

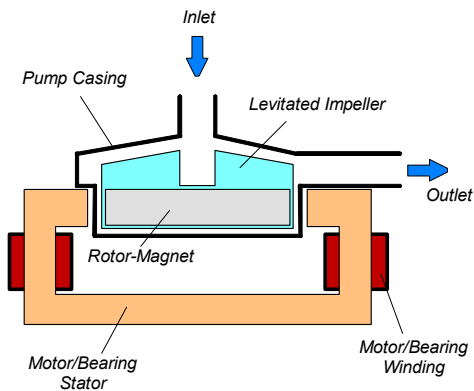
## Ultrapure Fluid Handling Integrated Pump System Series



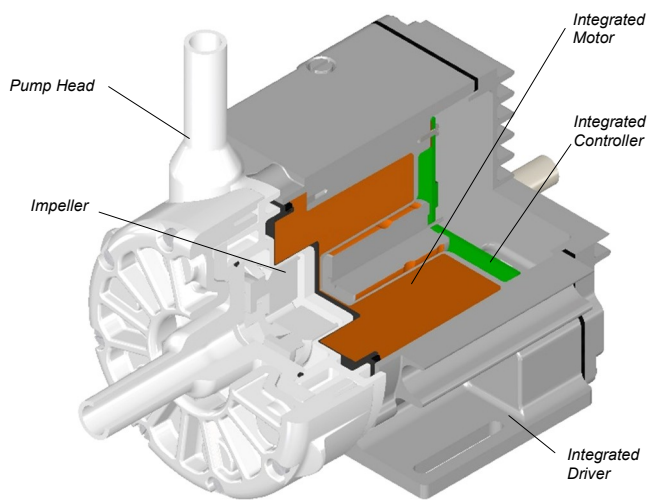
### BPS-i100

2 bar	(29 psi)
20 liters/min	(5.3 gallons/min)

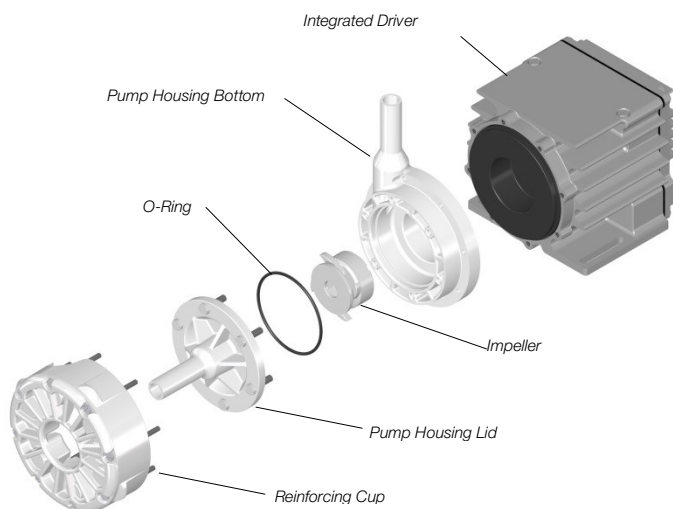
**No Bearings. No Seals. No Contamination!**



**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-i100* 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 – “STAND-ALONE”

Figure 7 and Figure 12 illustrate a “Plug and Play” stand-alone system with integrated user panel and buttons to set the speed manually. The driver also contains a PLC interface for remote speed control by analog and digital signals. Various accessories are available like a desktop power supply with relevant power cable and signal cables to connect to the PLC.

## SYSTEM CONFIGURATION – “EASYCONNECT”

The “EasyConnect” models (see Figure 10 and Figure 14) with according cable accessories are designed to realize various interface configurations with minimal setup effort. Two Fieldbus (IN and OUT) allow to setup arrays of multiple pumps. Therefore, serial pumping configurations as shown in Figure 10 can be realized. The PLC interface allows not only remote control by analog/digital signals but also connections of external sensors hence enabling for example a precise flow or pressure control. The Fieldbus interface allows remote control over a PC, a user panel or other devices with Modbus protocol. For enhanced chemical protection of the motor and cable connectors, protective connector covers (see Figure 19) are available.

## SYSTEM CONFIGURATION – “OEM”

The “OEM” models are designed for a compact integration with one integrated driver cable containing all available interface signals (see Figure 8 and Figure 16). Basically, all configurations of the “EasyConnect” models are possible allowing the users with integration capabilities to adapt the cable to their needs.

## PROCESS CONTROL WITH FEEDBACK SENSORS

Together with an external sensor, process parameters like flow or pressure can be controlled or monitored as shown in 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 6).

## ATEX / IECEx SYSTEM CONFIGURATION

An ATEX / IECEx certified driver (OEM model only) together with the pump head allows installation within an ATEX Zone 2 area (see Figure 9). An Ex conform solution is needed for the motor cables to leave the ATEX area. One option is an ATEX certified cable sealing system as listed in Table 3 (see Pos. 12).

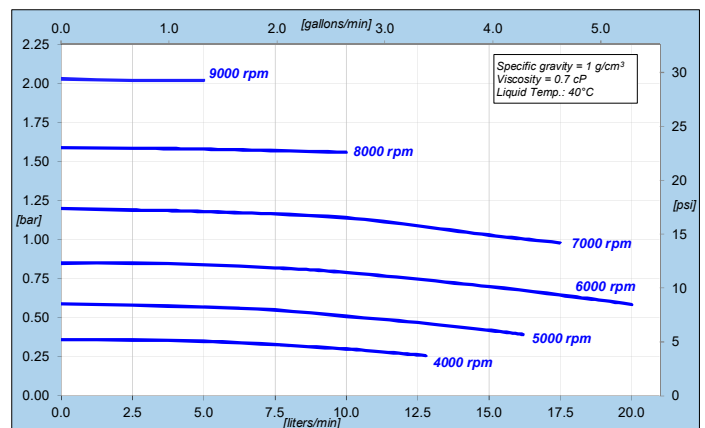


Figure 4: Pressure/flow curves for aqueous liquids (similar to water)

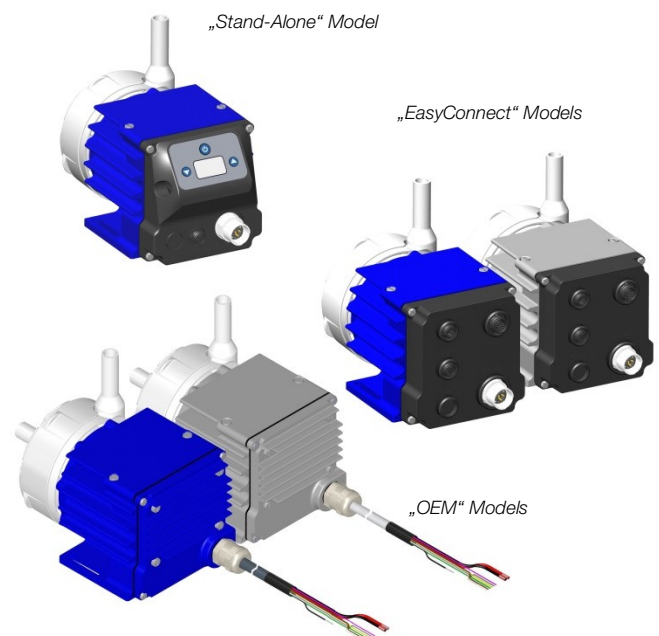


Figure 5: Pump system models

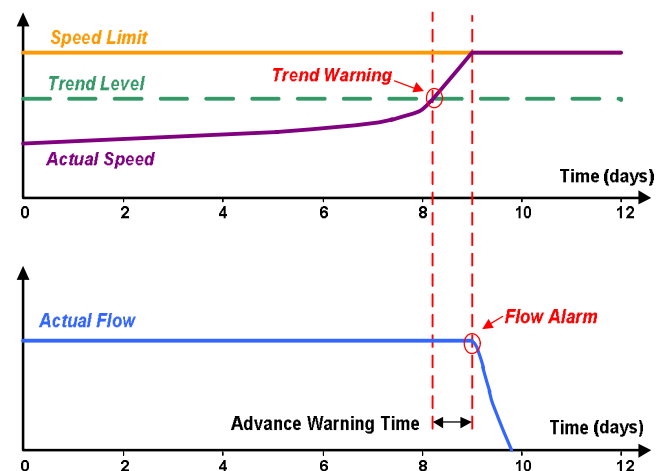
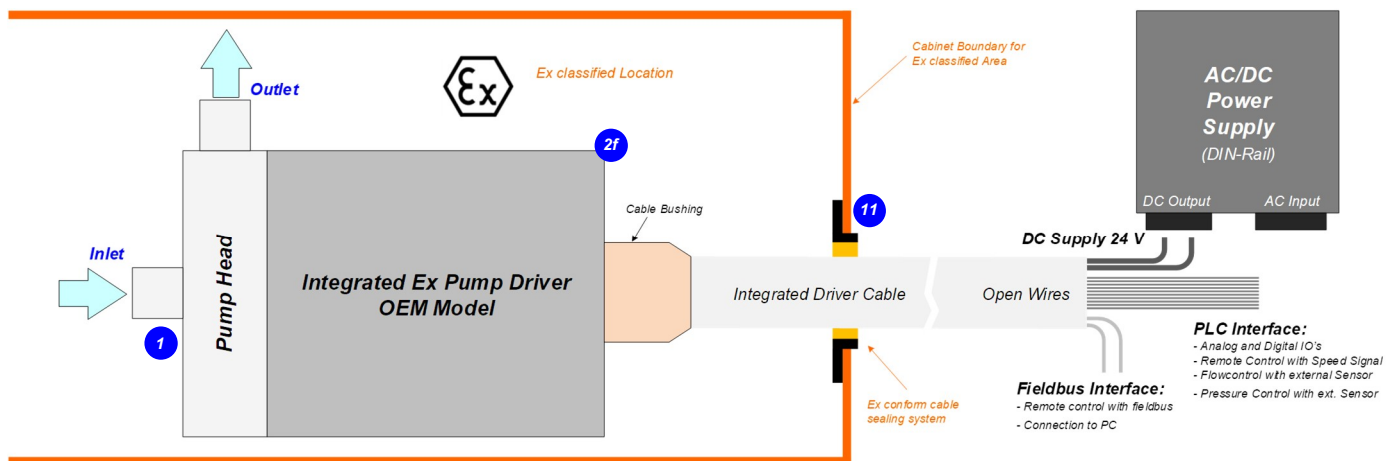
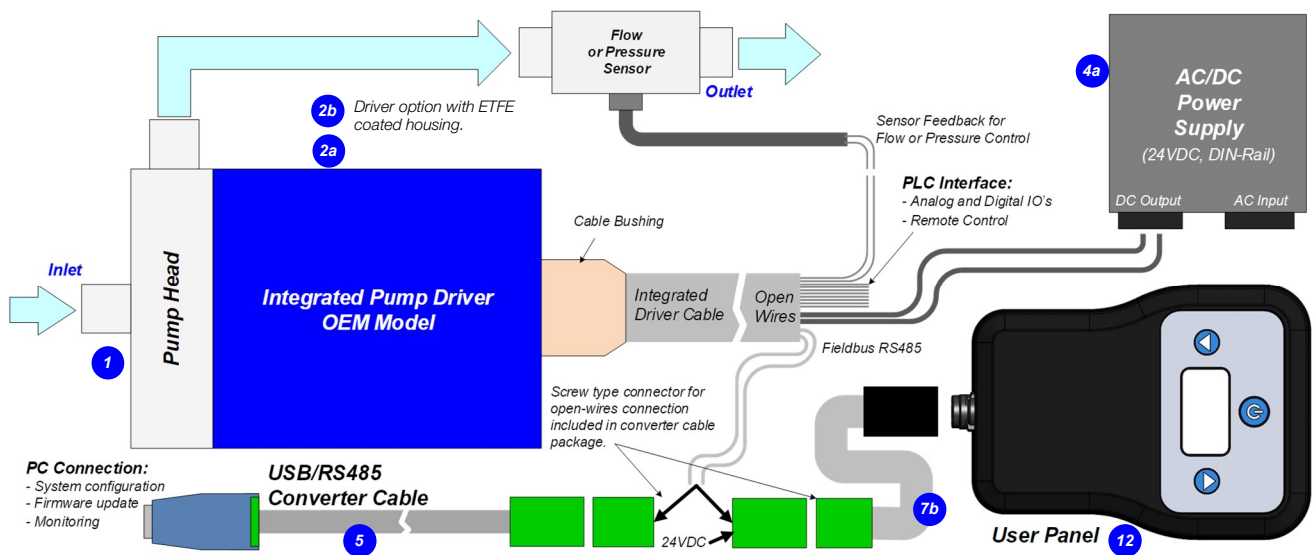
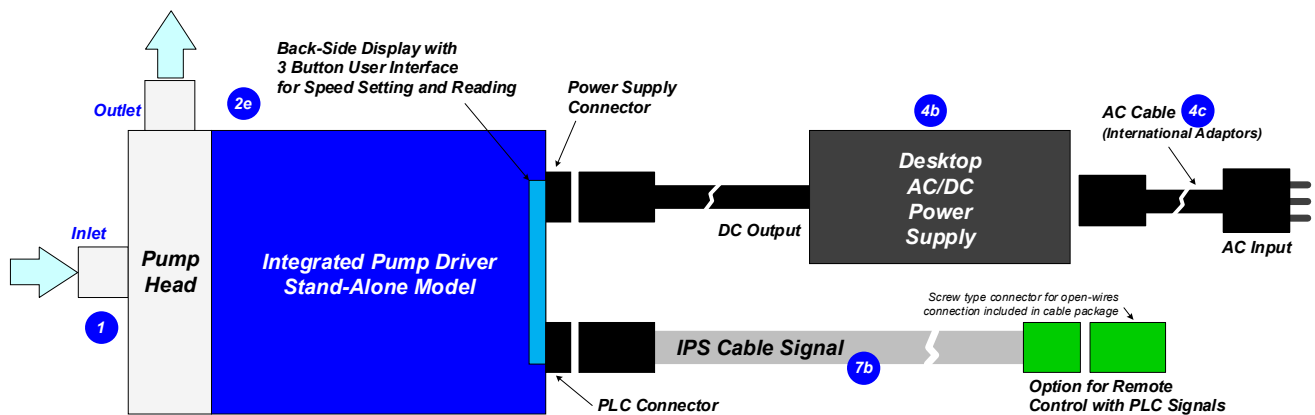
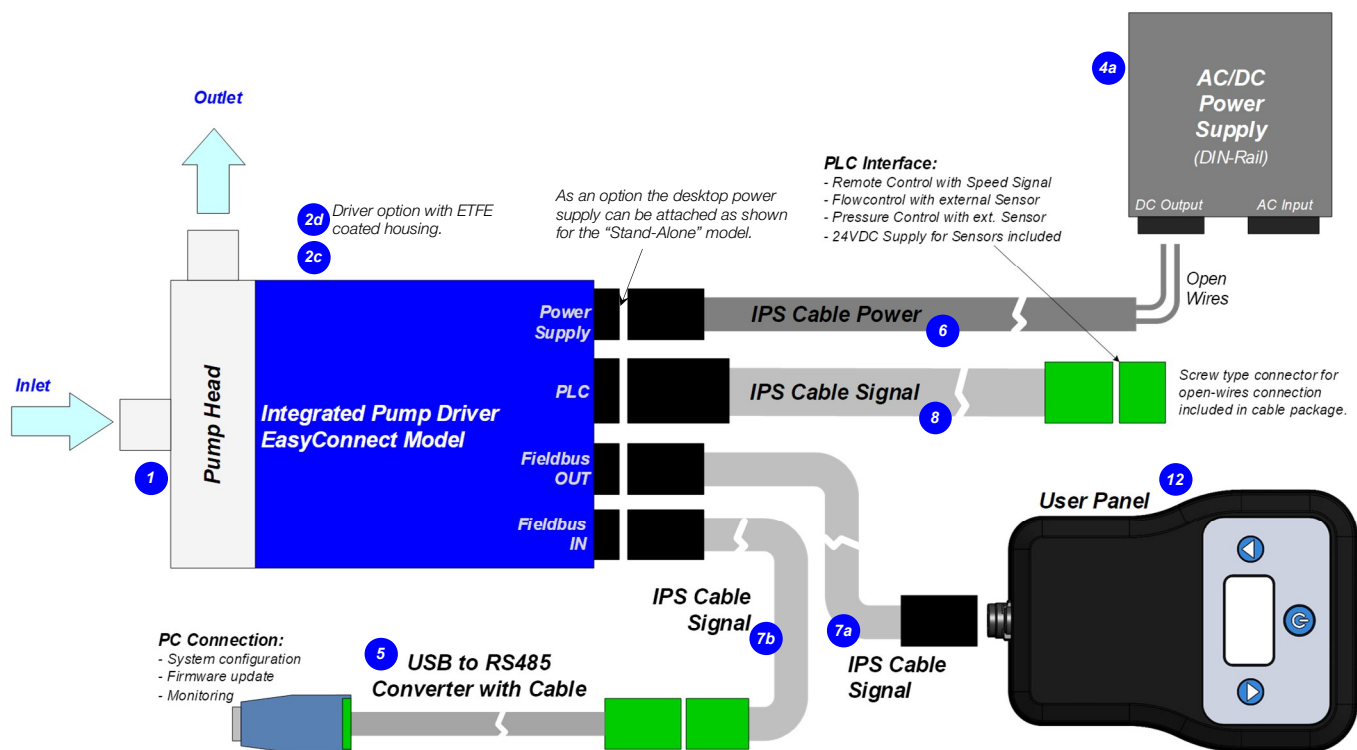


Figure 6: Dynamic Condition Trending (DCT)

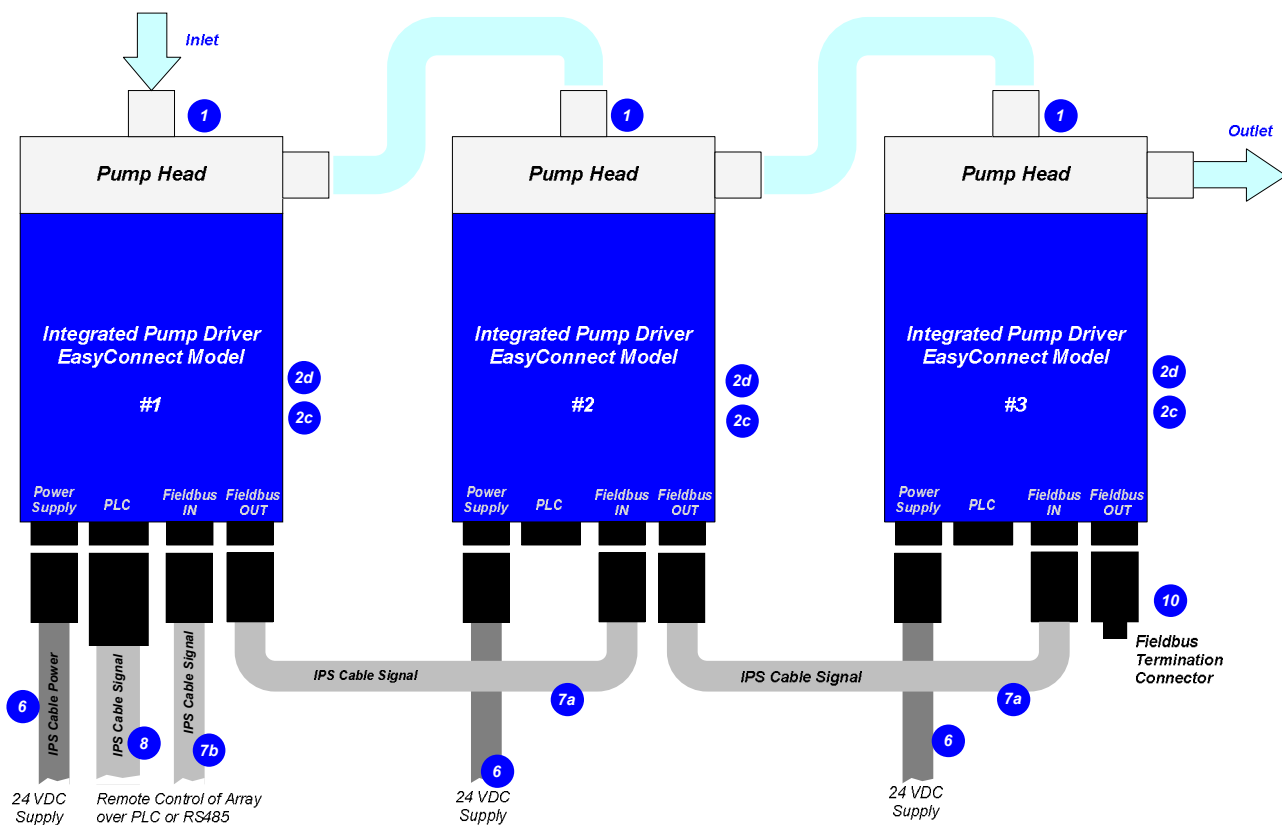


## SYSTEM CONFIGURATIONS

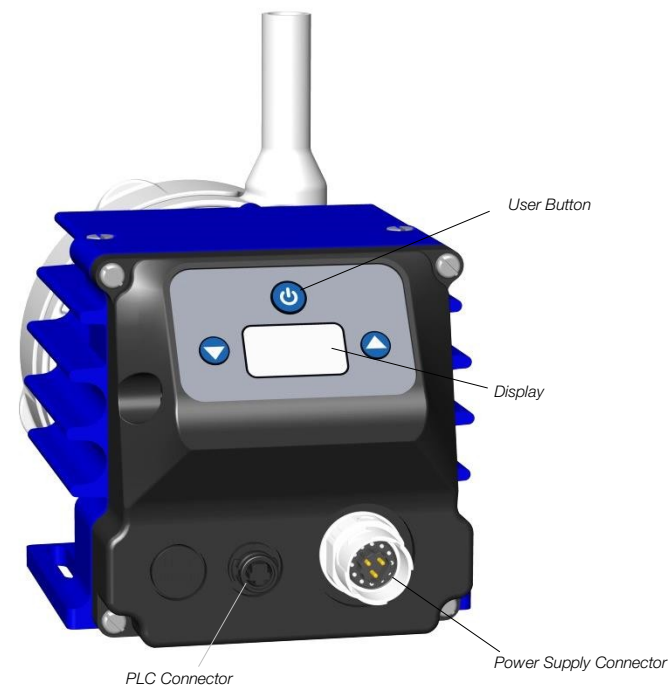




**Figure 10:** Standard "EasyConnect" system configuration with main accessories  
(See section "Order Information" for details to numbered components and other options)



**Figure 11:** Serial pumping configuration with "EasyConnect" models  
(See section "Order Information" for details to numbered components and other options)



Interface	PIN Name	Description	Standard Designation	Hardware Specification
Power Supply	P+	+ 24 VDC	Supply	Voltage: 24 VDC Power: 100 W
	P-	Power Input Ground / Earth		
	NC	Not connected.		
PLC 6	Ain	Analog Input (Current Input)	Remote Speed	Analog current input: 4 ~ 20 mA (450 Ohm shunt input, no galvanic isolation)
	Ain_GND	Analog In. GND	--	Reference for Ain
	Dout	Digital Output 1	Status	Open drain, max. 24V, 100mA Reference ground is GND
	GND	Analog Ground	--	Reference for Dout
	Din1	Digital Input 1	Enable (Reset)	Galvanic separation with optocoupler 2.2 kΩ input resistance, 5-24V for active input
	Din_COM	Com. Digi. Input	--	Reference for digital input.
Display and Buttons	--	Display	Speed and Status Display	
	--	Up/Down	Setting speed	--
	--	On/Off	Enable/Disable	--

Figure 12: Interface specifications of standard “Stand-Alone” model

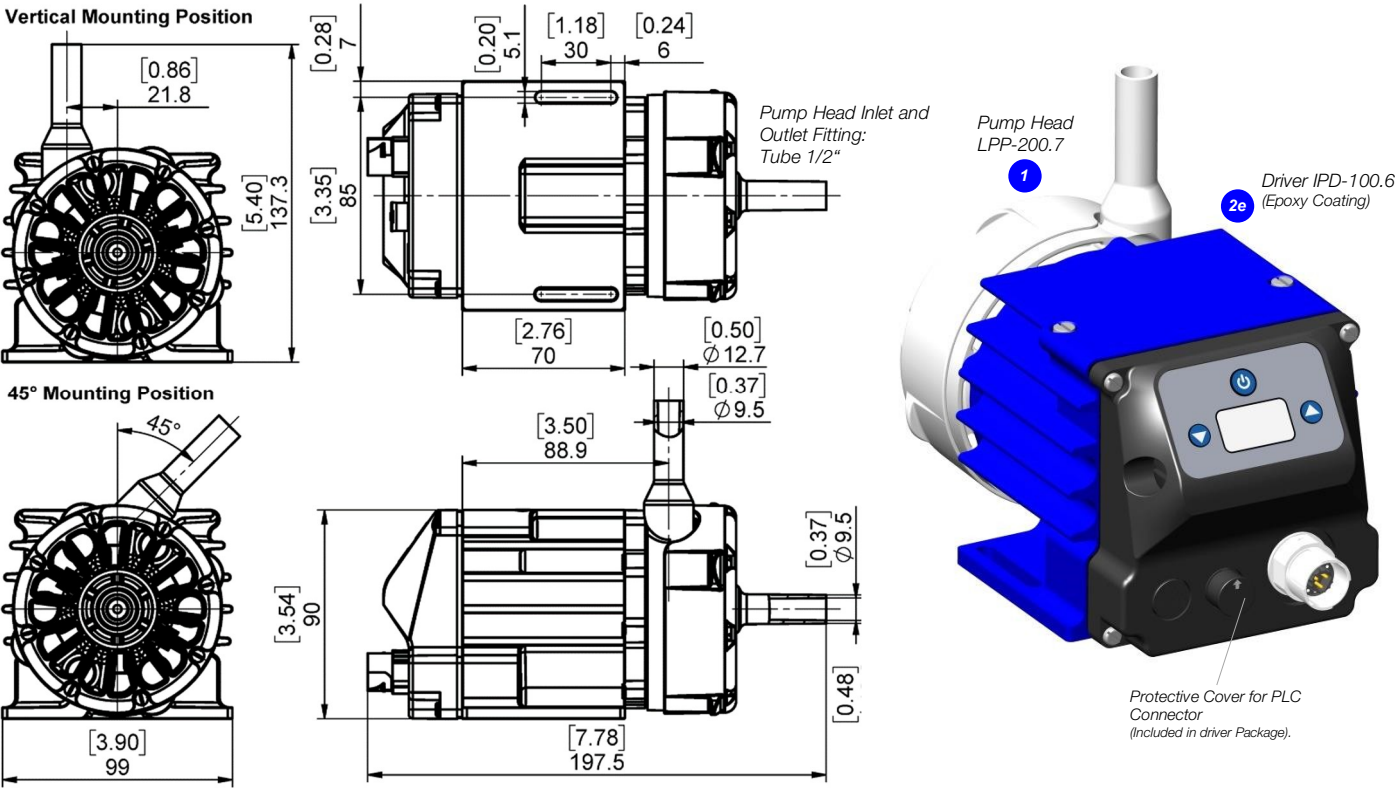


Figure 13: Basic dimensions and description of standard “Stand-Alone” model  
Note 1: Dimensions without tolerance are for reference only.

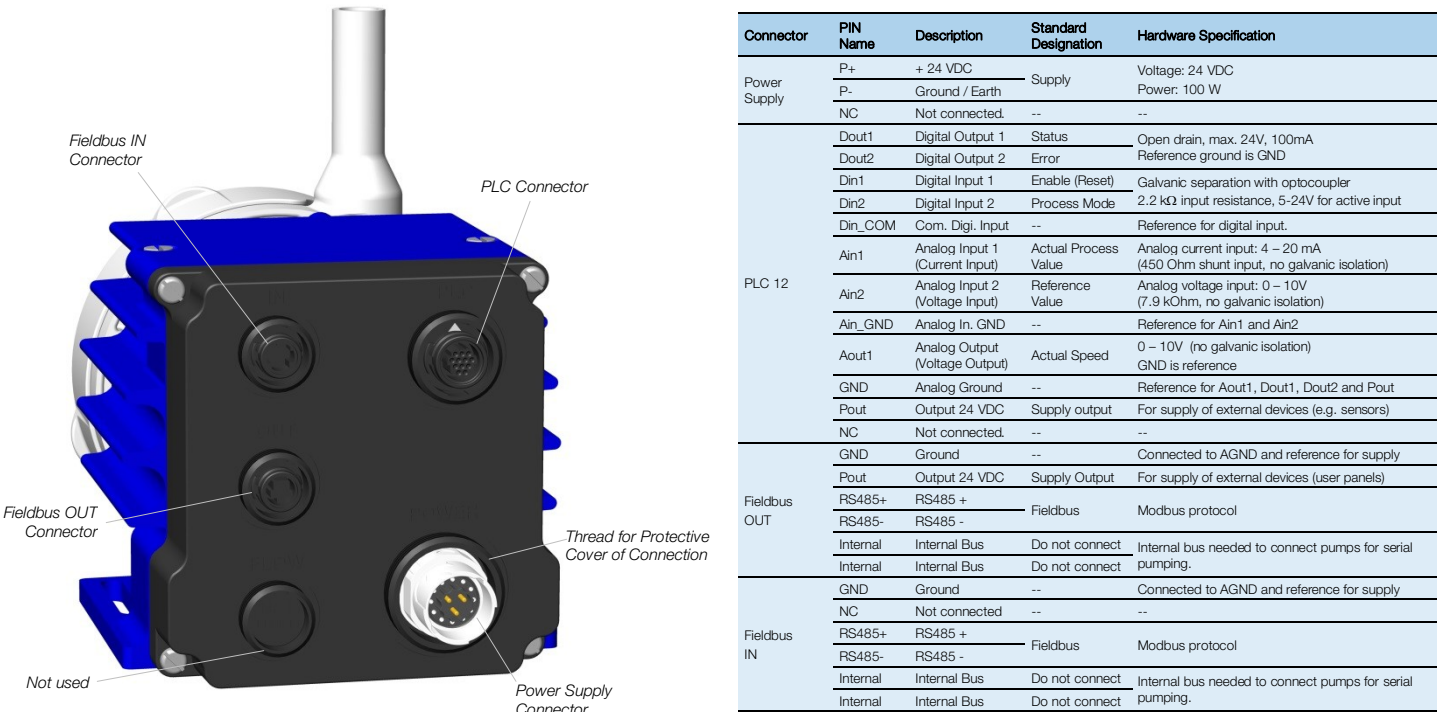


Figure 14: Interface specifications of standard “EasyConnect” models

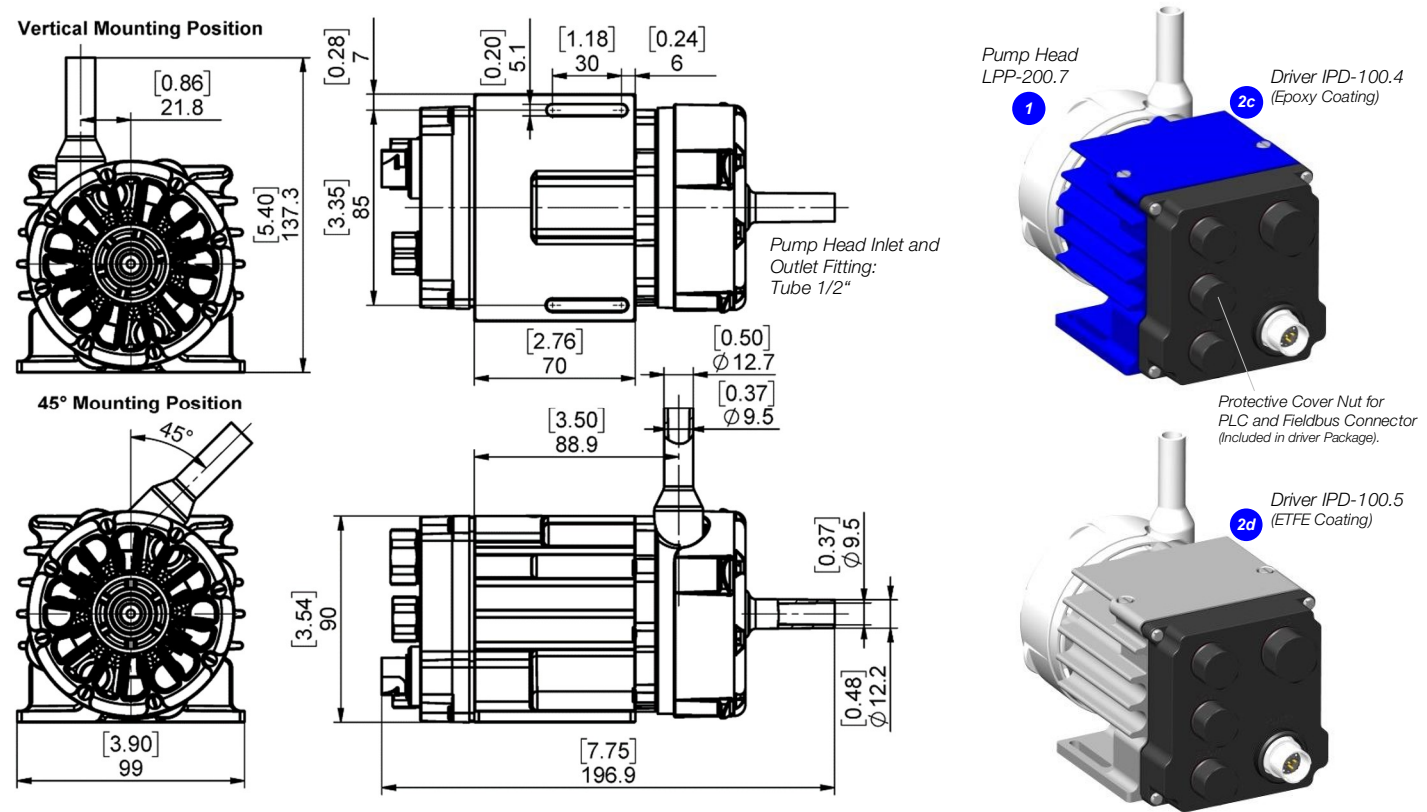
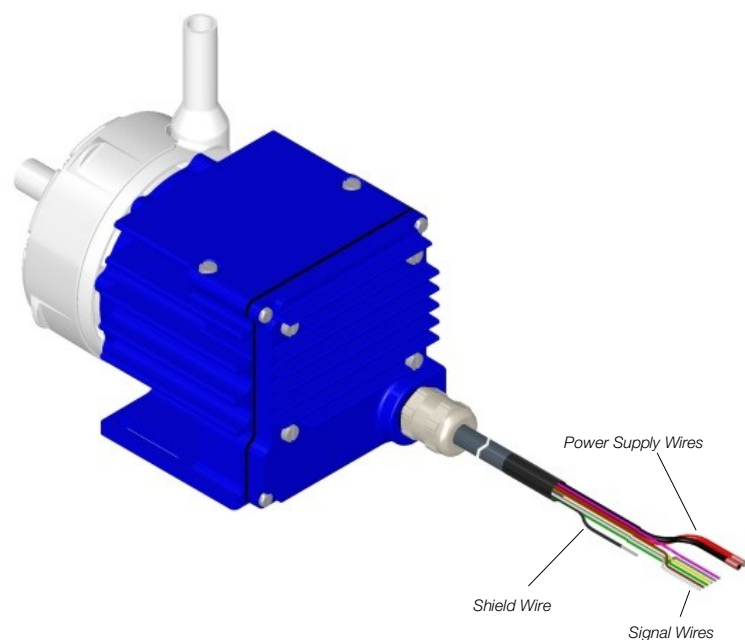


Figure 15: Basic dimensions and description of standard “EasyConnect” models  
Note 1: Dimensions without tolerance are for reference only.



Wire Name	Description	Standard Designation	Hardware Specification
P+	+ 24 VDC	Supply	Voltage: 24 VDC P- to be connected to earth
P-	Power Input Ground / 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 2.2 kΩ input resistance, 5-24V for active input
Din2	Digital Input 2	Process Mode	
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
GND	Analog Ground	--	Reference for Aout1, Dout1 and Dout2
RS485+	RS485 +	Fieldbus	Modbus protocol
RS485-	RS485 -		
Internal	Internal Bus	Do not connect	For internal usage.
Internal	Internal Bus	Do not connect	For internal usage.
Shield	Shielding	Shielding	To be connected to earth (see wire No. 2, P-)

Figure 16: Interface specifications of standard “OEM” models

Note 1: Power supply wires are 1.5mm<sup>2</sup> and signal wires 0.14mm<sup>2</sup>      Note 2: For more detailed description of interfaces consult user manual

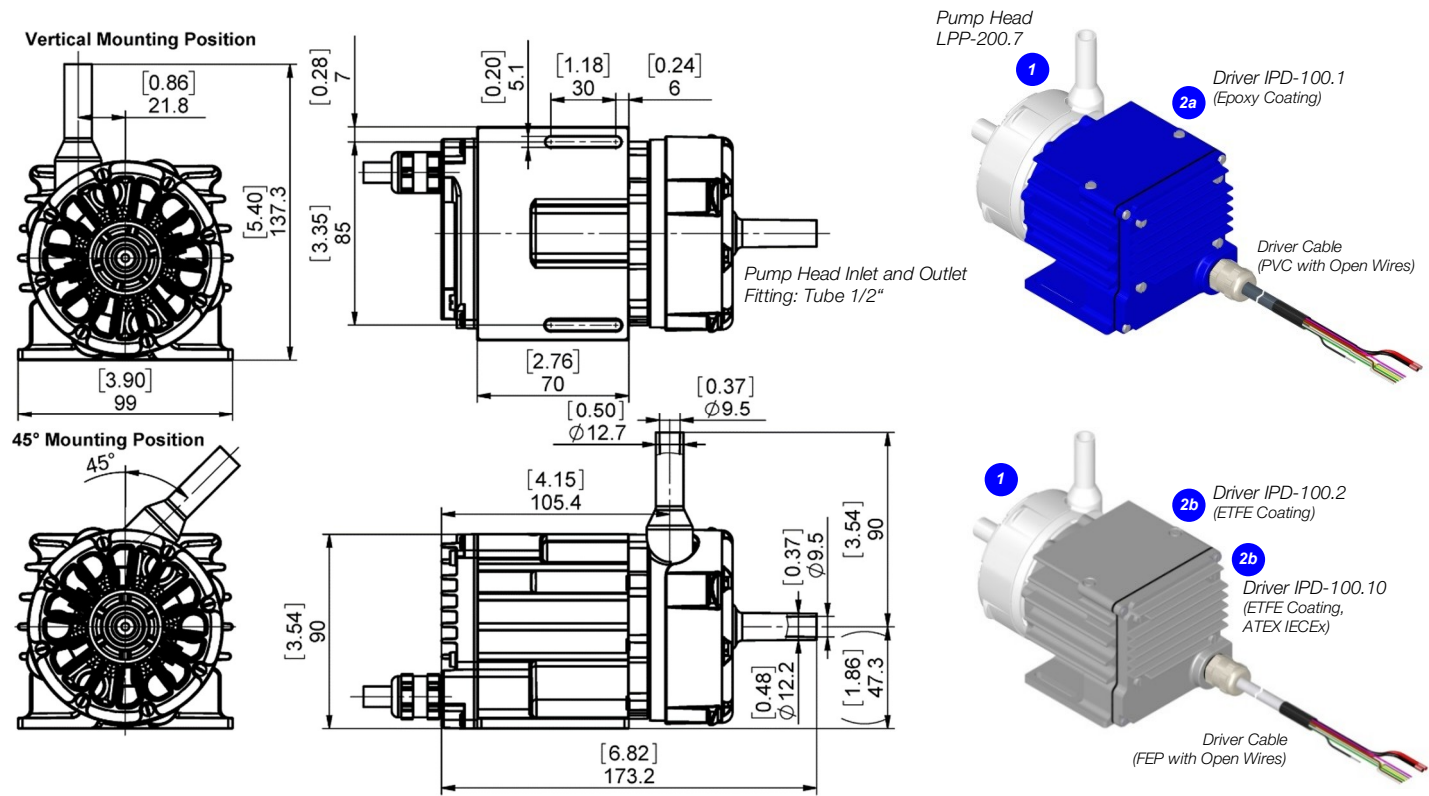
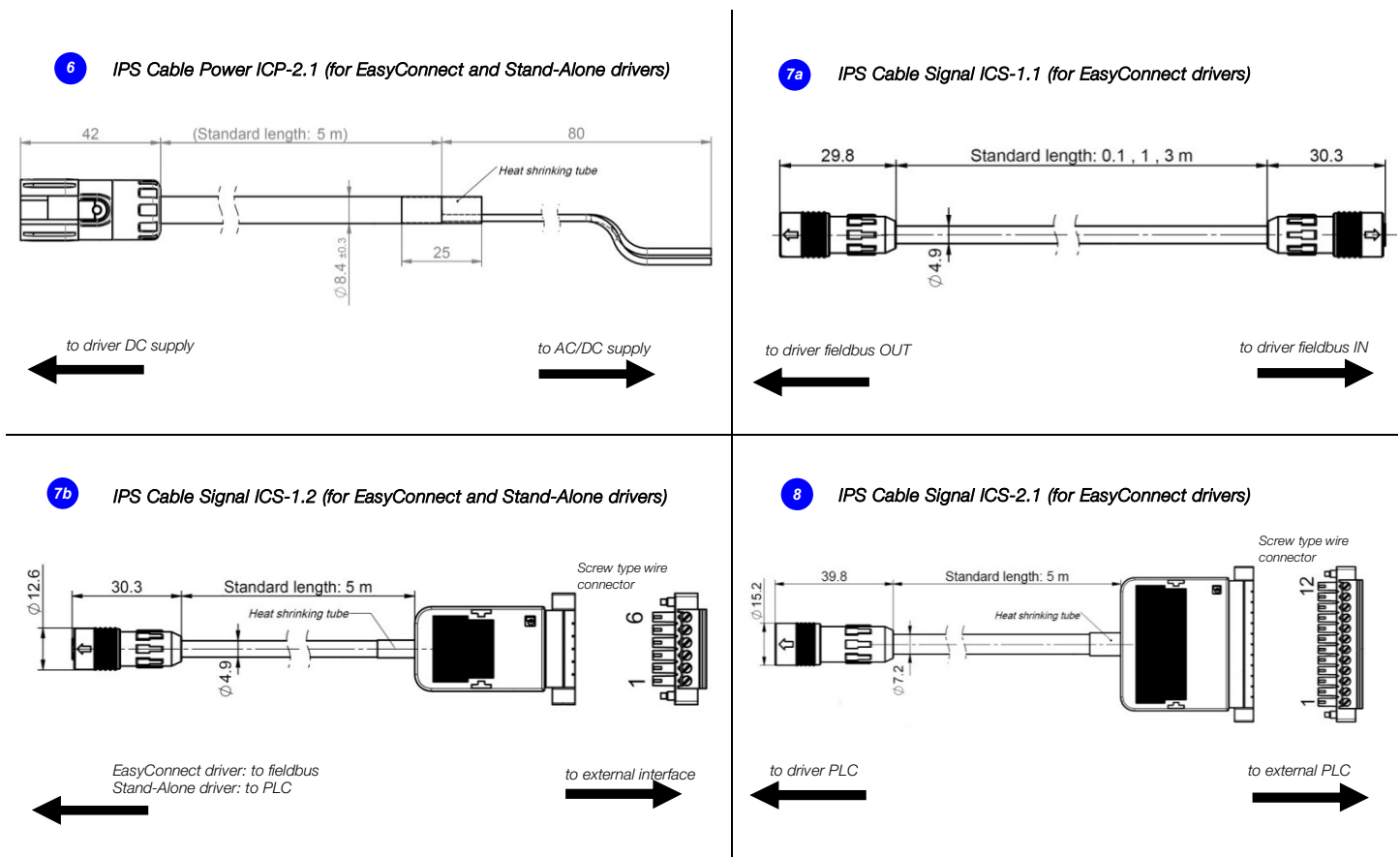


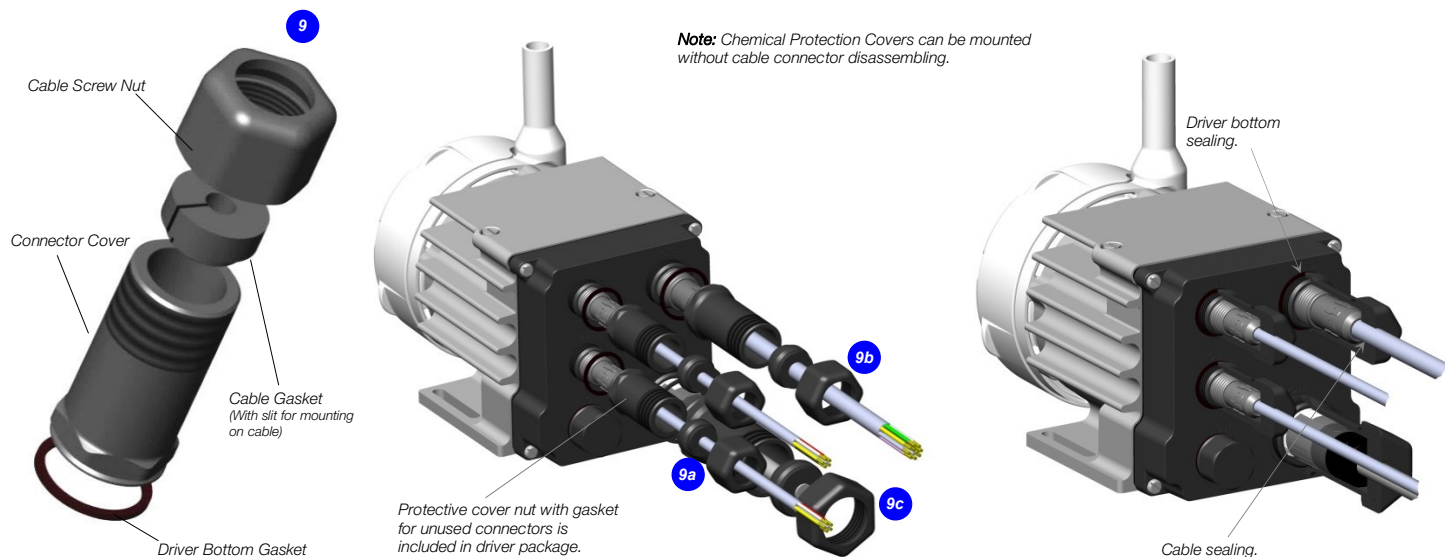
Figure 17: Basic dimensions and description of standard “OEM” models

Note 1: Dimensions without tolerance are for reference only.





**Figure 18:** Basic dimensions and specifications of standard IPS cables  
 Note 1: Dimensions without tolerance are for reference only.



**Figure 19:** Basic concept of protective covers for enhanced chemical protection of driver connectors  
 Note 1: Dimensions without tolerance are for reference only.

# ORDER INFORMATION

System Name	Article #	Pump Head	Driver	Note
BPS-i100.1	100-90719	LPP-200.7	IPD-100.1-50-01	OEM - Epoxy coated driver, 5 m PVC cable with open wires, PFA pump head.
BPS-i100.2	100-90720	LPP-200.7	IPD-100.2-50-01	OEM - ETFE coated driver, 5 m FEP cable with open wires, PFA pump head.
BPS-i100.11 (ATEX)	100-91365	LPP-200.7	IPD-100.10-50-01 (ATEX/IECEX)	OEM - ATEX - ETFE coated driver, 5 m FEP cable with open wires, PFA pump head.
BPS-i100.8	100-91082	LPP-200.7	IPD-100.4-01	EasyConnect - Epoxy coated driver with interface connectors, PFA pump head.
BPS-i100.9	100-91083	LPP-200.7	IPD-100.5-01	EasyConnect - ETFE coated driver with interface connectors, PFA pump head.
BPS-i100.7	100-91041	LPP-200.7	IPD-100.6-01	Stand-Alone - Epoxy coated driver with integrated user panel, PFA pump head.

**Table 1: Standard system configurations**

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
1	Pump Head	LPP-200.7	100-90708	Impeller / Pump Housing / O-Ring In-/Outlet Fittings Max. Flow / Max. Diff.-Pressure Max. Viscosity / Max. Liquid Temp.	PFA / PFA / FFKM (FFKM) perfluorelastomer 1/2" Tube 20 liters/min (5.3 gallons/min) / 2 bar (29 psi) 20 cP / 90 °C (194 °F) <sup>3</sup>
2a	Integrated Pump Driver ("OEM Models")	IPD-100.1-50-01	100-10069	Voltage, Power	24 VDC ±10%, 100 W
2b		IPD-100.2-50-01	100-10071	Housing Cable Interfaces Standard Firmware	Epoxy (a) or ETFE (b) coated Aluminum, PP for bottom lid, IP65 <sup>1</sup> PVC (a) or FEP (b) jacket, open wires, cable length 5 m PLC and RS485 with Modbus protocol (see Figure 16 for details) G1.48 <sup>2</sup>
2c	Integrated Pump Driver ("EasyConnect" Models)	IPD-100.4-01	100-10108	Housing	Epoxy (c) or ETFE (d) coated Aluminum, PP for bottom lid, IP65 <sup>1</sup>
2d		IPD-100.5-01	100-10109	Interfaces Standard Firmware	2x Fieldbus RS485 with Modbus protocol, PLC and power supply G1.48
2e	Integrated Pump Driver ("Stand-Alone" Model)	IPD-100.6-01	100-10101	Housing Interfaces Standard Firmware	Epoxy coated Aluminum, PP for bottom lid, IP65 <sup>1</sup> User panel with 3 user buttons, PLC and power supply G1.48
2f	Integrated Pump Driver ("OEM" ATEX Model)	IPD-100.10-50-01	100-10154	Housing / Cable ATEX / IECEx Marking	ETFE coated Aluminum, PP for bottom lid, IP65 <sup>1</sup> / FEP jacket, open wires, 5 m CE Ex II 3G Ex ec h mc IIC T4 Gc / CE Ex II 3D Ex h to IIIC T90°C Dc

**Table 2: Specification of standard components**

Note 1: Designed and tested for IP67. Note 2: Special firmware for serial pumping as one unit (see Figure 10) available on request. Note 3: ATEX driver IPD-100.10 is certified for max. 70°C liquid temperature.

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
3	Impeller Exchange Kit	IEK-200.4	100-90733	Impeller LPI-200.5 (A) / O-Ring (B) Pump (C) / Motor Screws (D) Exchange Tool IET-1.1 (E)	PFA / FFKM (FFKM) with dimensions: 50.52 x 1.78 mm 6x M4 x 16 mm / 8x M3 x 40 mm (stainless steel PTFE coated) POM-C
4a	AC/DC Power Supply	TSP 180-124 (Traco)	100-40018	Voltage Output / Input Basic Dimensions Certification or Standards	24 VDC with 180 W / 85 – 132 and 187 – 264 VAC (autoselect) 110 x 110 x 54 mm (mountable on DIN rail 35 mm) UL/cUL, CB, Semi F47
4b	Desktop AC/DC Power Supply	GST160A24-R7B IC915	100-40020	Voltage Output / Input Basic Dimensions Safety Approvals Note	24VDC, 160W / 85 – 264 VAC, 47-63 Hz 175 x 72 x 35 mm UL60950-1, CSA C22.2, TUV EN60950-1 Connector for direct connection to power supply of driver, cable length 1.2 m.
4c	AC Mains Cables	AMC-1.1 (2m) / AMC-1.2 (2.5m) AMC-1.3 / AMC-1.4 (2.5m) AMC-1.5 (2.5m)	190-10331 / 32 190-10333 / 34 190-10335	Country Country Country	US, Canada / CB, Germ., Den., Norway, Finl., Belg., Netherland, Sweden, Austria PSE, Japan / Switzerland CE, United Kingdom
5	USB to RS485 Adaptor-TR Isolated	YN-485I-TR	100-30392	Structure/Design Purpose	USB connector (A) with termination resistor and cable (2m) with connector pair (B and C) for external RS485 wire connection. Magnetically isolated. Cable length is 2m. Included is a USB space saver cable (D). Communication over fieldbus of driver with PC
6	IPS Cable Power 2 Wires	ICP-2.1-50 (5 m)	190-10370	Cable Material / Wires Connection In / Connection Out Main Purpose	PVC jacket / 2x 1.5 mm <sup>2</sup> Open wires / Circular Intercontec type to driver Connection of power supply to "Stand-Alone" and "EasyConnect" drivers
7a	IPS Cable Signal 6 Wires	ICS-1.1-02 (0.2 m) ICS-1.1-10 (1 m) ICS-1.1-30 (3 m)	190-10381 190-10344 190-10345	Cable Material / Wires Connection In / Connection Out Main Purpose	PVC jacket / 6x 0.08 mm <sup>2</sup> and shielding Circular Hirose type / Circular Hirose type Fieldbus connection between "EasyConnect" drivers (e.g. multi-pump arrays)
7b	IPS Cable Signal 6 Wires	ICS-1.2-50 (5 m)	190-10346	Cable Material / Wires Connection In / Connection Out Main Purpose	PVC jacket / 6x 0.08 mm <sup>2</sup> and shielding Connector with screw type plug for open wire connection / Circular Hirose type Fieldbus connection to "EasyConnect" drivers and to PLC of "Stand-Alone" drivers.
8	IPS Cable Signal 12 Wires	ICS-2.1-50 (5 m)	190-10347	Cable Material / Wires Connection In / Connection Out Main Purpose	PVC jacket / 12x 0.14 mm <sup>2</sup> and shielding Connector with screw type plug for open wire connection / Circular Hirose type General connection to PLC of "EasyConnect" drivers.
9a 9b 9c 9d	Chemical Protection Connector Cover	CPC-1.1 CPC-1.2 CPC-1.3 CPC-1.5	190-10349 190-10350 190-10351 190-10352	Materials, IP-Rating Main Purpose of CPC-1.1 Main Purpose of CPC-1.2 Main Purpose of CPC-1.3 Main Purpose of CPC-1.5	PP+GF30 and FPM/FKM for sealing gaskets, IP65 <sup>1</sup> Chemical protection of driver connectors of ICS-1.x cables. Chemical protection of driver connectors of ICS-2.x cables. Chemical protection of driver connector for supply with ICP-2.1 cable. Chemical protection of fieldbus termination connector FTC-1.1
10	Fieldbus Termination Connector	FTC-1.1	190-10348	Materials Main Purpose	PPS for connector housing and FPM for sealing. Termination of fieldbus.
11	ATEX Cable Sealing System	ACS-A.1 (Roxtec)	100-90292	Sleeve (A) and Gasket (B) Frame (C) 2x Cable Module (D)	Stainless Steel and EPDM Roxylon (EPDM rubber) Roxylon (EPDM rubber) Note: Lubricant (E) and measurement plates (F) are included.
12	User Panel	LUI-B.1-01	100-30448	Interface / Housing Rating Standard Firmware	RS485 / IP65 A3.00
13	Water Cooling Module	WCM-i100.1	190-10474	Materials Motor Mounting Screws Cooling Flow Pressure Drop / Max. Pressure Purpose	PTFE coated stainless steel for cooling plate (A) and mounting screws (B). 2x M4x16mm, stainless steel PTFE coated Min. 0.5 l/min at ≤ 20 °C. In- and outlet are NPT 1/8" x 6.7mm. 20 mbar for 1 l/min cooling flow (for water at 20 °C) / 4 bar Driver cooling for higher liquid temperatures (see user manual).

**Table 3: Specification of accessories**

Note 1: Designed and tested for IP67.



Figure 20: Pump systems with standard components



Figure 21: Standard 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 Semiconductor, Medical and Life Science 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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