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Operating instructions Peristaltic pumps small to medium and large flow volumes

BT100L · BT600L



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1 Safety instructions

⚠ **Important information: Read the operating instructions carefully before operating the pump.**

Symbol	Meaning
	Warning: Keep fingers away from moving parts.
	Warning: Caution.
	Warning: Caution, hot surface.
	Warning: Caution, electric shock hazard.
	Note: Recycle this product.
	Warning: Wear personal protective equipment.

Table 1 Safety symbols

1.1 Warning

⚠ Use the power supply specified on the device nameplate. Otherwise, the device may be damaged.

Switch off the power before inserting or removing the pump tubing. Keep clear of the rotating rollers to prevent fingers or clothing from becoming caught in the mechanism.

⚠ Switch off the power before connecting or disconnecting external control devices to prevent electric shock or equipment damage.

⚠ The protective earth contact of the mains plug must always be properly grounded. Otherwise, there is a risk of electric shock, electromagnetic interference or induced electrostatic charge.

⚠ This product is not suitable for explosion-protected environments and must not be used in potentially explosive atmospheres.

Before use, check that the pumped liquid does not react chemically with the tubing or pump head. Otherwise, the tubing or pump head may be damaged. If in doubt, contact Labmaterial GmbH.

⚠ If actual environmental conditions exceed the technical specifications, for example temperature, humidity, acids, alkalis, organic solvents or other corrosive influences, dust or supply voltage, and this damages the device, the damage is not covered by the standard manufacturer's warranty. The manufacturer offers chargeable repairs in such cases.

⚠ Protection against injury from moving pump parts is primarily provided by the pump head safety device. Safety devices differ between pump head models. Refer to the section for the relevant pump head.

⚠ If the pump was running before a power failure, it will restart automatically when power is restored.

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1.2 Danger

⚠ Do not dismantle the housing or modify the inside of the device yourself. This may cause malfunctions or electric shock.

Special operating procedures must be established for each hazardous liquid being pumped. Personnel must be protected against injury during use.

The tubing is a wear part and must be checked regularly. To the extent permitted by law, Leadfluid and Labmaterial GmbH accept no responsibility for losses resulting from tubing damage, particularly leaks of toxic, harmful or valuable liquids.

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2 Introduction to the peristaltic pump

A peristaltic pump is a device for safe and reliable liquid transfer. The liquid only touches the inside wall of the tubing. Pumping is achieved by compressing the tubing.

The valve-free and seal-free design with continuous tubing helps maintain liquid purity, reduces the risk of leaks and enables reliable, safe and clean transfer.

2.1 Operating principle

The tubing lies between the roller and the pressure block. It is sealed at the compressed contact point. As the roller rotates and moves along the tubing, the sealed contact point moves with it. Behind the roller, the tubing returns to its original shape. The resulting negative pressure draws in liquid.

Before the first roller reaches the end of the pressure block, a second roller begins compressing the tubing at the start of the block. The liquid is trapped between the two compression points. As the first roller leaves the pressure block, the second roller pushes the liquid towards the tubing outlet. At the same time, negative pressure forms behind the second roller and draws in more liquid from the inlet.

According to the manufacturer, the design prevents backflow and siphoning. When stopped, the pump closes the tubing; no separate valve is required for this operating principle.

2.2 Description

The BT100L, BT300L and BT600L intelligent flow peristaltic pumps are primarily intended for precise liquid metering and dispensing. Compared with the previous generation, they have a larger colour LCD touchscreen for more convenient operation and a more comprehensive information display. They support RS485 communication. Additional MODBUS protocol settings allow adaptation to different communication devices.

Drive	Flow range	Speed range
BT100L	0.00011–750mL/min	0.1–150rpm
BT300L	0.005–1'750mL/min	0.1–350rpm
BT600L	0.005–3'000mL/min	0.1–600rpm

Table 2 Drive and parameters

2.3 Applications

- The pump body does not come into contact with the liquid.
- No valve blockage.
- Smooth tubing inner surface that is easy to clean.
- According to the manufacturer, the suction lift can reach 8m of water column.
- Low shear forces; suitable for transferring emulsions and liquids containing foam, cells and similar constituents.
- Suitable for liquids containing gas, magnetic beads or small suspended particles.
- Suitable for precise transfer and dispensing. An appropriate tubing diameter and filling output allow the required accuracy to be achieved.
- Suitable for transferring liquids with a certain viscosity.
- The liquid comes into contact with the tubing only.

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- With suitable food-grade or medical-grade tubing, the pump can be used for transfer and filling in corresponding applications. This product is not medically certified. If incorporated into a medical device, the medical device itself must hold the appropriate certification.
- Tubing made from special materials can be used for abrasive liquids.

2.4 Functions and features

- Colour LCD; operation via touchscreen and keys.
- Forward and reverse rotation, start and stop, speed control and full speed.
- Speed resolution 0.1rpm; speed error less than ±0.2%.
- Flow display, flow control, cumulative liquid volume and flow calibration.
- Flow mode and timed dispensing.
- Five stored parameter groups for timed dispensing.
- An integrated expert system simplifies operation.
- Intelligent temperature control to reduce operating noise.
- Alarm for a blocked motor or loss of speed.
- Optional Wi-Fi communication: After connection to the network, the pump can be monitored or controlled remotely via an app. See Chapter 7.7 for details.
- Software switching of external analogue speed control between 0–5V, 0–10V and 4–20mA. External 5–24V signals control start/stop and direction; the signals are optically isolated.
- RS485 communication using the MODBUS protocol. Various communication parameters can be set to connect different control devices.
- Protective coating on the circuit board against dust and moisture.
- High interference immunity and wide-range power supply for demanding supply environments.
- Easy-to-clean stainless steel housing. The manufacturer describes its resistance to various acids, alkalis, salts and organic solvents. The cleaning instructions in Chapter 8 must nevertheless be followed.

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3 Components and interfaces

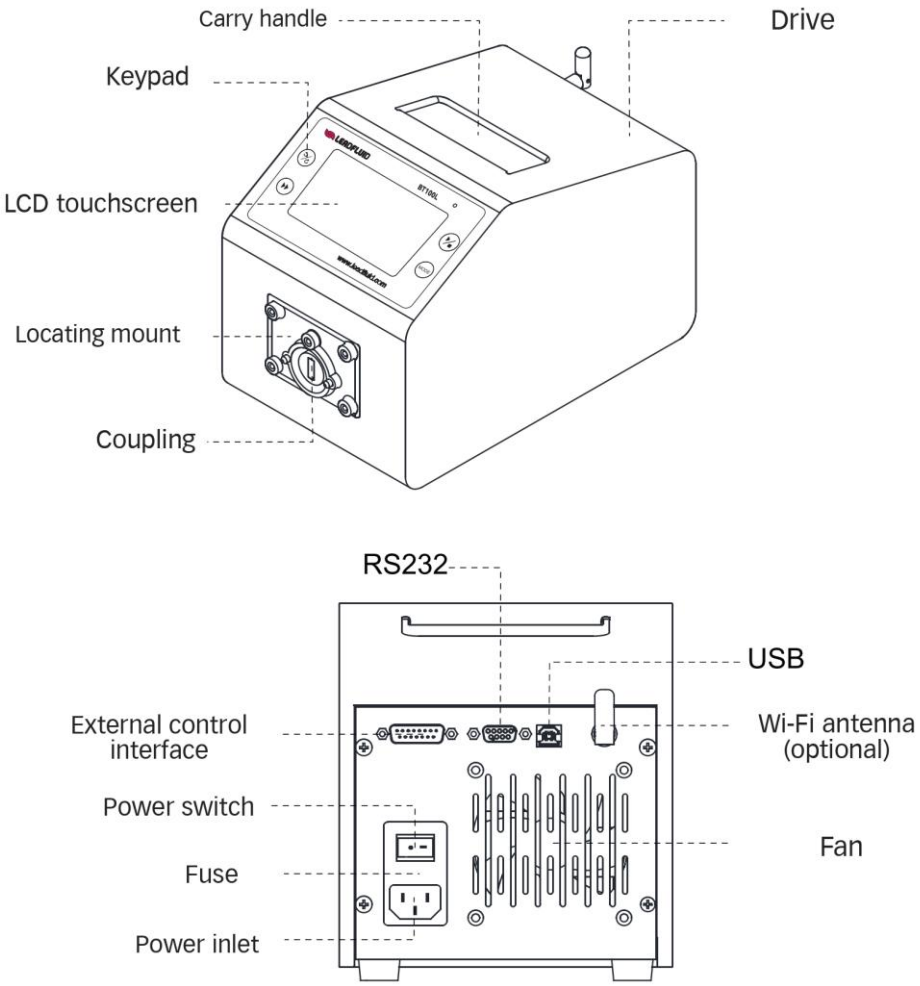

Figure 1 Components and interfaces

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4 Control panel and keys

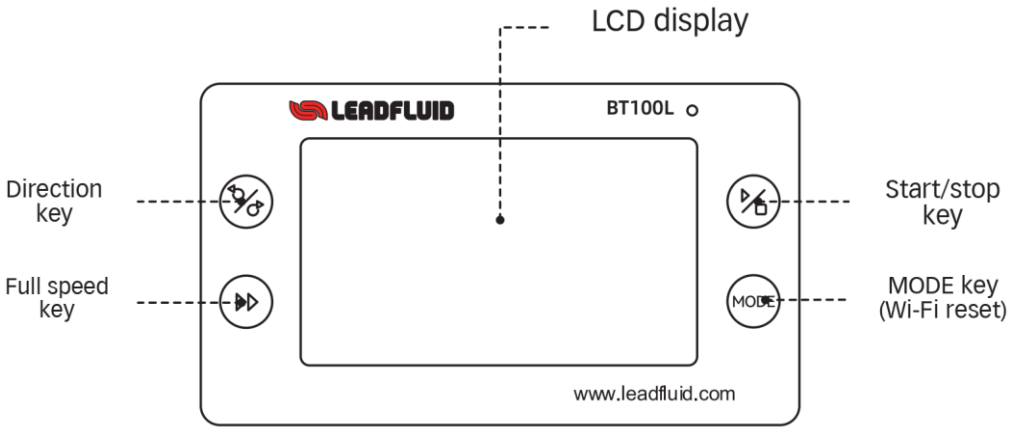

Figure 2 Control panel

4.1 Keypad

Start/stop key: Starts or stops the pump.

Direction key: Switches between forward clockwise rotation and reverse counterclockwise rotation.

Full speed key: The pump runs at maximum speed. This function fills or empties the tubing.

MODE key and Wi-Fi reset: Selects the operating mode and resets the Wi-Fi connection.

1. **Select operating mode:** On the main screen, MODE opens operating mode selection when the pump is stopped. On other screens, the key returns to the previous screen.
2. **Reset Wi-Fi:** On the main screen, press and hold MODE for 10 seconds. A beep sounds unless the pump is muted. The Wi-Fi icon flashes; the device waits for network configuration.

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4.2 Explanation of screen icons

Symbol	Function	Symbol	Function
	Sound on/off		Locked/unlocked
	Internal control		Footswitch mode
	Current signal control		Voltage signal control
	Communication connected		Communication disconnected
	Direction of rotation		Start/stop
	Wi-Fi connected/disconnected		Wi-Fi connected to local network
	Operating mode settings		Already configured, connecting
	Quick settings		Preview
	System menu		Calibration wizard
	Previous step/previous page		Exit screen
	Confirm		Next step/next page
	Decrease		Increase

Table 3 Description of screen icons

4.3 Touchscreen

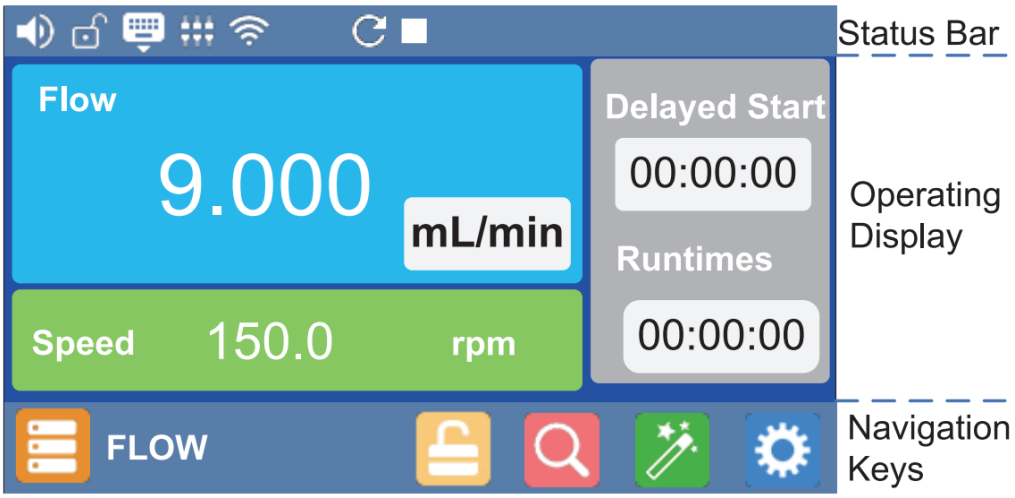

Figure 3 Touchscreen with status bar, operating area and navigation keys

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4.3.1 Status bar

A Sound status: Indicates whether notification and key tones are on or off.

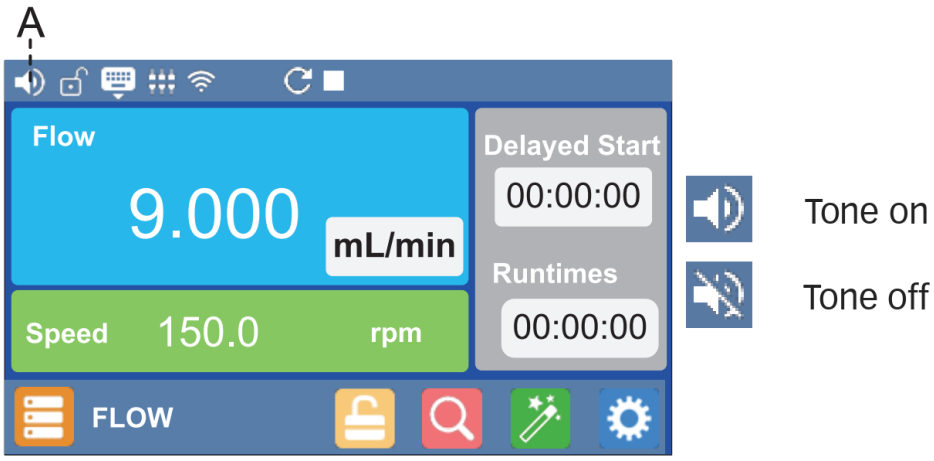

Figure 4 Sound on and off

B Lock status: Indicates whether the device is locked. When locked, the control method and system parameters cannot be changed.

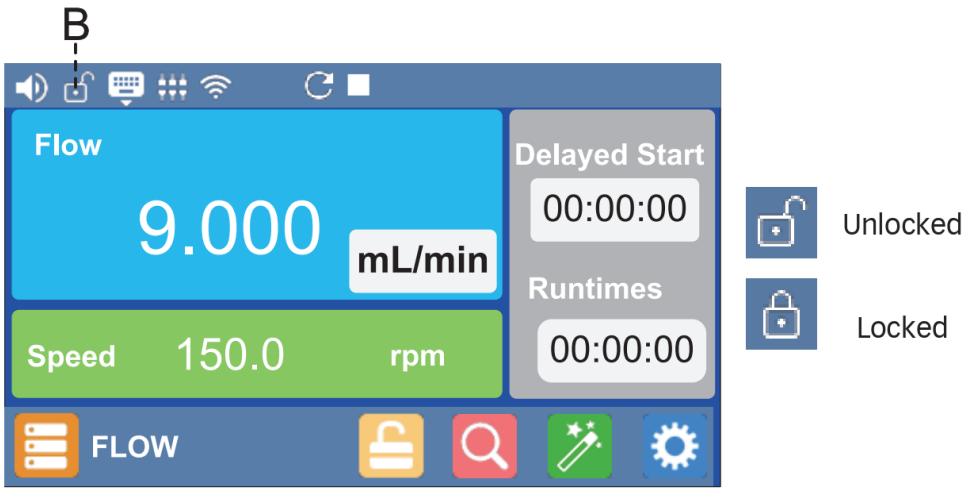

Figure 5 Unlocked and locked icons

C Control method: The current control method is displayed. Four methods are available:

- **Internal control:** Operation via the pump keys and touchscreen.
- **Footswitch mode:** Start and stop via the footswitch; other parameters via the keys and touchscreen.
- **Current signal control:** Flow control via an external 4–20mA analogue signal. Start/stop and direction via external signals. The keypad keys do not function in this mode.

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- **Voltage signal control:** Flow control via an external 0–5V or 0–10V analogue signal. Start/stop and direction via external signals. The keypad keys do not function in this mode.

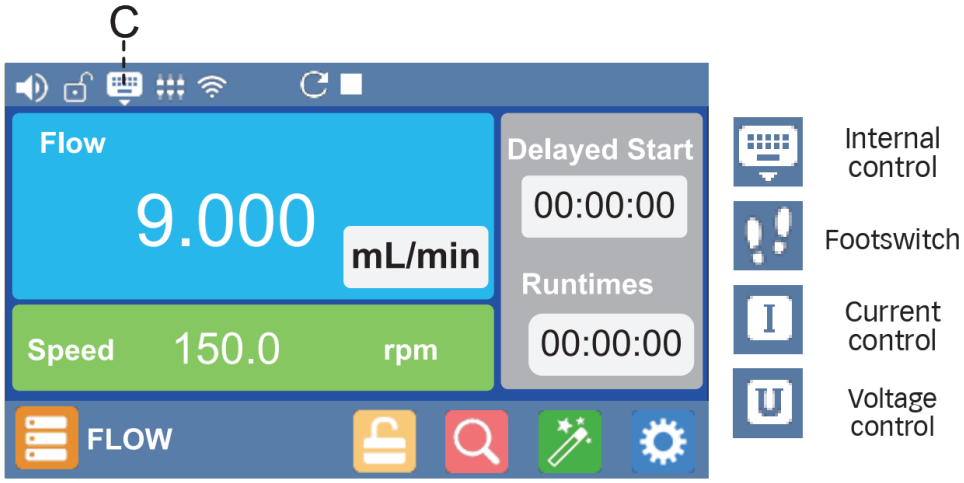

Figure 6 Display of the four control methods

D Communication status: Indicates whether communication is connected or disconnected.

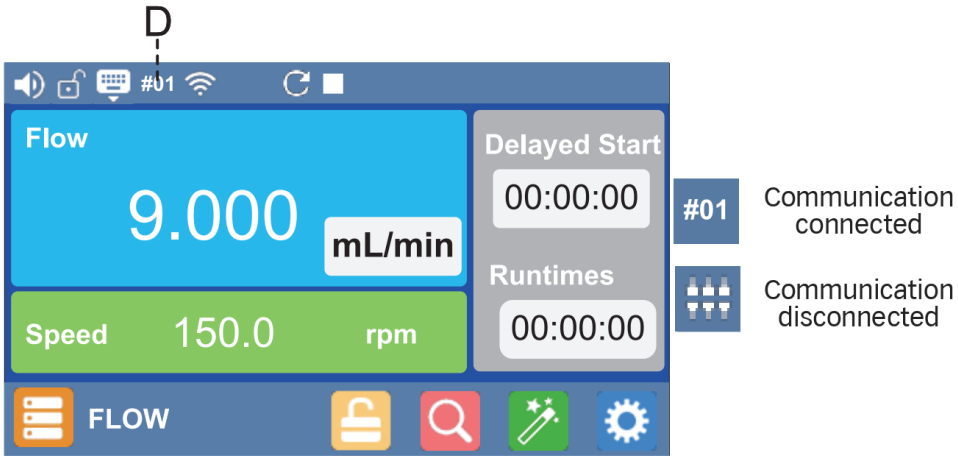

Figure 7 Communication connected and disconnected

E Wi-Fi status: Indicates the Wi-Fi connection status: not connected, connecting to the local network, not connected to the app or Wi-Fi connected.

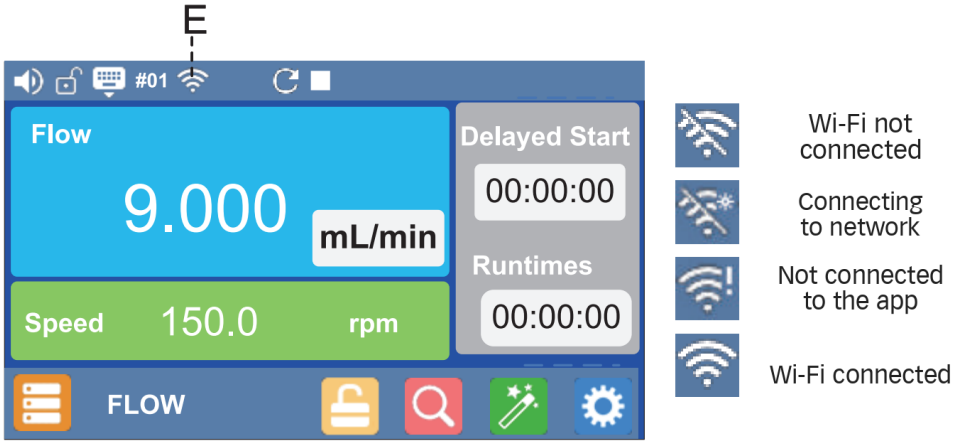

Figure 8 Wi-Fi connection states

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F Direction of rotation: Indicates the direction. When stopped, the direction icon is visible; during operation, a rotating orange ring indicates the direction.

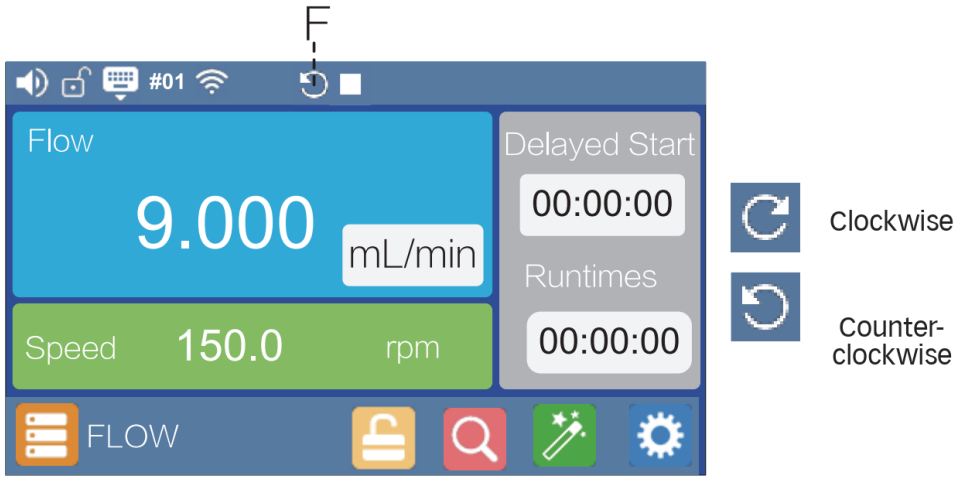

Figure 9 Direction display when the pump is stopped

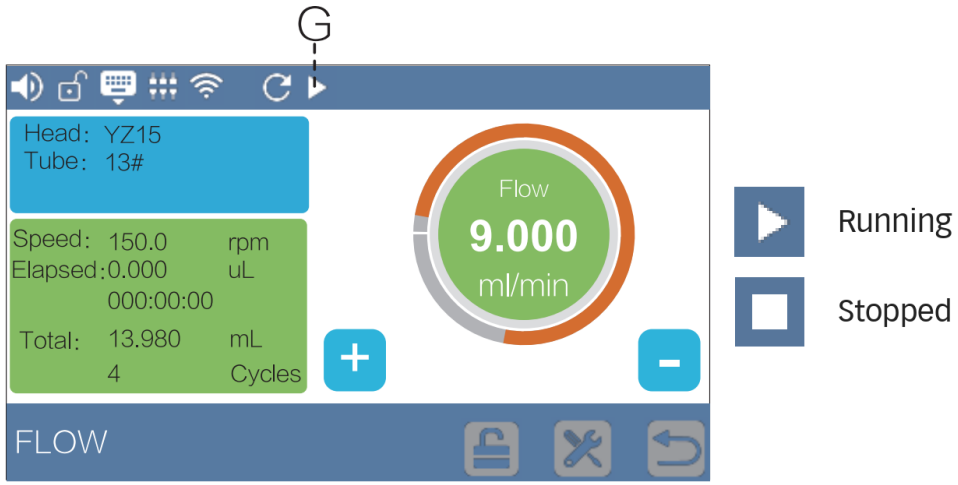

Figure 10 Operating display when the pump is running

G Operating status: The icon indicates whether the pump is running or stopped.

4.3.2 Operating area

A Enter numerical values: With the pump stopped, tap the numerical value. Enter the required value directly in the input window. Observe the permitted range and displayed unit.

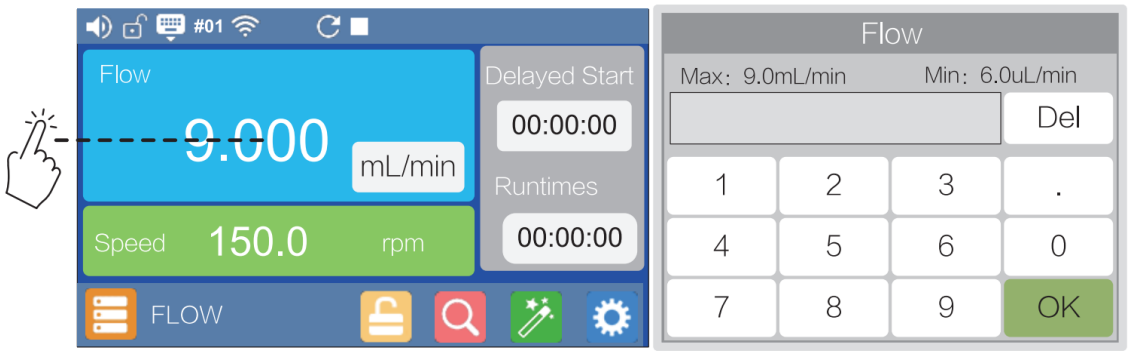

Figure 11 Numerical input window

⚠ **Note:** The flow must be calibrated for an accurate flow display.

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B Select unit: With the pump stopped, tap the unit. Select the required unit in the selection window. The example shows selection of the flow unit.

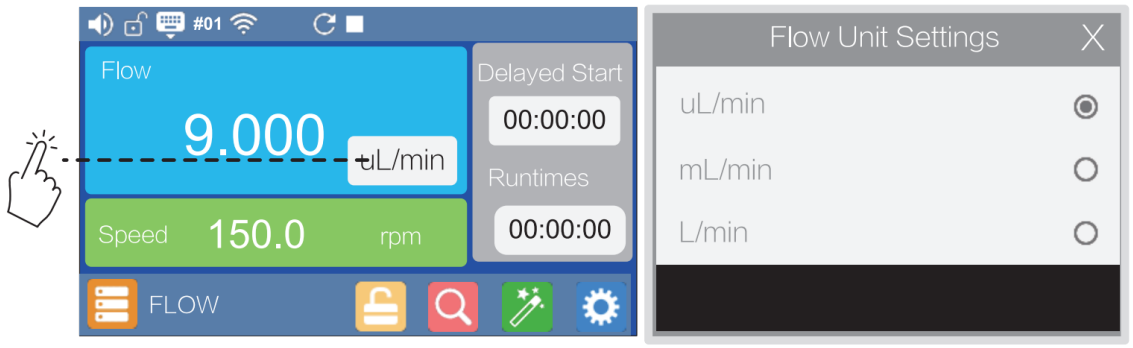
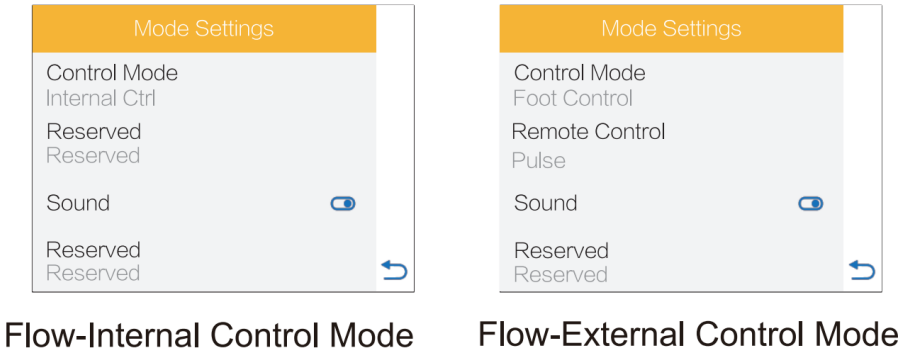


Figure 12 Flow unit selection

4.3.3 Navigation keys

Operating mode settings: Sets the control parameters of the selected mode. Notification sound and locking can also be switched on or off here.



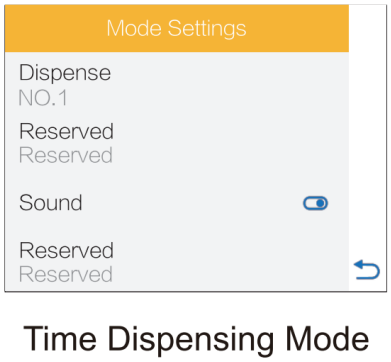


Figure 13 Settings for internal flow mode, external flow mode and timed dispensing

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Preview: Shows operating status and parameter changes. Current operating parameters are on the left; operating status is on the right.

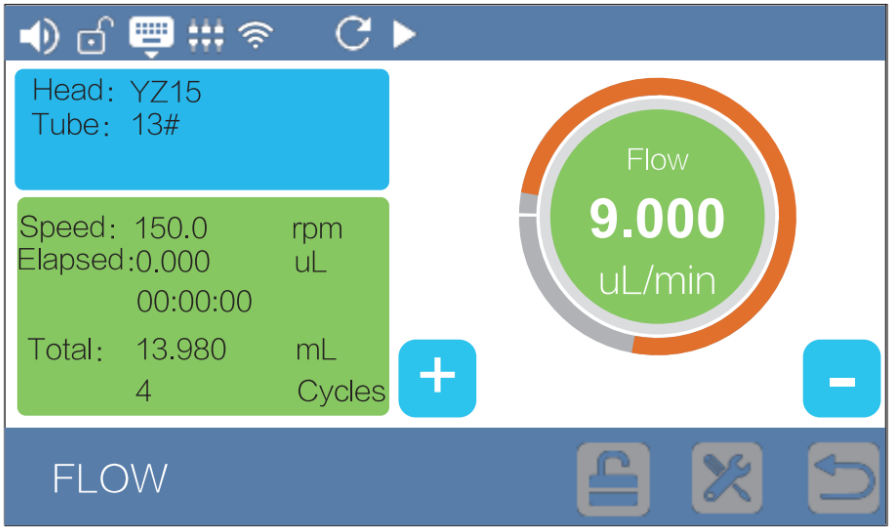

Figure 14 Preview screen

In flow mode, orange means stopped, green means running and yellow means paused.

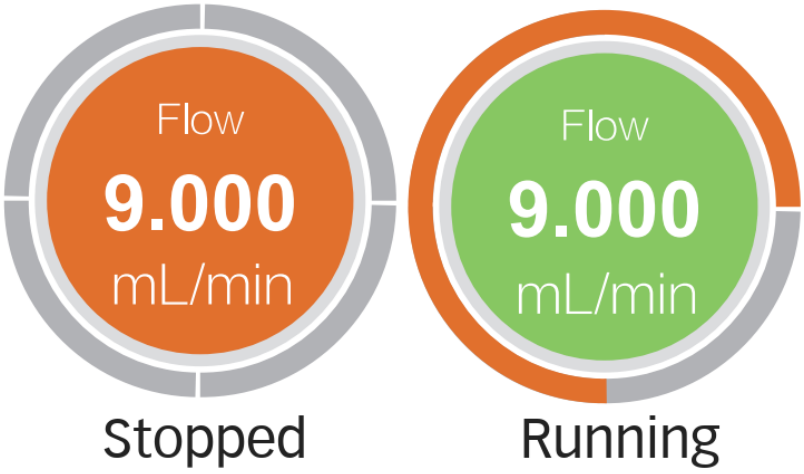

Figure 15 Status display in flow mode

During operation, the ring movement indicates the direction: left to right means clockwise; right to left means counterclockwise.

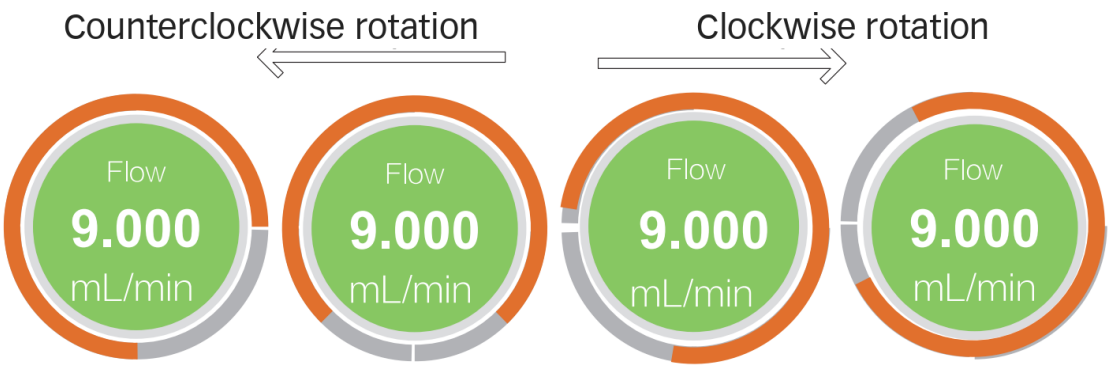

Figure 16 Direction indicated by the rotating ring

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In dispensing mode, orange also means stopped, green means running and yellow means paused.

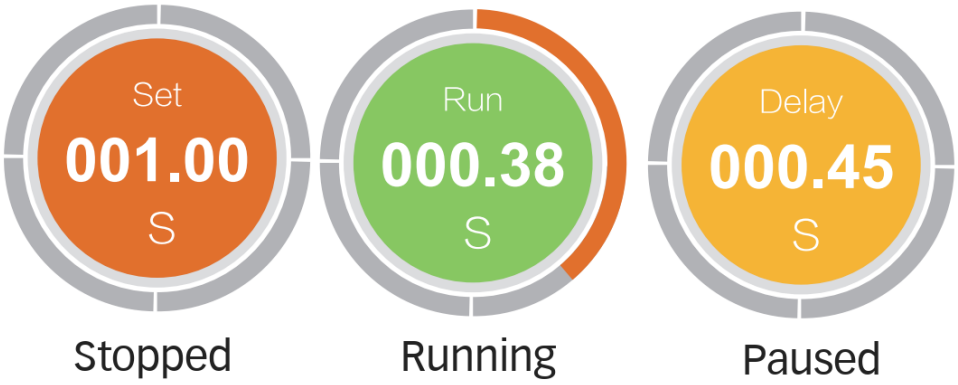

Figure 17 Status display in dispensing mode

Quick settings: Resets the cumulative liquid volume and number of runs. Notification sound and locking can be switched on or off.

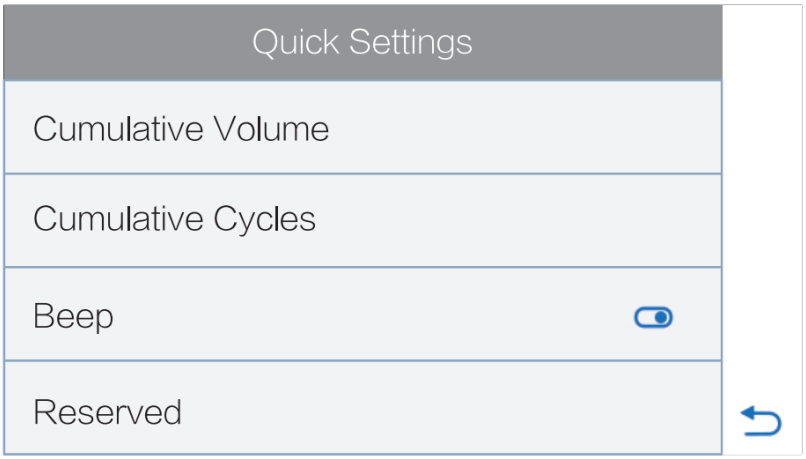

Figure 18 Quick settings

Fine adjustment: In the flow mode preview, the flow can be adjusted during operation. Plus increases it and minus decreases it by the smallest setting increment. Holding either key for more than one second changes the value continuously and more quickly.



Figure 19 Plus and minus keys for fine adjustment

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Calibration wizard: The flow must be calibrated for more accurate liquid transfer. Determine the actual liquid delivered using a balance or graduated cylinder, following the wizard's instructions. This adjusts the display to the actual flow.

Note: An accurate flow display requires calibration. See Chapter 7.2.

System menu: With the pump stopped, tap to open the main menu.

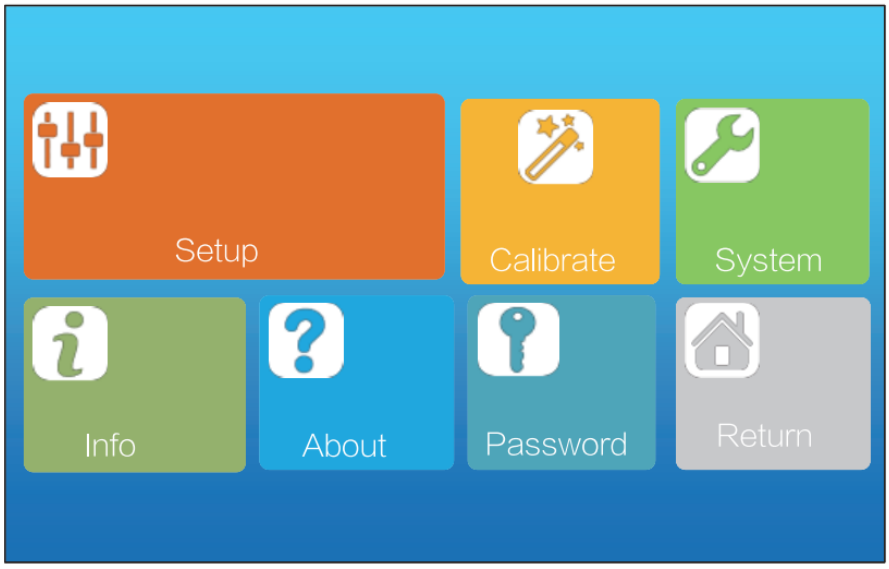

Figure 20 System menu

General parameters: Sets general pump parameters. Swipe up or down to display more entries.

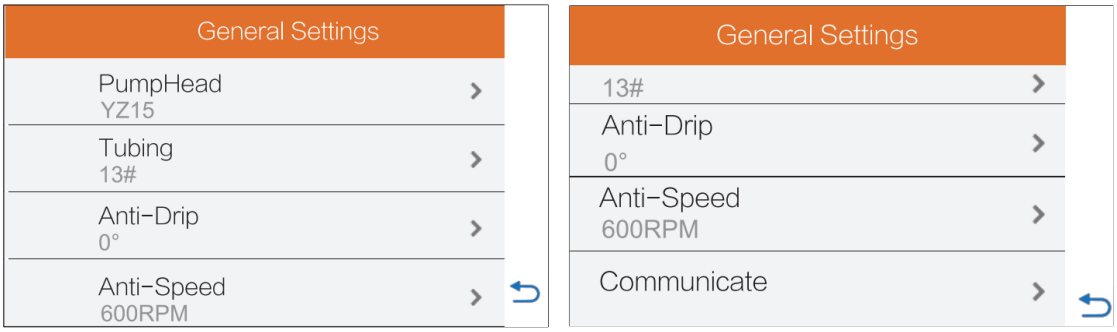

Figure 21 General parameters

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Select pump head: Select the pump head model actually installed. Swipe up or down to display more models.

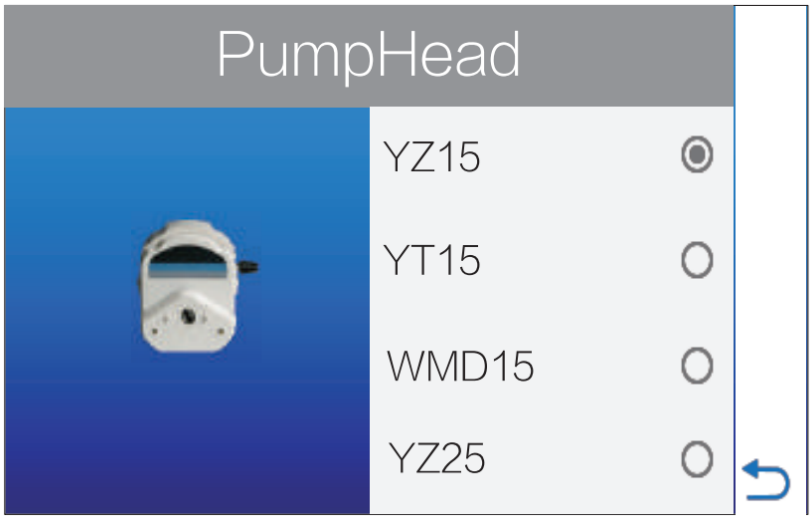

Figure 22 Pump head selection

⚠ **Note:** Selecting a DG or DT10 pump head limits the maximum speed to 100rpm by default.

Select tubing: Select the tubing actually used. Swipe up or down to display further choices.

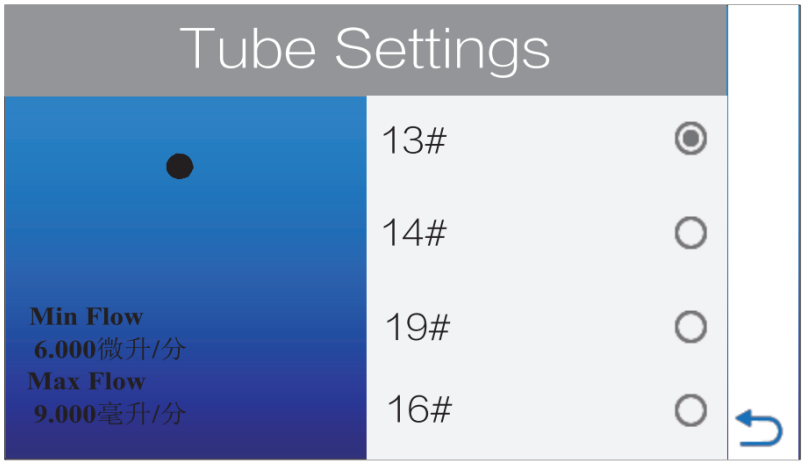

Figure 23 Tubing selection

⚠ **Note:** Each pump head has a range of suitable tubing. Pump head and tubing must be compatible.

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Anti-drip: When stopping, the motor reverses through an adjustable angle and draws liquid back into the tubing. This reduces dripping. Set the reverse angle in the anti-drip settings. At 0°, the function is off.

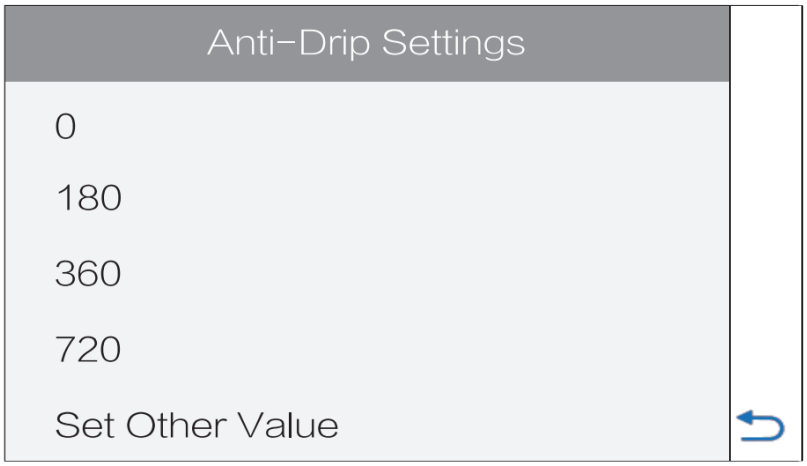

Figure 24 Anti-drip setting

Reverse speed: Set the suck-back speed to suit the application.

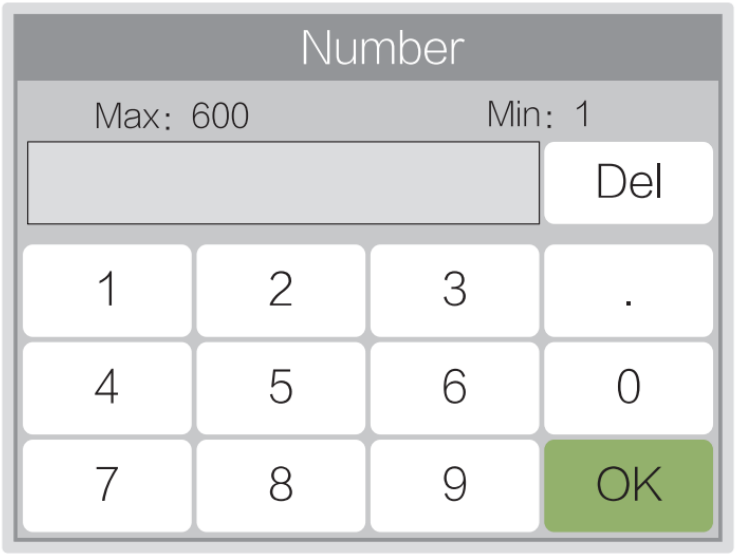

Figure 25 Reverse speed setting

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Communication: Set the RS485 communication parameters.

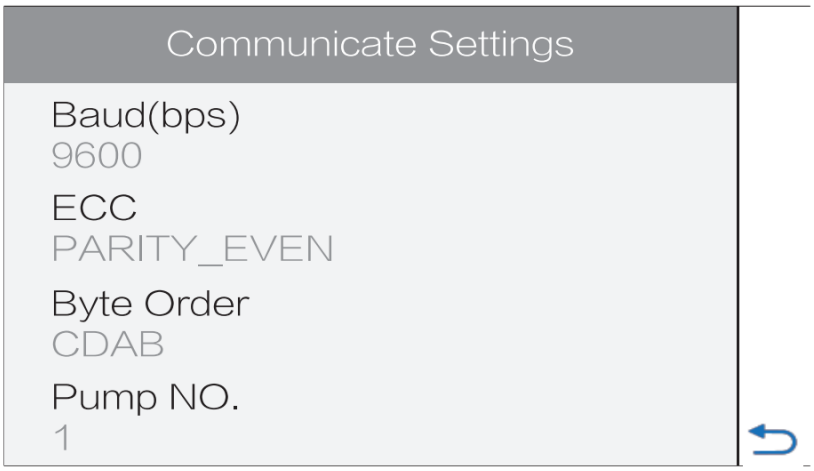

Figure 26 Communication settings

Advanced settings: After entering the correct user password, which is blank by default, reopen the general parameters. Additional settings appear. Swipe up or down to scroll through the menu.

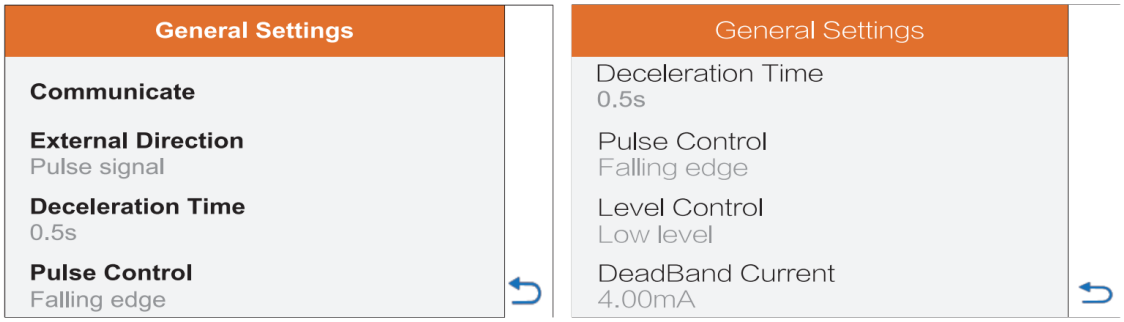

Figure 27 Advanced settings

External direction control: Choose level or pulse control. With level control, the applied high or low signal level determines the direction. With pulse control, the rising or falling edge of a level change is evaluated, for example the signal from a pushbutton. This setting applies in external control mode.

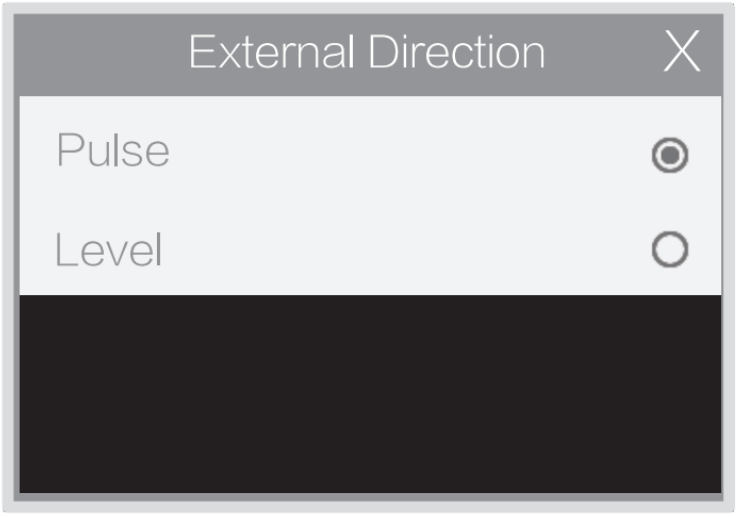

Figure 28 External direction control

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Deceleration time: Time from receipt of the stop signal until the pump stops. Adjusting this time can reduce splashing during filling.

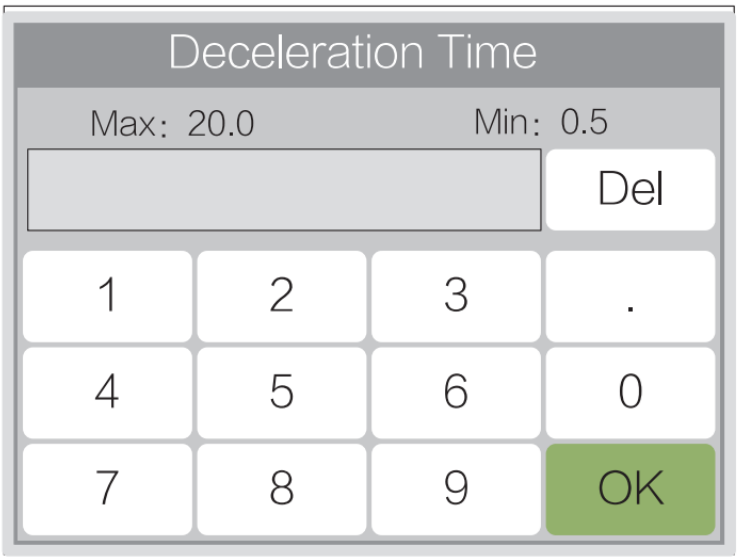

Figure 29 Deceleration time setting

Pulse signal: For an external pulse signal, either the falling or rising edge can be selected as active. Falling means a change from high to low; rising means a change from low to high.

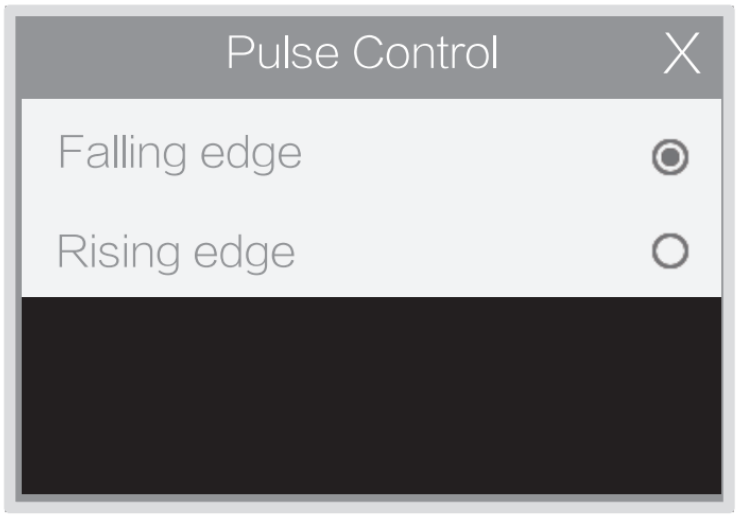

Figure 30 Active pulse edge selection

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Level signal: For external level control, either low or high can be selected as the active level.



Figure 31 Active signal level selection

Calibration wizard: To improve flow accuracy, measure the actual liquid delivered with a balance or graduated cylinder as instructed by the wizard. The display is adjusted to the actual flow.

⚠ **Note:** Calibration is required for an accurate flow display.

System parameters: Sets the pump system settings. Swipe up or down to display more entries.

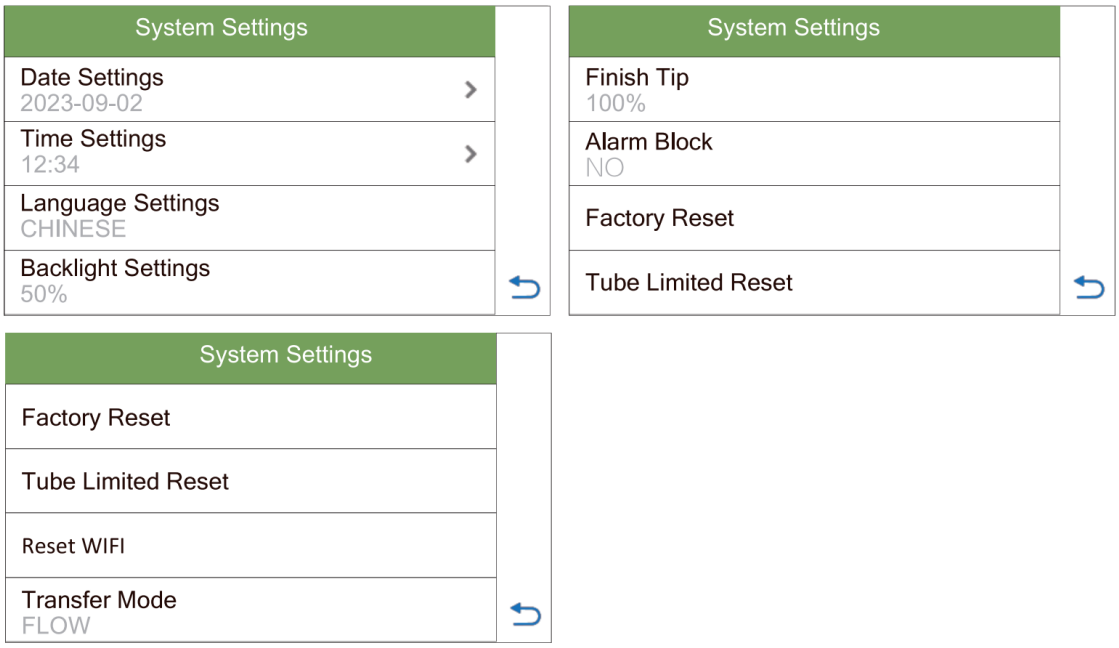

Figure 32 System settings

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Date: Select year and month with the arrow keys, then tap the day on the screen. The date is saved automatically when leaving the screen.

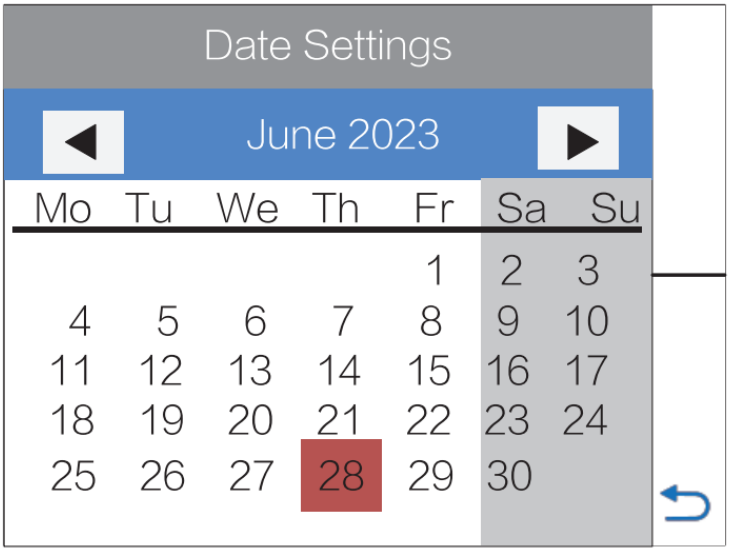

Figure 33 Setting the date

Time: Set hours, minutes and seconds using the up and down keys. The time is saved automatically when leaving the screen.

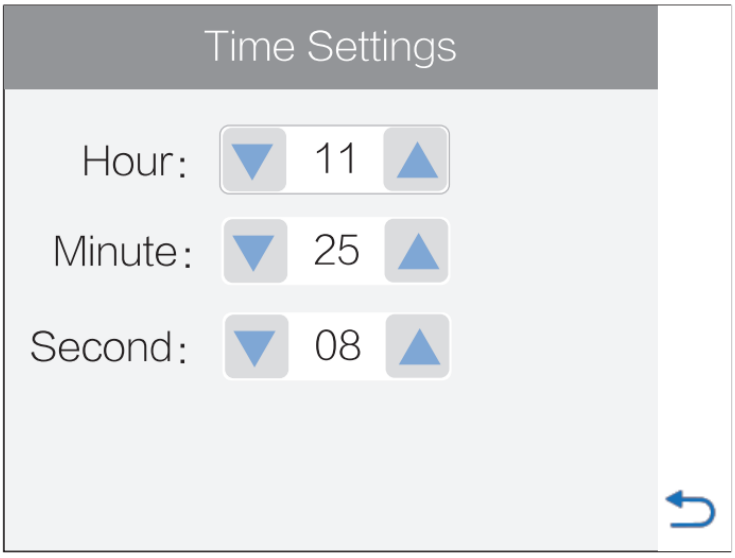

Figure 34 Setting the time

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Language: Select Chinese or English.



Figure 35 Language selection

Backlight: Set LCD brightness between 1% and 100%.

Motor stall alarm: The drive stops automatically if the rotor is blocked. This function is off by default.

Factory reset: Resets all parameters to their factory settings. Then restart the drive for the reset to take effect. Alternatively, with the pump switched off, hold the direction key and MODE key and switch on the power. The factory settings are restored once the main screen appears.



Figure 36 Factory reset

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Tubing replacement reminder: When enabled, the Lead Fluid Cloud Pump app sends a notification when the theoretical remaining tubing life reaches zero. It indicates that the tubing may be damaged and must be replaced in good time. This function is off by default.

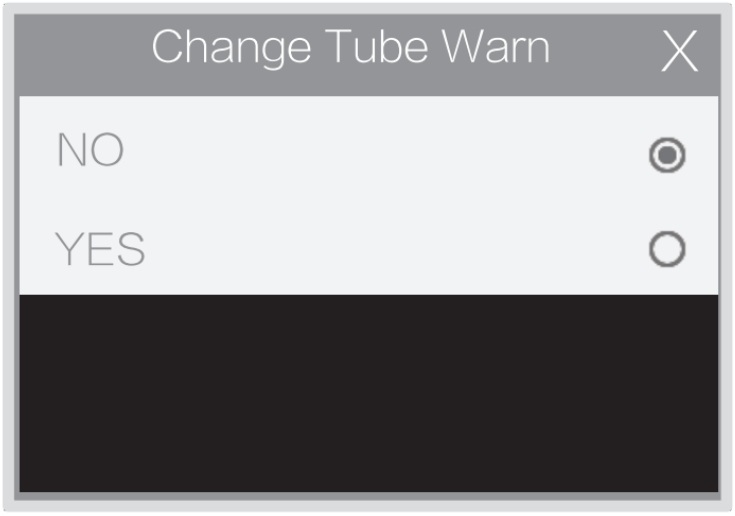

Figure 37 Tubing replacement reminder

Reset tubing life: Resets tubing life to its initial value. This is normally done after replacing the tubing.



Figure 38 Resetting tubing life

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Reset Wi-Fi: Deletes the Wi-Fi pairing. The drive then waits for network configuration and can be reconnected. On the main screen of any operating mode, MODE can be held for 10 seconds to do this.

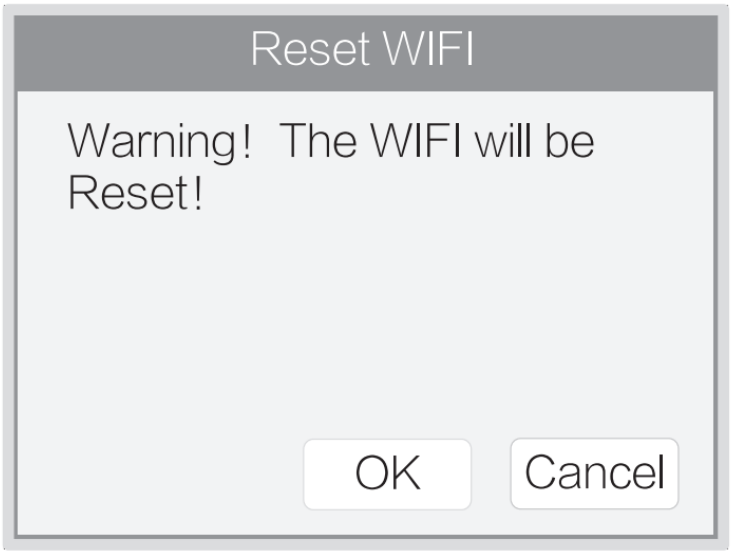

Figure 39 Resetting Wi-Fi

Device information: Shows usage and device information. Swipe up or down to display more entries.

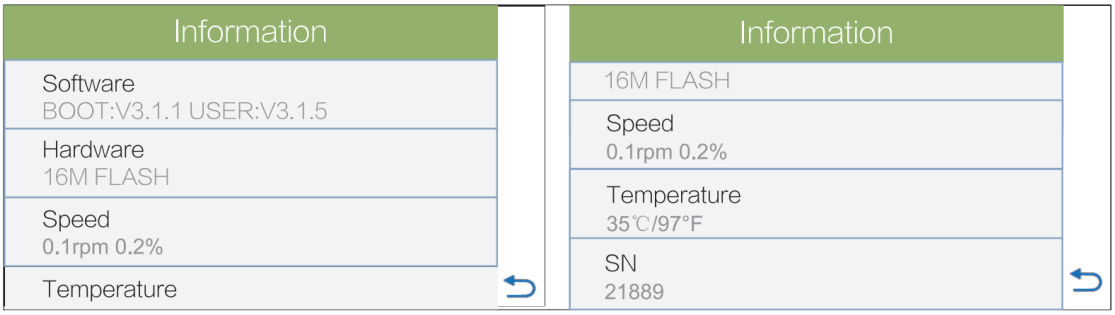

Figure 40 Device information

Operating information or About: Shows contact details and a brief introduction to Leadfluid.

Password: The user password locks and unlocks the device, prevents changes by other people and enables additional general parameters. No password is set by default.

On the main screen, tap operating mode settings and then the padlock. A blue padlock indicates a locked device. Tapping the padlock again opens password entry. After entry and confirmation, the device returns to the main screen. Open operating mode settings again: a grey padlock indicates the device is unlocked. The device also returns to the main screen after an incorrect entry. Therefore, check the actual lock status using the padlock.

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Change password: On first setup, Change Password is not initially shown. First tap OK and return to the main screen. Reopen password settings; Change Password is now displayed. Enter the desired password and tap Change Password. The password can contain one to eight digits.

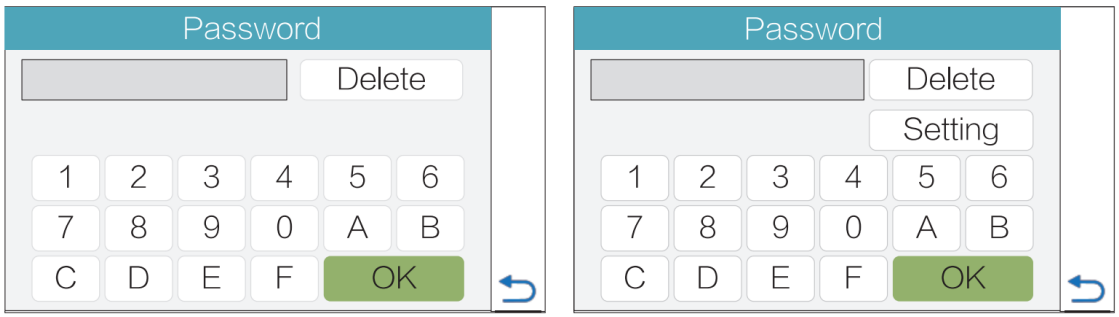

Figure 41 Setting and changing the password

If the password is forgotten, contact Labmaterial GmbH for resetting or recovery.

Return to main screen: Return opens the main screen.

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5 External control interface

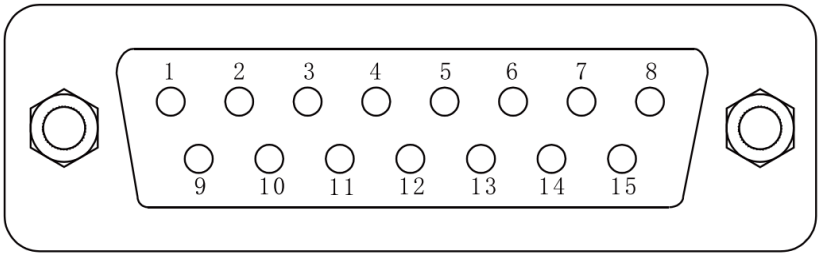

Figure 42 DB15 connector numbering

DB15 pin	Signal	Description
1	ADC_W	Positive external analogue signal input
2	B	RS485 communication line B
3	A	RS485 communication line A
4	VCC_W	External DC supply input
5	DAC	Analogue voltage signal output
6	CW_W	External direction input
7	PWM	Pulse signal output
8	COM	Common connection for external signals
9	AGND	Negative external analogue signal input
10	+12V	Positive connection of the internal 12V supply
11	GND	Internal supply ground
12	CW	Internal direction status output
13	RS_W	External start/stop input
14	PWM_W	External pulse signal input
15	RS	Internal start/stop status output

Table 4 External control connector pin assignments

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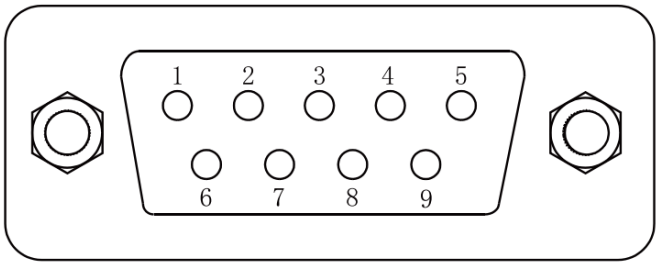

Figure 43 DB9 connector numbering

DB9 pin	Signal	Description
1	—	—
2	RXD	Receive data
3	TXD	Transmit data
4	—	—
5	GND	Signal ground
6	—	—
7	—	—
8	—	—
9	—	—

Table 5 RS232 connector pin assignments

⚠ **Note:** Do not connect mains voltage to the external control connector. Apply only the signals shown in the connection diagrams to the corresponding pins. Do not exceed the permitted signal ranges or apply supply voltage to other pins. Otherwise, permanent damage not covered by the manufacturer's warranty may occur.

⚠ **Note:** Low-voltage signals must be separated from the mains supply. Use a separate shielded ground wire.

⚠ **Note:** Use suitable ferrules on the ends of stranded wires. Otherwise, equipment damage may occur.

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6 Installation

6.1 Before commissioning

- When unpacking, check against the packing list that all accessories are complete, correct and undamaged. Contact Labmaterial GmbH immediately if anything is wrong.
- Read the operating instructions carefully and keep them accessible for future reference.
- Place the pump on a level surface. Leave at least 20cm clearance behind the pump.

6.2 Installing the pump head and tubing

The individual installation steps are described in detail in the instructions for the relevant pump head.

Installing YZ15 and YZ25 pump heads:

1. Align the flat pump head shaft with the slot in the drive coupling and insert it. Rotate the pump head until its screw holes line up with those in the pump head bracket. Seat the head fully, insert the two fixing screws into the provided holes and tighten them.
2. Operate the lever to open the pump head. Place the tubing smoothly and straight in the head. Return the lever to the horizontal position. The tubing is now installed.

Installing a DG multichannel pump head:

1. Align the flat pump head shaft with the slot in the drive coupling and insert it. Rotate the head until the positioning hole on its rear lines up with the positioning pin on the bracket. Seat the head fully. Insert and tighten the two socket head screws in the internal fixing holes.
2. Place the tubing smoothly and straight in the cassette. Press the tubing retainers at both ends into the fixing grooves. First engage the left end of the cassette in the round guide of the head, then snap the other end into the square guide.

6.3 Mains connection

Rated supply: 230V, 50/60Hz. Insert the supplied power cable into the mains connector on the rear of the drive.

⚠ **Note:** All supply cables must be rated for the device's power consumption.
⚠ **Note:** Position the pump so it can easily be disconnected from the power supply during use.
⚠ **Note:** The power supply must match the nameplate specification. Otherwise, the device may be damaged.

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7 Operation

7.1 First start and factory settings

The pump has preset operating parameters. The following table lists the preset parameters.

Parameter	Factory setting
Language	Chinese
Screen brightness	50%
Password	Blank
Key tone	On
Operating mode	Internal control, flow mode
Default flow	60µL/min
Default speed	1.0rpm
Direction of rotation	Clockwise
Delayed start	Off
Pump head	YZ15
Tubing	13#
Anti-drip	Angle 0°, off
Reverse speed	Model-dependent; BT100L maximum 150rpm
Baud rate	9'600Baud
Parity	Even
Byte order	CDAB
Pump number	1
External direction control	Pulse signal
Start/stop in footswitch mode	Pulse signal
Start/stop in other external control modes	Level signal
Deceleration time	0.5 seconds
Active pulse edge	Falling edge
Active signal level	Low level

Table 6 Device default parameters

7.2 Calibrating the flow

Measure the actual liquid delivered using a balance or graduated cylinder and use the result to calibrate the pump flow.

Calibration is required in the following cases:

- First operation.
- Change of pump head.
- Change of tubing.
- Reinsertion of tubing.
- Transfer of the same liquid with two pump heads.

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• Extended uninterrupted operation.

Procedure:

1. Install the pump head and tubing. Prepare a suitable balance or graduated cylinder and a collecting vessel.
2. Under general parameters, set the pump head and tubing actually used; see Figure 22 and Figure 23.
3. Use the full speed key to fill the tubing completely with liquid.
4. With the pump stopped, tap the calibration wizard icon . Alternatively, open the calibration wizard from the system menu .
5. The wizard displays the current test flow and test volume. Flow is the amount delivered per unit time; volume is the total amount delivered during the test. The example displays 9.000mL/min and 6.000mL. Tap values and units directly to change them. Select Next to open the test screen. Select Back/Exit to leave the wizard and return to system settings.

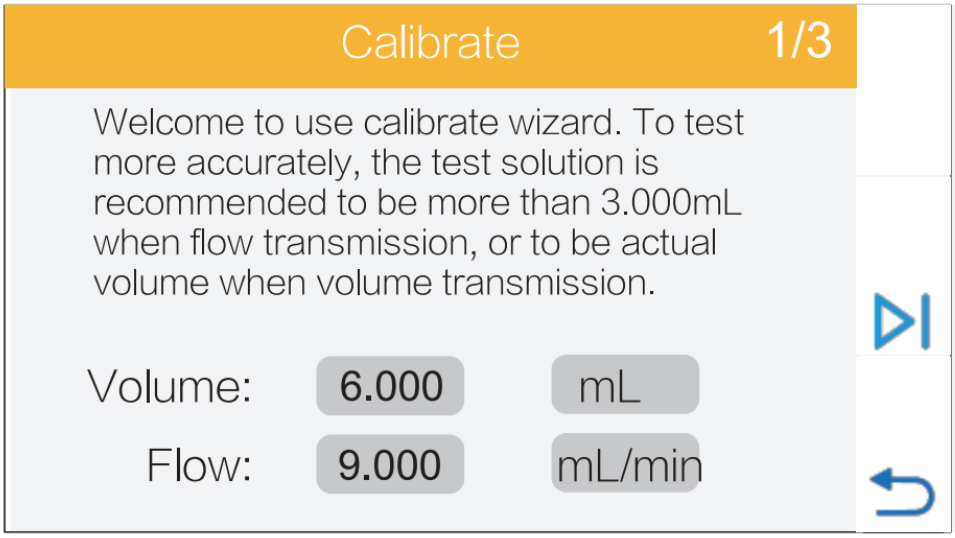

Figure 44 Calibration wizard settings

6. The test screen opens.

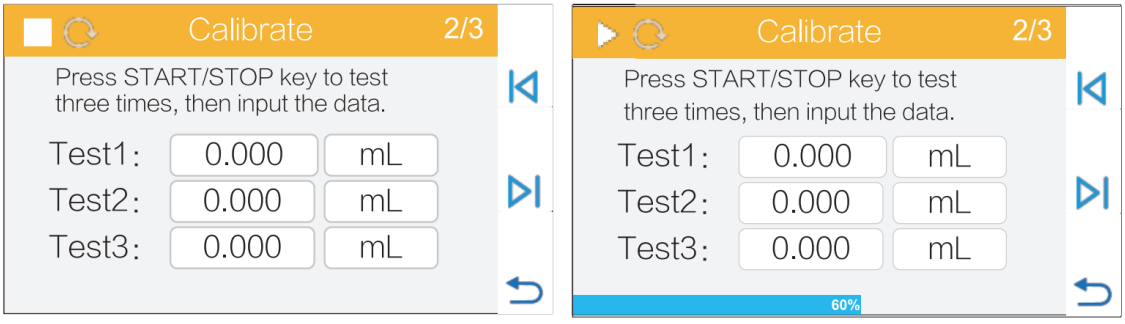

Figure 45 Actual measurements in the calibration wizard

⚠ **Note:** For accurate calibration in flow mode, do not use a test volume below the minimum recommended by the system. For volume dispensing, calibrate with the actual filling volume wherever possible.

Prepare a graduated cylinder or beaker and ensure the tubing is completely filled. Press Start/Stop. The pump delivers liquid and the progress bar shows the test progress. The pump stops automatically when complete. Measure the liquid using a balance or graduated cylinder and record the value.

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Repeat if necessary. Enter the measurements under Test 1, Test 2 and Test 3 and select the correct unit. Then select Next to proceed to calculation. Use Back to reset the test flow and volume. Use Exit to return to system settings.

⚠ **Note:** If a fault occurs during the test, press Start/Stop to halt it. Pressing again starts a new test. One or more measurement sets can be entered. The system automatically calculates the mean.

7. The system calculates the correction factor and displays the previous factor for comparison. If the difference exceeds a factor of two, check in particular:

- Measurement error.
- Incorrect measurement unit.
- Incorrect pump head or tubing model selected.
- Excessive liquid viscosity.
- Use of two pump heads.

If the correction factor is plausible, save it with the confirm icon. Select Previous Step to measure again. Select Exit to return to system settings without saving.

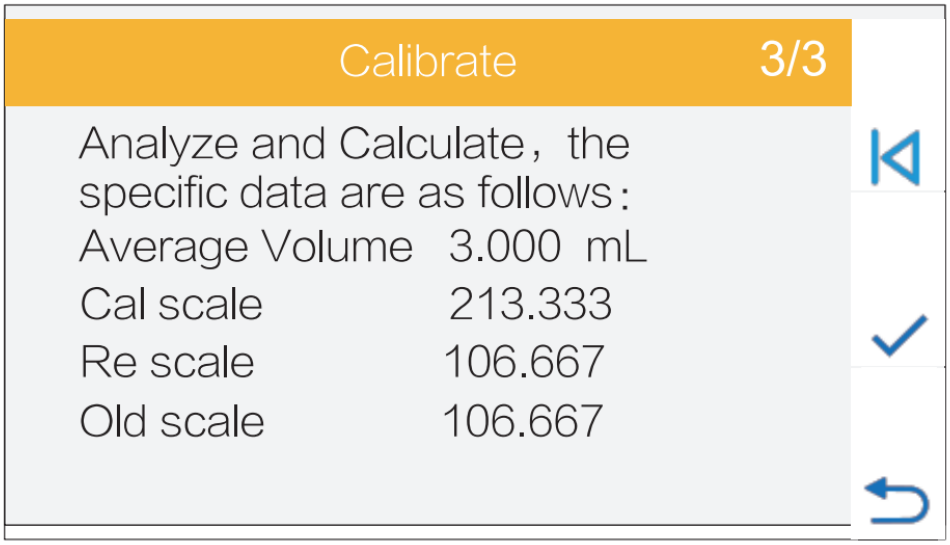

Figure 46 Calibration wizard calculation result

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If no measurements were entered, the following screen appears. Select Back to perform a new test.

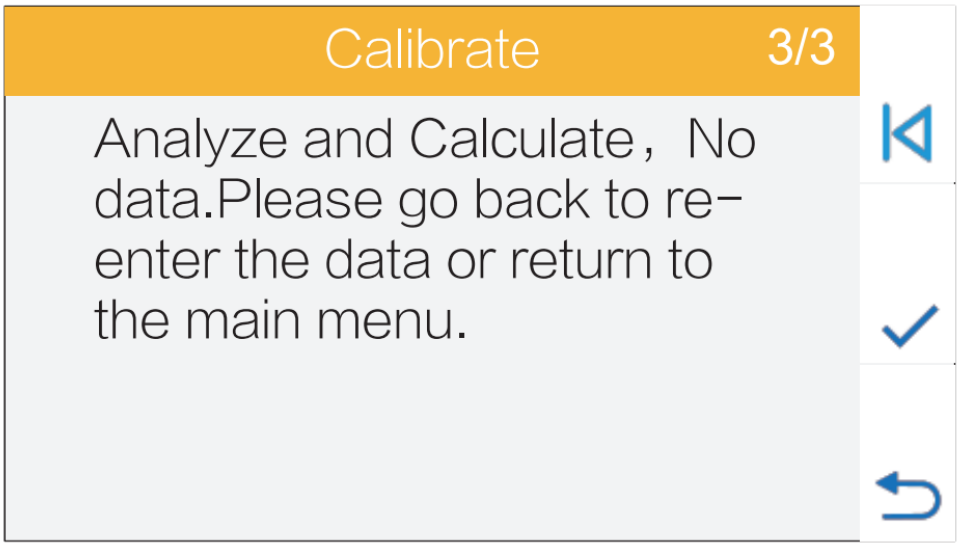

Figure 47 Calibration wizard without measurements

7.3 Operating modes

With the pump stopped, press MODE on the main screen to open operating mode selection.

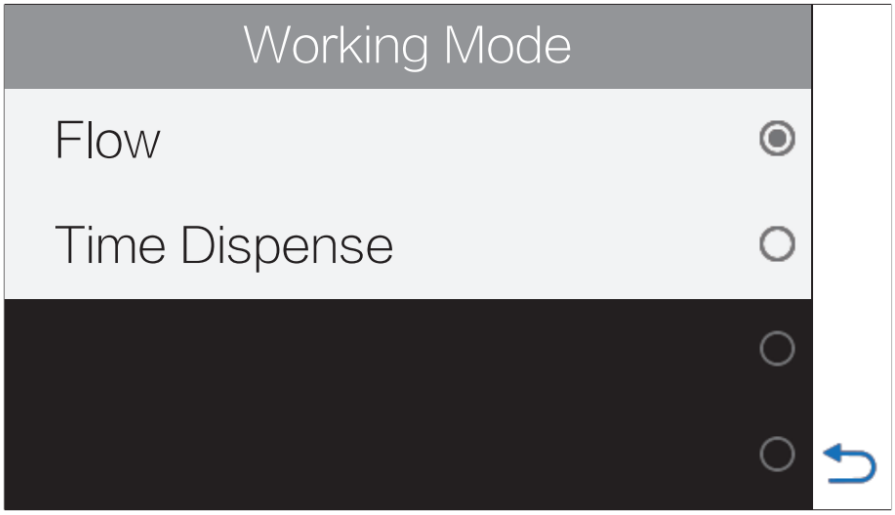

Figure 48 Operating mode selection

7.3.1 Flow mode

The pump runs continuously at the set flow and totals the liquid delivered.

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Set the flow and unit on the main screen. The flow can also be adjusted by changing the speed. The preview displays the pump head model, tubing, running time and cumulative liquid volume. Plus and minus provide fine flow adjustment.

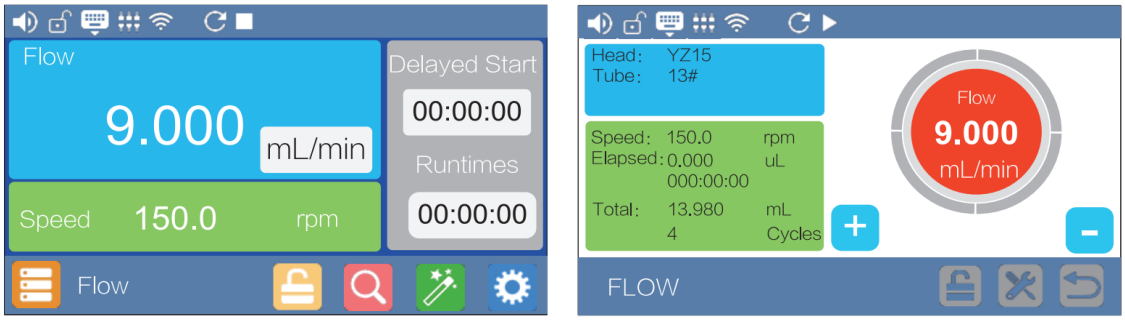

Figure 49 Flow mode main screen and preview

Delayed start and timed stopping are possible in flow mode. For example, to start the pump after 30 minutes and then run for 1 hour 30 minutes, tap the time fields and set the start delay and running time accordingly.



Figure 50 Setting start delay and running time

Press Start/Stop to activate the delayed start. An alarm clock icon appears in the status bar.

⚠ **Note:** If the running time is 0, delayed start is inactive regardless of the delay setting.

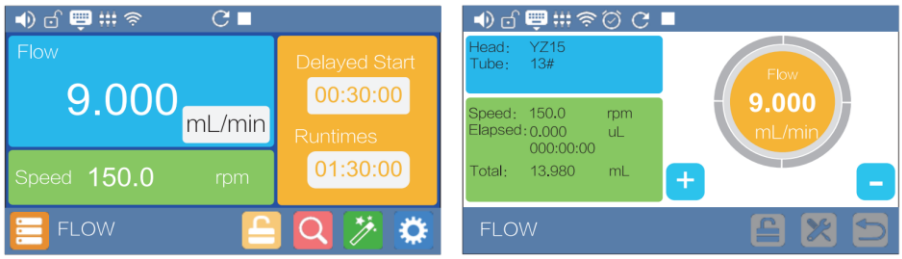

Figure 51 Active timing control

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7.3.2 Timed dispensing

The pump automatically calculates the dispensing volume from the set running time and flow.



Figure 52 Timed dispensing

Time: Duration of a dispensing cycle in hours, minutes or seconds.

Flow: Delivery rate during dispensing in µL/min, mL/min or L/min.

Interval: Pause between dispensing cycles in hours, minutes or seconds.

Cycles: Number of dispensing cycles. At 0, dispensing repeats continuously until Start/Stop is pressed. At 1, a single cycle is performed and the interval is not used. Above 1, the pump stops automatically after the set number.

The preview displays the pump head and tubing, current running time, cumulative liquid volume and number of runs.

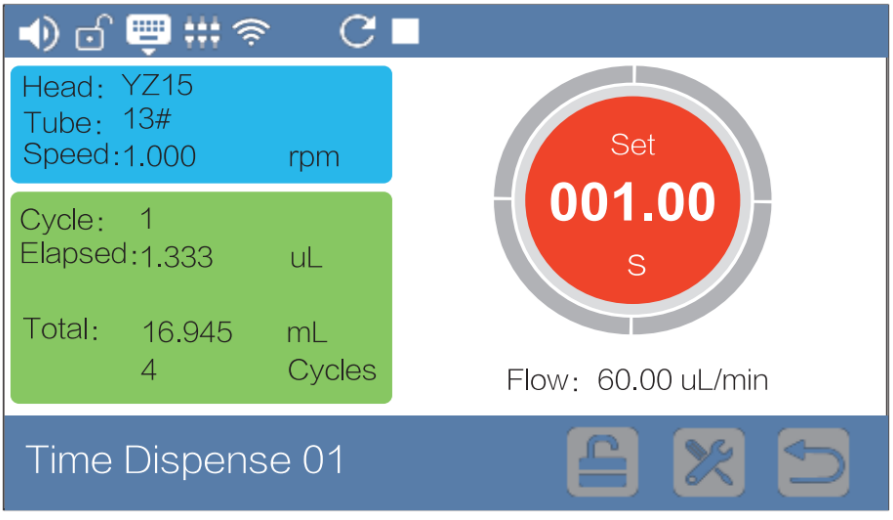

Figure 53 Timed dispensing preview

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In operating mode settings , different group numbers can be selected. Up to five parameter groups can be stored.

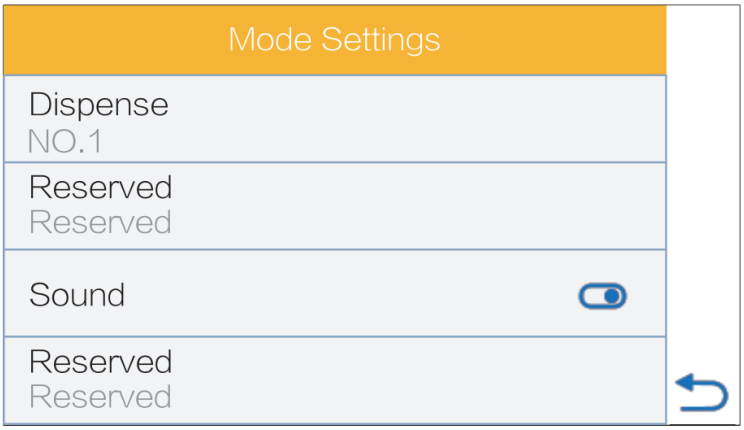

Figure 54 Timed dispensing parameter groups

7.4 External control

Speed is determined by an external analogue signal. Start/stop and direction are also controlled by external signals. The keypad keys do not function.

- Switch off the power. Wire the circuit with an internal or external supply as shown in the connection diagram. Connect the DB15 plug to the interface on the rear of the pump.

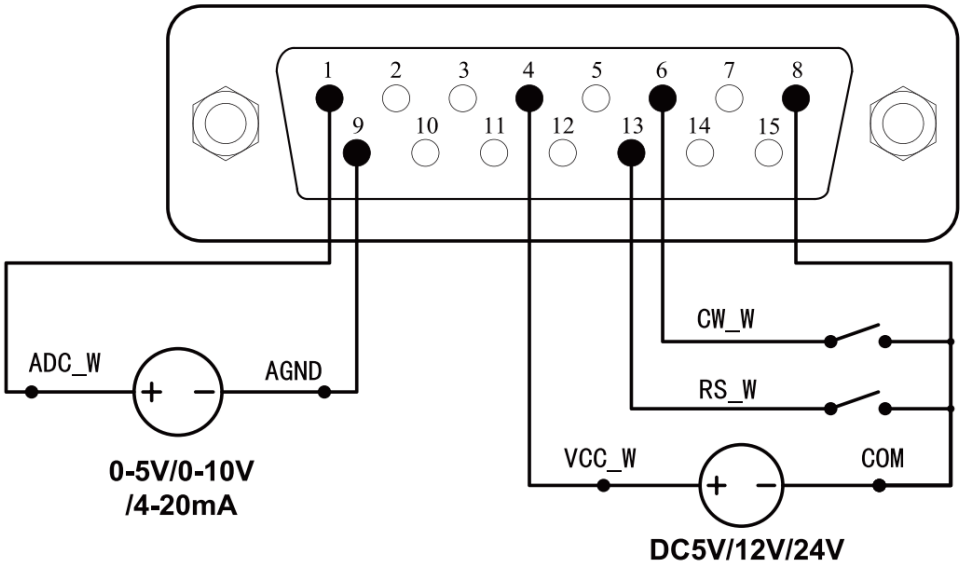

Figure 55 External control with external supply

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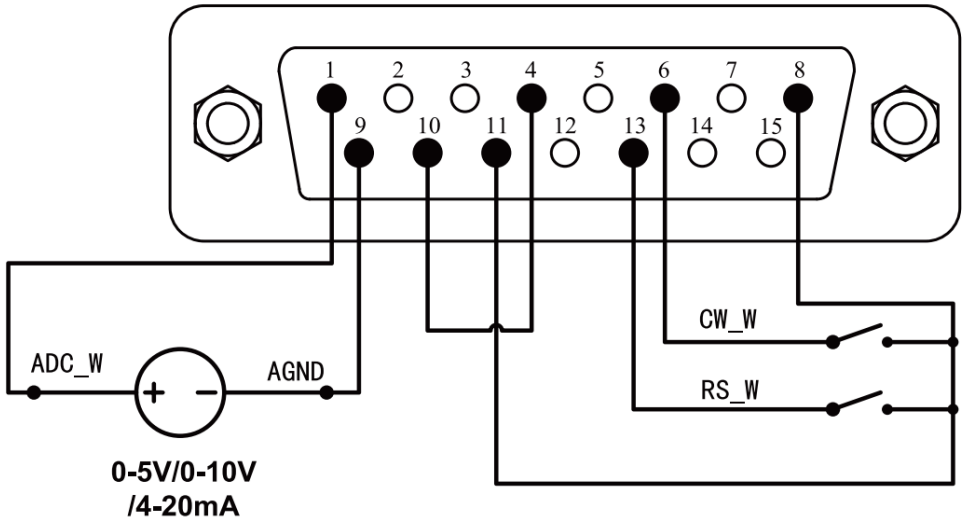

Figure 56 External control with internal supply

⚠ **Note:** Do not connect mains voltage to the external control connector. Apply only the signals shown in the connection diagrams to the corresponding pins. Do not exceed the permitted signal ranges or apply supply voltage to other pins. Otherwise, permanent damage not covered by the manufacturer's warranty may occur.

⚠ **Note:** Low-voltage signals must be separated from the mains supply. Use a separate shielded ground wire.

⚠ **Note:** Use suitable ferrules on the ends of stranded wires. Otherwise, equipment damage may occur.

- Turn on the mains switch. The main screen appears.
- Select flow mode with MODE.
- Open operating mode settings and select voltage or current signal control under Control Mode.

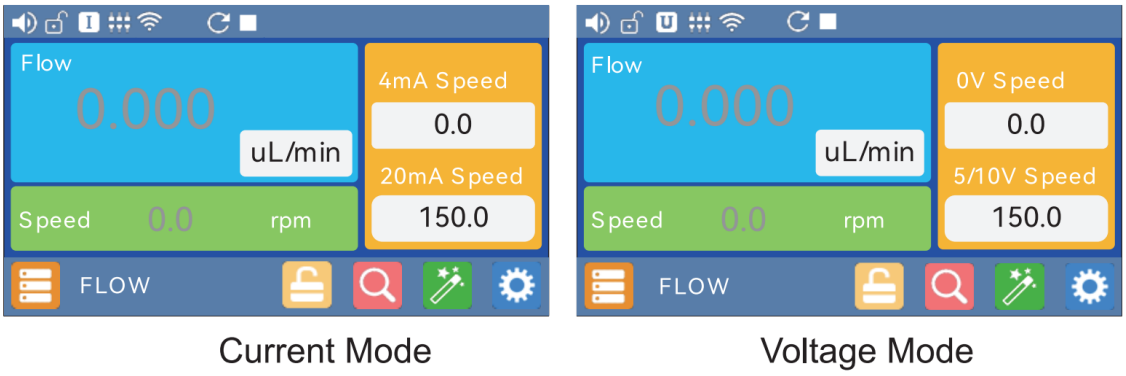

Figure 57 Analogue current and voltage signal control

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- Under External Start/Stop, choose whether start/stop is controlled by level or pulse.

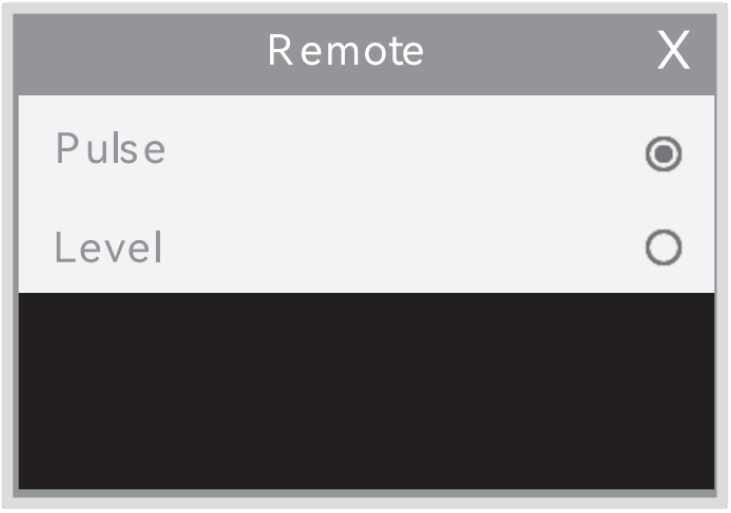

Figure 58 Selecting external start/stop control

- **Level-controlled start/stop:** Close the external RS_W switch and apply the analogue signal. Speed follows the analogue signal. Opening the RS_W switch stops the pump.
- **Pulse-controlled start/stop:** Close and open the RS_W switch once; apply the analogue signal. Speed follows the analogue signal. Closing and opening RS_W again stops the pump.
- **Level-controlled direction:** Set the external direction signal type under general parameters. With CW_W open, the pump runs clockwise; with it closed, counterclockwise.
- **Pulse-controlled direction:** Closing and opening CW_W once selects clockwise rotation; closing and opening it again selects counterclockwise rotation.

7.5 Communication mode

RS485 is not an Ethernet connection. Ethernet connectivity requires a suitable external gateway. RS485 communication supports the MODBUS protocol and can control various pump functions. Refer to the Leadfluid communication protocol for parameter addresses and supported commands.

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- Turn off the mains switch. Wire the circuit as shown in the following diagrams and connect the DB15 plug to the rear interface.

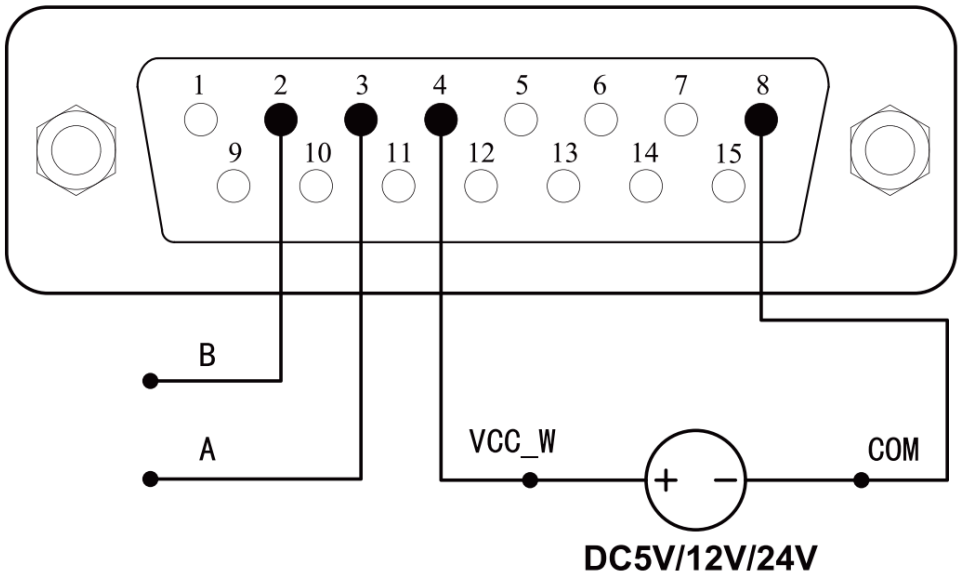

Figure 59 RS485 communication with external supply

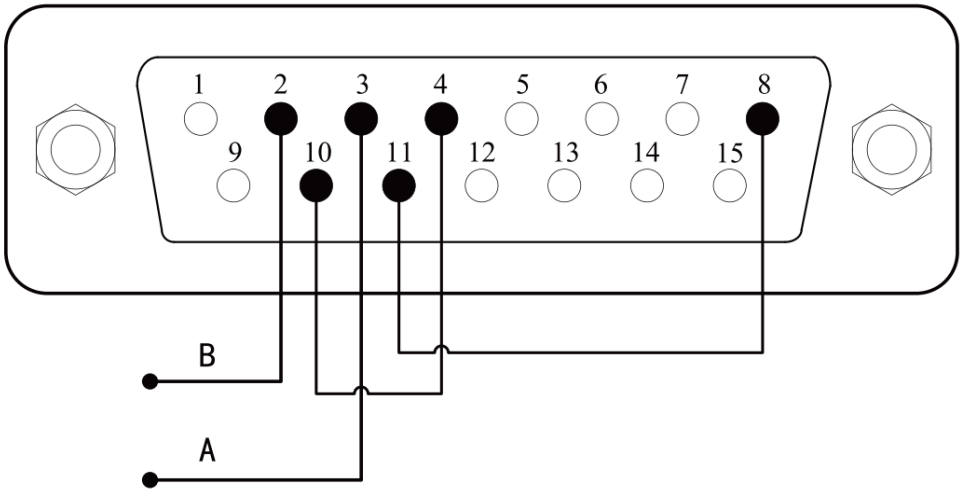

Figure 60 RS485 communication with internal supply

⚠ **Note:** Do not connect mains voltage to the external control connector. Apply only the signals shown in the connection diagrams to the corresponding pins. Do not exceed the permitted signal ranges or apply supply voltage to other pins. Otherwise, permanent damage not covered by the manufacturer's warranty may occur.

⚠ **Note:** Low-voltage signals must be separated from the mains supply. Use a separate shielded ground wire.

⚠ **Note:** Use suitable ferrules on the ends of stranded wires. Otherwise, equipment damage may occur.

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- Turn on the mains switch. The main screen appears.

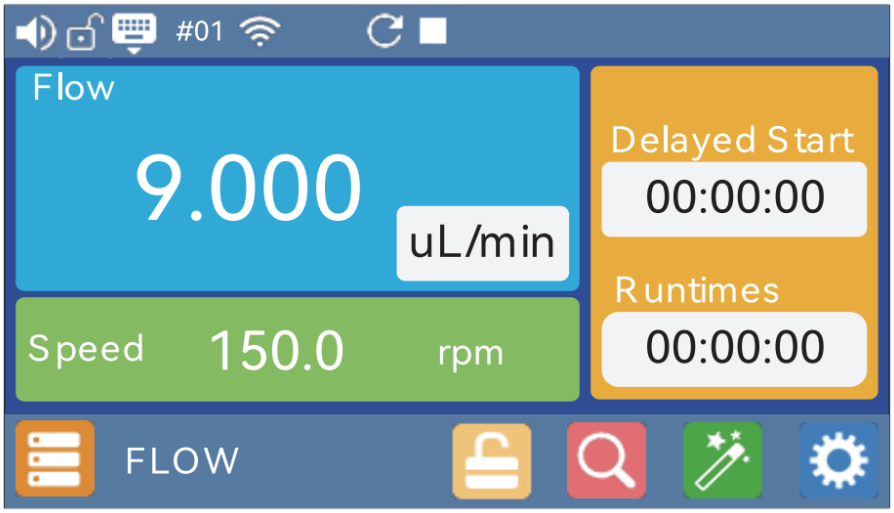

Figure 61 Display with communication connected

- Under internal control, the status bar shows the pump number, for example #01, when connected. Otherwise, disconnected communication is indicated.
- RS485 factory settings are 9'600Baud, eight data bits, even parity and one stop bit. Communication parameters can be changed under general parameters.

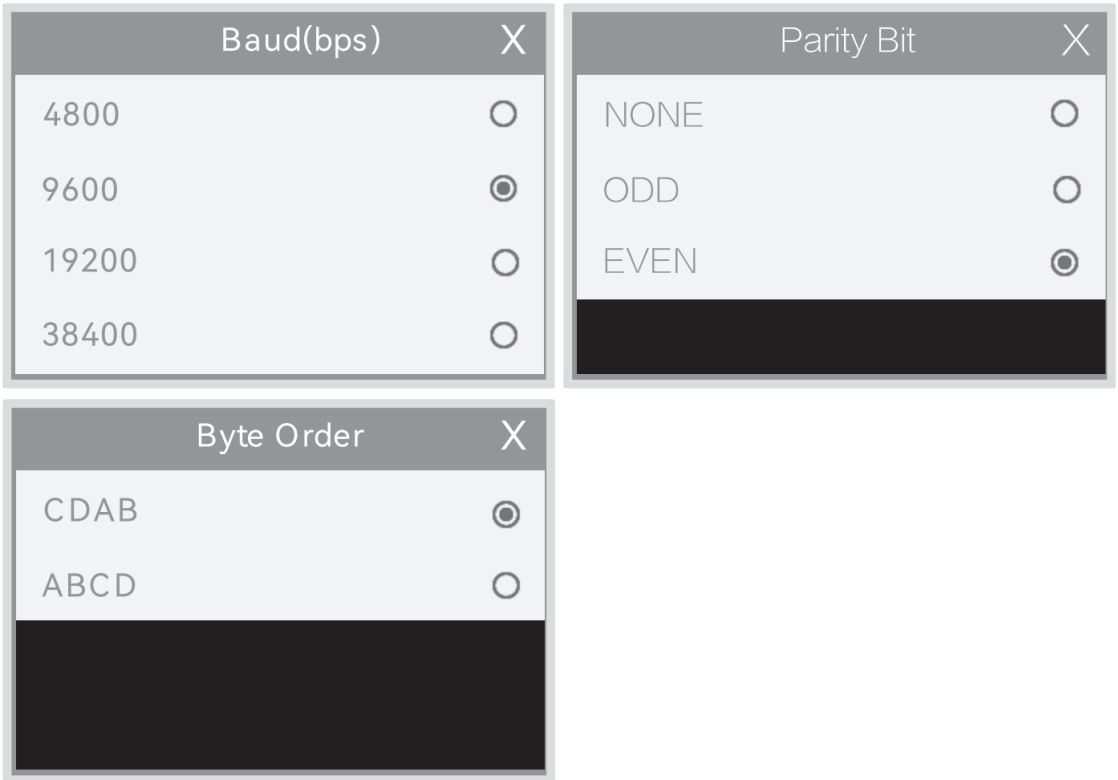

Figure 62 Baud rate, byte order and parity settings

- Once connected, communication commands control the pump functions.

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7.6 Footswitch mode

- Turn off the mains switch. Wire the circuit as shown in the following diagrams. Connect the DB15 plug to the interface on the rear of the pump.

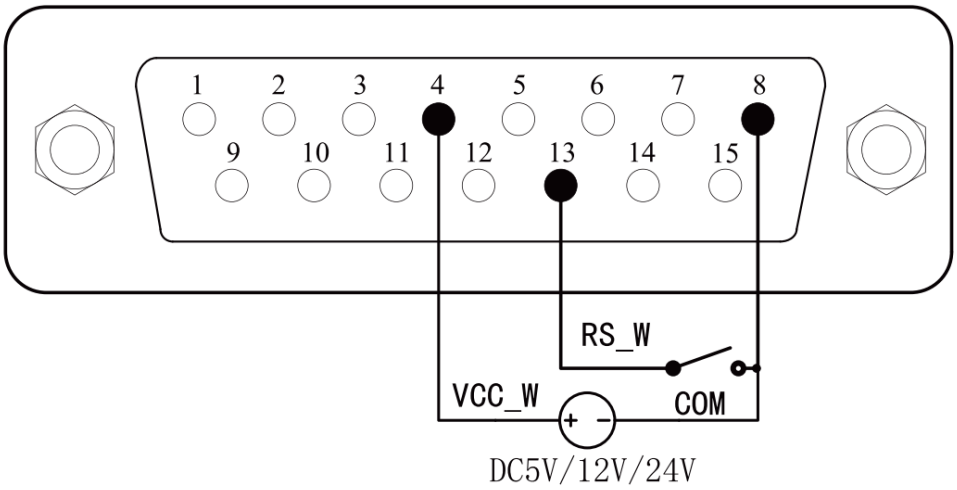

Figure 63 Footswitch with external supply

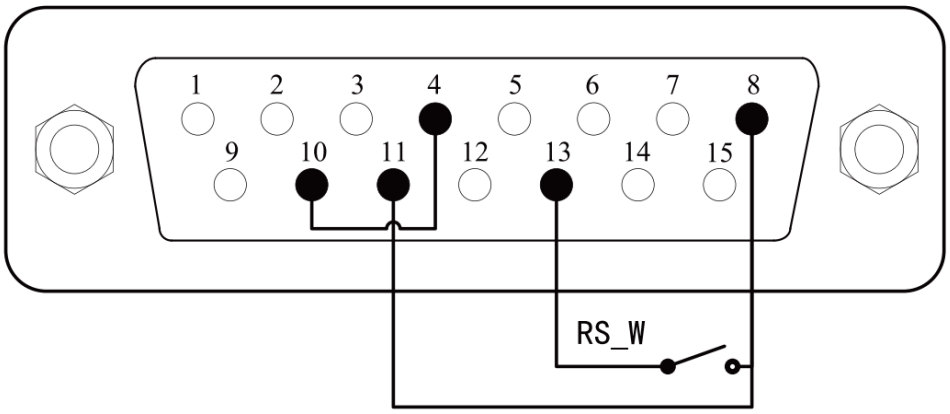

Figure 64 Footswitch with internal supply

⚠ **Note:** Do not connect mains voltage to the external control connector. Apply only the signals shown in the connection diagrams to the corresponding pins. Do not exceed the permitted signal ranges or apply supply voltage to other pins. Otherwise, permanent damage not covered by the manufacturer's warranty may occur.

⚠ **Note:** Low-voltage signals must be separated from the mains supply. Use a separate shielded ground wire.

⚠ **Note:** Use suitable ferrules on the ends of stranded wires. Otherwise, equipment damage may occur.

- Turn on the mains switch. The main screen appears.
- Under internal control in timed dispensing mode, close and open the footswitch once to start a dispensing cycle.
- **Level-controlled footswitch mode:** Close switch: pump runs. Open switch: pump stops.

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- **Pulse-controlled footswitch mode:** Close and open switch once: pump runs. Close and open again: pump stops.



Figure 65 Footswitch mode display

7.7 Connecting the device to the network

7.7.1 Preparation

Download app: Search for Lead Fluid Cloud Pump in the app store or use the indicated download method. Download and install the app.

Figure 66 Lead Fluid Cloud Pump app download code

The app is available from:

1. Android: Google Play Store.
2. iOS: Apple App Store.

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Register and log in: After installation, follow the app instructions to create a user account and log in.



Figure 67 Manufacturer app login screen

Permissions: The app requests Bluetooth and location access. Grant the required permissions as shown on screen.

Network: Connect the phone to a Wi-Fi network supporting the 2.4GHz band. Place phone, pump and router close together.

7.7.2 Network configuration

- On the main screen of any mode, hold MODE for 10 seconds until the Wi-Fi icon flashes and a beep sounds. The device now waits three minutes for network configuration.

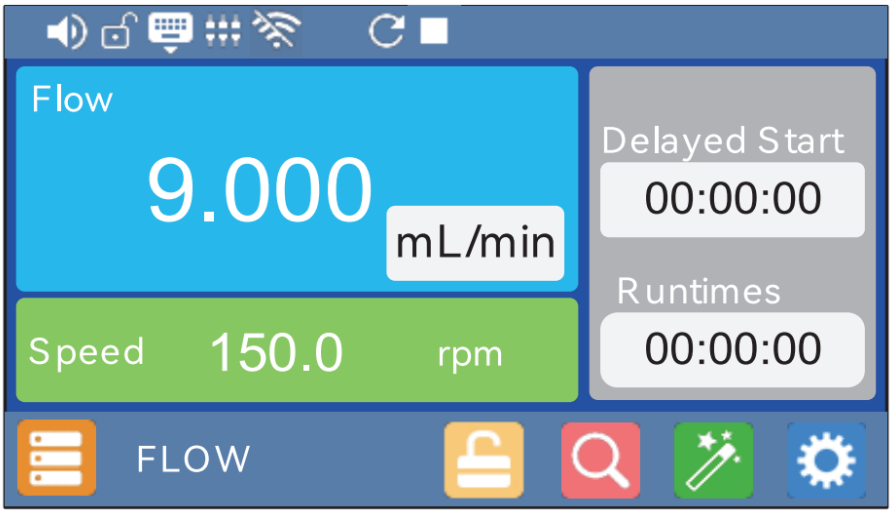

Figure 68 Device waiting for network configuration

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- In the app, select Plus at the top right of the home screen, then Add Device. The device should be found automatically. Tap Add and follow the instructions.

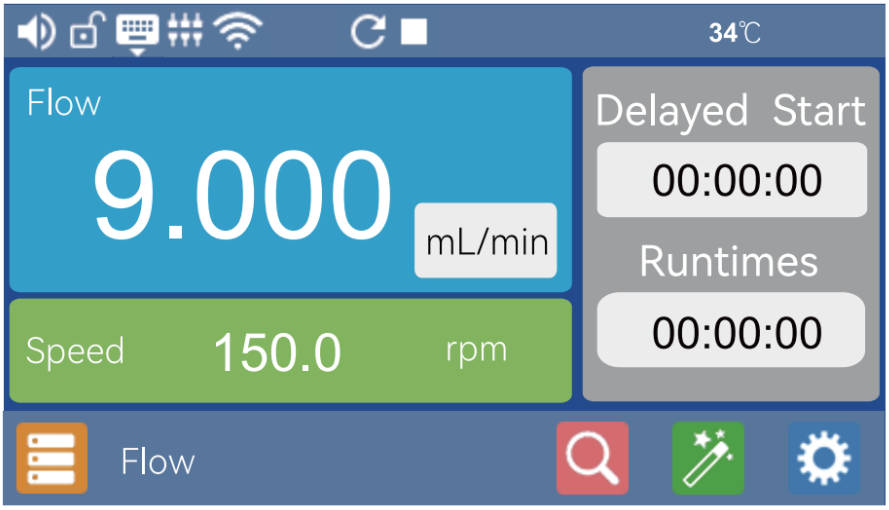

Figure 69 Completed network configuration

- After adding the drive successfully, it can be controlled using the Lead Fluid Cloud Pump app.

If setup fails, check the following and try again:

- Is the device in pairing mode? The Wi-Fi icon must flash quickly, approximately three times a second.
- Are Bluetooth and location access enabled on the phone and permitted for the app?
- Does the network connection work? Bring phone, pump and Wi-Fi device as close together as possible.
- Is the Wi-Fi password entered correctly?
- Is the 2.4GHz band used? If not, switch to a 2.4GHz network.
- After these checks, try setup again. If it fails again, contact the manufacturer.

7.8 Online device update

The Wi-Fi version of the peristaltic pump supports online firmware updates.

- When new firmware is available, open the Lead Fluid Cloud Pump app and follow the prompts. Select Online Upgrade.
- The drive displays update preparation.

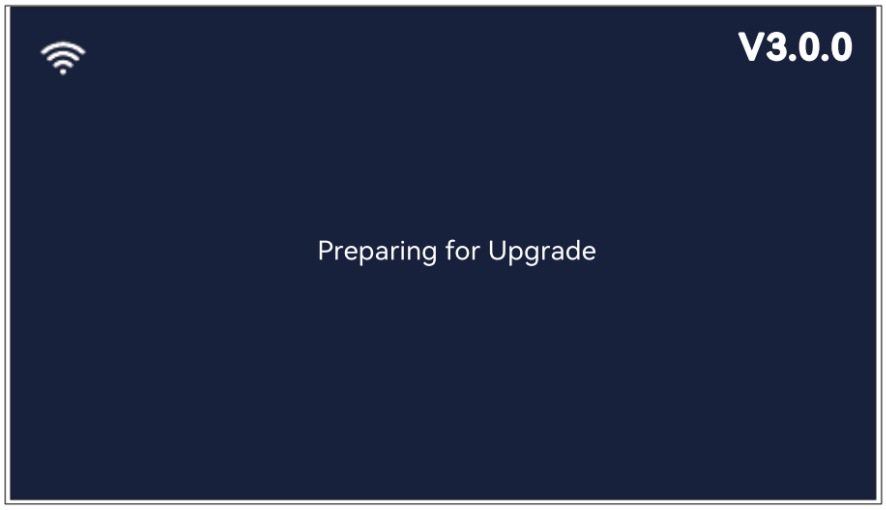

Figure 70 Firmware ready for update

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- The online update starts after approximately three seconds.

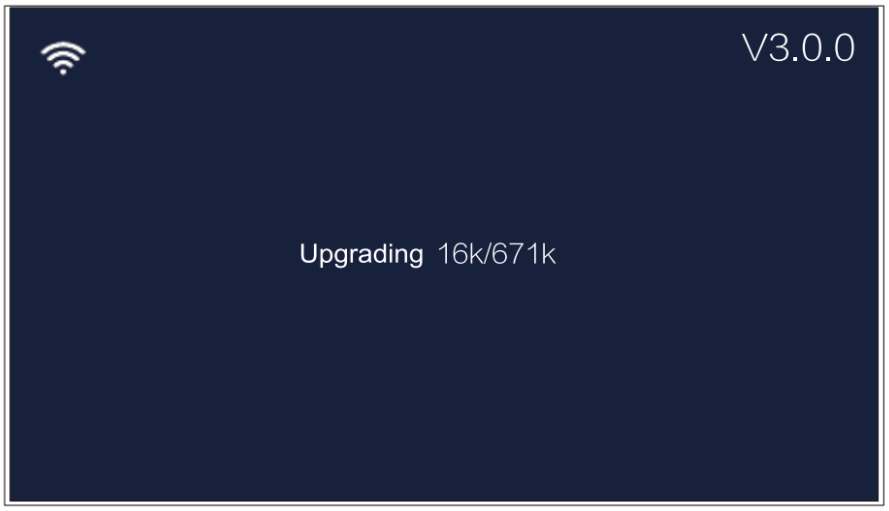

Figure 71 Firmware update in progress

- Wait until the firmware package has downloaded completely. The device displays Upgrade completed and returns automatically to the operating interface. The firmware is updated. The version check indicates that the current version is installed.

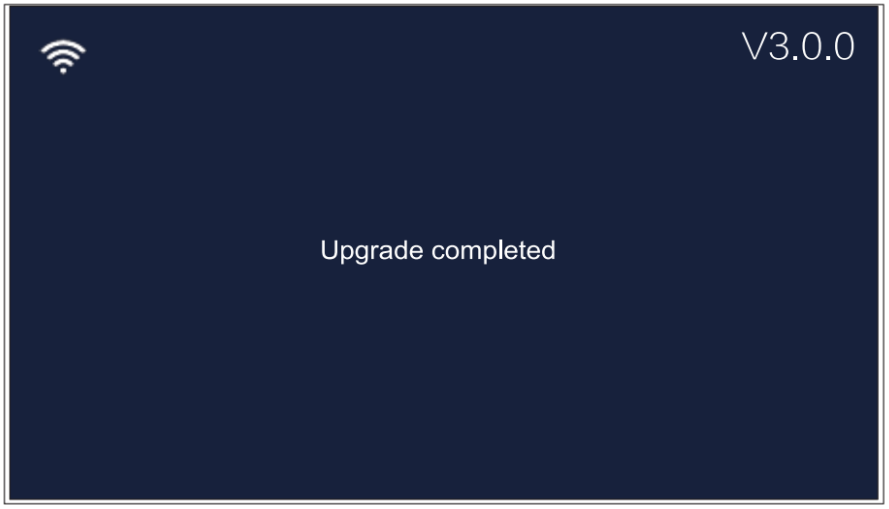

Figure 72 Firmware update complete

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- Do not interrupt the power supply during the update. Otherwise, the update may fail. If it fails, restart the device and repeat the update through the app.

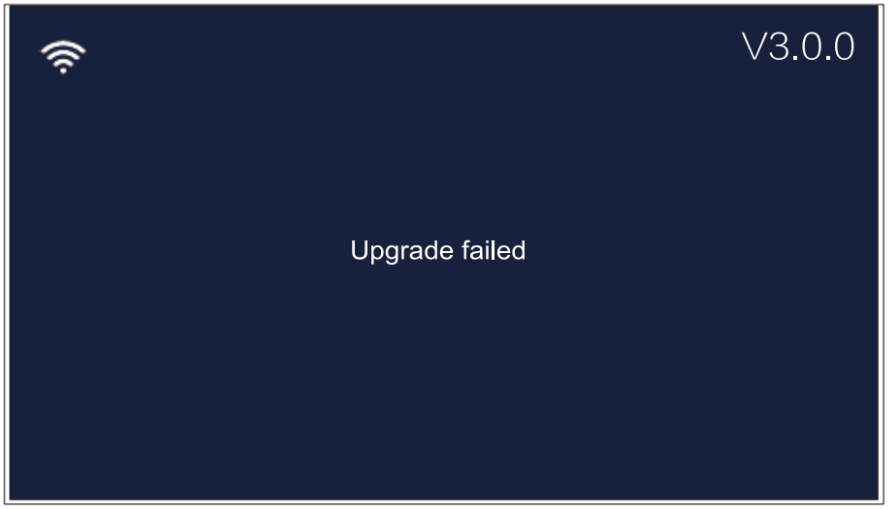

Figure 73 Firmware update failed

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8 Troubleshooting and maintenance

8.1 Manufacturer's warranty and customer service

The BT-L series has a three-year Leadfluid manufacturer's warranty. Contact Labmaterial for warranty handling and the conditions applicable at purchase.

1. The warranty applies exclusively to the complete BT-L peristaltic pump drive. Pump head, tubing and other consumables are excluded.
2. The warranty period starts on the purchase date shown on the customer's valid proof of purchase.
3. Within the warranty period, Leadfluid provides free repair or replacement of covered parts.
4. Damage caused by human intervention, for example water, dropping or improper use, is not covered. For such cases, Leadfluid specifies repairs without labour charges, with material costs charged.

⚠ **Special notes:** Check model and specifications before using tubing and other consumables. After unpacking and use, the manufacturer excludes returns and exchanges except for quality defects.

8.2 Drive spare parts

Spare part	Specification
Fuse	1A
Power cable	250V, 10A

Table 7 Drive spare parts

8.3 Daily maintenance

- Follow the maintenance table below for regular servicing.
- The fan is at the rear of the pump. Do not cover it, to avoid impairing heat dissipation.
- Do not rinse the peristaltic pump with water. If tubing bursts during operation, immediately remove liquid from the head and dry the affected areas.
- Do not use chemical solvents to clean the surfaces of the pump or head.

⚠ **Note:** Always disconnect the pump from the mains before opening the head cover to change tubing, or before installation, removal or maintenance.

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8.4 Maintenance schedule

Regular scheduled maintenance helps reduce damage to pump components and protect people and property.

Task	Frequency	Action if abnormal
Check pump for leaks and damage	Before every start; daily visual inspection; regularly during operation	Repair leaks and damage before operation; replace parts if necessary; remove spilled liquid completely.
Check for unusual temperature or noise	Daily visual inspection and regularly during operation	Check and replace worn parts.
Check whether tubing replacement is required	Check tubing condition at least every three days	Replace tubing if flow falls below 75% of the original value, the tubing has burst or is badly worn, or the specified replacement interval is reached.
Check pump head and rotor assembly	Check rollers weekly for free movement; check when changing tubing; perform a complete annual wear inspection including bearing play and operation	Worn or damaged surfaces can damage tubing prematurely. Replace worn parts in good time.

Table 8 Maintenance tasks

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8.5 Troubleshooting

No.	Type	Fault	Remedy
1	Hardware	No display	Check power cable and connection. Check whether the fuse is faulty; contact Labmaterial GmbH for replacement if it is.
2	Hardware	Motor does not rotate	Check whether a very low flow or speed is set, for example 0.1rpm.
3	Hardware	Motor vibrates	Check that pump head screws and locking lever are secure.
4	Hardware	Motor rotates in one direction only	Check the direction key and external direction signal.
5	Hardware	Key does not respond	Check whether the device is locked.
6	Hardware	Loud operating noise	The manufacturer identifies resonance ranges around 70rpm and 120rpm with increased noise. Check that pump head screws and locking lever are secure.
7	Hardware/software	Communication does not work	First check software: Is communication mode selected? Reset device address. Rule out duplicate bus addresses. Then check hardware: wiring and external control supply.
8	Hardware/software	External control does not work	First check operating mode. Then check external control wiring and supply.
9	Hardware/software	Inaccurate flow display	Calibrate the flow.

Table 9 Faults and remedies

⚠ **Note:** There are no user-repairable parts inside the pump. According to the manufacturer, unauthorised repairs void the pump warranty. If a fault persists after checking software and external connections, contact Labmaterial GmbH and do not repair the device yourself.

⚠ **Note:** This product is not medically certified. If used as part of a medical device, the medical device itself must hold the appropriate certification.

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9 Dimensions

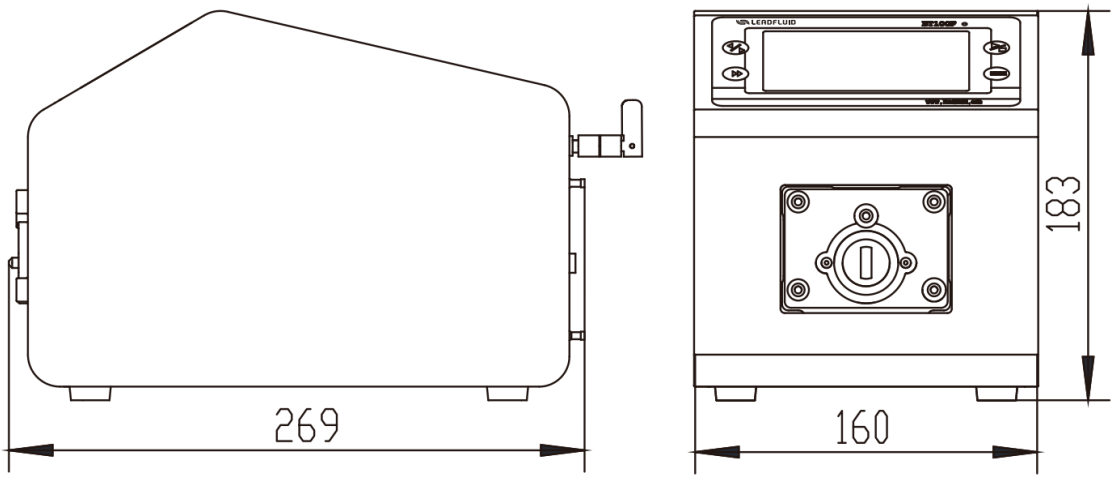

Figure 74 Drive dimensions in millimetres

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10 Ordering information

Product code	Product name	Drive and pump head
1701_1	Peristaltic pump – small to medium flow volumes – 1 channel	BT100L + YT25
1701_2	Peristaltic pump – small to medium flow volumes – 2 channels	BT100L + 2×YT25
1701_3	Peristaltic pump – small to medium flow volumes – 4 channels	BT100L + DG10-4
1701_5	Peristaltic pump – small to medium flow volumes – 4 channels	BT100L + DT15-44
1705_2	Peristaltic pump – large flow volumes – 1 channel	BT600L + YT25
1705_3	Peristaltic pump – large flow volumes – 1 channel	BT600L + YT15

Table 10 Ordering information

10.1 Optional accessories

Product code	Accessory	Use
P1701_1	Footswitch for peristaltic and gerotor pumps	BT100L and BT600L; function according to the selected control method

Table 11 Optional accessories

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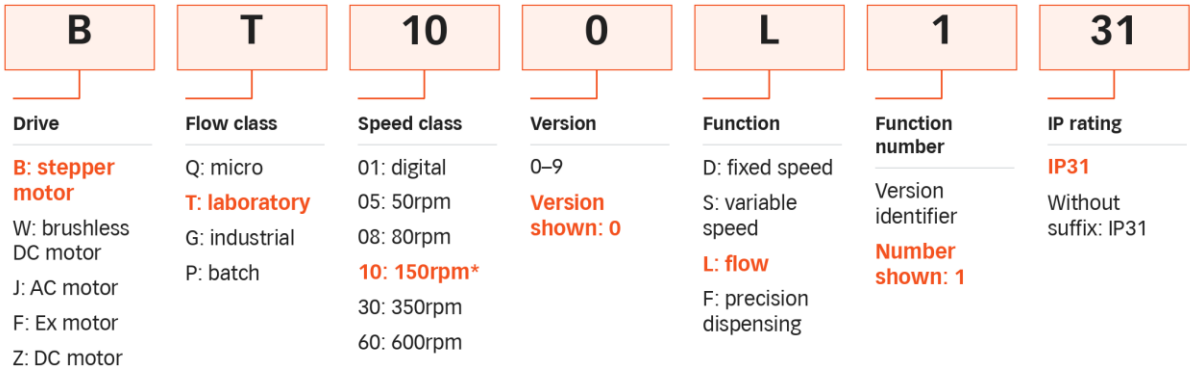
11 Model designation



* BT102S: 100rpm

Figure 75 Model designation system

Component	Meaning
Drive type	B: stepper motor; W: brushless DC motor; J: AC motor; F: explosion-protected motor; Z: DC motor
Flow class	Q: micro transfer; T: laboratory; G: industrial; P: batch transfer
Speed class	01: digital; 05: 50rpm; 08: 80rpm; 10: 150rpm; 30: 350rpm; 60: 600rpm. BT102S: 100rpm.
Version number	0–9
Function group	D: fixed speed; S: variable speed; L: flow control; F: precision dispensing
Function number	Identifies the version
IP designation	According to the manufacturer's diagram, IP31 applies if no additional marking is given

Table 12 Model designation system

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12 Technical data

12.1 BT100L

Technical data are listed separately for each drive. BT300L and BT600L specifications apply only to the model identified.

Property	Specification
Suitable pump heads	YZ15, YZ15 × 2, YZ25, YZ25 × 2, DG1, DG2, DG4, DG8, DT10-18, DT10-28, YT15, YT25
Functions	Key control for start/stop, direction and full speed; power failure memory; footswitch control; external start/stop and direction with galvanic isolation; 5V/12V/24V or 5–24V input; software switching between 0–5V, 0–10V and 4–20mA; flow mode and timed dispensing.
Communication	RS485, MODBUS
Screen	Colour LCD touchscreen
Direction of rotation	Forward and reverse rotation freely selectable

Table 13 BT100L functions

Property	Specification
Flow range	0.00011–750mL/min
Speed range	0.1–150rpm
Speed resolution and error	0.1rpm; speed error less than ±0.2%
Operation	Membrane keys and touchscreen
Display	Colour LCD touchscreen
Mains supply	230V AC, 50/60Hz; input voltage range 100–240V AC
Power consumption	<40W
Environment	Temperature 0–40°C; relative humidity <80%
Dimensions	269 × 160 × 183mm
Drive weight	4.25kg
Protection rating	IP31
Pollution degree	2

Table 14 BT100L performance data

12.2 BT300L

Property	Specification
Suitable pump heads	YZ15, YZ15 × 2, YZ25, YZ25 × 2, DT15, YT15, YT25
Functions	Key control for start/stop, direction and full speed; power failure memory; footswitch control; external start/stop and direction with galvanic isolation; 5V/12V/24V or 5–24V input; software switching between 0–5V, 0–10V and 4–20mA; flow mode and timed dispensing.
Communication	RS485, MODBUS
Screen	Colour LCD touchscreen
Direction of rotation	Forward and reverse rotation freely selectable

Table 15 BT300L functions

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Property	Specification
Flow range	0.005–1'750mL/min
Speed range	0.1–350rpm
Speed resolution and error	0.1rpm; speed error less than ±0.2%
Operation	Membrane keys and touchscreen
Display	Colour LCD touchscreen
Mains supply	230V AC, 50/60Hz; input voltage range 100–240V AC
Power consumption	<50W
Environment	Temperature 0–40°C; relative humidity <80%
Dimensions	269 × 160 × 183mm
Drive weight	5.3kg
Protection rating	IP31
Pollution degree	2

Table 16 BT300L performance data

12.3 BT600L

Property	Specification
Suitable pump heads	YZ15, YZ15 × 2, YZ25, YZ25 × 2, DT15, YT15, YT25
Functions	Key control for start/stop, direction and full speed; power failure memory; footswitch control; external start/stop and direction with galvanic isolation; 5V/12V/24V or 5–24V input; software switching between 0–5V, 0–10V and 4–20mA; flow mode and timed dispensing.
Communication	RS485, MODBUS
Screen	Colour LCD touchscreen
Direction of rotation	Forward and reverse rotation freely selectable

Table 17 BT600L functions

Property	Specification
Flow range	0.005–3'000mL/min
Speed range	0.1–600rpm
Speed resolution and error	0.1rpm; speed error less than ±0.2%
Operation	Membrane keys and touchscreen
Display	Colour LCD touchscreen
Mains supply	230V AC, 50/60Hz; input voltage range 100–240V AC
Power consumption	<60W
Environment	Temperature 0–40°C; relative humidity <80%
Dimensions	269 × 160 × 183mm
Drive weight	5.5kg
Protection rating	IP31
Pollution degree	2

Table 18 BT600L performance data

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13 Pump flow table

Drive	Pump head	Channels	Compatible tubing	Flow per channel mL/min
BT100L	DG6-1 (6 rollers)	1	Wall thickness 0.8–1mm; ID ≤2.79mm	0.00016–36
BT100L	DG10-1 (10 rollers)	1	Wall thickness 0.8–1mm; ID ≤2.79mm	0.00011–23
BT100L	DG6-2 (6 rollers)	2	Wall thickness 0.8–1mm; ID ≤2.79mm	0.00016–36
BT100L	DG10-2 (10 rollers)	2	Wall thickness 0.8–1mm; ID ≤2.79mm	0.00011–23
BT100L	DG6-4 (6 rollers)	4	Wall thickness 0.8–1mm; ID ≤2.79mm	0.00016–36
BT100L	DG10-4 (10 rollers)	4	Wall thickness 0.8–1mm; ID ≤2.79mm	0.00011–23
BT100L	DT10-18	1	#13, #14; wall thickness 0.8–1mm; ID ≤3.17mm	0.00023–64
BT100L	DT10-28	2	#13, #14; wall thickness 0.8–1mm; ID ≤3.17mm	0.00023–64
BT100L	DT10-48	4	#13, #14; wall thickness 0.8–1mm; ID ≤3.17mm	0.00023–64
BT100L	YZ15	1	#13, #14, #16, #19, #25, #17	0.005–450
BT100L	YZ25	1	#15, #24	0.17–450
BT100L	2 × YZ15	2	#13, #14, #16, #19, #25, #17	0.005–450
BT100L	2 × YZ25	2	#15, #24	0.17–450
BT100L	YT15	1	#13, #14, #16, #19, #25, #17, #18	0.006–675
BT100L	YT25	1	#15, #24, #35, #36	0.18–750
BT100L	2 × YT15	2	#13, #14, #16, #19, #25, #17, #18	0.006–675
BT100L	2 × YT25	2	#15, #24, #35, #36	0.18–750
BT100L	DT15-14	1	#16, #19, #25, #17	0.067–560
BT100L	DT15-24	2	#16, #19, #25, #17	0.067–560
BT100L	DT15-44	4	#16, #19, #25	0.067–330
BT300L	YZ15	1	#13, #14, #16, #19, #25, #17	0.005–1'050
BT300L	YZ25	1	#15, #24	0.17–1'050
BT300L	2 × YZ15	2	#13, #14, #16, #19, #25, #17	0.005–1'050
BT300L	2 × YZ25	2	#15, #24	0.17–1'050
BT300L	YT15	1	#13, #14, #16, #19, #25, #17, #18	0.006–1'575
BT300L	YT25	1	#15, #24, #35, #36	0.18–1'750
BT300L	2 × YT15	2	#13, #14, #16, #19, #25, #17, #18	0.006–1'575
BT300L	DT15-14	1	#16, #19, #25, #17	0.067–1'307
BT300L	DT15-24	2	#16, #19, #25, #17	0.067–1'307
BT300L	DT15-44	4	#16, #19, #25	0.067–770
BT600L	YZ15	1	#13, #14, #16, #19, #25, #17	0.005–1'800
BT600L	YZ25	1	#15, #24	0.17–1'800
BT600L	2 × YZ15	2	#13, #14, #16, #19, #25, #17	0.005–1'800

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Drive	Pump head	Channels	Compatible tubing	Flow per channel mL/min
BT600L	2 × YZ25	2	#15, #24	0.17–1'800
BT600L	YT15	1	#13, #14, #16, #19, #25, #17, #18	0.006–2'700
BT600L	YT25	1	#15, #24, #35, #36	0.18–3'000
BT600L	2 × YT15	2	#13, #14, #16, #19, #25, #17, #18	0.006–2'700

Table 19 BT-L series flow table

⚠ **Note:** The listed pump heads, channel counts and flow values per channel were determined with purified water and tubing at normal laboratory temperature and pressure. The values are for reference. Pressure, temperature, pumped medium properties, tubing material and other operating conditions affect actual flow performance. Contact Labmaterial GmbH for the specific application.

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14 Suitable pump heads



Figure 76 YZ15 and YZ25, YT15 and YT25, DG6 and DG10, and DT10 and DT15 pump heads

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15 Electrical data for control inputs and outputs

15.1 Digital inputs

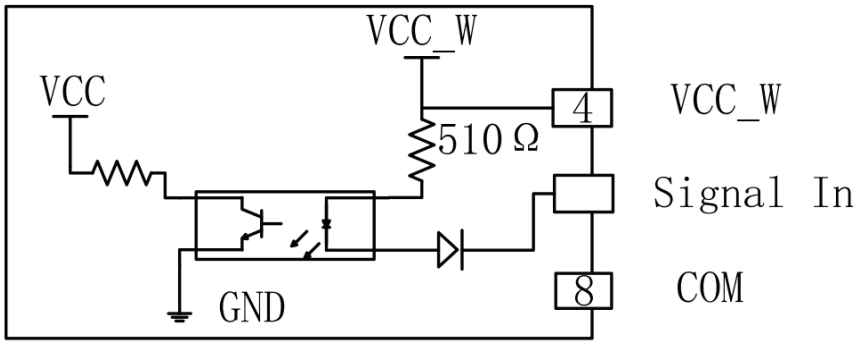

Figure 77 Optically isolated input circuit principle

Property	Parameter
Current when input active	5.5mA < I_on < 15mA
Current when input inactive	I_off < 1.5mA
Signal type	Open/closed contact or open-collector NPN transistor
External control voltage	5–24V
Isolation	Optoelectronic

Table 20 Property and parameter

15.2 Digital outputs

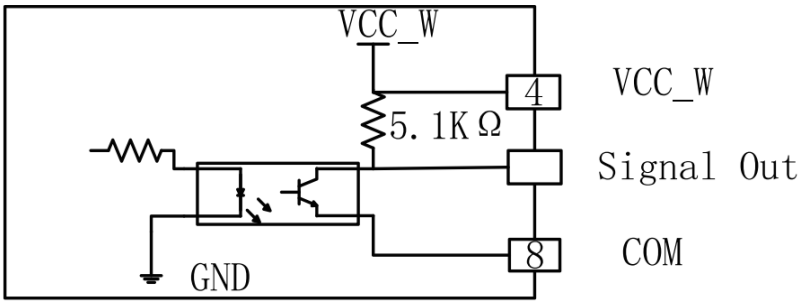

Figure 78 Optically isolated output circuit principle

Property	Parameter
Output type	Open-collector NPN transistor with internal pull-up
Isolation	Optoelectronic

Table 21 Property and parameter

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15.3 Analogue inputs

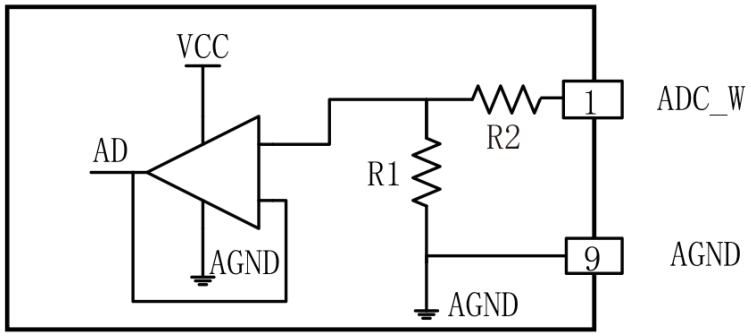

Figure 79 Analogue input circuit principle

Signal range	Input circuit below 100Hz	Permitted error	Resolution
0–5V	R1 = 1kΩ; R2 = 2.1kΩ	±1%	5mV
0–10V	R1 = 1kΩ; R2 = 2.1kΩ	±1%	10mV
4–20mA	R1 = 160Ω; R2 = 91Ω	±1%	16µA

Table 22 Analogue input data

15.4 Internal auxiliary supply

Property	Parameter
Output voltage	12V DC ±1V
Permitted output current	<130mA

Table 23 Property and parameter

15.5 External control circuit supply

Property	Parameter
Permitted input voltage	5–25V DC
Required available current	>350mA

Table 24 Property and parameter

Disclaimer

The suitability of the pump, pump head and tubing for the intended application must be checked before use. To the extent permitted by law, Labmaterial GmbH accepts no liability for damage caused by improper use, failure to follow these instructions, unauthorised modifications or the use of unsuitable media and tubing. Liability for intent and gross negligence and mandatory statutory product liability remain unaffected.