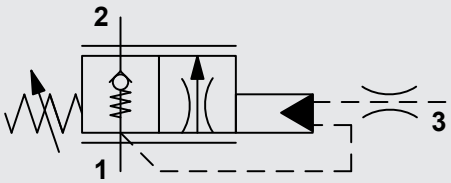
Counterbalance Valve Poppet Type, Direct-Acting Metric Cartridge – 420 bar

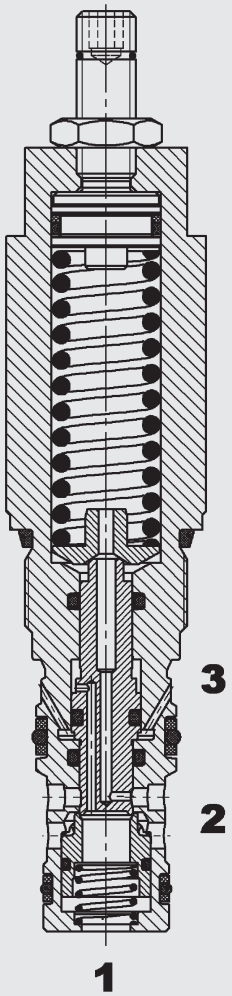
ISO

RSM10121-01



Up to 60 l/min
Up to 420 bar

FUNCTION



The counterbalance valve is a direct-acting poppet valve. Its function is to control the speed of a load according to the inlet flow. It also prevents the load from overrunning in case of pulling loads and ensures smooth action of them. In addition it fulfils the function of a hose-break valve.

Detailed function principle see page 3

FEATURES

- Used in lift-lowering applications
- Actuator is held in position leakage-free
- Prevents overrunning of pulling loads
- Acts as a hose-break valve to hold load if there is a leak in the control or feed line
- Restricts the load pressure to preset value (overload protection)
- Speed of actuator controlled in accordance with the inlet flow
- Low pressure drop due to CFD optimized flow path
- Option: Model with load-independent control function (version 0)
- Option: Model with control pressure independent of tank pressure (Version E, can be vented to atmosphere in cavity 10121 or separately to tank in cavity 10122)
- Option: Different versions of precision control of the lowering function
- Hardened and ground valve components to ensure minimal wear and extend service life
- Exposed surfaces zinc-nickel plated for increased corrosion protection (1.000 h Salt spray test)

SPECIFICATIONS*

Operating pressure:	max. 420 bar	
Nominal flow:	max. 60 l/min	
Cracking pressure of check valve:	2 bar	
Pressure setting range:	120 to 240 bar 240 to 420 bar 27 to 60 bar (Version 0 only) 27 to 110 bar (Version 0 only)	
Load pressure (port 1):	p = 0 - 350 bar (Max. 80 % of pressure setting)	
Pump / Tank pressure (port 2):	p = 0 - 350 bar Note: Pressures at port 2 have effect on the control and setting pressure. Solution: Vented version (E) of the valve	
Control pressure (port 3):	p = 0 - 420 bar	
Tank pressure (port 4):	p = 0 - 30 bar Note: This port is only required if a vented version (E) of the valve is used and the trapped oil, which collects in the spring chamber, is to be drained separately via a fourth port to the tank (cavity 10122).	
Pressure drop from port 2 to 1:	approx. 14 bar at 60 l/min (check function)	
Pressure drop from port 1 to 2:	see curve (dependent on fine control sleeve)	
Pilot ratio φ:	1:1, 2:1, 3:1, 5:1, 0 (0 = without pressure relief function)	
Leakage:	leak-free max. 5 drops/min (0,25 cm³/min) at max pressure	
Media operating temperature range:	min. -30 °C to max. +100 °C	
Ambient temperature range:	min. -30 °C to max. +100 °C	
Operating fluid:	Hydraulic oil to DIN 51524 Part 1, 2 and 3	
Viscosity range:	min. 2.8 mm²/s to max. 380 mm²/s	
Filtration:	Class 21/19/16 according to ISO 4406 or cleaner	
$MTTF_d$:	150 years	
Installation:	No orientation restrictions	
Materials:	Valve body:	Steel
	Poppet:	hardened and ground steel
	Seals:	NBR (standard) FKM (optional, media temperature range -20 °C to +120 °C)
	Back-up rings:	PTFE
Cavity:	10121 and 10122	
Weight:	0.275 kg	

* see "Conditions and instructions for valves" in brochure 53.000

MODEL CODE

RSM 10121 E - 01 - C - N - 3 - M 240 V 210

Basic model
Counterbalance valve, Metric

Cavity

Additional code
None = without venting (standard)
E = Version E - control pressure independent of tank pressure

Type
01 = standard

Body and ports*
C = cartridge only
Versions with bodies on request

Seals
N = NBR (standard)
V = FKM

Pilot ratio φ
1 = 1 : 1
2 = 2 : 1
3 = 3 : 1
5 = 5 : 1
0 = Version 0 – see function principle control independent of load pressure

Resolution (precision control due to sleeve)
(Q from 1 to 2 at max. control and Δp = 30 bar)
H = 20 l/min
M = 40 l/min
L = 60 l/min

Pressure range
with pilot ratio φ = 1, 2, 3 and 5
240 = 120 to 240 bar
420 = 240 to 420 bar
with pilot ratio φ = 0
60 = 27 to 60 bar
110 = 27 to 110 bar

Type of adjustment
V = allen head
F = fixed setting, non-adjustable

Pressure setting (factory preset)
Pressure in bar

Standard models

Model code	Part No.
RSM10121-01-C-N-3-M240F	3487868
RSM10121-01-C-N-3-M240V	3435438
RSM10121E-01-C-N-3-M240V	3487816

Other models on request

*Standard in-line bodies

see table on page 4

Seal kits

Code	Material	Part No.
SEAL KIT RSM10121...NBR	NBR	3638115
SEAL KIT RSM10121...FKM	FKM	3638116

CALCULATION OF CONTROL PRESSURE:

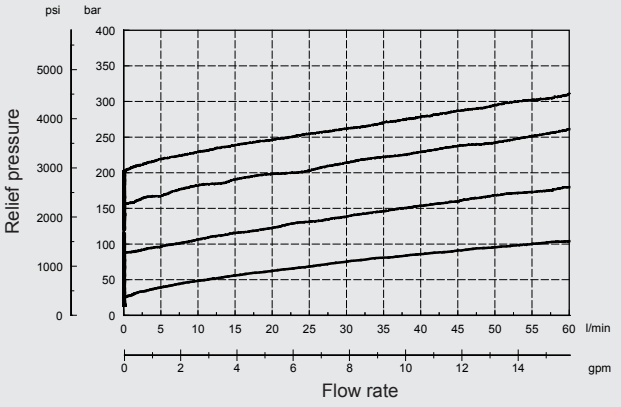
standard: $p_{ctrl} = \frac{p_e - p_1}{\varphi} + Kf \times p_2$ **vented:** $p_{ctrl} = \frac{p_e - p_1}{\varphi}$

p_e = Setting pressure
p_{ctrl} = Control pressure
p_1 = Load pressure
p_2 = Tank pressure
φ = Pilot ratio

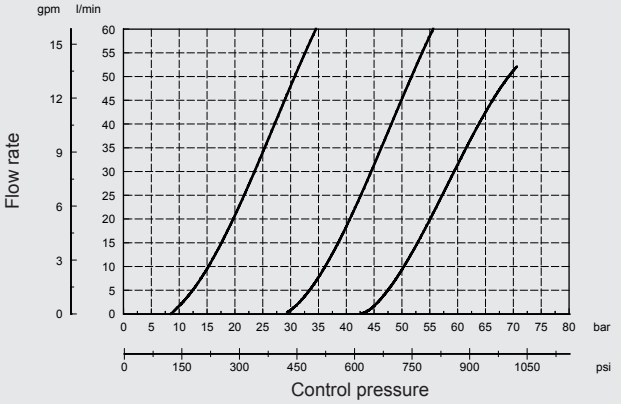
Kf (φ = 1) = 2
Kf (φ = 2) = 1.5
Kf (φ = 3) = 1.3
Kf (φ = 5) = 1.2
$p_e \geq 1.2 \times p_1$

PERFORMANCE

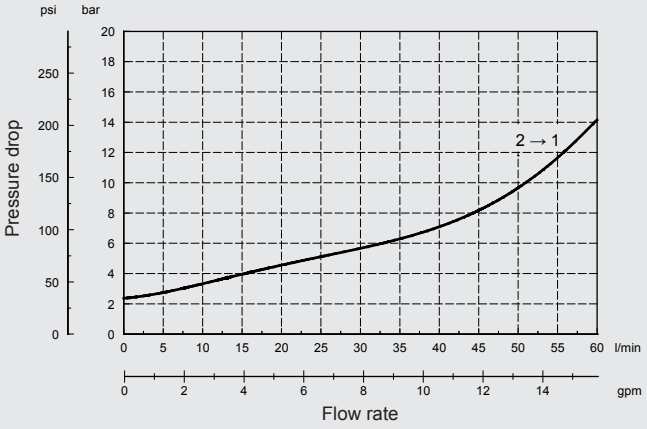
Measured at ν = 36 mm²/s, T_{oil} = 46 °C, with control sleeve M, φ = 3:1
Overload curve: Pressure at port 1 against flow rate from port 1 to 2, p_{ctrl} = 0 bar
Pressure relief function protects the system in the event of overload on the actuator.



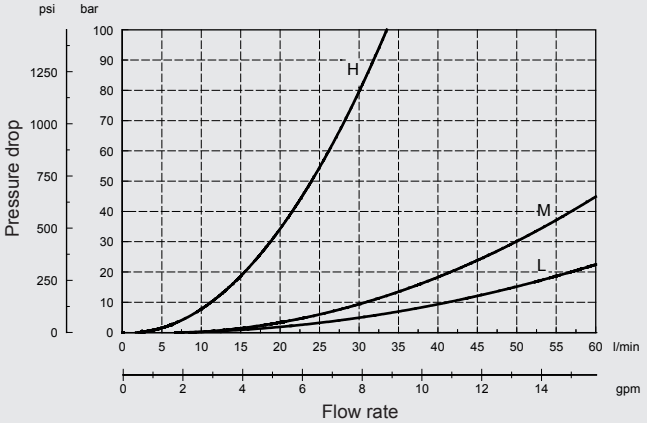
Control curve: Flow rate from port 1 to 2 against control pressure at port 3
The control function shows the lowering speed against the control pressure.
Setting pressure: 200 bar and Load pressure: 25, 50, 85 % of set pressure



Throttle curve: Δp-Q from port 2→1
The throttle curve shows the back-pressure against flow rate from port 2→1.



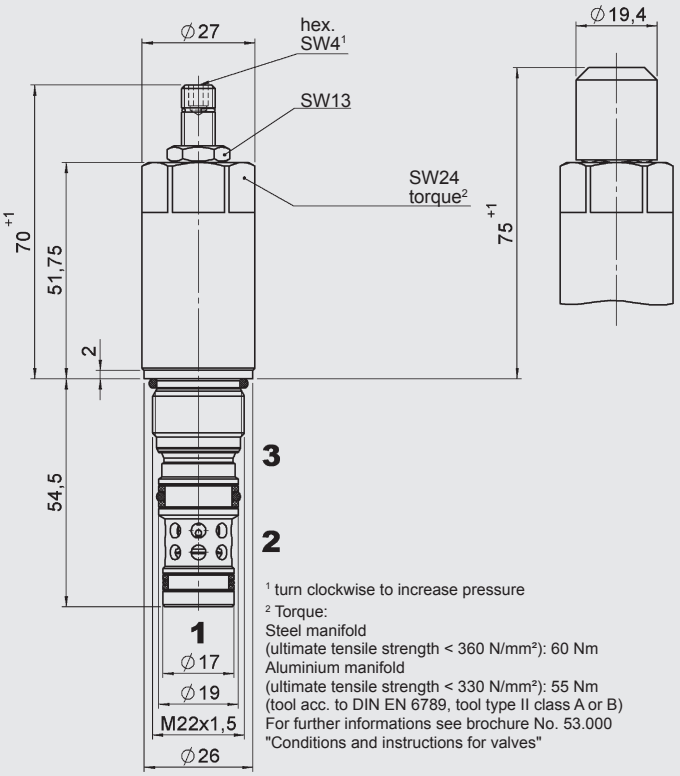
Throttle curve: Δp-Q from port 1→2 maximum control
The throttle curve shows the back-pressure against flow rate from port 1→2.
(for different sleeves)



Important!
The differential pressure from port 1→2 on a fully controlled valve is dependent on the resolution of the fine control sleeve.
When the resolution of the pilot function is higher, the back pressure increases.

DIMENSIONS

RSM10121-01-...V **RSM10121-01-...F**



[1] turn clockwise to increase pressure

[2] Torque:
Steel manifold
(ultimate tensile strength < 360 N/mm²): 60 Nm
Aluminium manifold
(ultimate tensile strength < 330 N/mm²): 55 Nm
(tool acc. to DIN EN 6789, tool type II class A or B)
For further informations see brochure No. 53.000
"Conditions and instructions for valves"

millimeter
subject to technical modifications

CONTINUATION OF FUNCTION PRINCIPLE

With the counterbalance valve, to raise a load, flow is permitted from pump port 2 to consumer port 1 via the built-in check valve.

To hold the load, the check valve piston is pressed against its seat by the load pressure at port 1 and seals leakage-free (control port 3 must be released of pressure).

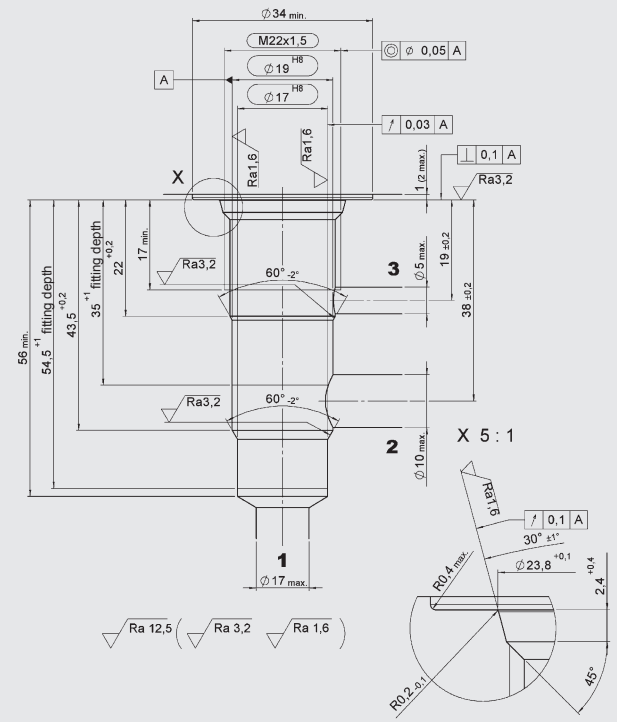
To lower the load, a combination of load- and control pressure is applied to control port 3 which opens the valve. The higher the load pressure, the lower the necessary control pressure. Flow is now permitted from load port 1 to port 2. A speeding-ahead of the load is prevented because the flow rate is controlled at the metering edge of the control piston according to the inlet pressure of the load (control port 3 must be connected directly to the cylinder).

An additional restriction of the load pressure is provided in that the actuator pressure (load pressure) at port 1 acts on a control piston within the valve and therefore against the force of the adjustment spring. When the spring tension is exceeded in case of overload, the control piston moves away from the check valve piston, and this opens the flow path from port 1 to 2 – the resulting flow limits the load pressure to the pre-set value. On a valve without venting the pressure on port 2 is additive to the pre-set value.

Version 0 only:
Pilot pressure on port 3 directly controls flow from port 1 to 2. Flow begins when pilot pressure on port 3 exceeds setting pressure. No pressure relief function when pressure on port 1 exceeds setting pressure. Free reverse flow by check valve from port 2 to 1.

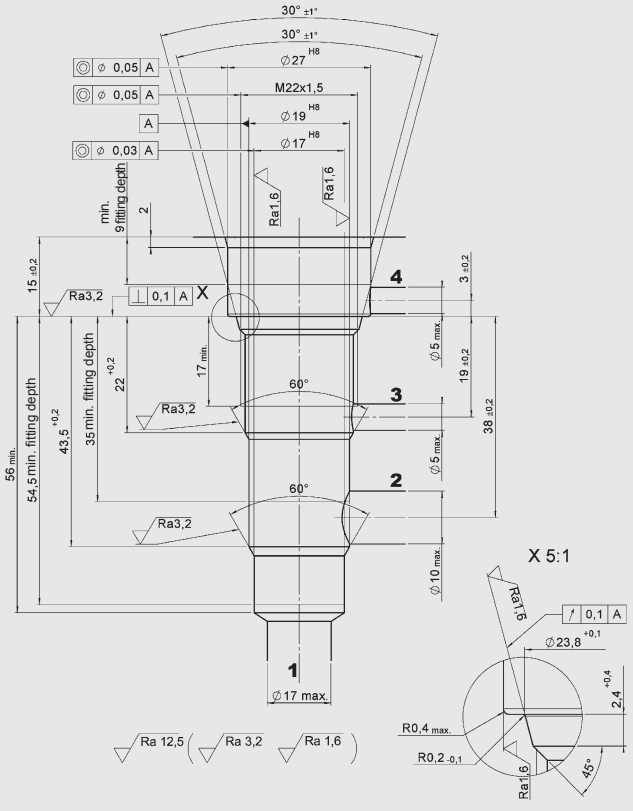
CAVITY

10121



Version E

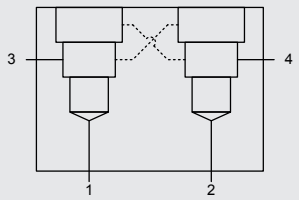
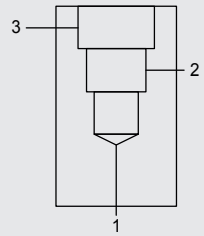
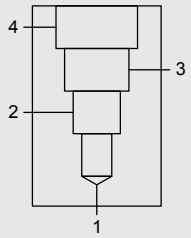
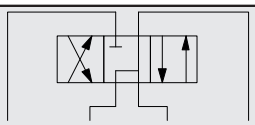
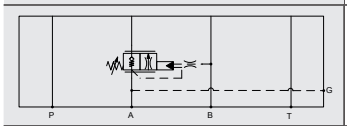
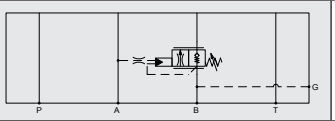
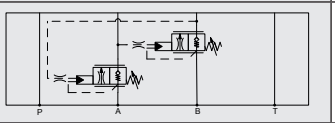
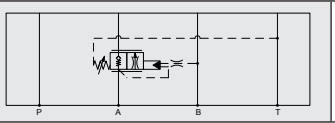
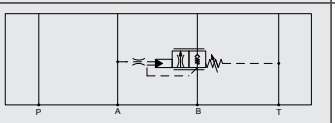
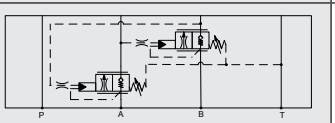
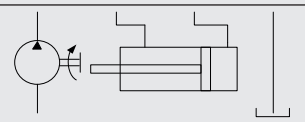
10122



Form tools (10121)

Tool	Part No.
Countersink MK4	163910
Reamer MK2	163911

millimeter
subject to technical modifications

Housing			Ports				Material	
Symbol	Code	Part No.	1	2	3	4	Aluminium max. pressure	Steel max. pressure
	H-S10121-AB4	3794286	G 1/2	G 1/2	G 1/2	G 1/2	210 bar	–
	H-S10121-SB4	3736140	G 1/2	G 1/2	G 1/2	G 1/2	–	Port 1, 2: 420 bar Port 3, 4: 350 bar
	H-R10121-SM22/14	395237	M22x1.5	M22x1.5	M14x1.5		–	Port 1, 2: 420 bar Port 3: 350 bar
	H-R10121-SB4/2	395236	G 1/2	G 1/2	G 1/4		–	Port 1, 2: 420 bar Port 3: 350 bar
	H-R10122-AB4/2	3794247	G 1/2	G 1/2	G 1/4	G 1/4	210 bar	–
	H-R10122-SB4/2	3736212	G 1/2	G 1/2	G 1/4	G 1/4		Port 1, 2: 420 bar Port 3, 4: 350 bar
								
	H-ZA/B10121-0105-SC3	3795962	ISO 4401-03				–	350 bar
	H-ZB/A10121-0105-SC3	3795964	ISO 4401-03				–	350 bar
	H-ZAB10121-0105-SC3	3795966	ISO 4401-03				–	350 bar
	H-ZA/BT10122-0105-SC3	3795969	ISO 4401-03				–	350 bar
	H-ZB/AT10122-0105-SC3	3795971	ISO 4401-03				–	350 bar
	H-ZAB/T10122-0105-SC3	3795973	ISO 4401-03				–	350 bar
								

Note
The information in this brochure relates to the operating conditions and applications described. For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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