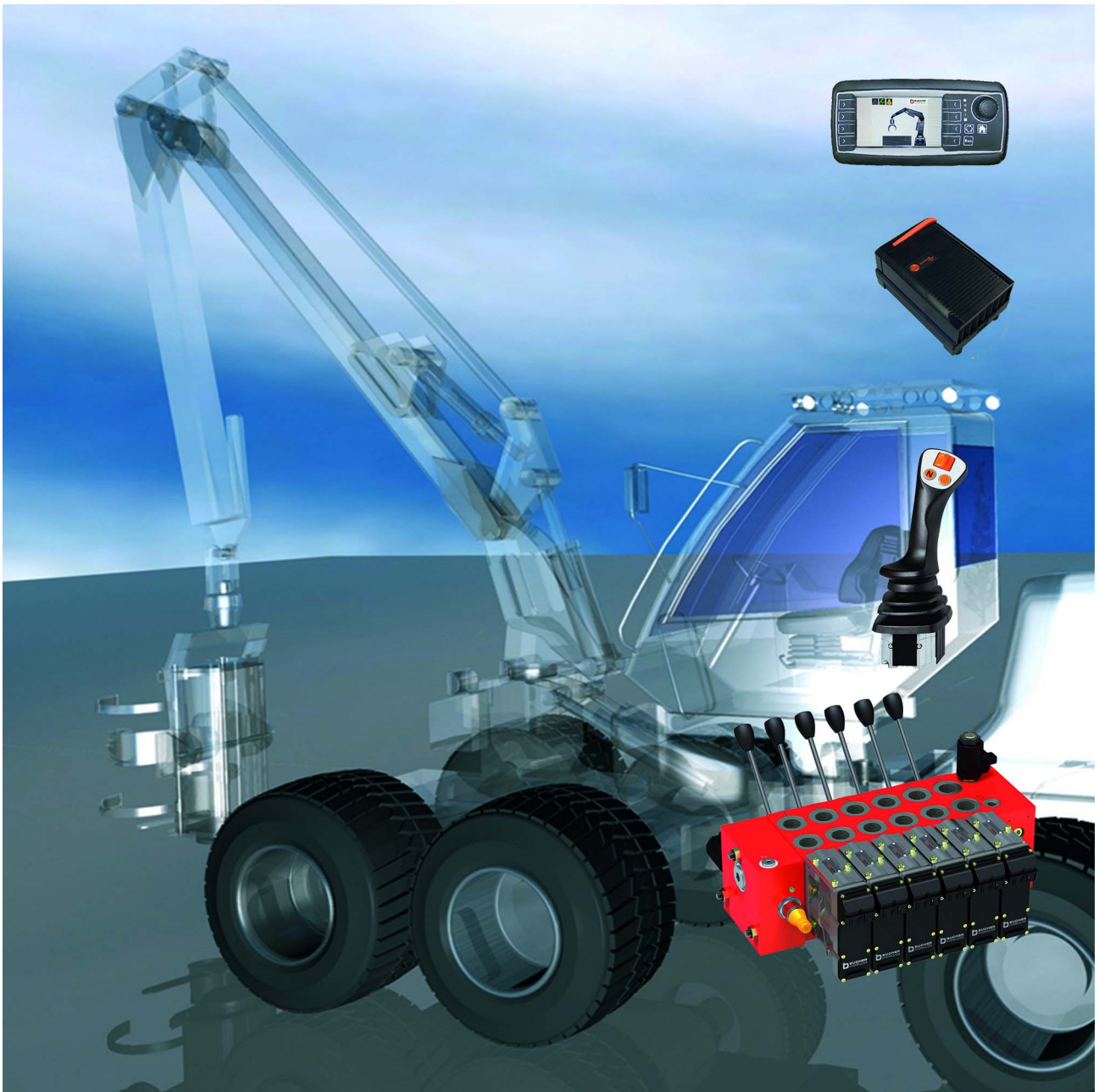


System Solutions for Crane Controls

System overview



Contents**Page**

1	General	5
	1.1 Description	5
	1.2 System	5
	1.3 Valve models	6
<hr/>		
2	Valve overview	6
	2.1 Auxiliary sections	6
	2.2 Directional valve with onboard electronics and additional manual operation	7
	2.3 Two-stage electro-hydraulic operation with additional manual operation	10
	2.4 Manual operation (hand lever, remote cable operation)	12
<hr/>		
3	System solutions	13
	3.1 High end, with onboard electronics	13
	3.2 Electro-hydraulically operated	14
	3.3 Manual operation	14
	3.4 System components	14
<hr/>		
4	System expansions	15
	4.1 Hydraulic control for stabilisers	15
	4.2 Hydraulic accumulator charging block for steering and brakes	16

1 General

1.1 Description

Bucher Hydraulics is a very capable partner for electro-hydraulic systems.

Bucher Hydraulics has many years' experience in the field of crane applications and has continually optimised the systems. The foundation for the optimised system solution is the basic LVS valve, which has been providing outstanding service in a wide variety of applications for many years. The following features deliver maximum performance:

- Downstream i.e. service-port pressure compensators for flow sharing during under-supply
- Integral secondary pressure relief
- Very stable control action
- Sections with custom auxiliary functions
- Using this system, individual functions and reliable parallel operation can be quickly implemented

1.2 System

In the system described below, the requirements of a crane control system are given particular consideration. Exacting demands on the dynamics and stability are exceptionally well implemented. Optimised spools have been developed for each function.

The components are marked out by their reliability despite variations in temperature, severe mechanical stresses and electromagnetic interference. The valve blocks are primed and painted black. Salt spray test: 500 hours.



Item	Main features
1	Crane slew
2	Main arm
3	Boom
4	Telescopic arm
5	Grab rotate
6	Grab open/close
7	Additional: stabilisers
8	Additional: tilt ¹⁾

1) During uphill travel, the crane can be positioned horizontally in the travel direction.

1.2.1 Control types

- Remote-controlled model
- Two-stage, electro-hydraulic operation
- Onboard electronics

1.2.2 Examples of application

- Forestry crane for skidders, forwarders, vehicle-mounted cranes
- Truck cranes
- Materials handling

1.2.3 Advantages

- Sustained cost reductions and increases in performance ratings
- Stable functions
- Functionality optimised for the application
- Parametrisation optimised for driver
- Tried and tested components
- Terminal for parametrisation and diagnostics
- Choice of several joysticks
- Comprehensive functional description
- Field-proven concept
- Additional functions for stabilisers, or expanded functionality
- Minimal unloaded and internal headlosses

Example:

Fixed displacement pump 120 l/min, pressure drop advantage of 8 bar, 1200 operating hours/a.

Result:

- annual savings of 1000 € for energy costs
- reduction of CO² emissions of 1,5 t per year



1.3 Valve models

1.3.1 Valves for cranes without load-holding valves

In these types of crane, the loads are held by special spools with tank-return notches. This means that the main arm, boom, telescope and crane-swivel functions employ spools that have been optimised in practice and combine the lowest possible pressure drop with the necessary tank-return pressure.

1.3.2 Valves for cranes with load-holding valves

In these valves, the spools are designed without tank-return notches, and negative loads are managed by the load-holding valves.

Both systems are characterised by very responsive operation. A very high level of stability is also achieved, so that very rapid movements are possible without effort. The downstream compensators ensure load-independent parallel operation, even if the supply flow is lower than the sum of the nominal flows of the spools that are being operated.

2 Valve overview

The program includes flexible systems ranging from simple manual or remote-controlled versions to software-configurable system solutions. With the appropriate auxiliary sec-

tion, the system can be used with all popular pump systems. More informations about the valves and systems see technical data sheet 100-P-000172.

2.1 Auxiliary sections

2.1.1 Systems with fixed-displacement pump

Model code	Type	Ordering code	Description
LVS-E-CF*-G110A00/P1=	Inlet section	100030365	3-way compensator, Δp 12 bar

2.1.2 Mechanical switchover, open centre (OC) - closed centre (CC)

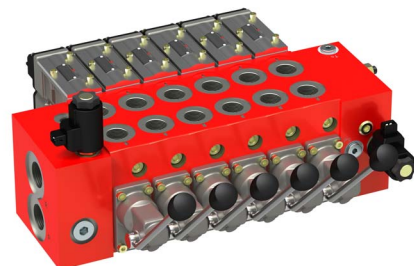
Model code	Type	Ordering code	Description
LVS-E-CM*-G110B64/P2=	Inlet section	100034881	Can be changed over from 3-way compensator function for fixed-displacement pumps to 2-way compensator function for LS pump supply. Constant-pressure pump supply is also possible.
LVS-E-CGE-G110A27/P2=/P3=	Inlet section	100036059	Priority function externally, dynamic LS, pressure relief for priority and surplus flows

2.1.3 Systems with LS pump

Model code	Type	Ordering code	Description
LVS-E-CF2-G110A57/P1=	Inlet section	100034192	2-way compensator with Δp 12 bar for a stable LS Δp at the block, pressure relief
LVS-E-CC*-G110A42/P=/P1=	Inlet section	100033915	Inlet section with LS max pressure relief and P pressure relief
LVS-E-CCL-G114J24A00/P1=190	Inlet section	100036942	Inlet section with LS max pressure relief and electrical LS unloading
LVS-E-CCL-G110J24A48/P=/P1=	Inlet section	100033704	Inlet section with LS max pressure relief and P pressure relief and electrical LS unloading
LVS-E-SA6-G100J24A00/P=330/P1=	Inlet section	100028772	Electrical flow switch-off, electrical LS switch-off LS max pressure relief (adjustable) + LS unloading; the LS gallery is unloaded to tank, the flow is shut off, the block is completely depressurised

2.2 Directional valve with onboard electronics and additional manual operation

- with integral pressure compensators
- simple parameter changes
- secondary pressure relief
- spools optimised for the application



The flow rates given are maximum amounts and may be scaled down correspondingly.

2.2.1 Advantages

Flexible

- Simple parameter changes
- Machine-specific configuration
- Easily extended

Cost-effective

- No adjustments during start-up
- Reduced cabling costs
- Simple, time-saving diagnostics

Coordinated system

- Integral sensors
- Proven, high-performance software
- Supported by application know-how

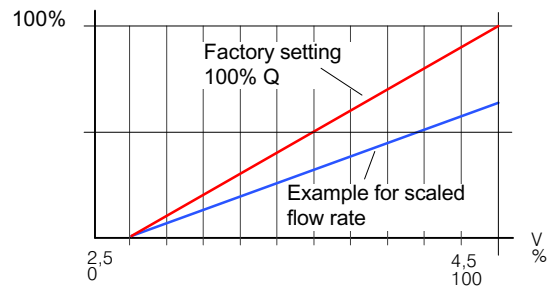
Safe

- Protection class IP67
- Sensors monitor the functionality
- Integral pilot pressure shut-off (end section)

2.2.2 Setting options

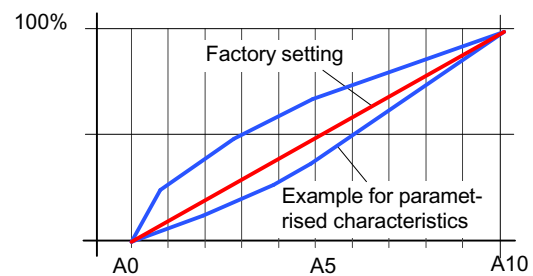
2.2.2.1 Scaling

Scaling of the flow rate with a constant input signal. The adjustment range is from 100% to 0%, and is adjustable in 1% steps.



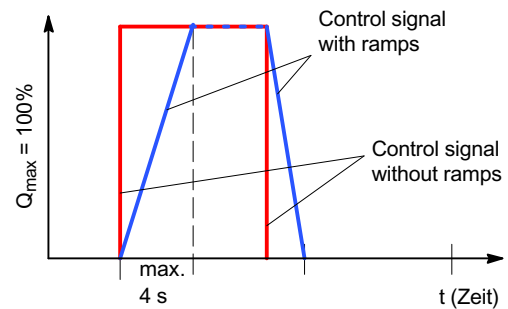
2.2.2.2 Actuator characteristic

The characteristics for actuator ports A and B are set with parameters A0 to A10.



2.2.2.3 Ramp function

A and B, as well as the start and stop ramp, can be set differently.



2.2.3 Maximum actuator flow rates:

Adjusting the maximum flow rate to the actuators does not change anything at the operating signal.

Main functions	Max. actuator flow rate [l/min]	Description
Boom	30 - 150	A and B different; each flow rate is set separately
Telescopic arm	30 - 150	A and B different; each flow rate is set separately
Main arm	30 - 150	A and B different; each flow rate is set separately
Grab rotate	10 - 063	A and B different; each flow rate is set separately
Grab open/close	30 - 150	A and B different; each flow rate is set separately
Crane slew	20 - 100	A and B different; each flow rate is set separately
Crane slew	30 - 150	A and B different; each flow rate is set separately
Expansion options	Max. actuator flow rate [l/min]	Description
Stabilisers	25	LVS08 ON - OFF operation
Tilt	25	LVS08 ON - OFF operation

2.2.4 Main functions:

Main arm

Model code	Type	Ordering code	Description
LVS12MM4ACHT22N0039C-SLRI0C	Directional valve	100036940	Double-acting, Q = 30 - 150 l/min, with optimised tank-return pressure and secondary pressure relief
LVS12MM4ACHT22N0015C-2SL0C		100036688	As 100036940 but with pressure sensor, max. working pressure at actuator port B (lower) can be steplessly adjusted

Telescopic arm

Model code	Type	Ordering code	Description
LVS12MM4ACHT22N0039C-LS0A	Directional valve	100036939	Q = 30 - 150 l/min, with optimised tank-return pressure and secondary pressure relief
LVS12MM4ACHT22N0015C-2LS0A		100036686	As 100036939 but with pressure sensor, max. working pressure at actuator port A can be steplessly adjusted

Boom

Model code	Type	Ordering code	Description
LVS12MM4ACHT22N0039C-SSRI0D	Directional valve	100036938	Q = 30 - 150 l/min, with optimised tank-return pressure and secondary pressure relief
LVS12MM4ACHT22N0015C-2SS0D		100036689	As 100036938 but with pressure sensor, max. working pressure at actuator port B (lower) can be steplessly adjusted

Crane slew

Model code	Type	Ordering code	Description
LVS12KK4ACHT22N0039C-QQ0E	Directional valve	100036691	Q = 20 - 100 l/min, with optimised tank-return pressure and secondary pressure relief.
LVS12KK4ACHT22N0162C-2RR0E		100036634	As 100036691 but with pressure sensor, max. working pressure at actuator port A and B can be steplessly adjusted

Grab rotate

Model code	Type	Ordering code	Description
LVS12KK4ACHT22N0162C-2SS0F	Directional valve	100036878	Q = 10 - 63 l/min, with secondary pressure relief

Grab open/close

Model code	Type	Ordering code	Description
LVS12MM4ACHT22N0039C-RRR20B	Directional valve	100036687	Q = 30 - 150 l/min, with secondary pressure relief
LVS12MM4ACHT22N0162C-2SS0B		100036631	As 100036687 but with pressure sensor, max. working pressure at actuator port A and B can be steplessly adjusted

Stabilisers and tilt

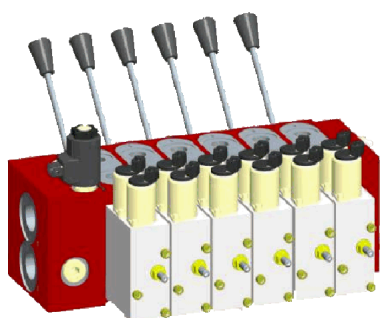
Model code	Type	Ordering code	Description
LVS08DD4A5BJ21A0000C	Directional valve	100033683	Q = 25 l/min, ON - OFF operation

End section

Model code	Type	Ordering code	Description
LVS-A-CA*-G110A10	End section	100030024	Ports for P, R and LS
LVS-A-CSA-G3/4J24A30/P=50/P1=30		100036522	Pressure reducing function for 30 bar pilot pressure, 50 bar safety pressure relief for pilot pressure, electrical shut-off valve for pilot pressure supply
LVS-A-CA* - ****A00		100027983	No control function

2.3 Two-stage electro-hydraulic operation with additional manual operation

- With integral pressure compensators
- Secondary pressure relief
- Spools optimised for the application
- Adjustable stroke limiter



Outputs:
 4 x proportional (Joystick)
 2 x ON / OFF (Joystick)
 2 x ON / OFF (additional functions)

2.3.1 Main functions

Telescopic arm

Model code	Type	Ordering code	Description
LVS12KK4ACZJ22F0076B-BA	Directional valve	100033955	Double-acting, single-acting, Q = 100 l/min, with optimised tank-return pressure and secondary pressure relief
LVS12K*3AAZJ22F0075B-S#	Directional valve	100033294	Single-acting, Q = 100 l/min, with optimised tank return pressure and secondary pressure relief

Telescopic arm

Model code	Type	Ordering code	Description
LVS12KK4ACZJ22F0076B-SM	Directional valve	100033298	Q = 100 l/min, with optimised tank-return pressure and secondary pressure relief

Boom

Model code	Type	Ordering code	Description
LVS12PK4RBZJ22F0037B-BB/ PA= PB=	Directional valve	100033338	Spool with regenerative function Q = 100 l/min, regenerative side 50 l/min, secondary pressure relief

Crane slew

Model code	Type	Ordering code	Description
LVS12PP4ACZJ22F0039B-SS	Directional valve	100033293	Q = 50 l/min, with optimised tank-return pressure and secondary pressure relief

Grab rotate

Model code	Type	Ordering code	Description
LVS12DD4ACZJ22F0076B-SS	Directional valve	100033296	Q = 25 l/min, with secondary pressure relief

Grab open / close

Model code	Type	Ordering code	Description
LVS12KK4ACZJ22F0076B-#S	Directional valve	100033957	Q = 100 l/min, with secondary pressure relief

2.3.2 Options
Option: stabiliser function

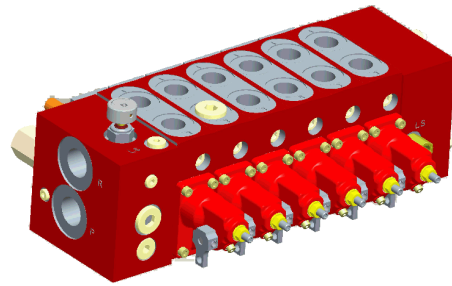
Model code	Type	Ordering code	Description
LVS08DD4A5BJ21A0000C	Directional valve, on/off solenoid	100033683	ON-OFF operation, with override pin, Q = 25 l/min

Option: stabiliser or tilt function

Model code	Type	Ordering code	Description
LVS08DD4A5BJ21A0000C	Directional valve, on/off solenoid	100033683	ON-OFF operation, with override pin, Q = 25 l/min

2.4 Manual operation (hand lever, remote cable operation)

- With integral pressure compensators
- Adjustable stroke limiting
- Secondary pressure relief
- Spools optimised for the application



2.4.1 Main functions:

Main arm

Model code	Type	Ordering code	Description
LVS12KK4ACQ*22F0041B-SM	Directional valve	100034292	Double-acting, Q = 100 l/min, with optimised tank-return pressure and secondary pressure relief
LVS12K*3AAQ*22F0077B-S#	Directional valve	100034290	Single-acting, Q = 100 l/min, with optimised tank-return pressure and secondary pressure relief

Telescopic arm

Model code	Type	Ordering code	Description
LVS12KK4ACQ*22F0041B-SM	Directional valve	100034292	Q = 100 l/min, with optimised tank-return pressure and secondary pressure relief

Boom

Model code	Type	Ordering code	Description
LVS12PK4RBQ*22F0037B-SS	Directional valve	100034291	Spool with regenerative function, Q = 100 l/min, regenerative side 50 l/min, secondary pressure relief

Crane slew

Model code	Type	Ordering code	Description
LVS12PP4ACQ*22F0039B-SS	Directional valve	100034289	Q = 50 l/min, with optimised tank-return pressure and secondary pressure relief

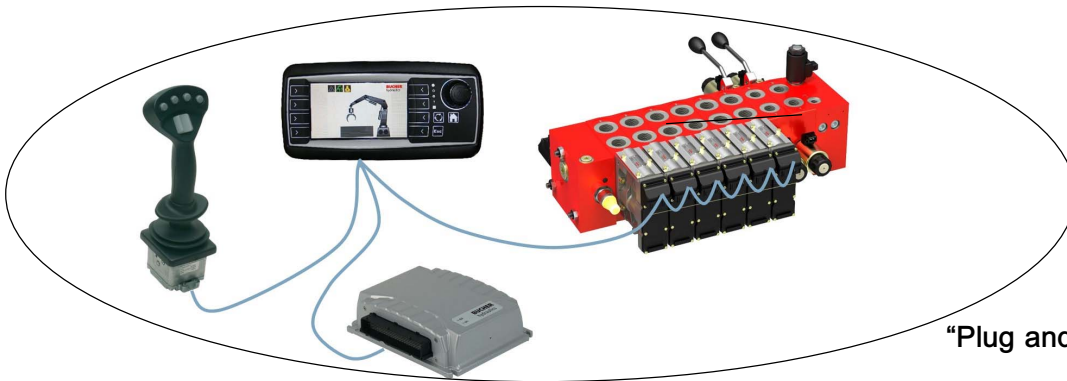
Grab rotate

Model code	Type	Ordering code	Description
LVS12DD4ACQ*22F0041B-SS	Directional valve	100034293	Q=25 l/min, with secondary pressure relief

Grab open / close

Model code	Type	Ordering code	Description
LVS12KK4ACQ*22F0041B-#S	Directional valve	100034294	Q=100 l/min, with secondary pressure relief

3 System solutions

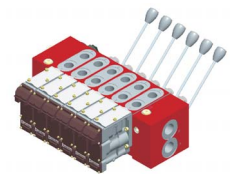


“Plug and Play” System

3.1 High end, with onboard electronics

3.1.1 Proportional directional valve system

- Adjust flow rates individually
- Modelling of flow-rate characteristic
- Set start and stop ramps individually
- Diagnostics via CAN bus



3.1.2 Master board ELMR225-01

- Hard-coded basic functions for crane control and ON/OFF functions
- Expansions (ex. stabilisers, 2 ON/OFF valves)
- Designed for tough duty in mobile machines
- Integral pilot pressure shut-off



3.1.3 Joystick FCE

- Freely-programmable joystick based on CANopen
- Easy cable installation, thanks to the CAN network
- Can be configured to customer requirements
- Choice of different models



3.1.4 Crane terminal EBT 450

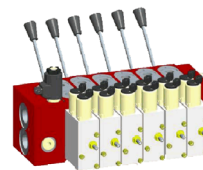
- Intelligent compact display
- Terminal for operation and parametrisation
- Up to 6 driver profiles can be parametrised and saved
- Functions can be assigned to the axes of the joysticks



3.2 Electro-hydraulically operated

3.2.1 Proportional directional valve system

- Stable control action
- Energising current 300 - 750 mA
- Stroke limiters for flow adjustment/matching



3.2.2 Control unit EBT-225010-MOBIL

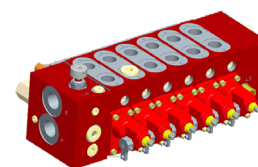
- 4 x proportional output for Joystick
- 2 x ON/OFF output for Joystick
- 2 x ON/OFF output for additional functions



3.3 Manual operation

3.3.1 Proportional directional valve system

- Lower spring forces for comfortable operation
- Secure spool-holding in neutral position
- Corrosion-protected spool actuators




3.4 System components


3.4.1 Joystick (see chapter 3.1)

Model code	Type	Ordering code	Data sheet	Illustration
FCEG-*A3HT1VG**/ID64H	Joystick	100027803	100-P-700051	
FCEG-*A3HT1VG**/ID65H	Joystick	100027804	100-P-700051	
FCER-*T5A1G**-JS3/D64H	Joystick	100030293	100-P-700051	
FCEL-*T5A1G**-JS3/D65H	Joystick	100030294	100-P-700051	
FCER-*1A2T***/J6 CAN OPEN	Joystick	100031877	100-P-700051	
FCEL-*1A2T***/J6 CAN OPEN	Joystick	100035992	100-P-700051	
FCE*3A5T***/J5 CAN OPEN	Joystick	100036363	100-P-700051	


3.4.2 Master board (see chapter 3.1)

Model code	Type	Ordering code	Data sheet	Illustration
ELMR225-01	Electronics	100035807	100-P-700051	
EKAB ELMR225-10	Wiring	100154222	100-P-700051	

3.4.3 Crane terminal (see chapter 3.1)

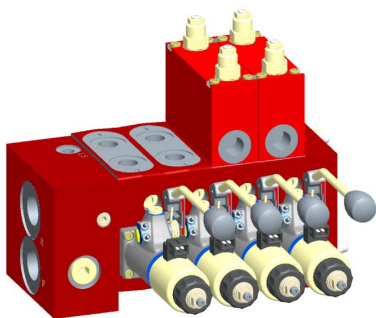
Model code	Type	Ordering code	Data sheet	Illustration
EBT-450-CRANE	Configura- tion module	100035275	100-B-000123	
EBT-4 BEFESTIGUNGSSET	Adapter case	100117064		
EBT-6 KUGELKOPFHALTER	Holder	100133351	100-P-000145	
EBT-450-CAB	Wiring	100035370	100-B-000123	

3.4.4 Control Unit

Model code	Type	Ordering code	Data sheet	Illustration
EBT-225010-CS-MOBIL	Control unit	100035894	100-B-000123	

4 System expansions

4.1 Hydraulic control for stabilisers



Model code	Type	Ordering code	Data sheet	Description
LVS-E-CE*-G110A01/P1=	Inlet section	100029646	100-P-000172	LSmax. pressure relief LS unloading

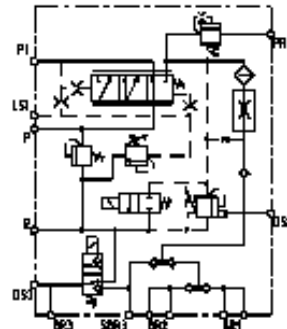
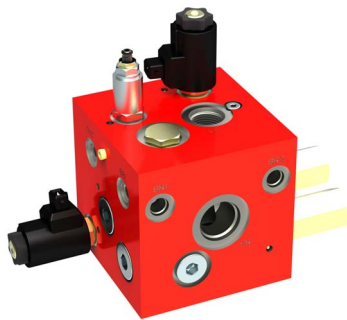
Prop. controlled stabiliser function with additional manual operation, optionally available with secondary pressure relief

Model code	Type	Ordering code	Data sheet	Description
LVS08BB4A5DJ21N0000C-AA/ PA=PB=	Directional valve	100035202	100-P-000172	10 - 10 l/min, Schock-, Einspeiseventil in Verbraucher A und B
LVS08BB4A5DJ21N0000C-AA/ PA=PB=				
LVS08FF4A5DJ21N0000C	Directional valve	100031887	100-P-000172	40 - 40 l/min
LVS08FF4A5DJ21N0000C				
LVS-A-CA* -****A00	End section	100027983	100-P-000172	No control function

4.2 Hydraulic accumulator charging block for steering and brakes

Priority for steering:

- Accumulator charging unit with flow-rate measurement, with priority for travel brake and parking brake
- Inverse-function shuttle valves for signalling lowest pressure for accumulator for travel brake and parking brake
- Unloading valve for cold starting
- On/off valve for parking brake
- Pressure relief for priority flow
- LS_{max} pressure relief valve
- P pressure relief for pressure peaks
- Test points



Model code	Type	Ordering code	Data sheet	Description
Accumulator charging block	Monoblock	100034857	100-P-000172	Q=250 l/min, priority up to 80 l/min

info.kl@bucherhydraulics.com

www.bucherhydraulics.com

© 2017 by Bucher Hydraulics GmbH, D-79771 Klettgau

All rights reserved.

Data is provided for the purpose of product description only, and must not be construed as warranted characteristics in the legal sense. The information does not relieve users from the duty of conducting their own evaluations and tests. Because the products are subject to continual improvement, we reserve the right to amend the product specifications contained in this catalogue.

Classification: 430.300.300.