behr
Labor-Technik

VLP
Peristaltic Pump

Pump head interchangeable

User's Manual

171112

Please read these operating instructions carefully before starting up your new peristaltic pump!

The operating manual gives clear and simple instructions for use of the apparatus.

In the interest of eliminating risk please observe the safety instructions given in this manual! They are marked with a ⚠ symbol.

Additional useful and important information on the functioning of the apparatus is marked by a stripe in the margin.

We wish you every success in your work with the

behr VLP
Peristaltic Pump

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Safety Advice

Danger of electric shock! Make sure that no liquids get into the cable connections or the inside of the equipment. Disconnect the device if the mains plug or cable are damaged.

Caution: rotating parts can squeeze your fingers or pull your hair in! During operation, do not grab in the hub or under the pump head. Pull the mains plug before changing the pump head or the hoses. Only operate the pump with the hose correctly inserted; then all rotating parts are covered.

Caution: hoses can burst and spurt out the liquids! Take appropriate measures to protect yourself and your lab equipment. Check the pump hoses regularly and replace them if they are damaged.

Contents

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Scope of supply

Please check the contents of the pack for completeness and freedom from damage immediately upon receipt.

Claims resulting from damage during transportation which is externally apparent must be lodged immediately with the carrier (i.e., the post/mail service, the railway administration, the freight organization, etc.) - see the label on the packaging.

In case of damage which is not apparent from outside („concealed transportation damage“), please contact the behr after-sales service immediately upon discovery of the damage. The same applies in the case of any other complaints.

Address:

behr Labor-Technik GmbH
Spangerstrasse 8
D-40599 Düsseldorf, Germany
Telephone: (+49 211) 7 48 47 17
Telefax: (+49 211) 7 48 47 48
E-mail: info@behr-labor.com

Appropriate Use

The peristaltic pump serves for metering purposes in laboratory. Hose material - of pump hoses as well as all other tubings - must be fit for the medium to be delivered.

The pump cannot work against excessive counterpressure. If there is no free outflow, the upper limits of counterpressure are

For min. 2,4 mm wall thickness:	max. 1.5 bar
Others:	max. 1 bar.

The pump hose is a wear-and-tear part that will be worn out during operation. Regularly check if its wall thickness will still allow safe operation.

The peristatic pump is not intended for medical application.

Do not make arbitrary alterations in the unit. They could affect its safety and reliability and will void the product guarantee.

Do not expose the device to aggressive vapours e. g. of acids, bases or solvents!

Non-appropriate use will make the guarantee void.

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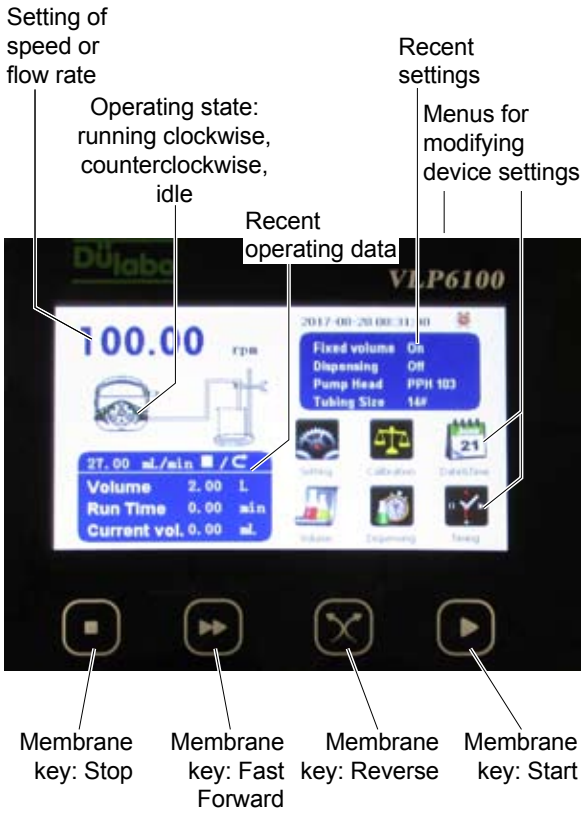
Overview of the Device

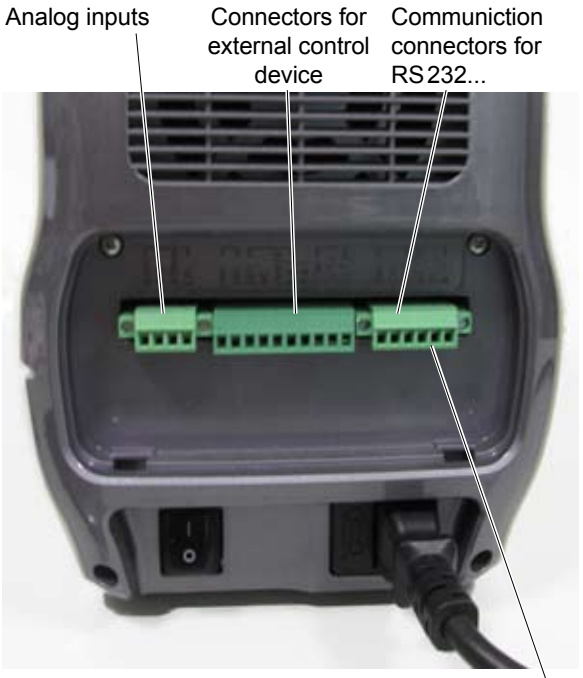
Front Side with Pump Head

Control Panel



Rear Side

Electrical Connections on the Rear Side



Installing the Pump Head

If you have received a peristaltic pump with a pump head installed, just skip this chapter for the moment.

Caution: rotating parts can squeeze your fingers or pull your hair in! Pull the mains plug before changing the pump head or the hoses.

- Switch the pump off and pull the mains plug.
- Take the hose cartridge and the hose out of the pump head.
- Unscrew the screws that are fastening the pump head to the drive unit.
- Dismantle the pump head.

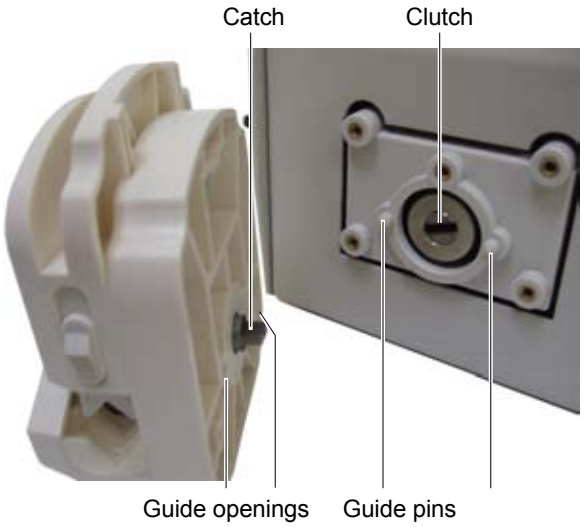
Pump Heads PPH 103, PPH 303:

The axis of the pump head has a catch that will engage in a clutch opening of the drive axis. Additionally, the drive unit has two guide pins, on the left and right of the drive axis, that will engage in two openings in the pump head and thus keep the pump head fixed.

On the front side of the pump head the pump head axis has a clutch too. You can use it to turn the axis into a definite position by means of a screwdriver.

- If the pump has been switched on, switch it off with the power switch and pull the mains plug.
- Turn the pump head axis in a position where the catch will engage in the clutch of the drive unit.
- Insert the pump head in such a way that the catch will engage in the clutch of the drive unit and the guide pins of the drive unit will engage in the guide openings of the pump head.
- Push the pump head on the drive unit in this position.
- Insert the long mounting screws into the screwholes and tighten them.

Tighten the screws handtight only. By tightening too much you could deform the housing.



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Pump Heads PPH 5061 through PPH 5068

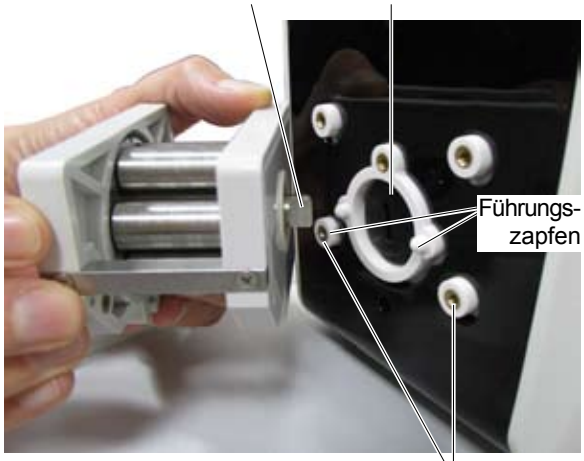
The axis of the pump head has a catch that will engage in a clutch opening of the drive axis. Additionally, the drive unit has two guide pins, on the left and right of the drive axis, that will engage in two openings in the pump head and thus keep the pump head fixed.

On the front side of the pump head the pump head axis has a clutch too. You can use it to turn the axis into a definite position by means of a screwdriver.

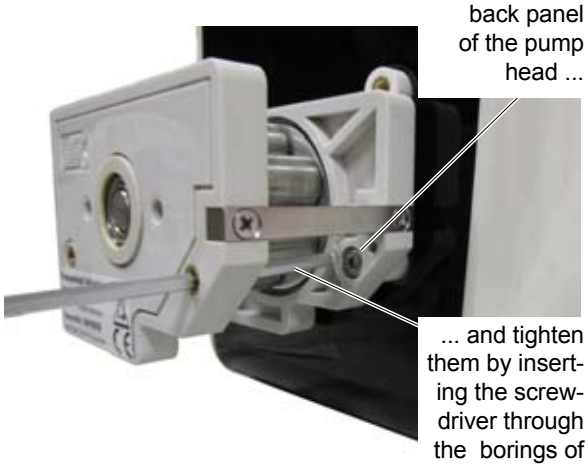
The pump head is screwed to the drive unit with two hex screws with its back panel. So don't wonder these screws are quite short. The borings in the front panel of the pump head are for you to access the screws with the screwdriver that came with the pump head.

- If the pump has been switched on, switch it off with the power switch and pull the mains plug.
- Insert the hex screws in the screwholes in the back panel of the pump head.
- Turn the pump head axis in a position where the catch will engage in the clutch of the drive unit.
- Insert the pump head in such a way that the catch will engage in the clutch of the drive unit and the guide pins of the drive unit will engage in the guide openings of the pump head.
- Push the pump head on the drive unit in this position.
- Insert the screwdriver through the front borings of the pump head to tighten the screws.

It is possible to attach a similar pump head to the front of a PPH 5068, resulting in a total of up to 16 pump channels. Ask us if this might be of interest for you.



Insert the screws in the back panel of the pump head ...



... and tighten them by inserting the screwdriver through the borings of the front panel

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Operation

Connecting and Switching On

- Connect the pump to a grounded mains receptacle with the mains cable.
- If it has not yet been done, tension the pump hose. See descriptions for the individual pump heads (pages 18 / 19).

Starting the Pump

- Switch the pump on with the main switch. It is in the rear of the pump.

The touchscreen display will show the settings that have been recently set:

- on the very top left there's the rotation speed or the delivery rate, depending on what you have set;
- in the blue field on the right, your configuration settings;
- in the lower blue field, the recent state of the metering that is going on.

Below these, on the right, there are six icons that allow you to modify settings of the pump.

If what you see are the settings you want anyhow, you just have to start metering. But first you might want to try with distilled water or another suitable matter.

Push the ***Start*** membrane key on the right side below the touchscreen display.

The pump will start the specified metering procedure with the specified speed or delivery rate. The blue field in the lower left of the touchscreen display will show the volume delivered and the time elapsed up to now.

Stopping the Pump

Push the ***Stop*** membrane key on the left side below the touchscreen display.

The pump will stop; the metering process is aborted.

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Filling or Emptying the Hose

In order to fill the pump hose quickly, to rinse or to empty it, you can use the Fast Mode key. As long as the key is pressed, the pump will run with maximum speed (600 rpm). As soon as the key is released, the pump will return to the speed you have set.

Toggling Rotation Sense

The pump is rotating the wrong way; Push this membrane key to toggle the sense of rotation.

When Work is Finished

If you won‘t need the pump any more today, you should release the hose so it won‘t get clammed.

- Switch the pump off with the mains switch and pull the mains plug.
- Release the pump hose as described in the chapters for the pump heads.

Modifying Settings

In order to modify settings of your pump, use the display. It is a touchscreen display; just touch, with your finger, the menu item you want to select.

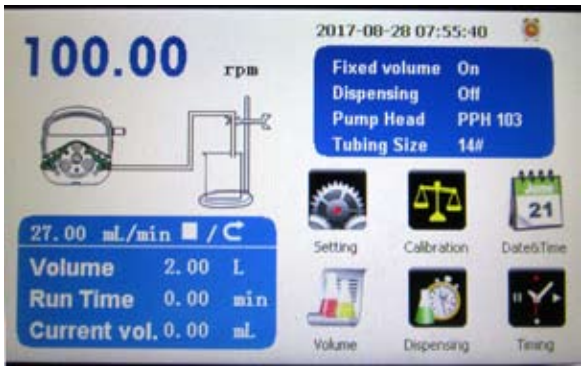
Setting Rotation Speed or Delivery Rate

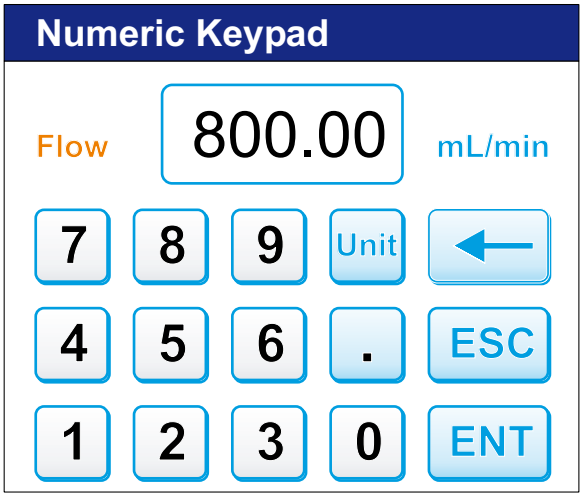
In order to make the pump run faster or slower, just touch with your finger the rotation speed or delivery rate displayed.

A Numeric Keypad window will appear that allows you to enter the desired value by "typing" it with your fingers. With the Unit key toggle the units (e. g. ml/min, l/min) that are allowed in this context. The blue left arrow is a backspace key. In order to adopt the value entered, type ENT. In order to leave the Numeric Keypad without changing entries, type ESC.

It will depend on your settings whether the value entered will be adopted as a rotation speed or as a delivery rate.

You can enter a rotation speed with an accuracy of 2 decimals, i. e. up to 0.01 rotations per minute. The smallest rotation speed possible, anyhow, is 0.1 rpm. Just try it.





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Basic Settings

In order to modify basic settings of your pump, touch the ***Setting*** icon.

A sub-menu will appear with five icons:

- ***Configuration***
- ***SuckBack***
- ***Communication***
- ***External Control***
- ***External Speed.***

The sixth icon, ***ESC***, just serves to exit this sub-menu.

Configuration: Specify here which pump head you are using and with which pump hose, and whether pump speed is to be expressed as flow rate or as rotation speed.

In the ***Pump Head*** choice box, select one of the pump heads available for this pump:

- PPH 103, PPH 303: single-channel heads
- PPH 5061-6 through PPH 5068-6 and PPH 5061-10 through PPH 5068-10: multichannel heads with 6 or 10 rollers, respectively.

For the pump head selected, the ***Tubing Size*** choice box offers you the suitable hose sizes. On selecting one of these sizes, the field on the left will display the flow rates that are possible with this hose.

With the ***Flow Rate*** and ***Rotation Speed*** choice boxes, select if the pump is to display the pump speed selected as Flow Rate or as Rotation Speed. On turning one possibility ***On***, the other one will automatically turn ***Off***.

Touch ***OK*** to adopt the entries, or ***Cancel*** to abort them and exit the menu.

Hoses Suitable for Pump Head PPH 103 and for the Multiple Pump Heads PPH 5061 through PPH 5068:

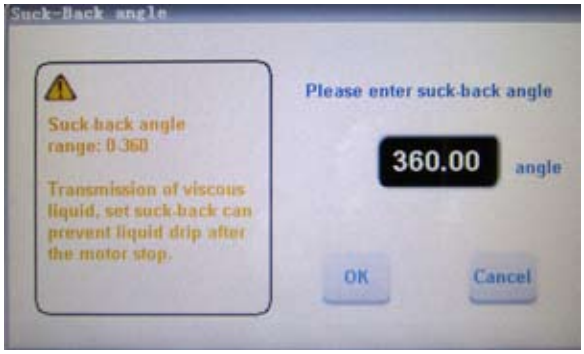
No.	Inner ø mm	Wall thickness mm
13#	0,8	1,6
14#	1,6	1,6
19#	2,4	1,6
16#	3,2	1,6
25#	4,8	1,6
17#	6,4	1,6
18#	8,0	1,6

Hoses Suitable for Pump Head **PPH 303**:

No.	Inner ø mm	Wall thickness mm
15#	4,8	2,4
24#	6,4	2,4

The entries for ***SuckBack*** are useful when delivering viscous liquids.

Touch the black field with the number in it. A Numeric Keypad will open. This Numeric Keypad will accept an entry ranging from zero to 360°. 360° means one complete rotation of the rotor.



Just try what will be happening. The pump will deliver the volume specified with the speed specified; then the rotor will turn backwards with maximum speed, by the suckback angle specified. This is intended to prevent a vacuum remaining in the hose at the end of a metering, a vacuum that would continue sucking liquid into the hose and spill it just when you are transferring the suction hose into another sample.

Communication:
External Control
External Speed

If you are going to control the pump from a PC or if you want to operate the pump with a foot switch, do the settings for this in these menues.

Ask our Customer Service if you are interested in these possibilities.

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(Fixed) Volume and Dispensing:

These two menu items are, in fact, part of a choice box.

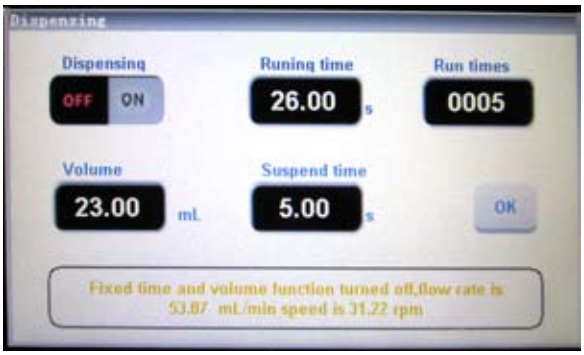
The Volume Menu:

If you touch ***Volume***, a menu will appear where you can enter the metering volume for the Fixed Volume function. Touch the black field displaying the number, and a Numeric Keypad will appear once again, where you can enter the numerical value and the unit (in this case, µl, ml or Liter).

If you set the switch to ***On*** position, these settings will become effective; at the same time the corresponding switch in the ***Dispensing*** menu will switch over to ***Off***. The value that has been entered will remain, no matter if the switch is ***On*** or ***Off*** .

The time needed for dispensing this volume will depend on the rotor speed (or delivery rate, depending on your settings) that you enter right in the start screen.

The Dispensing Menu:



In the ***Dispensing*** menu, do the settings for dispensing procedures: the ***Volume***, the dispensing time (***Runing Time***), the wait before the next dispensing (***Suspend Time***) to leave time for you to transfer the suction or outlet hose into the next sample vessel, and the number of repetitions (***Run Times***).

In this operating mode the device will compute the rotor speed from the entries for volume and metering time.

If you set the switch to ***On*** position, these settings will become effective; at the same time the corresponding switch in the ***Volume*** menu will switch over to ***Off***. The value that has been entered will remain, no matter if the switch is ***On*** or ***Off*** .

Calibrating the pump

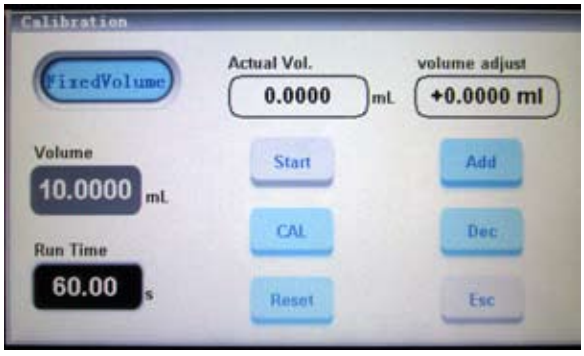
Before starting work with the pump, you should calibrate it for the pump-head and the pump hose you are using.

What the pump will do on calibrating and which settings you need will depend on the position of the switches in the ***Volume*** and ***Dispensing*** menus.

Calibrating by volume per run time

If the switch in the ***Volume*** menu is ***On*** (and the switch in the ***Dispensing*** menu is ***Off***), calibration is done for the volume that will be dispensed per time unit.

- Touch the ***Run Time*** field and enter a time. In the grey field above, the volume will appear that must be dispensed in this time.
- Weigh an empty vessel of suitable dimensions and place it under the outlet hose.
- First touch Reset to make sure that the pump is starting calibration from the factory settings.
- Then touch ***Start***.



The pump will run for the given time with the rotor speed specified. After this, a Numerical Keypad will appear.

- Measure or weigh the quantity of water delivered, and enter the result in the Numerical Keypad.

The device now asks if you want to do more tests to improve accuracy. If you want to do this:

- Tare the vessel and place it back under the outlet hose.
- Touch ***Start***.

The pump will run for the given time with the rotor speed specified. Once again, the Numerical Keypad will appear.

- Measure or weigh the quantity of water delivered, and enter the result in the Numerical Keypad.

The software will compute the mean value of the measurements that have been done. The mean value will appear in the ***Actual Vol.*** field.

Calibrating in Dispense Mode

If the switch in the ***Dispensing*** menu is ***On*** (and the switch in the ***Volume*** menu is ***Off***), calibration is done for the volume that will be dispensed per time unit. The procedure is the same as with Calibrating by Volume; but, as you are now calibrating entire dispensing procedures, dispensing time is invariable now.

- Weigh an empty vessel of suitable dimensions and place it under the outlet hose.
- First touch Reset to make sure that the pump is starting calibration from the factory settings.
- Then touch ***Start***.

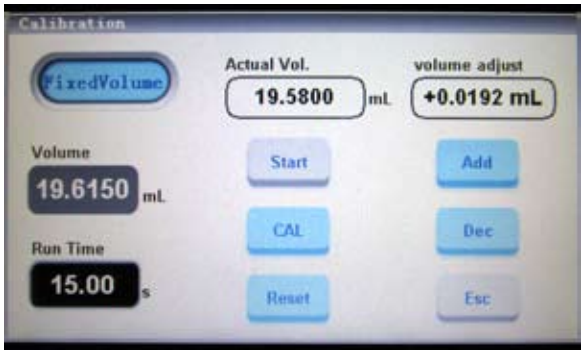
The pump will perform a dispensing with the settings you have made in the ***Dispensing*** menu, Then, once again, a Numerical Keypad will appear.

- Measure or weigh the quantity of water delivered, and enter the result in the Numerical Keypad.

The device now asks if you want to do more tests to improve accuracy, the same as in Volume mode. If you want to do this:

- Tare the vessel and place it back under the outlet hose.
- Touch ***Start***.

The software will compute the mean value of the measurements that have been made. The mean value will appear in the ***Actual Vol.*** field.



Correcting the Volume

You have made a sufficient number of measurements, but the mean value displayed differs significantly from the set value?

If the volume delivered is smaller than the setting, touch ***Add***. The ***Volume adjust*** field will display a correction value; it will increase if you touch ***Add*** again, and decrease if you touch ***Dec***. The increment / decrement value will depend on pump head and hose thickness.

When the sum of ***Actual Vol*** and ***Volume adjust*** has reached the set value as near as possible, touch ***Cal***. If you do a calibration now, the pump will deliver, within the bounds of possible accuracy, the volume you have set.

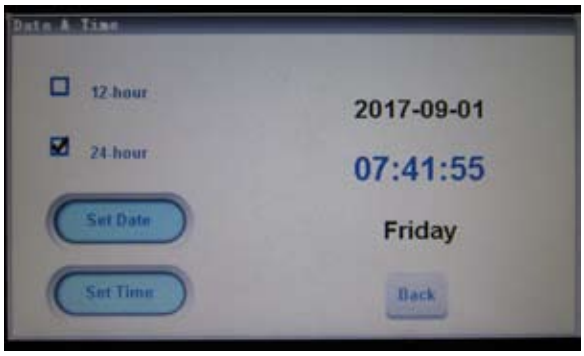
The procedure is the same for a calibration by volume per time as for a calibration in Dispense Mode.

Setting the Date and Time

In this menu you can set the time and date of the peristaltic pump.

- Check whether time is to be displayed in a 12-hour format (with hours a.m. and p.m.) or in a 24-hour format.

- Touch ***Set Date*** to adjust the date.



One after the other there will appear Numeric Keypads for ***YEAR***, ***MONTH***, and (***DAY***).

- Type the entries as required, finishing each entry by touching ***ENT***.

As soon as all entries are done, the new date will appear in the display in JJJJ-MM-TT format. If any of the entries is not plausible (say, a 13 entered for the month), the entire entry will be ignored, and the device will keep the previous date.

- Check the entries; if need be touch ***Set Date*** once more to repeat entering the date.

- Touch ***Set Time*** to set the clock.

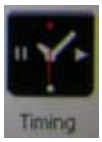
One after the other there will appear Numeric Keypads for ***HOUR***, ***MINUTE*** and ***SECOND***.

- Type the entries as required, finishing each entry by touching ***ENT***.

As soon as all entries are done, the new time will appear in the display in HH-MM-SS or, respectively, HH-MM-SS AM/PM format. If any of the entries is not plausible (say, a 25 entererd for the hour), the entire entry will be ignored, and the device will keep the previous time.

- Check the entries; if need be touch ***Set Time*** once more to repeat entering the time.

Setting a Start and an Over Time for Dispensing



In this menu you can decide to have the pump start dispensing each day at a given time, and - with repeated dispensings - stop dispensing at a given time too.

Setting a Start Time

- Touch the time display below the "Set Time" label.

One after the other there will appear Numeric Keypads for ***YEAR***, ***MONTH***, and (***DAY***).

- Type the entries as required, finishing each entry by touching ***ENT***.

As soon as all entries are done, the start time will appear in the display in HH-MM-SS or, respectively, HH-MM-SS AM/PM format. If any of the entries is not plausible (say, a 25 entered for the hour), the entire entry will be ignored, and the device will keep the previous start time.

If you touch ***Once***, this setting will just be for today (or tomorrow, respectively). If you touch ***Custom***, a window will appear where you can check the days of week on which the pump is supposed to start dispensing.

In order for these settings to come into effect, set the switch below the "Start Time" label to ***On*** position. If you set the switch to ***Off***, the device will remember the settings but without performing them.

Setting an Over time

Below the "***Over Time***" you can specify a time when the pump is to consider its work as complete ("over") so it won't start any more dispensings. Set the Over Time the same way as the Start Time. Quite the same as the Start time, the Over Time will come into effect only when you set the appropriate switch to ***On***.

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Inserting the Pump Hose

Caution: rotating parts can squeeze your fingers or pull your hair! Pull the mains plug before installing or changing the pump head.

Pump heads of types PPH 103, PPH 303

- If the pump has been switched on, switch it off with the power switch and pull the mains plug.
- Turn the lock lever to the left.
- Lay the hose out in front of the hose bed of the pump head.
- Pull the downholder knob upwards and, while holding it in this position, push the hose in the hose bed.
- Release the downholder knob. The downholder will come down and fix the hose in the hose bed.
- In the same way, push the hose into the hose bed on the other side too.
- Turn the lock lever to the right side. Now the hose is fixed and tightened.

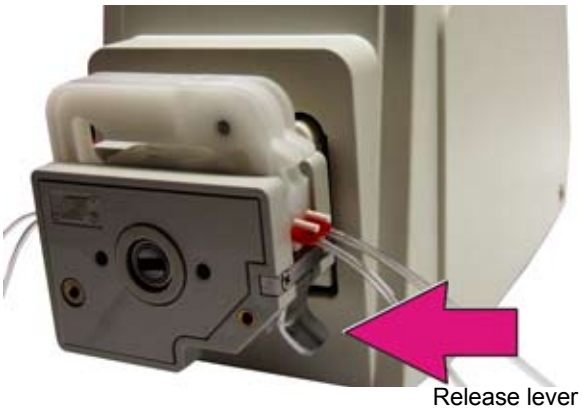
Release the hose if you are not going to use the pump for a longer time. To do this, just turn the lock lever to the left. If the hose is left tightened for a long time without being moved, it might get clogged.

Pump heads of types PPH 5062, PPH 5064, PPH 5066, PPH 5068:

- Switch the pump off by the main switch and pull the mains plug.

Taking the hose cassette out

- Press the release lever on the cassette (PPH 5061 / 5062) or the lower end of the right side of the cassette (PPH 5064 - 5068). The cassette will come out of the fixture; take it out of the pump head.

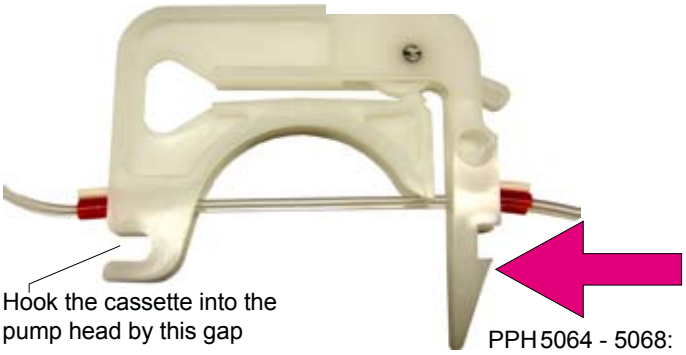


Inserting the new pump hose

- Hook the pump hose into the hose cassette as shown in the picture. The hose has three tabs on it; use two neighboring tabs.

Inserting the cassette into the pump head

- Introduce the cassette into the pump head left side first, hooking it to the pump head by the gap.
- Now press the right side of the cassette down until you hear it catch.



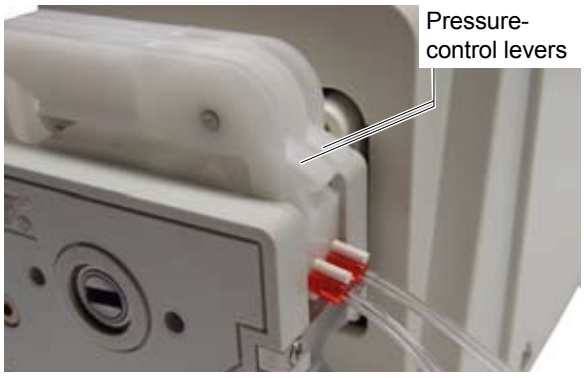
Adjusting the pressing force

- Connect the pump to mains power again and switch the mains switch on.
- Let the pump draw water and check if it delivers properly.

If need be, adjust the pressing force with the pressure-control lever.

When the hose gets worn just turn it round and use the other section between the tabs. That's why the hose has three tabs on it.

Release the hose if you are not going to use the pump for a longer time. To do this, firmly press the release lever. If the hose is left tightened for a long time without being moved, it might get clogged.



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The Pump Won‘t Deliver - What Do I Do?

Has the proper hose been inserted?

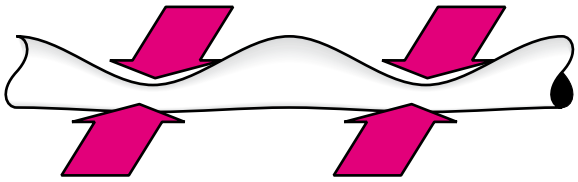
If the hose material, hose inner diameter or wall thickness are not suitable for the pump head, it won‘t get squeezed properly - the pump won‘t deliver. Even worse, an inadequate hose may soon become leaky.

Only use pump hoses that are suitable for the pump head you are using. You find them listed on pages 24/25.

Regularly check if the hose is still intact, and change it if necessary. With multi-channel pump heads, always change all hoses at a time.

Hose got clogged?

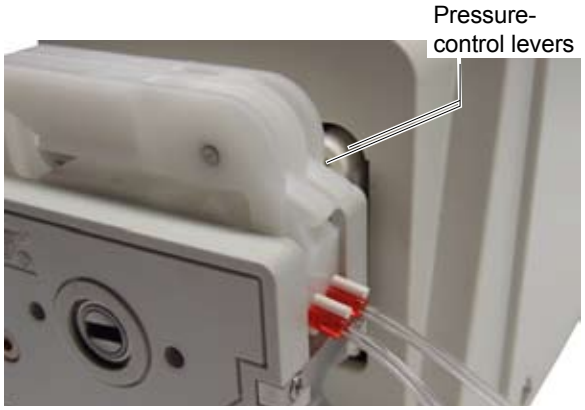
If the pump has been idle for a longer time with the hoses under pressure, it may be that the hose has got clogged and won‘t perform the peristaltic movements any more.



Usually it will still be possible to straighten the hose. Pull the hose out of the pump and knead the dents until the hose is in shape again. If the hose cannot be straightened you‘ll need to change it. With multi-channel pump heads, always change all hoses at a time.

Proper hose pressure?

In order for the pump to deliver, the rollers of the pump head must shut off the inner width of the hose completely.



With pump heads of types PPH 103 and PPH 303, the hose is properly pressed as soon as you turn the lock lever to the right. With PPH 5061 - PPH 5068, pressure is adjusted by thumbwheels.

Hose dry?

If the hose is still dry it may happen, especially with hoses of large diameter, that no vacuum will build up in the hose.

Have the pump run and introduce some liquid into the hose from suction side, e. g. using a washbottle. As soon as the pump has liquid to work with, it will usually deliver again.

Care and Maintenance

When Work is Finished: Release Hoses

When you have finished work with the pump, you should release the hoses from pressure. Thus you will avoid the rollers clogging the hose.

- Push the lock lever to the left so the cartridge will come out of the pump head. With the multiple-channel pump heads PPH 5062 - PPH 5068 release each of the hose cartridges. Now the hoses are released from pressure.

Cleaning

Keep the rollers in the pump head clean and dry. Dirty rollers will run poorly and may damage the hose and shorten the lifetime of the roller bearings.

Wipe the housing with a damp cloth only; if need be, use a drop of detergent. Do not use any abrasives or organic solvents.

Pump Heads and Hoses

The pump heads listed below are suitable for use with this peristaltic pump:

Pump head	Channels	for inner ø mm	Rollers	Max. delivery ml/min for maximum hose ø	Article No.
PPH 103	1	0,8 bis 8,0	3	2200	B 00454745
PPH 303	1	4,8; 6,4	3	1600	B 00454746
PPH 5061-6	1	0,13 bis 3,17	6	48 per channel	B 00454747
PPH 5062-6	2	0,13 bis 3,17	6	48 per channel	B 00491218
PPH 5064-6	4	0,13 bis 3,17	6	48 per channel	B 00455177
PPH 5066-6	6	0,13 bis 3,17	6	48 per channel	B 00455178
PPH 5068-6	8	0,13 bis 3,17	6	48 per channel	B 00455179
PPH 5061-10	1	0,13 bis 3,17	10	32 per channel	on request
PPH 5062-10	2	0,13 bis 3,17	10	32 per channel	on request
PPH 5064-10	4	0,13 bis 3,17	10	32 per channel	B 00658048
PPH 5066-10	6	0,13 bis 3,17	10	32 per channel	B 00662070
PPH 5068-10	8	0,13 bis 3,17	10	32 per channel	on request

Hoses Suitable for Pump Head PPH 103 and for the Multiple Pump Heads PPH 5061 through PPH 5068:

No.	Inner ø mm	Wall mm	Tygon R 3606	Pharmed BPT	Viton VITEC 60	Silicone
13#	0,8	1,6		B 0051 5421		B 0051 5440
14#	1,6	1,6	B 0051 5411	B 0051 5422	B 0051 5431	B 0051 5441
19#	2,4	1,6	B 0051 5412			
16#	3,2	1,6	B 0051 5413	B 0051 5423	B 0051 5432	B 0051 5442
25#	4,8	1,6	B 0051 5414	B 0051 5424	B 0051 5433	B 0051 5443
17#	6,4	1,6	B 0051 5415	B 0051 5425	B 0051 5434	B 0051 5444
18#	8,0	1,6	B 0051 5416	B 0051 5426	B 0051 5435	B 0051 5445

Hoses Suitable for Pump Head **PPH 303**:

No.	Inner ø mm	Wall mm	Tygon R 3606	Pharmed BPT	Viton VITEC 60	Silicone
15#	4,8	2,4	B 0051 5417		B 0051 5436	B 0051 5446
24#	6,4	2,4	B 0051 5418		B 0051 5437	B 0051 5447

The **No**. column lists the hose size numbers as you can select them in the Configuration Menu of the pump.

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Technical Data

Nominal voltage	220 V~ ± 10%, 50 - 60 Hz
Power consumption max.	50 W
Protection class	IP 31
Rotation speed	0.1 – 600 U/min, invertible
Accuracy	0.01 U/min
Torque	min. 1.6 Nm
Dimensions, drive unit (L x W x H in mm)	261 x 187 x 237
Weight, drive unit	5.4 kg
Display, operation	4.3" colour touch screen
Operating conditions: Temperature Humidity	 0 - 40 °C < 80%
Interface	RS 232 / RS 485, MODBUS protocol

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Customer Service

In the event of a malfunction or defect in your device, please contact our customer service:

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