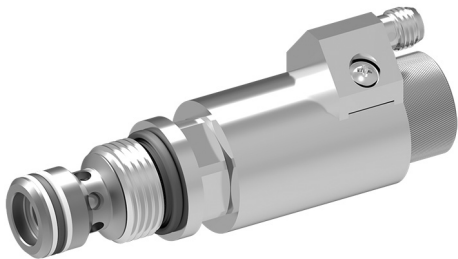


## 2/2 Cartridge Seat Valve, Size 5

$Q_{\max} = 30 \text{ l/min}$ ,  $p_{\max} = 350 \text{ bar}$

Digital valve, bidirectional seat-valve shut-off, direct acting

Series WS22GD... / WS22OD...



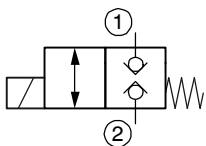
- For use in digital hydraulics
- With bidirectional seat-valve shut-off
- Compact construction for cavity type ALM – M20x1.5
- High switching performance
- Short response times
- All exposed parts with zinc-nickel plating
- High pressure wet-armature solenoids
- The slip-on coil can be rotated, and it can be replaced without opening the hydraulic envelope
- Can be fitted in a line-mounting body

### 1 Description

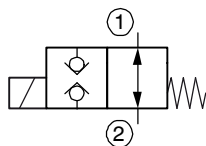
These direct acting 2/2 solenoid operated directional seat valves, series WS22GD... / WS22OD..., are screw-in cartridges with a M20x1.5 or 3/4-16 UNF mounting thread. They are designed on the poppet/seat principle, and are therefore virtually leak-free in both directions of flow (bidirectional seat-valve shut-off). Over-excitation, preferably through an electronic switching device (booster), is required to operate the solenoid. Combined with the low mass of the moving parts, this results in short response times and high switching performance in a compact package. "De-energised closed"

and "de-energised open" functions are available. The straightforward design delivers an outstanding price/performance ratio. The valves are used in applications in digital hydraulics, where fast response and long life with minimum size are vitally important. All external parts of the cartridge are zinc-nickel plated according to DIN EN ISO 19 598 and are thus suitable for use in the harshest operating environments. The slip-on coils can be replaced without opening the hydraulic envelope and can be positioned at any angle through 360°.

### 2 Symbol



WS22GD...



WS22OD...

### 3 Technical data

General characteristics	Description, value, unit with booster	Description, value, unit without booster
Designation	2/2 cartridge seat valve	
Design	digital valve, bidirectional seat-valve shut-off, direct acting poppet/seat design (pressure balanced)	
Mounting method	screw-in cartridge M20x1.5 or 3/4-16 UNF	
Tightening torque	50 Nm ± 10 %	
Size	nominal size 5,	cavity type ALM M20x1.5 cavity type AL 3/4-16 UNF please contact BUCHER
Weight	0.20 kg	

General characteristics	Description, value, unit with booster	Description, value, unit without booster
Mounting attitude	unrestricted	
Ambient temperature range	-25°C...+80 °C	-25°C...+50 °C

Hydraulic characteristics	Description, value, unit with booster	Description, value, unit without booster
Maximum operating pressure (ports 1 and 2)	350 bar	350 bar
Maximum flow rate	30 l/min	15 l/min (only 1 → 2)
Flow direction	1 → 2 / 2 → 1, see symbols	1 → 2
Hydraulic fluid	HL and HLP mineral oil to DIN 51 524; for other fluids, please contact BUCHER	
Hydraulic fluid temperature range	-25 °C ... +80 °C	
Viscosity range	10...500 mm <sup>2</sup> /s (cSt), recommended 15...250 mm <sup>2</sup> /s (cSt)	
Minimum fluid cleanliness Cleanliness class to ISO 4406 : 1999	class 20/18/15	

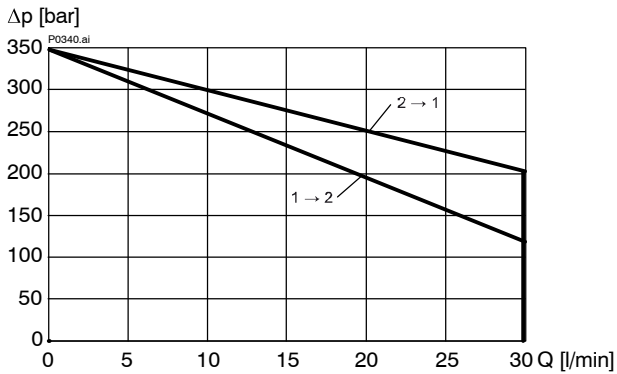
Electrical characteristics	Description, value, unit with booster	Description, value, unit without booster
Controlled booster voltage	48 V DC (standard)	-
Booster duration	4...5 ms	-
Holding voltage	12 V DC (standard)	-
Switching voltage with puls duration		24 V DC
Min. puls duration		70 ms
Voltage tolerance	± 5 % (at ambient temperature < 60°C : ± 10 %)	± 10 %
Nominal power consumption	15 W at 12 V DC	15 W at 12 V DC
Switching time	- model WS22G... 6 ... 20 ms (energising) 10 ... 30 ms (deenergising) - model WS22O... 6 ... 30 ms (energising) 5 ... 20 ms (deenergising)	10 ... 50 ms (energising) 10 ... 30 ms (deenergising) _ ... _ ms (energising) _ ... _ ms (deenergising)
These times are strongly influenced by fluid pressure, flow rate and viscosity, as well as by the dwell time under pressure.		
Relative duty cycle - (holding voltage)	100 % (12 V)	see characteristics
Duty cycle / switching frequency - dynamic	see characteristics	see characteristics
Protection class to ISO 20 653 / EN 60 529	IP 65	
Electrical connection:	3-pin plug M8x1 48 / 24 / 12 V DC 0 V not used	
	- PIN 1	
	- PIN 3	
	- PIN 4	

## 4 Performance graphs

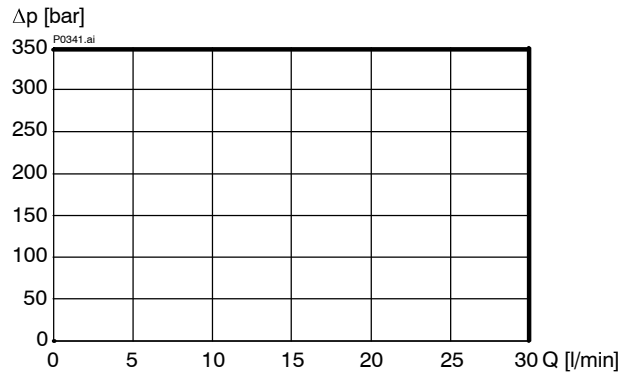
### 4.1 Control with booster

measured with oil viscosity 33 mm<sup>2</sup>/s (cSt), coil at steady-state temperature and 10 % undervoltage

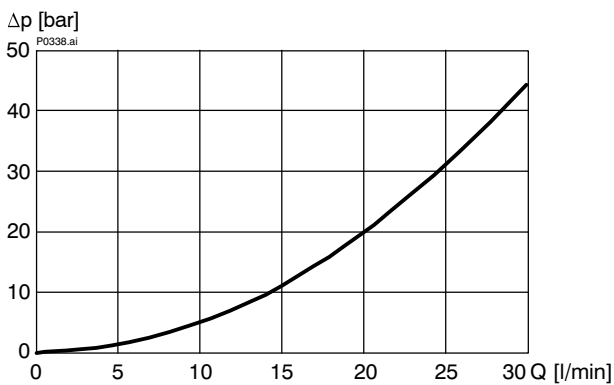
$p = f(Q)$  Performance limits  
[WS22GD...]



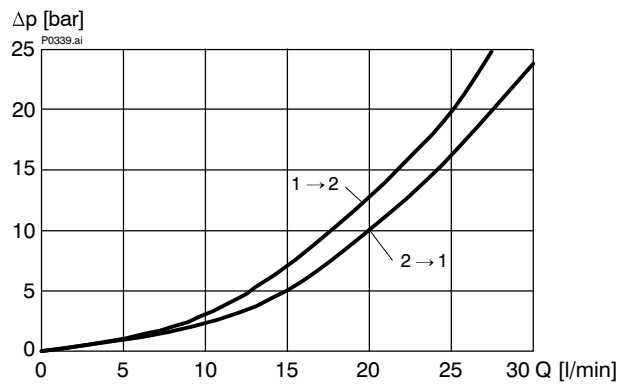
$p = f(Q)$  Performance limits  
[WS22OD...]



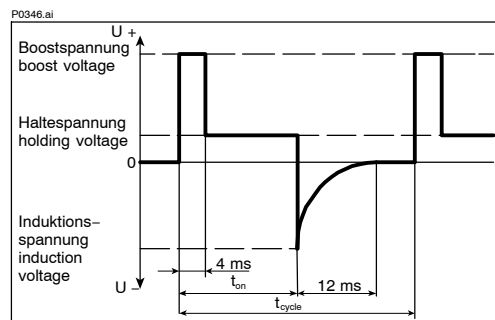
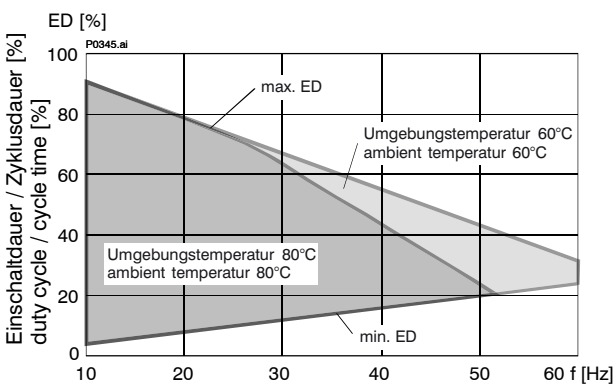
$\Delta p = f(Q)$  Pressure drop - Flow rate characteristic  
[WS22GD...]



$\Delta p = f(Q)$  Pressure drop - Flow rate characteristic  
[WS22OD...]



ED = f(f) duty cycle - switching frequency - characteristic [at steady-state coil temperature]

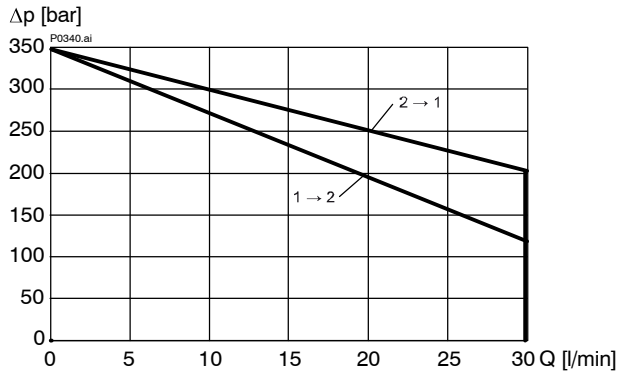


$$ED [\%] = \frac{t_{on}}{t_{cycle}} \times 100$$

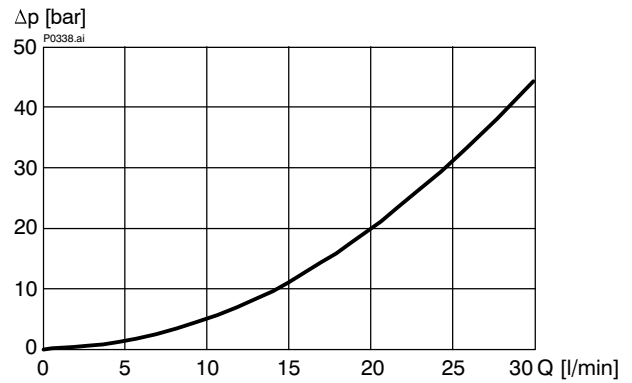
## 4.2 Control without booster

measured with oil viscosity 33 mm<sup>2</sup>/s (cSt), coil at steady-state temperature and 10 % undervoltage

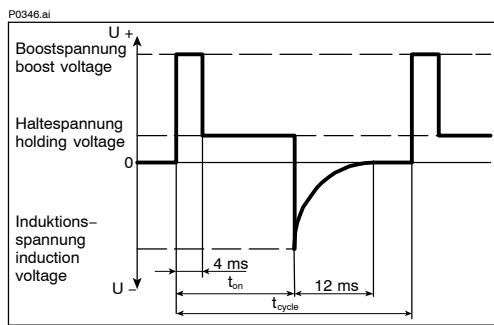
$\rho = f(Q)$  Performance limits  
[WS22GD...]



$\Delta p = f(Q)$  Pressure drop - Flow rate characteristic  
[WS22GD...]



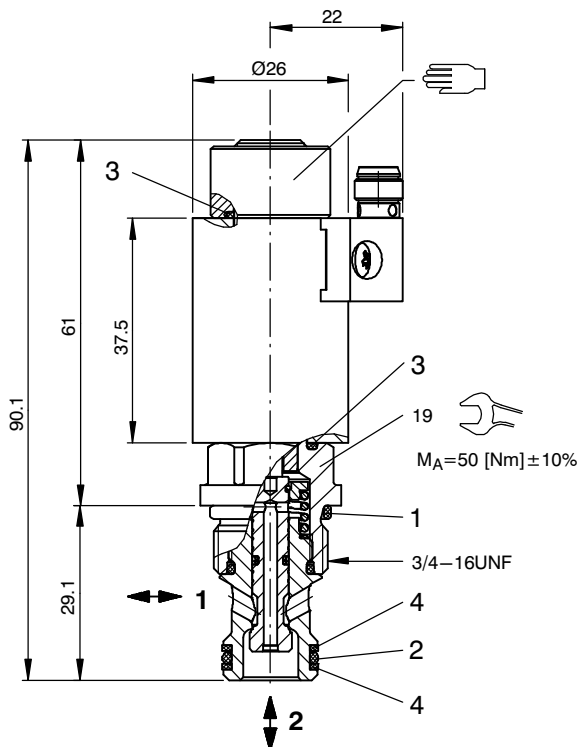
ED = f(f) duty cycle - switching frequency - characteristic [at steady-state coil temperature]



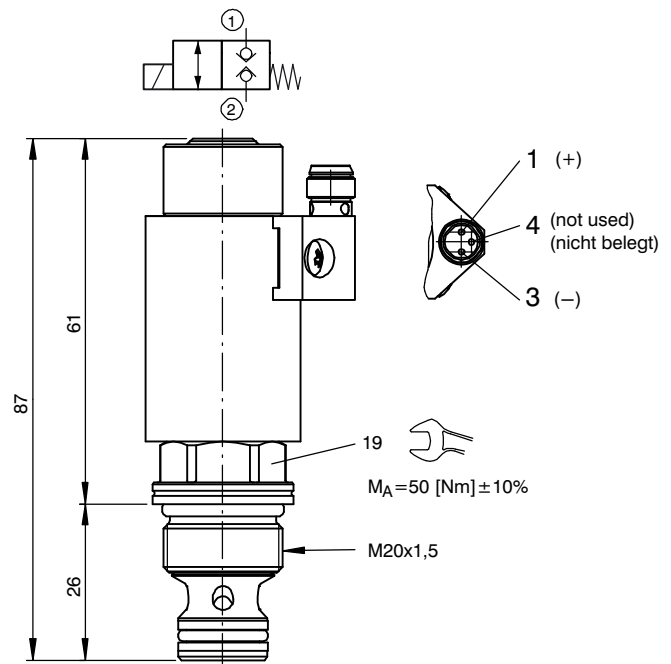
$$ED [\%] = \frac{t_{on}}{t_{cycle}} \times 100$$

## 5 Dimensions & sectional view

### 5.1 "Normally closed" design WS22GD...

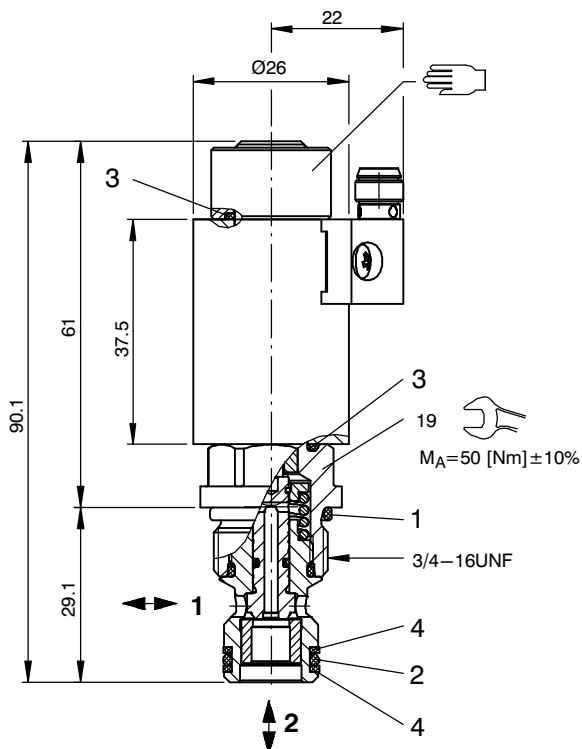


with 3/4-16 UNF thread – cavity type AL  
please contact BUCHER

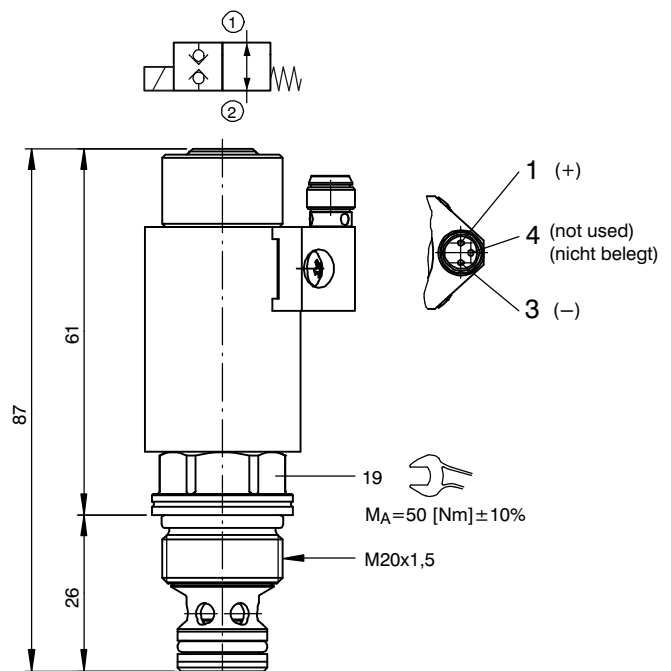


with M20x1.5 thread – cavity type ALM

### 5.2 "Normally open" design WS22OD...



with 3/4-16 UNF thread – cavity type AL  
please contact BUCHER



with M20x1.5 thread – cavity type ALM

### 6 Installation information



**IMPORTANT!**

When fitting the cartridges, use the specified tightening torque. No adjustments are necessary, since the cartridges are set in the factory.



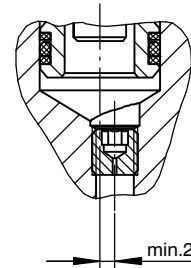
**ATTENTION!**

Only qualified personnel with mechanical skills may carry out any maintenance work. Generally, the only work that should ever be undertaken is to check, and possibly replace, the seals. When changing seals, oil or grease the new seals thoroughly before fitting them.



**ATTENTION!**

If an orifice is fitted directly in port 2 close to the valve, and if the flow direction is from 2 to 1, it is important to ensure that the axis of the orifice drilling is offset from the valve axis by at least 2 mm!



3/4-16 UNF "A" – NBR seal kit no. DS-435-N 1)

Item	Qty.	Description
1	1	O-ring no. 017 $\varnothing$ 17,17 x 1,78 N90
2	1	O-ring no. 014 $\varnothing$ 12,42 x 1,78 N90
3	2	O-ring $\varnothing$ 12.00 x 1.50 Viton
4	2	Backup ring $\varnothing$ 10.70 x 1,45 x 1,0 FI0751

M20x1.5 "Z" - NBR seal kit no. DS-436-N 1)

Item	Qty.	Description
1	1	O-ring no. 017 $\varnothing$ 17,17 x 1,78 N90
2	1	O-ring no. 013 $\varnothing$ 10,82 x 1,78 N90
3	2	O-ring $\varnothing$ 12.00 x 1.50 Viton
4	2	Backup ring $\varnothing$ 9.90 x 1,45 x 1,4 FI0751



**IMPORTANT!**

1) Seal kit with FKM (Viton) seals, no. DS-435-V



**IMPORTANT!**

1) Seal kit with FKM (Viton) seals, no. DS-436-V

### 7 Ordering code

Ex. 

W	S	22G	D	Z	5	-	1	12	D	-
---	---	-----	---	---	---	---	---	----	---	---

- W = directional valve
- S = seat valve, direct acting
- 22G = 2/2 function, de-energised closed
- 22O = 2/2 function, de-energised open
- D = digital valve
- Z = special features - with M20x1.5 thread (**standard**)
- A = standard model - with 3/4 - 16 UNF thread (please contact Bucher)
- 5 = nominal size 5
- (blank) = NBR (Nitrile) seals (**standard**)
- V = FKM (Viton) seals (special seals - please contact BUCHER)
- 1 ... 9 = design stage (omit when ordering new units)
- ... = voltage e.g. 12 (12 V)
- D = current DC
- (blank) = M8x1 male connector (**standard**)
- F = for flying leads (1000 mm), please contact Bucher



**IMPORTANT!**

For projects with min. 500 pcs/year

## 8 Related data sheets

Reference	(Old no.)	Description
400-P-040011	(i-32)	The form-tool hire programme
400-P-040171	(i-33.10)	Cavity type AL
400-P-040201	(i-33.13)	Cavity type ALM
400-P-720101	(G-4.10)	Line-mounting body, type GALA (G 3/8")
400-P-720105	(G-4.11)	Line-mounting body, type GALMA (M20 x 1.5)

[info.ch@bucherhydraulics.com](mailto:info.ch@bucherhydraulics.com)

[www.bucherhydraulics.com](http://www.bucherhydraulics.com)

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Classification: 430.300.-.305.305.300