

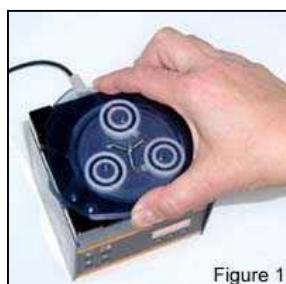
# HiFLOW

## OPERATING INSTRUCTIONS

The successful design and well-proved mechanics of PRECIFLOW pump has been extended for a flow rate programming. Up to 99 steps of time and flow rate can be easy programmed allowing a creation of any flow rate profile. The maximum flow rate has been increased up to 3000 ml/hr. Up to now it has not been possible to produce pumps with such a high flow rate in just 1 l of instrument volume.

### 1. OPERATING INSTRUCTIONS

- Plug the connector of the power supply in the corresponding socket on the backside of the pump and secure it in place by rotation of the ring.
- Plug the power supply into an AC mains outlet (230V/50–60 Hz). After a short beep signal the display will be illuminated. The last used settings will appear on the display.
- Remove the clear PVC cover by rotating it to the left or to the right (figure 1).
- Press the ON/OFF button and select the sense of rotation of the pump (button ◀|▶) so that the rotor will turn in a clockwise direction.
- Set the speed control to about 100 by pressing the corresponding buttons under the LED display.
- Press the tubing into the back slot on the top of the pump. Thin tubing should be pushed completely to the bottom of the slot. Guide the tubing around the outside of the slowly turning plastic bearing towards the front slot (figure 2). Then press the tubing into the front slot to secure it (figure 3).
- Replace the transparent cover by placing it on the top of the pump and turning it so that the steel ball embedded in the left-front corner fits into the corresponding notch in the PVC cover. (When the cover is gently pressed the bearings will automatically adjust themselves).



#### 1.1 ON/OFF button

By pressing the ON/OFF button the pump is switched on or off. The internal memory will show the last used speed and flow direction setting.

##### 1.1.1 Setting the flow rate

The rate of flow of liquid through the pumps depends upon the internal diameter of the tubing and the pump speed.

The HiFLOW pump has been constructed for tubing with an internal diameter ranging from 0.5 to 4 mm with a wall thickness of approximately 1-mm. The best results have been obtained with silicon tubing, but tubing made from other materials with similar elasticity can also be used.

With the speed control buttons under the LED display the speed of rotation can be selected. The volume of liquid pumped per hour for tubing of different diameter and different speed settings is shown in the flow rate diagram in section 5. The flow rate can be set between 0.02 and 3000 ml/hour.

#### 1.2 Setting of flow direction

The direction of pump rotation can be selected by the ◀|▶ button. The corresponding LED diode will be on.

## 1.3 Remote control

### 1.3.1 ON/OFF control

By interlinking the contacts no. 4 and 5 of the socket on the rear of the pump (see figure 4), the pump will be blocked (both direction indicating LEDs will be switched off). The same effect will be obtained by applying a voltage of 3 to 12 V DC to the contact no. 5 (0 line must be connected to contact no. 3). (Sometimes a reversed logic for the remote control is required. Please contact us in this case).



### 1.3.2 Remote control of the pump speed

This pump can be controlled over the whole range by an external signal (0–10 V, option 0–20 or 4–20 mA). The plus pole of the signal is connected to the contact no. 1, 0 line to the contact no. 3. Press the button REMOTE on the front panel. The corresponding LED diode will go on and the display will indicate an approximate voltage of the external signal. This indication may become unstable when external connection is not made indicating the high sensitivity of the electronics.

Attention: For safety reasons the voltage of the external signal must not exceed 48 V to earth!

## 1.4 How to program the pump

Up to 99 pairs of time and flow rate may be programmed in a simple way. The access to the program is opened by a simultaneous pressing of buttons REMOTE and RUN until an indication **PGM** will appear on display and *both* directions diodes (◀|▶ button) will be illuminated.

(If you repeat this simultaneous pressing, the memory will be cleared and the indication **cLE** will appear on the display. For programming press both buttons again until **PGM** appears again).

- Press the button ON/OFF. The indication F01 will shortly appear on the display indicating that you can select the first flow rate value. You can set the desired flow rate value (0 to 999 representing 0 to 100% speed of rotation) by pressing the buttons under the display. Press the ON/OFF button again. The indication t01 will appear for a few seconds on the display indicating that you can program the time period of the first step in minutes. Select the desired time period for the first programme step.
- Press the button ON/OFF again. The indication F02 will briefly appear on the display. You can enter the desired flow rate. After this press ON/OFF button again. An indication t02 will briefly appear on the display. You can now set the time of the second step.
- In a similar way up to 99 steps can be programmed.
- After having entered *the time* of the last step press simultaneously buttons REMOTE and RUN until an indication **End** will appear on the display (one of the direction diodes will go off). (It is not possible to end the programme after programming the flow rate).

To start the program press button RUN.

To stop the running program press button RUN.

It is possible to and the stop the rotation of the pump, to change the direction and speed of rotation during a running programme step. This facilitates urgent replacement of the tubing or allows reacting to another emergency situation. Do not forget to restore the right direction of flow rate and to switch the pump on after you have finished your intervention. The time basis in the microprocessor is not stopped so that the total time of the step and of the program will not be affected by this modification. After the end of the running step the pump will automatically go on to the following step. The program is not modified by this emergency intervention.

After the last step of the programme the pump will continue the pumping with the flow rate of the last step until it is switched off. If you wish that the pump stops after the last step, program an additional step with flow rate 000 during for example one minute.

You can view the programme by proceeding in the same way as during programming but without modification of it.

## 2. RECOMMENDATIONS

- It is advisable to use tubing with a small diameter and high-speed control setting for small flow rates rather than opposite. This allows a finer selection of flow rates.
- If possible use the clockwise rotation of the pump. This results in lower friction and the pressure of the liquid is also lower (approx. 0.1 MPa). If a higher pressure is required (up to 0.15 MPa) use the opposite direction.
- Periodically smear a small amount of petroleum jelly or similar grease on the inner side of the transparent PVC cover of the pump. This will increase the reliability and the lifetime of your pump. Do not grease the tubing holding slots.
- If as a consequence of tube breakage or some other accident liquid spills into the top of the pump disconnect the pump from the mains and clean it by removing the liquid and rinsing it with water. The rotor can be completely removed by screwing a nut (size M4) to the axis of the rotor and pulling the rotor out by hand or with a pair of pliers. After cleaning, grease the axis and replace the rotor by pressing and rotating until the rotor engages on the motor axis.
- Should you have any difficulties or questions concerning your HIFLOW pump please contact our service office.

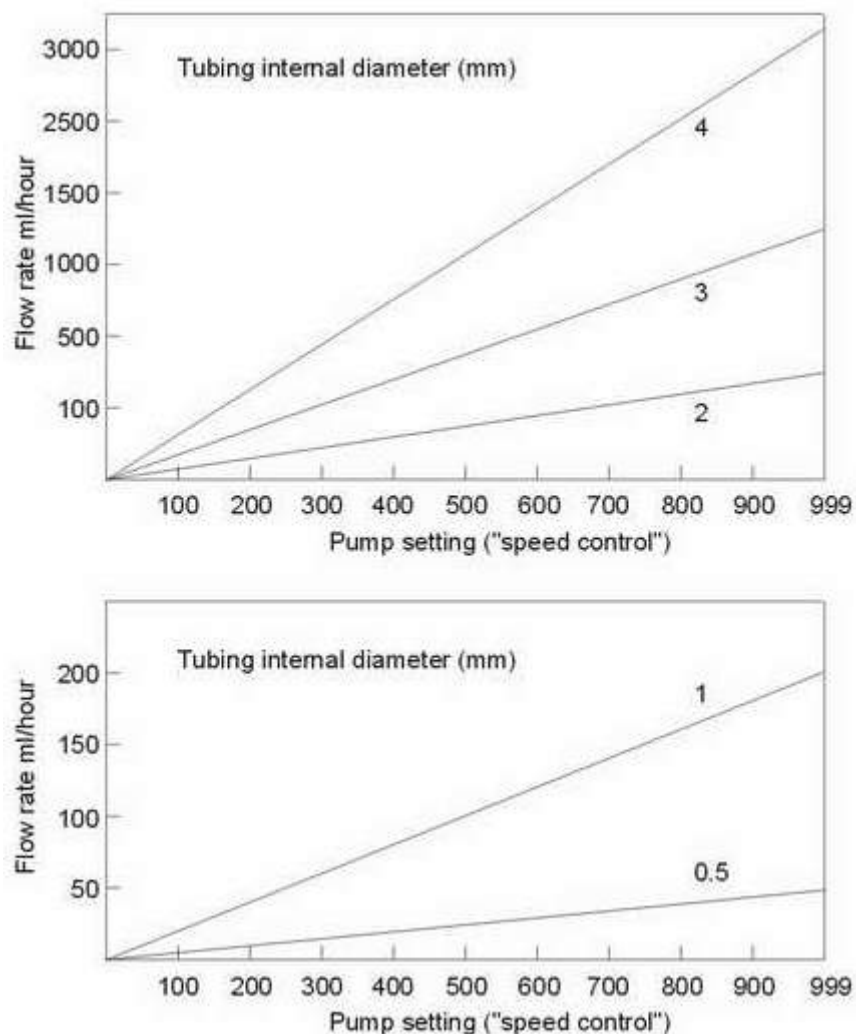
## 3. HIFLOW PUMP - FOR YOUR SAFETY

- Thanks to use of plug in power supply giving only low voltage of 12 V DC the danger of electrical shock during the use of a HIFLOW pump has been virtually eliminated. This holds even for the case when an electro-conducting solution penetrates the pump.
- The pump is usually used in a vertical position. The pumps can also be stacked on each other allowing optimal use of your expensive laboratory areas.
- If the pump is not used for an extended period of time, disconnect it from mains. We use modern miniaturised switching power supply, which has a negligible consumption of el. current when the pump is not used.

## 4. CONSTRUCTION ADVANTAGES OF THE HIFLOW PUMP

- Instead of small rollers, which are used by most pump producers, we use bearings of a larger diameter with glass beads. This reduces pulsation, friction and mechanical strain on the tubing leading to better pump performance.
- The bearings glide over the tubing so gently, that unlike other pumps, it is not necessary to prevent movement of the tubing by a special fixation. In this manner the lifetime of the tubing is considerably increased.
- The pressure on the tubing is delivered individually through an off-centre lever and spring of stainless steel. This assures that the minimal pressure is applied to the tubing, which still guarantees good functioning of the pump without unnecessary deformation of the tubing.
- The spring also reduces the liquid pressure to approx. 1 bar. This is useful when for any reason the line is blocked.
- The asymmetric pump head reduces pulsation.
- A high quality stepping motor together with integrated microprocessor electronics assure a high precision of flow rate with no inertia while turning the pump on and off.
- The pump head is made from hard, chemically stable epoxide.
- The pump dimensions have been minimised. Therefore the HIFLOW pump is considerably smaller than other products of similar performance. The pump is easy to use and saves space in the laboratory.
- Remote control and possibility of flow integration increases the scope of use of the pump in automatically controlled systems (e. g. fermentation, chemical synthesis, fraction collection, etc.)
- The microprocessor allows up to 99 steps of program. This opens a possibility to establish almost any flow rate profile. **This is particularly useful for add medium to the fermentor to feed the culture growing also exponentially. The growth rate and resulting culture activity are considerably increased.**

## 5. FLOW RATE DIAGRAM



## 6. ACCESSORIES AND SPARE PARTS

### 6.1 Pump-Flow Integrator (Cat. no. 4803)

The HIFLOW is the only pump on the market, which allows a simple but precise integration of the amount of liquid, which has been transported, by the pump.

The electric impulses, which move the stepping motor, are registered and transformed into a direct voltage. The voltage can be measured or recorded by common recorders or voltmeters.

In processes where the pump is controlled e.g. by a pH-stat during a fermentation to keep the pH of the medium constant, it is frequently important to know when and how much acid or base was added. This data yields important information about the process, its kinetics, time of completion, etc. Another use of the INTEGRATOR is for measurement of enzyme activities (esterases, amidases, lactamases and other enzymes). The PUMP-FLOW INTEGRATOR can be placed under the HIFLOW pump, to which it is connected by a cable to the 5-pole socket on the rear of the pump (figure 4).

### 6.2 Remote control cable (5 conductors) (Cat. no. 4810)

## 6.3 Spare parts

	Cat. No.
PE bearings	4805
Stainless spring	4806
Off-centre lever	4807
Rotor	4808
PVC cover	4809
Remote control cable (8 conductors)	4815

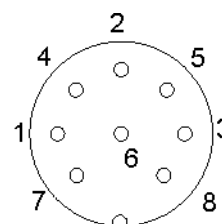
## 7. SPECIFICATIONS

Flow rates:	0.02 to 3000 ml/hr using tubing (silicone or similar) with internal diameter from 0.5 to 4 mm, wall thickness 1 mm
Dimensions:	10.5 (W) × 9,5 (H) × 10,5 (D) cm
Weight:	1.2 kg
Power source:	12 V/12 W, using plug-in power supply for 230 V/50–60Hz
Safety:	CE, meets IEC 1010/1 norm for laboratory instruments
Operating temperature:	0–40 °C
Operating humidity:	0–90 %
Remote control:	0–10 V, (option 0–20 or 4–20 mA) <i>! For safety reasons the voltage of the remote signal to earth must not exceed 48 V DC</i>

### INPUTS/OUTPUTS:

#### Contact number and cable colour code

1	+ input remote speed control 0–10 V (yellow)*
2	step signal from stepping motor (0 and 12 V) (grey)
3	earth, 0 V (green)
4	12 V + (brown)
5	+ input remote ON/OFF (white)*
6	0 V = ON, 3–12 V = OFF (this logic can be inversed on demand)
7	not connected (red)
8	not connected (blue)



\*(zero line connected to the contact no. 3)

## 8. GUARANTEE

Lambda gives a two-year guarantee for work and components when the instrument has been used according to our operating instruction and advice given above.

#### Conditions of guarantee:

- The instrument must be returned with a complete description of the defect or problem.
- The customer will send the instrument to our service office.
- Damage or loss during transport of items will not be compensated by Lambda.
- Failure to fulfil these requirements will disqualify the customer from compensation.

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