Introduction

Pressure variations in supply lines can be a serious problem for tools or processes that need a constant inlet pressure or a constant flow rate.

Together with a pressure regulator, the LeviBoost™ device is able to compensate any pressure fluctuations, independent whether the pressure in the supply line is higher or lower than the needed pressure.

Concept overview

Any pressure peaks are compressed or flattened by the pressure regulator and the pressure level is reduced. The LeviBoost™ device with integrated Levitronix® pump and closed loop pressure control increases the pressure to a defined level and compensates remaining pressure fluctuations.

Benefits

- Defined and constant pressure based on a closed loop control
- Removal of consumption dependent pressure drop in facility line
- Boost low facility pressure to a defined higher level
- Quick and easy implementation with a proven and robust stand alone solution
- Performs over a wide range of pressures and flow rates
- Highest MTBF due to bearing-less pump system concept
Introduction of LeviBoost™


1. Levitronix Pump and Motor
2. Levitronix Pump Controller
3. Pressure Transducer
4. User Interface

![Figure 2: Outer and inner view of LeviBoost™ device](image)

**Pressure boost**

![Figure 3: Pressure and flow output of LeviBoost™ 75 (up to 42L/min at delta 2.5 bar)](image)

![Figure 4: Pressure and flow output of LeviBoost™ 140 (up to 115L/min at delta 2.5 bar)](image)
Test setup

To prove the efficiency of LeviBoost devices, Levitronix set up a number of tests. Its results are delivered below, showing that the device will maintain a stable pressure.

Levitronix® pump (combined with a pressure transducer in pressure controlled loop)

![Complete schematic with all options](image-url)

**Basic setup characteristics:**

- Inlet pressure can be changed from 1 to 6 bar
- Pressure regulator is fixed on one pressure level
- Pump is running in pressure control loop (P/I-Controller) for a fix outlet pressure
- Hydraulic load generates the needed flow based on controlled outlet pressure

Test procedures

The following tests were performed with the results shown in detail below:

**Test 1:** Maintaining a consistent output pressure (4 bar) and flow (10 LPM) during inlet pressure variances of 1 – 6 bar

**Test 2:** Maintaining a consistent output pressure (4 bar) and flow (45 LPM) during inlet pressure variances of 1 – 6 bar

**Test 3:** Delivering a varied range of flows (10 – 40 LPM) at a constant outlet pressure (4 bar) with an inlet pressure at 1 bar

**Test 4:** Delivering a varied range of flows (10 – 40 LPM) at a constant outlet pressure (4 bar) with an inlet pressure at 6 bar
Test 1: Variation of inlet pressure with constant flow of 10 L/min

Flow rate: 10 l/min
Outlet pressure: controlled to 4 bar
Duration of step: approximately 10 sec
Scaling: 0..100% = 0..6 bar

Input Pressure

Figure 6: Inlet pressure 1-6 bar, 1 bar instant change after remaining for 10 seconds. Last interval shows extreme conditions simulation with an instant change of 5 bar.

Output Pressure

Figure 7: Output pressure that remains stable during dynamic input pressure change.

Speed [rpm] of Booster Pump
Figure 8: Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.
Test 2:  
Flow rate: 45 l/min  
Outlet pressure: controlled to 4 bar  
Duration of step: approximately 10 sec  
Scaling: 0..100% = 0..6 bar  

Variation of inlet pressure with constant flow of 45 L/min  

**Input Pressure**

![Input Pressure Graph](image)

*Figure 9: Inlet pressure 1-6 bar, 1 bar instant change after remaining for 10 seconds. Last interval shows extreme conditions simulation with an instant change of 5 bar.*

**Output Pressure**

![Output Pressure Graph](image)

*Figure 10: Output pressure that remains stable during dynamic input pressure change.*
Speed [rpm] of Booster Pump

Figure 11: Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.
Test 3:

Variation of flow rate with constant inlet pressure of 1 bar

- **Inlet pressure:** 1 bar
- **Flow rate:** step from 10 L/min to 40 L/min and back to 10 L/min
- **Outlet pressure:** controlled to 4 bar
- **Duration of step:** approximately 5 sec
- **Scaling:** 0..100% = 0..6 bar

**Output Pressure**

![Output Pressure Graph](image1)

*Figure 12: Output pressure during the dynamic flow rate change. No significant pressure drop visible.*

**Speed [rpm] of Booster Pump**

![Speed Graph](image2)

*Figure 13: Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.*
Test 4: Variation of flow rate with constant inlet pressure of 6 bar

- Inlet pressure: 6 bar
- Flow rate: step from 10 L/min to 40 L/min and back to 10 L/min
- Outlet pressure: controlled to 4 bar
- Duration of step: approximately 7 sec
- Scaling: 0..100% = 0..6 bar

**Output Pressure**

- **Figure 14:** Output pressure during the dynamic flow rate change. No significant pressure drop visible.

**Speed [rpm] of Booster Pump**

- **Figure 15:** Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.
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