

BoomLoc Valves (Designed & Tested to ISO8643)

Article of Interest

The requirement for hose rupture protection on mobile plant is enshrined in law in many territories and likely to become so in many others. ISO8643 requires that, in the event of a hose failure while lowering a boom it should not accelerate to more than twice its original speed with the control lever held in the same position. Additionally the valves introduced to achieve this should not unduly effect the operation of the machine to which they are fitted. (The current 100% maximum increase may be reduced to 75% in the future). If a hose were to fail while a boom is lifting or static the load should be held in position. We have developed a range of hose rupture valves, designated "BoomLoc", that are designed to meet the stipulations of ISO8643 and can be applied to numerous different machines.

BoomLoc valves are reliable because they make use of standard off the shelf components that have been field proven, in most cases for many years. All our cartridge valves are manufactured to a high standard with moving parts hardened and precision finished to give a long trouble free service life. Their performance is predictable so set up and development times can be dramatically reduced even when applied to a new system. In service the valves perform as intended with cartridges having been tested to over 1,000,000 cycles in our development department and having been used for many years in the field. When operating under normal circumstances, i.e. with hoses intact, BoomLoc valves offer high efficiency, as the hydraulic fluid is free to pass through the valve to the cylinder with negligible pressure loss. And by selecting the most appropriate pack-

age to match the performance of any given directional valve pressure losses in the return direction can be kept to an absolute minimum.

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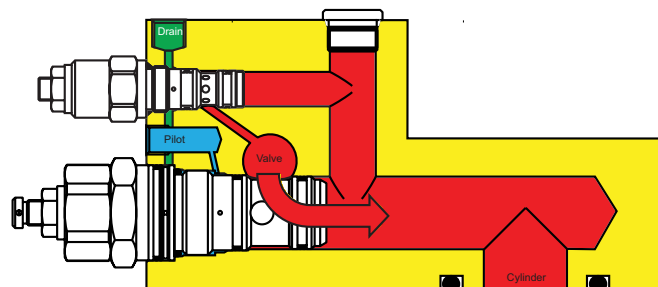
BoomLoc valves can provide a very compact solution. The valve should be mounted on the cylinder, either directly onto its port or connected to the port by rigid tube, so space can be quite restricted. Using Integrated Hydraulics Boomloc valves unique design potential to the full, transfer plates, commonly employed to permit the fitting of more bulky valves can often be eliminated. The block can be designed to suit the customer's installation and can even be done away with if the cartridge valves are incorporated into cylinder end caps thus dramatically reducing the space requirement and the cost of the overall package. Furthermore additional features can be incorporated in the block making the machine more versatile.

To achieve the desired protection without adversely affecting the operation of the machine it requires the accurate balancing of the hose rupture valve and the main directional valve. In order to work effectively the opening of the hose rupture valve should, ideally, lag behind that of the directional valve and the difference in pressure drop should

remain constant throughout the operating flow range. To achieve this the hose rupture valve should be matched to the system in which it is employed, a set up that works on one type of machine would not necessarily work on another. Due to the unique seat and poppet arrangement in the 1CPB series cartridges used in their "BoomLoc" range and the flexibility of the cartridge valve design "BoomLoc" valves can be tailored to suit most directional valves and so provide exceptionally fine control. A level of control that is particularly desired for levelling and grading, which can reduce (if not eliminate) the "washer board" effect frequently found when other valves are used. This fine control also has the benefits of enabling the operator to accurately position loads during craning operations.

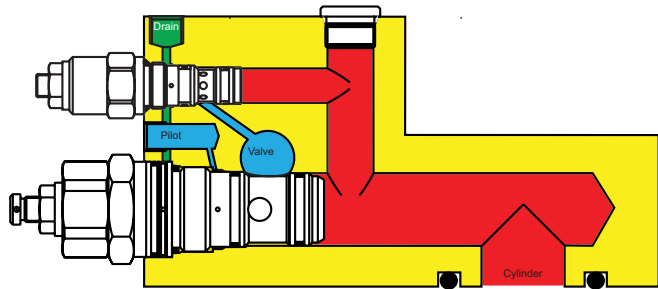
Reduced installation costs can be realised using these "BoomLoc" valves as they use a simple direct SAE mounting to cylinder. In order to minimise stock requirements we have, where possible designed the cylinder port face to be suitable for both SAE3000 and 6000 flanges. A pilot bleed port is available on most valves simplifying installation further. Service costs are also minimal, in the unlikely event of a BoomLoc valve being damaged, repair usually just involves the replacement of one or two self-contained cartridges. What is more there is rarely any need to remove the block from the cylinder when changing the cartridges - reducing the risk of the ingress of contaminants and the down time of the machine. Spares inventory is frequently reduced as the same two, standard, off-the shelf cartridges (albeit set differently) are often used on a wide range of machines.

Operation: Free flow to cylinder



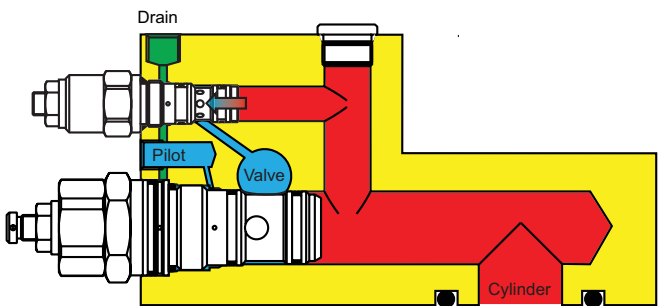
Upon operating the control to raise a boom, pilot pressure from the hydraulic remote control unit operates the appropriate spool in the main directional valve, permitting flow to the cylinder. At the cylinder the flow passes through our Hose Rupture Valve (HRV) check sections with minimal pressure loss and enters the cylinder. (The fluid from the other end of the cylinder flows directly to tank via the main control valve).

Load Holding



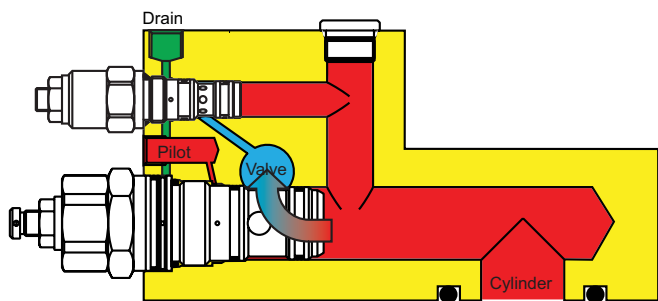
When the control lever is returned to neutral, the check valves in the HRV close and any return flow is blocked, the load is now locked in position.

Relieving



Cavitation and excessive pressure in the boom cylinder, (bottom end circuit), is prevented by an overload relief and make up check, located in the HRV. Flow being returned to tank via the main control valve port relief.

Controlled Lowering



When the control lever is pushed forward to the boom lower position, pilot pressure from the hydraulic remote control unit operates the appropriate section of the main directional valve, opening flow from the cylinder return line to tank. At the same time the pilot pressure opens the main poppet of the HRV, thus allowing oil to flow from the bottom end of the cylinder to the return line. The rate at which the boom descends is dependent on the position of the poppet in the HRV and the spool in the main directional valve. So in the event of a total hose failure the HRV will prevent the boom accelerating above twice its original speed. As the flow rate is now dictated by the pressure drop across only the BoomLoc valve. Releasing the control lever will permit the poppet in the BoomLoc HRV to close stopping the boom from further descent.

BoomLock Valves Set-up Procedures

For reasons of safety it is recommended that ALL adjustments to the Hose Rupture Valve be carried out with the bucket rested on the floor.

Unless otherwise requested the cartridges are preset to 350 bar (relief cartridge) and 10 bar (pilot cartridge, part number 1CPB** or 1CPBD**). The pilot valve will normally require adjustment, but the relief setting of 350 bar is generally suitable for most applications and ensures the maximum protection of the cylinders. Check the maximum pressure of the system and adjust the relief valve if required. Prior to all adjustment ensure pilot line has been fully bled. This can be achieved by operating the joystick to either roll in or lower the respective cylinder and opening the bleed port on the Hose Rupture Valve. In cases where no "BLEED" port is provided, disconnect the pilot hose from the Hose Rupture Valve and running it to a suitable container should suffice.

Relief Valve setting: The relief setting of 350 bar has been calculated to meet most systems but can be adjusted to individual requirements. It is advised that the setting be between 10 and 20% higher than the main control valve. To increase setting, screw the adjuster clockwise to increase pressure at a rate of approximately 65 bar per full turn. To decrease setting, screw the adjuster anti-clockwise to decrease pressure at the same rate.

Pilot Cartridge setting: To successfully set the pilot cartridge pressure, two 400 bar and one 50 bar gauges need

to be used. On the Hose Rupture Valve, connect one 400 bar gauge to the "E" port where provided (or the cylinder port if no "E" port) and the other 400 bar gauge in the valve inlet line "V", and connect the 50 bar gauge in the pilot line "P".

The procedure can be related to both the Arm cylinder and the Boom cylinders but for the ease of explanation, the following procedure is for Boom cylinders only.

- 1 Fully swing out Arm cylinder. Raise Boom to full extension and at the end of its stroke record the pressure in the valve and cylinder gauges.
- 2 To check setting, slowly move joystick to lower Boom. When the gauge in the valve line starts to fall, it is a signal that the main control valve has started to open, at this point note the setting in the pilot line, typically 8 bar.
- 3 Continue to slowly operate the joystick and note the reading in the pilot line when the gauge in the cylinder line starts to fall. This indicates the setting of the pilot cartridge (1CPB(D), typically 10 bar.

It is recommended that the Pilot Cartridge should dwell between 1.5 and 2 bar behind the Main Control Valve. If the pilot valve is set too low, pressure at "E" falls before "V" - adjust pilot valve clockwise.

If the difference between 2 and 3 above is greater than 2 bar - adjust the pilot valve anti-clockwise.