Line rupture protection valve type LB

Product documentation

Screw-in valve

Operating pressure p_{max}:	500 bar
Flow rate Q_{max}:	250 lpm

D 6990
12-2015-1.0

HAWE HYDRAULIK

Contents

1 Overview line rupture protection valve type LB

Line rupture protection valves, also called pipe rupture protection valves are a type of check valve. The valves are normally mounted directly on the cylinder. They prevent uncontrolled cylinder movement in the event of a pipe rupture or hose break.
The line rupture protection valve type LB offers a high level of safety in the event of pressure peaks. It features reproducibly accurate, secure closing at the pre-set trigger volumetric flow. Higher volumetric flows causes a plate raised from the valve seat by a spring to be pressed onto the housing seat. The valve closes. A variant with orifice bore in the valve plate permits a low volumetric flow in the check direction. Type LB is available as a screw-in valve and in a housing design for line installation.

Figure 1: Screw-in cartridge

Features and benefits:

- Pressures up to 700 bar

Intended applications:

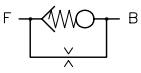
- Industrial trucks
- Lifting devices

2 Available versions, main data

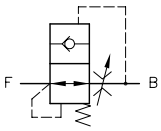
2.1 Screw-in cartridge and housing version

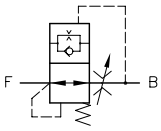
Circuit symbol:

Simplified

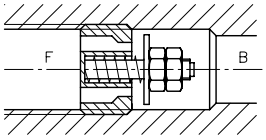


Detailed





Section view:



Order coding example:

LB 2	**C**		**- 40**
LB 3	**F**	**0,8**	**- 63**
LB 3 UNF	**C**	**1,0**	**- 50**

Response flow Table 4 Response flow

Orifices Table 3 Orifices

Version Table 2 Version

Basic type and size Table 1 Basic type and size

Table 1 Basic type and size

Basic type and size	Port size	Description	Housing type (Table 2)		
			C	G	F
LB 1	G 1/4 (A) (BSPP)		●	●	●
LB 2	G 3/8 (A) (BSPP)		●	●	●
LB 3	G 1/2 (A) (BSPP)		●	●	●
LB 4	G 3/4 (A) (BSPP)		●	●	●
LB 5	G 1 (A) (BSPP)		●		
LB 1 UNF	9/16-18 UNF	Version with UNF thread according to SAE J 514	●		
LB 2 UNF	3/4-16 UNF		●		
LB 3 UNF	7/8-14 UNF		●		●
LB 4 UNF	1 1/16-12 UN		●		
LB 14	M 14x1.5	With metric fine thread DIN 13 T6 (Only available for model C)	●		
LB 26	M 16x1.5		●		
LB 28	M 18x1.5		●		
LB 30	M 20x1.5		●		
LB 32	M 22x1.5		●		
LB 47	M 27x2		●		
LB 2/1	G 3/8 (A) (BSPP)	With threaded reducing ring	●	●	●
LB 3/2	G 1/2 (A) (BSPP)		●	●	●
LB 4/3	G 3/4 (A) (BSPP)		●	●	●

Table 2 Versions

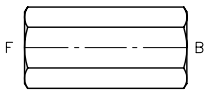
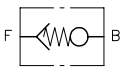
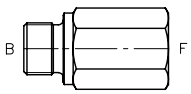
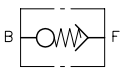
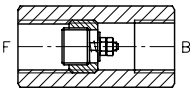
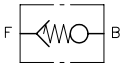
Model	Description	View	Circuit symbol
C	Screw-in cartridge		
G	Pipe connection on both sides		
F	Tapped journal on one side Also LB 1 F - JIS - ... with thread according to JIS B2351		
	With threaded reducing ring Screw-in cartridge sizes 1 to 3 with threaded reducing ring (Table 1) screwed into the next largest housing (G or F) sizes 2 to 4. Example of use: Adjustment to the port size of the hydraulic devices used, e.g. **LB 3/2 G-..**		

Table 3 Orifices

Type	Marking for orifice bore (△∅) only for valves					
	0.5	0.8	1.0	1.2	1.5	2.0
LB 1	●	●	●	●		
LB 2	●	●	●	●	●	
LB 3	●	●	●	●	●	●
LB 4		●	●	●	●	●
LB 5		●	●	●	●	●

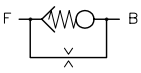
Table 4 Response flow

Basic type and size	Response flow Q_A (lpm)												
	-4	-6.3	-10	-16	-25	-40	-50	-63	-80	-100	-125	-160	-250
LB 1..	●	●	●	●	●								
LB 2..		●	●	●	●	●	●						
LB 3..				●	●	●	●	●	●				
LB 4..					●	●	●	●	●	●	●	●	
LB 5..									●	●	●	●	●
LB 2/1..	●	●	●	●	●								
LB 3/2..		●	●	●	●	●	●						
LB 4/3..				●	●	●	●	●	●				

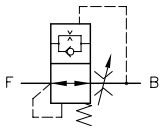
2.2 Fitting

Circuit symbol:

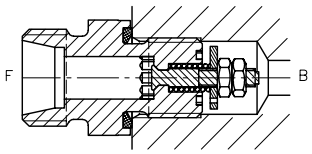
Simplified



Detailed



Section view:



Order coding example:

LB 1 E **LB 4 E**	**-10L** **-18L**	**/0,5**	**-10** **-80**	**- G 1/4 A-ED** **- G 3/4 A-ED**

Port size, block/cylinder side Table 5 Port size, block/cylinder side with Eolastik seal

Response flow Table 4 Response flow

Orifices Table 3 Orifices

Port size, hose side Table 5 Port size, hose side

Basic type and size Table 5 Basic type and size

Table 5 Basic type and size

Basic type and size	Port size, hose side	Port size (BSPP), block/cylinder side
LB 1 E -8L/...-... G 1/4 A-ED	M12x1.5	G 1/4 A
LB 1 E -10L/...-... G 1/4 A-ED	M16x1.5	G 1/4 A
LB 2 E -12L/...-... G 3/8 A-ED	M18x1.5	G 3/8 A
LB 3 E -12L/...-... G 1/2 A-ED	M18x1.5	G 1/2 A
LB 3 E -15L/...-... G 1/2 A-ED	M22x1.5	G 1/2 A
LB 4 E -15L/...-... G 3/4 A-ED	M22x1.5	G 3/4 A
LB 4 E -18L/...-... G 3/4 A-ED	M26x1.5	G 3/4 A
LB 4 E -25S/...-... G 3/4 A-ED	M36x2	G 3/4 A

3 Parameters

General information

Description	Line rupture protection valve
Design	Plate valve
Model	Screw-in valve, housing version, fitting
Material	Steel; valve housing galvanized zinc plated; hardened and ground functional inner parts Surface treatment (magnet): DIN 50961-Fe/Zn 12 bk cC
Installation position and direction	As desired; B = port on consumer side to be protected against rupture
Flow direction	Δp-Q characteristics for both flow directions (B $\rightarrow$ F or F $\rightarrow$ B) in accordance with adjusting length S (see also Chapter 5.3.2, "Reference values for the response flow").
Hydraulic fluid	Hydraulic oil conforming DIN 51 524 part 1 to 3; ISO VG 10 to 68 conforming DIN 51 519 Viscosity limits: min. approx. 4, max. approx. 1500 mm²/s opt. operation approx. 10... 500 mm²/s. Also suitable are biologically degradable pressure fluids types HEPG (Poly-alkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70°C.
Cleanliness level	**ISO 4406** 21/18/15...19/17/13
Temperatures	Ambient: approx. -40 ... +80°C, Fluid: -25 ... +80°C, Note the viscosity range! Permissible temperature during start: -40°C (observe start-viscosity!), as long as the service temperature is at least 20K higher for the following operation. Biologically degradable pressure fluids: Observe manufacturer's specifications. By consideration of the compatibility with seal material not over +70°C.

Pressure and flow rate

Pressure p_{max}	500 bar
Flow rate Q_{max}	In accordance with size and the set response flow/gap

Characteristic curves

Response flow/gap

Viscosity during measurements approx. 60 mm²/s

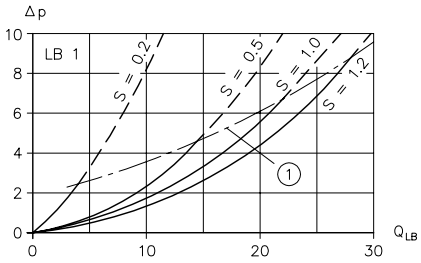


Figure 2: Q_{LB} flow rate (lpm); Δp flow resistance (bar)

1 Response flow (B → F)

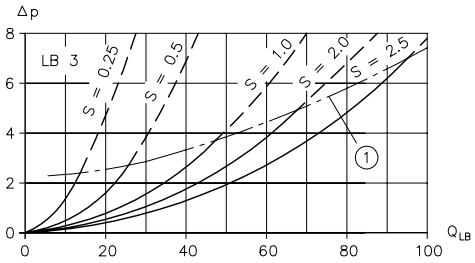


Figure 3: Q_{LB} flow rate (lpm); Δp flow resistance (bar)

1 Response flow (B → F)

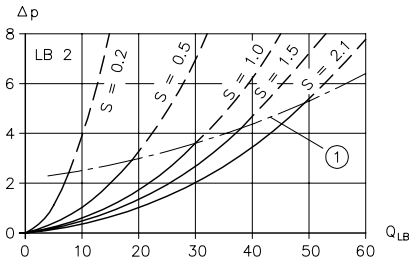


Figure 4: Q_{LB} flow rate (lpm); Δp flow resistance (bar)

1 Response flow (B → F)

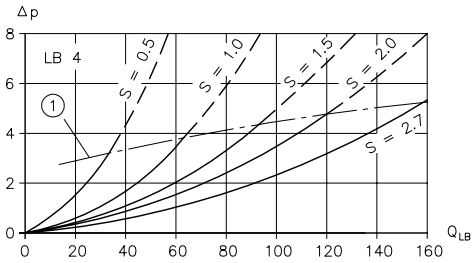


Figure 5: Q_{LB} flow rate (lpm); Δp flow resistance (bar)

1 Response flow (B → F)

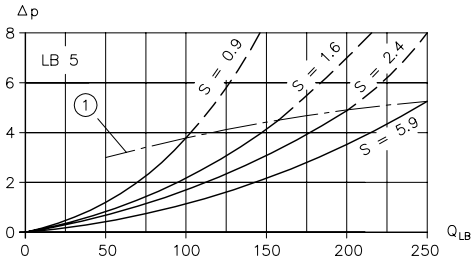


Figure 6: Q_{LB} flow rate (lpm); Δp flow resistance (bar)

1 Response flow (B → F)

- Valve closure occurs at the intersection of characteristic curve "S" with the dot-dash limit line.
- For valves with an orifice as per Table 3, the actual response flow is only higher by the proportion that flows through the orifice bore.
- Intermediate values are to be interpolated.
- For reference values for the response flow, see Chapter 5.3.2, "Reference values for the response flow"

Characteristic curves

Orifice characteristic curve

Viscosity during measurements approx. 60 mm²/s

Orifice characteristic curves (reference values) to determine the actual response flow

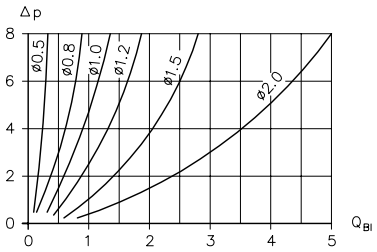


Figure 7: Q_{BI} flow rate (lpm); Δp flow resistance (bar) with responding LB valve

Orifice characteristic curves to determine the load lowering speed during response

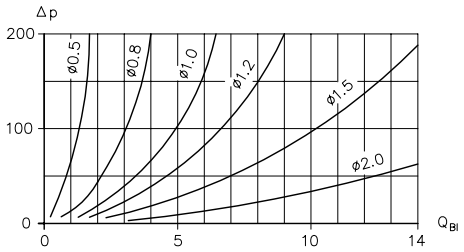


Figure 8: Q_{BI} flow rate (lpm); Δp flow resistance (bar) ≈ load pressure

Weight

Screw-in cartridge

Type LB 1	= approx. 6 g
Type LB 2	= approx. 12 g
Type LB 3	= approx. 21 g
Type LB 4	= approx. 45 g

Housing version

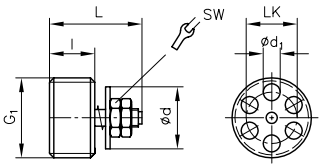
Type LB 1 F, LB 1 G	= approx. 70 g
Type LB 2 F, LB 2 G	= approx. 100 g
Type LB 3 F, LB 3 G	= approx. 170 g
Type LB 4 F, LB 4 G	= approx. 390 g

4 Dimensions

All dimensions in mm, subject to change!

4.1 Screw-in cartridge and housing version

Screw-in cartridge

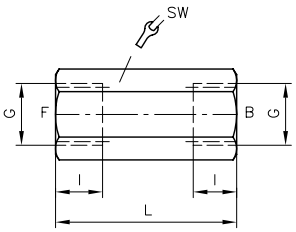


A corresponding assembly tool must be made locally in accordance with the hole pattern

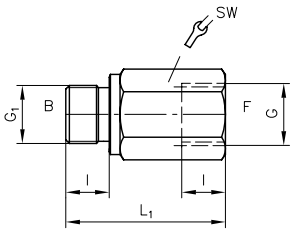
Type	G_1	L	l	∅d	$∅d_1$	LK	SW	Max. tightening torque M_A (Nm)
LB 1 C	G 1/4 A (BSPP)	17.5	8.1	9.5	2.4	8.5	5.5	8
LB 14 C	M 14x1.5	17.5	8.1	9.5	2.4	8.5	5.5	8
LB 1 UNF C	9/16-18 UNF	17.9	8.3	9.5	2.4	8.5	5.5	8
LB 2 C	G 3/8 A (BSPP)	21	10.6	12.5	3.5	11	5.5	12
LB 26 C	M 16x1.5	21	10.6	12.5	3.5	11	5.5	12
LB 28 C	M 18x1.5	21	10.6	12.5	3.5	11	5.5	12
LB 2 UNF C	3/4-16 UNF	21	10.6	12.5	3.5	11	5.5	12
LB 3 C	G 1/2 A (BSPP)	25	12.1	15	4.5	13	7	18
LB 30 C	M 20x1.5	25	12.1	16.2	4.5	13	7	18
LB 32 C	M 22x1.5	25	12.1	16.2	4.5	13	7	18
LB 3 UNF C	7/8-14 UNF	25	12.1	16.2	4.5	13	7	18
LB 4 C	G 3/4 A (BSPP)	30.5	17.1	17.5	6	16	7	23
LB 47 C	M 27x2	30.5	17.1	17.5	6	16	7	23
LB 4 UNF C	1 1/16-12 UNF	30.5	17.1	17.5	6	16	7	23
LB 5 C	G 1 A (BSPP)	38	22.1	26	7.5	19.5	7	25

Housing version

Type LB ... G

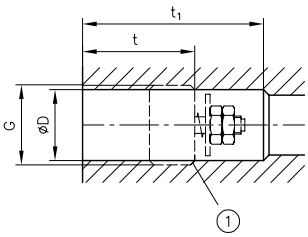


Type LB ... F



Type	G	G_1	L	L_1	l	SW
LB 1...	G 1/4 (BSPP)	G 1/4 A (BSPP)	50	48	12	19
LB 1... - JIS	G 1/4 JIS (BSPP)	G 1/4 JIS (BSPP)	--	55	12	19
LB 2...	G 3/8 (BSPP)	G 3/8 A (BSPP)	58	52	12	22
LB 3...	G 1/2 (BSPP)	G 1/2 A (BSPP)	65	60	14	27
LB 3...	7/8-14 UNF	7/8-14 UNF	--	70	17	30
LB 4...	G 3/4 (BSPP)	G 3/4 A (BSPP)	78	72	16	36

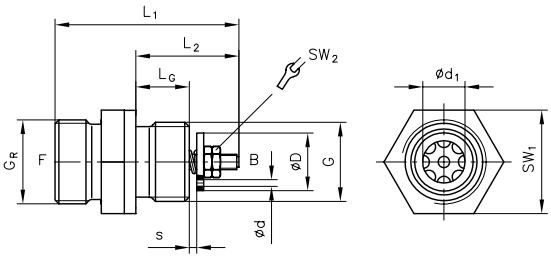
Creating the mounting hole



1 End of the thread with cut type E

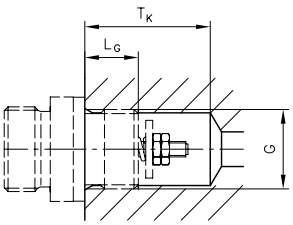
Type	G	∅D $^{+0.1}$	t	t_1
LB 1 C	G 1/4 (BSPP)	11.5	22	33
LB 14 C	M 14x1.5	12.5	22	33
LB 2 C	G 3/8 (BSPP)	15.0	26	37
LB 26 C	M 16x1.5	14.4	26	37
LB 28 C	M 18x1.5	16.4	26	37
LB 2 UNF C	3/4-16 UNF	17.5	26	37
LB 3 C	G 1/2 (BSPP)	18.7	30	45
LB 30 C	M 20x1.5	18.4	30	45
LB 32 C	M 22x1.5	20.4	30	45
LB 3 UNF C	7/8-14 UNF	20.4	30	45
LB 4 C	G 3/4 (BSPP)	24.2	38	54
LB 47 C	M 27x2	24.9	38	54
LB 4 UNF C	1 1/16-12 UNF	25.0	38	54
LB 5 C	G 1 (BSPP)	30.7	47	67

4.2 Fitting



Type	G_R	G (BSPP)	L_1	L_2	L_G	∅D	∅d	$∅d_1$	s	SW_1	SW_2
LB 1 E -8L/...-... G 1/4 A-ED	M12x1.5	G 1/4 A	38.4	21.4	12	10.3	0.5-1.2	7	0.2-1.3	19	5.5
LB 1 E -10L/...-... G 1/4 A-ED	M16x1.5	G 1/4 A	39.4	21.4	12	10.3	0.5-1.2	7	0.2-1.3	19	5.5
LB 2 E -12L/...-... G 3/8 A-ED	M18x1.5	G 3/8 A	44	22.5	12	12.5	0.5-1.5	9	0.3-1.5	22	5.5
LB 3 E -12L/...-... G 1/2 A-ED	M18x1.5	G 1/2 A	46.8	26.8	14	15	0.5-2.0	10	0.5-2.0	27	7
LB 3 E -15L/...-... G 1/2 A-ED	M22x1.5	G 1/2 A	48.8	26.8	14	15	0.5-2.0	11	0.5-2.4	27	7
LB 4 E -15L/...-... G 3/4 A-ED	M22x1.5	G 3/4 A	51.1	29.4	16	18.5	0.8-2.0	12	1.1-1.9	32	7
LB 4 E -18L/...-... G 3/4 A-ED	M26x1.5	G 3/4 A	51.1	29.4	16	20	0.8-2.0	15	1.1-2.7	32	7
LB 4 E -25S/...-... G 3/4 A-ED	M36x2	G 3/4 A	64.4	29.4	16	20	0.8-2.0	16	1.1-2.7	41	7

Creating the mounting hole



Type	G (BSPP)	L_G	T_K
LB 1 E -8L/...-... G 1/4 A-ED	G 1/4 A	12	23
LB 1 E -10L/...-... G 1/4 A-ED	G 1/4 A	12	23
LB 2 E -12L/...-... G 3/8 A-ED	G 3/8 A	12	23
LB 3 E -12L/...-... G 1/2 A-ED	G 1/2 A	14	29
LB 3 E -15L/...-... G 1/2 A-ED	G 1/2 A	14	29
LB 4 E -15L/...-... G 3/4 A-ED	G 3/4 A	16	32
LB 4 E -18L/...-... G 3/4 A-ED	G 3/4 A	16	32
LB 4 E -25S/...-... G 3/4 A-ED	G 3/4 A	16	32

5 Installation, operation and maintenance information

5.1 Designated use

This fluid-power product has been designed, manufactured and tested acc. to standards and regulations generally applicable in the European Union and left the plant in a safe and fault-free condition.

To maintain this condition and ensure safe operation, operators must observe the information and warnings in this documentation.

This fluid-power product must be installed and integrated in a hydraulic system by a qualified staff who is familiar with and observes the general engineering principles and relevant applicable regulations and standards.

In addition, application-specific features of the system or installation location must be taken into account if relevant.

This product may only be used within oil-hydraulic systems.

The product must be operated within the specified data. This documentation contains the technical parameters for various product versions.

Note
Non-compliance will void any warranty claims made against HAWE Hydraulik.

5.2 Assembly information

The hydraulic accumulator must be integrated in the system via state of the art connection components (screw fittings, hoses, pipes, etc.). The hydraulic system must be shut down as a precautionary measure prior to dismounting; this applies in particular to systems with hydraulic accumulators.

5.2.1 Creating the mounting hole

See description in Chapter 4, "Dimensions".

5.3 Operating instructions

Product, pressure and/or flow settings

All statements in this documentation must be observed for all product, pressure and/or flow settings on or in the hydraulic system.

Filtering and purity of the hydraulic fluid

Soiling in the fine range, e.g. abraded material and dust, or in the macro range, e.g. chips, rubber particles from hoses and seals, can cause significant malfunctions in a hydraulic system. It is also to be noted that new hydraulic fluid “from the drum” does not necessarily meet the highest purity requirements.

Pay attention to the purity of the hydraulic fluid in order to maintain faultless operation (also see cleanliness level in Chapter 3, "Parameters").

5.3.1 Adjusting the valve

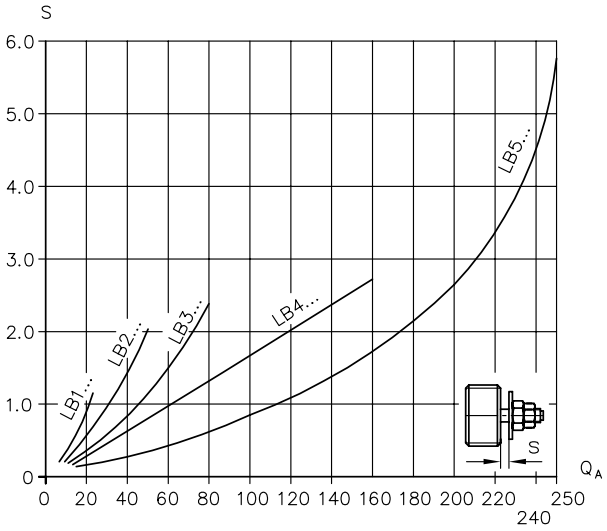
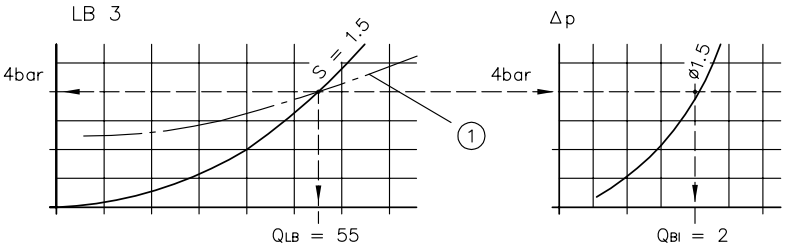


Figure 9: Q_A flow rate (lpm); S gap width (mm)

Determine the gap width for the required response flow. See Chapter 3, "Parameters" ("characteristics")

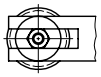
Example: LB 3C 1.5



1 Limit line for response flow

- Response flow Q_{LB} = 55 lpm → S = 1.5 mm
- Flow rate through orifice Q_{BI} = 2 lpm
- Actual response flow $Q_A = Q_{LB} + Q_{BI}$ = 5.7 lpm

After loosening the nuts, select gap width S using two equal feeler gauges or calliper gauge, lightly hand-tighten the nuts, remove the gauges and carefully lock the nuts against each other.



5.3.2 Reference values for the response flow

The return flow Q_{return} from the consumer, which occurs in direction B → F in untroubled operation, is important in relation to the setting value Q_A of the response flow. In practice, a feasible reference value is approximately ratio Q_A: $Q_{return} \geqq 1.5$ for manually operated directional valves or ≈ 2 for solenoid-actuated or other fast-switching directional valves.

For large-volume hydraulic cylinders and/or high load pressures, despite the response flow set according to these reference values the test run of normal system functions can sometimes generate unwanted shut-off of the LB protection valve, caused by the decompression surge from the consumer when the directional valve is switched. If the directional valve must not be adjusted during its switching time, the decompression surge must be suppressed by an orifice on the outlet side.

The orifice must be selected according to its Δp-Q characteristics so that, at the largest load pressure to be expected within the system, the flow rate is **less** than the response flow of the LB protection valve, but **equal to** or **greater** than (See "Application examples" in Chapter 6.1, "Application examples"for both) the return flow Q_{return}. Bear in mind that this orifice is not installed within the line cross section that is to be monitored for a break by the LB protection valve, but in a section no longer at risk (e.g. in the return line).

In the event of extremely great differences in load (e.g. between maximum load and unladen weight), the orifice must accept a potentially reduced lowering speed for low loads in accordance with the Δp-Q characteristics for the orifice.

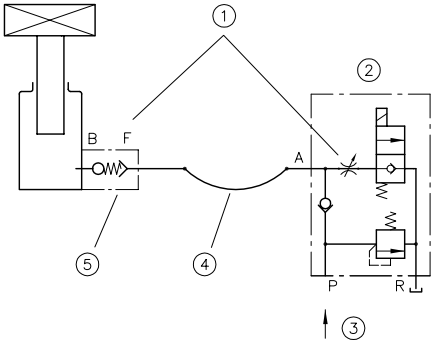
5.4 Maintenance information

This product is maintenance-free.

6 Other information

6.1 Application examples

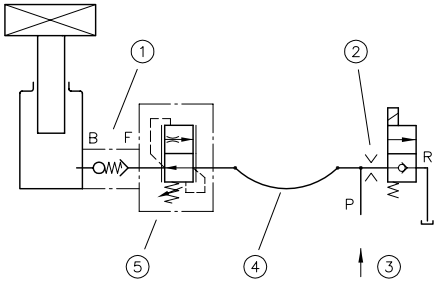
LB protection valve in lifting equipment with type HSV lifting/ lowering valve according to D 7032



1 Throttle valve adjustment produces Q_{return} at maximum load, Q_A then possible to 1.2 x value
2 Lifting/lowering valve type HSV
3 From the pump
4 Line cross section at risk
5 Line rupture protection valve type LB

LB protection valve in lifting equipment with solenoid-actuated directional valve, e.g. type EM according to D 7490/1 for lowering and drop-rate braking valve according to D 6920. This combination is possible due to the response delay of the flow valve, with the LB protection valve coming into effect within this time period in the event of damage.

The drop-rate brake determines return flow Q_{return} (= Q_{SB})



1 Line rupture protection valve type LB
2 Orifice type EB according to D 6465 or throttle valve type ED according to D 7540
3 From the pump
4 Line cross section at risk
5 Drop-rate braking valve type SB according to D 6920

Further information

HAWE Hydraulik supplies compact, energy-saving and durable hydraulic components and systems.
These are characterised by the following, for example:

- Consistent use of steel (no parts exposed to pressure made of cast-iron or aluminium)
- Components designed for high pressures
- Compact design (requiring minimal space)
- Zero leakage or controlled minimal leakage
- Approved for special operating conditions (e.g. ATEX)

Further information on HAWE Hydraulik and our range of products can be found at HAWE Hydraulik – global website.

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