2-way flow control valves (counterbalance valve) type SB, SQ

Product documentation

Operating pressure p_{max}:	315 bar
Flow rate Q_{max}:	400 lpm

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1 Overview of flow control valves type SB, SQ

Flow control valves are a type of flow valve. They generate a set constant flow rate, largely independently of the load.

The flow control valve type SB and SQ is available as a screw-in valve, a housing version with pipe connection or as a banjo bolt version. Type SB has a slightly inclined characteristic line for oscillation damping. Type SQ is largely independent of the load.

The freely movable sliding metering orifice enables greater flow in the opposite flow direction. No bypass check valve is therefore required. The flow control valve type SB and SQ is used to control the lowering speed of single-acting consumers.

Flow control valve type SB, SQ

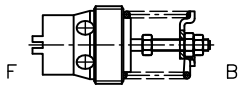
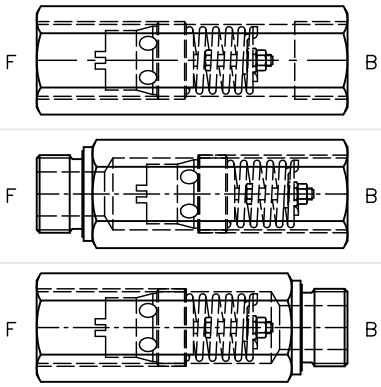
Features and advantages

- Compact screw-in valve
- Vibration isolating and load-independent
- Available in various housing versions
- 6 sizes from 1 to 400 lpm

Intended applications

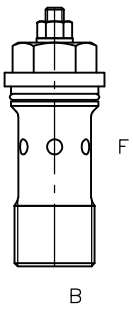
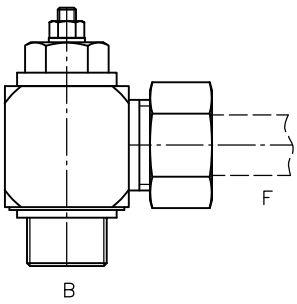
- General hydraulic systems
- Industrial vehicles
- Lifting equipment

1.1 Overview of non-adjustable version

Screw-in valve	Housing version
	

- Version with pipe thread (see Chapter 2.1.1, "Version with pipe thread")
- Version with metric thread (see Chapter 2.1.2, "Version with metric thread")
- Version with threaded reducing ring (see Chapter 2.1.3, "Version with threaded reducing ring")
- Version with UNF thread (see Chapter 2.1.4, "Version with UNF thread")

1.2 Overview of adjustable version (banjo bolt version)

Screw-in valve	Swivel housing version
	

- Version with pipe thread (see Chapter 2.2.1, "Version with pipe thread")
- Version with metric thread (see Chapter 2.2.1, "Version with pipe thread")

2 Available versions

2.1 Non-adjustable version

2.1.1 Version with pipe thread

Ordering example

SB 2 | **1** | **C** | **-20** | **/100**

- **/100** – **Pressure setting** – see Chapter 3.5, "Setting characteristic lines"
- **-20** – **Response flow** – see "Flow rate range"
- **C** – "Model"
- **1** – "Flow rate range"
- **SB 2** – "Basic type and size"

Basic type and size

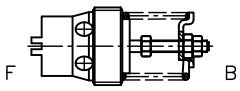
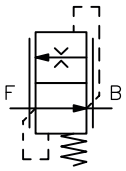
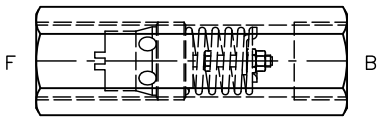
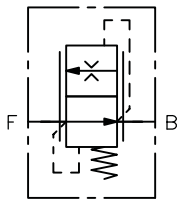
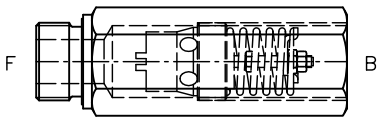
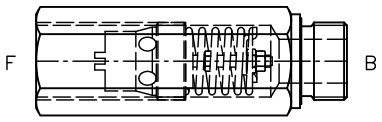
Type	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)	Ports Screw-in valve and housing as per ISO 228-1
			F, B
SB 0	15	315	G 1/4 (A)
SB 1	35		G 3/8 (A)
SQ 1	25		
SB 2	67		G 1/2 (A)
SQ 2	50		
SB 3	150		G 3/4 (A)
SQ 3	120		
SB 4	250		G 1 (A)
SB 5	400		G 1 1/4 (A)

Flow rate range

Type	Flow rate Q_{max} (lpm)					
	1	3	5	7	9	90
SB 0	1 to 1.6	1.6 to 2.5	2.5 to 4	4 to 6.3	6.3 to 10	10 to 15
SB 1 SQ 1	2.5 to 4	4 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 35 *
SB 2 SQ 2	16 to 21	21 to 28	28 to 37	37 to 50	50 to 67 *	--
SB 3 SQ 3	37 to 50	50 to 67	67 to 90	90 to 120	120 - 150 *	--
SB 4	80 to 100	100 to 125	125 to 160	160 to 200	200 - 250	--
SB 5	170 to 200	200 to 236	236 to 280	280 to 335	335 - 400	--

* Only available as type SB

Model

Coding	Description	View	Circuit symbol
C	Screw-in valves with pipe thread connection		
G	Housing version with pipe thread connection for direct in-line installation		
E			
F			

2.1.2 Version with metric thread

Ordering example

SB 2	5	22	C	-30	/100

- /100 — **Pressure setting** see Chapter 3.5, "Setting characteristic lines"
- -30 — **Response flow** see "Flow rate range"
- C — "Model"
- 22 — "Thread size"
- 5 — "Flow rate range"
- SB 2 — "Basic type and size"

Basic type and size

Type	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)
SB 0	15	315
SB 1	35	
SQ 1	25	
SB 2	67	
SQ 2	50	
SB 3	150	
SQ 3	120	
SB 4	250	
SB 5	400	

Flow rate range

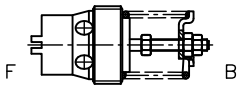
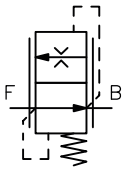
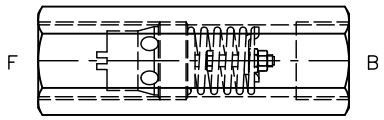
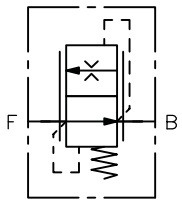
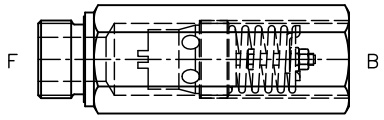
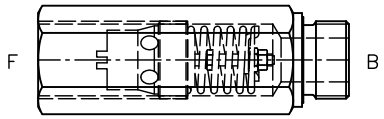
Type	Flow rate Q_{max} (lpm)					
	1	**3**	**5**	**7**	**9**	**90**
SB 0	1 to 1.6	1.6 to 2.5	2.5 to 4	4 to 6.3	6.3 to 10	10 to 15
SB 1 **SQ 1**	2.5 to 4	4 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 35 *
SB 2 **SQ 2**	16 to 21	21 to 28	28 to 37	37 to 50	50 to 67 *	--
SB 3 **SQ 3**	37 to 50	50 to 67	67 to 90	90 to 120	120 - 150 *	--
SB 4	80 to 100	100 to 125	125 to 160	160 to 200	200 - 250	--
SB 5	170 to 200	200 to 236	236 to 280	280 to 335	335 - 400	--

* Only available as type SB

Thread size

Coding	Type	Ports Screw-in valve and housing as per DIN 13 T6
		F, B
14	SB 0	M14x1.5
16	SB 1	M16x1.5
18	SQ 1	M18x1.5
20	SB 2	M20x1.5
22	SQ 2	M22x1.5
27	SB 3 SQ 3	M27x2
33	SB 4	M33x2
42	SB 5	M42x2

Model

Coding	Description	View	Circuit symbol
C	Screw-in valves with metric thread		
G	Housing version with metric thread for direct in-line installation ▪ Only available for size 0, 1 and 2		
E			
F			

2.1.3 Version with threaded reducing ring

Ordering example

SB 3/2 | 3 | G | -28 | /100

- /100 – **Pressure setting** see Chapter 3.5, "Setting characteristic lines"
- -28 – **Response flow** see "Flow rate range"
- G – "Model"
- 3 – "Flow rate range"
- SB 3/2 – "Basic type and size"

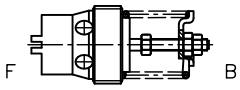
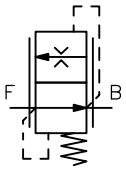
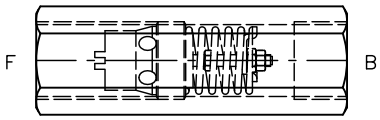
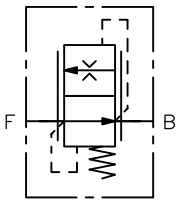
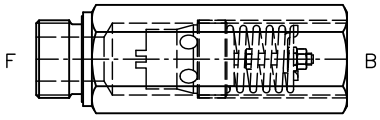
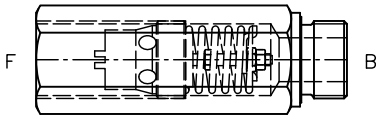
Basic type and size

Type	Description	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)	Ports (ISO 228-1)	
				Screw-in valve	Housing
				F, B	F, B
SB 1/0	▪ Screw-in valve size 0 ▪ Housing size 1	2,5	315	G 1/4 (A)	G 3/8 (A)
SB 2/1 **SQ 2/1**	▪ Screw-in valve size 1 ▪ Housing size 2	16		G 3/8 (A)	G 1/2 (A)
SB 3/2 **SQ 3/2**	▪ Screw-in valve size 2 ▪ Housing size 3	37		G 1/2 (A)	G 3/4 (A)
SB 4/3 **SQ 4/3**	▪ Screw-in valve size 3 ▪ Housing size 4	90		G 3/4 (A)	G 1 (A)
SB 5/4	▪ Screw-in valve size 4 ▪ Housing size 5	200		G 1 (A)	G 1 1/4 (A)

Flow rate range

Type	Flow rate Q_{max} (lpm)			
	1	3	5	7
SB 1/0	1 to 1.6	1.6 to 2.5	--	--
SB 2/1 **SQ 2/1**	2.5 to 4	4 to 6.3	6.3 to 10	10 to 16
SB 3/2 **SQ 3/2**	16 to 21	21 to 28	28 to 37	--
SB 4/3 **SQ 4/3**	37 to 50	50 to 67	67 to 90	--
SB 5/4	80 to 100	100 to 125	125 to 160	160 to 200

Model

Coding	Description	View	Circuit symbol
C	Screw-in valve with threaded reducing ring with pipe thread connection		
G	Housing version with pipe thread connection for direct in-line installation		
E			
F			

2.1.4 Version with UNF thread

Ordering example

SB 0 | **3** | UNF | **C** | **-20** | **/100**

- **Pressure setting** see Chapter 3.5, "Setting characteristic lines"
- **Response flow** see "Flow rate range"
- "Model"
- "Flow rate range"
- "Basic type and size"

Basic type and size

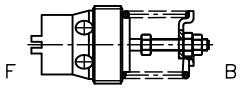
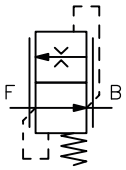
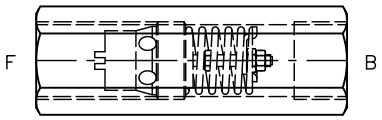
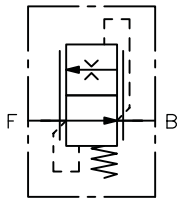
Type	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)	Ports Screw-in valve and housing as per SAE J 514
			F, B
SB 0	15	315	SAE-6 (9/16-18 UNF)
SB 1	35		SAE-8 (3/4-16 UNF)
SB 2	67		SAE-10 (7/8-14 UNF)
SB 3	150		SAE-12 (1 1/16-12 UN)
SB 4	250		SAE-16 (1 5/16-12 UN)
SB 5	400		SAE-20 (1 5/8-12 UN)

Flow rate range

Type	Flow rate Q_{max} (lpm)					
	1	**3**	**5**	**7**	**9**	**90**
SB 0	1 to 1.6	1.6 to 2.5	2.5 to 4	4 to 6.3	6.3 to 10	10 to 15
SB 1 **SQ 1**	2.5 to 4	4 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 35 *
SB 2 **SQ 2**	16 to 21	21 to 28	28 to 37	37 to 50	50 to 67 *	--
SB 3 **SQ 3**	37 to 50	50 to 67	67 to 90	90 to 120	120 - 150 *	--
SB 4	80 to 100	100 to 125	125 to 160	160 to 200	200 - 250	--
SB 5	170 to 200	200 to 236	236 to 280	280 to 335	335 - 400	--

* Only available as type SB

Model

Coding	Description	View	Circuit symbol
C	Screw-in valve with UNF threaded socket		
G	Housing version with UNF housing for direct in-line installation		

2.2 Adjustable version

2.2.1 Version with pipe thread

Ordering example

SB 3 | 9 | H 12 | /100

- /100 — **Pressure setting** see Chapter 3.5, "Setting characteristic lines"
- H 12 — "Model"
- 9 — **Response flow** see "Flow rate range"
- SB 3 — "Basic type and size"

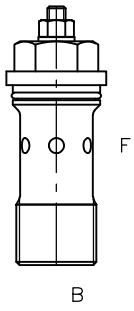
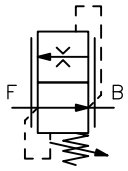
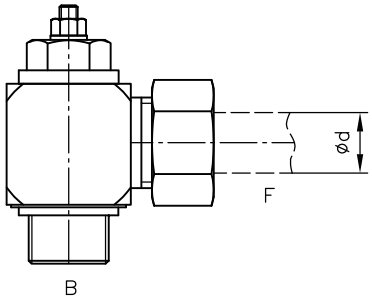
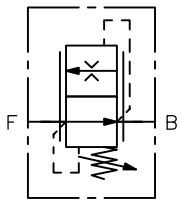
Basic type and size

Type	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)	Ports Screw-in valve and swivel housing as per ISO 228-1
			F, B
SB 0	15	315	G 1/4 (A)
SQ 0	10		
SB 1	35		G 3/8 (A)
SQ 1	16		
SB 2	67		G 1/2 (A)
SQ 2	50		
SB 3	150		G 3/4 (A)
SQ 3	120		

Flow rate range

Type	Flow rate Q_{max} (lpm)					
	1	3	5	7	9	90
SB 0	1 to 1.6	1.6 to 2.5	2.5 to 4	4 to 6.3	6.3 to 10	10 to 15
SQ 0	--	--	--			--
SB 1	2.5 to 4	4 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 35
SQ 1	--	--			--	--
SB 2	16 to 21	21 to 28	28 to 37	37 to 50	50 to 67	--
SQ 2					--	
SB 3	37 to 50	50 to 67	67 to 90	90 to 120	120 - 150	--
SQ 3					--	

Model

Coding	Description	View	Circuit symbol
H	Screw-in valve (banjo bolt) with pipe thread connection		
H 6 **H 8** **HL 10**	▪ Only available for SB 0, SQ 0 – H 6: ∅d = 6 mm – H 8: ∅d = 8 mm – HL 10: ∅d = 10 mm		
H 12	▪ Only available for SB 1, SQ 1 – H 12: ∅d = 12 mm		
H 16	▪ Only available for SB 2, SQ 2 – H 16: ∅d = 16 mm		
H 20	▪ Only available for SB 3, SQ 3 – H 20: ∅d = 20 mm		

2.2.2 Version with metric thread

Ordering example

SB 3	5	22	H 20	-75	/100

- /100 — **Pressure setting** see Chapter 3.5, "Setting characteristic lines"
- -75 — **Response flow** see "Flow rate range"
- H 20 — "Model"
- 22 — "Thread size"
- 5 — "Flow rate range"
- SB 3 — "Basic type and size"

Basic type and size

Type	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)
SB 0	15	315
SB 3	150	

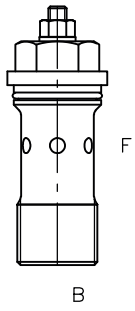
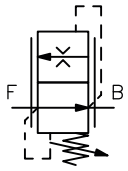
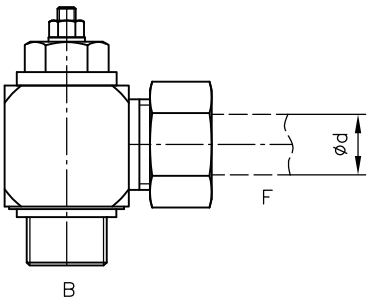
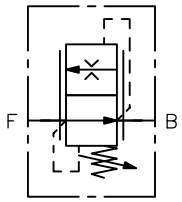
Flow rate range

Type	Flow rate Q_{max} (lpm)					
	1	**3**	**5**	**7**	**9**	**90**
SB 0	1 to 1.6	1.6 to 2.5	2.5 to 4	4 to 6.3	6.3 to 10	10 to 15
SB 3	37 to 50	50 to 67	67 to 90	90 to 120	120 - 150	--

Thread size

Coding	Type	Ports Screw-in valve and swivel housing as per DIN 13 T6
		F, B
14	SB 0	M14x1.5
27	SB 3	M27x2

Model

Coding	Description	View	Circuit symbol
H	Screw-in valve (banjo bolt) with pipe thread connection		
H 8 **HL 10**	▪ Only available for SB 0 – H 8: ∅d = 8 mm – HL 10: ∅d = 10 mm		
H 20	▪ Only available for SB 3 – H 20: ∅d = 20 mm		

3 Parameters

3.1 General information

Designation	2-way flow control valve (counterbalance valve)
Design	Flow control valve
Model	Screw-in valve, banjo bolt version, housing version
Material	▪ Screw-in valve: steel ▪ Piston surface: nitrided ▪ Housing: steel; galvanised surface ▪ Swivel housing:

Attachment

Model C	Screw-in valve, fixed	Is clamped in the outlet of the threaded hole when tightened to the prescribed torque
Model H	Screw-in valve, adjustable	Screwed into the device body
Model G	Housing version	Freely suspended in pipeline
Model E, F, H..	Housing version	Screwed into the device body

Installation position	any
Line connection	▪ Pipe thread ISO 228-1 ▪ Metric fine thread DIN 13 T6 ▪ UNF thread SAE J 514 see Chapter 4, "Dimensions"
Flow direction	▪ B → F regulated (restricted) flow ▪ F → B free flow
Hydraulic fluid	Hydraulic fluid, according to DIN 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 1500 mm²/s Optimal operating range: approx. 10 - 500 mm²/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	**ISO 4406** 20/17/14
Temperatures	Environment: approx. -40 to +80 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

3.2 Pressure and flow rate

Operating pressure	315 bar
Static overload capacity	2x p_{max}
Flow rate	Depends on the thread type ▪ **Non-adjustable version** – Pipe thread: see Chapter , "Flow rate range" – Metric thread: see Chapter , "Flow rate range" – Threaded reducing ring: see Chapter , "Flow rate range" – UNF thread: see Chapter , "Flow rate range" ▪ **Adjustable version** – Pipe thread: see Chapter , "Flow rate range" – Metric thread: see Chapter , "Flow rate range"
Pressure setting	50 bar if no other value is specified in the order. The pressure setting is the operating pressure at which the response flow is set (see Chapter 3.5, "Setting characteristic lines").
Response flow	Setting value in lpm as per order coding (see Chapter 3.5, "Setting characteristic lines")

3.3 Weight

Type	Non-adjustable version		Adjustable version	
	Screw-in valve	Housing	Screw-in valve	Housing
	C	G	H	H 6 to H 20
SB 0 SQ 0	13 g	130 g	50 g	▪ H 6: 55 g ▪ H 8: 50 g ▪ HL 10: 52 g
SB 1 SQ 1	23 g	150 g	110 g	▪ H 12: 99 g
SB 2 SQ 2	40 g	250 g	180 g	▪ H 16: 156 g
SB 3 SQ 3	80 g	550 g	270 g	▪ H 20: 316 g
SB 4	150 g	800 g	--	--
SB 5	300 g	1650 g	--	--

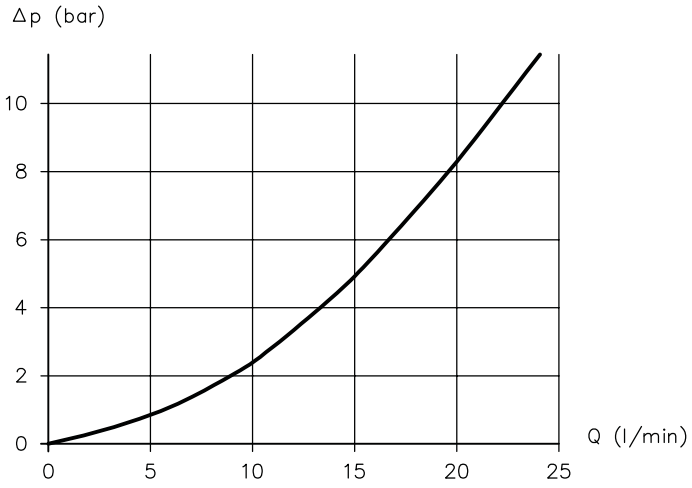
3.4 Characteristic lines

Δp-Q characteristic lines in free flow direction F → B

Viscosity of the hydraulic fluid approx. 60 mm²/s

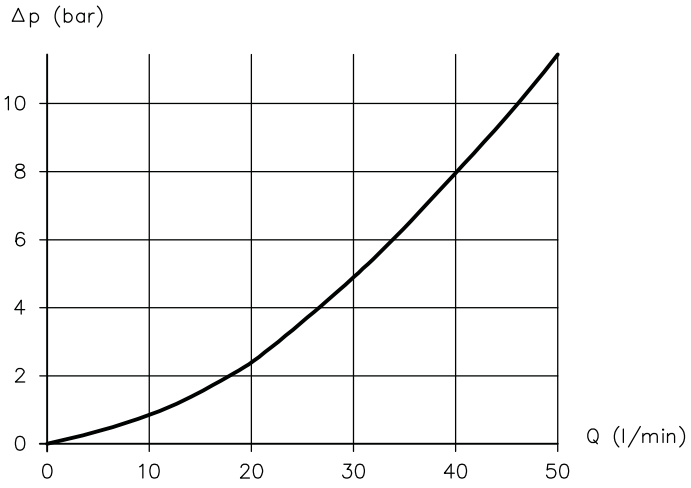
Non-adjustable version

SB 0, SB 1/0



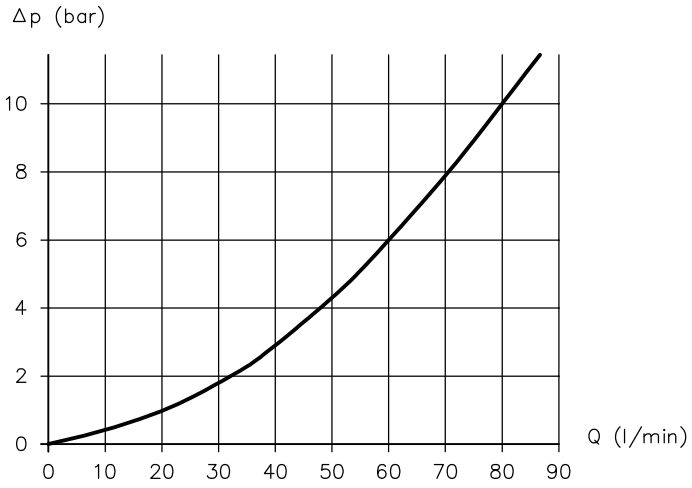
Q flow rate (lpm); Δp flow resistance (bar)

SB 1, SQ 1, SB 2/1, SQ 2/1



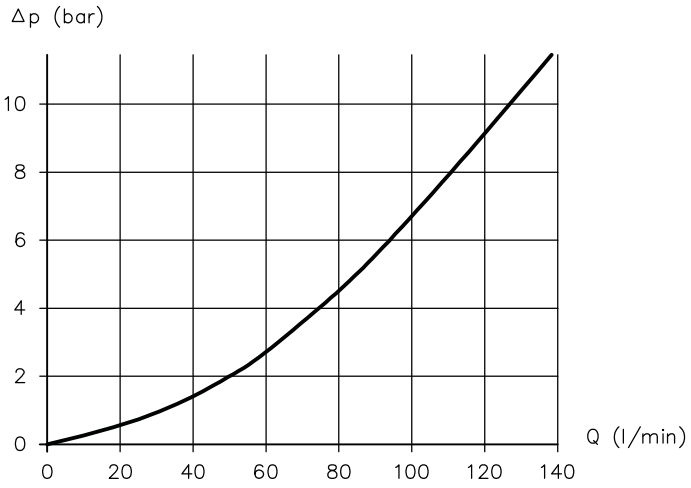
Q flow rate (lpm); Δp flow resistance (bar)

SB 2, SQ 2, SB 3/2, SQ 3/2



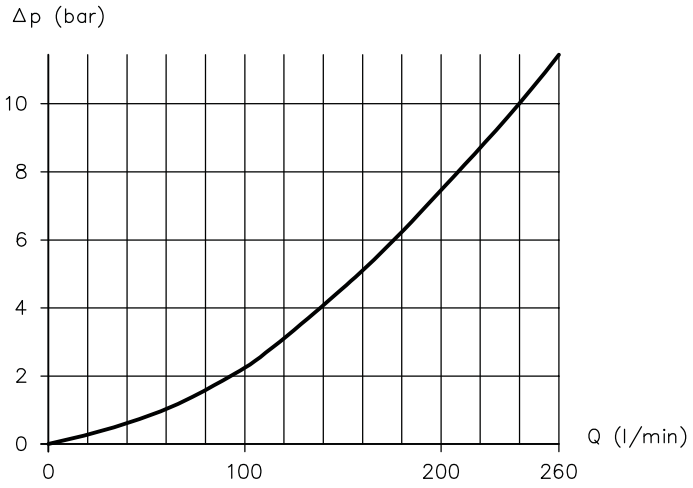
Q flow rate (lpm); Δp flow resistance (bar)

SB 3, SQ 3, SB 4/3, SQ 4/3



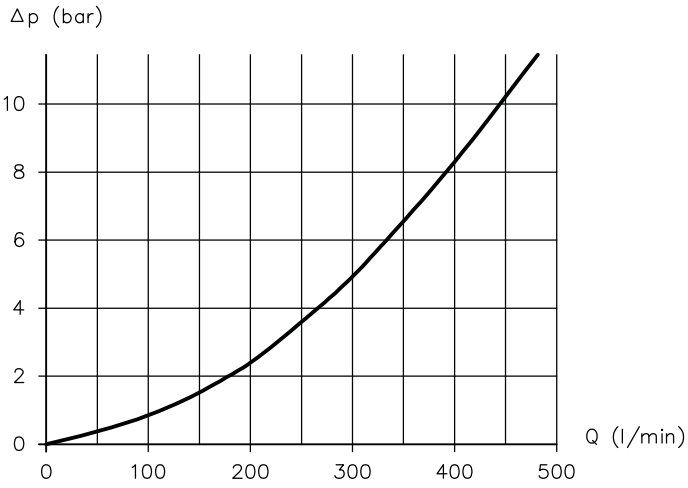
Q flow rate (lpm); Δp flow resistance (bar)

SB 4, SB 4/4



Q flow rate (lpm); Δp flow resistance (bar)

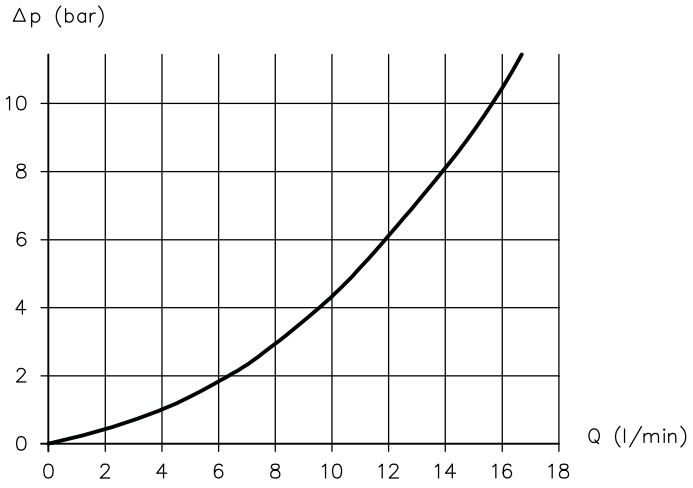
SB 5



Q flow rate (lpm); Δp flow resistance (bar)

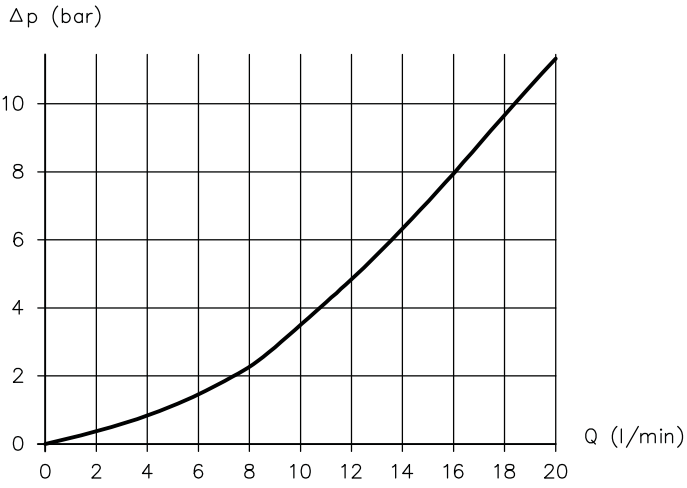
Adjustable version

SB 0..H 6, SQ 0..H 6



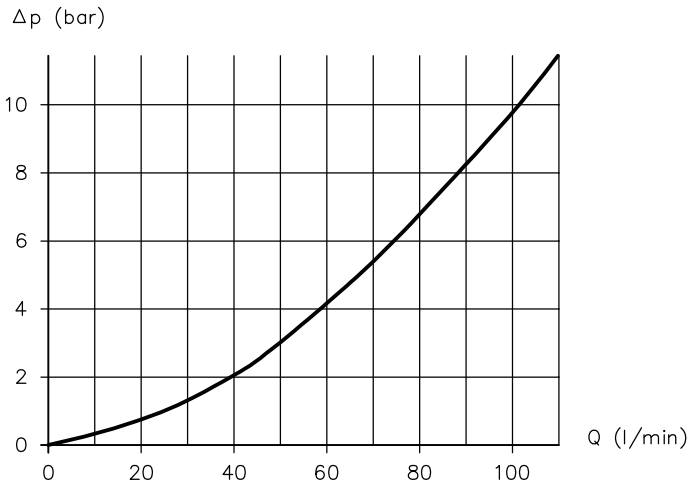
Q flow rate (lpm); Δp flow resistance (bar)

SB 0..H 8, SQ 0..H 8



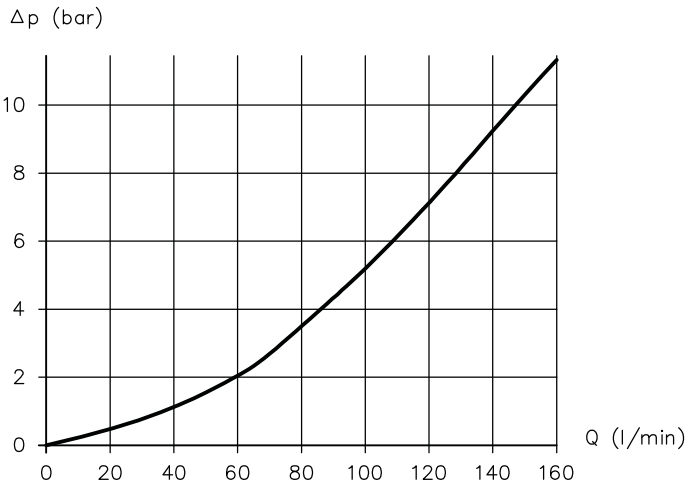
Q flow rate (lpm); Δp flow resistance (bar)

SB 2..H 16, SQ 2..H 16



Q flow rate (lpm); Δp flow resistance (bar)

SB 3 ..H 20, SQ 3..H 20

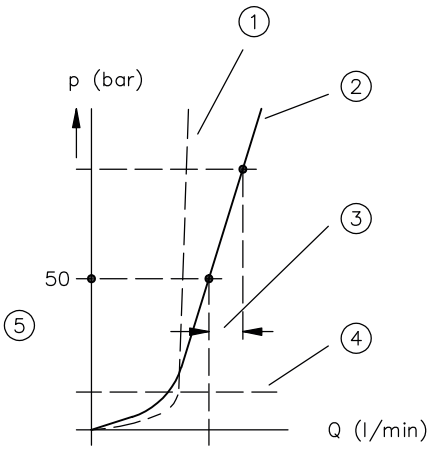


Q flow rate (lpm); Δp flow resistance (bar)

3.5 Setting characteristic lines

Response flow type SB (working direction B → F)

The response flow is factory-set at an operating pressure of 50 bar. If the characteristic line is completely independent of the pressure (vertical), oscillations may occur in lifting equipment during the lowering process as a result of the elasticity of the oil volume in the hydraulic cylinder and any hose lines. On lowering brakes SB, the characteristic line is therefore set at a slight incline, which effectively suppresses such oscillations.



Q response flow (lpm); p operating pressure (bar)

1 characteristic line is largely independent of the pressure (type SQ)
2 characteristic line has a slight positive incline (type SB)
3 As the pressure increases, the response flow increases slightly depending on the type and setting.
4 depending on the type and setting, it is not possible to adjust the flow limitation below approx. 10 to 15 bar
5 factory-set pressure setting

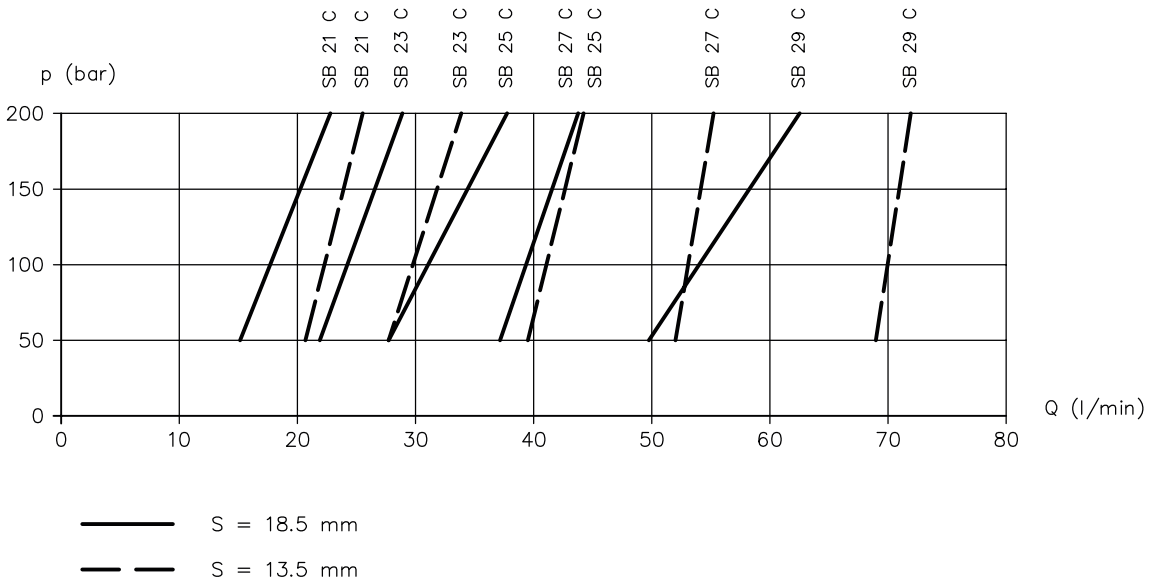
If the desired response flow (setting value) is to be achieved with a different pressure load, this pressure must be specified separately in the order. The factory-set setting will then be configured based on this pressure. This pressure will also be shown in the type specification on the valve housing alongside the response flow value, e.g. SB 25 G-30/150 (30 lpm at 150 bar).

NOTICE

Attention: the pressure setting must remain within the limits of what is technically feasible (see diagrams below)

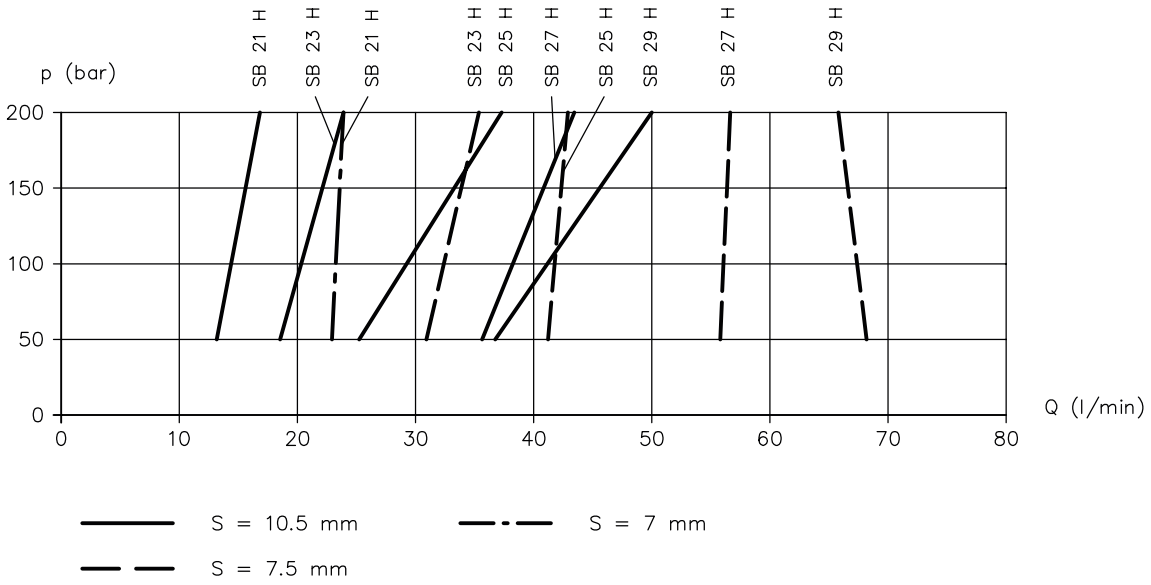
Viscosity of the hydraulic fluid approx. 40 mm²/s

SB 2..C



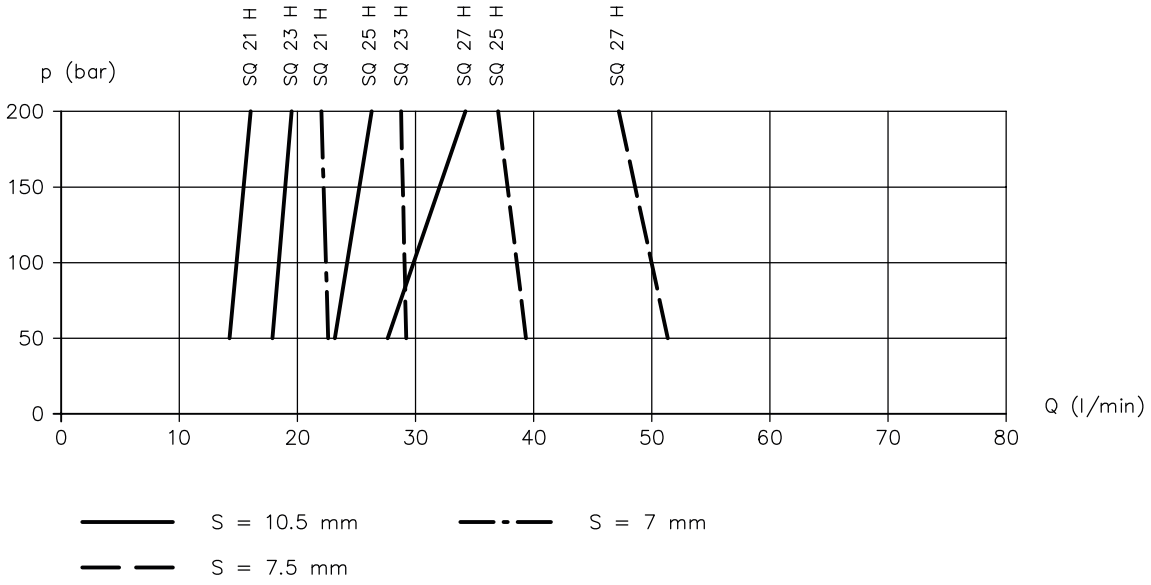
Q response flow (lpm); p operating pressure (bar)

SB 2..H



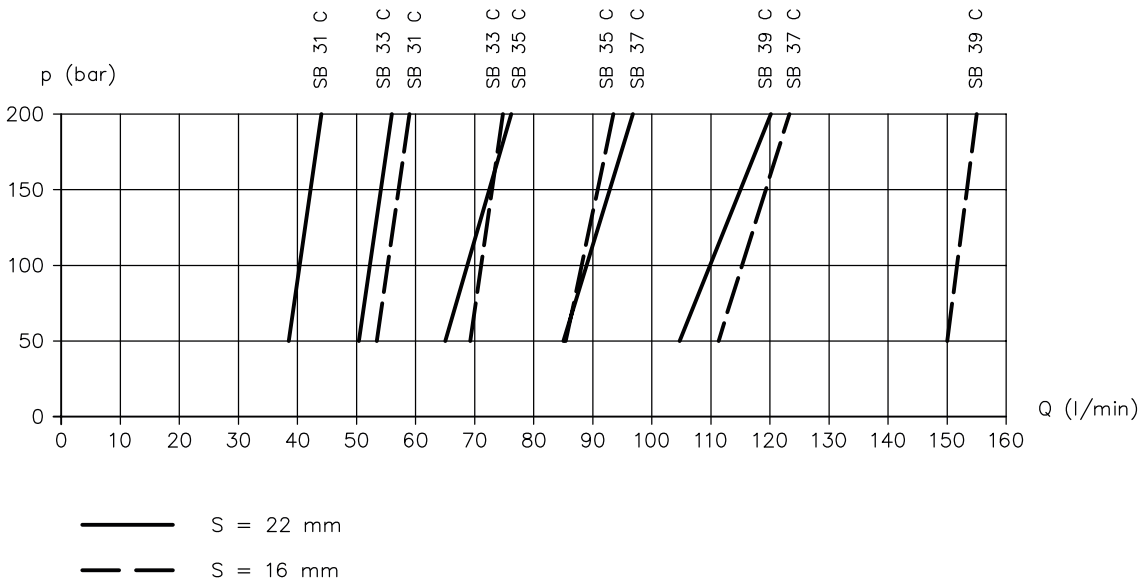
Q response flow (lpm); p operating pressure (bar)

SQ 2..H



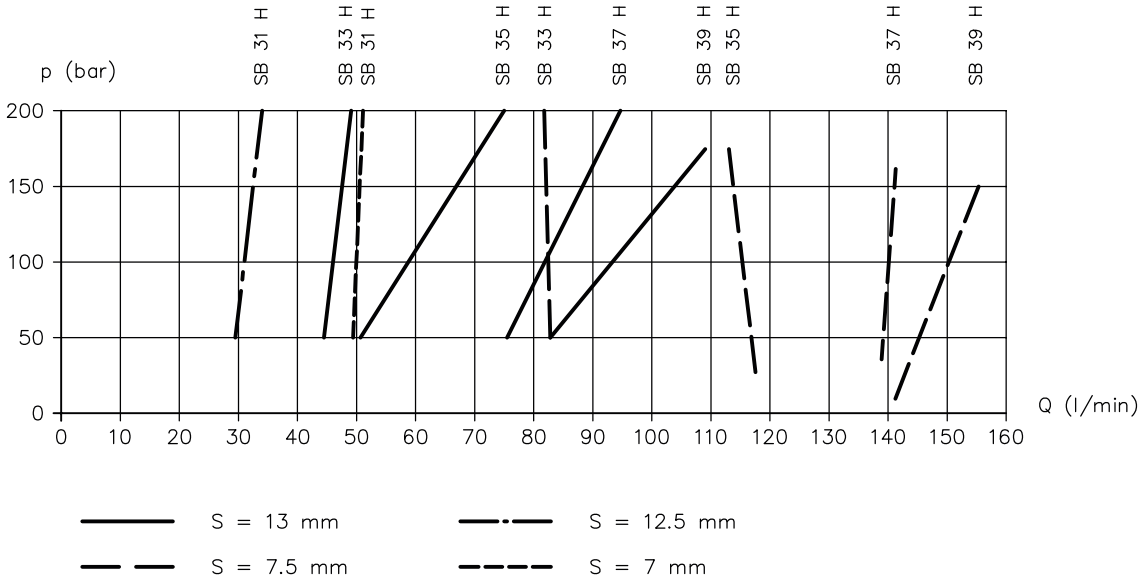
Q response flow (lpm); p operating pressure (bar)

SB 3..C



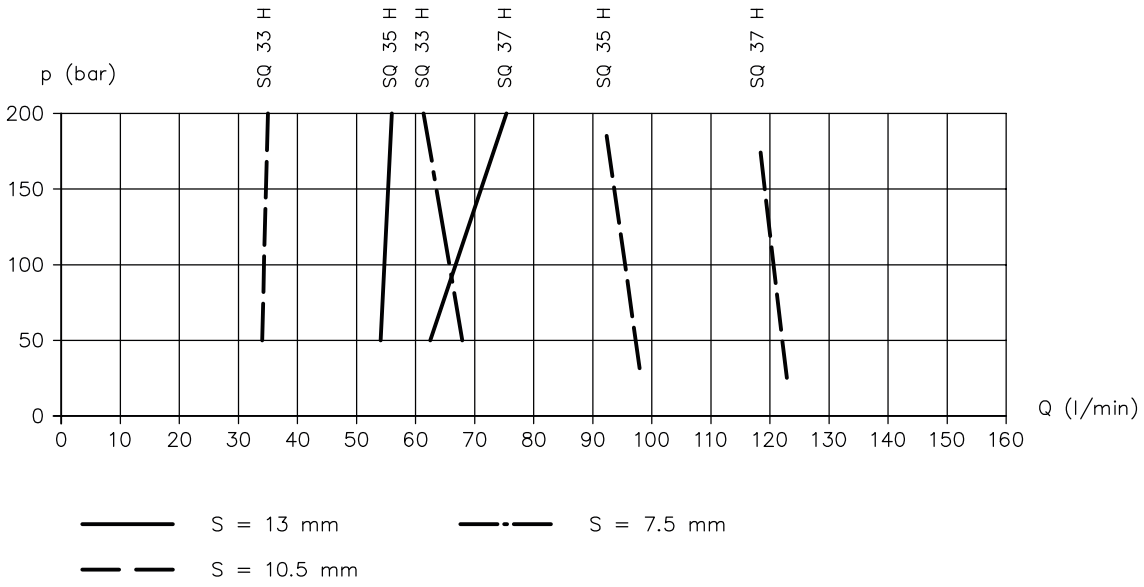
Q response flow (lpm); p operating pressure (bar)

SB 3..H



Q response flow (lpm); p operating pressure (bar)

SQ 3..H

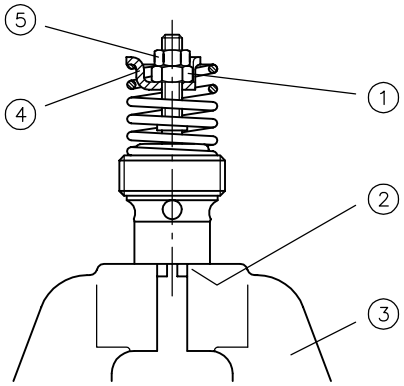


Q response flow (lpm); p operating pressure (bar)

Changing the setting length S: when installed, for non-adjustable version

The setting length S is a reference value for the response flow at $\Delta p_{B \rightarrow F}$ = 50 bar. Users are able to adjust it themselves within the adjustment range as set out in the suggestion below.

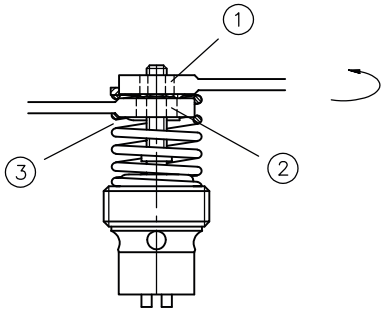
- **Clamping**



1 Internal hex nut
2 Gently grip the housing body hand-tight on the front face in a vice
3 Vice jaws
4 Spring plate
5 External hex nut

- **Adjustment**

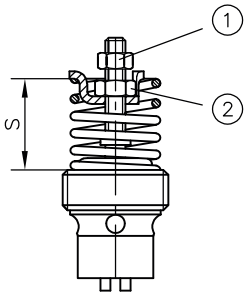
a) Undo the locking of the nut:



1 Loosen the external nut using an open-end or socket wrench
2 Hold the internal nut in place using an open-end wrench. For this purpose, press the spring plate down as required.
3 Spring plate

Type	External nut HAWE part	Internal nut ISO 4032-M..-8-A2K
SB 0..C	M3 (wrench size 4.5)	M3 (wrench size 5.5)
SB 1..C, SQ 1 SB 2..C, SQ 2 SB 3..C, SQ 3	M4 (wrench size 6)	M4 (wrench size 7)
SB 4..C	M5 (wrench size 7)	M5 (wrench size 8)
SB 5..C	M6 (wrench size 9)	M6 (wrench size 10)

b) Adjust as required and lock the nut:

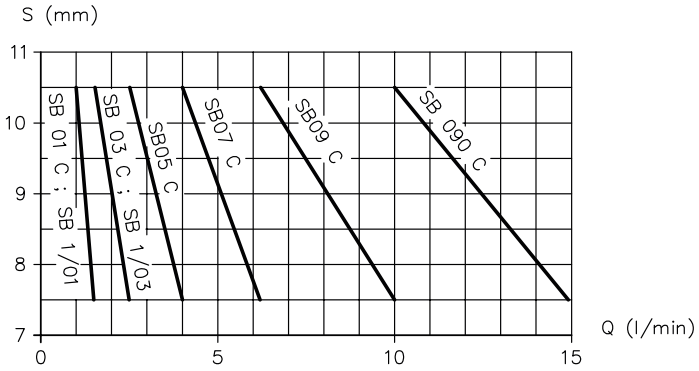


1 Then hold the internal nut in place as described under a) and tighten the external nut.
2 Screw the internal nut in or out in line with the necessary length S (a socket wrench is recommended). The expanding force of the spring prevents the control piston from turning in parallel. Measure the length S at three spring caps of the spring plate and calculate the average value.
(Reference value, length S: see Chapter 3.5.1)

Checking the setting

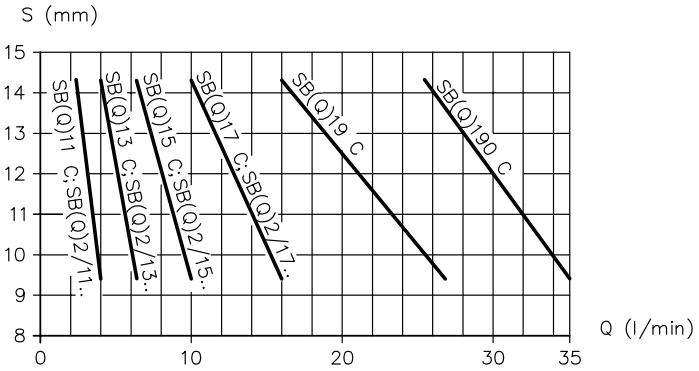
1. Install the flow control valve back in the hydraulic system and check the newly restricted flow rate.
2. If necessary, remove it again and correct the setting length.
3. To stop it coming loose, apply a punch mark to the rod thread that comes out at the lock nut and install.
   Observe the tightening torque, see Chapter 4, "Dimensions".

SB 0



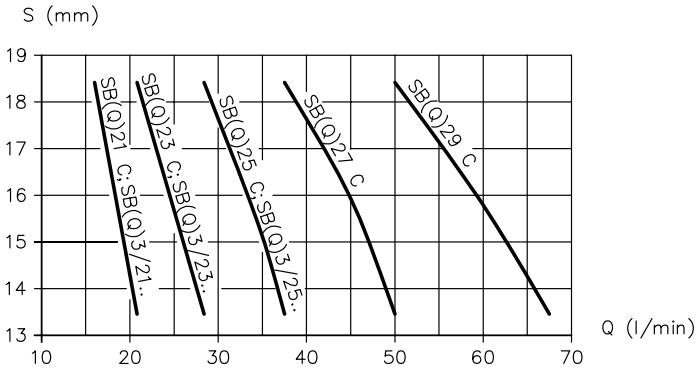
Q flow rate (lpm); S setting length (mm)

SB 1, SQ 1



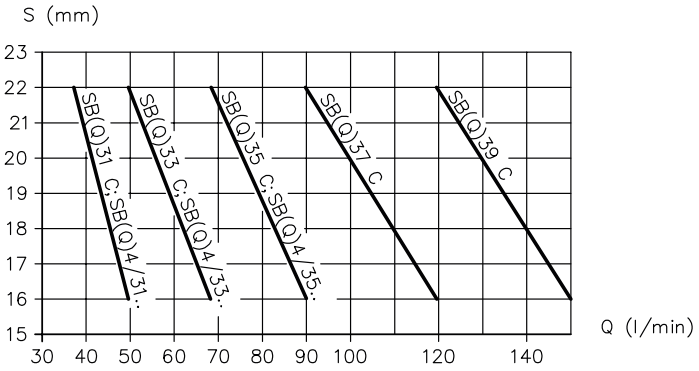
Q flow rate (lpm); S setting length (mm)

SB 2, SQ 2



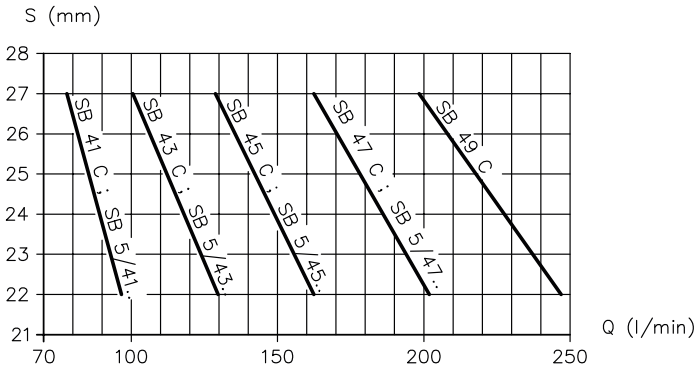
Q flow rate (lpm); S setting length (mm)

SB 3, SQ 3



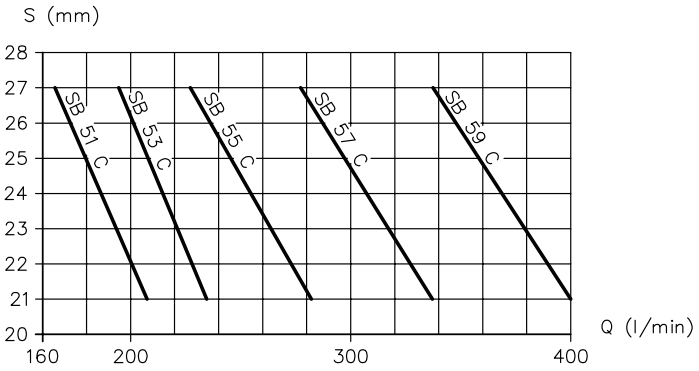
Q flow rate (lpm); S setting length (mm)

SB 4



Q flow rate (lpm); S setting length (mm)

SB 5



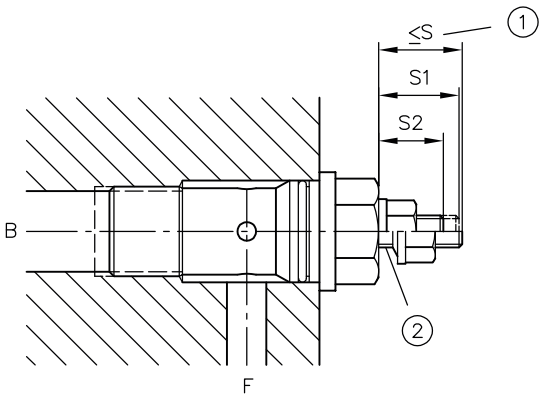
Q flow rate (lpm); S setting length (mm)

Screw-in valves SB..H and SQ..H: adjustable version

After undoing the Seal-Lock lock nut, the response flow can be adjusted within the relevant range; this is done at the threaded spindle using a size 3 hex wrench.

NOTICE

Do not unscrew the threaded spindle out of the housing beyond the dimension S_{max} because there is no internal end stop.
Add this note to the setting instructions in the operating manual.



Setting lengths (approximate reference values)

Type	S	S1	S2
SB 0..H SQ..	12	10 to 11	7 to 9.5
SB 1..H SQ..	13	11 to 12	7.5 to 9.5
SB 2..H SQ..	13	9.5 to 11	7 to 8.5
SB 3..H SQ..	14	11.5 to 13	7 to 9.5

1 Do not exceed the values stated in the table!

2 Before making the adjustment, loosen the lock nut sufficiently to ensure the integral vulcanised sealing ring is clear.

INFORMATION

- S1 roughly corresponds to the lower limit value of the response flow for the respective adjustment range.
- S2 roughly corresponds to the upper limit value of the response flow for the respective adjustment range.

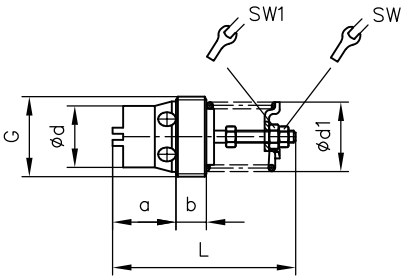
4 Dimensions

All dimensions in mm, subject to change.

4.1 Non-adjustable version

4.1.1 Screw-in valve

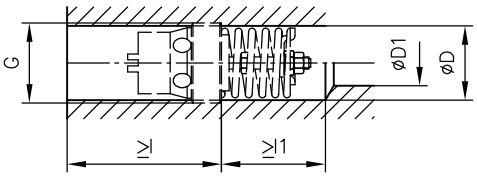
SB ., SQ .



SW = Wrench size

Type	G	L	a	b	∅d	∅d1	SW	SW1	Tightening torque (Nm)
SB 0	G 1/4 A	39	12,5	7	10	10,5	4,5	5,5	6
	M14x1.5								
SB 1 SQ 1	G 3/8 A	43	13,5	7	11,5	13,5	6	7	8
	M16x1.5								
	M18x1.5								
SB 2 SQ 2	G 1/2 A	49	16	8	15	18	6	7	12
	M20x1.5								
	M22x1.5								
	7/8-14 UNF-2B								
SB 3 SQ 3	G 3/4 A	62,5	21	10	20	23	6	7	15
	M27x2								
SB 4	G 1 A	78	25	15	26	28,5	7	8	20
	M33x2								
SB 5	G 1 1/4 A	94	31	21	33	34,5	9	10	25
	M42x2								

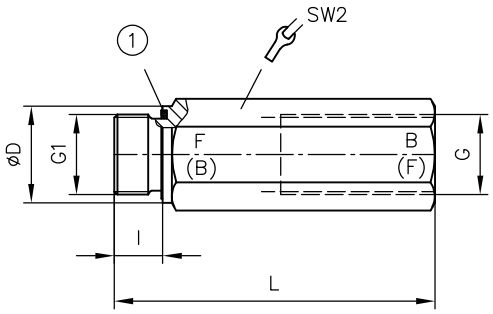
Mounting hole



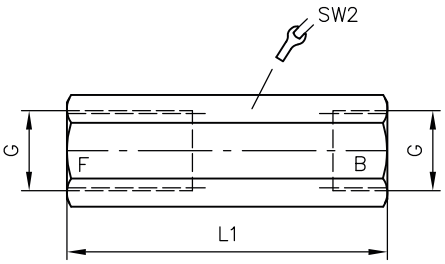
Type	G	∅D	∅D1	l	l1
SB 0	G 1/4	11,75	5	33	22
	M14x1.5				
SB 1 SQ 1	G 3/8	15,25	8	34	26
	M16x1.5				
	M18x1.5				
SB 2 SQ 2	G 1/2	19	12	40	30
	M20x1.5				
	M22x1.5				
	7/8-14 UNF-2A				
SB 3 SQ 3	G 3/4	24,5	16	51	29
	M27x2				
SB 4	G 1	30,5	20	65	40
	M33x2				
SB 5	G 1 1/4	39,5	25	78	42
	M42x2				

4.1.2 Housing version

Model **E, F**



Model **G**



SW = Wrench size

1 Fitting seal:
G 1/4 NBR (SB 0..E and F)
DRV 100 147 - NB 650 (SB 1..E and F; SQ 1..E and F)
DRV 100 185 - NB 650 (SB 2..E and F; SQ 2..E and F)
DRV 100 239 - NB 650 (SB 3..E and F; SQ 3..E and F)
DRV 100 297 - NB 650 (SB 4..E and F)
DRV 100 388 - NB 650 (SB 5..E and F)

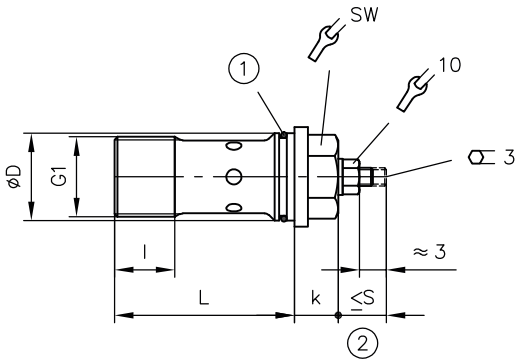
NOTICE
No fitting seal in the case of type SB 2..-7/8 14 UNF E(F); instead there is a cutting edge

Type	G	G1	∅D	L	L1	l	SW2
SB 0..E (F, G)	G 1/4	G 1/4 A	19	78	66	11,5	19
SB 1..E (F, G) SQ 1..E (F, G)	G 3/8	G 3/8 A	22	82	70	12	22
	M16x1.5	M16x1.5					
	M18x1.5	M18x1.5					24
SB 2..E (F, G) SQ 2..E (F, G)	G 1/2	G 1/2 A	27	96	80	14	27
	M20x1.5	M20x1.5					
	M22x1.5	M22x1.5					30
	7/8-14 UNF-2B	7/8-14 UNF-2A	--	102	--	19,3	
SB 3..E (F, G) SQ 3..E (F, G)	G 3/4	G 3/4 A	32	106	100	16	32
SB 4..E (F, G)	G 1	G 1 A	40	145	125	18	41
SB 5..E (F, G)	G 1 1/4	G 1 1/4 A	50	160	145	20	50

4.2 Adjustable version: banjo bolt version

4.2.1 Screw-in valve

SB ..H, SQ ..H



SW = Wrench size

1 O-ring

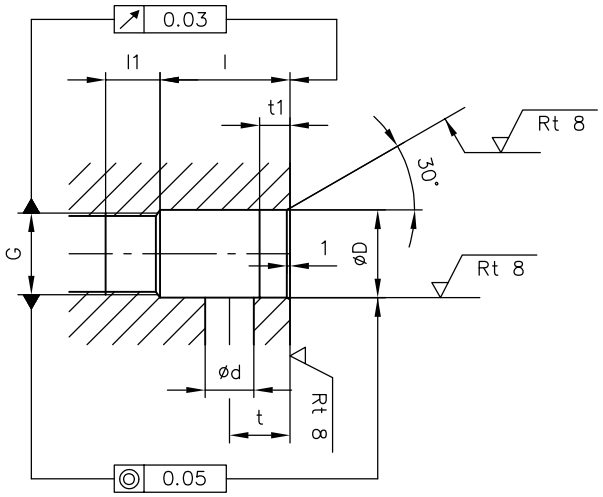
2 S_{max} = 12 to 14 depending on the type, see Chapter 3.5, "Setting characteristic lines"

Type	G1	∅D	L	k	l	SW	Tightening torque max. (Nm)	O-ring NBR 90 Shore
SB 0..H SQ 0..H	G 1/4 A	15.45	35	8	12	13	50	12.5x1.5
SB 0..14 H SQ 0..14 H	M14x1.5							
SB 1..H SQ 1..H	G 3/8 A	18.95	39	11	12	17	75	16x1.5
SB 1..18 H SQ 1..18 H	M18x1.5	20.95	43	13		19	130	18x1.5
SB 2..H SQ 2..H	G 1/2 A	22.95	49.5	12.5	15	19	130	20x1.5
SB 2..22 H SQ 2..22 H	M22x1.5							
SB 3..H SQ 3..H	G 3/4 A	28,95	59,5	14,5	20,5	24	250	25x2
SB 3..27 H SQ 3..27 H	M27x2							

NOTICE

Do not unscrew the threaded spindle out of the housing beyond the dimension S_{max} because there is no internal end stop.

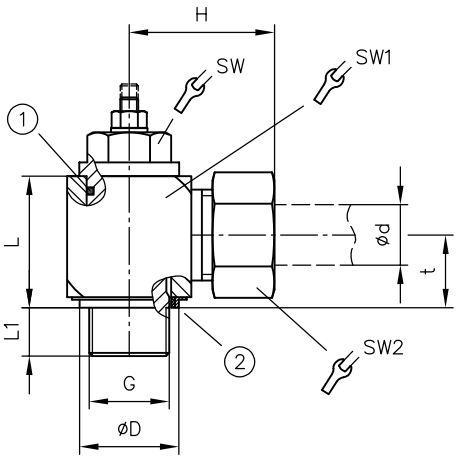
Mounting hole



Type	G	∅D	∅d	l	l1	t	t1
SB 0..H SQ 0..H	G 1/4	15.5 +0.1	5	23	13	12	5
SB 0..14 H SQ 0..14 H	M14x1.5						
SB 1..H SQ 1..H	G 3/8	19 +0.1	8	27		13	8
SB 1..18 H SQ 1..18 H	M18x1.5	21 +0.1		31			
SB 2..H SQ 2..H	G 1/2	23 +0.1	12	35	15	16	12
SB 2..22 H SQ 2..22 H	M22x1.5						
SB 3..H SQ 3..H	G 3/4	29 +0.1	16	43	18	20	10
SB 3..27 H SQ 3..27 H	M27x2						

4.2.2 Swivel housing version

SB ..H.., SQ ..H..



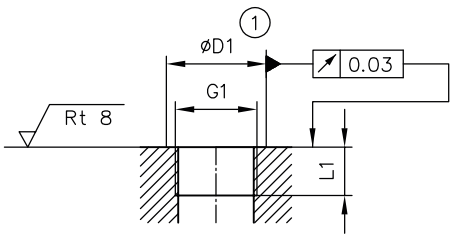
SW = Wrench size

1 Sealing with O-ring

2 Sealing with plastic sealing ring KDS (this must be replaced if the product is re-installed)

Type	G	G1	L	L1	H	∅D	∅d	t	SW	SW1	SW2	Tightening torque max. (Nm)
SB 0..H 6 SQ 0..H 6	G 1/4 A	G 1/4	24	11	31	18,9	6	14	13	22	17	50
SB 0..H 8 SQ 0..H 8	G 1/4 A	G 1/4	24	11	31	18,9	8	14	13	22	19	
SB 0..14 H 8 SQ 0..14 H 8	M14x1.5	M14x1.5	24	11	31	18,9	8	14	13	22	19	
SB 0..HL 10 SQ 0..HL 10	G 1/4 A	G 1/4	24	11	31	18,9	10	14	13	22	19	
SB 1..H 12	G 3/8 A	G 3/8	29	10	35	21,9	12	16,5	17	27	24	75
SB 2..H 16 SQ 2..H 16	G 1/2 A	G 1/2	35,5	15	40	26,9	16	21,5	19	32	30	130
SB 3..H 20 SQ 3..H 20	G 3/4 A	G 3/4	43,5	16	48	32,9	20	24	24	41	36	250
SB 3..27 H 20 SQ 3..27 H 20	M27x2	M27x2	43,5	16	48	32,9	20	24	24	41	30	

Mounting hole



1 Spot-face ∅D1 = approx. ∅D + 0.5 to 1 mm

5 Installation, operation and maintenance information

Observe the document B 5488 “General operating instructions for assembly, commissioning, and maintenance.”

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ► All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ► The product must only be assembled and put into operation by specialist personnel.
- ► The product must only be operated within the specified technical parameters described in detail in this document.
- ► All components must be suitable for the operating conditions when using an assembly.
- ► The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
   ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).

⚠ **DANGER**

Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

- ► Depressurise the hydraulic system.
- ► Perform safety measures in preparation for maintenance.

5.2.1 Creating the mounting hole

See description in Chapter 4, "Dimensions"

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTICE

- ► Read the documentation carefully before usage.
- ► The documentation must be accessible to the operating and maintenance staff at all times.
- ► Keep documentation up to date after every addition or update.

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.

Damage to the product is possible.

- ► Filter new hydraulic fluid to a high quality when filling.
- ► Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 Oil recommendations

5.4 Maintenance information

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

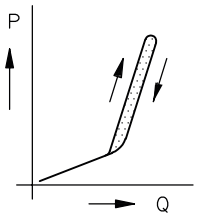
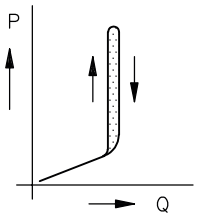
Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

6 Other information

6.1 Planning information

The flow control valves essentially consist of a cylinder liner (housing) with a control piston and piston spring and a metering orifice disc (sliding metering orifice) that can move freely. This is moved into the operating position (control position) by the medium flowing through and forms an annular orifice in the control piston. The flow resistance of this annular orifice in combination with the pre-load (setting length) of the piston spring determines the regulated flow rate. In the opposite direction, the sliding metering orifice moves back fully from the control position, the metering orifice (annular orifice) is cancelled and the flow rate can be provided with minimal resistance, completely independent of the respective adjustment range (check valve effect).

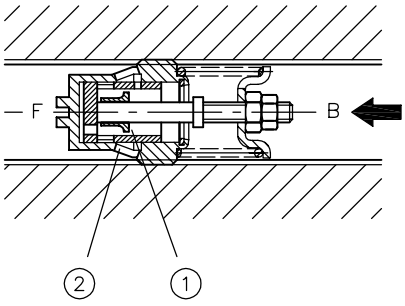
Difference between types SB and SQ

Type	Description	Characteristic line
SB	Used for weight-loaded lifting equipment; in order to dampen oscillations the Δp-Q characteristic line is slightly inclined depending on the load	
SQ	Used in hydraulic systems that are not prone to oscillations, e.g. to limit the speed of double-acting cylinders	

Operating principle

Working direction F ← B

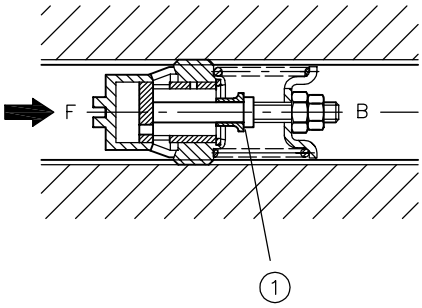
Flow rate is largely constant as a result of the internal pressure drop and the pre-load force of the control piston spring balancing one another out



1 Sliding metering orifice in control position
2 Control edges

Opposite direction F → B

Free, unobstructed flow rate with low resistance as a result of the sliding metering orifice moving back from the control position (orifice effect is cancelled)

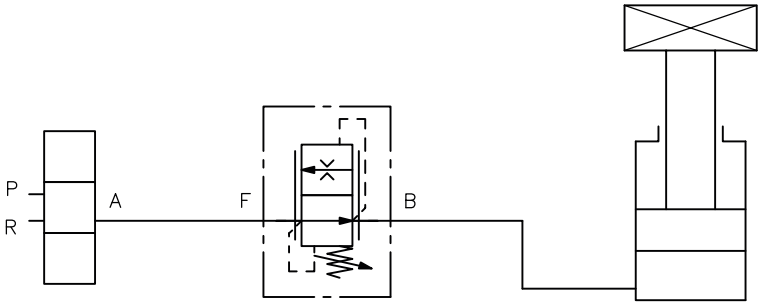


1 Sliding metering orifice in free flow direction

6.2 Circuit example

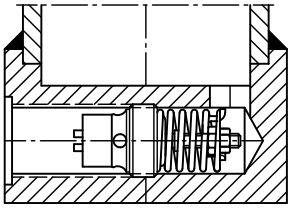
Use as a counterbalance valve

Circuit example



Counterbalance valve in the cylinder base

Installation example

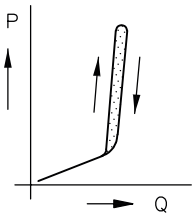


6.3 Housing version

Can be adjusted and blocked from the outside when installed.

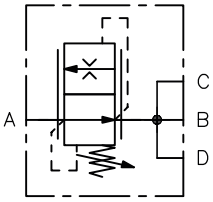
Version

- In order to check the operation of the line rupture valve in the system (e.g. in the case of industrial vehicles), the control piston can be blocked using the adjusting screw. This deactivates the control function provided by the counterbalance valve and provides a free flow B, C, D → A.
- In order to prevent oscillations when the hydraulic cylinder is lowered, the characteristic line of the standard version has a positive incline, meaning the flow rate becomes larger at p_{max} compared against the set flow rate (factory-set at 50 bar unless otherwise requested).
- The characteristic line can be erected by combining pistons and orifices within the type series, e.g. type SB 275 K.



NOTICE
When using industrial vehicles, check the oscillations in the fork lift.

Circuit symbol



Ordering example

SB 2 SB 27	7 5	K K

"Housing construction"

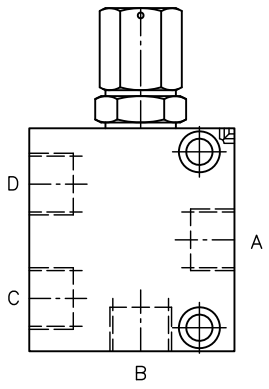
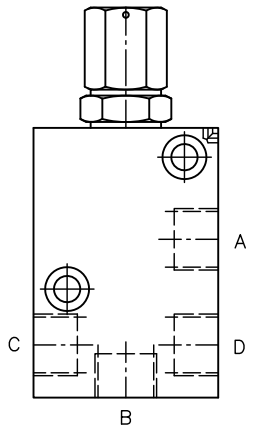
Coding for adjustment range "Basic type and size"

"Basic type and size"

Basic type and size

Type	Description	Adjustment range Response flow from ... to (lpm)				
		1	3	5	7	9
		16 - 21	21 - 28	28 - 37	37 - 50	50 - 67
SB 2	Series	●	●	●	●	●
SB 3		●	●	●	●	●
SB 23	Special version	●				
SB 25			●			
SB 27				●		
SB 29					●	
SB 33		●				
SB 35			●			
SB 37				●		
SB 39					●	

Housing construction

Coding	Type	Ports (ISO 228-1)	View
		A, B, C, D	
K	SB 2	G 1/2	
	SB 23		
	SB 25		
	SB 27		
	SB 29		
	SB 3	G 3/4	
	SB 33		
	SB 35		
	SB 37		
	SB 39		
K1	SB 2	G 1/2	
	SB 23		
	SB 25		
	SB 27		
	SB 29		

Parameters

General data

Attachment	With fastening holes for attachment at the side
Flow direction	▪ A → B, C, D free flow ▪ B, C, D → A regulated (restricted) flow

Pressure and volumetric flow

Operating pressure	p_{max} = 315 bar

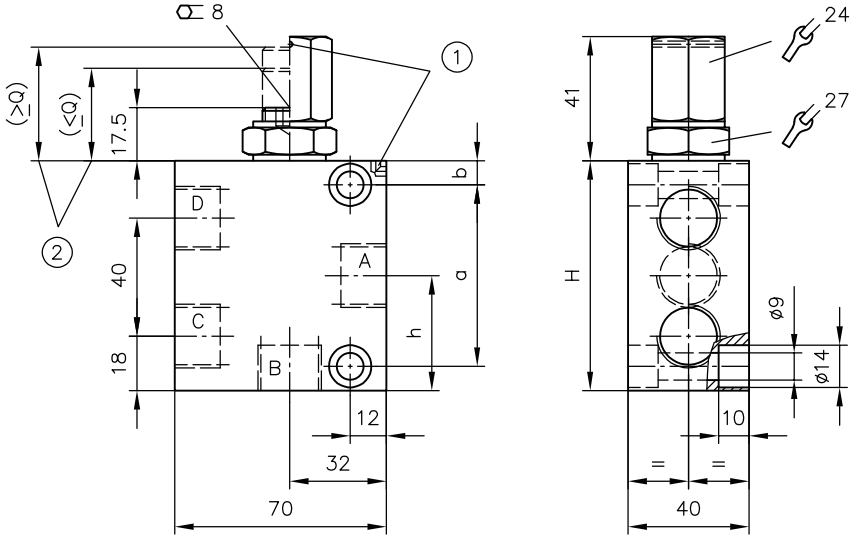
Weight

	Type	
	SB 2..K	= 1.4 kg
	SB 2..K1	= 1.2 kg
	SB 3..K	= 1.5 kg
Additional parameters	see Chapter 3, "Parameters"	

Dimensions

All dimensions in mm, subject to change!

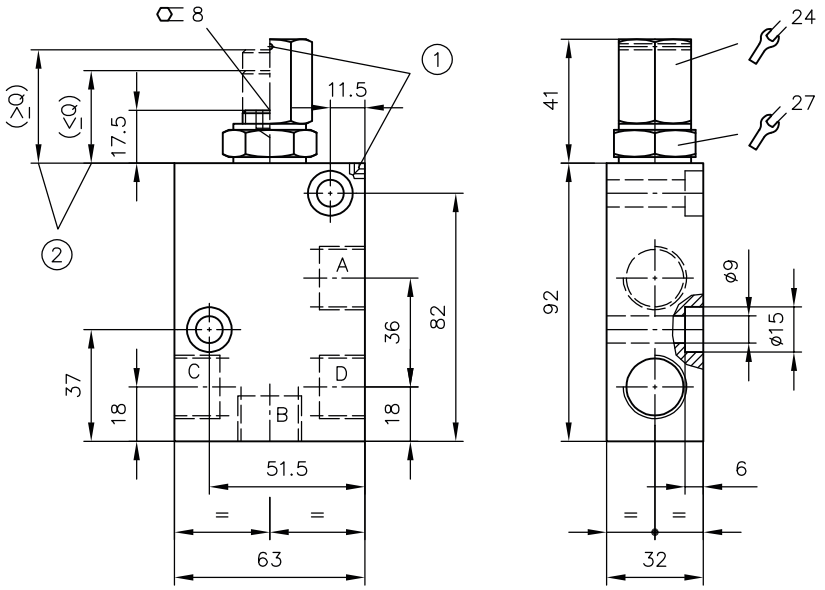
SB 2..K, SB 3..K



1 Sealing option
2 Adjustment range

Type	H	a	b	h	Ports (ISO 228-1)
					A, B, C, D
SB 2..K SB 275 K	76	60	8	38	G 1/2
SB 3..K	83	55	12	41	G 3/4

SB 2..K 1



1 Sealing option

2 Adjustment range

6.4 Accessories, spare and individual parts

To purchase spare parts, please see HAWE Hydraulik interactive contact map.

6.4.1 Non-adjustable version

Housing for pipeline installation

Coding	Type	Order no.
G	SB 0	3602 4025-00
	SB 1 SQ 1	3602 4014-00
	SB 2 SQ 2	3602 4005-00
	SB 3 SQ 3	3602 4007-00
	SB 4	3007 4189-00
	SB 5	3007 4188-00
E, F	SB 0	3602 4071-00
	SB 1 SQ 1	3602 4074-00
	SB 2 SQ 2	3602 4080-00
	SB 3 SQ 3	3602 4081-00
	SB 4	3007 4252-00
	SB 5	3007 4251-00

Housing with metric thread

Coding	Type	Order no.
G	SB 0...14	3602 4019-00
	SB 1...16 SQ 1...16	
	SB 1...18 SQ 1...18	3602 4226-00
	SB 2...20 SQ 2...20	3602 4079-00
	SB 2...22 SQ 2...22	3602 4202-00
E, F	SB 0...14	3602 4271-00
	SB 1...16 SQ 1...16	3602 4272-00
	SB 1...18 SQ 1...18	3602 4233-00
	SB 2...20 SQ 2...20	3602 4273-00
	SB 2...22 SQ 2...22	3602 4158-00

Housing with threaded reducing ring

Coding	Type	Order no.
G	SB 1/0 SQ 1/0	3602 4014-00
	SB 2/1 SQ 2/1	3602 4005-00
	SB 3/2 SQ 3/2	3602 4007-00
	SB 4/3 SQ 4/3	3007 4189-00
	SB 5/4	3007 4188-00
E, F	SB 1/0 SQ 1/0	3602 4074-00
	SB 2/1 SQ 2/1	3602 4080-00
	SB 3/2 SQ 3/2	3602 4081-00
	SB 4/3 SQ 4/3	3007 4252-00
	SB 5/4	3007 4251-00

Housing with UNF thread

Coding	Type	Order no.
G	SB 0	3602 4290-00
	SB 1 SQ 1	3602 4291-00
	SB 2 SQ 2	3602 4292-00
	SB 3 SQ 3	3602 4293-00
	SB 4	3602 4294-00
	SB 5	3602 4295-00

6.4.2 Adjustable version (banjo bolt version)

Swivel housing for banjo bolt version

Housing for pipeline installation

Coding	Type	Order no.
H 6	SB 0 SQ 0	6030 2176-00
H 8		6030 2181-00
HL 10		6030 2182-00
H 12	SB 1 SQ 1	6030 2183-00
H 16	SB 2 SQ 2	6030 2175-00
H 20	SB 3 SQ 3	6030 2173-00

Housing with metric thread

Coding	Type	Order no.
H 8	SB 0	6030 2181-00
HL 10		6030 2184-00
H 20	SB 3	6030 2173-00

References

Additional versions

- Flow control valve type SJ: D 7395
- Flow control valve type CSJ: D 7736
- Flow control valve type DSJ: D 7825
- Flow control valve type SD, SF and SK: D 6233
- Flow control valve type SR2, SR3: D 6402, D 6403, D 6404
- Line rupture protection valve type LB: D 6990
- Connection block type HMPL and HMPV for proportional directional spool valve: D 7700 H
- Lifting module type HST: SK 7650-HST2 and SK 7650-HST3

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