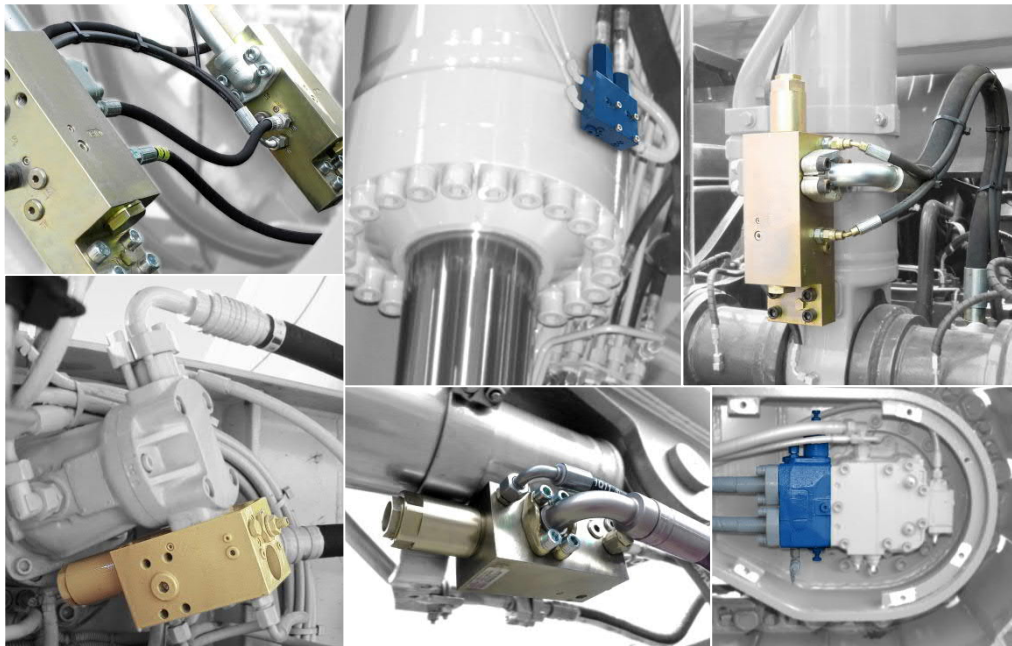


# Load Control Valve Technology for Safety of mobile Machines



- Load Holding Valves
- Load Control Valves
- Brake Valves  
for Cylinder- and Motor Applications

## Table of Content



1. Type LHB Load Control Valves usable for lifting Cylinders, telescopic Cylinders and luffing Cylinders .....	3
1.1 Applications .....	3
1.2 Type Code .....	6



2. Type LHC Load Control Valves usable for oscillation-prone Cylinder Applications .....	7
2.1 Applications.....	7
2.2 Designs .....	8
2.3 Description .....	8
2.4 Type Code .....	8



3. Type LHW Load Control Valves usable for Motor Applications .....	9
3.1 Applications.....	9
3.2 Designs .....	10
3.3 Description .....	11
3.4 Type Code .....	11



4. Type LBM Brake valves usable for Travel-, Track- and Winchdrives in open circuit .....	12
4.1 Applications .....	12
4.2 Description .....	13
4.3 Connections .....	14
4.4 Type Code .....	15

## 1. Load Control Valves usable for lifting Cylinders, telescopic Cylinders and luffing Cylinders



In case of a pipe or tube rupture the load control valve avoids uncontrolled movement of the cylinder. In various countries these valves are required by law when the construction machine is used for load lifting purposes. WESSEL load control valves stand for an excellent sensitivity and a very direct response to the joystick stroke.

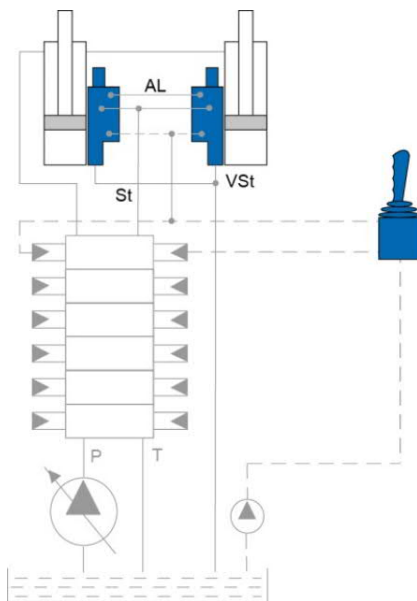
### Highlights:

- symmetrical structure of the ports
- filter screen in front of the pressure valve
- connection port for balance line
- maximum lowering speed adjustable (optional)
- leakage free
- complies with the requirements of standard DIN 24093, ISO 8643, EN 474
- Opening level independent from load pressure
- small hysteresis

### 1.1 Applications

Machine	Excavator or wheel loader
Task	<ul style="list-style-type: none"> <li>▪ Earthmoving</li> <li>▪ levelling</li> <li>▪ pipelaying</li> </ul>

The load control valve serves as a safety valve, but is also a leakage free lock valve which prevents from unintentional retraction of the cylinder. It is mounted on both the boom cylinders and arm cylinder. Also retrofits are possible.



Compact, space-saving design  
Type 4K compact design

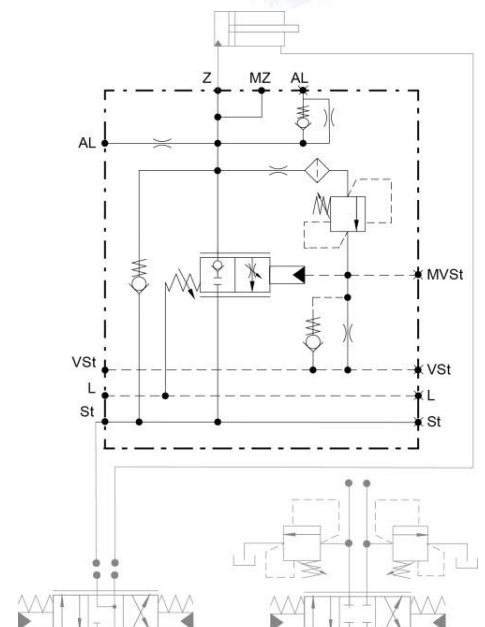


For tight spaces in the area of the cylinder flange  
Type 4N flat, stepped



Dimensions: SAE 3/4" to SAE 1 1/4"  
150 ... 550 l/min

- Absolutely leakage free locking of the cylinder
- Parallel operation of cylinders with even load sharing
- Sensitive handling over the entire speed range
- Adjustable flow limitation in order to avoid cavitation in the inlet (optional)
- Load pressure and return pressure compensation



## Machine Task

### Material Handling

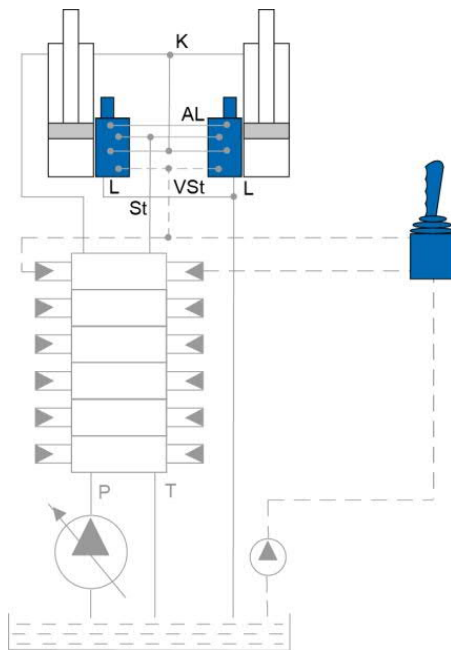
- port operations
- scrap handling
- material loading

For cargo handling speed is critical. This can be achieved either by regeneration circuits or by a return flow with as low as possible pressure. In the internal regeneration circuit the returning flow is dammed by an internal check valve and if necessary lead to the rod side (port K). Thus, the lift cylinder can be retracted without flow from the pump.

For the low pressurized return load control valves with an additional tank connection are available.

The maximum flow is 600 l/min (QZ max).

Detailed information see datasheet LHB-3R and LHB-3T.



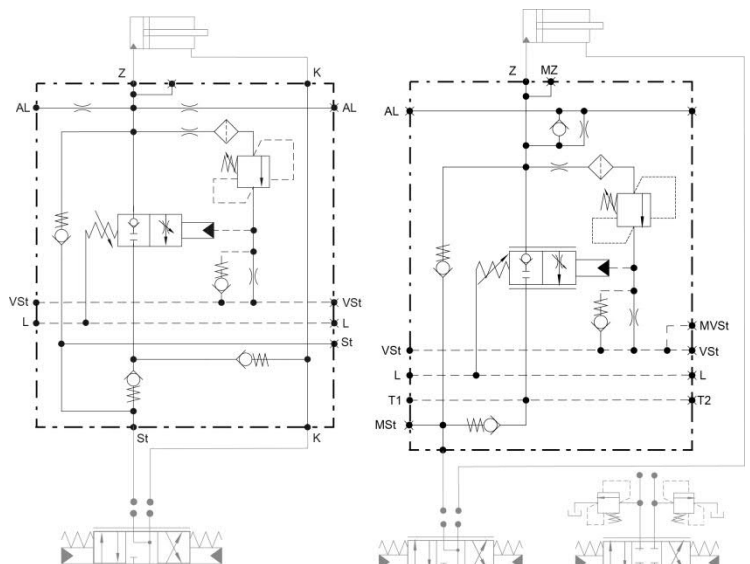
Regeneration:  
Type 3R  
Size: SAE 1 1/4", 600 l/min

Unpressurized return:  
Type 3T  
Size: SAE 1", 400 l/min



Dimensions: SAE 3/4" to SAE 1 1/4"  
150 ... 550 l/min

- Lowering without pump flow -> the handling capacity of the machine is significantly increased, fuel consumption is reduced
- Easy installation. The rod side can be connected to the valve
- Absolutely leakage-free locking of the cylinder
- Parallel operation of cylinders with balanced load
- Sensitive handling throughout the entire speed range
- Load pressure and return pressure compensated

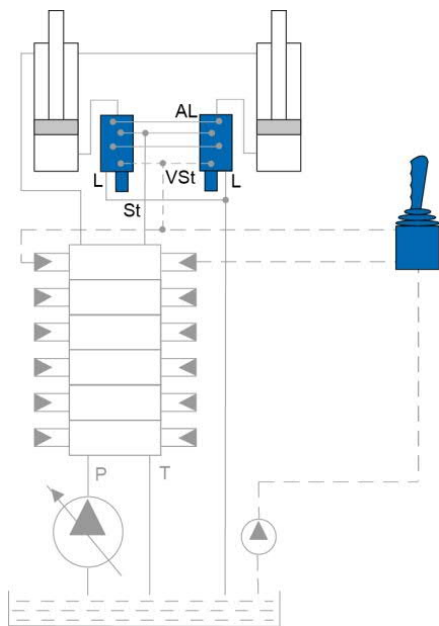




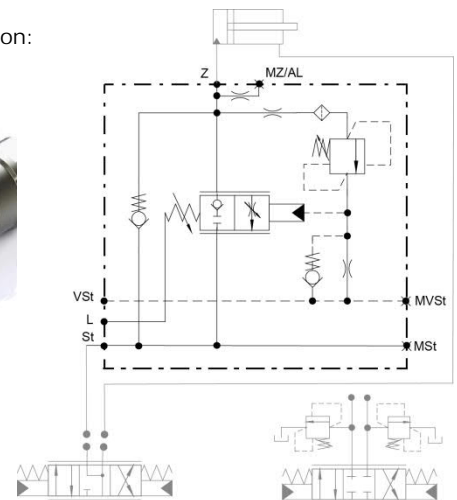
Machine      Telescopic Handlers, Wheel Loaders

Task            ■ loading  
                 ■ moving loads

This load control valve is intended for line installation. The maximum flow range is 150 l/min (QZmax).  
For detailed information see datasheet LHB-3P.



Line installation:  
Type 3P



Machine      Cranes

Task            ■ Lifting work with  
                 luffing cylinder

This load control valve on one hand provides a possibility of electric-proportional control on the other hand, a load compensation. If the flow in other designs increases with increasing pressure, this effect is compensated or even overcompensated by additional valve technology in this load control valve. This valve can be piloted proportional hydraulically or electrically. A typical application is luffing cylinder of mobile cranes.

The maximum flow is 550 l/min (QZ max).  
For detailed information see datasheet LHB-3E.

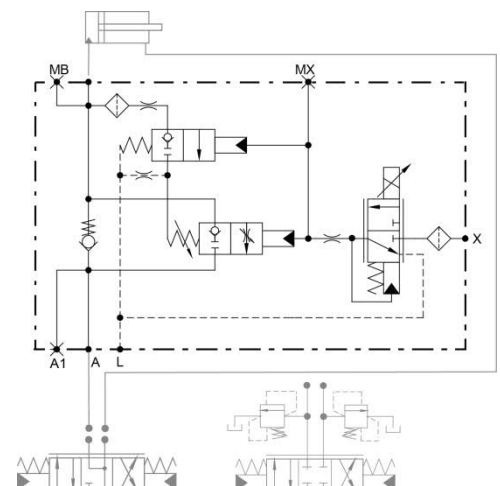


Dimensions:

SAE 1" to SAE 1 1/4"

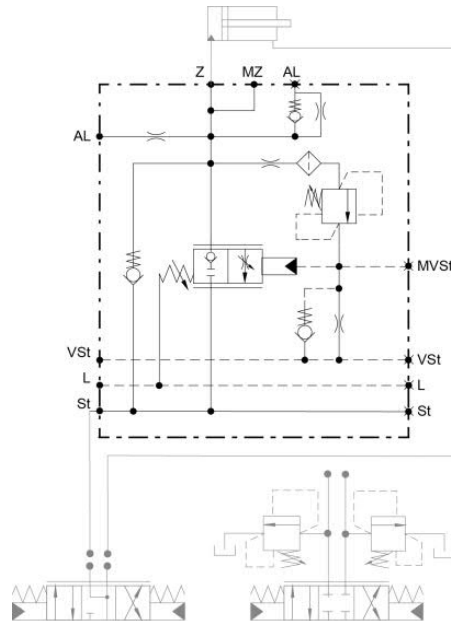
Flange design according to ISO 6162

With load compensation:  
Type 3E



Machine     Cranes  
Task         ■ telescoping

Load control valves of TYPE LHB-4K could also be used for the telescoping of mobile cranes. Valves for this application have a remarkable fine control range for accurate and sensitive positioning. Moreover, the pressure losses are reduced to a minimum at maximum speed.



## 1.2 Type Code

<b>LHB</b>								
00	01	02	03	04	05	06	07	08
00	Product group	Load Control Valve Boom						<b>LHB</b>
01	Design	4K 4N 3R 3T 3P 3E						
02	Connection Cylinder (Main control valve)	SAE 3/4" – (DIN ISO 6162-1, SAE J518/1 (CODE61))						04C
		SAE 1" – (DIN ISO 6162-1, SAE J518/1 (CODE61))						04E
		SAE 1/2" – (DIN ISO 6162-2, SAE J518/2 (CODE62))						05A
		SAE 3/4" – (DIN ISO 6162-2, SAE J518/2 (CODE62))						05C
		SAE 1" – (DIN ISO 6162-2, SAE J518/2 (CODE62))						05E
		SAE 1 1/4" – (DIN ISO 6162-2, SAE J518/2 (CODE62))						05E
03	Control spool [l/min]	Spool design optimized for the specified volume flow						
04	Pressure setting [bar]	Setting at a volume flow of 10 l/min						
05	Activation	HYP03B hydraulic proportional						24P002 24VDC proportional AMP Junior Timer plug
		4K, 4N, 3R, 3T, 3P, 3E						3E
06	Opening level	design 4K, 4N, 3R, 3T, 3P [bar]						008
		design 3E [mA]						400
07	Damping	4K, 4N, 3R, 3T, 3P						00 no damping
		3E						01 minor damping 02 medium damping 03 strong damping
08	Lowering speed limitation							yes 1
								no 0

XXX – Predetermined characteristics    XXX- Characteristics selectable by customer

## 2. Load Control Valves usable for oscillation-prone Cylinder Applications



Load control valves LHC are usable for oscillation-prone cylinder applications operating at volume flows up to 60 l/min (16 usgal/min) and a maximum pressure of 450 bar (6500 psi)

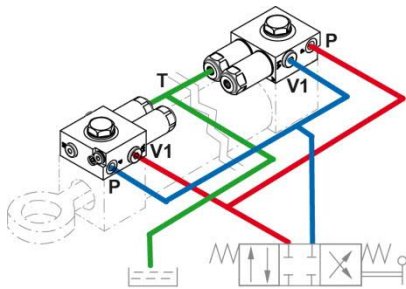
Multi-sectional booms moved by cylinders often tend to oscillations. When the damping is insufficient this problem might also be caused by the piloting of the cylinder. Any thereby caused reduction of the movement speed or pressure clamping of the cylinder is not necessary when using WESSEL valves.

Hardened steel for housing and pistons ensure high durability and reliability!

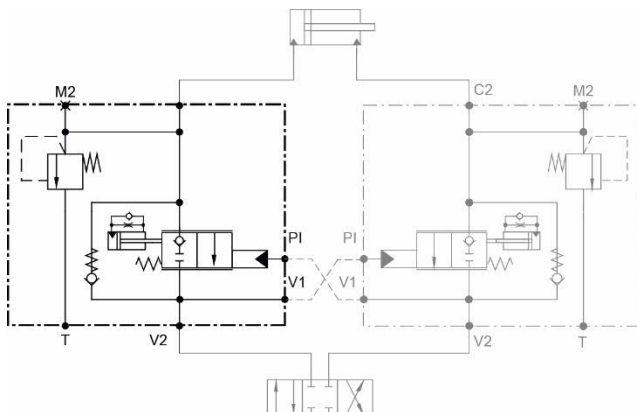
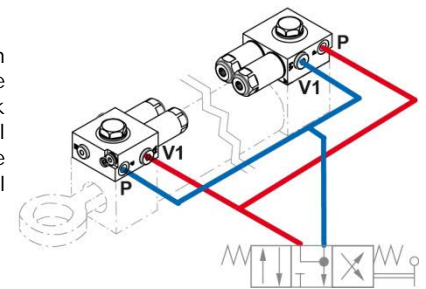
### 2.1 Applications

Machine	Lifting platforms, construction cranes, concrete boom applications
Task	<ul style="list-style-type: none"> <li>leakage-free locking</li> <li>Protect against hose rupture</li> <li>vibration-free lowering</li> </ul>

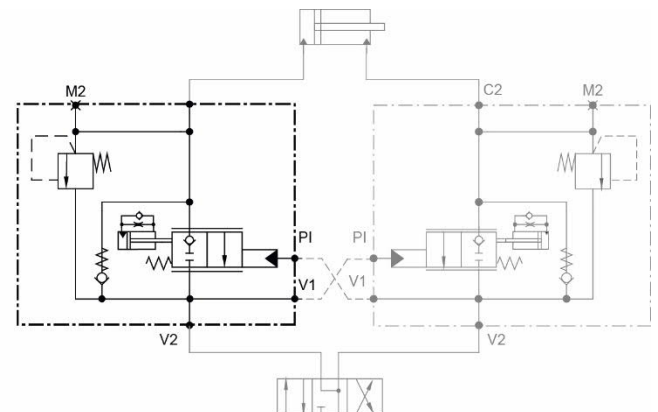
The load control valve LHC serves as a safety valve, but is also a leakage free locking of the cylinder and prevents unintended retraction or extension of the cylinder. A special feature is the good vibration damping in cranes or boom applications.



The valves have a lowering brake function and a pressure valve function. The pressure valve can be connected to a separate tank line, which allows the use of a main spool with closed idle position, or the pressure valve can use the line to the main control valve (A-B-T connection required).



Pressure valve type T: The pressure limiting valve is connected to a separate tank line (recommended)



Pressure valve type V: The pressure limiting valve is connected to port V2



## 2.2 Designs



**Type 3H**  
Connection and fastening on the cylinder with a banjo bolt



**Type 3N**  
Flanged mounting on the cylinder with four bolts



**Type 3D**  
Double lowering brake valve used for the bottom and rod side, with banjo bolts on the cylinder.

## 2.3 Description

In order to achieve a vibration-free lowering, the valve function is designed load independent. That means that the load pressure has no valve-opening effect, as in simple cartridge valves. The pressure relief function is completely independent of the lowering function. The valve characteristic is designed with vibration absorption. In addition, a damping cartridge can be integrated into the lowering function which allows only a slow opening of the valve. Fast closing is always guaranteed.

Damping cartridge  
Ensures oscillation  
free hydraulics



## 2.4 Type Code

LHC											
00		01	02	03	04	05	06	07			
00	Product group	Load Control Valve Cylinder							LHC		
01	Design	Attached with a banjo bolt on the cylinder connection							3H		
		Mounting with 4 bolts on the cylinder flange							3N		
		on request, please contact us							3D		
02	Connection spring caps: Port T	closed							000		
		AD16S							10R		
		AD12L							10F		
		M14x1,5							01D		
		G 3/8							03C		
		G 1/4							03B		
03	Connection spring caps: Port V	closed							000		
		AD12S							10P		
		AD6S							10M		
		AD12L							10F		
		M14x1,5							01D		
		G 3/8							03C		
		G 1/4							03B		
04	Nominal volume flow	l/min (optimized for the indicated volume flow)				6	10	20	25	40	60
05	Pressure setting	Opening level of the pressure limiting valve [bar]					>200 ≤450			XXX	
06	Damping	Standard damping								01	
		Strong damping								02	
07	Pressure valve outlet to ...	Tank	T, V	open	T1, V1	closed	T0				
			T, V1, V	open	T1	closed	T1				
		Return line	V	open	T, T1, V1	closed	V0				
			V, V1	open	T, T1	closed	V1				

XXX – Predetermined characteristics    XXX – Characteristics selectable by customer



### 3. Type LHW Load Control Valves usable for Motor Applications



Load control valves LHW are suitable for motor-applications. The consumer is locked leakage free. Opening is done independently from load pressure and controlled by the pressure of the opposite side. By that it is ensured, that the consumer cannot go ahead. These valves are used for oscillation-prone applications as e.g. winch drives and stand out for an excellent sensitivity and a very direct response to the joystick movement.

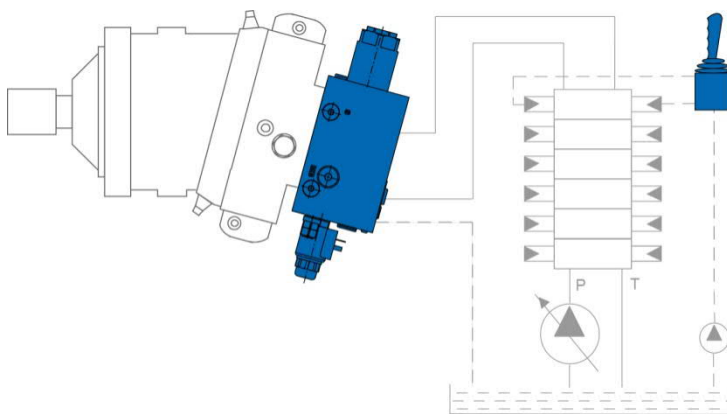
Features:

- Leakage free
- Load pressure independent opening
- small hysteresis
- optional pressure valve/"sunshine valve"
- quick closing performance
- damped opening performance

#### 3.1 Applications

Machine	Mobile cranes, main- and auxiliary winches
Task	<ul style="list-style-type: none"> <li>▪ Leakage free locking</li> <li>▪ Protection against hose rupture</li> <li>▪ Vibration-free lowering</li> </ul>

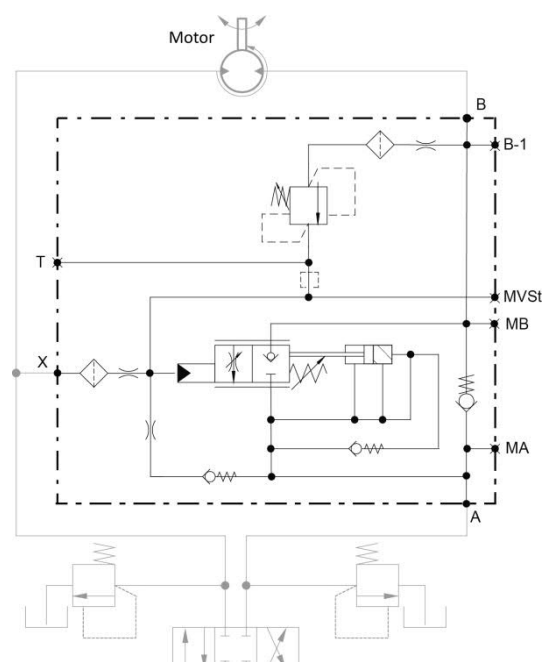
Counterbalance valves are available in sizes of SAE  $\frac{3}{4}$ " to SAE  $1\frac{1}{4}$ " and are flanged directly to the winch motor. They cover a volume flow range of 150 to 550 l/min. There are different configurations available. Besides pure lowering function, a pressure relief valve can be selected.



Dimensions: SAE  $\frac{3}{4}$ " to SAE  $1\frac{1}{4}$ "  
150 ... 550 l/min

Suitable for all standard motors (Rexroth, Parker, etc.)

- Leakage free holding of the winch motor
- Sensitive handling throughout the entire speed range
- Load pressure compensated
- Strong damping when opening
- Optional with pressure relief valves,
- Pilot valves for operating a mechanical brake

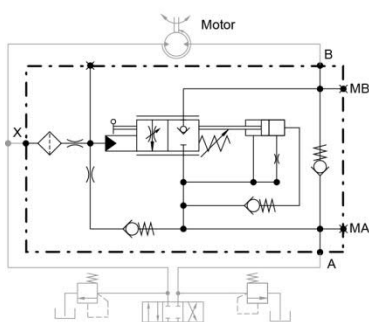


### 3.2 Designs

Type 3N  
Standard without pressure relief valve



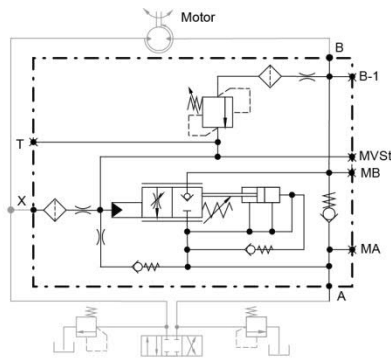
SAE 3/4", 1", up to 400 l/min



Type 3P  
with pressure relief valve



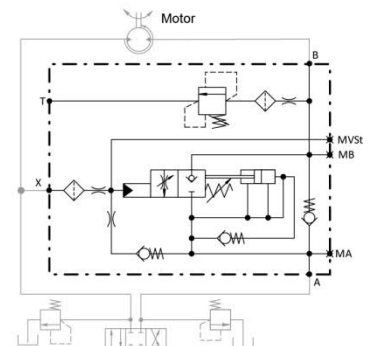
SAE 3/4", 1 1/4" up to 550 l/min



Type 3T  
with pressure relief valve as shock valve



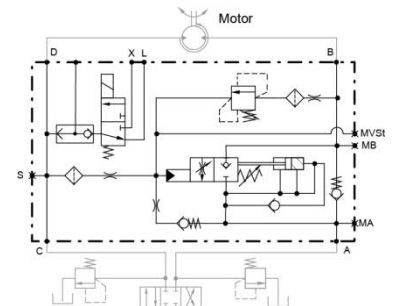
SAE 3/4", up to 400 l/min



Dimensions: SAE 1", SAE 1 1/4"  
up to 550 l/min  
Suitable for Rexroth A2FM, A6VM

The design 3D can be used for motors with double flange, such as Rexroth type A2FM. Detecting the lowering pressure is done internally, so that no additional piping is required. The braked side of the motor is protected by a pressure relief valve. As an option there is a brake release valve which can open a mechanical brake either by an internal or an external pressure signal.

Type 3D Double flange



- |         |   |
|---------|---|
| Machine | Telescoping excavators  |
| Task    | <ul style="list-style-type: none"> <li>■ Leakage free locking</li> <li>■ Protect against hose rupture</li> <li>■ Vibration free lowering</li> </ul> |

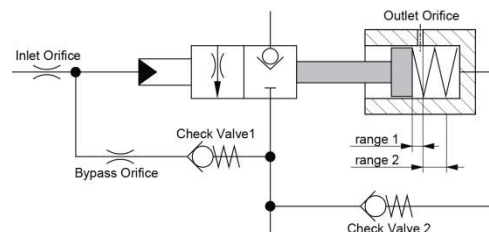
Load control valves can also be used for cylinder applications in order to prevent unintended extension or retraction of the cylinder. If the valve should be opened from the opposite side also the type LHW could be used.



### 3.3 Description

#### Plug and Play

WESSEL load control valves are optimized for oscillation-prone applications, as the valves are working with special measures for damping. A slight opening of the valve is always done with a low damping. By this a fast reaction of the valve is achieved without clamping-in the hydro motor. Increasing control pressure also causes damping to increase. A fast closing of the valve is always guaranteed, in order to attain a quick response to the operators command and to keep a great safety standard.



#### Highlights

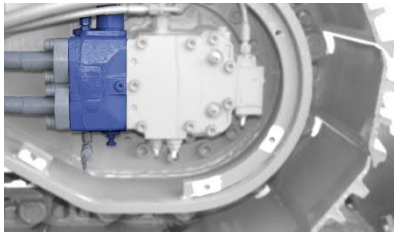
- quick setting to work
- optimized damping performance for challenging applications
- modification of damping performance does not affect the opening level
- opening level of the load control valve is independent from the load pressure
- even with high loads there is no sudden reach
- the piston opens with almost no hysteresis and the operator has a fairly direct handling of the load

### 3.4 Type Code

LHW					HYP03B			24S001
00	01	02	03	04	05	06	07	08
00	Product group	Load Control Valves						LHW
01	Design					3D	3N	3P
02	Connection	Motor / cylinder ISO 6162-2 (SAE J518 Code62) metric	SAE ¾"				05C	
			SAE 1"				05E	
			SAE 1¼"				05G	
03	Spool	Design of the spool optimized for the specified volume flow. Specifications in l/min	SAE ¾"				200	
			SAE ¾", SAE 1"				250	
			SAE ¾", SAE 1", 1¼"				300	
			SAE ¾", SAE 1", 1¼"				350	
			SAE 1", 1¼"				400	
			SAE 1¼"				500	
			SAE 1¼"				550	
			SAE 1¼"				600	
04	Pressure setting	LHW-3N – no pressure setting						0
		LHW-3D and LHW-3P - Opening level pressure valve at 10l/min in bar, 50bar to 420bar						XXX
05	Activation	hydraulic - proportional						HYP03B
06	Damping (orifice selection)	minor damping						01
		medium damping						02
		strong damping						03
07	Opening pressure	LHW-3D: pressure at port C: standard 13 bar = 013						XXX
		LHW-3P and LHW-3N: pressure at port X: standard 16 bar = 016						XXX
08	Shift valve for mechanical brake	24VDC switching, standard plug						24S001

XXX – Predetermined characteristics XXX- Characteristics selectable by customer

#### 4. Type LBM Brake valves usable for Travel-, Track- and Winchdrives in open circuit



Brake valves of type LBM are used as safety valves for applications with hydraulic motors, like traction motors on mobile or crawler excavators, as well as winch motors. They protect the hydraulic motor when going downhill or pulling loads against excessive speeds and possibly occurring cavitation on the inlet side of the motor.

Features:

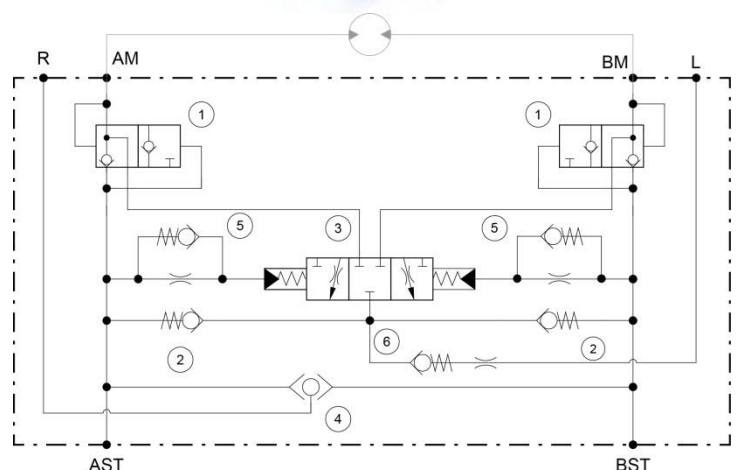
- load pressure independent opening
- Minimum pressure drop -> high speeds
- Damped open or close even at cold start
- fast reversing

##### 4.1 Applications

Machine	Mobile or Crawler Excavators
Task	<ul style="list-style-type: none"> <li>▪ Protect against excessive speeds</li> <li>▪ Hydraulic braking</li> <li>▪ „Counter balance“</li> </ul>

The brake valve is designed as a symmetrical spool valve. The inlet flow into the connected hydro motor is routed via patented flow diverters (1). Even with a high damping these flow diverter valves allow a quick reverse of the motor without circulating the oil flow through the brake valve's main piston (3). The brake valve is designed flow-optimized and can be used for volume flows up to 350 l/min with only small pressure losses. That allows high driving speed with little power loss. The braking function is regulated between 15 and 40 bar of inlet pressure. The piston motion is damped. Two different damping variants are offered:

Damped opening (Application: Winches and crawler vehicles) and damped closing (Application: Wheel excavators). Both variants are available as versions with more or less damping capability (5). Versions with considerable damping are additionally equipped with so called cold-start-valves, that ensure a reasonable response time even with cold oil. In case of insufficient oil supply the returning volume flow is fed into the inlet side of the motor via a suction valve (2). A connection for the regulator pressure of the motor via shuttle valve (4) and a leakage port via flush valve (6) are available.

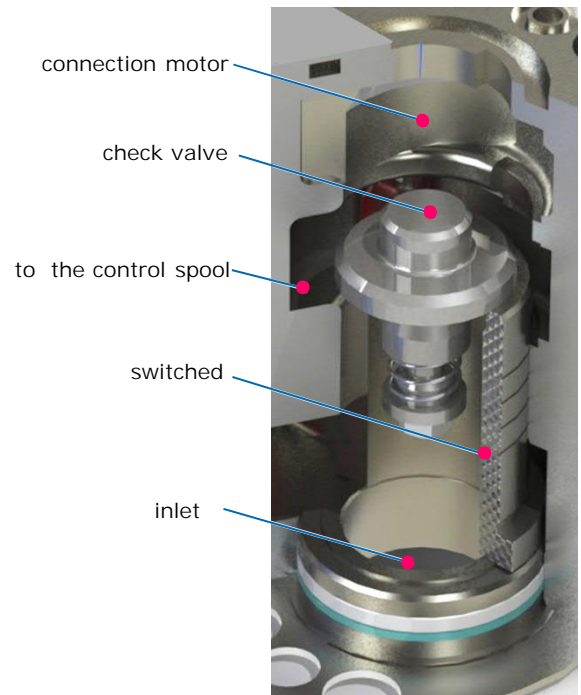




## 4.2 Description

### Patented Flow Diverter (1)

The flow diverter valves allow a quick reverse of the motor without circulating the oil volume flow through the brake valve's main spool. Therefore the connecting cavity to the brake valve is locked when the inlet check valve opens.



### Brake Valve Spool (3)

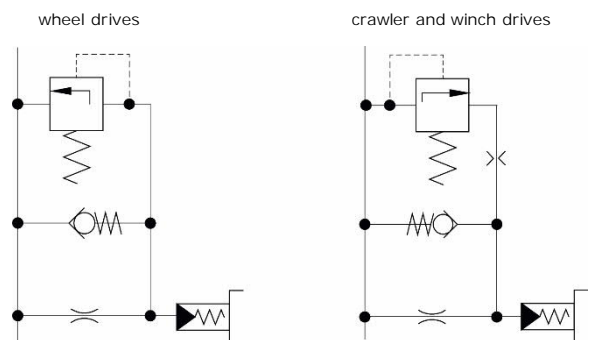
The main spool for WESSEL brake valves is available as for idle position open or for idle position closed. For the usage with drives of wheel excavators or crawler excavators it is recommended always to use a spool with a neutral open design. For winch drive applications a spool with a neutral closed design is imperative. WESSEL brake valve spools are offered with optimized designs for different volume flow requirements.



### Damping (5)

In the application "wheel excavator" a strong damping might be required: If the foot is taken off the accelerator the excavator should slow down slowly and must not stop abruptly. For this request a damping is offered which only works with the clearance of the spool. In order to achieve a quick response, e.g. during operation at low oil temperature, the damping can temporarily be overridden by means of pressure relief valves.

For the use with track- and winch drives a brake valve with a damped opening and quick closing feature is recommended.

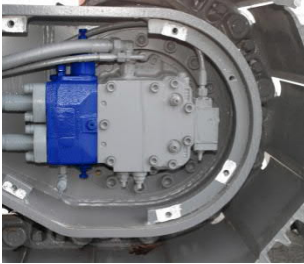


### Stroke Limitation

Additionally a piston stroke limitation is available. By this it is possible to throttle back the return flow of the motor in order to synchronize the speed of two crawler tracks.

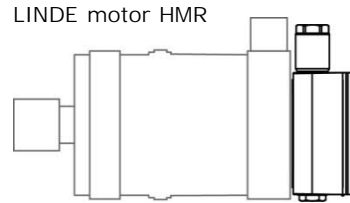


### 4.3 Connections



#### 1. Direct connection

The brake valve can be flanged directly onto LINDE hydro motors HMR-01 and HMR-02 of the sizes 75, 105 and 135.



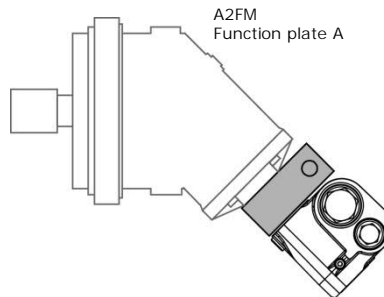
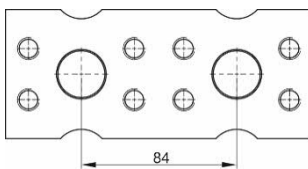
A port for the connection of the motor's regulator pressure is available via a shuttle valve (4) as well as a leakage port for the motor flush via a flush valve (6). As pressure relief valves are strongly recommended for the protection of the motor's inlet ports, it has to be determined, if the hydro motor is already equipped with them.

The direct connection is also possible for REXROTH hydro motors A2FM of the size NG80 and NG90.

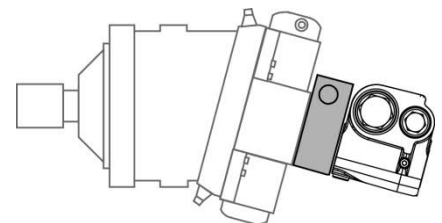
#### 2. Function plates

The connection to LINDE and REXROTH hydro motors can also be made by means of a function plate with a flange design as shown in the figure at the side. The utilization of the function plate together with pressure relief valves protects the motor against too high brake pressure.

Hole pattern of function plate A

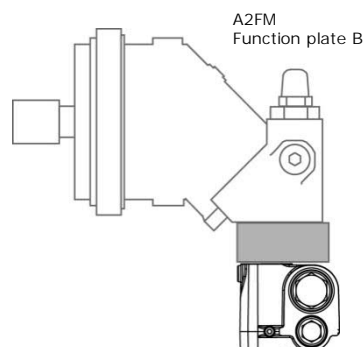
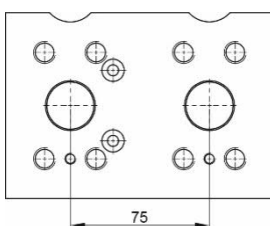


A6VM  
Function plate A

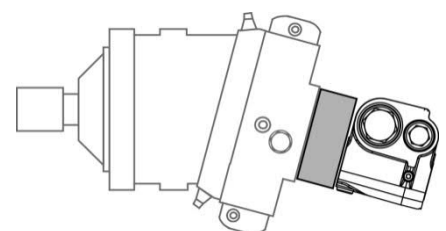


For REXROTH hydro motors with internal pressure relief valves a function plate as shown at the side is available. Regulator pressure and flush oil are provided by the brake valve.

Hole pattern of function plate B



A6VM  
Function plate B



## 4.4 Type Code

LBM							
00		01	02	03	04	05	06
00	Productgroup						LBM
01	Design	direct connection (Applications which need pressure limiting valves. Check if existent in the motor.)	HMR-01 oder HMR-02 BG 75 / 105 / 135				00
		direct connection (Applications where pressure limiting valves are not necessary)	A2FM80/61W-V...010; A2FM90/61W-V...010; A6VM80HZ3... 010; A6VM107HZ3... 010				
		with function plate A (contains pressure limiting valves for the protection of the motor)	A2FM80/61W-V...010; A2FM90/61W-V...010; A2FM80/61W-V...100; A2FM90/61W-V...100; A2FE80/16W-V...100; A2FE90/61W-V...100; A6VM80HZ3... 010; A6VM107HZ3... 010				A1
		with function plate B (Pressure limiting valves are existent in motor. Function plate contains regulator and flush ports)	A2FM80/61W-V...1810; A2FM90/61W-V...1810; A2FM80/61W-V...181; A2FM90/61W-V... 181; A6VM80HZ3... 010; A6VM107HZ3... 010				B1
02	Spool	Design of the spool optimized for the specified volume flow [l/min]					160
							250
03	Remaining opening	closed (required for winch applications)					00
		open with diameter 1,2mm					12
		open with diameter 1,6mm					16
		open with diameter 1,8mm					18
		open with diameter 2,0mm					20
04	Damping characteristics	damped opening, strong damping					B1
		damped opening, medium damping (orifice 0,25mm)					B2
		damped opening, minor damping (orifice 0,5mm)					B3
		damped closing, strong damping					C1
		damped closing, medium damping (orifice 0,25mm)					C2
		damped closing, minor damping (orifice 0,5mm)					C3
05	Flushing drain	closed					S00
		open with orifice 2,0mm					S01
06	Stroke limitation	without stroke limitation					L00
		with stroke limitation					L01
07	Idle Position	piston in idle position open (smooth stopping), 2 control edges					00
		piston in idle position open (smooth stopping), 4 control edges					01
		piston in idle position closed (smooth stopping), 2 control edges (required for winch applications)					11
		piston in idle position closed (smooth stopping), 4 control edges (required for winch applications)					12

XXX – Predetermined characteristics XXX- Characteristics selectable by customer

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