

Ultrapure Fluid Handling Integrated Pump System Series



BPS-i30

Standard High Pressure High Flow 1.5 bar (22 psi) 2.8 bar (40 psi) 1.1 bar (16 psi) 7.4 lpm (2 gpm) 3.8 lpm (1 gpm) 14.7 lpm (3.9 gpm)

No Bearings. No Seals. No Contamination!

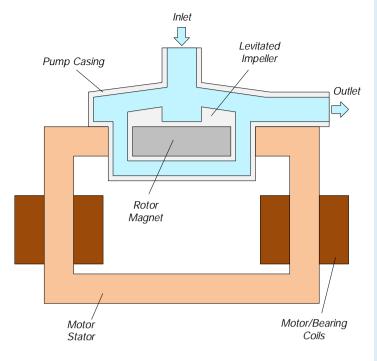


Figure 1: Schematic of the main elements of the MagLev centrifugal pump



Figure 2: Integrated MagLev pump driver with pump head

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 chemicalresistant 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 6 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 9* 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. 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 18*) are available.

SYSTEM CONFIGURATION - "OEM"

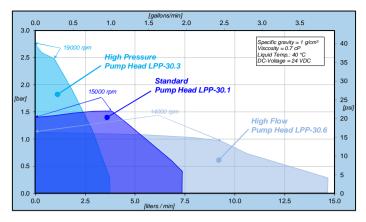
The "OEM" models are designed for a compact integration with one integrated driver cable containing all available interface signals (see *Figure 7* and *Figure 15*). Basically, all configurations of the "EasyConnect" models are possible allowing the users with integration capabilities to adapt the cable 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 7. 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, noflow conditions or line clogging. Dynamic Condition Trending (DCT) enables failure prediction and scheduling of preventive maintenance (Figure 5).

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 8*). 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*).



Flgure 3: Pressure/flow ranges for pump head models (similar to water) (Slandard, High Pressure and High Flow models)



Figure 4: Pump system models

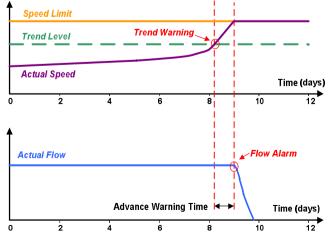
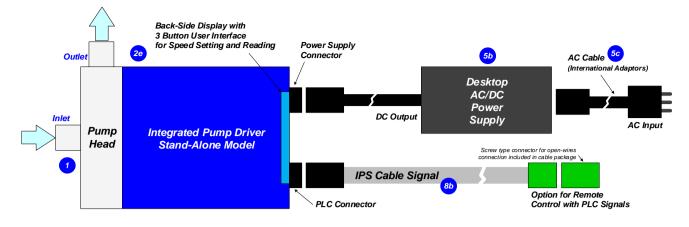
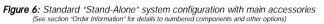


Figure 5: Dynamic Condition Trending (DCT)

SYSTEM CONFIGURATIONS





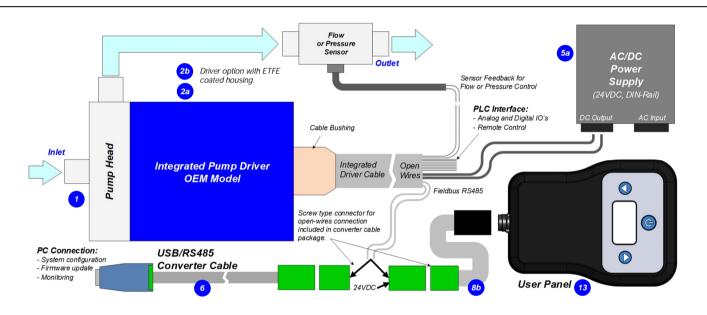


Figure 7: Standard "OEM" system configuration (See section "Order Information" for details to numbered components and other options)

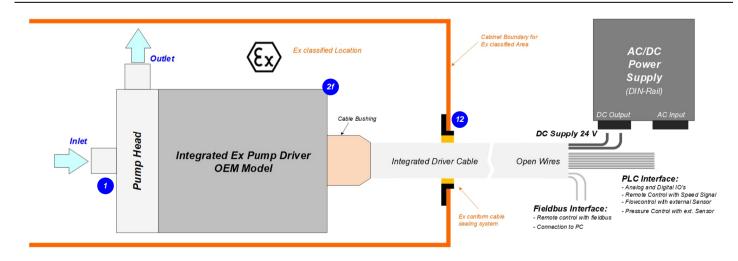


Figure 8: ATEX/IECEx "OEM" configuration (See section "Order Information" for details to numbered components and other options)

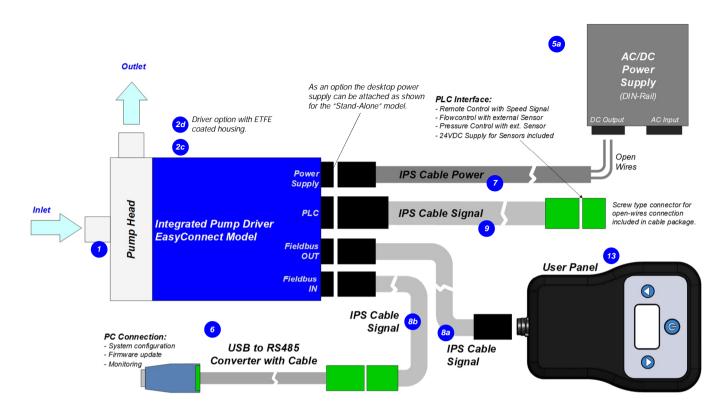


Figure 9: Standard "EasyConnect" system configuration with main accessories (See section "Order Information" for details to numbered components and other options)

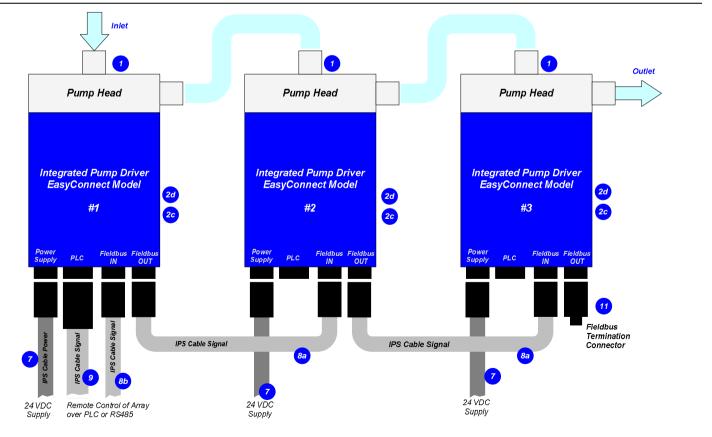


Figure 10: Serial pumping configuration with "EasyConnect" models (See section "Order Information" for details to numbered components and other options)



Interface	PIN Name	Description	Standard Designation	Hardware Specification
	P+	+ 24 VDC		Voltage: 24 VDC Power: 40 W
Power Supply	P-	Power Input Ground / Earth	Supply	
	NC	Not connected.		
	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
PLC 6	Dout	Digital Output 1	Status	Open drain, max. 24V, 100mA Reference ground is GND
1200	GND	Analog Ground		Reference for Dout
	Din1	Digital Input 1	Enable (Reset)	Galvanic separation with optocoupler 2.2 $k\Omega$ input resistance, 5-24V for active input
	Din_COM	Com. Digi. Input		Reference for digital input.
Display		Display	Speed and Status Display	
and Buttons		Up/Down	Setting speed	
		On/Off	Enable/Disable	

Figure 11: Interface specifications of standard "Stand-Alone" model

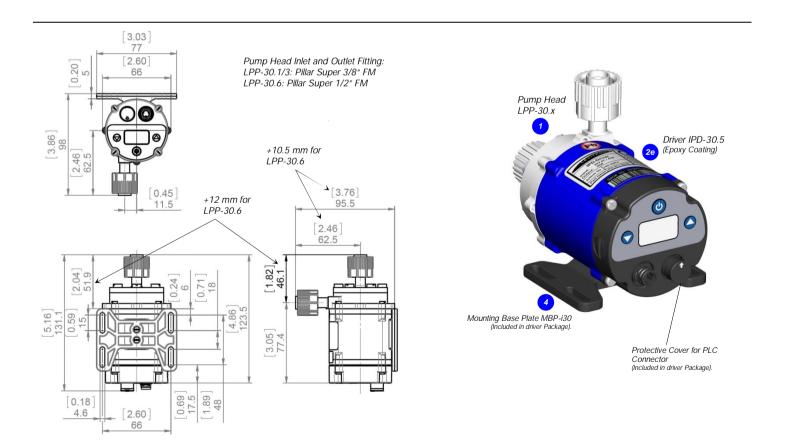


Figure 12: Basic dimensions and description of standard "Stand-Alone" model Note 1: Non-tolerated dimensions are for reference only.

MODEL DESCRIPTION – EASYCONNECT

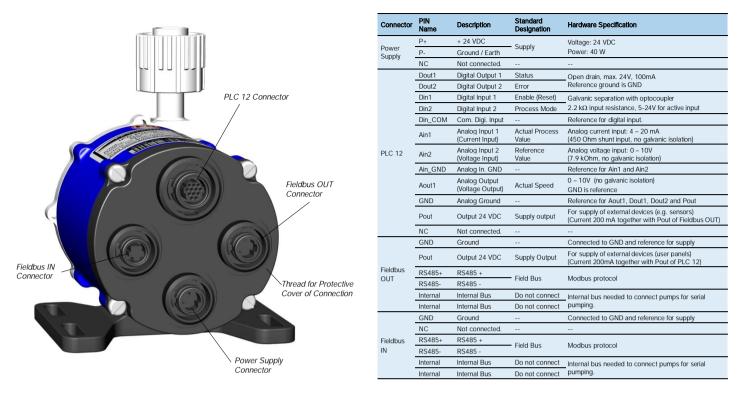


Figure 13: Interface specifications of standard "EasyConnect" models

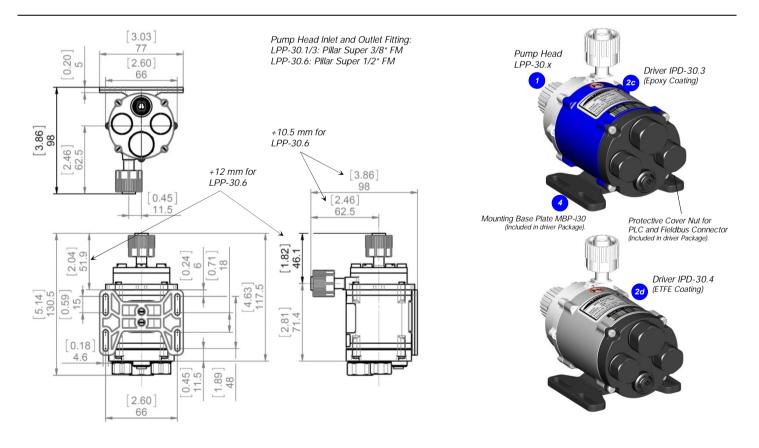
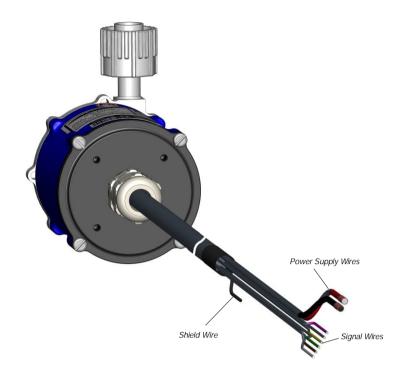


Figure 14: Basic dimensions and description of standard "EasyConnect" models Note 1: Non-tolerated dimensions are for reference only.



Wire Name	Description	Standard Designation	Hardware Specification	
P+	+ 24 VDC		Voltage: 24 VDC P- to be connected to earth	
Ρ-	Power Input Ground / Earth	Supply		
Ain1	Analog Input 1 Actual Proc (Current Input) 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	$2.2 \text{ k}\Omega$ input resistance, 5-24V for active input	
Din_COM Common Digital Input				
Aout1	Analog Output (Voltage Output)	Actual Speed	0 – 10V (no galvanic isolation) GND is reference	
Dout1	Digital Output 1	Status	Open drain, max. 24V, 100mA Reference ground is GND	
Dout2	Digital Output 2	Error		
GND Analog Ground			Reference for Aout1, Dout1 and Dout2	
RS485+	RS485 +	E-H D-H	Modbus protocol	
RS485-	RS485 -	 Field Bus 		
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" models Note 1: Power supply wires are 1.5mm² and signal wires 0.14mm² Note 2: For more detailed description of in Note 2: For more detailed description of interfaces consult user manual

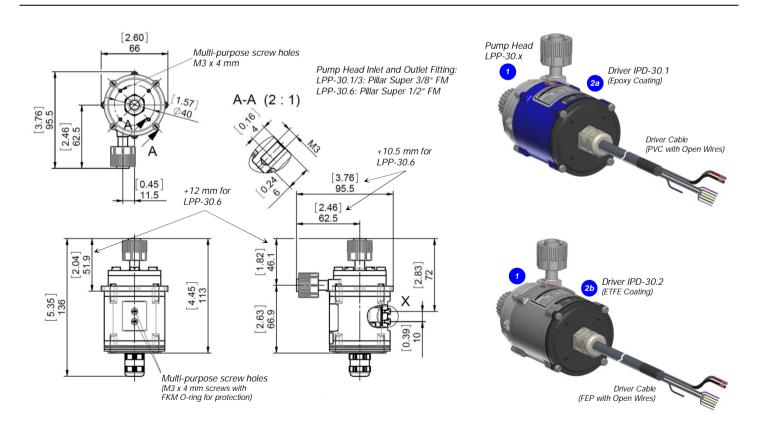


Figure 16: Basic dimensions and description of standard "OEM" models Note 1: Non-tolerated dimensions are for reference only.

ACCESSORIES DESCRIPTION

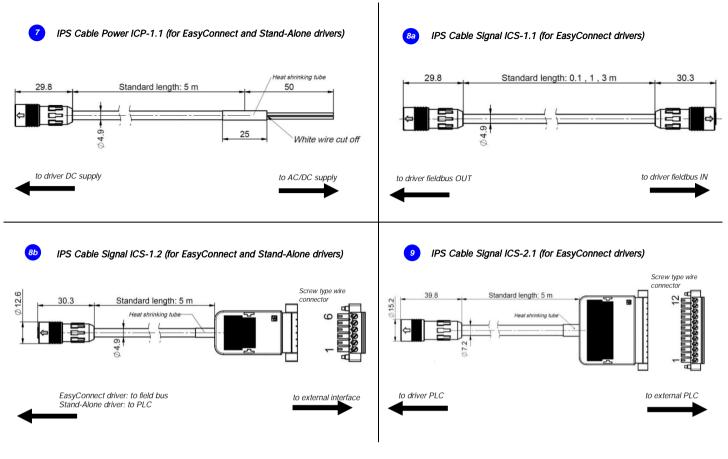


Figure 17: Basic dimensions and specifications of standard IPS cables Note 1: Non-tolerated dimensions are for reference only.

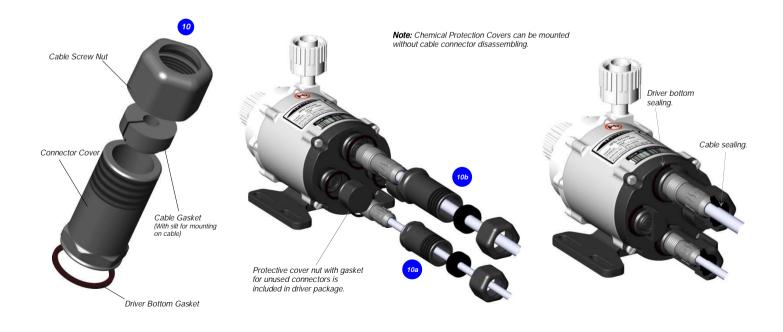


Figure 18: Basic concept of protective covers for enhanced chemical protection of driver connectors

ORDER INFORMATION

System Name	Article #	Pump Head	Driver	Note
BPS-i30.1 / 13 / 7	100- 90831 / 91209 / 91187	LPP-30.1 / 3 / 6 ²	IPD-30.1-50-01 / 03 / 04	OEM - Epoxy coated driver, 5 m PVC cable with open wires, PTFE pump head.
BPS-i30.2 / 14 / 8	100- 90832 / 91214 / 91189	LPP-30.1 / 3 / 6 ²	IPD-30.2-50-01 / 03 / 04	OEM - ETFE coated driver, 5 m FEP cable with open wires, PTFE pump head.
BPS-i30.20 / 21 / 22	100- 91362 / 91363 / 91364	LPP-30.1/3/6 ²	IPD-30.12-50-01 / 03 / 04	ATEX, OEM - ETFE coated driver, 5 m FEP cable open wires, PTFE pump head.
BPS-i30.3 / 15 / 9	100- 91022 / 91215 / 91188	LPP-30.1 / 3 / 6 ²	IPD-30.3-01 / 03 / 04 1	EasyConnect - Epoxy coated driver with interface connectors, PTFE pump head.
BPS-i30.4 / 16 / 10	100- 91023 / 91216 / 91210	LPP-30.1 / 3 / 6 ²	IPD-30.4-01 / 03 / 04 1	EasyConnect - ETFE coated driver with interface connectors, PTFE pump head.
BPS-i30.5 / 17 / 11	100- 90987 / 91217 / 91211	LPP-30.1 / 3 / 6 ²	IPD-30.5-01 / 03 / 04 1	Stand-Alone - Epoxy coated driver with integrated user panel, PTFE pump head.

 Table 1: Standard system configurations

 Note 1: Mounting Base Plate MBP-30.1 included.
 Note 2: LPP-30.1 is "Standard", LPP-30.3 is "High Pressure" and LPP-30.6 is "High Flow" pump head.

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
1a	Pump Head	LPP-30.1 (Standard) LPP-30.3 (High Pressure) LPP-30.6 (High Flow)	100-90828	Impeller / Housing / O-Ring In-/Outlet Fittings	PTFE / PTFE / FFPM (FFKM) perfluorelastomer (a)+(b): 3/8" Pillar Super 300 FM (female) (c): ½" Pillar Super 300 FM (female)
1b 1c			100-91213 100-91315	Max. Flow Max. DiffPressure Max. Viscosity Max. Liquid Temp.	(a): 7.4 lpm (2 gpm) (b): 3.8 lpm (1 gpm) (c): 14.7 lpm (3.9 gpm) (a): 1.5 bar (22 psi) (b): 2.8 bar (40 psi) (c): 1.1 bar (16 psi) (a): 10 cP (b): 10 cP (c): 10 cP 90 °C (194 °F) ³
2a 2b	Integrated Pump Driver ("OEM Models")	IPD-30.1-50-01 (Epoxy, Standard) IPD-30.1-50-03 (Epoxy, High Pressure) IPD-30.1-50-04 (Epoxy, High Flow) IPD-30.2-50-01 (ETFE, Standard) IPD-30.2-50-03 (ETFE, High Pressure) IPD-30.2-50-04 (ETFE, High Flow)	100-10075 100-10124 100-10117 100-10076 100-10125 100-10121	Voltage, Power Housing Cable Interfaces Standard Firmware	24 VDC ±10%, 35 W Epoxy (a) or ETFE (b) coałed Aluminum, PP for bottom lid, IP65 ¹ PVC (a) or FEP (b) jacket, open wires, cable length 5 m PLC and RS485 with Modbus protocol (see Figure 15 for details) Standard pump head: H1.48 High Pressure: H3.48 High Flow: H4.48
2c 2d	Integrated Pump Driver ("EasyConnect" Models) (MBP-i30.1 included)	IPD-30.3-01 (Epoxy, Standard) IPD-30.3-03 (Epoxy, High Pressure) IPD-30.3-04 (Epoxy, High Flow) IPD-30.4-01 (ETFE, Standard) IPD-30.4-03 (ETFE, High Pressure) IPD-30.4-04 (ETFE, High Flow)	100-10095 100-10126 100-10118 100-10096 100-10127 100-10122	Housing Interfaces Standard Firmware ²	Epoxy (c) or ETFE (d) coated Aluminum, PP for bottom lid, IP65 ¹ 2x Fieldbus RS485 with Modbus protocol, PLC and power supply Standard pump head: H1.48 High Pressure: H3.48 High Flow: H4.48
2e	Integrated Pump Driver ("Stand-Alone" Model) (MBP-i30.1 included)	IPD-30.5-01 (Standard) IPD-30.5-03 (High Pressure) IPD-30.5-04 (High Flow)	100-10092 100-10128 100-10119	Housing Interfaces Standard Firmware	Epoxy coated Aluminum, PP for bottom lid, IP65 ¹ User panel with 3 user buttons, PLC and power supply Standard pump head: H1.25 High Pressure: H3.48 High Flow: H4.48
2f	Integrated Pump Driver ATEX/IECEx ("OEM Models" only)	IPD-30.12-50-01 (ETFE, Standard) IPD-30.12-50-03 (ETFE, High Pressure) IPD-30.12-50-04 (ETFE, High Flow)	100-10156 100-10169 100-10170	Housing Cable ATEX / IECEx Marking	ETFE coated Aluminum, PP for bottom lid, IP65 ¹ FEP jacket, open wires, cable length 5 m くくと答 ⑮ II 3G Ex ec h mc IIC T4 Gc / くくど答 ⑮ II 3D Ex h tc 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 (Figure 9) available on request.
 Note 3:
 ATEX driver IPD-30.12 certified to run at max. 70°C liquid temperature.

Pos.	Component	Article Name	Article #	Characteristics	Value / Feature
3a 3b 3c	Impeller Exchange Kit	IEK-30.1 (Standard) IEK-30.3 (High Pressure) IEK-30.4 (High Flow)	100-90837 100-91219 100-91317	Impeller Material / Type (A) Sealing O-Ring (B) Pump Housing Screws (C) Pump Motor Screws (D) Exchange Tool IET-30.1 (E)	PTFE / (a): LPI-30.1 (b): LPI-30.4 (c): LPI-30.5 O-Ring, FFPM (FFKM) Dimensions: (a)+(b): 28.3 x 1.78 mm (c): 33.05 x 1.78 mm 6 pieces, stainless steel PTFE coated, M5 x 14 mm 4 pieces, stainless steel PTFE coated, M3 x 10 mm POM-C
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 HR30 (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 (HR30 Connector)	100-40015	Voltage Output / Input Basic Dimensions Safety Approvals Note	24VDC, 50 W / 90 – 264 VAC, 47-63 Hz 116 x 52 x 31 mm IEC60950-1, EN60950-1, UL/cUL60950-1 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 (2 m) / AMC-1.2 (2.5 m) AMC-1.3 (2.5 m) / AMC-1.4 (2.5 m) AMC-1.5 (2.5 m)	190-103 31 / 32 190-103 33 / 34 190-10335	Country Country Country	US, Canada / Germ., Denm., Norway, Finland, Belgium, Netherland, Sweden, Austria PSE, Japan / Switzerland CE, United Kingdom
6	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
7	IPS Cable Power 3 Wires	ICP-1.1-50 (5 m)	190-10342	Cable Material / Wires Connection In / Out Main Purpose	PVC jacket / 3x 0.5 mm² (only 2 wires used, 1 is cut) Open wires / Circular Hirose type to driver Connection of power supply to "Stand-Alkone" 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 / Out Main Purpose	PVC jacket / 6x 0.08 mm² 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 / Out Main Purpose	PVC jacket / 6x 0.08 mm² and shielding Connector with screw type plug for open wire connection / Circular Hirose type Fieldbus connection to "£asyConnect" 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 / 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.
10a 10b 10c	Chemical Protection Connector Cover	CPC-1.1 CPC-1.2 CPC-1.5	190-10349 190-10350 190-10352	Materials, IP-Rating Main Purpose of <i>CPC-1.1</i> Main Purpose of <i>CPC-1.2</i> Main Purpose of <i>CPC-1.5</i>	PP+GF30 and FPM/FKM for sealing gaskets, IP65 ⁻¹ Chemical protection of driver connectors of ICP-1.x and ICS-1.x cables. Chemical protection of driver connectors of ICS-2.x cables. Chemical protection of leidbus termination connector FTC-1.1
11	Fieldbus Termination Connector	FTC-1.1	190-10348	Materials Main Purpose	PPS for connector housing and FPM for sealing. Termination of fieldbus.
12 (A-F)	ATEX Cable Sealing System	ACS-A.1 (Roxtec)	100-90292	Sleeve (A) / Gasket (B) Frame (C) / 2x Cable Module (D)	Stainless Steel / EPDM Note: Lubricant (E) and measurement Roxylon (EPDM rubber) / Roxylon plates (F) are included.
13	User Panel	LUI-B.1-01	100-30448	Interface / Housing Rating Standard Firmware	RS485 / IP65 A3.00
14	Water Cooling Module	WCM-i30.2	190-10486	Materials Motor Mounting Screws Cooling Flow Pressure Drop / Max. Pressure Purpose	PTFE coated stainless steel for cooling plate (A) and mounting screws (B). 2 x M3x10, stainless steel PTFE coated Min. 0.4 Vmin at ≤ 20 °C. In- and outlet are NPT 1/8° x 6.7mm. 10 mbar for 1 Vmin cooling flow (for water at 20 °C) / 4 bar Driver cooling for higher liquid temperatures (see user manual).

 Table 3: Specification of cables and other accessories

 Note 1: Designed and tested for IP67.

ORDER INFORMATION



Figure 19: Pump systems with standard components



Figure 20: 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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