# EHBL DIGITAL BOOM CONTROL

# Using Pressure Control To Build a Better Boom

## OVERVIEW

When excavators are doing heavy lifting, it can put a strain on the hydraulic system. An unexpected spike in pressure or flow could cause a hose to rupture, endangering workers near the machine and the operator in the cab. To protect against this possibility, a lowering control device (boom lock valve) can be used to prevent sudden boom or arm drop and ensure controlled lowering of the load in the event of a hydraulic line failure. Equipment safety regulations like ISO 8643 now require the use of such devices.

Conventional boom lock valves are pilot-operated proportional poppet valves controlled via remote pilot pressure from a pilot-operated joystick and are installed between the boom and the main control valve. This architecture has worked well for many years; however, as machine designers replace the hydraulic pilot controls in the cab on these machines with electric joysticks to improve operator comfort and productivity, pilot-operated boom lock valves increase the complexity of the hydraulic system.

## THE FUTURE OF BOOM LOCK VALVES

The HydraForce Digital Boom Control takes a unique approach by controlling the pressure in the cylinder with an electro-proportional relief valve rather than the flow from the main control valve with a traditional pilot operated proportional pilot. It has a poppet seat for low leakage and spool-type metering for improved control. The electro-proportional valve is internally piloted, and does not need additional pilot lines, thus facilitating the integration of the safety valve in hydraulic systems controlled by electric joysticks and an ECU. The pressure control valve has been designed to fit within the existing space of a pilot-operated device with an integrated housing that also contains a built-in check valve for free reverse flow. The Digital Boom Control can be used for a sequence function or a relief function, depending on how it is plumbed. Using it as a sequence valve can help to reduce the effect of back pressure from the main control valve and hydraulic plumbing.

## NEW BOOM LOCK TECHNOLOGY

- Using a pressure control for lowering can be compared to the operation of a commonly used counterbalance valve. Counterbalance valves monitor pressure at the rod side of the cylinder to control base side pressure.


**The HydraForce EHBL Digital Boom Control can be configured to for a single or double boom cylinder or boom arm. Left-hand, right-hand or brick style housings are available.**

- HydraForce's new Digital Boom Control is a pressure control valve, in its simplest description. It controls the load at the base by electronically monitoring the resistance to movement of the incoming fluid on the rod side of the cylinder with a pressure sensor.
- Rod side pressure is used to determine downward force, similar to a pilot line for a counterbalance valve. But, unlike a counterbalance, HydraForce's Digital Boom Control adjusts the ratio to maintain stability. It also adjusts the pressure setting proportionally for optimal efficiency. This can all be controlled via on-board Electronics provided by HydraForce's EVDR plug-on controller.
- In order to increase efficiency compared with a typical counterbalance valve, both pilot ratio and relief settings are changed throughout operation dynamically to lower pressure drop. Field testing has demonstrated the following results:
- No boom drift
- ISO apecification for controlling under hose burst situations
- Better operator feel when compared to standard boom lock valves
- Lift - 4 second period @ 41 gpm (traditional boom lock 100 psi drop, HF 100 psi drop)
- Lower - 4 seconds @ 41 gpm (traditional boom lock 325 psi drop, HF 175 psi drop)
- Lower (Regen), 2 seconds @ 82gpm (Regen) (traditional boom lock 750psi drop, HF 210psi drop)
- Assuming a 20 second operation continuously over an 8 hour day, the Digital Boom Control offers 2.4% in fuel savings depending on application operation.

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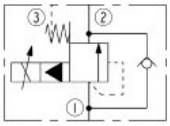
## RATINGS AND SPECIFICATIONS

### Description

The Digital Boom Control is a factory-assembled valve and body unit consisting of a proportional pressure relief valve with an electronic valve driver and reverse check valve. The regulated pressure is inversely proportional to the electrical current input.

### Symbol




### Operation

The Digital Boom Control blocks flow from port 1 to port 2 until the pressure at port 1 is sufficient to overcome the balance between the mechanical preset and electromagnetically variable forces. From port 2 to port 1, a reverse check valve permits flow. Port 3 is drain.

Typical configuration is cylinder base at port 1 and port 2 connected to inlet. Valve setting at 0 amp should be 15% higher than system pressure, permitting flow from 1 to 2 only when current is applied. In the event of a hose burst, current must be immediately reduced to zero to close valve.

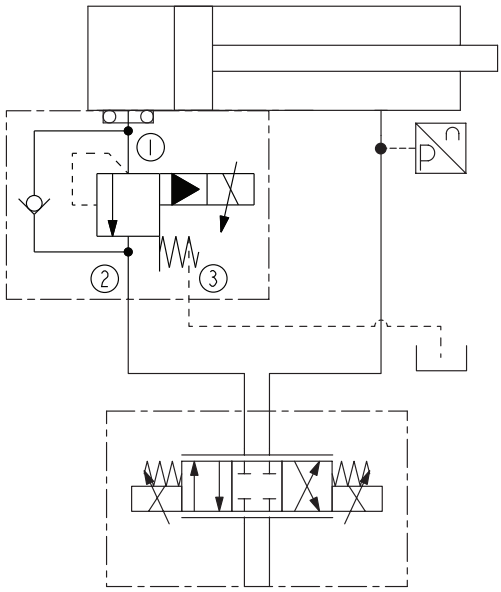
## RATINGS

- Pressure rating: 379 bar (5500 psi) at port 1<br>379 bar (5500 psi) at port 2<br>103 bar (1500 psi) at port 3
- Crack pressure: 448 bar (6500 psi) at zero current
- Flow rating: 3/4" port: 322 lpm (85 gpm)<br>1" port: 454 lpm (120 gpm)
- Leakage: 40 ml/min (2.4 in³/min)
- Operating temperature: -30 to 100 °C (-22 to 212 °F)

## APPLICATION

The Digital Boom Control is attached directly to the boom cylinder(s) via Code 61 or Code 62 flange mount. Two sizes are available: 3/4 in and 1 in. A pressure sensor feeds rod-end pressure to the control unit. A check valve allows free flow into the base end of the cylinder when raising. When lowering, the proportional pressure relief valve meters flow out at a pressure set by the control unit.

**Typical Circuit**




Using a pressure control for lowering is comparable to using a counterbalance valve. With a counterbalance valve, pressure in the base end of the cylinder is a fixed ratio above pressure in the rod end. Whereas when using the EHBL, the pressure sensor on the rod end monitors resistance to movement, allowing the pressure control to dynamically adjust the base end pressure maintaining stability.

## ADVANTAGES

Traditional pilot-operated boom lock valves used on excavators were added in response to earlier safety directives and were often "patched in" between the cylinder and main control valve and can interfere with the precise and smooth control of the boom and arm functions.

What if instead, the boom lock valve actually improved operator productivity and reduced energy consumption? What if the boom lock valve could also be used to store energy to be used for other functions on the machine?

The HydraForce Digital Boom Control is a solution that meets safety requirements while ensuring smooth operation and conserving energy. It also provides the potential to improve productivity, lower the boom using gravity, and can be used creatively in hybrid energy recovery circuits. Thus, the Digital Boom Control can greatly enhance the overall hydraulic system of a machine.

HydraForce Joining forces with rexroth A Bosch Company

For product information contact your local HydraForce representative at **hydraforce.com/distributors**