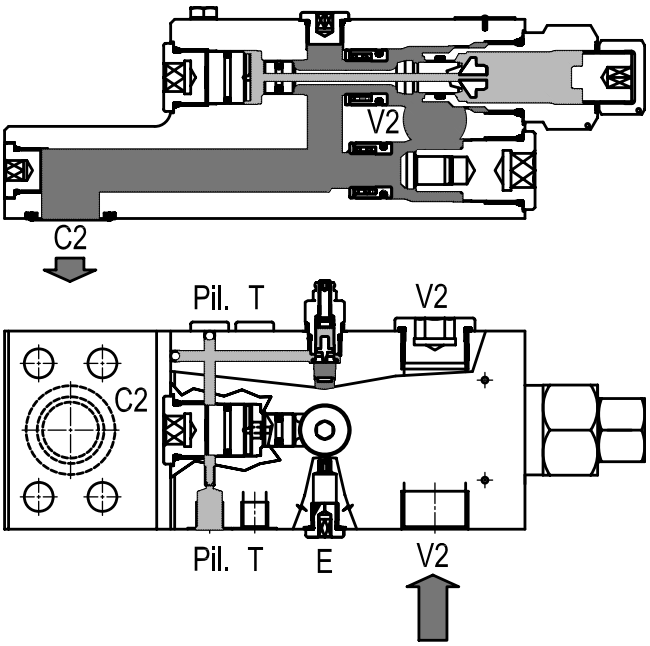
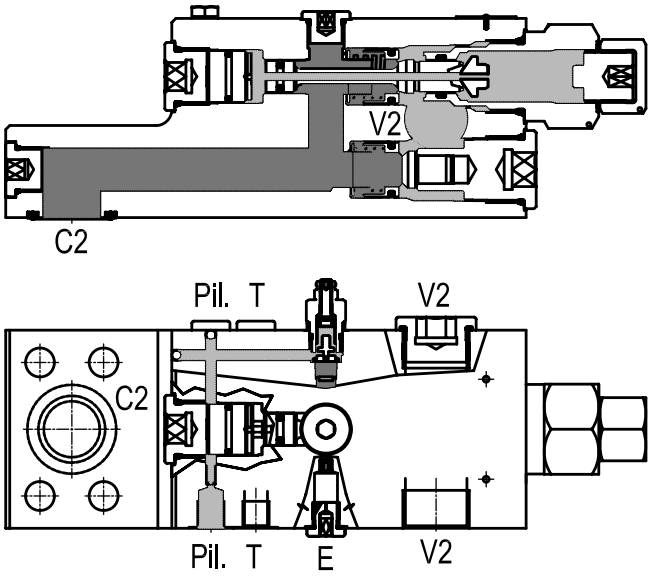
CHECK AND METERING VALVES

Bosch Rexroth Oil Control manufactures a complete range of check and metering valves, controlled by remote pilot pressure, designed **for protection systems against hose failure for boom cylinders** of hydraulic excavators. If chosen and calibrated to match the operating conditions of the excavator's hydraulic system, these valve modules can lock and meter down the oil flow in the event of hose failure. Consequently, they become important components of "**load lowering systems**" for excavators and earth moving equipment **which comply with the requirements of the European Standard EN 474 (ISO 8643)**, when the machines are employed to lift and handle "suspended loads".
These valves are available in different sizes: the smallest ones, designed for small machines, can be pipe mounted close to the boom cylinders, the larger ones, designed for medium and large machines, are optimized to match the port patterns (mostly SAE type flanges) and the space available at the cylinder inlets; they can be flange mounted onto the cylinder directly, simplifying plumbing, saving space and increasing safety.

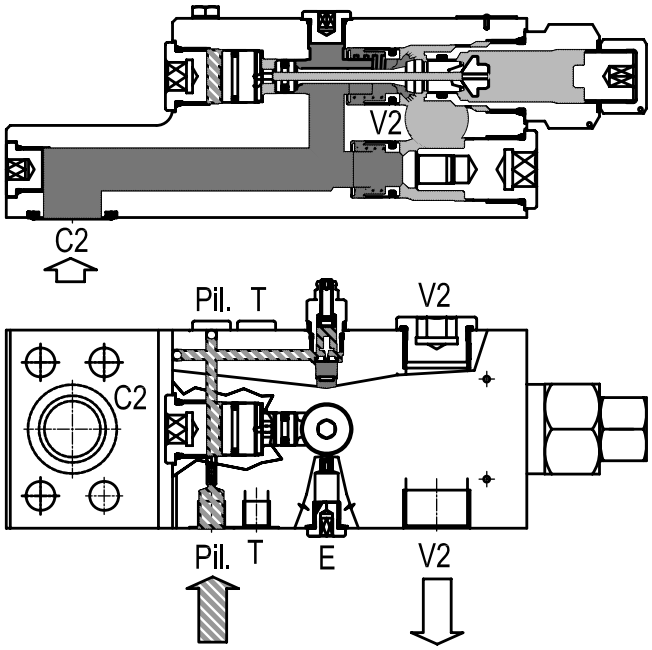
1) Principles of operation



A) ***Boom lifting***: the oil delivered by the Main Control Valve reaches port V2, opens the check valves, enters and extends the cylinder through port C2.

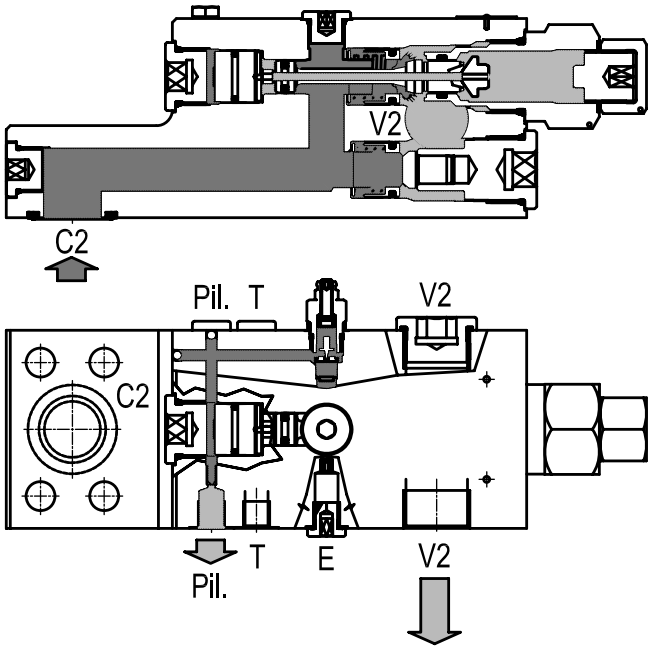


B) ***Boom holding***: the Main Control Valve is in neutral position and no flow is delivered to the cylinder. The pressure induced by the load inside the cylinder pushes back the annular check valves against the seats: the oil the cylinder is locked in a "leak free" mode and the boom is held stationary.



C) ***Boom lowering***: lowering starts when the joysticks delivers enough pilot pressure to open the Main Control Valve to tank, and, at the same time, to push the main piston away from the check valve seat, allowing flow from C2 to V2. For compliance with the "load lowering" requirements of the European Standard EN 474 (ISO 8643), during the initial lowering stroke, the load induced pressure inside the cylinder needs to be withheld by the check and metering valve, while the Main Control Valve is already wider open to tank. For this reason, the cracking point and the metering curve of the hose burst valve need to be synchronized and matched against the metering curve of the main control spool.

Note: according to the test procedure specified by ISO 8643, actual tests with the machine need to be performed in order to verify the compliance of the machine type to the test requirements.



D) ***Relieving***: if pressure inside the cylinder increases above the selected setting, the poppet of the pilot relief cartridge (2) opens, the exhaust oil builds up pressure on the pilot piston and the main piston is quickly pushed to the right, overcoming the spring force. The valve operates as an internally piloted relief, balanced to back pressure in the oil return hose (from V2 to the MCV), and it opens fully so that the cylinder pressure may be exhausted through the main hose by the Port Relief Valve at the Main Control block.

The schemes shown indicate a flangeable version valve in its 4 main working configurations: the same principles apply also to the pipe mounted valves.

The rear surface of the pilot piston, together with the main spring housing, are drained trough the "T" port to tank: the drained flow is negligible, and, for correct operation, it must be connected to a "low pressure" tank line, possibly the same tank line of the hydraulic joystick/servo-control system.

2) Valve fitting and connections

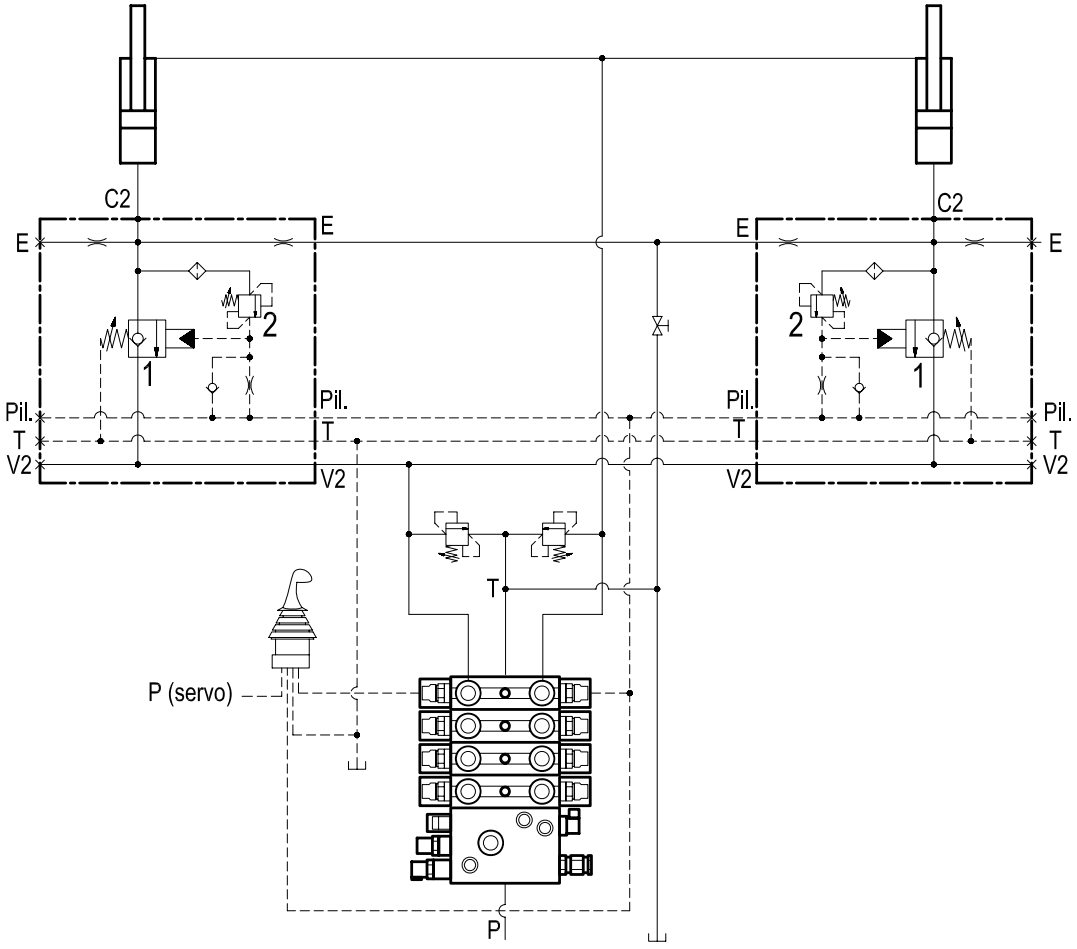
The “flange” mounted valves are symmetrical: the same valve can be fitted on the right or left hand cylinder. Instead the “pipe” mounted valves are available as right hand version (A-VBC-DX…) and left hand version (A-VBC-SX…): the overall dimensions are shown in the relevant data sheet of this catalogue, and the proper version must be chosen according to the space available on the machine.
Here is a complete layout showing 2 check and metering valves flange mounted to “paired cylinders”.
Summary of connections:

- Ports C2: one to each cylinder inlet.
- Ports V2: joined together and connected to the hose from MCV.
- Ports Pil (X): joined together and connected to the “lowering” line from the joystick.
- Ports T: joined together and connected to the joystick tank line.
- Ports E: joined together in order to equalize the pressures, and synchronize the valve openings when lowering.

The “E” ports are “restricted” to limit the eventual oil leakage in case of line rupture, as specified by **ISO 8643**.

This scheme includes a tap to open the E – E line to tank and to allow Emergency Boom Lowering, in case of loss of hydraulic power.

On each valve, the ports not used are blanked-off by threaded plugs supplied together with the valves.



IMPORTANT NOTE: the explanations and the schemes here shown are given only for a general understanding of this valve range. More details are available in each data sheet of this catalogue, but, in case of new installations, for the final choice of the Check and Metering Valve, its pressure settings, its performance characteristics, etc., please consult the Bosch Rexroth Oil Control Service Network.