

# Pressure Unloading Valve, Size 4

$Q_{max} = 30 \text{ l/min}$ ,  $p_{max} = 250 \text{ bar}$

Two-stage, various on-off pressure differentials, with manual adjustment

Series DWPB-4N...



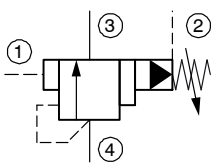
- Compact construction for cavity type AN – 3/4-16 UNF
- External pilot drain
- On-off differential independent of tank line pressure
- Choice of 5 on-off differentials
- 3 pressure ranges available
- With integral pressure-relief function
- Available with hand-knob
- All exposed parts with zinc-nickel plating
- Can be fitted in a line-mounting body

## 1 Description

Series DWPB-4N... cartridges are size 4, two stage, high performance pressure-unloading valves with an 3/4-16 UNF mounting thread. They consist of a spool-type main stage and a leak-free, ball-type pilot stage. Unloading valves are used wherever a pump has to be disconnected from and re-connected to a pressure circuit. For this purpose, either the 'Off' pressure or the 'On' pressure of the cartridge can be set. When the 'Off' pressure is set, the 'On' point will depend on the selected percentage on-off differential, or the other way round. To disconnect the pump, the cartridge responds to rising pressures at ports 4 and 1 by opening the connection from 4 → 3. This connection is then kept open until the selected percentage on-off differential is reached (falling pressure at port 1) and the connection 4 → 3 closes

again (the 'On' point). Because ports 2 and 3 are run back to tank separately, the on-off differential (bar) is unaffected by any back-pressure in port 3. These unloading valves are predominantly used in accumulator-charging circuits, 2-pump systems, and circuits for fast-ad vance → feed changeover, and in such cases the cartridges also provide a pressure-relief function e.g. for protecting the pump (see the application examples). All external parts of the cartridge are zinc-nickel plated to DIN 50 979 and are thus suitable for use in the harshest operating environments. If you intend to manufacture your own cavities or are designing a line-mounting installation, please refer to the section "Related data sheets".

## 2 Symbol



## 3 Technical data

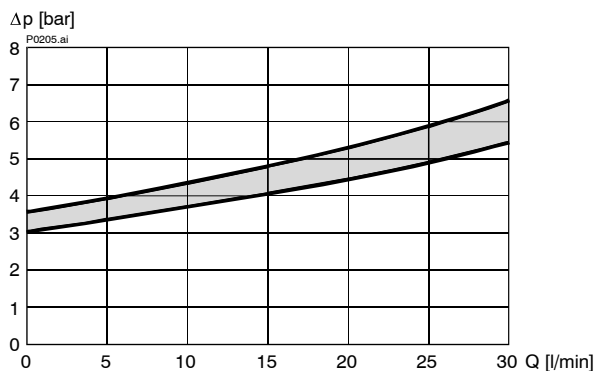
General characteristics	Description, value, unit
Designation	pressure unloading cartridge valve
Design	two-stage, with manual adjustment, various on-off pressure differentials
Mounting method	screw-in cartridge 3/4-16 UNF
Tightening torque	40 Nm ± 10 %
Size	nominal size 4, cavity type AN

General characteristics	Description, value, unit
Weight	0.2 kg
Mounting attitude	unrestricted
Ambient temperature range	-25 °C ... +80 °C

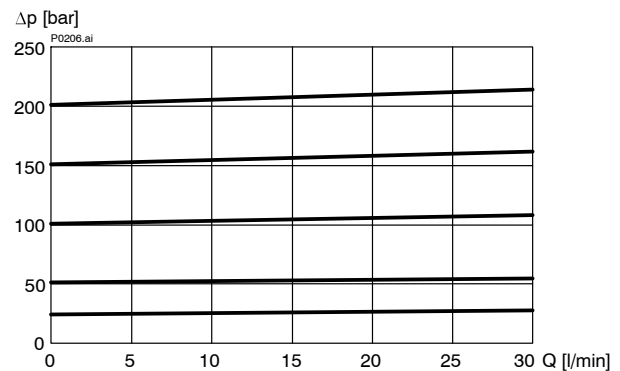
Hydraulic characteristics	Description, value, unit
Maximum operating pressure	250 bar
Maximum flow rate	30 l/min
Nominal pressure ranges	04 = (10...40 bar), 10 = (20...100 bar), 25 = (50...250 bar)
On-off differentials <sup>1)</sup> (on-off differential from 'Off' (unload) pressure)	8 ... 12 % 13 ... 17 % 17 ... 23 % 27 ... 33 % 37 ... 43 %
Flow direction	4 → 3, see symbols
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...650 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

## 4 Performance graphs measured with oil viscosity 33 mm<sup>2</sup>/s (cSt)

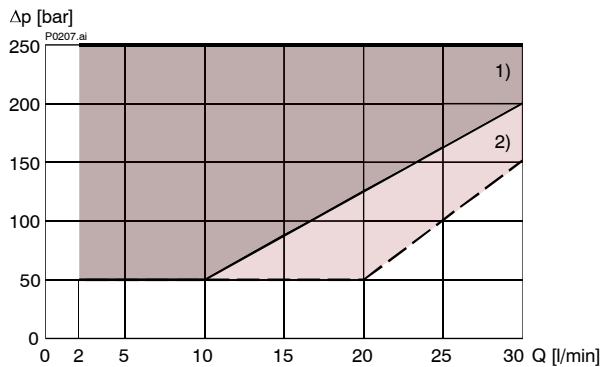
$\Delta p = f(Q)$  Pressure drop - Flow rate characteristic  
(for unloaded bypass, valve open)



$\Delta p = f(Q)$  Pressure drop - Flow rate characteristic  
(pressure-relief function)

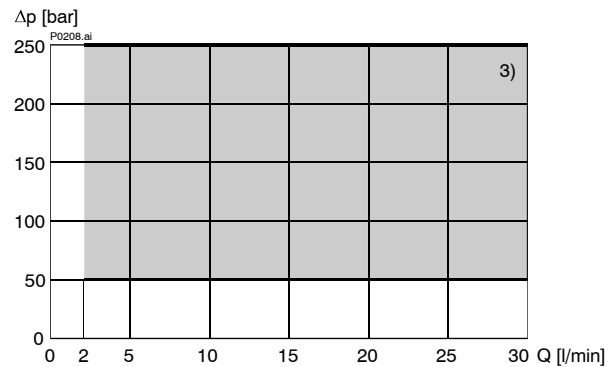


$p = f(Q)$  Performance limits [ 250 bar ]



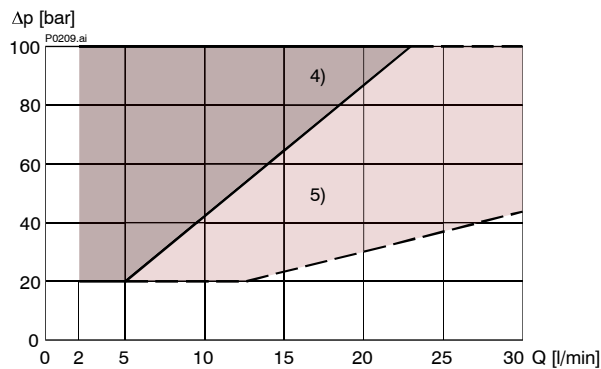
- 1) On-off differential 8...12 %
- 2) On-off differential 13...17 %

$p = f(Q)$  Performance limits [ 250 bar ]



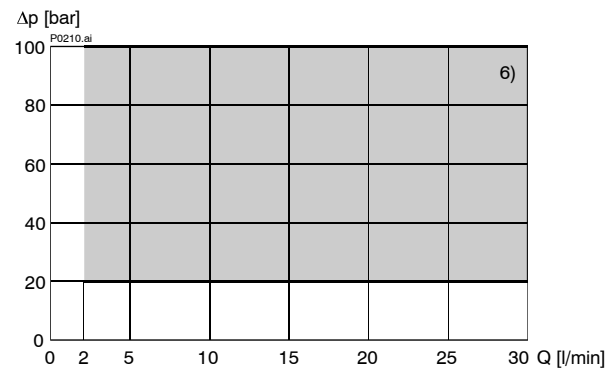
- 3) On-off differential 17...23 %, 27...33 % and 37...43 %

$p = f(Q)$  Performance limits [ 100 bar ]



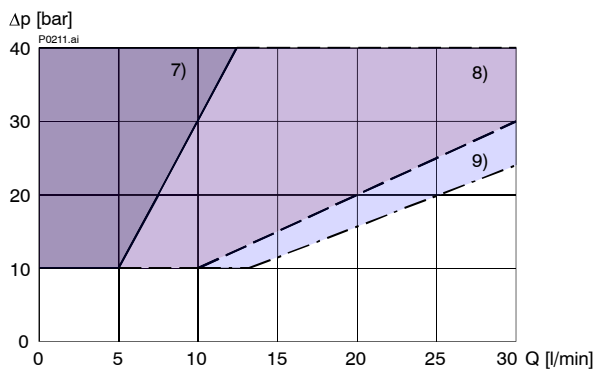
- 4) On-off differential 8...12 %
- 5) On-off differential 13...17 % and 17...23 %

$p = f(Q)$  Performance limits [ 100 bar ]



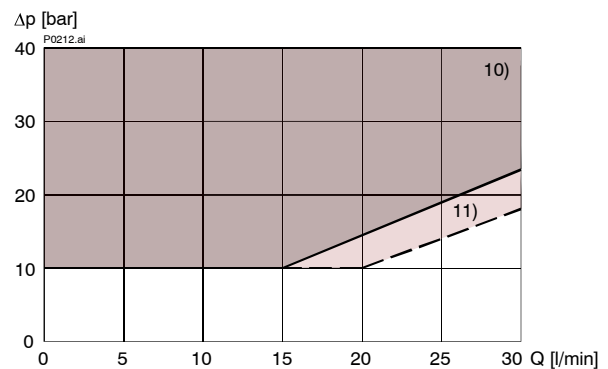
- 6) On-off differential 27...33 % and 37...43 %

$p = f(Q)$  Performance limits [ 40 bar ]



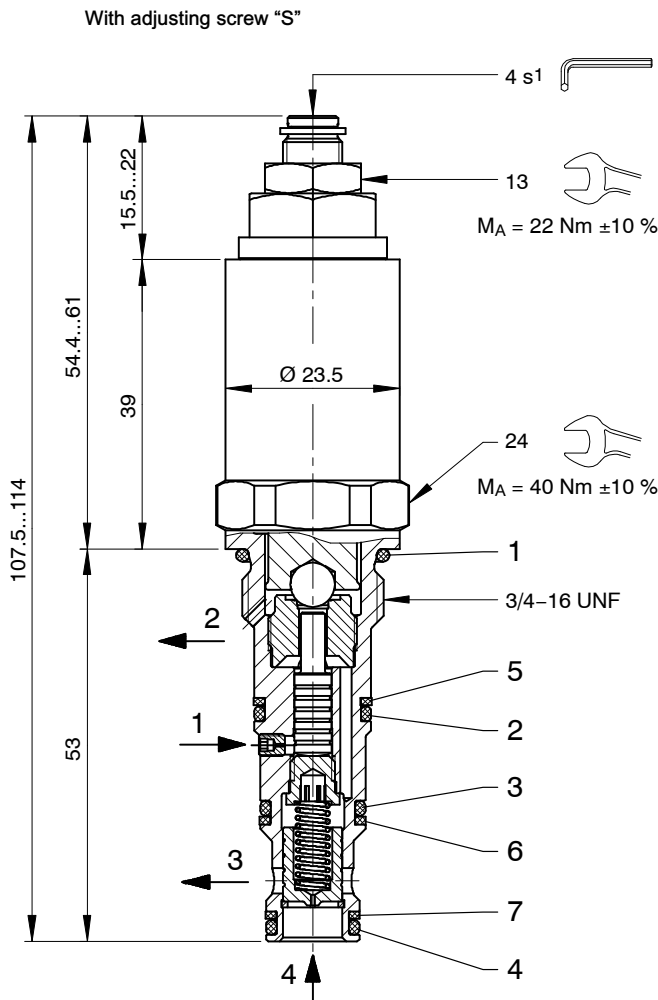
- 7) On-off differential 8...12 %
- 8) On-off differential 13...17 %
- 9) On-off differential 17...23 %

$p = f(Q)$  Performance limits [ 40 bar ]

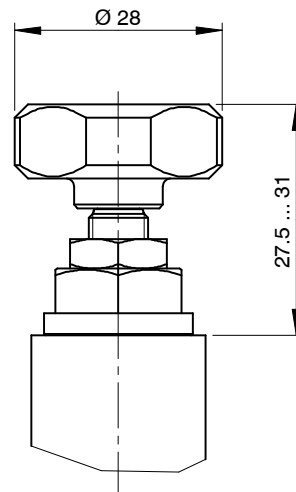


- 10) On-off differential 27...33 %
- 11) On-off differential 37...43 %

## 5 Dimensions & sectional view



With hand-knob adjuster "H"



## 6 Installation information



### IMPORTANT!

When fitting the cartridges, use the specified tightening torque. Set the switching point by means of the adjusting screw (s<sub>1</sub>) or the hand knob. Either set the 'Off' pressure, in which case the 'On' pressure will depend on the selected percentage on-off differential, or the other way around. After you have set the valve, lock the adjusting screw with the lock nut.



### 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.

### Seal kit NBR no. DS-325-N <sup>12)</sup>

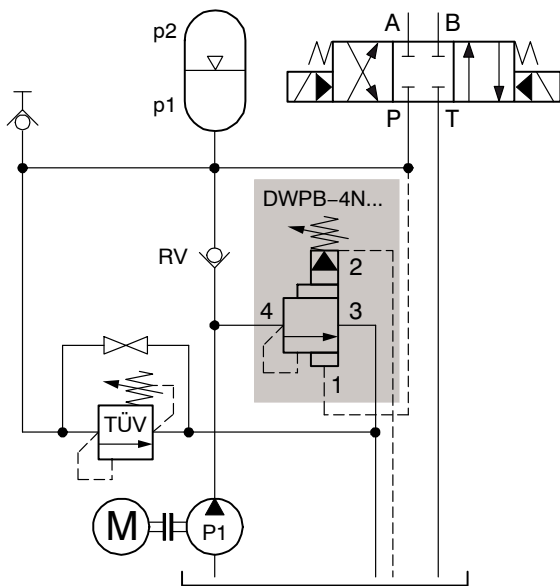
Item	Qty.	Description
1	1	O-ring no. 017 Ø 17,17 x 1,78 N90
2	1	O-ring no. 014 Ø 12,42 x 1,78 N90
3	1	O-ring no. 013 Ø 10,82 x 1,78 N90
4	1	O-ring no. 012 Ø 9,25 x 1,78 N90
5	1	Backup ring Ø 10,70 x 1,45 x 1,00 FI0751
6	1	Backup ring Ø 9,40 x 1,45 x 1,00 FI0751
7	1	Backup ring Ø 7,80 x 1,45 x 1,00 FI0751



### IMPORTANT!

<sup>12)</sup> Seal kit with FKM (Viton) seals, no. DS-325-V

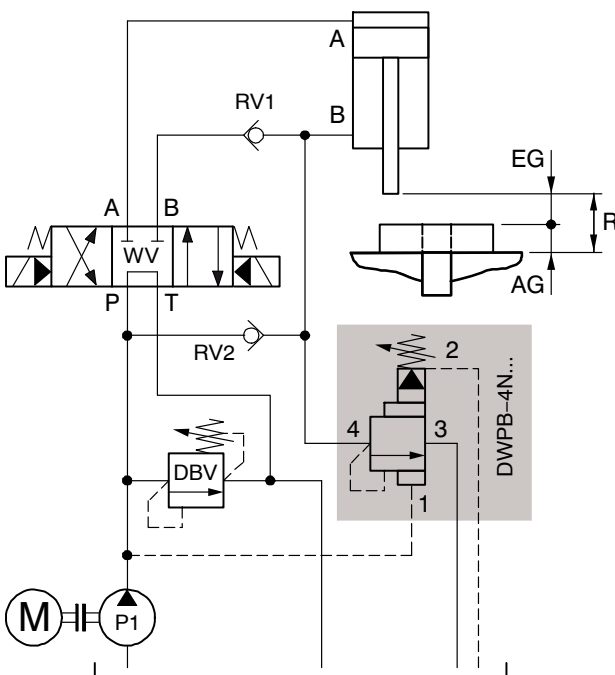
## 7 Application examples



p1 = 'On' pressure  
p2 = 'Off' pressure

### Accumulator-charging circuit

In this application, the DWPB-4N... unloading cartridge performs an automatic accumulator-charging function in response to the pressures at ports 4 and 1. Here, the normal procedure is to use the adjusting screw to set the upper, 'Off' pressure p2, and when this pressure is reached the pump will therefore be switched over to unloaded bypass (connection 4 → 3 open). The 'Off' pressure p2 and the on-off differential (10...40 %) determine the lower, 'On' pressure p1. When demand causes the pressure in the accumulator circuit to fall to p1, the unloading cartridge closes the connection 4 → 3 and the pump supplies oil to the accumulator circuit until the 'Off' pressure p2 is reached and another 'unload' occurs.



EG = fast-advance speed  
AG = feed speed  
R = return stroke

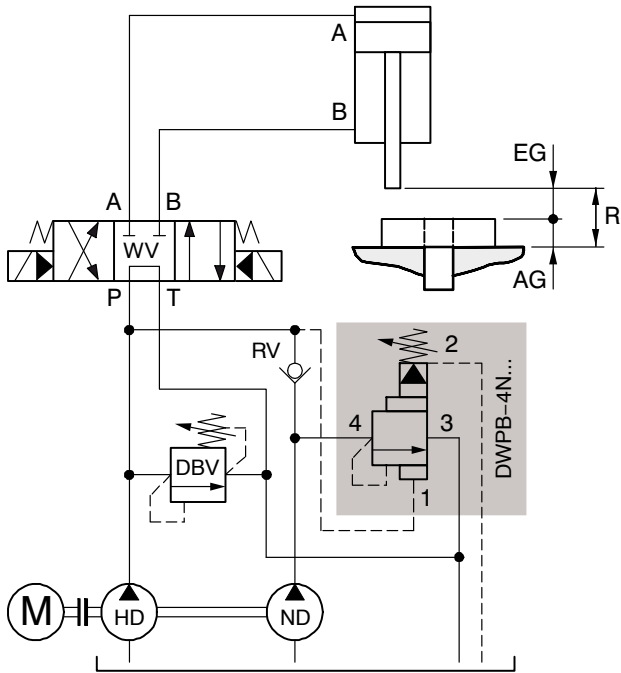
### Pressure-dependent fast-advance → feed changeover with 1 pump

In this application, when the directional valve (WV) is in its parallel-arrows position, the unloading cartridge DWPB-... remains closed until the valve pressure setting is reached, and oil discharging from the rod end of the cylinder is routed to the head end, where it supplements the pump delivery (fast-advance circuit). When the pressure at ports 4 and 1 rises above the setting, the unloading cartridge opens the connection 4 → 3 and the oil from the rod end flows to tank with virtually no back-pressure. This cancels the fast advance, and the cylinder's potential force is automatically increased (feed-speed circuit). The maximum force is limited by the pressure-relief valve (DBV) positioned on the primary side. When the directional valve (WV) is in its crossed-arrows position, the unloading cartridge is closed and the cylinder can be in-stroked again.



### IMPORTANT!

The changeover from fast to slow speed means a reduction in flow rate, which is often accompanied by a sharp drop in system pressure. We therefore recommend the use of unloading cartridges with an on-off differential of 20 %...40 %.



EG = fast-advance speed  
 AG = feed speed  
 R = return stroke

## High-/Low-pressure circuit with two pumps

There are applications with one high-pressure pump and one low-pressure pump where the load pressure is to automatically change the cylinder out-stroke speed from fast to slow. The DWPB-4N... unloading cartridge is used here to switch the low-pressure pump 'Off' i.e. to unloaded bypass. When the cylinder is in-stroked, the low-pressure pump is brought back on-load again, provided that the dynamic load pressure is less than the 'Off' pressure that has been set at the unloading cartridge.



### IMPORTANT!

We strongly recommend that unloading cartridges with an on-off differential of 30 %...40 % be used in all applications of this type.

## 8 Ordering code

Ex. 

D	WP	B	-	4	N	-	4	-	25	-	S	40	-	-	-	2
---	----	---	---	---	---	---	---	---	----	---	---	----	---	---	---	---

- D = pressure-control valve
- WP = two-stage unloading cartridge
- A ... Q = standard model - see relevant data sheets
- Z ... R = special features - please consult BUCHER
- 2 = pressure function 4  
(pilot drain 2 and remote control port 1 external)
- N = cavity type AN
- 4 = nominal size 4
- 25 = pressure range 50...250 bar
- 10 = pressure range 20...100 bar
- 04 = pressure range 10... 40 bar
- S = screw adjuster (standard)
- H = hand-knob adjuster
- On-off differential as % of Off (unload) pressure:
  - 10 = 8...12 %
  - 15 = 13...17 %
  - 20 = 17...23 %
  - 30 = 27...33 %
  - 40 = 37...43 %
- (blank) = NBR (Nitrile) seals (standard)
- V = FKM (Viton) seals  
(special seals - please contact BUCHER)
- 1 ... 9 = design stage (omit when ordering new units)

## 9 Related data sheets

Reference	(Old no.)	Description
400-P-040011	(i-32)	The form-tool hire programme
400-P-040191	(i-33.12)	Cavity type AN
400-P-720121	(G-4.30)	Line-mounting body, type GANA (G 3/8")

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

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

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Classification: 430.305.315.305.305.355