

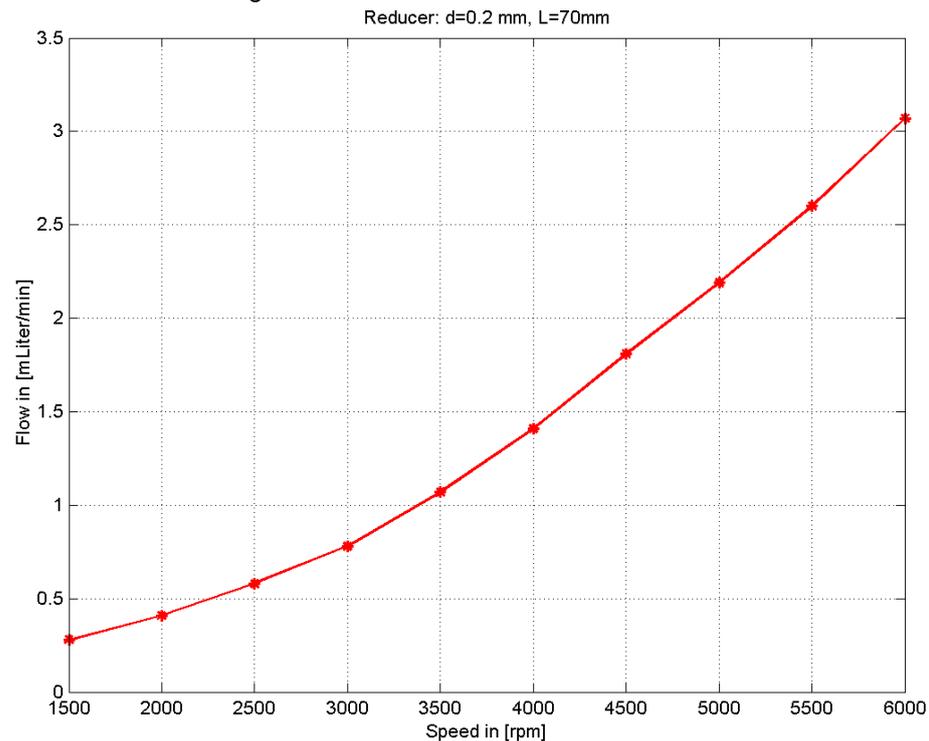
Summary

Levitronix® provides the *Bearingless Pump System BPS-200 or BPS-1* that can be used to deliver very low flow rates. Precise pump internal speed control enables in combination with a so-called *Reducer* the control of very small process flows. The basic principle is to map the flow range (of the process) to the given speed range (of the pump) with an artificial hydraulic load (*Reducer*). The method is based on the fact that the rotational speed of a centrifugal pump (like the *Levitronix®* pump) basically determines pump pressure (not pump flow). If an appropriate capillary – the *Reducer* – is used, the speed range of the pump can be mapped to the flow range whatever is desired, for example:

- 0.3 – 3 mL/min
- 30 – 300 mL/min
- (:)

Example of Low Flow Application

An example in the low flow range (0.3 – 3 mL/min) points out the performance and control capability of the Levitronix® system. The correspondence between pump speed and process flow is shown in Figure 1.



**Figure 1: Process Flow in Relationship to Pump Speed in Water
(Reducer: d = 0.2 mm, L = 70 mm)**

Benefits

Levitronix® provides systems that offer the following benefits:

- High control resolution down to 0.1 mL/min
- Flexible flow range from small flow range to high flow range
- High repeatability (no wearing out of membrane)

Concept of Low Flow System

The flow plan shown below in Figure 2 describes all components of the Levitronix® system for low flow applications. Whenever priming of the Bearingless Pump System cannot be accomplished by gravity feeding to the system, vacuum can be used to prime the pump (please refer to the Technical Note Priming of BPS-Series Bearingless Pump Systems for detailed information).

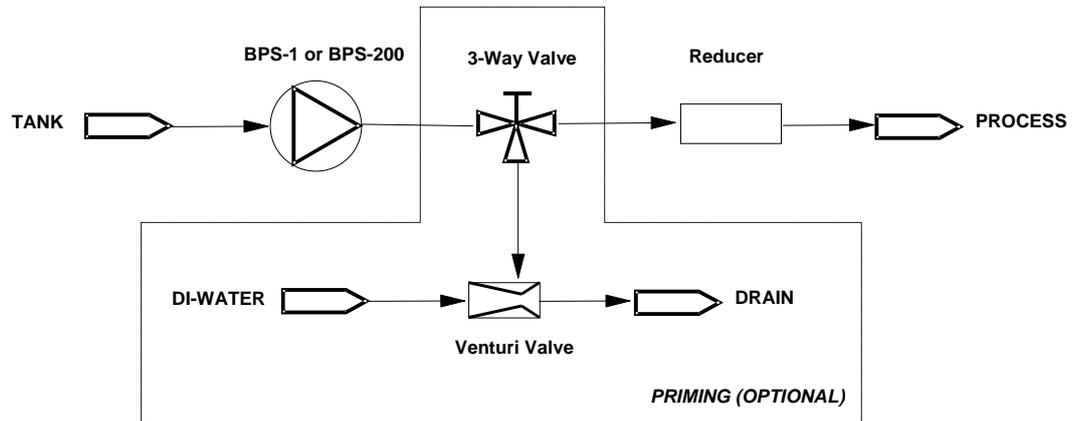


Figure 2: Flowplan of Bearingless Pump System for Low Flow Applications

Technical Detail about reducer

The *Reducer* is a very simple mechanical part – a capillary or tube of small inner diameter. The geometry of the *Reducer* depends on the intended process flow range. Recommendations for the *Reducer* geometry are listed in *Table 1* for fluid viscosities η between 1 and 10mPa.s. The calculations in *Table 1* do not take into account significant pressure drop over other system components (for example filters) in the process loop. Contact *Levitronix®* for detailed information and special requirements.

Process Flow Range in mL/min	Inner Diameter d of Reducer		Length L of Reducer ^(a)	
	in mm	in inch	in mm	in inch
0.3 – 3	0.20	1/128	$70 \cdot (\eta_{H_2O} / \eta)$	$2.76 \cdot (\eta_{H_2O} / \eta)$
3 – 30	0.40	1/64	$110 \cdot (\eta_{H_2O} / \eta)$	$4.33 \cdot (\eta_{H_2O} / \eta)$
30 – 300	1.59	1/16	$1000 \cdot (\eta_{H_2O} / \eta)$	$39.4 \cdot (\eta_{H_2O} / \eta)$

^(a) $\eta_{H_2O} = 1 \text{ mPa.s}$ (Viscosity of Water at 20°C)

Table 1: Recommended Geometry of the Reducer for different Process Flow Range

Technical Support

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

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