

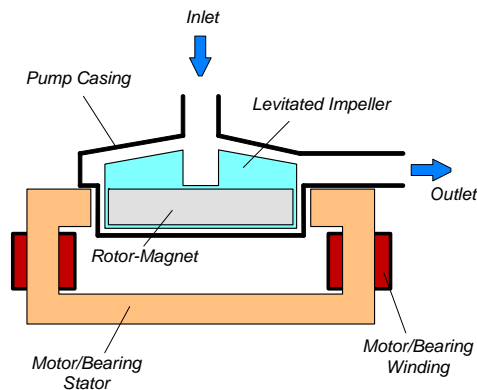
## **Improve Yield & Reduce Cost with Levitronix<sup>®</sup> Bearingless Pumps!**



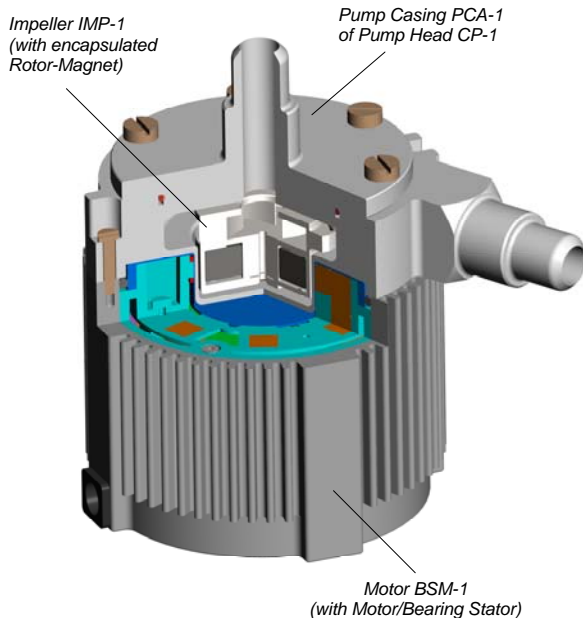
## **Stop Your Pumps from Stealing Your Profits!**

### **BEARINGLESS PUMP SYSTEMS**

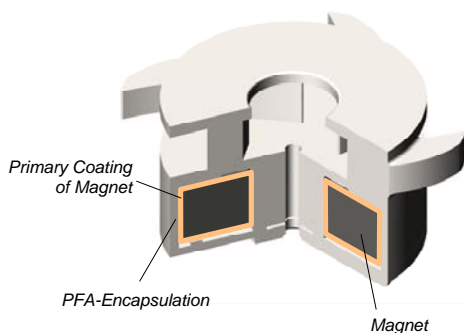
<b>BPS-1</b>	1.6 bar 21 liters/min	(23 psi) (5.5 gallons/min)
<b>BPS-3</b>	2.5 bar 75 liters/min	(36 psi) (20 gallons/min)
<b>BPS-4</b>	4.5 bar 140 liters/min	(65 psi) (37 gallons/min)



**Figure 1:** Schematic of the main elements of the bearingless centrifugal pump.



**Figure 2:** Cross-section of the bearingless pump motor and pump head.



**Figure 3:** Cross-section of the BPS impeller and encapsulated magnet

## REVOLUTIONARY MAGNETICALLY LEVITATED CENTRIFUGAL PUMP

Levitronix® has developed a revolutionary centrifugal pump that has no bearings to wear out or seals to break. Based on the principles of magnetic levitation, the pump's impeller is suspended contact-free inside a sealed casing and is driven by the magnetic field of the motor (*Figure 1*). The impeller and casing are both fabricated from chemical-resistant, high-purity fluorocarbon resins. Together with the rotor magnet they make up the pump head. Fluid flow rate and pressure are precisely controlled by electronically regulating rotor speed and eliminates pulsations.

### SYSTEM BENEFITS

- Improves process yields in CMP by producing 200-1000 times fewer scratching particles compared to other pumps.
- Increases filter life in CMP recirculation loops by a factor of up to 15 by generating less gels and large particles.
- Reduces particle contamination issues in wet processes by generating 10 to 50 times fewer particles.
- Improves and simplifies process control by eliminating pulsation and by accurately controlling both flow rate and rotor speed.
- Increases equipment uptime and lowers maintenance costs by reducing part wear.
- Increases equipment uptime and saves maintenance costs in plating applications by providing a clog-free operation.
- Saves valuable space in process tools by having a very small footprint.

### APPLICATIONS

- Highest market share of liquid pumps in single wafer processing tools.
- Widely used in electrochemical deposition.
- The ideal pump for CMP slurry handling - from bulk delivery to point of use flow control.
- Well-accepted in bulk chemical delivery.

**LEVITRONIX PUMPS ARE DESIGNED  
FOR HIGH-PURITY APPLICATIONS**

The *BPS* pump systems are designed for high-purity fluid applications where extremely low particle shedding and metal contamination are required.

Tests\* conducted by an independent laboratory prove that particle generation from a *Levitronix*® pump is significantly less than that from bellows pumps. It was shown that *Levitronix*® pumps flush up 50 times faster than bellows pumps of comparable hydraulic performance. Extremely low particle generation is achieved because the levitating impeller rotates contact-free inside the pump casing.

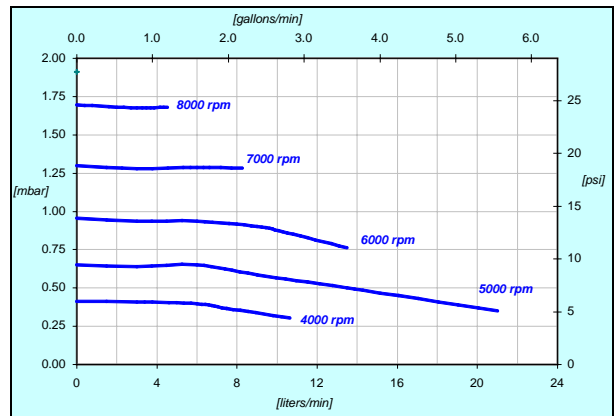
Independent tests\* also indicate that the area normalized surface contamination from all parts of a *Levitronix*® pump is well below the surface contamination specification of semiconductor equipment manufacturers and comparable to other ultra pure fluid pumps. Having a wetted surface that is 30 times smaller compared to that of bellows pumps of comparable hydraulic performance, the actual ionic contamination is about 30 times less with a *Levitronix*® pump.

Comparative tests\* among *Levitronix*®, bellows and diaphragm pumps, conducted with CMP slurries, showed the *Levitronix*® pumps producing 200-1000 times fewer large particles, which can scratch and damage wafers. The tests also showed that the *Levitronix*® pump, in fact, extended filter life in the CMP recirculation loop by 5 to 15 times over the other pumps.

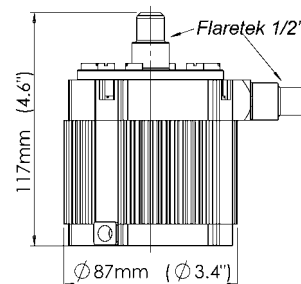
All wetted parts of the *Levitronix*® pumps are made from high-purity fluorocarbon resins (PTFE, PFA, ECTFE, PVDF). In addition, the rotor-magnet is totally encapsulated and protected by two polymeric layers, eliminating the possibility for metallic contamination (*Figure 3*). The first layer is a proprietary coating with extremely low permeability and the second is a high-purity PFA layer that enhances chemical resistance.

\* Test reports are available upon request

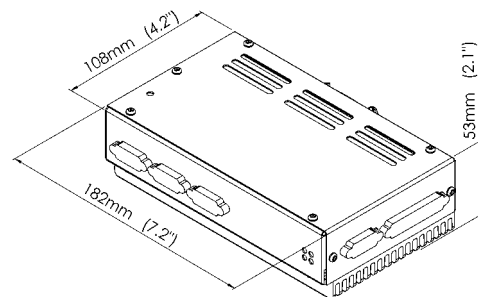
**BPS-1 PUMP SYSTEM**



**Figure 4:** Pressure-flow curves for BPS-1 pump system (liquid: 1 cP, 1 g/cm<sup>3</sup>).

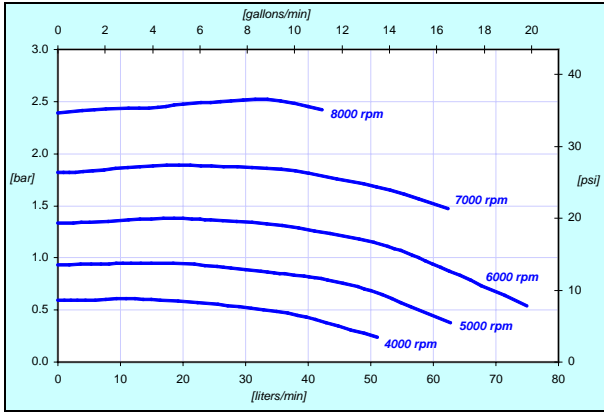


**Figure 5:** Basic dimensions of motor BSM-1 with pump head CP-1 for BPS-1 pump system.

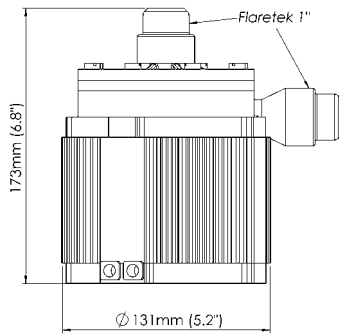


**Figure 6:** Basic dimensions of controller LC24 for BPS-1 pump system.

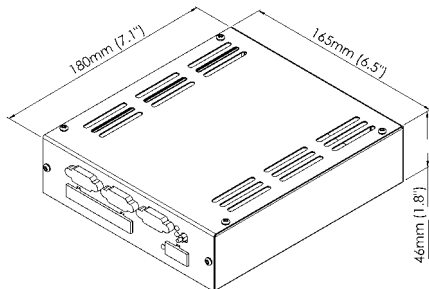
**BPS-3 PUMP SYSTEM**



**Figure 7:** Pressure-flow curves for BPS-3 pump system (liquid: 1 cP, 1 g/cm<sup>3</sup>).

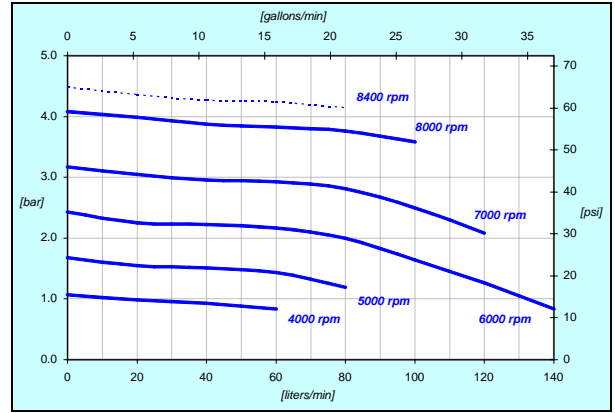


**Figure 9:** Basic dimensions of motor BSM-3 with pump head CP-3 for BPS-3 pump system.

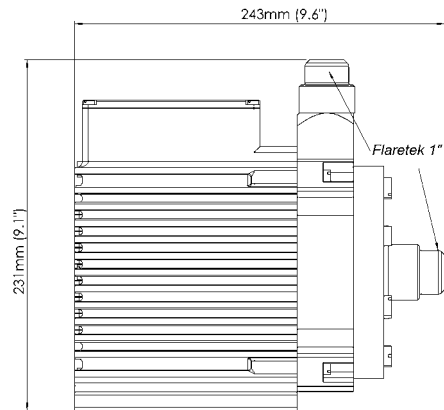


**Figure 11:** Basic dimensions of controller LC48 for BPS-3 pump system.

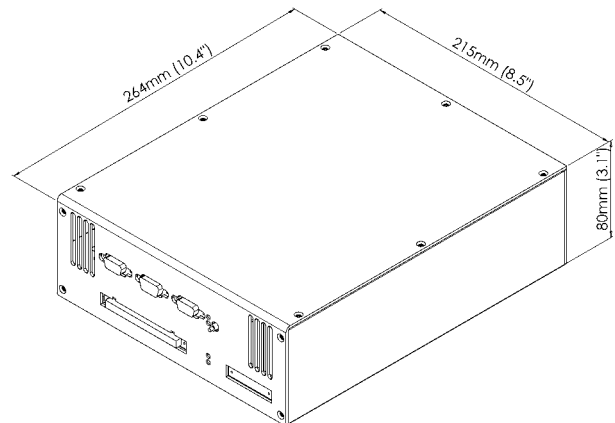
**BPS-4 PUMP SYSTEM**



**Figure 8:** Pressure-flow curves for BPS-4 pump system (liquid: 1 cP, 1 g/cm<sup>3</sup>).

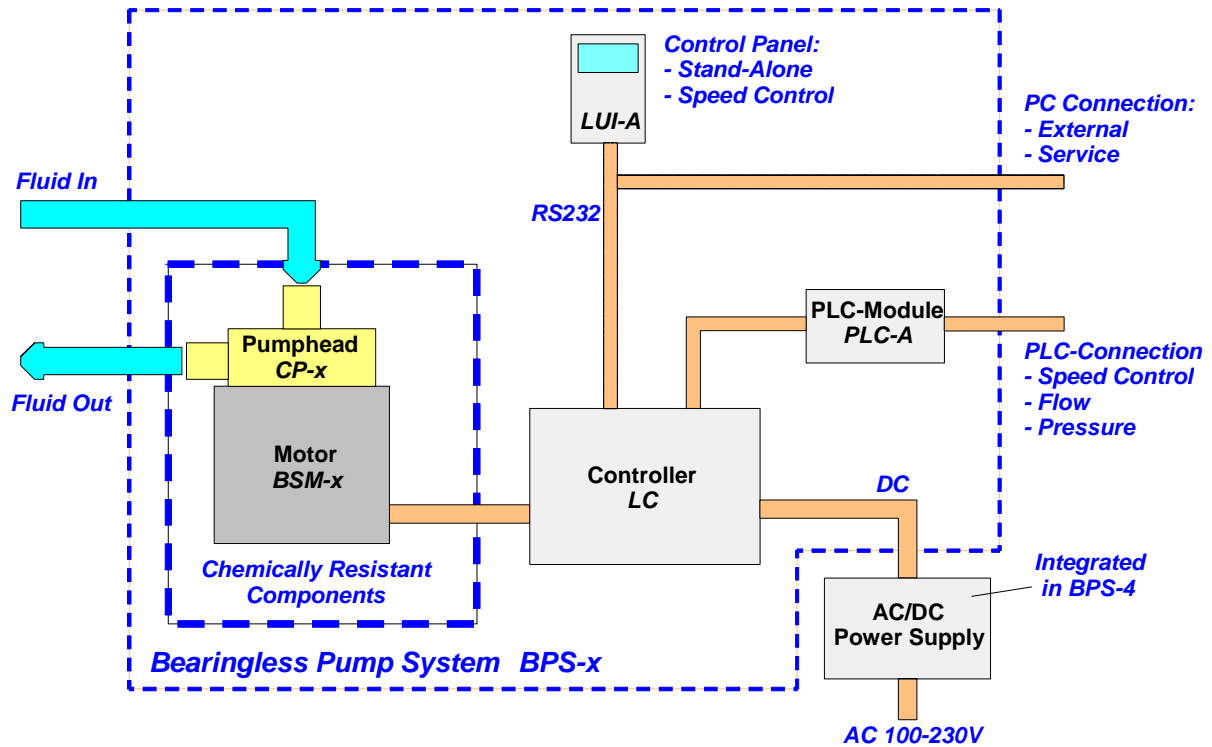


**Figure 10:** Basic dimensions of motor BSM-4 with pump head CP-4 for BPS-4 pump system.



**Figure 12:** Basic dimensions of controller LC325 for BPS-4 pump system.

**CONNECTIVITY OF THE LEVITRONIX® PUMP SYSTEM**



**STANDARD SYSTEM CONFIGURATIONS AND PRODUCT OPTIONS**

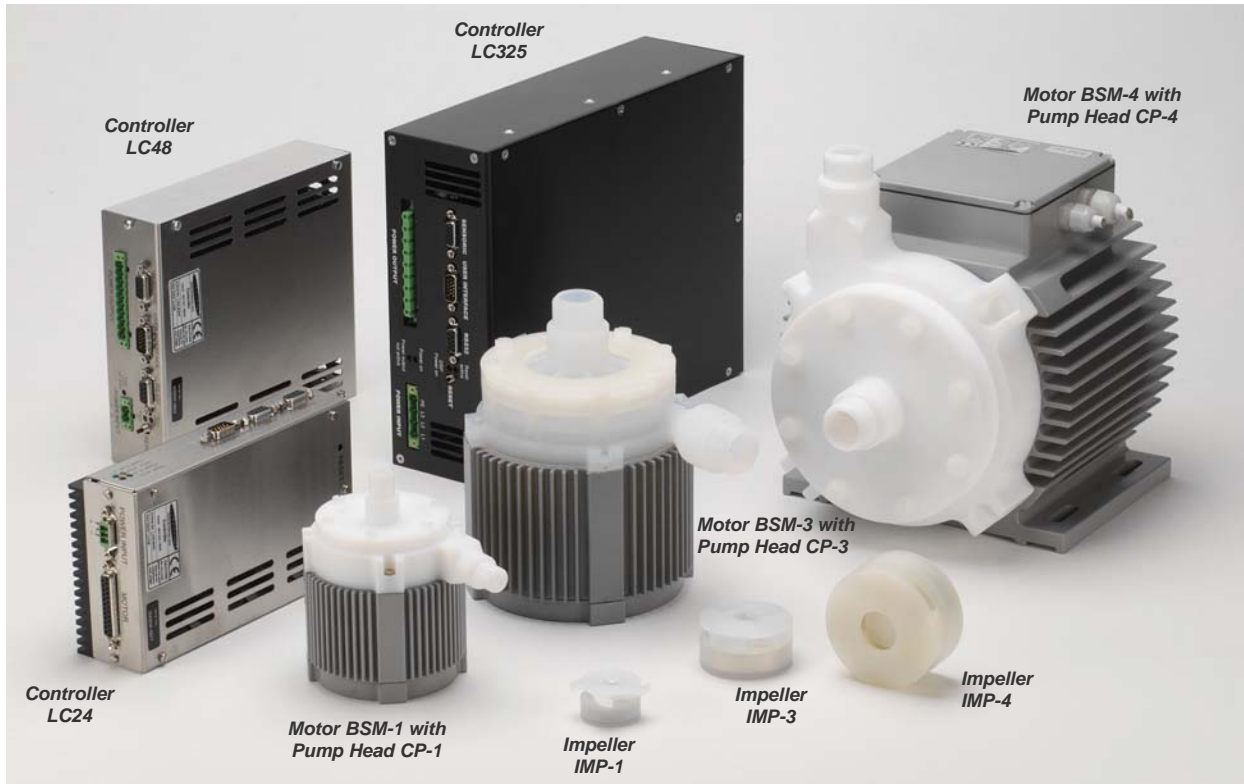
\*\* Custom configurations are available

Part	Characteristics	Pump System BPS-1	Pump System BPS-3	Pump System BPS-4
<b>Pump Head</b>	Part Name	CP-1 (Pump Casing PCA-1, Impeller IMP-1)	CP-3 (Pump Casing PCA-3, Impeller IMP-3)	CP-4 (Pump Casing PCA-4, Impeller IMP-4)
	Wet Materials: Impeller Pump Casing	PFA PFA, PVDF **	PFA, ECTFE PFA, PVDF **	ECTFE PTFE **
	Fittings	Flaretek 1/2" **	Flaretek 1" **	Flaretek 1" **
	Sealing O-Ring	Kalrez® perfluoroelastomer <sup>1</sup> **		
	Max. Flow	21 liters/min / 5.5 gallons/min	75 liters/min / 20 gallons/min	120 liters/min / 32 gallons/min
	Max. Diff.-Pressure	1.6 bar / 23 psi	2.5 bar / 36 psi	4.5 bar / 65 psi
<b>Motor</b>	Max. Liquid Temp.	90°C / 194°F	90°C / 194°F	90°C / 194°F
	Part Name	BSM-1	BSM-3	BSM-4
	Mechanical Power	50 W	300 W	900 W
	Housing	ETFE coated Aluminum, waterproofed and submersible		
	Cable	1 cable, 5m, FEP jacket **	2 cables, 6m, FEP jacket **	2 cables, 6m, FEP jacket **
<b>Controller</b>	Connector	D-SUB **	D-SUB / COMBICON **	D-SUB / COMBICON **
	Part Name	LC24	LC48	LC325
	Electrical Power	120 W	600 W	1500 W
	Supply Voltage	24 V DC	48 V DC	200-230V AC, 1 and 3-phase
Interfaces		PLC, RS232, Control panel for stand-alone operation		

1: Kalrez® is a registered trademark of DuPont Dow Elastomers

**LEVITRONIX® SYSTEM COMPONENTS**

*Levitronix® product family for ultra pure fluid handling*



**ACCESSORIES**

*Levitronix® accessories for BPS-3 pump system (same or similar accessories are available for BPS-1 and BPS-4)*



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