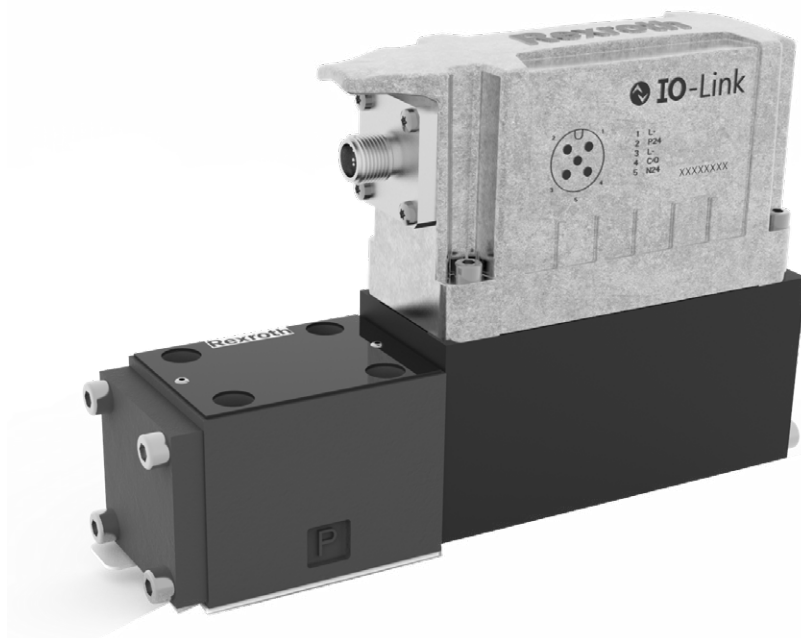


High-response directional valves with electrical position feedback and IO-Link interface

4WRPEH6, 4WRPEH10, 4WRPE10, 4WRLE

Parameter description
RE 29400-PA/2024-05

Replaces: 01.2019
English



The data specified only serve to describe the product. If information on the use of the product is given, it is only to be regarded as application examples and recommendations. Catalog information does not constitute warranted properties. The information given does not release the user from the obligation of own judgment and verification. Our products are subject to a natural process of wear and aging.

© This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without its consent.

The cover shows an example configuration. The product supplied may differ from the solution shown here.

The original operating instructions were prepared in German.

Content

1	About this documentation	4
1.1	Validity of the documentation	4
2	Communication	5
3	Parameter description	6
3.1	Process data input (PDI)	6
3.2	Process data output (PDO)	6
3.3	Variables	7
4	Functional description	10
4.1	Influencing the valve command value	10
4.2	Ramp slopes (index 202 to 205)	10
4.3	Operating hours	11
4.4	Temperature histogram	11
4.5	Compatibility mode	11
4.6	Write protection	11

1 About this documentation

1.1 Validity of the documentation

This documentation is valid for the following products:

- Direct operated and pilot operated high-response directional valves with IO-Link interface

This documentation is intended for fitters, operators, service technicians, system operators and plant/machine manufacturers.

It contains the description of parameters for high-response valves of type 4WRPEH, 4WRPE and 4WRLE.

Vendor ID 287 d / 01 1F h

Vendor name Bosch Rexroth AG

Vendor text www.boschrexroth.com

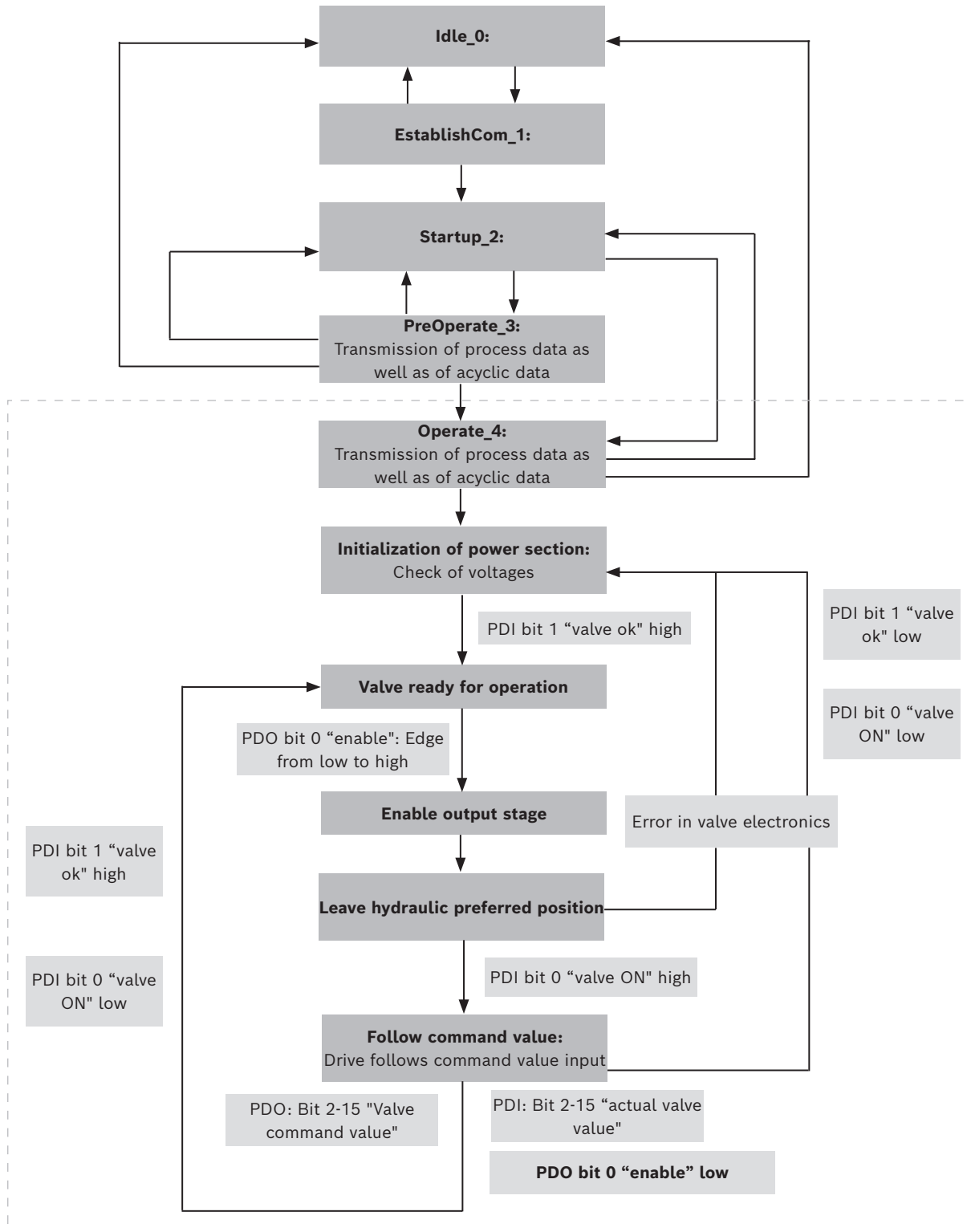
Vendor URL <http://www.boschrexroth.com>

Device ID	Device
220001 h / 2228225 d	4WRPEH6
220002 h / 2228226 d	4WRPEH6-3x as of firmware version IOL1_02V06
220003 h / 2228227 d	4WRPEH10-3x
220004 h / 2228228 d	4WRPE10-3x
220005 h / 2228229 d	4WRLE-4x

The present documentation provides supplementary information to data sheet 29121, 29122, 29123 and operating instructions 07600-B. Please observe the device descriptions and safety notes contained in these documents.

2 Communication

- IO-Link revision V1.1
- Bit rate COM3
- Minimum cycle time 0.6 ms



3 Parameter description

3.1 Process data input (PDI)

(Input process data) - total bit length = 16

Name	Description	Data type	Bit offset	Bit length	Value range
Actual value	Current actual value value	IntegerT	2	14	-100 to 100 -110 % = 0x8000 -100 % = 0x8BB0 -0.0134 % = 0xFFFC 0 % = 0x0000 +0.0134 % = 0x0004 +100 % = 0x7450 +110 % = 0x7FFC
Valve ok	High → no error Low → error	BooleanT	1	(False) inactive (True) active	
Valve ON	High → output stage active Low → output stage not active	BooleanT	0	(False) inactive (True) active	



3.2 Process data output (PDO)

(Output process data) - total bit length = 16

Name	Description	Data type	Bit offset	Bit length	Value range
Valve command value	Current valve command value	IntegerT	2	14	-100 to 100 -110 % = 0x8000 -100 % = 0x8BB0 -0.0134 % = 0xFFFC 0 % = 0x0000 +0.0134 % = 0x0004 +100 % = 0x7450 +110 % = 0x7FFC
Enable		BooleanT	0	(False) inactive (True) active	



3.3 Variables

Variables									
Name	Description	Index	Subindex bit offset	Data type	Length	Access rights	Standard	Value range	
Standard command		2	Sub 0	UIntegerT	8 bits	Write only		Acknowledging error 0xA0 Reset parameters to default values 0xA1 (only if not write-protected)	
Vendor name		16	Sub 0	StringT	max. 64 octets	Read only	Bosch Rexroth AG		
Vendor text		17	Sub 0	StringT	max. 64 octets	Read only	www.boschrexroth.com		
Product name		18	Sub 0	StringT	max. 64 octets	Read only	Valve family		
Product ID		19	Sub 0	StringT	max. 64 octets	Read only	Material number		
Product text		20	Sub 0	StringT	max. 64 octets	Read only	Valve order text		
Serial number		21	Sub 0	StringT	max. 16 octets	Read only			
Hardware version		22	Sub 0	StringT	max. 64 octets	Read only			
Firmware version		23	Sub 0	StringT	max. 64 octets	Read only			
Application-specific tag		24	Sub 0	StringT	max. 32 octets	Read/write	***		
Role	Function in the machine	25	Sub 0	StringT	max. 32 octets	Read/write	***	as of firmware version IOL1_02V06	
Position	Position in the machine	26	Sub 0	StringT	max. 32 octets	Read/write	***	as of firmware version IOL1_02V06	
Error counter		32	Sub 0	UIntegerT		Read only	Error counter		
Device status		36	Sub 0	UIntegerT	1 octet	Read only	0		
Detailed device status		37	Sub 0	-	23 octets	Read only	00 00 00 h	In preparation	
Warnings		64	Sub 0	-	1 octet	Read only	Bit 0: Overtemperature warning Bit 1 to bit 7: Not assigned	1: Temperature above warning threshold	
Operating hours		65	Sub 0	UIntegerT	4 octets	Read only		in minutes (as of firmware version IOL1_02V06)	
Error flags (stored)		66	Sub 0	-	1 octet	Read only	Bit 0: Status of PDI error message Bit 1: Error P24V Bit 2: Error of analog valve electronics Bit 3 to bit 6: Internal firmware error Bit 7: Communication error	0: No error, 1: Error 0: Voltage P24 applied 1: Voltage P24 not applied 0: No error, 1: Error 0: No error, 1: Error 0: No error, 1: Error	

Variables								
Name	Description	Index	Subindex bit offset	Data type	Length	Access rights	Standard	Value range
Error flags (current)		67	Sub 0	-	1 octet	Read only	Bit 0: Status of PDI error message Bit 1: Error P24V Bit 2: Error of analog valve electronics Bit 3 to bit 6: Internal firmware error Bit 7: Communication error	0: No error, 1: Error 0: Voltage P24 applied 1: Voltage P24 not applied 0: No error, 1: Error 0: No error, 1: Error 0: No error, 1: Error
Variables								
Name	Description	Index	Subindex bit offset	Data type	Length	Access rights	Standard	Value range
Time temperature1	Time temperature <0 °C	70	Sub 0	UIntegerT	4 octets	Read only		In minutes (as of firmware version IOL1_02V06)
Time temperature2	Time temperature >70 °C	71	Sub 0	UIntegerT	4 octets	Read only		In minutes (as of firmware version IOL1_02V06)
Time temperature3	Time temperature >100 °C	72	Sub 0	UIntegerT	4 octets	Read only		In minutes (as of firmware version IOL1_02V06)
Temperature		150	Sub 0	IntegerT	2 octets	Read only	Internal temperature in electronics housing [degrees Celsius] (tolerance: max. 10 °C)	
Set write protection	Setting write protection	199	Sub 0	StringT	max. 16 octets	Write only	0000	As of firmware version IOL1_02V06
Write protection	Input field for write protection	200	Sub 0	StringT	max. 16 octets	Write only	0000	As of firmware version IOL1_02V06
Offset	Offset to valve command value	201	Sub 0	SInteger	4 octets	Read/write	+/-40 % 0x00000BA0 0x FFFF460	As of firmware version IOL1_02V06
Ramp1	Ramp 1 slope	202	Sub 0	SInteger	4 octets	Read/write	0..100 % 0x0000 0000 .. 0x0000 7D00	As of firmware version IOL1_02V06
Ramp2	Ramp 2 slope	203	Sub 0	SInteger	4 octets	Read/write	0..100 % 0x0000 0000 .. 0x0000 7D00	As of firmware version IOL1_02V06
Ramp3	Ramp 3 slope	204	Sub 0	SInteger	4 octets	Read/write	0..100 % 0x0000 0000 .. 0x0000 7D00	As of firmware version IOL1_02V06
Ramp4	Ramp 4 slope	205	Sub 0			Read only		
Offset min	Minimum value for offset input	221	Sub 1	SInteger	4 octets	Read only	-40 % 0xFFFF F460	As of firmware version IOL1_02V06
Offset max	Minimum value for offset input	221	Sub 2	SInteger	4 octets	Read only	+40 % 0x0000BA0	As of firmware version IOL1_02V06
Offset default	Default value for offset	221	Sub 3	SInteger	4 octets	Read only	0	As of firmware version IOL1_02V06

Variables								
Name	Description	Index	Subindex bit offset	Data type	Length	Access rights	Standard	Value range
Ramp1 Min	Minimum value for ramp 1 input	222	Sub 1	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp1 Max	Maximum value for ramp 1 input	222	Sub 2	SIInteger	4 octets	Read only	100 % 0x0000 7D00	As of firmware version IOL1_02V06
Ramp1 Default	Default value for ramp 1	222	Sub 3	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp2 Min	Minimum value for ramp 2 input	223	Sub 1	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp2 Max	Maximum value for ramp 2 input	223	Sub 2	SIInteger	4 octets	Read only	100 % 0x0000 7D00	As of firmware version IOL1_02V06
Ramp2 Default	Default value for ramp 2	223	Sub 3	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp3 Min	Minimum value for ramp 3 input	234	Sub 1	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp3 Max	Maximum value for ramp 3 input	234	Sub 2	SIInteger	4 octets	Read only	100 % 0x0000 7D00	As of firmware version IOL1_02V06
Ramp3 Default	Default value for ramp 3	234	Sub 3	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp4 Min	Minimum value for ramp 4 input	235	Sub 1	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06
Ramp4 Max	Maximum value for ramp 4 input	235	Sub 2	SIInteger	4 octets	Read only	100 % 0x0000 7D00	As of firmware version IOL1_02V06
Ramp4 Default	Default value for ramp 4	235	Sub 3	SIInteger	4 octets	Read only	0	As of firmware version IOL1_02V06

4 Functional description

4.1 Influencing the valve command value

With the help of the variables “offset” and “ramps 1...4” the valve command value can be influenced.

The “offset” variable can be used to add a positive or negative value to the command value. The offset value is limited to min/max via index 221. The offset is used for correcting a hydraulic drive in case of a command value of 0 and with open-loop position control.

The input refers to a 14-bit representation of the actual value ($\pm 100\%$ corresponds to ± 7444)

Example: Index 201: Input value 74 means +1 % offset.

Proceeding in the case of drifting axes

The command value of the control must be set to "0". The hydraulic axis must be in open-loop control (no position controller active). By increasing/reducing index 201 the offset can now be changed until the axis shows the desired drift characteristics.

4.2 Ramp slopes (index 202 to 205)

Variables “ramp1” to “ramp4” are provided for limiting the change rate of the command value.

The ramp function covers 4 sections and hence 4 ramp slopes.

1. The valve opens or opens further in the positive command value direction (index 202)
2. The valve closes in the positive command value range (index 203)
3. The valve opens or opens further in the negative command value range (index 204)
4. The valve closes in the negative command value range (index 205)

The time basis for the ramp function 1 millisecond (ms).

When a new command value is received by the PDO, the internal working command value is increased or reduced, respectively, every millisecond by the amount of the relevant variable (ramp 1 to ramp 4) until the new command value is reached (see figure for the assignment of variables of ramp1 to ramp4).

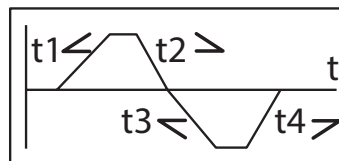


Abb. 1: 4Q ramp

Example 1 Index 202 = 744; input: Command value step-change from 0 to +7444 (100 %) → the working command value is increased in 10 steps = 10 ms from 0 to 100 %.

Example 2 Index 202 = 372; input: Command value step-change from 0 to +7444 (100 %) → the working command value is increased in 20 steps = 20 ms from 0 to 100 %.

Example 3 Index 202 = 1000; input: Command value step-change from 0 to +7444 (100 %) → the working command value is increased in 8 steps = 8 ms from 0 to 100 %.

If the value 0 is entered as a ramp slope the function is deactivated in the relevant section and the command value is fed forward again directly to the valve controller. All the other ramp values continue to work according to their setting. If the ramp function is to be deactivated completely, all 4 ramp slopes have to be set to 0.

4.3 Operating hours

With “voltage ON” the operating hours counter index 65 is counted up by one digit every 15 minutes and the value is stored. When the supply voltage is switched off and on again the value saved last is restored.

4.4 Temperature histogram

The 3 parameters of index 70 to 72 record the operating time within a temperature range in dependence upon the electronics temperature, e.g. index 70 <0 °C. Counting and storage take place in the same way as described in section 4.3. The same is valid for indices 71 >70 °C and index 72 >100 °C.

4.5 Compatibility mode

For valve family 4WRPEH6-3x two different device IDs (2228225 and 2228226) are available for the various firmware functions. As of firmware version IOL1_02V06 only device ID 2228226 is used. Downward compatibility ensures that valves with device ID 2228225 can be replaced by valves with device ID 2228226 without any error message being generated by the IO-Link master.

4.6 Write protection

The firmware offers the possibility of activating write protection for the variables. To this end a text has to be written to variable “set write protection” (index 199). If this text is unequal to “0000” write protection is activated. When the correct password is written to variable “write protection” (index 200) the variables can be written again until the next reset is executed. While write protection is active, default values cannot be set via the default command OXA1.

To provide protection against cyberattacks only a limited number of write attempts (max. number of accesses). Then, the write accesses to the password are ignored until the unit is switched off and on the next time.



The disguised representation of password strings is not provided in the IO-Link definition.

Passwords are defined as “string” in the IODD. For systemic reasons, passwords can only be entered in plain text in PC-assisted control tools and they remain displayed after having been written.

Remedy for ensuring secrecy:

Enter password without being observed, then write password to the device and then enter a blank as password string (do not write blank to the device!).

Bosch Rexroth AG

Industrial Hydraulics

Zum Eisengießer 1

97816 Lohr a. Main

Germany

Phone +49 (0) 9352/18-0

my.support@boschrexroth.de

www.boschrexroth.com