## Load and Motor Control Valves

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<th>FLOW</th>
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<th>PAGE NO.</th>
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<tr>
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<td>MHC-120</td>
<td>Counterbalance Valves</td>
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<td>12 GPM</td>
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<td><strong>Dual Motor Control</strong></td>
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<tr>
<td>MMB-015</td>
<td>Motor Control Valves</td>
<td>15 GPM</td>
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<td>LM43-LM48</td>
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<tr>
<td>MMB-025</td>
<td>Motor Control Valves</td>
<td>25 GPM</td>
<td>3000 PSI</td>
<td>LM49-LM54</td>
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<td>MMB-100</td>
<td>Motor Control Valves</td>
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<td>LM55-LM60</td>
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<td>Motor Control Valves</td>
<td>200 GPM</td>
<td>3000 PSI</td>
<td>LM55-LM60</td>
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</tbody>
</table>
Introduction

Counterbalance valves are one of the most misunderstood products in the hydraulic industry. Many people tend to complicate the task of selecting a counterbalance valve and as such avoid opportunities. The goal of this Technical Tips Section is to hopefully eliminate some of this confusion and help you choose the correct valve for your application. It is only a guide! It is not meant to be your only method of input, nor is it meant to replace good hydraulic common sense and reasoning.

Application

DO I NEED A COUNTERBALANCE VALVE?

A counterbalance is generally used for one or more of the following purposes:

Control an Overrunning Load – It restricts the flow from an actuator, thus forcing the load to be pushed through the restriction and providing control of the potential runaway load. This also helps in the prevention of cavitation.

Control in Critical Metering Applications – The outward restriction also helps to gain control of systems with varying loads and speeds.

Holding a Load – Much like a pilot operated check valve, a load is held in one direction until the appropriate pilot pressure is available to unseat the check and pass fluid.

Help Protect Against Hose Failures – Since the fluid must be pushed through a restriction, hose failures result in a controlled movement of the actuator and not a runaway load.

NOTE: Counterbalance Valves are only needed if the application calls for varying loads or varying speeds. If the load and speed are fixed, flow control valves and pilot operated check valves may be substituted at generally a lower cost.

Operation

An understanding of the general operation of a counterbalance valve is required before proceeding further into valve selection.

The counterbalance valve is a pressure control device and functions as follows: Pressure is developed at the Work Port of the holding valve when the actuator is pressurized. This pressure acts on the differential area, and the force generated is counteracted by the bias spring. When there is sufficient pressure present to overcome the spring setting, the poppet begins to shift, allowing fluid to pass through the valve to tank.

To assist in the shifting of the poppet, an external pressure source (generally the opposite side of the actuator) is connected to the pilot port. This pressure is applied to the pilot area and assists the differential area in opening the valve. The pilot assist reduces load pressure required to open the valve, and allows for a reduction in the horsepower required to move the load.

If the load attempts to “run away” (move faster than the pump can supply flow), the pilot signal will diminish and the piston will begin to close restricting flow to tank and thus controlling the load. The counterbalance piston will maintain a position that maintains a positive pilot signal and will control the descent of the load.

An added feature of the counterbalance valve is its built-in thermal relief characteristic. A temperature rise can cause thermal expansion of the hydraulic fluid trapped between the actuator and the counterbalance valve’s poppet. As the pressure increases and reaches the bias spring setting, the poppet unseats and a few drops of oil are allowed to escape through the valve port of the counterbalance valve. This relieves the thermal expansion of oil, allowing the counterbalance valve to continue holding the load in the same position.

When the flow is reversed to the actuator, then pressure unseats the built-in bypass check portion of the counterbalance valve allowing flow to pass from the valve port to the work port. When no pressure is applied to either port of the counterbalance valve, the load is held in place.
Valve Series

Parker offers the four series of products outlined below:

**MHB** – The MHB series is a body style counterbalance valve. It is an in-line valve and is ideal for mounting directly to an actuator port. There are various flow rates, pilot ratios, and mounting styles available in the MHB series.

**MHC** – The MHC series is a threaded cartridge style counterbalance valve. This series is ideal for incorporating into an integrated manifold or for installation directly into the port of the actuator. There are various flow rates and pilot ratios available for the MHC Series.

**CB101** – The CB101 is also a threaded cartridge style counterbalance valve. It also is ideal for incorporating into an integrated manifold or for installation directly into the port of the actuator. The CB101 has an industry common cavity (C10-3) and is available in three pilot ratios.

**MMB** – The MMB is a motor control valve. It is manifold mounted to fit the Parker, TB, TE, TF, & TG motors. It is available in an equal area or a 10:1 pilot ratio. While the basic concept is the same, motor control systems have different characteristics and requirements than cylinder applications. For assistance in applying a motor control valve, consult the Motor Control Section of the Technical Tips.

Selecting Options

Below is a walk through of the options available on the ordering information pages and a brief description of when each would be used.

**Flow Selection** – Generally the counterbalance valve is sized according to the actual flow the valve will see and not the system flow. Note that the ordering information callout is the nominal flow rate and not the maximum. In other words, refer to the pressure drop curves when sizing the valves. For example: A MHC-010 can flow 25 GPM, but is rated as a 10 GPM valve. It is possible to oversize a counterbalance valve! If the counterbalance is oversized, the annulus between the poppet and the seat is too large, thus the poppet opens too far causing instability. Remember you are gaining control by causing a restriction. If you oversize the counterbalance valve, the restriction is reduced and so is the control.

**Vented versus Non-Vented** – With a standard counterbalance valve, the bias spring is internally vented to tank. This means any pressure on the tank line is sensed in the bias spring chamber and additive to the setting. Thus, the pressure at the work port must be greater than the bias spring plus the tank pressure before the counterbalance poppet will shift allowing flow. A vented style counterbalance valve relieves the bias spring chamber to atmosphere. Thus, the spring chamber is in no way related to the tank chamber of the counterbalance valve. So, if the pressure on the tank line is high, or if the pressure setting is critical, then a vented style counterbalance valve would be required.

Parker's counterbalance valves are externally vented. This means no extra porting or manifold costs are incurred when a vented counterbalance is needed.
Selection Options (Continued)

Pilot Ratio – The pilot ratio is the ratio of the pilot area versus the differential area poppet. Thus, the higher the pilot ratio, the less pressure that is needed to assist the load pressure in unseating the poppet. This means there is less restriction to the unseating load, and more control of the load. So higher pilot ratio equates to less restriction to the unseating load, less control and less horsepower required. Lower ratio equates to more restriction to unseating load, more control and more horsepower required. The pilot ratio decision is one of Horsepower versus Control. For reference the most popular ratio is 6:1.

Sample Ratios:
50:1 and 25:1
Primary function is load holding or hose break protection

10:1
Primary function is load holding or hose break protection
Loads moving at fast speeds and positioning is not critical

7:1, 6:1 and 5:1
Most popular starting ratio

4:1 and 3:1
Positioning is critical such as a pick and place application
Instability with 6:1 ratio

1:1
Motor control application

ADJUSTMENT TYPE
Parker offers counterbalance valves with adjustable and non-adjustable pressure settings. The non-adjustable or shimmed version is recommended for most applications as it prevents tampering or improper adjustment uneducated end user.

SELECTING SETTINGS
There are three basic settings to consider before finalizing a counterbalance valve for your application.

Holding Setting – The holding setting is sometimes referred to as the counterbalance setting. It is the maximum load setting you expect the counterbalance to hold. Note that the counterbalance valve should be set for the absolute maximum hold pressure required. Also note that counterbalance valves are restrictive type devices and as such are not ideal for low pressure applications, such as those below 750 psi. The holding setting is the setting you choose when selecting a counterbalance valve.

Thermal Setting – Counterbalance valves have a built-in thermal relief valve that compensates for the expansion of oil, due to temperature, by bleeding off excess pressure. In other words, the thermal setting is the pressure that the counterbalance will unload at if no pressure is present at the pilot port. Obviously, this setting should be above the holding setting. The Parker counterbalance valves are automatically set 1000 psi above the holding setting of the valve. You do not specify this setting.

Pilot Area – The pilot pressure required to lower the cylinder when fully loaded and unloaded can also be determined before applying the valve. The pilot pressure can be determined by the below equation:

\[ P_P = \frac{(T_S - L)}{R_P} \]

Where:
- \( P_P \) = Pilot Pressure
- \( T_S \) = Thermal Setting
- \( L \) = Induced Load
- \( R_P \) = Pilot Ratio

Example:
The maximum load is 3000 psi. A 6:1 Pilot Ratio was chosen and the thermal relief setting is the standard 1000 psi over load setting. What is the pilot pressure required to retract the cylinder if it is fully loaded? What pilot pressure is required to retract the cylinder if there is no load?

FULLY LOADED:

\[ P_P = \frac{(4000 \text{ psi} - 3000 \text{ psi})}{6} = \frac{1000 \text{ psi}}{6} = 167 \text{ psi} \]

Thus, any time the pilot line sees at least 167 psi, the cylinder could lower the load.

UNLOADED:

\[ P_P = \frac{(4000 \text{ psi} - 0 \text{ psi})}{6} = \frac{4000 \text{ psi}}{6} = 667 \text{ psi} \]

Thus, at least 667 psi will be needed to lower the cylinder when it is unloaded.
Motor Controls

Counterbalance valves are used in motor circuits to stop overrunning loads and prevent cavitation. Since hydraulic motors leak internally, the counterbalance valve by itself cannot be used to hold the load. So, a mechanical brake is used to hold the load on the motor in place, as shown below. Some typical applications include winches, swing drives, and traction drives.

Brake Applications

When the directional control valve is shifted, hydraulic pressure (usually 300 psi) releases the mechanical brake and allows the load to be moved. The counterbalance valve is needed to provide back pressure to open the brake, then immediately counterbalance the load. Ideally, the brake will be disengaged before the motor begins to rotate. If this sequence is not achieved, the motor will try to rotate against the applied brake reducing the life of the brake. This would be the equivalent of trying to drive with your emergency break applied. Remember that hydraulic motors are equal area devices. So, in an effort to avoid the movement of the motor prior to the release of the brake, an equal area ratio counterbalance is used. To demonstrate let's look again at the above example with a 10:1 Ratio Counterbalance valve installed and a maximum thermal setting of 3000 psi.

10:1 Example

$$P_p = (T_s - L) / R_p$$
$$P_p = (3000 \text{ psi} - 0 \text{ psi}) / 10$$
$$P_p = 300 \text{ psi}$$

Thus, when there is no load on the motor, the counterbalance opens at 300 psi, or just as the brake is being released. When there is a 2000 psi load on the motor, the counterbalance will start to open with a pilot pressure of 100 psi. The brake requires 300 psi, so the motor can start to rotate before the brake is released, causing wear on the brake. To offset this problem, you could increase the maximum thermal setting to 5000 psi, but this is very inefficient.

1:1 (Equal Area) Example

Equal area counterbalance valves are used primarily in brake applications to avoid the wear problem described above. With an Equal Area counterbalance valve, there is no thermal relief valve, and there is no differential area to work on. In other words, the counterbalance valve only opens when the pilot pressure is greater than the valve setting. The applied load has nothing to do with the pilot pressure required. Thus you will want to choose a pressure setting for the equal area counterbalance valve that is just slightly above the brake release pressure (usually 350 psi).

In our example, the valve would be set at 350 psi. This would allow the brake to release before the counterbalance allows the load to move. Since the equal counterbalance valve always opens at 350 psi pilot pressure and is not dependent on the load, it is the best valve for brake applications.

Large Pressure Spike Application – Keep in mind that equal area counterbalance valves do not have a built-in thermal relief valve. As such, if there are large pressure spikes caused by the stopping of heavy loads, then a ratioed counterbalance, such as a 10:1 should be used. In most cases these are non-brake type applications.
High Flow Application (Over 25 GPM) – The high flow applications present a new set of issues that a designer needs to consider. In high flow applications you have large volume of oil in compression that acts as a media for transmitting pressure ripples. Thus, a ripple in a pump or motor cause a big ripple as it is transmitted through the large volume of oil to the system causing inconsistent control. To eliminate this problem a spool type counterbalance valve, such as the MMB-100 or MMB-160 must be used instead of a poppet style. Spool style counterbalance valves allow for a longer stroke than poppet valves and as such can be tailored to effectively reduce the ripple generated by the pump or motor.

Notches on a spool valve provide controlled counterbalance back pressure from 0 GPM to the maximum flow. A spool with a long stroke also allows the effective use of hydraulic dashpots to prevent spool over travel. Since poppets move such a short distance and the volume displaced is so small, the orifice size of an effective dashpot is too small and susceptible to contamination.

Application Reference Tree
General Description

MHB-015 series counterbalance valves are load holding valves with a pilot assist. They can control moving loads, prevent loads from running ahead of the pump, lock loads in any position without drift, and provide static overload relief and thermal expansion relief with open center directional control valves.

Operation

See Technical Tips.

Features

- Conical Poppet design provides longer metering stroke
- Hardened seat provides reliable load holding
- External vent option available for high back pressure applications
- Tamper resistant cap for added safety and security
- Various pilot ratios available for application flexibility

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Flow</td>
<td>46.25 LPM (15 GPM)</td>
</tr>
<tr>
<td>Maximum Inlet Pressure</td>
<td>207 Bar (3000 PSI)</td>
</tr>
<tr>
<td>Leakage</td>
<td>5 drops/min (.33 cc/min.)</td>
</tr>
<tr>
<td>Operating Temp. Range (Ambient)</td>
<td>-31.7°C to +121.1°C (-25°F to +250°F) (Fluorocarbon Seals Only)</td>
</tr>
<tr>
<td>Seal Compound</td>
<td>Fluorocarbon</td>
</tr>
<tr>
<td>Valve Material</td>
<td>All parts steel. All operating parts hardened steel.</td>
</tr>
<tr>
<td>Body Material</td>
<td>Aluminum</td>
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<tr>
<td>Filtration</td>
<td>ISO Code 16/13, SAE Class 4 or better</td>
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<tr>
<td>Mounting</td>
<td>No Restrictions</td>
</tr>
<tr>
<td>Cavity</td>
<td>None – Parts in Body</td>
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</table>

Symbols

Non-Vented Dual Counterbalance

Vented Dual Counterbalance

Performance Curve

Flow vs. Pressure Drop (Through cartridge only)
### Counterbalance Valves

#### Series MHB-015

**Dimensions**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dimensions</th>
</tr>
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<tbody>
<tr>
<td>MHB-015-L<em>A</em></td>
<td>Single Counterbalance, Non-Vented, In-line Mount</td>
<td>7.9 (0.31) x 46.2 (1.82)</td>
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<tr>
<td>MHB-015-W<em>A</em></td>
<td>Single Counterbalance, Vented, In-line Mount</td>
<td>22.4 (0.88)</td>
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<tr>
<td>MHB-015-L<em>D</em></td>
<td>Dual Counterbalance, Non-Vented, In-line Mount</td>
<td>63.5 (2.50)</td>
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<td>MHB-015-W<em>D</em></td>
<td>Dual Counterbalance, Vented, In-line Mount</td>
<td>74.2 (2.92)</td>
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</tbody>
</table>

*Inch equivalents for millimeter dimensions are shown in (**)"
Dimensions

Counterbalance Valves
Series MHB-015

*Inch equivalents for millimeter dimensions are shown in (**) 

Series MHB-015-L*B* Single Counterbalance, Non-Vented, Gasket Mount
Series MHB-015-W*B* Single Counterbalance, Vented, Gasket Mount

Series MHB-015-L*E* Dual Counterbalance, Non-Vented, Gasket Mount
Series MHB-015-W*E* Dual Counterbalance, Vented, Gasket Mount

Parker Hannifin Corporation
Integrated Hydraulics Division
Lincolnshire, Illinois 60069 USA

mhb-015.p65
## Ordering Information

**Counterbalance Valves**  
**Series MHB-015**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>A</td>
<td>1:1 Equal Area</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>3:1</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>6:1</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>10:1</td>
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</tbody>
</table>

* Equal Area does not have a thermal relief.

<table>
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<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>L</td>
<td>Non-vented</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Vented</td>
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<tr>
<th>Code</th>
<th>Type</th>
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<td>015</td>
<td>46.3 LPM (15 GPM)</td>
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**Shipping Weight**
- Single: 0.68 kg (1.5 lbs.)
- Double: 1.36 kg (3.0 lbs.)

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<th>Code</th>
<th>Type</th>
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<tr>
<td>51</td>
<td>SAE-6</td>
</tr>
<tr>
<td>52</td>
<td>SAE-8 (Gasket mount only)</td>
</tr>
<tr>
<td>04</td>
<td>1/4&quot; NPTF</td>
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</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>1/4&quot; NPTF (Code 04 body only)</td>
</tr>
</tbody>
</table>

**Pilot Porting**
- Code Type: N Internal Pilot (Dual valve only)
- Code Type: E SAE-6 (Code 51 & 52 bodies only)
- Code Type: B 1/4" NPTF (Code 04 body only)

**Holding Pressure**
- Code Type: C 17.2 to 34.5 Bar (250 to 500 PSI) 1:1 Pilot only
- Code Type: E 34.5 to 103.4 Bar (500 to 1500 PSI)
- Code Type: H 69 to 210 Bar (1000 to 3000 PSI)

Parker Hannifin Corporation  
Integrated Hydraulics Division  
Lincolnshire, Illinois 60069 USA
General Description
MHB-030 series counterbalance valves are load holding valves with a pilot assist. They can control moving loads, prevent loads from running ahead of the pump, lock loads in any position without drift, and provide static overload relief and thermal expansion relief with open center directional control valves.

Operation
See Technical Tips.

Features
- Conical Poppet design provides longer metering stroke
- Hardened seat provides reliable load holding
- External vent option available for high back pressure applications
- Tamper resistant cap for added safety and security
- Various pilot ratios available for application flexibility

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Flow</td>
<td>112.5 LPM (30 GPM)</td>
</tr>
<tr>
<td>Maximum Inlet Pressure</td>
<td>207 Bar (3000 PSI)</td>
</tr>
<tr>
<td>Leakage</td>
<td>5 drops/min (.33 cc/min.) @ 207 Bar (3000 PSI)</td>
</tr>
<tr>
<td>Operating Temp. Range (Ambient)</td>
<td>-31.7°C to +121.1°C (-25°F to +250°F) (Fluorocarbon Seals Only)</td>
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<tr>
<td>Seal Compound</td>
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<td>All parts steel. All operating parts hardened steel.</td>
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<td>ISO Code 16/13, SAE Class 4 or better</td>
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<tr>
<td>Mounting</td>
<td>No Restrictions</td>
</tr>
<tr>
<td>Cavity</td>
<td>None – Parts in Body</td>
</tr>
</tbody>
</table>

Symbols

- Non-Vented Dual Counterbalance
- Vented Dual Counterbalance

Performance Curve

Flow vs. Pressure Drop (Through cartridge only)
Counterbalance Valves
Series MHB-030

*Inch equivalents for millimeter dimensions are shown in (**)

Series MHB-030-L*A* Single Counterbalance, Non-Vented, In-line Mount
Series MHB-030-W*A* Single Counterbalance, Vented, In-line Mount

Series MHB-030-L*D* Dual Counterbalance, Non-Vented, In-line Mount
Series MHB-030-W*D* Dual Counterbalance, Vented, In-line Mount

MHB-030-L*A* Non-Vented

MHB-030-W*A* and MHB-030-W*D* Vented

MHB-030-L*D* Non-Vented
Dimensions

Series MHB-030-L*B* Single Counterbalance, Non-Vented, Gasket Mount
Series MHB-030-W*B* Single Counterbalance, Vented, Gasket Mount

*Inch equivalents for millimeter dimensions are shown in (**)

Series MHB-030-L*E* Dual Counterbalance, Non-Vented, Gasket Mount
Series MHB-030-W*E* Dual Counterbalance, Vented, Gasket Mount
Counterbalance Parts In Body | Nominal Flow Rating | Pilot Ratio | Body Style | Holding Pressure | Porting | Pilot Port
---|---|---|---|---|---|---
MHB - 030

**Code** | **Type**
---|---
L | Non-vented
W | Vented

**Code** | **Description**
---|---
030 | 112.5 LPM (30 GPM)

**Code** | **Ratio**
---|---
*A* | 1:1 Equal Area
B | 3:1
E | 6:1
J | 10:1

* Equal Area does not have a thermal relief.

**Code** | **Type**
---|---
52 | SAE-8
53 | SAE-10 (Gasket mount only)
06 | 3/8” NPTF
08 | 1/2” NPTF

**Code** | **Type**
---|---
52 & 53 bodies only

**Code** | **Type**
---|---
N | Internal Pilot (Dual valve only)
E | SAE-6
B | 1/4” NPTF (Code 06 and 08 bodies only)

Shipping Weight
- Single: 1.13 kg (2.5 lbs.)
- Double: 2.05 kg (4.5 lbs.)

**Pilot**

**Code** | **Porting**
---|---
L Non-vented
W Vented

**Code** | **Body Style**
---|---
A | Single Inline
B | Single Gasket
D | Double Inline
E | Double Gasket

Parker Hannifin Corporation
Integrated Hydraulics Division
Lincolnshire, Illinois 60069 USA
General Description

MHB-060 series counterbalance valves are load holding valves with a pilot assist. They can control moving loads, prevent loads from running ahead of the pump, lock loads in any position without drift, and provide static overload relief and thermal expansion relief with open center directional control valves.

Operation

See Technical Tips.

Features

- Conical Poppet design provides longer metering stroke
- Hardened seat provides reliable load holding
- External vent option available for high back pressure applications
- Tamper resistant cap for added safety and security
- Various pilot ratios available for application flexibility

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Flow</td>
<td>225 LPM (60 GPM)</td>
</tr>
<tr>
<td>Maximum Inlet Pressure</td>
<td>350 Bar (5000 PSI)</td>
</tr>
<tr>
<td>Leakage</td>
<td>5 drops/min (.33 cc/min.)</td>
</tr>
<tr>
<td>@ 207 Bar (3000 PSI)</td>
<td></td>
</tr>
<tr>
<td>Operating Temp. Range</td>
<td>-31.7°C to +121.1°C (-25°F to +250°F)</td>
</tr>
<tr>
<td>(Ambient)</td>
<td></td>
</tr>
<tr>
<td>Seal Compound</td>
<td>Fluorocarbon</td>
</tr>
<tr>
<td>Valve Material</td>
<td>All parts steel. All operating parts hardened steel.</td>
</tr>
<tr>
<td>Body Material</td>
<td>Steel</td>
</tr>
<tr>
<td>Filtration</td>
<td>ISO Code 16/13, SAE Class 4 or better</td>
</tr>
<tr>
<td>Mounting</td>
<td>No Restrictions</td>
</tr>
<tr>
<td>Cavity</td>
<td>None – Parts in Body</td>
</tr>
</tbody>
</table>

Symbols

Non-Vented Dual Counterbalance

Vented Dual Counterbalance

Performance Curve

Flow vs. Pressure Drop (Through cartridge only)
**Hydraulics**

**Counterbalance Valves**

**Series MHB-060**

*Inch equivalents for millimeter dimensions are shown in (**)*

**Series MHB-060-L*G* Single Counterbalance, Non-Vented, In-line Mount**

**Series MHB-060-W*G* Single Counterbalance, Vented, In-line Mount**

**Series MHB-060-L*K* Dual Counterbalance, Non-Vented, In-line Mount**

**Series MHB-060-W*K* Dual Counterbalance, Vented, In-line Mount**

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Parker Hannifin Corporation
Integrated Hydraulics Division
Lincolnshire, Illinois 60069 USA

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Inch equivalents for millimeter dimensions are shown in (**)*
**Dimensions**

Counterbalance Valves

Series MHB-060

*M* Inch equivalents for millimeter dimensions are shown in (**)

**Series MHB-060-L*H***: Single Counterbalance, Non-Vented, Gasket Mount

**Series MHB-060-W*H***: Single Counterbalance, Vented, Gasket Mount

**MHB-060-L*H* Non-Vented**

**MHB-060-W*H* and**

**MHB-060-W*L* Vented**

**Series MHB-060-L*L**: Dual Counterbalance, Non-Vented, Gasket Mount

**Series MHB-060-W*L**: Dual Counterbalance, Vented, Gasket Mount

**MHB-060-L*L Non-Vented**

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Parker Hannifin Corporation
Integrated Hydraulics Division
Lincolnshire, Illinois  60069  USA
General Description

MHB-120 series counterbalance valves are load holding valves with a pilot assist. They can control moving loads, prevent loads from running ahead of the pump, lock loads in any position without drift, and provide static overload relief and thermal expansion relief with open center directional control valves.

Operation

See Technical Tips.

Features

- Conical Poppet design provides longer metering stroke
- Hardened seat provides reliable load holding
- External vent option available for high back pressure applications
- Tamper resistant cap for added safety and security
- Various pilot ratios available for application flexibility

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Flow</td>
<td>450 L/M (120 GPM)</td>
</tr>
<tr>
<td>Maximum Inlet Pressure</td>
<td>350 Bar (5000 PSI)</td>
</tr>
<tr>
<td>Leakage</td>
<td>5 drops/min (.33 cc/min.) @ 207 Bar (3000 PSI)</td>
</tr>
<tr>
<td>Operating Temp. Range</td>
<td>-31.7°C to +121.1°C (-25°F to +250°F) (Fluorocarbon Seals Only)</td>
</tr>
<tr>
<td>Seal Compound</td>
<td>Fluorocarbon</td>
</tr>
<tr>
<td>Valve Material</td>
<td>All parts steel. All operating parts hardened steel.</td>
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<tr>
<td>Cavity</td>
<td>None – Parts in Body</td>
</tr>
</tbody>
</table>
Counterbalance Valves

Series MHB-120

*Inch equivalents for millimeter dimensions are shown in (**) 

Series MHB-120-L*G*-84E Single Counterbalance, Non-Vented, In-line Mount
Series MHB-120-W*G*-84E Single Counterbalance, Vented, In-line Mount

Series MHB-120-L*G*-85E Single Counterbalance, Non-Vented, In-line Mount
Series MHB-120-W*G*-85E Single Counterbalance, Vented, In-line Mount
**Counterbalance Valves**

Series MHB-120

- **MHB-120-L*G*-86E** Single Counterbalance, Non-Vented, In-line Mount
- **MHB-120-W*G*-86E** Single Counterbalance, Vented, In-line Mount

*Inch equivalents for millimeter dimensions are shown in (**)*

**Dimensions**

- **MHB-120-L*G*-86E Non-Vented**
  - 95.3 (3.75) Thread
  - 18.2 (.72) Cylinder Port
  - 38.1 (1.50) 5/8-11 UNC Thread

- **MHB-120-W*G*-86E Vented**
  - 109.3 (4.31) 13.5 (.53) Dia.
  - 10.9 (.43) 2 Thru Mfg. Holes

**Series MHB-120-L*G*-87E** Single Counterbalance, Non-Vented, In-line Mount

- 13.5 (.53) Dia.

**Series MHB-120-W*G*-87E** Single Counterbalance, Vented, In-line Mount

- 13.5 (.53) Dia.
  - 61.0 (2.40) 101.6 (4.00)
  - 79.4 (3.13) Valve Port

Parker Hannifin Corporation
Integrated Hydraulics Division
Lincolnshire, Illinois 60069 USA
# Counterbalance Valves
## Series MHB-120

### Ordering Information

**MHB**
- Counterbalance Parts In Body

**120**
- Nominal Flow Rating

**G**
- Pilot Setting

**E**
- Holding Pressure

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Non-vented</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Vented</td>
<td></td>
</tr>
</tbody>
</table>

**Code**
- Type: L Non-vented, W Vented

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Single Inline</td>
<td></td>
</tr>
</tbody>
</table>

**Code**
- Type: E SAE-6

<table>
<thead>
<tr>
<th>Code</th>
<th>Ratio</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>*A</td>
<td>1:1 Equal Area</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>3:1</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>6:1</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>10:1</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>10:1 Spherical Poppet</td>
<td></td>
</tr>
</tbody>
</table>

* Equal Area does not have a thermal relief.

**Shiping Weight**
- Steel: 9.53 kg (21.0 lbs.)

---

**Vent Setting**

**Nominal Flow Rating**

**Pilot Setting**

**Body Style**

**Holding Pressure**

**Porting**

**Pilot Port**

---

**Code**
- Type: C 17.2 to 34.5 Bar (250 to 500 PSI) 1:1 Pilot ratio only

**Code**
- Type: E 34.5 to 103.4 Bar (500 to 1500 PSI)

**Code**
- Type: H 69 to 210 Bar (1000 to 3000 PSI)

**Code**
- Type: K 69 to 350 Bar (1000 to 5000 PSI) Steel body only

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**Code**
- Type: 84 1-1/4" Code 62 Flange 350 Bar (5000 PSI)

**Code**
- Type: 85 1-1/4" Code 61 Flange 210 Bar (3000 PSI)

**Code**
- Type: 86 1-1/2" Code 62 Flange 350 Bar (5000 PSI)

**Code**
- Type: 87 1-1/2" Code 61 Flange 210 Bar (3000 PSI)