Precise

Dosing and Suspending

Betriebsanleitung
Operating instructions
Notice d'instructions

Hei-FLOW Core
Hei-FLOW Expert
Hei-FLOW Ultimate

heidolph
research made easy

About this document

This operating instructions manual describes the features and operation of **Hei-FLOW Core**, **Hei-FLOW Expert** and **Hei-FLOW Ultimate** peristaltic pumps. The operating instructions manual is an integral part of the delivery!

Typographic conventions

Standardized symbols, highlighting elements, and signal words are used in this document to identify warnings, cautions, important information, and special text contents.

Symbol	Signal word / explanatory note
	Warning symbols in combination with a signal word indicate dangers: **DANGER** Indicates a hazardous situation which, if not avoided,will result in death or serious injury. **WARNING** Indicates a possible hazardous situation which, if not avoided,may result in death or serious injury. **CAUTION** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or material/environmental damage.
	Mandatory signs are used to indicate important information regarding the product handling. This information is used to ensure operational safety and to maintain the value of the product.
[**GUI**]	**Parameter** designations, **display texts**, and **device labels** are highlighted in text and tables in a typographic manner to facilitate the assignment on the device.
	The arrow symbol indicates instructions to be followed in order to ensure the operational safety when handling the product.

Copyright protection

Basic product information

Guidelines applied, product certification

CE

CE Marking

The device complies with the following standards:

- European Machinery Directive, 2006/42/EC
- EMC Directive, 2004/108/EC

California Residents

Important information for California residents regarding Prop 65. Please visit www.P65Warnings.ca.gov for more information.

Residual risk

The device was designed and manufactured in accordance with the latest technical standards at the time of development and the recognized safety regulations.

During installation and use, as well as during maintenance work, repairs and cleaning, there are nevertheless certain residual risks associated with the device described. These are identified and described at the appropriate points in this document.

Intended use

Heidolph **Hei-FLOW Core** and **Hei-FLOW Expert** peristaltic pumps are specifically designed for the dispensing of fluids.

Heidolph **Hei-FLOW Ultimate** peristaltic pumps are specifically designed for the dispensing and dosing of fluids.

The mentioned peristaltic pumps are specifically designed for their use in the following areas: chemistry, pharmacy, biology, environmental analytics, basic research and research laboratories.

Any other use is not considered as intended!

Due to its design, the device in its delivery condition may only be used in analytical processes or in laboratory-like conditions in the food, cosmetics, and pharmaceutical industries as well as other comparable industries that manufacture products intended for consumption by humans or animals, or for use on humans or animals

Reasonably foreseeable misuse

For use under conditions or for purposes deviating from the intended use, additional measures may become necessary, and/or specific guidelines and safety regulations will have to be observed (see section „Special hygiene measures for the use of laboratory equipment in food, cosmetics and pharmaceutical production“, page 59). Corresponding requirements must be evaluated and observed by the operator in each individual case.

Compliance with and implementation of all relevant guidelines and safety measures for the respective field of application is within the sole responsibility of the operator.

All risks resulting from improper use are solely borne by the operator.

The device may exclusively be operated by authorized and instructed personnel. Training and qualification of the operating personnel as well as ensuring that the device is operated with responsibility are the sole responsibility of the operator!

Transportation

During transport, avoid severe shocks and mechanical stresses that can cause damage to the device.

Keep the original packaging in a dry and protected place for later use.

Storage

Always store the device in its original packaging. To protect against damage and unreasonable material aging, store the device in a dry environment that should be as temperature-stable and dust-free as possible.

Recommended ambient conditions for storage:

- 5 °C – 31 °C up to 80 % rel. humidity
- 32 °C – 40 °C up to 50 % rel. humidity (decreasing linearly)

Acclimatization

After each transport and after storage under critical climatic conditions (e.g. high temperature difference between inside and outside), allow the device to acclimatize at room temperature for a minimum of two hours to prevent possible damage from condensation before putting it into operation at the place of use. If necessary, extend the acclimatization phase if the temperature differences are very high.

Make all supply connections (power supply, tubing) only after the device has been acclimatized!

Permissible ambient conditions

The device is designed for indoor use only. Permissible ambient conditions for operation:

- 5 °C – 31 °C up to 80 % rel. humidity
- 32 °C – 40 °C up to 50 % rel. humidity (decreasing linearly)
- Maximum height above sea level: 2,000 m

When used in corrosive atmospheres, the service life of the device may be reduced depending on the concentration, duration and frequency of exposure.

The device **IS NOT** suitable for outdoor use!
The device **IS NOT** suitable for use in hazardous areas!

General safety information

- ➜ Before commissioning and using the device, familiarize yourself with all the safety regulations and guidelines for occupational safety applicable at the place of use and observe them at all times.
- ➜ Only operate the device if it is in perfect technical condition. In particular, ensure that there is no visible damage on the device itself and, where necessary, on connected devices or the supply connections.
- ➜ If there is missing or misleading information on the device or on occupational safety, contact the responsible safety specialist or our technical service.
- ➜ Only use the device in accordance with the regulations for intended use („Intended use“, page 55).

Electrical safety

- ➜ Ensure that the voltage indicated on the rating plate matches the supply voltage of the country in which the device is being used.
- ➜ Ensure that the power supply circuit provided is protected by means of a residual-current device (RCD).
- ➜ Always use the supplied power supply cord provided with the device (phase, neutral, ground).
- ➜ Prior to use, check that the device and the power supply cord are free of visible damage.
- ➜ Have repairs and/or maintenance work on the device carried out exclusively by an authorized and skilled electrician or by the technical service department of Heidolph Instruments.
- ➜ Always switch off and disconnect the device from the power supply before carrying out maintenance work, cleaning, or repairs.

Data security

- ➜ The user is responsible for ensuring data security when transferring data between the described device and other devices.
- ➜ Only use secure networks for the data transfer and avoid use of critical infrastructure.
- ➜ Only use high-quality shielded data cables for the data transfer.
- ➜ For data transfer via a USB B connection, an industrial standard USB hub should be preferably used to ensure the most stable connection possible.

Operational safety

- ➜ Operate the device under a closed ventilated fume hood when working with potentially hazardous substances (see EN 14175 and DIN 12924).
- ➜ Do not make any unauthorized changes or modifications to the device!
- ➜ Only use genuine spare parts and accessories, or those expressly approved by the manufacturer!
- ➜ Rectify malfunctions or faults on the device immediately. Switch off and disconnect the device from the power supply, preventing reconnection, if it is not possible to eliminate the malfunction or rectify the fault immediately.
- ➜ Observe all other applicable regulations such as laboratory and workplace guidelines, recognized safety technology rules and special local regulations.

Work safety

- ➜ Always use the prescribed personal protective equipment (PPE) such as protective clothing, safety goggles, protective gloves, safety shoes, etc.
- ➜ Do not operate any other devices in the immediate vicinity of the device ...
  - which can generate electromagnetic fields in the frequency range between 9×10^3 Hz to 3×10^{11} Hz,
  - which generate emission or radiation sources in the frequency range 3×10^{11} Hz to 3×10^{15} Hz (in the optical spectral range wavelengths from 1,000 µm to 0,1 µm),
  - which generate ultrasonic or ionizing waves.
- ➜ Do not operate the unit when adiabatic compression or shock waves may occur (pressure wave ignition).
- ➜ Do not use substances that could release energy in an uncontrolled way (exothermic reaction, spontaneous ignition of dusts).
- ➜ Route all cables free of kinks and outside the operating and hazardous area.
- ➜ Avoid excessive pressure on the device display.
- ➜ Avoid fluid accumulation on the device.
- ➜ Keep the base unit dry during operation.
- ➜ Ensure adequate safety distance: Do not store objects in the working and hazardous area of the device during operation.

Personal protective equipment (PPE)

The operator must determine and provide the necessary PPE, depending on the respective application and the media and chemicals used.

The corresponding instruction of the personnel is solely within the operator's responsibility.

Environmental protection

When processing environmentally hazardous substances, take appropriate measures to avoid risks to the environment.

The evaluation of corresponding measures such as the marking of a hazardous area, their implementation, and the training of the responsible personnel is the sole responsibility of the operator!

Biohazard

When processing biohazardous substances, take appropriate measures to prevent hazards to persons and the environment, including:

- ➜ Instruction of the personnel regarding the necessary safety measures.
- ➜ Provision of personal protective equipment (PPE) and instruction of the personnel in its use.
- ➜ Marking of the device with a biohazard warning symbol.

The evaluation of corresponding measures such as the marking of a hazardous area, their implementation, and the training of the responsible personnel is the sole responsibility of the operator!

Special hygiene measures for the use of laboratory equipment in food, cosmetics and pharmaceutical production

When laboratory equipment is used in the production processes of the food, cosmetics or pharmaceutical industry, special hygiene measures must be taken by the user to avoid sample contamination and to minimize any risk to humans and the environment as far as possible.

General Measures

- ➜ Ensure a clean working and storage environment when handling substances and materials.
- ➜ Train all employees in the field of occupational hygiene, document all training measures and check the implementation of all required hygiene measures during operation regularly.
- ➜ Use a hygiene control concept such as HACCP (Hazard Analysis and critical Control points). The HACCP comprises the following criteria:
  - Hazard analysis
  - Identification of critical control points
  - Definition of critical limit values
  - Establishment of a system for monitoring and controlling critical hazard control points (CCP)
  - Corrective actions for uncontrollable CCP
  - Establishment of a system to verify the implementation of all HACCP measures
  - Establishment of a system for documenting all associated procedures and protocols

The evaluation of the applicability of the mentioned rules and regulations is within the sole responsibility of the operator!

Device-specific measures

- ➜ Regularly clean components that come into contact with the product, such as flasks, seals, tubes, etc. in the autoclave (if available or possible) or chemically (e.g. with ethanol) to sterilize all surfaces.
- ➜ Make sure that even products that are intended for single use only are of sufficient purity.
- ➜ Do not use open containers.
- ➜ Avoid contamination by handling contaminated vessels, apparatus or aids with care.

Contact information

For further information, please contact our after sales service at any time.

Phone: +49-9122-9920-0

Mail: sales@heidolph.de

Other regulations

In addition to the notes and instructions in this document, observe all other applicable regulations such as laboratory and workplace guidelines, hazardous substances ordinances, recognized rules of safety engineering and occupational medicine as well as particular local regulations!

Noncompliance will invalidate any warranty against Heidolph Instruments.

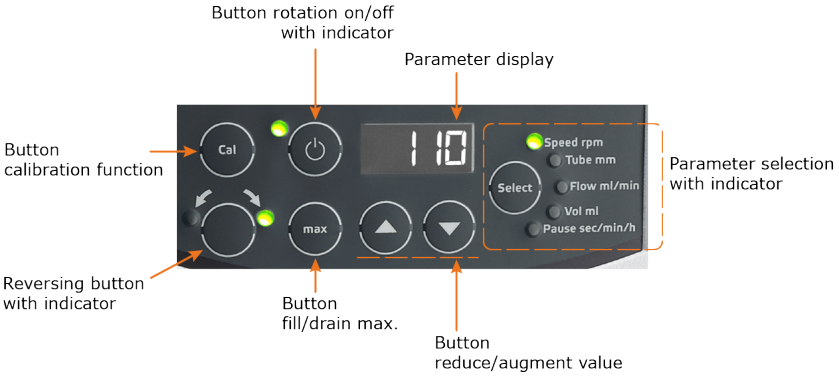
The operator is solely liable for all damage resulting from unauthorized changes or modifications to the unit, from the use of unauthorized or non-genuine spare parts and accessories, or from disregarding the safety instructions and hazard warnings or the manufacturer’s instructions!

Overview Hei-FLOW Core

Overview Hei-FLOW Expert

Overview Hei-FLOW Ultimate

Control panel Hei-FLOW Ultimate



Set up the device

CAUTION

Risk of injury, risk of damage to property due to leaking fluids and/or falling

- ➜ To use the device, place it on a clean, stable, level, horizontal, and resistant surface.
- ➜ The device must be freely accessible at all times.
- ➜ Observe the generally valid rules for the safe installation of work equipment.

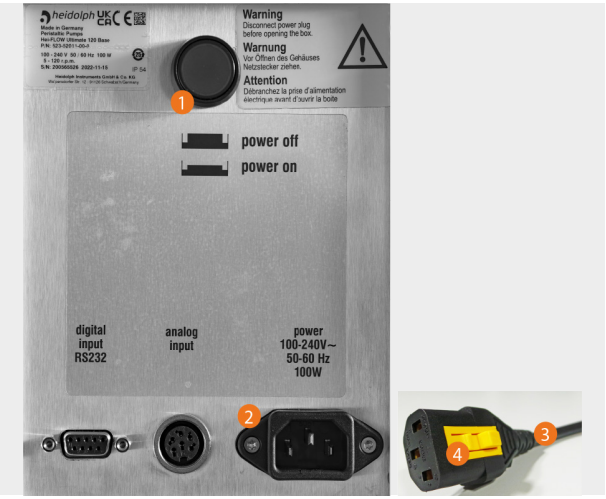
Heidolph instruments accepts no responsibility for direct and/or indirect personal injury or damage to property resulting from failure to observe the instructions for the correct mounting and positioning of the device.

Power supply

The device has an appliance inlet with V-Lock for the power supply. A three-pole power supply cord with matching V-Lock cable coupling is included in the scope of delivery. During operation, the V-Lock system prevents the detachment of the cable coupling (due to rotations) from the power supply.

Connect the power supply cord

- ➜ Before connecting the power supply cord, make sure that the the on/off switch of the device [1] is in position [power off].
- ➜ Press the Rast-Pin [4] of the cable coupling [3] and connect it to the power supply [2].



➜ As far as you release the Rast-Pin, the plug-in connection is secured.
➜ Connect the power supply cord to a properly secured power socket.
➜ Before switching on the device, check the plug-in connection for tight fit by pulling slightly on the cable coupling.

Disconnect the power supply cord

➜ Before disconnecting the power supply cord, make sure that the the on/off switch of the device [1] is in position [power off].
➜ Disconnect the power supply cord from the power socket.
➜ To unlock, press the Rast-Pin [4] of the cable coupling [3] and pull it off the appliance inlet [2].

Switching the device on/off

➜ Use the main switch [1] on the back panel to turn the device on and off:

- Hei-FLOW Expert: When switching on the device, the last activated direction of rotation is indicated (LED lights up).
- Hei-FLOW Ultimate: When switching on the device, the last activated direction of rotation is indicated (LED lights up). In addition, the last set operating values are displayed in sequence on the device display: pump head, gear stage, inner tube diameter, retraction.

➜ To turn off the device, press the on/off switch again. When off, the button of the on/off switch lights up white.

Operation Hei-FLOW Core

➜ Turn on the device as described in section „Switching the device on/off", page 65

➜ Use the [speed control] knob to set the desired pump speed (see also section „Overview Hei-FLOW Core", page 61).

- The pump speed be adjusted at time during operation.

➜ Use the rocker switch [reversing] to select the desired direction of rotation of the pump head (clockwise/counter-clockwise, observe the direction arrows on the device).

Before changing the direction of rotation, the rotation movement must be stopped with the rocker switch [rotation on/off]. An acoustic warning signal sounds when the rocker switch [reversing] is actuated while the pump is in operation.

➜ Start or stop pump operation with the [rotation on/off] rocker switch.

- When on, the button lights up.

In the event of a power interruption, the pump is switched off. When the power is restored, the [rotation on/off] rocker switch LED flashes.

Briefly switch the rocker switch to **0** and then back to **1** to restart the pump.

Operation Hei-FLOW Expert

➜ Turn on the device as described in section „Switching the device on/off“, page 65

➜ Use the [speed control] knob to set the desired pump speed (see also section „Overview Hei-FLOW Expert“, page 61).

– The pump speed be adjusted at time during operation.

➜ Use the [reversing] button to select the desired direction of rotation of the pump head (clockwise/counter-clockwise, observe the direction arrows on the device).

– The indicator (LED) shows the actual direction of rotation.

Before changing the direction of rotation, the rotation movement must be stopped with the [rotation on/off] button. An acoustic warning signal sounds when the [reversing] button is actuated while the pump is in operation.

➜ Press the [rotation on/off] button to start or stop pump operation.

– When switched on, the pushbutton indicator lights up.

In the event of a power interruption, the pump is switched off. When the power is restored, the [rotation on/off] button LED flashes.

Press the button twice to restart the pump (LED lights up).

Fast filling/emptying

With the [max] function, the pump can be temporarily set to maximum power for fast filling/emptying of the connected tube(s), independent of all other setting values:

➜ Turn on the device as described in section „Switching the device on/off“, page 65

➜ Make sure that the rotation movement is stopped.

➜ Use the [reversing] button to select the desired direction of rotation of the pump head (clockwise/counter-clockwise, observe the direction arrows on the device).

➜ Press and hold the [max] button.

– The pump runs at maximum speed to fill/drain the connected tube(s).

– The pump stops as soon as you release the button.

Operation Hei-FLOW Ultimate

Select the pump head

By default, peristaltic pumps Hei-FLOW Ultimate are set to **Pu 1**(pump head type SP quick). This setting must be adjusted according to the selected pump head:

➜ Turn off the device.

➜ Press the [Cal] button.

➜ While holding down the [Cal] button, turn the device on again.

– The display shows the currently set pump head.

➜ Release the [Cal] button and press one of the arrow keys repeatedly until the desired pump head type is displayed (see table below).

➜ Confirm with [Select].

Displayed value	Pump head
Pu 0	Multi-channel, C 8
Pu 1	Single-channel, SP quick
Pu 2	Single-channel, SP standard, SP vario
Pu 3	not used
Pu 4	not used
Pu 8	Multi-channel, C 12
Pu 9	Multi-channel, C 4

Operational parameters

The operating parameters of the Hi-FLOW Ultimate peristaltic pumps are set via the front panel (see also section „Control panel Hei-FLOW Ultimate“, page 62).

- ➞ Turn on the device as described in section „Switching the device on/off“, page 65
- ➞ Make sure the pump is operating at idle speed (no rotation).
- ➞ To select a certain operating parameter, press the [Select] button repeatedly until the corresponding LED lights up (see the [Parameters] table below).
- ➞ Use the arrow keys to set the individual value.
- ➞ Confirm with [Select] to accept the value.

Parameters	Function
Speed rpm	Pump Speed: Set the desired pump speed here. When a pump speed is set, the volumetric flow **Flow ml./min** will automatically be calculated and adjusted.
Tube mm	Inner tube diameter: Enter the inner diameter of the tube used here. This value determines the minimum/maximum possible volumetric flow per minute. When changing the inner tube diameter parameter, the **Vol ml** parameter is automatically adjusted (while adjusting, the corresponding LED flashes).
Flow rate ml./min	Volumetric flow. Specify a volumetric flow here. When a volume flow is specified, the pump speed **Speed rpm** will automatically be calculated and adjusted.
Vol ml	Dosing volume. Specify a specific volume of dosing here. As soon as this defined volume is reached, the pump automatically switches off.
Pause sec/min/h	Pause value for the interval dosing. Set a pause time of 0.1 seconds – 750 hours here. When a pause time is specified for the interval dosing, the volume dosing is performed in continuous operation with defined values of **Vol ml** and **Pause sec/min/h**.

Calibrating the pump

To compensate for tube manufacturing tolerances and to ensure the best dosing results, it is recommended to calibrate the pump at regular intervals and at each tube change.

To calibrate the pump, follow these steps:

➜ Make sure the pump is switched on and running at idle speed (no rotation).

➜ Make sure that all necessary tubing connections are made and the container(s) with the medium to be transferred is/are connected to the pump.

➜ Make sure that the parameters [pump head] and [inner tube diameter] are set correctly.

Calibrate volumetric flow:

➜ Use the [Select] button to activate the **[Flow ml/min]** function and enter the desired volumetric flow.

➜ Press the [Cal] button:

– The **Flow ml./min** value flashes.

➜ Start the pump operation by pressing the [rotation on/off] button:

– The pump delivers and automatically switches off after 60 seconds.

➜ Measure the actual volume being pumped and use the arrow keys on the unit to enter the value.

➜ Press and hold the [Cal] button for at least three seconds:

– The calculated value is converted and the parameter **[Flow ml./min]** is corrected accordingly.

Calibrate dosing volume:

➜ Use the [Select] button to activate the **[Speed rpm]** function and specify the desired pump rotation speed.

➜ Use the [Select] button to activate the **[Vol ml]** function and define a volume.

➜ Press the [Cal] button:

– The displayed **Flow ml./min** value flashes.

➜ Start the pump operation by pressing the [rotation on/off] button:

– The pump automatically switches off after 60 seconds, regardless of the actual volume being pumped.

➜ Measure the actual volume being pumped and use the arrow keys on the unit to enter the value.

➜ Press and hold the [Cal] button for at least three seconds:

– The calculated value is converted and the parameter **[Vol ml]** is corrected accordingly.

Setting the direction of rotation

To set/reverse the direction of rotation, follow these steps:

➜ Make sure the pump is switched on and running at idle speed (no rotation).

➜ Use the [reversing] button to select the desired direction of rotation of the pump head (clockwise/counter-clockwise, observe the direction arrows on the device).

– The indicator (LED) shows the actual direction of rotation.

Before changing the direction of rotation, the rotation movement must be stopped with the [rotation on/off] button. An acoustic warning signal sounds when the [reversing] button is actuated while the pump is in operation.

Start/stop pump operation

➜ Make sure that all operating parameters are correctly set.

➜ Press the [rotation on/off] button to start or stop pump operation.

– When switched on, the pushbutton indicator lights up.

In the event of a power interruption, the pump is switched off. When the power is restored, the [rotation on/off] button LED flashes.

Press the button twice to restart the pump (LED lights up).

Interval dosing

To activate the interval dosing function, follow these steps:

➜ Make sure the pump is switched on and running at idle speed (no rotation).

➜ Define a dosing volume (see section „Operational parameters“, page 68).

➜ Define the pause time (see section „Operational parameters“, page 68).

➜ After confirming the pause time, press the [Select] button repeatedly until the **[Vol ml]** and the **[Pause sec/min/h]** indicators light up simultaneously.

– In this state, the interval dosing is active.

– The display alternately shows the volume pumped and the elapsed pause time.

Retraction function

By a short return stroke of the pump, the retraction function avoids dripping in dosing mode.

To activate the retraction function, follow these steps:

➜ Turn off the device.

➜ Press the [Cal] button.

➜ While holding down the [Cal] button, turn the device on again.

– The display shows the currently set pump head.

➜ Release the [Cal] button and press one of the arrow buttons until **[r on]** (retraction function active) or **[r off]** (without retraction) is displayed.

➜ Confirm with [Select].

Fast filling/emptying

With the [max] function, the pump can be temporarily set to maximum power for fast filling/emptying of the connected tube(s), independent of all other setting values:

➜ Turn on the device as described in section „Switching the device on/off“, page 65

➜ Make sure that the rotation movement is stopped.

➜ Use the [reversing] button to select the desired direction of rotation of the pump head (clockwise/counter-clockwise, observe the direction arrows on the device).

➜ Press and hold the [max] button.

– The pump runs at maximum speed to fill/drain the connected tube(s).

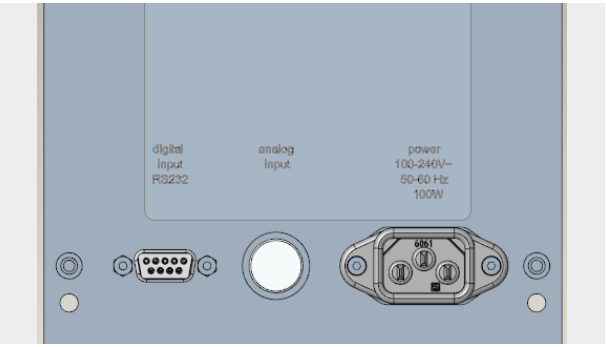
– The pump stops as soon as you release the button.

Troubleshooting

Fault	Possible cause, remedy
Device does not turn on Indicators remain off after switching on the device	➜ Power supply failure: Check the power supply connector ➜ Device fuse defective: Contact technical service ➜ Control/drive/LED defective: Contact technical service
Tube movement	➜ Tube not properly clamped
Pump does not deliver when rotation is switched on	➜ Inappropriate tube: Use tube with adequate wall thickness ➜ No rotation movement, coupling does not engage: Make sure that the pump head is in contact with the pump housing ➜ Tube guide system not closed (SP quick pump head only): Close the tube guide system ➜ Tube setting wrong (Hei-FLOW Ultimate only): Verify tube setting ➜ Overheat protection triggered: After a few minutes and when a certain temperature level is reached, the pump switches on again
Rotation indicator flashes (Hei-FLOW Expert and Ultimate)	➜ Power restored after power failure, restart rotation
Display **[----]** (Hei-FLOW Ultimate)	➜ Invalid values when calibrating the dosing volume: Correct values according to table

Interfaces

The interfaces are located on the rear of the device:



Devices of type Hei-FLOW Expert and Hei-FLOW Ultimate are equipped with an analogue interface by which the pump can be controlled.

Devices of type Hei-FLOW Ultimate are additionally equipped with a digital interface by which the pump can be connected to a PC.

All interfaces are protected against the penetration of liquids by suitable screw caps.

DANGER

Electric shock, material damage, loss of production

The penetration of liquid poses the danger of an electric shock.

In addition, the interfaces and other electronic components inside the housing can be damaged and cause the pump to fail!

- ➜ Use only the connectors recommended by the manufacturer.
- ➜ Make sure that the connection plugs are inserted correctly.
- ➜ Always protect unused interfaces with the supplied screw cap.

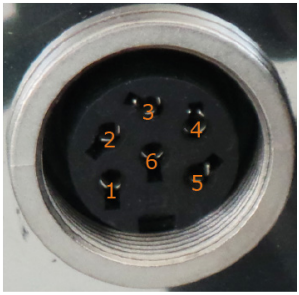
Analogue interface

Only use connectors with degree of protection IP 67 (Binder 6-pin, 99-5121-15-06, Heidolph order No. 14-010-006-81) to ensure adequate protection against splashing water.

Ensure that the connector is properly connected.

Pin assignment analogue interface

PIN 1	+5 V
PIN 2	Start/Stop
PIN 3	0 – 10 V
PIN 4	Direction of rotation
PIN 5	0 V (GND)
PIN 6	4 – 20 mA



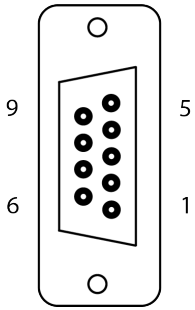
Control voltage	Control current	Hei-FLOW Expert/ Ultimate 01	Hei-FLOW Expert/ Ultimate 06
0 – 0.9 V	0 – 4.9 mA	0 rpm	0 rpm
1 V	5 mA	5 rpm	24 rpm
10 V	20 mA	120 rpm	600 rpm

- ➜ TTL level 0 V = clockwise rotation, TTL level 5 V = counter-clockwise rotation.
- ➜ TTL-pulse 5 V switches the rotation on and off again at the next pulse. This function is always activated.
- ➜ For controlling the [direction of rotation] and [rotation start/ stop] functions, a voltage of 5 V is also available at the interface socket in order to be able to switch with potential-free contacts.
- ➜ The analogue interface is detected at a voltage of 0.2 V or a current of 4 mA;
- ➜ Hei-FLOW Ultimate: When the interface is detected, the display shows **[EA]**. As long as the pump drive is controlled via the analogue interface, the display and all buttons except [Start/ Stop] are inactive.

Digital interface

The digital RS232 interface is designed as SUB-D9 socket.

Pin assignment digital RS232 interface



Pos. 2 SUB D9	Signal
	n.c.
	n.c.
2	Tx
	n.c.
3	Rx
	n.c.
	n.c.
5	GND

Interface commands

Adjustment inner tube diameter

Command	Inner tube diameter
SSD=0000!	0.8 mm
SSD=0001!	1.0 mm
SSD=0002!	1.7 mm
SSD=0003!	2.0 mm
SSD=0004!	3.0 mm
SSD=0005!	3.1 mm
SSD=0006!	4.0 mm
SSD=0007!	4.8 mm
SSD=0008!	5.0 mm
SSD=0009!	6.0 mm
SSD=0010!	6.3 mm
SSD=0011!	7.0 mm
SSD=0012!	7.9 mm
SSD=0013!	8.0 mm
SSD=0014!	9.0 mm

Interface commands (general)

Command to pump[1)]	Feedback	Description
LEDx?	LED=0000\r\n LED=0001\r\n	Select parameter: X=0-7 LED off LED on LED0?=Volume ml (volume) LED1?=Flow ml/min (volumetric flow/minute) LED2?=Tube mm (inner tube diameter) LED3?=speed rpm LED4?=rotation LED5?=rotate clockwise LED6?=rotate anti-clockwise LED7?=Pause sec/min/h (pause duration)
DSP?	DSP=xxx\r\n	Display query: Display current value
Tax!	-	Select function key: X=1-7 TA1!=Cal (Calibration) TA2!=Start/Stop (rotation button) TA3!=change direction of rotation TA4!=max (maximum speed) Ta5!=Up (arrow key) TA6!=Down (arrow key) TA7!=Select (select button)
SPX=xxxx!	-	Set pause duration: X=0;2;3 SP0=0001 - 5999 sec./10 e.g. 100 ms SP2=0010 - 0599 minutes SP3=0010 - 0750 hours
SMM=xxxx![2)]	-	Volumetric flow ml or µl (tube dependent) : Xxxx=000.0 - 9999
SDZ=xxxx!	-	Setting the speed rpm: Xxxx=0000 - 9999 (min/max depending on the gear)
SDM=xxxx![2)]	-	Volume dosing ml or µl (tube dependent): Xxxx=000.1 - 9999 (not possible when calibrating)
SSD=xxxx![2)]	-	Adjust inner tube diameter: X=4-digit number xxxx=0000 (see the following section "Interface commands: Tube parameters")
-	OK\r\n	Command successful
-	ERROR\r\n	Command failed
-	PO/r/n	Dosing finished

1) RS 232 interface parameters: 9600 Baud, No Parity, 8 Bit, 1 Stop Bit.

2) for tube-dependent parameters see also section Technical data.

Command to pump[1)]	Feedback	Description				
GDZ?	GDZ=xxxx\r\n	get actual rotation [rpm]				
GSW?	GSW=x.x.x\r\n	get software version				
GGT?	GGT=xx\r\n	get pump variant ➜ xx=01 – Hei-FLOW Ultimate 01 ➜ xx=06 – Hei-FLOW Ultimate 06				
GPK?	GPK=x\r\n	get type of pump head ➜ X=0 – Pu 0 – multi-channel C8 ➜ X=1 – Pu 1 – single-channel SP quick ➜ X=2 – Pu 2 – single-channel SP std/vario ➜ X=3 – Pu 3 – not assigned ➜ X=4 – Pu 4 – not assigned ➜ X=5 – Pu 8 – multi-channel C12 ➜ X=6 – Pu 9 – multi-channel C4				
GMD?	GMD= xxx,x\r\n	get volume [ml] resp. [µl] xxx,x = volume from pump start until query				
GMM?	GMM=xxxx\r\n	get volumetric flow rate [ml/min] resp. [µl/min]				
GSD?	GSD=xxxx\r\n	get tube diameter [mm]				
		Pu 0	**PU 1+2**	**PU 3**	**PU 4**	**PU 8+9**
	xxxx = 0000	0.8	0.8	0.8	0.8	0.2
	xxxx = 0001	1.0	1.0	1.0	1.7	0.5
	xxxx = 0002	1.7	1.7	1.7	3.1	0.9
	xxxx = 0003	4.8	2.0	2.0	4.8	1.4
	xxxx = 0004	6.3	3.0	3.0	6.3	2.8
	xxxx = 0005	-	3.1	3.1	7.9	-
	xxxx = 0006	-	4.0	4.0	-	-
	xxxx = 0007	-	4.8	-	-	-
	xxxx = 0008	-	5.0	-	-	-
	xxxx = 0009	-	6.0	-	-	-
	xxxx = 0010	-	6.3	-	-	-
	xxxx = 0011	-	7.0	-	-	-
	xxxx = 0012	-	7.9	-	-	-
	xxxx = 0013	-	8.0	-	-	-
	xxxx = 0014	-	9.0	-	-	-

➜ Do not send commands as a package! Leave a minimum interval of 0.1 seconds between packages.

➜ **Xxxx** = 4 digit number.

➜ All pump controls remain active when a PC is connected.

Mounting pump heads

When installing the pump heads, observe all general instructions as well as all specific safety instructions given in this chapter

CAUTION

Risk of crushing

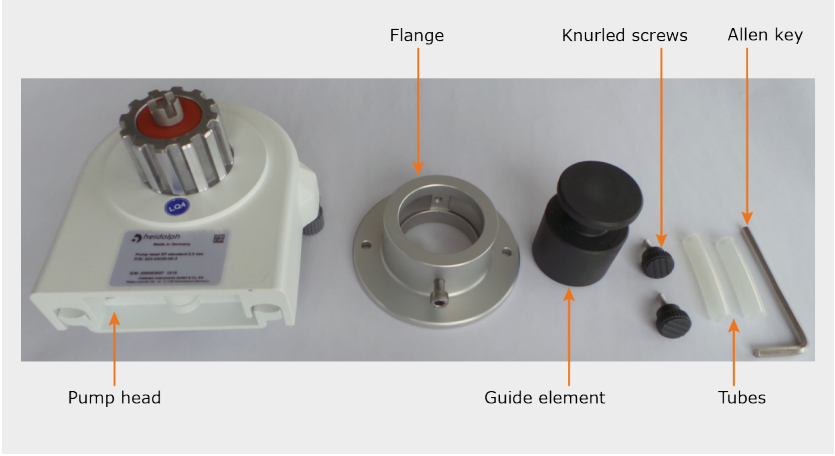
- ➜ When removing/mounting the pump head, observe all relevant safety regulations for mechanical activities to avoid injury to hands and fingers.
- ➜ Always disconnect the device from the mains before removing/mounting the pump head to avoid unintended start-up!
- ➜ Only dismantle protective and/or safety devices where necessary and exclusively for the purpose of removing/mounting components and re-assemble them properly after the work has been completed.
- ➜ Before switching on the device, make sure that all protective and/or safety devices are properly mounted.

Proceed as described in the following sections to remove/mount the pump head.

Pump heads SP standard and SP vario

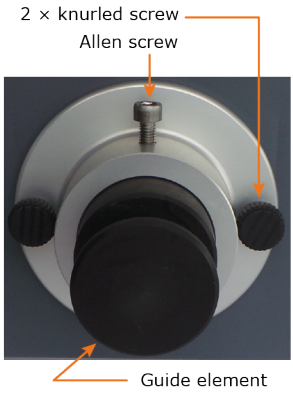
The SP standard and SP vario pump heads are mounted to the pump housing using the supplied flange.

Scope of delivery

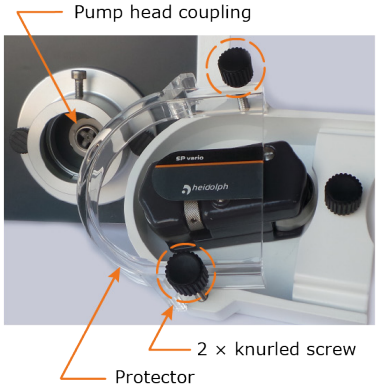


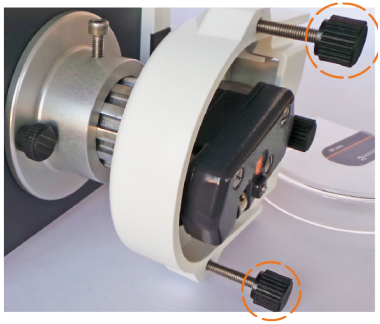
Mounting SP standard and SP vario

- ➜ Insert the guide element into the flange.
- ➜ Position the flange with the guide element on the pump drive so that the guide element is centered around the pump head coupling.
  - – Make sure that the Allen screw is facing upwards!
- ➜ Secure the flange to the pump drive on both sides with the knurled screws.
- ➜ Pull the guide element out of the flange.



- ➜ Remove the protector from the pump head.
- ➜ Fully insert the coupling of the pump head into the flange (if necessary, move the rotor slightly back and forth).
- ➜ Align the pump head - according to the the vessel arrangement - and secure it with the Allen screw.
- ➜ Mount the protector.



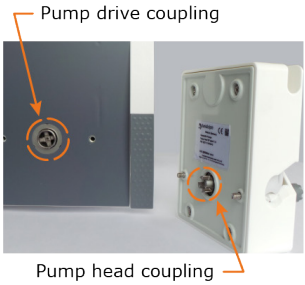


Pump head SP quick

The SP quick pump head is attached directly to the pump housing using the supplied screws.

Mounting SP quick

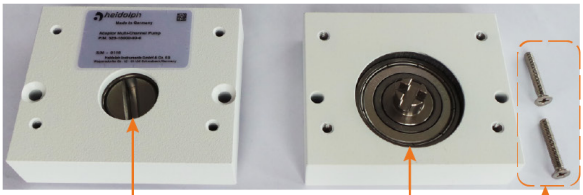
- ➜ Place the pump head on the pump drive so that the adaptor coupling of the pump head slides into the coupling on the pump drive (if necessary, move the rotor slightly back and forth).
- ➜ Secure the pump head to the pump housing using the knurled screws. Tighten the knurled screws evenly with a suitable tool
- ➜ Place the clamping lever from right to left to open the tube guide.



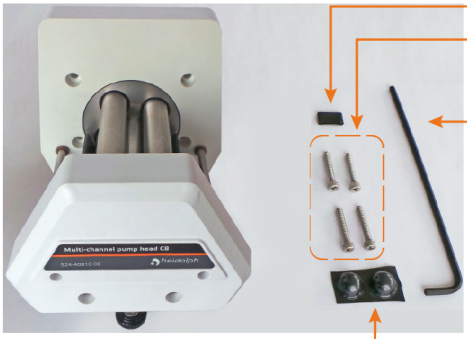
Multi-channel pump heads

Scope of delivery

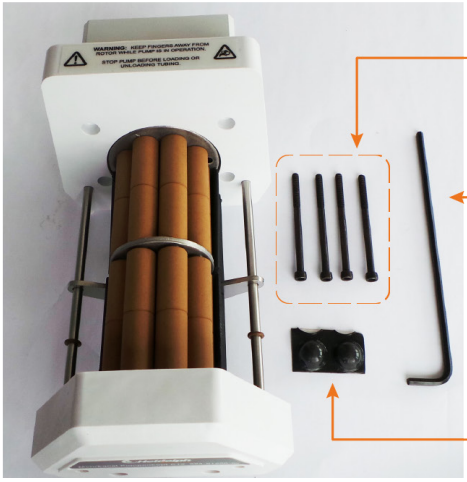
Adaptor for multi-channel pump heads C8, C4, C12



Multi-channel pump head C8



Multi-channel pump heads C4 + C12



Mounting the adapter for multi-channel pump heads

The multi-channel pump heads C 8, C 4 and C 12 are mounted to the pump housing using the supplied adapter.

➜ First, insert the back element with the adapter coupling onto the device coupling on the pump housing.

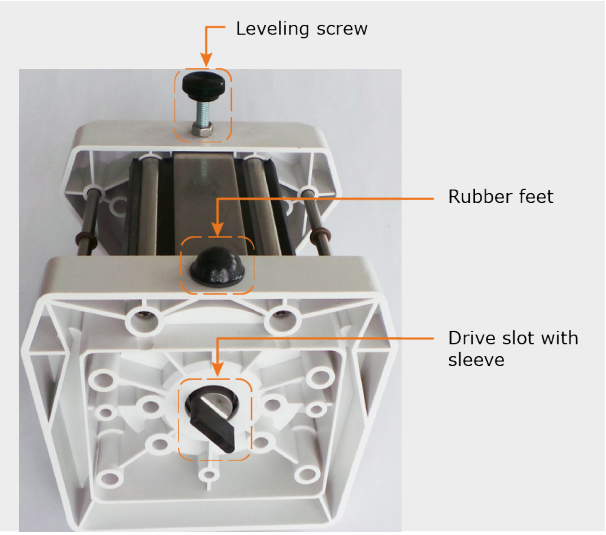
➜ Align the mounting holes of the back element with the mounting holes of the pump housing.

➜ Place the front element of the adapter on the attached back element and secure the unit using the two Phillips countersunk screws provided.

Mounting multi-channel pump heads C 8

Multi-channel pump heads of type C 8 must be fitted to the adapter with the supplied sleeve to avoid damage to the pump head!

➜ Put the sleeve onto the pump head drive (figure: coupling side C 8, bottom view!):



➜ Place the pump head on the adapter in such a way that the drive engages the adapter coupling.

– If necessary, turn the drive into the correct position.

➜ Insert the four fixing screws through the mounting holes of the pump head and tighten them evenly by hand.

➜ Check that the pump head is correctly seated on the adapter and then tighten the fixing screws using the supplied hex wrench.

➜ Adjust the leveling screw so that the pump head is aligned at a stable 90 ° angle to the pump housing.

Installation of multi-channel pump head C 4 + C 12

The procedure for mounting type C 4 and C 12 multi-channel pump heads is the same as for mounting type C8 multi-channel pump heads, see section „Mounting multi-channel pump heads C 8“, page 82.

However, multi-channel pump heads of types C 4 and C 12 are mounted without sleeve, as this is not required on these models!

Mounting tubes

When mounting the tubes, observe all general instructions as well as specific safety instructions given in this chapter. For detailed information on tube selection, see section „“, page 86.

CAUTION

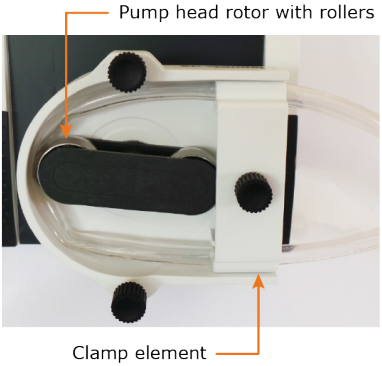
Risk of crushing, possible damage to the device

- ➜ When removing/mounting the tubes, observe all relevant safety regulations for mechanical activities to avoid injury to hands and fingers.
- ➜ Always disconnect the device from the mains before installing the tube(s) to avoid injury and/or damage to property due to an unintended pump start!
- ➜ Avoid excessive force when mounting the tube(s): All adjustment and fastening elements must be operated with manual force only.
- ➜ Only dismantle protective and/or safety devices where necessary and exclusively for the purpose of removing/ mounting components and re-assemble them properly after the work has been completed.
- ➜ Before switching on the device, make sure that all protective and/or safety devices are properly mounted.
- ➜ Check that all cassettes and tubes are securely seated before starting the pump.

Pump head SP standard

To mount tubes on the SP standard pump head, proceed as follows:

- ➜ Remove the protector from the pump head.
- ➜ Remove the clamping lever.
- ➜ Insert the tube into the pump head.
- ➜ Turn the pump head rotor in such a way that the inserted tube is prefixed between the rotor and the housing (see illustration, several turns may be necessary!).
- ➜ Mount the clamping lever.
- ➜ Slightly tighten the inserted tube: Pull on both ends with moderate force.
- ➜ Pre-tensioning increases the service life of the tube and ensures maximum operational reliability.
- ➜ Mount the protector.
- ➜ Perform a short test run before commissioning to ensure continuity of the mounted tube.



Pump head SP Vario

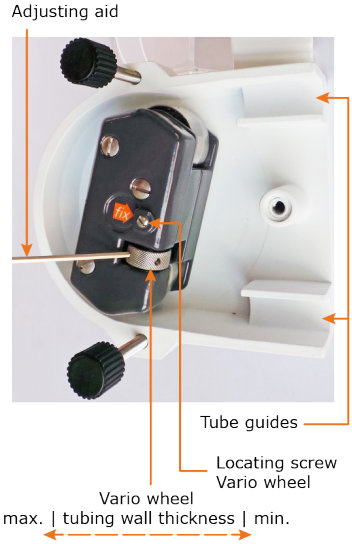
Pump heads of the type SP vario can be adjusted to different tube wall thicknesses. To mount tubes on the SP vario pump head, proceed as follows:

- ➜ Remove the protector from the pump head.
- ➜ Remove the clamping lever.
- ➜ Turn the Vario wheel to the [max.] position using the adjustment aid supplied (maximum opening for maximum tube wall thickness).
- ➜ Insert the tube into the pump head.
- ➜ Turn the pump head rotor in such a way that the inserted tube is prefixed between the rotor and the housing (see illustration, several turns may be necessary!).
- ➜ Turn the Vario wheel with the adjustment aid in the direction of the [min.] position until there is clear resistance.
- ➜ Remove the adjustment aid and store it safely.
- ➜ Mount the clamping lever.
- ➜ Slightly tighten the inserted tube: Pull on both ends with moderate force.
  - – Pre-tensioning increases the service life of the tube and ensures maximum operational reliability.
- ➜ Mount the protector.
- ➜ Perform a short test run before commissioning to ensure continuity of the mounted tube.

Small tubes

To stabilize small tubes (internal diameter 0.8 to 1.7 mm) in the pump head, use the two supplied tube pieces (see scope of delivery, section „Pump heads SP standard and SP vario“, page 78):

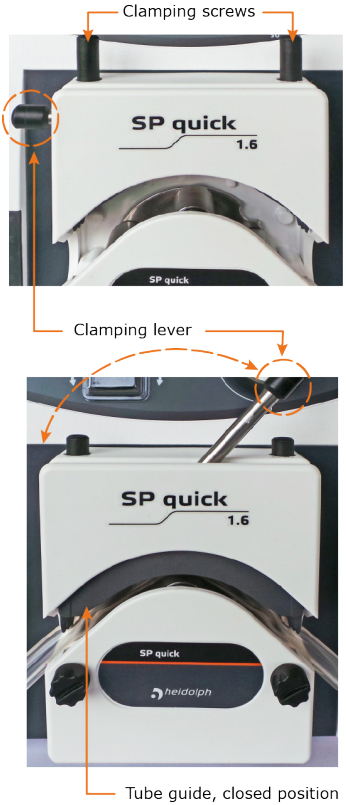
- ➜ Slide the tube pieces over the inserted tube.
- ➜ Place the tube pieces in the two tube guides and pre-tension the tube as described.
- ➜ Mount the protector and perform a short test run to ensure continuity of the tube.



Pump head SP quick

SP quick pump heads are equipped with a quick-release mechanism. To mount tubes on the SP quick pump head, proceed as follows:

- ➜ Place the clamping lever to left to open the tube guide.
- ➜ Turn the clamping screws counter-clockwise until they stop (maximum opening for maximum tube wall thickness).
- ➜ Place the tube in the open tube guide.
- ➜ Move the clamping lever to the right to close the tube guide.
  - In case of excessive resistance, ensure that the clamping screws are fully open and the tube is suitable for the pump head!
- ➜ Screw in the two clamping screws evenly with hand force to secure the inserted tube.
- ➜ Slightly tighten the inserted tube: Pull on both ends with moderate force.
  - Pre-tensioning increases the service life of the tube and ensures maximum operational reliability.
- ➜ Perform a short test run before commissioning to ensure continuity of the mounted tube.



Multi-channel pump heads

Multi-channel pump heads can be equipped with a number of specially designed tube cassettes. Possible combinations of multi-channel pump heads and tube cassettes are:

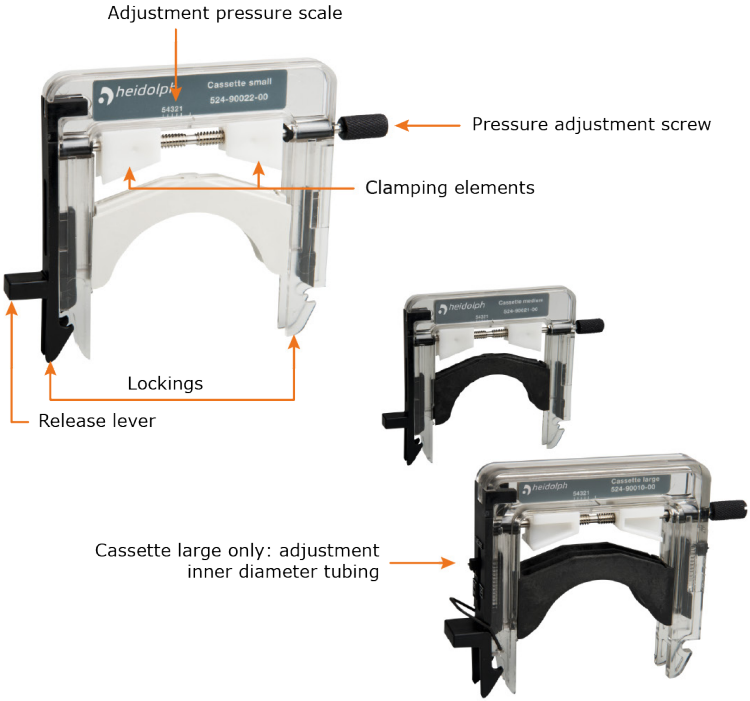
Multi-channel pump heads	Denomination cassette
C 4:	Cassette small
C 12:	
C 8:	Cassette medium
	Cassette large

- ➜ Refer to the tube selection table for the possible hose and cassette combinations, see section „Tubings – peristaltic pumps“, page 90.
- ➜ Note that two stop tubes can only be used in combination with multi-channel pump heads type C 4 and C 12! The tube stoppers on both sides prevent the tube from moving during operation and thus ensure the perfect functioning of the device.
- ➜ All tubing cassettes can be operated in both directions. It is always recommended to arrange the cassettes on the pump head in an alternate manner to ensure easy access to the adjusting screws at all times.

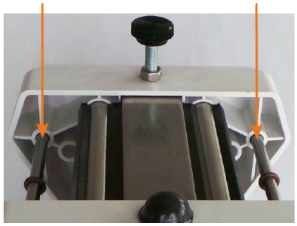
To mount tube cassettes and tubes on multi-channel pump heads, proceed as follows (see also the following figure [cassettes for multi-channel pump heads]):

- ➜ Turn the cassette contact pressure adjustment screw fully counter-clockwise to fully open the clamping elements.
- ➜ Tubing cassettes type Cassette large only: Use the slider to adjust the tubing size.
  - Inner tube diameter up to 3.1 mm: Slide to mark 16/14
  - Inner tube diameter 4.8 mm: Slide to mark 25
  - Inner tube diameter 6.3 mm: Slide to mark 17
- ➜ Insert the tube into the cassette from below without strain.
- ➜ Snap the cassette onto one of the two support rods of the multi-channel pump head.
- ➜ Hold the tube in place with one hand without tensile load and with the other hand, guide the cassette over the rollers of the multi-channel pump head until the free side of the cassette engages on the opposite support rod. Ensure that the tube is positioned correctly between the cassette and the rollers.
- ➜ Slide the cassette to the stop against the pump drive or cassette on the cassette.
- ➜ Secure the last tube cassette using the O-rings on the support rods of the multi-channel pump head.
- ➜ Set the correct contact pressure on all mounted tube cassettes: Turn the adjusting screw for the pressure of the tube cassette clockwise and observe the position of the inner edge of the clamping element.
  - Cassette small: Inner edge clamping element between scale marks 1 and 2.
  - Cassette medium and cassette large: Inner edge clamping element between scale marks 3 and 4.
- ➜ The contact pressure can be adjusted to the actual operating parameters at any time during operation!

Figure [cassettes for multi-channel pump heads]



Support rods for cassettes,
bottom view multi-channel pump head C 8



PTFE fittings

The connection of tube pieces and the tubes supplied as meter goods to the two stop tubings is made via PTFE fittings (for details of the available accessories, see homepage www.heidolph-instruments.de):

Fittings for tubes with inner diameter up to 1.4 mm

➜ Insert the tube ends through the union nuts.
  – Make sure that the threaded side of the union nut faces the open end of the tube!

➜ Slide three O-rings on each open end of the tube, see figure for location.

➜ Screw the union nuts of the tube ends to be connected onto the fitting with hand force.

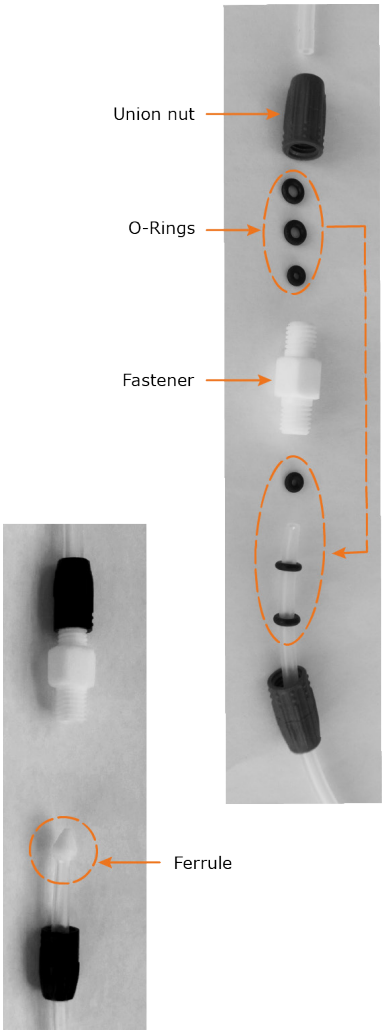
Fittings for tubes with inner diameter from 1.4 mm

➜ Insert the tube ends through the union nuts.
  – If necessary, cut the end of the tube at an angle to facilitate inserting.
  – If necessary, cut the end of the tube straight again after inserting!
  – Make sure that the threaded side of the union nut faces the open end of the tube!

➜ Slide a ferrule on each open end of the tube, see figure for arrangement.

➜ Insert the tube ends with the ferrule inserted into the fitting from both sides.

➜ Screw the union nuts of the tube ends to be connected onto the fitting with hand force.



Tubings – peristaltic pumps

Single-channel pumps		**Wall thickness 1.6 mm**				
Inner Ø (mm)		0.8	1.7	3.1	4.8	6.4
Outer Ø (mm)		4	4.9	6.3	8	9.5
Max. pressure continuous			0.7 bar		0.5 bar	
Max. pressure short time			1.7 bar		1.5 bar	
Suction head (mWs)			8.8		8.8	6.7
Pump head, pump		**Volumetric flow H_2O (ml/min)**				
SP standard SP vario (Pu 2)	Core 01	-	5-61	19-223	44-519	75-861
	Exp./Ultim. 01	-	2-55	9-221	21-530	33-813
	Core 06	-	22-249	93-1.037	228-2.613	364-4.151
	Exp./Ultim. 06	-	11-257	43-1.017	105-2.549	167-4.056
SP quick (Pu 1)	Core 01	0.83-9	3-41	11-134	25-292	36-413
	Exp./Ultim. 01	0.38-9	2-40	5-126	12-233	17-409
	Core 06	4-35	17-197	57-695	123-1.494	186-1.765
	Exp./Ultim. 06	2-33	8-186	26-653	59-1.529	89-2.072

Single-channel pumps		**Wall thickness 2.5 mm**		
Inner Ø (mm)		4.8	6.4	7.9
Outer Ø (mm)		9.8	11.3	12.9
Max. pressure continuous			0.8 bar	
Max. pressure short time			1.8 bar	
Suction head (mWs)			8.8 bar	
Pump head, pump		**Volumetric flow H_2O (ml/min)**		
SP standard SP vario (Pu 2)	Core 01	42-493	68-773	-
	Exp./Ultim. 01	15-491	28-769	-
	Core 06	203-2.426	313-3.782	-
	Exp./Ultim. 06	92-2390	139-3.821	-
SP quick (Pu 1)	Core 01	26-299	38-454	50-636
	Exp./Ultim. 01	12-299	18-435	25-630
	Core 06	123-1.580	180-2.411	257-3.436
	Exp./Ultim. 06	58-1.527	85-2.248	113-3.171

Multi-channel pumps		**Wall thickness 0.9 mm**				
Inner Ø (mm)		0.25	0.51	0.89	1.42	2.79
Outer Ø (mm)		2.05	2.31	2.69	3.22	4.59
Max. pressure continuous (bar)				0.5		
Max. pressure short time (bar)				1.5		
Suction head (mWs)				7		
Pump, pump head, cassette		**Volumetric flow H_2O (ml/min)**				
Core 01	C 4: (Pu 9), max. 4 × cassette small	0.04-0.53	0.17-2	0.57-6	1-15	4-37
	C 12: (Pu 8), max. 12 × cassette small	0.005-0.11	0.02-0.42	0.10-1	0.23-3	0.69-8
Expert 01 Ultimate 01	C 4: (Pu 9), max. 4 × cassette small	0.02-0.49	0.08-2	0.24-6	0.60-14	2-36
	C 12: (Pu 8), max. 12 × cassette small	0.005-0.11	0.01-0.54	0.03-1	0.10-3	0.29-9

Multi-channel pumps		**Wall thickness 1.6 mm**				
Inner Ø (mm)		0.8	1.7	3.1	4.8	6.4
Outer Ø (mm)		4	4.9	6.3	8	9.5
Max. pressure continuous (bar)		0.7		0.7		0.5
Max. pressure short time (bar)		1.7		1.7		1.5
Suction head (mWs)		7		7		6.7
Pump, pump head, cassette		**Volumetric flow H_2O (ml/min)**				
Core 01	C 8: (Pu 0), max. 8 × cassette medium	0.55-6.97	2.17-27	-	-	-
	C 8: (Pu 0), max. 4 × cassette large	-	2-27	7-85	18-246	26-364
Expert 01 Ultimate 01	C 8: (Pu 0), max. 8 × cassette medium	0.24-7	1-26	-	-	-
	C 8: (Pu 0), max. 4 × cassette large	-	1-27	4-90	8-192	11-329

All volumetric flow values are to be considered as a reference: tubing material Tygon®, medium H_2O.

The volumetric flow depends on the tubing material, the medium used, as well as on the environmental conditions!

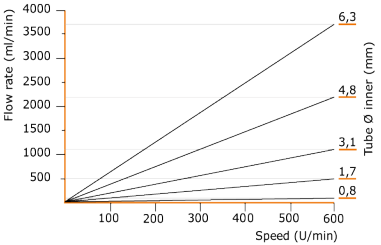
Technical data

Hei-FLOW peristaltic pumps	
Rated voltage	110-240 V, 50/60 Hz
Power consumption	100 W
Protection class	1 ⏚ (EN 61140)
IP code	IP 54 (EN 60529)
Acoustic pressure	< 55 (dB(A)) (in accordance with IEC 61010)
Drive	EC motor
Drive power	100 W
Speed control	digital
Control accuracy	± 0,5 %
Operation mode	continuous 24/7
Direction of rotation	left / right
Dimensions (w × h × d)	166 × 225 × 256 mm, w/o pump head

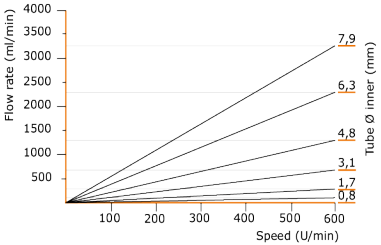
Hei-FLOW	Core		Expert		Ultimate	
	01	06	01	06	01	06
Overheat protection	yes		yes/current limiter			
Turns indicator	analogue		analogue		analogue	
Speed range U^{-1}	10-120	50-600	5-120	24-600	5-120	24-600
Volumetric flow single-channel (ml/min)	0.85-861	4.0-4151	0.38-813	2.0-4056	0.36-813	2.0-4056
Volumetric flow multi channel (ml/min)	0.005-364	-	0.005-329	-	0.005-329	-
Precision*	±5 %		±3,5 %		±1 %	±2 %
Display	-		-		digital	
Volume dosing (ml)	-		-		0.001-9999	
Interval dosing (ml)	-		-		0.001-9999, pause time 0.1 s – 750 h	
Soft start	-		-		yes	
Electronic brake	-		-		yes	
Digital interface	-		-		RS 232	
Analogue interface	-		(0-10 V / 4-20 mA) speed, direction, start/stop			
Foot switch port	-		yes			
Weight (w/o pump head, kg)	7.6	7.1	7.6	7.3	7.7	7.3

Performance range

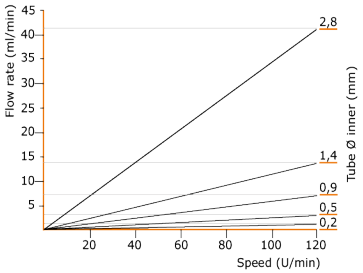
Single-channel pump SP standard / SP vario



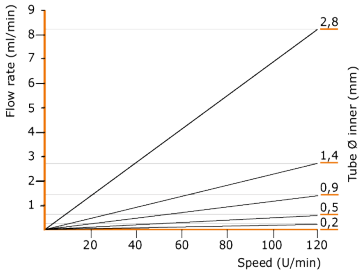
Single-channel pump SP quick



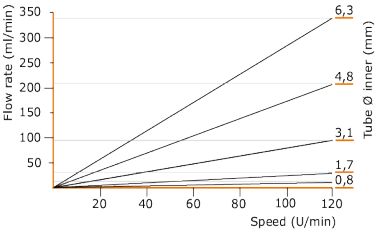
Multi-channel pump C 4



Multi-channel pump C 12



Multi-channel pump C 8



Scope of delivery

Item	Variants	Quant.	Product N°
Hei-FLOW	Core 01*	1	523-50010-00
	Core 06*	1	523-50060-00
	Expert 01*	1	523-51010-00
	Expert 06*	1	523-51060-00
	Ultimate 200*	1	523-51013-00
	Ultimate 400*	1	523-52060-00
User manual		1	01-005-002-75
Warrenty registration		1	01-006-002-78

Further information, in particular about the available expansion modules and the available accessories, can be found on our website at www.heidolph.com!

Service work

When carrying out service work on the device (cleaning, maintenance, repair), observe the general instructions and safety information described in this section.

WARNING: Danger of electric shock

Live components are installed inside the device.

When opening the device, there is a risk of touching live components.

- ➜ Switch the device's main switch off and disconnect it from the power supply before carrying out maintenance work, cleaning, or repairs.
- ➜ Penetrating liquid poses the danger of an electric shock.
- ➜ When cleaning, avoid the penetration of liquids.

Cleaning instructions

Wipe all surfaces of the device with a damp cloth if necessary. Persistent contamination can be removed with mild soapy water.

CAUTION: Damage to the device

Improper cleaning can damage the surfaces of the device.

Penetrating liquid can damage the electronic components inside the device.

- ➜ Clean the device's surfaces with a soft, lint-free and only slightly moistened cloth.
- ➜ Never use any aggressive or abrasive cleaning agents or aids.

Repairs

Repairs to the device may only be carried out by authorized skilled experts!

Unauthorized repairs during the warranty period will result in the loss of the warranty claim.

The owner is solely liable for damage caused by unauthorized repairs.

In case of repair contact an authorized dealer or our technical service, see „Contact information Heidolph international", page 96.

Include the completed Certificate of decontamination with every device return, see „Certificate of decontamination", page 97.

Maintenance

The device contains no user-serviceable components. The installed motors are maintenance-free. If necessary, in the event of abnormal operating behavior such as excessive noise or heat generation, for example, contact our technical service.

Disposal

- ➜ When disposing of the device, observe the provisions of the WEEE Directive 2012/19/EU and its transposition into national law in the country of use.
- ➜ When disposing of portable batteries, observe the provisions of the European Battery Directive 2013/56/EU and their transposition into national law in the country of use.
- ➜ Check the device and all components for residues of substances that are hazardous to health, the environment, and biohazardous before disposing.
- ➜ Properly remove and dispose residues of substances that are hazardous to health, the environment and biohazardous!

Contact information Heidolph international

Heidolph Instruments North America

Phone: 1-866-650-9604
E-mail: service@heidolph.com
www.heidolphNA.com

Heidolph Instruments United Kingdom

Phone: 01799 - 5133-20
E-mail: service@radleys.co.uk
www.heidolph-instruments.co.uk

Local distributors

To find your local distributor please visit www.heidolph.com

Warranty Statement

Heidolph Instruments provides a three-year warranty against material and manufacturing defects.

Glass and wear parts, transportation damage, and damage resulting from improper handling or non-intended use of the product are excluded from the warranty.

The warranty period for registered products begins on the date of purchase. Register the product with the enclosed warranty card or on our homepage www.heidolph.com.

For non-registered products, the warranty period begins with the date of the serial production (to be determined by the serial number).

In the event of material or manufacturing defects, the product will either be repaired or replaced free of charge within the warranty period.