STABILIZING AND INCREASING FACILITY PRESSURE WITH LEVIBOOST™

PR-2400-14 Rev01

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, independently of whether the pressure in the supply line is higher or lower than the needed pressure.

Concept overview

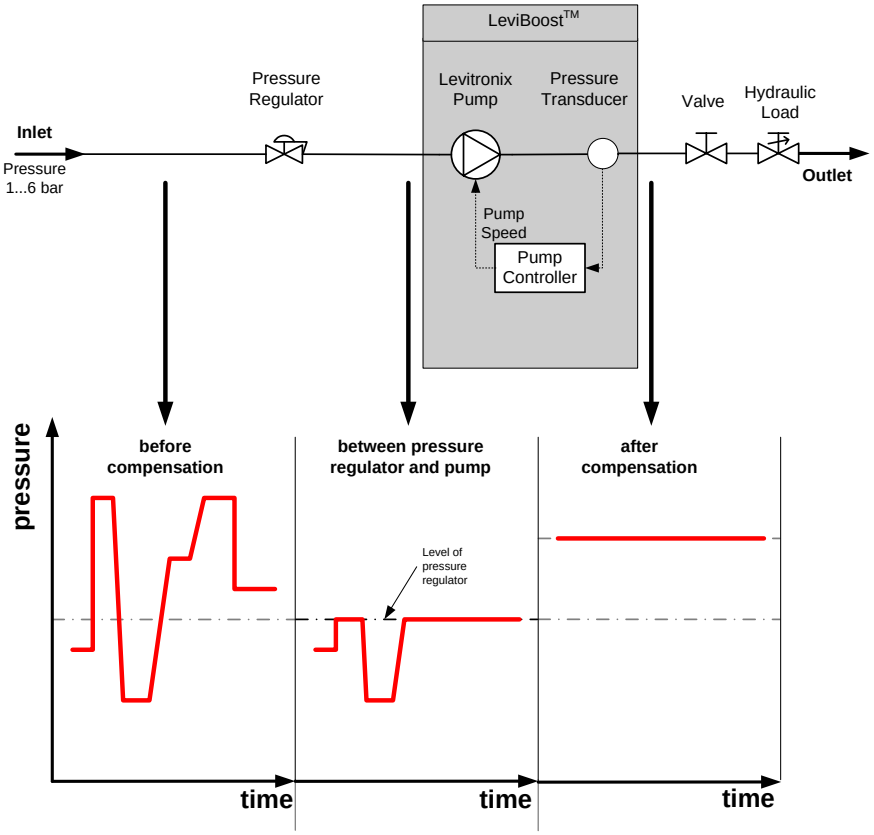

Figure 1: Pressure course corresponding to point in setup

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™

See additional details in LeviBoost™ brochure on Levitronix homepage.
http://www.levitronix.com/en/Product_Brochures_and_Manuals.html

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

Figure 2: Outer and inner view of LeviBoost™ device

Pressure boost

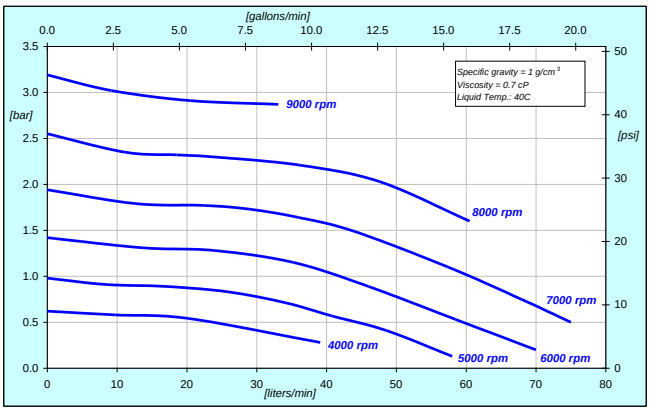

Figure 3: Pressure and flow output of LeviBoost™ 75 (up to 42L/min at delta 2.5 bar)

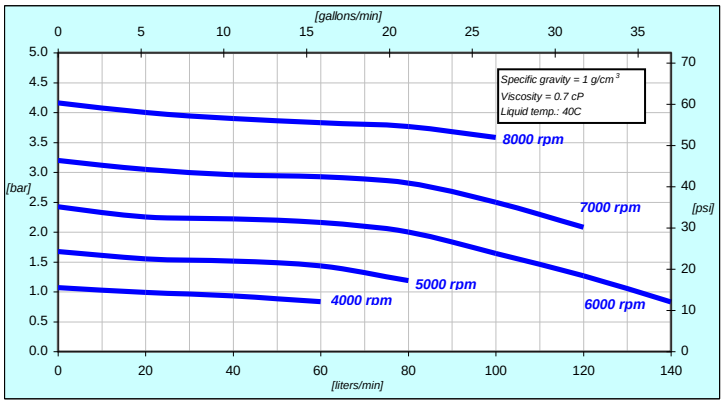

Figure 4: Pressure and flow output of LeviBoost™ 140 (up to 115L/min at delta 2.5 bar)

Test setup

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

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

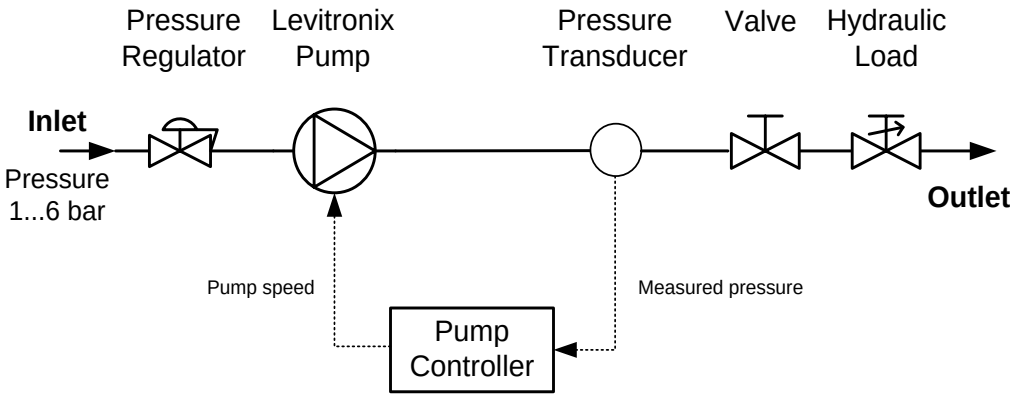

Figure 5: Complete schematic with all options (incl. pressure regulator, valve, hydraulic load)

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

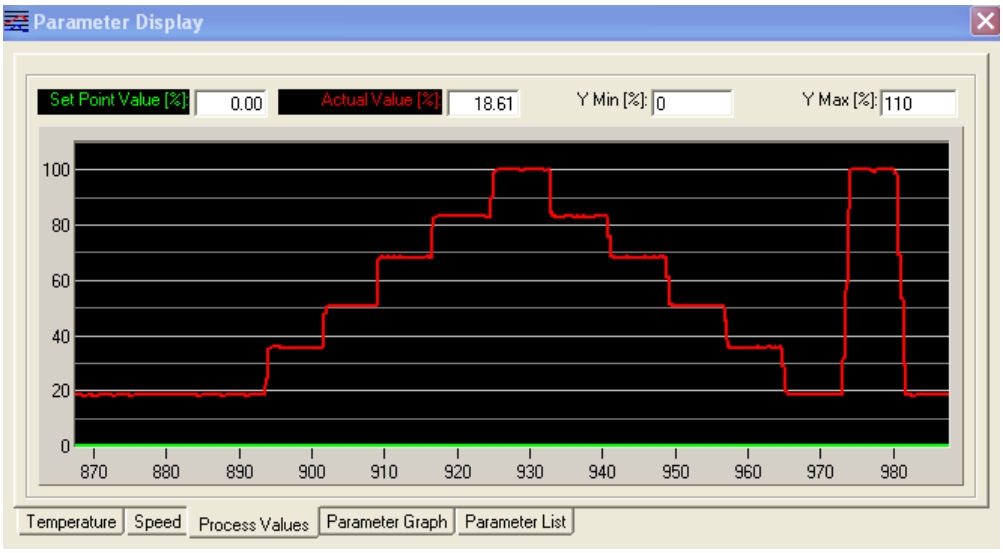

Figure 6: Inlet pressure 1-6 bar, 1 bar instant change after remaining for 10 seconds. Last interval shows extreme conditions simulation with an instant change of 5 bar.

Output Pressure

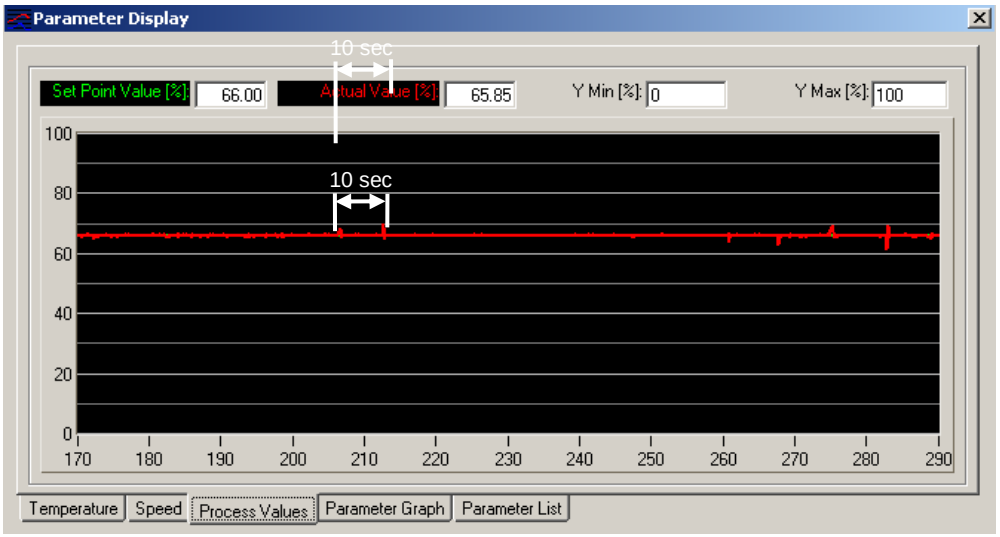

Figure 7: Output pressure that remains stable during dynamic input pressure change.

Speed [rpm] of Booster Pump

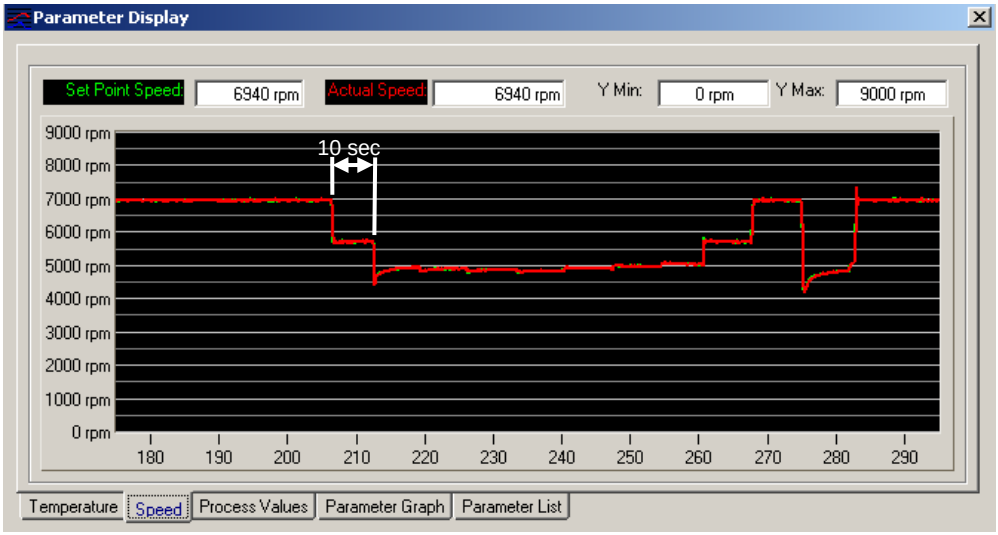

Figure 8: Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.

Test 2:

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

Flow rate: 45 l/min
Outlet pressure: controlled to 4 bar
Duration of step: approximately 10 sec
Scaling: 0..100% = 0..6 bar

Input Pressure

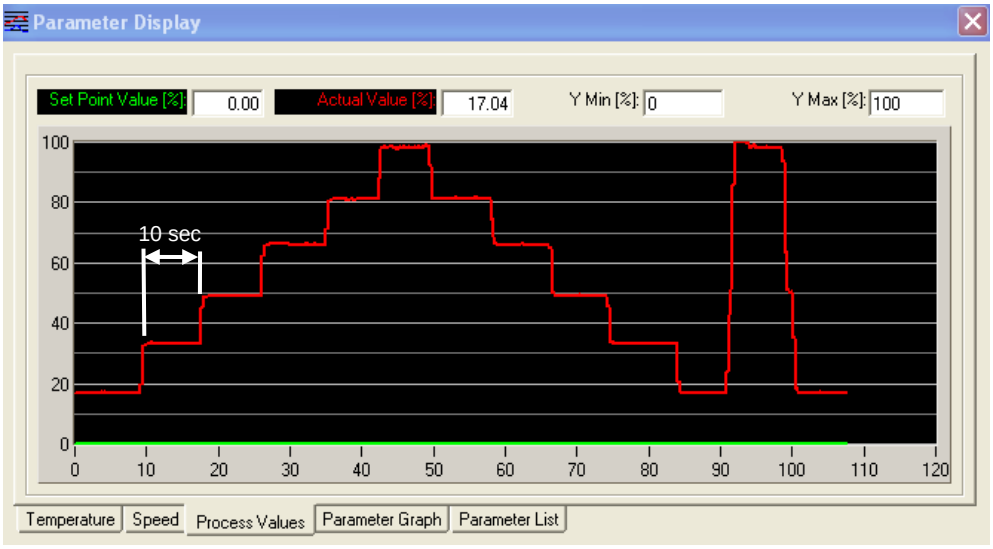

Figure 9: Inlet pressure 1-6 bar, 1 bar instant change after remaining for 10 seconds. Last interval shows extreme conditions simulation with an instant change of 5 bar.

Output Pressure

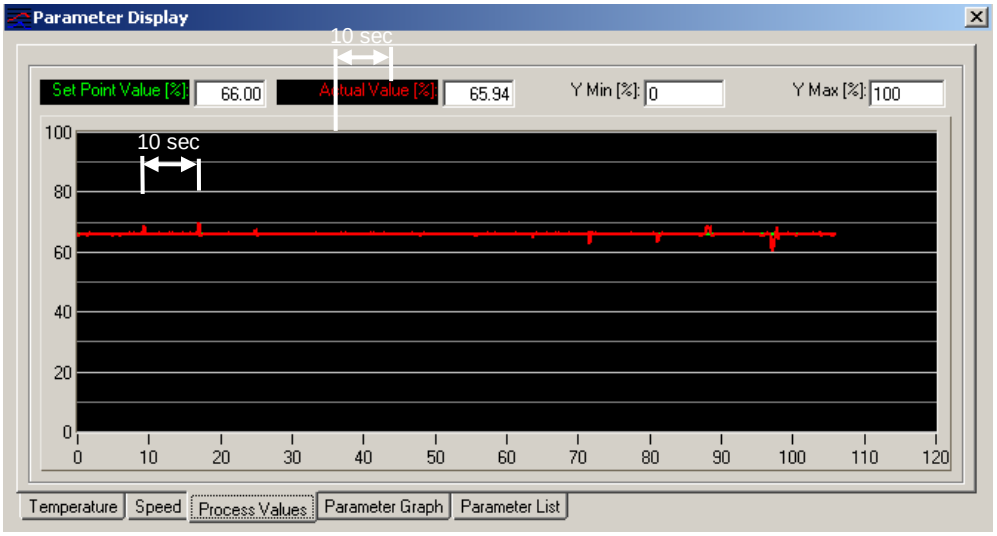

Figure 10: Output pressure that remains stable during dynamic input pressure change.

Speed [rpm] of Booster Pump

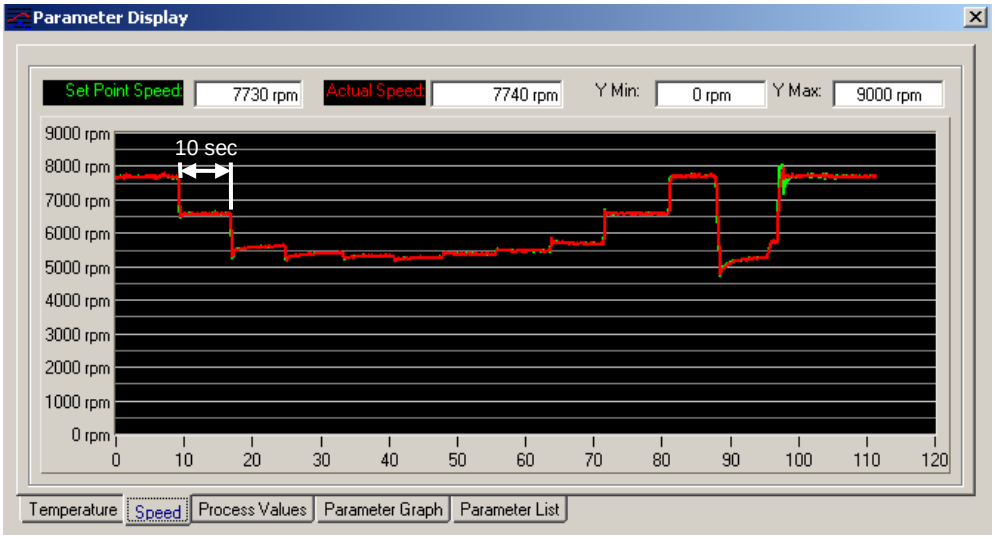

Figure 11: Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.

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

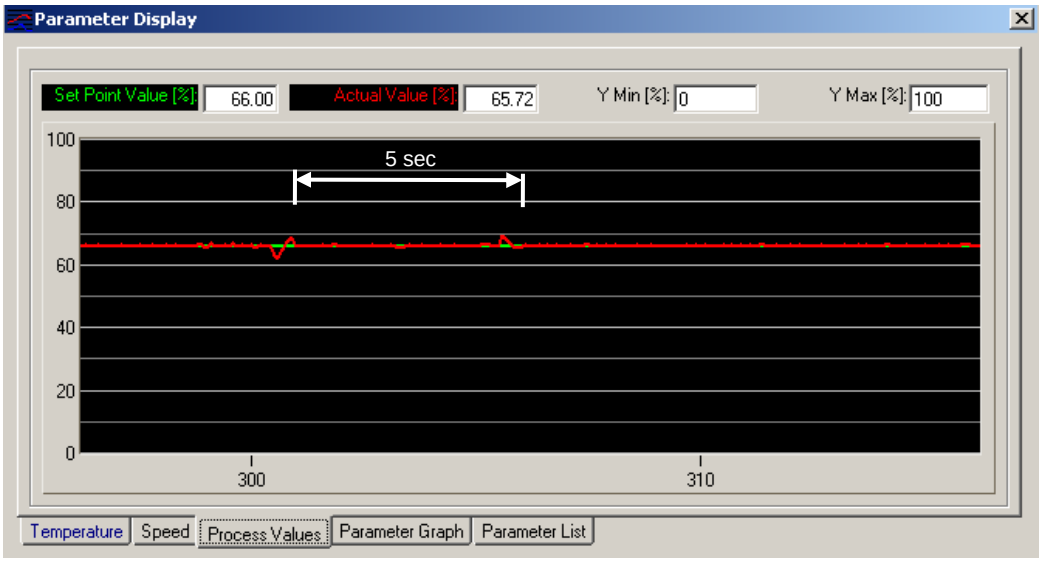

Figure 12: Output pressure during the dynamic flow rate change. No significant pressure drop visible.

Speed [rpm] of Booster Pump

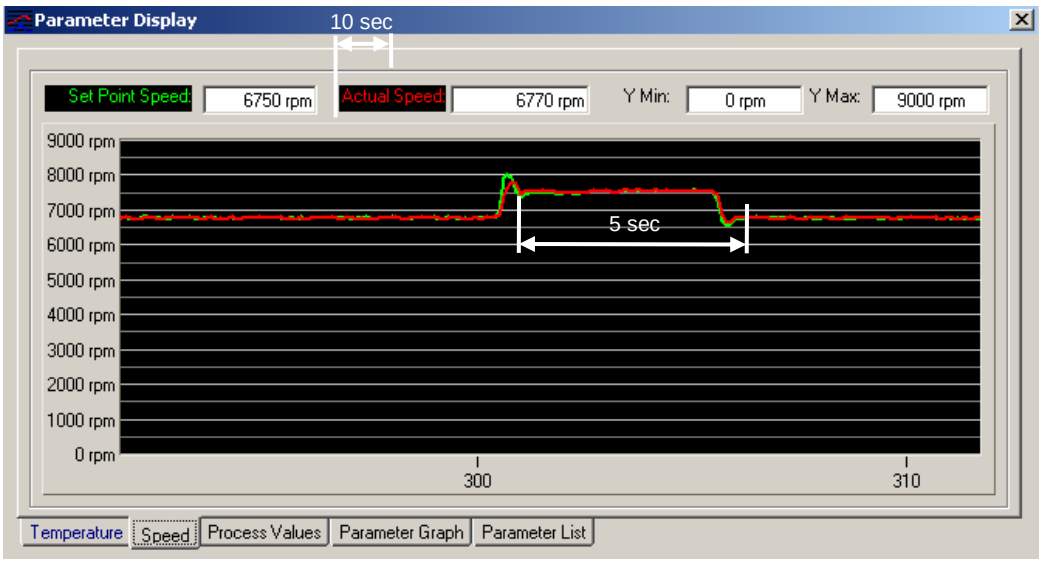

Figure 13: Dynamic adjusted pump speed to maintain defined output pressure of 4 bar.

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

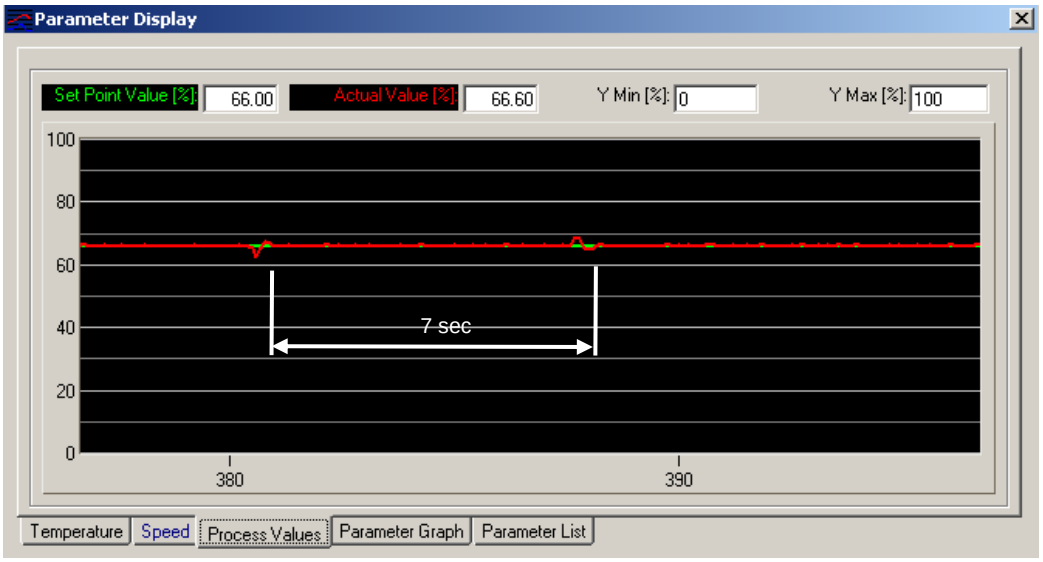

Figure 14: Output pressure during the dynamic flow rate change. No significant pressure drop visible.

Speed [rpm] of Booster Pump

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

Technical Support

For troubleshooting, support and detailed technical information contact *Levitronix® Technical Service Department*:

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