

# User Manual

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LabMate Series

Multi-Channel Independent Peristaltic Pump



Acmer Precision pump Co.,Ltd

Please read the following safety tips carefully to ensure the correct use of LabMate series peristaltic pumps.

## 1. Precaution

 Tube may crack due to wear and tear, causing liquid to overflow from the tubing. This can cause harm to the human body and equipment, so always check and replace hoses in time!

 Make sure the product is grounding reliably.

 Do not touch the rotor while pump is running.

 Release the track when pump stop running for a long time to avoid tube deformation caused by squeezing.

 If the power cable or plug is worn or damaged, remove the power plug.

 When the equipment fails, contact the seller or manufacturer in time. Do not open the case by yourself.

## 2. Warranty Service

Acmer, obligation under this warranty is limited to a period of two(2) year from the date of original purchase. Within the 2 year of warranty period, Acmer will replace or repair any defective free of charge. This warranty doesn't cover consumable part(tubing)

Warranty does not cover:

- Any damage or failure caused by improper installation, storage, maintenance or usage, not in compliance with operating manual.
- Any damage or failure caused by attempts by personnel other than authorized Acmer representatives to install, repair, modify or remove the product.
- Any damage or failure caused by non-Acmer parts, or user-replaceable parts purchased from unauthorized distributors.
- Any damage or failure caused by accidents or human errors (including wrong power supply voltage, corrosion, fall-off, etc.)
- Any damage or failure caused by natural disaster or other irresistible force (earthquake, fire, etc.)
- Other product damage or failure not caused by defects in design, material and workmanship.

### **3. Repair notes:**

Please contact Acmer or its distributor. Products which have been contaminated with, or exposed to, toxic chemicals or any other substance hazardous to health must be decontaminated before returning to Acmer or its distributor. You must ship the product in its original packaging or better, to insure it against possible damage or loss during the transport.

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## 1. Product overview

### 1.1 overview

At present, the structure of multi-channel peristaltic pump is a spindle, so the biggest problem is the large flow error between channels (about 10%). The LabMate series multi-channel independent peristaltic pump developed by our company adopts a multi-spindle structure, which not only has a compact structure and saves space, but also realizes the independent operation, independent control and independent calibration of each channel, so that the error between channels can be controlled within 1%.

LabMate series multi-channel independent peristaltic pump, using 800\*480 5-inch HD touch screen, simple and clear interface for customers to easily use, quickly complete parameter settings and various operations.

LabMate series multi-channel independent peristaltic pump has 2 channels, 3 channels and 4 channels. There are flow mode, fixed-time and fixed-speed mode, fixed-time and fixed-speed mode to meet the different needs of different customers.

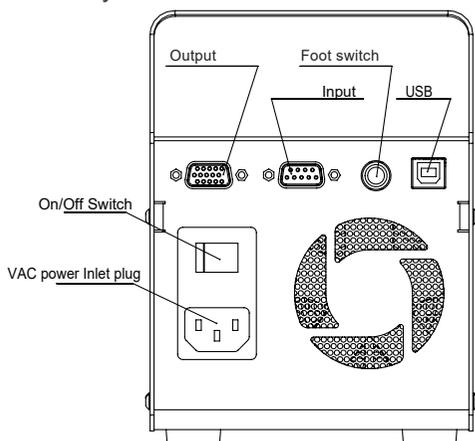
External control of LabMate series multi-channel independent peristaltic pump. Therefore, Foot switches, relay contacts or other external control signals are feasible. In addition, each channel can be started at the same time or separately, or the communication control of RS485 and USB is available..

### 1.2 Models and functional performance of the LabMate series

Model	LabMate2	LabMate3	LabMate4
Parameter			
Number of channels	2	3	4
Each channel is independent	Each channel is completely independent: independent configuration of Tubbing, independent configuration of parameters, independent operation, independent control, independent calibration		
Modes of Operation	Flow Rate Mode, Volume / Time Mode, Volume /Rate Mode, Time /Rate Mode		
Channel Disable	Any channel can be Disabled through the interface. After disabling the channel cannot be configured with parameters and operation		
Touch screen Display	800*480 5-inch high-definition , easy to operate, clear information		
Language type	Chinese and English. 2 languages are available		
Calibration function	Each channel is calibrated independently, and the calibration parameters of each channel are stored independently		
Online speed regulation	Rate or flow can be adjusted during operation		
Prompt function	Real-time display of the maximum flow and speed available for different specifications of Tubes. dynamic display of the respective operating parameters of each channel		

Power-on operation	Store the current dynamic operating parameters when power is off, and continue to run after power on again
External control function	Start-stop control is controlled by external signals . Control mode: high level (5-24v), low level, pulse optional
Foot switch	6.35-foot switch socket, through the foot switch to realize the total start and stop control,
Communication Type	RS485/USB optional, touch to set address and baud rate
Status output	Each channel independently outputs start-stop and direction status
range of Rate	0.1-150rpm
Rate resolution	0.01rpm
Tube specification	Tube ID≤3.17, Tube Thickness: 0.76mm - 1.0mm
Single channel reference flow	0.2μl/min-48ml/min (medium is water)
Volume range	0.1μl - 9999.999L
Time range	0.1s -999.9 hr
Cycles	0-65535, "0" means infinite loop
Back Angle	0 -999°
Pump Head Card material	POM,PVDF, 2 kinds of materials are optional
Roller material	PET, nylon + molybdenum disulfide, 2 kinds of materials are optional
Roller Number	10 rollers
Power Supply	VAC 90V-264V 50/60Hz
Operating Temperature	0 -40
Storage Temperature	-10 -70
Operating Humidity	80% @ 25 Ambient temperature
Storage Humidity	20%-80% RH non-condensing
IP Level	IP31
Dimensions(L×D×H)	252.5mm×126mm×165mm

## 1.3 Physical interface



• External control input interface

DB9 is used as the input interface, and the pin definitions are shown in Table 1:

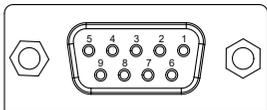


Table 1:

Pin	Definition	Description
1	Channel 1 External start signal	External start signal Types : high-level, low-level, and pulse 1. High level: --High level: means start to run, high level input range is 5-24V --Low level: means stop to run 2. Low level --Low level: means start to run --High level: means stop to run 3. Pulse mode: Each pulse is received, the start-stop state changes once
2	Channel 2 External start signal	
3	Channel 3 External start signal	
4	Channel 4 External start signal	
5	GND	
7	RS-485A	
8	RS-485B	
9	GND	
6	NC	

• Foot switch

The foot switch can realize the simultaneous start and stop control of all channel

The foot switch control start-stop Types selection is the same as Table 1 [External start signal Types], and is also set in the touch screen system interface, see 3.4 for details

• Output interface

DB15 is used as output interface, and the pin definitions are as follows:

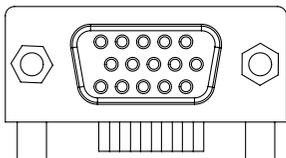


Table 2:

Pin	Definition	Description
1	Channel 1 start -stop status output	Start -Stop status output : TTL level output -- high level means running status, --low level means stop status
2	Channel 1 Direction output	
3	Channel 2 start -stop status output	Direction output : TTL level output --high level means clockwise direction --low level means counterclockwise direction
4	Channel 2 Direction output	
5	Channel 3 start -stop status output	
6	Channel 3 Direction output	
7	Channel 4 start -stop status output	
8	Channel 4 Direction output	
9	GND	
10-15	NC	

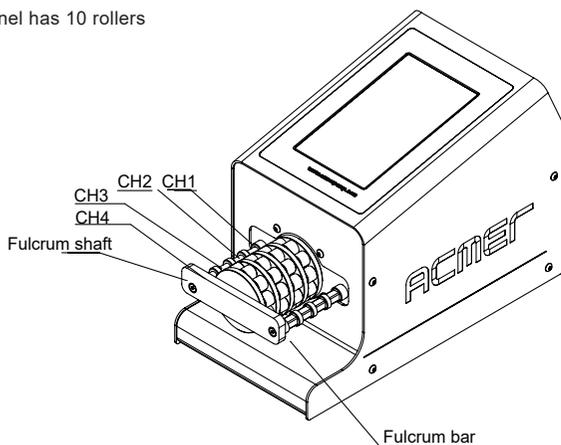
## 1.4 Optional accessories

- Foot Switch
- USB to RS485 module
- Leak detection module

## 2. Product Structure

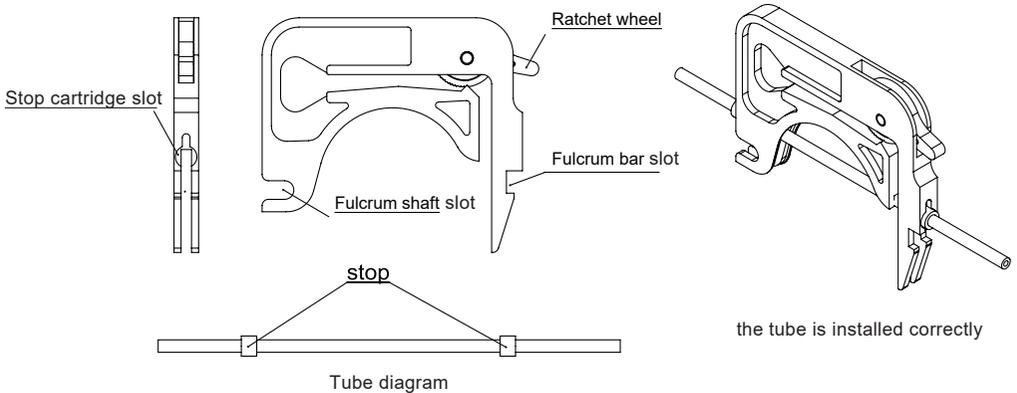
### 2.1 Structure diagram

The figure below is the product structure of LabMate4. The number of channels of LabMate2 and LabMate3 is divided into 2 and 3. Other structures are the same as LabMate4. Each channel has 10 rollers



## 2.2 Pump Head Cartridge installation

- 1) As shown in the following figure, clip one end of the tube [Stop] into the [Stop cartridge slot] on the left side of the cartridge, straighten the tube, and clip the other end of the tube [Stop] into the [Stop cartridge slot] on the right side of the cartridge. After the tube is installed in place, it is shown in the cartridge picture of [the tube is installed correctly].
- 2) First, clip the cartridge of [the tube is installed correctly] into the [supporting shaft] of [CH1] .press the upper of the cartridge, so that the [Fulcrum bar slot] on the right side of the cartridge is stuck in [Fulcrum bar] along the bevel of the cartridge
- 3) Other channels follow the 2) step to install the cartridge into each channel in the device. After completion, it is shown in the figure "LabMate products with correct installation of tube and cartridges"
- 4) There are different gears in the [Ratchet wheel] of the card, the purpose is to apply different specifications of tube.



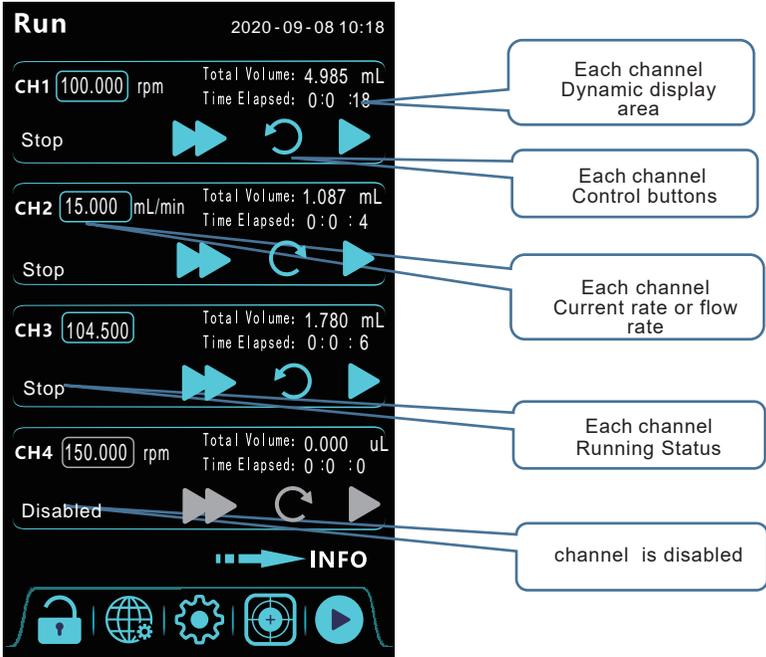
LabMate products with correct installation of tube and cartridges

3. Touch screen interface and operation 3.1

Run interface-main interface

3.1.1 Standby Run interface

The run interface is the main interface. After the device is powered on, it will automatically enter the run interface. The standby run interface is as follows:



Each channel is completely independent: each channel has an area to display and control display the current set rate or flow of this channel, the current running state (run / stop / disabled), display the dynamic parameters of [Total volume] and [Time Elapsed], as well as the control keys of this channel (full speed / direction / start -stop). the channel.

Channel is disabled: when a channel does not need to work, the channel parameter setting interface disables the channel. After the channel is disabled, the channel can not be controlled, and the parameters can not be set and calibrated. See 3.2 for details.

The key operation instructions are as follows:

- ▶ Independent start key for each channel: Click this key to run this channel. After starting, will be converted to ■. Click ■ during running to stop the running of this channel.

Realize independent start-stop control of each channel.

- 

Independent direction keys for each channel: Click this key to control the direction of this channel's rate.  is clockwise direction.  is counterclockwise direction. If the direction needs to be switched, click the key, then click once, and the direction will be switched once to realize independent direction control of each channel.
- 

Independent full rate key for each channel: click this key, the channel will run at full rate according to 100rpm, and the running direction is the currently set direction. The rapid filling or emptying of the pipeline can be realized, and the independent full rate control of each channel can be realized.
- 

System setup key: click the key to enter the system setup interface, see 3.4 for details.
- 

The parameter setting key: click the key to enter the parameter setting interface of each channel. The parameters of each channel are set independently. When this channel is not running, the parameters of this channel can be set, and the operation of other channels will not affect the parameter setting of this channel. See 3.2 for details.
- 

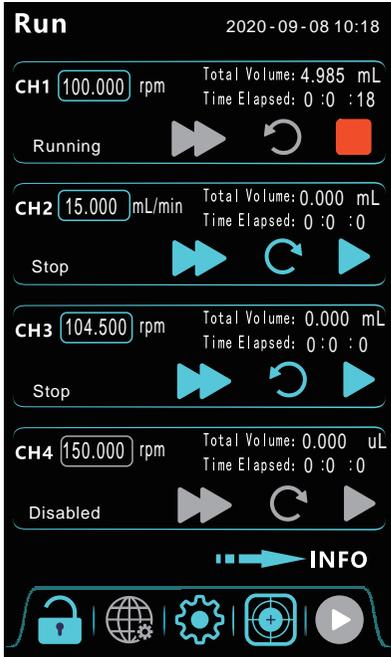
Calibration Key: click the Key to enter the calibration interface. The independent calibration of each channel is realized. When this channel is not running, the calibration of this channel can be carried out, and the operation of other channels will not affect the calibration of this channel. See 3.5 for details
- 

Lock Key: Manually lock the screen. If the lock needs to be unlocked, press the  key, and the keyboard will pop up. Enter the correct password to unlock it. After the screen is locked, except for the  key that can be operated, the other keys are displayed in gray, indicating that they are invalid.
- 

Start key: Click this key when all channels need to be started at the same time. After each channel is started,  is converted to , and means that each channel is running by clicking  to stop the running of each channel at the same time.
- 

**INFO** You need to view the setting parameter of each channel in detail, click this key to enter the parameter view interface. See 3.3 for details.

3.1.2 Interface in operation



Some channels are running



All channels are running

1) Operating characteristics during operation:

Each channel can independently start/stop, direction, and run at full speed to realize independent control of any channel at any time. It can also realize the simultaneous start/stop control requirements of each channel through start/stop key.

As shown in the figure, when some channels are running, the parameter setting key and calibration key in the running interface are blue, indicating that they are operable. When part of the channel is running, the unrun channel can enter the parameter setting interface and calibration interface to operate, which fully reflects the independent characteristics of each channel.

2) Rate regulation function:

"on-line rate regulation (running speed regulation)" and "non-online rate regulation (non-running rate regulation)" are realized. In addition to the "channel disabled" and "Volume/Time mode" conditions, when the "rate box" in the running interface is blue, it means that the rate can be adjusted directly.

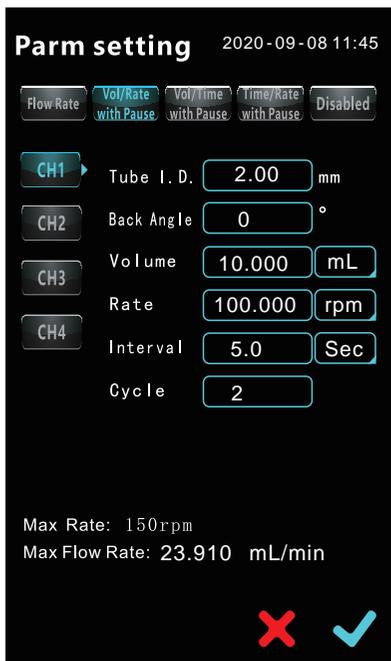
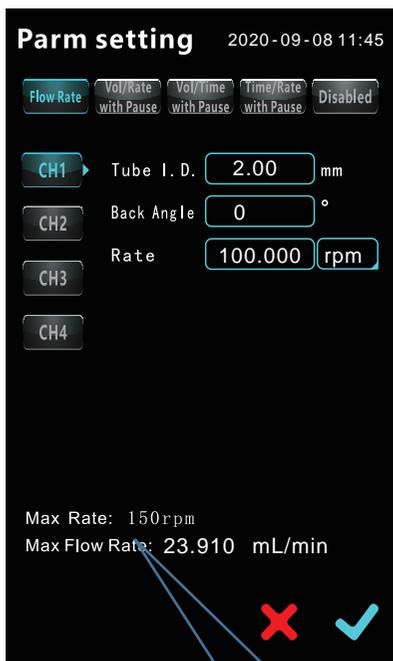
Click the speed box, pop up the keyboard in the icon, and you can enter the adjustment value directly. If the limit is exceeded, the value in the speed box will not change.



Keyboard

### 3.2 Parameter settings

Click the  key on the running interface to enter the parameter setting interface



Prompt information

**Parm setting** 2020-09-08 11:45

Flow Rate Vol/Rate with Pause Vol/Time with Pause Time/Rate with Pause Disabled

CH1 Tube I. D. 2.00 mm

CH2 Back Angle 0 °

CH3 Volume 20.000 mL

CH4 Time 30.0 min

Interval 1.0 Sec

Cycle 100

Max Rate: 150rpm  
Max Flow Rate: 23.910 mL/min

**Parm setting** 2020-09-08 11:45

Flow Rate Vol/Rate with Pause Vol/Time with Pause Time/Rate with Pause Disabled

CH1 Tube I. D. 2.00 mm

CH2 Back Angle 0 °

Rate 10.000 ml/min

CH3 Time 2.0 Hour

CH4 Interval 0 Sec

Cycle 1

Max Rate: 150rpm  
Max Flow Rate: 23.910 mL/min

**Parm setting** 2020-09-08 11:45

Flow Rate Vol/Rate with Pause Vol/Time with Pause Time/Rate with Pause Disabled

CH1 Disabled

CH2

CH3

CH4

rpm

uL/min    uL    Sec

mL/min    mL    Min

L/min    L    Hour

Rate Unit    Volume Unit    Time Unit

The parameter setting interface is a two-dimensional setting interface: one dimension is to select the channel number; the other dimension is to select the working mode. As shown in the figure, taking [CH1] as an example, you need to select [Flow Mode], then the operation method : Click , the [CH1] key is blue, indicating that it is selected; Then click  again, the [Flow Mode] key is blue, indicating that it is selected, and the parameters that need to be set under [Flow Mode] are displayed on the interface. Click the corresponding parameter setting box to set each parameter; Click  to complete the parameter setting and save.

The parameters of each channel are set independently : tube specifications, working modes, various parameters, and each channel is independently configured and not related to each other.

Channel is disabled: when a channel does not need to work, the channel parameter setting interface disables the channel. After the channel is disabled, the channel can not be controlled, and the parameters can not be set and calibrated. See 3.2 for details.

The range of [Tube Inner Diameter] is  $\leq 3.17\text{mm}$ , and the setting value of each channel must be consistent with the actual tube specifications used in each channel.

Maximum flow rate and maximum rate hint: the maximum flow rate is related to [tube inner diameter]. When [tube inner diameter] is determined, the maximum flow rate in the interface corresponds to it. The maximum rate has nothing to do with the inner diameter of the tube, and the maximum rate is the fixed value 150rpm.

The flow rate set cannot exceed the maximum prompt value of the interface.

[Flow Rate Mode]: indicates that after any channel starts to run, the channel runs at the set flow rate and needs to be stopped manually

[Volume/Rate Mode]: it means that after any channel starts to run, the channel will run at the set flow rate, and the channel will automatically stop the operation after the amount of liquid transferred reaches the set volume. This mode can be run in a cycle, and the interval time between cycles can be set, and the number of cycles can be set. If the number of cycles is more than 1, after completing the "Volume/Rate "for one time, the channel will stop temporarily according to the set interval time, and when the interval time is reached, the automatic cycle will execute the next "Volume/Rate", and cycle in turn, until the set number of cycles is reached, the equipment will stop and the task is completed. If the number of cycles is 0, it means an infinite loop and needs to be stopped manually.

[Volume/Time Mode]: it means that after any channel starts to run, the channel automatically stops this operation when the volume transmitted by this channel reaches the set volume within the set time.

This model can also be cycled, in the same way [Volume/Rate Mode].

NOTE: [Volume/Time Mode], the flow rate of the mode is automatically calculated by the equipment according to the set liquid volume and time, so this mode cannot adjust rate.

[Time/Rate Mode]: it means that after any channel starts to run, the channel will run at the set flow rate, and the channel will stop running automatically when the running time reaches the set value. This model can also be cycled, in the same way [Volume/Rate Mode].

[Channel is Disabled]: When any channel does not need to be used, select the corresponding channel  key. Click the  key to change the “Disabled” from gray to blue, indicating that the [Channel is Disabled] function is valid, and click  to confirm and save, then the channel will be Disabled. After the channel is Disabled, the channel parameters cannot be set, and the key corresponding to the channel on the running interface is gray and cannot be manipulated. Re-use the channel, the same operation method is the same as above. “Disabled” is from blue to gray, indicating that the “Disabled” function is invalid, the channel is opened, and click  to confirm and save, at this time, the channel parameters can be set and can be manipulated.

Unit selection: As shown in the figure, there are 4 optional flow rate units: rpm, uL/min, mL/min, L/min. There are 3 types of liquid volume units to choose from: uL, mL, L. There are 3 options for transmission time and interval time unit: Sec, Min, Hour.

### 3.3 View channel parameters

After the parameter setting of each channel, you need to view the parameter setting value of each channel, then click the  **INFO** key on the running interface to enter the view interface:

<b>Channel Info</b>		2020-09-08 11:38			
					
<b>Tube</b>	I. D 2.00mm	I. D 1.00mm	I. D 2.00mm	I. D 2.40mm	
<b>Mode</b>	flow Rate	Vol/Rate	Vol/Time	Disabled	
<b>Rate</b>	15.000 mL/min	100.00 rpm	----- -----	----- -----	
<b>Volume</b>	----- --	10.000 mL	500.000 mL	----- -----	
<b>Time</b>	-----	-----	30.0 Min	-----	
<b>Interval</b>	-----	5.0Sec	10.0Sec	-----	
<b>Cycles</b>	-----	1	10	-----	

 **RUN**

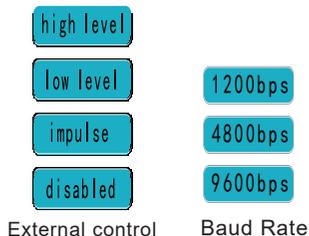
As shown in the figure, all channel parameter values can be viewed through this interface

In the interface,  is also a key, blue means it can be manipulated, and gray means it cannot be manipulated. For example, click  to enter the parameter setting interface of CH1, and the parameter setting method is the same as 3.2

Click the  **RUN** key to return to the run interface

### 3.4 System parameter setting

Click the  key on the run interface to enter the system parameter setting interface



There are two options for interface languages: Chinese and English. Choose one of them

[Power-up Running] function is optional, and if the function is valid in blue, it means that the device is powered off while it is running, and when the device is powered up again, the device automatically continues to run. If this feature is not required, the item is set to gray

[Audible Alarm After Leakage] and [Continue to Run After Leakage] function must be installed on the equipment "leakage detection module" optional accessories to be effective.

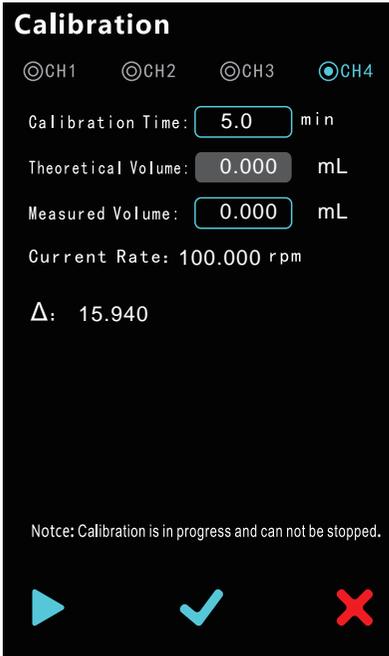
There are two options of communication interfaces: USB and RS485. When communication control is needed, choose one of the two

When you need external control signal control or "Foot switch "control start and stop, you can use this setting to achieve a total of four options, see the above figure "external control". If no external control is required, select the invalid option.

Password: is the lock screen unlock password, the factory default value is 1234, can be reset.

## 3.5 Calibration

When the channel needs to be calibrated, click the  key on the running interface to enter the calibration interface



Each channel is calibrated independently.

Calibration method: which channel needs to be calibrated, click the corresponding channel number, for example, to calibrate channel 4, click  CH4 blue is selected. The calibration time needs to be entered (in order to improve the calibration accuracy, it is recommended that the calibration time is 1.0min). After the calibration system is prepared, press the  start key to start the calibration. The device will automatically run at the current set rate to the set time, and the device will automatically stop. After stopping, the operator enters the actual measured liquid volume value into the blue text box in the interface, and presses the  calibration confirmation button. If the "calibration successful" pop-up window pops up, it means that the calibration has been successfully completed. The calibration method of each channel is the same as above

NOTE: During the calibration process, the calibration process cannot be terminated manually.

## 4. Communication protocol

The communication interface is divided into USB and RS485. The communication protocol adopts the RTU mode of ModBus protocol. For details of the communication protocol, please contact Acmer or its distributor



# ACMER



Tel : 86-312-2030565

URL : [www.acmerpump.com](http://www.acmerpump.com)

Email : [acmerpump@acmerpump.com](mailto:acmerpump@acmerpump.com)

Baoding Acmer Precision Pump Co.,Ltd

Baoding U Valley Baoding ,Herbei,China