

Self-cooling Motor-independent Frequency
Inverter

PumpDrive 2 Eco

Application Guide



Application Guide PumpDrive 2 Eco



The use cases in the application guide are only typical examples for training purposes. The examples are not customer specific solutions. The examples are not binding and can be incomplete. The examples do not cover all possible eventualities. The examples do not cover all design details and variants, nor do they cover all scenarios and situations that may arise during installation, operation or maintenance. The application guide is not replacing the operating manual. In any case of divergence the operating manual has higher priority. The operator must take care about the appropriate operation referring to the operating manual. The examples do not excuse from the safe operating, installation and service. Changes of this application guide will be done without announcement.

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1. Pre-Conditions

- The motor data are set according to the operating manual.
- The motor control is correct selected and suits to the motor.
- The pump curves are stored in the drive.

Pre-settings from production

Pumps with PumpDrive are delivered with the following pre-settings:

- Motor data
- Motion control according to motor type
- Pre-setting of PumpMeter including sensors
- Pump curves

Type series	Etaline / Etaline Z	Etanorm, Etabloc, Etachrom Multitec, Movitec, Sewatec	Retrofit Drive	PumpDrive spare part
selection	EasySelect	EasySelect	EasySelect	Material number
Motor data	preset	preset	Preset	-
Asynchronous motor	Vector ASM	Vector ASM	Vector ASM	-
SuPremE	Vector SuPremE	Vector SuPremE	Vector SuPremE	Vector SuPremE
with PumpMeter	Closed loop control: Differential pressure and sensors preset	Closed loop control: pressure p constant and sensors preset	-	-
without PumpMeter	Open-loop Control	Open-loop Control	Open-loop Control	Open-loop Control
Pump curve	preset	preset	-	-
Setpoint	with PumpMeter: preset	with PumpMeter: preset	-	-

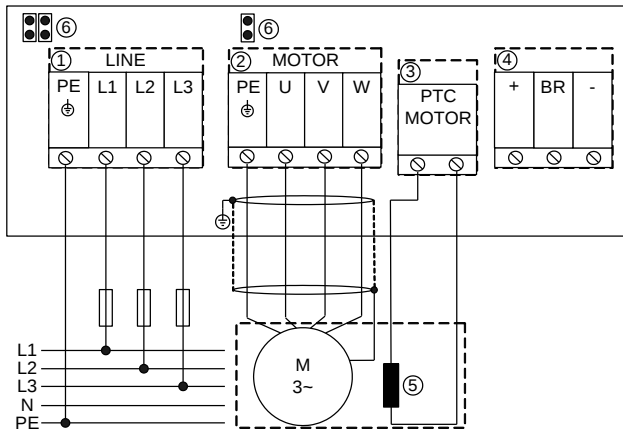
Retrofit PumpDrives, which will be selected in EasySelect, will be delivered only with motor data (work is in progress). The pump curves must be parameterized on site, can be uploaded from PumpMeter, can be set from ServiceTool or display.

PumpDrives (spare parts), which are ordered by material numbers are not parameterized in the production.

Using a 0/4...20mA or 0/2...10V Sensor for control a PumpMeter can be used as internal sensor in parallel. PumpMeter used as internal sensor improves the flow estimation.

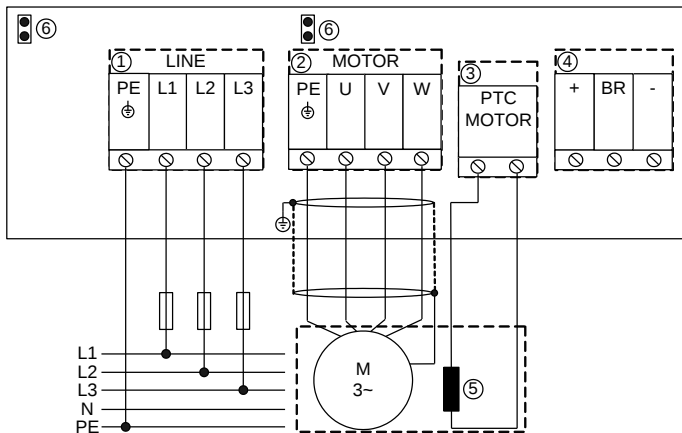
Connecting mains and motor

Size A (0,37 kW – 1,5 kW)



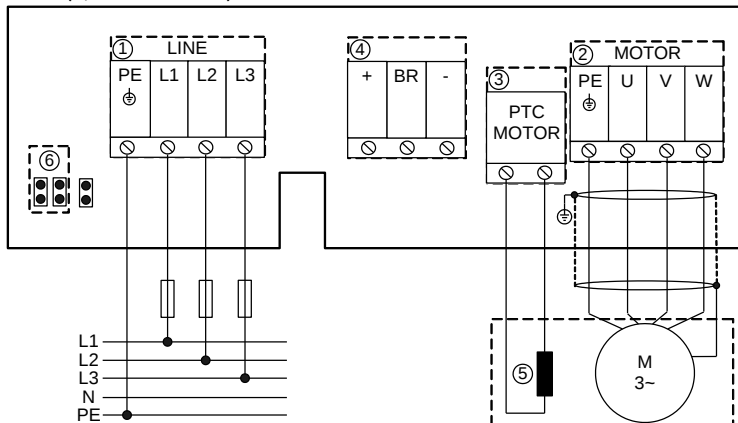
Nr.	Function
1	Mains connection
2	Motor connection
3	PTC connection
4	Brake
5	Motor PTC
6	Jumper for IT mains

Size B (2,2 kW – 4 kW)



Nr.	Function
1	Mains connection
2	Motor connection
3	PTC connection
4	Brake
5	Motor PTC
6	Jumper for IT mains

Size C (5,5 kW – 11 kW)



Nr.	Function
1	Mains connection
2	Motor connection
3	PTC connection
4	Brake
5	Motor PTC
6	Jumper for IT mains

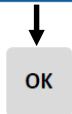
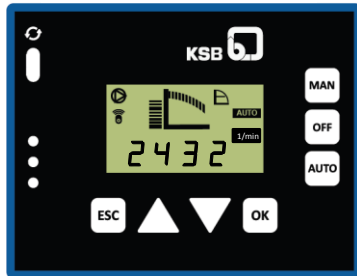
Standard Display

For the parameterization of the following applications the user must be logged in Customer Level.

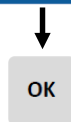
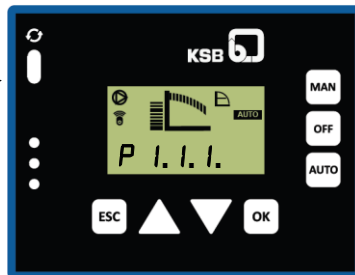
Customer Login in Favourite Menu:

By pressing the button OK Taste  the user selects the Favourite Menu, where the main parameters can be changed.

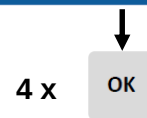
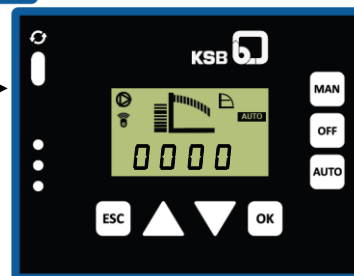
Main Screen



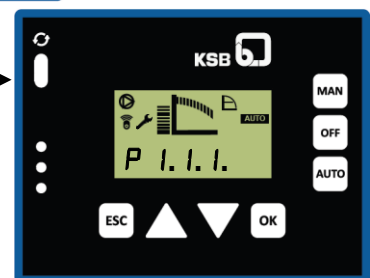
Favourite Menu First Parameter: 1-1-1 Login



Type in PIN: 0000



Favourite Menu



A screw driver is displayed after successful login

By pressing up and down buttons, the user can navigate through the Favourite Menu.

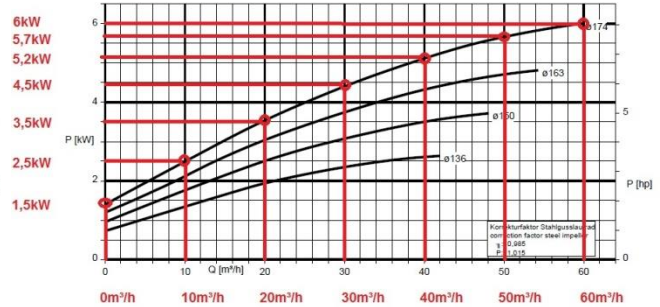
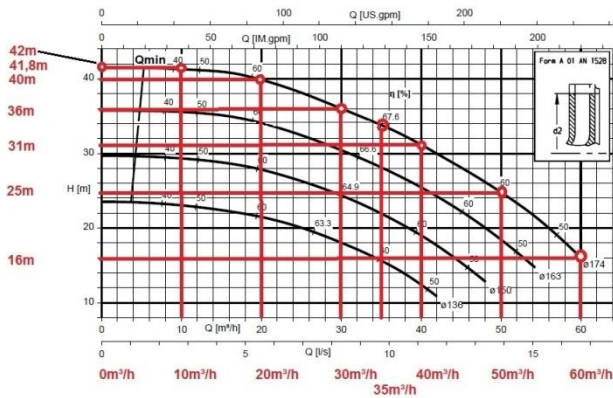
Settings:

By pressing ESC  and OK  at the same time, the user selects the first menu level, where he can navigate through the different menus and parameters.

1.1.1 Pump characteristic curve

The pump characteristic curve for an Etaline 040-040-160 with full impeller diameter 174 has to be set manually. The values for the pump characteristic curves are readout of the type series booklet at nominal speed of the pump with impeller diameter 174.

Etaline 40-40-160, $n = 2900 \text{ min}^{-1}$



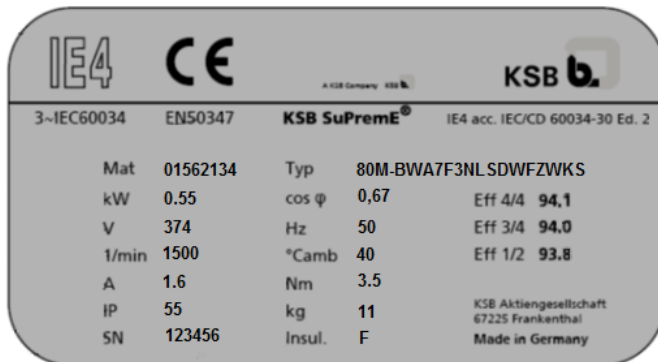
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-4-3-1	Flow Rate Q_0	0.0 [m³/h]	Preset: 0,0 m3/h	ServiceTool
3-4-3-2	Flow Rate Q_1	10.0 [m³/h]	Preset: 10,1 m3/h	ServiceTool
3-4-3-3	Flow Rate Q_2	20.0 [m³/h]	Preset: 20,3 m3/h	ServiceTool
3-4-3-4	Flow Rate Q_3	30.0 [m³/h]	Preset: 30,5 m3/h	ServiceTool
3-4-3-5	Flow Rate Q_4	40.0 [m³/h]	Preset: 40,6 m3/h	ServiceTool
3-4-3-6	Flow Rate Q_5	50.0 [m³/h]	Preset: 50,8 m3/h	ServiceTool
3-4-3-7	Flow Rate Q_6	60.0 [m³/h]	Preset: 60,9 m3/h	ServiceTool
3-4-3-8	Flow Rate Q_opt	35.0 [m³/h]	Preset: 35,0 m3/h	ServiceTool
3-4-3-9	Pump Input Power P_0	1.50 [kW]	Preset: 1,52 kW	ServiceTool
3-4-3-10	Pump Input Power P_1	2.50 [kW]	Preset: 2,62 kW	ServiceTool
3-4-3-11	Pump Input Power P_2	3.50 [kW]	Preset: 3,73 kW	ServiceTool
3-4-3-12	Pump Input Power P_3	4.50 [kW]	Preset: 4,64 kW	ServiceTool
3-4-3-13	Pump Input Power P_4	5.20 [kW]	Preset: 5,39 kW	ServiceTool
3-4-3-14	Pump Input Power P_5	5.70 [kW]	Preset: 5,97 kW	ServiceTool
3-4-3-15	Pump Input Power P_6	6.00 [kW]	Preset: 6,34 kW	ServiceTool
3-4-3-16	Head H_0	42.00 [m]	Preset: 43,06 m	ServiceTool
3-4-3-17	Head H_1	41,80 [m]	Preset: 42,89 m	ServiceTool
3-4-3-18	Head H_2	40.00 [m]	Preset: 41,41 m	ServiceTool
3-4-3-19	Head H_3	36.00 [m]	Preset: 37,48 m	ServiceTool
3-4-3-20	Head H_4	31.00 [m]	Preset: 32,45 m	ServiceTool
3-4-3-21	Head H_5	25.00 [m]	Preset: 25,88 m	ServiceTool
3-4-3-22	Head H_6	16.00 [m]	Preset: 16,88 m	ServiceTool
3-4-3-30	Low Flow Limit Flow Rate in % Qopt	30 [%]	Preset	ServiceTool

2) Pre-settings for completely assembled pump, motor, drive

1.1.2 Parameterization of Motor data

A PumpDrive 2 is parameterized for a 2 pole SuPremE Motor. The pump rotation is clockwise.

Name plate of motors:



Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-2-1-1	Nominal Motor Power	0.55 [kW]	Preset: 0.55 [kW]	ServiceTool, Display
3-2-1-2	Nominal Motor Voltage	374 [V]	Preset: 400 [V]	ServiceTool, Display
3-2-1-3	Nominal Motor Frequency	50.0 [Hz]	Preset: 50.0 [Hz]	ServiceTool, Display
3-2-1-4	Nominal Motor Current	1.60 [A]	Preset: 1.60 [A]	ServiceTool, Display
3-2-1-5	Nominal Motor Speed	1500 [1/min]	Preset: 1500 [1/min]	ServiceTool, Display
3-2-1-6	Nominal Cos Phi Value	0.67	Preset: 0.57	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	Preset: 500 [1/min]	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	1500 [1/min]	Preset: 1500 [1/min]	ServiceTool, Display
3-2-3-1	PTC Data Analysis	1 = ON	Preset: ON	ServiceTool, Display
3-2-3-2	Thermal Motor Protection Behaviour	Non-self-acknowledging	Preset: Non-self-acknowledging	ServiceTool
3-2-4	Motor Direction of Rotation	0 = Clockwise ⁴⁾	Preset: Clockwise	ServiceTool, Display
3-3-1	Motor Control Method	Vector SuPremE	Preset: SuPremE Vector Control	ServiceTool
3-3-4-1	Update Motor Parameters	Run	Preset	ServiceTool

2) Pre-settings for completely assembled pump, motor, drive

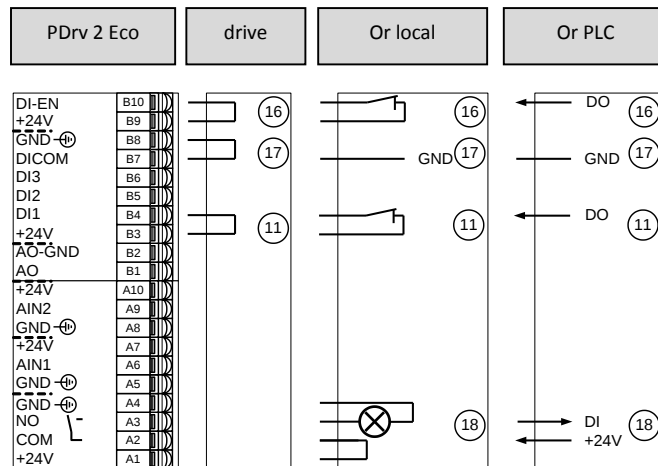
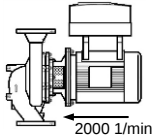
4) Pump dependent

2. Single pump

2.1 Single pump – Open loop control

2.1.1 Open loop control: control value at display

A fixed speed of 2000 1/min should be set on the display. The nominal speed of the 2 pole motor is 2950 1/min.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
18	Alarm

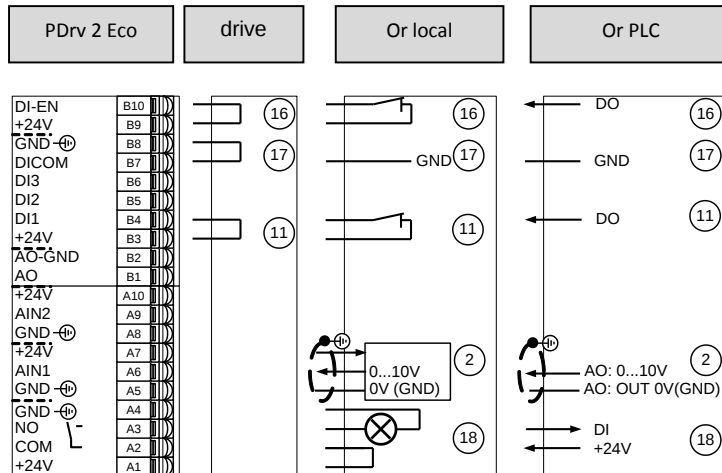
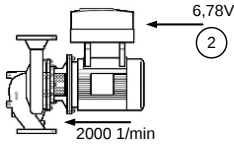
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
1-3-3	Control Value (Open-loop Control)	2000 [1/min]	motor specific	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.1.2 Open loop control: control value by external signal 0...10V

A fixed speed of 2000 1/min should be given by an external signal 0...10V at analog input 1.
2000 1/min is equal to 6,78 V when using a 2-pole motor with a nominal speed of 2950 1/min.
Information: the set point can't be lower than the minimum speed.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Set point (open loop): external signal 0...10V
18	Alarm

Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
3-8-1-1	Analog Input 1 Signal	4 = 0...10V	0 = Off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	1 = Setpoint/Control value (Auto)	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0 [1/min]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	2950 [1/min]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

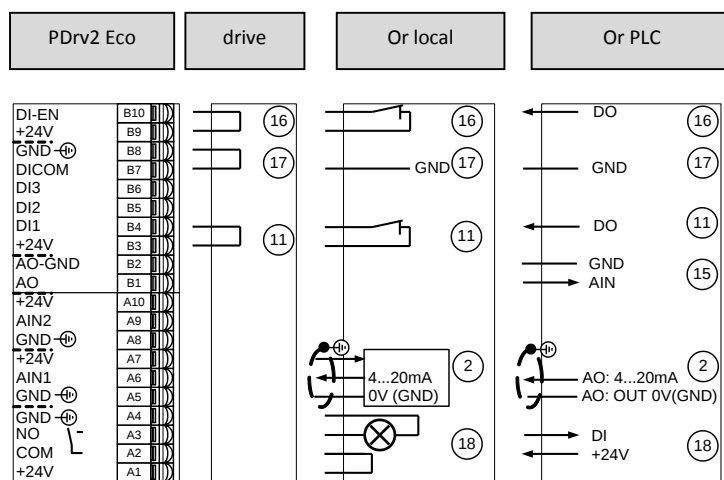
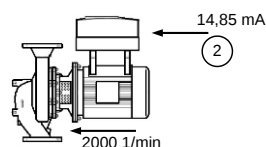
2) Pre-settings for completely assembled pump, motor, drive

2.1.3 Open loop control: control value by external signal 4...20mA

A fixed speed of 2000 1/min should be given by an external signal 4...20mA at analog input 1.

The feedback of the speed should be send by analog output to a PLC.

2000 1/min is equal to 14,85 mA when using a 2-pole motor with a nominal speed of 2950 1/min ($16\text{mA} / 2950 \text{ rpm} * 2000 \text{ rpm} + 4 \text{ mA} = 14,85 \text{ mA}$). Information: the set point can't be lower than the minimum speed



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
15	Analog output: speed
2	Set point (open loop): external signal4...20mA
18	Alarm

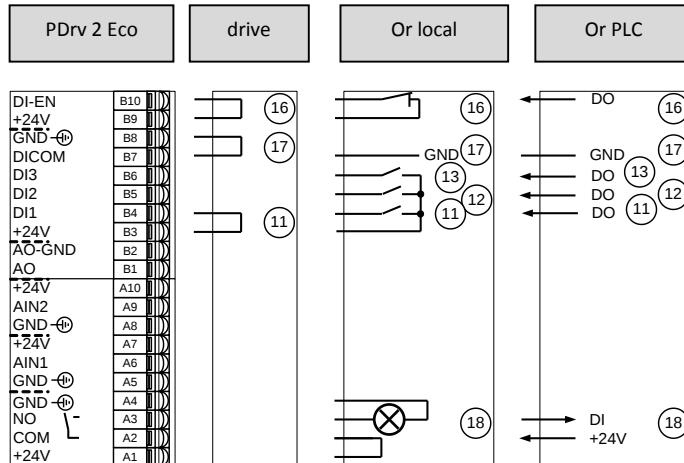
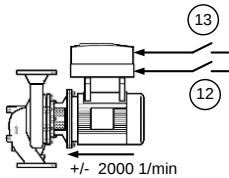
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
3-8-1-1	Analog Input 1 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	1 = Setpoint/Control value (Auto)	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0 [1/min]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	2950 [1/min]	-	ServiceTool, Display
3-8-7-1	Assignment 1 Analog Output 1	Motor speed	preset	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.1.4 Open loop control: digital motor potentiometer

A fixed speed of 2000 1/min should be changeable by the digital inputs with an increment of 10 [1/min].



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
13	DI3: Increase speed
12	DI2: Decrease speed
11	System start with DI1 ¹⁾
18	Alarm

Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
1-3-3	Control Value (Open-loop Control)	2000 [1/min]	motor specific	ServiceTool, Display
3-8-6-2	Digital Input 2 Function	Potentiometer Auto -	No Function	ServiceTool
3-8-6-3	Digital Input 3 Function	Potentiometer Auto +	No Function	ServiceTool
3-6-6-2	Speed Change Increment	10 [1/min]	preset	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

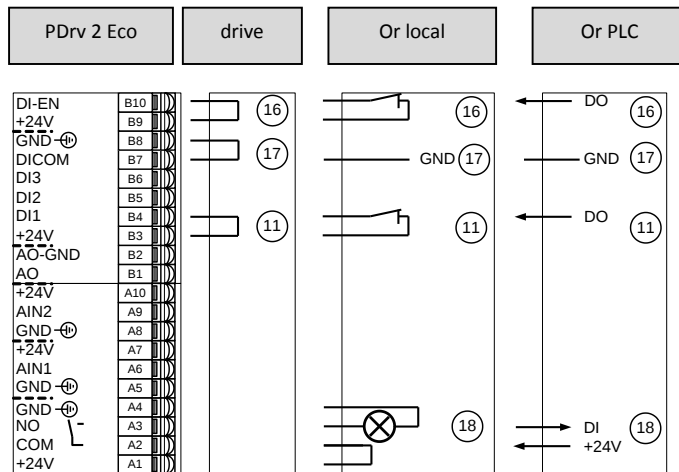
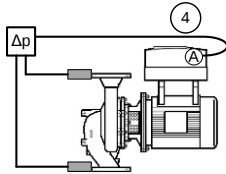
1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

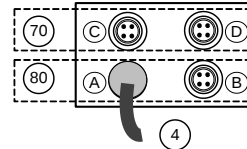
2.2 Single pump – closed loop control

2.2.1 Closed loop control: Differential pressure with PumpMeter (Modbus)

A constant differential pressure of 4 bar is needed. PumpMeter is used as a differential pressure sensor in the measurement range of -1 ... 10 bar. PumpMeter is connected by Modbus to the M12 Module of the drive. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
18	Alarm
4	Actual value: tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)



Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	M12 Module female A: connection PumpMeter (Modbus)
B	-
C	-
D	-

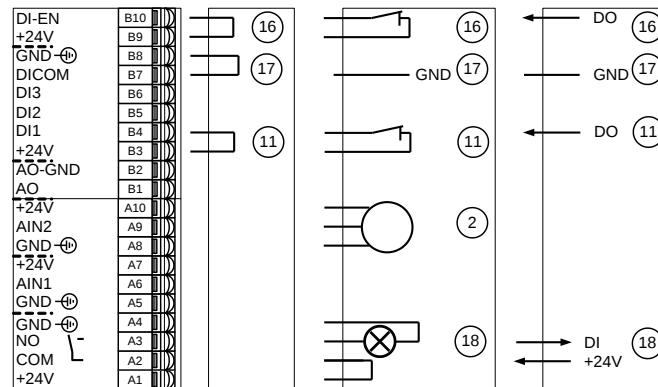
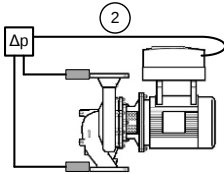
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	preset - see chapter 1	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	preset	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	preset acc. specified Q _H	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/Dis-charge Pressure	preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive and PumpMeter

2.2.2 Closed loop control: differential pressure with sensor 4...20mA

A constant differential pressure of 4 bar is needed. The 4...20mA differential pressure sensor with a measurement range of 0-6 bar is connected to analog input 2. The set point is given by the display



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value: differential pressure sensor 4...20mA
18	Alarm

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	6 = Differential Pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	-1.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

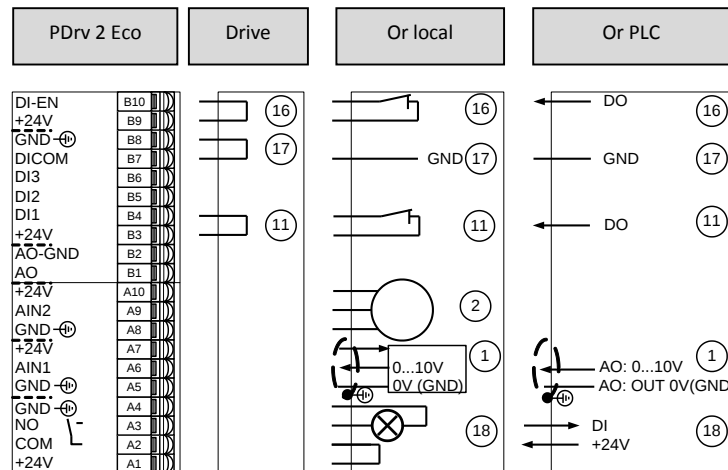
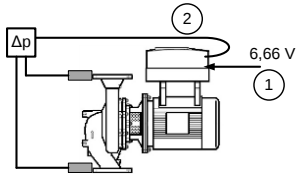
1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.3 Closed loop control: differential pressure with sensor 4...20mA set point via analog input

A constant differential pressure of 4 bar is needed. The 4...20mA differential pressure sensor with a measurement range of 0-6 bar is connected to analog input 2. The set point is given via analog input 1 by a voltage 0...10V signal. The set point is 4 bar is equivalent to 6,66V (10V/6bar*4bar).

Info: the set point via analog input has a higher priority than the set point via display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value: differential pressure sensor 4...20mA
1	Set point: 0...10V
18	Alarm

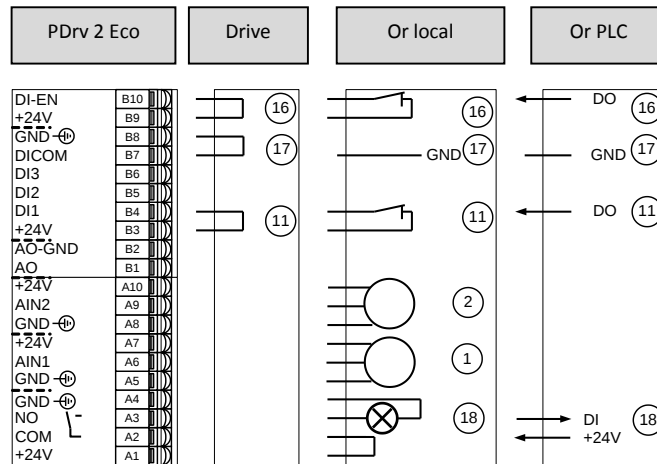
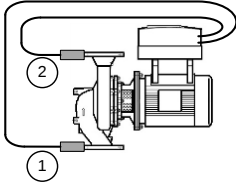
Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	0.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
3-8-1-1	Analog Input 1 Signal	4 = 0...10V	0 = Off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	1 = Setpoint/Control value (Auto)	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	6 = Differential Pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.4 Closed loop control: differential pressure with 2 pressure sensors 4...20 mA

A constant differential pressure of 4 bar is needed. A 4...20mA pressure sensor on the high pressure side with a measurement range of 0-6 bar is connected to analog input 1. A 4...20mA pressure sensor on the low pressure side with a measurement range of 0-2 bar is connected to analog input 2. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value high pressure side: Pressure sensor 4...20mA
1	Actual value low pressure side: Pressure sensor 4...20mA
18	Alarm

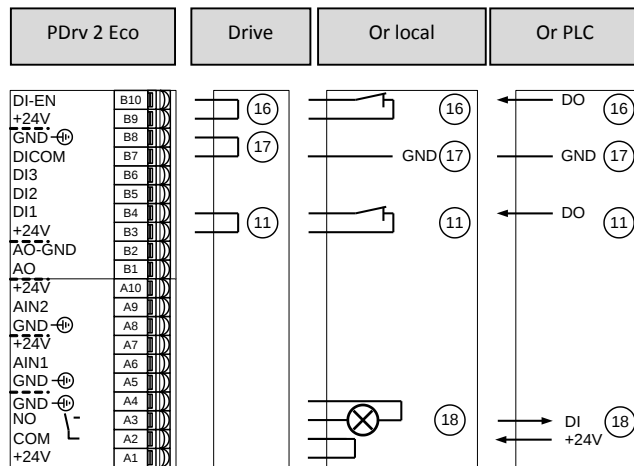
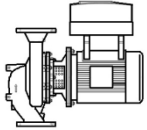
Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	0.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
3-8-1-1	Analog Input 1 Signal	1= 4...20mA	0 = Off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	5 = Discharge Pressure	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	2.00 [bar]	-	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	4 = Suction pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	2.00 [bar]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.5 Closed loop control: Sensorless differential pressure control

A constant differential pressure of 4 bar is needed without using a sensor. The set point is given by the display. The procedure is based on the characteristic curves of the pump. Steep power curves are conducive to high process accuracy. The process is suitable to a limited extent if sections of the power curve are constant over the flow rate. To facilitate sensorless differential pressure control, all parameters of the pump characteristic curves (3-4-1, 3-4-3-1 to 3-4-3-22) and the pipe diameters (3-5-2-1 und 3-5-2-2) must be entered. All needed parameters for the flow rate estimation like pipe diameters are preset in the pump production when ordering a completely assembled pump, motor and drive.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
18	Alarm

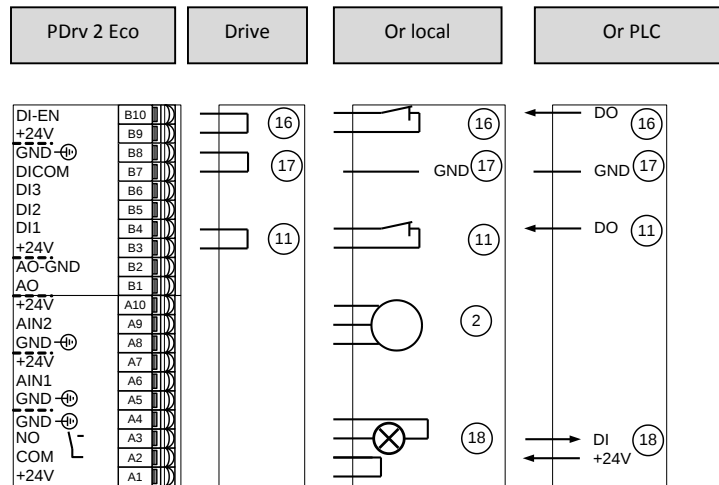
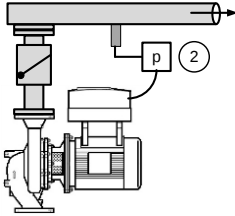
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	4 = Differential Pressure (sensorless)	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]	ServiceTool, Display
3-9-8-1	Flow Rate Estimation	1 = ON	preset	ServiceTool, Display
3-5-2-1	Pipe Diameter_Suction Pressure Measuring Point	30 mm	preset	ServiceTool
3-5-2-2	Pipe Diameter_Discharge Pressure Measuring Point	30 mm	preset	ServiceTool
3-5-2-3	Height Difference_Pressure Measuring Points	0,4 m	preset	ServiceTool
3-5-2-4	Pressure Measuring Point Positions	Close to Pump	preset	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.6 Closed loop control: pressure with pressure sensor 4...20 mA

A constant pressure of 4 bar is needed. The 4...20mA pressure sensor on the high pressure side with a measurement range of 0-6 bar is connected to analog input 2. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value Pressure: Pressure sensor 4...20mA
18	Alarm

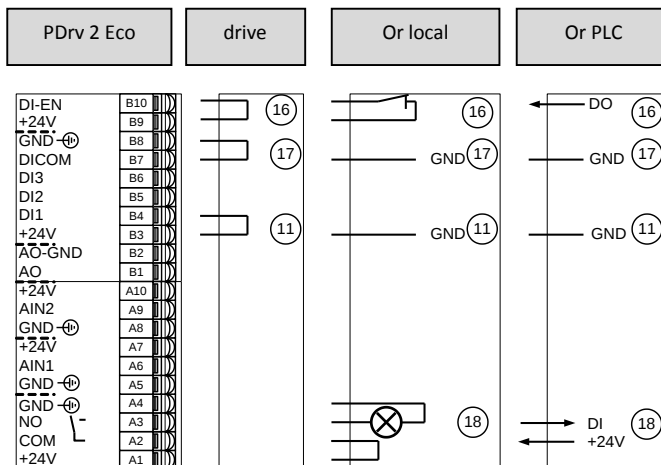
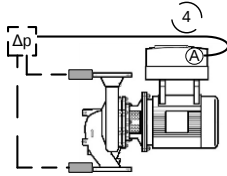
Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	1 = Discharge Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	0.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	5 = Discharge Pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

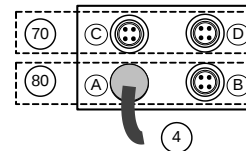
2) Pre-settings for completely assembled pump, motor, drive

2.2.7 Closed loop control: Pressure with PumpMeter (Modbus)

A constant pressure of 4 bar is needed. PumpMeter is used as a pressure sensor in the measurement range of -1 ... 10 bar. PumpMeter is connected by Modbus to the M12 Module of the drive. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
18	Alarm
4	Actual value: tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)



Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	M12 Module female A: connection PumpMeter (Modbus)
B	-
C	-
D	-

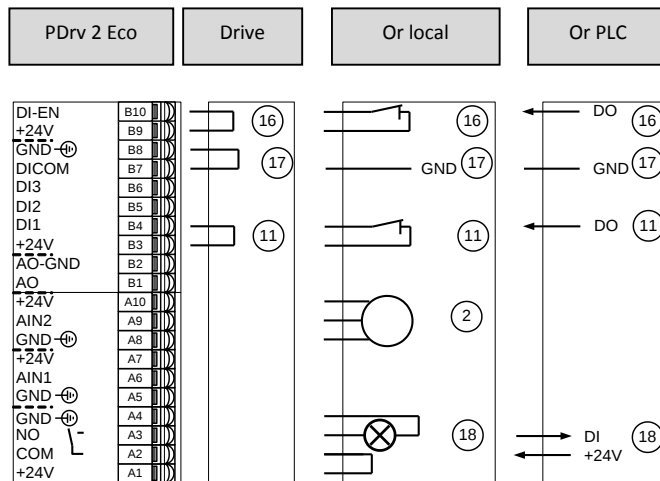
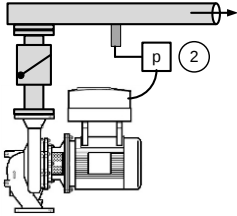
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	1 = Discharge Pressure	preset - see chapter 1	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	preset	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	preset acc. specified Q _H	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/Discharge Pressure	preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive and PumpMeter

2.2.8 Closed loop control: Pressure with Pressure sensor 0...10 V

A constant pressure of 4 bar is needed. The 0...10V pressure sensor on the high pressure side with a measurement range of 0-6 bar is connected to analog input 2. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value Pressure: Pressure sensor 0...10V
18	Alarm

Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	1 = Discharge Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	0.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	4 = 0...10V	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	5 = Discharge Pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

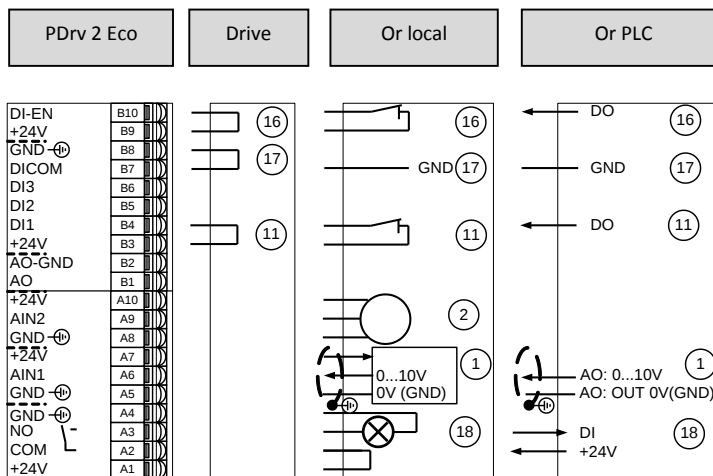
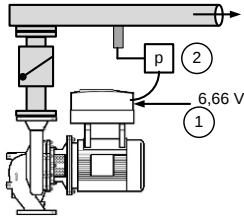
1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.9 Closed loop control: Pressure, Set point (closed loop) at analog input 0...10V

A constant pressure of 4 bar is needed. A 4...20mA pressure sensor on the high pressure side with a measurement range of 0-6 bar is connected to analog input 2. The set point is given by an external voltage signal connected to analog input 1. A set point with 4 bar is equal to 6,66V ($10V/6bar \cdot 4bar$).

Info: The set point given by an analog input has a higher priority than the set point typed in at display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	Optional: System start with DI ¹⁾
2	Actual value: Pressure sensor 4...20mA
1	Set point (closed loop): 0...10V
18	Alarm

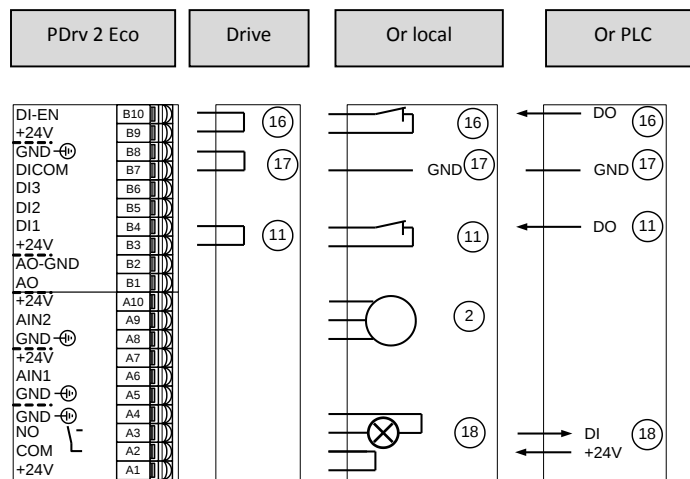
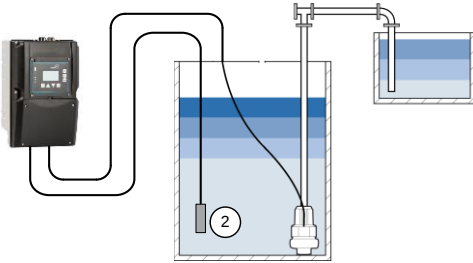
Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	1 = Discharge Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	0.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	bar	ServiceTool
3-8-1-1	Analog Input 1 Signal	4 = 0...10V	0 = Off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	1 = Setpoint/Control value (Auto)	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	5 = Discharge Pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.10 Closed loop control: constant level at low pressure side with submersible sensor 4...20mA

A constant level of 2 m is needed in a tank on the suction side. The 4...20mA level sensor with a measurement range of 0-1 bar is connected to analog input 2. 1 bar is equal to 10,197 meter water column. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value low pressure side: submersible sensor 4...20mA
18	Alarm

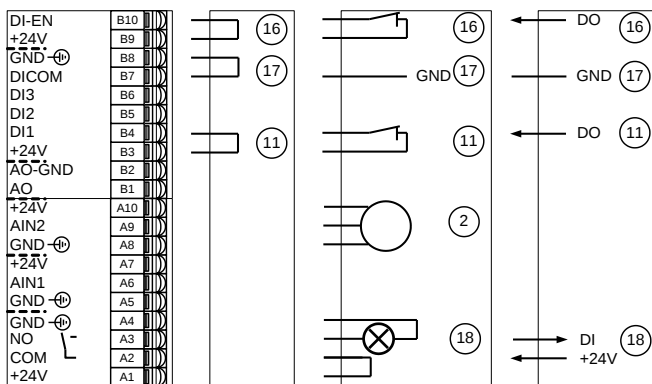
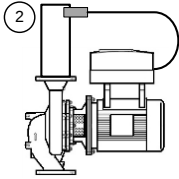
Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	8 = Suction-side Level	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-5-1	Minimum Level	0.00 [m]	preset	ServiceTool
3-11-5-2	Maximum Level	10.20 [m]	100,00 [m]	ServiceTool
3-11-5-3	Level Unit	m	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	2.00 [m]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	8 = Level	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [m]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	10.20 [m]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.11 Closed loop control: temperature with thermometer 4...20mA

A constant cooling temperature of 50°C is needed. The 4...20mA thermometer on the high pressure side with a measurement range of 0-150°C is connected to analog input 2. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value: thermometer 4...20mA
18	Alarm

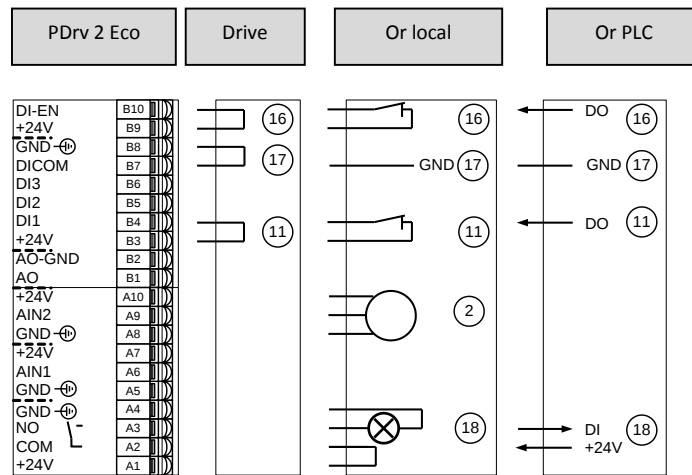
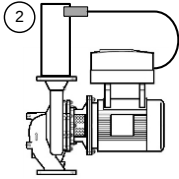
Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	6 = Temperature (Cooling)	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-4-1	Minimum Temperature	0.00 [°C]	-200.00 [°C]	ServiceTool
3-11-4-2	Maximum Temperature	150.00 [°C]	350.00 [°C]	ServiceTool
3-11-4-3	Temperature Unit	°C	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	50.00 [°C]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	9 = Temperature	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [°C]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	150.00 [°C]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

2.2.12 Closed loop control: Flow rate with flow rate sensor 4...20mA

A constant flow rate of 100 l/min is needed. The 4...20mA flow rate sensor on the high pressure side with a measurement range of 0...200 l/min is connected to analog input 2. The set point is given by the display.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI1 ¹⁾
2	Actual value: Flow rate sensor 4...20mA
18	Alarm

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	5 = Flow Rate	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-3-1	Minimum Flow Rate	0.00 [l/min]	0.00 [m³/h]	ServiceTool
3-11-3-2	Maximum Flow Rate	200.00 [l/min]	9999.99 [m³/h]	ServiceTool
3-11-3-3	Flow Rate Unit	l/min	m³/h	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	100.00 [l/min]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	7 = Flow Rate	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [l/min]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	200.00 [l/min]	-	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

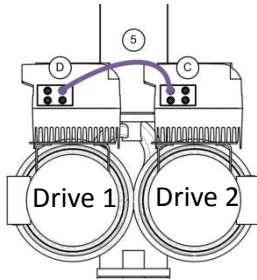
2) Pre-settings for completely assembled pump, motor, drive

3. Double pump

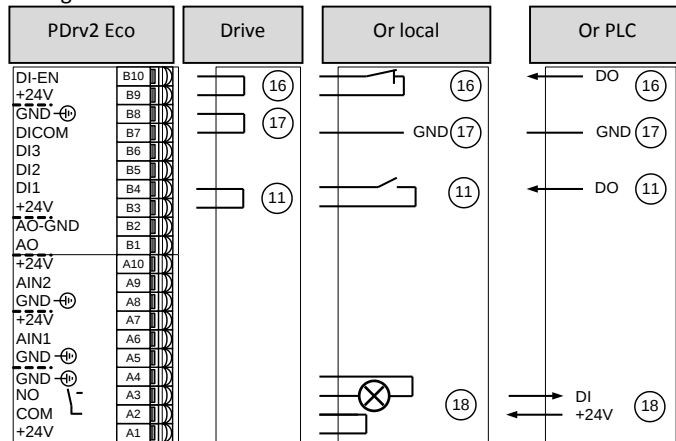
3.1 Double pump – Open loop control

3.1.1 Open loop control: control value at display

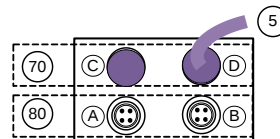
Etaline Z double pump (2x100%): A fixed speed of 2000 1/min should be set on the display. The nominal speed of the 2 pole motor is 2950 1/min. Pump changeover will take place regularly after 24 hours of operation.



Configuration of drive 1:



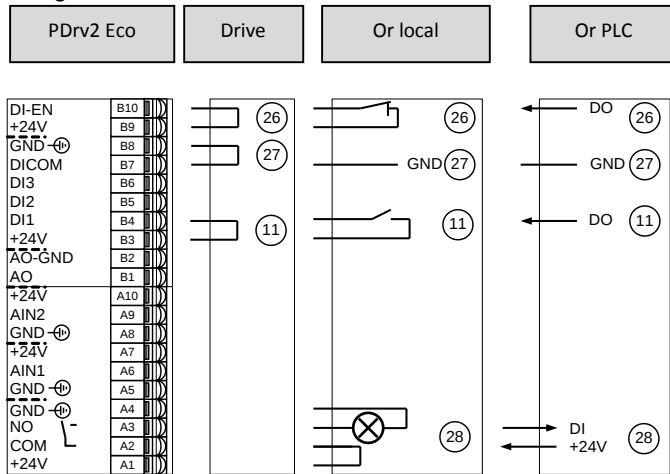
Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI ¹⁾
18	Alarm
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)



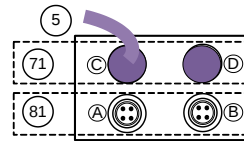
Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	-
B	-
C	M12 Module female C: Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus)

Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
1-3-3	Control Value (Open-loop Control)	2000 [1/min]	motor specific	ServiceTool, Display
3-7-1	Role in multi pump operation	0 = Master	preset	ServiceTool, Display
3-7-2	Pumps running	1	preset	ServiceTool, Display
3-7-4-1	Automatic pump change	1 = operating hours	preset	ServiceTool, Display
3-7-4-2	Time pump running	24 [h]	preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

Configuration of drive 2:



Nr.	Function
26	Enable power electronic
27	Ground for digital inputs
11	System start with DI ¹⁾
28	Alarm
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)



Nr.	Function
71	M12 Module: Double and multi pump operation
81	M12 Module: PumpMeter
A	-
B	-
C	M12 Module female C: for Double and multi pump operation (KSB-device bus)
D	M12 Module female D: Bus resistor

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	3000 [1/min]	preset	ServiceTool, Display
1-3-3	Control Value (Open-loop Control)	2000 [1/min]	motor specific	ServiceTool, Display
3-7-1	Role in multi pump operation	0 = Master	preset	ServiceTool, Display
3-7-2	Pumps running	1	preset	ServiceTool, Display
3-7-4-1	Automatic pump change	1 = Operating hours	preset	ServiceTool, Display
3-7-4-2	Time pump running	24 [h]	preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

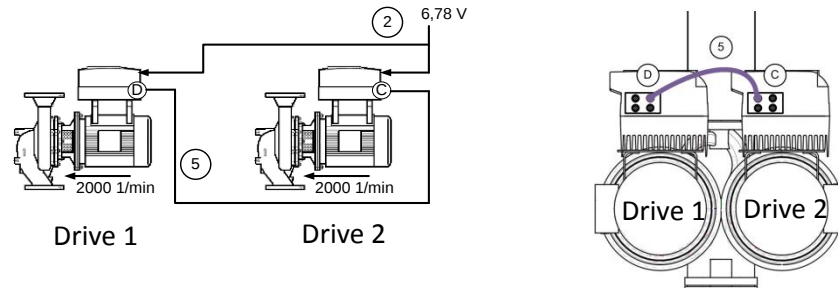
1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

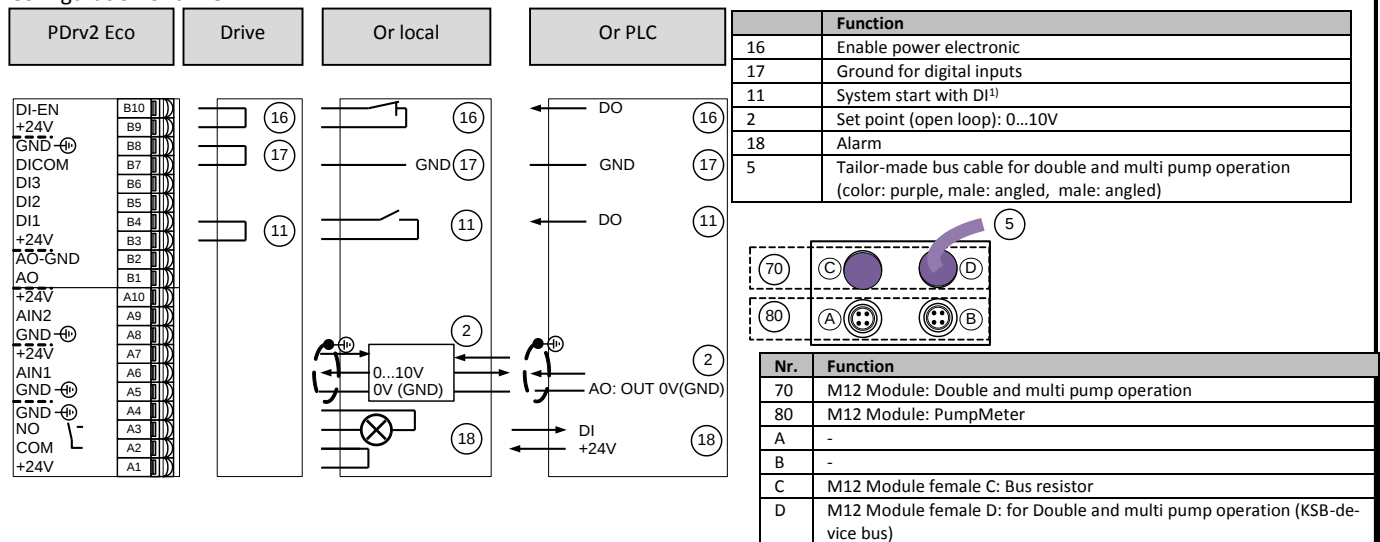
3.1.2 Open loop control: control value with external signal

Etaline Z double pump (2x50%): A fixed speed of 2000 1/min is given by an external signal 0...10V at analog input 1. 2000 1/min is equal to 6.78 V when using a 2-pole motor with a nominal speed of 2950 1/min.

Information: the set point can't be lower than the minimum speed.

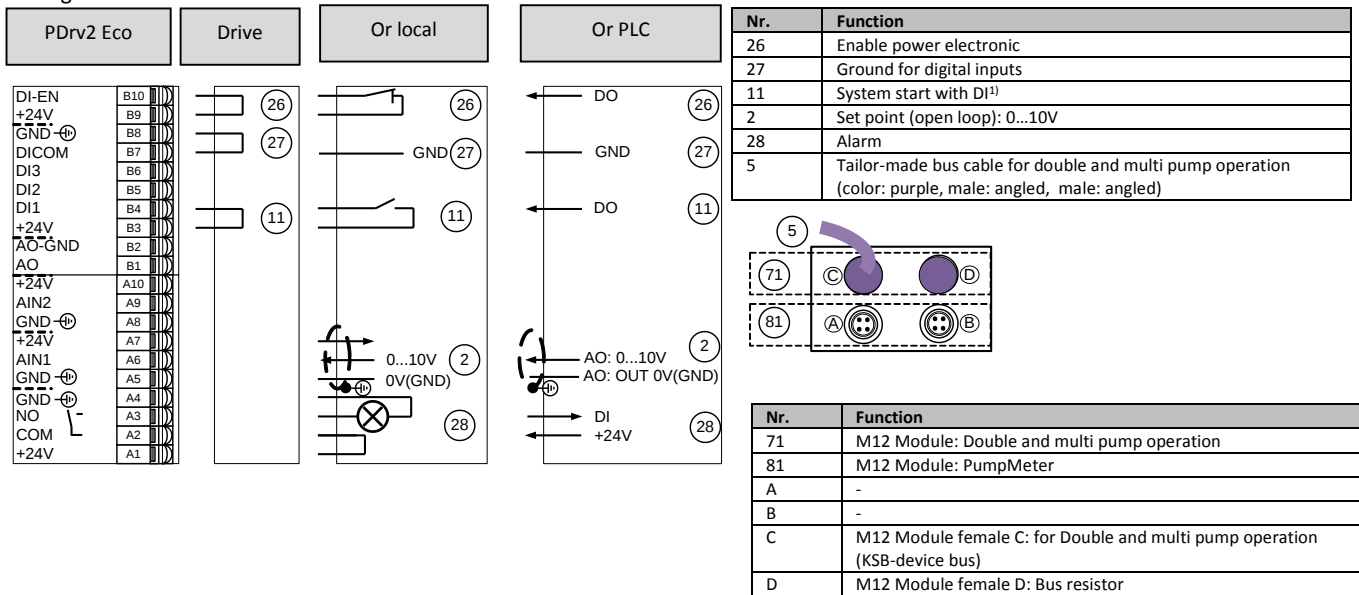


Configuration of drive 1:



Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
3-8-1-1	Analog Input 1 Signal	4 = 0...10V	0 = Off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	1 = Setpoint/Control value (Auto)	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0 [1/min]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	2950 [1/min]	-	ServiceTool, Display
3-7-1	Role in multi pump operation	0 = Master	preset	ServiceTool, Display
3-7-2	Pumps running	2	1	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

Configuration of drive 2:



Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	0 = OFF (Open-loop Control)	preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	preset	ServiceTool, Display
3-8-1-1	Analog Input 1 Signal	4 = 0...10V	0 = off	ServiceTool, Display
3-8-1-2	Analog Input 1 Function	1 = Setpoint/Control value (Auto)	0 = No Function	ServiceTool, Display
3-8-1-3	Analog Input 1 Lower Limit	0 [1/min]	-	ServiceTool, Display
3-8-1-4	Analog Input 1 Upper Limit	2950 [1/min]	-	ServiceTool, Display
3-7-1	Role in multi pump operation	0 = Master	preset	ServiceTool, Display
3-7-2	Pumps running	2	1	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

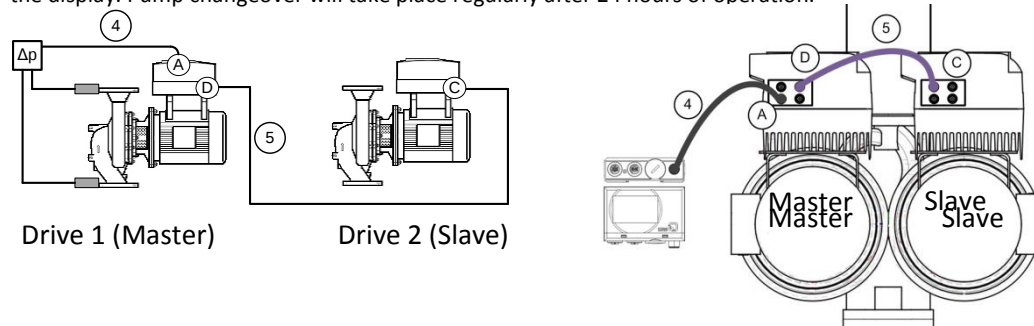
1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

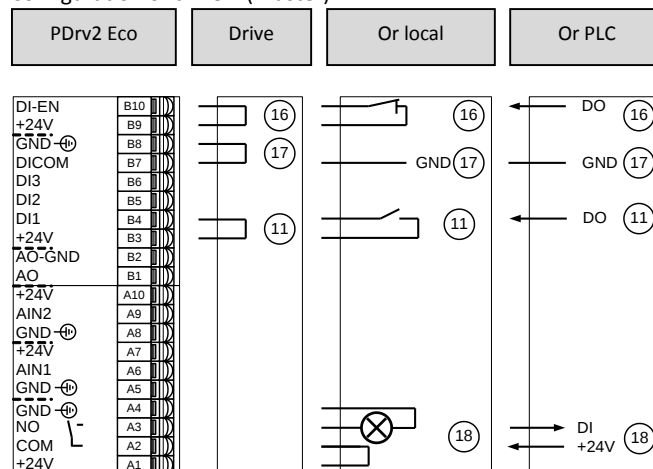
3.2 Double pump – closed loop control

3.2.1 Closed loop control non redundant: differential pressure with PumpMeter (Modbus) – typical application

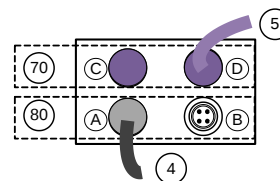
Etaline Z double pump (2x100%): A constant differential pressure of 4 bar is needed. PumpMeter is used as a differential pressure sensor in the measurement range of -1 ... 10 bar. PumpMeter is connected by Modbus to the M12 Module of the drive. The set point is given by the display. Pump changeover will take place regularly after 24 hours of operation.



Configuration of drive 1 (Master):



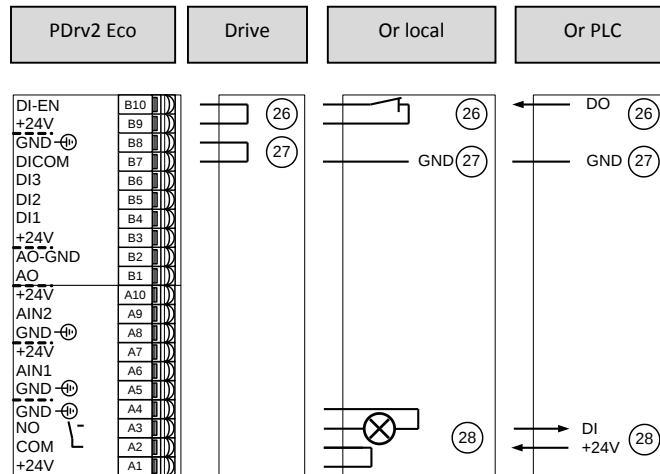
Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI ¹⁾
18	Alarm
4	Actual value: tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)



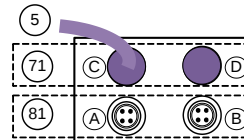
Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	M12 Module female A: connection PumpMeter (Modbus)
B	-
C	M12 Module female C: Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus)

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	preset	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	preset	ServiceTool
3-11-2-3	Pressure Unit	bar	preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	preset acc. specified Q _H	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/Discharge Pressure	preset	ServiceTool, Display
3-7-1	Role in multi pump operation	0 = Master	preset	ServiceTool, Display
3-7-2	Pumps running	1	preset	ServiceTool, Display
3-7-4-1	Automatic pump change	1 = operating hours	preset	ServiceTool, Display
3-7-4-2	Time pump running	24	preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	preset	ServiceTool

Configuration of drive 2 (Slave):



Nr.	Function
26	Enable power electronic
27	Ground for digital inputs
11	System start with DI ¹⁾
28	Alarm
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)



Nr.	Function
71	M12 Module: Double and multi pump operation
81	M12 Module: PumpMeter
A	-
B	-
C	M12 Module female C: for Double and multi pump operation (KSB-device bus)
D	M12 Module female D: Bus resistor

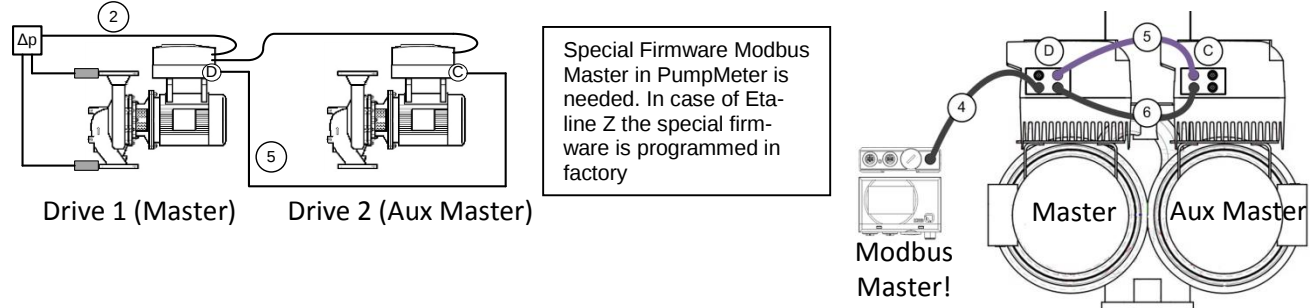
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-7-1	Role in Multiple Pump System	1 = Auxiliary	preset	ServiceTool, Display

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

3.2.2 Closed loop control redundant: differential pressure with PumpMeter (Modbus)

Etaline Z double pump (2x100%): A constant differential pressure of 4 bar is needed. PumpMeter is used as a differential pressure sensor in the measurement range of -1 ... 10 bar. PumpMeter is connected by Modbus to the M12 Module of the drive. The sensor signal of PumpMeter is linked by a cross link cable (see accessories) from drive to drive. The AuxMaster can take over control if the Master fails. The set point is given by the display. Pump changeover will take place regularly after 24 hours of operation.



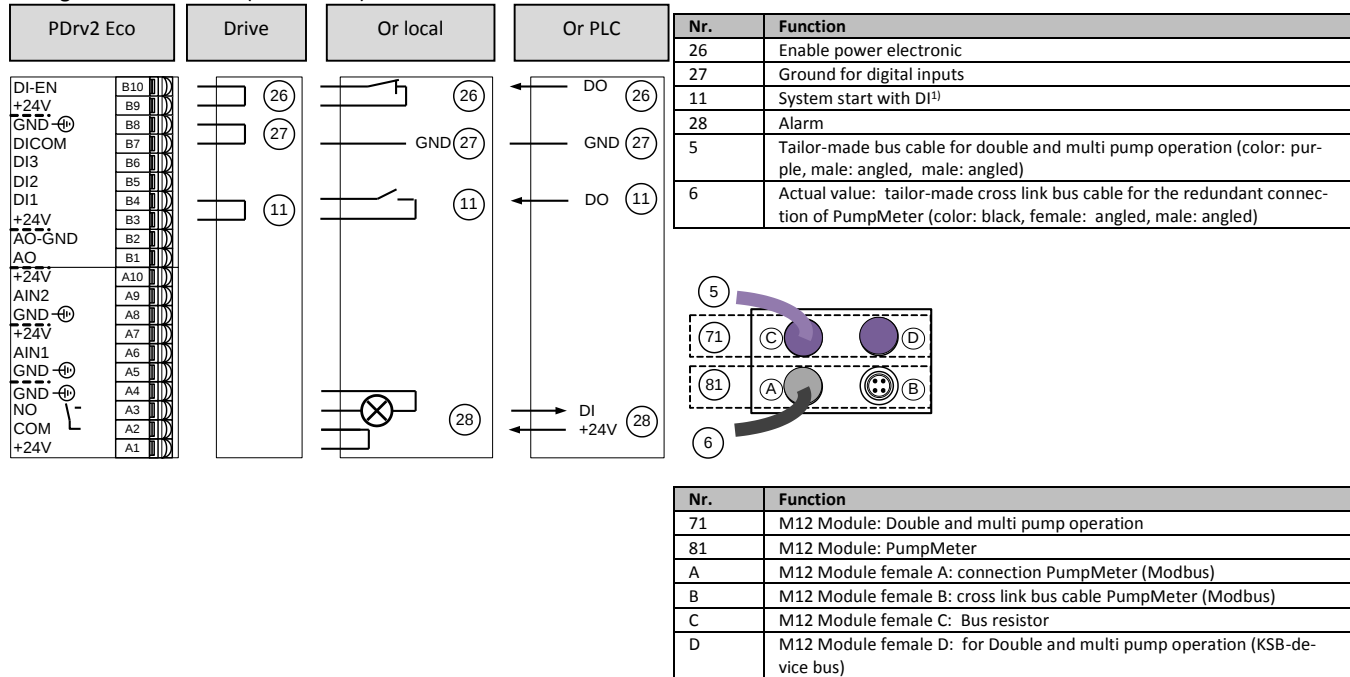
Configuration of drive 1 (Master):

PDrv2 Eco	Drive	Or local	Or PLC	Nr.	Function
DI-EN	B10		DO (16)	16	Enable power electronic
+24V	B9			17	Ground for digital inputs
GND	B8		GND (17)	11	System start with DI ¹⁾
DICOM	B7			18	Alarm
DI3	B6			4	Actual value: tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)
DI2	B5		DO (11)	5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)
DI1	B4			6	Actual value: tailor-made cross link bus cable for the redundant connection of PumpMeter (color: black, female: angled, male: angled)
+24V	B3				
AO-GND	B2				
AO	B1				
+24V	A10				
AIN2	A9				
GND	A8				
+24V	A7				
AIN1	A6				
GND	A5				
NO	A4				
COM	A3				
+24V	A2				
	A1				

Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	M12 Module female A: connection PumpMeter (Modbus)
B	M12 Module female B: cross link bus cable PumpMeter (Modbus)
C	M12 Module female C: Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus)

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	preset	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	Preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	Preset	ServiceTool
3-11-2-3	Pressure Unit	bar	Preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	Acc. specified Q,H preset	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/Dis-charge Pressure	Preset	ServiceTool, Display
3-13-5	PumpMeter Master/Slave	Master	Preset for Etaline Z	ServiceTool
3-7-1	Role in multi pump operation	0 = Master	Preset	ServiceTool, Display
3-7-2	Pumps running	1	Preset	ServiceTool, Display
3-7-4-1	Automatic pump change	1 = Operating hours	Preset	ServiceTool, Display
3-7-4-2	Time pump running	24	Preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool

Configuration of drive 2 (AuxMaster):



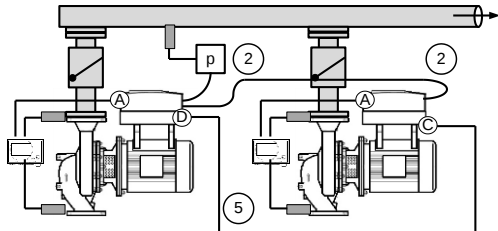
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	Preset	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	Preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	Preset	ServiceTool
3-11-2-3	Pressure Unit	bar	Preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	preset acc. specified Q,H	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/Discharge Pressure	Preset	ServiceTool, Display
3-13-5	PumpMeter Master/Slave	Master	Preset for Etaline Z	ServiceTool
3-7-1	Role in multi pump operation	0 = master	Slave when Etaline Z	ServiceTool, Display
3-7-2	Pumps running	1	Preset	ServiceTool, Display
3-7-4-1	Automatic pump change	1 = Operating hours	Preset	ServiceTool, Display
3-7-4-2	Time pump running	24	Preset	ServiceTool, Display
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

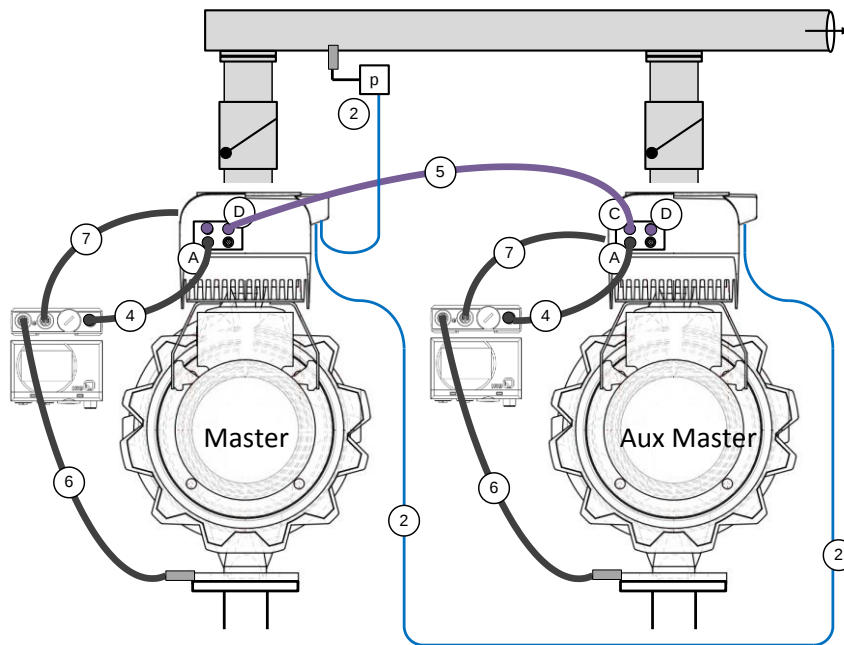
2) Pre-settings for completely assembled pump, motor, drive and PumpMeter

3.2.3 Closed loop control redundant: Discharge pressure with sensor 4...20mA and PumpMeter each pump

Etaline / Etabloc (2x100%): In a multi pump system with three pumps a constant pressure of 4bar is needed. The 4...20mA pressure sensor with a measurement range of 0-6 bar placed in the manifold is connected in parallel to each analog input 2 of Master and AuxMaster1. The AuxMaster can take over control if the Master fails. When connecting a 4...20mA sensor in parallel to all drives the 4...20mA current signal must be converted to 2...10V voltage signal: therefore the DIP switch of the analog input 2 of the Master must be set to "ON"³⁾. Each pump uses PumpMeter as an internal sensor -1 to 6bar, which is not used for the control. The set point is given by the display.

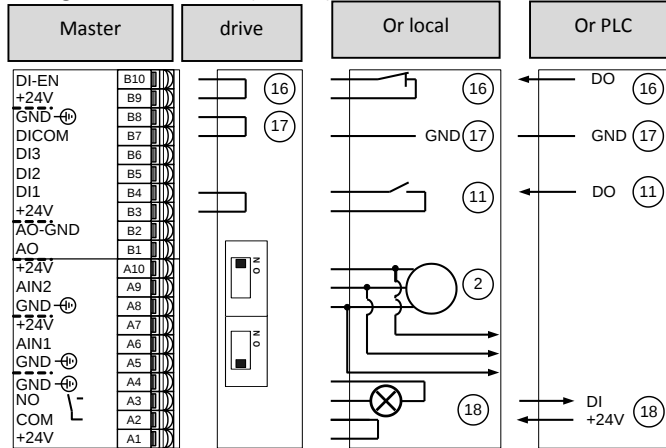


Drive 1 (Master) Drive 2 (AuxMaster)

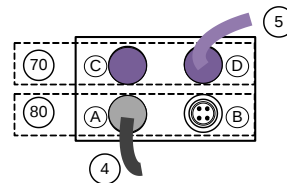


Nr.	Function
2	Actual value: pressure sensor 4...20mA redundant
4	Tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)
6	Sensor PumpMeter suction side
7	Sensor PumpMeter pressure side
A	M12 12 Module female A: connection PumpMeter (Modbus)
B	-
C	M12 Module female C: for Double and multi pump operation (KSB-device bus) or Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus) or Bus resistor

Configuration of Drive 1 (Master):



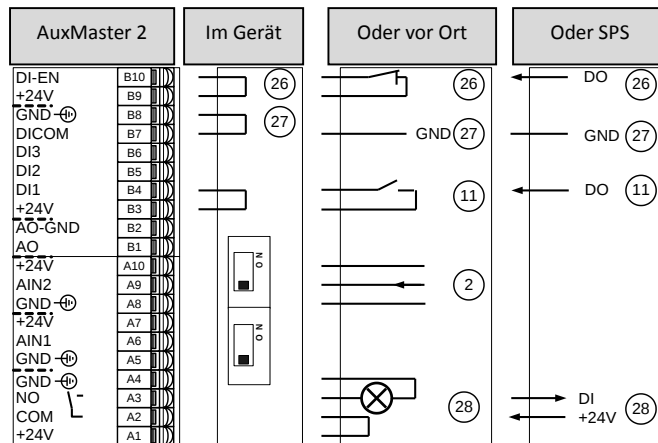
Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI ¹⁾
2	Actual value: pressure sensor 4...20mA
18	Alarm
4	Tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)



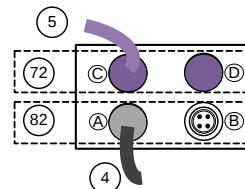
Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	M12 12 Module female A: connection PumpMeter (Modbus)
B	-
C	M12 Module female C: Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus)

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾
3-6-1	Type of Control	1= Discharge Pressure	3 = Differential pressure
3-11-2-1	Minimum Pressure	0.00 [bar]	-1.00 [bar]
3-11-2-2	Maximum Pressure	6.00 [bar]	6.00 [bar]
3-11-2-3	Pressure Unit	bar	Preset
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]
3-8-2-1	Analog Input 2 Signal	2 = 2...10V ³⁾	0 = OFF
3-8-2-2	Analog Input 2 Function	5 = Discharge Pressure	0 = No Function
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-
3-8-4-1	Function M12 Module Input A	2 = PMtr Internal Suction/Discharge Pressure ⁴⁾	1 = PMtr Suction/Discharge Pressure
3-7-1	Role in Multiple Pump System	0 = Master control	Preset
3-7-2	Maximum Number of Pumps Running	1	1
3-7-4-1	Automatic Pump Changeover	1 = Runtime	Preset
3-7-4-2	Runtime Prior to Pump Changeover	24	Preset
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset

Configuration Drive 2 (AuxMaster 1):



Nr.	Function
26	Enable power electronic
27	Ground for digital inputs
11	System start with DI ¹⁾
2	Actual value: pressure sensor 4...20mA
28	Alarm
4	Tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)



Nr.	Function
72	M12 Module: Double and multi pump operation
82	M12 Module: PumpMeter
A	M12 12 Module female A: connection PumpMeter (Modbus)
B	-
C	M12 Module female C: for Double and multi pump operation (KSB-device bus)
D	M12 Module female D: Bus resistor

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾
3-6-1	Type of Control	1= Discharge Pressure	3 = Differential pressure
3-11-2-1	Minimum Pressure	0.00 [bar]	-1.00 [bar]
3-11-2-2	Maximum Pressure	6.00 [bar]	6.00 [bar]
3-11-2-3	Pressure Unit	bar	Preset
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]
3-8-2-1	Analog Input 2 Signal	2 = 2...10V ³⁾	0 = OFF
3-8-2-2	Analog Input 2 Function	5 = Discharge Pressure	0 = No Function
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-
3-8-4-1	Function M12 Module Input A	2 = PMtr Internal Suction/Discharge Pressure ⁴⁾	1 = PMtr Suction/Discharge Pressure
3-7-1	Role in Multiple Pump System	0 = Master control	Preset
3-7-2	Maximum Number of Pumps Running	1	1
3-7-4-1	Automatic Pump Changeover	1 = Runtime	Preset
3-7-4-2	Runtime Prior to Pump Changeover	24	Preset
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

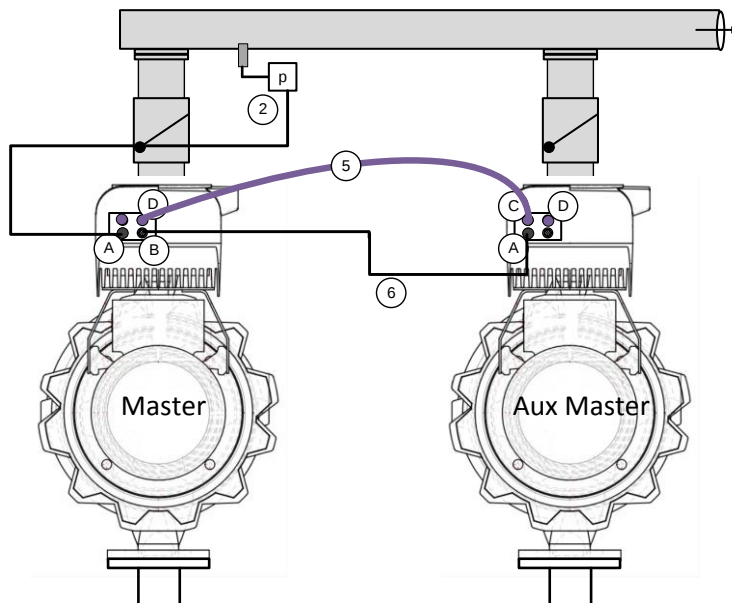
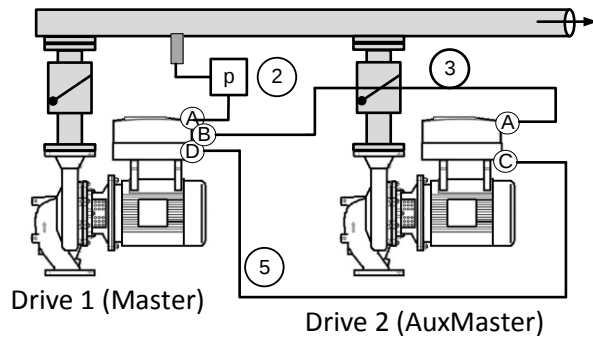
2) Pre-settings for completely assembled pump, motor, drive

3) On all drives will be the 4...20mA signal converted to 2...10V³⁾ signal, if the DIP switch in the Master is set to „ON“

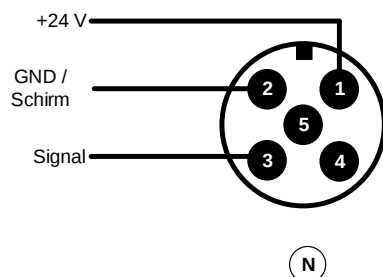
4) If PumpMeter is only used as an internal measured variable at input A of the M12 module (via Modbus) and not for control, the Function M12 Module Input A parameter (3-8-4-1) must be set to PMtr Internal Suction/Discharge Pressure.

3.2.4 Closed loop control redundant: Discharge pressure with pressure sensor 4...20mA via M12

Etaline / Etabloc (2x100%): In a multi pump system with three pumps a constant pressure of 4bar is needed. The 4...20mA pressure sensor with a measurement range of 0-6 bar placed in the manifold is connected in parallel to each analog input 2 of Master and AuxMaster1. The AuxMaster can take over control if the Master fails. When connecting a 4...20mA sensor in parallel to all drives the 4...20mA current signal must be converted to 2...10V voltage signal: therefore the DIP switch of the analog input 2 of the Master must be set to "ON"³⁾. The set point is given by the display. After 24 h the pumps switch automatically.

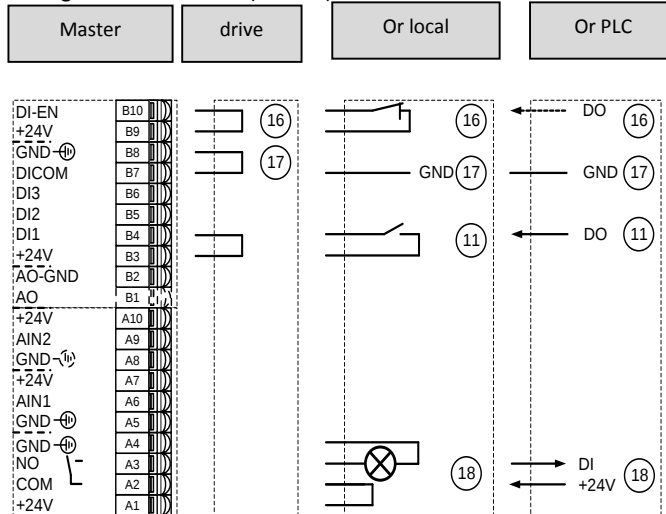


Assignment M12 plug pressure sensor:

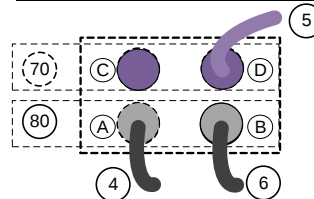


Nr.	Function
2	Actual value: pressure sensor 4...20mA redundant
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)
6	tailor-made cross link bus cable for the redundant connection of the pressure sensor (color: black, female: angled, male: angled)
A	M12 Module female A: connection pressure sensor
B	M12 Module female B: connection cross link bus cable for the redundant connection
C	M12 Module female C: for Double and multi pump operation (KSB-device bus) or Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus) or Bus resistor

Configuration of Drive 1 (Master):



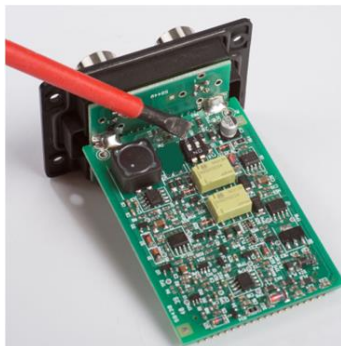
Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI ¹⁾
18	Alarm
4	Tailor-made cable for the connection of pressure sensor to the M12 Module
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)
6	tailor-made cross link bus cable for the redundant connection of the pressure sensor (color: black, female: angled, male: angled)



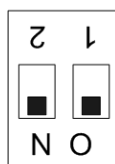
Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter / Pressure Sensor
A	M12 Module female A: connection pressure sensor
B	M12 Module female B: cross link bus cable for the redundant connection of the pressure sensor
B	M12 Module female B: cross link cable is not necessary if there is an additional sensor connected to the Aux Master.
C	M12 Module female C: Bus resistor
D	M12 Module female D: for Double and multi pump operation (KSB-device bus)

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Adjustable via
3-6-1	Type of Control	1= Discharge Pressure	3 = Differential pressure	ServiceTool, HMI
3-11-2-1	Minimum Pressure	0.00 [bar]	-1.00 [bar]	ServiceTool, HMI
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool, HMI
3-11-2-3	Pressure Unit	bar	Preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]	ServiceTool, HMI
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, HMI
3-8-4-1	Function M12 Module Input A	4 = Discharge Pressure	0 = OFF	ServiceTool, HMI
3-8-4-2	Lower Limit M12 Module Input A	0.00 [bar]	-	ServiceTool, HMI
3-8-4-3	Upper Limit M12 Module Input A	6.00 [bar]	-	ServiceTool, HMI
3-7-1	Role in Multiple Pump System	0 = Master control	Preset	ServiceTool, HMI
3-7-2	Maximum Number of Pumps Running	1	Preset	ServiceTool, HMI
3-7-4-1	Automatic Pump Changeover	1 = Runtime	Preset	ServiceTool
3-7-4-2	Runtime Prior to Pump Changeover	24	Preset	ServiceTool, HMI
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool

DIP Switch M12 Module Drive 1

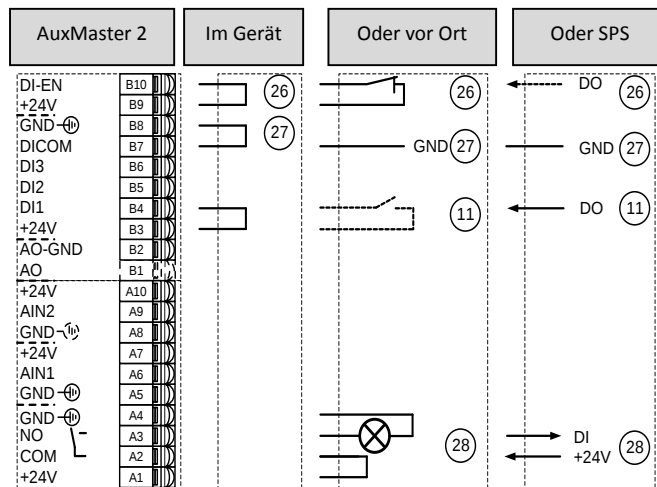


CURR-IN
485-TRM

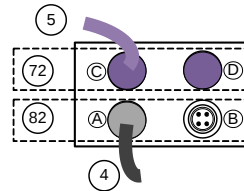


(Picture shows the preset DIP switch)

Configuration Drive 2 (AuxMaster 1):



Nr.	Function
26	Enable power electronic
27	Ground for digital inputs
11	System start with DI ¹⁾
28	Alarm
4	Tailor-made cable for the connection of pressure sensor to the M12 Module
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)
6	tailor-made cross link bus cable for the redundant connection of the pressure sensor (color: black, female: angled, male: angled)

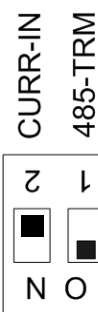
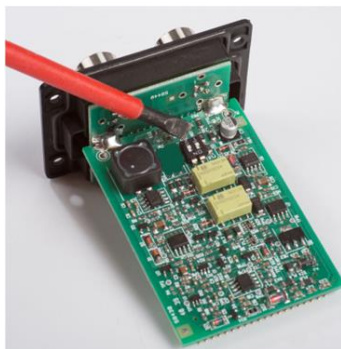


Nr.	Function
72	M12 Module: Double and multi pump operation
82	M12 Module: PumpMeter / Pressure Sensor
A	M12 Module female A: connection pressure sensor
B	-
C	M12 Module female D: for Double and multi pump operation (KSB-device bus)
D	M12 Module female C: Bus resistor

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Adjustable via
3-7-1	Role in Multiple Pump System	0 = Master control	Preset	ServiceTool, HMI
3-7-2	Maximum Number of Pumps Running	1	1	ServiceTool, HMI
3-7-4-1	Automatic Pump Changeover	1 = Runtime	Preset	ServiceTool, HMI
3-7-4-2	Runtime Prior to Pump Changeover	24	Preset	ServiceTool, HMI

- 1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)
- 2) Pre-settings for completely assembled pump, motor, drive
- 3) On all drives will be the 4...20mA signal converted to 2...10V signal, if the DIP switch in the Master is set to „ON“
- 4) If there is a cross link cable for the redundant connection of the pressure sensor, only one switch CURR-IN should be set to ON. So the 4...20mA signal will be converted to 2...10V signal.
- 5) If an additional sensor is connected to the AUX master the DIP switch should be ON.

DIP Switch M12 Module Drive 2

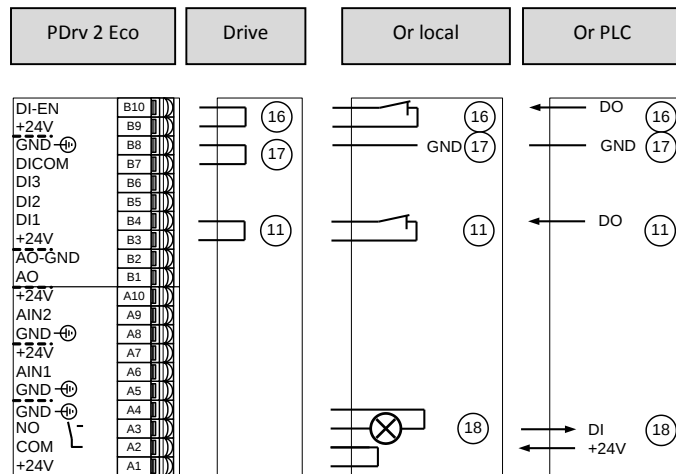
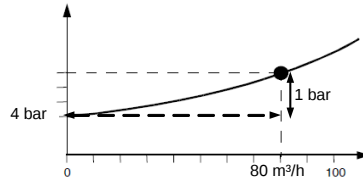
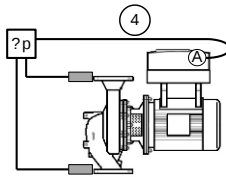


4. Pump functionality

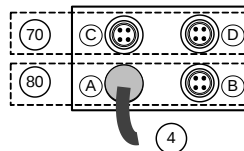
4.1 Closed loop control

4.1.1 Closed loop control: dynamic differential pressure set point compensation based on flow rate estimation

A constant differential pressure of 4 bar is needed. PumpMeter is used as a differential pressure sensor in the measurement range of -1 ... 10 bar. PumpMeter is connected by Modbus to the M12 Module of the drive. The set point is given by the display. For the optimal energy saving the “dynamic differential pressure set point compensation based on flow rate estimation” is activated. The nominal flow is 80 m³/h. The pipe friction losses are roundabout 1 bar. All parameters needed for the flow estimation like pipe diameters are preset individually for each pump size by the pump production when ordering a completely assembled pump, motor, drive.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI ¹⁾
18	Alarm
4	Actual value: tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)



Nr.	Function
70	M12 Module: Double and multi pump operation
80	M12 Module: PumpMeter
A	M12 Module female A: connection PumpMeter (Modbus)
B	-
C	-
D	-

Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	
3-6-1	Type of Control	3 = Differential Pressure	preset - see chapter 1	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	Preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	Preset	ServiceTool
3-11-2-3	Pressure Unit	bar	Preset	ServiceTool
3-11-3-1	Minimum Flow rate	0.00 [m³/h]	Preset	ServiceTool
3-11-3-2	Maximum Flow rate	100.00 [m³/h]	9999.99 [m³/h]	ServiceTool
3-11-3-3	Unit Flow rate	m³/h	Preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	preset acc. specified Q _{0H}	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/ Discharge Pressure	Preset	ServiceTool, Display
3-9-8-1	Flow Rate Estimation	1 = On	Preset	ServiceTool, Display
3-5-2-1	Pipe Diameter Suction Pressure Measuring Point	30 mm	Preset	ServiceTool

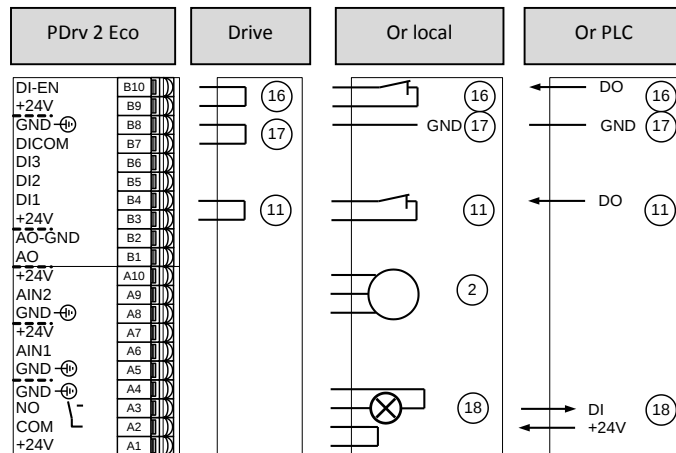
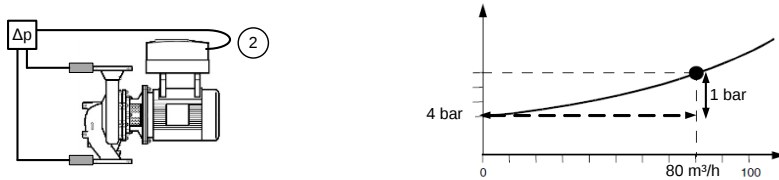
3-5-2-2	Pipe Diameter Discharge Pressure Measuring Point	30 mm	Preset	ServiceTool
3-5-2-3	Height Difference_Pressure Measuring Points	0,4 m	Preset	ServiceTool
3-5-2-4	Pressure Measuring Point Positions	Close to Pump	Preset	ServiceTool
3-9-3-1	Dynamic Pressure Setpoint Compensation Method	2 = Flow rate	0 = OFF	ServiceTool, Display
3-9-3-2	Dyn Press Setpoint Comp Q Data Point	80.00 [m³/h]	0.00 [bar]	ServiceTool
3-9-3-4	Setpoint Compensation	1.00 [bar]	0.00 [bar]	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive and PumpMeter

4.1.2 Closed loop control: dynamic differential pressure set point compensation based on speed

A constant differential pressure of 4 bar is needed. The 4...20mA differential pressure sensor with a measurement range of 0-6 bar is connected to analog input 2. The set point is given by the display. If neither the measured nor estimated flow rate is available, dynamic pressure setpoint compensation can be realized based on speed. This is only possible for closed hydraulic circuits, however. The nominal flow is 80 m³/h. The pipe friction losses are roundabout 1 bar. All parameters needed for the flow estimation like pipe diameters are pre-set individually for each pump size by the pump production when ordering a completely assembled pump, motor, drive.



Nr.	Function
16	Enable power electronic
17	Ground for digital inputs
11	System start with DI ¹⁾
2	Actual value: pressure sensor 4...20mA
18	Alarm

Nr.	Parameter	Change value to	Pre-settings by factory 2)	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	0 = OFF (Open-loop Control)	ServiceTool, Display
3-11-2-1	Minimum Pressure	0.00 [bar]	-1,00 [bar]	ServiceTool
3-11-2-2	Maximum Pressure	6.00 [bar]	999,99 [bar]	ServiceTool
3-11-2-3	Pressure Unit	bar	Preset	ServiceTool
3-2-2-1	Minimum Motor Speed	500 [1/min]	Preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	Preset	ServiceTool, Display
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	0,00 [bar]	ServiceTool, Display
3-8-2-1	Analog Input 2 Signal	1 = 4...20mA	0 = Off	ServiceTool, Display
3-8-2-2	Analog Input 2 Function	6 = Differential Pressure	0 = No Function	ServiceTool, Display
3-8-2-3	Analog Input 2 Lower Limit	0.00 [bar]	-	ServiceTool, Display
3-8-2-4	Analog Input 2 Upper Limit	6.00 [bar]	-	ServiceTool, Display
3-9-3-1	Dynamic Pressure Setpoint Compensation Method	1 = speed	0 = Off	ServiceTool, Display
3-9-3-3	Dyn Press Setpoint Compensation Data Point	100 [%]	0 [%]	ServiceTool
3-9-3-4	Setpoint Compensation	1.00 [bar]	0.00 [bar]	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

4.1.3 Open loop control: 1 fix speed selected by digital switches or variable speed via analog signal

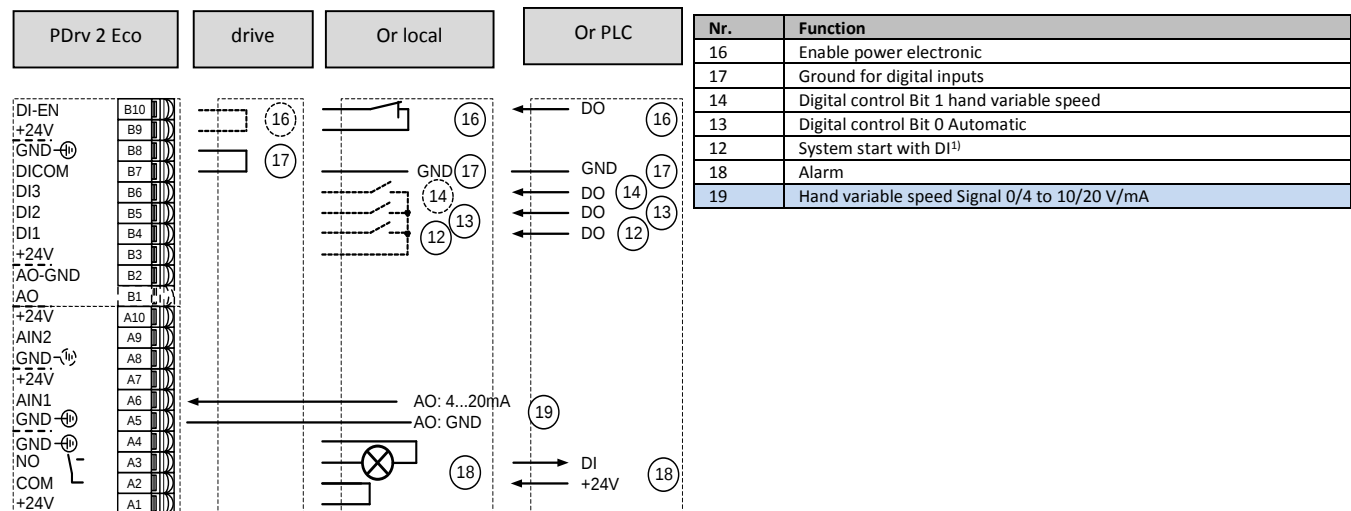
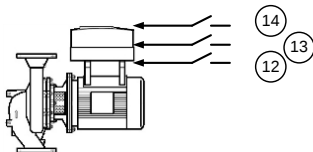
A fixed speed of 2000 1/min should be set on the display. The nominal speed of the 2 pole motor is 2950 1/min.
1 additional fixed speeds and OFF should be selectable by local digital switches:

Attention: The drive must now always be turned on via the digital inputs by selecting auto zero or Man

The keyboard will be blocked when you select this function

		DI 1 Automatic Run	DI 2: Control Digital Bit 0	DI 3: Control Digital Bit 1
All DI on 0	Off	0	0	0
Automatic only Bit 0 DI 2 on 1	Automatic	0	1	0
Automatic Start Bit 0 DI 2 on 1 and DI 1 on f 1	Automatic Start System	1	1	0
Hand variable speed only Bit 1 DI 3 on 1	Hand (variable speed)	0	0	1
Fix speed e.g. 2950 1/min DI 2 + 3 Bit 0 and 1 on 1	Hand (fix speed 1)	0	1	1

Info: by selecting a fixed speed the drive changes to manual operation. The Auto button at the display is then out of function (see also control point concept)



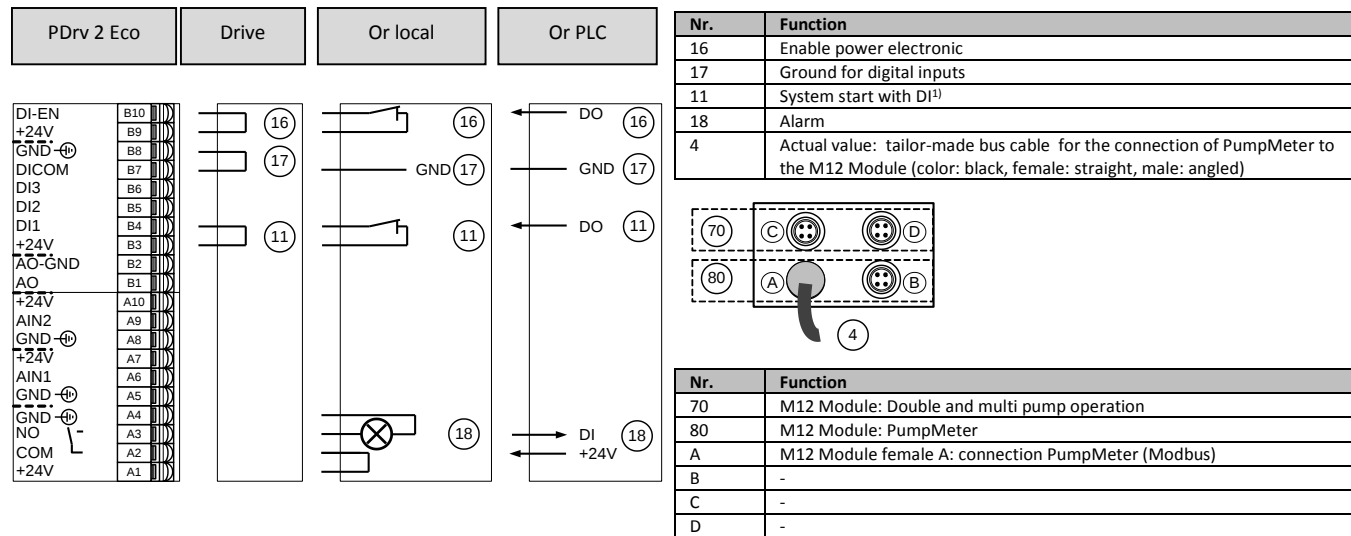
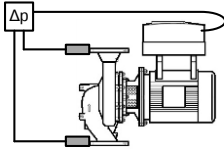
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	OFF (Open-loop Control)	Preset	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	Preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	Preset	ServiceTool, Display
1-3-3	Control Value (Open-loop Control)	2000 [1/min]	500 [1/min]	ServiceTool, Display
3-6-5-1	Fixed speed 1	2950 [1/min]	500 [1/min]	ServiceTool
3-8-1-2	Analog Input 1 Function	3 = Control Point Hand	0 = No Function	ServiceTool
3-8-1-3	Analog Input 1 Lower Limit	0 [1/min]	-	ServiceTool
3-8-1-4	Analog Input 1 Upper Limit	2950 [1/min]	-	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool
3-8-6-2	Digital Input 2 Function	Control Digital Bit 0	Reset Messages	ServiceTool
3-8-6-3	Digital Input 3 Function	Control Digital Bit 1	No Function	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive

4.1.4 Closed loop control: sleep Mode

A constant differential pressure of 4 bar is needed. PumpMeter is used as a differential pressure sensor in the measurement range of -1 ... 10 bar. PumpMeter is connected by Modbus to the M12 Module of the drive. The set point is given by the display. The frequency inverter stops the pump without setpoint increase in the case of low flow rates, i.e. when the low flow limit or stop speed is reached: Sleep mode without setpoint increase. Sleep mode is only active in the automatic operation.



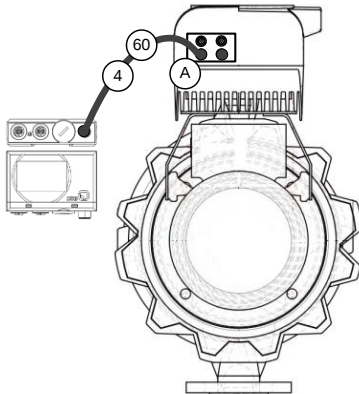
Nr.	Parameter	Change value to	Pre-settings by factory ²⁾	Changeable by
3-6-1	Type of Control	3 = Differential Pressure	preset - see chapter 1	ServiceTool, Display
3-2-2-1	Minimum Motor Speed	500 [1/min]	Preset	ServiceTool, Display
3-2-2-2	Maximum Motor Speed	2950 [1/min]	Preset	ServiceTool, Display
3-11-2-1	Minimum Pressure	-1.00 [bar]	Preset	ServiceTool
3-11-2-2	Maximum Pressure	10.00 [bar]	Preset	ServiceTool
3-11-2-3	Pressure Unit	bar	Preset	ServiceTool
1-3-2	Setpoint (Closed-loop Control)	4.00 [bar]	preset acc. specified Q,H	ServiceTool, Display
3-8-4-1	Function M12 Module Input A	1 = PMtr Suction/Discharge Pressure	Preset	ServiceTool, Display
3-9-4-1	Sleep Mode	1 = ON	0 = OFF	ServiceTool, Display
3-9-4-2	Setpoint Increase	0.00 [bar]	Preset	ServiceTool
3-9-4-3	Monitoring Period	30.0 [s]	Preset	ServiceTool
3-9-4-4	Duration of Setpoint Increase	100.0 [s]	Preset	ServiceTool
3-9-4-5	Permissible Deviation	1.00 [bar]	Preset	ServiceTool
3-9-4-6	Minimum Runtime	60.0 [s]	Preset	ServiceTool
3-9-4-7	Ramp-up Time for Setpoint Increase	30.0 [s]	Preset	ServiceTool
3-9-4-8	Stop Speed	500 [1/min]	Preset	ServiceTool
3-8-6-1	Digital Input 1 Function	System Start ¹⁾	Preset	ServiceTool

1) Digital Input 1 is set as at the factory as system start. If a digital input is set as system start, the parameter 1-3-1 System start is automatically without function (see control point concept in operating manual)

2) Pre-settings for completely assembled pump, motor, drive and PumpMeter

5. M12 Cable

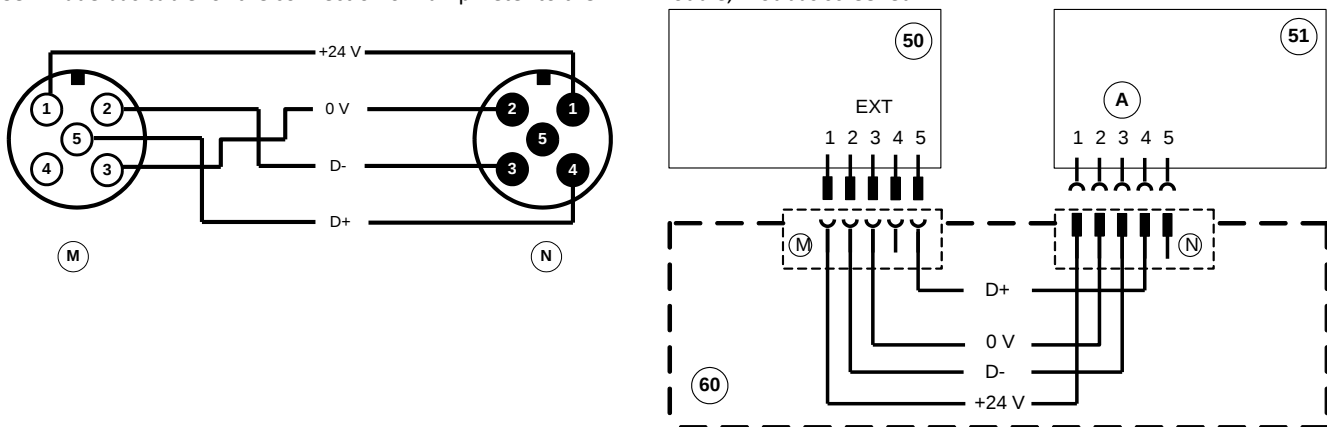
5.1 Bus cable for connecting PumpMeter to the M12-Module



Tailor-made cable

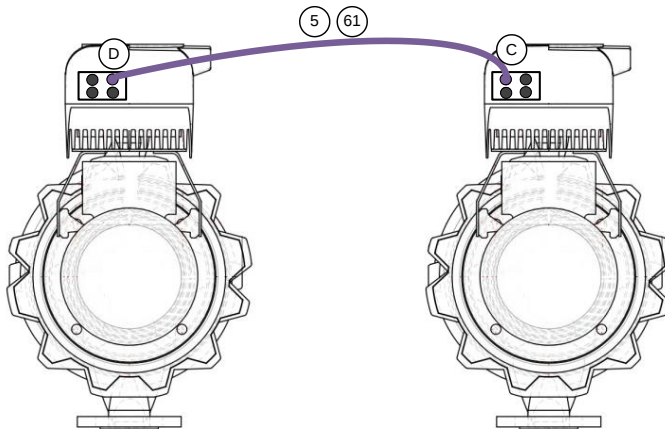
Nr.	function	length	Mat.-Nr.
4	tailor-made bus cable for the connection of PumpMeter to the M12 Module (color: black, female: straight, male: angled)	1 m	01533775
		2 m	01533776
		3 m	01533777
		5 m	01533778
		10 m	01670718
		20 m	01670719

Self-made bus cable for the connection of PumpMeter to the M12 Module, Modbus screened:



Nr.	Function	length	Mat.-Nr.
50	PumpMeter Connector EXT		
51	PumpDrive 2 M12 Module – Connector A		
60	CAN-Bus Cable, also for Modbus, cut to length, screened, twisted pair, cable 2 x 2 x 0,22 mm ²	1 m	01111184
		5 m	01304511
		10 m	01304512
		20 m	01304513
M	M12 female, A-coded, 5 poles (Binder Connector Type: 99 1436 814 05)		-
N	M12 male, A-coded, 5 poles		01523004

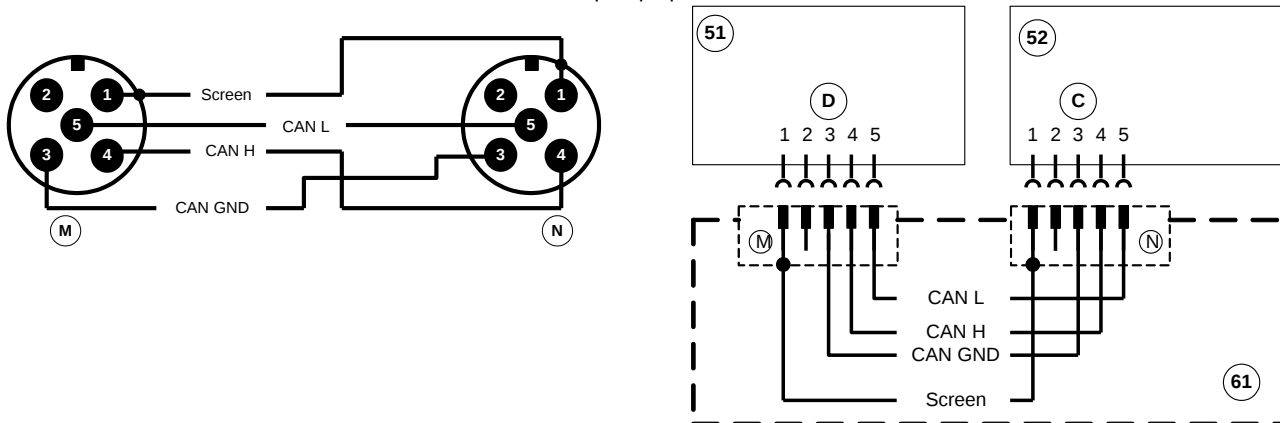
5.2 Bus cable for Double- and Multi Pump Operation



Tailor-made cable

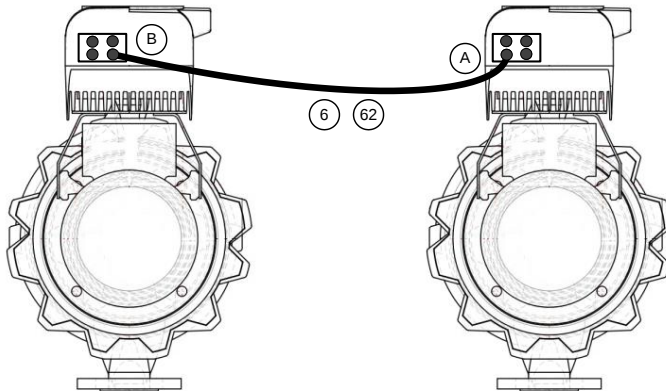
Nr.	function	length	Mat.-Nr.
5	Tailor-made bus cable for double and multi pump operation (color: purple, male: angled, male: angled)	1 m	01533747
		2 m	01533748
		3 m	01533749
		5 m	01651182
		10 m	01651183
		20 m	01651184

Self-made bus cable for the connection for double and multi pump operation:



Nr.	function	length	Mat.-Nr.
51	PumpDrive 2 (Drive 1) with M12 Module – Connector D		
52	PumpDrive 2 (Drive 2) with M12 Module – Connector C		
61	CAN-Bus cable cut to length, screened, twisted pair, cable 2 x 2 x 0,22 mm ²	1 m	01111184
		5 m	01304511
		10 m	01304512
		20 m	01304513
M, N	M12 male, A-coded, 5 poles		01523004

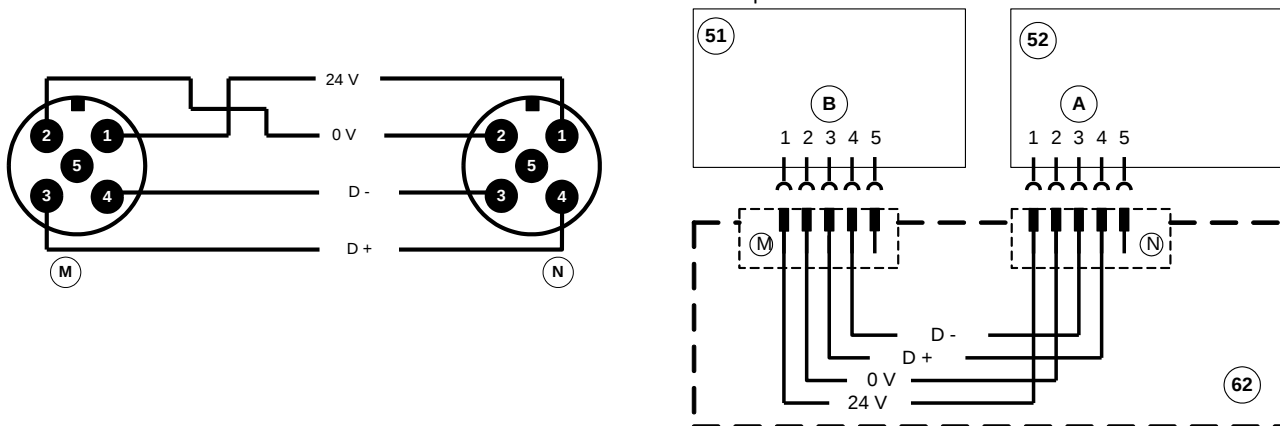
5.3 Crosslink cable



Tailor-made cable:

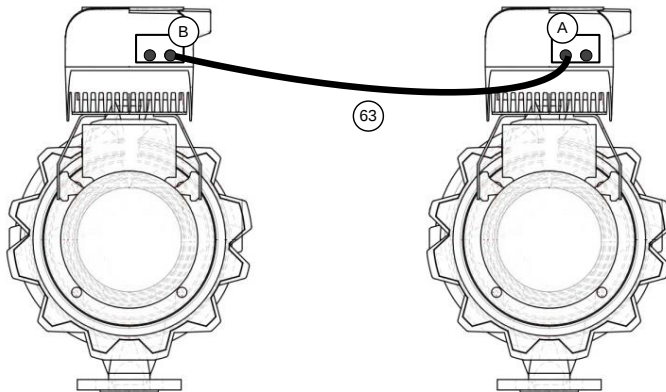
Nr.	function	length	Mat.-Nr.
6	tailor-made cross link bus cable for the redundant connection of PumpMeter (color: black, female: angled, male: angled)	1 m	01533769
		2 m	01533770
		3 m	01533771
		5 m	01533772
		10 m	01533773
		20 m	01533774

Self-made bus cable for the connection for the redundant connection of PumpMeter:



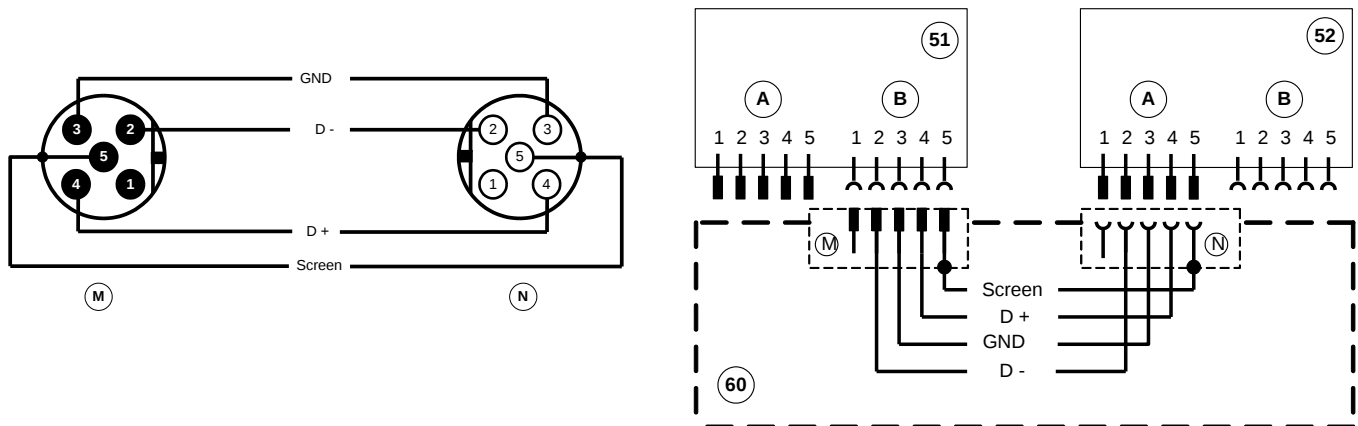
Nr.	function	length	Mat.-Nr.
51	PumpDrive 2 (Drive 1) with M12 Module – Connector B		
52	PumpDrive 2 (Drive 2) with M12 Module – Connector A		
62	CAN-Bus cable cut to length, screened, twisted pair, cable 2 x 2 x 0,22 mm ²	1 m	01111184
		5 m	01304511
		10 m	01304512
		20 m	01304513
M, N	M12 male, A-coded, 5 poles		01523004

5.4 M12 Cable for fieldbus module Modbus RTU



Tailor-made cables are not available due to individual length.

Self-made bus cable for fieldbus module Modbus:



Nr.	function	length	Mat.-Nr.
51	PumpDrive 2 (Drive 1) with Modbus Module – connector B		
52	PumpDrive 2 (Drive 2) with Modbus Module – connector A		
63	CAN-Bus cable cut to length, screened, twisted pair, cable 2 x 2 x 0,22 mm ²	1 m	01111184
		5 m	01304511
		10 m	01304512
		20 m	01304513
M	M12 male, B-coded, 5 poles (Binder Connector Type: 99 1437 920 05)		01651264
N	M12 female, B-coded, 5 poles (Binder Connector Type: 99 1436 820 05)		01651298
-	M12 end resistor male for Modbus Alternative: Phoenix Contact male: SAC-5P-M12MS PB TR - 1507803		01125102

Description:

Nr.	Function

[illegible]

7. Other documents

PumpDrive 2 - PumpDrive 2 Eco Type Series Booklet 4074.5

https://shop.ksb.com/document/ES000911/4074.5_EN

Pump Drive 2 – Application Guide 4074.51

https://shop.ksb.com/document/ES000911/4074.51_EN

Pump Drive 2 Eco – Application Guide 4074.52

https://shop.ksb.com/document/ES000911/4074.52_EN

Pump Drive 2 – Operating manual 4074.81

https://shop.ksb.com/document/ES000911/4074.81_EN

Pump Drive 2 Eco – Operating manual 4074.82

https://shop.ksb.com/document/ES000911/4074.82_EN

PumpMeter - Type Series Booklet 4072.5

https://shop.ksb.com/document/ES000807/4072.5_EN

PumpMeter - Operating manual 4072.8

https://shop.ksb.com/document/ES000807/4072.8_EN

Pump Drive 2 - Modbus supplementary operating manual 4074.803

https://shop.ksb.com/document/ES000911/4074.803_EN



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