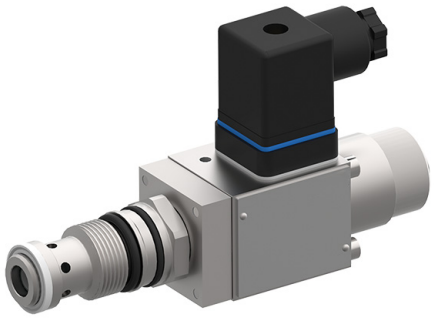
Proportional Throttle Cartridges, Size 10

Q_{max} = 45 l/min, p_{max} = 250 bar
Direct acting, de-energized closed, with port for secondary unloading
Series MDRPA-…

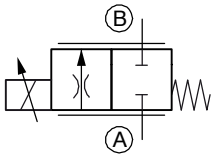


- Sliding-spool design
- Model with port Z for secondary unloading (Load Sensing)
- Compact construction for cavity types DD or DC (with adapter ring C)
- 4 nominal flow ranges
- All exposed parts with zinc-nickel plating
- High pressure wet-armature solenoids
- Various plug-connector systems and voltages are available
- Optionally with auxiliary manual adjustment (via rotary knob)
- Can be fitted in a line-mounting body
- Can be fitted in sandwich bodies

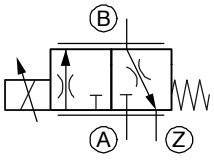
1 Description

Series MDRPA… direct acting proportional throttle valves are size 10, high performance screw-in cartridges with an M24 x 1.5 mounting thread. They are designed on the proven sliding-spool principle and can be fitted in cavity types DD or DC. The rate of flow changes in proportion to the change in the required value (amplifier output current). In the initial position (solenoid de-energized) the connection A → B is closed. The additional port Z is used for secondary unloading from B → Z in applications where an LS line (load sensing) is required. The proportional throttle cartridges are available in 4 nominal flow ranges. The flow ranges Q_N = 12 and 20 l/min can be used with the maximum pressure differential from A → B (Δp 250 bar). Conversely, the flow ranges Q_N = 30 and 40 l/min must only be used in combination with inline or bypass pressure-compensator cartridges (max. permissible Δp from A → B ≤ 14 bar or ≤ 9 bar respectively). As an option, the cartridges can be provided with an auxiliary manual adjustment (rotary knob) for setting the required flow rate mechanically if, for example, a proportional solenoid is defective. In both mobile and industrial applications, these proportional throttle cartridges are the ideal choice for responsive and controlled lifting and lowering movements where large pressure differentials exist. 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. For self-assembly, please refer to the section related data sheets.

2 Symbol



MDRPA-…G-10…



MDRPA-DGE-10…

3 Technical data

General characteristics	Description, value, unit
Designation	proportional throttle cartridge
Design	direct acting, sliding-spool design, model with secondary unloading (B → Z) available
Mounting method	screw-in cartridge M24 x 1.5

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General characteristics	Description, value, unit
Size	nominal size 10, cavity type DD or cavity type DC (option with adapter ring C)
Weight	1.15 kg
Mounting attitude	unrestricted (preferably vertical, coil down)
Ambient temperature range	-25 °C … +50 °C

Hydraulic characteristics		Description, value, unit
Maximum operating pressure		250 bar
Maximum flow rate		45 l/min
Nominal flow rate Q_N	- model “120” - model “200” - model “300” - model “400”	12 l/min 20 l/min 30 l/min [1)] 40 l/min [1)]
Flow direction		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 … +70 °C
Viscosity range		15…380 mm^2/s (cSt), recommended 20...130 mm^2/s (cSt)
Minimum fluid cleanliness Cleanliness class to ISO 4406 : 1999		class 18/16/13

ATTENTION!

1) Must only be used in combination with inline or bypass pressure-compensator cartridges.
30 l/min = ≤ 14 bar permissible Δp from A→ B
40 l/min = ≤ 9 bar permissible Δp from A→ B
See performance graphs and application examples.

Electrical characteristics		Description, value, unit
Supply voltage		12 V DC, 24 V DC
Control current		12 V = 300…1400 mA, 24 V = 150…700 mA
Coil resistance R	- cold value at 20 °C - cold value at -25 °C - max. warm value	12 V = 6.4 Ω / 24 V = 24.5 Ω 12 V = 5.2 Ω / 24 V = 20.0 Ω 12 V = 10.0 Ω / 24 V = 38.4 Ω
Inductance Measured non-operated, at 0.1 mA (rms) / 1 kHz		12 V = 13 mH 24 V = 54 mH
Recommended PWM frequency (dither)		150…200 Hz
Hysteresis with PWM		2…4 % I_N
Reversal error with PWM		2…4 % I_N
Sensitivity with PWM		< 1 % I_N
Reproducibility with PWM		< 2 % p_N
Relative duty cycle		100 %
Nominal power consumption		max. 19 W
Insulation class to VDE 0580		H (180 °C)

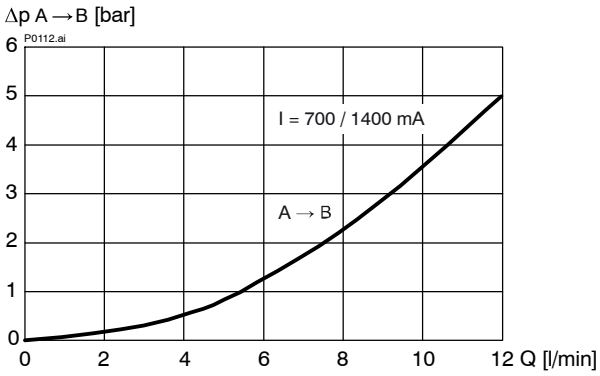
Electrical characteristics	Description, value, unit
Protection class to ISO 20 653 / EN 60 529	IP 65 (with appropriate mating connector and proper fitting and sealing)
Electrical connection	DIN EN 175301-803, 3-pin 2 P+E (standard) for other connectors, see “Ordering code”

4 Performance graphs

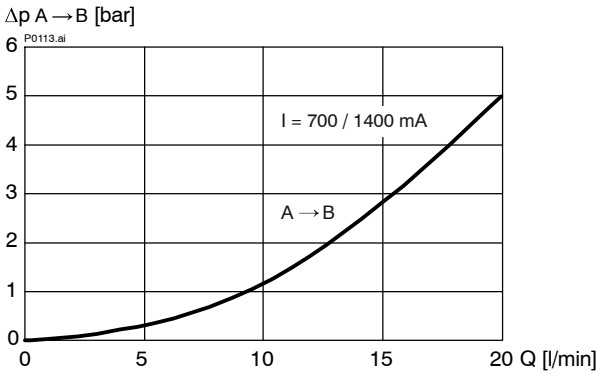
measured with oil viscosity 33 mm^2/s (cSt)

Can be used without pressure compensators - nom. flow ranges Q_N 12 and 20 l/min

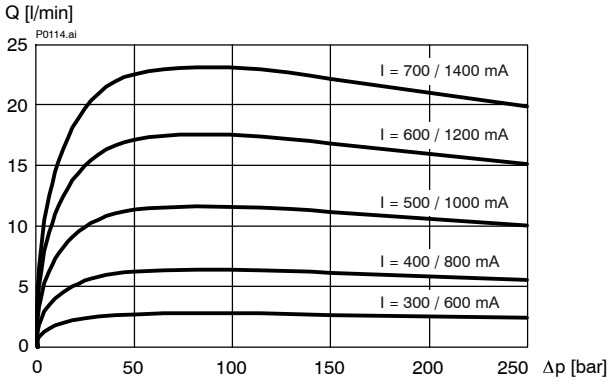
Δp = f (Q) Pressure drop - Flow rate characteristic [„120“]



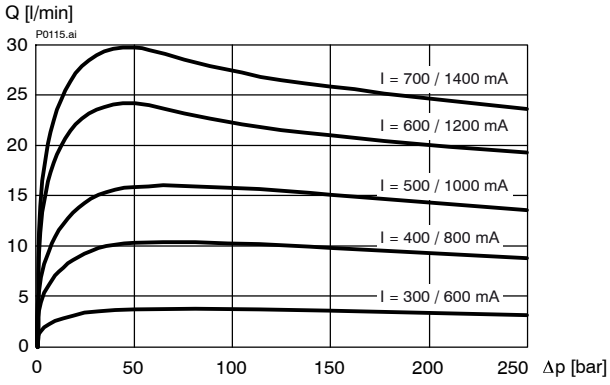
Δp = f (Q) Pressure drop - Flow rate characteristic [„200“]



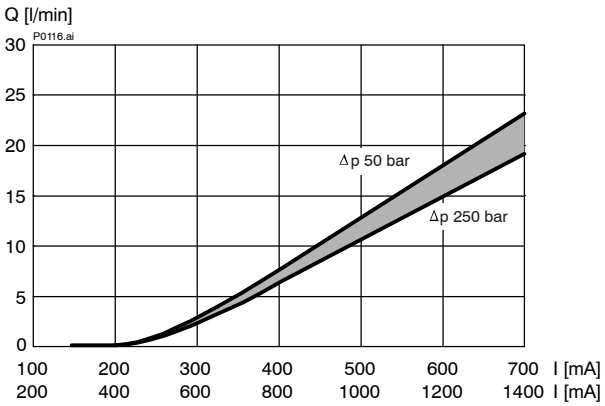
Q = f (Δp; I) Flow rate adjustment characteristic [„120“]



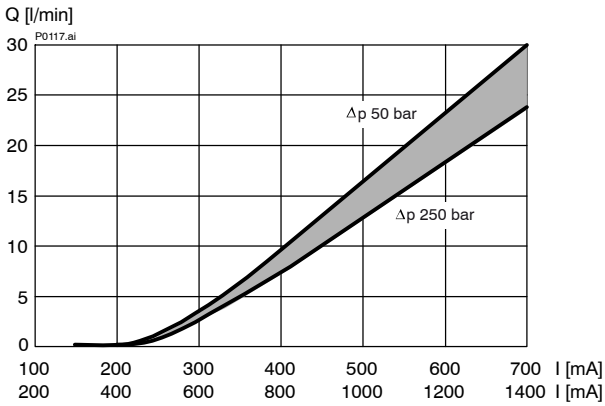
Q = f (Δp; I) Flow rate adjustment characteristic [„200“]



Q = f (I; Δp) Flow rate adjustment characteristic [„120“]



Q = f (I; Δp) Flow rate adjustment characteristic [„200“]



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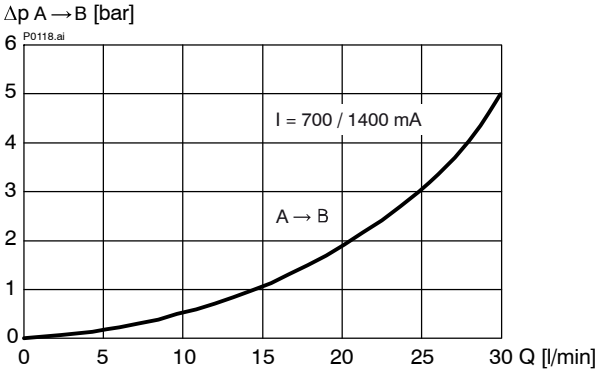
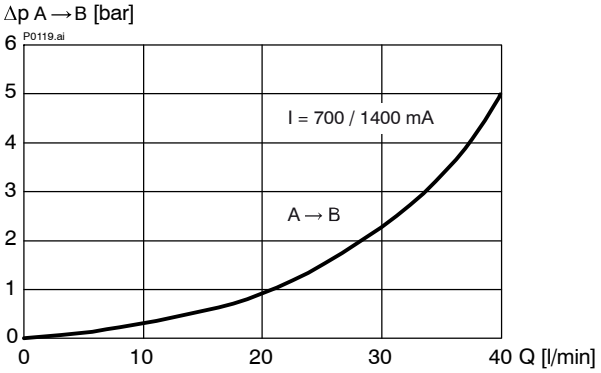
Must be used with pressure compensators - Q_N 30 and 40 l/min

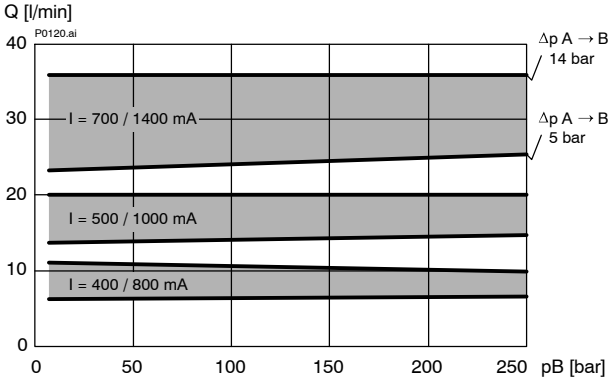
Δp = f (Q) Pressure drop - Flow rate characteristic [„300“]



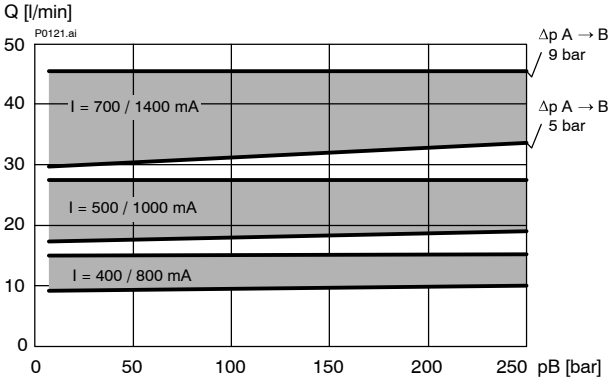
Δp = f (Q) Pressure drop - Flow rate characteristic [„400“]



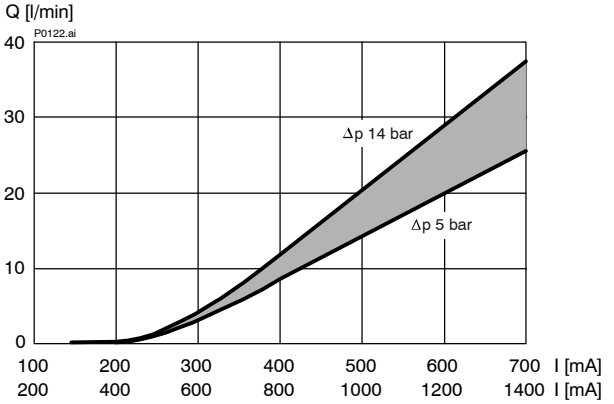
Q = f (Δp; I) Flow rate adjustment characteristic [„300“]



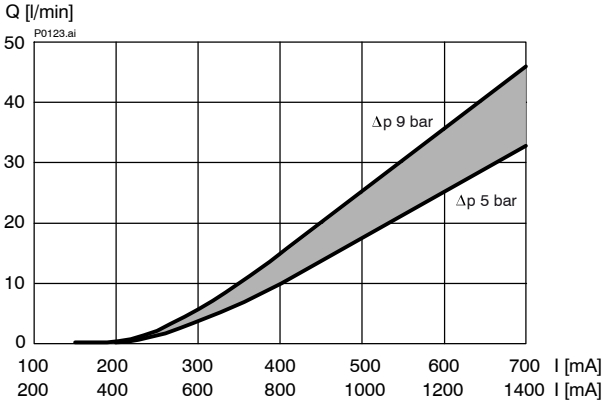
Q = f (Δp; I) Flow rate adjustment characteristic [„400“]



Q = f (I; Δp) Flow rate adjustment characteristic [„300“]



Q = f (I; Δp) Flow rate adjustment characteristic [„400“]

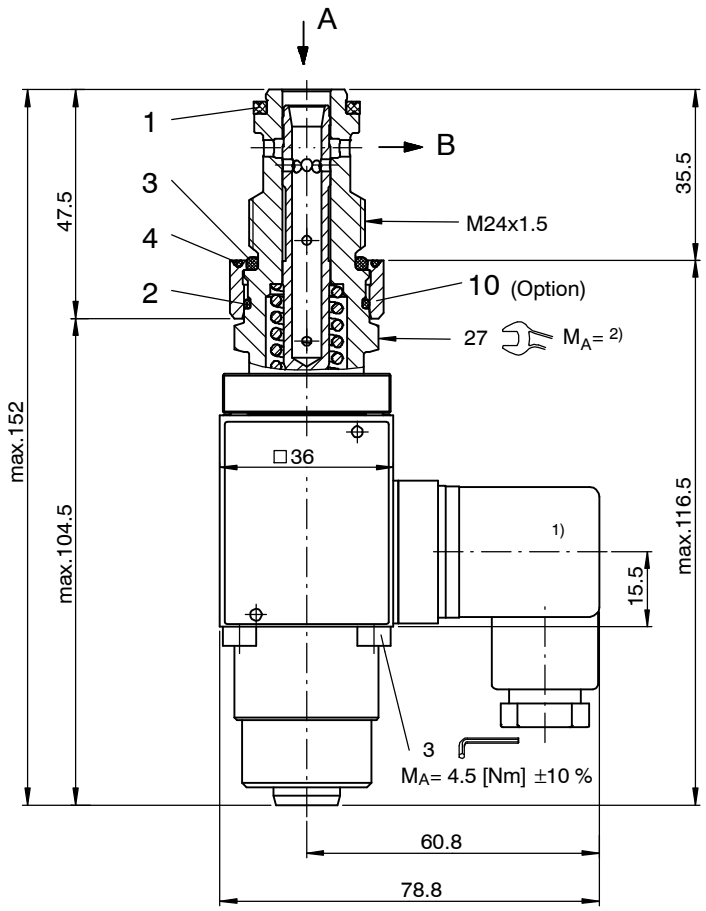


ATTENTION!
Must only be used in combination with inline or by-pass pressure-compensator cartridges.
30 l/min = ≤ 14 bar permissible Δp from A → B
40 l/min = ≤ 9 bar permissible Δp from A → B
See performance graphs and application examples.

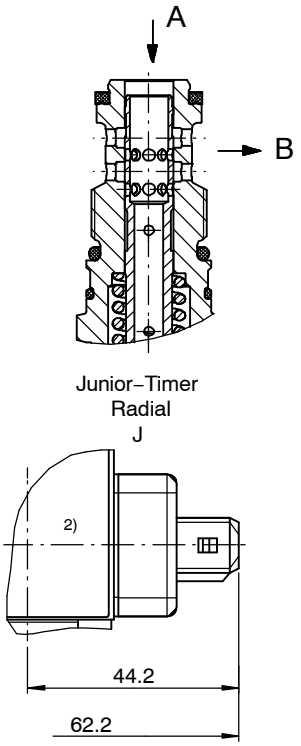
5 Dimensions & sectional view

5.1 Model without secondary unloading

Nominal flow ranges Q_N 12 and 20 l/min



Nominal flow ranges Q_N 30 and 40 l/min



Tightening torque M_A 2) ± 10 %

Cavity type	DD	DC
Can be fitted in steel	65 [Nm]	100 [Nm]
Can be fitted in aluminium	50 [Nm]	100 [Nm]

NBR seal kit no. DS-265-N 3)

Item	Qty.	Description			
1	1	O-ring		∅ 22.10 / 16.50 x 2.50	
2	1	O-ring	no. 020	∅ 21,95 x 1,78	N90
3	1	O-ring	no. 117	∅ 20,29 x 2,62	N90
4	1	O-ring		∅ 27,00 x 1,50	N70

IMPORTANT!

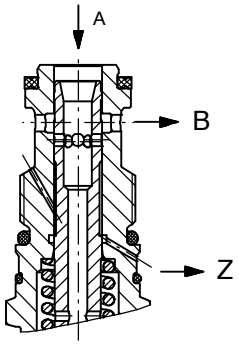
3) Seal kit with FKM (Viton) seals, no. DS-265-V

Option with adapter ring C

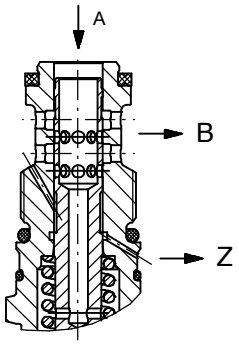
Item	Qty.	Description	
10	1	Adapter ring C	∅ 32.00 x 12.00

5.2 With secondary unloading (port Z)

Q_N 12 and 20 l/min



Q_N 30 and 40 l/min



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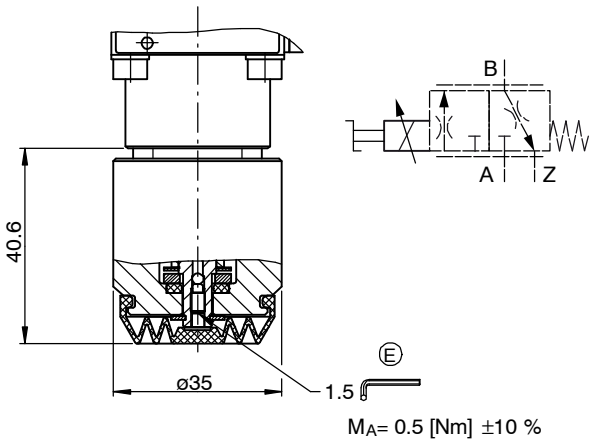
6 Auxiliary manual adjustment (S508B - on request)

As an option, series MDRPA... proportional throttle cartridges can be provided with an auxiliary manual adjustment, **type S508B**, for setting the required flow rate mechanically if, for example, a proportional solenoid is defective. The auxiliary manual adjuster also incorporates an air-bleed screw (item E), which allows air to be bled from the cartridges in special applications.

- the flow rate can be set mechanically
- manual override if power supply or solenoid fail
- protected against water splash/spray



7 Installation information

IMPORTANT!
When fitting the cartridges, note the mounting attitude (preferably vertical, with coil down → automatic air bleed) and 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.

7.1 Orientation of proportional solenoid

ATTENTION!
There must always **be a uniform gap all the way round** between the mounting flange and the proportional solenoid.

H Solenoid retaining screws (4 pcs.)

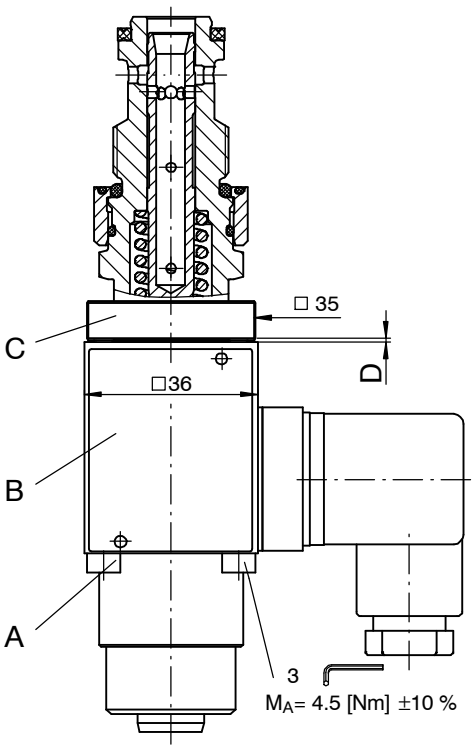
I Proportional solenoid □ 36 mm

J Mounting flange □ 35 mm

K **Existing gap between solenoid and flange**

After the throttle cartridge has been tightened in its cavity, the proportional solenoid's plug connector might not be facing the required direction. Use the following procedure to realign the solenoid to the required position:

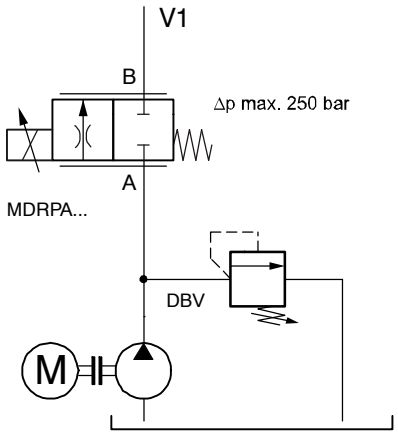
1. Loose the M4 solenoid retaining screws a little (3 A/F).
2. Align the solenoid so that the plug connector is facing the required direction.
3. Tighten the proportional solenoid to the mounting flange with the M4 retaining screws (Ma 4.5 Nm ±10 %).
4. After re-assembly, check that there is **a uniform gap all the way round between** the mounting flange and the proportional solenoid.



8 Application examples

8.1 Used without pressure compensator

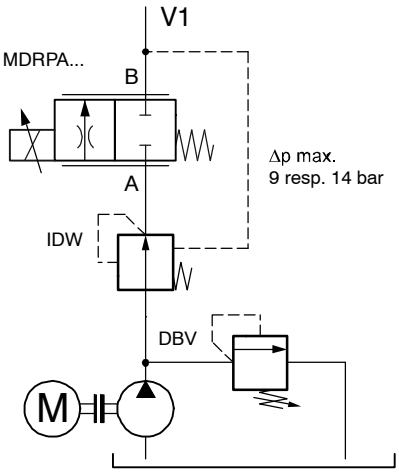
Proportional throttle cartridges with Q_N = 12 and 20 l/min can be used in applications in which the maximum Δp from A → B (250 bar) may occur.



8.2 Used with secondary unloading

Proportional throttle cartridges with Q_N = 30 and 40 l/min must only be used in combination with pressure-compensator cartridges. A bypass compensator can also be used instead of an inline compensator.

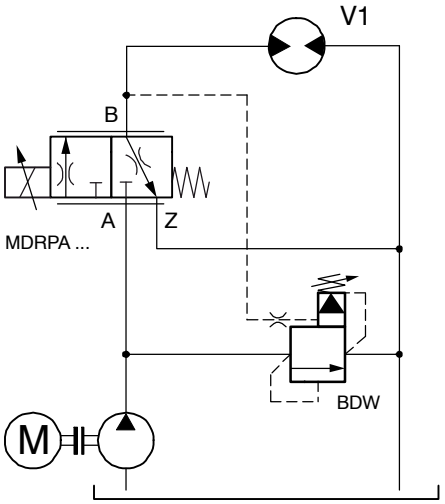
Δp A → B: ≤ 14 bar for Q_N 30 l/min
≤ 9 bar for Q_N 40 l/min



8.3 Used with pressure compensator

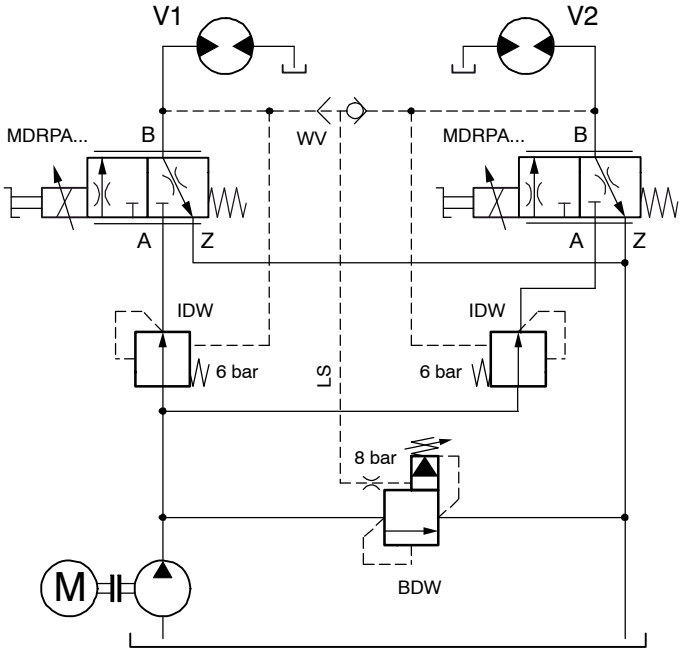
Typical use of a proportional throttle cartridge with additional port Z for secondary unloading. This circuit includes the following functions:

- MDRPA… de-energized = unpressurised flow through bypass compensator (BDW)
- MDRPA… energized = stepless and load-independent speed control at V1
- MDRPA… energized = LS operation with fixed-displacement pump



8.4 Classic combinations

Typical application of proportional throttle cartridges (Q_N = 30 and 40 l/min) for parallel operation of two actuators (V1, V2) with different load pressures. To avoid exceeding the maximum permissible Δp from A → B, inline pressure-compensator cartridges (IDW) are positioned before the throttles. When an actuator is not being used, its LS line is unloaded through the B → Z connection. When both actuators are unloaded, unpressurised flow circulates through the bypass pressure-compensator cartridge (BDW).



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9 Ordering code

Ex. MD R P A - D G _ - 10 - 200 _ - 5 24 D _ _

M D	=	throttle valve, direct acting
R	=	proportional-solenoid operated
P	=	cartridge design
A ... Q	=	standard model - see relevant data sheets
Z ... R	=	special features - please consult BUCHER
D	=	cavity type DD (**standard**)
C	=	cavity type DC (option with adapter ring C)
G	=	de-energized closed
E	=	with port Z for secondary unloading *(in cavity type "DD" only)*
10	=	nominal size 10 mm
120	=	nominal flow rate 12 l/min
200	=	nominal flow rate 20 l/min
300	=	nominal flow rate 30 l/min (max. Δp 14 bar)
400	=	nominal flow rate 40 l/min (max. Δp 9 bar)
(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. **24** (24 V)
D	=	current DC
(blank)	=	DIN EN 175301-803 connection with mating plug (**standard, IP 65**)
M100	=	DIN EN 175301-803 connection without mating plug
J	=	Junior Timer radial plug connection without mating plug (protection class IP 65)
S508B	=	as option: auxiliary manual adjustment (via rotary knob) - mechanical air bleed

10 Related data sheets

Reference	(Old no.)	Description
400-P-040011	(i-32)	The form-tool hire programme
400-P-060121	(i-45.2)	Cavity type DD
400-P-060111	(i-45.1)	Cavity type DC (option with adapter ring C)
400-P-330101	(D-28.12)	Bypass compensator cartridge, size 10, direct acting, type DWDPA-2D…
400-P-330201	(D-28.22)	Bypass compensator cartridge, size 10, two-stage, type DWVPA/Z-2D…
400-P-330501	(D-28.55)	Inline compensator cartridge, size 10, direct acting, type DWDPA-5D…
400-P-740111	(G-24.21)	Line- and manifold-mounting body, type DD-12 (G 1/2")
400-P-740101	(G-24.20)	Line- and manifold-mounting body, type DC-12 (G 1/2")

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Classification: 430.310.325.305.320.310