

RE 29293

Edition: 2022-05

Replaces: 2019-06

rexroth
 A Bosch Company

Directional control valve, pilot-operated, with integrated field bus (IFB-Multi-Ethernet)

Type 4WRLF



H8152

- ▶ Sizes 10 ... 27
- ▶ Component series 4X
- ▶ Maximum operating pressure of 350 bar (ports P, A, B)
- ▶ Rated flow 600 l/min ($\Delta p = 10$ bar)

CE

Features

- ▶ Open
 - Integrated fieldbus (IFB Multi-Ethernet)
 - Bus connection/service interface (Sercos, EtherCAT, EtherNet/IP, PROFINET RT, VARAN)
- ▶ Scalable
 - 2 configurable analog pressure sensor inputs
- ▶ Precise
 - Integrated pressure/force control, optional
 - High response sensitivity and low hysteresis
- ▶ Safe
 - Internal safety function (can be used up to category 4/PL e according to EN 13849-1)
 - CE conformity according to EMC Directive 2014/30/EU

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HYQUIP Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK

2/32 **4WRLF** | Directional control valve

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
4	WRL	F						-	4X	/			00	/	24	D9	*

01	4 main ports	4
02	Directional control valve, pilot-operated	WRL
03	With integrated fieldbus	F
04	Size 10	10
	Size 16	16
	Size 25	25
	Size 27	27

Symbols

05	Possible versions see page 4	
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Rated flow at 10 bar pressure differential (5 bar per control edge)

06	- Size 10	
	60 l/min (only symbol E, E1-, W6-, W8-, V and V1-)	60
	100 l/min	100 ◇
	- Size 16	
	200 l/min (only symbol W6- and W8-)	200 ◇
	250 l/min (only symbol E, E1-, V, V1- and Q3)	250 ◇
	- Size 25	
	350 l/min (only symbol W6- and W8-) ¹⁾	350 ◇
	400 l/min (only symbol E, E1-, V, V1- and Q3)	400 ◇
	- Size 27	
	430 l/min (only symbol W6- and W8-) ¹⁾	430 ◇
	600 l/min (only symbol E, E1-, V, V1- and Q3)	600 ◇

Flow characteristic

07	Linear	L ◇
	Linear with fine control range (only NG10; other sizes on request)	P
	Progressive with linear fine control range (only symbols Q3-)	M
08	Without overlap jump (only symbols V, V1- and Q3)	No code
	With overlap jump (opening point 5% with covered valve; only symbols E, E1-, W6-, W8-)	J
09	Component series 40 ... 49 (40 ... 49: unchanged installation and mounting dimensions)	4X

Seal material (observe compatibility of seals with hydraulic fluid used, see page 10)

10	NBR seals	M ◇
	FKM seals	V

Pilot oil flow

11	External pilot oil supply, external pilot oil return	XY ◇
	Internal pilot oil supply, external pilot oil return	PY
	Internal pilot oil supply, internal pilot oil return	PT ◇
	External pilot oil supply, internal pilot oil return	XT

Sandwich plate shut-off valve

12	Without shut-off valve	no code ◇
	With shut-off valve (sandwich plate valve "Z4WE 6 E166-3X/EG24...", see data sheet 23193)	WL

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
4	WRL	F						-	4X	/			00	/	24	D9	*

13	Without internal pressure sensors	00
14	Supply voltage 24 V	24

Ethernet interface

15	EtherNET/IP	E
	PROFINET RT	N
	Sercos	S
	EtherCAT (CANopen profile)	T
	VARAN	V


Connector

16	Voltage supply, enable acknowledgment	D9
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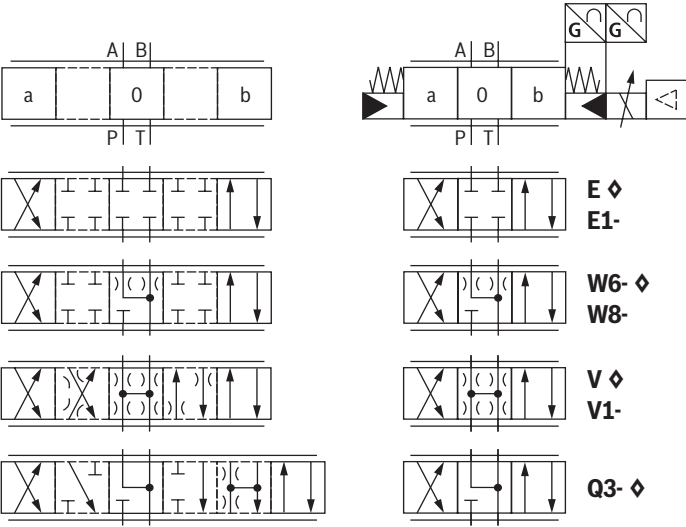
Pressure sensor interface

17	Without interface	0
	Analog interface for a maximum of 3 external pressure sensors (0 ... 10 V)	5
18	Further details in the plain text	*

¹⁾ Higher rated flow upon request

 **Notice:** **◇** = Preferred type

Symbols



With symbol E1-, V1- and W8-:

P → A: $q_{V \max}$ B → T: $q_{V/2}$
P → B: $q_{V/2}$ A → T: $q_{V \max}$

Notice: ♦ = Preferred type

Version	Simple	Detailed
"XY"		
"PY"		
"PT"		
"XT"		

Notice:

- Representation according to DIN ISO 1219-1.
- Hydraulic interim positions are shown by dashes.
- For information on the "switch-off behavior", refer to Technical data on page 10.
- Symbols V and V1 are not suitable for use in safety applications (no overlap).

Function

General

The pilot-operated **IFB Multi-Ethernet** valve (Integrated **Fieldbus**) is a digital directional control valve with integrated fieldbus.

The following operating modes are possible:

- ▶ Standard:
 - Valve direct control
 - Flow control
- ▶ Version "5" (with external pressure sensors):
 - Pressure/force control
 - Active damping
 - Alternating control (flow - pressure/force); pQ function (flow-controlled)
- ▶ Command value presetting is done via the Ethernet interface (X7E1 or X7E2)
- ▶ The feedback information of the actual value signals to the higher-level control is provided via the Ethernet interface (X7E1 or X7E2)
- ▶ The controller parameters are set via the Ethernet interface (X7E1 or X7E2)

Set-up

The directional control valve with IFB Multi-Ethernet electronics mainly consists of:

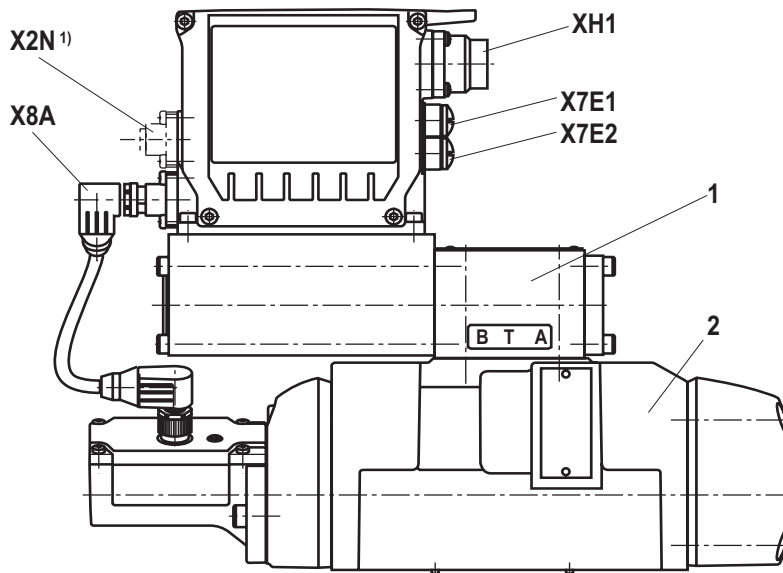
- ▶ Pilot control valve (1) with control spool and sleeve in servo quality
- ▶ Main stage (2) with centering springs and position feedback
- ▶ Integrated fieldbus (3) with:
 - connector, voltage supply, safety shut-down (XH1)
 - Ethernet interfaces (X7E1, X7E2)
 - analog sensor interfaces (X2N)
 - interface for the position transducer of the main stage (X8A)

Function

The integrated electronics (OBE) compare the specified command value to the position actual value of the control spool of the main stage. In case of a control deviation, the control solenoid of the pilot control valve is activated and its control spool is adjusted.

The flow which is activated via the control cross-sections at the pilot control valve leads to an adjustment of the control spool of the main valve. The stroke/control cross-section of the main valve is regulated proportionally to the command value. In case of a command value presetting of 0%, the electronics adjust the control spool of the main valve to central position.

The pilot oil supply in the pilot control valve is either internal via port P or external via port X. The feedback can be internal via port T or external via port Y to the tank.



1) Only version "5"

6/32 **4WRLF** | Directional control valve

Function

Symbol V and V1-

The control spool of the main valve is not in a safe position after the release is switched off. The enable acknowledgment (pin C) is not set. If the supply voltage fails or in case of cable break, the integrated electronics will de-energize the control solenoid, the pilot control spool will move to the fail-safe position and will unload the pilot oil chambers of the main valve. Operated by the spring, the control spool of the main valve will move to the offset position (approx. 6% P → B/A → T).

Symbol E., W. and Q3-

If the control spool of the main valve is in the covered spring-centered central position, the enable acknowledgment (pin C) is set. If the control spool of the main valve leaves the covered spring-centered central position or the release is set, the enable acknowledgment expires. If the supply voltage fails or in case of cable break, the integrated electronics will de-energize the control solenoid, the pilot control spool will move to the fail-safe position and will unload the pilot oil chambers of the main valve. The control spool of the main valve assumes the covered spring-centered central position.

Safety function

Thanks to the control solenoid (enable pin D, low signal) at the connector (XH1), shut-off is enabled. The control spool of the valve is in spring-centered central position after shut-off (see notes).

Enable acknowledgment pin C for solenoid B is "high".

By connection of the control solenoid (enable pin D, high signal), the valve can be regulated in both directions by command value presetting.

Enable acknowledgment pin C for solenoid B is "low".

The integrated control electronics (OBE) of the valve enables the additional shut-off of a channel according to EN 13849-1 in both directions (depending on the symbol, the valve can be considered as safely shut-off).

For this purpose, a suitable control system must be provided to perform the plausibility check between the direction-dependent valve signals "enable input" and "enable acknowledgment" (diagnosis signal fed back by the valve) and react in an error case. When using symbol V and V1-, the valve cannot be used in a safety-relevant manner according to EN 13849-1.

Monitoring

The digital control electronics enable comprehensive monitoring functions/error detection including:

- ▶ Undervoltage
- ▶ Communication error
- ▶ Cable break for analog sensor inputs
- ▶ Monitoring of the microcontroller (watchdog)
- ▶ Temperature of the integrated electronics

IndraWorks DS PC program

To implement the project planning task and to parameterize the valves, the user may use the IndraWorks DS engineering tool (see accessories):

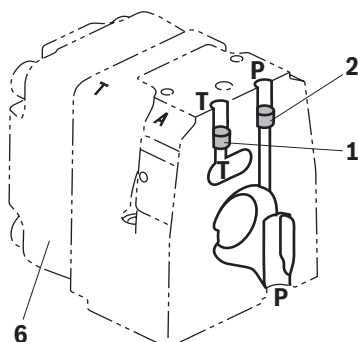
- ▶ Project planning
- ▶ Parameterization
- ▶ Commissioning
- ▶ Diagnosis
- ▶ Comfortable administration of all data on a PC
- ▶ PC operating systems: Windows 7-10

Notice:

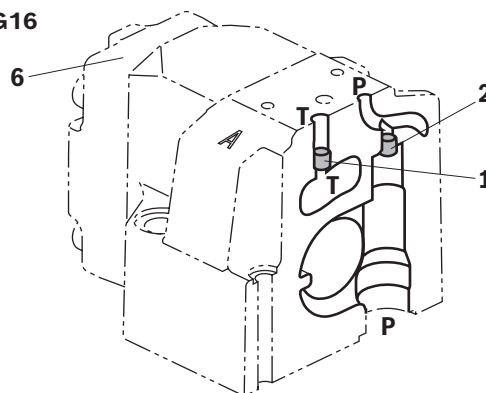
- ▶ Symbol V and V1-:
Pilot-operated 4/3 directional control valves are only functional in the active control loop and do not have a locking basic position when deactivated. Consequently, "external check valves" are required in many applications and must be taken into account regarding the switch-on/switch-off order. While the electrical supply voltage is being switched off, the drive may be accelerated for a short time in functional direction P → B.
- ▶ Symbol E. and W.:
Pilot-operated 4/3 directional control valves with positive overlap are functional in controlled or regulated axes. The overlap in the de-energized state is approx. 20% of the control spool stroke. While the release is being switched off, the drive may be accelerated for a short time in functional direction P → B (see operating instructions 29391-B).
- ▶ 4/3 directional control valves do not have a leakage-free basic locking when deactivated. Leakage must be considered when designing the drive.
- ▶ Valve type 4WRLF can be used as shut-off element cat. 3 or 4 (up to PL e according to EN 13849-1). For both categories, an additional shut-off element is required to achieve a two-channel shut-off. For further information on the safety application, see operating instructions 29391-B.

Pilot oil supply (schematic illustration)

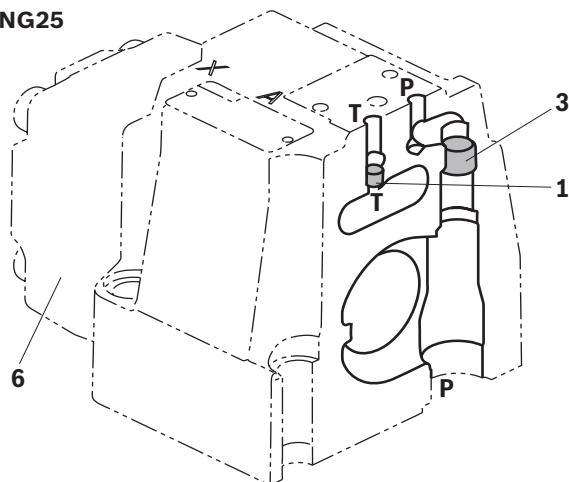
NG10



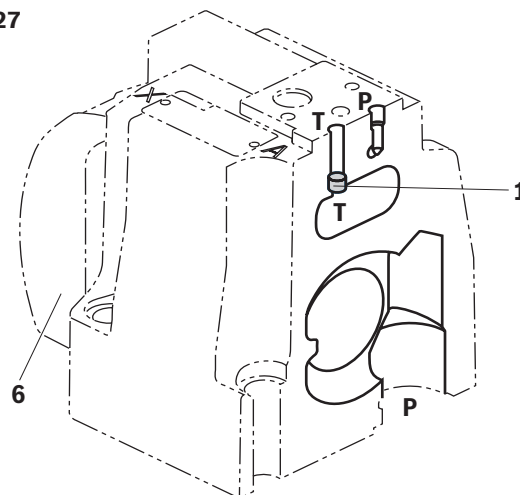
NG16



NG25



NG27



- 1 Plug screw M6 according to DIN 906, wrench size 3
– pilot oil return
- 2 Plug screw M6 according to DIN 906, wrench size 3
– pilot oil supply
- 3 Plug screw M12 x 1.5 according to DIN 906,
wrench size 6
– pilot oil supply
- 6 Housing cover main stage (position transducer side)

Pilot oil supply

external: **2, 3** closed

internal: **2, 3** open

Pilot oil return

external: **1** closed

internal: **1** open

Further explanations on page 8.

8/32 4WRLF | Directional control valve

Pilot oil supply

Version "XY"

External pilot oil supply

External pilot oil return

In this version, the pilot oil is supplied from a separate control circuit (external).

The pilot oil return is not directed into channel T of the main valve but is separately directed to the tank via port Y (external).

Version "PY"

Internal pilot oil supply

External pilot oil return

With this version, the pilot oil is supplied from channel P of the main valve (internal).

The pilot oil return is not directed into channel T of the main valve but is separately directed to the tank via port Y (external).

In the subplate, port X is to be closed.

Version "PT"

Internal pilot oil supply

Internal pilot oil return

With this version, the pilot oil is supplied from channel P of the main valve (internal).

The pilot oil is directly returned to channel T of the main valve (internal).

In the subplate, ports X and Y are to be closed.

Version "XT"

External pilot oil supply

Internal pilot oil return

In this version, the pilot oil is supplied from a separate control circuit (external).

The pilot oil is directly returned to channel T of the main valve (internal).

In the subplate, port Y is to be closed.

Technical data

(For applications outside these values, please consult us!)

General					
Size	NG	10	16	25	27
Type of connection	Subplate mounting				
Porting pattern		ISO 4401 -05-05-0-05	ISO 4401 -07-07-0-05	ISO 4401 -08-08-0-05	ISO 4401 -08-08-0-05
Weight	kg	9	12	19	21
Installation position	any				
Ambient temperature range	°C	−20 ... +60			
Storage temperature range	°C	+5 ... +40			
Maximum storage time	years	1 (if the storage conditions are observed, refer to the operating instructions 07600-B)			
Maximum relative humidity (no condensation)	%	95			
Protection class according to EN 60529	IP65 (if suitable and correctly mounted mating connectors are used)				
Maximum surface temperature	°C	120 (individual operation)			
MTTF _D value according to EN ISO 13849	► Hydraulic (category 1)	years	75 (for further details, see operating instructions 29391-B)		
	► Hydraulic and electric (category 3 and 4, without power supply unit)	years	70 (for further details, see operating instructions 29391-B)		
Sine test according to DIN EN 60068-2-6	10 ... 2000 Hz / maximum of 10 g / 10 cycles / 3 axes				
Noise test according to DIN EN 60068-2-64	20 ... 2000 Hz / 10 g _{RMS} / 30 g peak / 30 min. / 3 axes				
Transport shock according to DIN EN 60068-2-27	15 g / 11 ms / 3 axes				
Conformity	► CE according to EMC directive 2014/30/EU, tested according to	EN 61000-6-2 and EN 61000-6-3			
	► RoHS directive	2011/65/EU ¹⁾			

¹⁾ The product fulfills the substance requirements of the RoHS directive 2011/65/EU.

Technical data

(For applications outside these values, please consult us!)

Hydraulic					
Size	NG	10	16	25	27
Maximum operating pressure	► Ports A, B, P				
	– External pilot oil supply	bar	350		270
	– Internal pilot oil supply	bar	280		270
	► Port X	bar	280		270
	► Ports T, Y	bar	250		210
Hydraulic fluid		see table page 10			
Hydraulic fluid temperature range (flown-through)		°C	–20 ... +70		
Viscosity range	► Recommended	mm²/s	30 ... 45		
	► Maximum admissible	mm²/s	20 ... 380		
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)		Class 18/16/13 ²⁾			
Rated flow (Δp = 5 bar per control edge) ³⁾		l/min	60/100	200/250	350/400 430/600
Maximum flow		l/min	300	800	1250 1850
Leakage flow (inlet pressure 100 bar)	► Symbol E, E1-				
	– Main valve	l/min	0.06	0.13	0.17
	– Main valve + pilot control valve	l/min	0.14	0.28	0.42
	► Symbol W6-, W8-				
	– Main valve	l/min	0.12	0.26	0.35
	– Main valve + pilot control valve	l/min	0.2	0.41	0.6
Minimum pilot pressure (pilot control valve)		bar	10		
Pilot flow ⁴⁾	► Symbol E, W	l/min	2.4	3.5	7.5
	► Symbol V, Q3-	l/min	4.5	11.5	22

²⁾ The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

³⁾ Flow for deviating Δp (per control edge):

$$q_x = q_{Vnom} \times \sqrt{\frac{\Delta p_x}{5}}$$

⁴⁾ At port X and Y with stepped input signal from 0 ... 100% (100 bar)

10/32 **4WRLF** | Directional control valve

Technical data

(For applications outside these values, please consult us!)

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	► Insoluble in water	HETG	ISO 15380	90221
		HEES		
	► Soluble in water	HEPG	ISO 15380	
Flame-resistant	► Water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	► Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223



Important information on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:**
If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.

► Flame-resistant – containing water:

- Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended – if possible specific to the installation – backing up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
- Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, the command value profile is to be adjusted for proportional and high-response valves.

Static/dynamic					
Size	NG	10	16	25	27
Hysteresis	%	< 0.1			
Range of inversion	%	< 0.08			
Response sensitivity	%	< 0.05			
Manufacturing tolerance q_{Vmax}	%	≤ 10			
Temperature drift (temperature range 20 °C ... 80 °C)	%/10 °C	Zero shift < 0.25			
Zero point calibration	%	±1 (ex works)			
Step response time (for 0 ... 100% at X = 100 bar)	ms	40	60	60	60
Switch-off behavior (after electric shut-off)	► Symbols E, E1-, W6-, W8-	Pilot control valve in fail-safe position, main valve moves to overlapped spring-centered central position			
	► Symbol V, V1-	Pilot control valve in fail-safe position, main valve moves to spring-centered "offset position" (approx. 6%, P→B/A→T)			
	► Symbol Q3	Pilot control valve in fail-safe position, main valve moves to spring-centered "offset position" (P blocked, A/B to port T open)			

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Technical data

(For applications outside these values, please consult us!)

Electrical, integrated electronics (OBE)			
Supply voltage ^{5), 6)}	► Nominal value	VDC	24
	► Minimum	VDC	18
	► Maximum	VDC	36
	► Maximum residual ripple	Vpp	2.5 (comply with the absolute supply voltage limit values)
	► Maximum power consumption	W	40
	► Fuse protection, external	A	4, time-lag
Current consumption	► Maximum ⁷⁾	A	2.5
	► Impulse current	A	4
Relative duty cycle time according to VDE 0580		%	S1 (continuous operation)
Functional ground and screening		see connector pin assignment (CE-compliant installation) page 14	
Booting time		s	< 15
Switching input (enable) XH1	► Quantity		1
	► Low level range	V	-3 ... 5
	► High-level range	V	15 ... U_B
	► Maximum current consumption at high level	mA	< 1
Switching output (enable acknowledgment) XH1	► Quantity		1
	► Low level range	V	0 ... 3
	► High-level range	V	15 ... U_B
	► Current carrying capacity	mA	50 (short-circuit-proof)
	► Inductive load admissible		No
Analog sensor X2N	► Quantity (voltage inputs)		3 ⁸⁾
	► Supply voltage	V	24 (corresponding to supply voltage applied to XH2)
	► Maximum supply current	mA	50
	► AD resolution	bit	12
	► Voltage inputs		
	– Measurement range	V	0 ... 10
		– Input resistance	kΩ 100 +10%

⁵⁾ Supply voltage is used directly for sensor connection X8M (no internal voltage limitation)

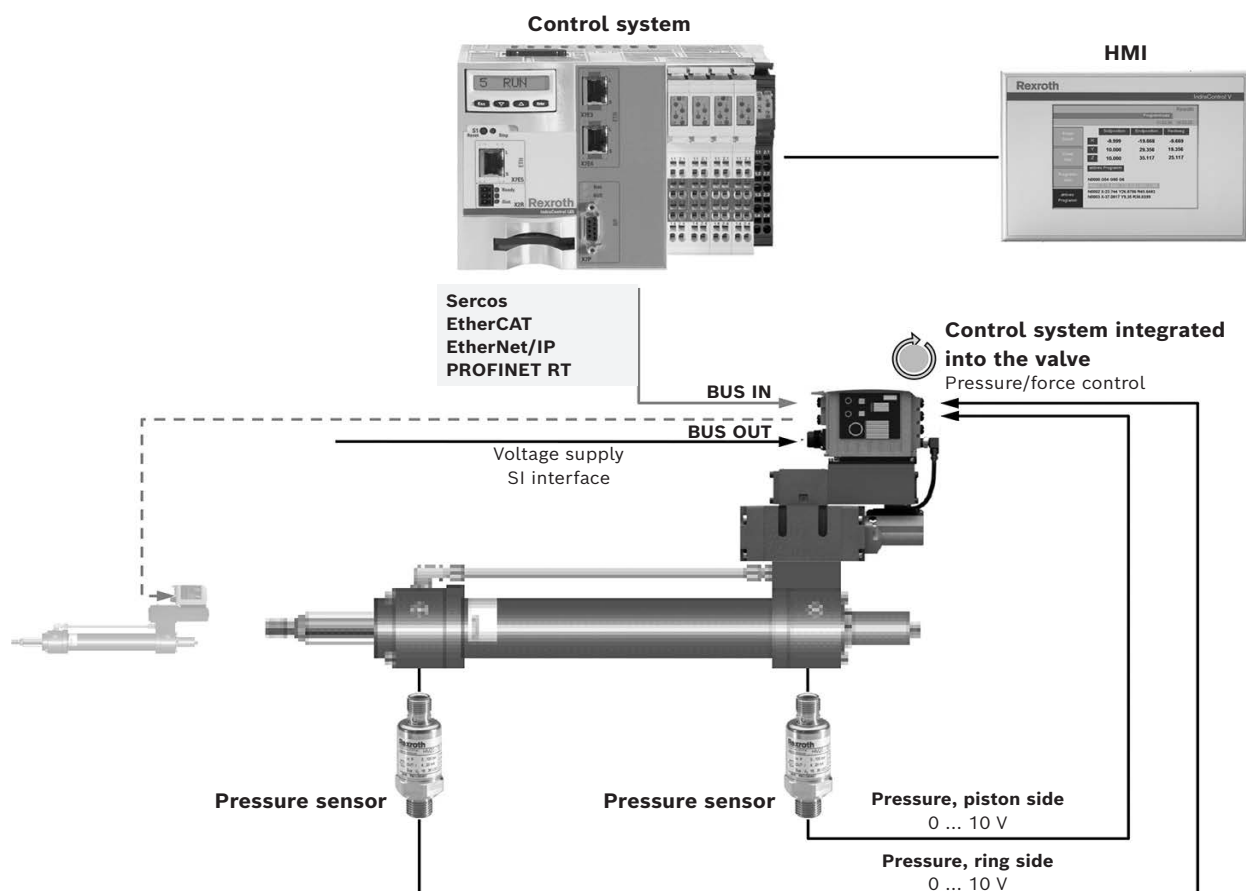
⁶⁾ Voltage limit values must be observed directly at the connector of the valve (observe line length and cable cross-section!)

⁷⁾ The maximum current consumption will increase when using the sensor inputs or the switching output according to the external load

⁸⁾ Only version "5"

12/32 **4WRLF** | Directional control valve

Representation in the system network (version "5")

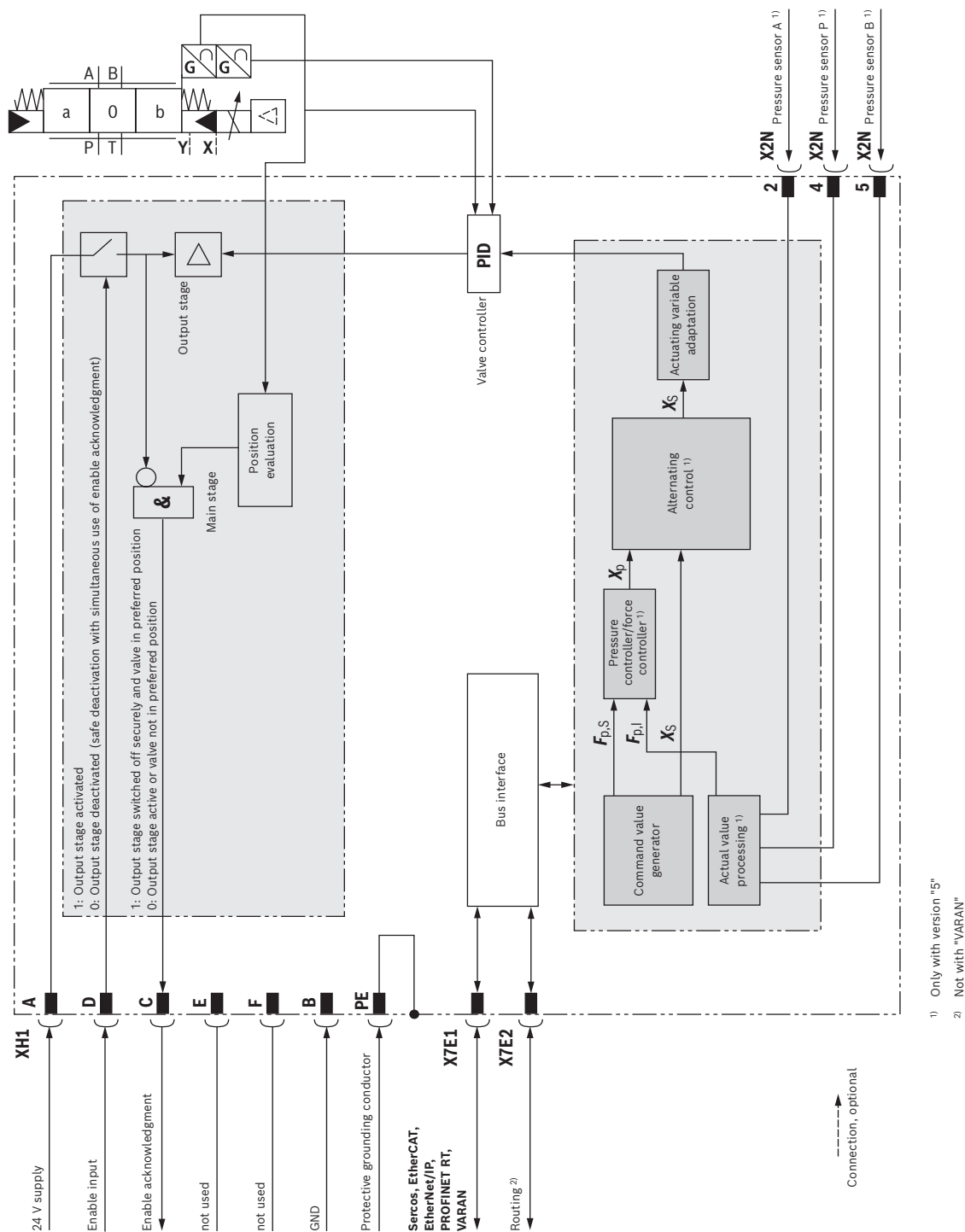


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Block diagram/controller function block



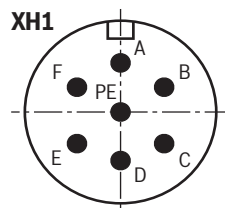
14/32 4WRLF | Directional control valve

Electrical connections, assignment

Connector pin assignment XH1, 6-pole + PE according to DIN 43563

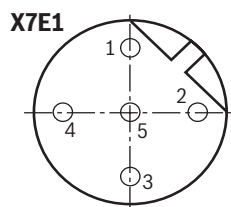
Pin	Assignment of interface D9
A	24 VDC supply voltage ¹⁾
B	GND
C	Enable acknowledgment 24 VDC (I_{\max} 50 mA) ²⁾ (high \geq 15 V; low $<$ 2 V)
D	Enable input 24 VDC (high \geq 15 V; low $<$ 2 V)
E	not used
F	not used
PE	Functional ground (connected directly to metal housing)

- ¹⁾ A load increases the current consumption on pin A
²⁾ Enable acknowledgment is issued only if the valve has safely switched off according to EN 13849-1, see operating instructions 29391-B.



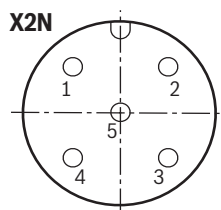
Connector pin assignment for Ethernet interface "X7E1" and "X7E2" (coding D), M12, 4-pole, socket

Pin	Assignment
1	TxD +
2	RxD +
3	TxD -
4	RxD -
5	not used



Analog configurable sensor interface, port "X2N" (coding A), M12, 5-pole, socket

Pin	Assignment
1	+24 V voltage output
2	Analog sensor input 2 (0 ... 10 V)
3	GND
4	Analog sensor input 4 (0 ... 10 V)
5	Analog sensor input 3 (0 ... 10 V)



Only with version "5"

Notice:

- Reference potential for all signals: GND
- We recommend connecting the shields on both sides via the metal housings of the plug-in connectors. Using connector pins will affect the effectiveness of the shielding effect. Internal screens are not required.

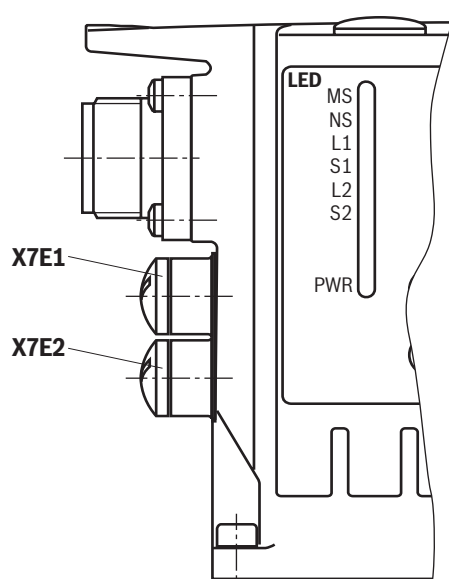
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LED displays

LED	Interface	Sercos	EtherNET/IP	EtherCAT	PROFINET RT	VARAN
MS	Electronics module	Module status	Module status	Module status	Module status	Module status
NS		S	Network status and others	Network status and others	Network status and others	Network status and others
L1	X7E1	Link and others	Link and others	Link/activity	Link and others	Link and others
S1		Activity and others	Activity and others	not used	Activity and others	Active and others
L2	X7E2	Link and others	Link and others	Link/activity	Link and others	not used
S2		Activity and others	Activity and others	not used	Activity and others	not used
PWR	XH1	Power	Power	Power	Power	Power



Displays of the status LEDs

Power LED (LED PWR)	Display status
Off	No voltage supply
Green	Operation

Module status LED (LED MS)	Display status
Off	No voltage supply
Green-red, flashing	Initialization
Green, flashing	Drive ready for operation
Green	Drive active
Orange, flashing	Warning
Red, flashing	Error
Green, rapidly flashing	Firmware must be loaded

Link LED (LED L1)	Display status
Permanently lit	Cable plugged in, connection established

Activity LED (LED S1)	Display status
Flashing	Data sent/received

Notice:

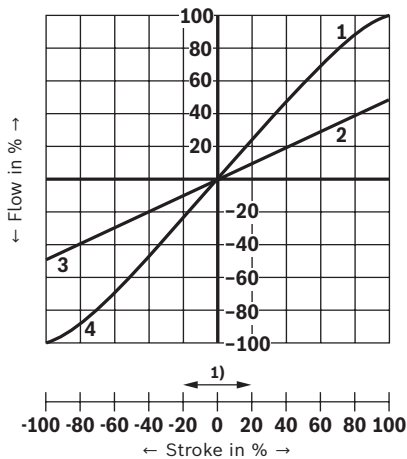
- For the connection to the M12 sockets, we recommend using self-locking mating connectors
- The MS module status LED relates to the electronics module
- The NS network status LED indicates the status of the control communication, see application description 30338-FK
- LEDs L1, S1, L2 and S2 relate to interfaces "X7E1" and "X7E2"
- For a detailed description of the diagnosis LEDs, please refer to the functional description Rexroth HydraulicDrive HDx.
- Function is only available after start-up of the electronics.

16/32 4WRLF | Directional control valve

Characteristic curves: Flow characteristic "L" and "P"
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

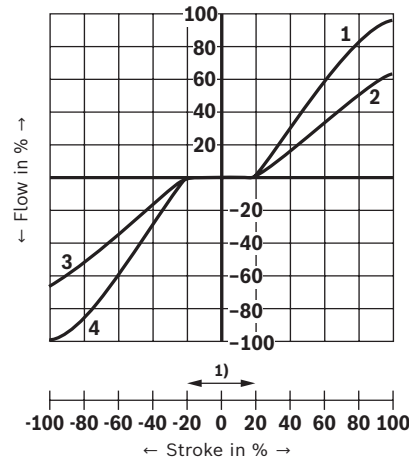
Flow/signal function – Version "L"

Symbol V, V1-



- 1 P-A; B-T (1:1)
- 2 B-T (2:1)
- 3 P-B (2:1)
- 4 P-B; A-T (1:1)

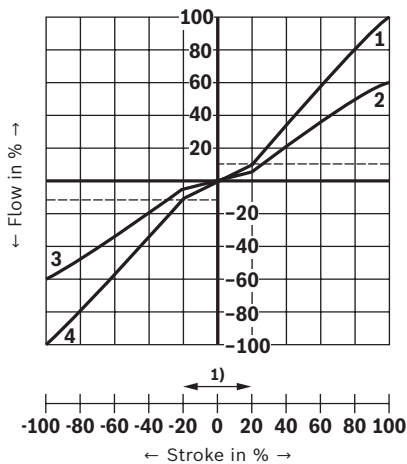
Symbols E, E1-, W6-, W8-



- 1 P-A; B-T (1:1)
- 2 B-T (2:1)
- 3 P-B (2:1)
- 4 P-B; A-T (1:1)

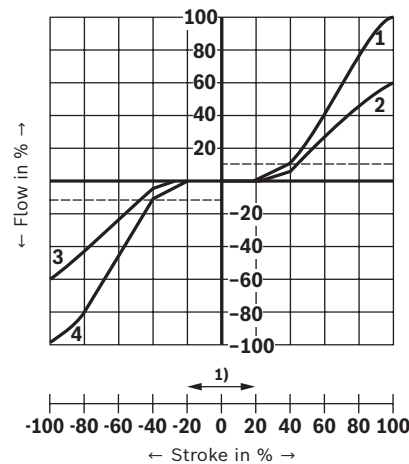
Flow/signal function – Version "P"

Symbol V, V1-



- 1 P-A; B-T (1:1)
- 2 B-T (2:1)
- 3 P-B (2:1)
- 4 P-B; A-T (1:1)
- 10% q_v

Symbols E, E1-, W6-, W8-

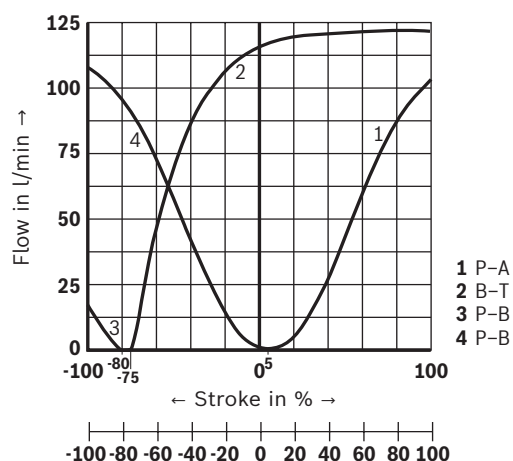


- 1 P-A; B-T (1:1)
- 2 B-T (2:1)
- 3 P-B (2:1)
- 4 P-B; A-T (1:1)
- 10% q_v

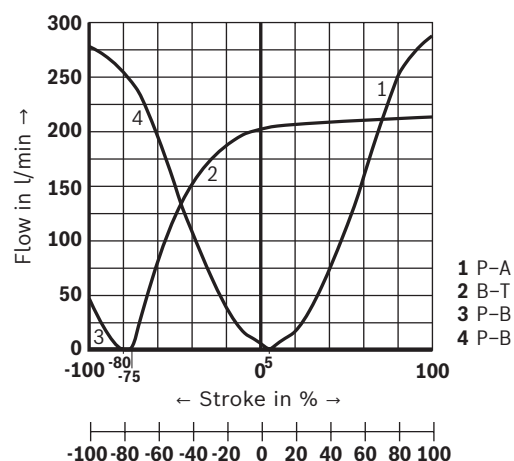
1) Step compensation (opening at 5%)

Characteristic curves: Flow characteristic "M"
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

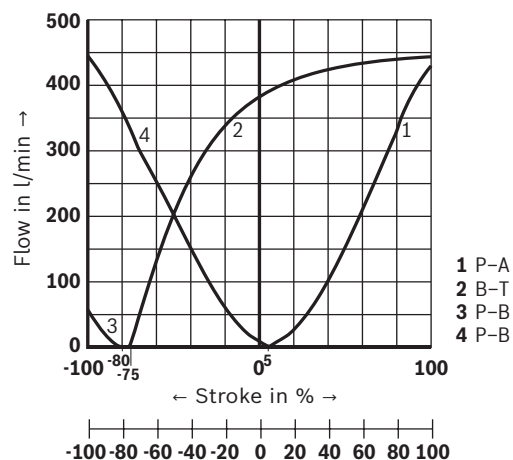
Symbol Q3, version "100"



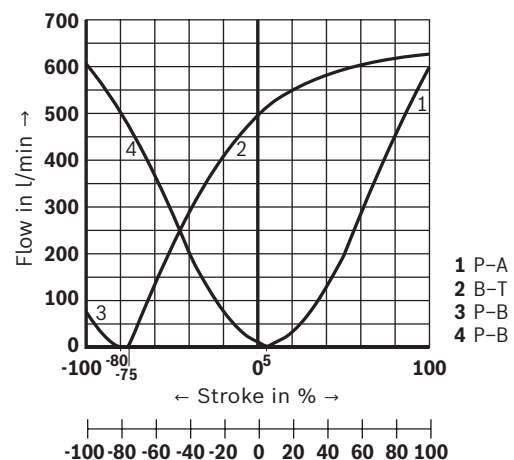
Symbol Q3, version "250"



Symbol Q3, version "400"



Symbol Q3, version "600"

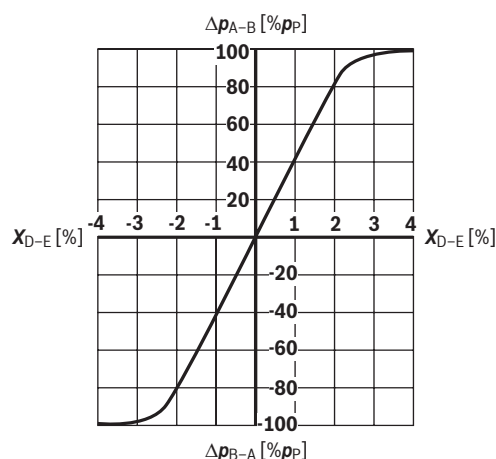
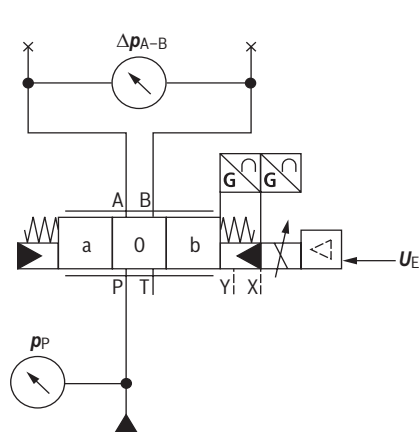


18/32 4WRLF | Directional control valve

Characteristic curves

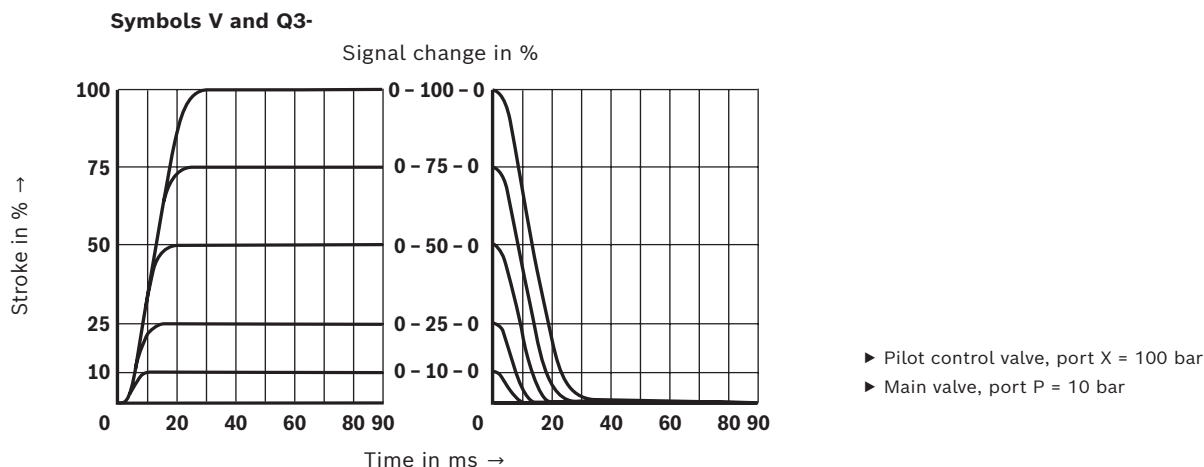
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Pressure amplification

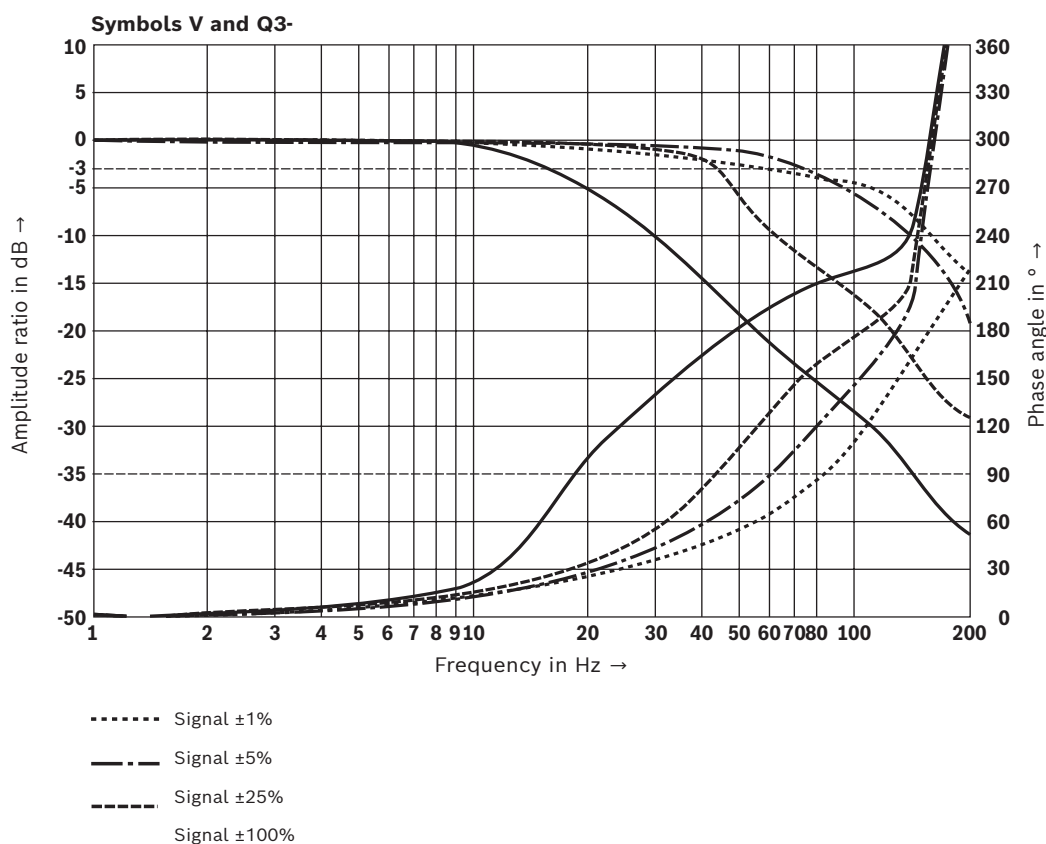


Characteristic curves: Size 10
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Transition function with stepped electric input signals



Frequency response



RE 29293, edition: 2022-05, Bosch Rexroth AG

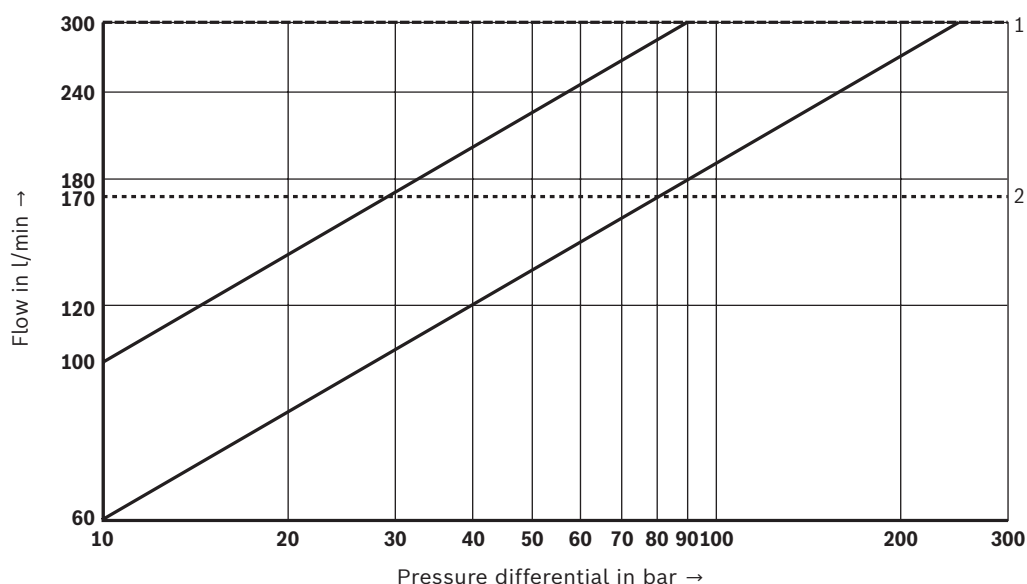
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20/32 4WRLF | Directional control valve

Characteristic curves: Size 10
(valid for HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Flow/load function (with maximum valve opening; tolerance $\pm 10\%$)



- 1 Maximum admissible flow
- 2 Recommended flow
(flow velocity 30 m/s)

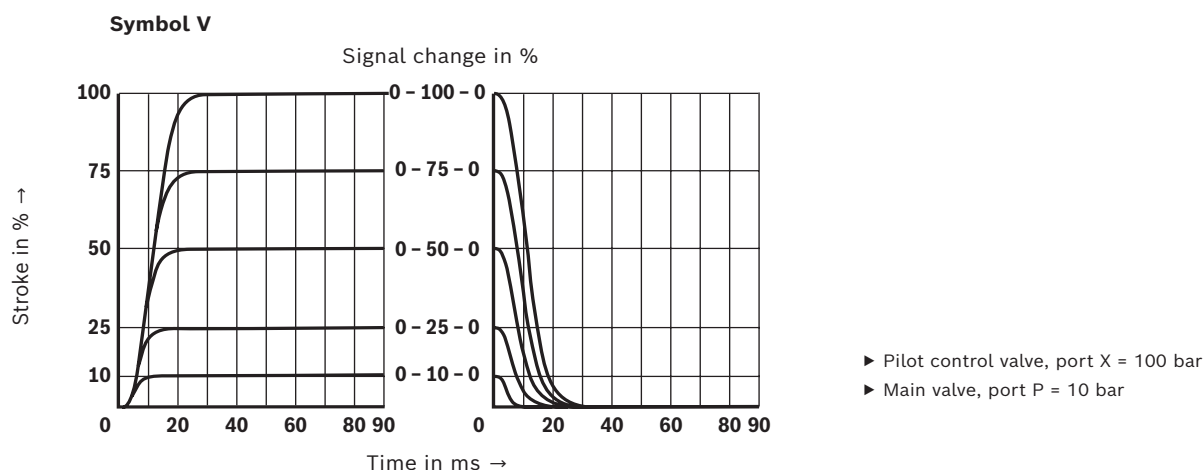
Bosch Rexroth AG, RE 29293, edition: 2022-05

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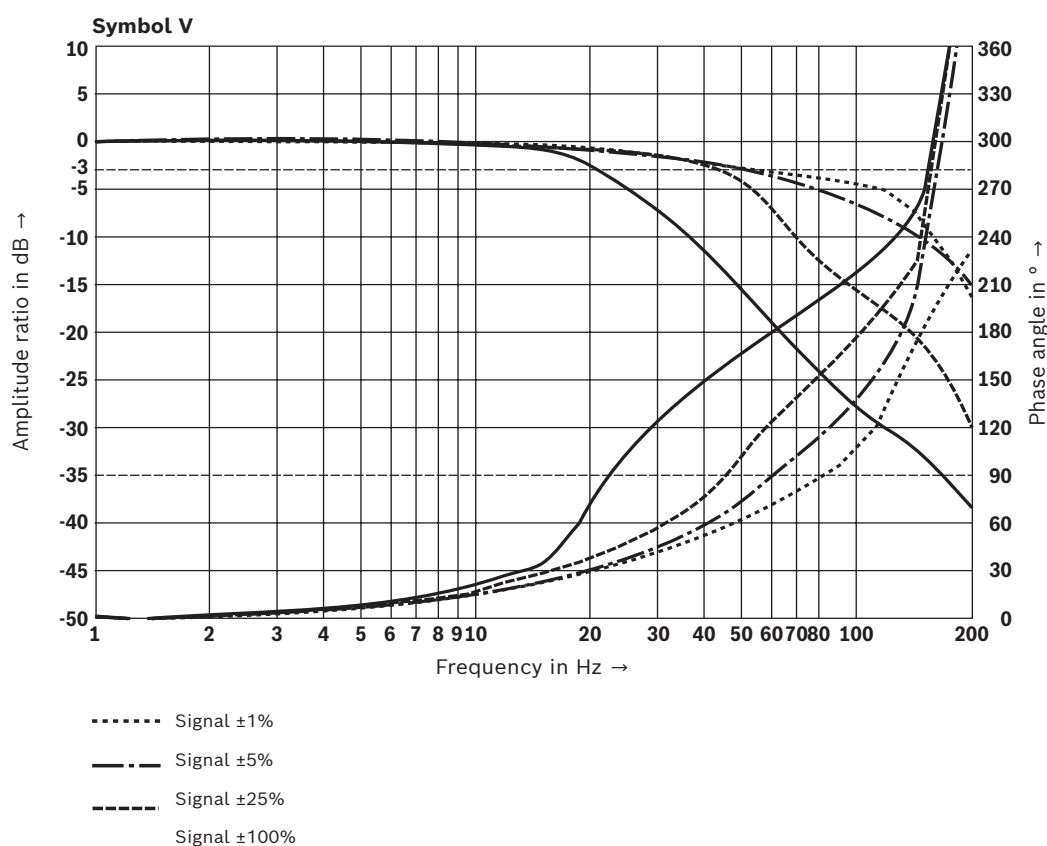
HYQUIP Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK

Characteristic curves: Size 16
 (measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Transition function with stepped electric input signals



Frequency response



RE 29293, edition: 2022-05, **Bosch Rexroth AG**

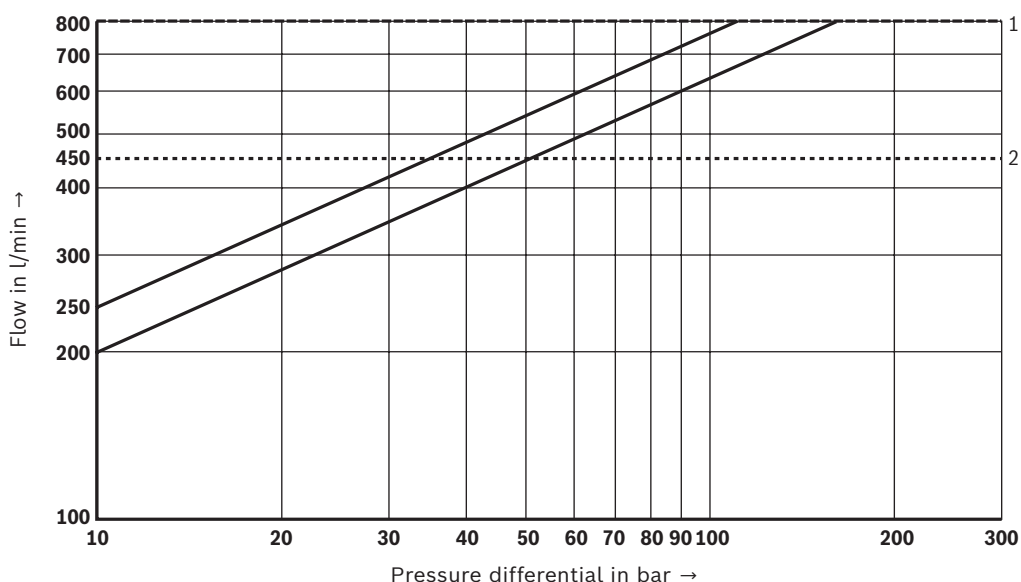
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22/32 4WRLF | Directional control valve

Characteristic curves: Size 16
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Flow/load function (with maximum valve opening; tolerance $\pm 10\%$)



- 1 Maximum admissible flow
- 2 Recommended flow limitation
(flow velocity 30 m/s)

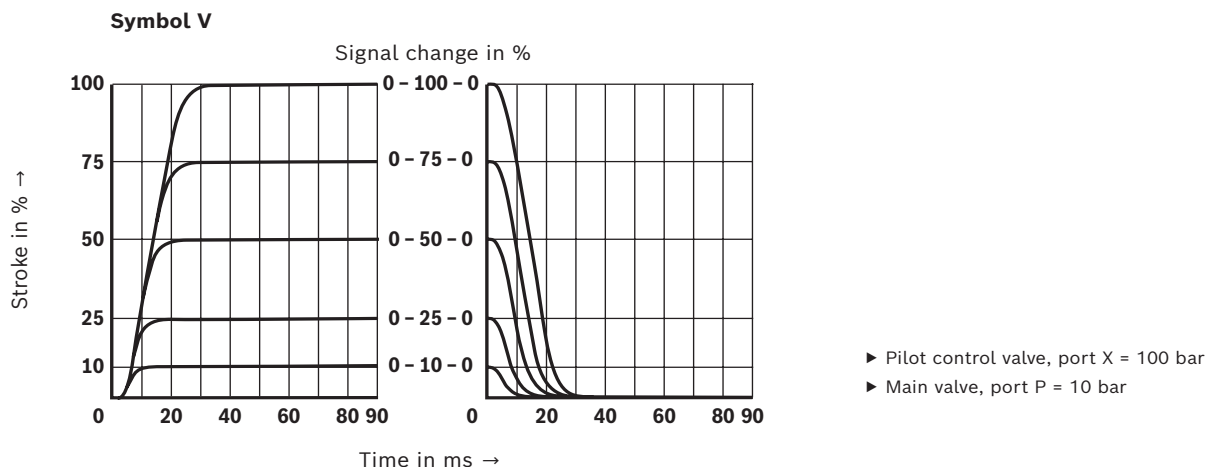
Bosch Rexroth AG, RE 29293, edition: 2022-05

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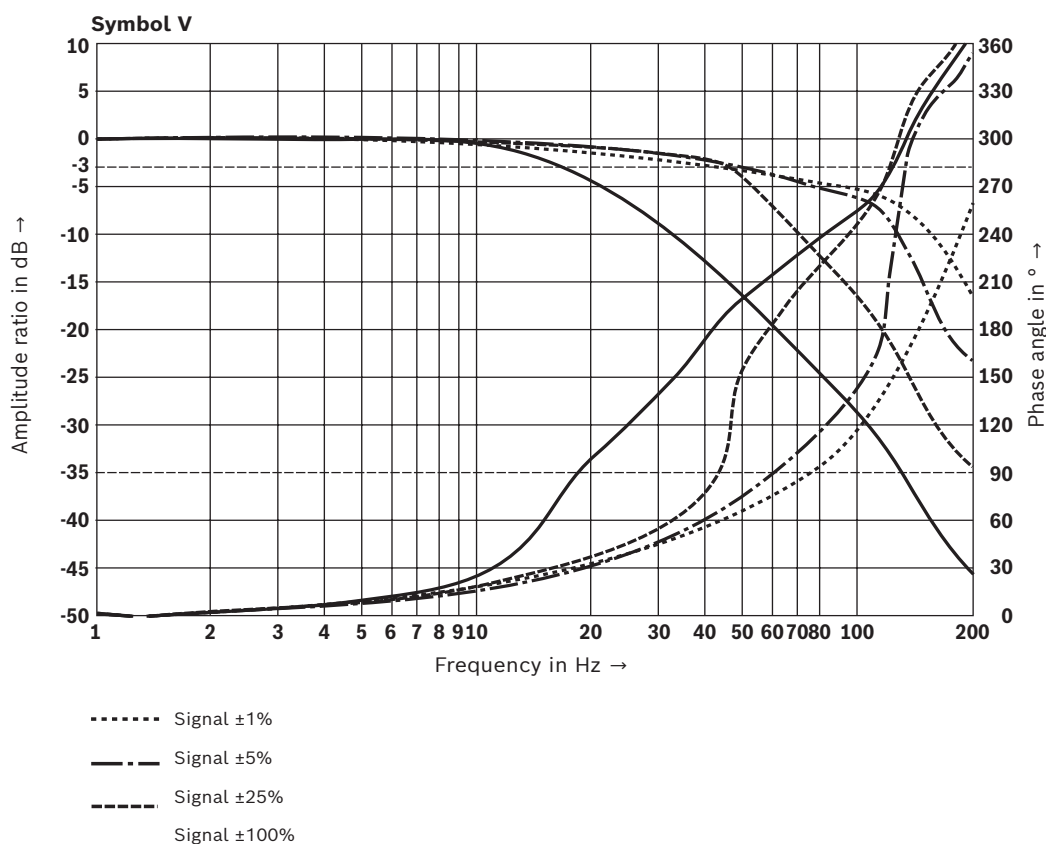
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Characteristic curves: Size 25
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Transition function with stepped electric input signals



Frequency response



RE 29293, edition: 2022-05, Bosch Rexroth AG

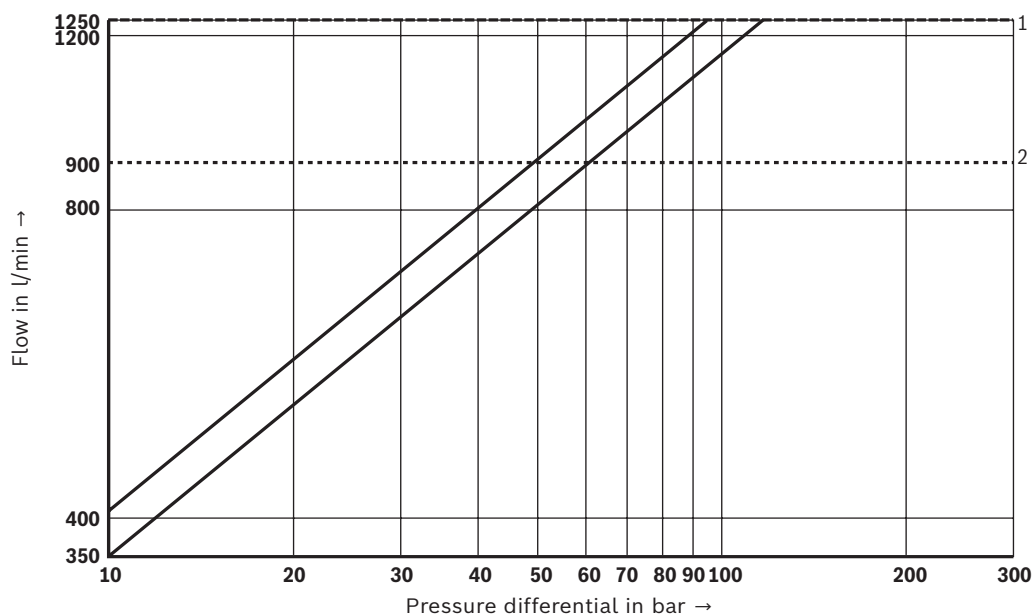
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24/32 4WRLF | Directional control valve

Characteristic curves: Size 25
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

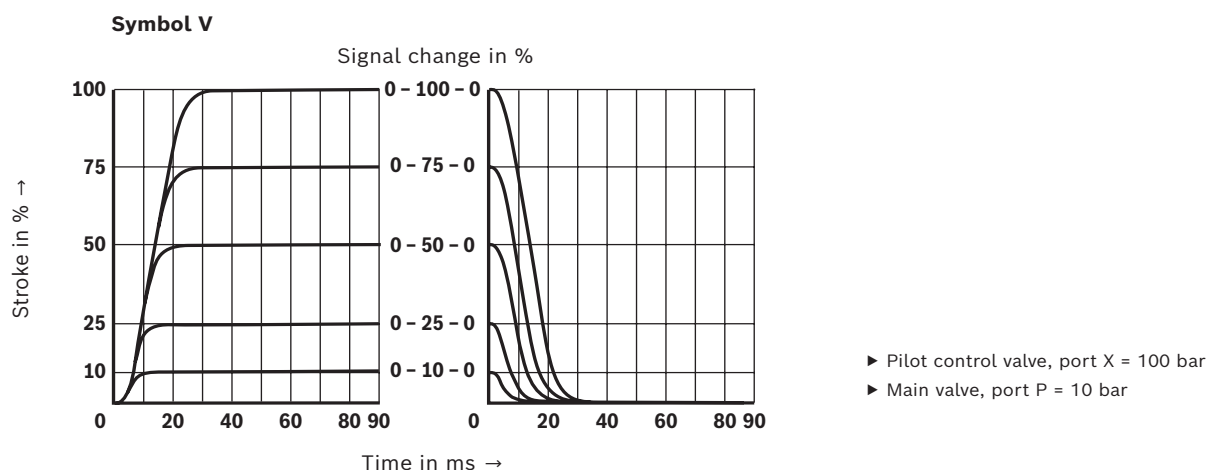
Flow/load function (with maximum valve opening; tolerance $\pm 10\%$)



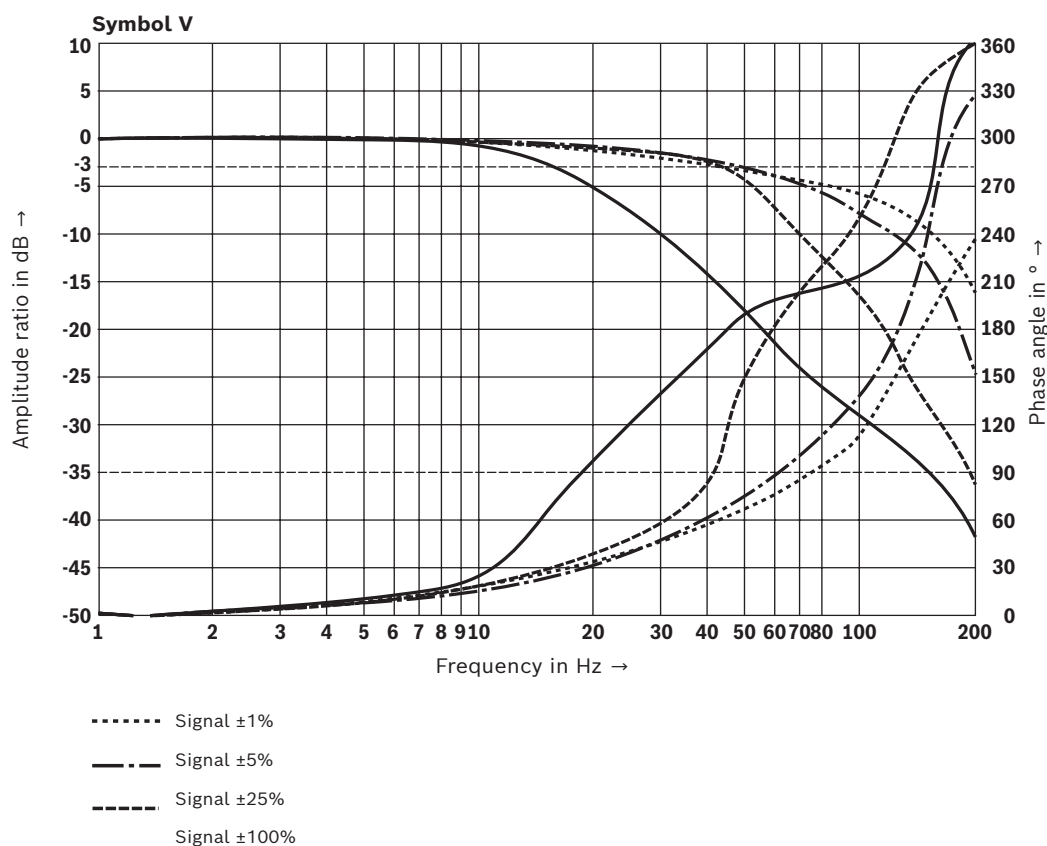
- 1 Maximum admissible flow
- 2 Recommended flow limitation
(flow velocity 30 m/s)

Characteristic curves: Size 27
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Transition function with stepped electric input signals



Frequency response



RE 29293, edition: 2022-05, Bosch Rexroth AG

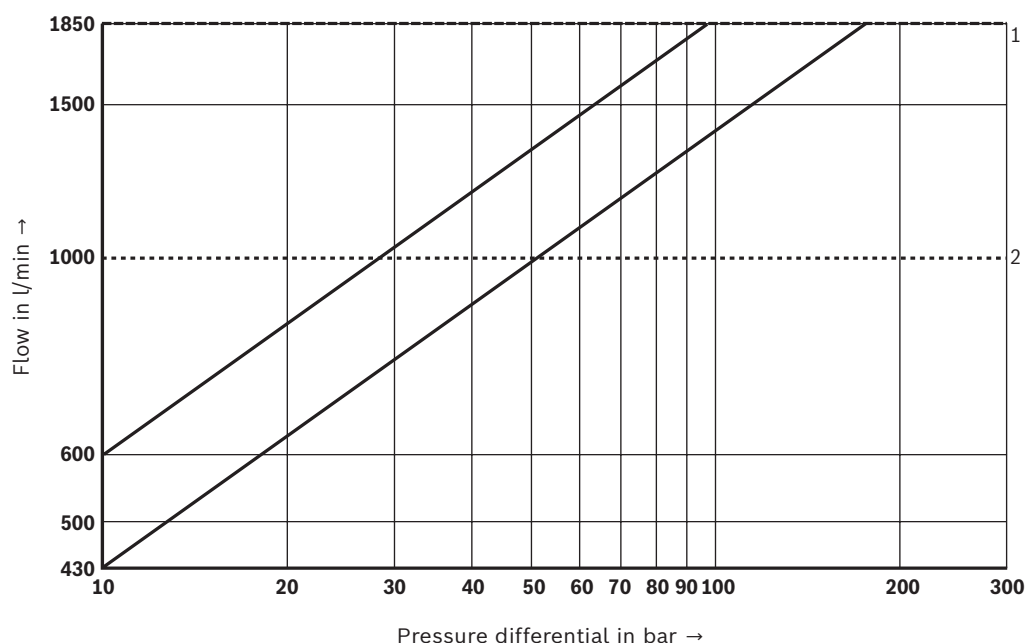
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26/32 4WRLF | Directional control valve

Characteristic curves: Size 27
 (measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Flow/load function (with maximum valve opening; tolerance $\pm 10\%$)



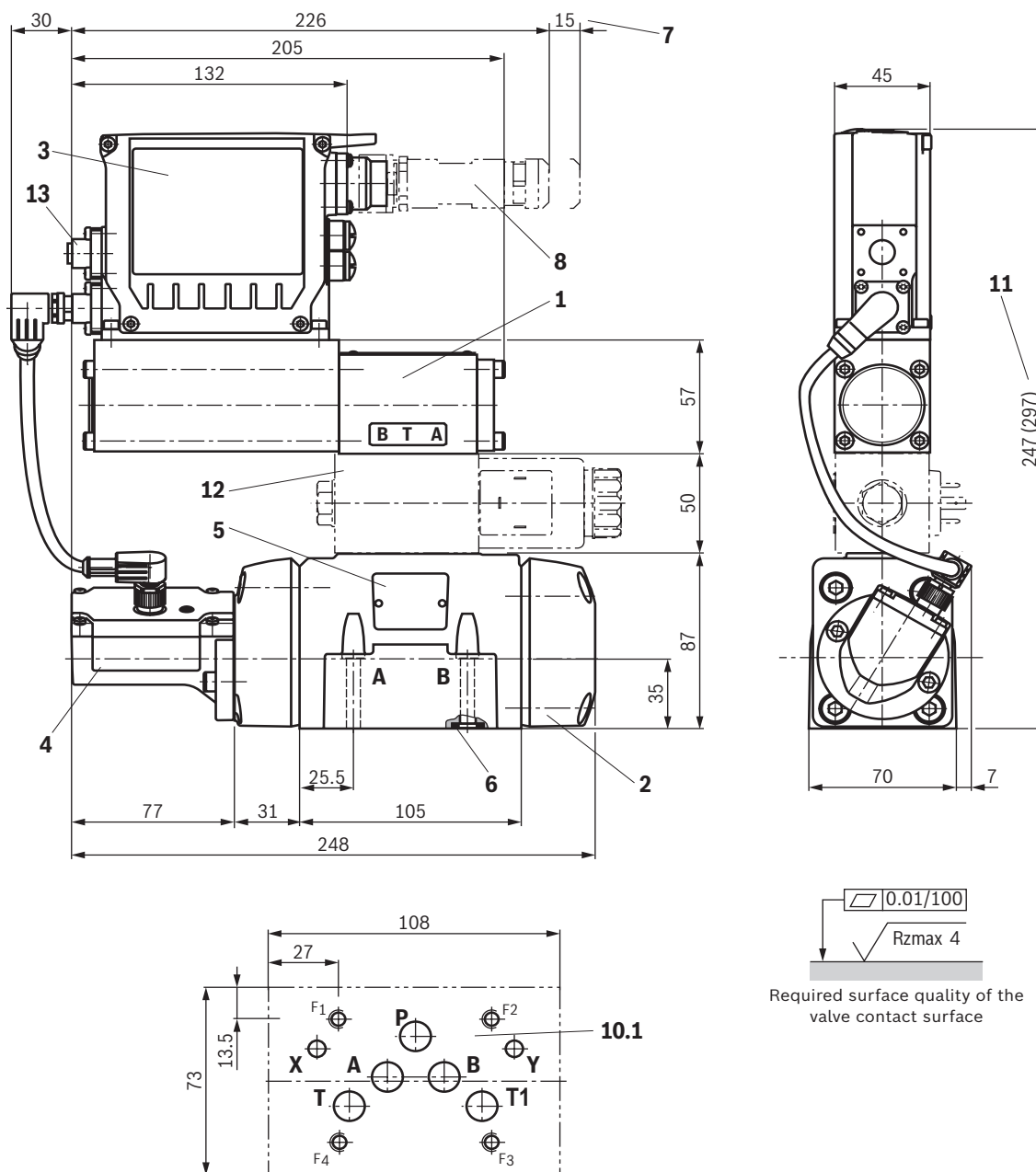
- 1 Maximum admissible flow
- 2 Recommended flow limitation
 (flow velocity 30 m/s)

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Dimensions: Size 10
(dimensions in mm)



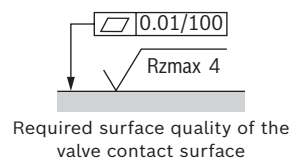
For item explanations, valve mounting screws and subplates, see page 30.




Notice:

The dimensions are nominal dimensions which are subject to tolerances.

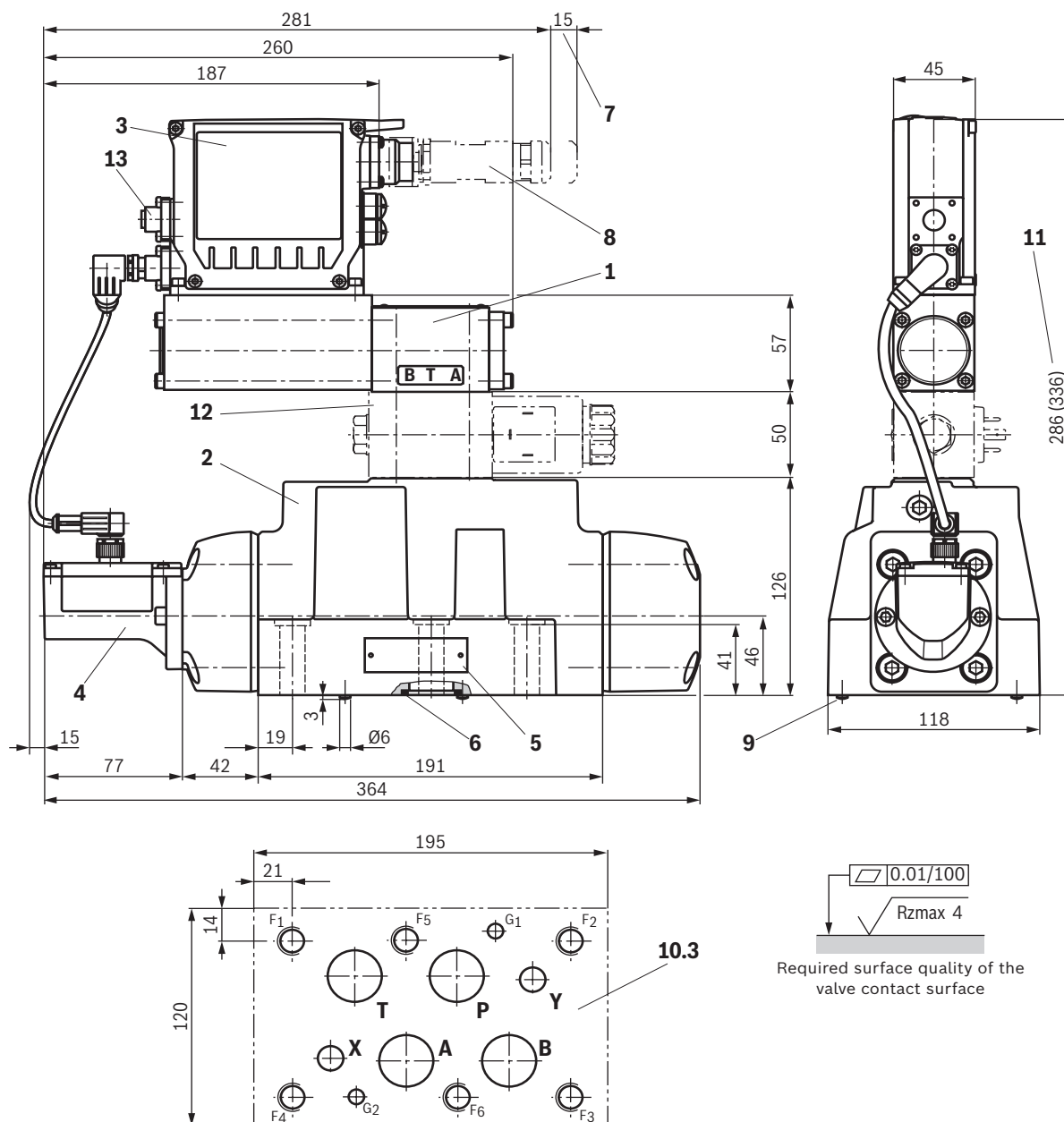
Dimensions: Size 16
(dimensions in mm)



 **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

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Dimensions: Sizes 25 and 27
(dimensions in mm)



NG	L1	L2	L3	L4	L5	L6	L7	H1	H2	H3	(H3)	H4	B1	B2
25	15	19	364	191	187	260	281	46	126	286	336	195	118	120
27	15	20.5	371	198	190	264	284	50	140	300	350	200	120	124

For item explanations, valve mounting screws and subplates, see page 30.



Notice:

The dimensions are nominal dimensions which are subject to tolerances.

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30/32 **4WRLF** | Directional control valve

Dimensions

- 1** Pilot control valve
- 2** Main valve
- 3** Integrated electronics (OBE)
- 4** Inductive position transducer (main valve)
- 5** Name plate
- 6** Identical seal rings for ports P, A, B, T;
Identical seal rings for ports X, Y
- 7** Space required for removing the mating connector
- 8** Mating connectors, separate order, see page 31 and data sheet 08006.
- 9** Locking pin
- 10.1** Machined valve contact surface,
porting pattern according to ISO 4401-05-05-0-05
- 10.2** Machined valve contact surface,
porting pattern according to ISO 4401-07-07-0-05
Deviating from the standard: ports P, A, B, T – Ø20 mm
Minimum screw-in depth:
▶ Ferrous metal: 1.5 x Ø
▶ Non-ferrous metal: 2.0 x Ø
- 10.3** Machined valve contact surface,
porting pattern according to ISO 4401-08-08-0-05
Deviating from the standard:
▶ NG25: Ports X, Y – Ø14 mm
▶ NG27: Ports P, A, B, T – Ø32 mm
Minimum screw-in depth:
▶ Ferrous metal: 1.5 x Ø
▶ Non-ferrous metal: 2.0 x Ø
- 11** Dimension () with version "WL"
- 12** Shut-off valve, optional (sandwich plate valve
"Z4WE 6 E166-3X/EG24...", see data sheet 23193)
- 13** Port X2N (only version "5")

Valve mounting screws (separate order)

Size	Quantity	Hexagon socket head cap screws	Material number
10	4	ISO 4762 - M6 x 45 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B Tightening torque $M_A = 13.5 \text{ Nm} \pm 10\%$	R913043777
	or		
	4	ISO 4762 - M6 x 45 - 10.9 Tightening torque $M_A = 15.5 \text{ Nm} \pm 10\%$	Not included in the Rexroth delivery range
16	2	ISO 4762 - M6 x 60 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B Tightening torque $M_A = 12.2 \text{ Nm} \pm 10\%$	R913043410
	4	ISO 4762 - M10 x 60 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B Tightening torque $M_A = 58 \text{ Nm} \pm 20\%$	R913014770
	or		
	2	ISO 4762 - M6 x 60 - 10.9 Tightening torque $M_A = 15.5 \text{ Nm} \pm 10\%$	Not included in the Rexroth delivery range
	4	ISO 4762 - M10 x 60 - 10.9 Tightening torque $M_A = 75 \text{ Nm} \pm 20\%$	
25, 27	6	ISO 4762 - M12 x 60 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B Tightening torque $M_A = 100 \text{ Nm} \pm 20\%$	R913015613
	or		
	6	ISO 4762- M12 x 60 - 10.9 Tightening torque $M_A = 130 \text{ Nm} \pm 20\%$	Not included in the Rexroth delivery range



Notice:

The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure.

Subplates (separate order) with porting pattern according to ISO 4401, see data sheet 45100.

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Accessories (separate order)

Mating connectors and cable sets

Port	Designation	Version	Short designation	Material number	Data sheet
XH1	Mating connector; for valves with round connector, 6-pole + PE	Straight, metal	7PZ31...M	R900223890	08006
		Straight, plastic	7PZ31...K	R900021267	
		Angled, plastic	–	R900217845	–
	Cable sets; for valves with round connector, 6-pole + PE	Plastic, 3.0 m	7P Z31 BF6	R901420483	08006
		Plastic, 5.0 m		R901420491	
		Plastic, 10.0 m		R901420496	
		Plastic, 20.0 m	–	R901448068	–
X7E1, X7E2	Cable set; shielded, 4-pole, D coding	Straight connector M12, on straight connector M12, line cross-section 0.25 mm², CAT 5e, length freely selectable (= xx.x)	–	R911172111 ¹⁾	–
	Cable set; shielded, 4-pole	Straight connector M12, on straight connector RJ45, line cross-section 0.25 mm², CAT 5e, length freely selectable (= xx.x)	–	R911172135 ²⁾	–
X2N	Cable set; shielded, 5-pole, for connecting Rexroth pressure sensors, type HM20, A coding	PUR/PVC, straight connector M12, on straight socket M12, line cross-section 0.34 mm², 0.6 m	–	R901111709	–
		PUR/PVC, straight connector M12, on straight socket M12, line cross-section 0.34 mm², 1.0 m	–	R901111712	–
		PUR/PVC, straight connector M12, on straight socket M12, line cross-section 0.34 mm², 2.0 m	–	R901111713	–
	Cable set; shielded, 5-pole, A coding	Straight connector M12, on free line end, line cross-section 0.34 mm², 1.5 m	–	R901111752	–
		Straight connector M12, on free line end, line cross-section 0.34 mm², 3.0 m	–	R901111754	–
		Straight connector M12, on free line end, line cross-section 0.34 mm², 5.0 m	–	R901111756	–
		Straight connector M12, on free line end, line cross-section 0.34 mm², 10.0 m	–	R913005147	–

¹⁾ Additional indication of type designation RKB0040/xx.x

²⁾ Additional indication of type designation RKB0044/xx.x




Notice:

- Tighten the M12 connector with a manual torque wrench by 1 Nm.
- Self-locking M12 cables must be used.
- It must be ensured that cables are secured without radial force.
- All cables connected to "XH1", "X7E1" and "X7E2" must be bundled in a wire harness after 20 cm the latest. The wire harness must be fixed after further 20 ... 30 cm. Make sure that there is no relative motion between the fixation and the valve.
- Before the fixation point, there must not be any cable loops.
- In general, the information on installation provided by the cable manufacturers must be observed.
- Respectively, the cable of "X2N" (if used) is also fixed as described above.
- For further information, see operating instructions 29391-B

32/32 **4WRLF** | Directional control valve

Accessories (separate order)

Protective cap

Protective cap M12	Version	Material number
		R901075563

Parameterization

The following is required for the parameterization with PC		Material number/download
1 Commissioning software	IndraWorks, Indraworks D, Indraworks DS	www.boschrexroth.com/IAC
2 Connection cable, 3 m	Shielded, M12 on RJ45, length can be freely selected (= xx.x)	R911172135 (additional indication of type designation RKB0044/xx.x)

Project planning and maintenance instructions

- ▶ The supply voltage must be permanently connected; otherwise, bus communication is not possible.
- ▶ If electro-magnetic interference is to be expected, take appropriate measures for ensuring the function (depending on the application, e.g. shielding, filtration).
- ▶ The devices have been tested in the plant and are supplied with default settings.
- ▶ Only complete devices can be repaired. Repaired devices are returned with default settings. User-specific settings will not be applied. The machine end-user will have to retransfer the corresponding user parameters.

Further information

- ▶ High-response/proportional valve with Multi-Ethernet interface
- ▶ Operation fieldbus electronics (xx = software version):
 - Functional description Rexroth HydraulicDrive HDx-20
 - Parameter description Rexroth HydraulicDrive HDS-16, HDx-17 ... HDx-20
 - Description of diagnosis Rexroth HydraulicDrive HDS-16, HDx-17 ... HDx-20
- ▶ Subplates
- ▶ Hydraulic fluids on mineral oil basis
- ▶ Environmentally compatible hydraulic fluids
- ▶ Flame-resistant, water-free hydraulic fluids
- ▶ Flame-resistant hydraulic fluids – containing water
- ▶ Hydraulic valves for industrial applications
- ▶ General product information on hydraulic products
- ▶ Installation, commissioning and maintenance of servo valves and high-response valves
- ▶ Commissioning software and documentation on the Internet
- ▶ Information on available spare parts

Operating instructions 29391-B

- 30338-FK
- 30330-PA
- 30330-WA

Data sheet 45100

Data sheet 90220

Data sheet 90221

Data sheet 90222

Data sheet 90223

Operating instructions 07600-B

Data sheet 07008

Data sheet 07700