

Proportional pressure relief valve, pilot operated, with anti-cavitation function decreasing characteristic curve **KBVS.2DB**



H8110

- ▶ Size 2
- ▶ Series B
- ▶ Maximum working pressure 420 bar
- ▶ Maximum flow 240 l/min

Features

- ▶ Cartridge valve
- ▶ Mounting cavity R/FC and R/LG
- ▶ 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, maximum 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		2	D	B	/		C		V		*

Valve type

01	Proportional pressure relief valve, pilot operated	KBVS
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Pressure stage

02	Up to 350 bar	R
	Up to 420 bar	T

03	Size 2	2
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04	If setpoint value = 0, maximum pressure is set, with anti-cavitation function	D
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05	Series	B
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Mounting cavity

06	R/FC mounting cavity	DC
	R/LG mounting cavity	DM

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), other seals on request	V
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Solenoid coil

11	Standard variant	No code
	24 V / 800 mA	-8

12	Further details in plain text	*
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Preferred types

R/FC mounting cavity

Type	Material number
KBVSR2DB/DCCG24K40V-8	R901468576
KBVST2DB/DCCG24K40V-8	R901198274
KBVST2DB/DCCG24C4V-8	R901432348

R/LG mounting cavity

Type	Material number
KBVST2DB/DMCG24K40V-8	R901228604

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

Functional description

General

Valves of type KBVS are pilot operated proportional pressure relief valves in seat 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. Maximum pressure is set in case of power failure or if the setpoint value is 0.

Basic principle

The valves are mechanically set to maximum pressure at the factory. To proportionally decrease the system pressure, a setpoint value is specified using the control electronics. Depending on this setpoint value, the

electronics controls the solenoid coil with electric current, which uses the pilot control valve (1) and main valve (2) to actually set the pressure at port P.

($p_{\max}$ = setpoint value of 0; $p_{\min}$ = maximum setpoint)

Anti-cavitation function

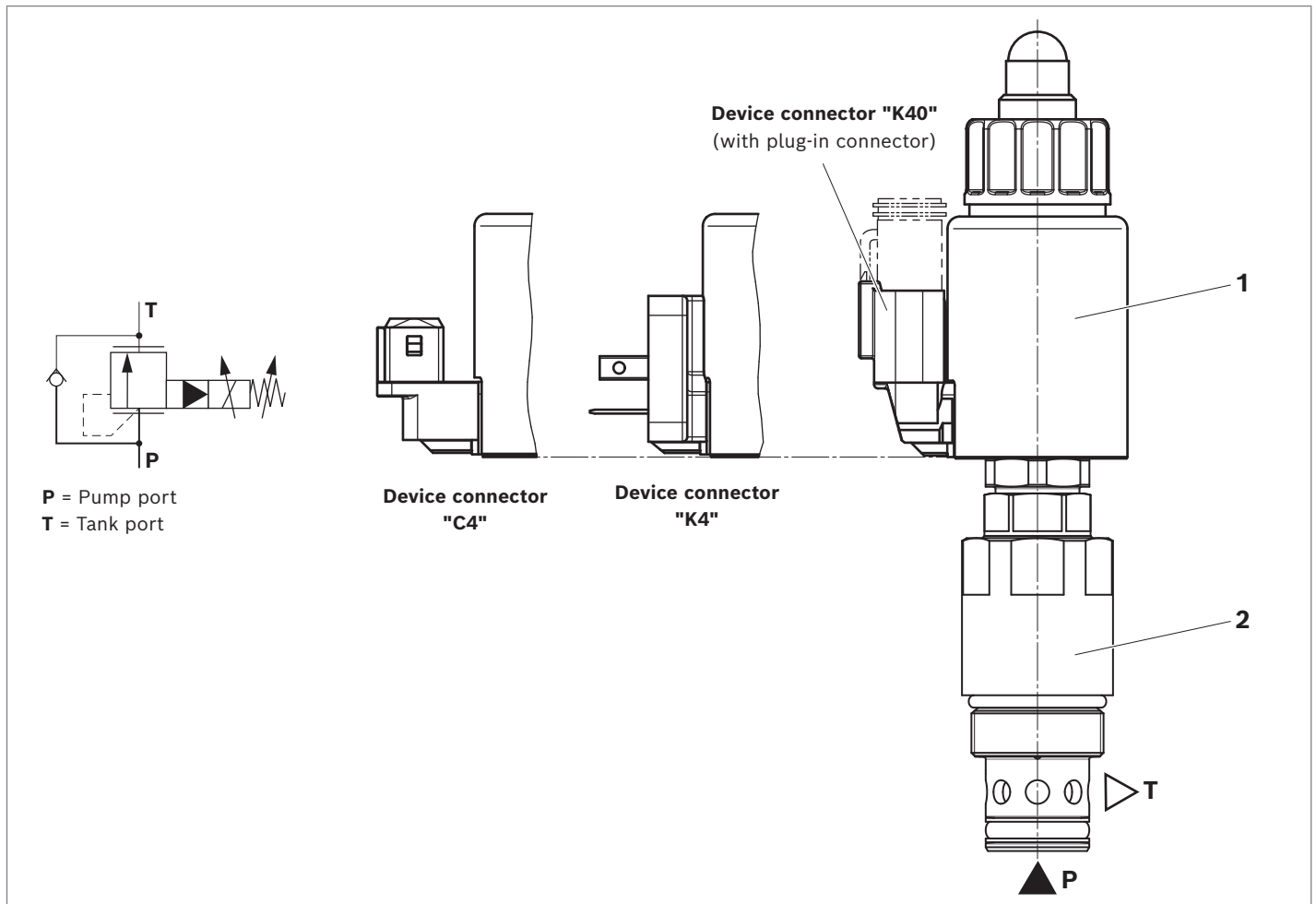
The anti-cavitation function replaces inadequate hydraulic fluid volume caused, e.g. by leakage, pressure valve response or leading loads.

If the pressure at port P is less than that at port T, the control spool is raised from its seat. Hydraulic fluid then flows from port T to port P.

Notice

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

▼ KBVS.2DB...DC (FC mounting cavity)



Technical data

General		
Weight (approx.)	kg	0.81
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	-20 ... +120 (see pages 8 and 9)
Storage temperature range	°C	-20 ... +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	p_A	bar	420
Maximum return flow pressure	Port T	p_T	bar	210
Maximum set pressure ²⁾		$p_{E \max}$		See setpoint value pressure characteristic curve on page 7
Minimum set pressure at maximum setpoint value		$p_{E \min}$		See characteristic curves page 7
Maximum flow	P → T	q_v	l/min	240
Leakage flow		q_L	ml/min	< 80 (pilot control valve closed and HLP46, $\vartheta_{oil} = 40^\circ\text{C}$)
Hydraulic fluid				See table below
Hydraulic fluid temperature range		ϑ	°C	-20 ... +80
Viscosity range		ν	mm ² /s	5 ... 400 (preferably 10 ... 100)
Maximum admissible degree of contamination of hydraulic fluid Cleanliness level per ISO 4406 (c)				Level 20/18/15 ³⁾
Load cycles				2 mil.
Hysteresis ⁴⁾				< 7% of maximum set pressure
Turnover voltage ⁴⁾				< 0.5% of maximum set pressure
Responsiveness ⁴⁾				< 0.5% of maximum set pressure
Setpoint value pressure characteristic curve tolerance	Setpoint value 100%			< 2% of maximum set pressure
	Setpoint value 0			< 5% of maximum set pressure
Step response ($T_u + T_g$) 0 → 100% or 100% → 0		t	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-dissolving, 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 = 200 Hz).

Electric						
Voltage type			DC voltage			
Supply voltages		U	V	12	24	24 ("–8")
Maximum solenoid current		$I_{\max}$	mA	1760	1200	800
Coil resistance	Cold value at 20 °C	R	Ω	2.3	4.8	11.5
	Maximum warm value	R	Ω	3.8	7.9	18.9
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⁾			
			IP6K9K ⁷⁾ (only with Rexroth type R901022127)			
	Connector version "K40"		IP6K7 and IP6K9K ⁷⁾			
Control electronics (separate order)			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	200		
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!

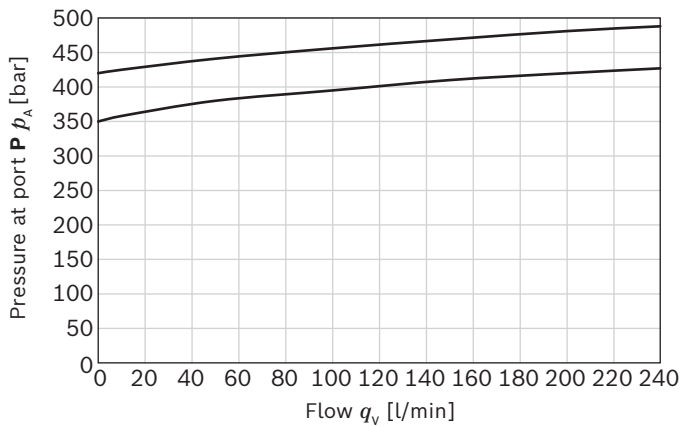
⁷⁾ With installed and locked plug-in connector. Plug-in connectors are not included in the scope of delivery and must be ordered separately, see data sheet 08006.

Characteristic curves

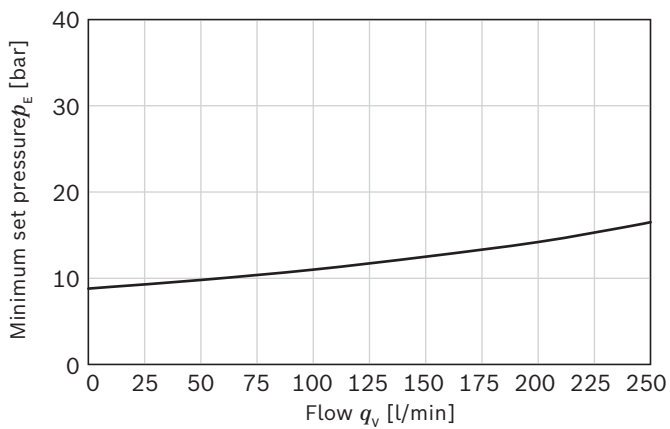
p - q_v flow characteristic curves

▼ Pressure at port P depending on flow

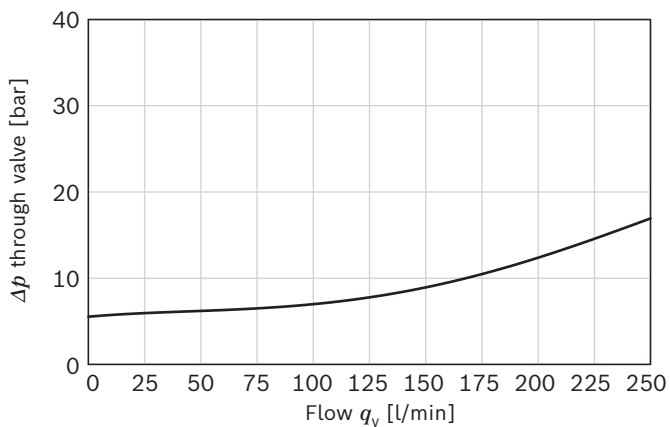
(The characteristic curves were measured without back-pressure at port T)



▼ Minimum set pressure p_E at port P depending on flow at setpoint value 100%



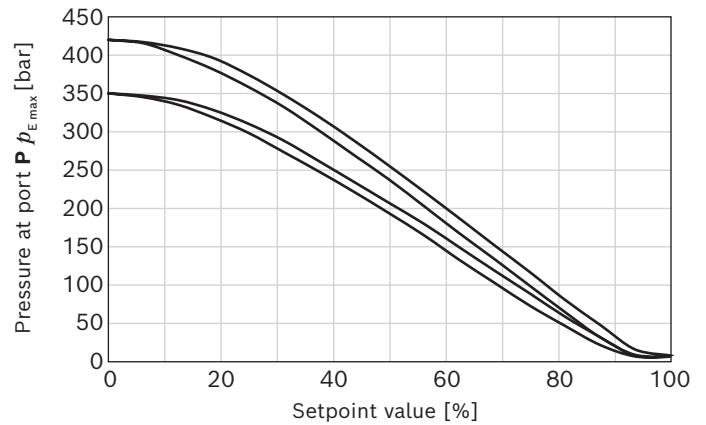
▼ Anti-cavitation function



p - I characteristic curves

▼ Pressure at port P depending on the setpoint value

(Flow = 10 l/min)



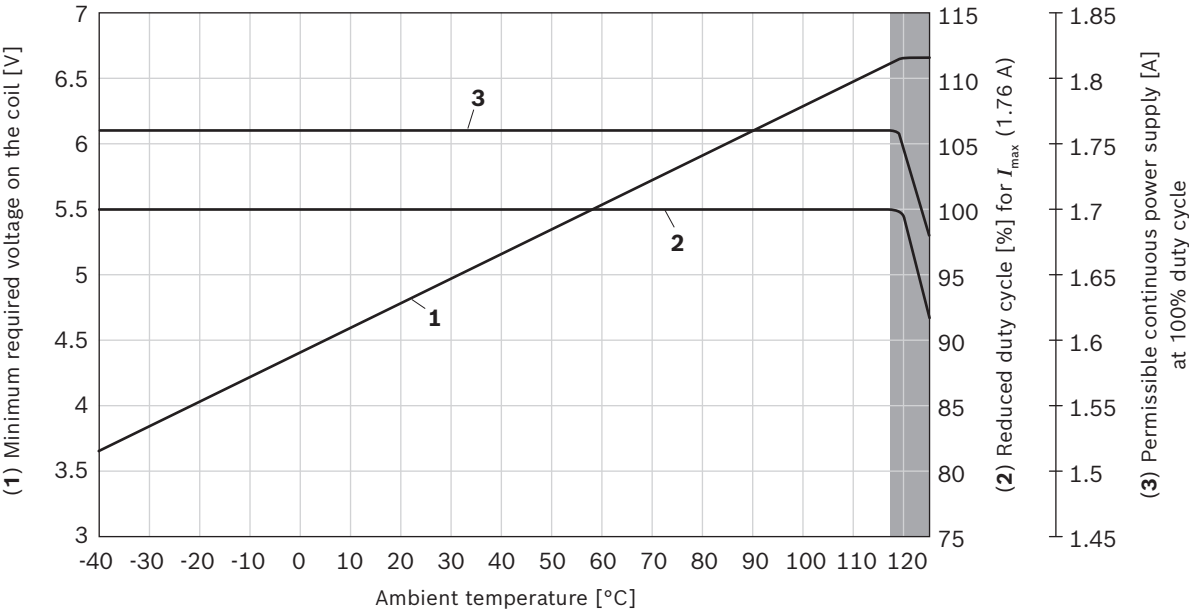
Notice

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

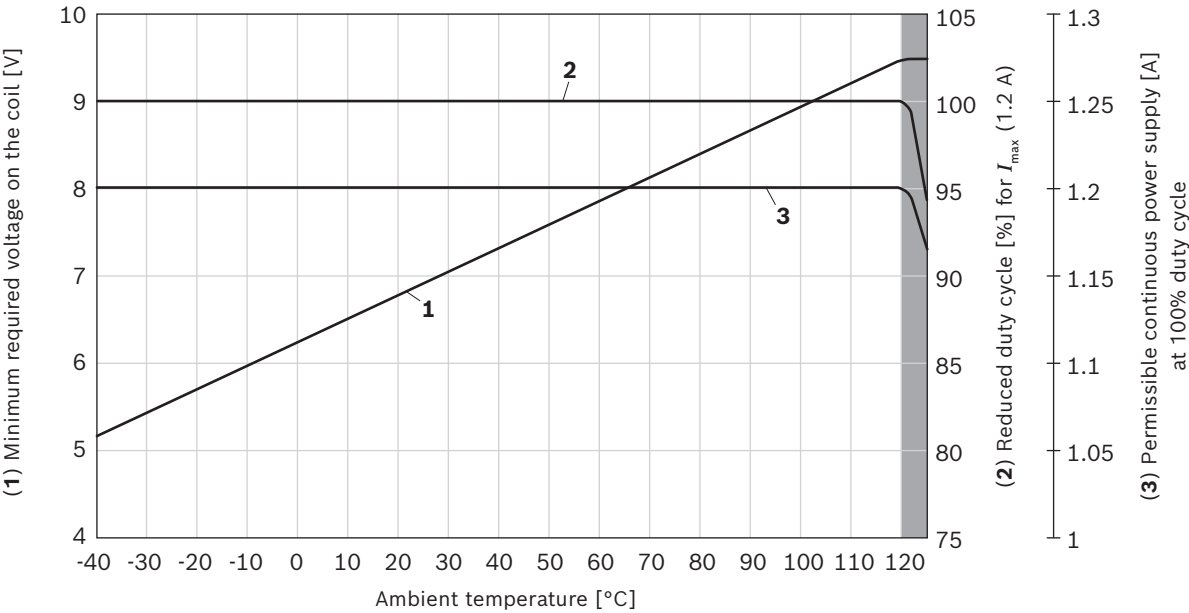
Permissible working range

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

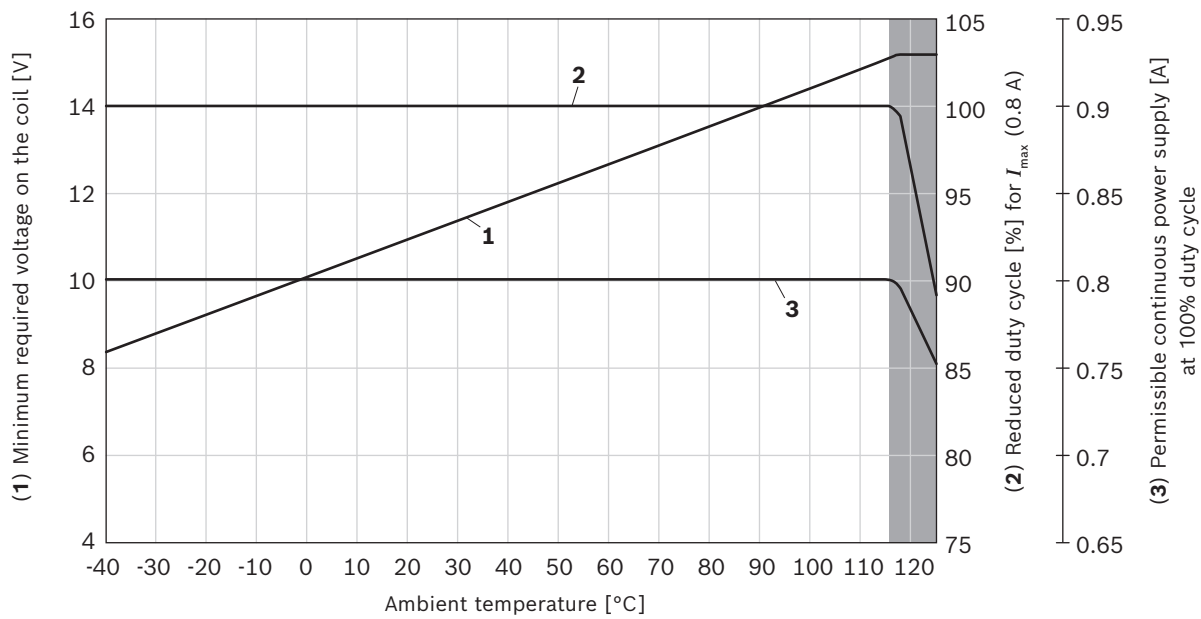
▼ Version "G12"



▼ Version "G24"



▼ Version "G24...-8"



 = Limited valve performance

Notice

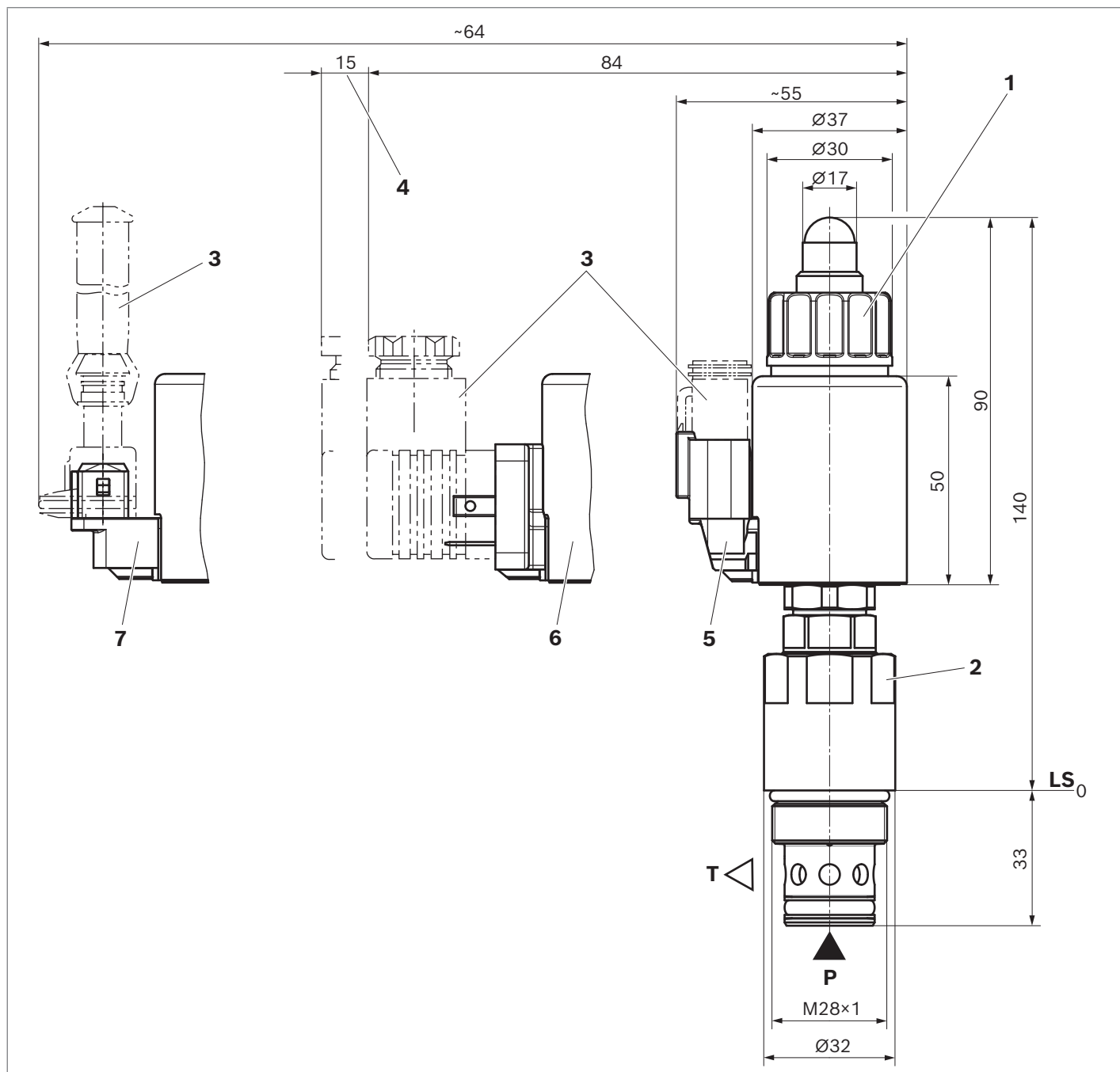
The characteristic curves were determined for coils with valve for medium test block size (80 x 80 x 80 mm), w/o flow in still air.

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.

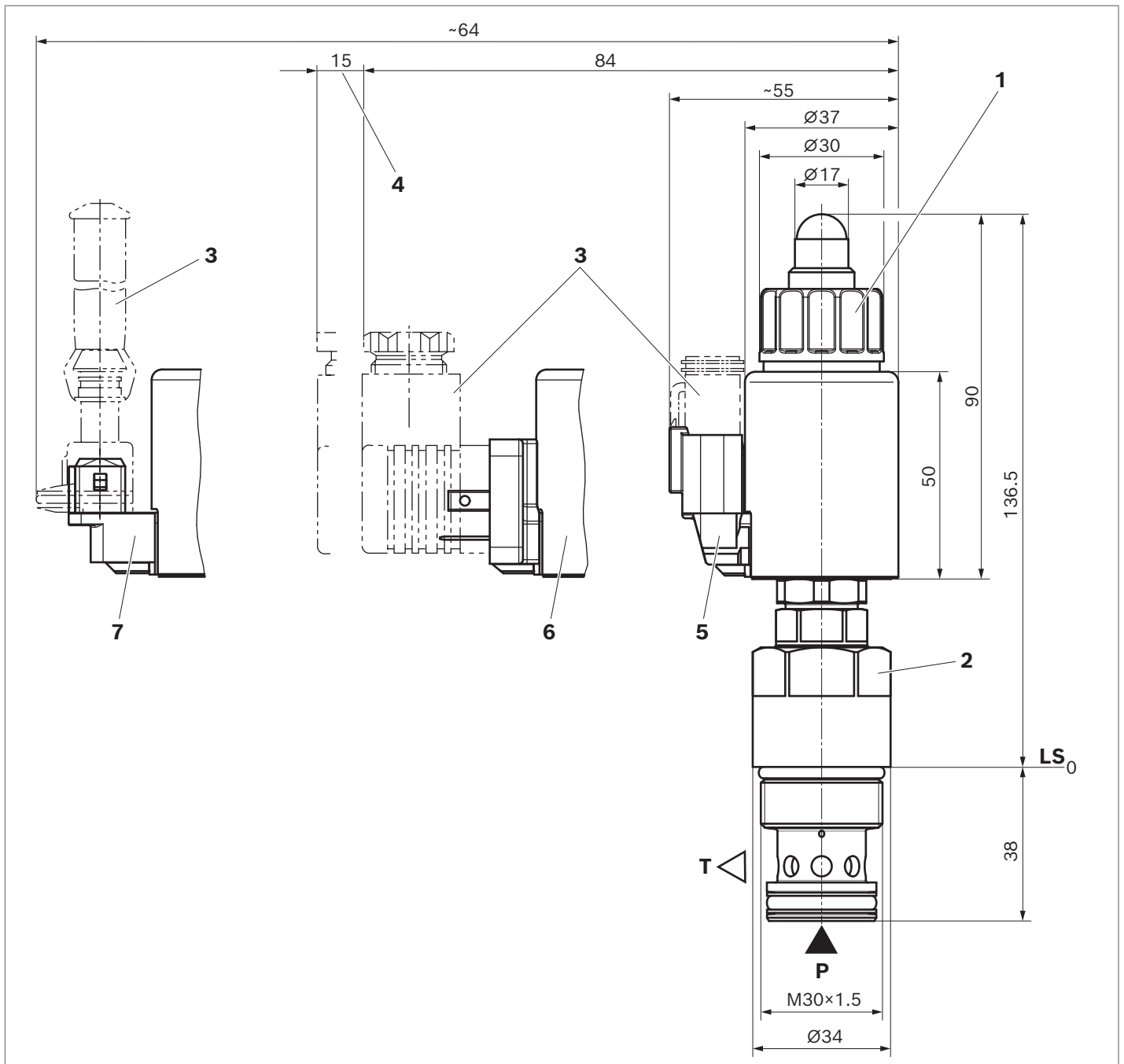
Dimensions

▼ KBVS.2DB...DC (version for FC mounting cavity)



- 1 Nut, tightening torque $M_A = 5+1$ Nm
- 2 Hexagon SW30, tightening torque $M_A = 100\pm 10$ 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

▼ **KBVS.2DB...DM (version for LG mounting cavity)**

- 1 Nut, tightening torque $M_A = 5+1$ Nm
- 2 Hexagon SW30, tightening torque $M_A = 120\pm 12$ 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"

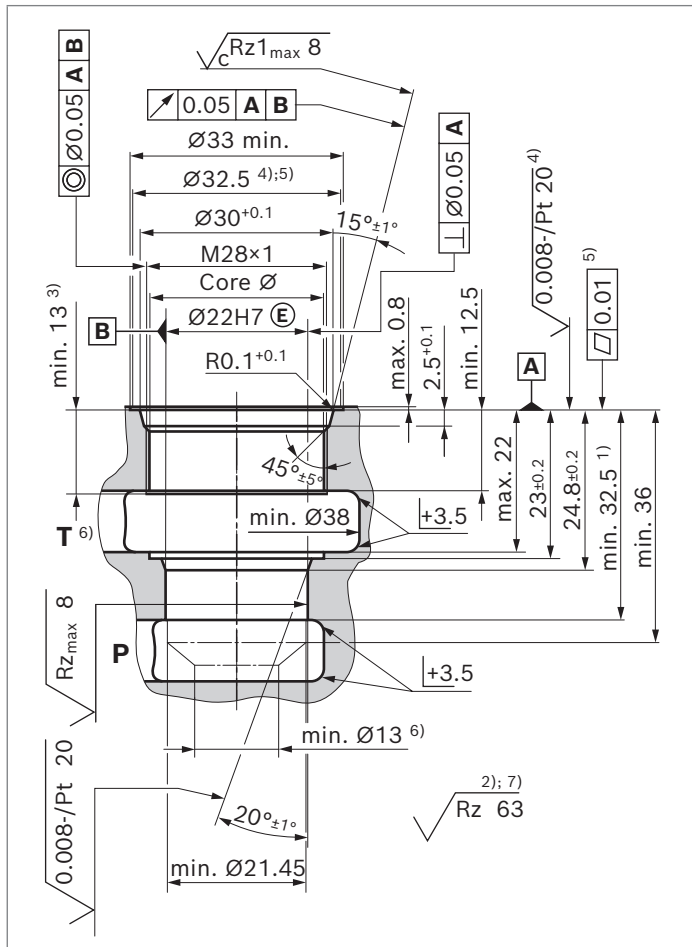
P = Pump port

T = Tank port

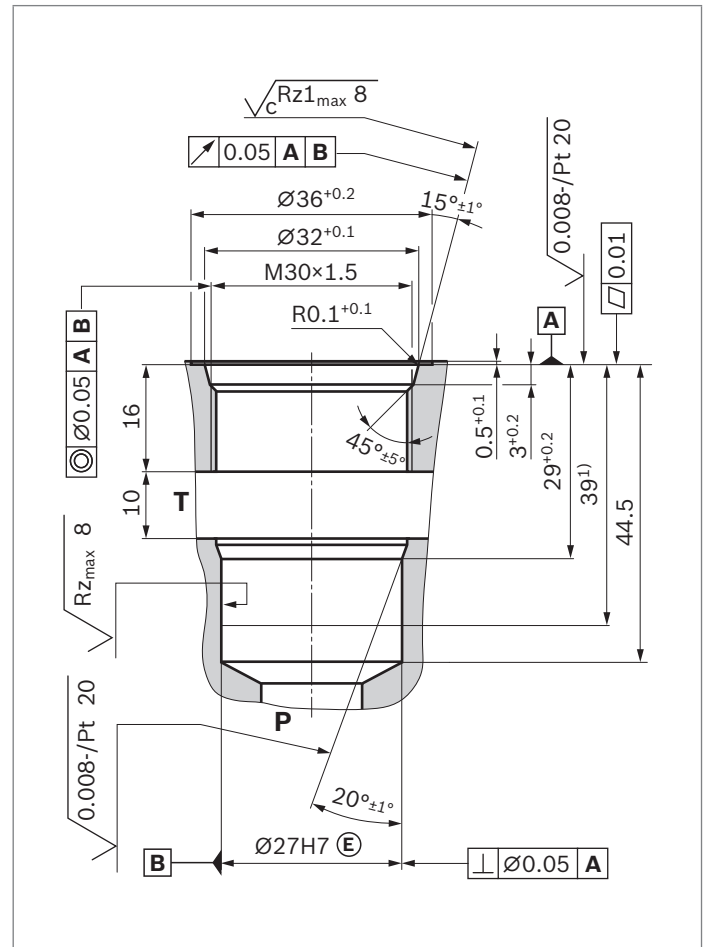
LS = location shoulder

Mounting cavity

▼ Version FC (M28 × 1)



▼ Version LG (M30 × 1.5)



P = Pump port

T = Tank port

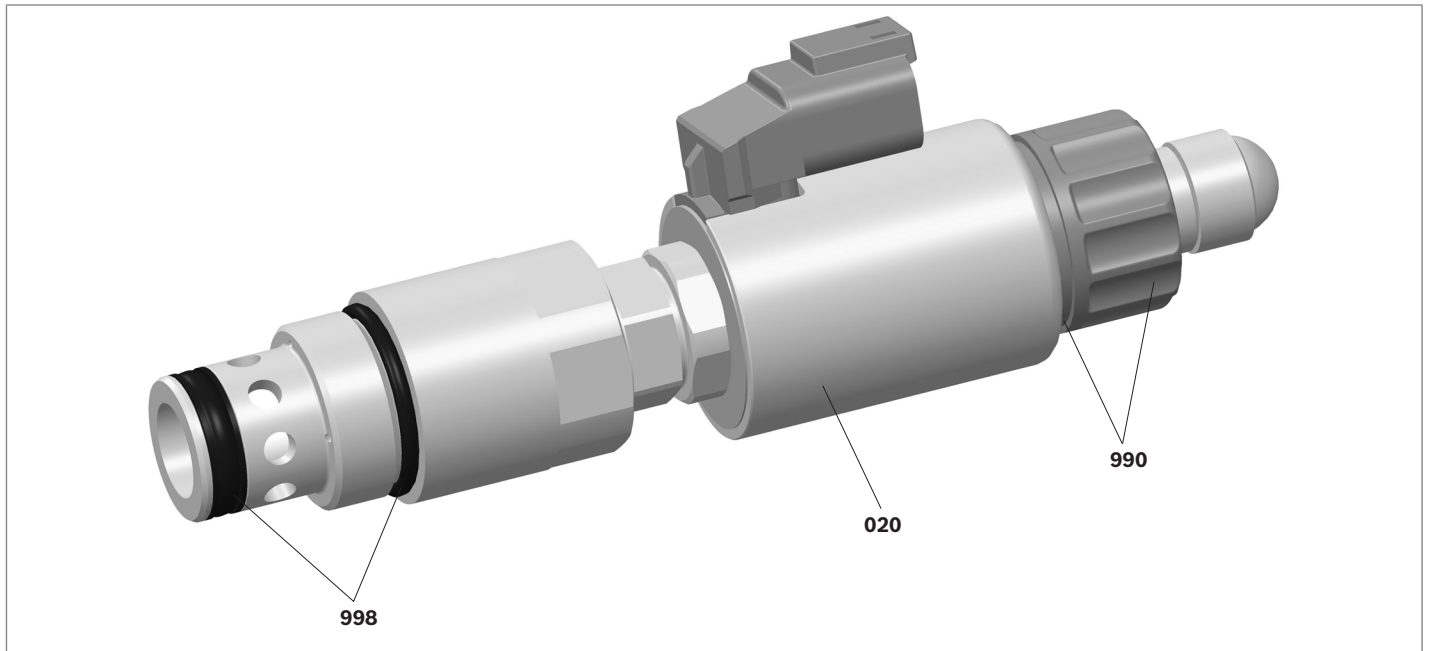
All seal ring insertion faces are rounded and free of burrs.

Standards:

Workpiece edges	ISO 13715
Shape and position tolerance	ISO 1101
General tolerances for machining	ISO 2768-mK
Tolerance	ISO 8015
Surface finish	ISO 1302

- 1) Depth of fit
- 2) Visual inspection
- 3) Thread depth
- 4) Coarseness up to d = 32.5 required
- 5) Evenness up to d = 32.5 required
- 6) Required opening cross-section for pump (P) and tank port (T) > 132 mm²
- 7) For casting channels

Available individual components



Item	Denomination		DC voltage	Material no.
020	Coil for single connection ¹⁾	Device connector "K4"	12 V	R901002932
			24 V	R901002319
			24 V / 800 mA	R901049962
		Device connector "K40"	12 V	R901003055
			24 V	R901003053
			24 V / 800 mA	R901050010
		Device connector "C4"	12 V	R901003044
			24 V	R901003026
			24 V / 800 mA	R901049963
990	Nut and seal ring for pole tube			R961010456
998	Seal kit for DC valve version (FC mounting cavity)			R901109598
	Seal kit for DM valve version (LG mounting cavity)			R901109616

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 (Top hat rail installation)	Type VT-MSPA	Data sheet 30232
– Analog amplifier	– BODAS controller	Type RA	Data sheet 95230
		Type RC	Data sheets 95204, 95205, 95206
► Matching housing for threaded port			Data sheet 25818
► Mineral oil-based hydraulic fluids			Data sheet 90220
► Environmentally acceptable hydraulic fluids			Data sheet 90221
► MTTF _D values			Data sheet 90294

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