

PuraLev® Life Science Integrated Pump Series



PuraLev® i30SU (Single-Use)

1.0 bar	(14.5 psi)
7.7 liters/min	(2.0 gallons/min)

Low Shear Design - High Cell Viability

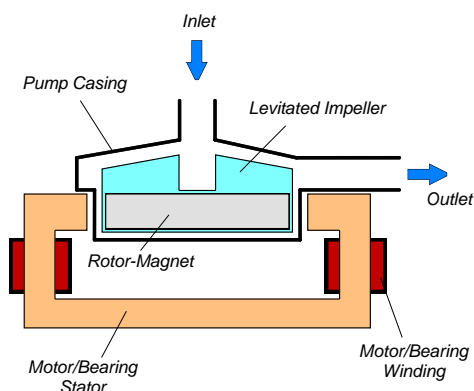


Figure 1: Schematic of the main elements of the MagLev centrifugal pump

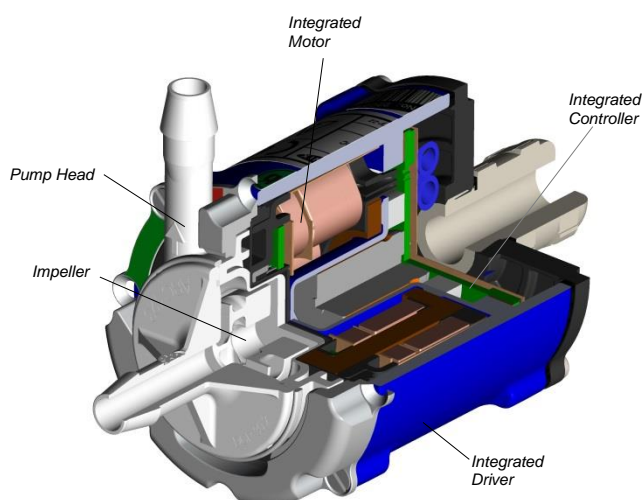


Figure 2: Integrated MagLev pump driver with pump head

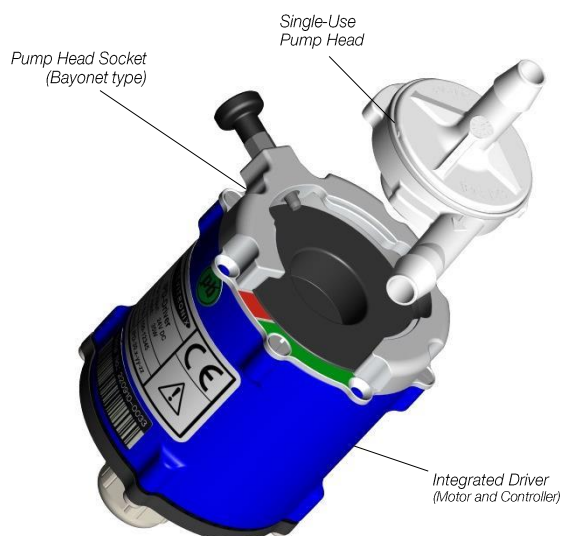


Figure 3: Single-use pump head concept

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 head 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 is gamma sterilizable.
- 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 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.

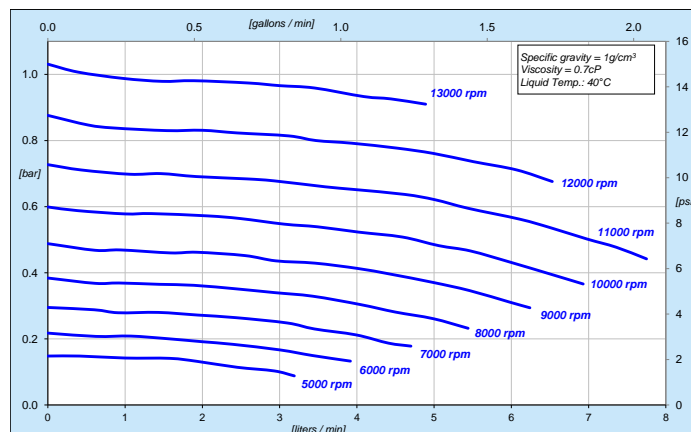


Figure 4: Pressure/flow curves for aqueous liquids (similar to water)

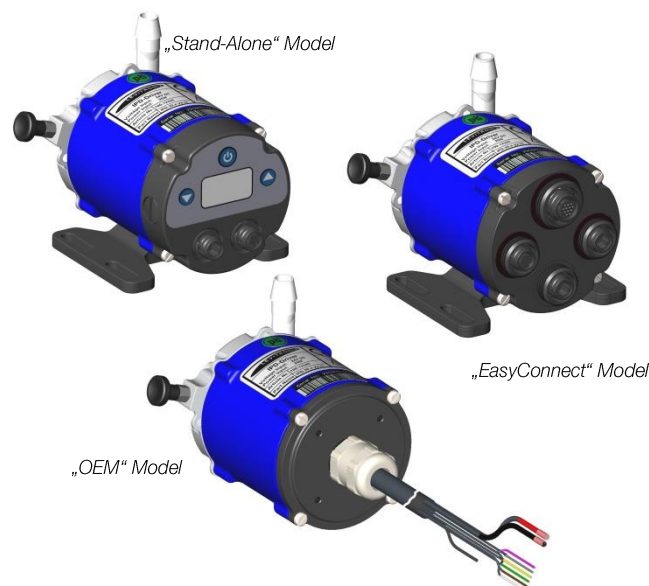


Figure 5: Pump system models

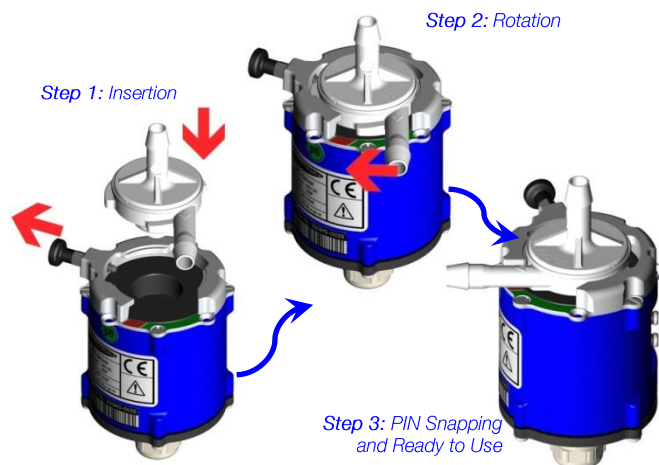


Figure 6: Intuitive 3-step pump head mounting procedure with bayonet type socket (PHS-i30.1)

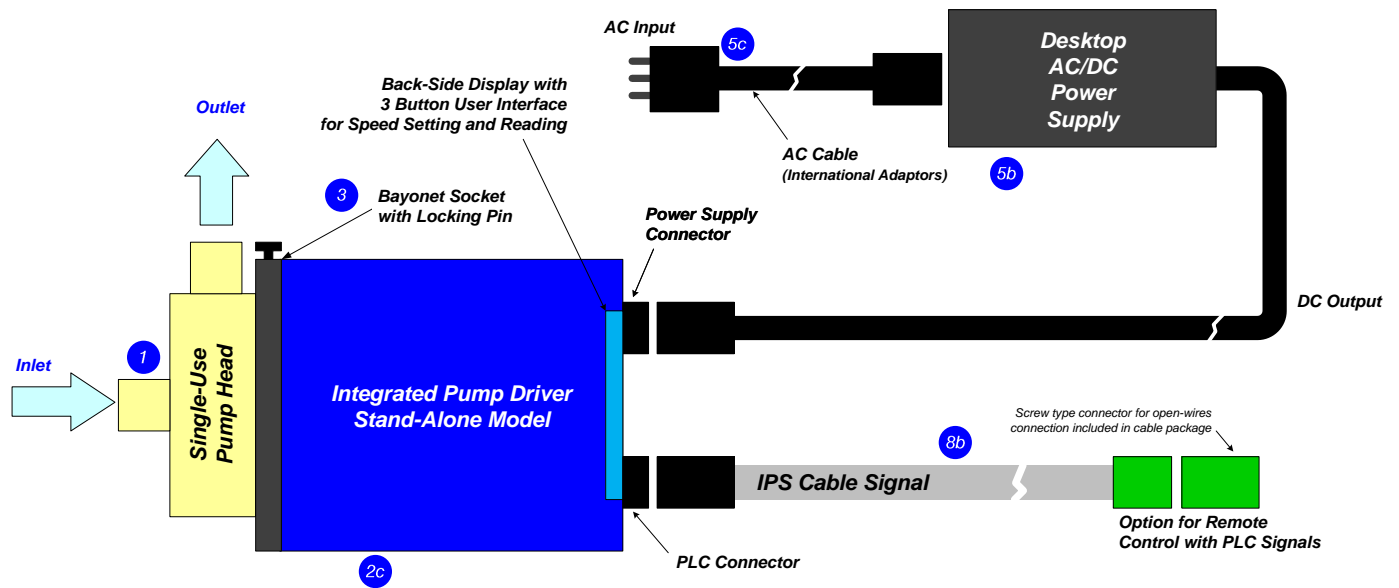


Figure 7: Standard "Stand-Alone" system configuration with main accessories
(See section "Order Information" for details to numbered components and other options)

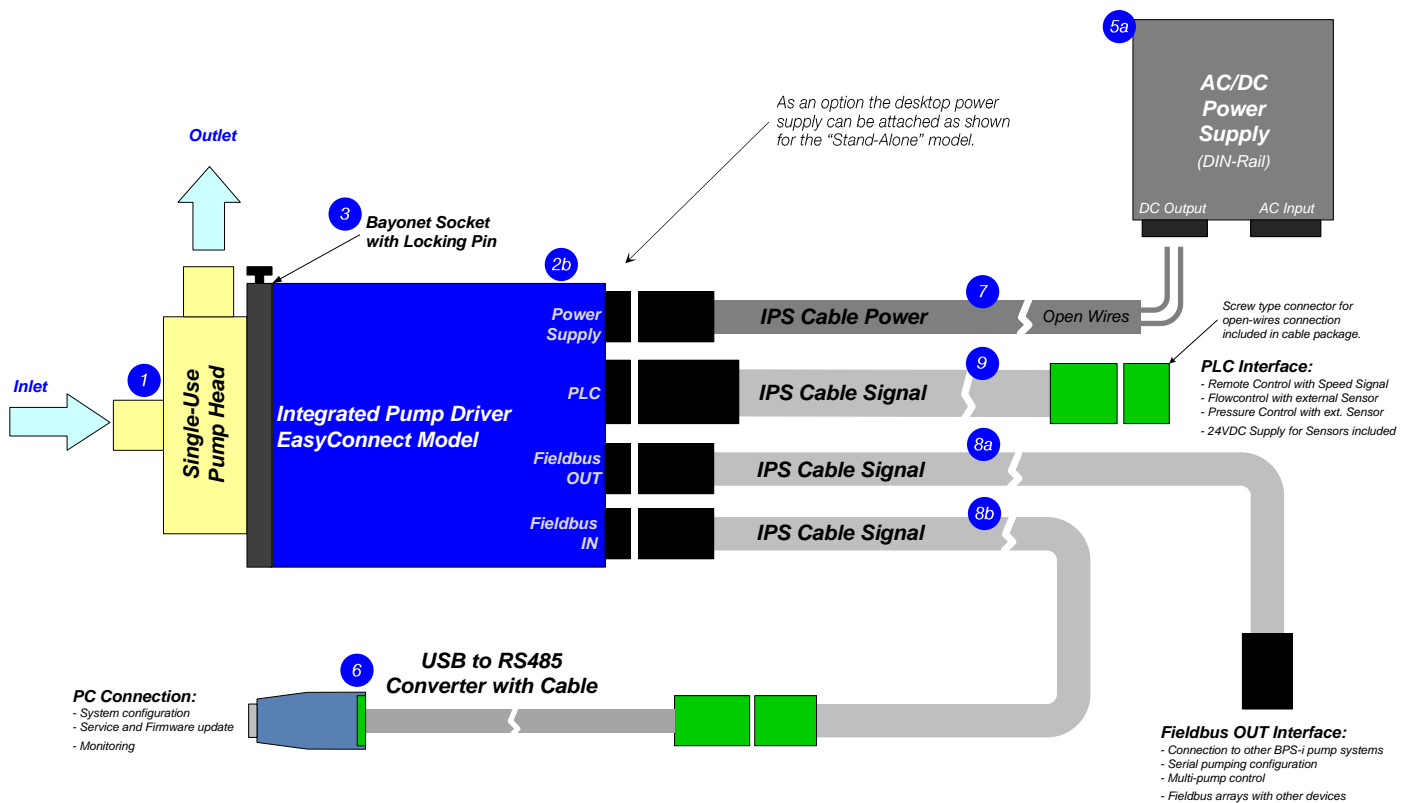


Figure 8: Standard "EasyConnect" system configuration with main accessories
(See section "Order Information" for details to numbered components and other options)

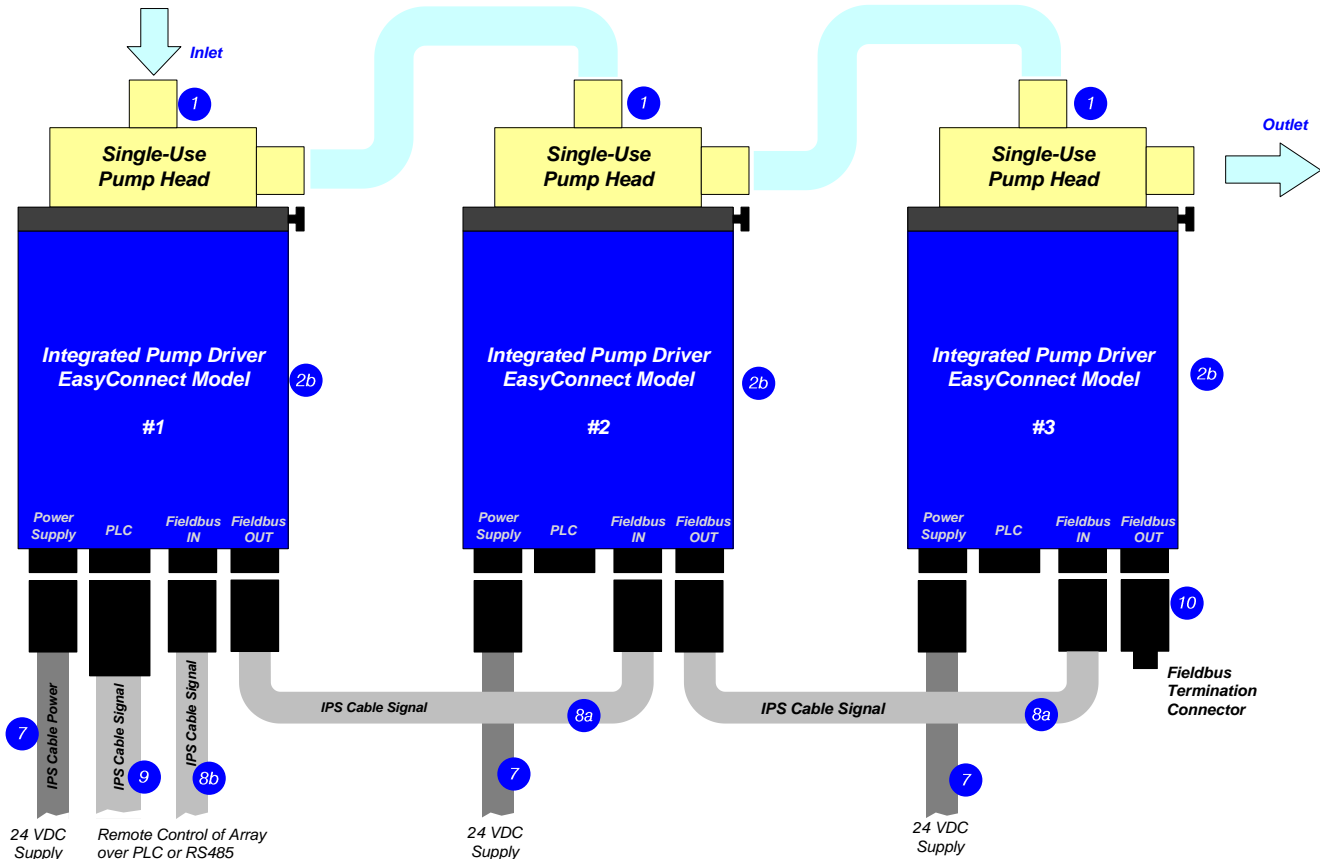


Figure 9: Serial pumping configuration with “EasyConnect” models
(See section “Order Information” for details to numbered components and other options)

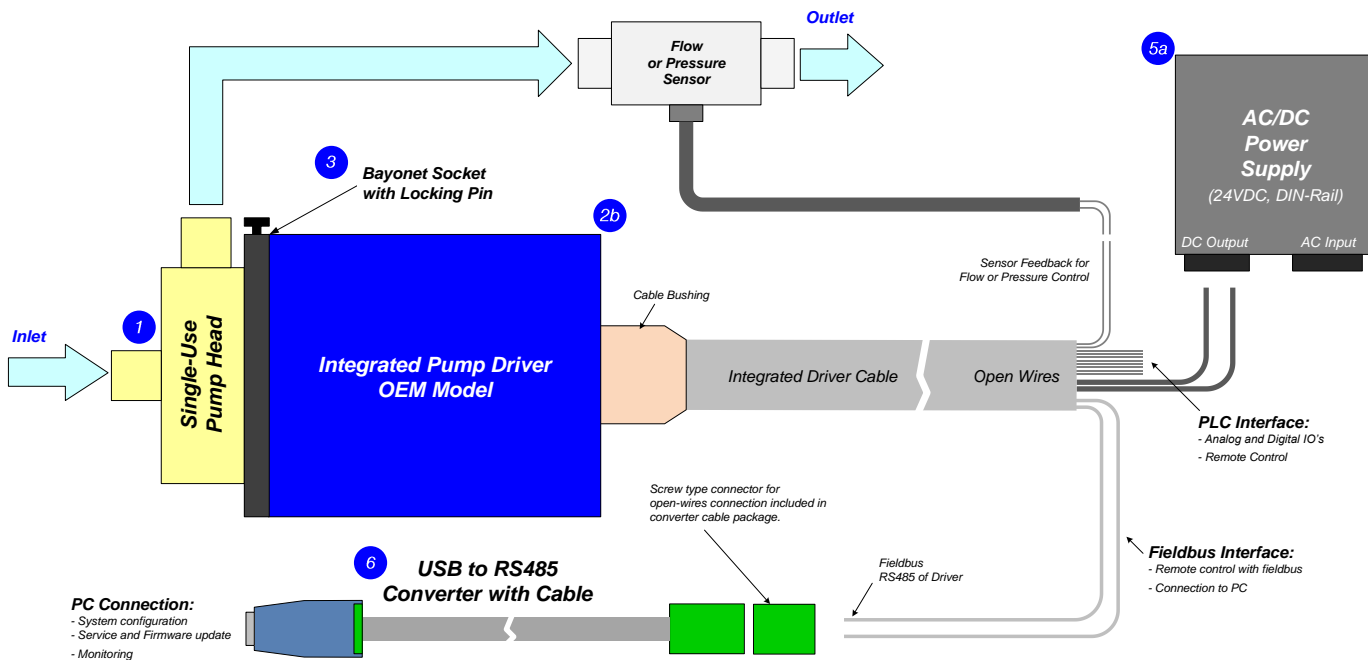


Figure 10: Standard “OEM” system configuration
(See section “Order Information” for details to numbered components and other options)

MODEL DESCRIPTION – STAND-ALONE



Interface	PIN Name	Description	Standard Designation	Hardware Specification
Power Supply	P+	+ 24 VDC	Supply	Voltage: 24 VDC
	P-	Power Input Ground / Earth		Power: 35 W
	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

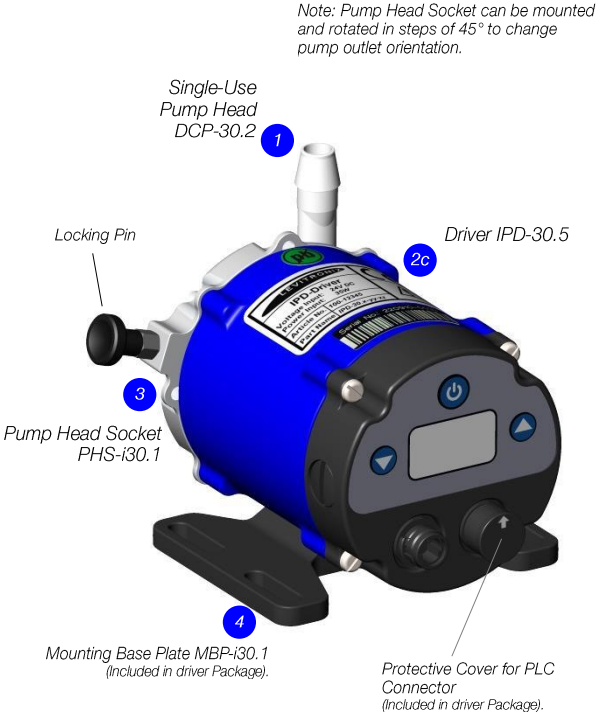
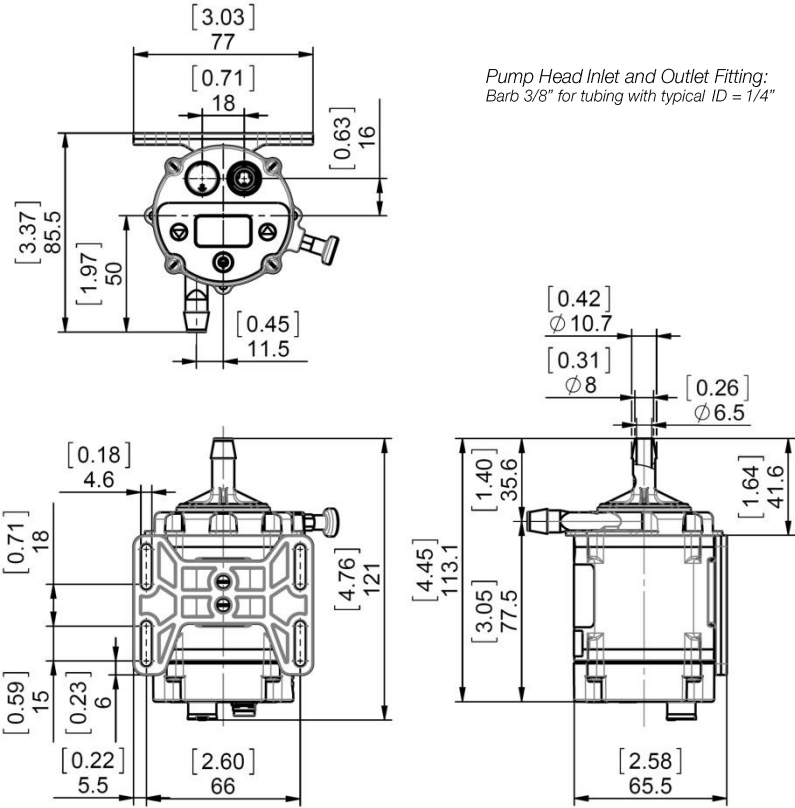
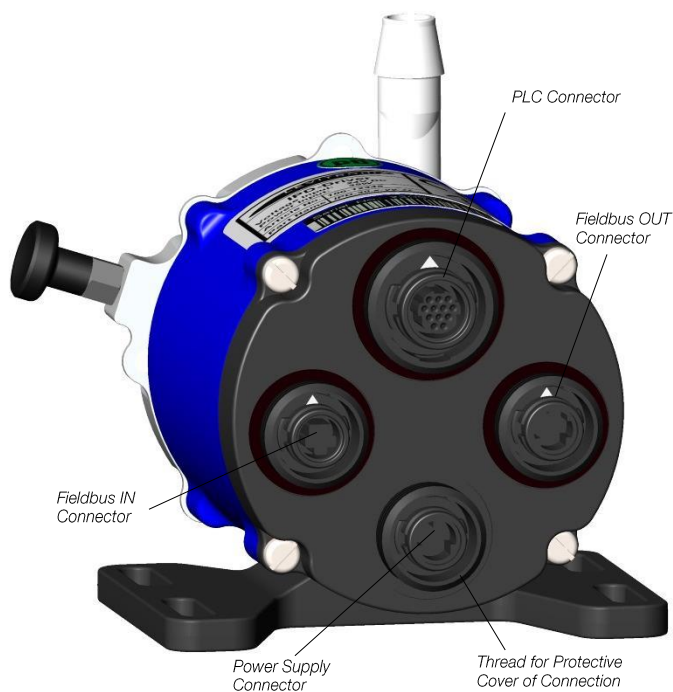


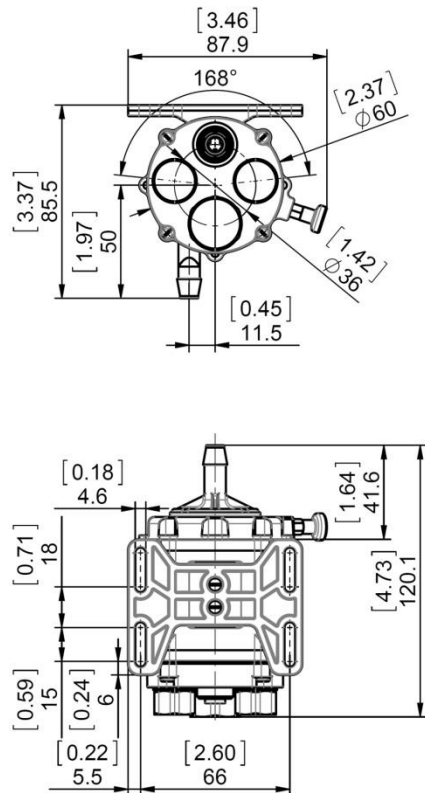
Figure 12: Basic dimensions and description of standard “Stand-Alone” model

MODEL DESCRIPTION – EASYCONNECT

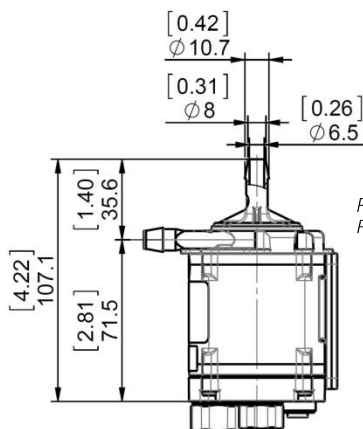


Connector	PIN Name	Description	Standard Designation	Hardware Specification
Power Supply	P+	+ 24 VDC	Supply	Voltage: 24 VDC
	P-	Ground / Earth		Power: 35 W
	NC	Not connected.	--	--
PLC 12	Dout1	Digital Output 1	Status	Open drain, max. 24V, 100mA
	Dout2	Digital Output 2	Error	Reference ground is AGND
	Din1	Digital Input 1	Enable (Reset)	Galvanic separation with optocoupler
	Din2	Digital Input 2	Process Mode	2.2 kΩ 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 is reference
	GND	Analog Ground	--	Reference for Aout1, Dout1, Dout2 and Pout
	Pout	Output +24VDC	Supply Output	For supply of external devices (e.g. sensors). (Current 200mA together with Pout o Fieldbus OUT)
	NC	Not connected.	--	--
Fieldbus OUT	GND	Ground	--	Reference for Pout.
	Pout	Output +24VDC	Supply Output	For supply of external devices (user panels) (Current 200mA together with Pout of PLC 12)
	RS485+	RS485 +	Field Bus	Modbus protocol
	RS485-	RS485 -		
	Internal	Internal Bus	Do not connect.	Internal bus needed to connect pumps for serial pumping.
Fieldbus IN	Internal	Internal Bus	Do not connect	
	GND	Ground	--	Connected to PLC12 GND and reference for supply
	NC	Not connected.	--	--
	RS485+	RS485 +	Field Bus	Modbus protocol
	RS485-	RS485 -		
	Internal	Internal Bus	Do not connect.	Internal bus needed to connect pumps for serial pumping.
	Internal	Internal Bus	Do not connect.	
	Internal	Internal Bus	Do not connect.	

Figure 13: Interface specifications of standard "EasyConnect" model



Pump Head Inlet and Outlet Fitting:
Barb 3/8" for tubing with typical ID = 1/4"



Pump Head Socket
PHS-i30.1

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

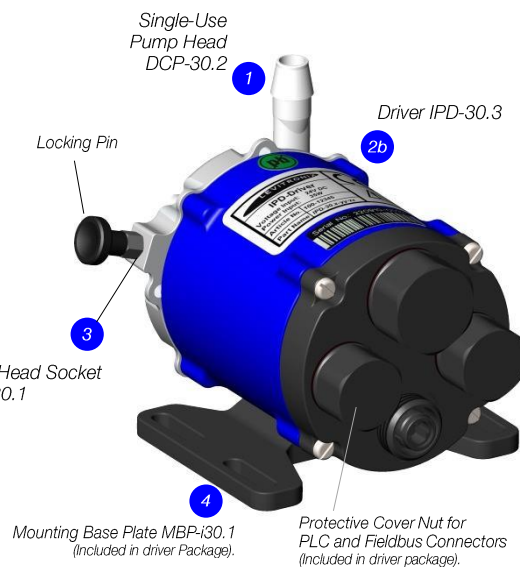
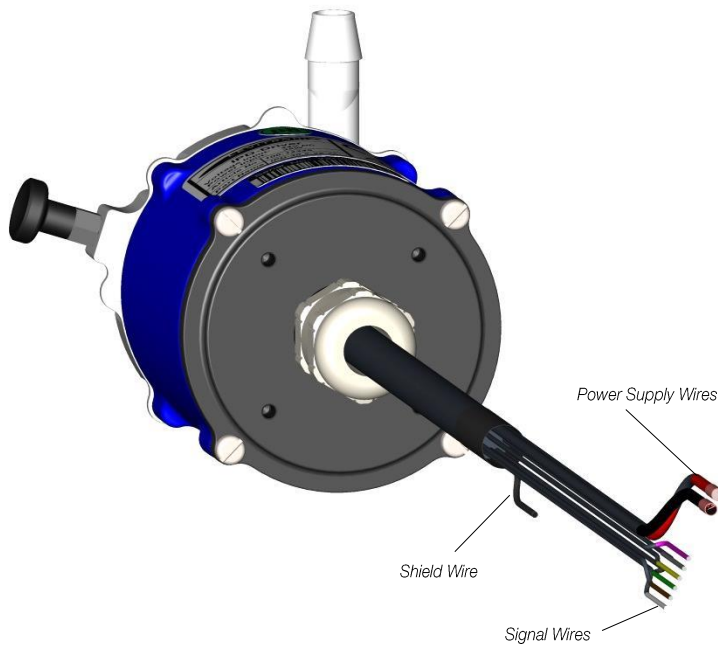


Figure 14: Basic dimensions and description of standard "EasyConnect" model



Wire Name	Description	Standard Designation	Hardware Specification
P+	+ 24 VDC	Supply	Voltage: 24 VDC
P-	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 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	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 15: Interface specifications of standard "OEM" model

Note 1: Power supply wire cross-section is 1.5 mm² and for signal wires 0.14 mm²

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

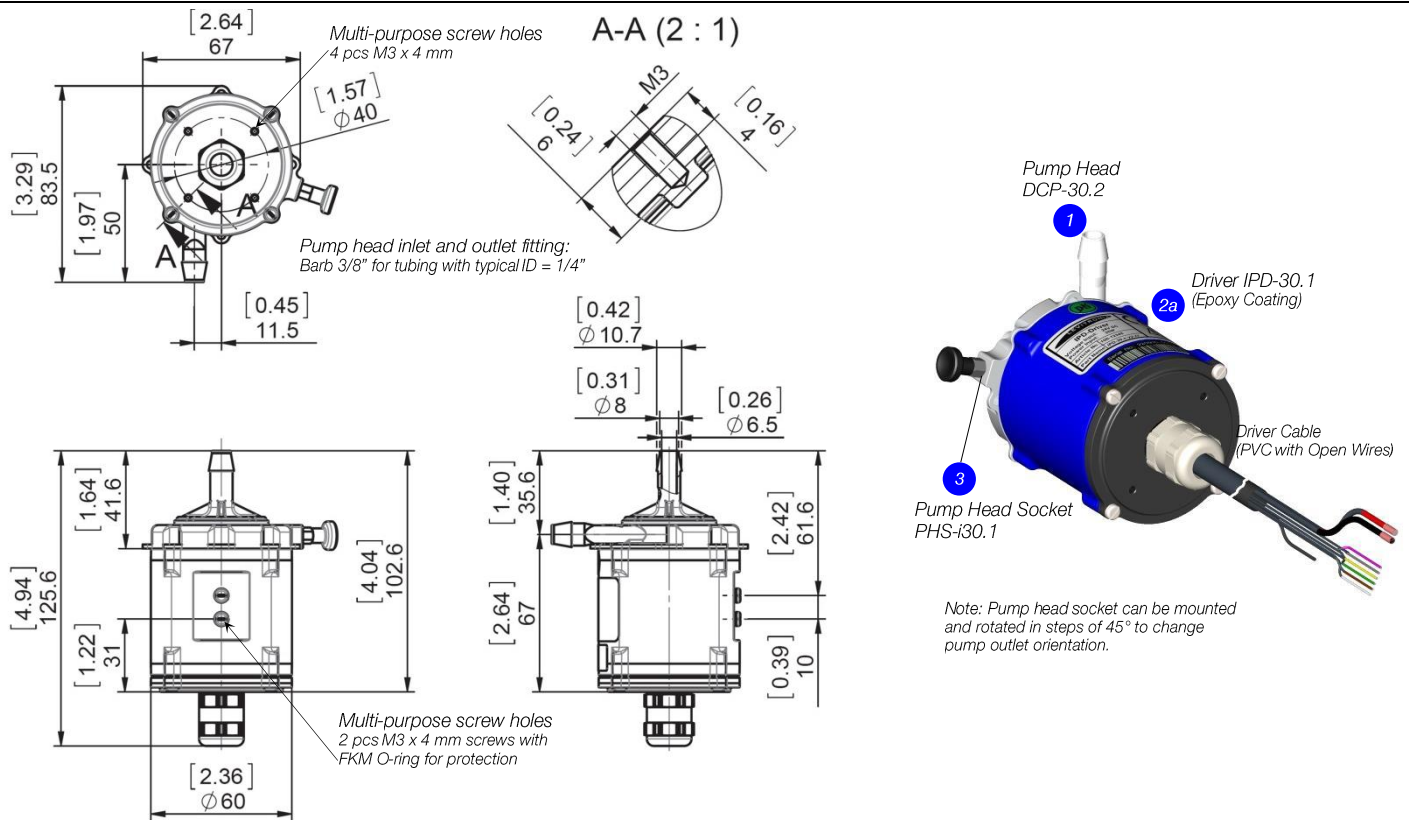
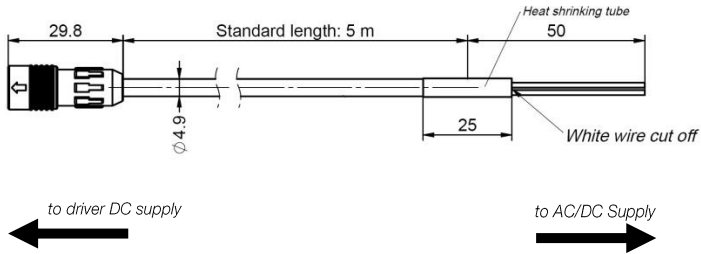
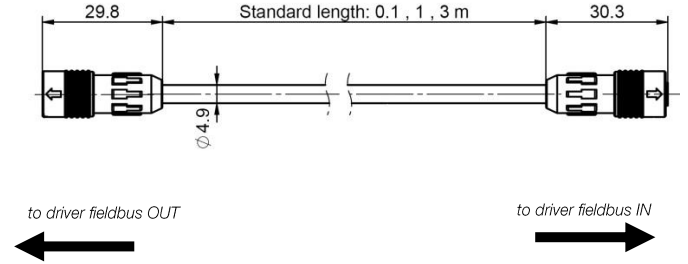


Figure 16: Basic dimensions and description of standard "OEM" model

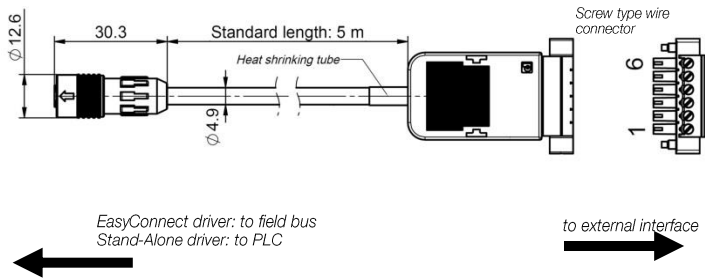
7 IPS Cable Power ICP-1.1 (for EasyConnect and Stand-Alone drivers)



8a IPS Cable Signal ICS-1.1 (for EasyConnect drivers)



8b IPS Cable Signal ICS-1.2 (for EasyConnect and Stand-Alone drivers)



9 IPS Cable Signal ICS-2.1 (for EasyConnect drivers)

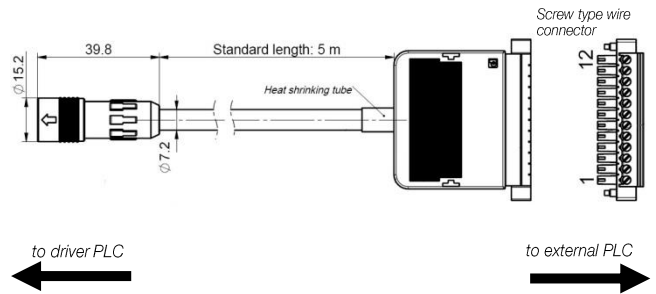


Figure 17: Basic dimensions and specifications of standard cables

ORDER INFORMATION

System Name	Article #	Pump Head Socket	Driver	Note
PLD-i30SU.1	100-90955	PHS-i30.1	IPD-30.1-50-02	OEM - Driver, 5 m PVC cable with open wires, pump head socket
PLD-i30SU.2	100-91025	PHS-i30.1	IPD-30.3-02 (MBP-i30.1 included)	EasyConnect - Driver with interface connectors, pump head socket.
PLD-i30SU.3	100-91026	PHS-i30.1	IPD-30.5-02 (MBP-i30.1 included)	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	Disposable Pump Head	DCP-30.2	100-90968	Material Impeller and Pump Housing Housing Sealing In-/Outlet Fittings Max. Flow Max. Diff.-Pressure Max. Viscosity Max. Liquid Temp. Wet Pump Volume/Surface Sterilization Methods	Polypropylene (FDA, USP Class VI, BSE/TSE/Animal free) Infrared welding Barb 3/8" for tubing with typical ID = 1/4" 7.7 liters/min / 2.0 gallons/min 1.0 bar / 14.5 psi 10 cP 60 °C / 140 °F 7.7 ml / 55.9 cm ³ Gamma radiation up to 40kGy
1b	Irradiated Disp. Pump Head	DCP-30.2-G25	100-91071	Applied Gamma Dosage	≥ 25 kGy
2a	Integrated Pump Driver ("OEM Model")	IPD-30.1-50-02	100-10088	Voltage, Power Housing Cable Interfaces Standard Firmware	24 VDC ±10%, 35 W Epoxy coated Aluminum, PP for bottom lid, IP65 ¹ PVC jacket, open wires, cable length 5 m PLC and RS485 with Modbus protocol (see Figure 15 for details) H2.48
2b	Integrated Pump Driver ("EasyConnect" Model)	IPD-30.3-02 (MBP-i30.1 included)	100-10097	Housing Interfaces Standard Firmware	Epoxy coated Aluminum, PP for bottom lid, IP65 2x Fieldbus RS485 with Modbus protocol, PLC and power supply H2.48 ²
2c	Integrated Pump Driver ("Stand-Alone" Model)	IPD-30.5-02 (MBP-i30.1 included)	100-10098	Housing Interfaces Standard Firmware	Epoxy coated Aluminum, PP for bottom lid, IP65 User panel with 3 user buttons, PLC and power supply H2.25
3	Pump Head Socket	PHS-i30.1	100-90947	Mounting Type Material Assembly Screws	Bayonet type with locking pin Anodized Aluminum 4 pcs M3 x 6 mm (Stainless Steel, INOX A4)

Table 2: Specification of standard components

1: Designed and tested for IP67. 2: Special firmware for serial pumping (see Figure 9) as one unit available on request.

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
4	Mounting Base Plate	MBP-i30.1	190-10313	Material / Mounting Screws	PP + 30% GF / 2 pieces, stainless steel FEP coated, M3 x 10 mm
5a	AC/DC Power Supply	TPC 055-124 (Traco)	100-40014	Voltage Output / Input Basic Dimensions Certification or Standards	24 VDC with 55 W / 85 – 264 VAC, 47-63 Hz 45 x 90 x 96.5 mm (mountable on DIN rail 35 mm) UL, CSA, CB, Semi F47
5b	Desktop AC/DC Power Supply	AC/DC Power Supply VEC50US24 HR30	100-40015	Voltage Output / Input Basic Dimensions Safety Approvals Note	24VDC, 50W / 90 – 264 VAC, 47-63 Hz 116 x 52 x 31 mm IEC60950-1, EN60950-1, UL/cUL 60950-1 Connector for direct connection to power supply of driver with cable length 1.2m.
5c	AC Mains Cables (for Desktop power supply 5b)	AMC-1.1 (2m) AMC-1.2 (2.5m) AMC-1.3 (2.5m) AMC-1.4 (2.5m) AMC-1.5 (2.5m)	190-10331 190-10332 190-10333 190-10334 190-10335	Approvals and Country Approvals and Country Approvals and Country Approvals and Country Approvals and Country Cable Specifications	UL, cUL, US, Canada CB, Germany, Denmark, Norway, Finland, Belgium, Netherlands, Sweden, Austria PSE, Japan Switzerland CE, United Kingdom Black color, ROHS
6	USB to RS485 Adaptor-TR Isolated	YN-485-TR	100-30392	Structure/Design Purpose	USB connector (6a) with termination resistor and cable with connector pair (6b and 6d) for external RS485 wire connection. Magnetically isolated. Cable length is 2m. Communication over fieldbus of driver with PC

Table 3: Specification of general accessories

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
7	IPS Cable Power 3 Wires	ICP-1.1-50 (5 m)	190-10342	Cable Material / Wires Connection In / Connection Out Main Purpose	PVC jacket / 3x 0.5 mm ² (only 2 wires used, 1 is cut) Open wires / Circular Hirose type to driver Connection of power supply to "Stand-Alone" and "EasyConnect" drivers
8a	IPS Cable Signal 6 Wires	ICS-1.1-01 (0.1 m) ICS-1.1-10 (1 m) ICS-1.1-30 (3 m)	190-10343 190-10344 190-10345	Cable Material / Wires Connection In / Connection Out Main Purpose	PVC jacket / 6x 0.08 mm ² and shielding Circular Hirose type / Circular Hirose type Fieldbus connection between "EasyConnect" drivers (e.g. multi-pump arrays)
8b	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 ² 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.
9	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 ² and shielding Connector with screw type plug for open wire connection / Circular Hirose type General connection to PLC of "EasyConnect" drivers.
10	Fieldbus Termination Connector	FTC-1.1	190-10348	Materials Main Purpose	PPS for connector housing and FPM for sealing. 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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