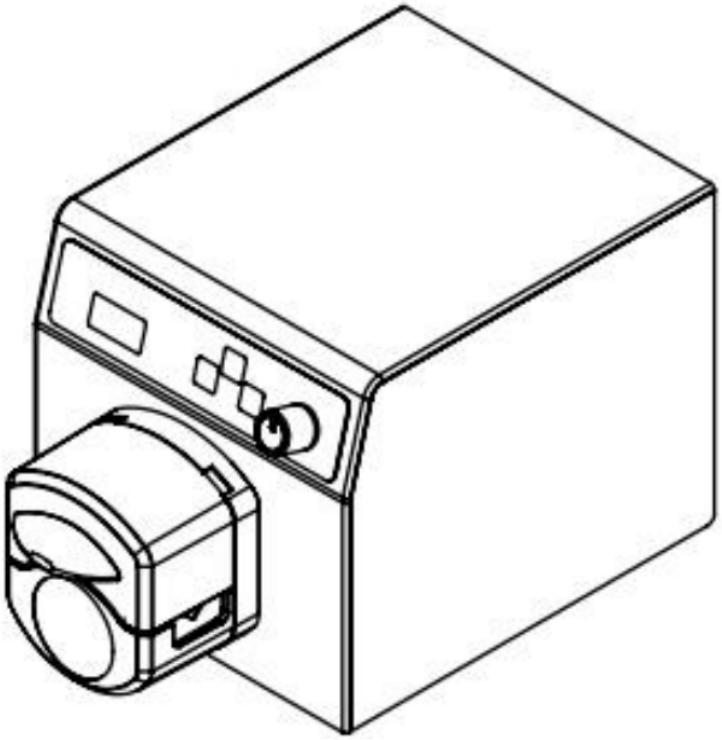
# Manual for ST-HandyPump Peristaltic Pump



This manual shall be made available to all users of this peristaltic pump. To ensure the best results and maximum durability of this U.S. SOLID LLC (here after U.S. SOLID or The Company) product, read and follow all instructions carefully. Failure to do so may lead to serious bodily injury and catastrophic damage to the pump, supplies, or surrounding area. All safety suggestions must be followed closely and precautions must be taken to guarantee this pump is only used by qualified personnel who have understood this guide.

# Contents



# Contact

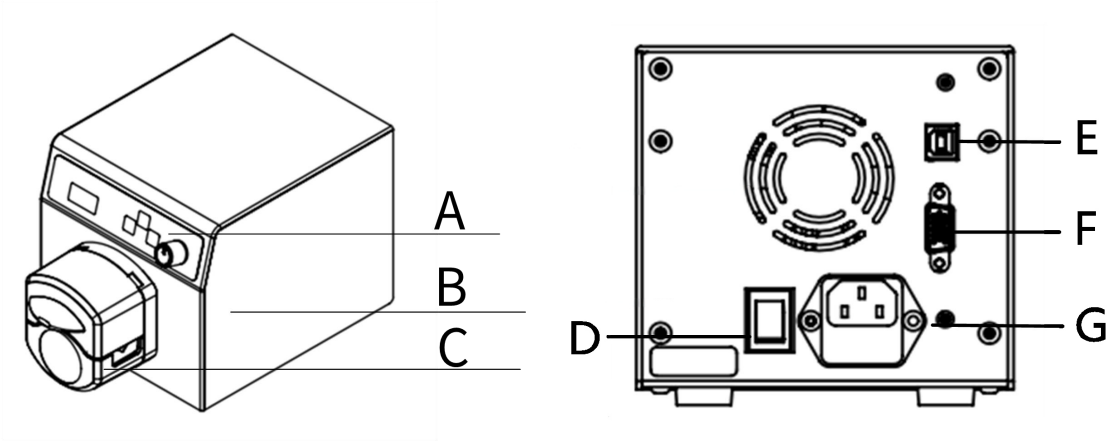
Our Website: www.ussolid.com

Customer Support: service@ussolid.com

# I.Pump Safety Instruction

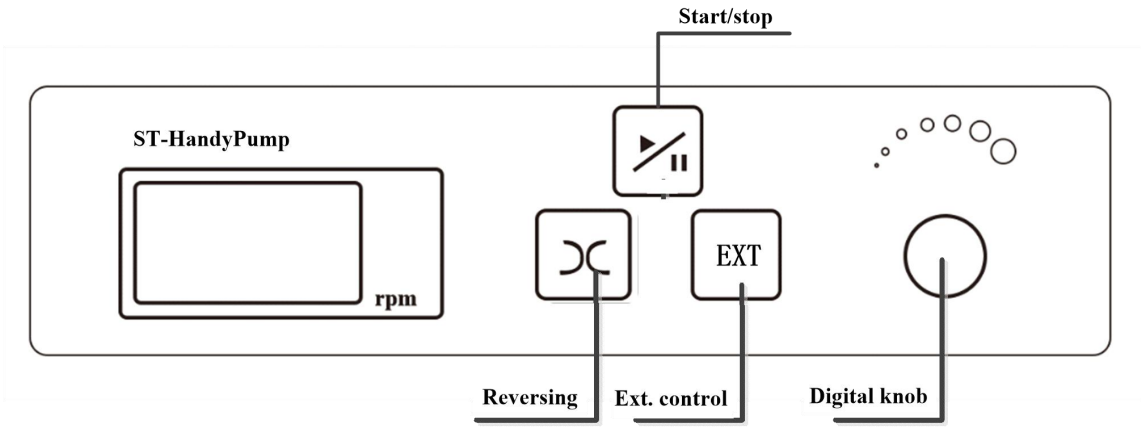
- Please read the manual carefully before operating the product.
- Connect the power cord to the wall socket directly, and avoid using the extended electric wire.
- If the power cord or plug had wear and other damage, please disconnect the plug (Hold the plug instead of the wire).
- If fluid splashes on the pump or if you think the pump need to maintain or repair, please turn off the power supply and disconnect the plug (Hold the plug instead of the wire).
- The user's power socket must have ground wire,and have reliable grounding.
- **Note:** The foot pedal switch and other external control plugs must be connected or disconnected in the power-off status to prevent the external control interface from being burned.

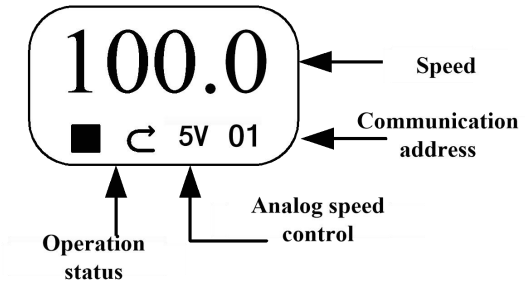
# II.Pump Appearance




| | | | |
|---|---|---|---|
| A | Control panel | D | Power switch |
| B | Drive | E | USB interface |
| C | Pump head | F | External control interface |
| | | G | Power socket |

# III.Pump Control Panel




- **Start/Stop Button**

Pumps run and stops can be controlled by this button. Press this button once, the pump working status change once. When drive runs, the screen display '▶ ', when the pump stops, the screen display '■ '.

- **Reversing**

This button is used to change the motor running direction, press this button once, the running direction of pump changes once.

- **External control button**

This button is used to change the method of analog speed control, press this button once, that will cycle display Empty → 5V → 10V → mA → Empty. Respectively corresponding to Turning off analog speed regulation→0-5V→0-10V voltage analog speed regulation → 4-20mA analog speed regulation → Turning off analog speed regulation.

Note: Keep pressing this button and turn on the power supply of this device in the same time, it will initialize the device and all the parameters will be lost.

➢ **Digital Knob**

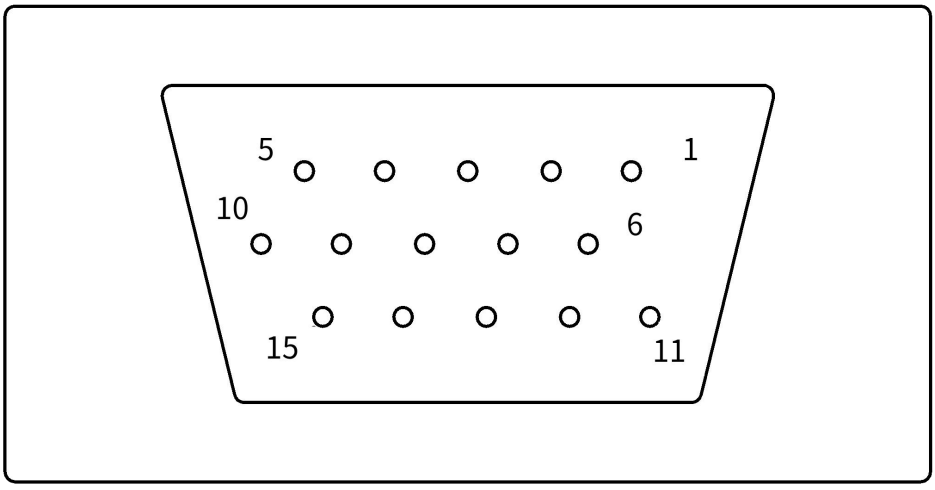
The digital knob used to increase or decrease the motor speed.

(1) In the running state, the digital knob is used to adjust the speed. Turn clockwise to increase the speed, turn counterclockwise to decrease the speed. If you keep pressing the digital knob, the motor will run at the highest speed (full speed), and release it to return to normal speed.

(2) In the stop state, press the digital knob, the lower right corner of the OLED flashes and the value is RS485 communication address (1~32). At this time, you can rotate the digital knob to change the value. After setting, press the digital knob to save the data and the screen no longer flashes.

# IV.Pump External Control Interface Guide

ST-HandyPump series has the 15 pins interface for external control interface, as the below figure shows. That includes function of external control start/stop, direction, analog speed regulation, communication, status output.




Pin 1, port of external control start/stop;

Pin2, port of external control direction;

Pin3, external control level mode switching;

Pin4, RS485B-;

Pin5, RS485A+;

Pin6, analog speed regulation 0-5V signal terminal;

Pin7, analog speed regulation 0-10V signal terminal;

Pin8, analog speed regulation 4-20mA signal terminal;

Pin9, analog speed regulation common terminal AGND;

Pin10, active external control isolated signal common terminal, factory defaults passive external control signal, and this pin is empty;

Pin11, status output negative terminal (POWER_GND);

Pin12, status output terminal (OUT_RUN)

Pin13, status output active terminal (POWER_VDD);

Pin14, internal isolated 5V output active terminal;

Pin15, internal isolated 5V output negative terminal.

(1) Passive external control start/stop, direction

**Pulse mode:**

Pin1 to Pin14, short circuit break (pulse mode) is start, short circuit break again is stop.

Pin2 to Pin14, short circuit break (pulse mode) is direction.

**Level mode**:

Pin3 is external control level mode switching. Short circuited Pin3 and Pin14 to switch to external control level mode.

Pin1 to Pin14, short circuit is start, breaking them is stop.

Pin2 to Pin14, short circuited, motor is counterclockwise, breaking them, motor is clockwise.

Note: External start/stop and direction is defaulted to passive signal when leaving factory. And this interface could be connected with foot pedal equipped by our company.

(2) Active external control start/stop, direction

**Pulse mode:**

Pin10 connects with negative pole of active external control signal.

Pin1 connects positive pole of active external control signal, short circuit and then disconnect, the motor will start. Do it again, the motor will stop.

Pin2 connects positive pole of active external control signal, short circuit and then disconnect, the motor will change direction. Do it again, the motor will change direction again.

**Level mode:**

Pin10 connects with negative pole of active external control signal.

Pin3 is the pin of external control level mode switching. Short circuited Pin3 and positive pole of active external control signal switches to external control level mode.

Short circuited Pin1 and positive pole of active external control signal is start, breaking them is stop.

Short circuited Pin2 and positive pole of active external control signal, the motor is counterclockwise, break them, the motor is clockwise.

**Note:** The active external control isolated signal is 5V, 12V, 24V (Universal)

**(3) Analog speed regulation**

**0-5V voltage signal speed regulation**

Choose the analog speed regulation signal of the pump to 0-5V voltage signal by external control button. The analog signal is displayed “5V” in the screen.

Voltage 0-5V speed regulation, Pin6 connects positive pole of voltage analog 0-5V signal. Pin9 connects negative pole. Change the voltage value of the analog signal, and the speed changes linearly. 0V corresponds to speed 0rpm, 5V corresponds to maximum speed.

**0-10V voltage signal speed regulation**

Choose the analog speed regulation signal of the pump to 0-10V voltage signal by external control button. The analog signal is displayed “10V” in the screen.

Voltage 0-10V speed regulation, Pin7 connects positive pole of voltage analog 0-10V signal. Pin9 connects negative pole. Change the voltage value of the analog signal, and the speed changes linearly. 0V corresponds to speed 0rpm, 10V corresponds to

maximum speed.

**External control button for current signal speed regulation**

Choose the analog speed regulation signal of the pump to current signal, the analog signal is displayed “mA” in the screen.

Current 4-20mA speed regulation, Pin8 connects positive pole of current analog 4-20mA signal. Pin9 connects negative pole. Change the current value of the analog signal, and the speed changes linearly. 4mA corresponds to speed 0rpm, 20mA corresponds to maximum speed.

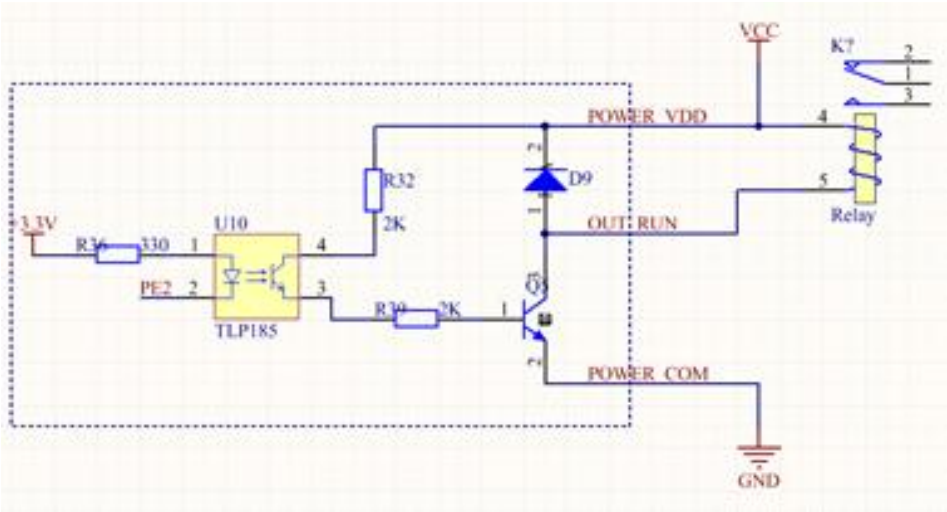
**Note:** It is forbidden to connecting 0-5V/0-10V signal with 4-20mA input terminal. Wrong connections may cause device damaged. The external control plugs must be connected and disconnected in the power-off status to prevent the external control interface from being burned.

(4) Output signal

1) Connect Power-VDD with positive pole of external connection power supply 5V.

2) Connect Power-GND with negative pole of external connection power supply 5V.

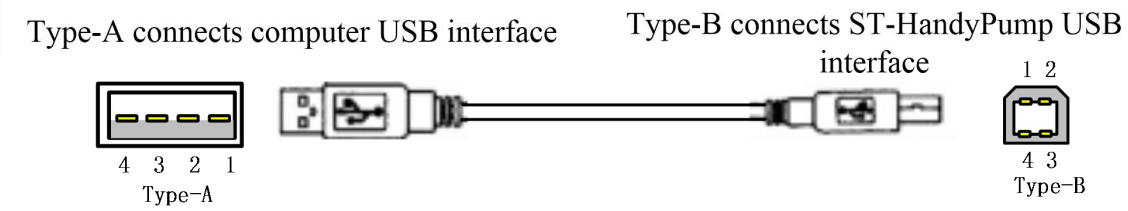
3) Start motor, relay pull-in; Motor stops, relay breaks.

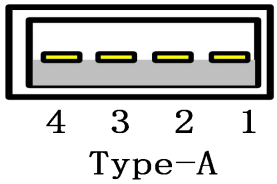
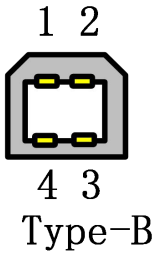


# V.Communication Function Instruction

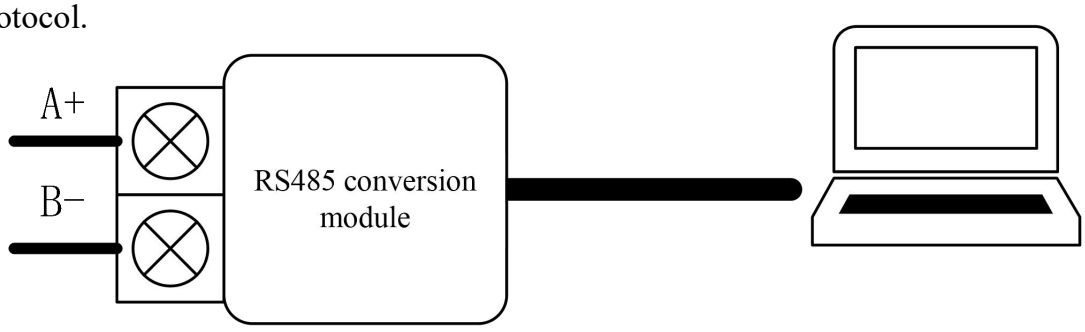
The pump supports standard Modbus protocol (RTUmode), communication mode are RS485 and USB. It can control the pump start/stop, direction and motor speed; also can read the current running status.

USB communication mode need to use USB cable (one side is head A and the other side is head B) , connect the pump with computer through the USB interface.




| Type | Type-A | Type-B |
|---|---|---|
| Plug(male)<br>USB2.0 |  |  |
| | Connect with computer | Connect with external control USB interface |

RS485 communication: Connect A+ (pin5) from external control interface (as shown in Picture) to T/R+ of RS485 module; and connect B- (pin4) to T/R- of RS485 module. Users can control the pump working according with the communication protocol.

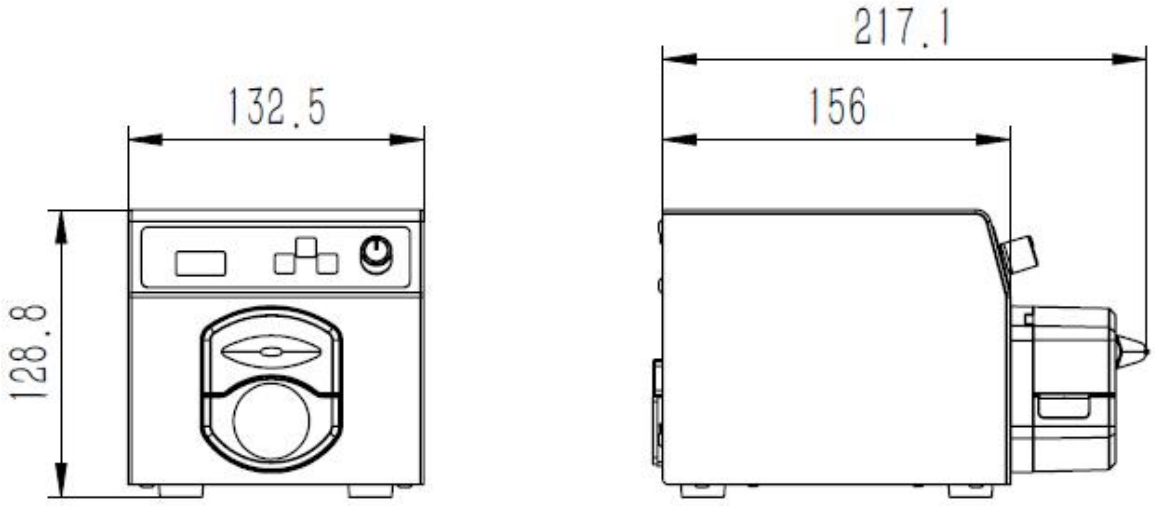


# VI.Pump Technical Specification

| | | | |
|---|---|---|---|
| Flow rate | 0.0033~365.69 mL/min | Power supply | AC100V~240V(50HZ/60HZ) |
| Speed range | 0.1~300rpm | External control | Start/stop: Switch signal<br>Speed control: 0-5V, 0-10V, 4-20mA for option |
| Speed resolution | 0.1rpm | Communication | RS485 |
| Control | Digital knob/ pure imported keypad | Temperature | 0-40℃ |
| Motor | 57 closed -loop stepper motor | Relative humidity | <80% |
| Display | OLED | Output interface | Output motor working status |
| Power consumption | ≤75W | IP rate | IP31 |

# VII.Pump Dimension Drawing

ST-HandyPump+HandyPump



# VIII.Pump Main Functions

- Suitable Pump Head: HandyPump pump head.
- Digital knob control speed, control speed manually or by external control interface automatically.
- Multiple pumps can be controlled by one controller at the same time, RS485 address can not be repetitive.
- The circuit has excellent performance, good heat dissipation conditions, low working noise, stable operation, and has power-off memory function.
- RS485 standard Modbus protocol, that is more convenient to connect with PLC.
- 304 stainless steel shell, anti-corrosion, no rust, conform to GMP requirements.
- OLED displays motor speed and working status.

# IX.Pump Maintenance

➢Check the running status of machine before starting it, ensure that the power supply of the device is reliably grounded. Normal operation can be put into use. The external wiring of the equipment must be operated in the power-off state to prevent burning the equipment.

➢Check if it is damage for the tubing and the equipment is leakage, please ensure that liquid in the tubing is discharged to the container or discharge pipe; Wipe the leaked liquid around the pump in time and correct any possible faults in time. Keep the rollers of pump head clean and dry, otherwise it can quicken the tubing wear (it also can damage the tubing cause of solid substances in the liquid), reduce the useful life of tubing and lead the rollers to damage in earlier; If the pump head in water accidentally, use soft cloth and other absorbent soft cloth to wipe dry to prevent damage to the pump head. If liquid splashed on the pump, please turn off the power supply and unplug the power wiring; Check whether liquid is in inner, if it enters equipment, please contact manufacture.

➢The factors affecting the flow are as follows:

1) The inner diameter and wall thickness of tubing may have some deviations due to its tolerance and different batches.
2) Different liquid properties
3) It will decrease flow rate when input port and output port change small or there are suction and lift.
4) The speed of DC/AC motor will change according to load, temperature and humidity.

That may make influence on product flow accuracy, please leave a margin when choose tubing.

➢This product has no waterproof measures. Please take protective measures when using in water environment. When the product does not use for a long time, please clean it and keep it in dry and ventilated environment.

➢Pump head can not resist organic solvent (Except for special indication) and strong corrosion liquid, please be attention when use it.

➢The data tested in a short time in this manual may change for using a long time.

➢The current will over the rated running current when DC/AC motor starts or blocks, it may be about 3-5 times the rated operating current;

➢This product does not have special certification such as medical certification. When it needs to be used in special fields such as medical and military, please self-certify. Load changes will also cause changes in operating current. Therefore, please conduct margin design for power supply power

➢The company shall not bear the direct and indirect losses caused by the malfunction or improper operation of this product.

# X.Pump Head Safety Instruction

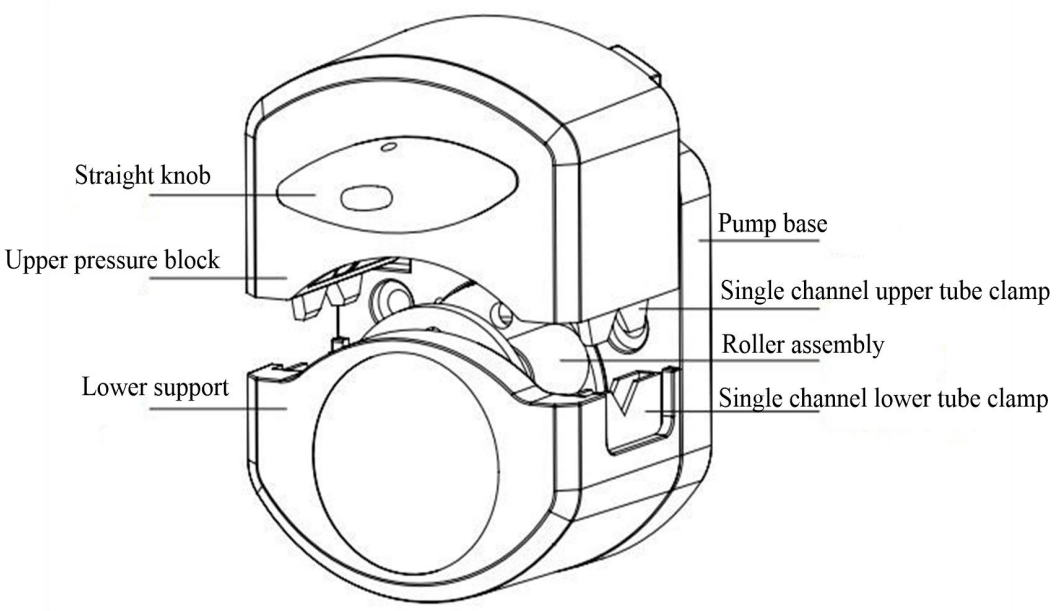
- Tubing may have crack due to wear. It results in the overflow of fluid from tubing. In that time human body and instruments may be damaged. So user must check usually and change tubing in time.
- When changing the tubing or the position of the tubing, please stop the pump head rotating, otherwise fingers or clothes may be caught.
- The presence of solid substances in the liquid can damage the hose.
- There are moving parts of the pump head inner, before opening the upper block, it must be carried out according to the following requirements:

  1) Ensure the pump is isolated from the main power supply.
  2) Ensure there is no pressure in tubing.
  3) If the tubing gets mistakes, ensure the liquid in the tubing is discharged to other containers or drain tubing.
  4) If transports the dangerous liquid, must wear the protective clothing and eye protection.

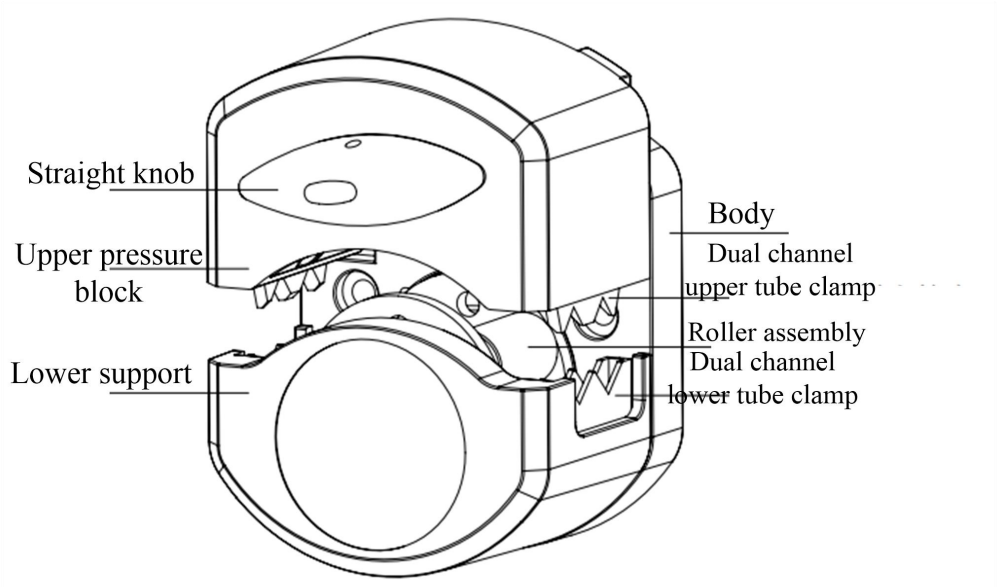
# XI.Pump Head Introduction

HandyPump pump head is easy to install tubing. Open the upper block by front knob to save operation space. This product is suitable for supporting instruments as OEM pump. Adaptive clamping device makes replacing tubing rapidly. Driven by different motors according to the different technical requests, such as stepper motor, DC motor, synchronous motor and AC motor. HandyPump pump head is widely used in analytical instruments. Single and dual channel for optional. It can fit for 5 different sizes tubing to meet different flow rate need.

HandyPump01




HandyPump02



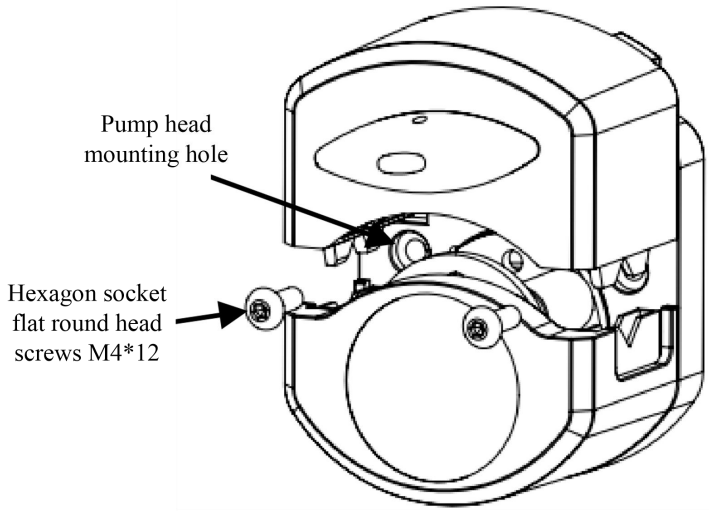
# XII.Pump Head Installation Instruction

- Try to install the pump head in the liquid level end or directly below the liquid level to ensure maximum efficiency of liquid transmission.
- Do not install the pump in a narrow position without adequate air flow around the pump.
- Be sure to keep all moving parts of the pump head clean, free of contamination and debris.
- The tubing diameter used at the suction end and the conveying end of the pump must be equal to or greater than the tubing diameter in the pump head , especially when transferring viscous liquid, the tubing diameter used at the suction end is several times greater than the tubing diameter in the pump head.
- Always operate at low speeds when transferring viscous liquids.

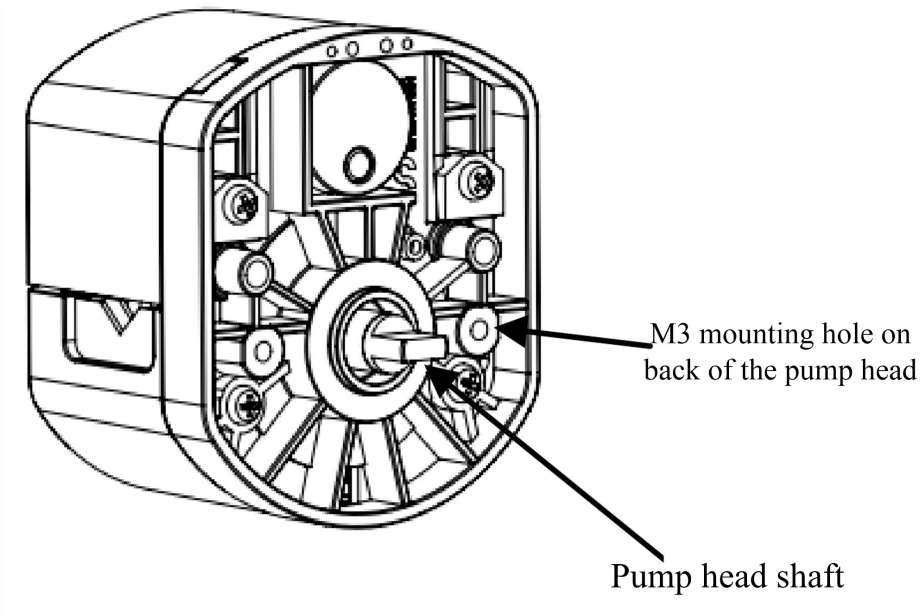
**Single Pump Head Installation**

(1) Install pump head from front mounting hole

Insert the pump head shaft into pump drive motor shaft, use two special screws to insert into the mounting holes on the pump head, and at the same time align with the connecting hole of the driver, try to tighten the screws with the same force.



(2) Use the mounting hole on the back of the pump head to install through the panel Align and insert the pump head shaft into the motor shaft, use two matching screws to pass through the panel to align the mounting holes on the back of the pump head, and then tighten the screws.



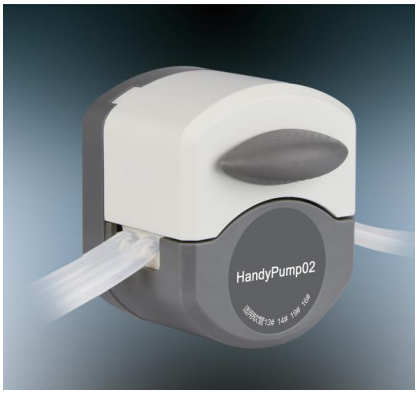

**Tubing Installation**

① Turn the straight knob 180° in counterclockwise to open the block.

② Put the tubing between the roller and the upper block naturally with both hands, and tighten it gently.


③ Turn the knob 180° in clockwise to push the pressure block into place andtighten the tubing.


Single channel

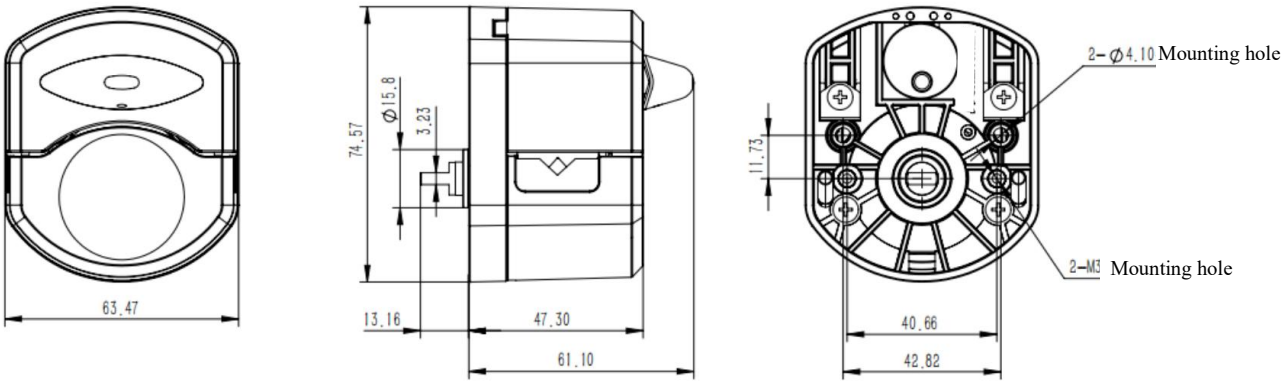



Dual channel

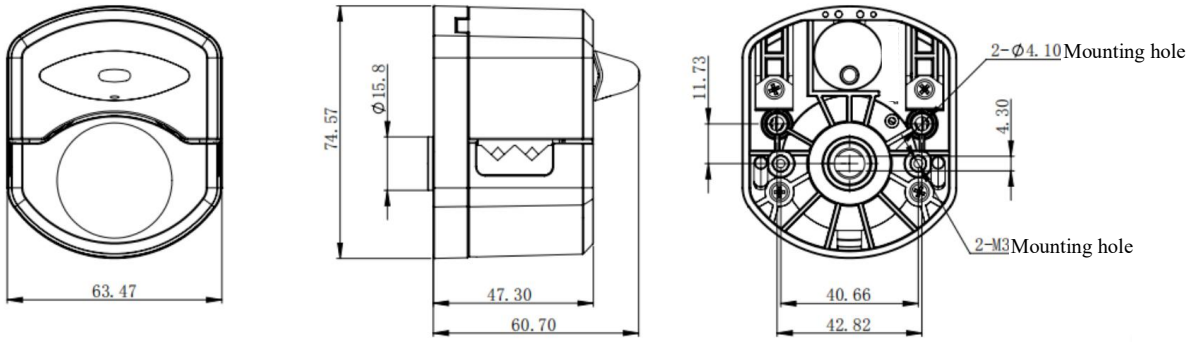
# XIII.Pump Head Dimension Drawings

Unit:mm

HandyPump01 Standard shaft )




HandyPump02 (Compact shaft )

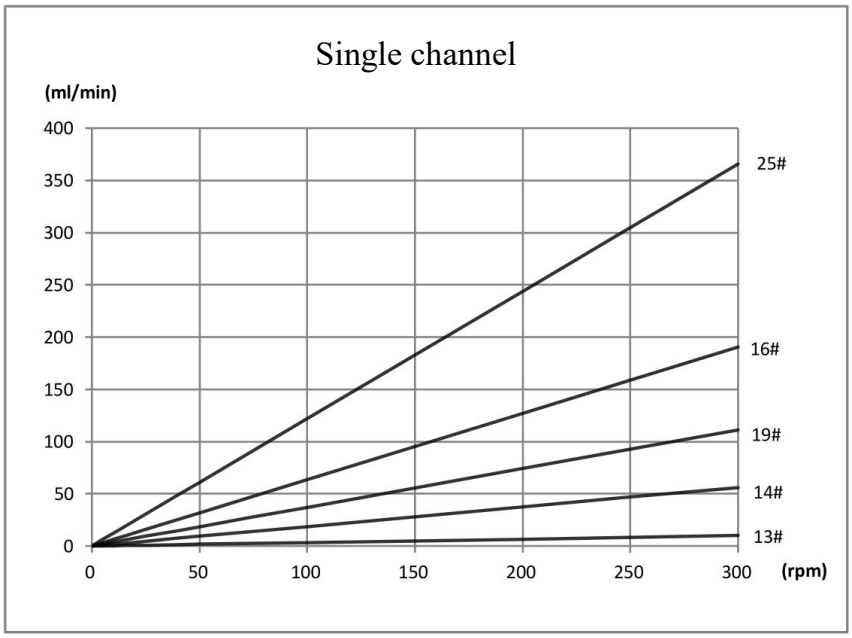


**Pump head opening height dimension:**

Turn the straight knob 180° in counterclockwise, the upper pressure block is lifted up and the pump head is opened, and the total height becomes 85.2mm.

# XIV.Pump Head Specification

| Pump Head | Tubing | ID×WT (mm) | ml/rpm | | Flow rate (ml/min) | | | Tubing pressure Mpa | | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3 rollers | 6 rollers | Speed: 0.1~300 rpm | | Speed: 0.1~600rpm | Interm-ittent | Conti-nuous | |
| | | | | | 3 rollers | 6 rollers | Stainless steel3-roller | | | |
| HandyPump01 | 13# | 0.8×1.6 | 0.033 | 0.031 | 0.0033~10.03 | 0.0031~9.36 | 0.0033~20.06 | 0.27 | 0.17 | 0.224 (3 rollers) 0.302 (6 rollers) 0.247 (stainless steel 3-roller) |
| | 14# | 1.6×1.6 | 0.187 | 0.126 | 0.0187~56.09 | 0.0126~37.68 | 0.0187~112.18 | | | |
| | 19# | 2.4×1.6 | 0.371 | 0.215 | 0.0371~111.17 | 0.0215~64.51 | 0.0371~222.34 | | | |
| | 16# | 3.1×1.6 | 0.636 | 0.345 | 0.0636~190.76 | 0.0345~103.51 | 0.0636~381.52 | | | |
| | 25# | 4.8×1.6 | 1.219 | 0.636 | 0.1219~365.69 | 0.0636~190.81 | 0.1219~731.38 | 0.24 | 0.14 | |
| HandyPump02 | 13# | 0.8×1.6 | 0.033 | -- | 0.0033~10.03 | -- | -- | 0.27 | 0.17 | 0.224 (3 rollers) |
| | 14# | 1.6×1.6 | 0.187 | -- | 0.0187~56.09 | -- | -- | | | |
| | 19# | 2.4×1.6 | 0.371 | -- | 0.0371~111.17 | -- | -- | | | |
| | 16# | 3.1×1.6 | 0.636 | -- | 0.0636~190.76 | -- | -- | | | |




**Note:** The above flow reference data are measured under the conditions of no pressure and no suction lift at room temperature under standard atmospheric pressure with pure water as the transmission medium. It is actually affected by many factors such as transmission medium, inlet and outlet pressure, tubing material and error, working environment, etc. This data is for reference only.

# XV.Pump Head Troubleshooting

If the pump head is running but the flow is small or no flow, please check the following items:

- Check whether the pump is supplied with transmission liquid;
- Detect whether the suction side pipeline of the pump is blocked by suction wall;
- Check if the tube is cracked;
- Check for blockages or kinks in the tube;
- Check whether the wall thickness of the tube used is correct;
- Check whether all valves in the tube are open;
- Check whether the rotation direction of the pump is correct.

# XVI.Pump Head Maintenance

- When pump does not work, please loose the upper block which press the tubing for avoiding changing the shape of tubing because of longtime extrusion.
- Keep the rollers of pump head clean and dry, otherwise it can quicken the tubing wear, reduce the useful life of tubing and lead the rollers to damage in earlier.
- Before starting the pump you should check carefully whether tubing is broken.
- If the pump head in water accidentally, use soft cloth and other absorbent soft cloth to wipe dry to prevent damage to the pump head.
- After replacing the tube, fluid or any connecting tube, must be re-calibrated the pump. It is recommended to re-calibrate the pump regularly to maintain accuracy.
- The pump head is not resistant to organic solvents (except for special indications) and strong corrosive liquids, special attention should be paid when using.
- Regarding the tubing, there is a certain deviation in the inner diameter and wall thickness of the hose due to its own tolerance and different batches; it will affect the product flow accuracy, and it is recommended that customers should leave a certain margin design when selecting.
- When the input and output diameters become smaller or there is suction and lift, the flow will be affected and the flow will be reduced.
- The data recorded in this document is the value under short-term measurement conditions, and there will be changes in long-term use.
- The company shall not bear the direct and indirect losses caused by the malfunction or improper operation of this product.