

Flow Control Valve

Series LVM..



- high flow rates (180 l/min)
- flow rates are unaffected by temperature change or when the higher load pressure alternates between the outlet ports
- proportional flow-sharing principle
- easy to service
- reliable
- safe

1 Description

1.1 General description

Series LVM flow-control valves are used to set the speed of single-acting hydraulic actuators. The flow rate is set by the proportional or mechanical displacement of the control spool.

The integral downstream pressure compensator makes it possible to design systems that work on the principle of proportional flow-sharing (see section 10: Circuit examples). There are 3 versions of the flow-control valve.

1.1.1 Load sensing (LS) pumps without 2-way pressure compensator

The Δp created by the LS pump determines the flow to the actuator. The LS pressure is safeguarded by the integral LS_{max} pressure relief function.

1.1.2 Load sensing (LS) pumps with 2-way pressure compensator

The flow-control valve works with a control Δp of 12 bar. The integral LS_{max} pressure relief limits the LS pressure. If it is activated, the 2-way pressure compensator cuts off the flow to the actuator, which then allows higher pressures to be developed in the hydraulic system.

1.1.3 Fixed-displacement pumps with integral 3-way pressure compensator

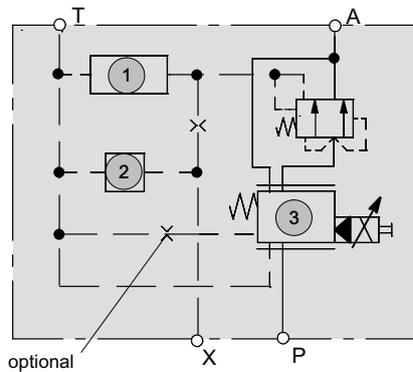
The flow that is not required is routed directly to tank.

1.2 Application examples

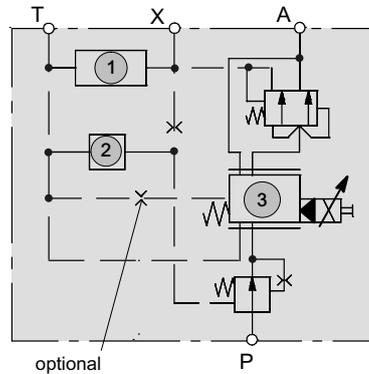
- Harvesters
- Sweepers
- Construction equipment
- Chippers/Shredders
- Municipal vehicles
- Asphalt pavers

2 Symbols

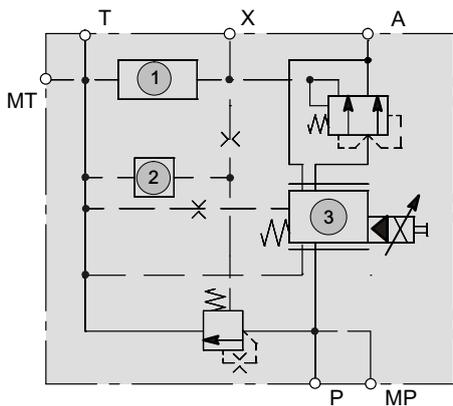
2.1 For load sensing pumps without 2-way pressure compensator (LVM2W...)



2.2 For load sensing pumps with 2-way pressure compensator (LVM2C...)



2.3 For fixed-displacement pumps with integral 3-way pressure compensator (LVM3C...)



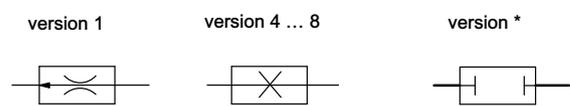
1	LS unloading (control valve, orifice, none)
2	LS _{max} pressure relief
3	spool type

2.4 Overview of variants

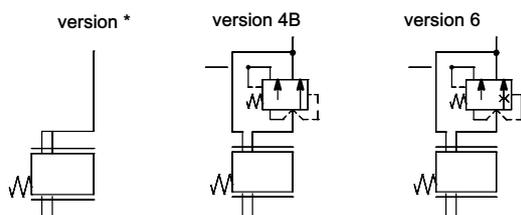
2.4.1 Spool type



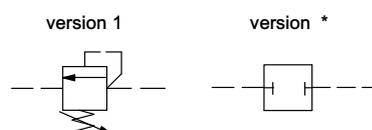
2.4.3 LS unloading



2.4.2 Pressure compensator



2.4.4 LS_{max} pressure relief



3 Technical data

IMPORTANT: Values refer to an oil viscosity of 35 mm²/s [cSt]. For others viscosities please contact Bucher Hydraulics.

General characteristics	Unit	Description, value
Design		Monoblock
Seals		NBR (Nitrile Butadiene rubber)
Operation		Two-stage electrohydraulic, mechanical operation
Mounting attitude		unrestricted

Electrical characteristics	Unit	Description, value
Design		Proportional solenoid
Supply voltage	V DC	12 or 24 from an electronic controller
Power consumption	W	max. 18 (at 1.5A and 12V, or 0.75A and 24V)
Dither frequency required	Hz	100
Relative duty cycle at I _{max}	%	100
Protection class (with a properly-fitted plug)		AMP Junior Timer - IP65; Deutsch plug - IP67
Electrical connection		AMP Junior Timer plug connector (2-pole); Deutsch plug DT04-2P-EP04

Hydraulic characteristics	Unit	Description, value
Controlled-flow range	l/min	16, 25, 32, 40, 50, 63, 80, 100, 125, 150 and 180
Nominal inlet flow, 3-way function	l/min	max. 180
Nominal inlet flow, 2-way function	l/min	max. 200
Maximum pressure at the inlet "P"	bar	max. 280
Maximum pressure at the outlet "T"	bar	50 static 200 optional
Maximum pressure at the actuator ports	bar	max. 300
Fluid		mineral oil to DIN 51524
Fluid temperature range	°C	-20 ... +80 (but comply with the viscosity limits)
Viscosity range	mm ² /s	permitted: 10 ... 360 ideal: 20 ... 80
Minimum fluid cleanliness level		ISO 4406 code 20/18/15

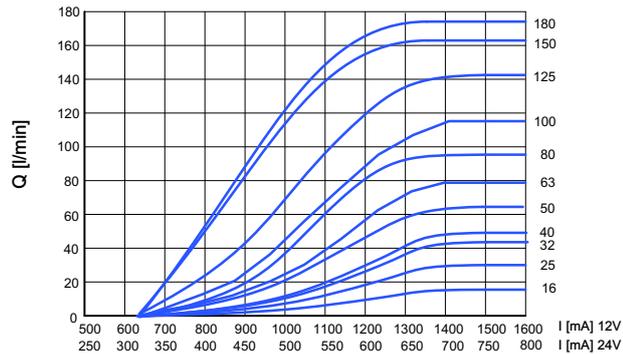
4 Performance graphs

Values refer to an oil viscosity of 35 mm²/s [cSt].

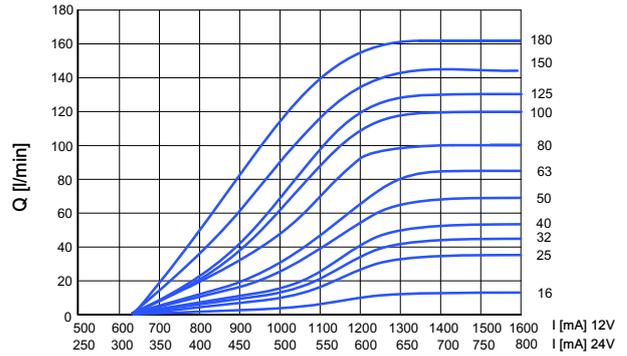
4.1 Control characteristics

Electrohydraulically operated valve with 12 bar pressure drop at the orifice. Q [l/min] = flow rate at the actuator port, I [mA] = current at the solenoid

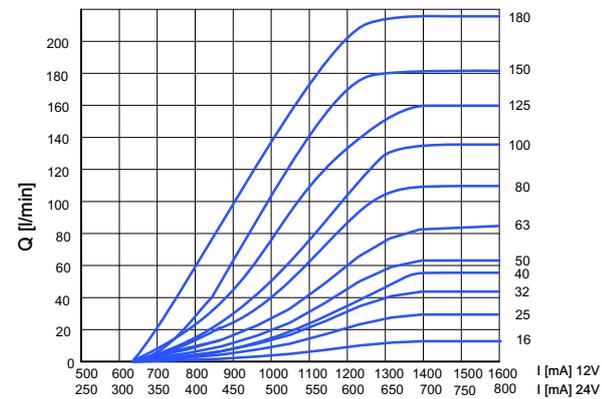
4.1.1 Flow characteristic LVM2W



4.1.2 Flow characteristic LVM2C

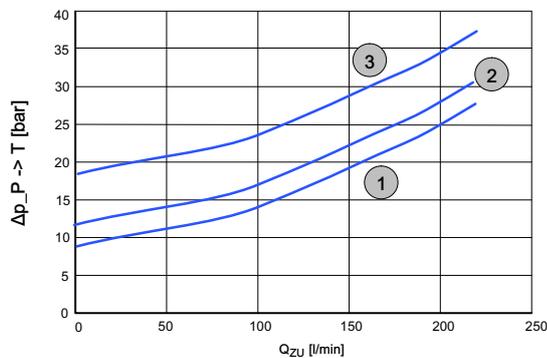


4.1.3 Flow characteristic LVM3C



4.2 Unloaded bypass

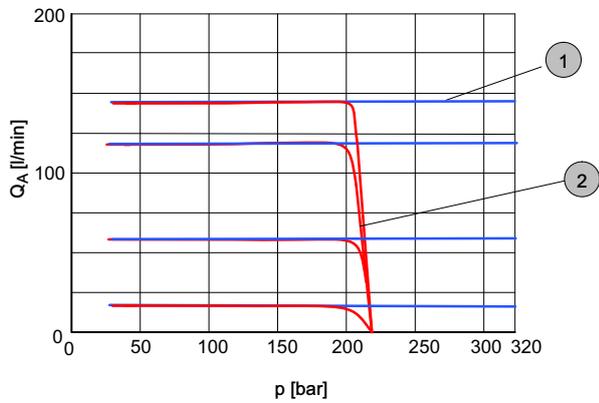
4.2.1 LVM3C



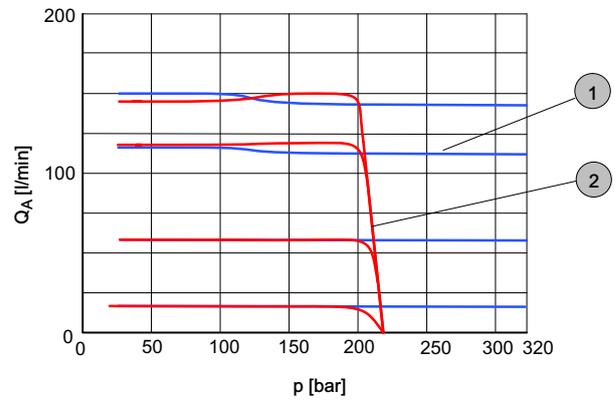
1	Control Δp 9 bar
2	Control Δp 12 bar (standard)
3	Control Δp 18 bar

4.3 Load characteristic

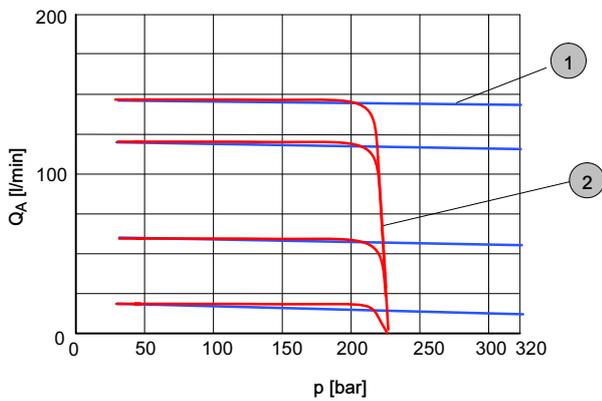
4.3.1 LVM2W



4.3.2 LVM2C



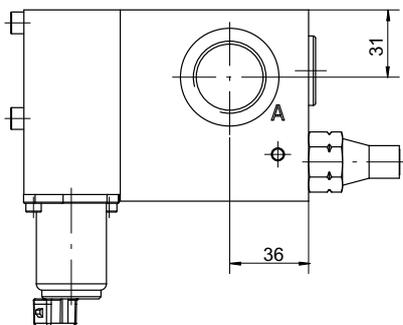
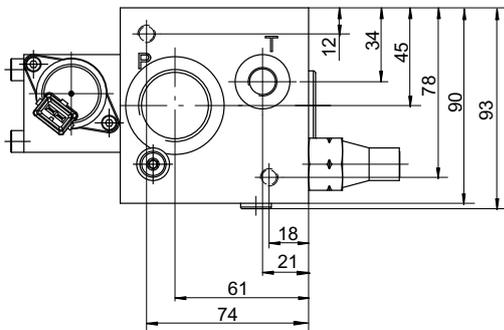
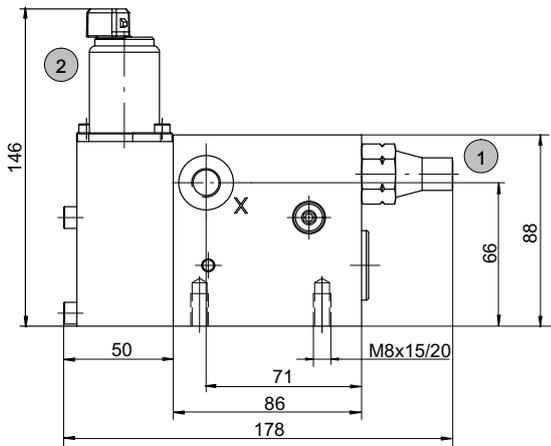
4.3.3 LVM3C



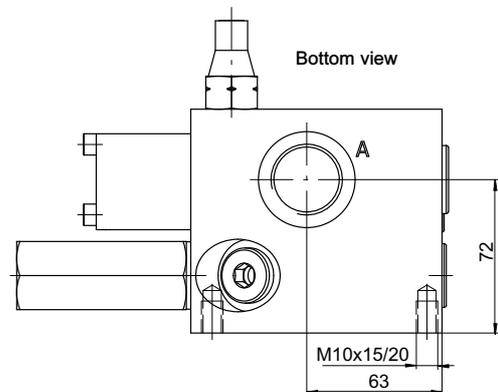
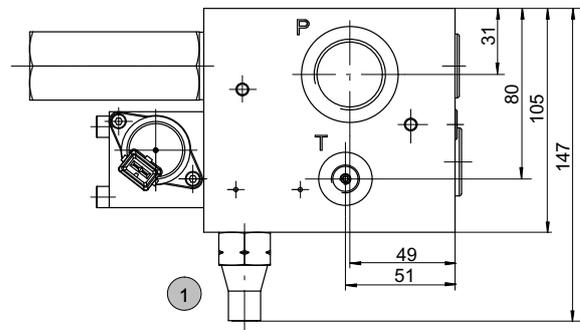
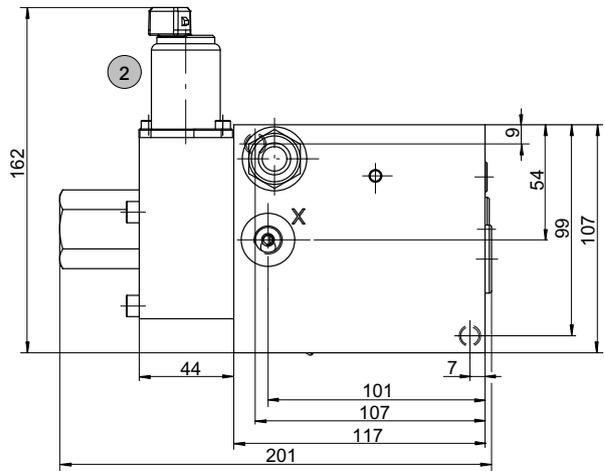
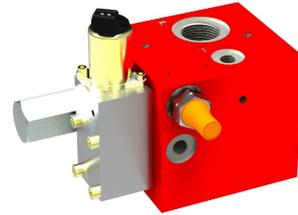
- | | |
|---|---|
| 1 | Q_A - constant flow is pressurised |
| 2 | Actuator pressure relief / flow cut-off 220 bar |

5 Dimensions

5.1 Load sensing pumps without two-way pressure compensator (LVM2W...)

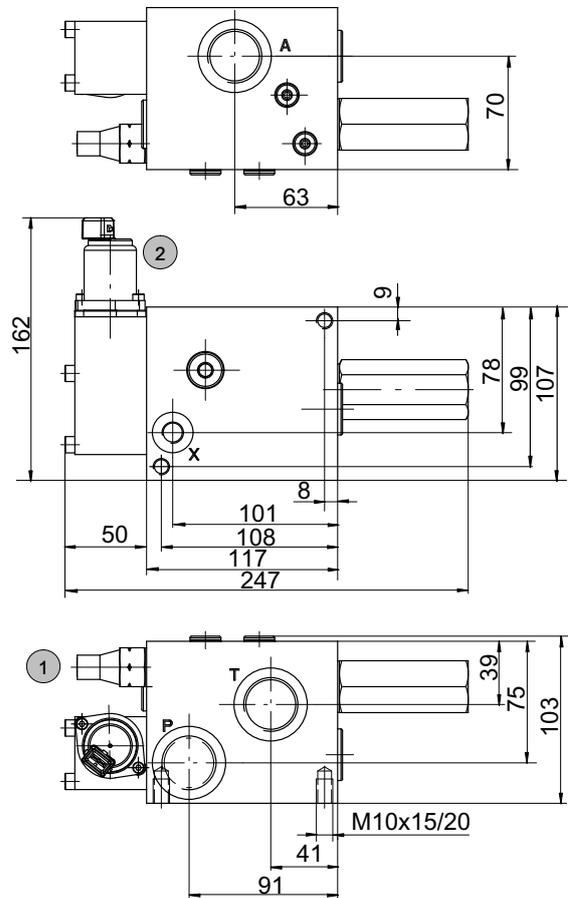
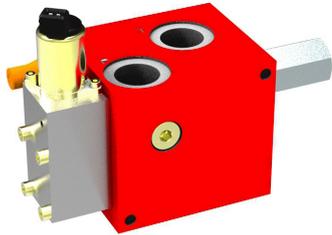


5.2 Load sensing pumps with two-way pressure compensator (LVM2C...)



1	Model with pressure relief function	2	Model with electrohydraulic operation (standard)
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5.3 Fixed-displacement pump with integral 3-way pressure compensator (LVM3C...)



1 Model with pressure relief function

2 Model with electrohydraulic operation (standard)

6 Versions

6.1 Pilot head

Electrohydraulic, standard model	Electrohydraulic with horizontal solenoid	Mechanical operation
		<p>MA = 20-30 Nm</p>

6.2 Connector socket

AMP Junior Timer	Deutsch plug

7 Ordering code

L₁ V₁ M 2W E 0,5,0 A 4 1 F J 1 G 1,0,0 * 0,0,0,0 C / P1

Flow-control valve

without 2-way pressure comp. =2W
 with 2-way pressure comp. =2C
 with 3-way pressure comp. =3C

Control Δp for compensator (2C, 3C)

Control Δp 9 bar (reduced) = E
 Control Δp 12 bar (standard) = *
 Control Δp 18 bar (raised) = H

Maximum controlled flow

16 l/min	= 016
25 l/min	= 025
32 l/min	= 032
40 l/min	= 040
50 l/min	= 050
63 l/min	= 063
80 l/min	= 080
100 l/min	= 100
125 l/min	= 125
150 l/min	= 150
180 l/min	= 180

Spool type (see chapter 2.4)

In 0 - position closed = A
 in 0 - position open = D

Pressure compensator (load sensing)

Standard = 4
 Damped = 6
 Fine control = B

Load sensing unloading

with LS unloading control = 1
 without LS unloading control = *
 LS unloading orifice $\varnothing 0,4$ = 4
 LS unloading orifice $\varnothing 0,5$ = 5
 LS unloading orifice $\varnothing 0,6$ = 6
 LS unloading orifice $\varnothing 0,7$ = 7
 LS unloading orifice $\varnothing 0,8$ = 8

Pilot head

Prop. electrohydraulic 12 V (standard) = F
 Prop. electrohydraulic 24 V (standard) = G
 Prop. electrohydraulic 12 V (horizontal) = T
 Prop. electrohydraulic 24 V (horizontal) = U
 Mechanical operation = M

P1 = pressure setting
 in plain text
 2-way = LS_{max}
 3-way = P_{max}

Design
 (to be inserted by the factory)

Option
 (to be inserted by the factory)

Manual override

without = *
 Override pin = A
 Mechanical operation = N

Port threads

to DIN 3852 - Part 2 or ISO 11926

2-way compensator (2W, 2C)

P and A G $\frac{3}{4}$ "
 X (LS) and T G $\frac{1}{4}$ " = G100
 P and A G1"
 X (LS) and T G $\frac{1}{4}$ " = G110

3-way compensator (3C)

P and A G $\frac{3}{4}$ "
 X (LS) G $\frac{1}{4}$ "
 T G1" = G100
 P, T and A G1"
 X (LS) G $\frac{1}{4}$ " = G110

LS_{max} pressure relief

with LS_{max} pressure relief = 1
 without = *

Solenoid connector socket

AMP Junior-Timer = J
 Deutsch DT04-2P-EP04 = T
 with mechanical operation = *

8 Accessories

Description	Type	Order-No.	Data sheet
Plug for AMP Junior Timer with 2 metres of cable	Plug, Junior Timer, 2-pin	100152575	-
Plug for Deutsch DT04-2P-EP04 with 2 metres of cable	Deutsch DT04-4P-CE09	100608468	-

9 Electronics

For controlling LVM... flow-control valves, we recommend the ELSK106 series of control units and plug-in cards. These are used to control 1 or 2 proportional solenoids and can also operate on/off solenoids and other auxiliary functions. Plug-in cards are available and fully customised con-

trol units can be supplied.

The following table contains a small selection of the extensive range of accessories and electronics from Bucher Hydraulics.

Type	Description	Order-No.
ELSK106-91***	with screw terminals	100018790
ELSK106-81***	with screw terminals, encapsulated	100018791
ELSK106-81***/02	with screw terminals, encapsulated, with ramp 2s	100013454
ELSK106-81***/04	with screw terminals, encapsulated, with ramp 4s	100026079
ESSK107	Multifunction card for controlling one proportional flow-control valve (1 axis) and one on/off valve (e.g. seat valve)	see data sheet 100-P-700033
ELSK106	Multifunction card for controlling one proportional flow-control valve (1 axis) and one on/off valve (e.g. seat valve)	See data sheet 100-P-700008

9.1 Examples of control units

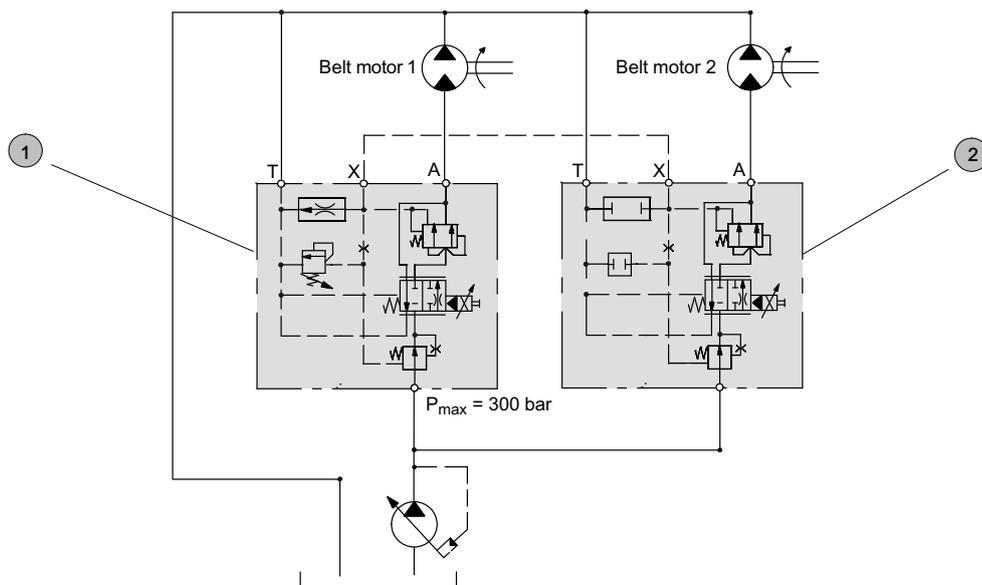
<p>ELSK 106 controller</p> 	<p>Description</p> <p>Proportional amplifier module; front plate and indicator knob</p>
<p>ELSK 106-01***/11 controller</p> 	<p>Description</p> <p>Makrolon® housing with rotary potentiometer, indicator knob, LED and magnetic clamp</p>

<p>ELSK 106-02***/11 controller</p> 	<p>Description</p> <p>Makrolon® housing with rotary potentiometer, indicator knob, ON/OFF switch, LED and magnetic clamp</p>
<p>EBT control unit</p> 	<p>Description</p> <p>The control unit consists of a solid aluminium enclosure with impact-resistant plastic covers (IP65). The user-friendly operating interface can be customised. The example shown is fitted with 1 rotary potentiometer (current output for proportional solenoid), 4 switches (detented or momentary), 1 ON/OFF switch.</p>
<p>Proportional amplifier EBM 300308-DS-MOBI</p> 	<p>Description</p> <p>The EBM-300308-DS-MOBI proportional amplifier is used for controlling three proportional directional valves (three axes / six solenoids) or two proportional directional valves and one directional seat valve. The three axes can be controlled independently of one other. The current-compensation feature ensures that the output current is unaffected by fluctuations in the coil temperature or supply voltage.</p>

10 Circuit examples

10.1 Circuit example of flow-control valve with 2-way pressure compensator

- Constant-pressure supply
- Load-independent drives using proportional flow-sharing
- Flow cut-off for belt-drive motor 1
- Unloading of actuator in neutral position

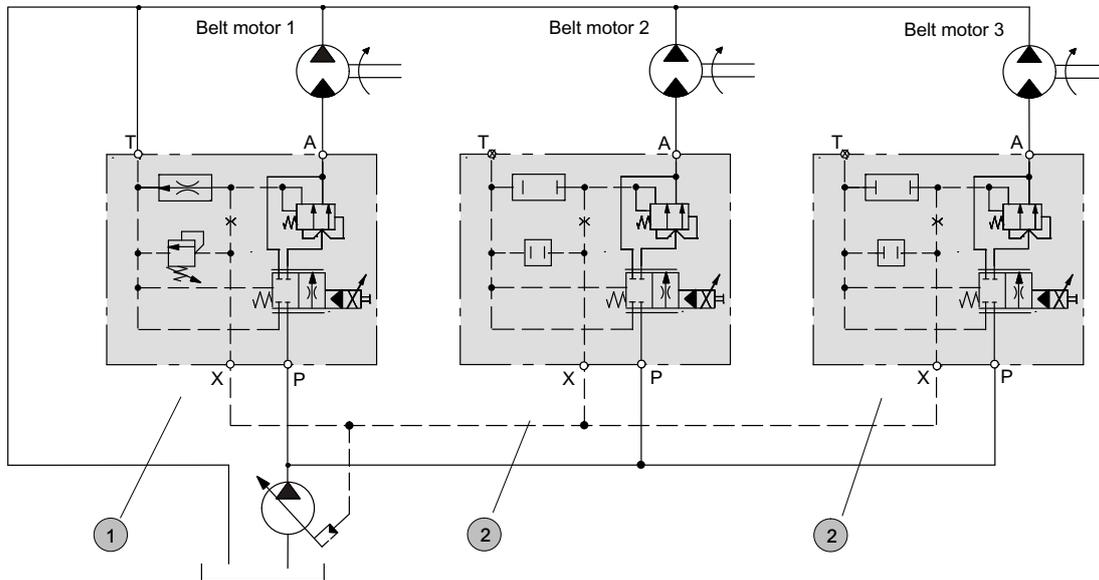


1 Flow-control valve with 2-way compensator, with LS unloading and LS pressure relief: LVM2C*080A41FJ1G110A0000C/P300

2 Flow-control valve with 2-way compensator, without LS unloading or LS pressure relief: LVM2C*050A4*FJ*G110A0000C

10.2 Circuit example of flow-control valve without 2-way pressure compensator

- Supply from LS variable-displacement pump
- Load-independent drives using proportional flow-sharing
- LS_{max} pressure relief effective for all actuators
- No unloading of actuator in neutral position

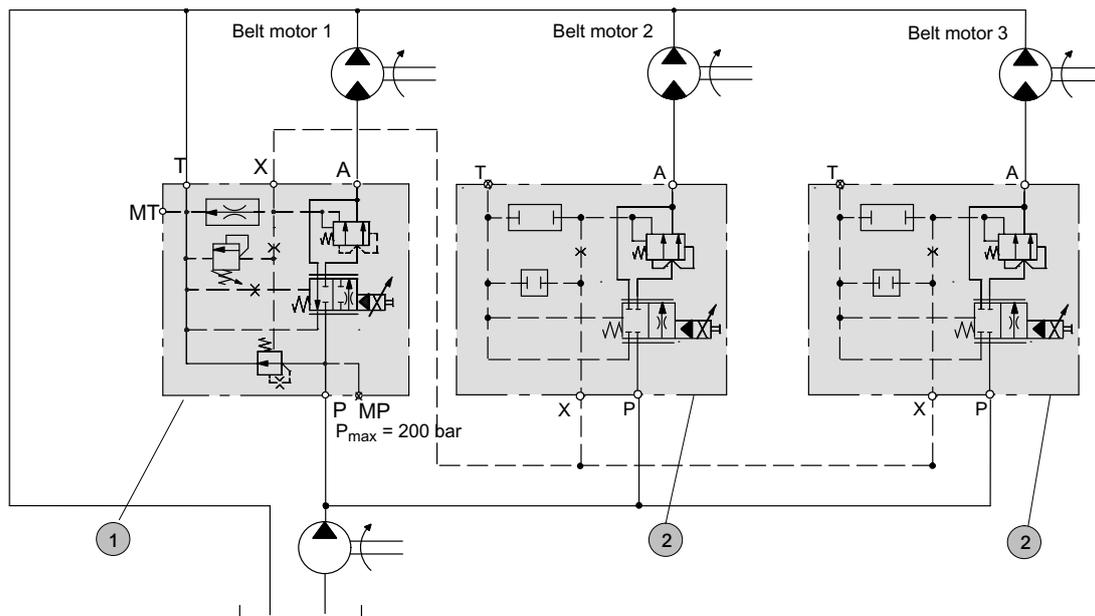


1 Flow-control valve without 2-way compensator, with LS unloading and LS pressure relief: LVM2W*050A41FJ1G110A0000C/P200

2 Flow-control valve without 2-way compensator, and without LS unloading or LS pressure relief: LVM2W*025A4*FJ*G110A0000C

10.3 Circuit example of flow-control valve with 3-way pressure compensator

- Supply from fixed-displacement pump
- Load-independent supply of the actuators, using proportional flow-sharing
- LS_{max} pressure relief effective for all actuators
- Unloading of motor 1 in neutral position. No unloading of motor 2 and 3 in neutral position.



1 Flow-control valve with 3-way compensator, with LS unloading and LS pressure relief: LVM3C*100D41FJ1G110A0000C/P200

2 Flow-control valve without 2-way compensator, and without LS unloading or LS pressure relief: LVM2W*050A4*FJ*G110A0000C

11 Fluid

Flow-control valves require fluid with a minimum cleanliness level of ISO 4406 code 20/18/15.

We recommend the use of fluids that contain anti-wear additives for operation with boundary lubrication. Fluids without appropriate additives reduce the service life of the valves.

The user is responsible for maintaining and regularly checking of the fluid quality. Bucher Hydraulics recommends a load capacity of ≥ 30 N/mm² to Brugger EN/ DIN 51347-2.

12 Note

This catalogue is intended for users with specialist knowledge. The user must check the suitability of the equipment described here in order to ensure that all of the conditions necessary for the safety and proper functioning of the system are fulfilled.

If you have any doubts or questions concerning the use of these valves, please consult Bucher Hydraulics GmbH.

13 Fluid cleanliness

Cleanliness class to ISO 4406 and NAS 1638

Code ISO 4406	Number of particles / 100 ml		
	$\geq 4 \mu\text{m}$	$\geq 6 \mu\text{m}$	$\geq 14 \mu\text{m}$
23/21/18	8000000	2000000	250000
22/20/18	4000000	1000000	250000
22/20/17	4000000	1000000	130000
22/20/16	4000000	1000000	64000
21/19/16	2000000	500000	64000
20/18/15	1000000	250000	32000
19/17/14	500000	130000	16000
18/16/13	250000	64000	8000
17/15/12	130000	32000	4000
16/14/12	64000	16000	4000
16/14/11	64000	16000	2000
15/13/10	32000	8000	1000
14/12/9	16000	4000	500
13/11/8	8000	2000	250