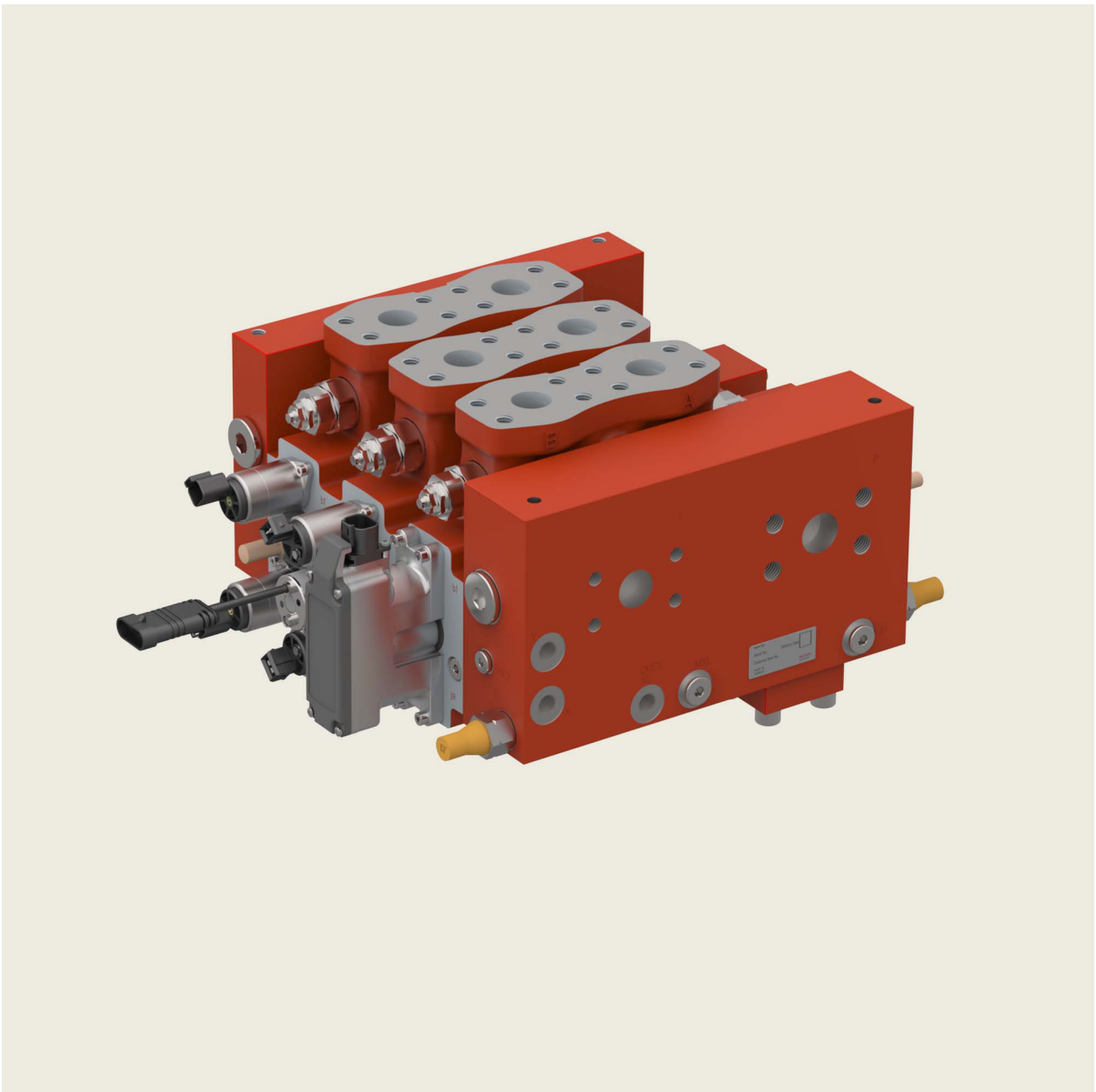


# Proportional Directional Valve System

in Sectional Design  
Series LVS 22





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## 1 General

### 1.1 Description

Our sectional proportional valves regulate the flow rate to the actuator by means of an internal closed-loop control system. The valve sections each contain a proportional directional control valve and a downstream pressure compensator (proportional flow-sharing principle). LVS22 valve blocks can be configured for both fixed- and variable-displacement pumps. The basic LVS22 valve block has 5 operator options: hand lever, hydraulic, on/off, electrohydraulic proportional, and onboard electronics. Unlike conventional load-sensing valves, with the proportional flow-sharing principle of the LVS22 valve, the load signal is fed directly to the variable-displacement pump or system pressure-control valve i.e. without using a series of shuttle valves. In addition, valve operation is particularly economical thanks to the optimized flow paths.

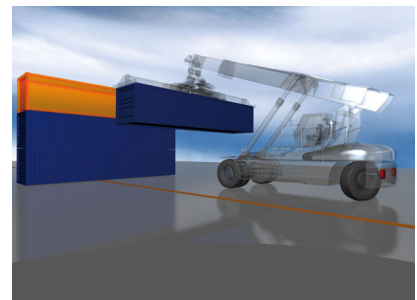
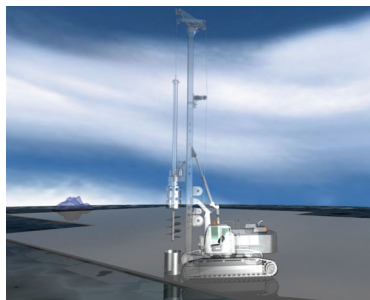
The highly adaptable modular system, specifically designed for use in mobile hydraulics, consists of an inlet module, actuator modules (up to 8), and an end module. (> 8 actuator modules on application). Optionally, the valve can be equipped with secondary pressure relief valves with make-up function and/or actuator pressure relief. Float-position or fast-speed functions can also be implemented. Inlet and end modules are application-specific (e.g. with system pressure relief and pressure-peak reduction). Specifically designed for use in mobile hydraulics, it provides the machine manufacturer with the ideal configuration for every application. In addition, the valve sections can be combined with Bucher Hydraulics LVS08/12/18 and HDS24/34 valve series with the help of adapter plates.

### 1.2 Features of the valve block

- Compact sectional design
- Load sensing
- Actuator sections with individual pressure compensators
- Secondary pressure relief valves, also with make-up function
- Load-independent flow control, even with parallel operation of several actuators
- Proportional flow-sharing mode
- Primary pressure relief (cartridge)
- Can be used with variable- and fixed-displacement pump systems
- LS pressure relief for the whole control block
- Various operator types, including onboard electronics (OBE)

### 1.3 Application examples

- Cranes
- Ground drilling rigs
- Container forklifts
- Excavators
- Wheel loaders
- Material handlers



## 2 Technical data

### 2.1 General technical data

General characteristics	Unit	Description, value
Design		Proportional valves, sectional design max. 8 sections
Type of operation		<ul style="list-style-type: none"> <li>• Electrohydraulic proportional</li> <li>• Electrohydraulic on-off</li> <li>• Hydraulic</li> <li>• Manual (oil-tight enclosure)</li> <li>• Onboard electronics</li> <li>• For other types, please contact Bucher</li> </ul>
Connection type		SAE flange
Mounting attitude		Unrestricted, but ensure good air-bleeding
Ambient temperature range	°C	-30 ... +60

Hydraulic characteristics	Unit	Description, value
Hydraulic fluid		HL and HLP mineral oil to DIN 51524
Hydraulic fluid temperature range	°C	-20 ... +80, recommended +20 ... +60
Viscosity range	mm <sup>2</sup> /s (cSt)	10 ... 500, recommended 15...250
Minimum fluid cleanliness level		ISO 4406 code 20/18/15
Maximum inlet flow rate	l/min	600
Maximum actuator flow rate ( $\Delta p_{P-XL} = 14$ bar)	l/min	380
Maximum pump pressure (port P)	bar	420
Maximum pressure at a service port (port A/B)	bar	420
Maximum tank pressure (port T)	bar	50
Maximum tank pressure for electrohydraulic pilot stage (port Y or T)	bar	5

Hydraulic operation	Unit	Description, value
Pilot-pressure range	bar	6 ... 20
Maximum pressure rating of pilot circuit	bar	50

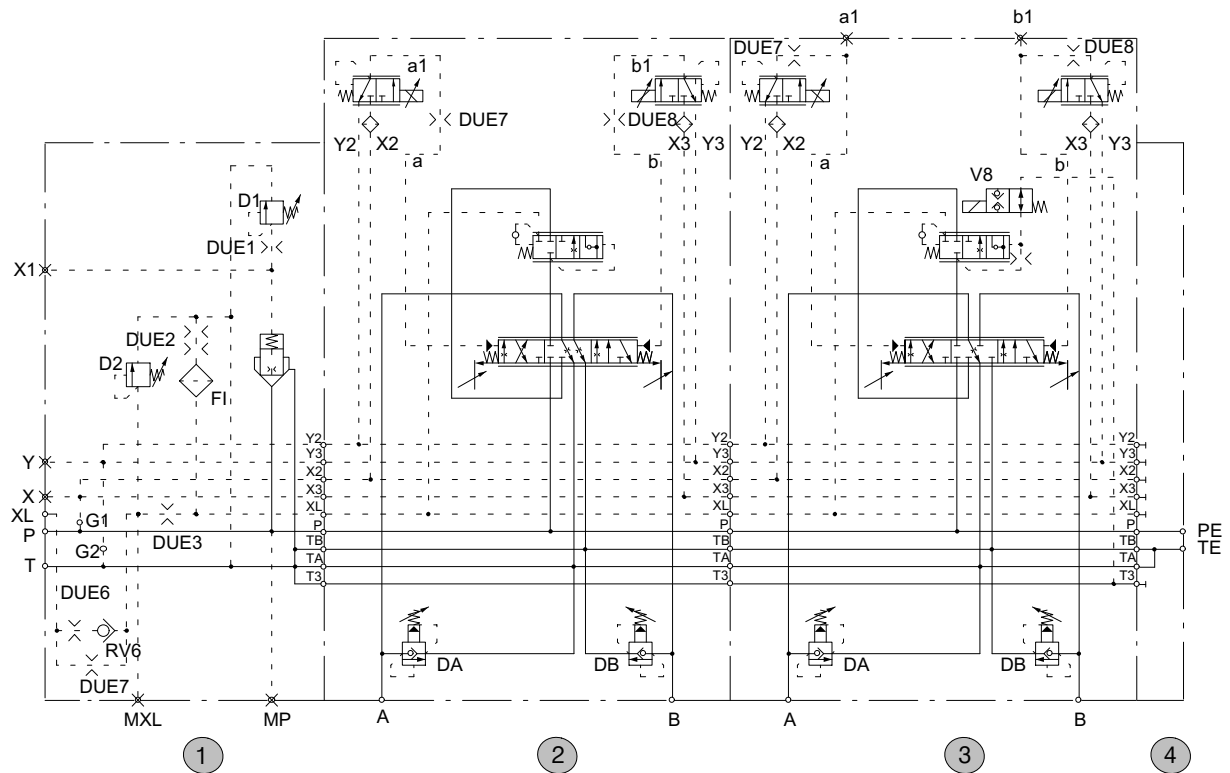
Electrical characteristics	Unit	Description, value
Electroproportional control: current range	mA	350 ... 700 (24 V, opening point to full deflection) 700 ... 1400 (12 V, opening point to full deflection)
Electrohydraulic pilot valves		See Section 4

## 2.2 Port sizes

Type	Port	ISO 1179 Part 1	SAE flange
Actuator	A/B		1" 6000 PSI
Pump	P		1 1/4" 6000 PSI
Tank	T		1 1/4" 3000 PSI
Load sensing	XL	G1/4"	
Pump for pilot stage	X </td <td>G1/4"</td> <td></td>	G1/4"	
Tank for pilot stage	Y	G1/4"	
Test points	MP, MXL, X1	G1/4"	

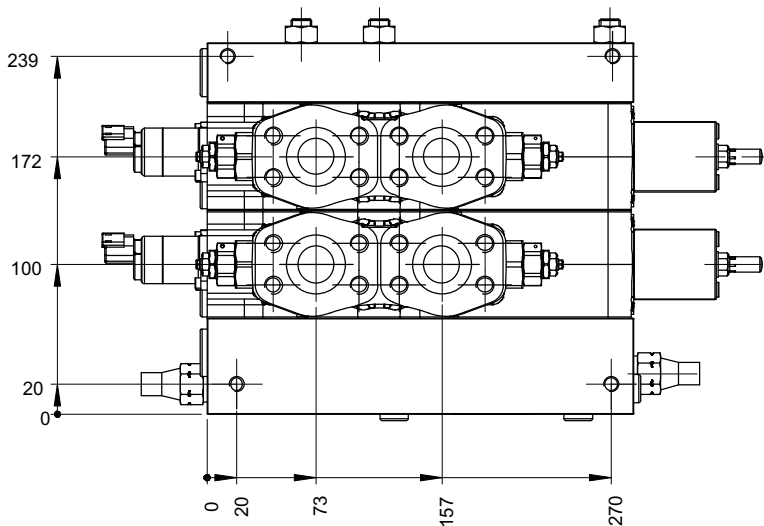
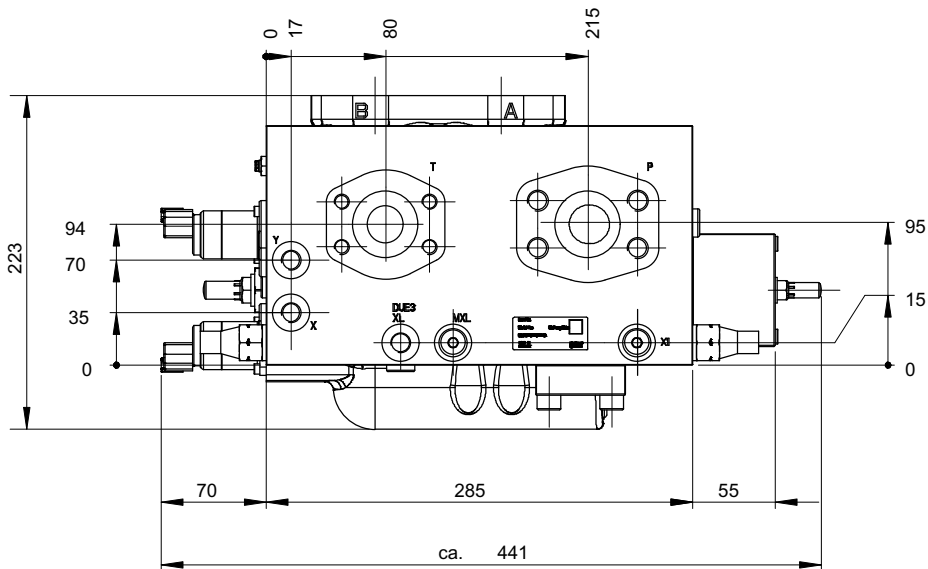
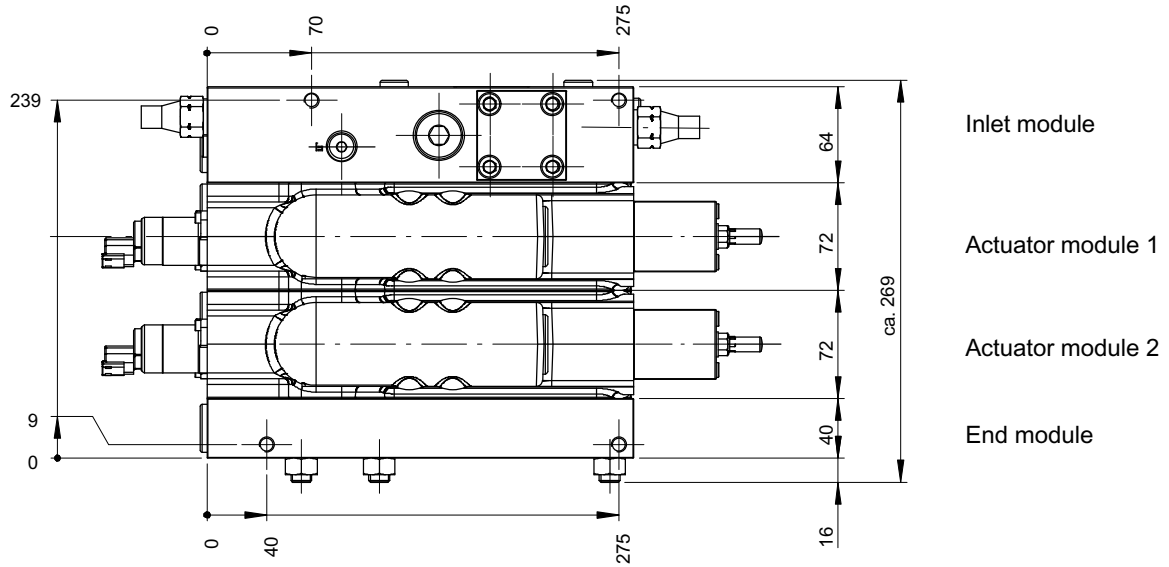
## 2.3 Circuit diagram

### 2.3.1 Example of complete valve



Item	Description
1	Inlet module with primary and $LS_{max}$ pressure relief, as well as asymmetrical damping of the load sensing signal
2	Standard actuator module with secondary valves
3	Actuator module with switchable (on/off) pressure compensator and secondary valves
4	End module with additional pump and tank ports

2.4 Dimensions (complete valve example)



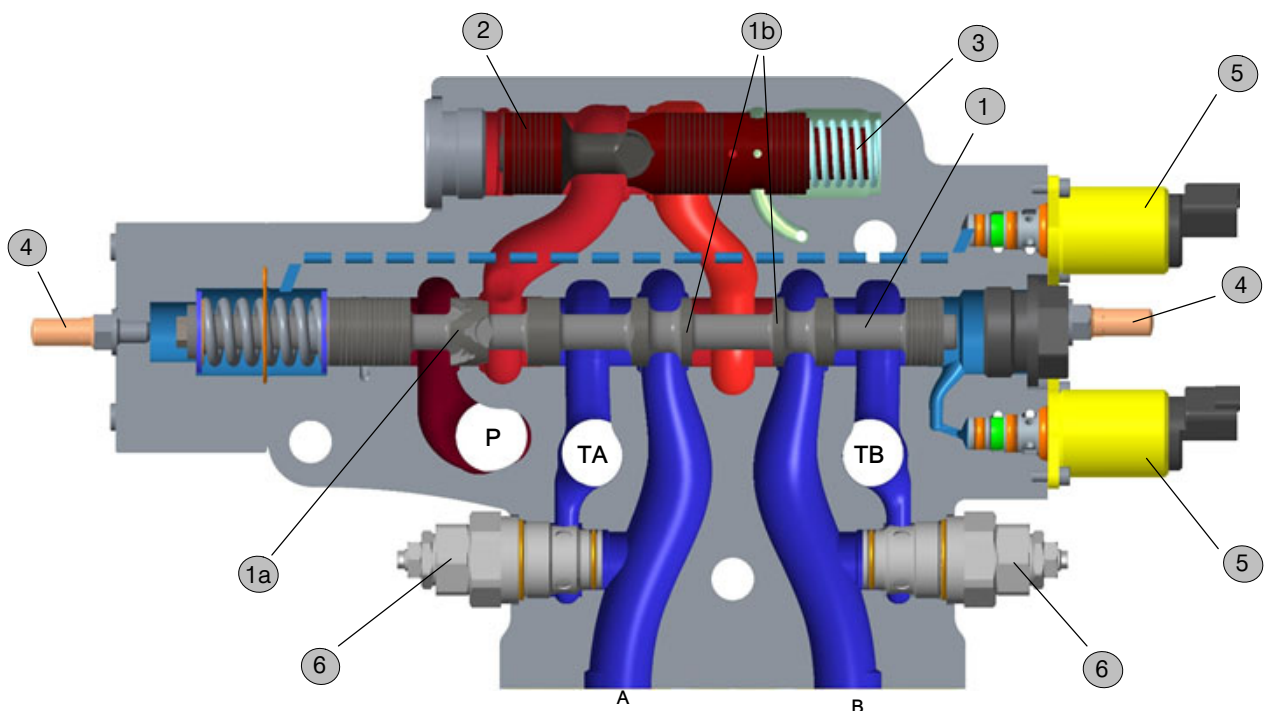


### 3 Actuator modules

#### 3.1 Functional description

Functionally, the valve system operates on the principle of proportional flow sharing. When the main spool is in its neutral position, both the connection from P to the downstream pressure compensator (2) and the connection from the gallery after the pressure compensator (2) to the actuator ports A and B are blocked. If the main spool (1) is deflected by actuating one of the two pressure reducing valves (5), this produces a corresponding opening cross-section (metering orifice) (1a). At the same time, the main spool opens the path to actuator port A or B (directional valve function) (1b). The pressure-compensator piston now has the task of keeping the pressure difference across the metering orifice constant. Since the pump pressure is always present up-

stream of all the metering orifices, including those of the other actuator sections, the pressure compensator pistons must throttle the respective actuator flow rates until the same pressure exists downstream of all the metering orifices. Due to the system design, this pressure is the highest load pressure, which is signaled to the pump controller via load-sensing drillings depending on the displacement of the pressure compensator piston. Thus, except for the pressure losses between the pump and the valve block, the pressure difference at all metering orifices is equal to the pressure difference acting on the pump controller.



Sectional view of LVS22 actuator module

Item	Description
1	Main valve spool
1a	Metering orifice
1b	Directional valve function
2	Pressure compensator spool
3	Pressure compensator control spring
4	Stroke limiter
5	Pressure reducing valve
6	Pressure relief valve

### 3.2 Flow rate combinations

Preferred flow-rate combinations with the standard pressure differential of 14 bar between the P port on the valve block and  $LS_{max}$  [l/min].

$Q_A/Q_B$	$Q_A/Q_B$	$Q_A/Q_B$	$Q_A/Q_B$	$Q_A/Q_B$	$Q_A/Q_B$
380/380	320/320	270/270	230/230	180/180	120/120
380/320	320/230	270/180	230/120	180/120	120/60
380/230	320/120	270/60	230/60	180/60	
380/120	320/60				
380/60					

### 3.3 Conversion factor

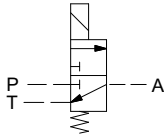
While holding a constant spool position, the flow rate at the actuator ports can be varied by varying the  $\Delta p$  setting (pump LS) at the compensator or pump controller. The corres-

ponding conversion factors are shown in the table below. If this facility is used, the actuator flow rate must be limited to a maximum of 380 l/min.

$\Delta p$	Conversion factor
12 bar	0,93
14 bar	1,00
16 bar	1,07
18 bar	1,13
20 bar	1,20
25 bar	1,30

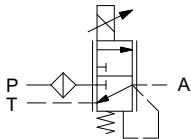
## 4 Solenoid valves

### 4.1 Electrohydraulic pilot valves, on-off (max. supply pressure 50 bar)



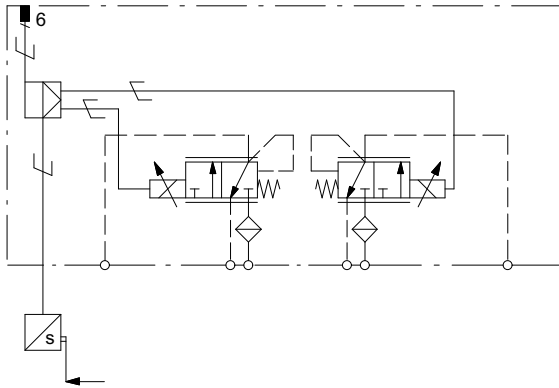
General characteristics	Unit	Description, value	
Supply voltage	V DC	12	24
Protection class to EN 60529		up to IP6K6 / IPX7 / IPX9K	
Insulation class to VDE 0580		H	
Coil resistance at 20 °C	Ω	8,15 ± 5%	32,5 ± 5%
Duty cycle		100%	
Switching time			
t <sub>on</sub>	ms	< 60	
t <sub>off</sub>	ms	< 100	

### 4.2 Electrohydraulic pilot valves, proportional



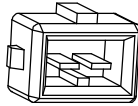
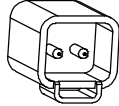
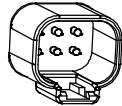
General characteristics	Unit	Description, value	
Supply voltage	V DC	12	24
Control current at opening point	mA	650	325
Control current at max. stroke	mA	1360	680
PWM frequency (recommended) The PWM frequency should be optimised to suit the application and operating conditions.	Hz	100	
Protection class to EN 60529		IP 65	
Insulation class to VDE 0580		H	
Coil resistance at 20 °C	Ω	5,3 ± 5%	21,2 ± 5%
Coil resistance at 60 °C	Ω	6,1 ± 5%	24,5 ± 5%
Power consumption at maximum stroke of the main valve spool (coil resistance at 60 °C)	VA	10,4	
Duty cycle 100%	mA	1500	750

## 4.3 Onboard electronics: electrohydraulic actuator (EHA)



General characteristics	Unit	Description, value
Supply voltage	V DC	24
Electrical connection		DT14-6P

## 4.4 Connector-socket type

AMP Junior Timer 2-pole	DT04-2P	DT14-6P
		
2-pin	2-pin	6-pin

Mating plugs are not included in the delivery.

## 5 Note

This catalogue is intended for users with specialist knowledge. The user must check the suitability of the equipment described herein 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 contact Bucher Hydraulics.

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Classification: 450