

COUNTERBALANCE VALVES

FOR MOBILE & INDUSTRIAL HYDRAULICS

- Load-Holding
- Overrunning Control
- Maximum Pressure Limited
- Anti-Cavitation
- Deceleration Control
- Thermal Relief Protection



WINNER HYDRAULICS COUNTERBALANCE VALVES

Winner
hydraulics

CB, CA, CW, MB and MW series
FOR LOAD-HOLDING VALVES

CO, CK, CC series
FOR STATIC LOAD LOCKING

■ BRAND MISSION

CONTROL. SAFETY. RELIABILITY.

Winner delivers industry-leading hydraulic solutions engineered to eliminate uncontrolled movement and actuator drift under load. Every valve we design is built on a singular commitment: ensuring your equipment operates with maximum safety and unwavering operational reliability — in the most demanding environments on earth.

From heavy construction to precision industrial automation, Winner counterbalance valves act as the critical safeguard between motion and disaster — holding loads with confidence, releasing them with precision.



LOAD SAFETY

Prevents uncontrolled descent or movement of suspended loads under any failure condition.



PRESSURE CONTROL

Maintains precise back-pressure ratios, eliminating drift caused by thermal expansion or leakage.



OPERATIONAL UPTIME

Hardened construction and engineered tolerances deliver consistent performance across millions of cycles.

“ When gravity and pressure conspire against you, ”
Winner holds the line — every time

■ WHY CHOOSE WINNER HYDRAULICS

01

SUPERIOR QUALITY

Precise pressure and flow control ensure process stability, maximizing resource efficiency and output.

02

RELIABLE LEAD TIMES

Efficient production and inventory management ensure stable, competitive delivery schedules.

03

EXPERT SUPPORT

From selection to maintenance, our experts provide rapid response, customized solutions.

04

LONG-TERM VALUE

Superior price-to-performance ratio and long-term return on investment.

■ WHAT IS A COUNTERBALANCE VALVE?

Also known as a Load Holding Valve or Over-center Valve. Counterbalance valves prevent uncontrolled actuator movement caused by overrunning loads. They maintain load stability, provide controlled lowering, and protect hydraulic systems from hose failure or sudden pressure loss.

CORE FUNCTIONS

- ◆ **MOTION CONTROL & ANTI-CAVITATION**
Modulates return flow to prevent load runaway and protects actuators from cavitation.
- ◆ **PILOT CUSHIONING DESIGN**
Optimized pilot path for smooth opening and rapid, decisive closure.
- ◆ **LOAD HOLDING**
Provides pressure-compensated locking for static safety and stability.
- ◆ **THERMAL & SHOCK PROTECTION**
Integrated relief function protects against pressure surges and thermal expansion.
- ◆ **FAIL-SAFE FUNCTIONALITY**
Secures actuator position during hose bursts, power loss, or accidental operation.

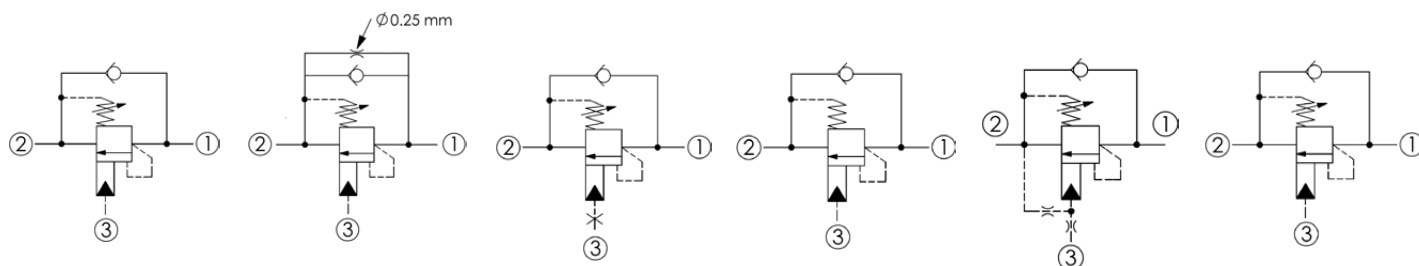
APPLICATION FIELDS

AERIAL LIFTS	EXCAVATORS	BOOM TRUCKS	MATERIAL HANDLING	WINCHES	OFFSHORE PLATFORM
EMERGENCY VEHICLES	CRANES	INDUSTRIAL PRESSES	FORKLIFTS	CONCRETE BREAKER CLAMP	



CB SERIES OVERVIEW

The CB Series is a 3-port counterbalance valve designed for general load-holding and motion control applications. It provides reliable load retention and smooth load lowering in hydraulic systems where moderate backpressure conditions are present.



From left to right:

Standard/ Restrictive/ Semi-restrictive/ Ultra-restrictive Counterbalance Valve → Standard Counterbalance Valve with a Ø0.25 mm Orifice
→ Counterbalance Valve without Pilot Assist → Fixed Setting Counterbalance Valve
→ Counterbalance Valve with Bleed through Pilot → Pilot Assisted Relief with Check Counterbalance Valve

FUNCTIONS

- Allows free flow from Port 1 to Port 2 during lifting through an integral high-capacity check valve
- Blocks reverse flow until pilot pressure is applied to maintain load position
- Modulates return flow to prevent load overrun and ensure controlled lowering

DESIGN CHARACTERISTICS

- 3-port configuration
- Poppet-type load holding design
- Stable load control performance
- Compact cartridge construction
- Pressure at Port 2 adds directly to the spring setting (1:1 ratio)

TECHNICAL DATA

PARAMETER	VALUE
Maximum Operating Pressure	420 bar (6,000 psi)
Nominal Flow	Up to 480 LPM
Pilot Ratios	1:1 to 16:1
Internal Leakage	≤ 5 drops/min (0.3 cc/min)
Installation	Cartridge, industry-standard cavity



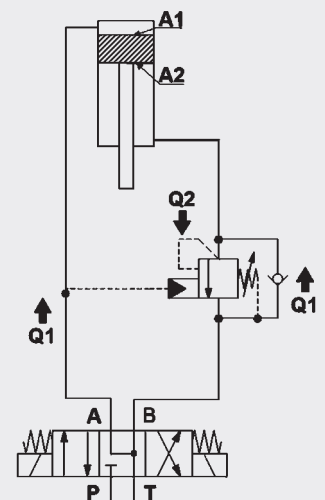
RESTRICTION LEVELS

Counterbalance valves are available in various "restriction" levels to tune system stability and energy efficiency. These models prevent hunting (vibration) during descent, especially in cylinders with rod-down orientations or large area ratios.

TYPE	STABILITY	FLOW CAPACITY	BEST FOR
Semi-Restrictive	Balanced	Moderate-High	General hydraulic circuits
Restrictive	High	Low-Moderate	Precision control
Ultra-Restrictive	Highest	Lowest	Small actuators / Critical stability

QUICK SELECTION GUIDE (PORT 1 → PORT 2)

- 01** CB11A3CHL
Standard : 30 – 60 LPM
- 02** CB11A3CHL40
Semi-Restrictive: 15 – 40 LPM
- 03** CB11A3CHL20
Restrictive: 5 – 20 LPM
- 04** CB11A3CHL10
Ultra-Restrictive: < 10 LPM



APPLICATION EXAMPLES — AREA RATIO IMPACT

As cylinder area ratio (A_1/A_2) increases, return flow drops — requiring a more restrictive valve.

SCENARIO A: $Q_1 = 60$ LPM

A_1/A_2	Q_2 (RETURN)	Model
1.3	46 LPM	CB11A3CHL
2	30 LPM	CB11A3CHL40
3	20 LPM	CB11A3CHL20 CB11A3CHL40

SCENARIO B: $Q_1 = 30$ LPM

A_1/A_2	Q_2 (RETURN)	Model
1.3	23 LPM	CB11A3CHL40
2	15 LPM	CB11A3CHL20
3	10 LPM	CB11A3CHL10 CB11A3CHL20

SCENARIO C: $Q_1 = 15$ LPM

A_1/A_2	Q_2 (RETURN)	Model
1.3	1.5 LPM	CB11A3CHL20
2	7.5 LPM	CB11A3CHL20 CB11A3CHL10
3	5 LPM	CB11A3CHL10 CB11A3CHL20

CB SERIES ENCODING PRINCIPLE

MODEL NUMBER STRUCTURE

CB	—	17A	—	33	—	H	—	L	—	10 / 20 / 32 / 40 / 60 / 80 / 160
TYPE		CAVITY		PILOT RATIO		ADJ. RANGE		OPTIONS		Rated flow from Port 1 to Port 2 (semi-restrictive, restrictive, ultra-restrictive type)

VALVE TYPES

CB	Standard Type, Max. Setting 280 / 350 / 420 bar
CB	Semi-Restrictive Type, Max. Setting 280 / 350 / 420 bar
CB	Restrictive Type, Max. Setting 280 / 350 bar
CB	Ultra-Restrictive Type, Max. Setting 280 / 350 bar
CB	Fixed Setting Type, Max. Setting 280 bar / 350 bar
CB	Fixed Setting, Semi-Restrictive Type, Max. Setting 350 bar
CB	Pilot Assisted Relief with Check Type
CB	Counterbalance Valve without Pilot Assist
CBA	Fixed Setting Type, Max. Setting 280 / 350 bar

CAVITY SIZE

2A	1"-14UNS	10WB	7/8"-14UNF	20MS	M20 x 1.5
11A	M20 x 1.5	10WC	7/8"-14UNF	27M	M27 x 1.5
17A	M36 x 2	16WC	1-5/16"-12UN	12B	1-1/16"-12UN
19A	M48 x 2	16WS	1-5/16"-12UN		
163A	M16 x 1.5	20WS	1-5/8"-12UN		

PILOT RATIOS

30	10:1	32	2:1	33	3:1
34	4.5:1	35	5:1	38	8:1
3A	1.5:1 (sealed pilot)	3B	2.3:1 (sealed pilot)	3C	3:1 (sealed pilot)
3D	4:1 / 4.5:1 (sealed pilot)	3E	5:1 (sealed pilot)	3G	7:1 (sealed pilot)
3H	8:1 (sealed pilot)	3J	10:1 (sealed pilot)	3P	16:1 (sealed pilot)
3Q	2:1 (bleed through pilot)				



CB SERIES ENCODING PRINCIPLE

MODEL NUMBER STRUCTURE

CB – **17A** – **33** – **H** – **L** – **10 / 20 / 32 / 40 / 60 / 80 / 160**

TYPE

CAVITY

PILOT RATIO

ADJ. RANGE

OPTIONS

Rated flow from Port 1 to Port 2
(semi-restrictive, restrictive, ultra-restrictive type)

ADJUSTMENT RANGES

CRACKING PRESSURE 1.7 bar

H	70 - 280 bar (std. setting 210 bar)	J	140 - 350 / 200 - 350 bar (std. setting 210 bar)
I	25 - 105 bar (std. setting 70 bar)	K	70 - 175 bar (std. setting 140 bar)
M	16 - 55 bar (std. setting 25 bar)	P	20 - 105 bar (std. setting 70 bar)
G	140 - 420 bar (std. setting 210 bar)		

CRACKING PRESSURE 0.3 bar

A	42 - 280 bar (std. setting 210 bar)	D	21 - 210 bar (std. setting 140 bar)
W	70 - 350 bar (std. setting 210 bar)		

SPECIAL PURPOSE - CRACKING PRESSURE 0.3 bar

A	70 - 280 bar (std. setting 210 bar)	C	140 - 350 bar (std. setting 210 bar)
B	25 - 105 bar (std. setting 70 bar)	D	70 - 175 bar (std. setting 140 bar)
E	16 - 55 bar (std. setting 25 bar)	R	20 - 105 bar (std. setting 70 bar)

FIXED SETTING

100	100 - 140 bar	225	210 - 240 bar	250	235 - 265 bar	300	285 - 310 bar
170	155 - 185 bar	230	215 - 245 bar	260	245 - 280 bar	310	285 - 340 bar
200	180 - 220 bar	240	220 - 260 bar	270	245 - 290 bar	350	325 - 390 bar
220	200 - 245 bar						

OPTIONS

L	Leakproof hex socket screw	C	Stainless steel tamper resistant
LP	Leakproof hex socket screw with stainless steel external metal components	CP	Stainless steel tamper resistant cover with stainless steel external metal components
CA	Plastic tamper resistant cover of general type hex nut		
CH	Plastic tamper resistant cover of general type hex nut	T	Three-winged handknob kit
N	Non-adjustable, cracking pressure 2.0 bar	Q	Non-adjustable, cracking pressure 0.3 bar

■ CA SERIES OVERVIEW

The CA Series is a 3-port counterbalance valve featuring a balanced design that maintains stable valve performance even when return line pressure varies. It is suitable for applications where downstream pressure fluctuations may influence valve operation.



From left to right:

Vented, Atmospherically Referenced Counterbalance Valve

→ Vented, Atmospherically Referenced, Fully Balanced, Load Control Valve without Relief Function

FUNCTIONS

- Provides free flow during actuator extension via an integral check valve
- Prevents reverse flow until pilot pressure is applied
- Regulates return flow to control load descent and prevent runaway motion



IMPORTANT NOTE

The vent port must remain clean and unobstructed. Keep the vent port free of debris, paint, or blockages at all times.

DESIGN CHARACTERISTICS

- 3-port configuration
- Balanced design independent of return line pressure
- Consistent cracking pressure and pilot response
- Suitable for systems with variable backpressure

TECHNICAL DATA

PARAMETER	VALUE
Maximum Operating Pressure	420 bar (6,000 psi)
Nominal Flow	Up to 480 LPM
Pilot Ratios	1:1, 2:1, 3:1, 4:1, 4.5:1, 5:1, 7:1, 8:1, 10:1
Internal Leakage	≤ 5 drops/min (0.3 cc/min)
Installation	Cartridge, CB-compatible cavity
Port Configuration	3-Port
Spring Chamber	Atmospherically Referenced



■ CA SERIES ENCODING PRINCIPLE

MODEL NUMBER STRUCTURE

CA – **11A** – **3A** – **H** – **L**

TYPE CAVITY PILOT RATIO ADJ. RANGE OPTIONS

VALVE TYPES

CA	Vented, Atmospherically Referenced Type, Max. Setting 280 / 350/ 420 bar
CA	Vented, Atmospherically Referenced, Fully Balanced Load Control Valve without Pilot Assist, Max. Setting 350 bar

CAVITY SIZE

2A	1"-14UNS	27M	M27 x 1.5
11A	M20 x 1.5	18MS	M18 x 1.5
17A	M36 x 2.0	10WB	7/8"-14UNF
19A	M48 x 2.0	10WC	7/8"-14UNF

PILOT RATIOS

3A	1.5:1 (sealed pilot)	3B	2.3:1 (sealed pilot)	3C	3:1 (sealed pilot)
3D	4:1 / 4.5:1 (sealed pilot)	3E	5:1 (sealed pilot)	3G	7:1 (sealed pilot)
3H	8:1 (sealed pilot)				
3N	With sealed pilot, atmospherically referenced				

■ CA SERIES ENCODING PRINCIPLE

MODEL NUMBER STRUCTURE

CA – **11A** – **3A** – **H** – **L**

TYPE CAVITY PILOT RATIO ADJ. RANGE OPTIONS

ADJUSTMENT RANGES

CRACKING PRESSURE 1.5 bar

H	70 - 280 bar (std. setting 210 bar)	F	70 - 175 bar (std. setting 140 bar)
I	25 - 105 bar (std. setting 70 bar)	G	140 - 420 bar (std. setting 280 bar)

CRACKING PRESSURE 2.0 bar

H	105 - 280 bar (std. setting 210 bar)	I	20 - 160 bar (std. setting 70 bar)
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CRACKING PRESSURE 2.8 bar

H	70 - 280 bar (std. setting 210 bar)	I	25 - 105 bar (std. setting 70 bar)
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CRACKING PRESSURE 1.7 bar

H	70 - 280 bar (std. setting 210 bar)	M	8 - 28 bar (std. setting 25 bar)
I	25 - 105 bar (std. setting 70 bar)	N	16 - 55 bar (std. setting 25 bar)

SPECIAL PURPOSE - CRACKING PRESSURE 0.3 bar

A	70 - 280 bar (std. setting 210 bar)	E	16 - 55 bar (std. setting 25 bar)
B	25 - 105 bar (std. setting 70 bar)	Q	8 - 28 bar (std. setting 14 bar)
C	140 - 350 bar (std. setting 210 bar)		

PILOT ADJUSTMENT RANGES

1050	20 - 105 bar (std. setting 70 bar)	2100	35 - 210 bar (std. setting 70 bar)
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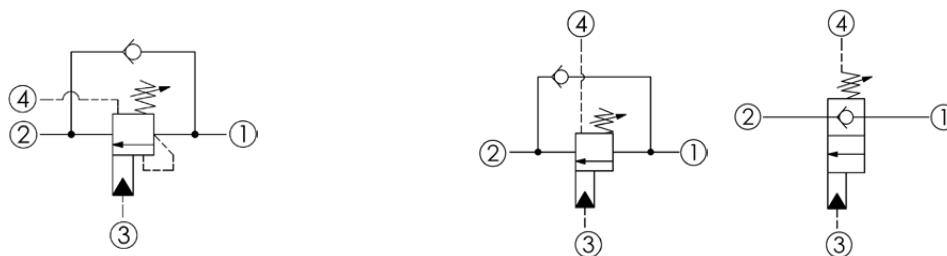
Options

L	Leakproof hex socket screw	C	Stainless steel tamper resistant
LP	Leakproof hex socket screw with stainless steel external metal components	CA	Plastic tamper resistant cover of general type hex nut
K	Handknob with lock knob	CB	Plastic tamper resistant cover
T	Three-winged handknob kit	CH	Plastic tamper resistant cover of general type hex nut



■ CW SERIES OVERVIEW

The CW Series is a 4-port counterbalance valve designed for applications with high or unstable return line pressure. The external drain configuration isolates internal valve operation from backpressure, ensuring consistent load control.



From left to right:

Vented Counterbalance Valve → Vented, Fully Balanced Load Control Valve without Relief Function

FUNCTIONS

- Allows free flow during load lifting through an integral check valve
- Blocks reverse flow until pilot pressure is applied
- Modulates return flow to maintain stable load lowering

DESIGN CHARACTERISTICS

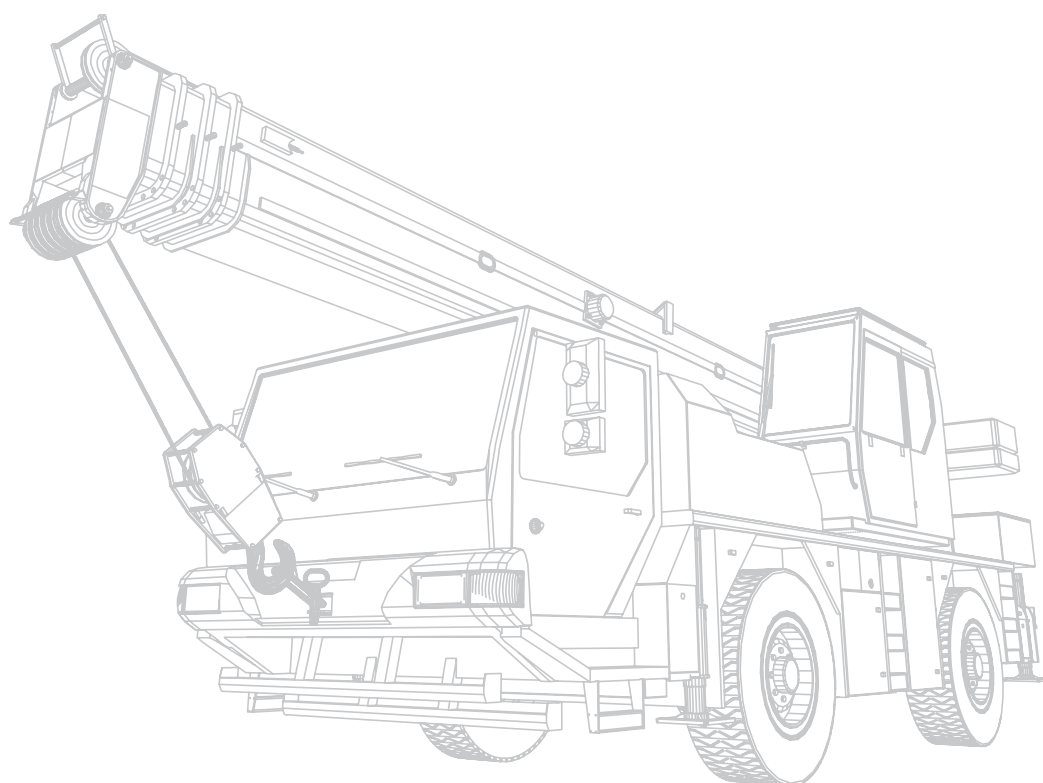
- 4-port configuration with external drain
- Independent of return line backpressure
- Improved stability in high-backpressure systems
- Reliable load-holding performance

TECHNICAL DATA

PARAMETER	VALUE
Maximum Operating Pressure	420 bar (6,000 psi)
Nominal Flow	Up to 480 LPM
Pilot Ratios	1:1 to 10:1
Internal Leakage	≤ 5 drops/min (0.3 cc/min)
Installation	Cartridge, CB-compatible cavity
Drain Requirement	Independent line to tank

SERIES QUICK COMPARISON

FEATURE	CB	CA	CW
Ports	3	3	4
Reference	Internal (Port 2)	Atmospheric vent	External Drain
Backpressure	Sensitive	Independent	Independent
Typical Use	Standard	General Mobile	Heavy-Duty





■ CW SERIES ENCODING PRINCIPLE

MODEL NUMBER STRUCTURE

CW – **21A** – **4A** – **H** – **L**

TYPE CAVITY PILOT RATIO ADJ. RANGE OPTIONS

VALVE TYPES

CW	4-Port Vented Type, Max. Setting 280 / 420 bar
CW	4-Port Vented Type without Relief Function Fully Balanced, Load Control Valve, Max. Setting 350 / 420 bar
CWA	4-Port Vented Type, Max. Setting 350 bar

CAVITY SIZE

21A	M20 x 1.5	23A	M36 x 2.0
22A	1"-14UNS	24A	M48 x 2.0

PILOT RATIOS

4A	1:1 (sealed pilot)	4B	2:1 (sealed pilot)	4C	3:1 (sealed pilot)
4D	4:1 (sealed pilot)	4E	5:1 (sealed pilot)	4J	10:1 (sealed pilot)
4N	With sealed pilot, balanced				

ADJUSTMENT RANGES

CRACKING PRESSURE 1.5 / 2.8 bar		CRACKING PRESSURE 1.7 bar	
H	70 - 280 bar (std. setting 210 bar)	H	70 - 280 bar (std. setting 210 bar)
I	25 - 105 bar (std. setting 70 bar)	I	25 - 105 bar (std. setting 70 bar)
F	70 - 175 bar (std. setting 140 bar)	F	70 - 175 bar (std. setting 140 bar)
G	140 - 420 bar (std. setting 280 bar)	G	140 - 420 bar (std. setting 280 bar)
		W	140 - 350 bar (std. setting 210 bar)

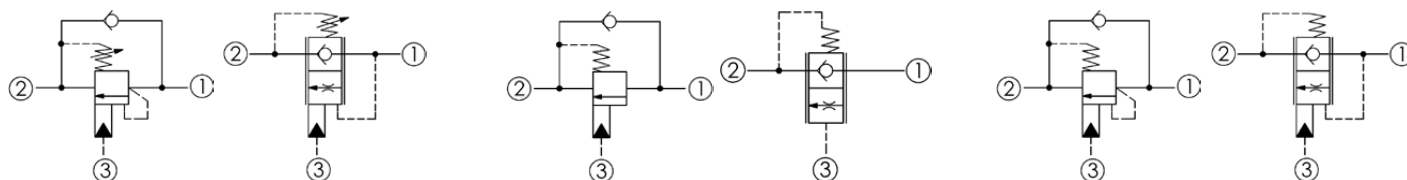
Options

L	Leakproof hex socket screw	C	Stainless steel tamper resistant		
LP	Leakproof hex socket screw with stainless steel external metal components	CB	Plastic tamper resistant cover	CH	Plastic tamper resistant cover of general type hex nut

3-Port Fully Balanced Counterbalance Valve

■ MB SERIES OVERVIEW

The MB Series integrates proportional control capability with counterbalance valve functionality. It provides precise load control and smooth motion modulation for applications requiring adjustable pressure settings.



From left to right:

Load Reactive, Load Control Valve → Fixed Setting, Load Reactive, Load Control Valve
→ 3-Port Fully Balanced Load Control Valve without Relief Function

FUNCTIONS

- Enables proportional pressure control for precise load handling
- Maintains load position until pilot pressure or control signal is applied
- Modulates return flow to prevent load overrun and ensure smooth motion

“ The higher the load, the greater the stability. ”

DESIGN CHARACTERISTICS

- 3-port proportional counterbalance design
- Adjustable and precise pressure modulation
- Stable control response
- Suitable for precision motion systems

TECHNICAL DATA

PARAMETER	VALUE
Maximum Operating Pressure	420 bar (6,000 psi)
Nominal Flow	Up to 480 LPM
Pilot Ratios	1.5:1, 3:1, 4.5:1
Internal Leakage	≤ 5 drops/min (0.3 cc/min)
Port Configuration	3-Port

3-Port Fully Balanced Counterbalance Valve**■ MB SERIES ENCODING PRINCIPLE****MODEL NUMBER STRUCTURE**

MB – **11A** – **3A** – **H** – **L**

TYPE CAVITY PILOT RATIO ADJ. RANGE OPTIONS

VALVE TYPES

MB	Non-Vented Load Reactive, Load Control Valve Max. Setting 350 / 420 bar
MB	Non-Vented, Fixed Setting, Load Reactive, Load Control Valve Max. Setting 350 bar
MB	3-Port Fully Balanced Load Control Valve without Relief Function Max. Setting 350 bar

CAVITY SIZE

11A	M20 x 1.5	17A	M36 x 2.0
2A	1"-14UNS	19A	M48 x 2.0

PILOT RATIOS

3A	1:1 (sealed pilot)	3C	3:1 (sealed pilot)	3D	4.5:1 (sealed pilot)
3N	With sealed pilot, balanced				

ADJUSTMENT RANGES

CRACKING PRESSURE 1.5 bar		MINIMUM PILOT SPRING PRESSURE			
H	70 - 280 bar (std. setting 210 bar)	0050	5 bar	0200	20 bar
I	25 - 105 bar (std. setting 70 bar)	0150	10.5 bar	0330	33 bar
J	140 - 350 bar (std. setting 210 bar)	0140	14 bar	0367	36.7 bar
F	70 - 175 bar (std. setting 140 bar)	FIXED SETTING - CRACKING PRESSURE 1.7 bar			
G	140 - 420 bar (std. setting 280 bar)	310	290 - 330 bar		

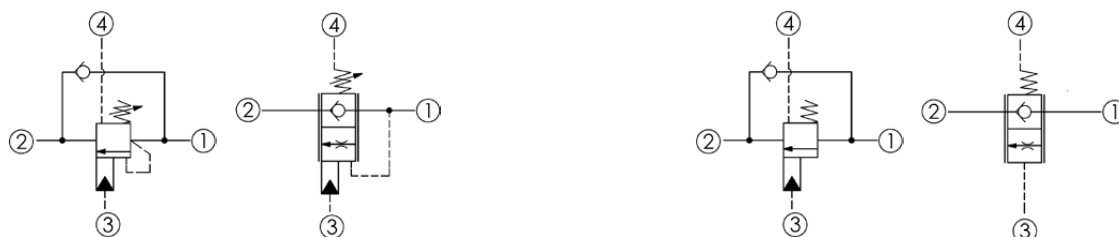
Options

L	Leakproof hex socket screw	C	Stainless steel tamper resistant	N	Non-adjustable
LP	Leakproof hex socket screw with stainless steel external metal components				

4-Port Fully Balanced Counterbalance Valve

■ MW SERIES OVERVIEW

The MW Series combines proportional modulation with external drain isolation, making it ideal for high-performance hydraulic systems requiring both precise control and independence from return line backpressure.



From left to right:

Vented Load Reactive, Load Control Valve → Vented, Fully Balanced Load Control Valve without Relief Function

FUNCTIONS

- Allows free flow from Port 1 to Port 2 during lifting through an integral high-capacity check valve
- Blocks reverse flow until pilot pressure is applied to maintain actuator position
- Modulates return flow to prevent load overrun and ensure smooth lowering

“ The higher the load, the greater the stability. ”

DESIGN CHARACTERISTICS

- 4-port configuration with external drain
- Fully balanced proportional design
- External drain isolation from return line pressure
- Stable modulation under dynamic load conditions

TECHNICAL DATA

PARAMETER	VALUE
Maximum Operating Pressure	420 bar (6,000 psi)
Nominal Flow	Up to 480 LPM
Pilot Ratios	1.5:1, 3:1, 4.5:1
Internal Leakage	≤ 5 drops/min (0.3 cc/min)
Drain Requirement	Independent line to tank

4-Port Fully Balanced Counterbalance Valve**MW SERIES ENCODING PRINCIPLE****MODEL NUMBER STRUCTURE**

MW – **22A** – **4A** – **H** – **L**

TYPE CAVITY PILOT RATIO ADJ. RANGE OPTIONS

VALVE TYPES

MW	4-Port Vented Load Reactive, Load Control Valve Max. Setting 350 bar
MW	4-Port, Vented, Fully Balanced Load Control Valve without Relief Function Max. Setting 350 bar

CAVITY SIZE

22A	1"-14UNS
23A	M36 x 2
24A	M48 x 2

PILOT RATIOS

4A	1.5:1 (sealed pilot)	4C	3:1 (sealed pilot)	4D	4.5:1 (sealed pilot)
4N	With sealed pilot, balanced				

ADJUSTMENT RANGES

CRACKING PRESSURE 1.7 bar		MINIMUM PILOT SPRING PRESSURE			
H	70 - 280 bar (std. setting 210 bar)	0050	5 bar (pilot range 10 - 30 bar)	0200	20 bar
J	140 - 350 bar (std. setting 210 bar)	0070	7 bar (pilot range 11 - 25 bar)	0330	33 bar
F	140 - 420 bar max. setting (std. setting 140 bar)	0105	10.5 bar	0367	36.7 bar

Options

L	Leakproof hex socket screw
N	Non-adjustable

WINNER PRODUCT SELECTION GUIDE

Winner provides a comprehensive range of counterbalance valves designed to meet diverse hydraulic system requirements, from standard industrial applications to high-precision proportional control systems.

SERIES	PORTS	PROPORTIONAL	BACKPRESSURE INDEP.	TYPICAL USE
CB	3	No	No	General Industrial
CA	3	No	Yes	Variable Return Pressure
CW	4	No	Yes	High Backpressure
MB	3	Yes	No	Precision Proportional
MW	4	Yes	Yes	High-precision, High-dynamic



SELECTION TIP

- For systems where return-line pressure may fluctuate, CA or CW Series provide more stable performance.
- For applications requiring precise electronic control, choose MB or MW Series proportional valves.



INSTALLATION GUIDELINES

- Install valve as close as possible to actuator
- Keep pilot lines short and properly sized
- For 4-port models, connect drain directly to tank with minimal backpressure
- Maintain fluid cleanliness ISO 4406 18/16/13 or better
- Set cracking pressure to approximately $1.3 \times$ maximum load-induced pressure



CRITICAL SAFETY WARNING

Never service a counterbalance valve while a load is suspended.

PRODUCT SELECTION GUIDE

PILOT PRESSURE REQUIREMENTS

Load lowering is initially restricted by the relief section of the counterbalance valve. The load-induced pressure generates a force that assists in opening the valve, working against spring force. As a result, the load itself reduces the actual pilot pressure required to open the relief piston.

KEY PARAMETERS

P = Pressure Required to Open Valve

L = Load-induced Pressure

P_s = Pressure Setting

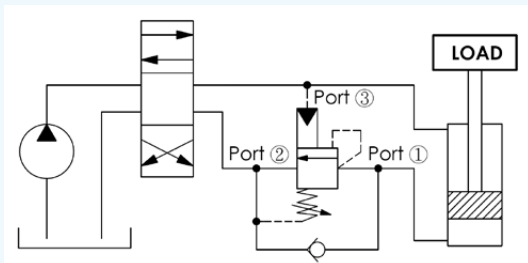
C_R = Cylinder Area Ratio = Bore Area ÷ Annular Area

P_R = Pilot Ratio = Area of Pilot Piston ÷ Differential Area of Control Piston

PRESSURE FORMULAS BY INSTALLATION TYPE

LOAD RETRACTS CYLINDER ROD (VALVE ON BLIND END)

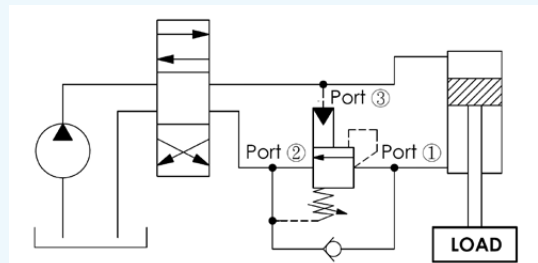
$$P = (P_s - L) / (P_R + \frac{1}{C_R})$$



Often simplified as: $P = (P_s - L) / P_R$

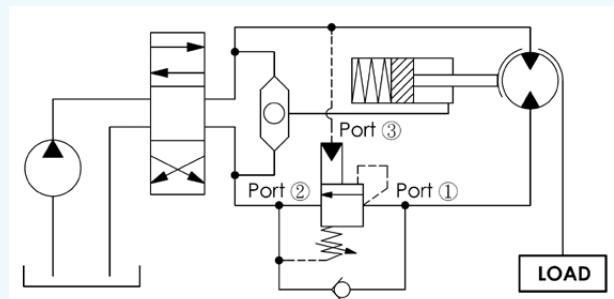
LOAD EXTENDS CYLINDER ROD (VALVE ON ROD END)

$$P = (P_s - L) / (P_R + C_R)$$



EQUAL-AREA ACTUATOR OR HYDRAULIC MOTOR ($C_R = 1$)

$$P = (P_s - L) / (P_R + 1)$$



CALCULATION CONDITIONS

Formulas apply under ideal conditions: no return line backpressure, and no seal friction. Real-world conditions may require adjustment.

FOR STATIC LOAD LOCKING

WINNER SOLUTION FOR STATIC LOAD LOCKING

Winner CC, CK, and CO series are cartridge-style pilot-operated check valves designed for static loading in hydraulic circuits. Suitable for static load applications requiring zero-leakage cylinder or motor position holding. They prevent drift in overrunning loads until pilot-released, ideal for safety-critical mobile and industrial hydraulics.

SERIES	TYPE	KEY CHARACTERISTIC
CO	Standard pilot Small pilot leakage acceptable	Standard (unsealed) pilot: Allows a small amount of pilot leakage into the work port
CK	Small pilot leakage acceptable	Vented design: Dedicated vent port (Port 4) isolates the pilot piston from backpressure, ensuring stable operation
CC	Sealed pilot Internal piston seal, no port leakage	Sealed pilot design: Internal seal on the pilot piston prevents leakage between the pilot port and work ports

COMPARISON: COUNTERBALANCE VS LOAD-HOLDING

FEATURE	LOAD-HOLDING	COUNTERBALANCE VALVE
Primary Function	Static load locking	Dynamic load control
Operating Principle	On/Off: Opens fully once pilot pressure exceeds threshold	Modulating: Opens proportionally to match flow demand
Motion Control	May cause instability or chatter when lowering heavy loads	Smooth and controlled descent with backpressure
Overrunning Load Control	Not suitable	Designed for overrunning loads
Hose-Burst Safety	Excellent (Static)	Excellent (Static & Dynamic)
Heat Generation	Very Low	Higher (due to induced backpressure)
Thermal Relief	None	Yes, CB can vent heat-induced pressure

FOR STATIC LOAD LOCKING

■ WHEN TO USE

Use CC, CK, or CO if...

- Need zero-leakage to prevent a cylinder from drifting over many hours.
- Load is "non-overrunning".
- Only need to lock a position (e.g., a lift table that stays at a specific height).

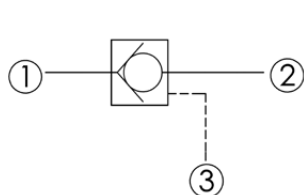
Use CBV (counterbalance) if...

- Smooth, controlled lowering is required (no bouncing or vibration).
- Load may overrun the hydraulic supply.
- Thermal expansion protection (CB valves can act as relief valves to bleed off pressure caused by heat; standard CO/CC valves cannot).

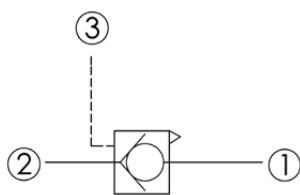
Key Highlights

Load-holding valves secure the load at rest.
Counterbalance valves ensure safe and controlled motion.

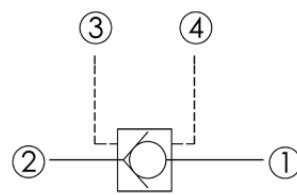
LOAD-HOLDING VALVE SYMBOLS



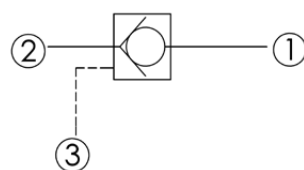
CC Series
Pilot-to-close



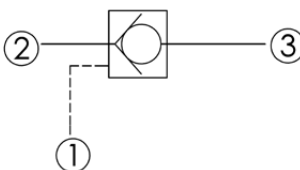
CK Series
Vented, Atmospherically
Referenced, Pilot-to-open



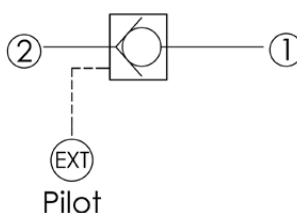
CK Series
Vented, Pilot-to-open



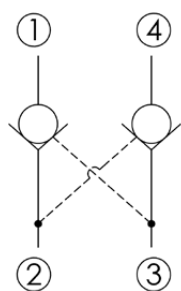
CO Series
Pilot-to-close, Ports 2 to 1



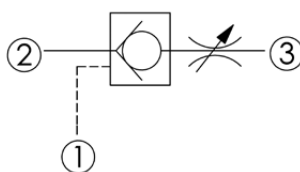
CO Series
Pilot-to-close, Ports 3 to 2



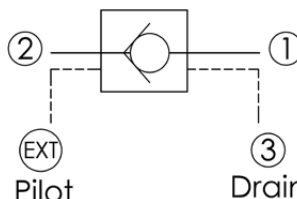
CO Series
Pilot-to-open with External
Pilot Port



CO Series
Dual Pilot-to-open



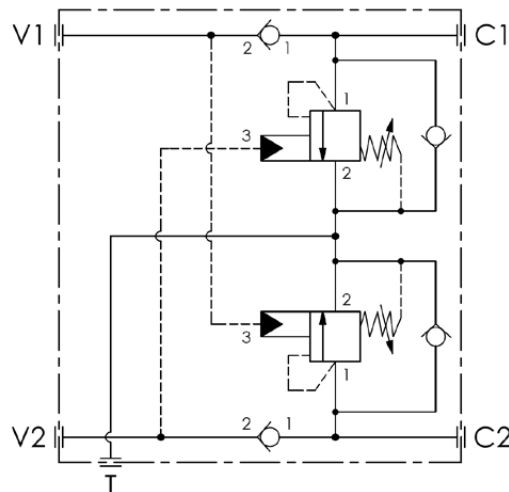
CO Series
Pilot-to-open with Adjustment



CO Series
Pilot-to-open with External
Pilot Port, Sealed Pilot,
and Stem Seal

■ DUAL CUSHION LOCK ASSEMBLY

This setup is standard for cranes and winches. The counterbalance valve controls load movement in three key operating modes, ensuring safety and precision at every stage.



1 EXTENSION — RAISING THE LOAD

Action: Fluid enters port V1, flows through the check valve, and fills the cylinder.

Result: The cylinder extends smoothly. Return flow from the other side is metered (restricted) to keep movement stable.

2 RETRACTION — LOWERING THE LOAD

Action: Fluid enters the rod end while simultaneously sending a pilot signal to the counterbalance valve.

Result: This "unlocks" the valve. The load is lowered under control — the valve creates backpressure, preventing runaway speeds caused by gravity.

3 NEUTRAL — LOCKING THE LOAD

Action: The directional valve is centered (closed).

Result: The counterbalance valves close immediately. This mechanically locks the fluid inside the cylinders, preventing load drift even if a hose bursts or the pump stops.

PRESSURE FORMULAS BY INSTALLATION TYPE

If a cylinder moves faster than the pump can supply oil (e.g., a heavy load dropping quickly), a vacuum can form. The T port allows the cylinder to draw in low-pressure oil from the tank to fill that void, preventing cavitation and air bubbles.

APPLICATION EXAMPLES

■ ASSEMBLY VARIANTS

The Dual Cushion Lock Assembly is available in four configurations, each building on the basic design with additional protection or signaling capability.

BASIC DUAL CUSHION LOCK ASSEMBLY

Two counterbalance valves mounted in parallel for standard load holding and controlled motion in both directions.

+ SHUTTLE VALVE

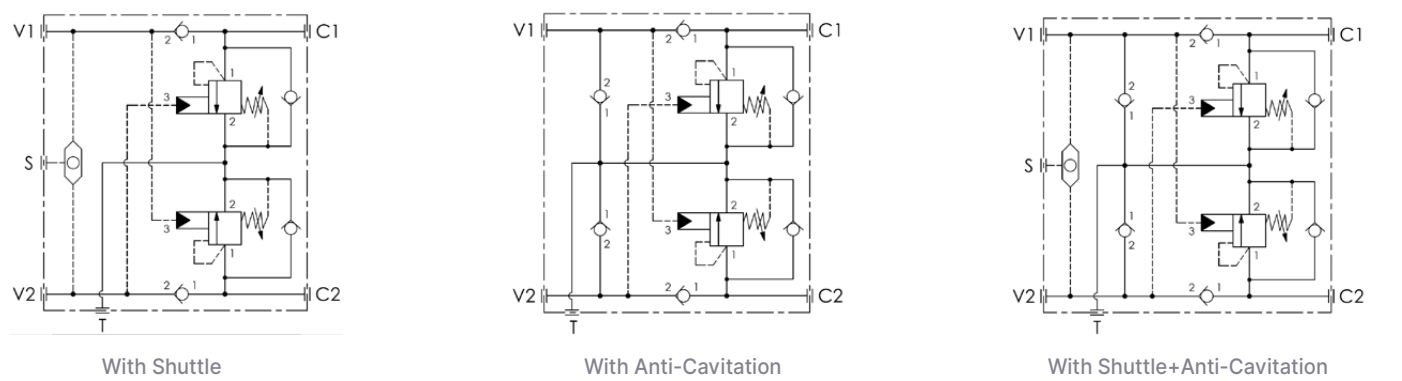
Shuttle valve senses the active line and adds a brake release signal for enhanced control integration.

+ ANTI-CAVITATION CHECKS

Anti-cavitation check valves connected to the T port prevent rod-side vacuum formation during rapid lowering.

+ SHUTTLE + ANTI-CAVITATION CHECKS

Combined configuration offering both brake release signaling and full cavitation protection — the most comprehensive variant.



VARIANT COMPARISON

VARIANT	KEY ADDITIONS	COUNTERBALANCE ROLE	VS. BASIC
With Shuttle	Shuttle valve	Load metering/ holding	Adds brake release signal
Shuttle + Anti-Cavitation	Shuttle + checks	Checks prevent rod vacuum	Brake signal + Cavitation protection
Anti-Cavitation Only	Anti-Cavitation checks	Optional T port	Cavitation protection only

WE CONNECT

Winner Hydraulics offers a complete counterbalance valve platform, covering applications from standard load holding to advanced stability control and high-precision proportional systems. Our comprehensive product range ensures that you have the right solution for every hydraulic control challenge — CA, CB, CW, MB, and MW series.

COUNTERBALANCE VALVES OVERCENTRE VALVES LOAD-HOLDING VALVES

CB SERIES

CA SERIES

CW SERIES

MB SERIES

MW SERIES

CO SERIES

CK SERIES

CC SERIES



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