RE 21004-01
Edition: 2024-03

rexroth
A Bosch Company

2-way cartridge valves

Type LC (cartridge valves)


R0024

- Size 16 ... 32
- Component series 8X
- Maximum operating pressure 450 bar
- Maximum flow rate 2200 l/min (***Δp*** = 10 bar)

Features

- With or without control spool bore
- Various cracking pressures ("springs")
- Directional function
  - High-flow design
  - Control spool with or without overlap
  - Control spool with or without fine control range
  - 2 area ratios (7% and 50%)
  - Piston seal
- Pressure limiting function "DB"
  - Control spool with or without fine control range
  - Relief pressure up to 490 bar
  - Piston seal
- Pressure reducing function "DR"

Contents

Ordering code: Directional function

01	02	03	04	05	06	07		08	09	10	11
LC						**8X**	**/**				

01	Cartridge valve	**LC**

02	Size 16	**16**
	Size 25	**25**
	Size 32	**32**

Control spool version (area ratios see page 7)

03	A_1: A_2 = 2 : 1 (A_2 = 50%)	**A**
	A_1: A_2 = 14.3 : 1 (A_2 = 7%)	**B**

Cracking pressure (in reference to version "A". Conversion to version "B" see page 11; others on request)

04	0 bar (without spring)	**00**
	Approx. 0.5 bar (especially for anti-cavitation and check valve function)	**05** [1]
	Approx. 1 bar	**10** [1]
	Approx. 2 bar (standard)	**20**
	Approx. 4 bar	**40**

Control spool form (see symbols, page 3)

05	Control spool without overlap (standard)	**E**
	Control spool with overlap (version "A" only)	**F**
	Control spool with overlap and fine control range (version "A" only)	**D**

Piston seal (see symbols, page 3)

06	Without seal (retrofittable)	**L**
	With seal (standard)	**K**

07	Component series 80 ... 89 (80 ... 89: unchanged installation and connection dimensions)	**8X**

08	Operating pressure 420 bar	**420**
	Operating pressure 450 bar	**450**

Bore/orifice in control spool (other versions on request) (diameter in mm = ordering code/10)

09	None	**No code**
	Bore from port B to spring chamber (only "LC 16 B.E")	**B30** [1]
	Bore from port B to spring chamber (only "LC 25 B.E")	**B40** [1]
	Bore from port B to spring chamber (only "LC 32 B.E")	**B50** [1]
	Orifice from port A to spring chamber (only "LC . A.E")	**Axx**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 10)

10	NBR seals (version "450"; only on request)	**N**
	FKM seals (version "450"; only on request)	**F**
	H-Ecopur (only version "450")	**P**

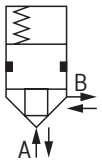
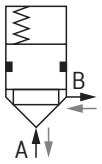
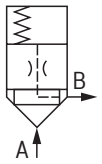
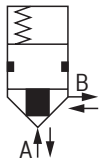
Special versions (additional special versions available on request)

11	Standard	**No code**
	Repair kit with oversize upper socket diameter (+1 mm)	**R05**
	Installation space compatible version as replacement for "LC...7X/-004" and existing special cover (larger spring installation space); only version "K"; compensation disk included	**-004**

[1] Not for version "K".

Ordering code: Directional function

Symbols

Version			
"A.EK", "A.FK"	**"B.EK"**	**"B.EL..B.."**	**"A.DK"**
			
Area ratio 2 : 1 (50%)	Area ratio 14.3 : 1 (7%)	Area ratio 14.3 : 1 (7%)	Area ratio 2 : 1 (50%)

Ordering code: Pressure limiting function

01	02	03	04	05	06	07		08	09	10	11
LC		**DB**				**8X**	**/**				

01	Cartridge valve	**LC**

02	Size 16	**16**
	Size 25	**25**
	Size 32	**32**

03	Pressure limiting function (A_1 : A_2 = 1 : 0 (A_2 = 0%)	**DB**

Cracking pressure (others on request)

04	0 bar (without spring)	**00**
	Approx. 2 bar (standard)	**20**
	Approx. 4 bar	**40**
	Approx. 5 bar	**50**
	Approx. 8 bar	**80** [1]

Control spool form (see symbols, page 5)

05	Control spool without fine control (standard)	**E**
	Control spool with fine control	**D**

Piston seal

06	Without seal (retrofittable except version "LC 16 DB.D")	**L**
	With seal (standard; not version "LC 16 DB.D")	**K**

07	Component series 80 ... 89 (80 ... 89: unchanged installation and connection dimensions)	**8X**

08	Operating pressure 420 bar	**420**
	Operating pressure 450 bar	**450**

Bore/orifice in control spool (other versions on request) (diameter in mm = ordering code/10)

09	None	**No code**
	Bore from port A to spring chamber (only "LC 16 DB.D")	**A07**
	Orifice from port A to spring chamber (not "LC 16 DB.D")	**Axx** [2]

Seal material (observe compatibility of seals with hydraulic fluid used, see page 10)

10	NBR seals (version "450"; only on request)	**N**
	FKM seals (version "450"; only on request)	**F**
	H-Ecopur (only version "450")	**P**

Special versions (additional special versions available on request)

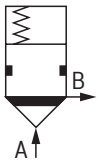
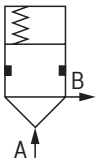
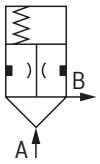
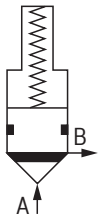
11	Standard	**No code**
	Repair kit with oversize upper socket diameter (+1 mm)	**R05**
	Installation space compatible version as replacement for "LC...7X/-004" and existing special cover (larger spring installation space); only version "K"; compensation disk included	**-004**

[1] Additional intermediate cover required
- ▶ NG16: "LFA...D22"
- ▶ NG25 and 32: "LFA...D19"

[2] Orifice selection, see page 19.

Ordering code: Pressure limiting function

Symbols

Version			
"DB . DK"	**"DB . EK"**	**"DB . EK...Axx"**	**"DB . 80DK"**
			

Selection aid to obtain set pressure <10 bar (e.g. depressurized circulation)

- The lowest set pressure depends on the choice of the control spool form, the compression spring and the mounting cover that is used. Please refer to the corresponding data sheet for the "LFA" control cover.
- Please observe the following information for higher set pressures.

NG	**Version**	**Flow** (limit value) in l/min
16	"E"	300
	"D"	175
25	"E"	600
	"D"	300
32	"E"	800
	"D"	450

☞ **Notes:**

- The specified flows do not represent the maximum admissible values, but indicate limits to achieve the lowest possible circulation pressures even in the case of a "depressurized circulation" operating mode that can be activated in addition.
- The intended function is primarily decisive when selecting the size and control spool form.
- Operating states in which, for example, high pressure differentials are repeatedly reduced to the tank pressure increase wear on the block (cavitation erosion).

Ordering code: Pressure reducing function

01	02	03	04	05	06	07		08	09	10	11
LC		**DR**		**E**	**L**	**8X**	**/**	**420**			

01	Cartridge valve	**LC**
02	Size 16	**16**
	Size 25	**25**
	Size 32	**32**
03	Pressure reducing function (A_1 : A_2 = 1 : 1 (A_2 = 0%)	**DR**

Cracking pressure (others on request)

04	0 bar (without spring)	**00**
	Approx. 2 bar	**20**
	Approx. 4 bar	**40**
	Approx. 5 bar (standard)	**50**
	Approx. 8 bar	**80** [1]

Control spool form (see symbols below)

05	Control spool with fine control (without seat)	**E**

Control spool seal

06	Without seal	**L**
07	Component series 80 ... 89 (80 ... 89: unchanged installation and connection dimensions)	**8X**
08	Inlet pressure 420 bar (see page 10)	**420** [2]

Thread in control spool (other versions on request) (diameter in mm = ordering code/10)

09	None	**No code**
	Orifice from port A to spring chamber	**Axx** [3]

Seal material (observe compatibility of seals with hydraulic fluid used, see page 10)

10	NBR seals	**N**
	FKM seals	**F**

Special versions (additional special versions available on request)

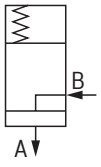
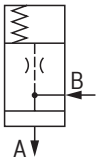
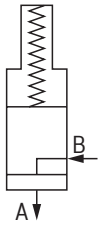
11	Standard	**No code**
	Repair kit with oversize upper socket diameter (+1 mm)	**R05**

[1] Additional intermediate cover required
- NG16: "LFA...D22"
- NG25 and 32: "LFA...D19"

[2] Observe maximum pressure differential.

[3] Orifice selection, see page 19.

Symbols

Version		
"DR . E"	**"DR . E...Axx"**	**"DR . 80E"**
		

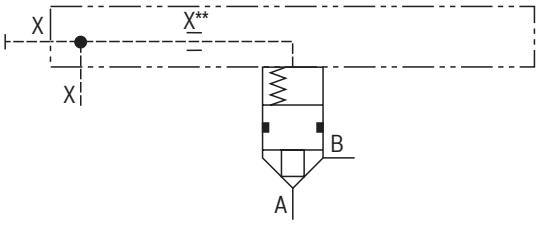
Function, section, symbol: Directional function

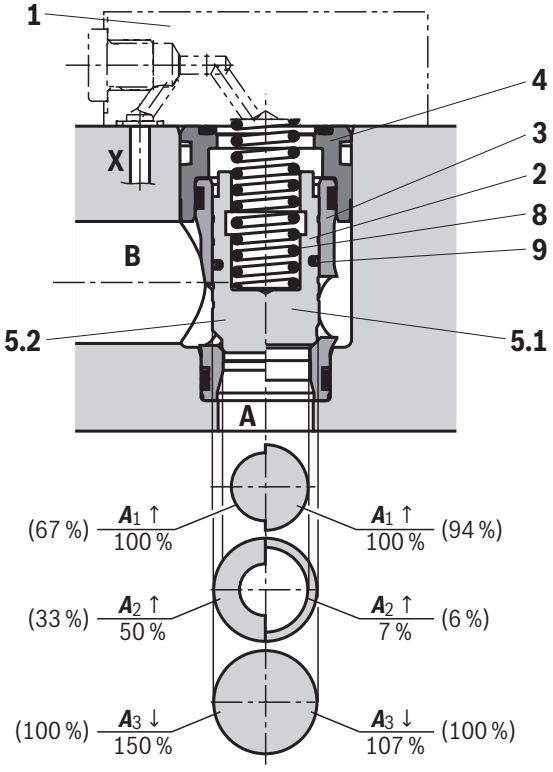
2-way cartridge valves are elements that have been designed for a compact block design. The power section with ports A and B is inserted into an ISO 7368 installation bore and closed pressure-tight to the outside with a control cover. The control cover thereby establishes the connection to the spring chamber of the power section, which is required for control of the power section, and can additionally accommodate different pilot control valves. By selecting the control cover type and possible combinations with corresponding pilot control valves, the power section can assume the pressure, directional and throttle function or a combination of these functions. Functionally efficient and energy-efficient solutions are obtained through appropriate selection. Cost-effective and compact solutions (including the block) can be realized when the power section can perform several functions via the control of the control cover.

2-way cartridge valves generally consist of a control cover (1), cartridge valve (2), and compression spring (8). The control cover (1) can accommodate a maximum of 4 pilot oil bores. Various equipment with, for example, stroke limitation, shuttle valves and hydraulically controlled 3/2-way directional control valves already make it possible to implement numerous standard functions. Additional directional control valves expand the range of functions.
The cartridge valve (2) consists of a two-part socket (3) and ring (4), control spool (5) (control spool version "B" (5.1) or "A" (5.2)) and compression spring (8).
Depending on the selected compression spring (8), the control spool seal (9) is fitted as standard.
The function of 2-way cartridge valves is pressure-dependent. Therefore, its effective pressurized areas A_1, A_2 and A_3 must be taken into account when selecting the control spool (5).
Available area ratios $A_1 : A_2$ are 14.3 : 1 (7%) or 2 : 1 (50%).
The area at the valve seat A_1 is always normalized to 100% independently of the actual area ratio $A_1 : A_2$. Therefore, it is the reference for specifying the cracking pressure for the two area ratios.
The area A_3 is the same size for both control spools (7% or 50%) ($A_3 = A_1 + A_2$).

In general, the following applies:
The areas A_1 and A_2 act in the opening direction. Area A_3 and the compression spring (8) act in the closing direction. The direction of action of the resulting force from the opening and closing forces determines the spool position of the 2-way cartridge valve.
The flow through the 2-way cartridge valves can be from A→B or from B→A. In case of pressurization of area A_3 by pilot oil discharge from channel B or by an external pilot oil supply, channel A is blocked and leakage-free.

Example:
Control cover "LFA . D...F..." with cartridge valve "LC . A20EK..."





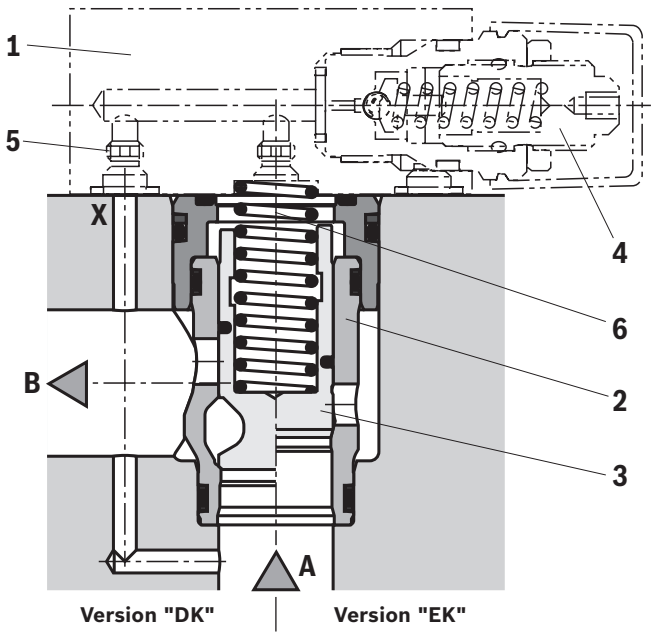
Function, section, symbol: Pressure limiting function

2-way cartridge valves for pressure functions (pressure reducing function, see page 9) are pilot-operated valves in a seat design. The power section designed as a cartridge valve (2) is installed into a receiving hole standardized according to ISO 7368 and closed with a control cover (1).
The pilot control valve (4) for manual or electrically proportional pressure adjustment is integrated into the control cover (1) or installed on the control cover (1).
Different pressure functions can be realized through the combination of cartridge valves and control covers.

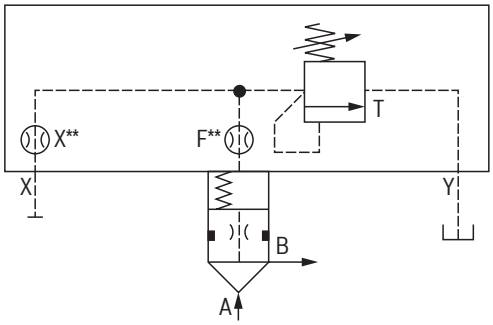
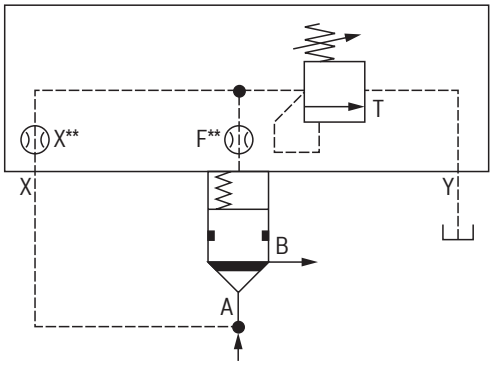
Cartridge valve "LC . **DB**"
The cartridge valve (2) is available with control spool form "D" or "E". Both versions have no effective area A_2. Thus, the effective area A_1 is equal to spring chamber area A_3.
The working pressure applied to A_1 is guided either externally or internally via the control nozzle (5) to the spring side (6) of the cartridge valve (2).
Below the pressure set at the pilot control valve (4), the control spool (3) is pressure-compensated and closed by the spring force. On reaching the set pressure, the control spool (3) is opened and the pressure at port A is limited according to the pressure-flow characteristics.

☞ **Notes:**

- Alternatively, the pressure feedback can be realized directly via an orifice to the spring side (6) of the element (see symbols below). The port X is thus omitted on the block side.
  If adaptations of the desired pressure function to specific and different system requirements are necessary, changing the control spool orifice is more complicated than with the external pressure supply (pressure feedback via port X).
- All standard cartridge valves "LC . DB" are pressure-compensated when operating in a typical basic function (pilot oil supply = pressure in port A or B). An excessive load in the seat area of the control spool can therefore occur in applications with an external pilot oil supply. See "Project planning information" on page 23.



Examples:

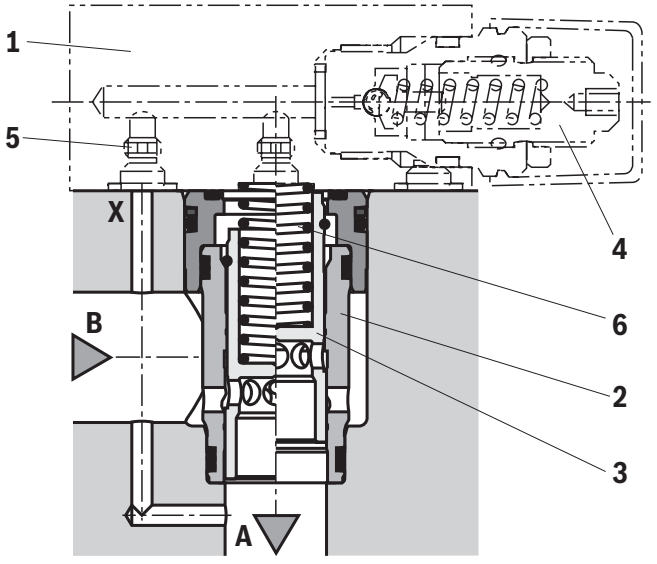
Internal pressure feedback (version "D" and "E")	**External pressure feedback** (version "D" and "E")
	

Function, section, symbol: Pressure reducing function

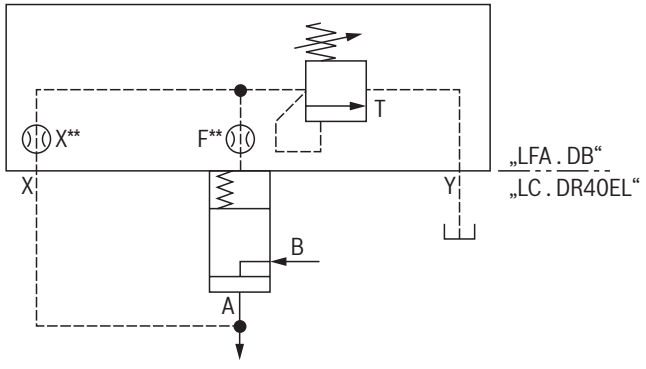
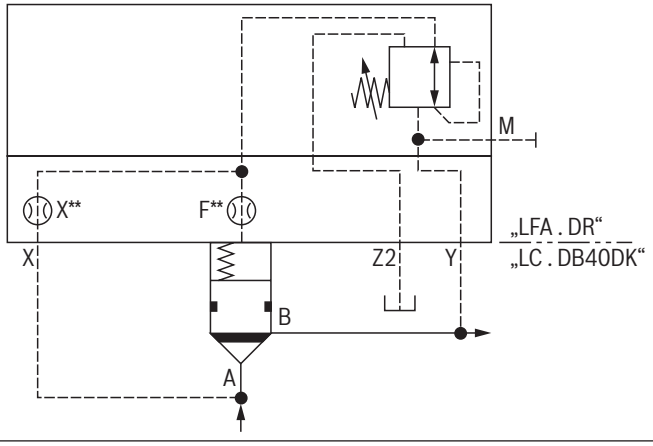
Rest position open
Cartridge valve "LC . **DR**"
Control cover "LFA . **DB**"
The cartridge valve "LC . DR" (2) for pressure reducing functions is designed as a spool construction with closing characteristics. It has no seat face. The control cover (1) versions "LFA . DB" are used.
The cartridge valve (2) has no effective area A_2 on port B. Therefore, the effective area A_1 is equal to the spring chamber area A_3.
The working pressure required at A_1 is supplied either externally or internally via a control nozzle (5) to the spring side (6) of the cartridge valve (2).

Below the power limit and the pressure set on the pilot control valve, the control spool (3) is pressure-compensated and held in the control position by spring force. Only when the set pressure at port A is reached is the volume flow regulated according to the pressure flow characteristics.

Features
- Direction of flow B→A
- Better closed-loop accuracy than "rest position closed"
- Automatic power limitation
- Special function with free return flow A→B on request



Basic position "open" | **Working position "closed"**

Rest position open	**Rest position closed**
	

Technical data
(Please consult us for applications outside these values!)

General					
Size		NG	16	25	32
Weight		kg	0.25	0.5	1.1
Ambient temperature range		°C	–30 ... +80 (NBR seals) -20 ... +80 (FKM and H-Ecopur seals)		
$MTTF_D$ values according to EN ISO 13849		Years	150 ... 1200 (see data sheet 08012 for further information)		
Conformity	▶ RoHS Directive		2011/65/EU [1]		

Hydraulic			
Maximum operating pressure	▶ Port A, B		
	– "LC" (directional function)	bar	420; 450
	– "LC . DB"		420; 450
	– "LC . DR"	bar	420 (port B only) [2]
Hydraulic fluid			See table on page 10
Hydraulic fluid temperature range		°C	–30 ... +80 (NBR seals) -20 ... +80 (FKM and H-Ecopur seals)
Viscosity range		mm^2/s	2.8 ... 500
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]
Maximum flow (***Δp*** = 10 bar) [4]		l/min	Size- and type-dependent; see characteristic curves, page 14 ... 18

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**	**Data sheet**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM, H-Ecopur	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	FKM, H-Ecopur	ISO 15380	90221
		HEES	FKM, H-Ecopur		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM, H-Ecopur	ISO 12922	90222
		HFDU (ester base)	FKM, H-Ecopur		
		HFDR	FKM		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**
- ▶ For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- ▶ **Flame-resistant – containing water:**
  Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended – if possible considering conditions specific to the installation – to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.

[1] The product fulfills the substance requirements of the RoHS Directive 2011/65/EU.

[2] The maximum pressure differential between ports B and A is 300 bar.

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

[4] The indication of a maximum flow is usually normalized to a pressure difference of 10 bar and does not represent a limit value in the case of logic elements. In particular, the flow velocity in the pipe and line cross-sections occurring at the maximum flow should be considered when making a selection.

Technical data: Directional function
(Please consult us for applications outside these values!)

Control spool area in cm²

Control spool area	Port	Version	Size 16	Size 25	Size 32
A_1	A	"A"	2.08	4.26	6.79
		"B"	2.92	5.73	9.51
A_2	B	"A"	1.06	1.89	3.39
		"B"	0.22	0.43	0.67
A_3	X	"A"	3.14	6.16	10.18
		"B"	3.14	6.16	10.18

Control spool stroke

		Size 16	Size 25	Size 32
Stroke	mm	9.0	12.0	14.0
Pilot volume	cm³	2.8	7.4	14.3
Theoretical pilot flow [5]	l/min	1.6	4.4	8.6

[5] Reference: Switching time ***t*** =100 ms
This value is used only for estimation and is therefore not a limit value for opening and closing times that can be obtained.

☞ **Note:**
Control spools in design "D" are mainly used in applications with additional stroke limitation devices and in position-monitored versions. Due to the better flow values and thus lower hydraulic losses, a control spool without fine control range is recommended as standard.

Cracking pressure in bar (without control spool seal)

Direction of flow	Version	Size 16	Size 25	Size 32
A→B	"A00" [6]	0.02	0.03	0.05
	"A05"	0.36	0.35	0.36
	"A10"	0.72	0.68	0.72
	"A20"	1.84	2.18	2.12
	"A40"	3.37	3.90	3.80
	"B00" [6]	0.01	0.02	0.04
	"B05"	0.26	0.26	0.26
	"B10"	0.51	0.50	0.51
	"B20"	1.31	1.62	1.52
	"B40"	2.04	2.90	2.70
B→A	"A00"[6]	0.04	0.05	0.1
	"A05"	0.71	0.78	0.72
	"A10"	1.43	1.53	1.42
	"A20"	3.64	4.91	4.25
	"A40"	6.68	8.74	7.6
	"B00" [6]	0.24	0.25	0.5
	"B05"	3.48	3.40	3.64
	"B10"	7.01	6.69	7.24
	"B20"	17.9	21.5	21.6
	"B40"	32.9	38.3	38.6

[6] The values are derived from the weight of the control spool.

Technical data: Pressure limiting function
(Please consult us for applications outside these values!)

Control spool area in cm²

Control spool area	Port	Size 16	Size 25	Size 32
A_1	A	2.27	4.91	8.04
A_2	B	0	0	0
A_3	X	2.27	4.91	8.04

Control spool stroke

		Version	Size 16	Size 25	Size 32
Stroke	cm	"E"	6.0	6.5	8.5
	cm	"D"	6.5	7.5	9.6

Cracking pressure in bar (spring chamber area A_3 depressurized; without control spool seal)

Version	Size 16	Size 25	Size 32
"00" [6]	0.02	0.03	0.05
"20"	2	2	2
"40"	4	4	4
"50"	5	5	5
"80" [7]	8	8	8

[6] The values are derived from the weight of the control spool.

[7] Additional intermediate cover required
- NG16: "LFA...D22"
- NG25 and 32: "LFA...D19"

Technical data: Pressure reducing function (Please consult us for applications outside these values!)

Control spool area in cm²

Control spool area	Port	Size 16	Size 25	Size 32
A_1	A	2.01	4.52	7.07
A_2	B	0	0	0
A_3	X	2.01	4.52	7.07

Control spool stroke

		Size 16	Size 25	Size 32
Stroke	mm	6.3	9.1	11.0
Pilot volume	cm^3	1.27	4.11	7.78

Closing pressure in bar (spring chamber area A_3 depressurized)

Version	Size 16	Size 25	Size 32
"00" [6]	0.02	0.03	0.05
"20"	2	2	2
"40"	4	4	4
"50"	5	5	5
"80" [7]	8	8	8

6) The values are derived from the weight of the control spool.

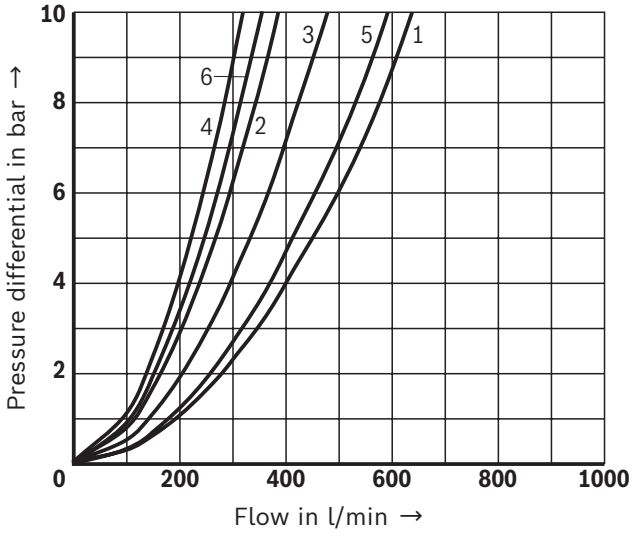
7) Additional intermediate cover required
- ▶ NG16: "LFA...D22"
- ▶ NG25 and 32: "LFA...D19"

☞ **Notes:**
- ▶ Tolerance of the stated closing pressures ±0.2 bar.
- ▶ The control spool is "open" in the basic position. To achieve a controlled position, a pressure increase up to the desired control pressure is required on the actuator side "A". Excessively rapid connection of the system pressure (especially in case of an incompletely prefilled actuator volume) can therefore lead to pressure peaks.
- ▶ The choice of compression spring determines the power limit and control dynamics.
- ▶ The control spool is inserted from the bottom side of the socket and secured by a snap ring (spring chamber side).

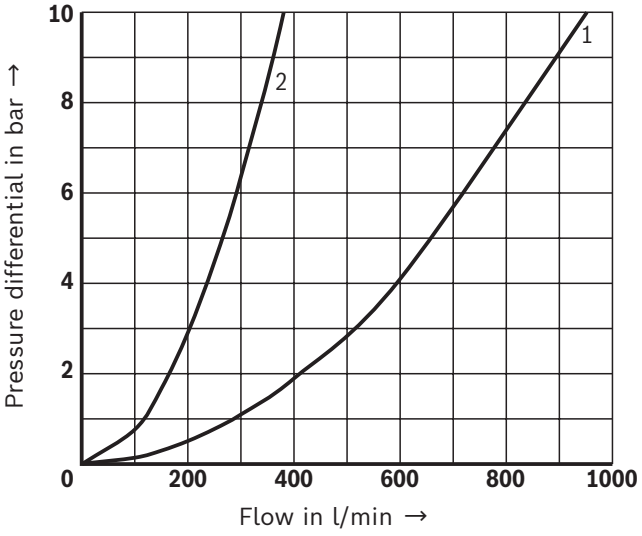
Characteristic curves: Directional function (simulated with HLP46, ϑ_{oil} = 40±5 °C)

Δp-q_V characteristic curves

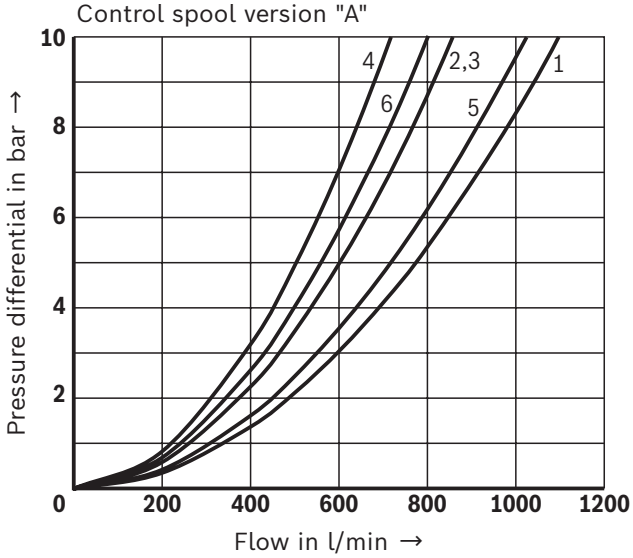
Size 16
Control spool version "A"



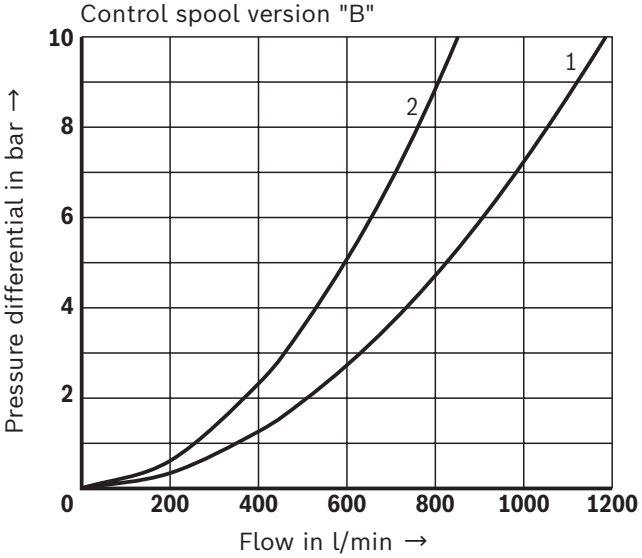
Size 16
Control spool version "B"



Size 25
Control spool version "A"



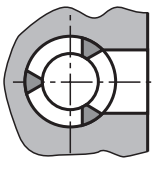
Size 25
Control spool version "B"



1 Control spool form "E"; A→B
2 Control spool form "E"; B→A
3 Control spool form "D"; A→B
4 Control spool form "D"; B→A
5 Control spool form "F"; A→B
6 Control spool form "F"; B→A

☞ **Notes:**
- The specified characteristic curves were simulated with 100% control spool stroke and an aligned socket (see sketch). This is based on an installation geometry with maximum bore diameters "A" and "B" and a simulation model according to ISO 4411/2008-10-01.
- Typical characteristic curves that are subject to tolerance variations.

Recommended socket alignment

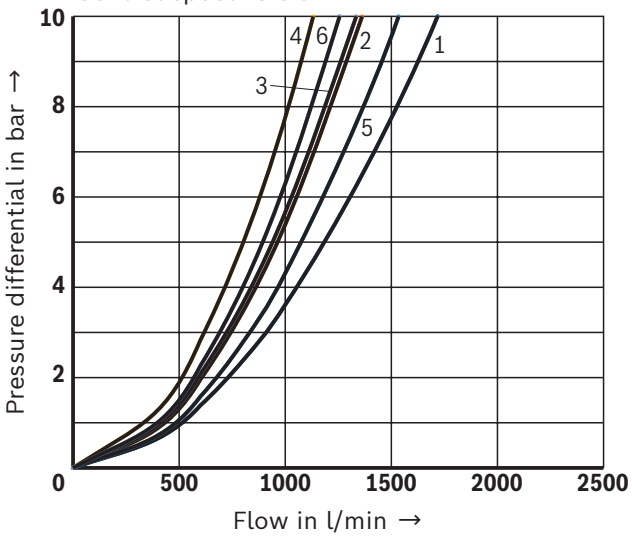


Bore on bore

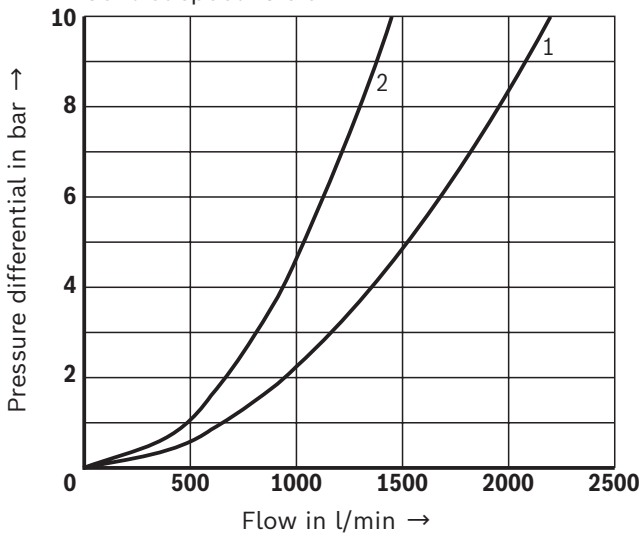
Characteristic curves: Directional function (simulated with HLP46, ϑ_{oil} = 40±5 °C)

Δp-q_V characteristic curves

Size 32
Control spool version "A"



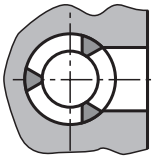
Size 32
Control spool version "B"



1 Control spool form "E"; A→B
2 Control spool form "E"; B→A
3 Control spool form "D"; A→B
4 Control spool form "D"; B→A
5 Control spool form "F"; A→B
6 Control spool form "F"; B→A

☞ **Notes:**
- The specified characteristic curves were simulated with 100% control spool stroke and an aligned socket (see sketch). This is based on an installation geometry with maximum bore diameters "A" and "B" and a simulation model according to ISO 4411/2008-10-01.
- Typical characteristic curves that are subject to tolerance variations.

Recommended socket alignment

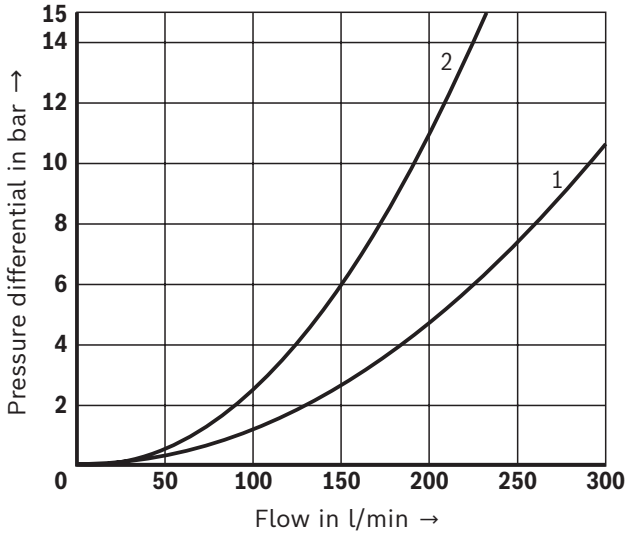


Bore on bore

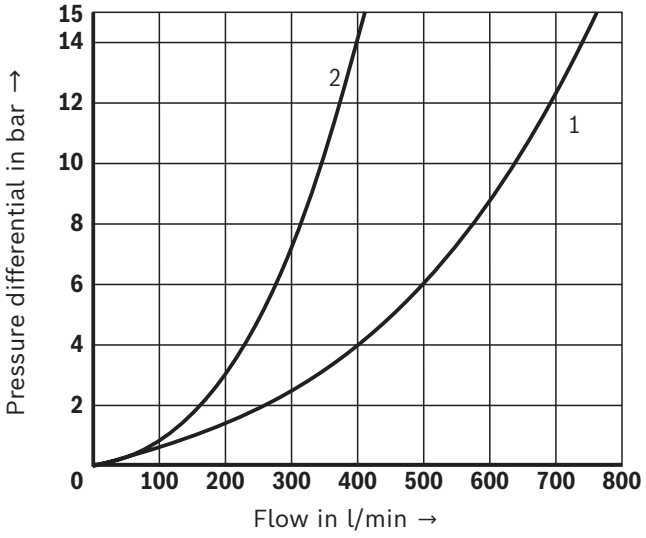
Characteristic curves: Pressure limiting function (measured with HLP46, ϑ_{oil} = 40±5 °C)

Δp-q_V characteristic curves

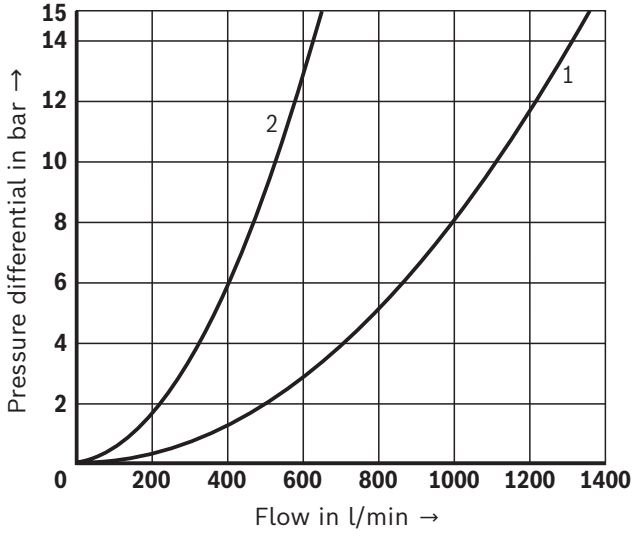
Size 16



Size 25



Size 32



1 Control spool form "E"

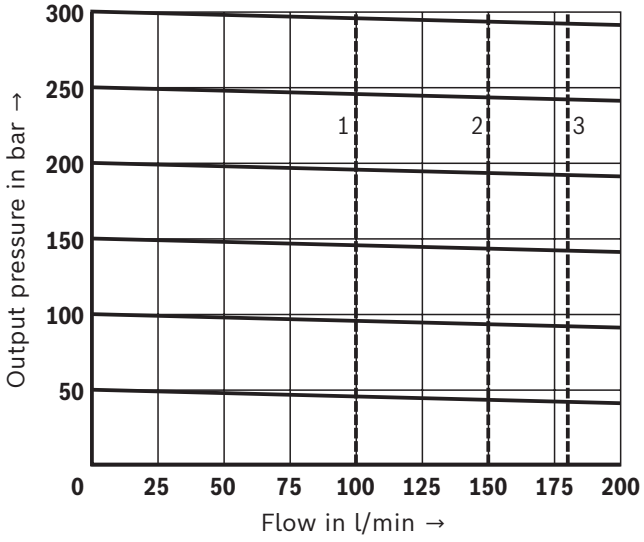
2 Control spool form "D"

☞ **Notes:**

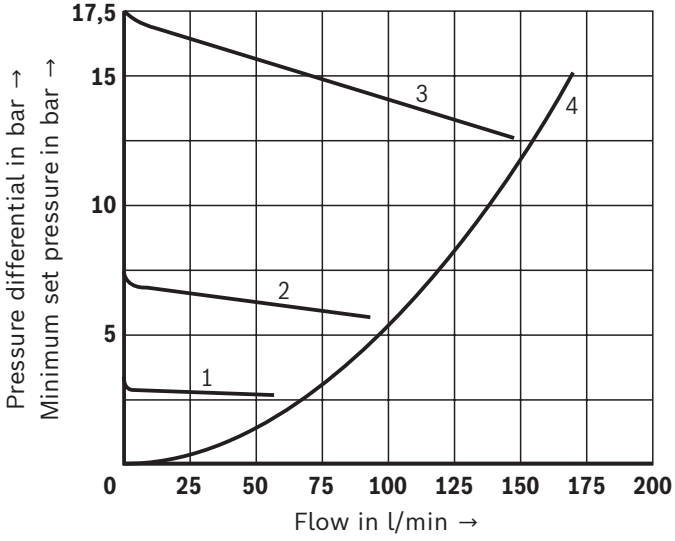
- The characteristic curves provided were determined at 100% control spool stroke (without compression spring). The measuring block is designed with the maximum bore diameters "A" and "B".
- The control characteristic curves (circulation pressure, pressure-flow dependency) are obtained by selecting the compression spring and the control cover "LFA. DB". These characteristic curves are shown in the relevant data sheet.
- The maximum flow velocities in the tank line have to be observed for pressure limiting functions. Due to the special seat geometry, switching cycles with an external pilot oil supply with control spool version "E" are not recommended, since this can lead to overloading of the seat geometry (the operation of standard pressure limiting functions is pressure-compensated).
- Typical characteristic curves that are subject to tolerance variations.

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

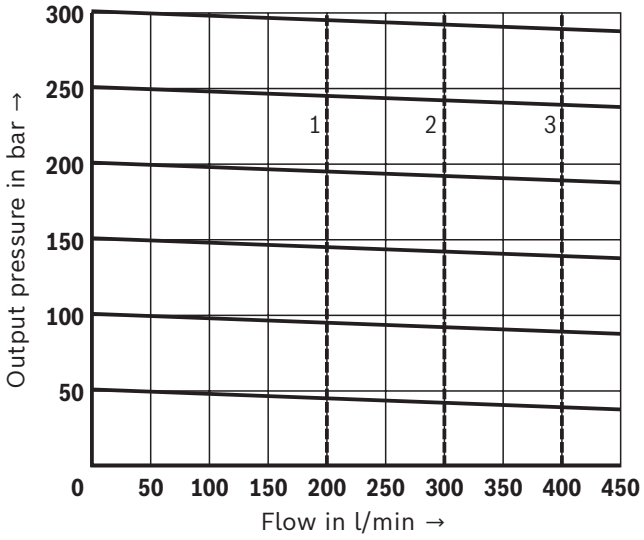
Size 16
Power limit



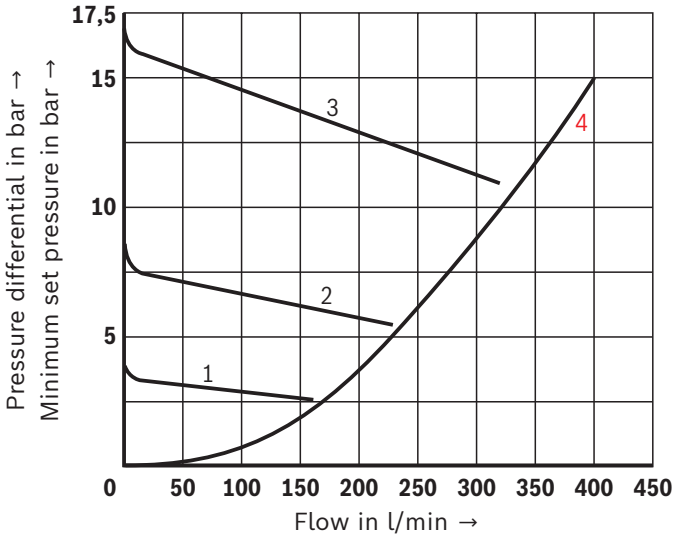
Size 16
Theoretical (basic position "open")



Size 25
Power limit



Size 25
Theoretical (basic position "open")

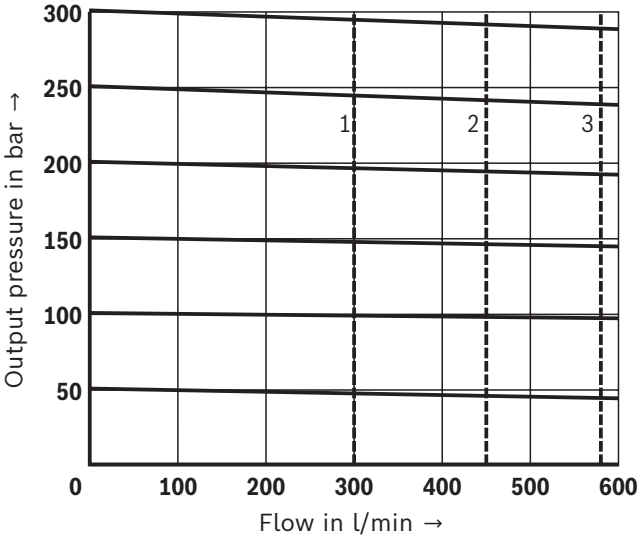


1 Version "20"
2 Version "40" and "50"
3 Version "80"
4 Theoretical limit curve

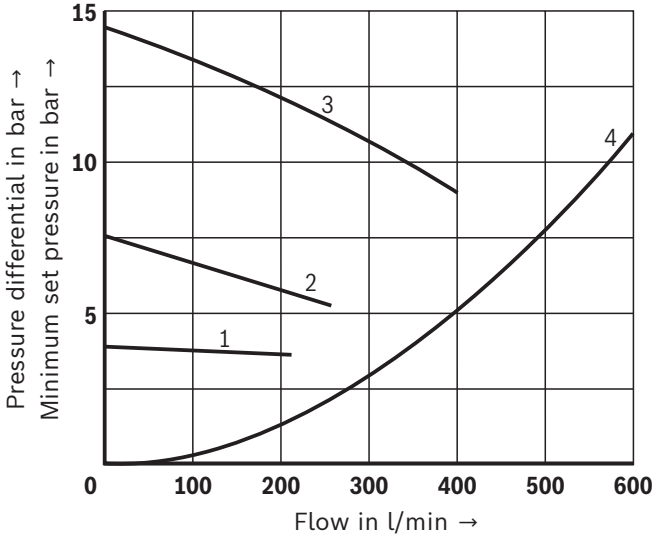
☞ **Notes:**
- ▶ Control function only possible in direction of flow B→A.
- ▶ In the illustrated characteristic curves, the overall function with the pilot components of the cartridge valve "LC . DR" must be taken into account, e.g.
  - – Pressure reducing function
  - – Pressure compensator
  - – Flow controller
- ▶ The power limit is determined by the flow forces and back pressure acting on the control spool.
- ▶ A stronger compression spring increases the power limit.
- ▶ Version "50" increases the power limit by approximately 20% compared to "40"; standard installation space
- ▶ Typical characteristic curves that are subject to tolerance variations.

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

Size 32
Power limit



Size 32
Theoretical (basic position "open")

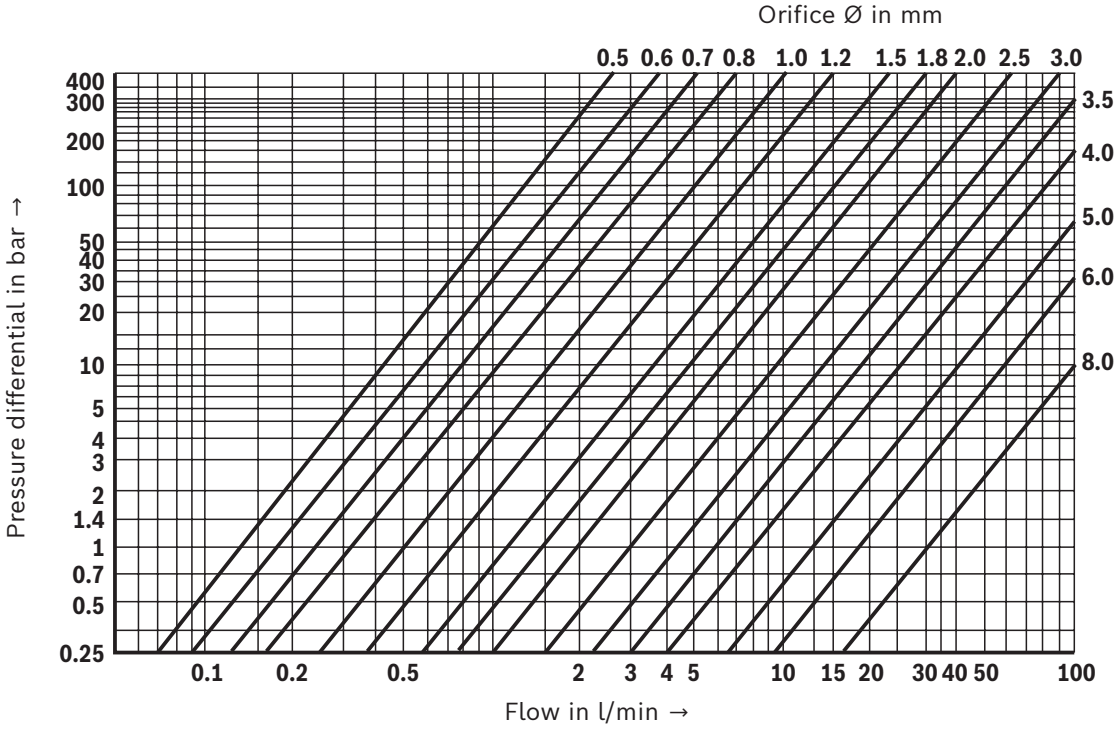


1 Version "20"
2 Version "40" and "50"
3 Version "80"
4 Theoretical limit curve

☞ **Notes:**
- ▶ Control function only possible in direction of flow B→A.
- ▶ In the illustrated characteristic curves, the overall function with the pilot components of the cartridge valve "LC . DR" must be taken into account, e.g.
  - – Pressure reducing function
  - – Pressure compensator
  - – Flow controller
- ▶ The power limit is determined by the flow forces and back pressure acting on the control spool.
- ▶ A stronger compression spring increases the power limit.
- ▶ Version "50" increases the power limit by approximately 20% compared to "40"; standard installation space
- ▶ Typical characteristic curves that are subject to tolerance variations.

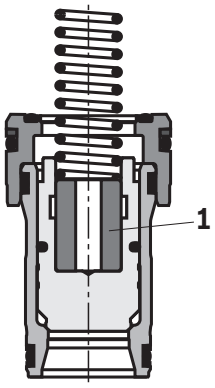
Accessories (separate order)

Characteristic curves for selecting orifices



Orifices "1/16-27 NPTF" and **blanking plug**

Orifice Ø in mm	**Order numbers**	**Material numbers**
0.8	**08**	1810361029
1.0	**10**	1810361020
1.2	**12**	1810361021
1.5	**15**	1810361045
1.8	**18**	1810361024
2.0	**20**	1810361028
2.5	**25**	1810361054
3.0	**30**	R996001304
Blanking plug	**99**	1813464004



Compensation disk (1)

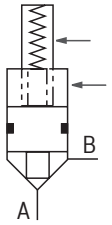
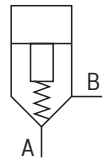
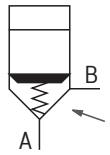
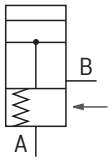
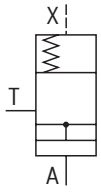
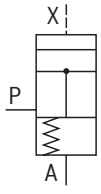
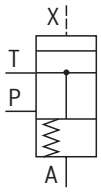
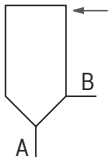
Size	**Material numbers**
16	R901578885
25	R901578906
32	R901578904

To produce a compatible spring projection to "LC ... 7X/-004" or "LC ... 7X/-146".
Height compensation when special cover "LFA" is included in the scope of delivery of "LC ... 8X/-004".

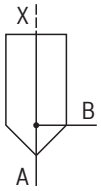
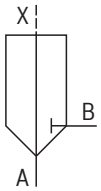
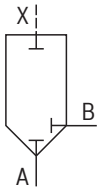
Compression springs

NG	**Version**	**Material numbers**	
		Directional function	**Pressure function**
16	"02"	R900013844	–
	"05"	R900002110	R900002110
	"10"	R900002111	R900002111
	"20"	R900062747	R900062747
	"40"	R901429745	R900062754
	"50"	–	R900062757
	"80"	–	R900082073
25	"02"	R900013845	–
	"05"	R900002114	R900002114
	"10"	R900002115	R900002115
	"20"	R900062762	R900062762
	"40"	R900062764	R900062820
	"50"	–	R900062819
	"80"	–	R900082072
32	"02"	R900028984	–
	"05"	R900002116	R900002116
	"10"	R900002117	R900002117
	"20"	R900062813	R900062813
	"40"	R900062783	R900062810
	"50"	–	R900062805
	"80"	–	R900082071

Additional functions with special versions (on request)

Symbol	**Type** (examples)	**Component series**	**Size**	**Description/special characteristic**
	LC...-**004**	8X	16 ... 32	▶ Standard cartridge valve "LC...K" with compensation disk included ▶ This simulates the spring projection "LC...7X/-004" and "LC...7X/-146" (with shaft seal option) ▶ The compensation disk is only required if there is no "D19" intermediate cover or if an existing special cover cannot be adjusted. ▶ If the compensation disk is not installed, the spring projection is normal.
	LC . A.E...-**054** LC . A.D...-**054** LC . B.E...-**054**	6X	16 ... 32 16 ... 32 25 ... 32	▶ Pulling logic with open zero position ▶ Special cover (e.g. "D54") required
	LC . DB40D...-**018**	6X	16 ... 32	Basic position "open" (only "LC . DB") ▶ Spring acts in opening direction ▶ External pilot pressure $p_{St} > p_A + 8$ bar required ▶ Direction of flow control operation: A→B
	LC . DR40D...-**028**	6X	16 ... 32	Basic position "closed" (only "LC . DR.") ▶ Spring acts in closing direction ▶ External pilot pressure $p_{St} > p_A + 8$ bar required ▶ Direction of flow control operation: B→A
	LC . DR.D...-**072**	6X	25 ... 32	▶ Pressure-dependent select (DAU) function (discharge) ▶ Control via port X ▶ Special mounting hole ▶ Separate documentation on request
	LC . DR.D...-**073**	6X	25 ... 32	▶ Pressure-dependent select (DAU) function (supply) ▶ Control via port X ▶ Special mounting hole ▶ Separate documentation on request
	LC . DR.D...-**074** LC . DR.D...-**174**	6X	25 ... 32 32	▶ 3/2 pressure reducing function ▶ Control via port X ▶ Special mounting hole ▶ SO074: A→T restricted (20%) ▶ SO174: A→T restricted (50%)
	LC...-**R05**	8X	16 ... 32	▶ Repair kit (socket outer diameter "top" 1 mm larger than standard size) ▶ Other dimensions and features as standard

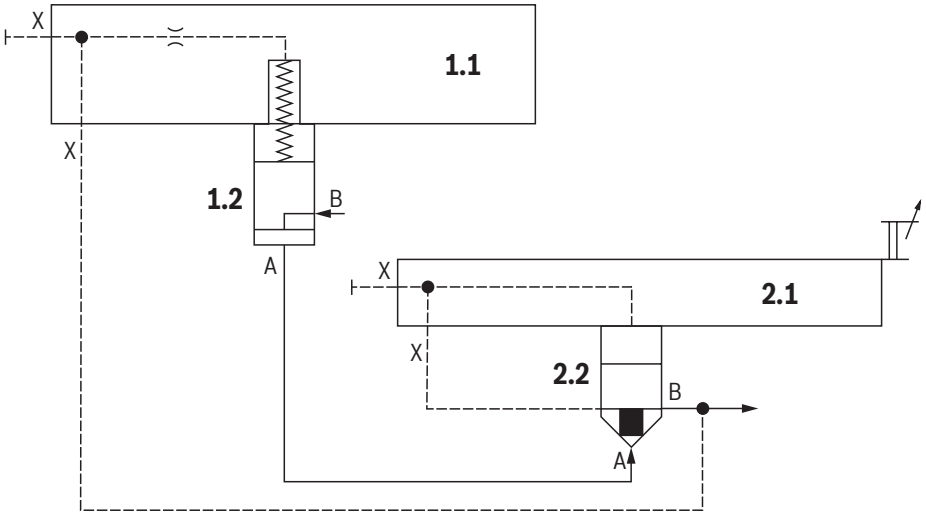
Additional functions with special versions

Symbol	**Type** (examples)	Size	Description/special characteristic
	LC . XAB00E...	16 ... 32	▶ Blind element without control spool ▶ All channels (A, B, X) connected ▶ When using the "LFA" control cover, its spring chamber supply may need to be closed. Alternative: Control cover "LFA . D7X/FX99" ▶ Functionally corresponds to a standard "directional" or "DB" element with the control spool removed
	LC . XAF00E...	16 ... 32	▶ Blind element without control spool ▶ Channel A↔X connected ▶ Channel B closed ▶ When using the "LFA" control cover, its spring chamber supply may need to be closed. Alternative: Control cover "LFA . D7X/FX99"
	LC . X00E...	16 ... 32	▶ Blind element without control spool ▶ All channels (A, B, X) closed ▶ When using the "LFA" control cover, its spring chamber supply may need to be closed. Alternative: Control cover "LFA . D7X/FX99"

Function, circuit examples: Flow controller

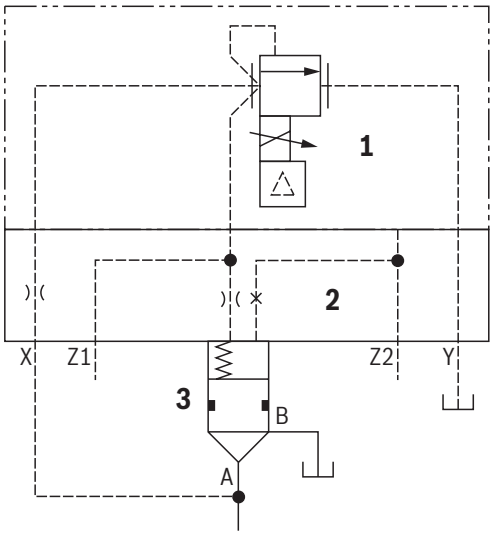
- Assembly 1:
  - Control cover "LFA 16 D8-7X/FX...", "LFA 25 D16-7X/FX..." or "LFA 32 D16-7X/FX..."
  - Cartridge valve "LC . DR80EL-8X..."
- Assembly 2:
  - Control cover "LFA . H2-7X/F..."
  - Cartridge valve "LC . A00DL-8X..."

A flow controller for high volume flows can be implemented with a combination of assemblies 1 and 2. Assembly 2 is used as a metering orifice, in which stroke limitation is used to set a specific pressure drop.
The power limit of the cartridge valve "LC . DR" has to be considered in the coordination of the flow values. It is therefore recommended to select the spring "80" in order to increase the power limit.
When the spring "80" is selected, a larger installation space in the control cover is required (special cover "LFA . D8", "LFA . D16" or a combination of intermediate covers "LFA . D22", "LFA . D19" and standard cover "LFA . D".
The control spool with fine control range at pos. 2.2 supports a finer adjustment of the working point via the stroke limitation of the "LFA" control cover. No spring ("00") is required for this position.



1.1 Control cover "LFA . D8-7X/FX..."
Control cover "LFA . D16-7X/FX..."
1.2 Cartridge valve "LC . DR80EL-8X..."
2.1 Control cover "LFA . H2-7X/F..."
2.2 Cartridge valve "LC . A00DL-8X..."

Function, circuit examples: Pressure function with control cover "LFA . WEMA" and pressure limiting pilot valve



1 Proportional pressure relief valve "DBET(E)-7X/Axx...",
2 Control cover "LFA . WEMA-7X/PxxFxx",
3 Cartridge valve "LC . DB20EK-8X..."

☞ **Notes:**
- Orifice fitting "P" and "F" in accordance with the standard fitting for control covers "LFA . DBE"
- Use of the control cover "LFA . WEMA" only with pilot control valves with internal connection P→A.

Project planning information

- Control spool form selection aid:
  - "LC . DB.E" (seat construction): high dynamics, higher volume flows
  - "LC . DB.D" (seat-spool construction): softer response, preferable for pressure reducing functions
  - As an alternative to the standard control spool, we also offer a version with center bore. Here the pressure feedback takes place directly via the control spool without the additional connection line A→X in the control block. Subsequent adjustment of this variant is subject to costs for elevated control requirements. Therefore, pressure feedback via channel X is the standard recommendation.
- Size selection notes for "LC . DB":
  - When selecting the size of an "LC . DB" cartridge valve, the intended function of the cartridge valve is decisive. In the case of a combined version with, for example, "depressurized circulation", the characteristic curves of the minimum set pressure must be observed. If, on the other hand, the cartridge valve is to be used only for pressure limitation, the selection criterion is the maximum expected flow.
  - If maximum pressure relief is the only requirement, "LC . DB" cartridge valves are often selected too large.
- General information:
  - Depending on the nominal size selected, certain inflow and outflow geometries (block, piping) result, which generate a corresponding volumetric flow rate. The practically proven upper limit for using a logic valve is 30 m/s.
- Spring selection aid:
  - "LC . DB" standard: 2 bar; 4 bar with pressure reducing function
  - "LC . DR" standard: 5 bar; 5 ... 8 bar with "flow controller" function
- In directional functions, the cracking pressure is not equal to the pressure differential "Δp." This assignment is primarily applicable to check valve functions.
- External supply of the pilot pressure (external pilot pressure source)
  - In general, all "LC . DB" and "LC . DR" cartridge valves are pressure-compensated for circuitry with internal pilot oil return.
  - For external supply, we therefore recommend an "LFA" control cover with flow controller in supply X in order to primarily limit the switching dynamics.
  - "LC . DR": Control spool has no seat stop. Therefore, observe the admissible control and differential pressures.
  - "LC . DB": Using control spool form "D" is recommended

"LFA" control cover

▶ Directional function "LFA...7X", NG16 ... 32 (420 bar)	Data sheet 21010
▶ Pressure function "LFA...7X", NG16 ... 32 (420 bar)	Data sheet 21050
▶ Directional function "LFA...7X", NG16 ... 32 (450 bar)	Data sheet 21030
▶ Pressure function "LFA...7X", NG16 ... 32 (450 bar)	Data sheet 21030

Further information

▶ 2-way cartridge valves - directional functions	Data sheet 21010
▶ 2-way cartridge valves - pressure functions	Data sheet 21050
▶ 2-way cartridge valves, pressure limiting function, type-examination tested	Data sheet 21055
▶ 2-way cartridge valves with spool position monitoring, passively controlled	Data sheet 21015
▶ 2-way cartridge valves, pressure and directional functions - high pressure series	Data sheet 21030
▶ 2-way cartridge valve, actively controllable, type LC2A	Data sheet 21040
▶ 2-way cartridge valves, pressure and directional functions - high pressure series	Data sheet 21045
▶ Installation bore according to ISO 7368	Data sheet 21067
▶ Hydraulic fluids based on mineral oils	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Data sheet 90222
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ Use of non-electrical hydraulic components in a potentially explosive environment	Data sheet 07011
▶ Hydraulic valves for industrial applications	Operating instructions 07600-B
▶ Information on available spare parts	www.boschrexroth.com/spc

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