# Differential Lock Valve

## Series MT..DVD (for 3 motors)

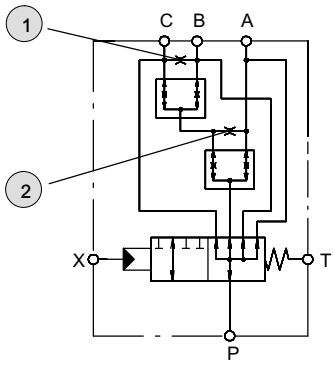
- robust and reliable
- energy-optimised over the whole flow range
- simple control
- compact design offers space-saving installation
- reliable, uniform motion of the wheel-drives being controlled

## 1 Description

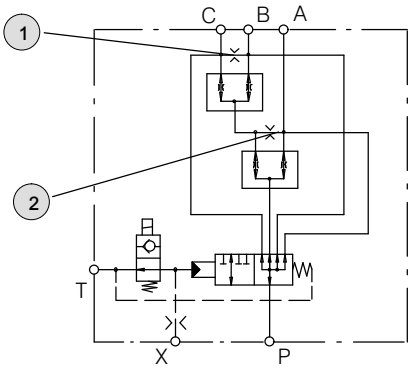
The differential lock valve consists essentially of two bi-directional flow dividers (dividing and combining) and a directional valve for optionally bypassing the flow dividers. It is intended for use in either open- or closed-loop hydrostatic drives with parallel-connected hydraulic motors. When the lock valve is switched OFF, the inlet flow can divide itself among the motors in any required manner. When the lock valve is switched ON, however, the inlet flow is divided into three pressure compensated portions in accordance with the division ratio of the lock valve. The motors are thus driven at fixed speeds, regardless of their respective loads. This arrangement prevents any hydraulic wheel motor from spinning in conditions of poor traction. Two balancing orifices can optionally be arranged between the outlets A, B and C. These allow some redistribution of flow and prevent unwanted torque build-up between wheels in these circumstances, and when turning. The differential lock valves can be supplied with either hydraulic, or electro-hydraulic, actuation.

## 2 Symbols

### 2.1 Hydraulic actuation




### 2.2 Electrohydraulic actuation




| | |
|---|---|
| 1 | Balancing orifice D2 can be fitted |
| 2 | Balancing orifice D1 can be fitted |

# 3 Technical data

| Hydraulical characteristics | Unit | Description, value | |
|---|---|---|---|
| | | Size 08 | Size 16 |
| Nominal flow rate $Q_{max}$ | l/min | 100 | 250 |
| Flow range [1) 2)] | l/min | 25, 50, 75, 100 | 120, 160, 200, 250 |
| Operating pressure $p_{max}$ | bar | 420 | |
| Pilot pressure $p_{p\ min.}$- $p_{p\ max.}$ | bar | 10 ... 30 | |
| Viscosity range | $mm^2/s$ | 10 ... 300 | |
| Maximum fluid cleanliness | | ISO 4406, class 20/18/15 (NAS 1638 class 9); achievable with a filter rating of $ß_{10} \geqq 75$ | |
| Fluid temperature range | °C | -20 ... +80 | |
| Division ratio (for others, contact Bucher Hydraulics) | | 1:1:1 | |
| Fluids | | HL/HLP mineral oils DIN 51524; other fluids consult Bucher Hydraulics | |
| **Electrical characteristics (type of actuation: EH)** | **Unit** | **Description, value** | |
| Voltage | Volt DC | 12 / 24 | |
| Power consumption | W | 18 | |
| Nitrile seals | | NBR | |
| Duty cycle | | 100 ED % | |
| Ambient temperature | °C | max. +60 | |
| Coil temperature | °C | max. +180 (insulation class H) | |
| Enclosure protection DIN 40050 | | IP65 | |
| Electrical connection | | Connector DIN 43650 | |

1) State the application's effective nominal flow when ordering
2) Observe minimum flow rate in accordance with section 4.2

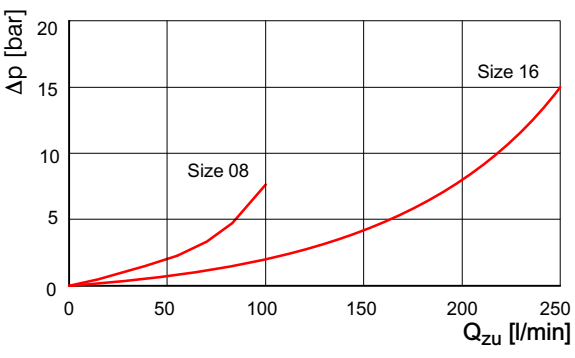
# 4 Performance graphs

Measured with viscosity 35 $mm^2/s$.

## 4.1 Flow resistance

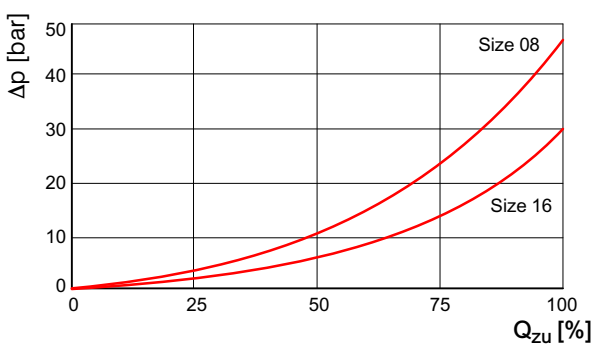
### 4.1.1 Dividing function switched OFF

(in relation to the input $Q_{zu}$ volume flow rate)



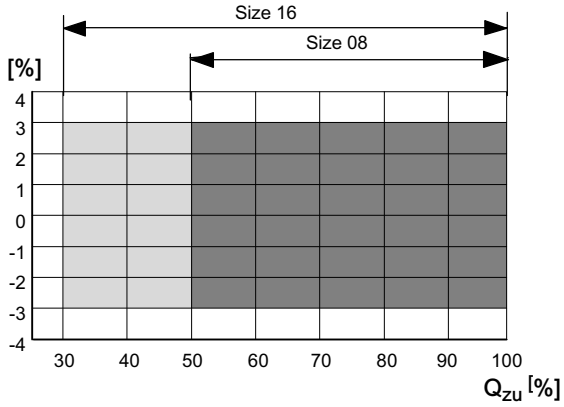

### 4.1.2 Dividing function switched ON

(in relation to the flow range)



## 4.2 Division accuracy

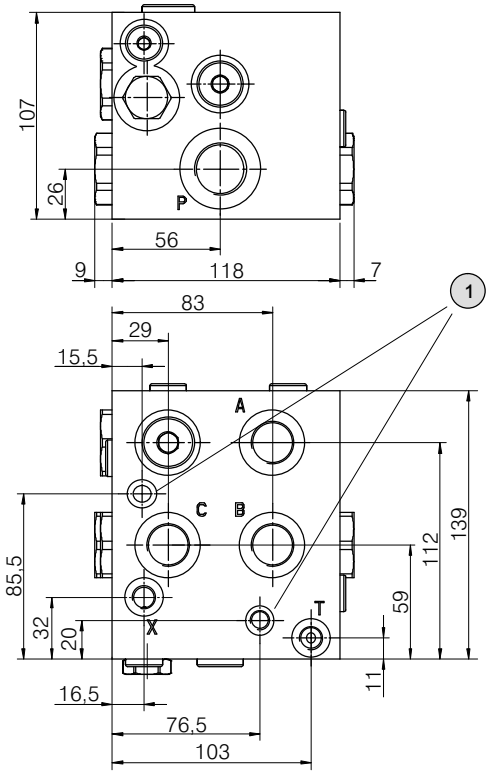
Percentage of the applicable nominal flow without a balancing orifice between A and B (hole plugged)




# 5 Dimensions

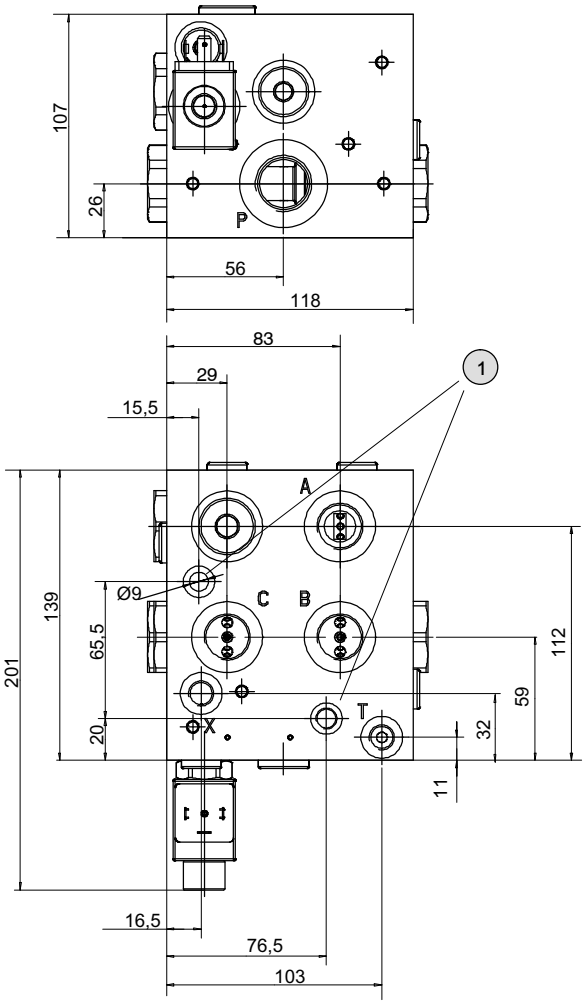
## 5.1 MT08DVD (Serie index 3)

### 5.1.1 Hydraulic actuation MT08DVD...-*H-3***



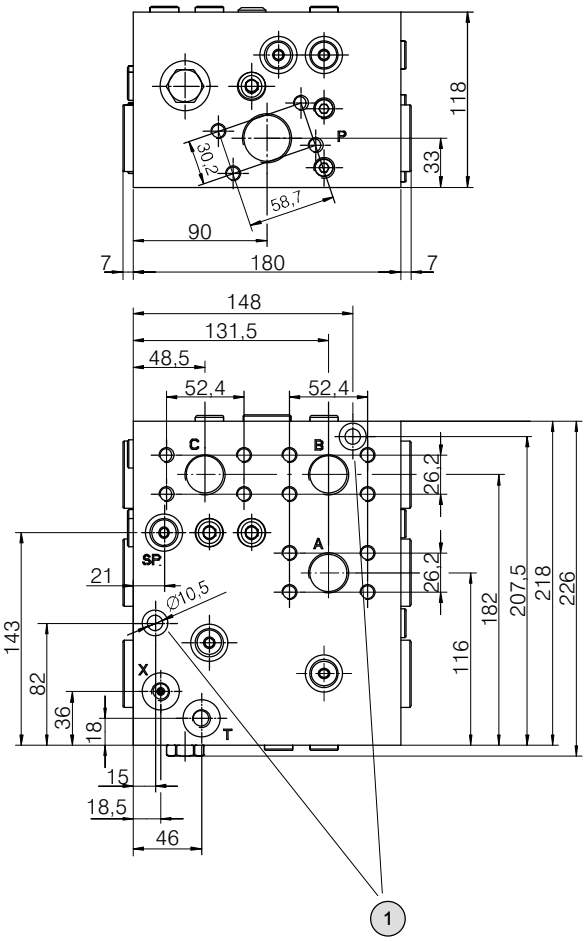

| | |
|---|---|
| 1 | Clearance holes for M8 mounting cap screws to DIN 912 |

### 5.1.2 Electrohydraulic actuation MT08DVD...-EH-3G…

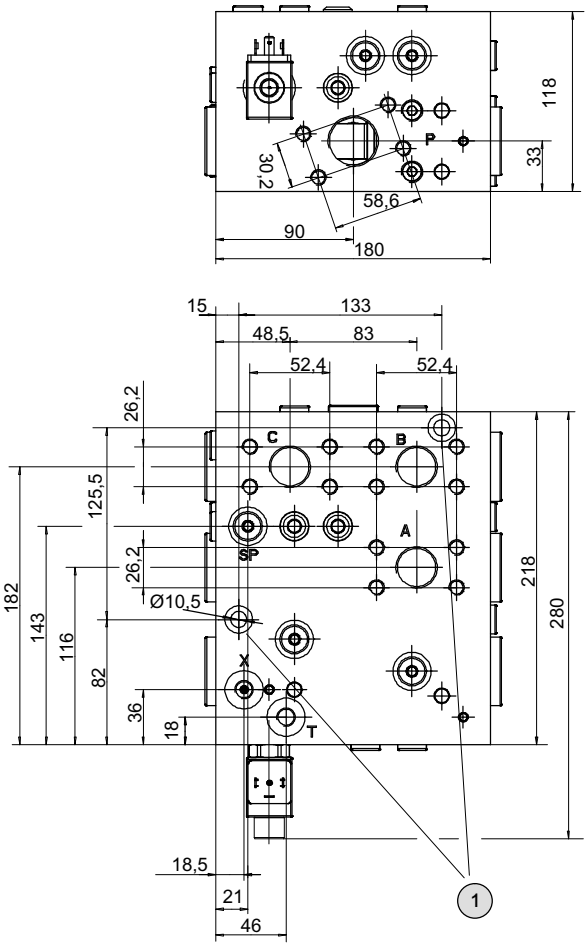


## 5.2 MT16DVD (Serie index 2)

### 5.2.1 Hydraulic actuation MT16DVD...-*H-2***




### 5.2.2 Electrohydraulic actuation MT16DVD...-EH-2G…

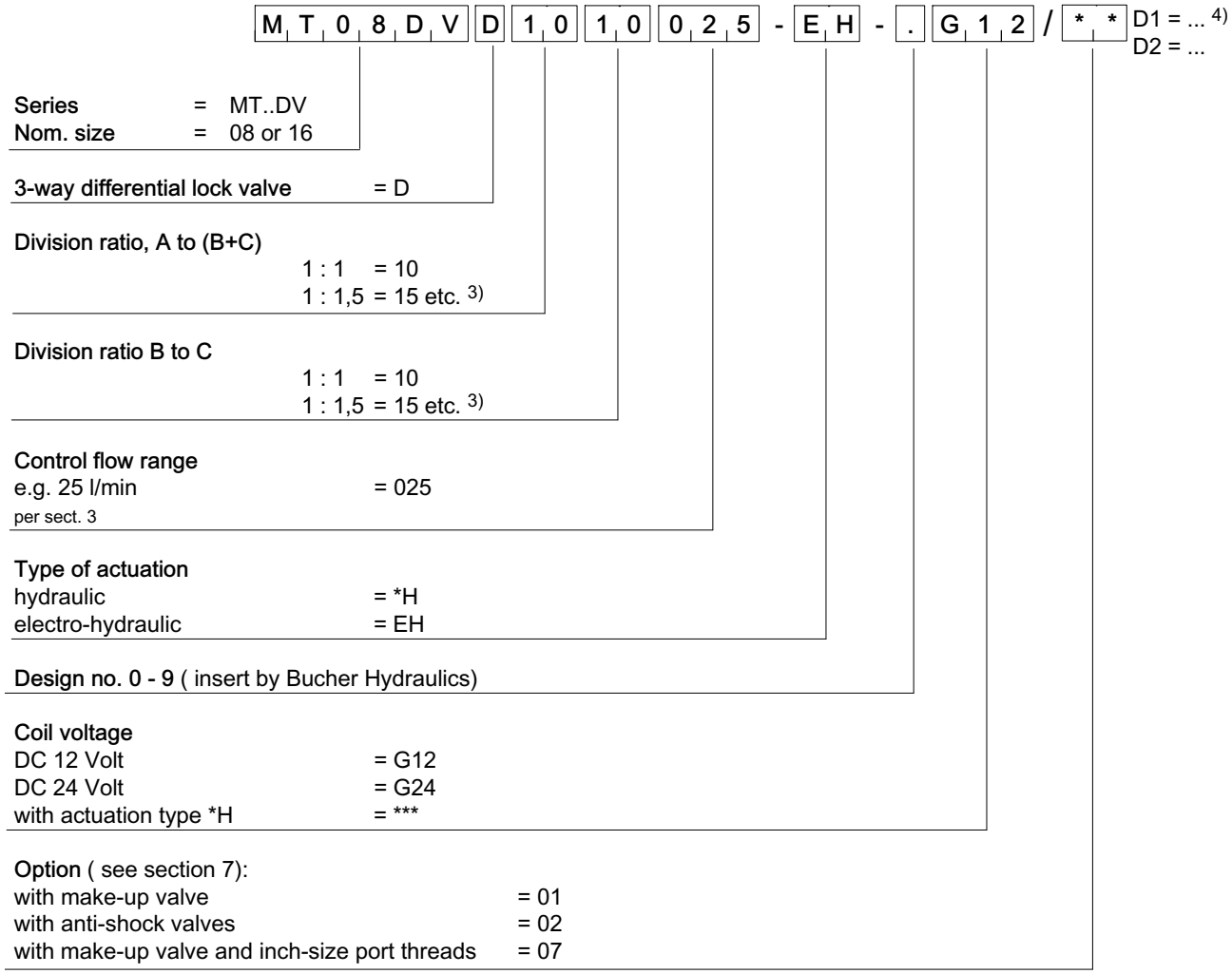



| | |
|---|---|
| 1 | Clearance holes for M8 mounting cap screws to DIN 912 |

## 5.3 Connection size

| MT08DVD | | MT16DVD | |
|---|---|---|---|
| Port threads: | | Port threads: | |
| Port P: | M27 x 2 | Port P: | M 33 x 2, alternatively<br>SAE (3000 PSI) R $1^{1}/_{4}$ |
| Ports A and B: | M22 x 1,5 | Ports A and B: | M 27 x 2, alternatively<br>SAE (3000 PSI) R 1” |
| Ports X and T: | M12 x 1,5 | Ports X and T: | M 12 x 1,5<br>SAE flanges, see data sheet 100-P-000049 |

# 6 Ordering code




3) With unequal division between A and (B+C), the larger flow goes to (B+C)
between B and C, the larger flow goes to C

4) Size of balancing orifices must be plainly stated (see also sect. 2) e.g. 0.6 / 0.8 / 1.0
e.g. if balancing orifice D1 is to be 0.8 mm, then D1 = 08
if balancing orifice D2 is to be 1.0 mm, then D2 = 10

# 7 Options

In addition to the standard versions, differential-lock valves can also be equipped with numerous auxiliary functions and combined in customer-specific manifold blocks. In these cases, technical datas and performance graphs may differ from standard.

/01 = With make-up valve

/02 = With anti-shock valves (pressure-relief+make-up valves)

/07 = with make-up valves and inch-size port threads

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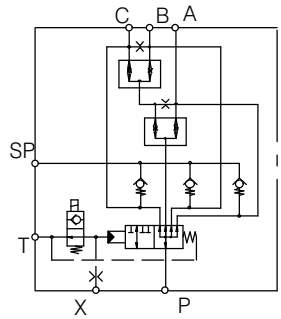
## 7.1 Examples

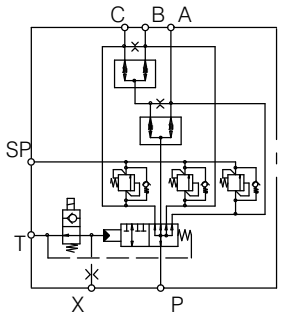
### 7.1.1 MT..DVD../01

With make-up valve



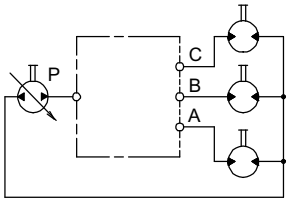

### 7.1.2 MT..DVD../02

With anti-shock valves (pressure-relief+make-up valves)




# 8 Application example

## 8.1 3-wheel Drive




# 9 Installation

Horizontal mounting is recommended. Do not bolt the valve body onto an uneven mounting surface.

# 10 Fluid

Differential lock valves require fluid with a minimum cleanliness level of NAS 1638, Class 9 or ISO 4406, code 0/18/15.
We recommend the use of fluids that contain anti-wear additives for mixed-friction operating conditions. Fluids without appropriate additives can reduce the service life of pumps and motors.
The user is responsible for maintaining, and regularly checking the fluid quality. Bucher Hydraulics recommends a load capacity of > 30 N/mm2 to Brugger DIN 51347-2.

# 11 Fluid cleanliness class

Cleanliness class (RK) onto ISO 4406 and NAS 1638

| Code ISO 4406 | Number of particles / 100 ml | | | |
|---|---|---|---|---|
| | ≤ 4 µm | ≤ 6 µm | ≤ 14 µm | NAS 1638 |
| 23/21/18 | 8000000 | 2000000 | 250000 | 12 |
| 22/20/18 | 4000000 | 1000000 | 250000 | - |
| 22/20/17 | 4000000 | 1000000 | 130000 | 11 |
| 22/20/16 | 4000000 | 1000000 | 64000 | - |
| 21/19/16 | 2000000 | 500000 | 64000 | 10 |
| 20/18/15 | 1000000 | 250000 | 32000 | 9 |
| 19/17/14 | 500000 | 130000 | 16000 | 8 |
| 18/16/13 | 250000 | 64000 | 8000 | 7 |
| 17/15/12 | 130000 | 32000 | 4000 | 6 |
| 16/14/12 | 64000 | 16000 | 4000 | - |
| 16/14/11 | 64000 | 16000 | 2000 | 5 |
| 15/13/10 | 32000 | 8000 | 1000 | 4 |
| 14/12/9 | 16000 | 4000 | 500 | 3 |
| 13/11/8 | 8000 | 2000 | 250 | 2 |

# 12 System augmentation

## 12.1 Switch valve for traction drives

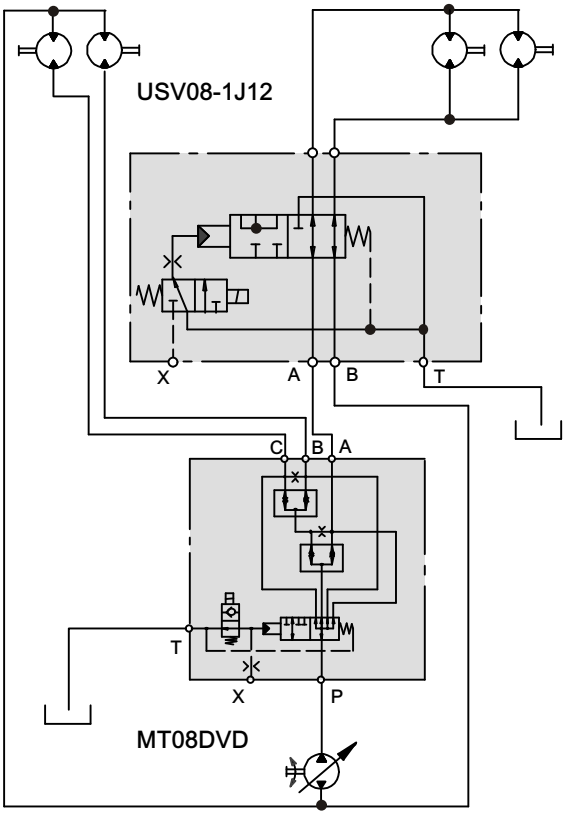
### 12.1.1 USV08 and USV16 series

These valves enable switching from a serial connection, for example “drive mode,” into a parallel connection using a differential lock valve. For the user, such solutions mean reliable output and fast operating speeds.

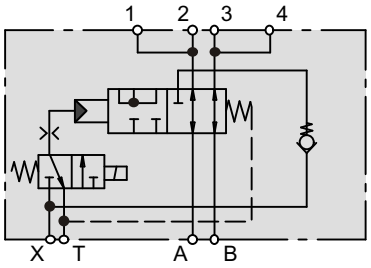
### 12.1.2 Application examples

- Sweepers
- Cold milling machines
- Black-top pavers
- Forklifts
- Compact rollers

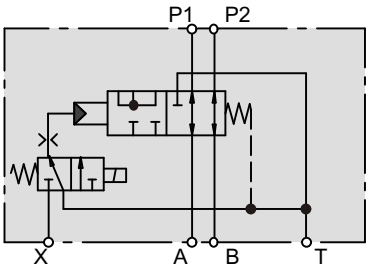
### 12.1.3 Circuit diagram




USV16-0G12




USV08-1J12



### 12.1.4 Technical data

| Hydraulical characteristics | Unit | Description, value | |
|---|---|---|---|
| | | Size 08 | Size 16 |
| Operating pressure $p_{max}$ | bar | 420 | 420 |
| Nominal flow rate | l/min | 120 | 160 |
| Dimensions (valve body without solenoid) | mm | 160x105x130 | 220x118x185 |
| Ordering Information and order number | | USV08-1J12 = 100032930 | USV16-0G12 = 100028253 |
| Fluid temperature range | °C | -20 ... +80 | |
| Viscosity range | $mm^2/s$ | 10 ... 300 | |
| Maximum fluid cleanliness | | ISO 4406, class 20/18/15 (NAS 1638 class 9); achievable with a filter rating of $ß_{10} \geqq 75$ | |
| Nitrile seals | | NBR (Nitril-Butadien-Kautschuk) | |
| Port threads::<br>USV08<br><br><br><br>USV16 | | <br>P1, P2, A, B = M27x2<br>T, C = M18x1,5<br>X = M14x1,5<br>according to DIN EN ISO 9974-1<br><br>1 - 4, A, B = M27x2<br>T = M14x1,5<br>X = M14x1,5<br>according to DIN EN ISO 9974-1 | |
| **Electrical characteristics** | **Unit** | **Description, Value** | |
| Supply voltage | V DC | 12, 24 | |
| Supply voltage tolerance | | ± 10% | |
| Nominal power consumption - version „N“<br>- version „E“ | V DC | V DC = 27 W / V AC = 25 W<br>V DC = 17 W / V AC = 17 W | |
| Switching time | | Version „E“ (17W): 25 … 70 (energising)<br>15 … 50 (deenergising)<br>Version „N“: (27/25W): 25 … 100 (energising<br>20 … 70 (deenergising)<br>These times are strongly influenced by fluid pressure, flow rate and viscosity, as well as by the dwell time under pressure. | |
| Relative duty cycle | | 100% | |
| Protection class to EN 60 529 | | IP65<br>(when connector plugs are properly fitted) | |
| Electrical connection | | 3-pin square plug to ISO 4400 / DIN 43 650 (standard) | |





Classification: 430.310.336.347.000