

## Cartridge Valves Technical Information

### Counterbalance valves

#### Quick reference

Hydraulic Vent	Model No.	Cavity	Description	Flow*	Pressure	Page
	CP448-1	CP08-3L	Counterbalance Valve, Hydraulic Vent	20 l/min [5 US gal/min]	350 bar [5000 psi]	09.6
	CB10-HV	SDC10-3S		60 l/min [16 US gal/min]	350 bar [5000 psi]	09.7
	CP441-1	CP12-3S		115 l/min [30 US gal/min]	350 bar [5000 psi]	09.8
	CP443-1	CP20-3S		190 l/min [50 US gal/min]	350 bar [5000 psi]	09.9

Atmospheric Vent	Model No.	Cavity	Description	Flow*	Pressure	Page
	CB10-AV	SDC10-3S	Counterbalance Valve, Atmospheric Vent	60 l/min [16 US gal/min]	350 bar [5000 psi]	09.10

Atmospheric Vent	Model No.	Cavity	Description	Flow*	Pressure	Page
	VCB 12-CN	NCS12/3	Counterbalance Valve, Atmospheric Vent	140 l/min [37 US gal/min]	350 bar [5000 psi]	09.11

\* Flow ratings are based on a pressure drop of 7 bar [100 psi] unless otherwise noted. They are for comparison purposes only.

## Cartridge Valves Technical Information

### Counterbalance valves

### Quick reference

Dual Counterbalance	Model No.	Cavity	Description	Flow*	Pressure	Page
	1EEC11-1	None	Dual-Counterbalance Valve, with Makeup Checks, Catalog HIC	57 l/min [15 US gal/min]	345 bar [5000 psi]	09.12

Dual Counterbalance	Model No.	Cavity	Description	Flow*	Pressure	Page
	CP448-2	None	Counterbalance Valve, Hydraulic Vent, Catalog HIC	20 l/min [5 US gal/min]	350 bar [5000 psi]	09.13
	DCB10-HV	None		60 l/min [16 US gal/min]	350 bar [5075 psi]	09.14
	CP441-2	None		115 l/min [30 US gal/min]	350 bar [5000 psi]	09.15

Dual Counterbalance	Model No.	Cavity	Description	Flow*	Pressure	Page
	DCB10-AV	None	Counterbalance Valve, Atmospheric Vent, Catalog HIC	60 l/min [16 US gal/min]	350 bar [5075 psi]	09.16

\* Flow ratings are based on a pressure drop of 7 bar [100 psi] unless otherwise noted. They are for comparison purposes only.

**MOTION CONTROL VALVES**

Motion control valves, also referred to as load holding valves, are used to control the motion of a load in the following ways:

- Prevent a load from dropping in case of hose or tube failure.
- Prevent a load from drifting caused by directional control valve spool leakage.
- Provide smooth, modulated motion when the load is in a lowering or run-away mode.
- Provide smooth, modulated motion when the directional control valve is suddenly closed.

There are two basic types of motion control valves:

- Pilot-operated, or pilot-to-open check valves will satisfy the first two of the above requirements.
- Counterbalance valves will satisfy all four of the above requirements.

**Counterbalance valves**


F102 005

**COUNTERBALANCE VALVES**

A counterbalance valve provides several functions:

- Free flow in one direction.
- Leak-free load holding.
- Protection against hydraulic line failure.
- Protection against pressure shocks caused by external forces or overrunning loads
- Cavitation-free motion control to match speed to pump flow when a load could cause loss of control of an actuator (cylinder or motor).
- Smooth, modulated motion control when the directional valve is suddenly closed.

## Cartridge Valves Technical Information

### Counterbalance valves

#### Application notes

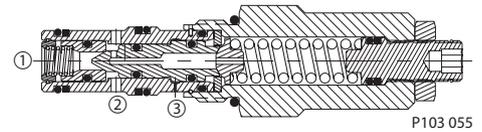
#### COUNTERBALANCE VALVES (continued)

Counterbalance valves will positively hold a pressurized load and will control the motion of the load based on application of a pressure signal to the pilot port. Counterbalance valves are available as individual cartridges or standard cartridge-in-body (CIB) packages.

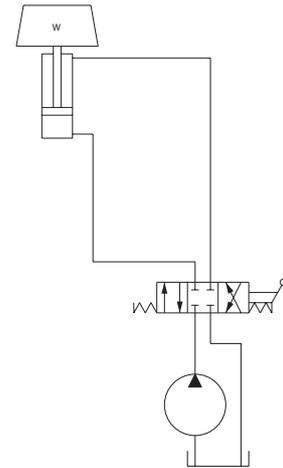
A typical circuit application for a counterbalance valve contains a pump, directional control valve, and an actuator. Without a counterbalance valve the load will drift down due to spool leakage if the directional control valve is centered with the load raised. Additionally there is no protection against the load dropping in the event of hydraulic line failure.

Adding a counterbalance valve controls motion and provides protection against hose or tube failure. In this circuit, moving the directional control valve to the left causes the cylinder to extend, raising the load with free flow going through the check valve portion of the counterbalance valve. When the directional control valve is centered, the counterbalance valve will prevent leakage and lock the load in position. Moving the directional control valve to the right sends flow/pressure to the rod end of the cylinder. This pressure also acts to pilot open the counterbalance valve and allows the load to be lowered. Should the load cause the cylinder to run away from the pump, pilot pressure to the counterbalance valve will decrease and the counterbalance valve will modulate to match the cylinder speed to the pump flow.

#### Individual cartridge counterbalance valve

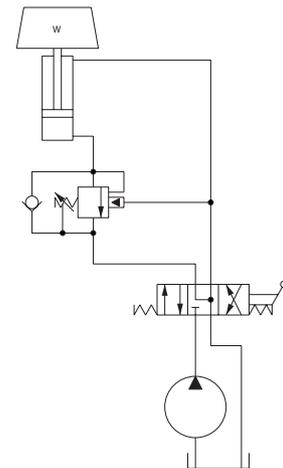


#### Circuit without a counterbalance valve



P103 121

#### Circuit with a counterbalance valve



P103 122

**COUNTERBALANCE VALVES**  
 (continued)

The pressure required to pilot open the counterbalance valve can be calculated as follows:

$$P = \frac{(P_s \cdot A_b) - W}{(A_b \cdot R) + A_r} \text{ (load retracts cylinder)}$$

$$P = \frac{(P_s \cdot A_r) - W}{(A_r \cdot R) + A_b} \text{ (load extends cylinder)}$$

W = Load

P<sub>s</sub> = Counterbalance valve relief setting; see below for more information

A<sub>b</sub> = Cylinder bore area

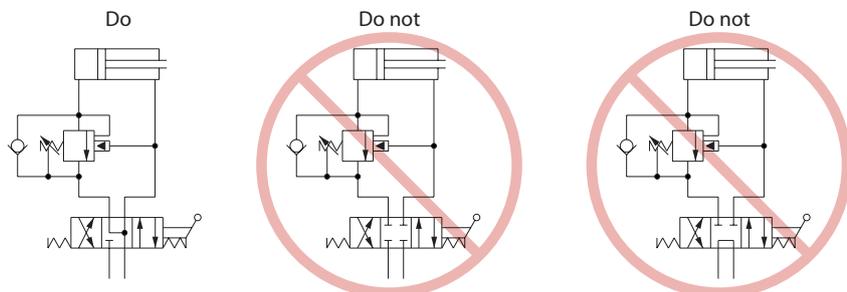
A<sub>r</sub> = Cylinder rod area

R = Counterbalance valve pilot ratio; see below for more information

Note that these equations are idealized and do not consider any backpressure in the circuit, which is additive to the pressure required to pilot open the check valve.

Some additional guidelines for counterbalance valve applications:

- Specify the counterbalance valve relief setting high enough to stop any motion (flow) at the maximum expected actuator pressure. Generally it is recommended to use a setting of 1.3 multiplied by the maximum load pressure.
- Use low pilot ratios (3:1 and 4.5:1) for applications where loads may vary widely. Low pilot ratios require higher pilot pressure and are less efficient but provide stable, precise control for varying loads.
- Use high pilot ratios (8:1 and 10:1) for applications where loads are relatively constant. High pilot ratio valves require lower pilot pressure, have faster response, and are more efficient, but lack stability and precision in response to varying loads.
- Do not oversize counterbalance valves. There is no pressure drop operating limit for counterbalance valves and in fact some pressure drop is required to maintain valve operation.
- Locate counterbalance valves at or near the actuator to provide maximum load holding protection in the event of hydraulic line failure.
- Do not use counterbalance valves with closed-center directional control valves. Pressure trapped between the directional control valve and the actuator can pilot the counterbalance valve open and result in undesired load motion.
- Do not use counterbalance valves with tandem-center directional control valves. Backpressure in the system can prevent the counterbalance valve from opening.





# Cartridge Valves Technical Information

## Counterbalance valves

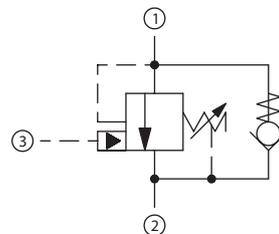
### Hydraulic Vent

#### CP448-1

### OPERATION

This is a pilot-operated counterbalance valve.

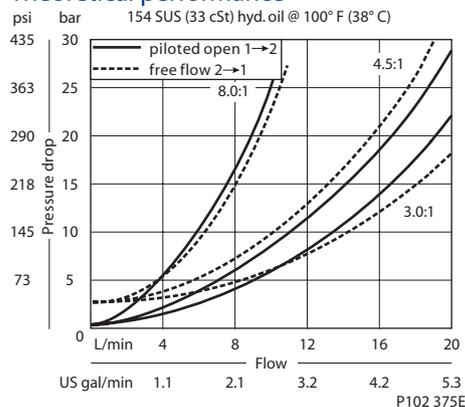
### Schematic



P102 376E

### SPECIFICATIONS

#### Theoretical performance



P102 375E

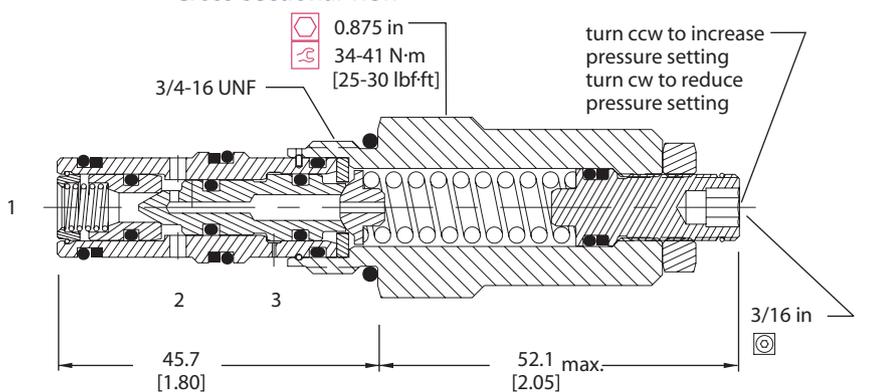
### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 22 bar [319 psi]	20 l/min [5 US gal/min]
Leakage	10 drops/min @ 70% of crack pressure
Weight	0.16 kg [0.36 lb]
Pilot ratio	3:1, 4.5:1, 8:1
Cavity	CP08-3L

### DIMENSIONS

mm [in]

#### Cross-sectional view



P102 360E

### ORDERING INFORMATION

#### Seals

B = Buna-N  
V = Viton

#### Housing and ports

0 = No Housing  
2B = AL, 1/4 BSP  
3B = AL, 3/8 BSP  
4S = AL, #4 SAE  
6S = AL, #6 SAE  
Other housings available

#### Adjustment option

E = External

CP448 - 1 - B - 6S - E - B - 150 - 4.5 - 040

**Seal kit**  
120238  
120239

**Housing P/N**  
No Housing  
CP08-3L-2B  
CP08-3L-3B  
CP08-3L-4S  
CP08-3L-6S

**Pilot ratio**  
3.0:1  
4.5:1  
8.0:1

**Free flow check crack pressure**  
bar [psi]  
040 = 2.76 [40]

**Crack pressure**  
Code x 10 = psi  
Example: 150 = 1500 psi  
XXX = Std. setting w/no stamping

#### Pressure range

**Pilot ratio 3.0**  
bar [psi]  
A = 41-103 [600-1500]  
Std. setting 69 [1000]  
B = 69-207 [1000-3000]  
Std. setting 103 [1500]  
C = 124-345 [1800-5000]  
Std. setting 172 [2500]

**Pilot ratio 4.5**  
bar [psi]  
A = 55-172 [800-2500]  
Std. setting 103 [1500]  
B = 103-345 [1500-5000]  
Std. setting 172 [2500]

**Pilot ratio 8.0**  
bar [psi]  
A = 103-345 [1500-5000]  
Std. setting 172 [2500]

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# Cartridge Valves Technical Information

## Counterbalance valves

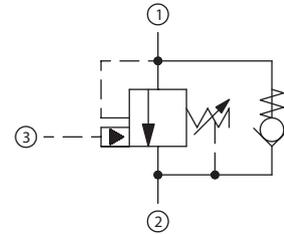
### Hydraulic Vent

### CB10-HV

#### OPERATION

This is a pilot-operated counterbalance valve.

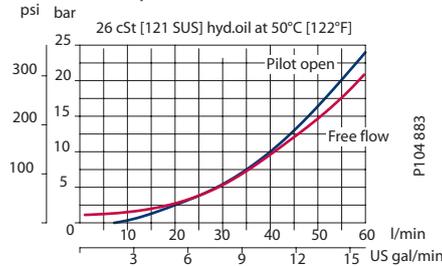
#### Schematic



P102 376E

#### SPECIFICATIONS

#### Theoretical performance



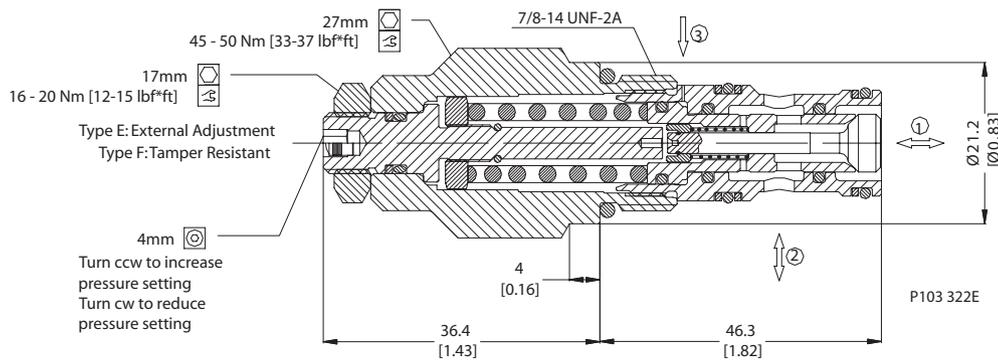
#### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 22 bar [319 psi]	60 l/min [16 US gal/min]
Leakage	10 drops/min @ 70% of crack pressure
Weight	0.22 kg [0.47 lb]
Pilot ratio	1.5:1, 3:1, 4.5:1, 10:1
Cavity	SDC10-3S

#### DIMENSIONS

mm [in]

#### Cross-sectional view



#### ORDERING INFORMATION

**CB10-HV-1-A-1-E-70-B-XXXX**

<p><b>Spring Range</b></p> <p><b>For Pilot Ratio Z (1.5:1)</b></p> <p>1 = 20-70 bar [290-1015 psi]</p> <p>2 = 30-90 bar [435-1305 psi]</p> <p>3 = 50-140 bar [725-2030 psi]</p> <p><b>For Pilot Ratio A (3:1)</b></p> <p>1 = 35-110 bar [507-1595 psi]</p> <p>2 = 60-150 bar [870-2175 psi]</p> <p>3 = 80-230 bar [1160-3335 psi]</p> <p><b>For Pilot Ratio B (4.5:1)</b></p> <p>1 = 55-180 bar [797-2610 psi]</p> <p>2 = 75-240 bar [1087-3480 psi]</p> <p>3 = 90-350 bar [1305-5075 psi]</p> <p><b>For Pilot Ratio C (10:1)</b></p> <p>1 = 90-350 bar [1305-5075 psi]</p>	<p><b>Pilot Ratio</b></p> <p>Z = 1.5 to 1</p> <p>A = 3 to 1</p> <p>B = 4.5 to 1</p> <p>C = 10 to 1</p>	<p><b>Adjustment type</b></p> <p>E = external adjustment</p> <p>F = tamper resistant</p>	<p><b>Body and ports</b></p> <p>00 = Cartridge only</p> <p>6S = Aluminium, #6 SAE</p> <p>8S = Aluminium, #8 SAE</p> <p>SE3B = Aluminium, 3/8" BSPP</p> <p>SE4B = Aluminium, 1/2" BSPP</p>	<p><b>Body Nomenclature</b></p> <p>No Body</p> <p>SDC10-3S-6S</p> <p>SDC10-3S-8S</p> <p>SDC10-3S-SE3B</p> <p>SDC10-3S-SE4B</p>	<p><b>Std. setting</b></p> <p>45 = 45 bar [650 psi] Set in Spring 1 For Pilot Ratio Z</p> <p>60 = 60 bar [870 psi] Set in Spring 2 For Pilot Ratio Z</p> <p>70 = 70 bar [1015 psi] Set in Spring 1 For Pilot Ratio A</p> <p>100 = 100 bar [1450 psi] Set in Spring 3 For Pilot Ratio Z</p> <p>100 = 100 bar [1450 psi] Set in Spring 1 For Pilot Ratio B</p> <p>100 = 100 bar [1450 psi] Set in Spring 2 For Pilot Ratio A,B</p> <p>175 = 175 bar [2537 psi] Set in Spring 3 For Pilot Ratio A,B</p> <p>175 = 175 bar [2537 psi] Set in Spring 1 For Pilot Ratio C</p>	<p><b>Seals</b></p> <p>B = Buna-N</p> <p>V = Viton</p>	<p><b>Seal kit</b></p> <p>230001020</p> <p>35401519</p>
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Counterbalance valves  
CB10 HV



# Cartridge Valves Technical Information

## Counterbalance valves

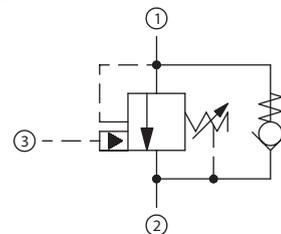
### Hydraulic Vent

#### CP441-1

### OPERATION

This is a pilot-operated counterbalance valve.

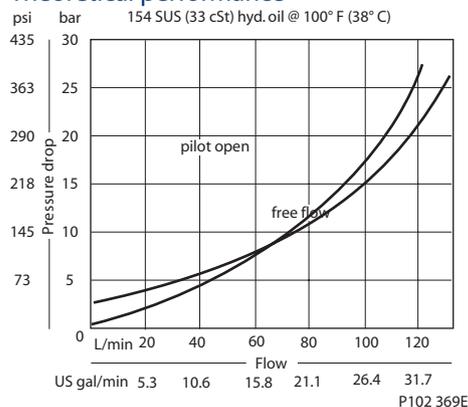
### Schematic



P102 376E

### SPECIFICATIONS

#### Theoretical performance



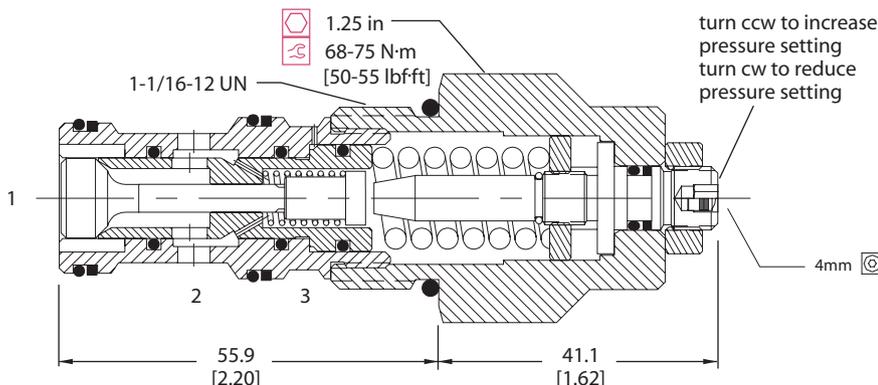
### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 22 bar [319 psi]	115 l/min [30 US gal/min]
Leakage	10 drops/min @ 70% of crack pressure
Weight	0.22 kg [0.48 lb]
Pilot ratio	3:1, 4.5:1, 10:1
Cavity	CP12-3S

### DIMENSIONS

mm [in]

#### Cross-sectional view



### ORDERING INFORMATION

**Seals**  
B = Buna-N  
V = Viton

**Housing and ports**  
0 = No Housing  
4B = AL, 1/2 BSP  
6B = AL, 3/4 BSP  
10S = AL, #10 SAE  
12S = AL, #12 SAE  
Other housings available

**Adjustment option**  
E = External adjustment

CP441 - 1 - B - 12S - E - B - 250 - 4.5 - 015

**Seal kit**  
120335  
120336

**Housing P/N**  
No Housing  
CP12-3S-4B/2B  
CP12-3S-6B/2B  
CP12-3S-10S/4S  
CP12-3S-12S/4S

**Pilot ratio**  
3.0:1  
4.5:1  
10.0:1

**Free flow check Crack Pressure**

bar	[psi]
005 = .34	[5]
015 = 1.03	[15]

**Crack pressure**  
Code x 10 = psi  
Example: 250 = 2500 psi  
XXX=Std. setting w/no stamping

#### Pressure range

**Pilot ratio 3.0**

bar	[psi]
A = 34-103	[500-1500]
Std. setting 69	[1000]
B = 103-207	[1500-3000]
Std. setting 172	[2500]

**Pilot ratio 4.5**

bar	[psi]
A = 34-138	[500-2000]
Std. setting 103	[1500]
B = 103-345	[1500-5000]
Std. setting 207	[3000]

**Pilot ratio 10.0**

bar	[psi]
A = 69-345	[1000-5000]
Std. setting 172	[2500]

P102 097E

Counterbalance valves CP441-1



# Cartridge Valves Technical Information

## Counterbalance valves

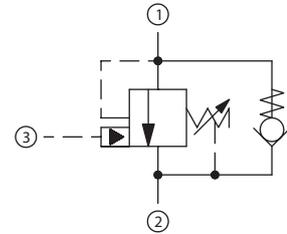
### Hydraulic Vent

#### CP443-1

### OPERATION

This is a pilot-operated counterbalance valve.

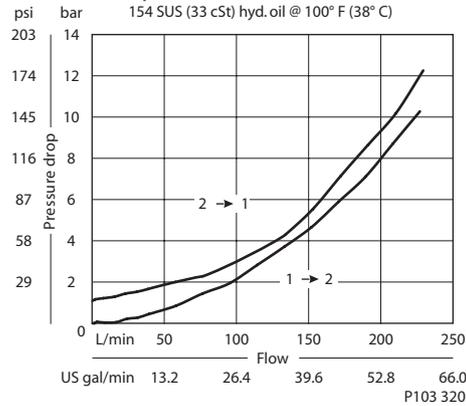
### Schematic



P102 376E

### SPECIFICATIONS

#### Theoretical performance



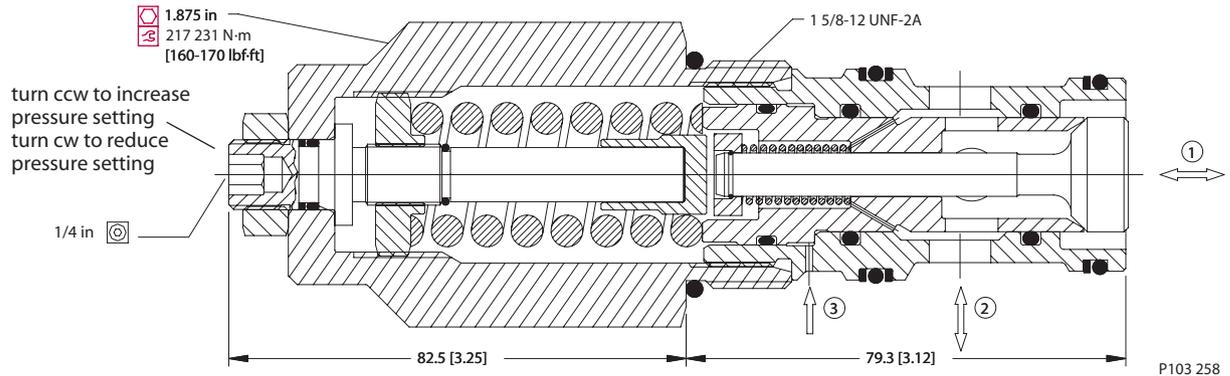
### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 7 bar [100 psi]	190 l/min [50 US gal/min]
Leakage	10 drops/min @ 70% of crack pressure
Weight	1.22 kg [2.69 lb]
Pilot ratio	3:1, 4.5:1, 10:1
Cavity	CP20-3S

### DIMENSIONS

mm [in]

#### Cross-sectional view



### ORDERING INFORMATION

**CP443 - 1 - B - 16S - E - A - 100 - 3.0 - 015**

- Seals**  
B = Buna-N  
V = Viton
- Housing and ports**  
0 = No Housing  
8B = AL, 1 BSP  
10B = AL, 1-1/4 BSP  
16S = AL, #16 SAE  
20S = AL, #20 SAE  
Other housings available
- Adjustment option**  
E = External
- Seal kit**  
120380  
120381
- Housing P/N**  
No Housing  
CP20-3S-8B/2B  
CP20-3S-10B/2B  
CP20-3S-16S/4S  
CP20-3S-20S/4S
- Pilot ratio**  
3.0 = 3.0:1  
4.5 = 4.5:1  
10.0 = 10.0:1
- Free flow check Cracking Pressure**  
bar [psi]  
015 = 1.00 [15]
- Cracking pressure**  
Code x 10 = psi  
Example: 100 = 1000 psi  
XXX = Std. setting w/no stamping
- Pressure range**

Pilot ratio	bar	[psi]
3.0	A = 34-103	[500-1500]
	Std setting 69	[1000]
	B = 103-207	[1500-3000]
	Std setting 172	[2500]
4.5	A = 34-138	[500-2000]
	Std setting 103	[1500]
	B = 103-345	[1500-5000]
	Std setting 207	[3000]
10.0	A = 69-345	[1000-5000]
	Std setting 172	[2500]

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Counterbalance valves  
CP443-1



# Cartridge Valves Technical Information

## Counterbalance valves

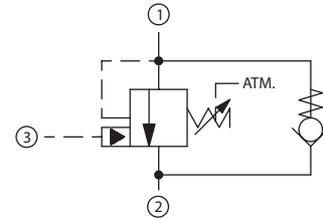
### Atmospheric Vent

#### CB10-AV

### OPERATION

This is a pilot-operated counterbalance valve with an atmospheric vent.

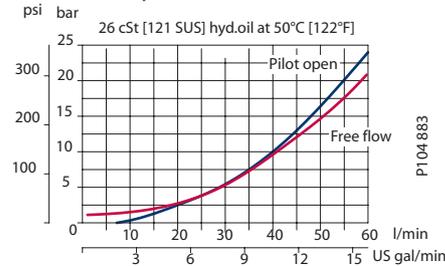
### Schematic



P103 325

### SPECIFICATIONS

#### Theoretical performance



P104-883

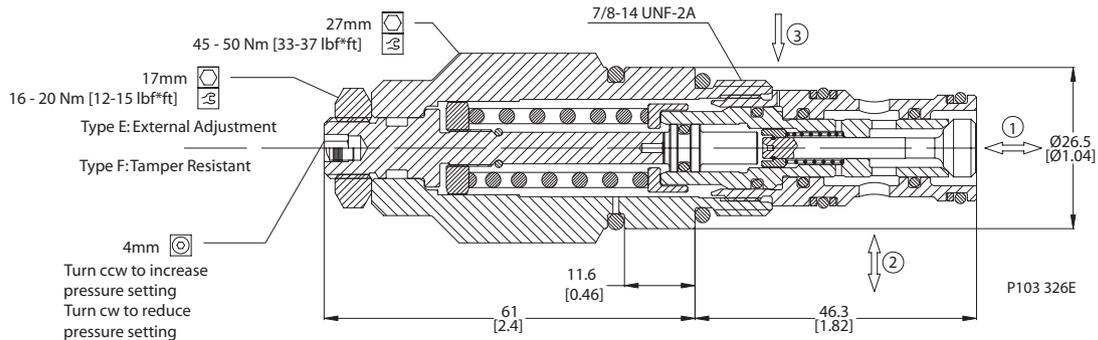
### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 22 bar [319 psi]	60 l/min [16 US gal/min]
Leakage	10 drops/min @ 70% of crack pressure
Weight	0.27 kg [0.60 lb]
Pilot ratio	1.5:1, 3:1, 4.5:1, 10:1
Cavity	SDC10-3S

### DIMENSIONS

mm [in]

#### Cross-sectional view



P103 326E

### ORDERING INFORMATION

CB10-AV-1-A-1-E-70-B-XXXX

#### Spring Range

- For Pilot Ratio Z (1.5:1)**
  - 1 = 20-70 bar [290-1015 psi]
  - 2 = 30-90 bar [435-1305 psi]
  - 3 = 50-140 bar [725-2030 psi]
- For Pilot Ratio A (3:1)**
  - 1 = 35-110 bar [507-1595 psi]
  - 2 = 60-150 bar [870-2175 psi]
  - 3 = 80-230 bar [1160-3335 psi]
- For Pilot Ratio B (4.5:1)**
  - 1 = 55-180 bar [797-2610 psi]
  - 2 = 75-240 bar [1087-3480 psi]
  - 3 = 90-350 bar [1305-5075 psi]
- For Pilot Ratio C (10:1)**
  - 1 = 90-350 bar [1305-5075 psi]

**Pilot Ratio**  
Z = 1.5 to 1  
A = 3 to 1  
B = 4.5 to 1  
C = 10 to 1

**Adjustment type**  
E = external adjustment  
F = tamper resistant

#### Std. setting

- 45 = 45 bar [650 psi] Set in Spring 1 For Pilot Ratio Z
- 60 = 60 bar [870 psi] Set in Spring 2 For Pilot Ratio Z
- 70 = 70 bar [1015 psi] Set in Spring 1 For Pilot Ratio A
- 100 = 100 bar [1450 psi] Set in Spring 3 For Pilot Ratio Z
- 100 = 100 bar [1450 psi] Set in Spring 1 For Pilot Ratio B
- 100 = 100 bar [1450 psi] Set in Spring 2 For Pilot Ratio A,B
- 175 = 175 bar [2537 psi] Set in Spring 3 For Pilot Ratio A,B
- 175 = 175 bar [2537 psi] Set in Spring 1 For Pilot Ratio C

#### Body and ports

- 00 = Cartridge only
- 6S = Aluminium, #6 SAE
- 8S = Aluminium, #8 SAE
- SE3B = Aluminium, 3/8" BSPP
- SE4B = Aluminium, 1/2" BSPP

#### Body Nomenclature

- No Body
- SDC10-3S-6S
- SDC10-3S-8S
- SDC10-3S-SE3B
- SDC10-3S-SE4B

**Seals**  
B = Buna-N  
V = Viton

**Seal kit**  
230001020  
35401519

P103 327E

Counterbalance valves  
CB10 AV



# Cartridge Valves Technical Information

## Counterbalance valves

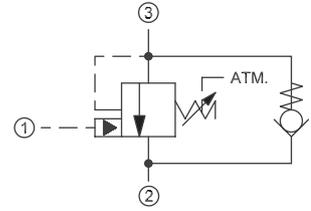
### Atmospheric Vent

### VCB 12-CN

#### OPERATION

This is a pilot-operated counterbalance valve with an atmospheric vent.

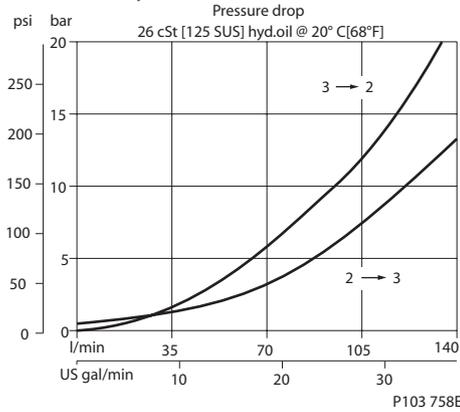
#### Schematic



P103 502

#### SPECIFICATIONS

#### Theoretical performance



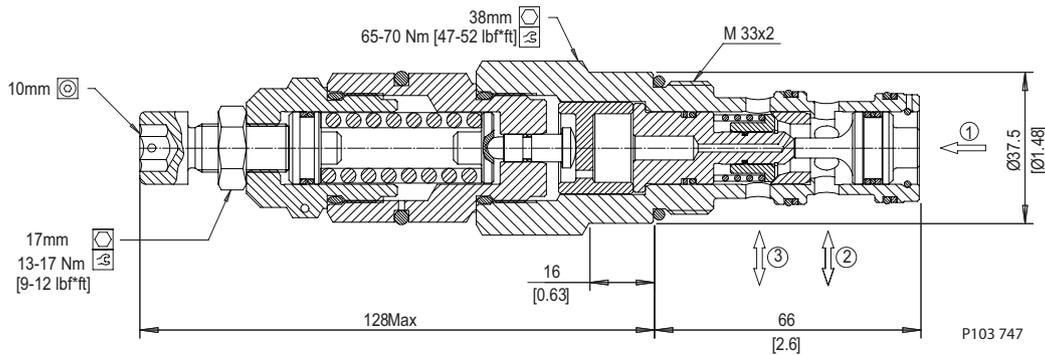
#### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 22 bar [319 psi]	140 l/min [37 US gal/min]
Weight	0.93 kg [2.05 lb]
Pilot ratio	4.7:1, 5.9:1, 6.9:1
Cavity	NCS12/3

#### DIMENSIONS

mm [in]

#### Cross-sectional view



#### ORDERING INFORMATION

#### VCB 12-CN-2-A-SE3/8-V

**Spring range**  
Pilot ratio A & C  
1 = 25 to 140 bar [363 to 2031 psi]  
2 = 70 to 250 bar [1015 to 3626 psi]  
3 = 105 to 350 bar [1523 to 5076 psi]

**Pilot ratio B**  
1 = 25 to 120 bar [363 to 1740 psi]  
2 = 60 to 200 bar [870 to 2901 psi]  
3 = 90 to 280 bar [1305 to 4061 psi]

**Pilot ratio:**  
A = 6.9:1  
B = 4.7:1

**Seals**  
Omit = Buna N  
V = Viton

**Seal kit**  
230000130  
230000360

**Housing and ports**  
00 = No Housing  
SE1/2 = AL, 1/2 BSP  
SE3/4 = AL, 3/4 BSP  
SE85 = AL, #8 SAE  
SE125 = AL, #12 SAE  
Other housings available

**Housing P/N**  
No Housing  
NCS12/3-SE-1/2  
NCS12/3-SE-3/4  
NCS12/3-SE-85  
NCS12/3-SE-125

To order this valve with a specific factory setting, contact your Sauer-Danfoss representative

P103 859

Counterbalance valves  
VCB 12-CN



# Cartridge Valves Technical Information

## Counterbalance valves

### Dual Counterbalance

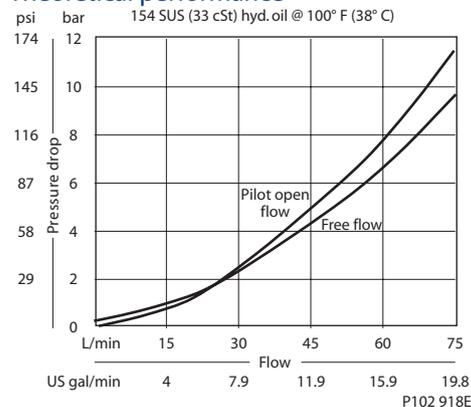
#### 1EEC11

### OPERATION

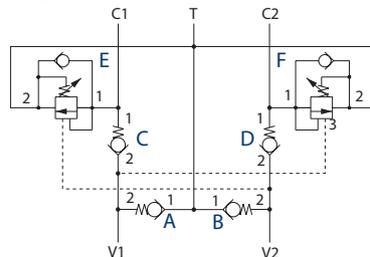
This valve is a dual counterbalance valve with make up checks.

### SPECIFICATIONS

#### Theoretical performance



### Schematic



P102 686

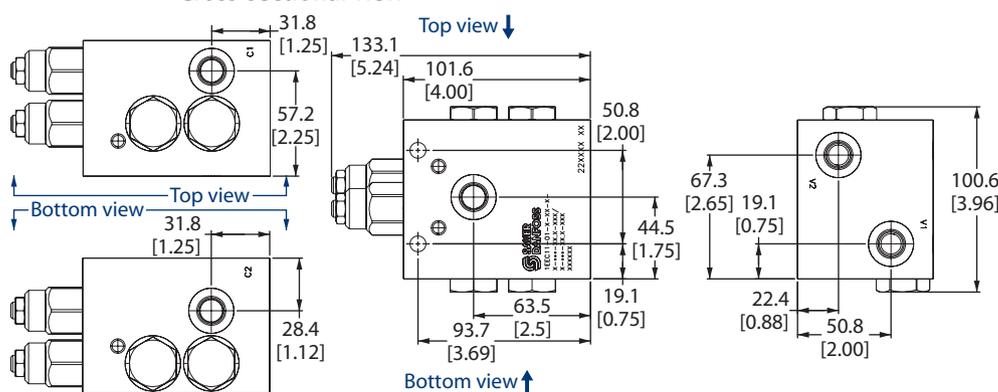
### Specifications

Rated pressure	345 bar [5000 psi]
Rated flow at 7 bar [100 psi]	57 l/min [15 US gal/min]
Weight	2.04 kg [4.50 lb]
Pilot ratio	3:1, 4.5:1, or 10:1
Cavity	none

### DIMENSIONS

mm [in]

#### Cross-sectional view



P102 684

### ORDERING INFORMATION

1EEC11-01-B-85-E-A- 100 - 3.0 - 005

#### Seals

B = Buna-N  
V = Viton

#### Body and ports

6S = #6 SAE (T, C and V ports)  
8S = #8 SAE (T, C and V ports)

#### Relief adjustment option

E = External adjustment  
K = Knob adjustment

#### Free flow check cracking pressure

005 = 0.34 bar [5 psi]  
015 = 1.03 bar [15 psi]

#### Pilot ratio

Pressure range	Pilot ratio 3.0	Pilot ratio 4.5	Pilot ratio 10.0
A =	34-103 bar [500-1500 psi] Standard setting 69 bar [1000 psi]	34-172 bar [500-2500 psi] 103 bar [1500 psi]	103-345 bar [1500-5000 psi] 172 bar [2500 psi]
B =	69-172 bar [1000-2500 psi] Standard setting 103 bar [1500 psi]	69-241 bar [1000-3500 psi] 103 bar [1500 psi]	
C =	103-241 bar [1500-3500 psi] Standard setting 172 bar [2500 psi]	103-345 bar [1500-5000 psi] 172 bar [2500 psi]	

P102 685E

Counterbalance valves  
1EEC11



# Cartridge Valves Technical Information

## Counterbalance valves

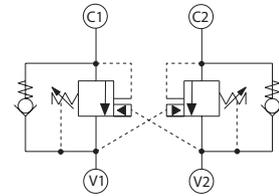
### Dual Counterbalance

### CP448-2

#### OPERATION

This valve is a dual counterbalance valve. It uses two CP448-1 cartridges.

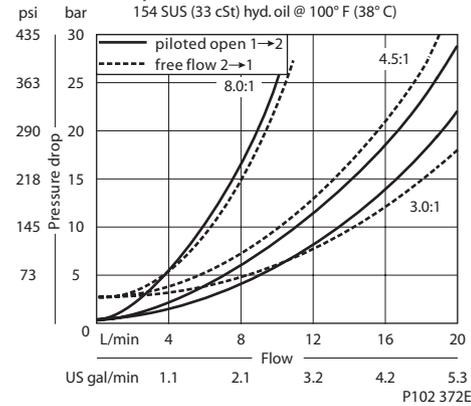
#### Schematic



P102 379E

#### SPECIFICATIONS

#### Theoretical performance



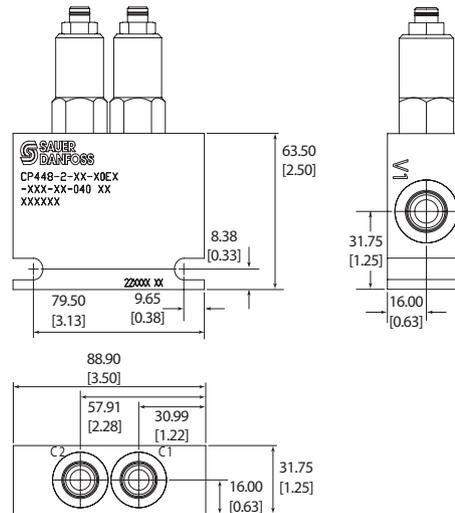
#### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 22 bar [319 psi]	20 l/min [5 US gal/min]
Weight	0.78 kg [1.72 lb]
Pilot ratio	3:1, 4.5:1, 8:1
Cavity	none

#### DIMENSIONS

mm [in]

#### Cross-sectional view



P102 749

#### ORDERING INFORMATION

CP448-2-4S-B-0-E-B-150-4.5-040

- Check crack pressure**  
040 = 2.8 bar [40 psi]
- Pilot ratio**  
1.5 — 3.0 — 4.5 — 8.0
- Crack pressure**  
Code x 10 = psi  
Example: 050 = 500 psi
- Pressure range**

A	14-55 bar [200-300 psi]	41-124 bar [600-1800 psi]	55-186 bar [800-2700 psi]	103-345 bar [1500-5000 psi]
B	[500-1700 psi]	[1000-3500 psi]	[1500-5000 psi]	
C	55-207 bar [800-3000 psi]	124-345 bar [1800-5000 psi]		
- Adjustment option**  
E = External
- Seals**  
B = Buna N  
V = Viton
- Seal kits**  
120238  
120239
- Housing and ports**  
4S = AL, #4 SAE  
6S = AL, #6 SAE  
other housings available, consult factory

P102 750E



# Cartridge Valves Technical Information

## Counterbalance valves

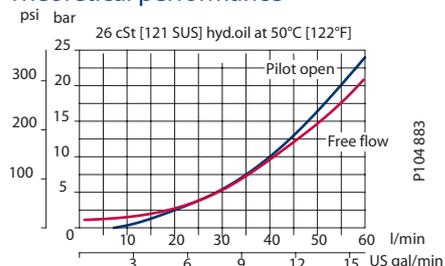
### Dual Counterbalance DCB10-HV

#### OPERATION

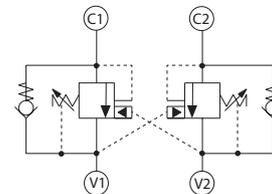
This is a dual counterbalance valve with hydraulic vent. This assembly uses the CB10-HV valve.

#### SPECIFICATIONS

#### Theoretical performance



#### Schematic



P102 379E

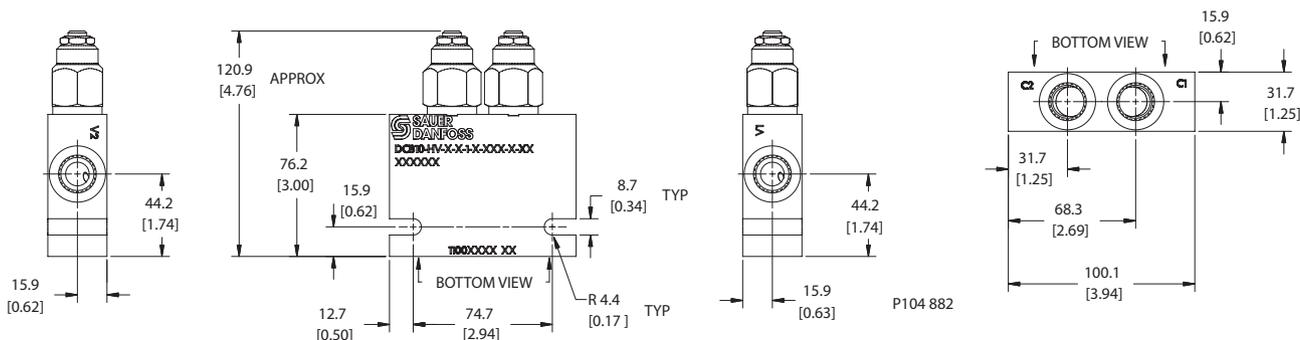
#### Specifications

Rated pressure	350 bar [5075 psi]
Rated flow at 22 bar [319 psi]	60 l/min [16 US gal/min]
Leakage	10 drops/min @ at 70% of crack pressure
Weight	0.90 kg [1.98 lb]
Pilot ratio	1.5:1, 3.0:1, 4.5:1, 10.0:1
Cavity	None

#### DIMENSIONS

mm [in]

#### Cross-sectional view



#### ORDERING INFORMATION

**DCB10-HV-1-B-1-E-100-B-8S**

- Spring range**
  - For pilot ratio Z (1.5:1)
    - 1 = 20-70 bar [290-1015 psi]
    - 2 = 30-90 bar [435-1305 psi]
    - 3 = 50-140 bar [725-2030 psi]
  - For pilot ratio A (3:1)**
    - 1 = 35-110 bar [507-1595 psi]
    - 2 = 60-150 bar [870-2175 psi]
    - 3 = 80-230 bar [1160-3335 psi]
  - For pilot ratio B (4.5:1)**
    - 1 = 55-180 bar [797-2610 psi]
    - 2 = 75-240 bar [1087-3480 psi]
    - 3 = 90-350 bar [1305-5075 psi]
  - For pilot ratio C (10:1)**
    - 1 = 90-350 bar [1305-5075 psi]
- Pilot ratio**
  - Z = 1.5 to 1
  - A = 3 to 1
  - B = 4.5 to 1
  - C = 10 to 1
- Check crack pressure**
  - 1 = 1 bar [14.5 psi]
- Adjust type**
  - E = External adjustment
  - F = Tamper resistant
- Body and ports**
  - 6S = Aluminium, #6 SAE
  - 8S = Aluminium, #8 SAE
  - SE3B = Aluminium, 3/8" BSPP
  - SE4B = Aluminium, 1/2" BSPP
  - S6S = Steel, #6 SAE
  - S6S = Steel, #8 SAE
- Seals**
  - B = Buna-N
  - V = Viton
- Std. setting**
  - 45 = 45 bar [650 psi] Set in Spring 1 For Pilot Ratio Z
  - 60 = 60 bar [870 psi] Set in Spring 2 For Pilot Ratio Z
  - 70 = 70 bar [1015 psi] Set in Spring 1 For Pilot Ratio A
  - 100 = 100 bar [1450 psi] Set in Spring 3 For Pilot Ratio Z
  - 100 = 100 bar [1450 psi] Set in Spring 1 For Pilot Ratio B
  - 100 = 100 bar [1450 psi] Set in Spring 2 For Pilot Ratio A,B
  - 175 = 175 bar [2537 psi] Set in Spring 3 For Pilot Ratio A,B
  - 175 = 175 bar [2537 psi] Set in Spring 1 For Pilot Ratio C
- Body P/N**
  - 11002669
  - 11001779
  - 11008008
  - 11008009
  - 11009171
  - 11009170

P104 884

Counterbalance valves DCB10-HV



# Cartridge Valves Technical Information

## Counterbalance valves

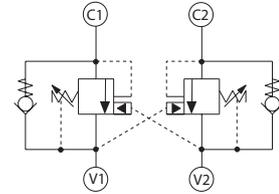
### Dual Counterbalance

#### CP441-2

### OPERATION

This valve is a dual counterbalance valve. It uses two CP441-1 cartridges.

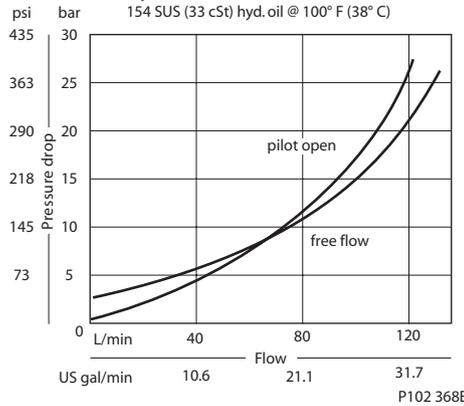
### Schematic



P102 379E

### SPECIFICATIONS

#### Theoretical performance



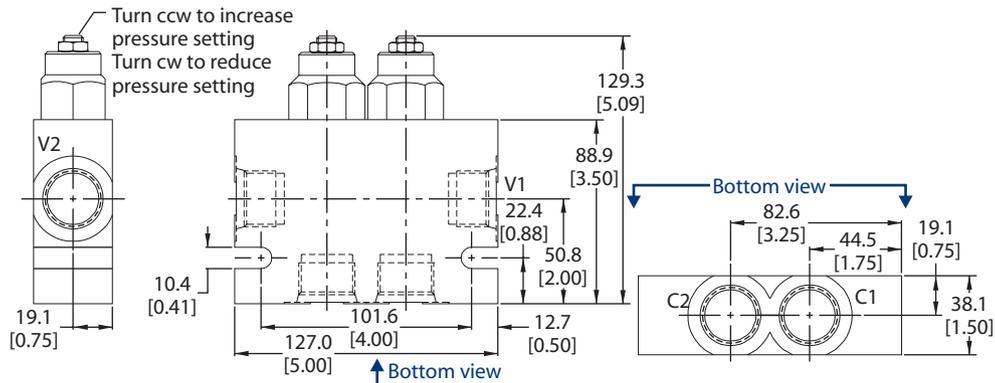
### Specifications

Rated pressure	350 bar [5000 psi]
Rated flow at 7 bar [100 psi]	115 l/min [30 US gal/min]
Weight	1.26 kg [2.77 lb]
Pilot ratio	3:1, 4.5:1, 10:1
Cavity	none

### DIMENSIONS

mm [in]

#### Cross-sectional view



P102 348E

### ORDERING INFORMATION

CP441 - 2 - 12S - B - E - B - 250 - 4.5 - 015

<b>Housing and ports</b>	<b>Housing P/N</b>		<b>Free flow check</b>		<b>Pilot ratio</b>
10S = AL, #10 SAE	220752		<b>Cracking pressure</b>		
12S = AL, #12 SAE	220753		bar [psi]		
6B = AL, 3/4 BSP			005 = .34 [5]		
4B = AL, 1/2 BSP			015 = 1.03 [15]		
other housings available, consult factory					
<b>Seals</b>	<b>Seal kit</b>		<b>Crack pressure</b>		
B = Buna-N	120414		Code x 10 = psi		
V = Viton	120415		Example: 250 = 2500 psi		
<b>Adjustment option</b>			<b>Pressure range</b>		
E = External adjustment					
		Pilot ratio 3.0		Pilot ratio 4.5	Pilot ratio 10.0
		bar [psi]		bar [psi]	bar [psi]
		A = 34-103 [500-1500]		A = 34-138 [500-2000]	A = 69-345 [1000-5000]
		Std. setting 69 [1000]		Std. setting 103 [1500]	Std. setting 172 [2500]
		B = 103-207 [1500-3000]		B = 103-345 [1500-5000]	B = N/a [N/a]
		Std. setting 103 [1500]		Std. setting 103 [1500]	

P102 089E

Counterbalance valves CP441-2



# Cartridge Valves Technical Information

## Counterbalance valves

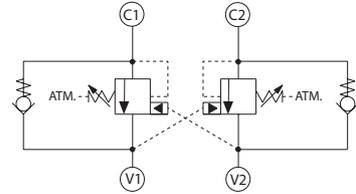
### Dual Counterbalance

### DCB10-AV

#### OPERATION

This is a dual counterbalance valve with atmospheric vent. This assembly uses the CB10-AV valve.

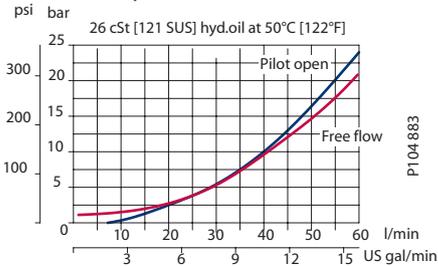
#### Schematic



P104 885

#### SPECIFICATIONS

#### Theoretical performance



P104 883

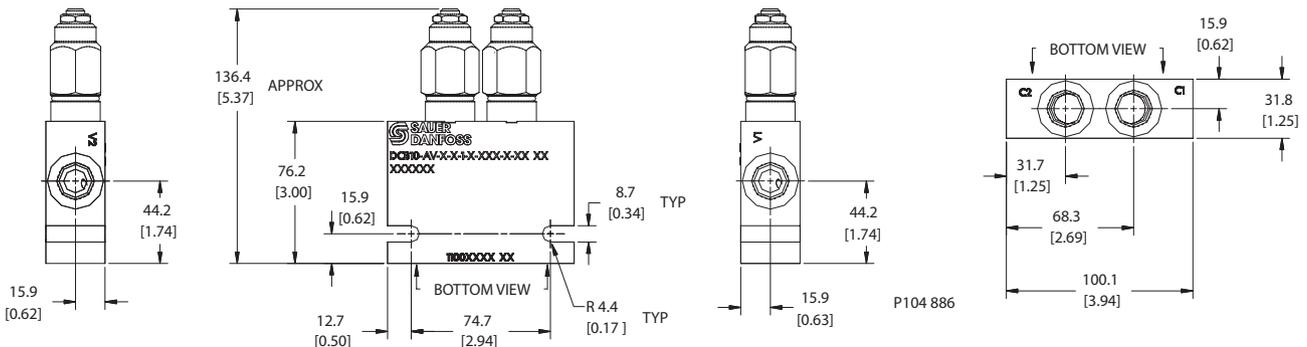
#### Specifications

Rated pressure	350 bar [5075 psi]
Rated flow at 22 bar [319 psi]	60 l/min [16 US gal/min]
Leakage	10 drops/min @ at 70% of crack pressure
Weight	0.90 kg [1.98 lb]
Pilot ratio	1.5:1, 3.0:1, 4.5:1, 10.0:1
Cavity	None

#### DIMENSIONS

mm [in]

#### Cross-sectional view



P104 886

#### ORDERING INFORMATION

**DCB10-AV-1-B-1-E-100-B-8S**

**Spring range**  
 For pilot ratio Z (1.5:1)  
 1 = 20-70 bar [290-1015 psi]  
 2 = 30-90 bar [435-1305 psi]  
 3 = 50-140 bar [725-2030 psi]  
**For pilot ratio A (3:1)**  
 1 = 35-110 bar [507-1595 psi]  
 2 = 60-150 bar [870-2175 psi]  
 3 = 80-230 bar [1160-3335 psi]  
**For pilot ratio B (4.5:1)**  
 1 = 55-180 bar [797-2610 psi]  
 2 = 75-240 bar [1087-3480 psi]  
 3 = 90-350 bar [1305-5075 psi]  
**For pilot ratio C (10:1)**  
 1 = 90-350 bar [1305-5075 psi]

**Pilot ratio**  
 Z = 1.5 to 1  
 A = 3 to 1  
 B = 4.5 to 1  
 C = 10 to 1

**Check crack pressure**  
 1 = 1 bar (14.5 psi)

**Adjust type**  
 E = External adjustment  
 F = Tamper resistant

**Body and ports**  
 6S = Aluminium, #6 SAE  
 8S = Aluminium, #8 SAE  
 SE3B = Aluminium, 3/8" BSPP  
 SE4B = Aluminium, 1/2" BSPP  
 S6S = Steel, #6 SAE  
 S6S = Steel, #8 SAE

**Seals**  
 B = Buna-N  
 V = Viton

**Std. setting**  
 45 = 45 bar [650 psi] Set in Spring 1 For Pilot Ratio Z  
 60 = 60 bar [870 psi] Set in Spring 2 For Pilot Ratio Z  
 70 = 70 bar [1015 psi] Set in Spring 1 For Pilot Ratio A  
 100 = 100 bar [1450 psi] Set in Spring 3 For Pilot Ratio Z  
 100 = 100 bar [1450 psi] Set in Spring 1 For Pilot Ratio B  
 100 = 100 bar [1450 psi] Set in Spring 2 For Pilot Ratio A,B  
 175 = 175 bar [2537 psi] Set in Spring 3 For Pilot Ratio A,B  
 175 = 175 bar [2537 psi] Set in Spring 1 For Pilot Ratio C

**Seal kit**  
 11002672  
 11002673

**Body P/N**  
 11002669  
 11001779  
 11008008  
 11008009  
 11009171  
 11009170

P104 887

Counterbalance valves  
DCB10-AV