

# DeltaMacro

## Application Guide



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Application Guide DeltaMacro

Original operating manual

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## 1 Principles

The presented application examples are intended to provide support for typical tasks. The application examples do not therefore represent customer-specific solutions.

The application examples are non-binding and do not claim to be complete as regards configuration and equipment.

Likewise, the application examples cannot take all eventualities into account.

These application examples do not relieve the user of his/her responsibility to use safe practices in application, installation, operation and maintenance. These application examples may be modified and updated at any time without prior notice.

### Installation/operating manual

The application examples do not replace the installation/operating manual. In the case of deviations from the installation/operating manual, the content of the installation/operating manual has priority.

The user must ensure proper operation of the described products in accordance with the installation/operating manual.

### 1.1 Prerequisites

- The pressure booster system has been selected for the correct flow rate and pressure.

Factory default settings:

- Number of pumps
- Pump operating mode
- Pump characteristic curves
- Dry running protection
- Setpoint

## 2 Selected Information on the System

### 2.1 Name plates

#### KSB BoosterCommand Pro (Plus) name plate



Fig. 1: Name plate (example)

1	Type series	2	Size
3	Material number	4	Month / year of construction
5	Input voltage - mains frequency - power input	6	Enclosure

#### Pressure booster system name plate

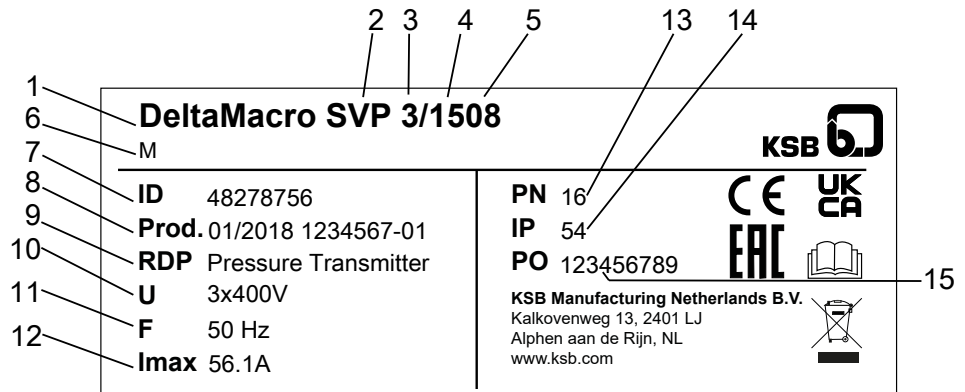


Fig. 2: Name plate (example)

1	Type series	9	Dry running protection
2	Design	10	Power supply voltage
3	Number of pumps	11	Power supply frequency
4	Size	12	Maximum current input
5	Number of pump stages	13	Max. operating pressure
6	Connection type (⇒ Section 4, Page 13)	14	Enclosure
7	Material number	15	Order number
8	Month of production / year of production, consecutive number		

### 2.2 Description of the control system

The control system KSB BoosterCommand Pro (Plus) is available in two variants: One variant is designed for controlling the PBS via frequency inverter(s) to ensure the pressure setpoint is met (systems VC and SVP); the other controls the system via the start-up pressure and stop pressure (systems F).

The control system KSB BoosterCommand Pro serves to control 2-4 pumps; KSB BoosterCommand Pro Plus serves to control 2-6 pumps and offers further options.

### 2.2.1 Designation

Example: F: 4p (6p) VC/SVP:6p

Table 1: Designation key

Code	Description	
F	Pump operating mode	
	F	Fixed speed
	VC	Speed-controlled by cabinet-mounted frequency inverter
	SVP	Speed-controlled by motor-mounted frequency inverter
4p		Number of pumps that can be connected

### 2.2.2 Control panel

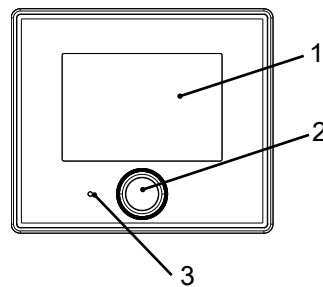


Fig. 3: Control panel

1	Screen (⇒ Section 2.2.2.1, Page 6)
2	Turn/push button (⇒ Section 2.2.2.2, Page 7)
3	Status LED (⇒ Section 2.2.2.3, Page 7)

#### 2.2.2.1 Screen

To save power the screen is turned off automatically.

To turn on the screen push or turn the turn/push button arranged below the screen.

If a message is active, the screen also lights up and displays the current message ID as well as the system status.

2.2.2.1.1 Symbols on the screen

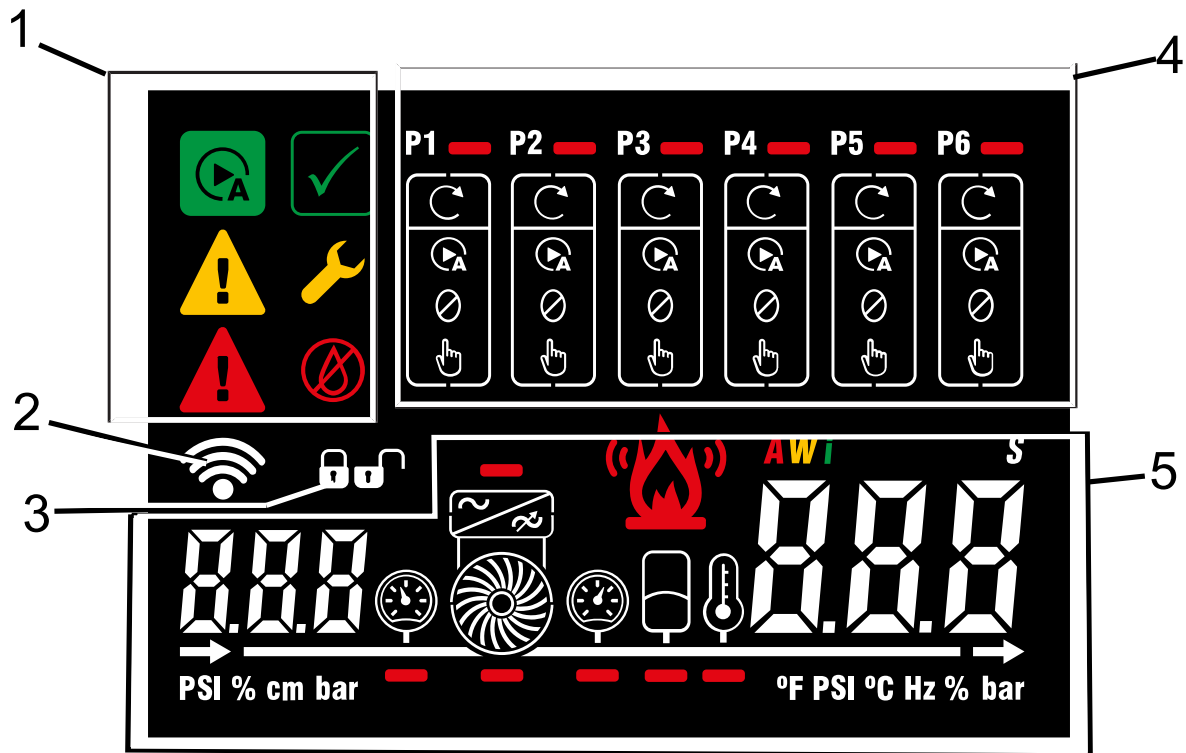


Fig. 4: Overview of all symbols on the screen

1	Operating status of the system	2	Status of the Bluetooth connection
3	Locking/unlocking the screen	4	Operating status of the pump
5	Information on the system		

2.2.2.2 Turn/push button

The turn/push button serves to make a selection on the screen. The initial movement of the turn/push button activates its function. The symbol selected on the screen flashes briefly.

**Starting point** The starting symbol is always the lock/unlock symbol.

**Turning the turn/push button** Turning the turn/push button makes all selectable symbols flash one after the other in a specific sequence, depending on the system configuration. After the flashing cycle of all selectable symbols has been completed, the selection returns to the lock/unlock symbol.





To increase a value turn the turn/push button clockwise. To decrease a value turn the turn/push button anti-clockwise.

**Pressing the turn/push button** A selected symbol can be confirmed by pressing the turn/push button. Depending on the symbol, a setting is displayed or a selection can be made.

2.2.2.3 Status LED


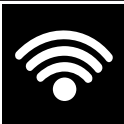

When the screen is not lit, the status LED shows that the system is energised and that the control unit is in operation. The LED is only lit when the screen is not. Based on a traffic light system, the colour indicates the system status.

**Table 2:** Explanation of the status LED

Colour of the status LED		Description
	Green (flashing)	System in operation, no messages are active.
	Green (continuous)	One or more information messages are active.
	Yellow (continuous)	One or more warning messages are active (as well as any messages of a lower priority).
	Red (continuous)	One or more alert messages are active (as well as any messages of a lower priority).

### 2.2.2.4 Activating the Bluetooth connection

**Table 3:** Bluetooth connection status symbols

Symbol		Description
 Flashing	Looking for Bluetooth connection	The control unit has activated the wireless connection and is waiting for a request for connection.
 Continuous	Connected to the Bluetooth connection of a smartphone or tablet	The control unit is currently connected.
	Bluetooth connection disabled	The Bluetooth connection has been disabled. To activate it, press the turn/push button for five seconds.

1. Press the turn/push button for a minimum of 5 seconds.

⇒ The *Bluetooth connection* symbol flashes.

While the *Bluetooth connection* symbol flashes, the control unit can be connected to a wireless device.

An existing connection is displayed by a continuously lit *Bluetooth connection* symbol on the screen.

If no connection is established, the flashing *Bluetooth connection* symbol extinguishes after some time.



### 3 Electrical connection

#### 3.1 Electrical connections

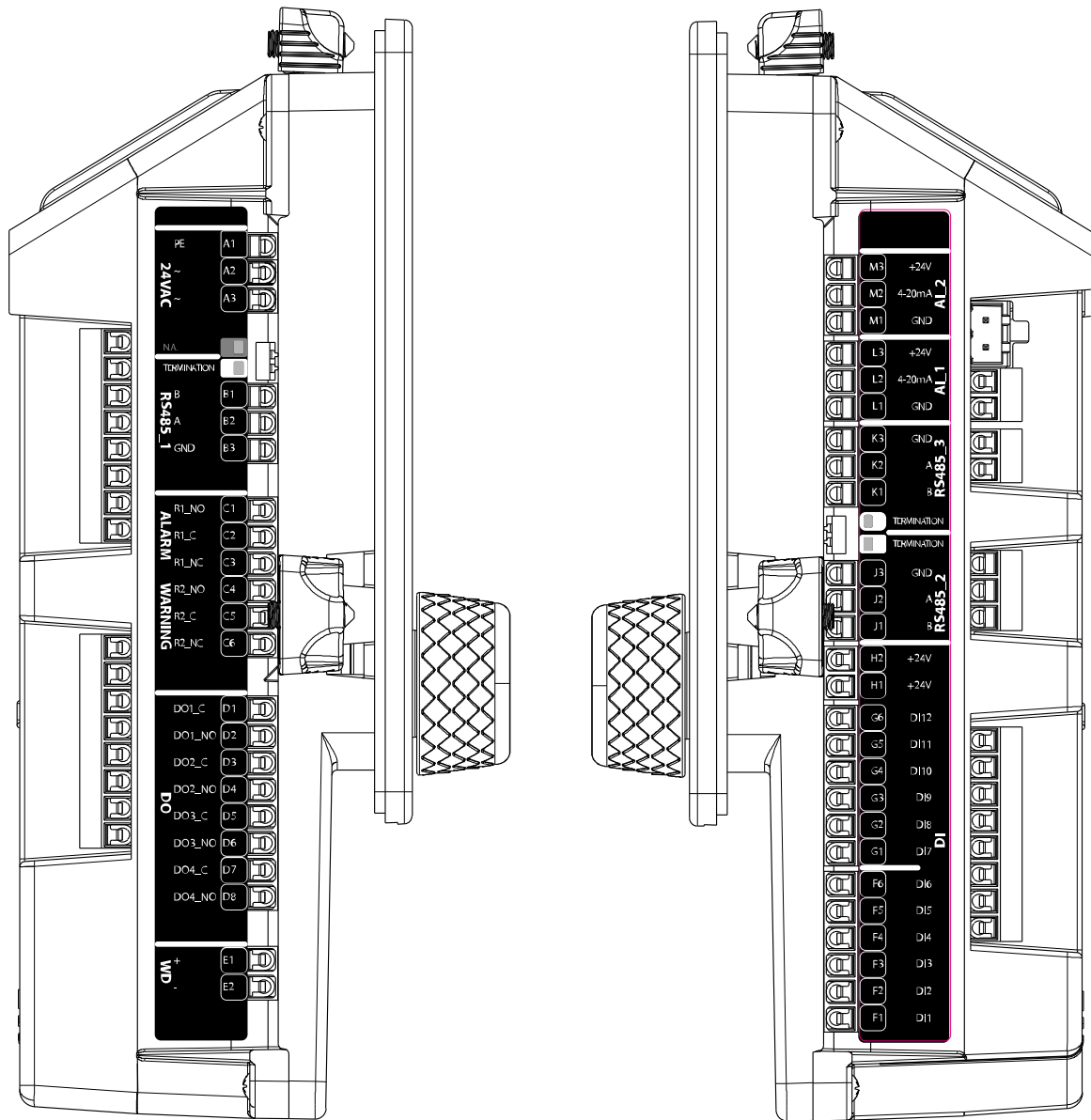


Fig. 5: Terminal strip, mainboard

Table 4: Mainboard connections

Code	Designation	Description
A1	PE	Potential equalisation
A2	~	24 V AC power supply
A3	~	
B1	B	RS485_1 communication cable. A terminating resistor located next to this connection has to be set to ON if it is the end of the communication cable.
B2	A	
B3	GND	
C1	R1_NO	Switching relay Alert.
C2	R1_C	Normally open when one or several alert messages are present or when the control unit is off.
C3	R1_NC	

1983.51/01-EN

Code	Designation	Description
C4	R2_NO	Switching relay Warning.
C5	R2_C	Normally open when one or several warning messages are present or when the control unit is off.
C6	R2_NC	
D1	DO1_C	Digital outputs 1 to 4, pre-configured for starting up pumps 1 to 4.
D2	DO1_NO	
D3	DO2_C	
D4	DO2_NO	
D5	DO3_C	
D6	DO3_NO	
D7	DO4_C	
D8	DO4_NC	
E1	+	Connections for leakage detection
E2	-	
F1	DI1	Digital inputs 1 to 12, configuration depending on system requirements
F2	DI2	
F3	DI3	
F4	DI4	
F5	DI5	
F6	DI6	
G1	DI7	
G2	DI8	
G3	DI9	
G4	DI10	
G5	DI11	
G6	DI12	
H1	+24V	+24 V connections for digital inputs 1 to 12
H2	+24V	
J1	B	RS485_2 communication cable.
J2	A	A terminating resistor located next to this connection has to be set to ON if it is the end of the communication cable.
J3	GND	
K1	B	RS485_3 communication cable.
K2	A	A terminating resistor located next to this connection has to be set to ON if it is the end of the communication cable.
K3	GND	
L1	GND	Analog input 1, configurable function
L2	4-20mA	
L3	+24V	
M1	GND	Analog input 2, factory-set as discharge pressure sensor
M2	4-20mA	
M3	+24V	

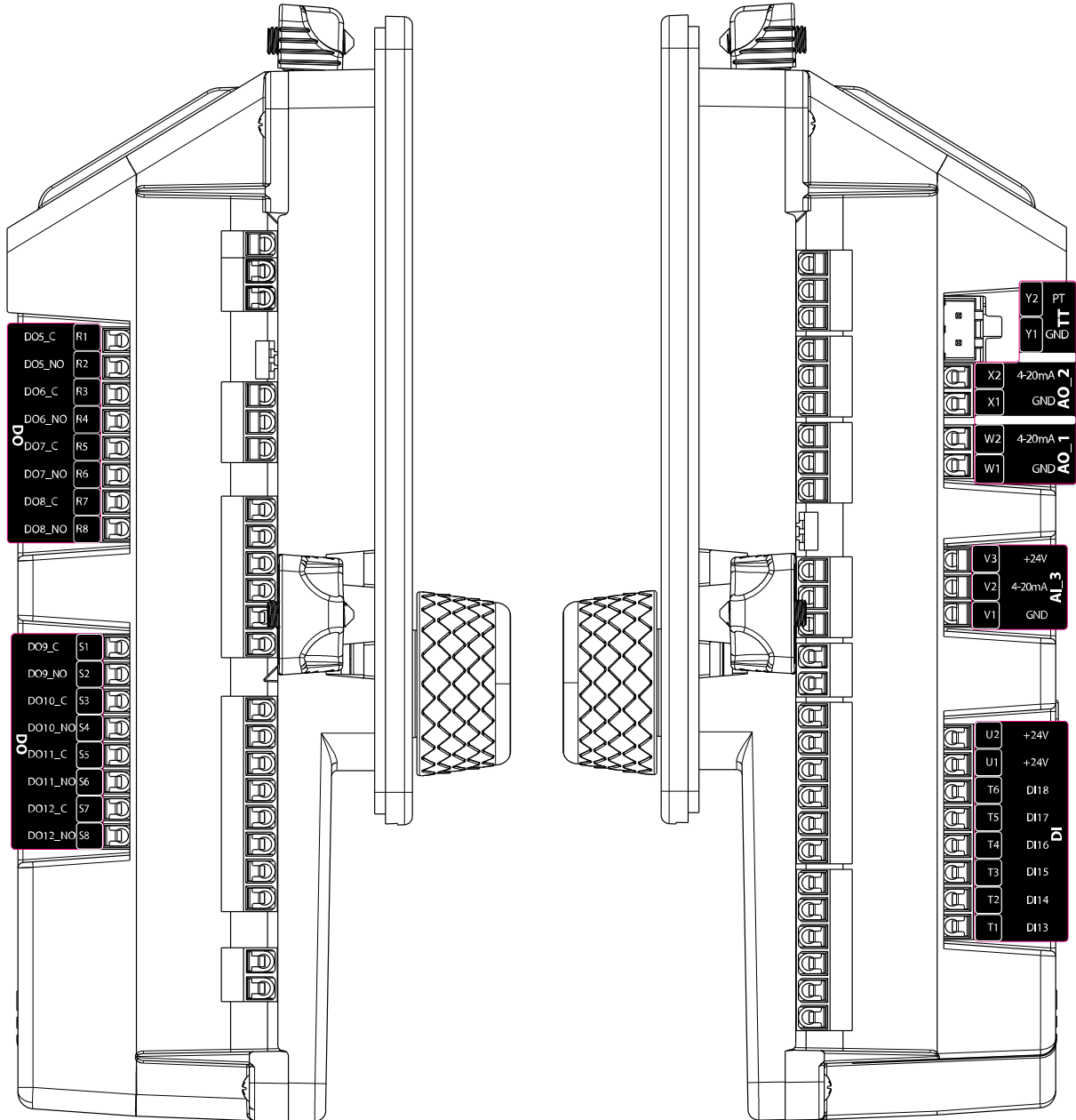


Fig. 6: Terminal strips on extension board

Table 5: Connections of the extension board

Code	Designation	Description
R1	DO5_C	Digital outputs 5 to 12 with configurable function
R2	DO5_NO	
R3	DO6_C	
R4	DO6_NO	
R5	DO7_C	
R6	DO7_NO	
R7	DO8_C	
R8	DO8_NC	
S1	DO9_C	Digital inputs 1 to 8
S2	DO9_NO	
S3	DO10_C	
S4	DO10_NO	

1983.51/01-EN

Code	Designation	Description
S5	DO11_C	Digital outputs 5 to 12 with configurable function
S6	DO11_NO	
S7	DO12_C	
S8	DO12_NC	
T1	DI13	Digital inputs 13 to 18, configuration depending on system requirements
T2	DI14	
T3	DI15	
T4	DI16	
T5	DI17	
T6	DI18	
U1	+24V	+24 V connections for digital inputs 13 to 18
U2	+24V	
V1	GND	Analog input 3, configurable function
V2	4-20mA	
V3	+24V	
W1	GND	Analog output 1, configurable function
W2	4-20mA	
X1	GND	Analog output 2, configurable function
X2	4-20mA	
Y1	GND	Connection for thermometer resistance measurement for Pt100/Pt1000
Y2	PT	

### 3.2 Principle of terminal assignment in the control cabinet

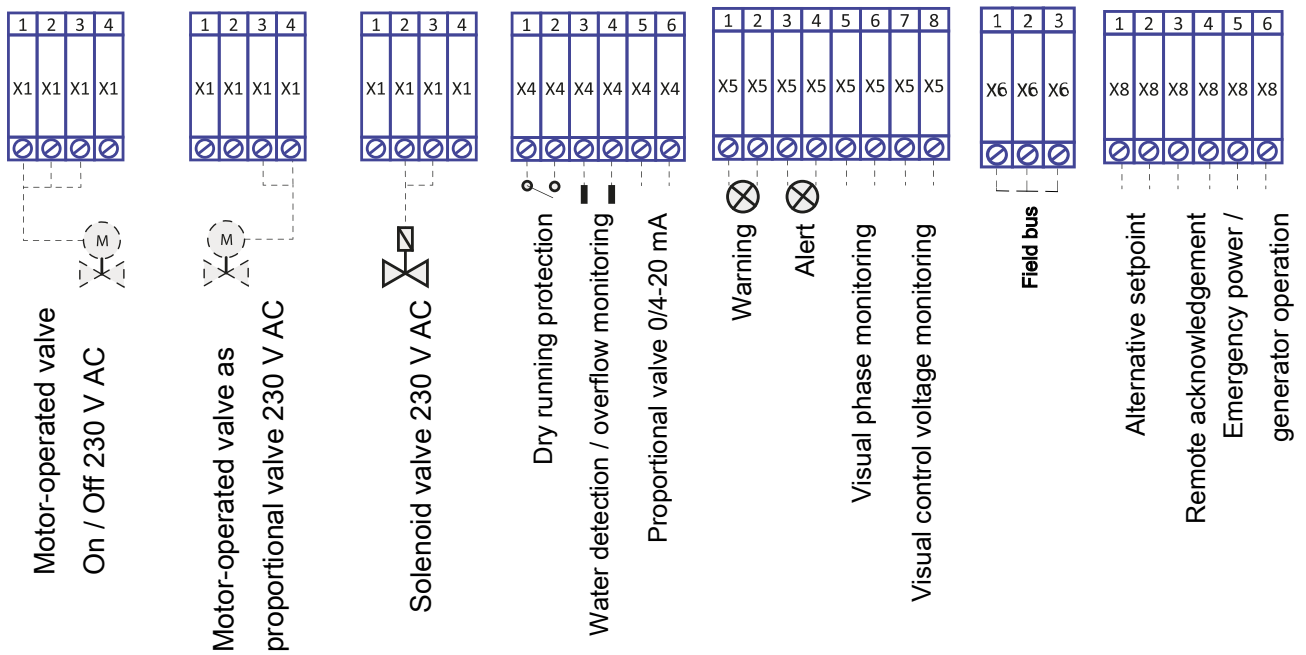
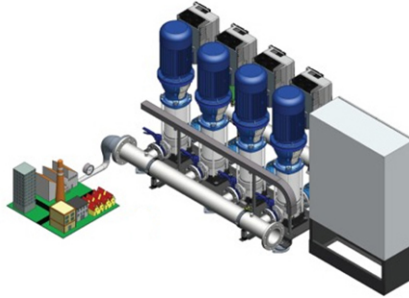


Fig. 7: Overview of all terminal assignments in the control cabinet

## 4 Connection types (inlet conditions) of pressure booster systems

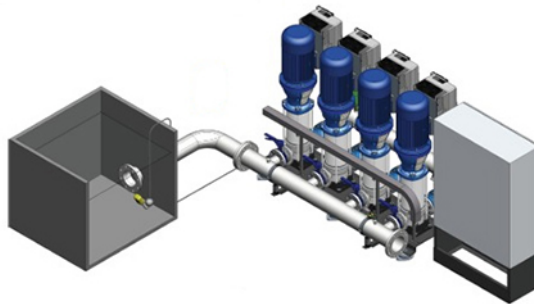
### 4.1 Connection type M (direct)



**Fig. 8:** Connection type M

In connection type M (Mains), the pump system is connected directly to the (usually municipal) water supply system, making use of the mains pressure supplied.

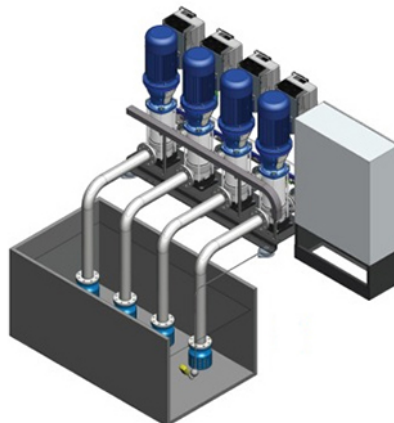
### 4.2 Connection type F



**Fig. 9:** Connection type F

Connection type F (Flooded) features a break tank (usually open to atmosphere) whose water level is higher than the pressure booster system inlet.

### 4.3 Connection type L



**Fig. 10:** Connection type L

Connection type L (Lift) features a break tank (open to atmosphere) arranged at a lower level whose water level is lower than the connection of the pump sets.

## 5 Functions

Table 6: Overview

Functions	Activation by	
	Parameterisation only	Parameterisation and connection
Additional setpoint increase	<b>X</b>	-
External On/Off mode	-	<b>X</b>
Fire alarm	-	<b>X</b>
Membrane rupture detection	-	<b>X</b>
Response to pressure sensor failure	<b>X</b>	-
Dynamic pressure setpoint compensation	<b>X</b>	-
Pipe filling function	<b>X</b>	-
Temperature monitoring (⇒ Section 5.8, Page 18)	-	<b>X</b>
Functional check run	<b>X</b>	<b>X</b>
Pump changeover	<b>X</b>	-
Discharge pressure monitoring	<b>X</b>	-
Leakage detection	-	<b>X</b>
Alternative setpoint (⇒ Section 5.13, Page 22)	<b>X</b>	<b>X</b>
Emergency power operation (⇒ Section 5.14, Page 23)	-	<b>X</b>
Dry running protection (⇒ Section 5.15, Page 24)	-	<b>X</b>

### 5.1 Additional setpoint increase

**Additional setpoint increase** For pressure booster systems operated on a frequency inverter, Additional Setpoint Increase (parameter 2-1-9) can be used to increase the setpoint immediately before the last pump set is stopped to fill an accumulator with a higher pressure.

Table 7: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-1-9	Additional setpoint increase	0 ... 1 bar	0.3 bar	All	Customer	-

### 5.2 External On/Off mode

**External On/Off mode** The External On/Off mode can be used to stop all pumps or to activate the pressure control system. All functions that could result in the pump sets being started up are disabled. If a pump set cannot be started up due to a function being executed, e.g. the check run, the function will be performed as soon as the pump sets are available again. Functions that do not involve the pump sets continue to be executed e.g. the tank filling function. This function has to be enabled (parameter 1-1-7-1). The External On/Off mode must be assigned a digital input (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26)

Table 8: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-1-7-1	External On/Off mode	Disabled	Disabled	All	Service	-
		Enabled				

### 5.3 Fire alarm

**Fire alarm** The Fire Alarm mode starts up all pump sets at full speed, regardless of the pressure control system. All error messages and other functions will be ignored, and all pump sets will be started up. This also includes all pump sets in External On/Off mode or with an active error message about excessive motor temperature, for example. This function has to be enabled (parameter 1-1-6-1). The Fire Alarm mode must be assigned a digital input (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26)

Table 9: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-1-6-1	Fire alarm mode	Disabled	Disabled	All	Service	-
		Enabled				

### 5.4 Membrane rupture detection

**Membrane rupture detection** Membrane Rupture Detection can be activated for accumulators (parameter 1-1-8-1). Two different Sources can be used to trigger the detection (parameter 1-1-8-3). For signalling by an external device, Membrane Rupture Detection has to be assigned a digital input (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26) A delay can be set for the corresponding message (Delay Time Membrane Rupture Detection) and resetting of that message (Delay Time Reset) (parameters 1-1-8-4 and 1-1-8-5).

Table 10: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-1-8-1	Membrane rupture detection	Disabled	Disabled	All	Service	-
1-1-8-3	Source	Water detection integrated	Water detection integrated	All	Service	-
		Membrane rupture detection by external device				
1-1-8-4	Delay time membrane rupture detection	0 ... 99 s	10 s	All	Service	-
1-1-8-5	Delay time reset	0 ... 99 s	2 s	All	Service	-

### 5.5 Response to pressure sensor failure

**Pressure sensor failure** In the event of a pressure sensor failure on the discharge side, a pump set response can be selected to ensure a specific water supply. Pump response to pressure sensor failure is selected separately for pump sets in mains operation (parameter 2-4-1-5) and pump sets operated on frequency inverters (parameter 2-4-1-4). The options are *Stop all pumps*, *Freeze number of pumps running and speed* or *Run a specific number of pumps at fixed speed* (Parameter 2-4-1-6). For pumps in mains operation the fixed speed is the nominal speed.

Table 11: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-4-1-4	Pump response to pressure sensor failure	Stop all pumps	Stop all pumps	All	Service	-
		Freeze number of pumps running and speed				
		Run one pump at fixed speed				
		Run two pumps at fixed speed				
		Run three pumps at fixed speed				
		Run four pumps at fixed speed				
		Run five pumps at fixed speed				
Run six pumps at fixed speed						



Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-4-1-5	Pump response to pressure sensor failure	Stop all pumps	Stop all pumps	All	Service	-
		Freeze number of pumps running				
		Run one pump				
		Run two pumps				
		Run three pumps				
		Run four pumps				
		Run five pumps				
		Run six pumps				
2-4-1-6	Pump speed on pressure sensor failure	0 ... 100%	0	All	Service	-

### 5.6 Dynamic pressure setpoint compensation

**Dynamic pressure setpoint compensation** To compensate any pressure losses in the piping Dynamic Pressure Setpoint Compensation can be Enabled (parameter 2-4-7-1). The Maximum Discharge-side Pressure Deviation (parameter 2-4-7-2) added to the setpoint is reached at Maximum System Load (parameter 1-1-4). Starting from a pump load of "zero" the current setpoint is increased quadratically until the setpoint plus maximum discharge pressure deviation at maximum system load is reached.

Table 12: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-4-7-1	Dynamic pressure setpoint compensation	Disabled	Disabled	All	Service	-
		Enabled				
2-4-7-2	Maximum discharge-side pressure deviation	-10 bar ... 10 bar	0	All	Service	-

### 5.7 Pipe filling function

**Pipe filling function** The Pipe Filling Function can be Enabled (parameter 2-5-6-1) and will then check prior to every start-up of the first pump set of the pressure booster system whether the deviation of the current discharge pressure from the setpoint is higher than the value programmed as Deviation from Setpoint (parameter 2-5-6-2). The function will then start with the current discharge pressure as the new current setpoint and increases the setpoint by the Ramp Step for Increasing Setpoint (parameter 2-5-6-3) every time the ramp step is reached within the Maximum Time for Ramp Step (parameter 2-5-6-4). If the ramp step could not be reached after the Maximum Number of Attempts (parameter 2-5-6-5), the function is cancelled and a message is output. The message has to be reset manually for the pumps to be started up again. If the configured setpoint is reached, the function ends.

Table 13: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-6-1	Pipe filling function	Disabled	Disabled	All	Service	-
		Enabled				
2-5-6-2	Deviation from set-point	0 ... set-point	10	All	Service	-
2-5-6-3	Ramp-step for increasing set-point	0 ... 10 bar	0.1 bar	All	Service	-
2-5-6-4	Maximum time on ramp-step	0 ... 600 s	60 s	All	Service	-
2-5-6-5	Maximum number of attempts	1 ... 10	3	All	Service	-

### 5.8 Temperature monitoring

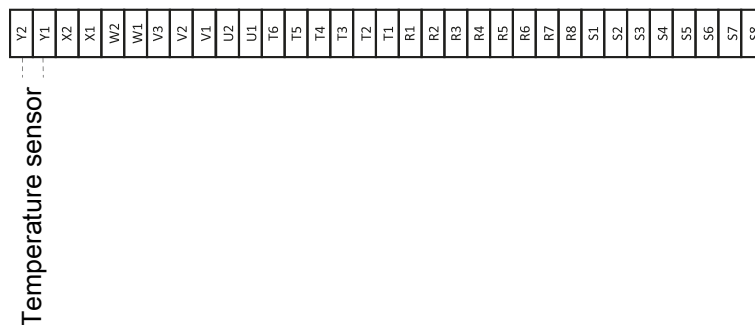


Fig. 11: Terminal diagram

The temperature sensors are always connected directly (Pt100 / Pt1000 to Y1+Y2) at the rear of the control unit.

When Temperature Monitoring is Enabled (parameter 2-5-3-2-1), the temperature is measured by a thermometer. The temperature measurement input has to be configured for this purpose (parameter 1-3-5). The Response to the temperature exceeding the Maximum Temperature (parameter 2-5-3-2-2) or falling below the Minimum Temperature (parameter 2-5-3-2-3) can be selected as only a Message or, in addition, Flushing of the pressure booster system (parameter 2-5-3-2-4).

Table 14: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-3-5-1	Analog input Pt100/Pt1000	Disabled	Disabled	All	Service	-
		Enabled				
1-3-5-2	Selection of thermometer resistance	Pt100	Pt100	All	Service	-
		Pt1000				

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-3-5-3	Selection of thermometer function	Ambient temperature	Ambient temperature	All	Service	-
		Water temperature				
2-5-3-2-1	Maximum temperature monitoring	Disabled	Disabled	All	Service	-
		Enabled				
2-5-3-2-2	Maximum temperature	0 ... 70 °C	25.0 °C	All	Service	-
2-5-3-2-3	Minimum temperature	0 ... 70 °C	5 °C	All	Service	-
2-5-3-2-4	Response	Message	Message	All	Service	-
		Flushing				

### 5.9 Functional check run

**Functional check run** A Check Run can be activated for the pump set (parameter 2-4-4-1), so the pump set starts up regularly if it has not been operated for a defined period of time. The Function can be triggered by different sources (parameter 2-4-4-2). When the function is configured based on idle time and a pump set has not been operated for a configurable Standstill Time (parameter 2-4-4-4), the pump set will be started up and operated for a defined Duration (parameter 2-4-4-3). When a Time Stamp for Activation has been set (parameters 2-4-4-5 and 2-4-4-6) and the function has been configured for a specific time, all pump sets that are not in operation and have got the same time stamp are started up for a check run, one after the other. When the Function is configured for a Triggered Check Run, the check run takes place when the digital input level is high. For this purpose, the check run must be assigned a digital input (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26)

Table 15: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-4-4-1	Check run	Disabled	Enabled	All	Service	-
		Enabled				
2-4-4-2	Function	Idle time dependent	Time-of-day configured	All	Service	-
		Time-of-day configured				
		Triggered check run				
2-4-4-3	Duration	0 ... 600 s	10 s	All	Service	-
2-4-4-4	Standstill time	0: 00: 00: 00 ... 7: 00: 00: 00 d: hh: mm: ss	24 h	All	Service	-
2-4-4-5	Time stamp for activation (hours)	Day of week, time	Mo, 12: 00: 00	All	Service	-
2-4-4-6	Time stamp for activation (minutes)	Day of week, time	Mo, 12: 00: 00	All	Service	-

## 5.10 Pump changeover

**Pump changeover** When the runtime of the pump set exceeds the configured Maximum Runtime (parameter 2-4-2-2), a Changeover within Pump Group can be triggered (parameter 2-4-2-1). Another available pump set then takes over as the duty pump. For pressure booster systems in nominal speed operation, Over-/Undersupply can be selected for a changeover between the two pumps (parameter 2-4-2-3). A Time of Over-/Undersupply (parameter 2-4-2-4) can be configured for the pump changeover. In speed-controlled pressure booster systems the transition is smooth with a handshake between the two pumps. A duration for the Ramp up Time (parameter 2-4-2-5) for starting up the pump and a duration for the Ramp down Time (parameter 2-4-2-6) for stopping the pump can be configured.

Table 16: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-4-2-1	Changeover within pump group	Disabled	Enabled	All	Service	-
		Enabled				
2-4-2-2	Maximum runtime	1 s ... 24 h	24 h / Number of pumps	All	Service	-
2-4-2-3	Over-/undersupply	Oversupply	Oversupply	All	Service	-
		Undersupply				
2-4-2-4	Time of over-/undersupply	0 ... 60 s	0	All	Service	-
2-4-2-5	Ramp up time	0 ... 60 s	0	All	Service	-
2-4-2-6	Ramp down time	0 ... 60 s	0	All	Service	-

## 5.11 Discharge pressure monitoring

**Discharge pressure monitoring** The current discharge pressure is monitored continuously. When the pressure falls below the configured Maximum Discharge Pressure (parameter 2-5-5-1-1) or exceeds the configured Minimum Discharge Pressure (parameter 2-5-5-2-1), a message is output after a Delay Time (parameter 2-5-5-1-2 resp. parameter 2-5-5-2-2) or the pump sets are stopped in addition, depending on the configured Selection of Pump Response (parameter 2-5-5-1-1 resp. parameter 2-5-5-2-3).

Table 17: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-5-1-1	Maximum discharge pressure	0 ... maximum pump head	Maximum pump head	All	Service	-
2-5-5-1-2	Delay time	0 ... 60 s	10 s	All	Service	-
2-5-5-1-3	Selection of pump response	Message	Message	All	Service	-
		Message and stop all pumps				
2-5-5-2-1	Minimum discharge pressure	0 ... maximum pump head	0	All	Service	-
2-5-5-2-2	Delay time	0 ... 60 s	10 s	All	Service	-
2-5-5-2-3	Selection of pump response	Message	Message	All	Service	-

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-5-2-3	Selection of pump response	Message and stop all pumps	Message	All	Service	-

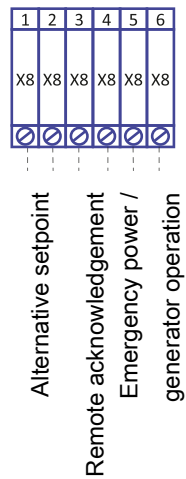
### 5.12 Leakage detection

**Leakage detection** If leakage detection is to be used, Leakage Detection has to be set to Enabled (parameter 2-5-2-1). As a detection signal Source *Water detection integrated* or *Leakage-detection by external device* (parameter 2-5-2-2) can be selected.

For signalling by an external device, Leakage-detection by external device has to be assigned a digital input (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26) Leakage detection can monitor the Leakage of pump system or Overflow of tank, which can be selected via the Position (parameter 2-5-2-4). The Response to any leakage being detected can be configured (parameter 2-5-2-5). In the event of leakage at the pump system options are either Message only or Message and stop all pumps. In the event of a tank overflow, the options available are Message only, Message and close inlet valve, and Message, close inlet valve and stop pumps, referring to the rainwater pumps. Settings can also be made for the Delay Time Leakage Detection (parameter 2-5-2-6) and for the Delay Time Reset (parameter 2-5-2-7).

Table 18: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-2-1	Leakage detection	Disabled	Disabled	All	Service	-
		Enabled				
2-5-2-2	Source	Water detection integrated	Water detection integrated	All	Service	-
		Leakage-detection by external device				
2-5-2-4	Position	Leakage of pump system	Leakage of pump system	All	Service	-
		Overflow of tank				
2-5-2-5	Response	Message only	Message only	All	Service	-
		Message and stop pumps				
		Message and close inlet valve				
		Message, close inlet valves and stop pumps				
2-5-2-6	Delay time leakage detection	0 ... 99 s	10 s	All	Service	-
2-5-2-7	Delay time reset	0 ... 99 s	2 s	All	Service	-



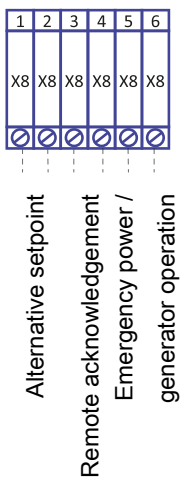
### 5.13 Alternative setpoint

An Alternative Setpoint (parameter 2-1-3) can be activated either timer-controlled or via a digital input by configuring the Alternative Setpoint Selection (parameter 2-1-4) accordingly. The Alternative Setpoint Start Time (parameters 2-1-5 and 2-1-6) and Alternative Setpoint Stop Time (parameters 2-1-7 and 2-1-8) for activating the alternative setpoint have to be set accordingly. If a digital input is to be used for activating the alternative setpoint, a digital input has to be assigned to the alternative setpoint (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26)

Fig. 12: Terminal assignment

Table 19: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-1-3	Alternative setpoint	0 ... 99 bar	2.5 bar	All	Customer	-
2-1-4	Alternative setpoint selection	Disabled	Disabled	All	Customer	-
		Time enabled				
		Digital input enabled				
2-1-5	Alternative set-point start time (hours)	0 ... 24 h	0	All	Customer	-
2-1-6	Alternative set-point start time (minutes)	0 ... 60 min	0	All	Customer	-
2-1-7	Alternative set-point stop time (hours)	0 ... 24 h	0	All	Customer	-
2-1-8	Alternative set-point stop time (minutes)	0 ... 60 min	0	All	Customer	-



### 5.14 Emergency power operation

If the pressure booster system is operated on an alternative external power supply (backup or emergency power supply network), the pump load can be reduced.

When a digital input has been assigned to emergency power operation, this function is enabled. When the input signal level is high, the system load is limited to the Maximum System Load (parameter 2-5-4-2). Stop Delay Enabled/Disabled (parameter 2-5-4-3) serves to select whether pumps running above maximum load are to be stopped immediately or stopped one after the other after a stop delay as is the standard procedure.

**Fig. 13:** Terminal assignment

**Table 20:** Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-4-2	Maximum system load	1 ... maximum number of pumps	1	All	Service	-
2-5-4-3	Stop delay enabled/disabled	Disabled	Enabled	All	Service	-
		Enabled				

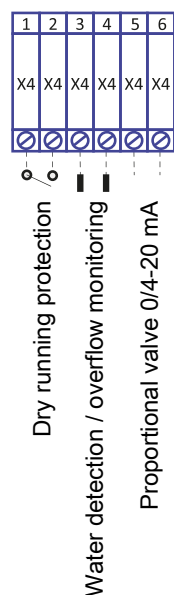


Fig. 14: Terminal assignment

### 5.15 Dry running protection

To prevent dry running of the pump sets the control unit monitors the suction side of the pressure booster system for lack of water. The availability of water can be monitored with different devices.

Lack of water has to be detected for a defined period of time (Delay Time for System Stop) (parameter 2-5-1-1-2) before the message is triggered. If a lack of water is detected, all pumps are stopped automatically with a Dry Running Protection Stop Delay (parameter 2-5-1-1-5) between the stops of the individual pump sets.

If no lack of water is detected any more, a defined Delay Time Reset (parameter 2-5-1-1-3) has to pass before the lack-of-water message can be reset.

The suction-side pressure can be monitored by a pressure sensor. For calibrating the sensor range the pressure Value at 4 mA (parameter 1-3-7-1-1-1) and the pressure Value at 20 mA (parameter 1-3-7-1-1-2) can be used. The *suction-side Pressure sensor* has to be selected as the Source (parameter 2-5-1-1-1). Further to be set are the Minimum Suction-side Pressure for System Stop (parameter 2-5-1-3-1) before a dry running condition is detected, and the Minimum Suction-side Pressure for Reset (parameter 2-5-1-3-2) when the lack of water condition is no longer present. When using a pressure switch, *Pressure switch* has to be selected as the Source (parameter 2-5-1-1-1). Dry running protection is then effected in accordance with the corresponding digital input for the pressure switch (parameters 1-3-3-1 to 1-3-3-18). A dry running event is detected when the input signal level is low. A float switch can also be used, provided an inlet tank is installed upstream of the pressure booster system. In this case, *Float switch* has to be selected (parameter 2-5-1-1-1) and the float switch has to be assigned as digital input (parameters 1-3-3-1 to 1-3-3-18). A dry running event is detected when the input signal level is low. For pressure booster systems with an upstream inlet tank whose fill is also monitored by the control unit, a pressure sensor installed at the tank that measures the tank fill level can also be used for dry running protection. In this case, *Pressure sensor at tank* has to be selected as the Source (parameter 2-5-1-1-1). The Low-water Level (parameter 2-7-1-2-7) and the Low-water Reset Level (parameter 2-7-1-2-8) of the tank correspond with the general lack-of-water levels. An Additional Source can also be set (parameter 2-5-1-2-1). In this case, two sources that are independent of each other are used for monitoring the lack of water. Different types of monitoring can be used in this way. The Delay Time for System Stop and Delay Time Reset can be set separately for each monitoring source (parameter 2-5-1-2-2 and parameter 2-5-1-2-3). In particular, a Maximum Number of Dry Running Protection Events per Hour can be configured (parameter 2-5-1-1-4) to monitor the number of lack of water events that have occurred. If this number is exceeded, an information message is output.

Table 21: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-1-1-1	Source	No function	No function	All	Service	-
		Pressure sensor on suction side				
		Pressure sensor at tank				
		Pressure switch				
		Float switch				
		Flow monitor				
2-5-1-1-2	Delay time for system stop	0 ... 99 s	10 s	All	Service	-
2-5-1-1-3	Delay time reset	0 ... 99 s	2 s	All	Service	-
2-5-1-1-4	Maximum number of dry running protection events per hour	1 ... 10	3	All	Service	-



Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-1-1-5	Dry running protection stop delay	1 ... 5 s	1 s	All	Service	-
2-5-1-3-1	Minimum suction-side pressure for system stop	0 ... maximum pressure sensor range	1 bar	All	Service	-
2-5-1-3-2	Minimum suction-side pressure for reset	Minimum suction-side pressure for stop ... Maximum pressure sensor range	1.5 bar	All	Service	-
2-5-1-2-1	Additional source	No function	No function	All	Service	-
		Pressure sensor on suction side				
		Pressure sensor at tank				
		Pressure switch				
		Float switch				
Flow monitor						
2-5-1-2-2	Delay time for system stop	0 ... 99 s	10 s	All	Service	-
2-5-1-2-3	Delay time reset	0 ... 99 s	2 s	All	Service	-
2-7-1-2-7	Low-water level	0 ... low-water reset level	10 %	All	Service	-
2-7-1-2-8	Low-water reset level	Low-water level ... critical water level	15 %	All	Service	-
1-3-7-1-1-1	Value at 4 mA	0 ... value at 20 mA	0	All	Service	-
1-3-7-1-1-2	Value at 20 mA	Value at 0/4 mA ... 100 bar	10 bar	All	Service	-

## 5.16 Digital inputs

Table 22: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-3-3-1	Input 1	No function	No function	All	Service	-
1-3-3-2	Input 2	Pressure switch				
1-3-3-3	Input 3	Float switch				
1-3-3-4	Input 4	Flow monitor				
1-3-3-5	Input 5	Failure motor circuit breaker pump 1				
1-3-3-6	Input 6	Failure motor circuit breaker pump 2				
1-3-3-7	Input 7	Failure motor circuit breaker pump 3				
1-3-3-8	Input 8	Failure motor circuit breaker pump 4				
1-3-3-9	Input 9	Failure motor circuit breaker pump 5				
1-3-3-10	Input 10	Failure motor circuit breaker pump 6				
1-3-3-16	Input 16 (extension board)	Manual mode at M-0-A switch pump 1				
1-3-3-17	Input 17 (extension board)	Manual mode at M-0-A switch pump 2				
1-3-3-18	Input 18 (extension board)	Manual mode at M-0-A switch pump 3				
		Manual mode at M-0-A switch pump 4				
		Manual mode at M-0-A switch pump 5				
		Manual mode at M-0-A switch pump 6				
		Automatic mode at M-0-A switch pump 1				
		Automatic mode at M-0-A switch pump 2				
		Automatic mode at M-0-A switch pump 3				
		Automatic mode at M-0-A switch pump 4				
		Automatic mode at M-0-A switch pump 5				
		Automatic mode at M-0-A switch pump 6				
		Over-temperature motor pump 1				
		Over-temperature motor pump 2				
		Over-temperature motor pump 3				
		Over-temperature motor pump 4				

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
1-3-3-1	Input 1	Over-temperature motor pump 5	No function	All	Service	-
1-3-3-2	Input 2	Over-temperature motor pump 6				
1-3-3-3	Input 3	Failure motor-circuit breaker rainwater pump 1				
1-3-3-4	Input 4	Failure motor-circuit breaker rainwater pump 2				
1-3-3-5	Input 5	Manual-mode at M-0-A-switch rainwater pump 1				
1-3-3-6	Input 6	Manual-mode at M-0-A-switch rainwater pump 2				
1-3-3-7	Input 7	Automatic-mode at M-0-A-switch rainwater pump 1				
1-3-3-8	Input 8	Automatic-mode at M-0-A-switch rainwater pump 2				
1-3-3-9	Input 9	External On/Off				
1-3-3-10	Input 10	Fire alarm				
1-3-3-16	Input 16 (extension board)	Acknowledge all				
1-3-3-17	Input 17 (extension board)	Alternative setpoint				
1-3-3-18	Input 18 (extension board)	Triggered check run				
		Emergency power operation				
		Forced flushing				
		Module water quality sensor/monitoring				
		Membrane rupture detection				
		Leakage-detection by external device				
		Failure supply-valve				
		Failure additional supply-valve				
		Redundant system				

## 6 Typical applications

Table 23: Overview of typical applications

Connection type			Break tank	Water supply			Rainwater application	Tank monitoring / water supply monitoring / fill level monitoring	Dry running protec- tion		Typical application
M	F	L		Float valve	Solenoid valve	Proportional valve			Float switch	Pressure transmitter	
-	<b>X</b>	-	<b>X</b>	<b>X</b>	-	-	-	-	<b>X</b>	-	Typical application 1 (⇒ Section 6.1, Page 29)
-	<b>X</b>	-	<b>X</b>	-	<b>X</b>	-	-	<b>X</b>	<b>X</b>	-	Typical application 2 (⇒ Section 6.2, Page 30)
-	<b>X</b>	-	<b>X</b>	-	-	<b>X</b>	-	-	<b>X</b>	-	Typical application 3 (⇒ Section 6.3, Page 33)
-	<b>X</b>	-	<b>X</b>	-	-	-	<b>X</b>	-	<b>X</b>	-	Typical application 4 (⇒ Section 6.4, Page 37)
<b>X</b>	-	-	-	-	-	-	-	-	-	<b>X</b>	Typical application 5 (⇒ Section 6.5, Page 39)
-	-	<b>X</b>	-	-	-	-	-	-	<b>X</b>	-	Typical application 6 (⇒ Section 6.6, Page 40)

## 6.1 Typical application 1

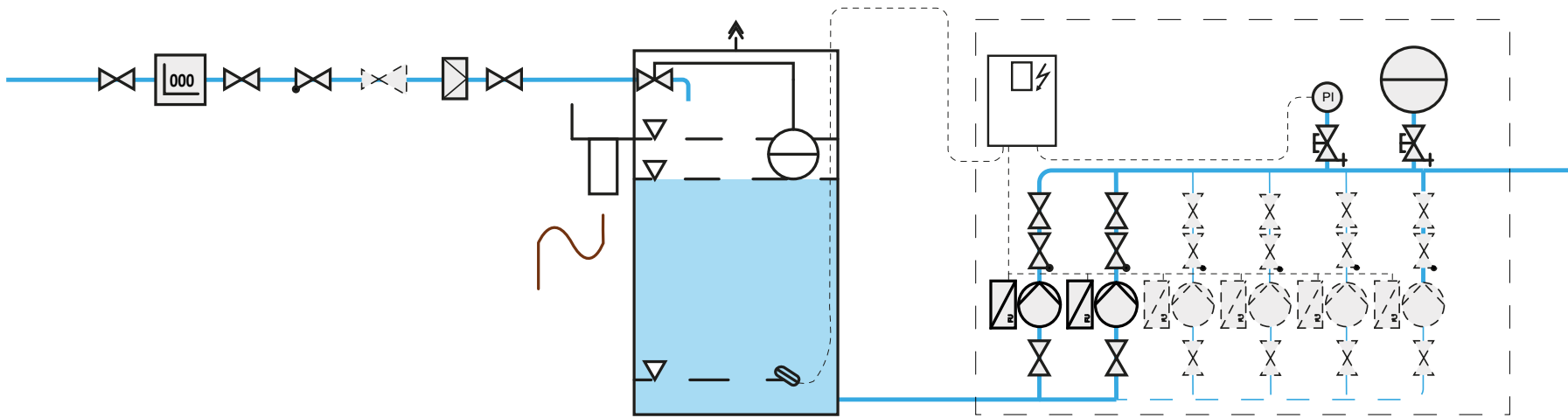


Fig. 15: Typical application 1

- Connection type F
- Intake from break tank (suction head operation)
- Water supply via float valve
- Float switch as dry running protection

## 6.2 Typical application 2

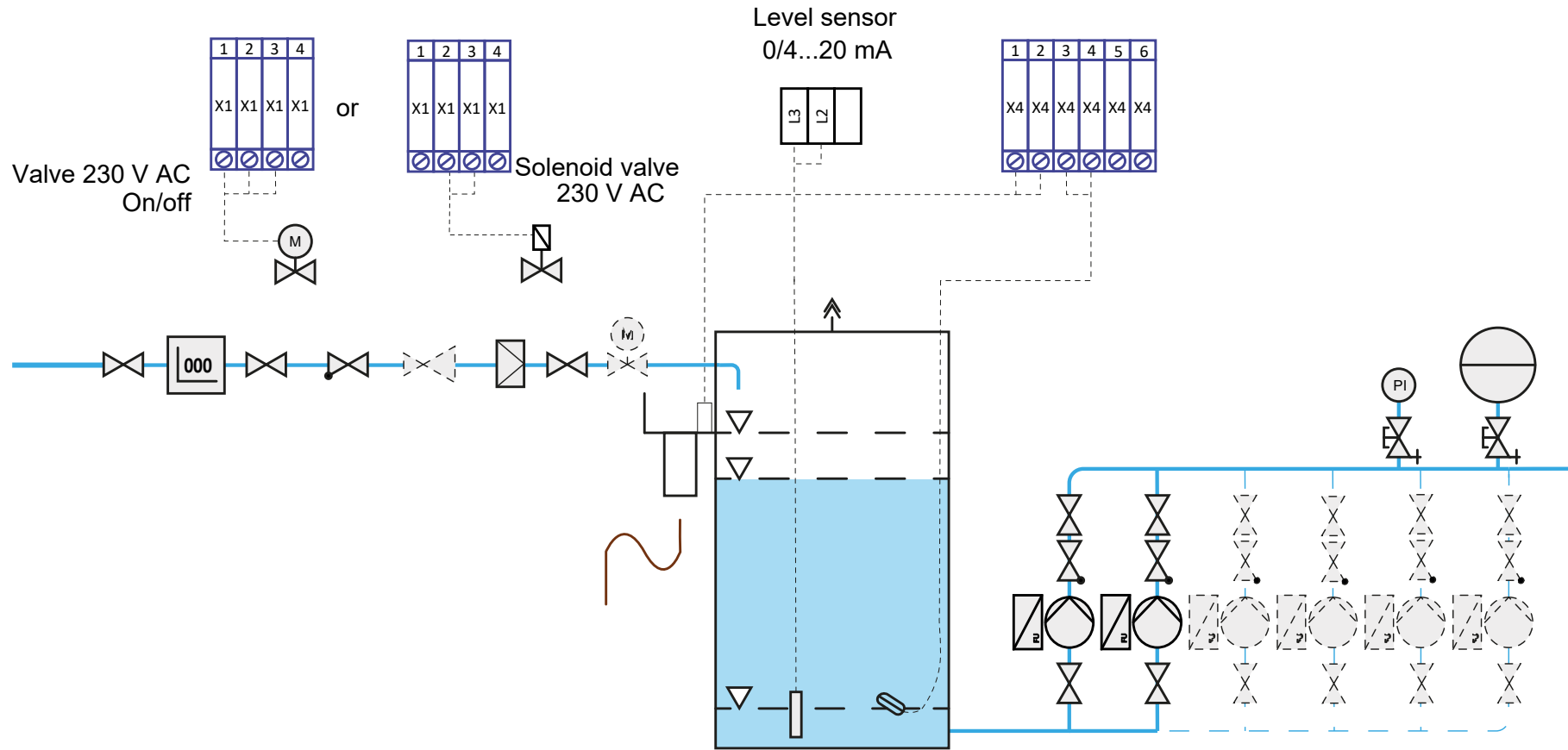


Fig. 16: Typical application 2

- Connection type F
- Intake from break tank (suction head operation)
- Water supply via on/off valve
- Dry running protection via fill level measurement
- Additional dry running protection using float switch
- Tank monitoring / water supply monitoring via 4-20 mA sensor

For pressure booster systems with a break tank, filling of this tank can be controlled by the control unit. To do so, Drinking Water Filling must be activated (parameter 2-7-1-1-1). For filling the tank the Inlet Valve Type has to be selected (parameter 2-7-1-3-1).

It has to be set to "Tank filling on/off valve".

For measuring the tank fill level and setting several tank fill levels in percent, the Absolute Height at 0 % (parameter 2-7-1-2-4) and Absolute Height at 100 % (parameter 2-7-1-2-5) have to be configured as well as the Position of Sensor above Tank Bottom (parameter 2-7-1-2-6). This serves to set the measured tank fill level with reference to the tank bottom.

Different fill levels can be configured for different actions and for triggering messages at specific tank fill levels. With Low-water Level (parameter 2-7-1-2-7) and Low-water Reset Level (parameter 2-7-1-2-8) the dry running protection can be configured.

A hysteresis can be set between the fill levels for triggering and resetting. As a warning for a possible upcoming lack of water, Critical Water Level (parameter 2-7-1-2-9) and Level for Reset Critical Water Level (parameter 2-7-1-2-10) can be set. With High-water Level (parameter 2-7-1-2-16) and Level for Reset High-water Level (parameter 2-7-1-2-15) a warning for a possible tank overflow can be set.

Tank filling is controlled by the two fill levels Start Tank Filling Level (parameter 2-7-1-2-11) and Stop Tank Filling Level (parameter 2-7-1-2-14). These fill levels lead to opening and closing of the tank filling valve.

#### Dry running protection via fill level measurement

For pressure booster systems with an upstream break tank, a pressure sensor installed at the tank measures the tank fill level, which serves as dry running protection. In this case, the Source *Pressure sensor at tank* has to be selected (parameter 2-5-1-1-1). The Low-water Level (parameter 2-7-1-2-7) and the Low-water Reset Level (parameter 2-7-1-2-8) of the tank correspond with the general lack-of-water levels. Lack of water has to be detected for a defined period of time (Delay Time for System Stop) (parameter 2-5-1-1-2) before the message is triggered. If a lack of water is detected, all pumps are stopped automatically with a Dry Running Protection Stop Delay (parameter 2-5-1-1-5) between the stops of the individual pump sets. If no lack of water is detected any more, a defined Delay Time Reset (parameter 2-5-1-1-3) has to pass before the lack-of-water message can be reset.

#### Additional dry running protection using float switch

An Additional Source can also be set (parameter 2-5-1-2-1). In this case, two sources that are independent of each other are used for monitoring the lack of water. A float switch can be used. In this case, Float switch has to be selected (parameter 2-5-1-2-1) and the float switch has to be assigned a digital input (parameters 1-3-3-1 to 1-3-3-18). A dry running event is detected when the input signal level is low. The Delay Time for System Stop and Delay Time Reset can be set separately for each monitoring source (parameter 2-5-1-2-2 and parameter 2-5-1-2-3). In particular, a Maximum Number of Dry Running Protection Events per Hour can be configured (parameter 2-5-1-1-4) to monitor the number of lack of water events that have occurred. If this number is exceeded, an information message is output.

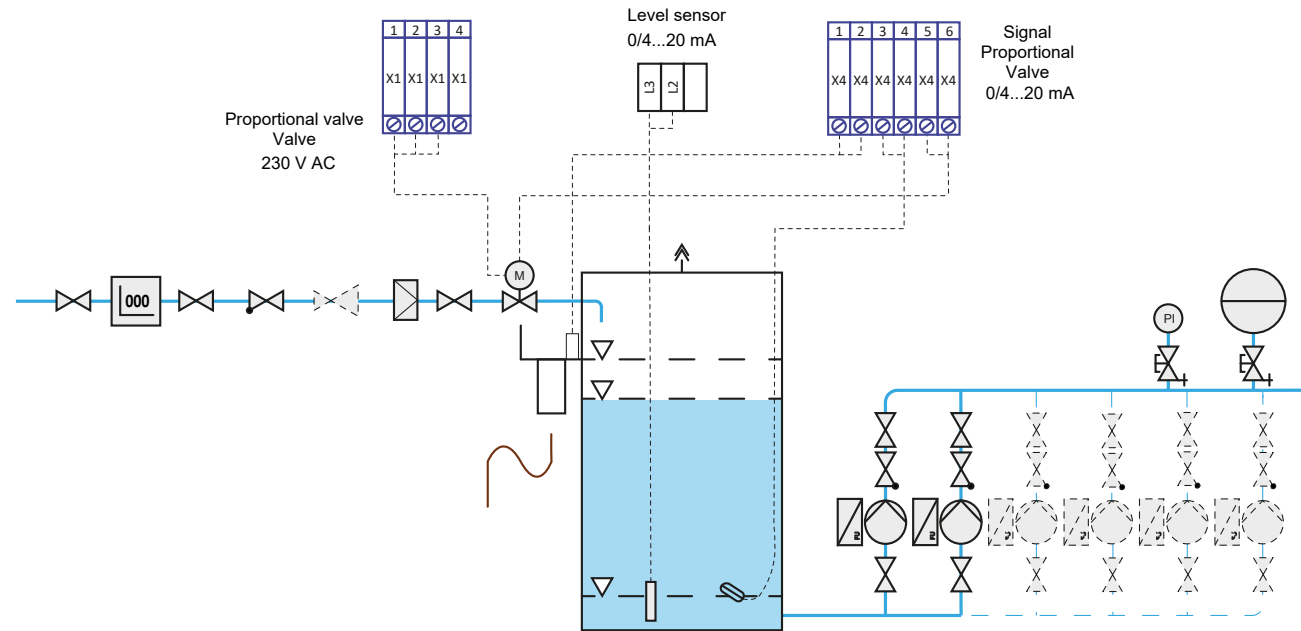
Table 24: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-7-1-1-1	Drinking water filling	Disabled	Disabled	All	Service	-
		Enabled				
2-7-1-2-4	Absolute height at 0 %	0 ... absolute height at 100 %	Position of sensor above tank bottom	All	Service	-
2-7-1-2-5	Absolute height at 100 %	Absolute height at 0 % ... 2000 cm	200 cm	All	Service	-
2-7-1-2-6	Position of sensor above tank bottom	0 ... level at 20 mA	20 cm	All	Service	-
2-7-1-2-7	Low-water level	0 ... low-water reset level	10 %	All	Service	-

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-7-1-2-8	Low-water reset level	Low-water level ... critical water level	15 %	All	Service	-
2-7-1-2-9	Critical water level	Low-water level ... high-water level	30 %	All	Service	-
2-7-1-2-10	Level for reset critical water level	Critical water level ... high-water level	35 %	All	Service	-
2-7-1-2-11	Start tank filling level	Low level ... stop tank filling level	70 %	All	Service	-
2-7-1-2-14	Stop tank filling level	Start tank filling level ... high-water level	95 %	All	Service	-
2-7-1-2-15	Level for reset high-water level	Stop tank filling level ... high-water level	100 %	All	Service	-
2-7-1-2-16	High-water level	Stop tank filling level ... according to sensor type or level at 20 mA	105 %	All	Service	-
2-7-1-3-1	Inlet valve type	Tank filling on/off valve	Tank filling on/off valve	All	Service	-
		Tank filling proportional valve				
2-5-1-1-1	Source	No function	No function	All	Service	-
		Pressure sensor on suction side				
		Pressure sensor at tank				
		Pressure switch				
		Float switch				
Flow monitor						
2-5-1-1-2	Delay time for system stop	0 ... 99 s	10 s	All	Service	-
2-5-1-1-3	Delay time reset	0 ... 99 s	2 s	All	Service	-
2-5-1-1-4	Maximum number of dry running protection events per hour	1 ... 10	3	All	Service	-
2-5-1-1-5	Dry running protection stop delay	1 ... 5 s	1 s	All	Service	-
2-5-1-2-1	Additional source	No function	No function	All	Service	-
		Pressure sensor on suction side				
		Pressure sensor at tank				
		Pressure switch				
		Float switch				
Flow monitor						
2-5-1-2-2	Delay time for system stop	0 ... 99 s	10 s	All	Service	-
2-5-1-2-3	Delay time reset	0 ... 99 s	2 s	All	Service	-



## 6.3 Typical application 3



**Fig. 17:** Typical application 3

- Connection type F
- Intake from break tank (suction head operation)
- Dry running protection via fill level measurement
- Water supply via proportional valve
- Additional dry running protection using float switch

For pressure booster systems with a break tank, filling of this tank can be controlled by the control unit. To do so, Drinking Water Filling must be activated (parameter 2-7-1-1-1). For filling the tank the Inlet Valve Type has to be selected (parameter 2-7-1-3-1).

When *Tank filling proportional valve* is selected, the Minimum Opening Angle of Valve (parameter 2-7-1-3-2) and Step Width for Valve Actuation (parameter 2-7-1-3-3) also have to be configured. Additional Tank Filling (parameter 2-7-1-4-1) can be configured with separate settings. 2-7-1-4-2, 2-7-1-4-3 and 2-7-1-4-4 have to be configured accordingly.

**Tank monitoring** For measuring the tank fill level and setting several tank fill levels in percent, the Absolute Height at 0 % (parameter 2-7-1-2-4) and Absolute Height at 100 % (parameter 2-7-1-2-5) have to be configured as well as the Position of Sensor above Tank Bottom (parameter 2-7-1-2-6). This serves to set the measured tank fill level with reference to the tank bottom.

Different fill levels can be configured for different actions and for triggering messages at specific tank fill levels. With Low-water Level (parameter 2-7-1-2-7) and Low-water Reset Level (parameter 2-7-1-2-8) the dry running protection can be configured.

A hysteresis can be set between the fill levels for triggering and resetting. As a warning for a possible upcoming lack of water, Critical Water Level (parameter 2-7-1-2-9) and Level for Reset Critical Water Level (parameter 2-7-1-2-10) can be set. With High-water Level (parameter 2-7-1-2-16) and Level for Reset High-water Level (parameter 2-7-1-2-15) a warning for a possible tank overflow can be set.

**Tank filling** Tank filling is controlled by the two fill levels Start Tank Filling Level (parameter 2-7-1-2-11) and Stop Tank Filling Level (parameter 2-7-1-2-14). These fill levels lead to opening and closing of the tank filling valve. The opening of the proportional valve between these two fill levels is controlled in a linear manner. At the Stop Tank Filling Level the valve is fully closed. Below this filling level the valve remains closed until the fill level required for the minimum opening angle is reached. The valve then opens up to its minimum opening angle. When the fill level falls further, the valve opens in a linear manner. At the Start Tank Filling Level the valve is fully open. When the valve closes, it reaches its fully closed condition at the Stop Tank Filling Level. The proportional valve is always opened and closed in increments in accordance with the set Step Width for Valve Actuation (parameter 2-7-1-3-3). The step width is scaled to the range between the Start Tank Filling Level and the Stop Tank Filling Level.

**Dry running protection via fill level measurement** For pressure booster systems with an upstream break tank, a pressure sensor installed at the tank measures the tank fill level, which serves as dry running protection. In this case, the Source *Pressure sensor at tank* has to be selected (parameter 2-5-1-1-1). The Low-water Level (parameter 2-7-1-2-7) and the Low-water Reset Level (parameter 2-7-1-2-8) of the tank correspond with the general lack-of-water levels. Lack of water has to be detected for a defined period of time (Delay Time for System Stop) (parameter 2-5-1-1-2) before the message is triggered. If a lack of water is detected, all pumps are stopped automatically with a Dry Running Protection Stop Delay (parameter 2-5-1-1-5) between the stops of the individual pump sets. If no lack of water is detected any more, a defined Delay Time Reset (parameter 2-5-1-1-3) has to pass before the lack-of-water message can be reset.

**Additional dry running protection using float switch** An Additional Source can also be set (parameter 2-5-1-2-1). In this case, two sources that are independent of each other are used for monitoring the lack of water. A float switch can be used. In this case, Float switch has to be selected (parameter 2-5-1-2-1) and the float switch has to be assigned a digital input (parameters 1-3-3-1 to 1-3-3-18). A dry running event is detected when the input signal level is low. The Delay Time for System Stop and Delay Time Reset can be set separately for each monitoring source (parameter 2-5-1-2-2 and parameter 2-5-1-2-3). In particular, a Maximum Number of Dry Running Protection Events per Hour can be configured (parameter 2-5-1-1-4) to monitor the number of lack of water events that have occurred. If this number is exceeded, an information message is output.

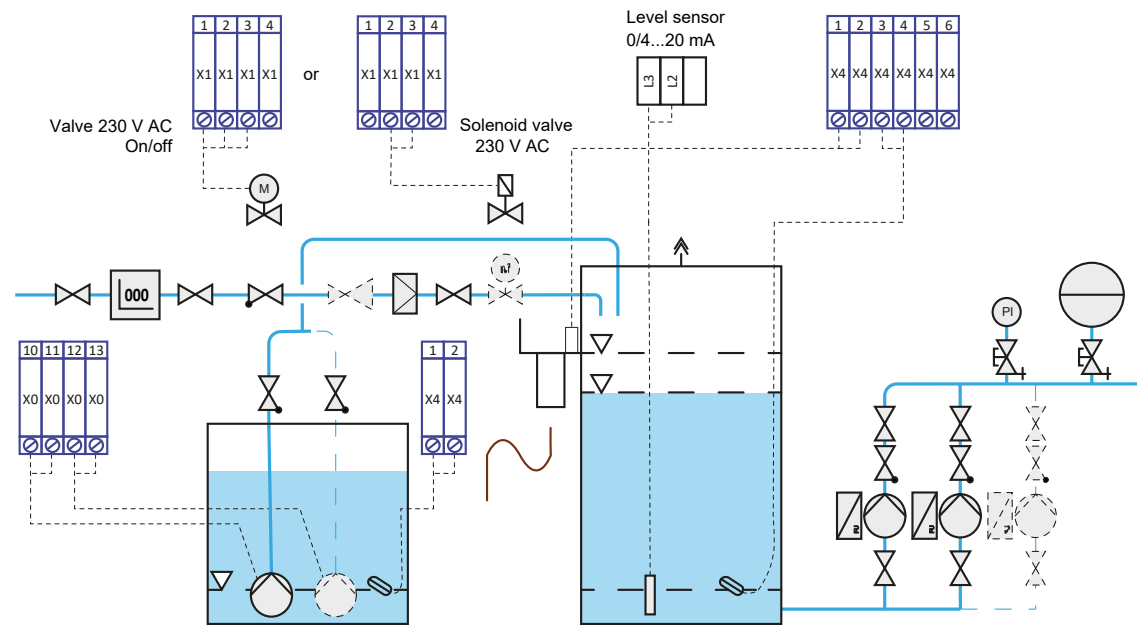
Table 25: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-7-1-1-1	Drinking water filling	Disabled	Disabled	All	Service	-
		Enabled				
2-7-1-2-4	Absolute height at 0 %	0 ... absolute height at 100 %	Position of sensor above tank bottom	All	Service	-
2-7-1-2-5	Absolute height at 100 %	Absolute height at 0 % ... 2000 cm	200 cm	All	Service	-
2-7-1-2-6	Position of sensor above tank bottom	0 ... level at 20 mA	20 cm	All	Service	-

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-7-1-2-7	Low-water level	0 ... low-water reset level	10 %	All	Service	-
2-7-1-2-8	Low-water reset level	Low-water level ... critical water level	15 %	All	Service	-
2-7-1-2-9	Critical water level	Low-water level ... high-water level	30 %	All	Service	-
2-7-1-2-10	Level for reset critical water level	Critical water level ... high-water level	35 %	All	Service	-
2-7-1-2-11	Start tank filling level	Low level ... stop tank filling level	70 %	All	Service	-
2-7-1-2-14	Stop tank filling level	Start tank filling level ... high-water level	95 %	All	Service	-
2-7-1-2-15	Level for reset high-water level	Stop tank filling level ... high-water level	100 %	All	Service	-
2-7-1-2-16	High-water level	Stop tank filling level ... according to sensor type or level at 20 mA	105 %	All	Service	-
2-7-1-3-1	Inlet valve type	Tank filling on/off valve	Tank filling on/off valve	All	Service	-
		Tank filling proportional valve				
2-7-1-3-2	Minimum opening angle of valve	0 ... 100 %	10 %	All	Service	-
2-7-1-3-3	Step width for valve actuation	0 ... 100 %	10 %	All	Service	-
2-5-1-1-1	Source	No function	No function	All	Service	-
		Pressure sensor on suction side				
		Pressure sensor at tank				
		Pressure switch				
		Float switch				
		Flow monitor				
2-5-1-1-2	Delay time for system stop	0 ... 99 s	10 s	All	Service	-
2-5-1-1-3	Delay time reset	0 ... 99 s	2 s	All	Service	-
2-5-1-1-4	Maximum number of dry running protection events per hour	1 ... 10	3	All	Service	-
2-5-1-1-5	Dry running protection stop delay	1 ... 5 s	1 s	All	Service	-
2-5-1-2-1	Additional source	No function	No function	All	Service	-
		Pressure sensor on suction side				
		Pressure sensor at tank				
		Pressure switch				
		Float switch				
		Flow monitor				

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-5-1-2-2	Delay time for system stop	0 ... 99 s	10 s	All	Service	-
2-5-1-2-3	Delay time reset	0 ... 99 s	2 s	All	Service	-

## 6.4 Typical application 4



**Fig. 18:** Typical application 4

- Connection type F
- Intake from break tank (suction head operation)
- Supply of drinking water and rainwater
- Water supply via on/off valve
- Water supply via solenoid valve
- Float switch as dry running protection

For further information on "Water supply via on/off valve" see typical application 2. (⇒ Section 6.2, Page 30)

For further information on "Water supply via solenoid valve" see typical application 3. (⇒ Section 6.3, Page 33)

The following describes the additional supply with rainwater only.

If the tank is to be filled with rainwater instead of drinking water, Rainwater Filling can be Enabled (parameter 2-7-2-1-1) as an additional tank control function.

In this case, 1 or 2 rainwater pumps set for Number of Rainwater Pumps (parameter 2-7-2-2-5) are started up to pump rainwater from a rainwater tank into the water storage tank. Dry running protection for the rainwater pumps can be configured by selecting the Source for Dry Running Protection of Rainwater Pump (parameter 2-7-2-2-1). The float switch in the rainwater tank must be assigned a digital input (one of parameters 1-3-3-1 to 1-3-3-18). (⇒ Section 5.16, Page 26) A Delay Time for Stop (parameter 2-7-2-2-3) and Delay Time for Reset (parameter 2-7-2-2-4) have to be set. Rainwater pumps only run for the configured Maximum Runtime (parameter 2-7-2-2-8). If two pump sets are available, a pump changeover takes place after the Changeover Delay (parameter 2-7-2-2-9). If a rainwater pump exceeds the Maximum Number of Pump Starts per Hour (parameter 2-7-2-2-10), the rainwater pump is only started up again when the number falls below the limit. Start Level for Rainwater Tank Filling and Stop Level for Rainwater Tank Filling (parameters 2-7-1-2-17 and 2-7-1-2-18) have to be configured in addition to the values for drinking water fill levels.

Table 26: Parameter

Parameter	Description	Value range and dependencies	Factory setting	Access level Read	Access level Write	Re-start required
2-7-1-2-17	Start level for rainwater tank filling	Start tank filling level drinking water ... stop tank filling level rainwater	75 %	All	Service	-
2-7-1-2-18	Stop level for rainwater tank filling	Start tank filling level rainwater ... high-water level	100 %	All	Service	-
2-7-2-1-1	Rainwater filling	Disabled	Disabled	All	Service	-
		Enabled				
2-7-2-2-1	Source for dry running protection of rainwater pump	No function	No function	All	Service	-
		Float switch at rainwater tank				
2-7-2-2-3	Delay time for stop	0 ... 99 s	1 s	All	Service	-
2-7-2-2-4	Delay time reset	0 ... 99 s	1 s	All	Service	-
2-7-2-2-5	Number of rainwater pumps	1 ... 2	0	All	Service	-
2-7-2-2-8	Maximum runtime	0 ... 3600 s	60 s	All	Service	-
2-7-2-2-9	Changeover delay	0 .... 60 s	1 s	All	Service	-
2-7-2-2-10	Maximum number of pump starts per hour	1/h ... 20/h	20/h	All	Service	-

6.5 Typical application 5

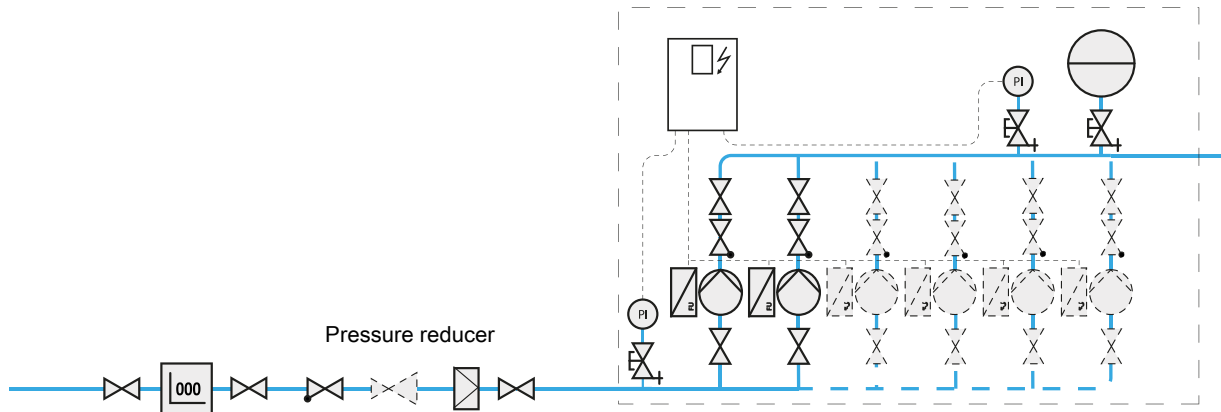


Fig. 19: Schematic of connection type M

- If pressure fluctuations on the supply side are to be expected with the maximum supply pressure exceeding the controlled pressure of the pressure booster system (set discharge pressure), a pressure reducer has to be fitted on the inlet side for limitation.
- For inlet pressure fluctuations of 1-1.5 bar using a pressure reducer is advisable. Check the pump characteristic curve.
- Pressure booster systems with cascade control  $p_{out-in}$   $p_{out-out}$  are possible with up to four pumps. Observe the applicable national regulations regarding the design upstream and downstream of the pressure booster system.

6.6 Typical application 6

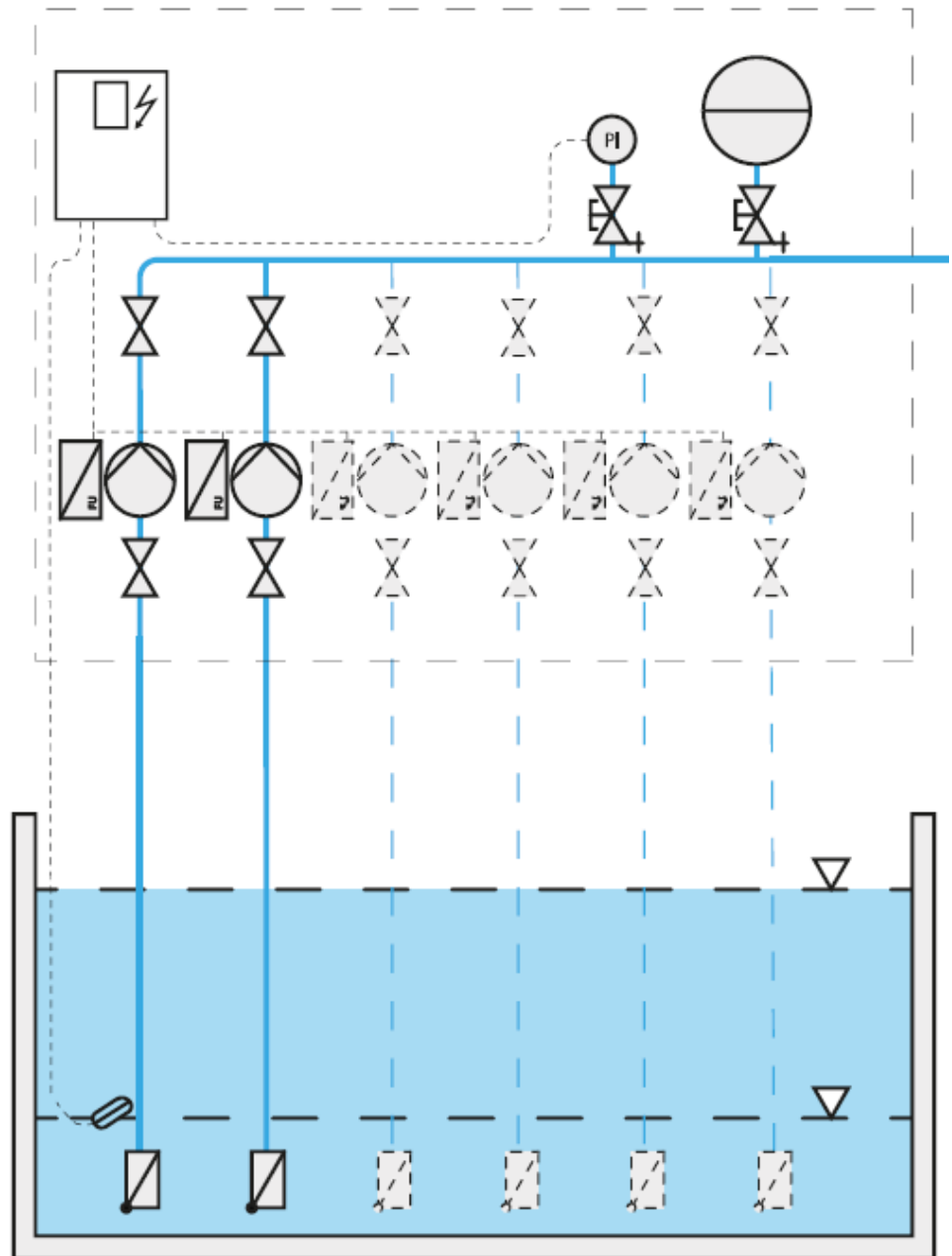


Fig. 20: Schematic of connection type L

- The pressure booster system is neither fitted with a suction-side manifold nor with discharge-side lift check valves.
- Every pump set has got its own inlet connection with integrated foot valve.
- The pump sets are not self-priming, which means that the individual pipes have to be primed and vented separately prior to commissioning.



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