

Proportional pressure relief valve, pilot operated, increasing characteristic curve KBVS.1A



- ▶ Size 1
- ▶ Series A
- ▶ Maximum working pressure 420 bar
- ▶ Maximum flow 80 l/min

Features

- ▶ Cartridge valve
- ▶ R/UNF10-01-0-06 mounting cavity
- ▶ Pilot operated proportional valve for limiting system pressure
- ▶ Suitable for mobile and industrial applications
- ▶ Actuated by proportional solenoid with central thread and removable coil
- ▶ Rotatable solenoid coil
- ▶ In case of power failure, minimum pressure is set
- ▶ Setpoint value pressure characteristic curve can be finely calibrated using control electronics externally

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Type code

01	02	03	04	05	06	07	08	09	10	11	12
KBVS		1	A	A	/	F	C		V		*

Valve type

01	Proportional pressure relief valve, pilot operated	KBVS
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Pressure stage

02	Up to 50 bar	C
	Up to 100 bar	F
	Up to 150 bar	H
	Up to 210 bar	L
	Up to 250 bar	N
	Up to 315 bar	P
	Up to 350 bar	R
	Up to 420 bar	T

03	Size 1	1
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04	If setpoint value = 0, minimum pressure is set	A
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05	Series	A
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06	R/UNF-10-01-0-06 mounting cavity (see page 11)	F
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07	Proportional solenoid, switching in oil	C
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Supply voltage

08	Control electronics 12 V DC	G12
	Control electronics 24 V DC	G24

Electrical connection¹⁾

09	Device connector according to DIN EN 175301-803	K4
	Device connector 2-pin, DT 04-2P (DEUTSCH)	K40
	Device connector 2-pin, Junior Timer (AMP)	C4

Sealing material

10	FKM (fluorocarbon rubber)	V
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11	Standard variant	No code
	Coil 24 V/800 mA	-8

12	Further details in plain text	*
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¹⁾ Plug-in connectors are not included in the scope of delivery and must be ordered separately, see data sheet 08006.

Preferred types

Type	Material number
KBVSC1AA/FCG24K40V	R901290550
KBVSF1AA/FCG24K40V	R901290561
KBVSH1AA/FCG24K40V	R901290562
KBVSL1AA/FCG24K40V	R901290567

Type	Material number
KBVSN1AA/FCG24K40V	R901290569
KBVSP1AA/FCG24K40V	R901290570
KBVSR1AA/FCG24K40V	R901290580
KBVST1AA/FCG24K40V	R901290585

Functional description

General

Valves of type KBVS are pilot operated proportional pressure relief valves of spool design and are used to limit the pressure in hydraulic systems. Their primary components are a screw-in proportional pilot control valve (1) and the main valve (2). These valves can be used for infinitely adjusting the pressure to be limited depending on the setpoint value. Minimum pressure is set in case of power failure or if the setpoint value is 0.

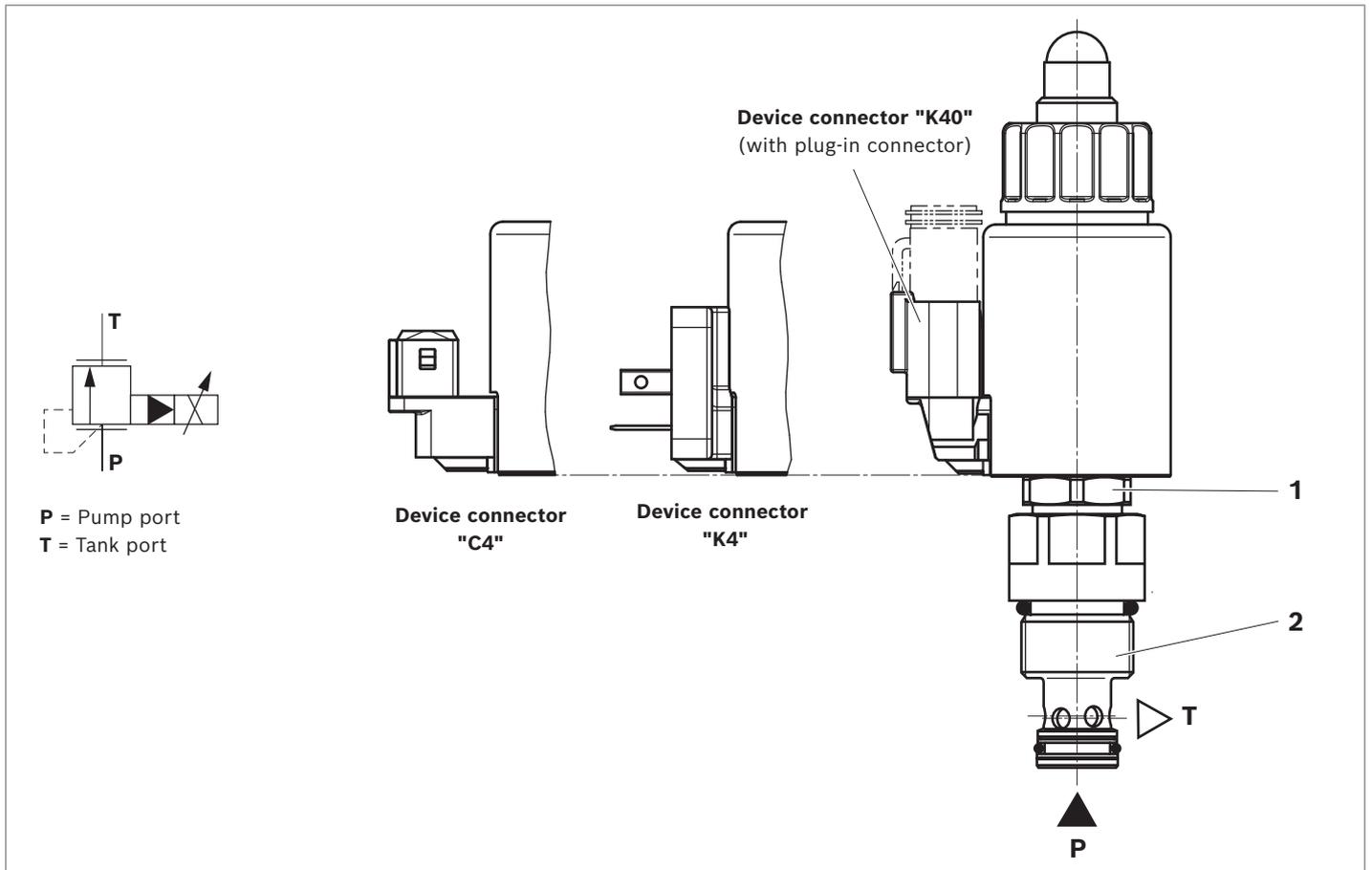
Basic principle

To proportionally increasing the system pressure, a setpoint value is specified using the control electronics. Depending on this setpoint value, the electronics power the solenoid coil, which uses the pilot control valve (1) and main valve (2) to actually set the pressure at port P. (p_{max} = maximum setpoint value; p_{min} = setpoint of 0)

Notice

Occurring tank pressures (port T) are added to the set value at port P.

▼ Type KBVS.1A..



Technical data

General		
Weight	kg	0.75
Installation position		Any - if it is ensured that no air can collect upstream the valve. Otherwise we recommend suspend installation of the valve.
Ambient temperature range	°C	-40 to +120 (see pages 8 and 9)
Storage temperature	°C	-20 to +80

Environmental testing

Vibration test in accordance with DIN EN 60068-2/IEC 60068-2/two axes (X/Y)		
DIN EN 60068-2-6: 05/96	Sinusoidal vibration	10 cycles (5 Hz to 2000 Hz back to 5 Hz) with logarithmic sweep rate of 1 oct/min, 5 to 57 Hz, amplitude 1.6 mm (p-p), 57 to 2000 Hz, amplitude 10 g
IEC 60068-2-64: 05/93	Vibration (random) and broadband noise	20 to 2000 Hz, amplitude 0.1 g ² /Hz (14 g RMS/30 g peak), testing time 24 h
DIN EN 60068-2-27: 03/95	Shock	Half sine 15 g/11 ms; 3× in positive, 3× in negative direction (6 single shocks total)
DIN EN 60068-2-29: 03/95	Continuous shock	Half sine 15 g/11 ms; 1000× in positive, 1000× in negative direction (2000 single shocks total)
Indication per axis		
Climate test in accordance with DIN/EN 60068-2/IEC 60068-2 (environmental audit)		
DIN EN 60068-2-1: 03/95	Storage temperature	-40 °C, dwell time 16 h
DIN EN 60068-2-2: 08/94		+110 °C, dwell time 16 h
DIN EN 60068-2-1: 03/95	Cold test	2 cycles, -25 °C, dwell time 2 h
DIN EN 60068-2-2: 08/94	Dry heat test	2 cycles, +120 °C, dwell time 2 h
IEC 60068-2-30: 1985	Humid heat, cyclical	Variant 2/ +25 °C to +55 °C 93 % to 97 % RH, 2 cycles of 24 h
Salt spray test in accordance with DIN 50021		
	h	720
→ Varnishing generally not necessary. If varnishing, note reduced radiation output.		

Notice

For applications outside these values, please consult us!

Hydraulic			
Maximum working pressure ¹⁾	Port P	bar	420
Maximum return flow pressure	Port T	bar	210
Maximum set pressure ²⁾	See setpoint value pressure characteristic curve on page 7		
Minimum set pressure at setpoint value 0	See characteristic curve on page 7		
Maximum flow		l/min	80
Leakage		ml/min	< 200 (at $\Delta p = 250$ bar; closed pilot control valve and HLP46, $\vartheta_{oil} = 40$ °C)
Hydraulic fluid	See table below		
Hydraulic fluid temperature range		°C	-40 to +80
Viscosity range		mm ² /s	5 to 400 (preferably 10 to 100)
Maximum admissible degree of contamination of hydraulic fluid Cleanliness level per ISO 4406 (c)	Class 20/18/15 ³⁾		
Load cycles	10 mil.		
Hysteresis ⁴⁾	< 4 % of maximum set pressure		
Turnover voltage ⁴⁾	< 0.5 % of maximum set pressure		
Responsiveness ⁴⁾	< 0.5 % of maximum set pressure		
Setpoint pressure characteristic curve tolerance	Setpoint value 100%	< 5 % of maximum set pressure	
	Setpoint value 0	< 2 % of maximum set pressure	
Step response ($T_u + T_g$) 0 → 100 % or 100 % → 0		ms	100 (depending on system)

Hydraulic fluid

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP	FKM	DIN 51524	90220
Environmentally acceptable	Insoluble in water	HEES	FKM	ISO 15380	90221
	Soluble in water	HEPG	FKM	ISO 15380	90221

Notice

- ▶ Further information and details on using other hydraulic fluids are available in the above data sheets or on request.
- ▶ Restrictions are possible with the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- ▶ The flash point of the hydraulic fluid used must be 40 K above the maximum solenoid surface temperature.
- ▶ **Environmentally acceptable:** If environmentally acceptable hydraulic fluids are used that are also zinc-soluble, there may be an accumulation of zinc.

- 1) The maximum working pressure is the aggregate of set pressure and return flow pressure!
- 2) The valves come preset. Changing the settings voids the warranty.
- 3) Cleanliness levels specified for the components must be maintained in the hydraulic systems. Effective filtration prevents malfunctions and simultaneously extends the service life of the components.
- 4) Measured with analog amplifier of type RA2-1/10, see data sheet 95230 (PWM = 300 Hz).

Electric				
Voltage type			DC voltage	
Supply voltage	V	12 DC	24 DC	"-8"/24 DC
Maximum solenoid current	mA	1760	1200	800
Coil resistance	Cold value at 20 °C	Ω	2.3	4.8
	Maximum warm value	Ω	3.8	7.9
Duty cycle	%	See characteristic curve on pages 8 and 9 ⁵⁾		
Maximum coil temperature ⁶⁾	°C	150		
Type of protection according to ISO 20653	Connector version "K4"	IP6K5 ⁷⁾		
	Connector version "C4"	IP6K6K ⁷⁾		
	Connector version "K40"	IP6K9K ⁷⁾ (only with Rexroth type R901022127)		
Control electronics (separate order)		IP6K7 and IP6K9K ⁷⁾		
		Proportional amplifier type VT-SSPA1, data sheet 30116		
		Proportional amplifier type VT-MSPA, data sheet 30232		
		Analog amplifier type RA, data sheet 95230		
		BODAS controller type RC, data sheets 95204, 95205, 95206		
Recommended dither frequency (PMW)	Hz	300		
Design according to VDE 0580				

Notice

For the electrical connection, a protective earth (PE \perp) connection is mandatory based on the specification.

5) Consult the manufacturer if planning to use > 2000 m above sea level.

6) Due to the occurring surface temperatures of the solenoid coils, the standards ISO 13732-1 and ISO 4413 must be observed!

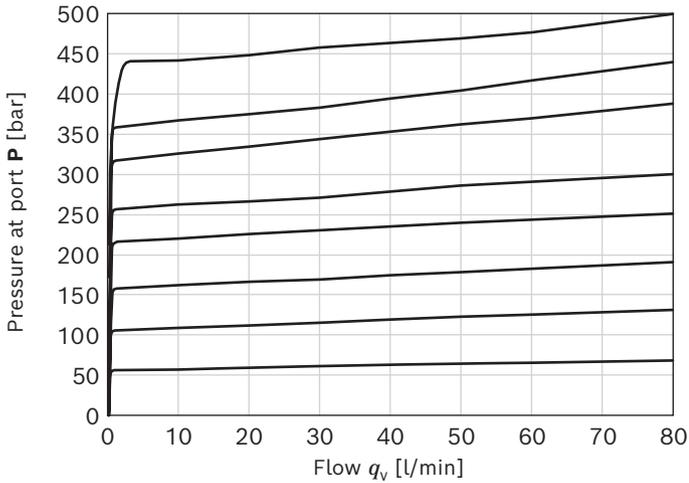
7) With installed and locked plug-in connector. Plug-in connectors are not included in the scope of delivery and must be ordered separately, see data sheet 08006.

Characteristic curves

p - q_v flow characteristic curves

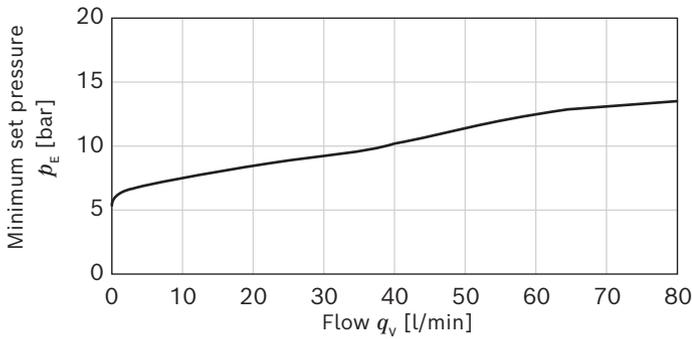
▼ Pressure at port P depending on flow

(The characteristic curves were measured without back-pressure at port T.)



▼ Minimum set pressure p_E at port P depending on flow at setpoint value 0

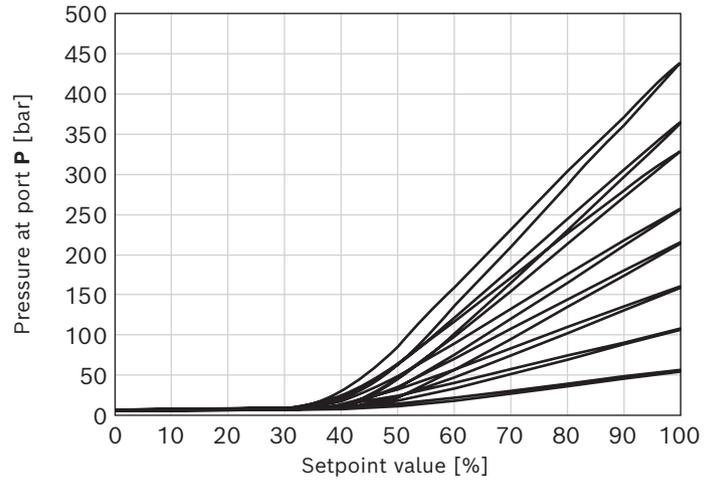
(The characteristic curve was measured without back-pressure at port T.)



p -I characteristic curves

▼ Pressure at port P depending on the setpoint value

(Flow = 10 l/min)



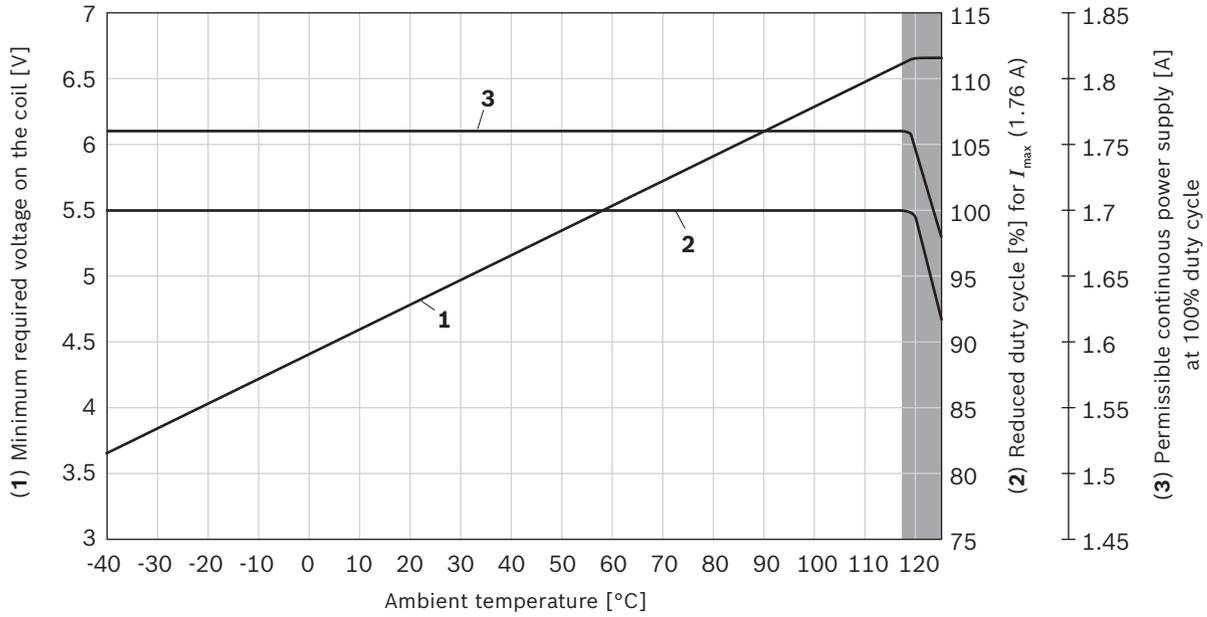
Notice

Characteristic curves measured with HLP46,
 $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ and 24 V coil.

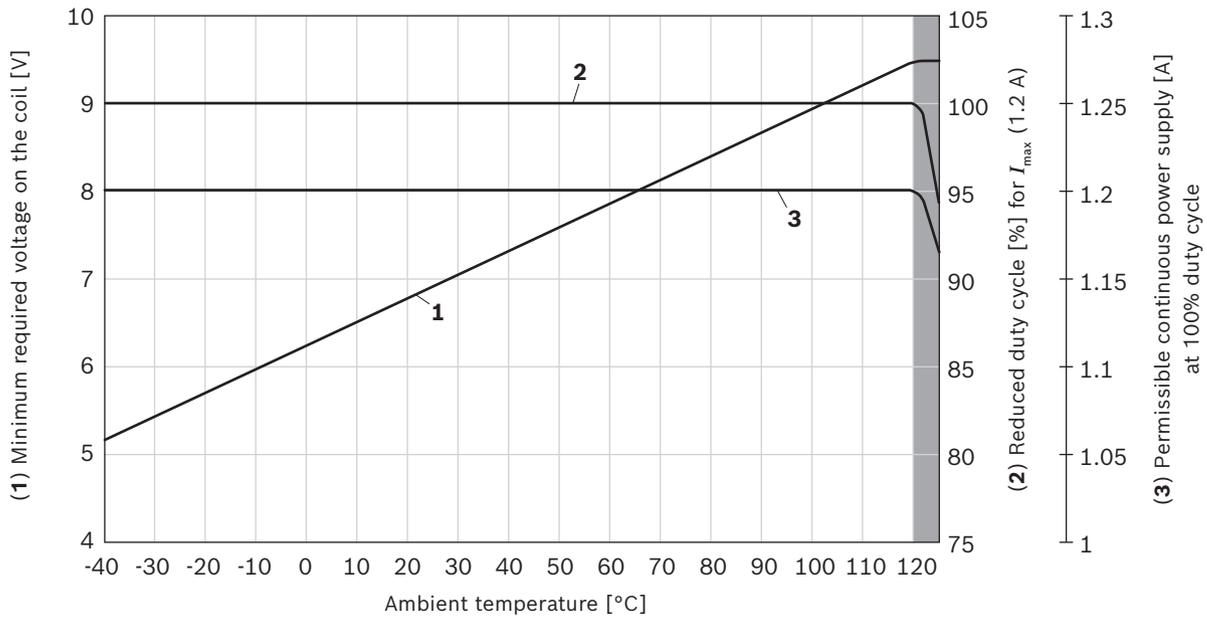
Permissible working range

Minimum terminal voltage on the coil and relative duty cycle depending on the ambient temperature

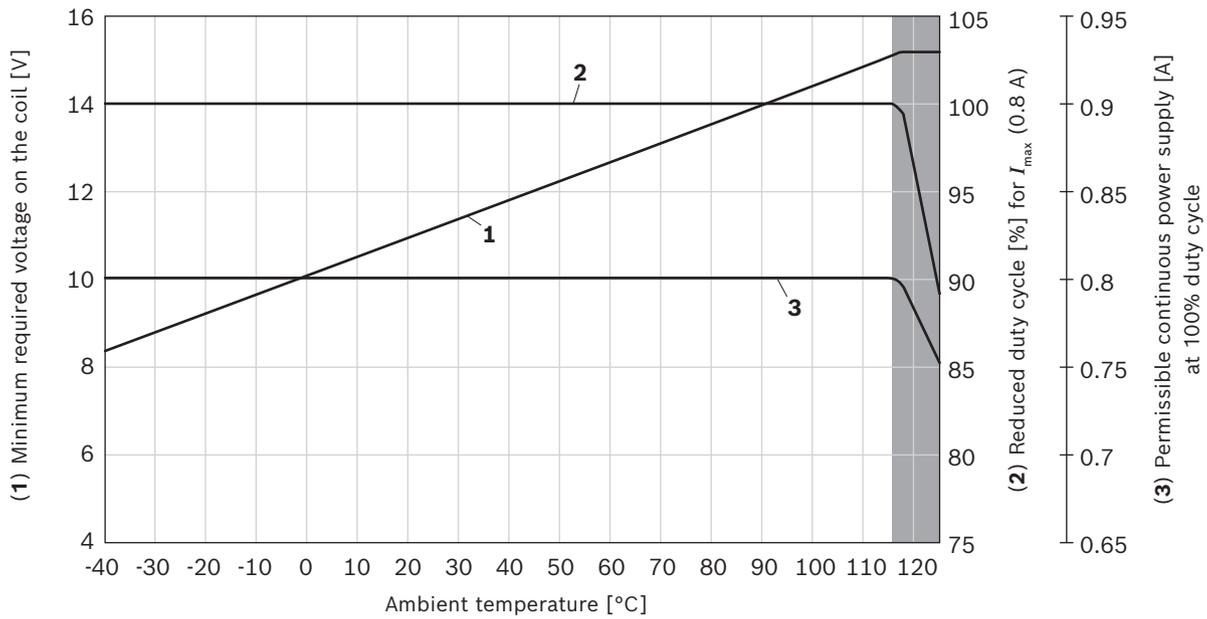
▼ Version "G12"



▼ Version "G24"



▼ Version "G24...-8"



= Limited valve performance

Notice

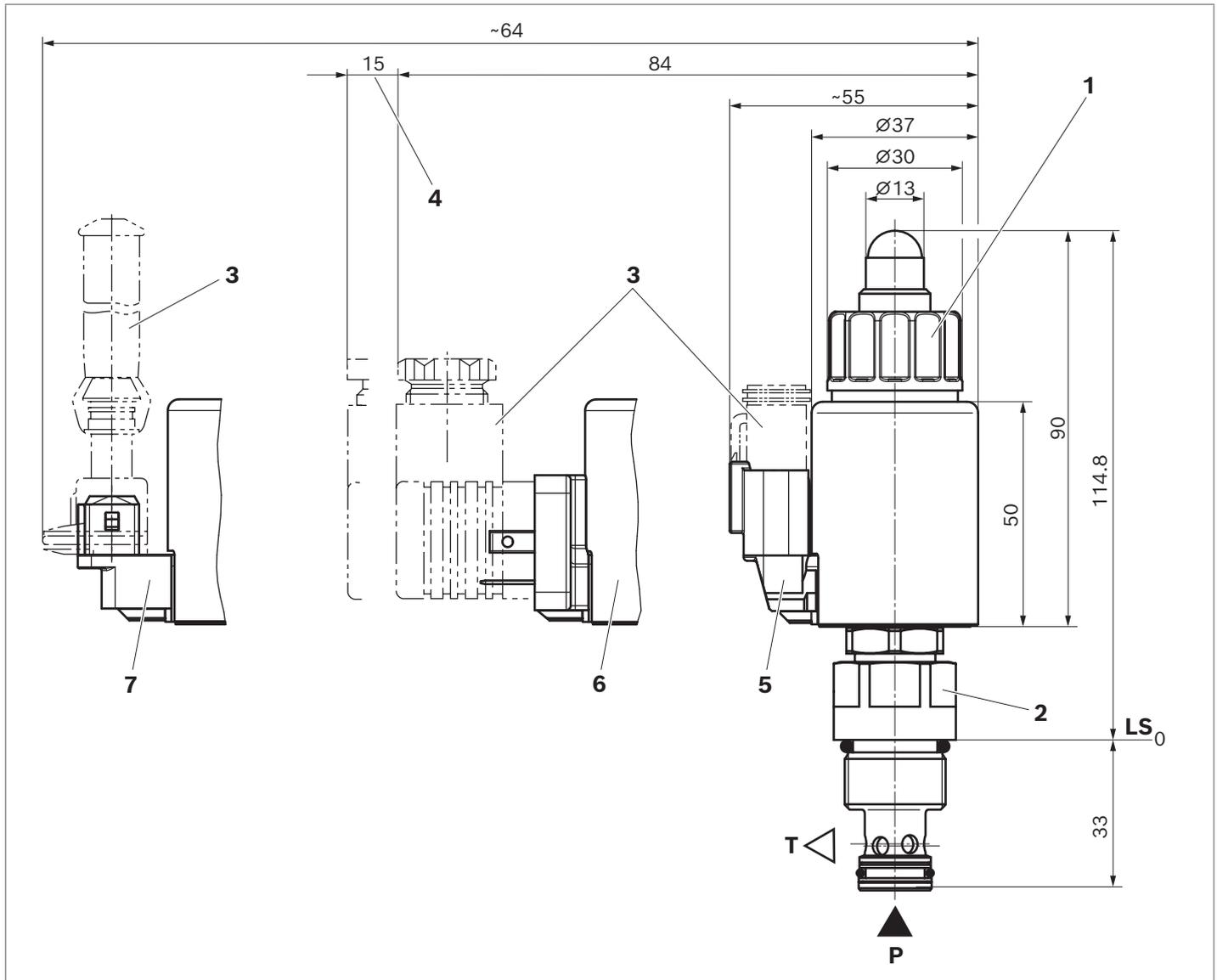
The characteristic curves were determined for coils with valve for medium test block size (80 x 80 x 80 mm), w/o flow in still air.

Depending on installation conditions (block size, flow, air circulation, etc.), heat dissipation may be better. This increases the range of applications.

In specific instances, unfavorable conditions may limit the range of applications.

Dimensions

▼ KBVS.1A

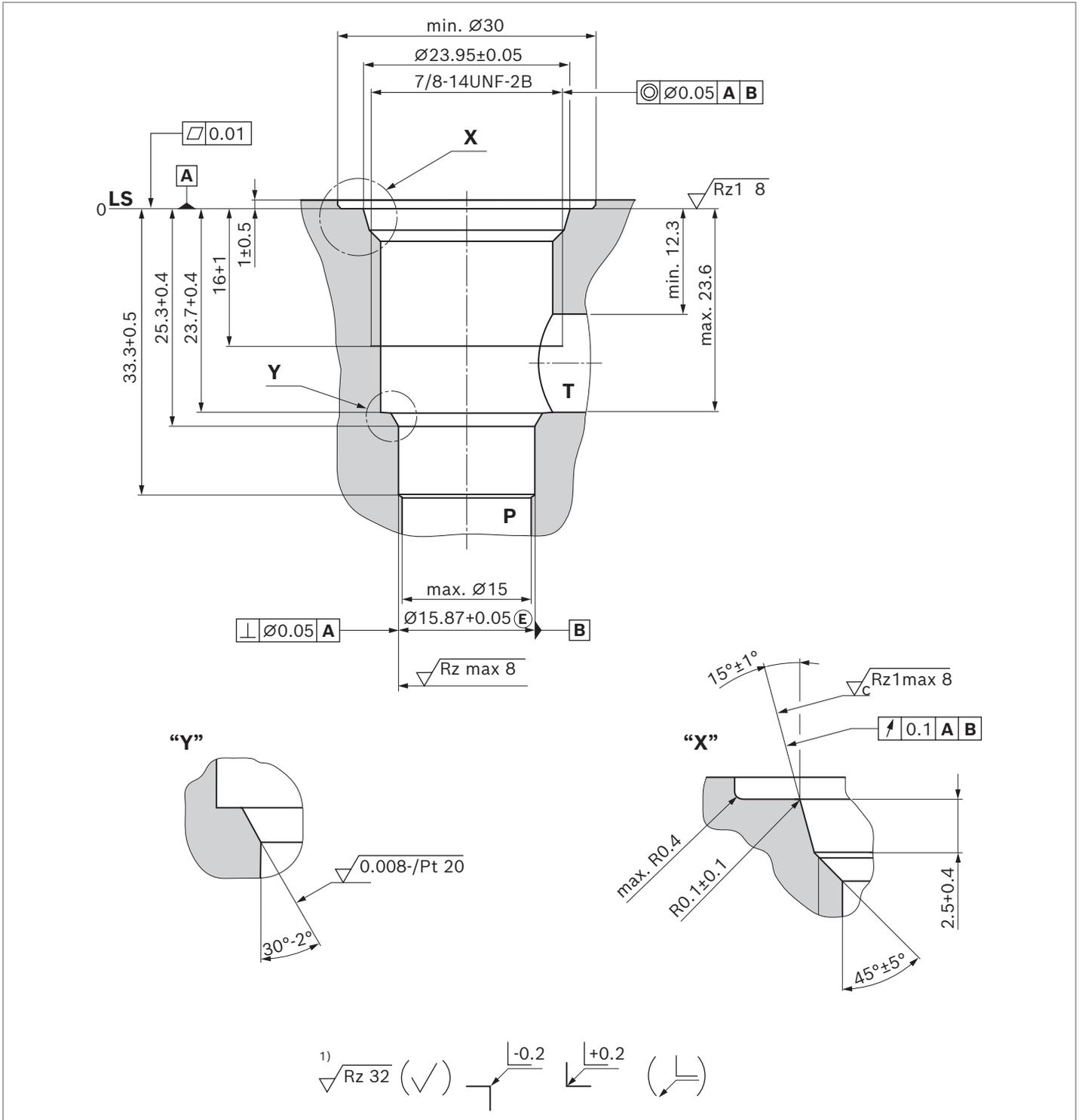


- 1 Nut, tightening torque $M_A = 5+1$ Nm
- 2 Hexagon SW24, tightening torque $M_A = 55+5$ Nm
- 3 Plug-in connectors, separate order, see data sheet 08006
- 4 Space required to remove the plug-in connector
- 5 Device connector "K40"
- 6 Device connector "K4"
- 7 Device connector "C4"

- P** = Pump port
- T** = Tank port
- LS** = location shoulder

Mounting cavity

▼ R/UNF-10-01-0-06; 2 ports; thread 7/8-14UNF-2B



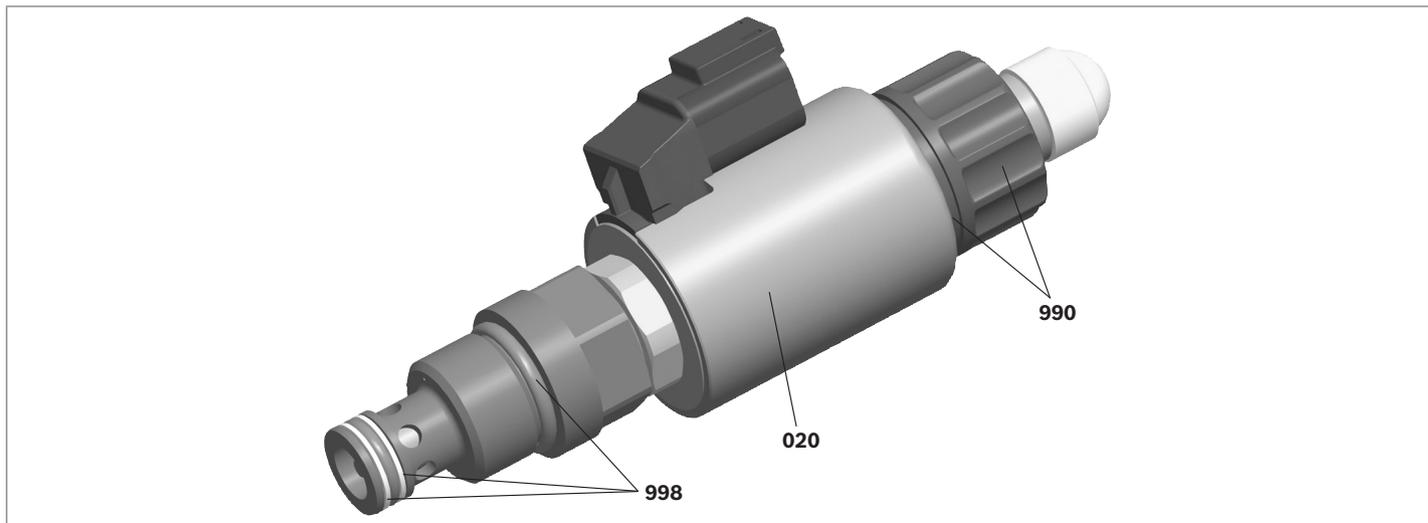
P = Pump port

T = Tank port

LS = location shoulder

1) Visual inspection

Available individual components



Item	Denomination		DC voltage	Material number
020	Coil for single connection ¹⁾	K4	12 V	R901002932
			24 V/1200 mA	R901002319
			24 V/800 mA	R901049962
		K40	12 V	R901003055
			24 V/1200 mA	R901003053
			24 V/800 mA	R901050010
C4	12 V	R901003044		
	24 V/1200 mA	R901003026		
	24 V/800 mA	R901049963		
990	Nut and seal ring for pole tube			R961010456
998	Seal kit of the valve			R961006735

1) Replacing the solenoid coil may result in a change of $\pm 5\%$ in the factory pressure setting.

Related documentation

- ▶ Control electronics:
 - Valve amplifiers for proportional valves Type VT-SSPA1 Data sheet 30116
 - Valve amplifiers for proportional valves Type VT-MSPA Data sheet 30232
 - Analog amplifier Type RA Data sheet 95230
 - BODAS controller Type RC Data sheets 95204, 95205, 95206
- ▶ Mineral oil-based hydraulic fluids Data sheet 90220
- ▶ Environmentally acceptable hydraulic fluids Data sheet 90221
- ▶ $MTTF_p$ values Data sheet 90294