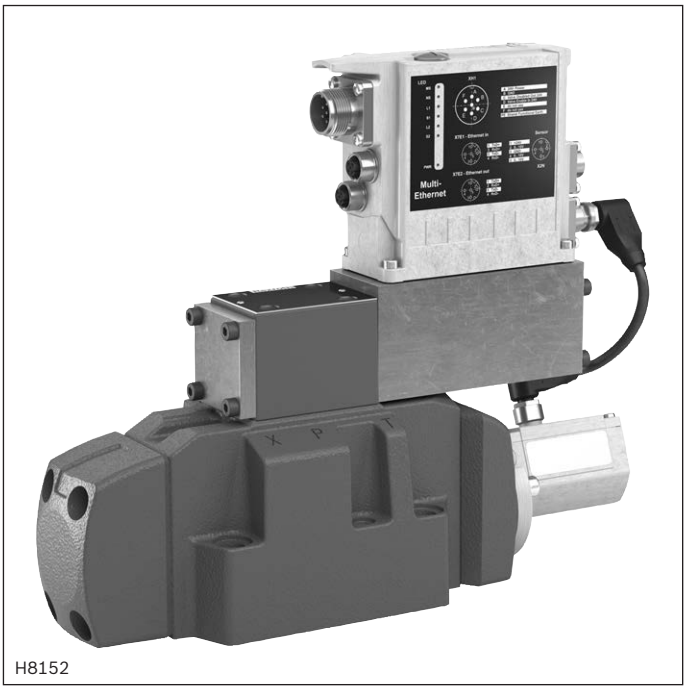
Directional control valve, pilot-operated, with integrated fieldbus (IFB-Multi Ethernet)

Type 4WRLF

RE 29293
Edition: 2019-06



H8152

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

CE

Features

- Open
  - Integrated fieldbus (IFB Multi-Ethernet)
  - Bus connection/service interface (Sercos, EtherCAT, EtherNet/IP, PROFINET RT, POWERLINK, VARAN)
- Scalable
  - 2 configurable analog pressure sensor inputs
- Precise
  - Integrated pressure-force control
  - 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

Contents

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	

Rated flow at 10 bar pressure differential (5 bar/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**
13	Without internal pressure sensors	**00**

[1] Higher rated flow upon request

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**		*****

14	Supply voltage 24 V	**24**

Ethernet interface

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

Connector

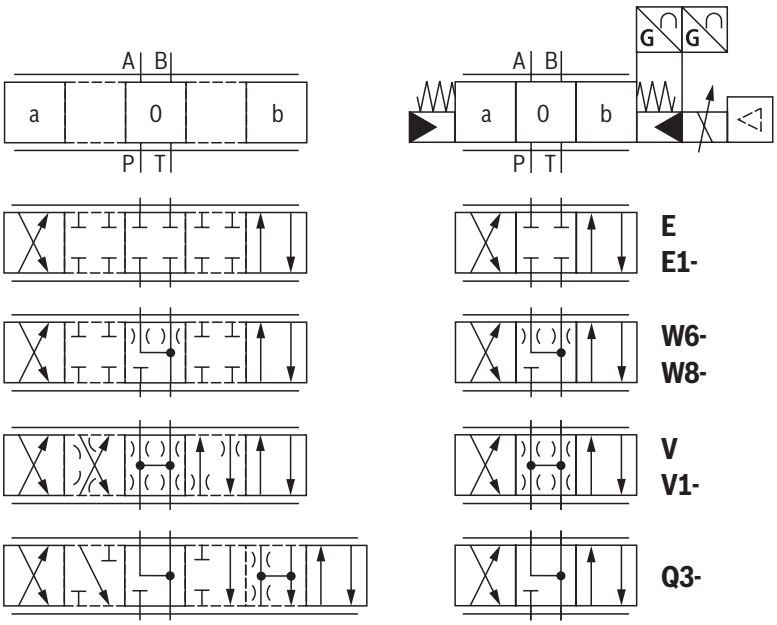
16	Voltage supply, enable acknowledgement	**D9**

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	*****

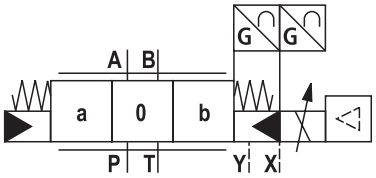
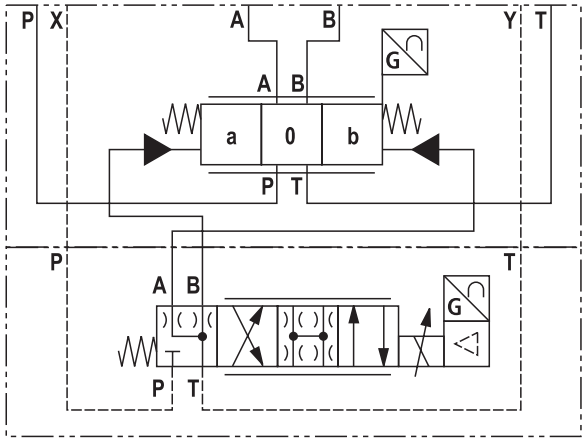
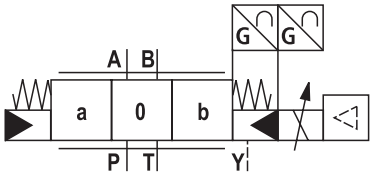
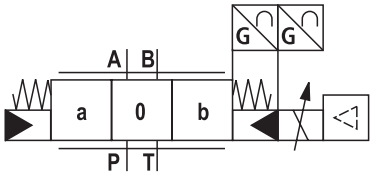
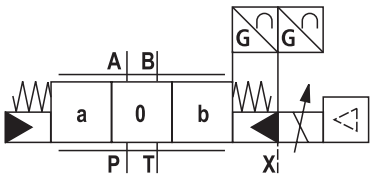
Symbols



With symbol E1–, V1– and W8–:

P → A: $q_{V\,max}$ B → T: $q_V/2$

P → B: $q_V/2$ A → T: $q_{V\,max}$

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 the technical data on page 10.
- Symbols V and V1 are not suitable for use in safety applications (no overlap).

Function

General information

The pilot-operated **IFB Multi-Ethernet** valve (**I**ntegrated **F**ield**b**bus) is a digital directional control valve with integrated fieldbus:

The following operating modes are possible:

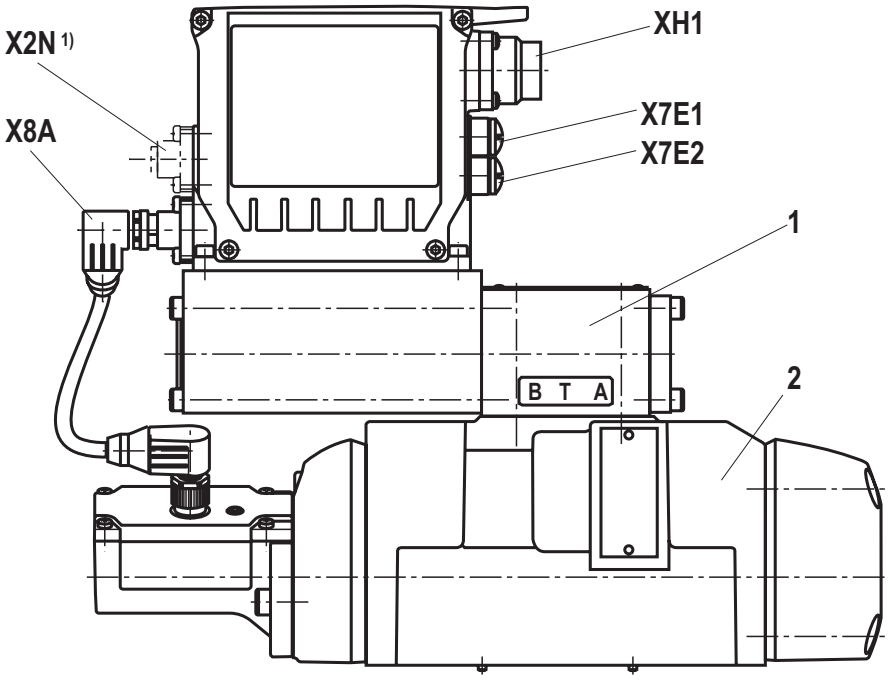
- Standard:
  - Valve direct control
  - Flow control
- Version "5" (with external pressure sensors):
  - Pressure/force control
  - Active damping
  - Substitutional control (flow - pressure/force); pQ function (flow-controlled)

- Command value presetting is done via the Ethernet interface (X7E1 or X7E2)
- The feedback information of the actual value signals to the superior control system 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)



1) Only version "5"

Function

Function (symbol V, V1- and Q3-)
When the control solenoid of the pilot control valve is de-energized, its spring-operated control spool is in the "fail safe" position. The control spool of the main valve is in the spring-centered offset position at approx. 6% of the stroke in direction P→B/A→T.
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.

Switching off the release (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 acknowledgement is not set (pin C). 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).

Function (symbol E. and W.)
When the control solenoid of the pilot control valve is de-energized, its spring-operated control spool is in the "fail safe" position. The control spool of the main valve is in spring-centered central position.
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.
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.

Switching off the release (symbol E., W. and Q3-)
If the control spool of the main valve is in the safe position, the enable acknowledgement is set (pin C).
If the control spool of the main valve leaves the safe position or the release is set, the enable acknowledgement 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. Operated by the spring, the control spool of the main valve will move to the central position.

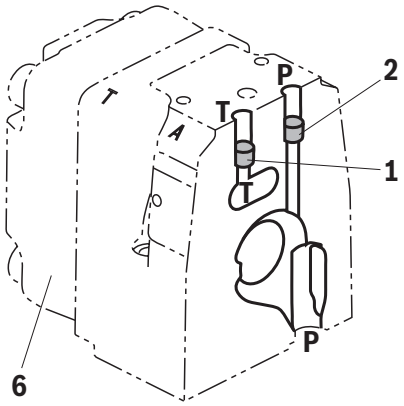
Monitoring
The digital control electronics enable comprehensive monitoring functions/error detection including:
- Undervoltage
- Communication error
- Cable break for analog sensor inputs
- Monitoring of the microcontroller (watchdog)
- Temperature of the integrated electronics

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

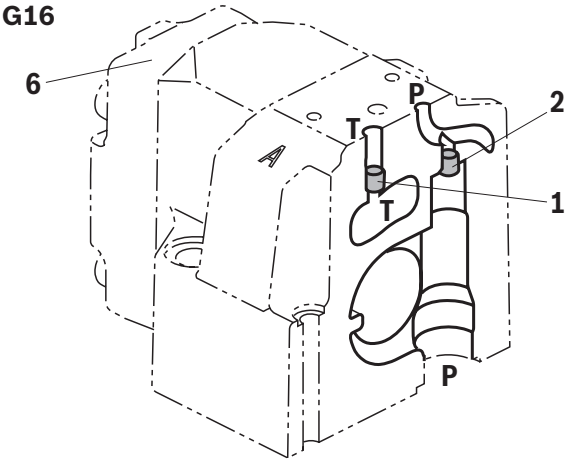
☞ **Notice:**
- Symbol V and V1-:
  Pilot-operated 4/3 directional control valves are only functional in the active control loop and do not have a locking basic position when deactivated.
  Consequently "external isolator valves" are required in many applications and must be taken into account regarding 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).

Pilot oil supply (schematic illustration)

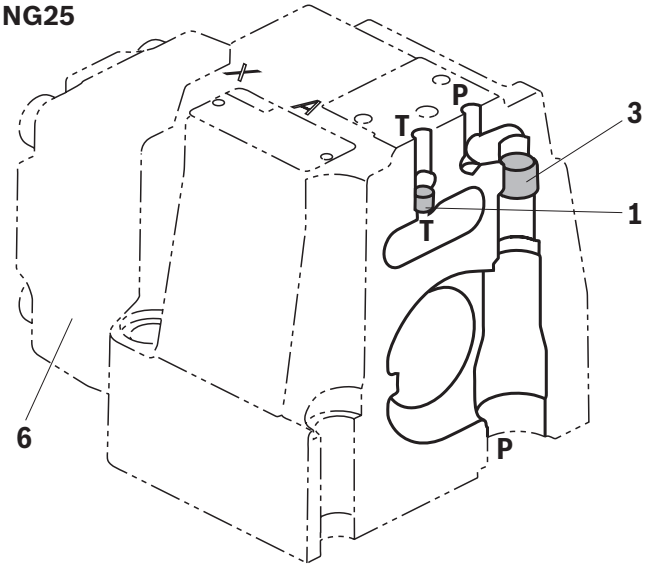
NG10



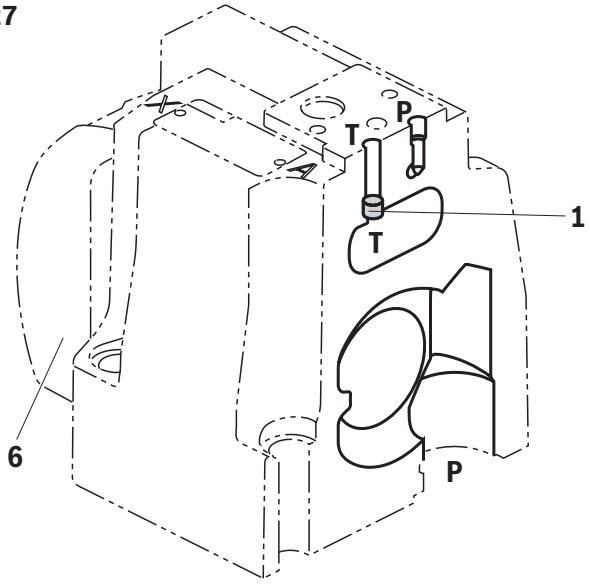
NG16



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.

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
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)			
Vibration resistance	▶ 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			
Weight		kg	9	12	19	21
Maximum relative humidity (no condensation)		%	95			
Maximum solenoid 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)			

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
Minimum pilot pressure (pilot control valve)		bar	10						
Maximum flow		l/min	300		800		1250		1850
Rated flow (***Δp*** = 5 bar/control edge) [1]		l/min	60/100		200/250		350/400		430/600
Pilot oil flow [2]	▶ Symbol E, W	l/min	2.4		3.5		7.5		
	▶ Symbol V, Q3-	l/min	4.5		11.5		22		
Maximum 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		
Maximum zero flow (inlet pressure 100 bar)	▶ Symbol V, V1-								
	– Main valve	l/min	1.7		2.3		2.8		3.3
	– Main valve + pilot control valve	l/min	1.85		2.6		3.2		3.7
	▶ Symbol Q3-								
	– Main valve	l/min	0.4		1.6		1.8		2.2
	– Main valve + pilot control valve	l/min	0.55		1.9		2.2		2.6
Flow unloading central position Δ***p*** = 5 bar/control edge			A→T	B→T	A→T	B→T	A→T	B→T	A→T	B→T
	▶ Symbol W6-	l/min	2.8	2.8	4	4	6	6	6	6
	▶ Symbol W8-	l/min	2.8	1.4	4	2	6	3	6	3
Hydraulic fluid			See table page 10						
Viscosity range	▶ Recommended	mm^2/s	30 ... 45						
	▶ Maximum admissible	mm^2/s	20 ... 380						
Hydraulic fluid temperature range (flown-through)		°C	–20 ... +70						
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 18/16/13 [3]						

1) Flow for deviating ***Δp*** (valve pressure differential):

$$q_x = q_{Vnom} \times \sqrt{\frac{\Delta p_x}{10}}$$

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

3) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.
Available filters can be found at www.boschrexroth.com/filter.

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	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM	ISO 12922	90222
		HFDU (ester base)	FKM		
		HFDR	FKM		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	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 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 - to back 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			
Response sensitivity		%	< 0.05			
Range of inversion		%	< 0.08			
Manufacturing tolerance q_{Vmax}		%	≤ 10			
Actuating time for 0 ... 100% at X=100 bar	▶ Symbols E, E1-, W6-, W8-	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)			
Temperature drift (temperature range 20 °C ... 80 °C)		%/10 °C	Zero shift < 0.25			
Zero compensation			Ex plant ±1%			

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

Electrical, integrated electronics (OBE)			
Relative duty cycle		%	100 (continuous operation)
Protection class according to EN 60529			IP 65 with mounted and locked plug-in connectors
Supply voltage [4; 5]	▶ Nominal voltage	VDC	24
	▶ Lower limit value	VDC	18
	▶ Upper limit value	VDC	36
Maximum admissible residual ripple		Vpp	2.5 (comply with absolute supply voltage limit values)
Current consumption	▶ Maximum [6]	A	2.5
	▶ Impulse current	A	4

Electrical, integrated electronics (OBE)			
Maximum power consumption		W	40
AD/DA resolution	▶ Analog inputs [7]		12 bit
Protective grounding conductor and screening			see connector pin assignment (CE-compliant installation) page 14
Required fuse protection, external		A	4, time-lag
Adjustment			Calibrated in the plant, see characteristic curves page 16 ... 26
Conformity			CE according to EMC Directive 2014/30/EU tested according to EN 61000-6-2 and EN 61000-6-3
Parameterization interface			Ethernet
Scan time pressure and force controller (minimum) [7]		ms	0.5
Booting time		s	< 15
Switching input Enable XH1	▶ Quantity		1
	▶ Low level	V	–3 ... 5
	▶ High level	V	15 ... U_B
	▶ Current consumption at high level	mA	< 1
	▶ Reference potential		Pin 5
Switching output Enable acknowledgment XH1	▶ Quantity		1
	▶ Low level	V	0 ... 3
	▶ High level	V	15 ... U_B
	▶ Current carrying capacity	mA	50 (short-circuit-proof)
	▶ Signal delay time	ms	0.2 ... 210 [7]
	▶ Reference potential		GND
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%
	– Temperature drift		< 15 mV / 10 K

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

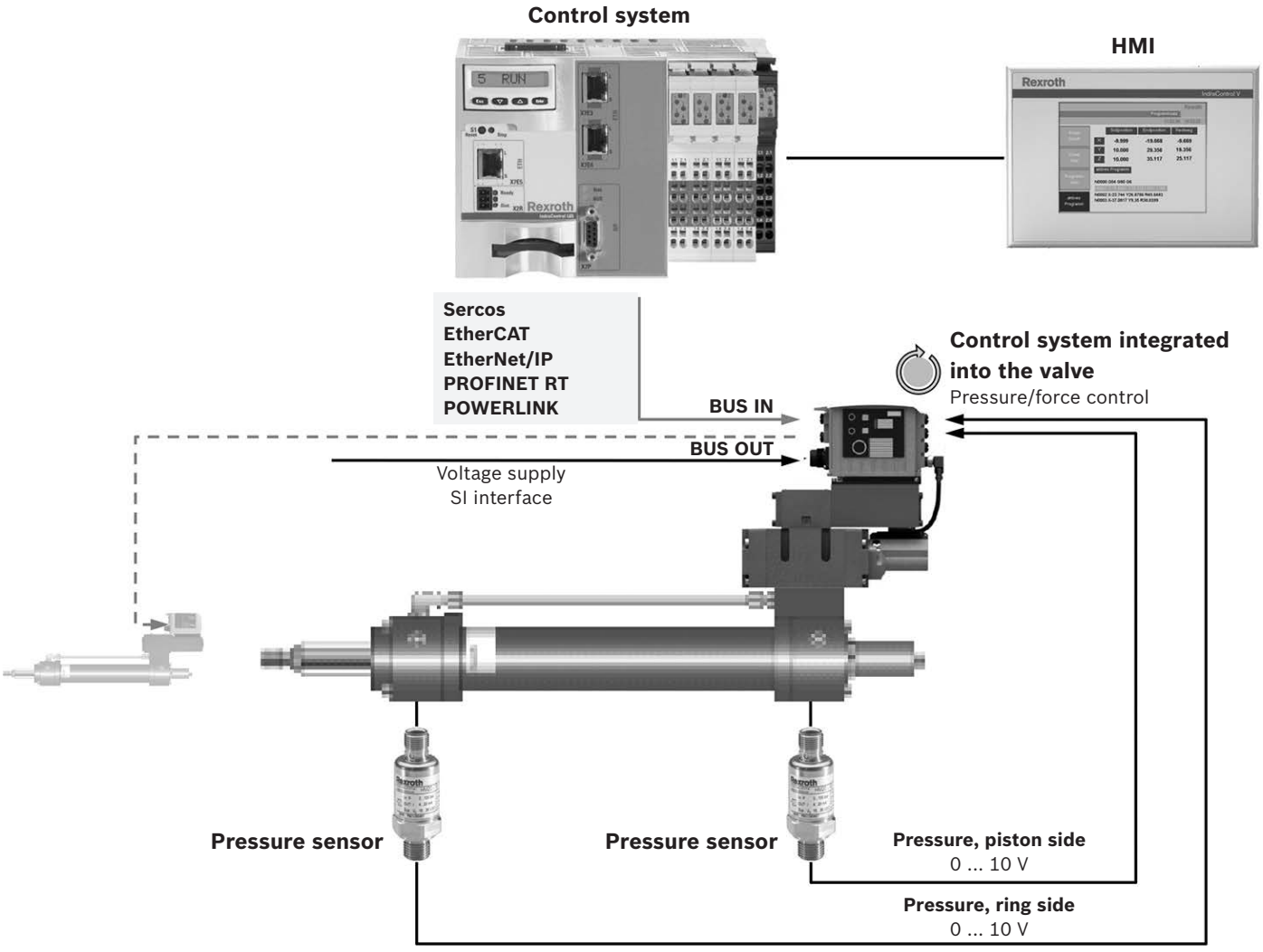
5) Voltage limit values must be observed directly at the connector of the valve (observe line length and cable cross-section!)

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

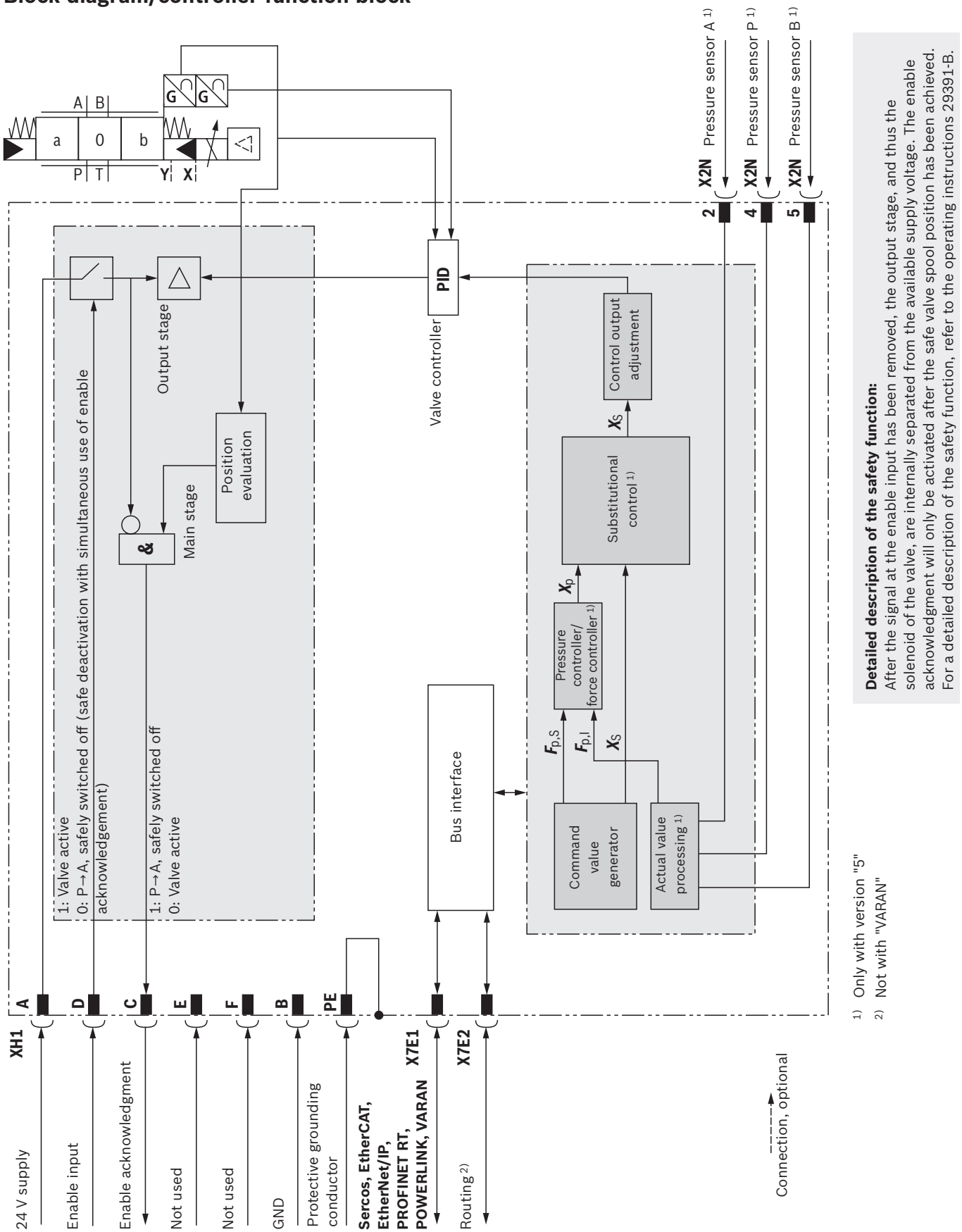
7) Depending on valve and operating condition, see operating instructions 29391-B

8) Only version "5"

Representation of the IFB valve in the system network (version "5")



Block diagram/controller function block



Detailed description of the safety function:
After the signal at the enable input has been removed, the output stage, and thus the solenoid of the valve, are internally separated from the available supply voltage. The enable acknowledgment will only be activated after the safe valve spool position has been achieved. For a detailed description of the safety function, refer to the operating instructions 29391-B.

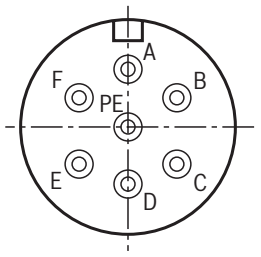
1) Only with version "5"
2) Not with "VARAN"

Electrical connections, assignment

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

Pin	Assignment of interface D9
A	24 V DC supply voltage [1]
B	GND
C	Enable acknowledgment 24 V DC (I_{max} 50 mA) [2] (high ≥ 15 V; low < 2 V)
D	Enable input 24 V DC (high ≥ 15 V; low < 2 V)
E	Not assigned
F	Not assigned
PE	Functional ground (connected directly to metal housing)

XH1



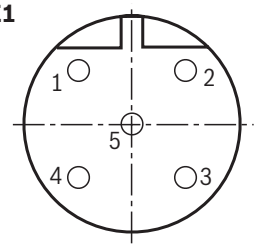
1) A load increases the current consumption on pin A

2) Enable acknowledgement 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 assigned

X7E1

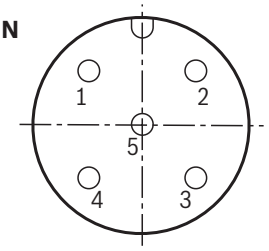


Analog configurable sensor interface, port "X2N" (coding A), M12, 5-pole, socket

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"

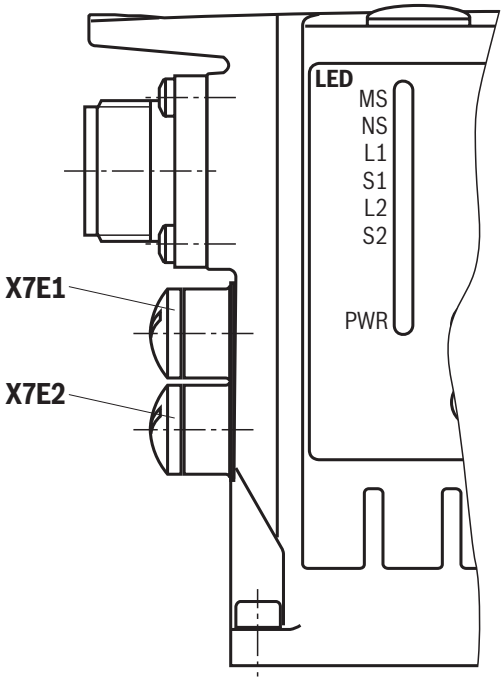
X2N



Notice:
- Reference potential for all signals: GND
- We recommend connecting the shields on both sides via the metal housings of the plug-in connectors.

LED displays

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



Displays of the status LEDs

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

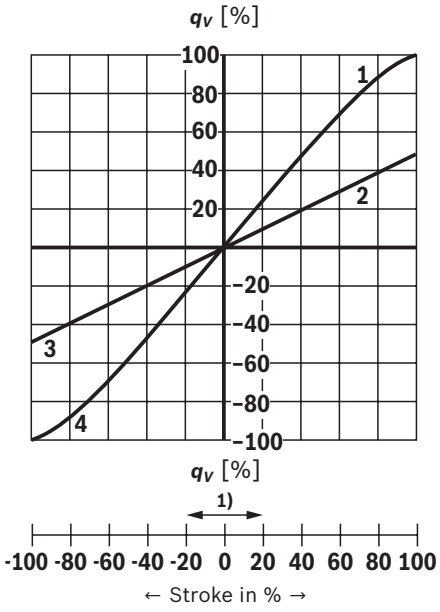
Module status LED (LED MS)	Display status
Off	No voltage supply
Green-red, flashing	Initialization
Green, flashing	Drive Ready for operation
Green	Drive active
Orange, flashing	Warning
Red, flashing	Error
Green, rapidly flashing	Firmware must be loaded

☞ **Notice:**
- ▶ For the connection to the M12 sockets, we recommend using self-locking mating connectors
- ▶ Module status LED MS relates to the electronics module
- ▶ The network status LED NS indicates the status of the control communication, see application description 30338-FK
- ▶ LEDs L1, S1, L2 and S2 relate to interfaces "X7E1" and "X7E2"
  - – Link: Cable plugged in, connection established (permanently lit)
  - – Activity: Data sent/received (flashing)
- ▶ For a detailed description of the diagnosis LEDs, please refer to the functional description Rexroth HydraulicDrive HDx.

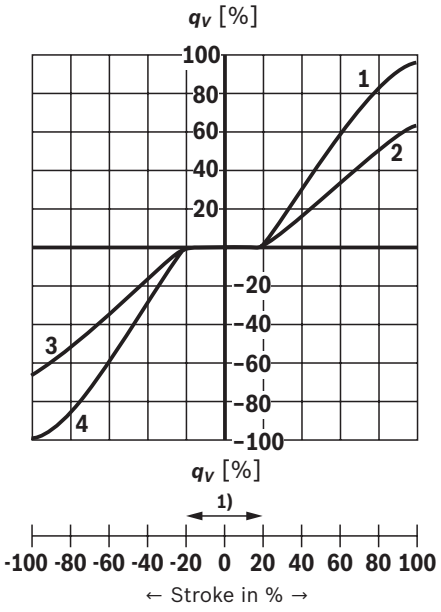
Characteristic curves: Flow characteristic "L" and "P"
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Flow/signal function – Version "L"

Symbol V, V1-

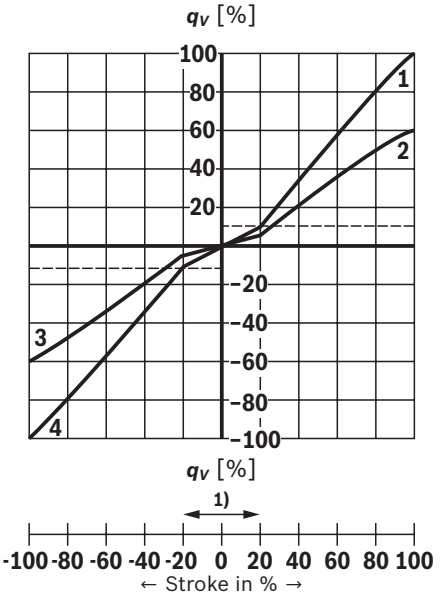


Symbols E, E1-, W6-, W8-

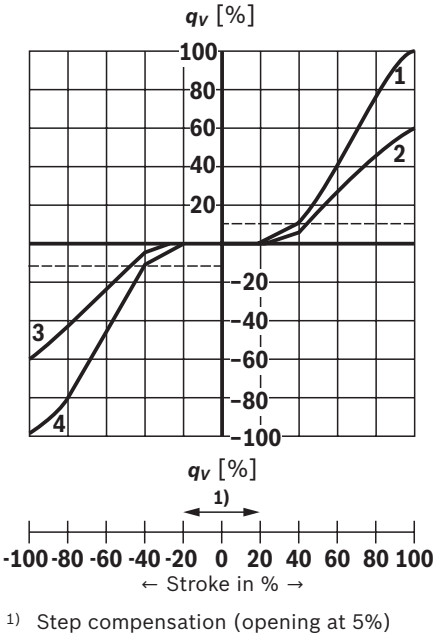


Flow/signal function – Version "P"

Symbol V, V1-



Symbols E, E1-, W6-, W8-

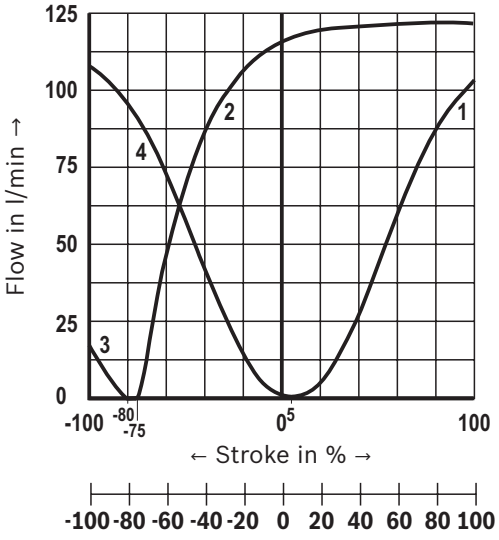


1 P–A; B–T (1:1)
2 B–T (2:1)
3 P–B (2:1)
4 P–B; A–T (1:1)
––– 10% q_V

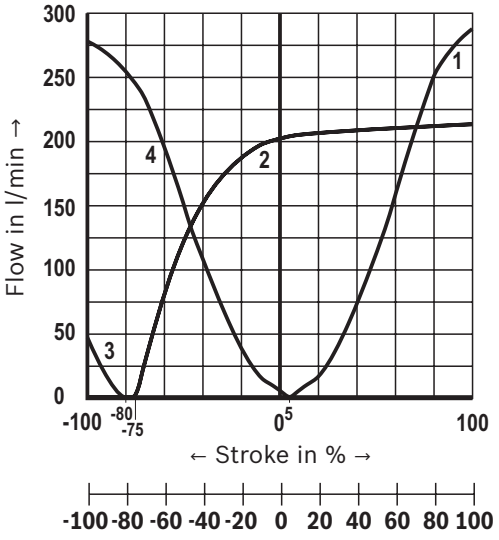
[1] Step compensation (opening at 5%)

Characteristic curves: Flow characteristic "M"
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

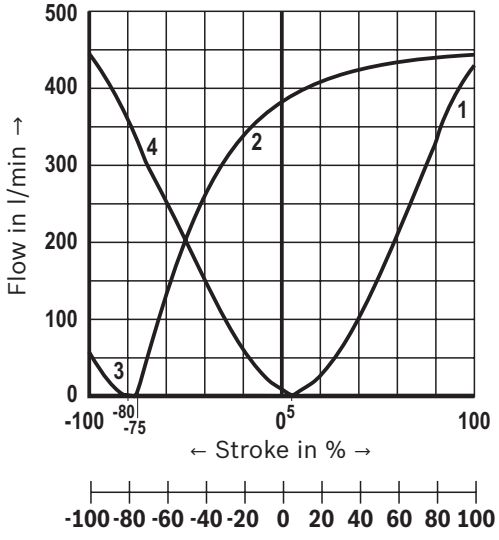
Symbol Q3, version "100"



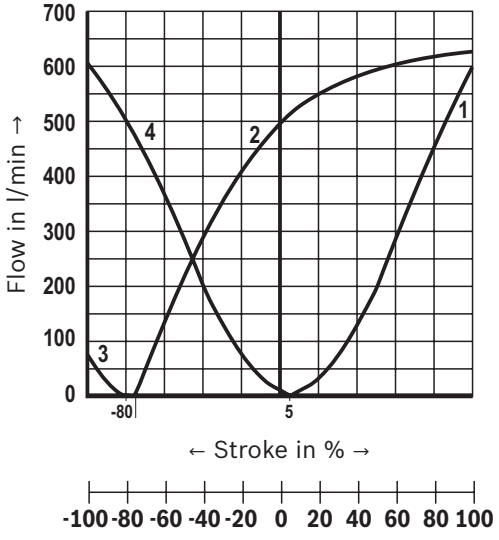
Symbol Q3, version "250"



Symbol Q3, version "400"



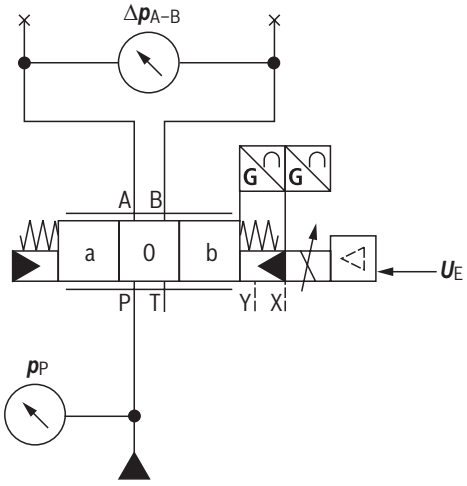
Symbol Q3, version "600"

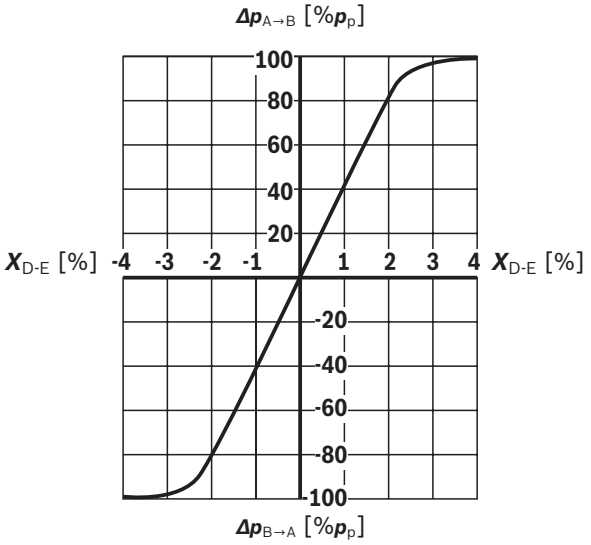


1 P–A
2 B–T
3 P–B
4 A–T

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Pressure amplification

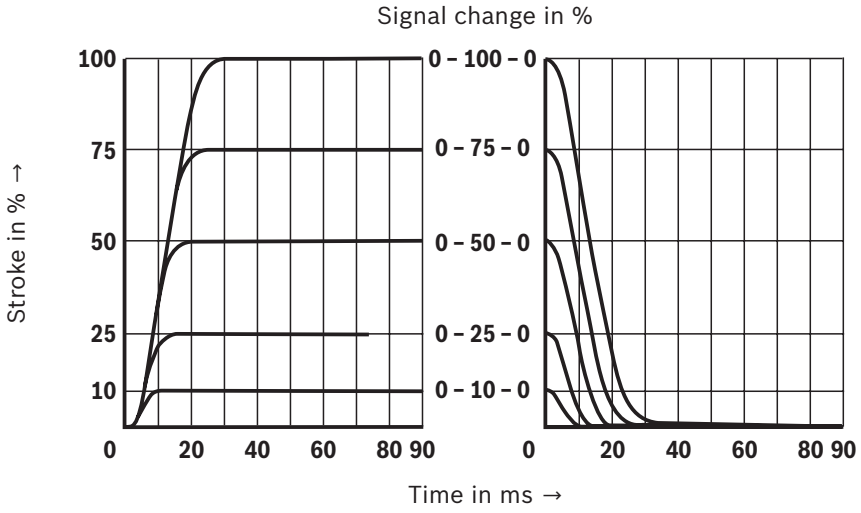




Characteristic curves: Size 10
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Transition function with stepped electric input signals

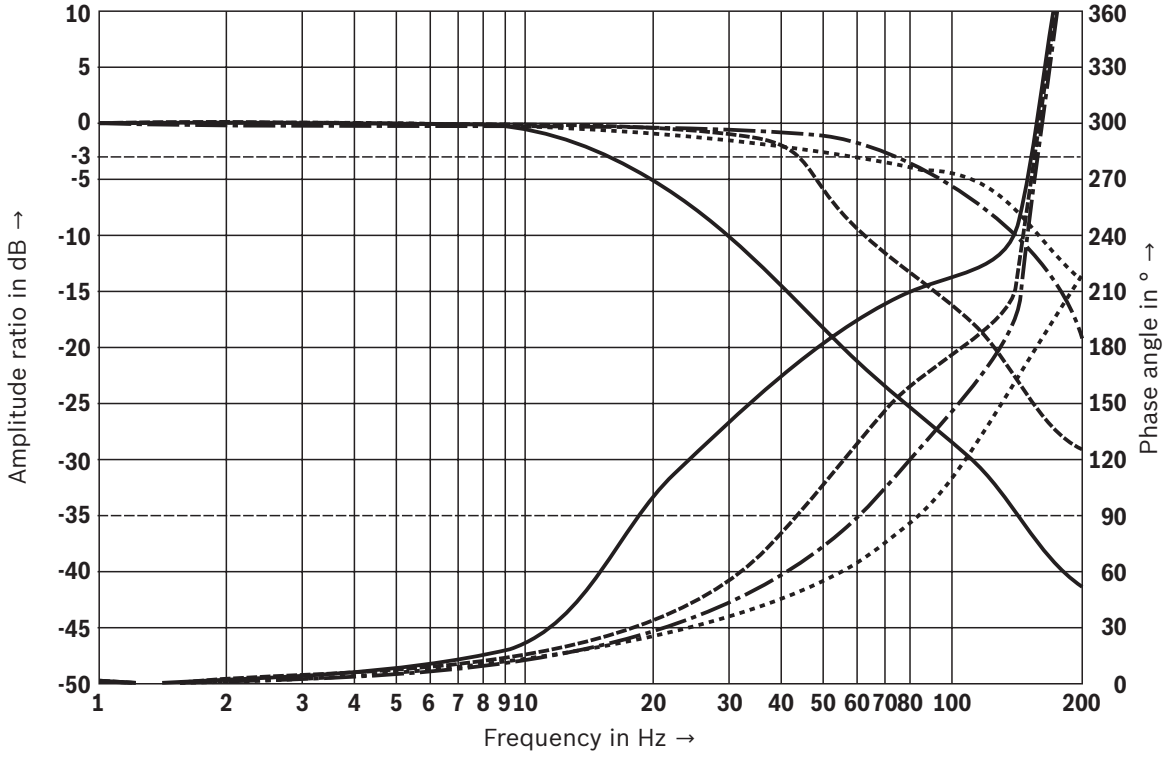
Symbols V and Q3-



- ▶ Pilot control valve, port X = 100 bar
- ▶ Main valve, port P = 10 bar

Frequency response characteristic curves

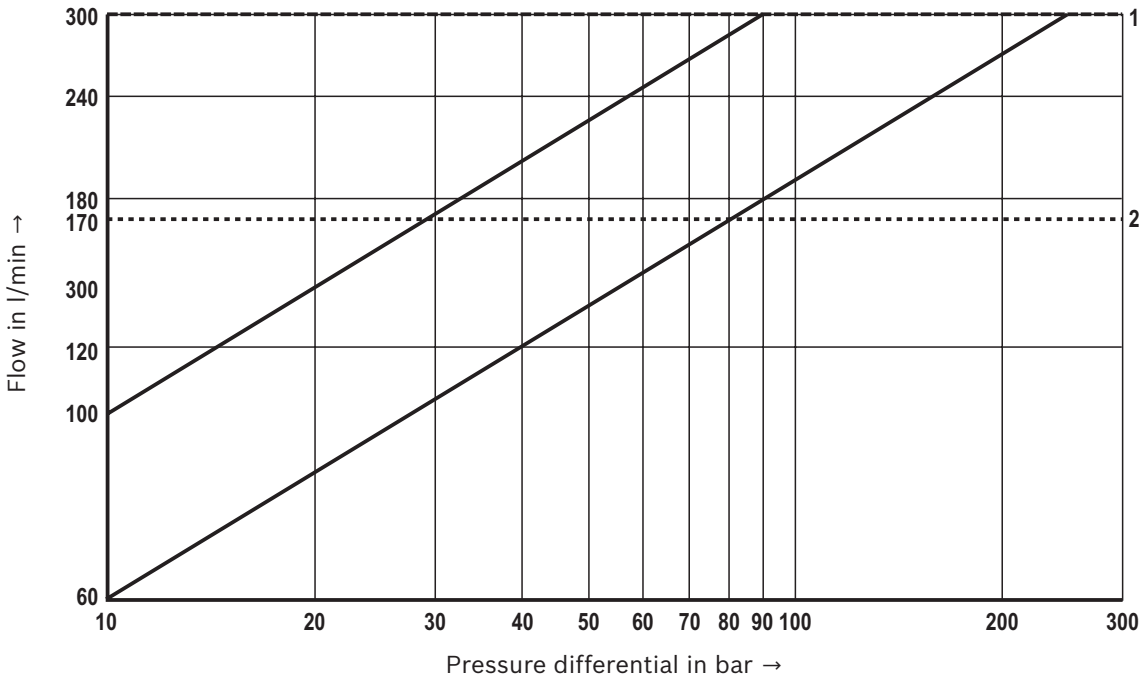
Symbols V and Q3-



- Signal ±1%
- Signal ±5%
- Signal ±25%
- Signal ±100%

Characteristic curves: Size 10
(valid for HLP46, ϑ_{oil} = 40 ±5 °C)

Flow/load function (with maximum valve opening; tolerance ± 10%)

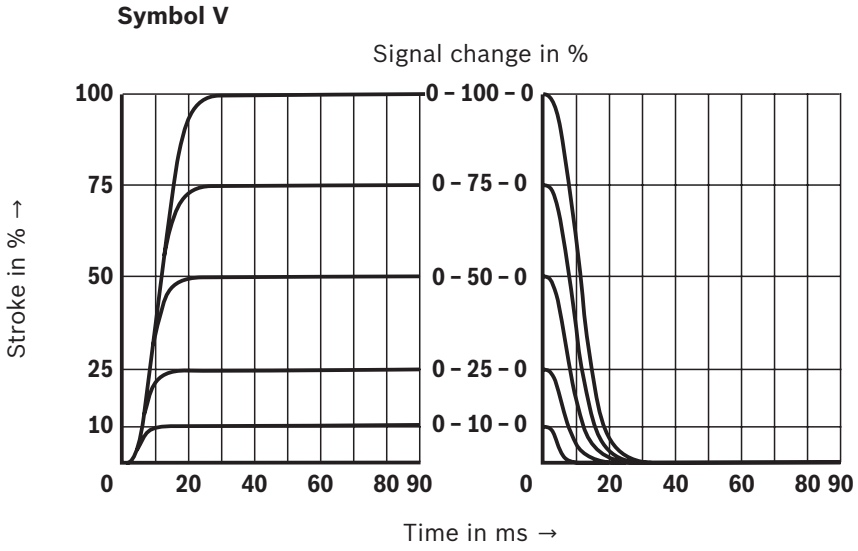


1 Maximum admissible flow

2 Recommended flow
(flow velocity 30 m/s)

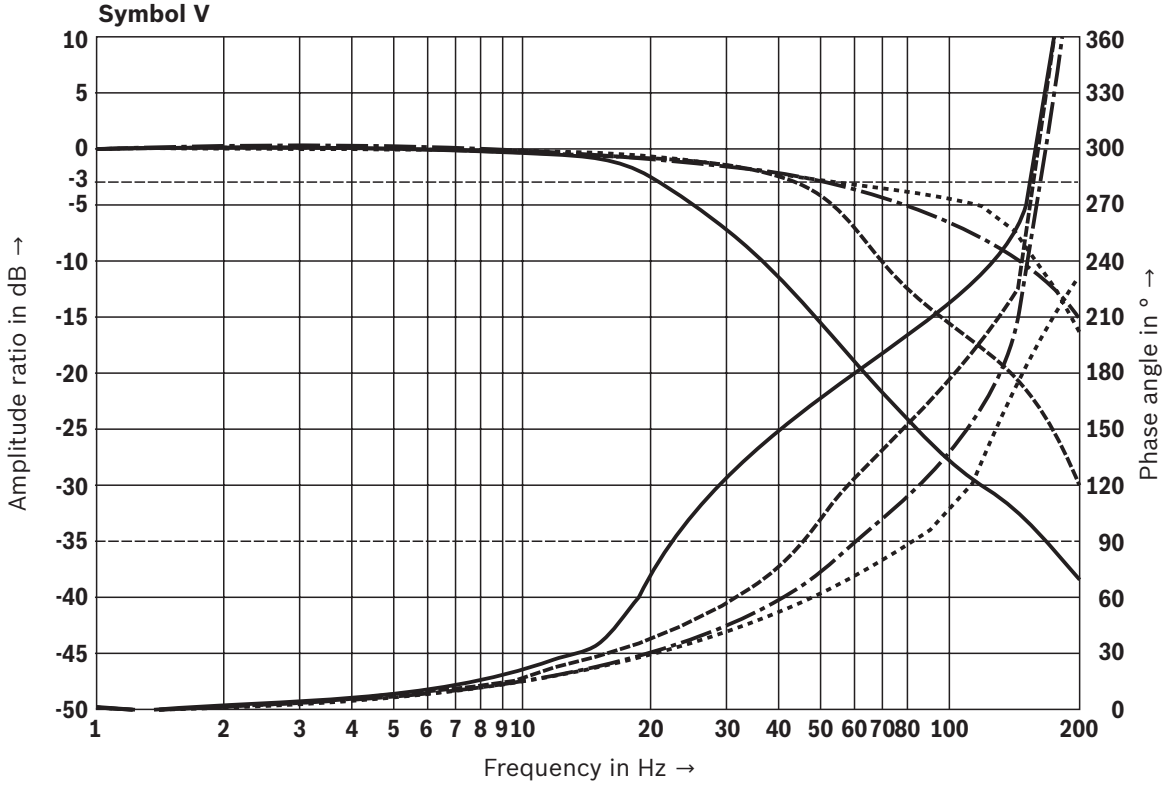
Characteristic curves: Size 16
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Transition function with stepped electric input signals



- ▶ Pilot control valve, port X = 100 bar
- ▶ Main valve, port P = 10 bar

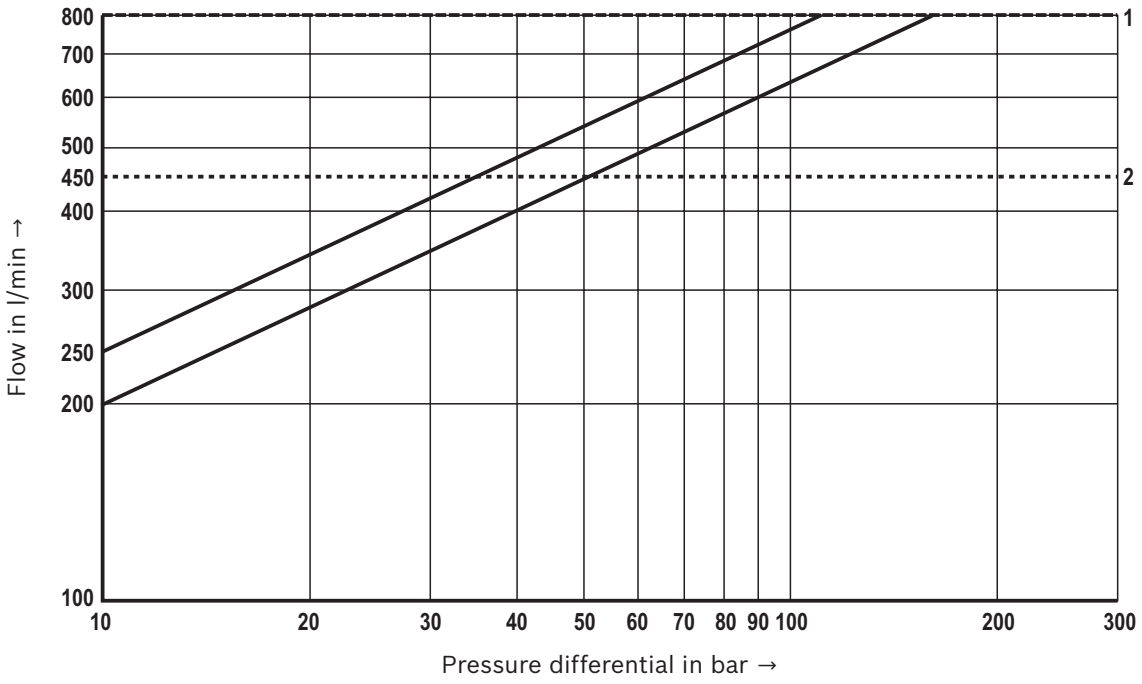
Frequency response characteristic curves



- Signal ±1%
- Signal ±5%
- Signal ±25%
- Signal ±100%

Characteristic curves: Size 16
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Flow/load function (with maximum valve opening; tolerance ± 10%)

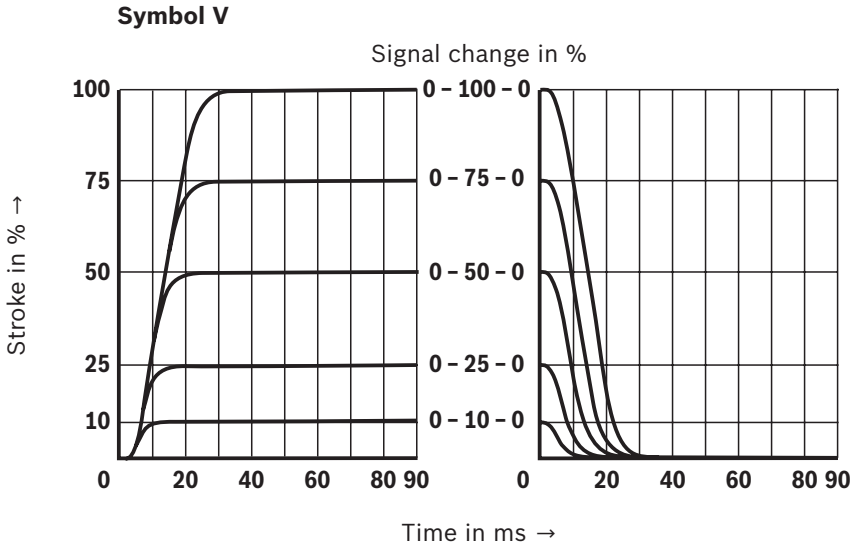


1 Maximum admissible flow

2 Recommended flow limitation
(flow velocity 30 m/s)

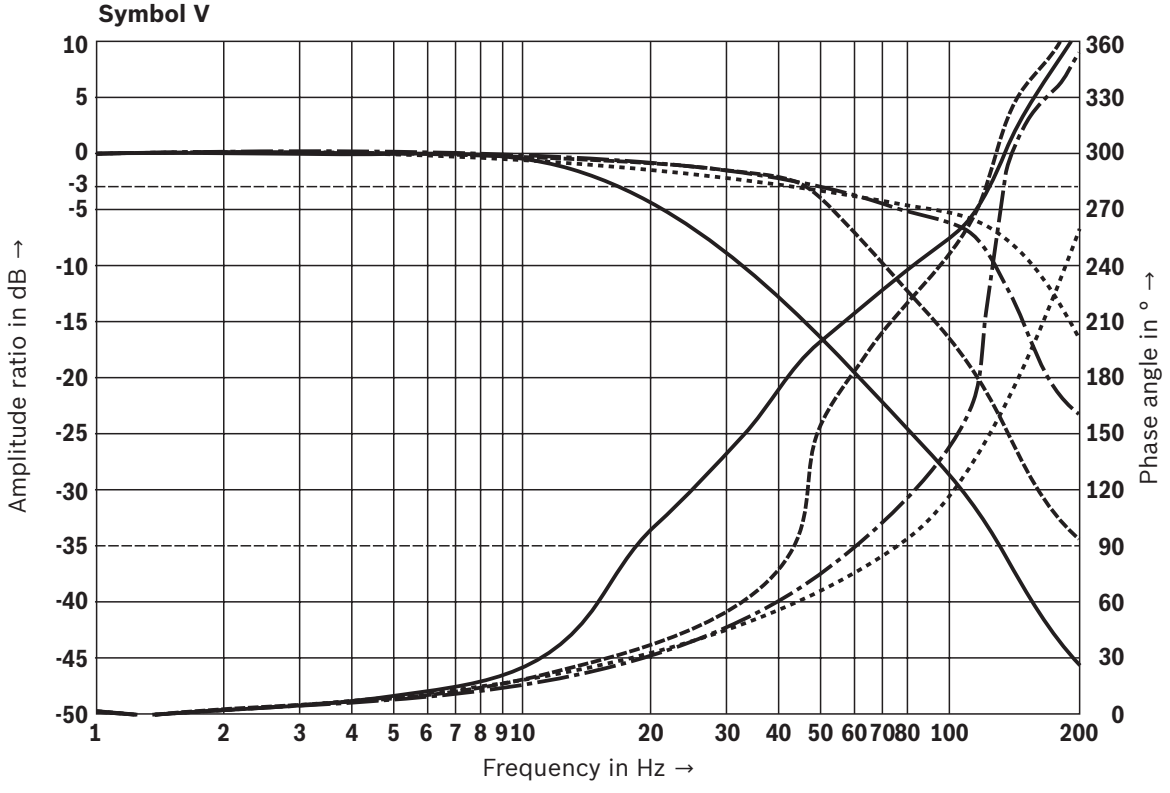
Characteristic curves: Size 25
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Transition function with stepped electric input signals



- ▶ Pilot control valve, port X = 100 bar
- ▶ Main valve, port P = 10 bar

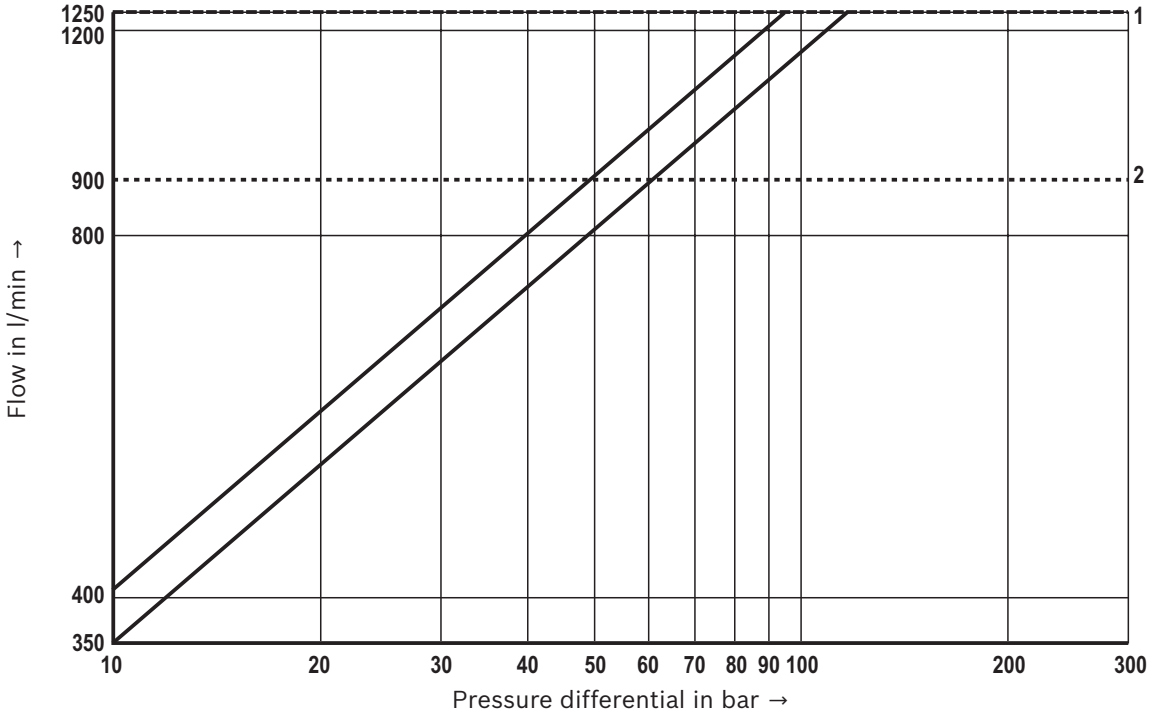
Frequency response characteristic curves



- Signal ±1%
- Signal ±5%
- Signal ±25%
- Signal ±100%

Characteristic curves: Size 25
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Flow/load function (with maximum valve opening; tolerance ± 10%)

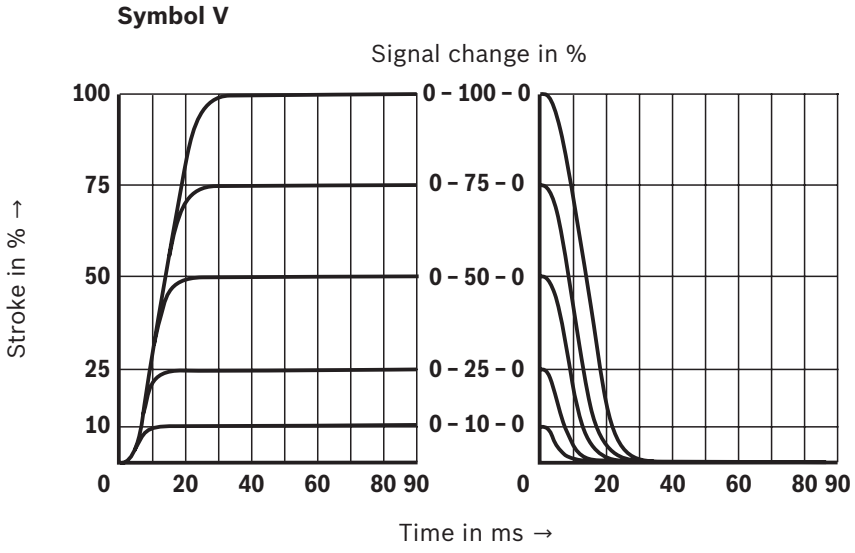


1 Maximum admissible flow

2 Recommended flow limitation
(flow velocity 30 m/s)

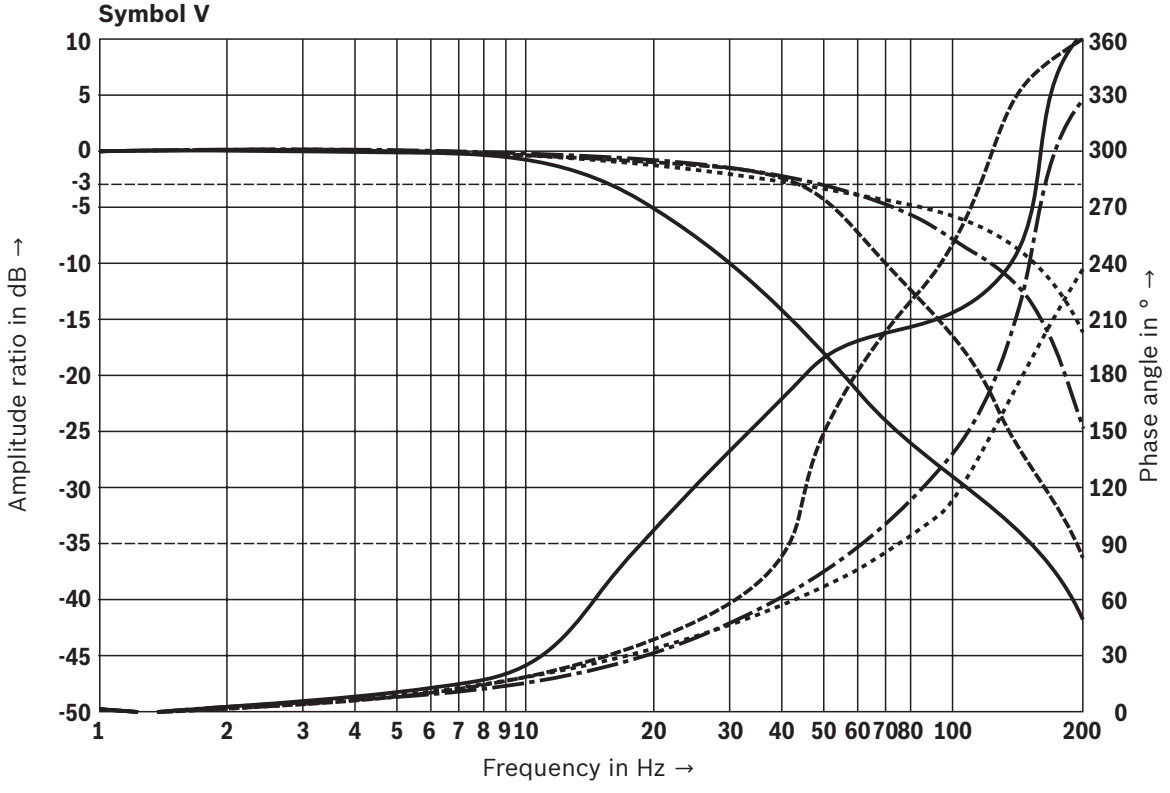
Characteristic curves: Size 27
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Transition function with stepped electric input signals



- ▶ Pilot control valve, port X = 100 bar
- ▶ Main valve, port P = 10 bar

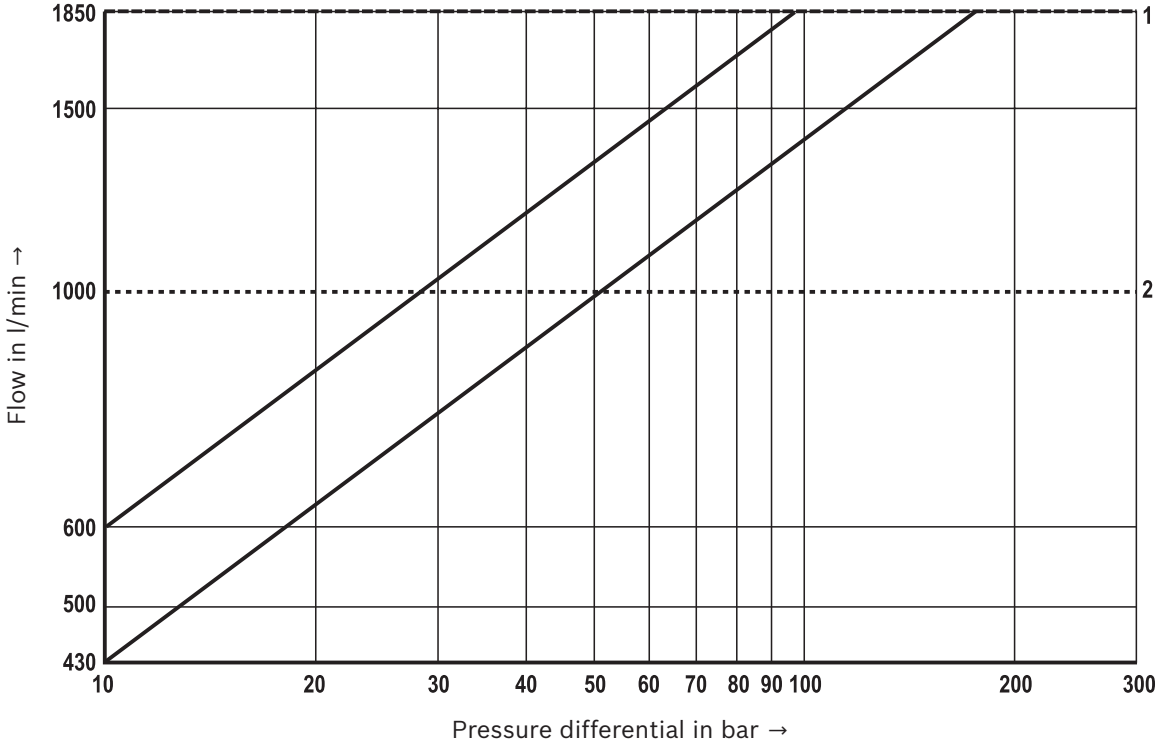
Frequency response characteristic curves



- Signal ±1%
- Signal ±5%
- Signal ±25%
- Signal ±100%

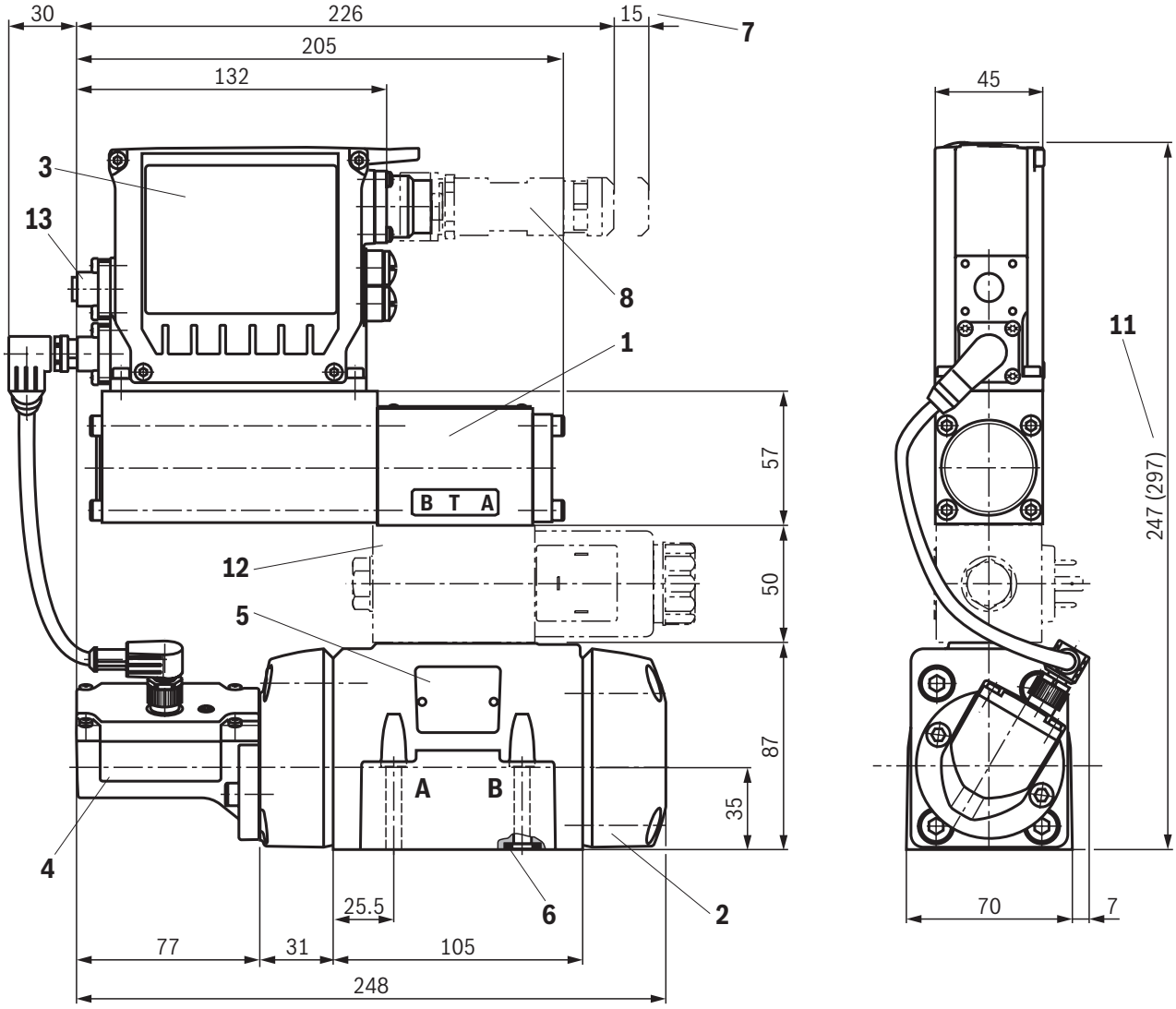
Characteristic curves: Size 27
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

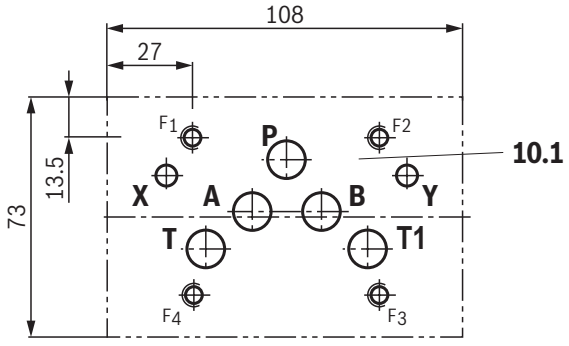
Flow/load function (with maximum valve opening; tolerance ± 10%)

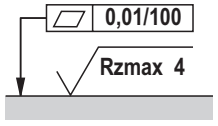


1 Maximum admissible flow
2 Recommended flow limitation (flow velocity 30 m/s)

Dimensions: Size 10
(dimensions in mm)





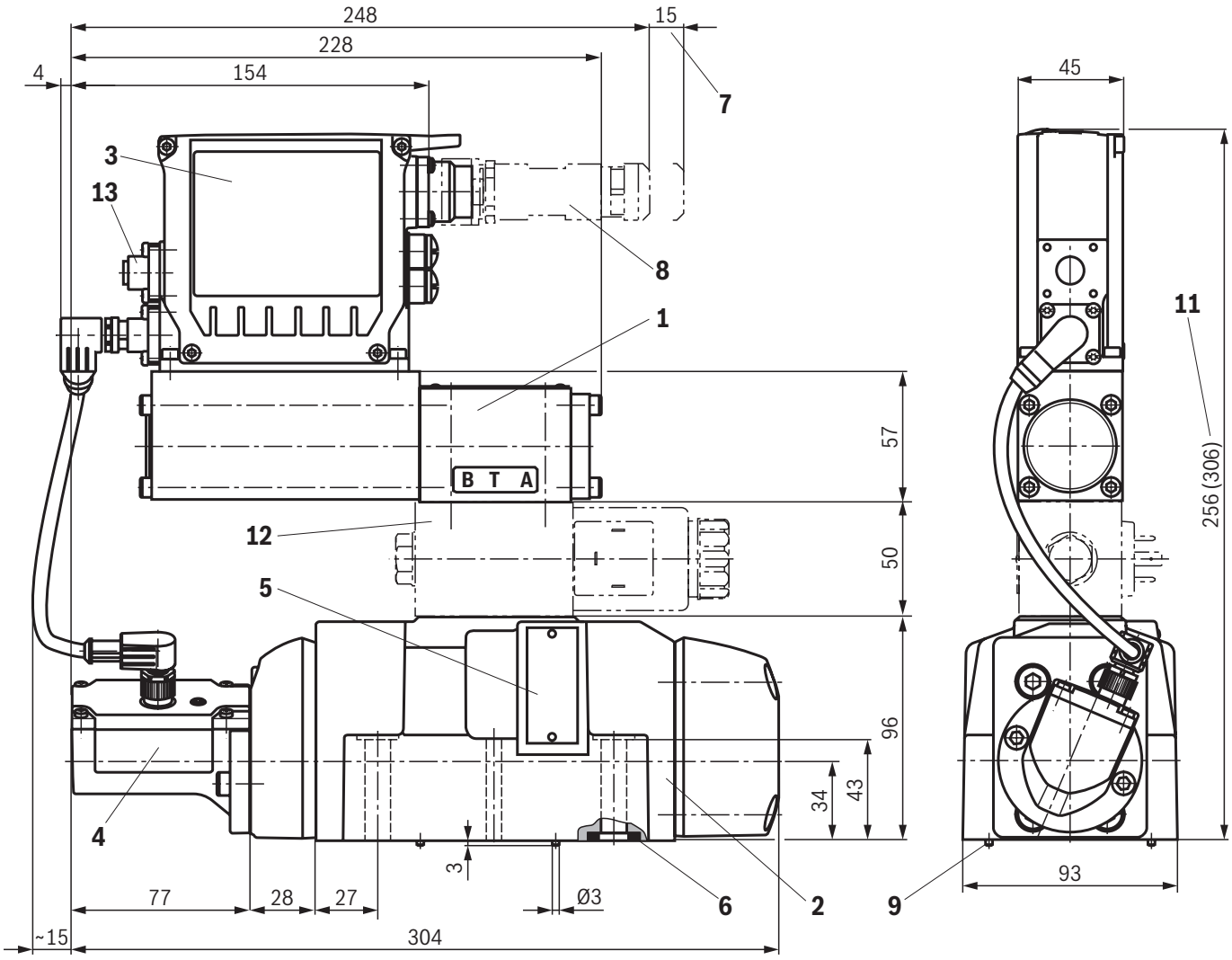


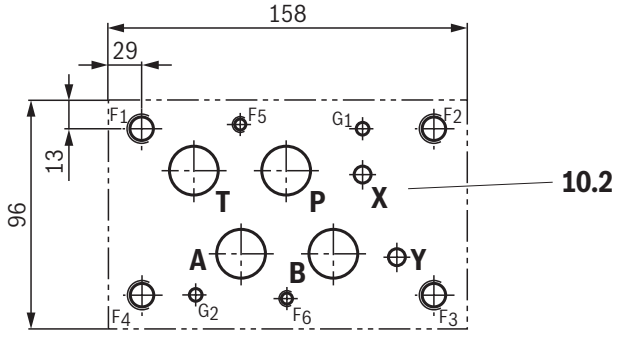
Required surface quality
of the valve contact surface

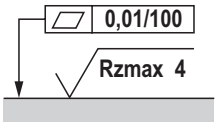
For **item explanations, valve mounting screws** and **subplates,** see page 30.

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

Dimensions: Size 16
(dimensions in mm)





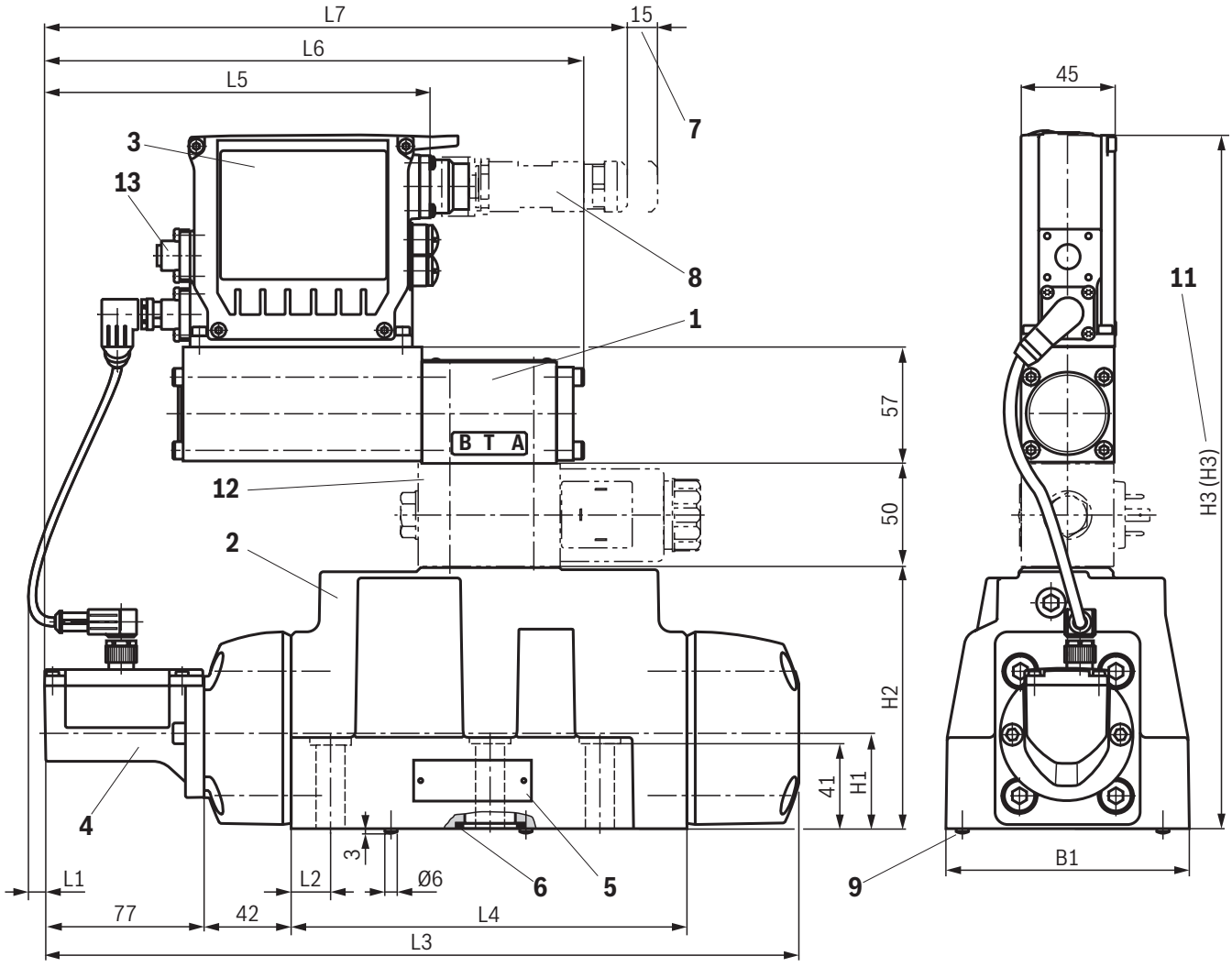


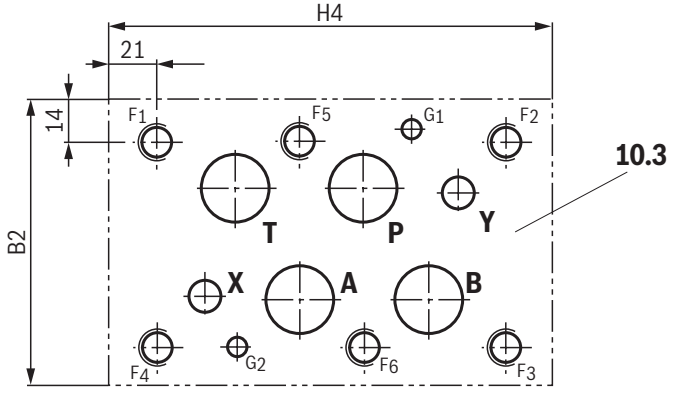
Required surface quality
of the valve contact surface

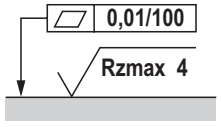
For **item explanations, valve mounting screws** and **subplates,** see page 30.

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

Dimensions: Sizes 25 and 27
(dimensions in mm)







Required surface quality
of the valve contact surface

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.

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 Nm ±10%	**R913043777**
	or		
	4	**ISO 4762 - M6 x 45 - 10.9** Tightening torque M_A = 15.5 Nm ±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 Nm ±10%	**R913043410**
	4	**ISO 4762 - M10 x 60 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B** Tightening torque M_A = 58 Nm ±20%	**R913014770**
	or		
	2	**ISO 4762 - M6 x 60 - 10.9** Tightening torque M_A = 15.5 Nm ±10%	Not included in the Rexroth delivery range
	4	**ISO 4762 - M10 x 60 - 10.9** Tightening torque M_A = 75 Nm ±20%	
25, 27	6	**ISO 4762 - M12 x 60 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B** Tightening torque M_A = 100 Nm ±20%	**R913015613**
	or		
	6	**ISO 4762- M12 x 60 - 10.9** Tightening torque M_A = 130 Nm ±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.

Accessories (separate order)

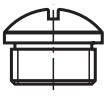
Mating connectors and cable sets

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] Additionally indication of type designation RKB0040/xx.x

[2] Additionally indication of type designation RKB0044/xx.x

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** (additionally 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 must be expected, take appropriate measures to ensure 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	Operating instructions 29391-B
▶ CE Declaration of Conformity	Upon request
▶ Subplates	Data sheet 45100
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Data sheet 90222
▶ Hexagon socket head cap screws, metric/UNC	Data sheet 08936
▶ Hydraulic valves for industrial applications	Operating instructions 07600-B
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of servo valves and high-response valves	Data sheet 07700
▶ Assembly, commissioning and maintenance of hydraulic systems	Data sheet 07900
▶ Operation fieldbus electronics (xx = software version):	
– Functional description Rexroth HydraulicDrive HDx-20	– 30338-FK
– Parameter description Rexroth HydraulicDrive HDS-16, HDx-17 ...HDx-20	– 30330-PA
– Description of diagnosis Rexroth HydraulicDrive HDS-16, HDx-17 ...HDx-20	– 30330-WA
▶ Commissioning software and documentation on the Internet	www.boschrexroth.com/IFB
▶ Selection of filters	www.boschrexroth.com/filter
▶ Information on available spare parts	www.boschrexroth.com/spc

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