VALVES FOR MOTORS:
DUAL COUNTERBALANCE WITH BRAKE RELEASE PORT

Bosch Rexroth Oil Control manufactures a variety of valves for pressure, flow and motion control of actuators working in both forward and reverse direction. A few of these valves are designed to be line mounted on the 2 main hoses, but many of them are studied to match the port patterns of commercially available hydraulic motors and they can be flanged onto the motor directly simplifying plumbing and saving space.

This catalogue shows examples of valves for Rexroth A2FE Series and Sauer-Danfoss orbital motors, but the valve range extends to a number of other motors as well.

The valves are grouped by hydraulic function as follows:
4a) DUAL CROSS OVER RELIEF
4b) SINGLE COUNTERBALANCE WITH BRAKE RELEASE PORT
4c) DUAL COUNTERBALANCE WITH BRAKE RELEASE PORT
4d) MOTION CONTROL

4c) DUAL COUNTERBALANCE WITH BRAKE RELEASE PORT

They are a combination of a two internally cross-piloted counterbalance valves and of a shuttle valve for brake release through « C3 » port; they are usually employed to control hydraulic motors where loads or inertia forces can be overrunning in both directions, and which have a spring loaded holding brake (example: hydraulic motors for forward and reverse travelling, or for clockwise and anti-clockwise slewing).

NOTE: these hydraulic circuits usually have a Main Control Valve with both ports open to Tank in central position in order to prevent pressure building up in either V1 or V2 line, with possibility of inadvertent releasing of the holding brake through the C3 port.

In systems powered by hydraulic motors, the pressure induced by the overrunning loads generally is not subject to high changes during motion. Consequently, the pilot ratio “R” can be chosen as high as possible in order to speed up motion and save energy. However “R” must comply with the limit resulting from the following consideration: the “pilot pressure” needed to open the counterbalance valve must always be “higher” than the pressure capable to release the brake (generally 15 ÷ 20 bar). In fact, when motion is commanded in either direction, first the pilot pressure must build-up to a level capable to release the brake, then the pilot pressure can open the counterbalance valve and allow the motor to start rotating.

With hydraulic motors, the pilot pressure needed to open the counterbalance valve can be calculated by the following formula:

\[
P_{\text{pil}} = \frac{P_t \cdot P_{\text{load}}}{R + 1}
\]

and the lowest pilot pressure (P\text{pil}) is:

\[
(P_{\text{pil}} \text{ min}) = \frac{P_t \cdot P_{\text{load max}}}{R + 1}
\]

where:

\(P_t\) = pressure setting (relief setting)
\(P_{\text{load}}\) = load induced pressure
\(R\) = pilot ratio

Example:

\(P_{\text{load max}} = 170\) bar (pressure generated by the maximum load capacity)
\(P_t = 325\) bar (\(> 1.3 \times 170\) bar)
\(R = 8:1\) (Pilot ratio)

Brake release pressure: \(\geq 17\) bar

\[
(P_{\text{pil}} \text{ min}) = \frac{325 \cdot 170}{8 + 1} \text{ bar} = 17.2 \text{ bar} > 17\text{ bar}
\]

The selected counterbalance valve, with \(R = 8 : 1\) and \(P_t = 325\) bar, complies with the correct lowering sequence because the lowest pilot pressure is 17.2 bar > 17 bar: also with the highest load capacity, the holding brake is released before any motion of the hydraulic motor is started.

If compliance is not met, a different pilot ratio or a different pressure setting must be selected.

If it is necessary to limit the pressure to the brake, a pressure reducer cartridge may be incorporated into the valve between the shuttle and C3 (Example: code 08.46.32.X.Y.Z)