. If a valve type is configured as proportional valve, the actual current value measures the flow passing through the valve. When using the "Static PWM", the actual current value feedback provides the value "Zero".

4 Parameters, diagnostics and information

PDI = Parameters, diagnostics and information

Parameter and diagnostic data as well as status messages and other information are transferred via the PDI channel.



For information on the PDI, refer to the application description of the system IndraControl S20, part number [R911335988](#).

The communication via the PDI channel is organized via objects. The created common standard objects and vendor-specific application objects are described in the following chapters.

Applies to all following tables:

Data type	Meaning
Var	Simple variable: Individual, simple variable
Array	Sequence of simple variables of the same data type
Record	Sequence of simple variables of a different data type or of the same data type, but with a different length
Visible String	Byte string with only printable ASCII characters, terminated with 00 _{hex}
Octet String	Byte string with any content
Unsigned 8	Unsigned value, only positive values 00 _{hex} ... FF _{hex}
Unsigned 16	Unsigned value, only positive values 0000 _{hex} ... FFFF _{hex}
Unsigned 32	Unsigned value, only positive values 0000 0000 _{hex} ... FFFF FFFF _{hex}

Tab. 4-1: Explaining object codes and data types

Abbreviation	Meaning
A	Number of elements
L	Length of one element in bytes
R	Read
W	Write

Tab. 4-2: Abbreviations in table headers

4.1 Standard objects

4.1.1 Objects for identification (device type plate)

Object number (hex)	Object name	Object code	Data type	A	L	Rights	Meaning	Content
Vendor								
0001	VendorName	Var	Visible String	1	16	R	Vendor name	Bosch Rexroth AG
0002	VendorID	Var	Visible String	1	7	R	Vendor ID	006034

Parameters, diagnostics and information

Object number (hex)	Object name	Object code	Data type	A	L	Rights	Meaning	Content
0003	VendorText	Var	Visible String	1	49	R	Note on the vendor	Components and systems for industrial automation
0012	VendorURL	Var	Visible String	1	30	R	Vendor URL	boschrexroth.com
Module, general								
0004	DeviceFamily	Var	Visible String	1	20	R	Device family	I/O Function Module
0006	ProductFamily	Var	Visible String	1	33	R	Product family	IndraControl S20
000E	CommProfile	Var	Visible String	1	4	R	Communication profile	633
000F	DeviceProfile	Var	Visible String	1	5	R	Device profile	0010
0011	ProfileVersion	Record	Visible String	2	33	R	Version name of device profile	2011-12-07 Basis-Profil V2.0
003A	Version-Count	Array	Unsigned 16	4	2	R	Version counter	0007 0001 0000 0005
Module, special								
0007	ProductName	Var	Visible String	1	19	R	Product name	S20-PWM-4-T
0008	SerialNumber	Var	Visible String	1	11	R	Serial number	xx xx xx xx xx xx xx x (e.g. 7260201123456BC)
0009	ProductText	Var	Visible String	1	47	R	Product text	S20 PWM endstage with 4 outputs
000A	OrderNumber	Var	Visible String	1	8	R	Part number	R911173461
000B	HardwareVersion	Record	Visible String	2	14	R	Hardware version	E.g. 2014-07-02; AA0
000C	FirmwareVersion	Record	Visible String	2	17	R	Firmware version	E.g. 2014-07-02, FW version V1.01
000D	PCHVersion	Record	Visible String	2	17	R	Parameter channel version	E.g. 2010-01-08; V1.00
0037	DeviceType	Array	Octet String	1	8	R	Module identification	08 00 20 0C 01 00 00 DA
Device use								
0014	Location	Var	Visible String	1	58	R/W	Mounting location	Can be filled in by the user.
0015	EquipmentId	Var	Visible String	1	58	R/W	Equipment ID	Can be filled in by the user.
0016	ApplDeviceAddr	Var	Unsigned 16	1	2	R/W	User-defined device number	Can be filled in by the user.

Tab. 4-3: Objects for identification

4.1.2 Object for multilingualism

Object number (hex)	Object name	Object code	Data type	A	L	Rights	Meaning	Content
0017	Language	Record	Visible String	2	6; 8	R	Language	en-us; English

Tab. 4-4: Object for multilingualism

4.1.3 Objects for diagnostics

Object for diagnostics

Index (hex)	Object name	Object code	Data type	A	L	Rights	Meaning and content
0018	DiagState	Record	-	6	22	R	Diagnostic state

Tab. 4-5: Object for diagnostics

Diagnostic state (0018hex: DiagState)

This object is used for the structured message of a fault.

This object can only be accessed via the subindex 0. Thus, the complete object can be read.

0018_{hex}: DiagState (Read)

Subindex (hex)	Datentyp	Length in bytes	Meaning	Content
0	Record	22	Diagnostic state	Complete diagnostic information state
1	Unsigned 16	2	Fault number	0 ... 65535 _{dec} Consecutive fault number since last reset or error memory reset
2	Unsigned 8	1	Priority	00 _{hex} No fault 01 _{hex} Error still pending 02 _{hex} Warning still pending 81 _{hex} Resolved error 82 _{hex} Resolved warning

Parameters, diagnostics and information

0018_{hex}: DiagState (Read)

3	Unsigned 8	1	Channel	00 _{hex} No fault
				01 _{hex} Fault, channel 1
				02 _{hex} Fault, channel 2
				03 _{hex} Fault, channel 3
				04 _{hex} Fault, channel 4
				FF _{hex} Fault not assigned to specific channel
4	Unsigned 16	2	Fault code	Refer to the following table
5	Unsigned 8	1	More follows	00 _{hex} (not supported)
6	Visible String	15	Text (14 characters)	Refer to the following table

Tab. 4-6: Diagnostic state



The message with either priority 81_{hex} or 82_{hex} is a unique internal message to the parent control or the bus coupler. The message is transferred to the error mechanisms of the parent system.

Error messages

The following table lists all error messages that can be issued by the module.



Messages of priority 1 are errors due to which the function of the complete module cannot be ensured anymore. Messages of priority 2 are errors due to which the complete function of the module is still provided, but single channels might not be able to read in or output valid values.

Fault	Fault code (hex)	Text	Note	Priority (hex)	Channel (hex)
No fault	0000	–	Status OK	01	FF
24 V supply supplies undervoltage	3421	24 V Main supply low voltage	Fault at 24 V supply voltage	01	FF
Short-circuit or overload at 24 V supply	2137	24 V Main supply short or overcurrent	Fault at 24 V supply voltage	01	FF
Watchdog overflow	6010	Watchdog Error	Exception in the software	01	FF

Parameters, diagnostics and information

Fault	Fault code (hex)	Text	Note	Priority (hex)	Channel (hex)
Incorrect parameters	6320	Parameter Table Error	Incorrect data in characteristic chart Incorrect data of the customized command value-frequency characteristic Range violation, ramp times Parameterized valves exceed the maximum permitted sum current of the module Unsupported valve selected	01	FF
Short circuit or overload at the PWM output, channel 1	2340	Valve channel 0 short or overcurrent	Short circuit or overload at the PWM output, channel 1	02	01
Short circuit or overload at the PWM output, channel 2	2340	Valve channel 1 short or overcurrent	Short circuit or overload at the PWM output, channel 2	02	02
Short circuit or overload at the PWM output, channel 3	2340	Valve channel 2 short or overcurrent	Short circuit or overload at the PWM output, channel 3	02	03
Short circuit or overload at the PWM output, channel 4	2340	Valve channel 3 short or overcurrent	Short circuit or overload at the PWM output, channel 4	02	04
Wire break at PWM output, channel 1	7701	Valve channel 0 wire break	Wire break at PWM output, channel 1	02	01
Wire break at PWM output, channel 2	7702	Valve channel 1 wire break	Wire break at PWM output, channel 2	02	02
Wire break at PWM output, channel 3	7703	Valve channel 2 wire break	Wire break at PWM output, channel 3	02	03
Wire break at PWM output, channel 4	7704	Valve channel 3 wire break	Wire break at PWM output, channel 4	02	04
General software error	6100	Device Software Error	General software error	01	FF
Communication error with the flash	7630	Communication Error Flash	Communication error with the flash	01	FF
Communication error with the field bus or the S20 bus	8111	Fieldbus or S20 Bus not available	Communication error with the field bus or the S20 bus	01	FF

Tab. 4-7: Fault code and corresponding text for diagnostic messages with priority "error"

Parameters, diagnostics and information

4.1.4 Objects for process data management for S20-PWM-4-T

Object number (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
25	PDIN	Record	Integer 16	6	-	R	Input process data
26	PDOUT	Record	Integer 16	6	-	R/W	Output process data

Tab. 4-8: Objects for process data management for S20-PWM-4-T – Overview

Input process data (0025hex: PDIN)

Input process data of the module can be read using this object. The structure corresponds to the representation in [chapter 3 "Process data" on page 11](#).

0025 (hex): PDIN(Read)			
Subindex	Data type	Length in bytes	Meaning
0	Integer 16	2	Status of channel 1, channel 2
1	Integer 16	2	Actual value, channel 1
2	Integer 16	2	Actual value, channel 2
3	Integer 16	2	Status of channel 3, channel 4
4	Integer 16	2	Actual value, channel 3
5	Integer 16	2	Actual value, channel 4

Tab. 4-9: Structure of the object PDIN (0025hex)

Output process data (0026hex: PDOUT)

Output process data of the module can be written using this object. The structure corresponds to the representation in [chapter 3 "Process data" on page 11](#).

0026 (hex): PDOUT(Read)			
Subindex	Data type	Length in bytes	Meaning
0	Integer 16	2	Command of channel 1, channel 2
1	Integer 16	2	Command value, channel 1
2	Integer 16	2	Command value, channel 2
3	Integer 16	2	Command of channel 3, channel 4
4	Integer 16	2	Command value, channel 3
5	Integer 16	2	Command value, channel 4

Tab. 4-10: Structure of the object POUT (0026hex)

4.2 Application objects

4.2.1 Overview

Object number (hex)	Object name	Object type	Data type	A	L	Rights	Meaning
0080	Parameter for pwm output	-	-	-	-	R/W	Setting for PWM outputs

Tab. 4-11: Objects for parameterization

4.2.2 Object "Parameter for PWM output"

The object "Parameter for PWM output" is used to set the PWM outputs. Select the valve type first. This creates a subset matching the valve type. Also refer to the following table.

Object number (hex)	0x0080
Subindex (hex)	Corresponds to channel number
	0x00 = Channel 1
	0x01 = Channel 2
	0x02 = Channel 3
	0x03 = Channel 4
Object name	Parameter for PWM output

Tab. 4-12:

Note that not all parameters can be selected at every channel.

Subindex (dec)	Parameter	Offset (bytes)	Length (bytes)	Values (dec)	Standard (dec)	Description
0, 1, 2, 3	Act_Length	0	16	68	---	---
0, 1, 2, 3	Max_Length	2	16	68	---	---
0, 1, 2, 3	Function	4	4	00 .. 09	00	Valve type selection
0, 1, 2, 3	Rexroth – directional valve with 1 solenoid	5	8	00 ... 06	00	Directional control valve selection
0, 1, 2, 3	Rexroth – directional valve with 2 solenoids	5	8	00 ... 05	00	Selection of directional control valves with two magnets
0, 1, 2, 3	Rexroth – pressure control valve with 1 solenoid	5	8	00 ... 21	00	Pressure valve selection
0, 1, 2, 3	Setpoint: t1	6	16	0 ... 30000	20000	Increasing ramp time (pos) [ms]
0, 1, 2, 3	Setpoint: t2	8	16	0 ... 30000	20000	Falling ramp time (pos) [ms]
0, 1, 2, 3	Setpoint: t3	10	16	0 ... 30000	20000	Increasing ramp time (neg) [ms]
0, 1, 2, 3	Setpoint: t4	12	16	0 ... 30000	20000	Falling ramp time (neg) [ms]

Parameters, diagnostics and information

Subindex (dec)	Parameter	Offset (bytes)	Length (bytes)	Values (dec)	Standard (dec)	Description
0, 1, 2, 3	Setpoint: t5	14	16	0 ... 30000	20000	Single ramp [ms]
0, 1, 2, 3	Valve characteristic: Vw	18	16	0 ... 500	0	Bias current magnet B/A [%]
0, 1, 2, 3	Valve characteristic: Sw+	22	16	0 ... 500	20	Jump height, magnet B [%]
0, 1, 2, 3	Valve characteristic: Gw+	24	16	700 ... 1000	1000	Sensitivity of magnet B [%]
1, 3	Valve characteristic: Sw-	32	16	0 ... 500	20	Jump height, magnet A [%]
1, 3	Valve characteristic: Gw-	34	16	700 ... 1000	1000	Sensitivity of magnet A [%]
0, 1, 2, 3	Valve characteristic: Zw	36	16	-1000 ... 1000	0	Zero point offset
0, 1, 2, 3	Valve characteristic: Gw	38	16	0 ... 1000	1000	Command value scaling [%]
0, 1, 2, 3	Clock generator: Frequency Offset	40	16	-200 ... 200	0	Frequency offset
0, 1, 2, 3	reaction on CC disable	48	8	00 ... 01	00	Response when disabling the current controller
0, 1, 2, 3	reaction on bus failure	49	8	00 ... 01	00	Response on bus errors
0, 1, 2, 3	sustitute value	50	16	0 ... 1100	0	Substitute value [%]
0, 1, 2, 3	PWM frequency	52	16	50 ... 1000	500	Frequency in [Hz] ¹⁾
0, 1, 2, 3	Valve characteristic: I max	54	16	0 ... 2700	0	Maximum current [mA]
0, 1, 2, 3	Clock generator: F1	56	16	50 ... 500	380	P1 – Frequency [Hz]
0, 1, 2, 3	Clock generator: F2	58	16	50 ... 500	380	P2 – Frequency [Hz]
0, 1, 2, 3	Clock generator: D2	60	16	0 ... 1000	200	P2 – Command value adaptation [%]
0, 1, 2, 3	Clock generator: F3	62	16	50 ... 500	380	P3 – Frequency [Hz]
0, 1, 2, 3	Clock generator: D3	64	16	0 ... 1000	200	P3 – Command value adaptation [%]
0, 1, 2, 3	Clock generator: F4	66	16	50 ... 500	380	P4 – Frequency [Hz]

Tab. 4-13: Object 0x0080 to set the PWM outputs

Parameter – Function

The parameter "Valve Type" is used to select the valve type that is to be connected to the respective channel. Note that valves with one magnet can be selected at any channel. Valves with two magnets can only be selected at channel 1 and at channel 3.

If a valve with two magnets is configured on channel 1, channel 2 is not available. Disable channel 2. The same applies when using the channels 3 and 4.

1) Only available with "Direct PWM"

Parameters, diagnostics and information

Coding	Channel x - Function	Default settings	Description
00	Disabled	✓	Channel is disabled, no valve type selected
00	Disabled / Parametrized with channel y ^①	✓	Channel is disabled, no valve type selected or channel was parameterized with preceding channel
01	Rexroth – directional valve with 1 solenoid		Rexroth proportional valve with one magnet
02	Rexroth – directional valve with 2 solenoids		Rexroth proportional valve with two magnets ^①
03	Rexroth – pressure control valve with 1 solenoid		Rexroth pressure valve
04	User defined – proportional valve with 1 solenoid – channel x ^②		Proportional valve with one magnet, user-defined parameterization
05	User defined – proportional valve with 2 solenoids – channel x/y ^③		Proportional valve with two magnets, user-defined parameterization ^①
0A	Direct PWM – 1 output – channel x ^④		Static PWM to control a valve amplifier (controlling a valve with one magnet)
0B	Direct PWM – 2 outputs – channel x/y ^④		Static PWM to control a valve amplifier (controlling a valve with two magnets) ^①

① The functionality is only available for channel 1 and channel 3. Channel 2 and channel 4 are not available upon selection.

② x corresponds to 1 up to 4

③ y corresponds to 2 or 4

④ x/y corresponds to 1/2 or 3/4

Tab. 4-14: Preselecting valve and valve function

The following directional valves are available:

Coding	Channel x - Valve family directional valve ^①	Default settings
00	4WRA6...2x (2.5 A)	✓
01	4WRA10...2x (2.5 A)	
02	4WRZ...7x (1.5 A)	
04	3DREP...2x (1.5 A)	
05	4WRPH6...2X/...-855 (2.7 A)	
06	DBEP6 (0.8 A)	
07	3DREP6 (SO674) (0.8 A)	

① x corresponds to 1 up to 4

Tab. 4-15: Parameter - Rexroth - directional valve with 1 solenoid

Parameters, diagnostics and information



The valve "4WRPH6" can only be used for channel 1 or channel 3. The current controller of the module uses internal resources of the next higher channel. Thus, note the following: If the valve "4WRPH6" is used on channel 1, channel 2 *cannot* be used. If the valve "4WRPH6" is used on channel 3, channel 4 *cannot* be used.



The valves "DBEP6" and "3DREP6 (SO674)" require a supply voltage of 28 V.

To ensure the maximum current for high-impedance proportional magnets in the complete temperature range of the magnet, the minimum operation voltage is 28 V. Also refer to the data sheet RD29935.

The following proportional valves are available with two magnets:

Coding	Channel x/y - Valve family directional valve with 2 solenoids ^①	Default settings
00	4WRA6...2x (2.5 A)	✓
01	4WRA10...2x (2.5 A)	
02	4WRZ...7x (1.5 A)	
04	3DREP...2x (1.5 A)	
06	DBEP6 (0.8 A)	
07	3DREP6 (SO674) (0.8 A)	

①

x/y corresponds to 1/2 or 3/4

Tab. 4-16: Parameter - Rexroth - directional valve with 2 solenoids



The valves "DBEP6" and "3DREP6 (SO674)" require a supply voltage of 28 V.

To ensure the maximum current for high-impedance proportional magnets in the complete temperature range of the magnet, the minimum operation voltage is 28 V. Also refer to the data sheet RD29935.

Parameter - Ramp time - setpoint: t1, t2, t3, t4 and t5

The ramp time specifies the edge steepness of the valve current. The ramp times refer to +100% of the command value and to -100% of the command value (only for two-armed valves). The ramp times t1, t2, t3 and t4 describe the delay times of the 4-quadrant ramp.

Example:

Ramp time interpretation

Ramp time t1 = 10000 corresponds to 10 s

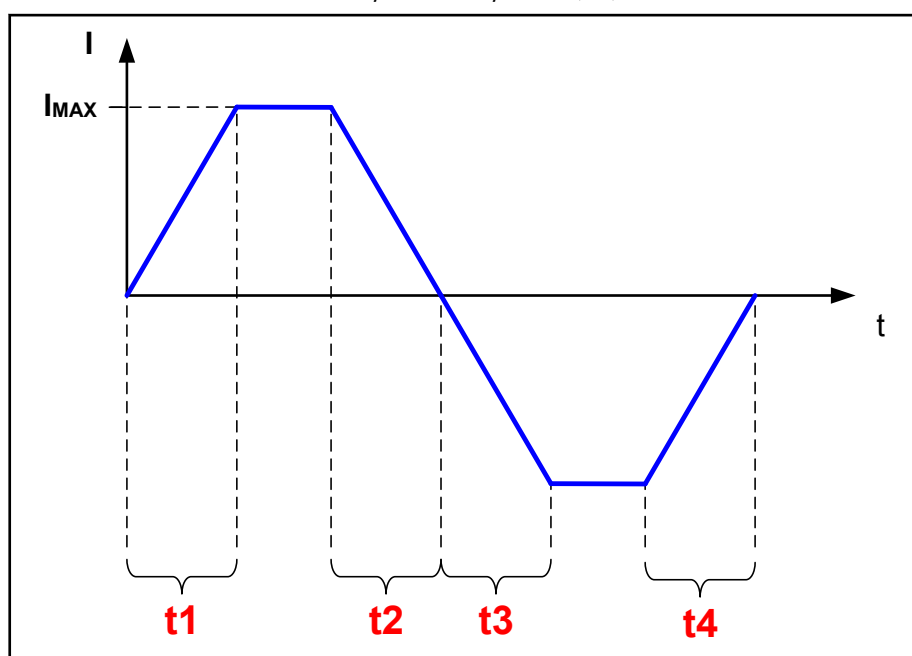
Command value of 100% corresponds to a ramp time of 10 s

Command value of 50% corresponds to a ramp time of 5 s

Parameters, diagnostics and information

Parameter	Change in command value	Description
Setpoint: t1	0% after +100%	Positively increasing ramp time (positive command value increase) for valves with one or two magnets
Setpoint: t2	+100% after 0%	Positively falling ramp time (positive command value reduction) for valves with one or two magnets
Setpoint: t3	0% after -100%	Negatively increasing ramp time (negative command value increase) for valves with two magnets
Setpoint: t4	-100% after 0%	Negatively falling ramp time (negative command value reduction) for valves with two magnets

Tab. 4-17: Parameter - Ramp time - setpoint: t1, t2, t3 and t4



Ramp times t1 and t2 for magnet B at channel 1 or channel 3 and ramp times t3 and t4 for magnet A at channel 2 or channel 4

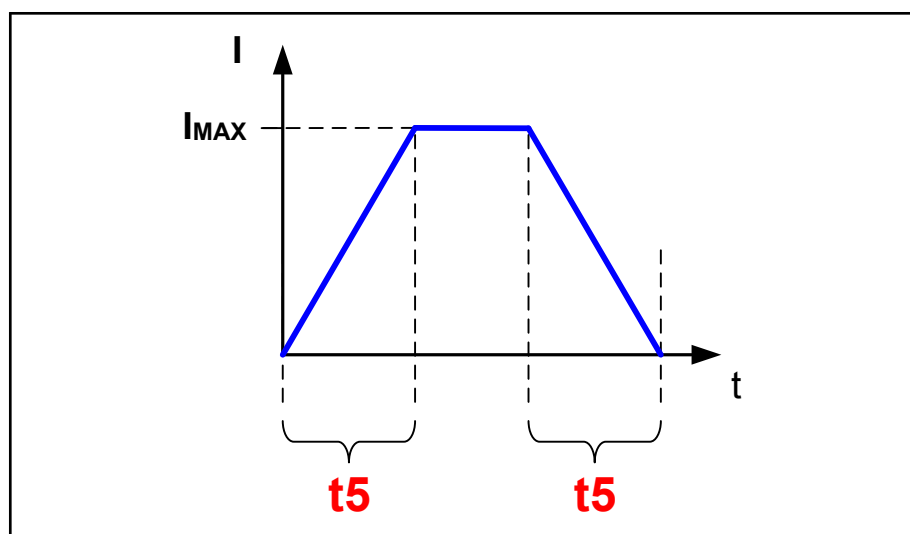
Fig. 4-1: 4-quadrant ramp

Parameter - Ramp time - setpoint: t5

Parameter	Change in command value	Description
Setpoint: t5	0% after $\pm 100\%$	Increasing ramp time (positive or negative command value increase) for valves with one or two magnets
	$\pm 100\%$ after 0%	Falling ramp time (positive or negative command value reduction) for valves with one or two magnets

Tab. 4-18: Parameter - Ramp time - setpoint: t5

Parameters, diagnostics and information



The ramp time of the single ramp t_5 specifies the edge steepness of the valve current used when the command value increases 0 to $\pm 100\%$ in a jump.

Fig. 4-2: Single ramp

Example:

Ramp time interpretation

Ramp time $t_1 = 5000$ corresponds to 5 s

Command value of 100% corresponds to a ramp time of 5 s

Command value of 50% corresponds to a ramp time of 2.5 s

Parameter characteristic charts - Valve characteristic: Vw, Sw+, Gw+, Sw-, Gw-

The characteristic chart can be used to compensate static non-linearities within the connected proportional valve. The following table provides information on the parameters of the characteristic chart.

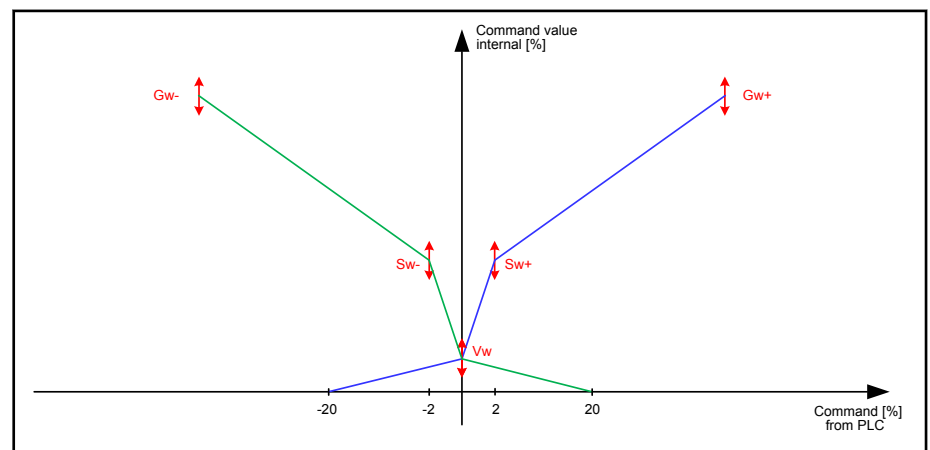
Parameter	Change in command value	Description
---	Minimum current, magnet B	Cannot be set, fixedly set to -20%
Valve characteristic: Vw	Bias current, magnet B/A	Bias current if command value 0%
---	Jump height, magnet B	Cannot be set, fixedly set to 2%
Valve characteristic: Sw+	Jump height, magnet B	Jump height for positive command values
Valve characteristic: Gw+	Sensitivity of magnet B	Amplitude attenuator for positive command values
---	Minimum current, magnet A	Cannot be set, fixedly set to 20%
---	Jump height, magnet A	Cannot be set, fixedly set to 2% Only used for valves with two magnets

Parameters, diagnostics and information

Parameter	Change in command value	Description
Valve characteristic: Sw-	Jump height, magnet A	Jump height for negative command values Only used for valves with two magnets
Valve characteristic: Gw-	Sensitivity of magnet A	Amplitude attenuator for negative command values Only used for valves with two magnets

Tab. 4-19: Parameter, characteristic charts – Valve characteristic: Vw, Sw+, Gw+, Sw-, Gw-

The following figure shows the characteristic for proportional valves with two magnets.



Blue Magnet B, channel 1 or channel 3
Green Magnet A, channel 2 or channel 4

Fig. 4-3: Characteristic charts

The following figure shows the characteristic for proportional valves with one magnet.

Parameter – Valve characteristic: Zw

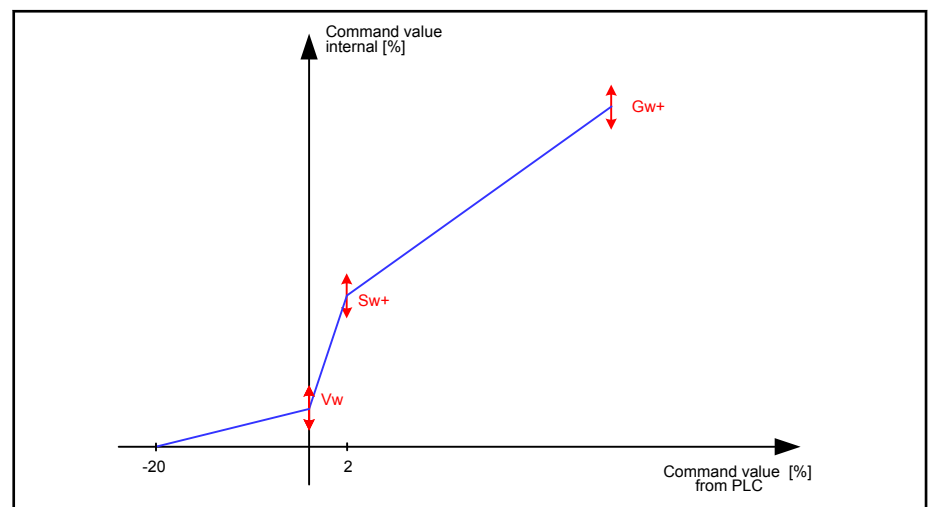


Fig. 4-4: Characteristic charts

Parameters, diagnostics and information

If the current controller is active and when proportional valves are used, the zero point offset is added to the current command value. If the current controller is disabled, the current offset is deducted from the current command value and the current controller controls to "Zero". In case of the substitute value behavior, the current offset is added to the active substitute value.

Parameter – Valve characteristic: Gw

The parameter "Valve characteristic: Gw" is used to scale the current command value to the maximum valve current permitted. This parameter is only available for Rexroth pressure valves.

Parameter – Valve characteristic: Frequency

Valve characteristic: The parameter "Valve characteristic: Frequency" is used to correct the offset frequency for proportional valves between -20% and +20%.

Parameter – Reaction on CC disable

The parameter "Reaction on CC disable" describes the response on the current output when the currently controller (CC) is disabled.

Coding	Channel x - reaction on CC disable	Default setting	Description
00	ramp down with t5	✓	Ramp command value with t5 against 0 and disable the current controller
01	abrupt shutdown		Immediate disabling of the current controller

x 1 to 4
Tab. 4-20: Parameter – Reaction on CC disable

Parameter – Reaction on bus failure

This parameter describes the response of the current output on a field bus error or S20 bus error. If the parameter "disable current controller" is selected, the settings of the parameter "Reaction on CC disable" are used.

Coding	Channel x - reaction on bus failure	Default setting	Description
00	disable current controller	✓	Disabling the current controller
01	set substitute value and ramp with t5		Set substitute value and ramp the value with t5

x 1 to 4
Tab. 4-21: Parameter – Reaction on bus failure

Parameter – substitute value

This parameter specifies the substitute value.

Parameters, diagnostics and information

Coding	Channel x - reaction substitute value	Default setting	Description
--------	---	--------------------	-------------

0 to 1100	substitute value	0	Substitute value when disabling the current controller
-----------	------------------	---	--

x 1 to 4

Tab. 4-22: Parameter – substitute value

Parameter – PWM frequency

The parameter "PWM frequency" is only available in the operating mode "Static PWM" (direct PWM with 1 magnet or direct PWM with 2 magnets). This parameter specifies the frequency of the static PWM.

Coding	Channel x - PWM frequency	Default setting	Description
--------	------------------------------	--------------------	-------------

50 to 1000	PWM frequency	500	Frequency [Hz]
------------	---------------	-----	----------------

x 1 to 4

Tab. 4-23: Parameter – PWM frequency

Parameter – Valve characteristic: I max

The parameter "PWM I max" is only available in the following operating modes:

- Proportional valve with one magnet, user-defined parameter (User defined – proportional valve with 1 solenoid)
- Proportional valve with two magnets, user-defined parameters (User defined – proportional valve with 2 solenoids)
- Static PWM to control a valve amplifier (controlling a valve with one magnet) (Direct PWM – 1 output)
- Static PWM to control a valve amplifier (controlling a valve with two magnets) (Direct PWM – 2 outputs)

This parameter specifies the maximum current permitted in the connected valve or valve amplifier.

Coding	Channel x - Valve characteristic: I max	Default setting	Description
--------	--	--------------------	-------------

0 to 2700	Valve characteristic: I max	800	Maximum current [mA]
-----------	-----------------------------------	-----	----------------------

x 1 to 4

Tab. 4-24: Parameter – Valve characteristic: I max

Parameter frequency characteristic (customized) - Clock generator: P1, P2, P3, P4

A customized command value-frequency characteristic is available for third-party valves. The four points (P1, P2, P3 and P4) can be defined in a frequency-command value diagram. Point P1 is assigned to the command value 0.0% and point P4 to the command value 100.0%. The parameters of the customized frequency characteristic are only available for customized proportional valves with one or two magnets. A constant frequency of 380 Hz is specified in the default setting.

Parameters, diagnostics and information

Coding	Channel x - Clock generator	Default setting	Description
50 ... 500	Clock generator: F1	380	P1 – Frequency [Hz]; D1 is set to 0.0%
50 ... 500	Clock generator: F2	380	P2 – Frequency [Hz]
0 ... 1000	Clock generator: D2	200	P2 – Command value adaptation [%]
50 ... 500	Clock generator: F3	380	P3 – Frequency [Hz]
0 ... 1000	Clock generator: D3	200	P3 – Command value adaptation [%]
50 ... 500	Clock generator: F4	380	P4 – Frequency [Hz]; D4 is set to 100.0%

x 1 to 4

Tab. 4-25: Parameter – Clock generator: P1, P2, P3, P4

The following figure shows a customized command value-frequency characteristic (default setting) with a frequency that does not depend on the command value. Set the parameters F1, F2, F3 and F4 to the requested frequency. Set the same value for all four parameter pairs.

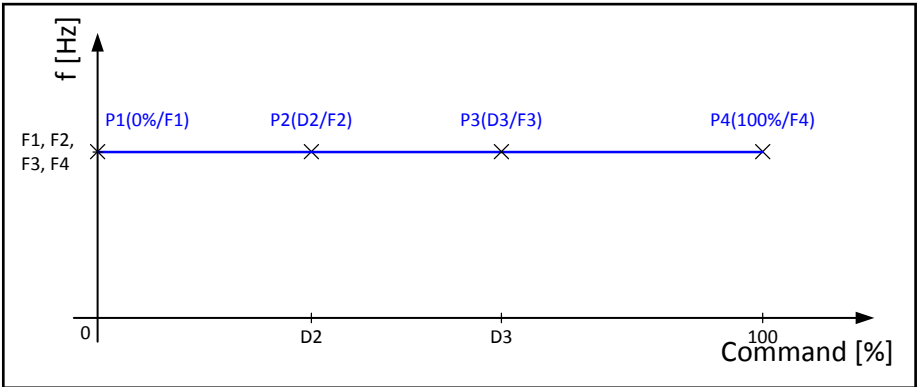


Fig. 4-5: Frequency characteristic of the command value

The following figure shows a customized command value-frequency characteristic with a frequency that depends on the command value.

Parameters, diagnostics and information

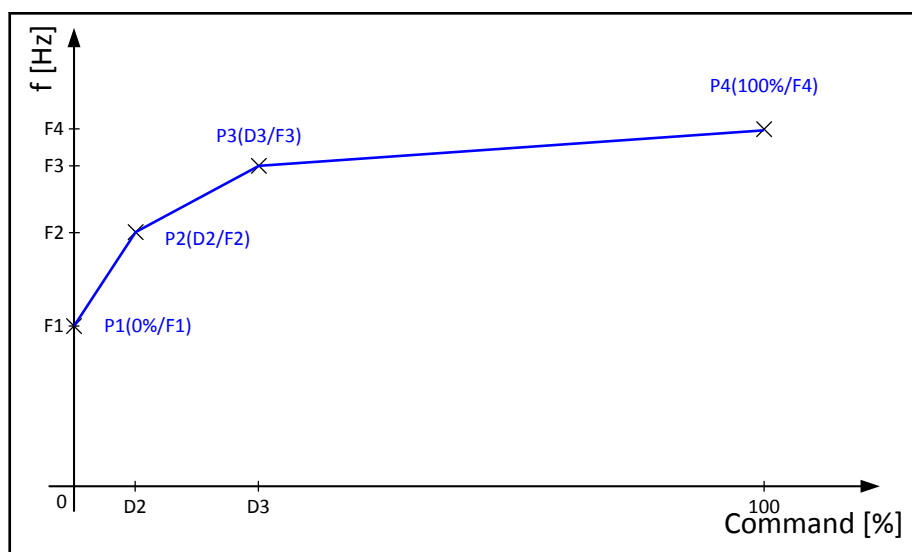


Fig. 4-6: Frequency characteristic of the command value

5 Commissioning

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. Up to 6.4 A can be applied to the output side of the module. A load above 6.4 A is not permitted.

NOTICE

Electronic damage due to incorrect 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.

5.1 Use case

A hydraulic cylinder "50-36/920" is controlled via a proportional valve "4WRA 6". The system pressure is 200 bar. The proportional valve "4WRA 6" is controlled via channel 1 and channel 2 of the module S20-PWM-4-T. The axis is extended with a positive command value. The axis is retracted with a negative command value. A pressure reduction valve ZDRE 10 can be used to set the pressure on the piston side of the cylinder between 20 bar and 200 bar. Channel 3 of the module S20-PWM-4-T is used. The parameterization and the control of the module are described in the following.

Name	Type	Part number
Rexroth PWM amplifier with four output stages	S20-PWM-4-T	R911173461
Rexroth pressure valve	ZDRE 10 VP2-2X/ 200YMG24K4M	R901160004
Rexroth proportional valve with two magnets	4WRA 6 E15-23/G24K4/V	R900904438

Tab. 5-1: List of hardware used

Channel	Valve
1	4WRA 6, magnet B
2	4WRA 6, magnet A
3	ZDRE 10
4	Not used

Tab. 5-2: Wiring the valves to the module S20-PWM-4-T

5.1.1 Parameterizing the valves with IndraWorks Engineering

The valve 4WRA 6 is a proportional valve with two magnets and it should be configured at channel 1 and at channel 2. Make the following settings using the data sheet of the 4WRA 6 RD29055:

Commissioning

Channel	Parameter	Value	Explanation
1	Function	User defined - proportional valve with 2 solenoids - channel 1/2	
	Valve characteristic: I max	2500	2500 correspond to 2.5 A
	Valve characteristic: Vw	8	Bias current of 20 mA 8 per mille of 2500
	Valve characteristic: Sw+	140	Jump height of 350 mA
	Valve characteristic: Sw-		140 per mille of 2500
	Valve characteristic: Gw+	1000	Amplitude attenuator of 2500 mA
	Valve characteristic: Gw-		1000 per mille of 2500
	Clock generator: F1	380	Frequency of 380 Hz
	Clock generator: F2		
	Clock generator: F3		
	Clock generator: F4		
2	Function	Disabled / Parameterized with channel 1	Channel 1 controls channel 2

Tab. 5-3: Parameter settings for the valve "4WRA 6" under IndraWorks



All other parameters can remain on their default values.

The valve "ZDRE 10" is a pressure valve and is to be configured at channel 3. Make the following settings using the data sheet of the ZDRE 10 RD29279:

- Magnet current of 100 mA min.
- Magnet current of 1600 mA max.
- Cycle frequency between 180 and 400 Hz

Commissioning

Channel	Parameter	Value	Explanation
3	Function	User defined - proportional valve with 1 solenoid - channel 3	
	Valve characteristic: I max	1600	1600 correspond to 1.6 A
	Valve characteristic: Vw	62	Bias current of 100 mA, 62 per mille of 1600. This corresponds to the minimum magnet current.
	Valve characteristic: Sw+	62	For a steady characteristic curve, select the value selected for Vw
	Valve characteristic: Gw+	1000	Amplitude attenuator of 1600 mA 1000 per mille of 1600
	Clock generator: F1	380	Permitted cycle frequency between 180 and 400 Hz A frequency of 380 Hz was selected.
	Clock generator: F2		
	Clock generator: F3		
	Clock generator: F4		

Tab. 5-4: Parameter settings for the valve "ZDRE 10" in IndraWorks



All other parameters can remain on their default values

Process data	Variable	Channel	Data type
Output process data	wCommandWordPWM_1_2_gb	PWM Command 1/2	WORD
	wSetValuePWM_1_2_gb	PWM Channel 1	WORD
		PWM Channel 2	WORD
	wCommandWordPWM_3_gb	PWM Command 3/4	WORD
	wSetValuePWM_3_gb	PWM Channel 3	WORD
		PWM Channel 4	WORD
Input process data		PWM Response 1/2	WORD
	wValuePWM_1_magnetB_gb	PWM Channel 1	WORD
	wValuePWM_1_magnetA_gb	PWM Channel 2	WORD
		PWM Response 3/4	WORD
		PWM Channel 3	WORD
		PWM Channel 4	WORD

Tab. 5-5: Process image of input and output data

Valve enabling is set by the two variables:

- bEnablePWM_gb
- bEnablePWM_Pressure_gb

The command values for the valve "4WRA 6" are specified within the value range from -100 to 100 using the variables `lrSetValueValve`. The command values for the valve "ZDRE 10" are specified within the value range from 0 to 100 using the variables `lrSetValuePressureValve`.

Commissioning

5.1.2 Declaration part

Program:

```

PROGRAM PWMSercosSyncProg
(*#####*)
Description : Cyclic call for PWM modul, usually in Sercos cycle time
(*#####*)
VAR
    bRamp: BOOL;
    bRamp_Pressure: BOOL;
    bRamp4quadrant: BOOL;
    ToHMI_ValveA: WORD;
    ToHMI_ValveB: WORD;
    lrSetValueValve: LREAL;
    lrSetValuePressureValve: LREAL;
END_VAR

```

5.1.3 Calls

Program:

```

// Set Enable Bit on PWM
wCommandWordPWM_1_2_gb.0 := bEnablePWM_gb; // for Valve with 2 magnets
wCommandWordPWM_3_gb.0 := bEnablePWM_Pressure_gb; // for Pressurevalve

// if needed set ramp
wCommandWordPWM_1_2_gb.1 := bRamp; // ramp if true
wCommandWordPWM_3_gb.1 := bRamp_Pressure; // ramp with t5 if true

//4-quadrant ramp
//ramp with t5 if false, else with t1,t2,t3,t4
wCommandWordPWM_1_2_gb.2 := bRamp4quadrant;

// send setpoint to PWM modul (from % to per mille)
// for valve with 2 magnets from -100% to 100%
wSetValuePWM_1_2_gb := LREAL_TO_WORD(lrSetValueValve * 10);
// for pressure valve from 0% to 100%
wSetValuePWM_3_gb := LREAL_TO_WORD(lrSetValuePressureValve * 10);

//optional, read back signal from Valve, magnet A and B
ToHMI_ValveA := wValuePWM_1_magnetB_gb;
ToHMI_ValveB := wValuePWM_1_magnetA_gb;

```

6 Service and support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

Service Germany Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Hotline** and **Service Helpdesk** under:

Phone: **+49 9352 40 5060**
Fax: **+49 9352 18 4941**
E-mail: service.svc@boschrexroth.de
Internet: <http://www.boschrexroth.com>

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances
- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)

Index

0 ... 9

0000hex.....	20
0018hex.....	19
0025hex.....	22
0080hex.....	23, 24
2137hex.....	6, 20
2340hex.....	7, 21
3421hex.....	6, 20
6010hex.....	6, 20
6100hex.....	21
6320hex.....	7, 21
7630hex.....	7, 21
7701-7704hex.....	7
7701hex.....	21
7702hex.....	21
7703hex.....	21
7704hex.....	21
8111hex.....	7, 21

A

Actual current value.....	16
Actual value.....	16
ANSI Z535.6-2006.....	3

C

Command.....	11
Enable ramps.....	13
Enable valves.....	12
Command value.....	13
Commission.....	35
Communication error "Flash" (7630).....	7

D

Data types.....	17
Device type plate.....	17
Diagnostics.....	6, 17, 19
Error messages.....	20

E

Enabling ramps.....	13
Enabling valves.....	12
Error messages.....	20
Error, parameter table (6320).....	6
Example.....	35

F

Fault code 2137.....	6
Fault code 2340.....	7
Fault code 3421.....	6
Fault code 6010.....	6
Fault code 6320.....	7
Fault code 7630.....	7
Fault code 7701-7704.....	7
Fault code 8111.....	7

Functional description of the module.....	5
---	---

H

Hazard warnings.....	3
Helpdesk.....	39
Hotline.....	39

I

Identification objects.....	17
Information.....	17
Input process data.....	14, 22
Status.....	14
Status error.....	16
Status of command value.....	16
Status of valve.....	16
Status warning.....	16
Internal software error (2340).....	7
Interruption of field bus or S20 bus (8111).....	7

M

Multilingualism.....	19
----------------------	----

O

Object codes.....	17
Object for multilingualism.....	19
Objects for diagnostics.....	19
Error messages.....	20
Objects for identification.....	17
Objects for parameterization.....	23
Objects for process data management.....	22
Output currents.....	6
Output process data.....	11, 22
Command.....	11
Command value.....	13
Overload (2340).....	7
Overload (6010).....	6

P

Parameter – Function.....	24
Parameter for PWM output.....	23
Parameterization.....	23
Parameters.....	17
PDI.....	17
Process data.....	11
Process data management.....	22
Process data, Input.....	14
Process data, output.....	11
PWM outputs.....	5
Diagnostics.....	6
Substitute value behavior.....	6

S

Safety instructions.....	3
Sercos-synchronous operation.....	7

Index

Service hotline.....	39
Short circuit (2340).....	7
Short circuit (6010).....	6
Signal alert symbol.....	3
Signal words.....	3
Software error, internal (2340).....	7
Standard objects.....	17
Status.....	14
Status error.....	16
Status of command value.....	16
Status of valve.....	16
Status warning.....	16
Substitute value behavior.....	6
Support.....	39
Symbols.....	4

T

Type plate.....	17
-----------------	----

U

Undervoltage (3421).....	6
Use case.....	35

V

Valve, enabling.....	12
----------------------	----

W

Warnings.....	3
Watchdog error (6010).....	6
Wire break (7701-7704).....	7

Notes

Notes

Notes

Bosch Rexroth AG

Electric Drives and Controls

P.O. Box 13 57

97803 Lohr, Germany

Bgm.-Dr.-Nebel-Str. 2

97816 Lohr, Germany

Phone +49 9352 18 0

Fax +49 9352 18 8400

www.boschrexroth.com/electrics



R911376949