LEVITRONIX®

Ultrapure Fluid Handling
Integrated Pump System Series

BPS-i30

1.5 bar	(23 psi)
5.5 liters/min	(1.5 gallons/min)

No Bearings. No Seals. No Contamination!

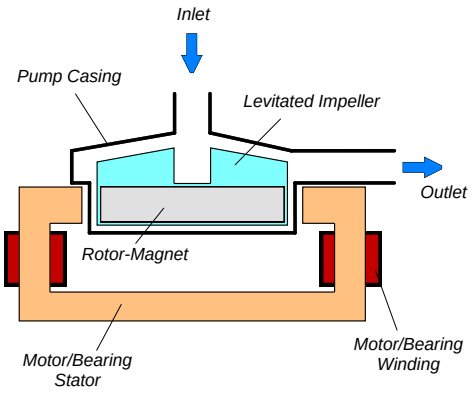


Figure 1: *Schematic of the main elements of the MagLev centrifugal pump*

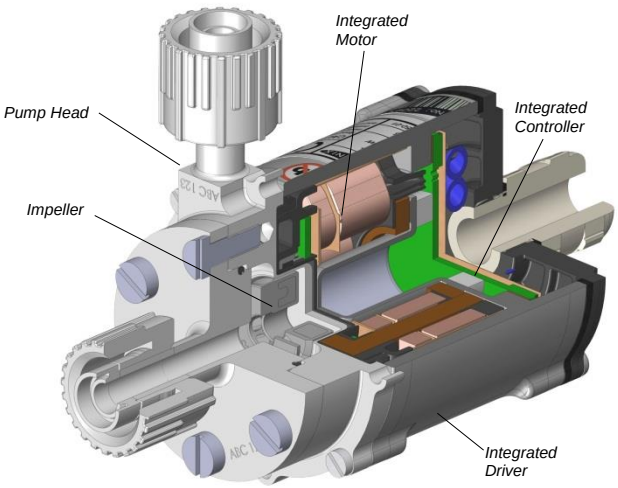


Figure 2: *Integrated MagLev pump driver with pump head*

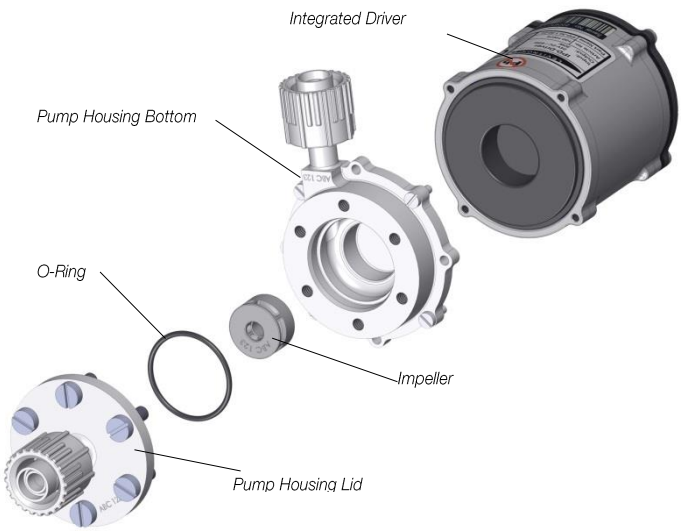


Figure 3: *Disassembled pump head*

INTRODUCTION

The *BPS-i30* pump system is a revolutionary centrifugal pump that has no bearings to wear out or seals to break down and fail. Based on the principles of magnetic levitation, the pump 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.

The controller and the motor are integrated into the driver housing (see *Figure 2*), hence cabling effort is reduced. Fluid flow rate and pressure are precisely controlled by electronically regulating the impeller speed without pulsation.

SYSTEM BENEFITS

- Extremely low particle generation due to the absence of mechanically contacting parts.
- Increased equipment uptime.
- Lower maintenance costs by eliminating valves, bearings, rotating seals and costly rebuilds.
- Very low integration costs as no external controller is needed for speed or closed loop control.
- Reduced risk of contamination due to the self-contained design with magnetic bearings.
- Very gentle to sensitive fluids due to low-shear design.
- No narrow gaps and fissures where particles or microorganisms could be entrapped.
- Smooth, continuous flow without pressure pulsation.
- Electronic speed control.
- Compact design compared to pneumatic and mag-drive pumps.
- Proven technology in medical and semiconductor industry (MTBF > 50 years).

APPLICATIONS

- Semiconductor wet processing.
- Flip chip and advanced packaging.
- Solar cell production.
- Flat panel display manufacturing.
- Hard-disk fabrication.
- Printer ink handling.
- Pharmaceutical production.
- Plating.
- Circulation in flow batteries.

SYSTEM CONFIGURATION FOR SPEED CONTROL

Figure 7 illustrates the interfacing of the integrated pump systems. Various PLC signals allow a simple setup with precisely setting the speed via an analog input. Various digital inputs and outputs allow controlling and monitoring of the system.

A *RS485* interface allows communication with a PC in connection with the *Levitronix® Service Software*. Hence parameterization, firmware updates and failure analysis are possible. The *RS485* can also be used as a fieldbus to implement more intelligent concepts of pump control.

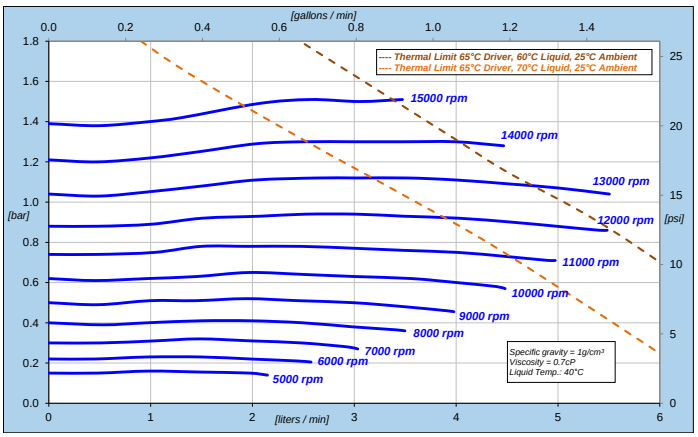


Figure 4: *Pressure/flow curves for aqueous liquids (similar to water)*

SYSTEM CONFIGURATION FOR PROCESS CONTROL

The *PLC* interface of the *BPS-i30* pump system enables the implementation of precise closed loop flow or pressure control in connection with either a flow or pressure sensor (see *Figure 8*).

Precise ultrapure flow control systems can be realized with the *BPS-i30* pump system in combination with *LEVIFLOW®* flowmeters. *Levitronix®* provides either turnkey solutions for closed loop flow control or helps to design your own flow control system. Experience has been gained with fluids such as CMP slurries, surface-conditioning chemicals, plating solutions, ultrapure water and solvents.

The versatility of *Levitronix®* flow control systems goes far beyond the capabilities of simple flow controllers. In addition to the flow control function, the *Levitronix®* control firmware comes with several condition monitoring features to monitor the integrity of the fluid circuit. *Levitronix®* flow control systems can generate alarms for preventive filter exchange, no-flow conditions or line clogging. Dynamic Condition Trending (DCT) enables failure prediction and scheduling of preventive maintenance (*Figure 5*).

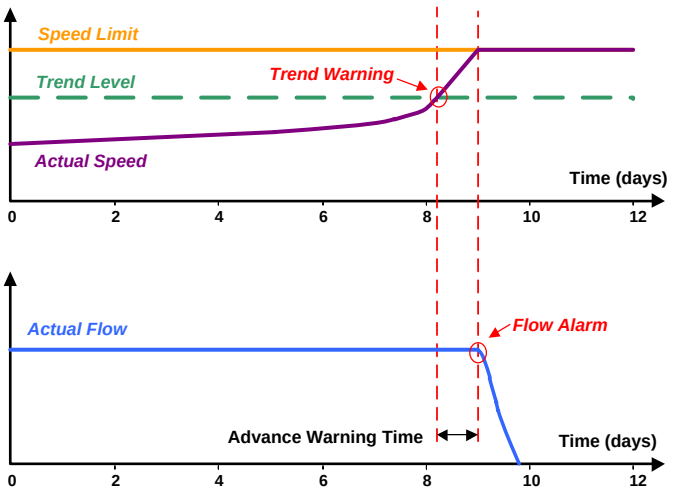


Figure 5: *Dynamic Condition Trending (DCT)*

MULTI-PUMP SYSTEM CONFIGURATION

The RS485 fieldbus allows easy usage of multiple pumps addressing each pump with a unique address, which can be set via *Levitronix® Service Software*.

For application with low flows and high pressure a serial configuration as shown in *Figure 6* is possible using either the PLC or the fieldbus. This setup allows control of the system as one pump.

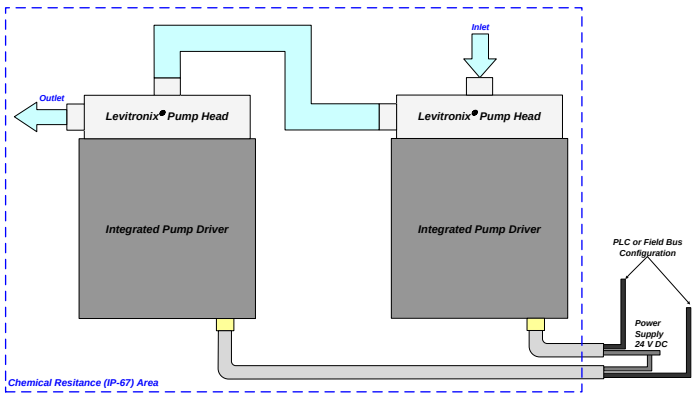
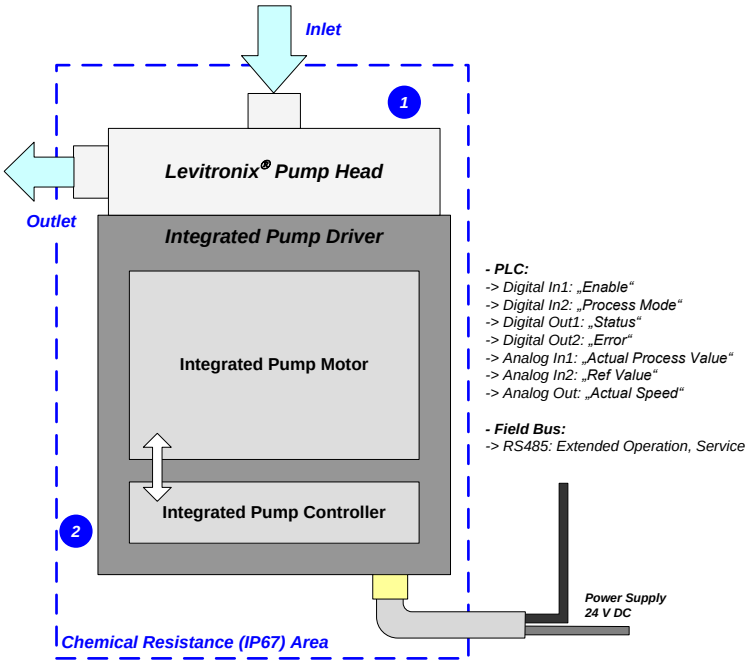


Figure 6: *Concept of serial pumping*



Wire Name	Description	Standard Designation	Hardware Specification
P+	+ 24 VDC	Supply	Voltage: 24 VDC
P-	Power Input Ground / Earth		P- to be connected to earth
Ain1	Analog Input 1 (Current Input)	Actual Process Value	Analog current input: 4 – 20 mA (450 Ohm shunt input, no galvanic isolation)
Ain2	Analog Input 2 (Voltage Input)	Reference Value	Analog voltage input: 0 – 10V (7.9 kOhm, no galvanic isolation)
Ain_GND	Analog Input Ground	--	Reference for Ain1 and Ain2
Din1	Digital Input 1	Enable (Reset)	Galvanic separation with optocoupler
Din2	Digital Input 2	Process Mode	2.2 kΩ input resistance, 5-24V for active input
Din_COM	Common Digital Input	--	--
Aout1	Analog Output (Voltage Output)	Actual Speed	0 – 10V (no galvanic isolation) AGND is reference
Dout1	Digital Output 1	Status	Open drain, max. 24V, 100mA
Dout2	Digital Output 2	Error	Reference ground is AGND
AGND	Analog Ground	--	Reference for Aout1, Dout1 and Dout2
RS485+	RS485 +	Field Bus	Modbus protocol
RS485-	RS485 -		
NC	Do not connect	--	--
NC	Do not connect	--	--
Shield	Shielding	Shielding	To be connected to earth (see wire No. 2, P-)

Figure 7: Standard system configuration of BPS-i30 for speed control
Note: Power supply wires (No. 1,2) are 1.5mm² and signal wires 0.14mm²
Note: For more detailed description of interface consult user manual

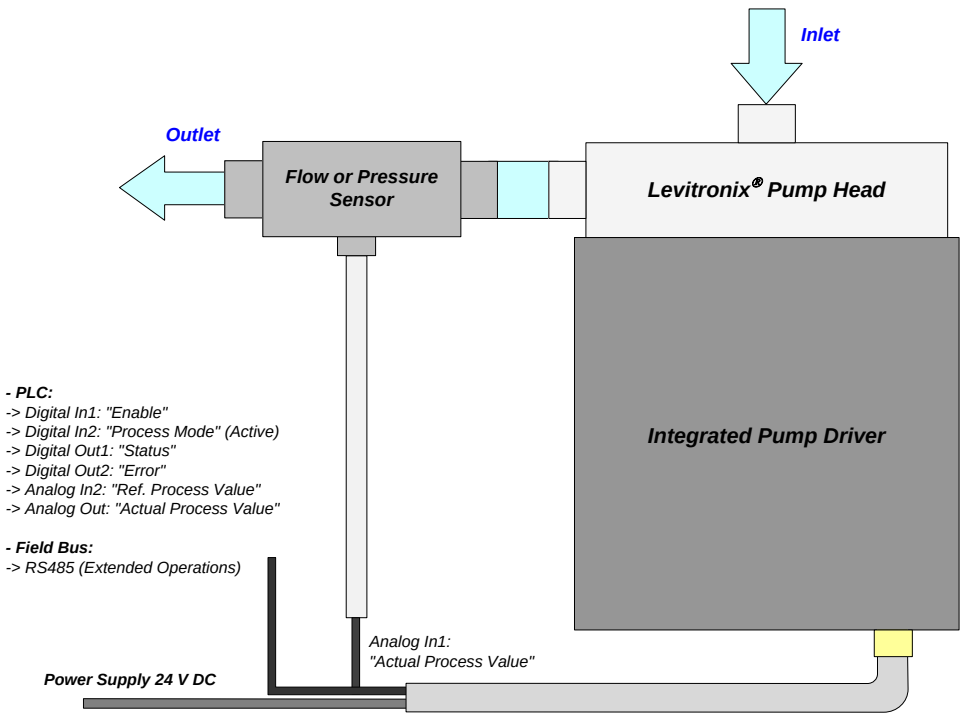
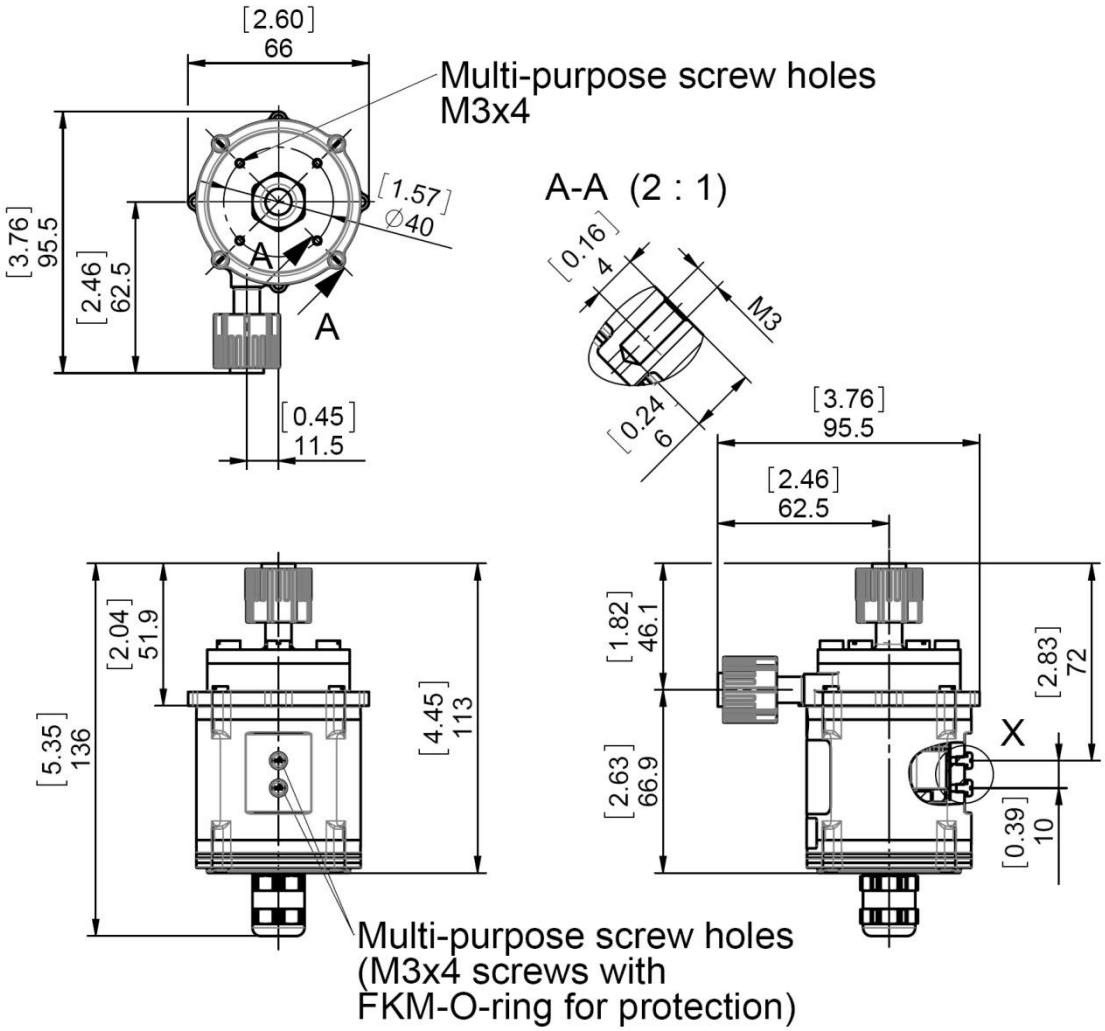


Figure 8: Standard system configuration of BPS-i30 for process control
Note: Parameters of closed loop control can be configured via Levitronix® Service Software over RS485



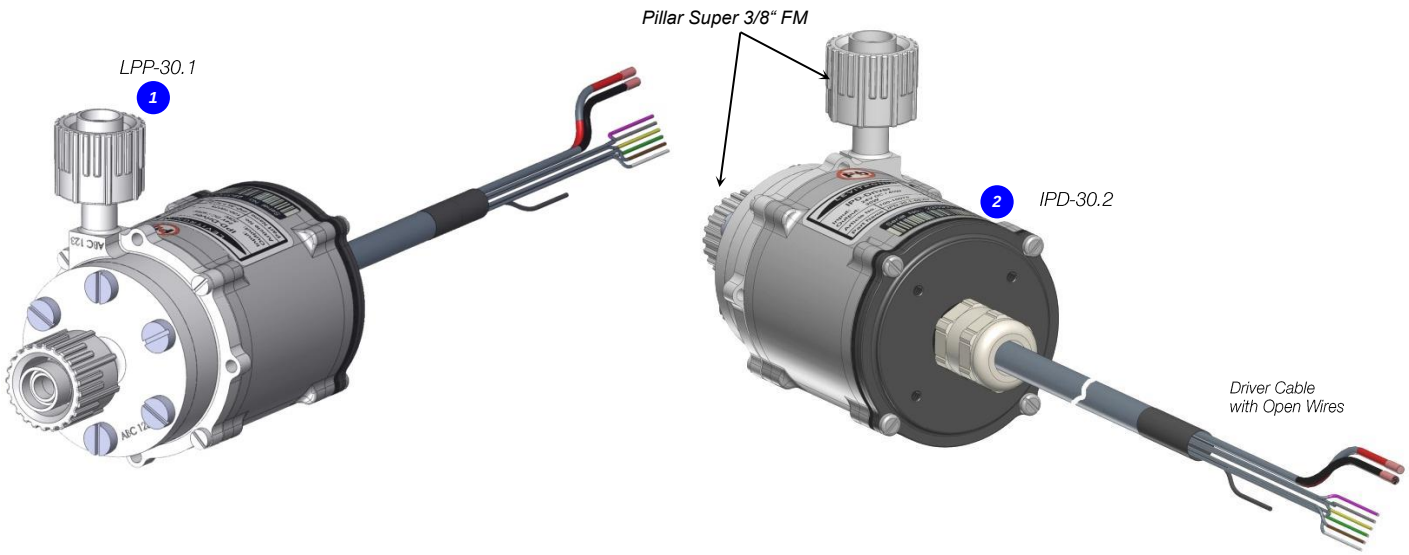


Figure 9: Dimensions of integrated driver with pump head (in mm and [inch])

ORDER INFORMATION

System Name	Article #	Pump Head	Driver	Note
BPS-i30.1	100-90831	LPP-30.1	IPD-30.1-50-01	*PTFE pump head, Epoxy coated motor, 5 m PVC cable with open wires*
BPS-i30.2	100-90832	LPP-30.1	IPD-30.2-50-01	*PTFE pump head, ETFE coated motor, 5 m FEP cable with open wires*

Table 1: Standard system configurations

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
1	Pump Head	LPP-30.1	100-90828	Impeller / Pump Housing	*PTFE / PTFE*
				Sealing O-Ring	*Kalrez® perfluorelastomer [1]*
				In-/Outlet Fittings	*3/8" Pillar Super 300 FM (female)*
				Max. Flow	*5.5 liters/min / 1.5 gallons/min*
				Max. Diff.-Pressure	*1.5 bar / 23 psi*
				Max. Viscosity	*10 cP*
				Max. Liquid Temp.	*70 °C / 158 °F*
2a	Integrated Pump Driver	IPD-30.1-50-01	100-10075	Voltage, Power	*24 VDC ±10%, 35 W*
				Housing	*Epoxy (corrosion resistant) coated Aluminum, PP for bottom lid Waterproofed (IP67)*
				Cable	*PVC jacket, open wires, cable length 5m*
				Interfaces	*PLC with - 1 analog input 4 – 20 mA; - 1 analog input 0 - 10 V; - 1 analog output 0 – 10 V; - 2 digital inputs 0 – 24 V (optocoupler); - 2 digital outputs 0 – 24 V / 100 mA (open drain)* *RS485 interface (for service and extended field operation). Modbus protocol.*
				Standard Firmware	*H030 H1.48*
2a	Integrated Pump Driver	IPD-30.2-50-01	100-10076	Housing	*ETFE (corrosion resistant) coated Aluminum, PP for bottom lid*
				Cable	*FEP jacket, open wires, cable length 5m*

Table 2: Specification of standard components
1: Kalrez® is a registered trademark of DuPont Dow Elastomers

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
3	Impeller Exchange Kit	IEK-30.1	100-90837	Impeller LPI-30.1 (a)	*PTFE*
				Sealing O-Ring (b)	*O-Ring, Kalrez® 28.3 x 1.78 mm*
				Pump Housing Screws (c)	*6 pieces, stainless steel PTFE coated, M5 x 14 mm*
				Pump Motor Screws (d)	*4 pieces, stainless steel PTFE coated, M3 x 10 mm*
				Exchange Tool IET-30.1 (e)	*POM-C*
4	Mounting Base Plate	MBP-i30.1	190-10313	Material	*PP + 30% GF*
				Feet Mounting Screws	*2 pieces, stainless steel FEP coated, M3 x 10 mm*
5	AC/DC Power Supply	TPC 055-124 (Traco)	100-40014	Voltage / Power Output	*24 VDC / 55 W*
				Voltage Input	*85 – 264 VAC, 47-63 Hz*
				Basic Dimensions	*45 x 90 x 96.5 mm (mountable on DIN rail 35 mm)*
				Certification or Standards	*UL, CSA, CB, Semi F47*
6	USB to RS485 Adaptor TR	USB-RS485-WE-5000-BT-TR	100-30336	Structure/Design	*USB connector (6a) with termination resistor connector (6b) and connector for external RS485 wire connections (6c)*
				Purpose	*Communication over fieldbus of driver with PC*

Table 3: Specification of accessories

Figure 10: Pump system with standard components

Figure 11: Accessories

Levitronix® is the world-wide leader in magnetically levitated bearingless motor technology. *Levitronix®* was the first company to introduce bearingless motor technology to the Semicondutor, Medical and Lifescience markets. The company is ISO 9001 certified. Production and quality control facilities are located in Switzerland. In addition, *Levitronix®* is committed to bring other highly innovative products like the *LEVIFLOW®* flowmeter series to the market.

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