

## PuraLev® Life Science Integrated Pump Series



### PuraLev® i100SU (Single-Use)

2 bar	(29 psi)
17 liters/min	(4.5 gallons/min)

Low Shear Design - High Cell Viability

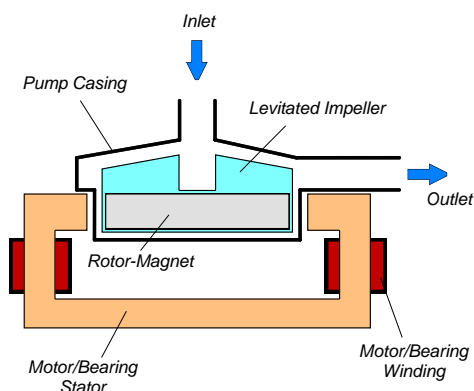


Figure 1: Schematic of the main elements of the MagLev centrifugal pump

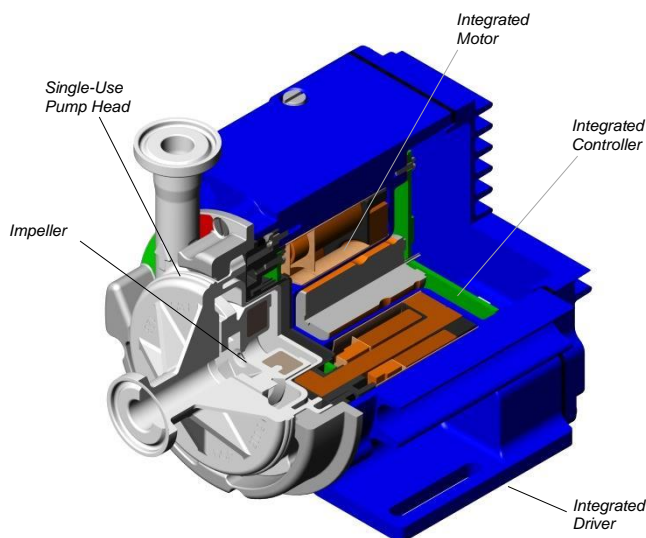


Figure 2: Integrated MagLev pump driver with single-use pump head

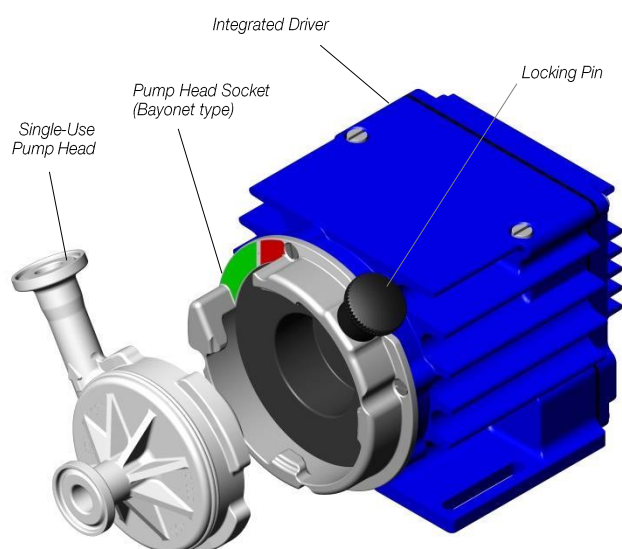


Figure 3: Single-use pump head concept

## INTRODUCTION

Levitronix® has developed a revolutionary 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 biocompatible (FDA, USP-VI, BSE/TSE and Animal free) gamma sterilizable polypropylene (PP) and together they make up the disposable pump head. A simple and intuitive exchange of the single use pump head is achieved with a bayonet socket type mounting procedure (see Figure 6). Flow rate or pressure is precisely controlled by electronically regulating the rotor speed, which eliminates any pulsation. With the lack of mechanical bearings plus the self-contained pump head design, the risk of contamination is drastically reduced. The absence of narrow gaps between the impeller and pump casing, plus the low-shear pump design allows the gentle pumping of sensitive liquids. The pump housing is fabricated with Triclamp fittings and can be easily inserted and removed with an intuitive bayonet socket. The controller and the motor are integrated into the driver housing (see Figure 2), hence cabling effort is reduced.

## SYSTEM BENEFITS

- Low shear-forces.
- Reduced risk of contamination due to the self-contained design with magnetic bearings.
- No particle generation.
- No over-pressure situations (compared to roller pumps).
- No narrow gaps between the impeller and pump casing where bacteria could be entrapped.
- Pump head can be gamma sterilized.
- Biocompatibility of wet materials: FDA, USP-VI, Animal/BSE/TSE free
- Bayonet socket design for easy and intuitive exchange of disposable pump head (see Figure 6).
- Small size.
- Dry running capability.
- Proven technology in the medical (disposable blood pumps) and semiconductor (high-purity pumps) industries.
- High flow capability with compact design.
- Pulsation free.

## APPLICATIONS

- Pumping of shear-sensitive liquids and cells.
- Bioprocessing (for example perfusion).
- Recirculation and transfer applications in bioreactors.
- Filtration.

## SYSTEM CONFIGURATION – “STAND-ALONE”

Figure 7 and Figure 11 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 8 and Figure 13) with according cable accessories are designed to realize various interface configurations with minimal setup effort.

Two Fieldbus connectors (IN and OUT) allow to setup arrays of multiple pumps. Therefore serial pumping configurations as shown in Figure 9 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 (see notes below).

## SYSTEM CONFIGURATION – “OEM”

The “OEM” models are designed for a compact integration with one integrated driver cable containing all available interface signals (see Figure 10 and Figure 15). 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 10.

Precise ultrapure flow control systems can be realized with the 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 a wide range of applications.

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.

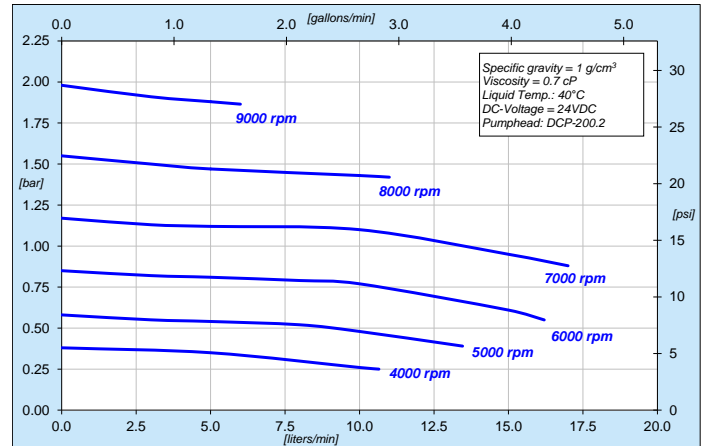


Figure 4: Pressure/flow curves for aqueous liquids (similar to water)

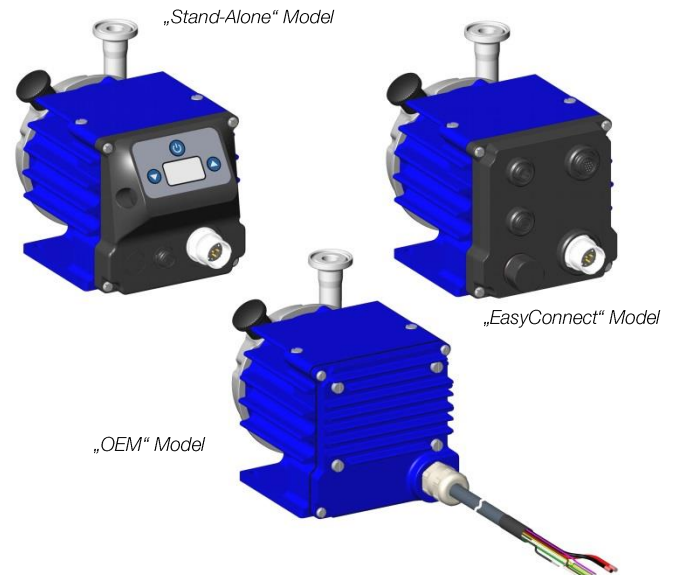


Figure 5: Pump system models

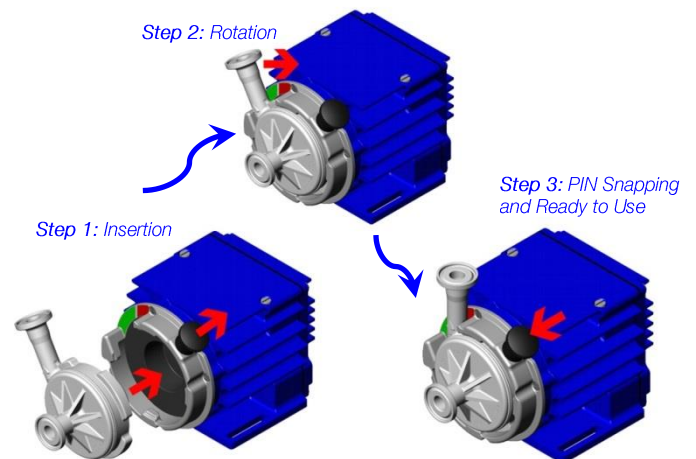


Figure 6: Intuitive 3-step pump head mounting procedure with bayonet type socket (PHS-i100.1)

## SYSTEM CONFIGURATIONS

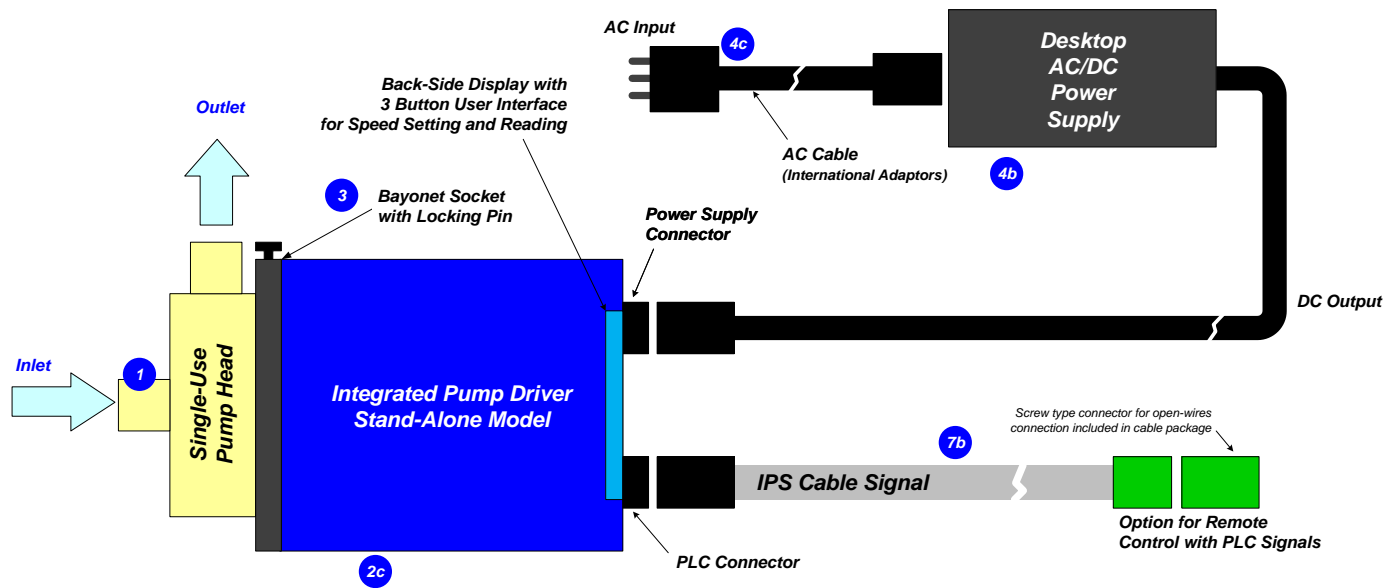


Figure 7: Standard "Stand-Alone" system configuration with main accessories  
(See section "Order Information" for details to numbered components and other options)

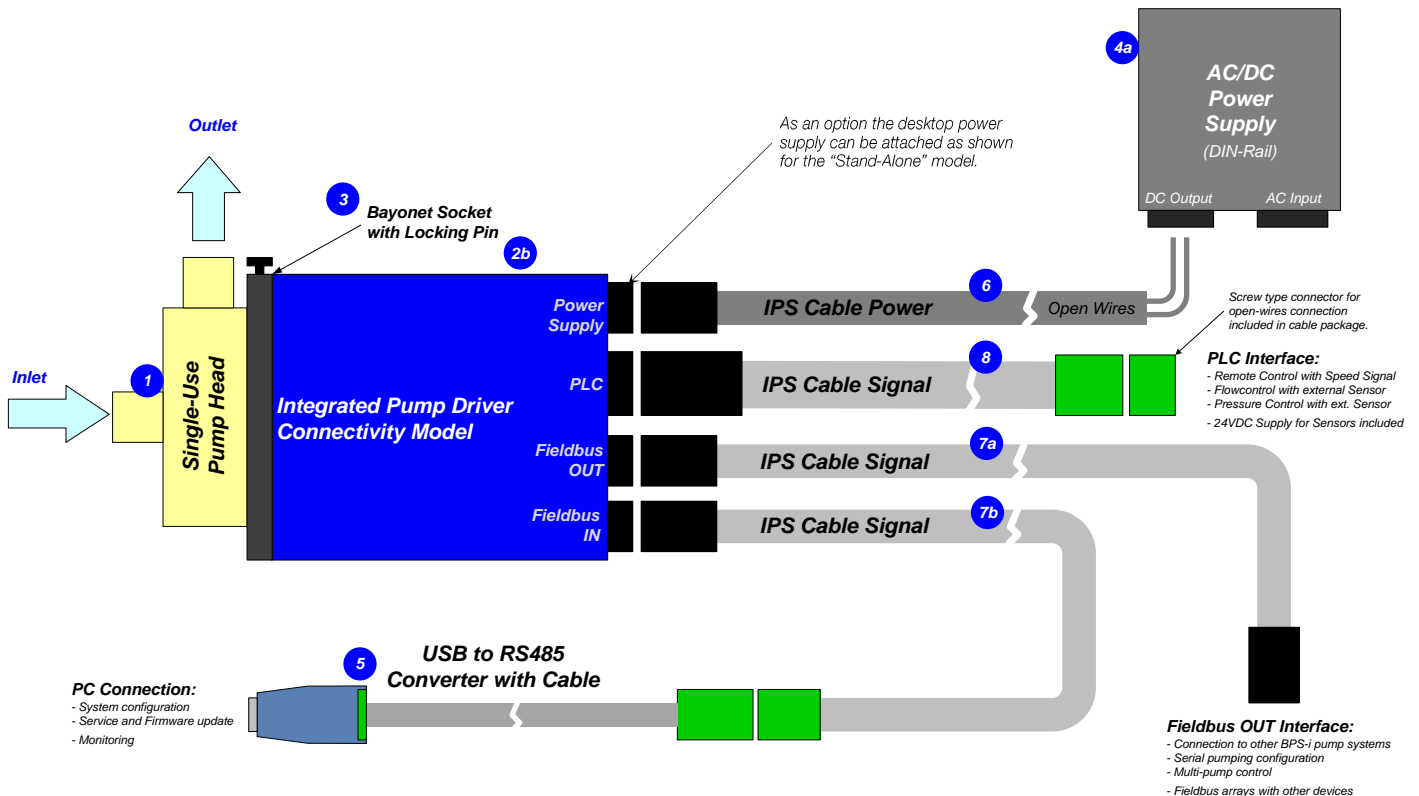


Figure 8: Standard "EasyConnect" system configuration with main accessories  
(See section "Order Information" for details to numbered components and other options)



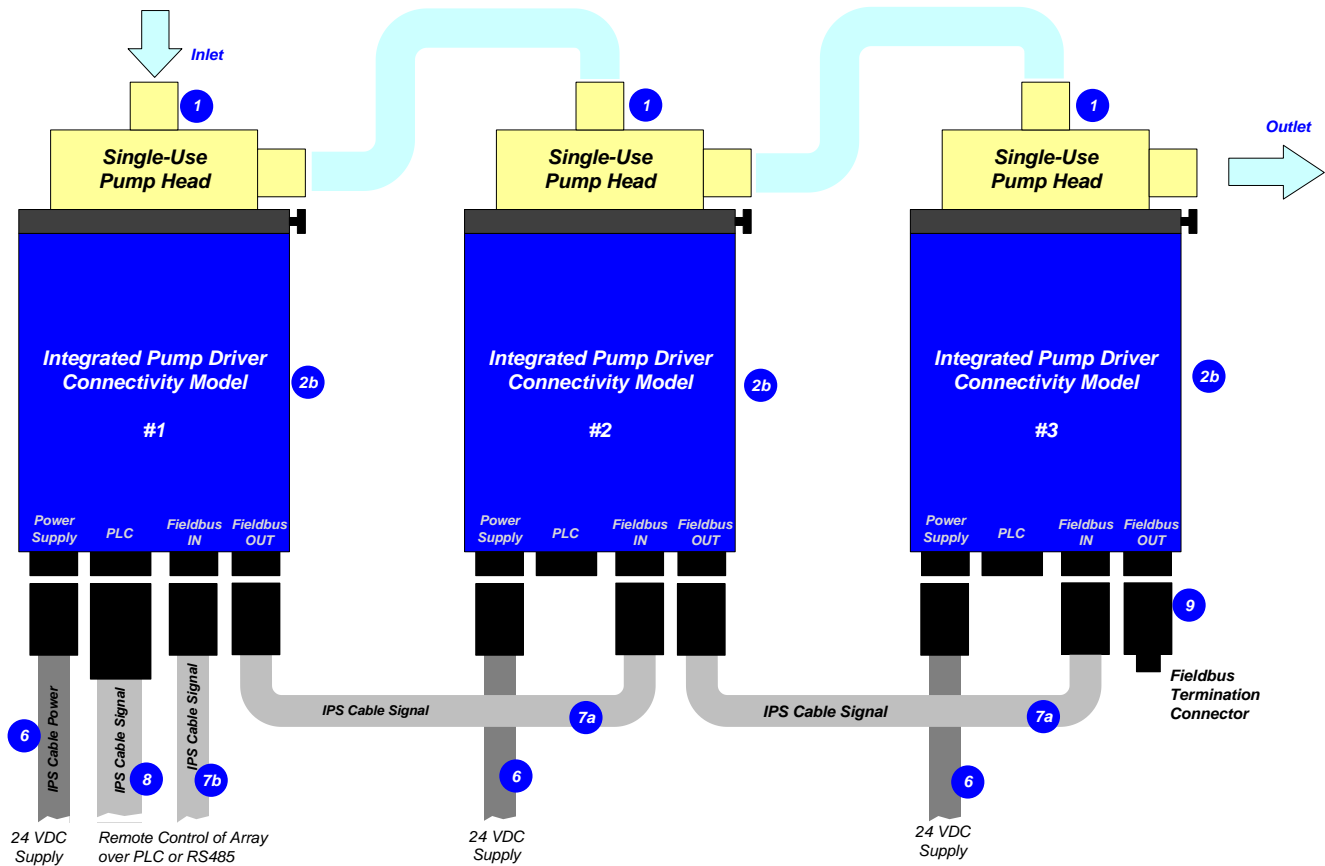


Figure 9: Serial pumping configuration with "EasyConnect" models  
(See section "Order Information" for details to numbered components and other options)

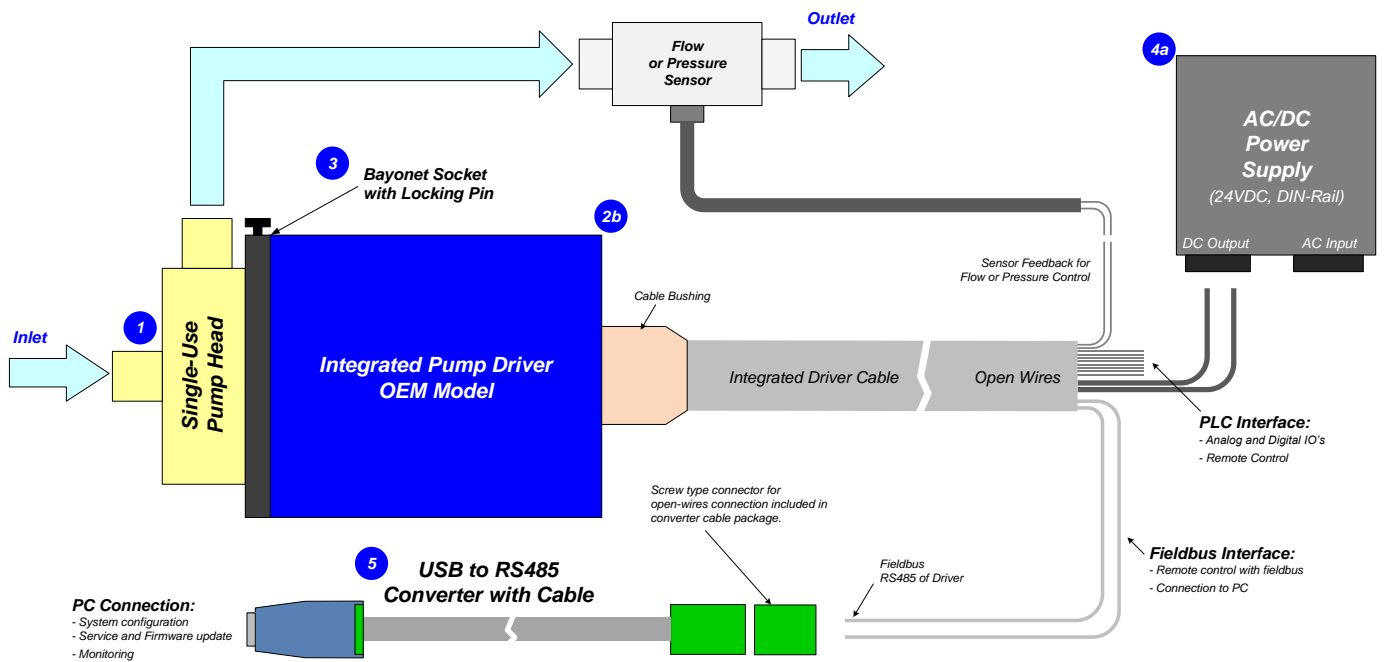
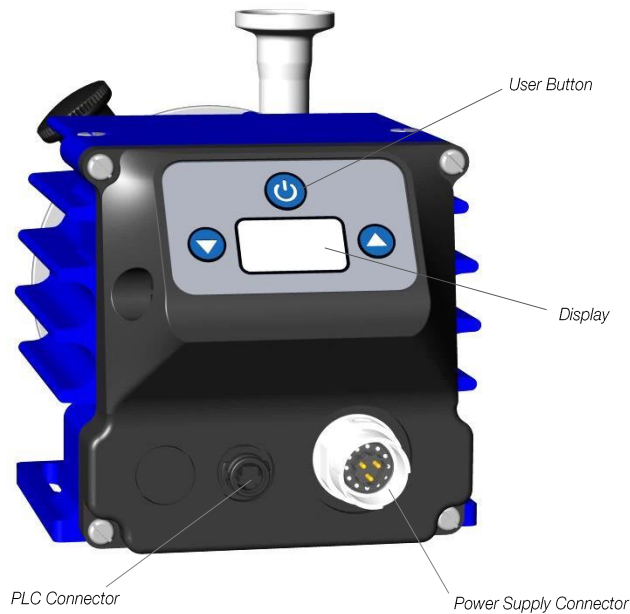


Figure 10: Standard "OEM" system configuration  
(See section "Order Information" for details to numbered components and other options)

MODEL DESCRIPTION – STAND-ALONE



Interface	PIN Name	Description	Standard Designation	Hardware Specification
Power Supply	P+	+ 24 VDC	Supply	Voltage: 24 VDC Power: 110 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 11: Interface specifications of standard “Stand-Alone” model

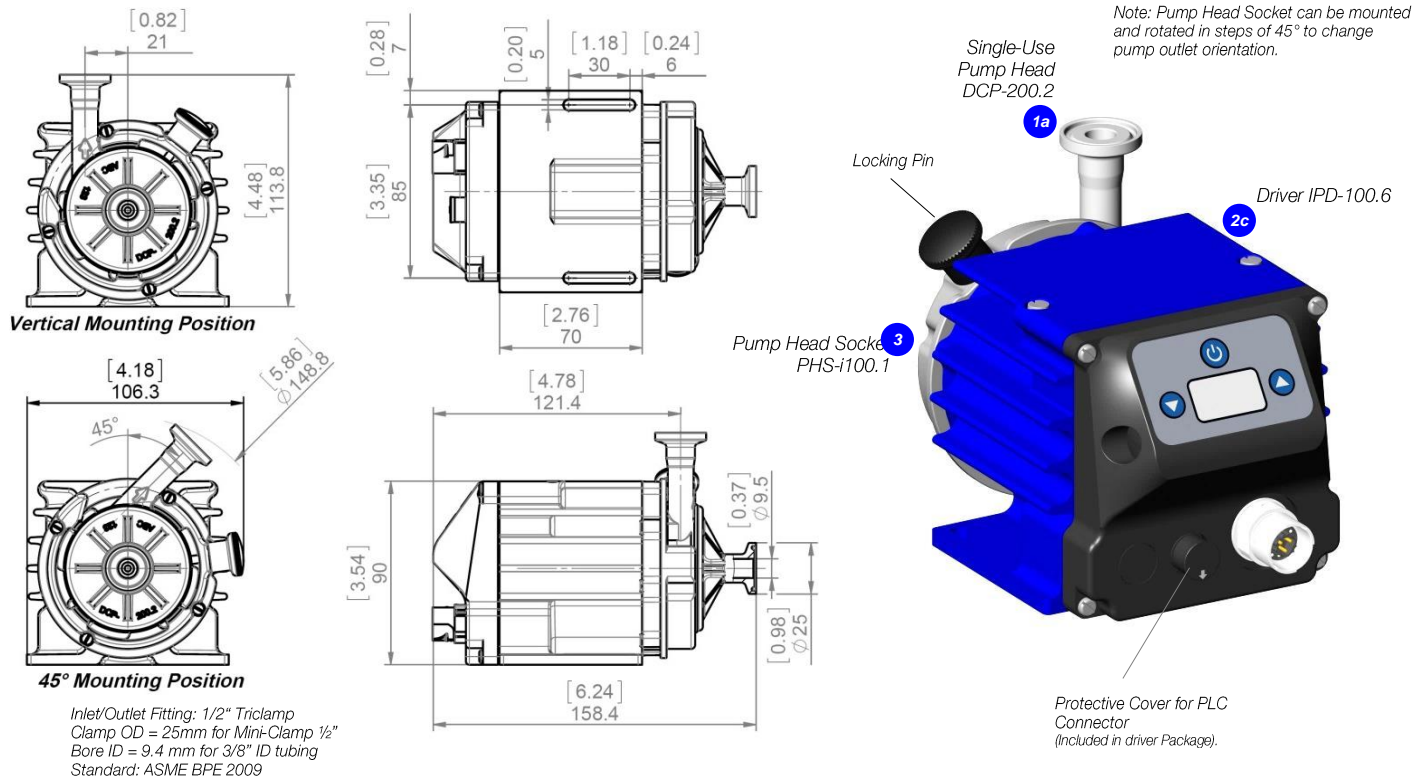
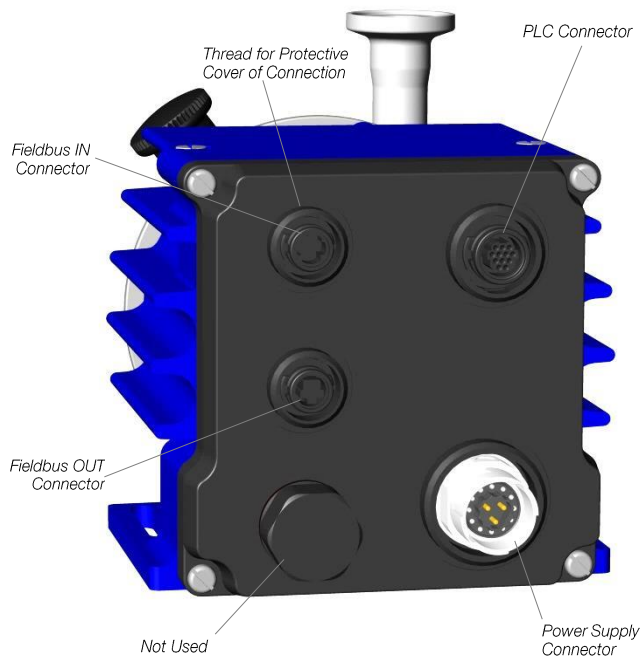


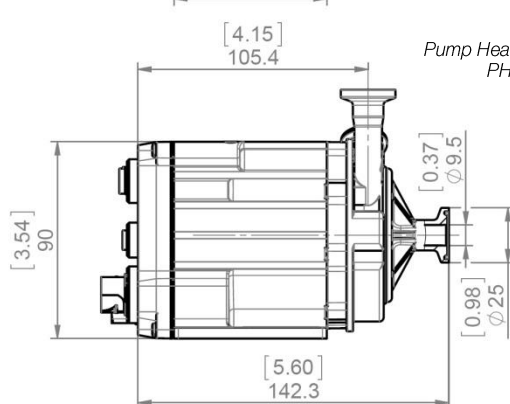
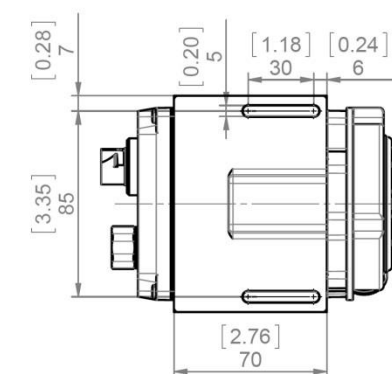
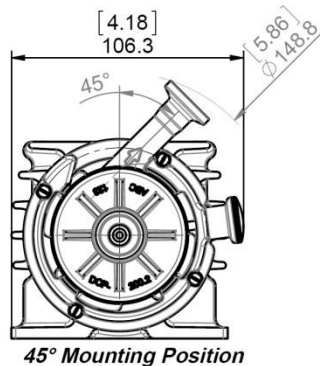
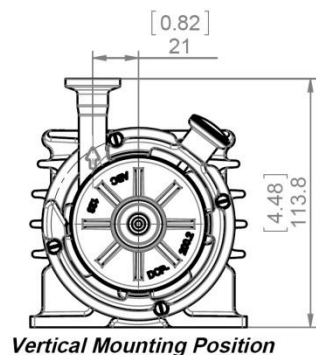
Figure 12: Basic dimensions and description of standard “Stand-Alone” model (Driver IPD-100.6 with pump head socket PHS-i100.1 and single-use pump head DCP-200.2)

## MODEL DESCRIPTION – EASYCONNECT



Connector	PIN Name	Description	Standard Designation	Hardware Specification
Power Supply	P+	+ 24 VDC	Supply	Voltage: 24 VDC
	P-	Ground / Earth		Power: 110 W
	NC	Not connected.	--	--
PLC 12	Dout1	Digital Output 1	Status	Open drain, max. 24V, 100mA
	Dout2	Digital Output 2	Error	Reference ground is AGND
	Din1	Digital Input 1	Enable (Reset)	Galvanic separation with optocoupler
	Din2	Digital Input 2	Process Mode	2.2 k $\Omega$ input resistance, 5-24V for active input
	Din_COM	Com. Digi. Input	--	Reference for digital input.
	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 In. GND	--	Reference for Ain1 and Ain2
	Aout1	Analog Output (Voltage Output)	Actual Speed	0 – 10V (no galvanic isolation)
	GND	Analog Ground	--	GND is reference
Fieldbus OUT	Supply	Output 24 VDC	Supply Output	For supply of external devices (e.g. sensors)
	NC	Not connected.	--	--
	GND	Ground	--	Reference for Pout.
	Pout	Output 24 VDC	Supply Output	For supply of external devices (user panels)
	RS485+	RS485 +	Field Bus	Modbus protocol
Fieldbus IN	RS485-	RS485 -	Field Bus	Modbus protocol
	Internal	Internal Bus	Do not connect	Internal bus needed to connect pumps for serial pumping.
	Internal	Internal Bus	Do not connect	
	GND	Ground	--	--
	NC	Not connected.	--	--

Figure 13: Interface specifications of standard "EasyConnect" model



Inlet/Outlet Fitting: 1/2" Triclamp  
Clamp OD = 25mm for Mini-Clamp 1/2"  
Bore ID = 9.4 mm for 3/8" ID tubing  
Standard: ASME BPE 2009

Note: Pump Head Socket can be mounted and rotated in steps of 45° to change pump outlet orientation.

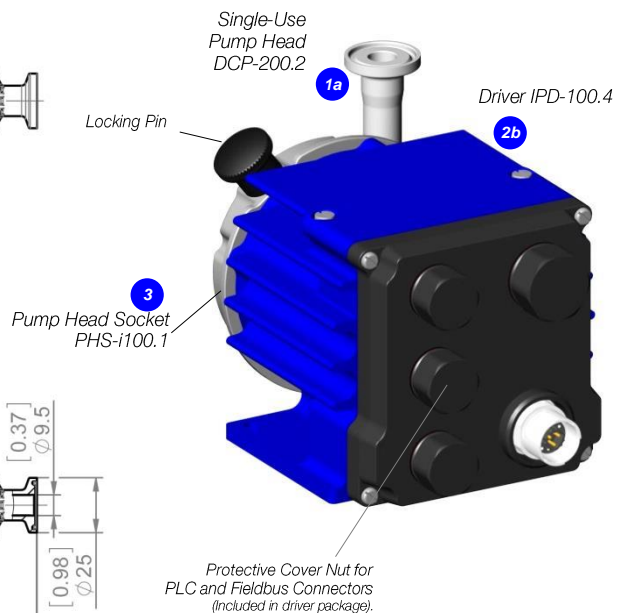
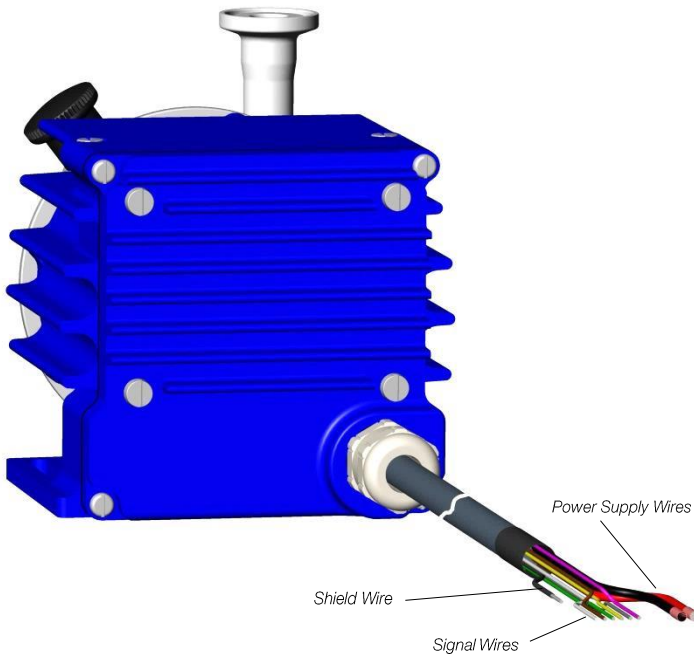


Figure 14: Basic dimensions and description of standard "EasyConnect" model

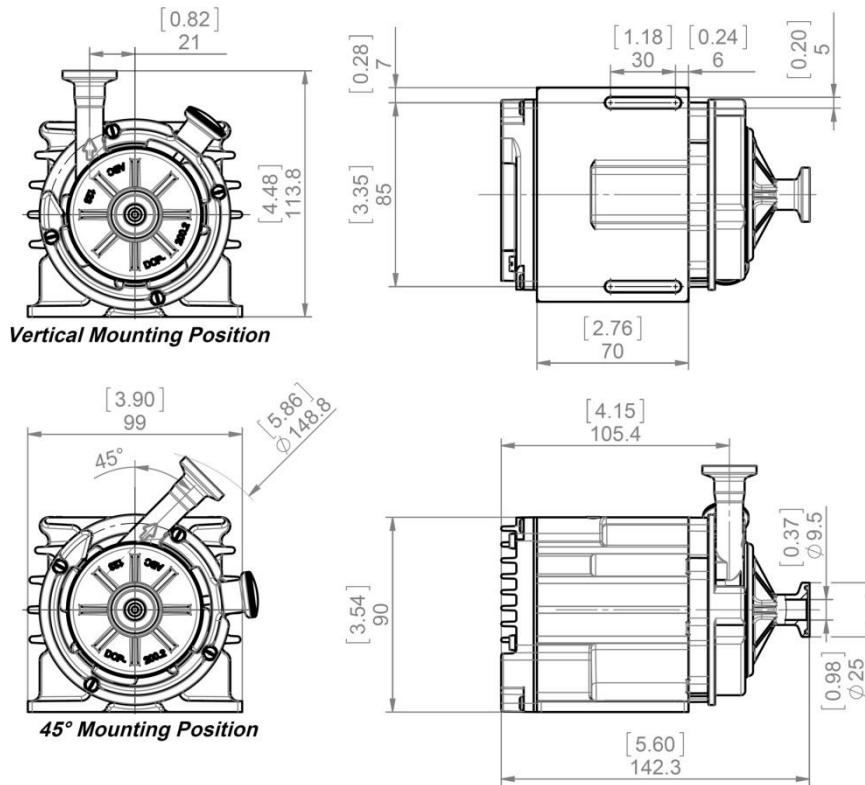


Wire Name	Description	Standard Designation	Hardware Specification
P+	+ 24 VDC	Supply	Voltage: 24 VDC P- to be connected to earth
P-	Power Input Ground / Earth		
Ain1	Analog Input 1 (Current Input)	Actual Process Value	Analog current input: 4 – 20 mA (450 Ohm shunt input, no galvanic isolation)
Ain2	Analog 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 GND
GND	Analog Ground	--	Reference for Aout1, Dout1 and Dout2
RS485+	RS485 +	Field Bus	Modbus protocol
RS485-	RS485 -		
Internal	Internal Bus	Do not connect	--
Internal	Internal Bus	Do not connect	--
Shield	Shielding	Shielding	To be connected to earth (see wire No. 2, P-)

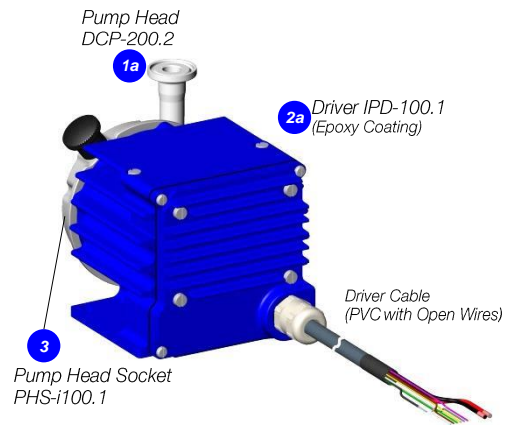
**Figure 15: Interface specifications of standard "OEM" model**

Note 1: Power supply wire cross-section is 1.5 mm<sup>2</sup> and for signal wires 0.14 mm<sup>2</sup>

Note 2: For more detailed description of interfaces consult user manual



Inlet/Outlet Fitting: 1/2" Triclamp  
Clamp OD = 25mm for Mini-Clamp 1/2"  
Bore ID = 9.4 mm for 3/8" ID tubing  
Standard: ASME BPE 2009

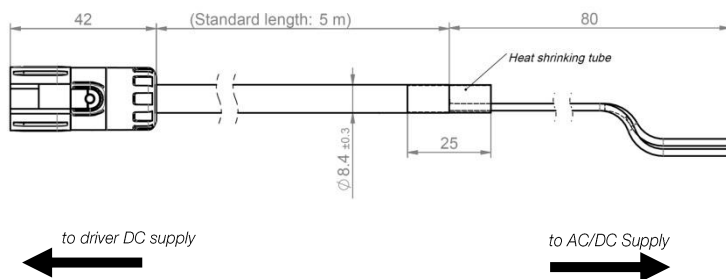


Note: Pump head socket can be mounted and rotated in steps of 45° to change pump outlet orientation.

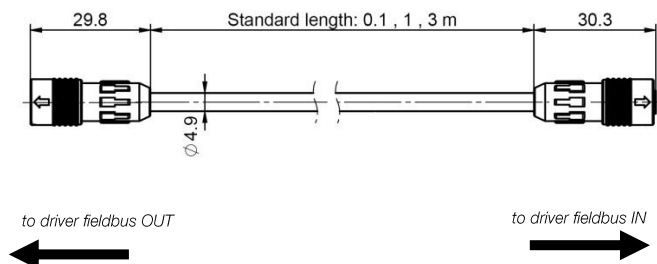
**Figure 16: Basic dimensions and description of standard "OEM" model**



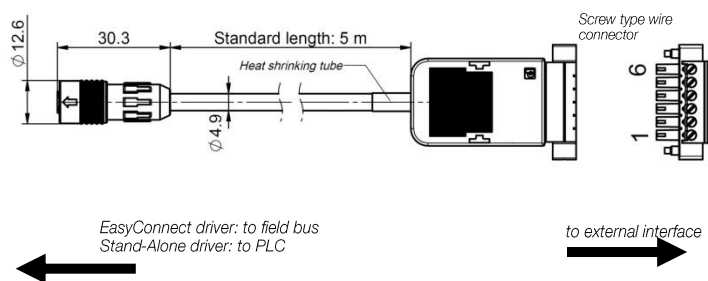
## 6 IPS Cable Power ICP-2.1 (for EasyConnect and Stand-Alone drivers)



## 7a IPS Cable Signal ICS-1.1 (for EasyConnect drivers)



## 7b IPS Cable Signal ICS-1.2 (for EasyConnect and Stand-Alone drivers)



## 8 IPS Cable Signal ICS-2.1 (for EasyConnect drivers)

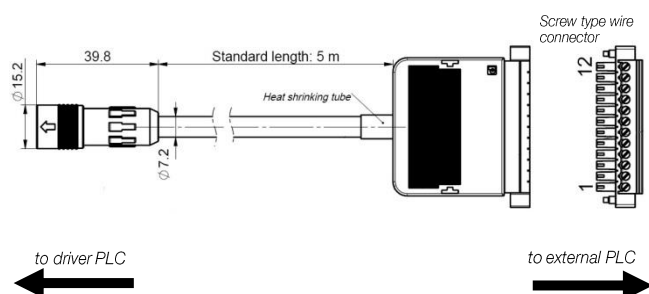


Figure 17: Basic dimensions and specifications of standard cables

# ORDER INFORMATION

System Name	Article #	Pump Head Socket	Driver	Note
PLD-100SU.1	100-91054	PHS-i100.1	IPD-100.1-50-02	OEM - Driver, 5 m PVC cable with open wires, pump head socket.
PLD-100SU.2	<b>100-91095</b>	PHS-i100.1	IPD-100.4-02	EasyConnect - Driver with interface connectors, pump head socket.
PLD-100SU.3	100-91055	PHS-i100.1	IPD-100.6-02	Stand-Alone - Driver with integrated user panel, pump head socket.

**Table 1: Standard driver system configurations**

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
1a 1b 1c 1d	Single-Use Pump Heads	DCP-200.2 (Triclamp)	100-90734	Impeller / Pump Housing	Polypropylene (FDA, USP Class VI, BSE/TSE/Animal free)
		DCP-200.3 (Barb)	100-90792	Housing Sealing	Infrared welding
				In-/Outlet Fittings	Triclamp ½" or Barb ½" for tubing with typical ID 3/8"
				Max. Flow	21 liters/min / 5.5 gallons/min
				Max. Diff.-Pressure	2 bar / 29 psi
				Max. Viscosity	< 20 cP
		DCP-200.2-G25	100-91078	Wet Pump Volume/Surface	24 ml / 150 cm² with Triclamp and 25 ml / 150 cm² with Barb fittings
		DCP-200.3-G25	100-91122	Max. Liquid Temp.	60°C / 140°F
		(Gamma Irradiated with Dosage ≥ 25 kGy)		Applicable Sterilization	Gamma radiation up to 40kGy
2a	Integrated Pump Driver ("OEM Model")	IPD-100.1-50-02	100-10070	Voltage, Power	24 VDC ±10%, 110 W
				Housing Cable	Epoxy coated Aluminum, PP for bottom lid, IP65 <sup>1</sup>
				Interfaces	PVC jacket, open wires, cable length 5 m
				Standard Firmware	PLC and RS485 with Modbus protocol (see Figure 15 for details)
2b	Integrated Pump Driver ("EasyConnect" Model)	IPD-100.4-02	<b>100-10111</b>	Housing	Epoxy coated Aluminum, PP for bottom lid, IP65
				Interfaces	2x Fieldbus RS485 with Modbus protocol, PLC and power supply
				Standard Firmware	G3.48 <sup>2</sup>
2c	Integrated Pump Driver ("Stand-Alone" Model)	IPD-100.6-02	100-10106	Housing	Epoxy coated Aluminum, PP for bottom lid, IP65
				Interfaces	User panel with 3 user buttons, PLC and power supply
				Standard Firmware	G3.25
3	Pump Head Socket	PHS-i100.1	100-91053	Mounting Type	Bayonet type with locking pin
				Material	Anodized Aluminum
				Assembly Screws	4 pcs M3 x 8 mm (Stainless Steel, INOX A4)

**Table 2: Specification of standard components**

1: Designed and tested for IP67. 2: Special firmware for serial pumping as one unit available on request.

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
4a	AC/DC Power Supply	TSP 180-124 (Traco)	100-40018	Voltage Output / Input	24 VDC with 120 W / 85 – 132 and 187 – 264 VAC (autoselect)
				Basic Dimensions	110 x 110 x 54 mm (mountable on DIN rail 35 mm)
				Certification or Standards	UL/cUL, CB, Semi F47
4b	Desktop AC/DC Power Supply	GST160A24-R7B IC915	100-40020	Voltage Output / Input	24VDC, 160W / 85 – 264 VAC, 47-63 Hz
				Basic Dimensions	175 x 72 x 35 mm
				Safety Approvals	UL60950-1, CSA C22.2, TUV EN60950-1
				Note	Connector for direct connection to power supply of driver with cable length 1.2 m.
4c	AC Mains Cables (for Desktop power supply 5b)	AMC-1.1 (2m)	190-10331	Approvals and Country	UL, cUL, US, Canada
		AMC-1.2 (2.5m)	190-10332	Approvals and Country	CB, Germany, Denmark, Norway, Finland, Belgium, Netherl., Sweden, Austria
		AMC-1.3 (2.5m)	190-10333	Approvals and Country	PSE, Japan
		AMC-1.4 (2.5m)	190-10334	Approvals and Country	Switzerland
		AMC-1.5 (2.5m)	190-10335	Approvals and Country	CE, United Kingdom
				Cable Specifications	Black color, ROHS
5	USB to RS485 Adaptor-TR Isolated	YN-485I-TR	100-30392	Structure/Design	USB connector (5a) with termination resistor and cable with connector pair (5b and 5c) for external RS485 wire connection. Magnetically isolated. Cable length is 2m.
				Purpose	Communication over fieldbus of driver with PC

**Table 3: Specification of general accessories**

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
6	IPS Cable Power 2 Wires	ICP-2.1-50 (5 m)	190-10370	Cable Material / Wires	PVC jacket / 2x 1.5 mm <sup>2</sup>
				Connection In / Connection Out	Open wires / Circular Intercontec type to driver
				Main Purpose	Connection of power supply to "Stand-Alone" and "EasyConnect" drivers
7a	IPS Cable Signal 6 Wires	ICS-1.1-02 (0.2 m)	190-10381	Cable Material / Wires	PVC jacket / 6x 0.08 mm <sup>2</sup> and shielding
		ICS-1.1-10 (1 m)	190-10344	Connection In / Connection Out	Circular Hirose type / Circular Hirose type
		ICS-1.1-30 (3 m)	190-10345	Main Purpose	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	PVC jacket / 6x 0.08 mm <sup>2</sup> and shielding
				Connection In / Connection Out	Connector with screw type plug for open wire connection / Circular Hirose type
				Main Purpose	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	PVC jacket / 12x 0.14 mm <sup>2</sup> and shielding
				Connection In / Connection Out	Connector with screw type plug for open wire connection / Circular Hirose type
				Main Purpose	General connection to PLC of "EasyConnect" drivers.
9	Fieldbus Termination Connector	FTC-1.1	190-10348	Materials	PPS for connector housing and FPM for sealing.
				Main Purpose	Termination of fieldbus.

**Table 4: Specification of driver cables and other accessories**

1: Designed and tested for IP67.



Figure 18: Pump systems with standard components



Figure 19: General standard accessories



Figure 20: Standard cables

*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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