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V1.3

LM60A Intelligent Peristaltic Pump
Instruction Manual

南京润泽流体控制设备有限公司
NANJING RUNZE FUID CONTROL EQUIPMENT CO.LTD

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Chapter 1 Product Introduction

1.1 Overview

LM60A intelligent filling peristaltic pump, using high-performance processor and motor drive, controlling stepper motor, motor subdivision adaptive, the minimum speed can reach 0.1rpm; rich application scenarios, support keyboard control mode, communication control mode (RS232 /RS485), external control mode (optional multiple signal conversion modules); passive contact status output.

1.2 Product Features

The product is composed of main machine, pump head, pump tube and other parts. The product can perform flow control, speed control, liquid volume control, and time control through the button panel. The four control modes are calibrating mode, continuous mode, rationing mode, booking mode. The interface functions are clear and intuitive, and customers can perform various combined operations, which are convenient and simple.

Chapter 2 Instruction of Port and Structure

2.1 Technical Parameters

Item	Parameters
Speed range	0.1 ~ 300/400.0rpm (Maximum speed vary from different pump heads, tube types and tube sizes.)
Speed resolution	± 0.1 rpm
Flow rate	0.027 ~ 1380 ml / min
Pedal input port	foot switch control start/stop (keyboard control mode only)
Speed signal input port	support multiple speed control signal input (external control mode only)
Direction signal input port	Support steering switch control input (external control mode only)
Start signal input port	support start / stop signal input (external control mode only)
External communication control port	RS232 / RS485 (communication control mode only)
Power supply	DC24V±10%
Power consumption	35W
Working environment	temperature 0-40 C°, relative humidity < 80%
Dimensions (unit: mm)	218 (length) × 148 (width) × 199 (height)
Weight	3.5 kg
Protection grade	IP31

2.2 Overall Structure Diagram
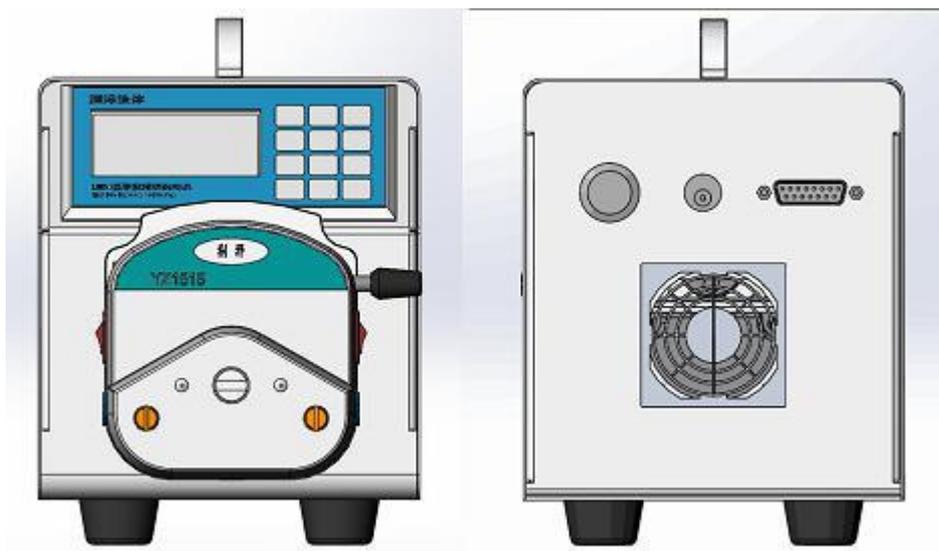
Figure 2-2 *Structure diagram of LM60A*

2.3 Definition of Communication Interface

No.	Item	Description
1	+24V	DC24V Power Supply
2	RXD	RS232 Data output
3	TXD	RS232 Data input
4	COM	Passive contact output - common port
5	+5V	+5V Power supply
6	CB	Passive contact output –common close port
7	CK	Passive contact output –common open port
8	FT_EXST	Foot pedal/ external start stop signal input port
9	GND	Ground wire
10	EX_DIR	External steering signal input port
11	A	RS485-A port
12	B	RS485-B port
13	SWD-DIO	SWD Data
14	SWD-CLK	SWD Clock
15	ADC-IN	External speed signal input port（3.3V port）

Table 2-3 *DB15 external terminal attribute definition*

2.4 Pump Head/Tube Selection

Pump head	Applicable tube	Maximum flow rate	Maximum speed
YZ1515X-3X	14#,16#,25#,17#	1385ml/min	400rpm
YZ1515X-6X	14#,16#	265ml/min	400rpm
YZ2515X-3X	15#, 24#	1322ml/min	400rpm
SN15-3	14#,16#,25#,17#	1097ml/min	300rpm
SN15-6	14#,16#	180ml/min	300rpm
SN25-3	15#	551ml/min	300rpm

Table 2-4 *Pump head / tube model and corresponding maximum flow reference*

Note:

(1) Please refer to the flow chart in Chapter 6 before selecting the proper pump head and tube.

(2) The tube of the same size but different materials with different ductility, resilience and

hardness will lead to difference of flow rate, so the maximum flow rate is only for reference.

(3) When using a tube with thicker wall (such as 24# tube), the current can be set to be larger, so as to increase the torque of the pump at high speed.

(4) When using a tube with thicker wall (such as 24# tube), the pump might be stalled when it starts at high speed after stopping working for a period of time. It is necessary to add lubricating oil and work at low speed for 1 to 2 minutes.

2.5 Special Function Switching

2.5.1 Restore factory settings: Press and hold the "edit" key to turn on the machine,

2.5.2 Chinese / English language interface switching: Press and hold the "CW / CCW" key to turn on the machine

2.5.3 Keyboard control mode: Press and hold the "HOME" key to turn on the machine and switch to the normal keyboard mode.

2.5.4 Communication control mode: Press and hold the "left" key to turn on the machine, supporting RS232 / RS485.

2.5.5 External control mode: Press and hold the "right " key to turn on the machine, supporting external speed / steering / start input control.

2.5.6 Query version function: Press and hold the "Enter" key to turn on the machine, supporting the query of software version and software release time.

Chapter 3 Keyboard Control Mode

3.1 Main Menu
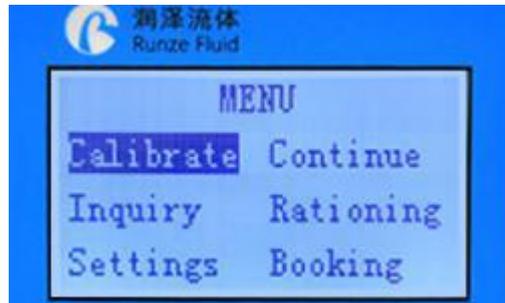
Figure 3-1 *The main menu*

The main menu shows six functions, "Calibration", "Continuous", " Rationing ", "Booking", "Query" Setting".

On the main menu, you can press "up", "down", "left" and "right" keys to switch functions.

On the main menu, when a function is displayed reversely, press the "Enter" key to enter the standby interface of the function; press "Edit" to enter the editing interface of this function.

On the editing interface, "up" ／ "down" changes the value, and "left" ／ "right" changes the cursor position. Press the "Home" key, if the edited value is wrong, an error message will be prompted and return to the main menu after three seconds. If the input value is correct, it will return to the main menu immediately after saving. Press the "Enter" key, if the edited value is wrong, an error message will be prompted. If the parameter is input correctly, it will return to the standby interface immediately after saving.

On the main menu or standby interface, press the " ANGLE " key to quickly enter the suction angle editing interface. The direction keys can change the value or cursor position, and press "Enter" or "HOME" key to save.

3.2 Working Mode Description

3.2.1 Calibration Mode

After the instrument is used for the first time, or after the pump head or pump tube is replaced, in order to obtain an accurate liquid volume result, it is necessary to perform a "calibration" operation

and input the calibration result. The specific calibration process is as follows:

Figure 3-2-1 *Use of flow curve table*

(1) Determine calibration speed. According to the flow rate you need, query the flow curve of the corresponding pump head / tube (Chapter 6 flow curve) to obtain the approximate calibration speed. Take YZ1515X-6 wheel and 16# tube as an example. If you need a flow rate of 175ml / min, find the approximate position of 175ml / min on the longitudinal axis, make a horizontal line intersecting with the red line of the flow curve of the 16# tube, make a vertical line from the intersection point to the horizontal axis, and the intersection point with the horizontal axis is the calibrated target speed (about 275rpm).

(2) Edit calibration parameters. On the calibration editing interface, input the calibration speed and calibration time, set the liquid volume to 0, and press the "Enter" key to save.

(3) Perform calibration process. Press the "CW/CCW" key, select the required steering direction, pre fill the tube, and empty the liquid in the receiving container. In the calibration standby interface, press the "ON/OFF" to start the peristaltic pump. After running the "calibration time", the dispensed liquid volume is the " volume" of this calibration. Use the measuring cup to read the milliliter of dispensed liquid.

(4) Input calibration data: after calibration, press the "Edit" to input the above calibration data (ml of liquid volume), and press "Enter" to save. After that, the system will automatically return to the main interface. When saving, if it displays "maximum flow overflow default value!", you need to check the calibration process again to see if the test value is wrong.

Note: The calibration time of the pump is 60 seconds by default. You can also extend it

appropriately. Repeat the test for many times to obtain the average value of the liquid volume obtained from multiple calibrations, which can improve the accuracy of the calibration results.
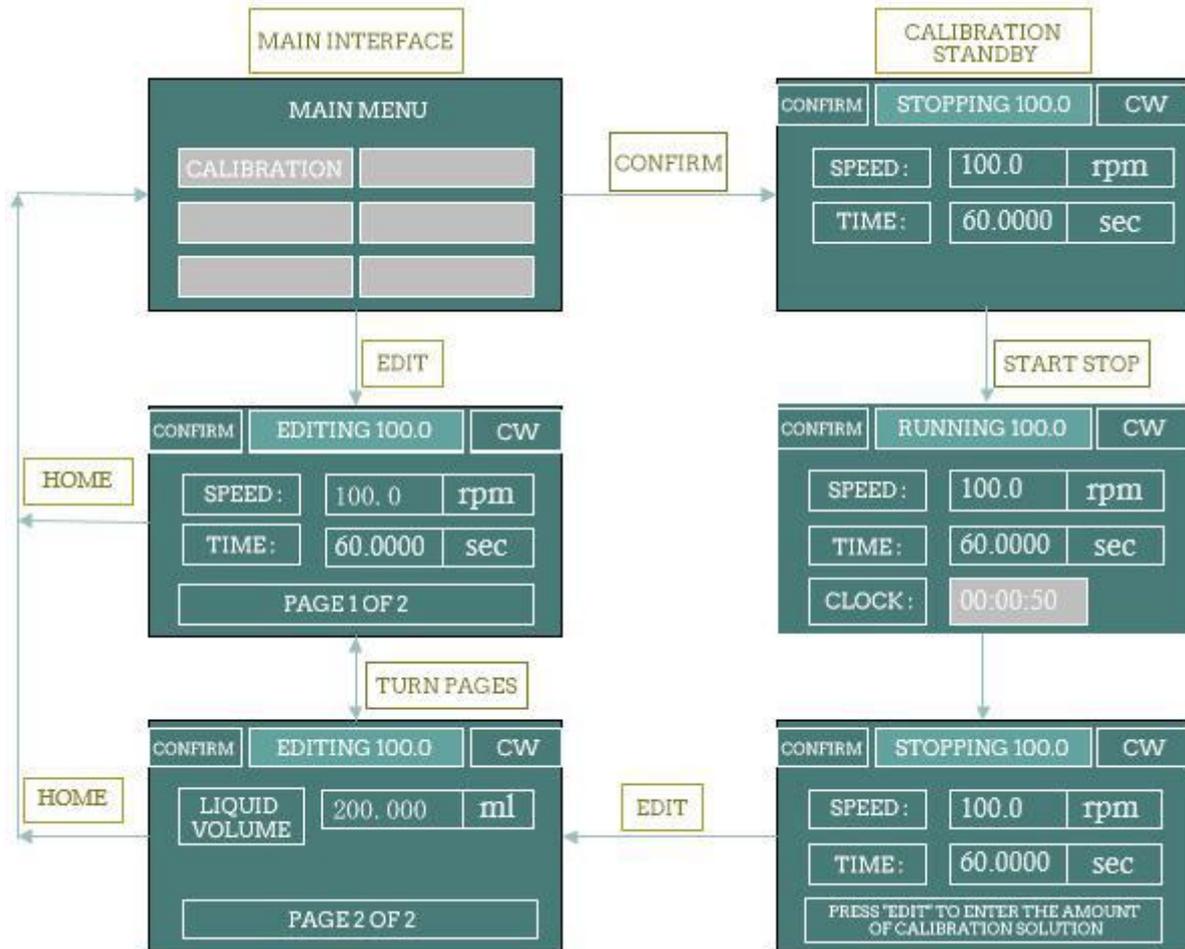
Figure 3-2-2 *Editing and process of calibration*

3.2.2 Inquiry Mode

Parameters such as standard speed, standard flow, minimum flow, maximum flow and standard ratio can be queried.

3.2.2.1 Calibrated speed

Last calibrated speed value. The default is 100.0 rpm

3.2.2.2 Standard flow

After the calibration, the system automatically calculates the calibrated flow under the correct input of the calibrated speed and the liquid volume value under the fixed time. Flow unit: ml / min.

3.2.2.3 Minimum flow

According to the calibrated speed, minimum speed (0.1 rpm) and calibrated flow, the system

automatically calculates the minimum flow

3.2.2.4 Maximum flow

According to the calibrated speed, maximum speed and calibrated flow, the system automatically calculates the maximum flow.

3.2.2.5 Calibration ratio

Calibration ratio = calibrated flow / calibrated speed. Calibration ratio unit: ml / r. This is a reference unit for calculation.

3.2.3 Setting Mode

Parameters such as maximum speed, one key full speed, backlight time, contrast, current code and foot switch working mode can be set on the editing interface.

3.2.3.1 Maximum speed

It is the upper limit of motor speed. The maximum speed of the pump is generally related to the pump head model / pump tube model, which generally does not need to be changed. If the maximum speed is changed, it is necessary to recalibrate and input the calibrated value correctly.

3.2.3.2 Full speed

That is the speed of the motor when the motor is on the standby interface and press the "full speed" key. This function is generally used for emptying / filling. In order to ensure the stable running of the pump, the full speed is generally lower than the maximum speed.

3.2.3.3 Backlight time

This is the retention time after the backlight is turned on, in second (SEC). Each time you press the new key, the backlight retention time is recalculated.

3.2.3.4 Contrast

Contrast is used to adjust the brightness of the LCD screen.

3.2.3.5 Current code

The current code is used to set the maximum current of the motor.

Definition table of current code as below:

Current Code	Maximum motor output current (A)	Effective motor output current (A)	Current Code	Maximum motor output current (A)	Effective motor output current (A)
7	1.000	0.700	20	2.625	1.840
8	1.125	0.790	21	2.750	1.925
9	1.250	0.875	22	2.875	2.013
10	1.375	0.960	23	3.000	2.100
11	1.500	1.050	24	3.125	2.188
12	1.625	1.140	25	3.250	2.275
13	1.750	1.225	26	3.375	2.363
14	1.875	1.300	27	3.500	2.450
15	2.000	1.400	28	3.625	2.540
16	2.125	1.490	29	3.750	2.625
17	2.250	1.575	30	3.875	2.710
18	2.375	1.660	31	4.000	2.800
19	2.500	1.750	-	-	

Table 3-2-3 *Comparison table of current code and maximum motor output current*

3.2.3.6 Foot switch

There are three states of foot switch: disabled, inching and linked switch.

Disable: The foot switch is disabled.

Inching: in "continuous" mode, the motor will run when the foot switch is stepped down, and the motor will stop when it is released.

Linked: in "continuous" mode, when the foot switch is stepped down and released, the motor will run; when it is stepped down again and released again, the motor will stop.

In other modes, the foot switch only serves as a start /stop function

3.2.4 Continuous Mode

In continuous mode, the machine has been through the normal calibration process by default.

3.2.4.1 Adjust speed in continuous mode

In continuous mode, the motor is allowed to work continuously. The direction of rotation of the motor can be adjusted to CW / CCW. The motor speed can be changed by setting the flow rate to achieve the purpose of changing the flow rate. When the pump is running, the speed can be changed by ± 0.1 rpm by "up" and "down"; and can be changed by ± 1 rpm by "left" and "right"; you can also press any one of direction keys and hold it for 1 second without release to realize the rapid change of

speed / flow.

3.2.5 Rationing Mode

In rationing mode, the machine has been through the normal calibration process by default.

(1) On the main menu, select "Rationing" and press "Edit" to enter the rationing editing interface. On the main menu, select " Rationing " and press "Enter" to enter rationing standby interface.

(2) On the rationing editing interface, input the required liquid volume and time, and press "Enter" to save, and automatically jump to the standby interface.

(3) On the Rationing standby interface, press "ON/OFF" to realize a rationing process

3.2.6 Booking Mode

In booking mode, the machine has been through the normal calibration process by default.

Realize the function of "waiting-running 1-interval-running 2-interval-… running n". You can set the value of N (N = 0000 for infinite loop, the maximum can be set to 9999) and you can also set the corresponding liquid volume and corresponding running time (related to the speed and calibration ratio).

Booking Mode	Action	Result
Waiting	Press "ON/OFF"	End the booking process and start running 0001# directly.
	Press "HOME"	Exit the booking process and return to the main menu.
Running	Press "ON/OFF"	End the running time and enter the suspension. If it is the last run, the pump will automatically end the booking process.
Interval	Press "ON/OFF"	End this interval and enter the suspension.
Suspension	Press "ON/OFF"	Enter the next running process.
	Press "HOME"	Exit the booking process and return to the main menu.

Table 3-2-6 *List of function keys "ON/OFF" and "HOME" during the booking process*

Chapter 4 Communication Control Mode

4.1 Command Format

4.1.1 Common Command Format (send 10 bytes, return 10 bytes)

Byte send:

1	2	3	4	5	6	7	8	9	10
FH (Frame header)	Address code	Function code	Function parameters				EOF (End of frame)	Cumulative sum	
STX	ADDR	FUNC	1-8 bit	9-16 bit	17-24 bit	25-32 bit	ETX	Low byte	High byte

The 1st byte STX: frame header (CCH)

The 2nd byte ADDR: slave address (01H~ F7H)

The 3rd byte FUNC: function code

The 4-7th bytes: parameters corresponding to the function code

The 8th byte ETX: end of frame (DDH)

The 9th-10th bytes: cumulative sum check code from byte 1 to 8

Byte return:

1	2	3	4	5	6	7	8	9	10
FH (Frame header)	Address code	State code	State parameters				EOF (End of frame)	Cumulative sum	
STX	ADDR	STATE	1-8 bit	9-16 bit	17-24 bit	25-32 bit	ETX	Low byte	High byte

The 1st byte STX: frame header (CCH)

The 2nd byte ADDR: slave address (01H~ F7H)

The 3rd byte STATE: state code

The 4-7th bytes: parameters corresponding to the state code

The 8th byte ETX: end of frame (DDH)

The 9th-10th bytes: cumulative sum check code from byte 1 to 8

4.1.2 Factory Command Format (send 14 bytes, return 8 bytes)

Byte send:

1	2	3	4-7	8	9	10	11	12	13	14
FH (Frame header)	Address code	Function code	Password	Function Parameters				EOF (End of frame)	Cumulative sum	
STX	ADDR	FUNC		1-8 bit	9-16 bit	17-24 bit	25-32 bit	ETX	Low byte	High byte

The 1st byte STX: frame header (CCH)

The 2nd byte ADDR: slave address (01H~ F7H)

The 3rd byte FUNC: function code

The 4-7th bytes: password of factory command

The 8th-11th bytes: parameters corresponding to the function code

The 12th byte ETX: end of frame (DDH)

The 13th-14th bytes: cumulative sum check code from byte 1 to 12

Byte return:

1	2	3	4	5	6	7	8
FH (Frame header)	Address code	State code	State parameters		EOF (End of frame)	Cumulative sum	
STX	ADDR	STATE	1-8 bit	9-16 bit	ETX	Low byte	High byte

The 1st byte STX: frame header (CCH)

The 2nd byte ADDR: slave address (01H~ F7H)

The 3rd byte STATE: state code

The 4-5th bytes: parameters corresponding to the state code

The 6th byte ETX: end of frame (DDH)

The 7th-8th bytes: cumulative sum check code from byte 1 to 6

4.2 Setting Command (suitable for factory command format)

The password to set the command is AABBEEFFH (the lower one comes first).

Serial number	FUNC Code	Function	Parameter	Remark
1	00H	Set the device address	00000001H-000000F7H (1-247)	0x00 is broadcast address and it only accepts, but does not reply.
2	01H	Set RS232 baud rate	00000000H-00000004H	0：9600bps （Default） 1：19200bps 2：38400bps 3：57600bps 4：115200bps
3	02H	Set RS485 baud rate	00000000H-00000004H	
4	03H	Set suction angle	00000000H-00000E10H (0-3600 degrees)	Default 36 degrees.
5	04H	Set direction	00000000H~00000001H	0：CCW 1：CW （Default）

6	05H	Set maximum speed	00000001H~0000FA0H (0.1~400.0rpm)	10 times storage; fixed parameters (1~4000); default 3000

Table 4-2 *List of setting command*

4.3 Query Command（suitable for common command format）

Serial number	Function code	Function	Parameter	Remark
1	20H	Query the device address	No parameter	The slave does not recognize the command address, and when one more device with RS485, the query address has the risk of hardware conflict.
2	21H	Query RS232 baud rate	No parameter	
3	22H	Query RS485 baud rate	No parameter	
4	23H	Query suction angle	No parameter	
5	24H	Query storage steering	No parameter	
6	25H	Query maximum speed	No parameter	10 times storage，stability of the system

Table 4-3 *List of query command*

4.4 Control command（suitable for common command format）

Serial number	FUNC Code	Function	Parameters	Remarks
1	40H	Take a few steps clockwise	00000001H-FFFFFFFFH	
2	41H	Take a few steps counterclockwise	00000001H-FFFFFFFFH	
3	42H	Take a few steps clockwise. At the end, it runs according to the suction angle setting.	00000001H-FFFFFFFFH	
4	43H	Take a few steps counterclockwise. At the end, it runs according to the suction angle setting.	00000001H-FFFFFFFFH	
5	44H	Turn the specified circle clockwise	00000001H-FFFFFFFFH	
6	45H	Turn the specified circle counterclockwise	00000001H-FFFFFFFFH	
7	46H	Query motor status（Number of cycles left）	random	Return current status. The parameter is the number of cycles left.
8	47H	Turn continuously clockwise	random	The returned status parameter is 0.
9	48H	Turn continuously counterclockwise	random	

10	49H	Forced to stop	random	The returned status parameter is 0.
11	4AH	Query motor status（Number of steps left）	random	Return current status. The parameter is the number of steps left.
12	4BH	Set dynamic speed	0001H~FA0H (0.1rpm~400.0rpm)	10 times the actual speed value
13	4CH	Query dynamic speed	random	Return 10 times the dynamic speed

Table 4-4 *List of control command（include the command of Query status）*

4.5 Communication Control Mode Interface

4.5.1 Control command (example)
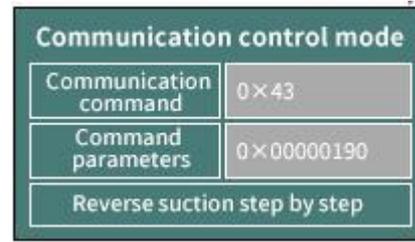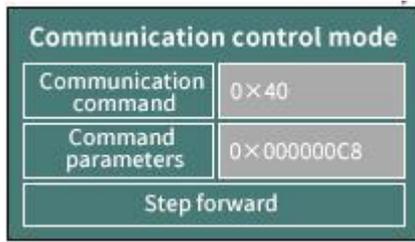
Figure 4-5-1-1 CW 0xC8(200 Steps)   Figure 4-5-1-2 CCW 0x190 (400 Steps) with suction

4.5.2 Status query command (example)
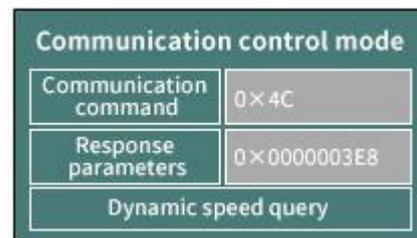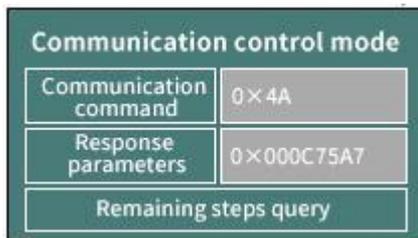
Figure 4-5-2-1 Query steps left during motor running   Figure 4-5-2-2 Query dynamic speed 0x3E8(100rpm)

4.5.3 Set command (factory command) and query (example)

Setting address interface (address setting command is 0x00, address query command is 0x20)
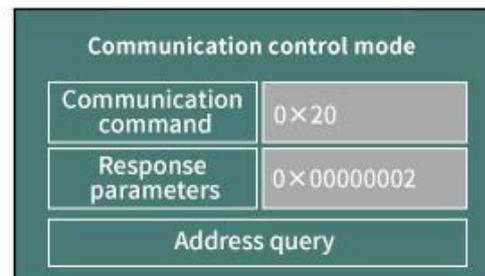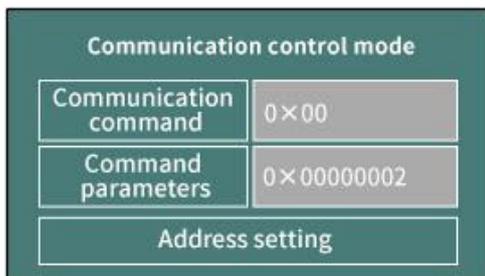
Figure 4-5-3-1 address setting interface   Figure 4-5-3-2 address query interface

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Chapter 5 External Control Mode

5.1 External Speed Control Operation

(1) Press and hold the "right" key to switch to external control mode. The default is in the stop state of the external control mode.

(2) Press the "ON/OFF" on the keyboard or the middle button of the rotary encoder to switch between start and stop.
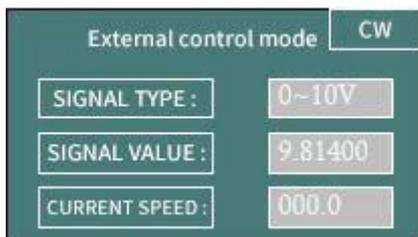
Figure 5-1-1 stop state   *Figure 5-1-2 running state*

(3) When the motor stops, press "up" or "down" key to switch the type of external control signal. The definition of adjusting speed signal code as follows
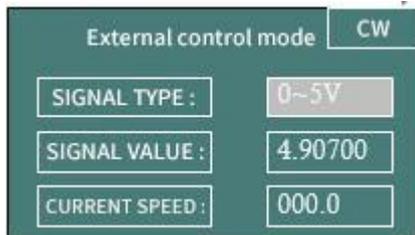
Figure 5-1-3 when motor stops, press "up" or "down" key to switch the type of signal
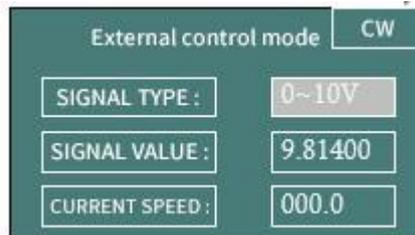
(4) When the motor stops, press "CW/CCW" key to change the direction.
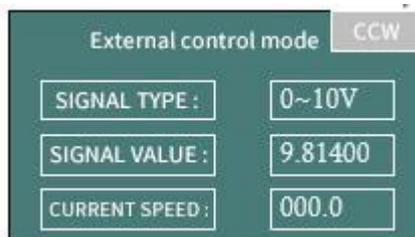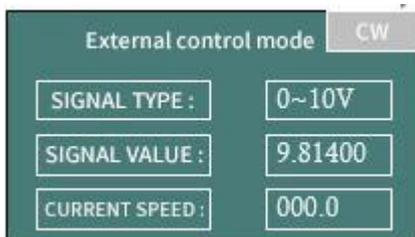
Figure 5-1-4 When the motor stops, press "CW/CCW" key to change the direction

(5) The external steering input port EXDIR can switch the steering no matter when the motor running or not. Set EXDIR high (open circuit with ground) to turn CW, and set EXDIR low (short circuit with ground) to turn CCW.

(6) External start/stop input port EXST. Setting EXST high (open circuit with ground) prohibits

rotation, and setting EXST low (short circuit with ground) allows rotation.

(7) External speed control input port ADC-IN can adjust signal. The port voltage is 0 ~ DC3.3V. If you want to input other speed control signals, the corresponding signal converters need to be connected for correct operation.

External speed control signal	Definition	Remark
0	0-3. 3V external speed control	The voltage signal of 0 ~ 3.3V can be directly connected to the ADC-IN port
1	0-5V external speed control	Special conversion module from 0 ~ 5V to 0 ~ 3.3V is required
2	0-10V external speed control	Special conversion module from 0 ~ 10V to 0 ~ 3.3V is required
3	4-20mA external speed control	Special conversion module from 4 ~ 20mA to 0 ~ 3.3V is required
4	0-10KHz external speed control	Special conversion module from 0 ~ 10KHz to 0 ~ 3.3V is required

Table 5-1 List of external speed control signal

Note: the external control speed can only be adjusted between 0-maximum speed. Due to the error of AD, the actual minimum speed will be greater than 0.1 rpm, and the actual maximum speed will be less than the theoretical maximum speed.

5.2 Maximum Speed Setting

When the motor stops, set the maximum speed through RS232 / RS485, please refer to the command of 0x05 in Chapter 4.2.

When the instrument leaves the factory, the suitable maximum speed will be preset according to the optional pump head/pump tube. The user does not need to set.

Chapter 6 Technical Parameters of Peristaltic Pump Tube

6.1 Table of Commonly Used Flexible Tube

Model	LM60A					
Tube number	14#	16#	25#	17#	15#	24#
Wall thickness（Metric：mm）	1.6				2.4	
Wall thickness（Inch）	1/16"				3/32"	
Inner Diameter(Metric：mm)	1.6	3.2	4.8	6.4	4.8	6.4
Inner Diameter（Inch）	1/16"	1/8"	3/16"	1/4"	3/16"	1/4"
Pressure（Mpa） Continuous	0.17		0.14	0.10	0.17	
Pressure（Mpa） Short	0.27		0.24	0.14	0.27	

Table 6-1 table of commonly used flexible tube

6.2 Peristaltic Pump Head-Tube Reference Flow Curve

(1) YZ1515X-3 rollers (LM60A) flow-speed curve
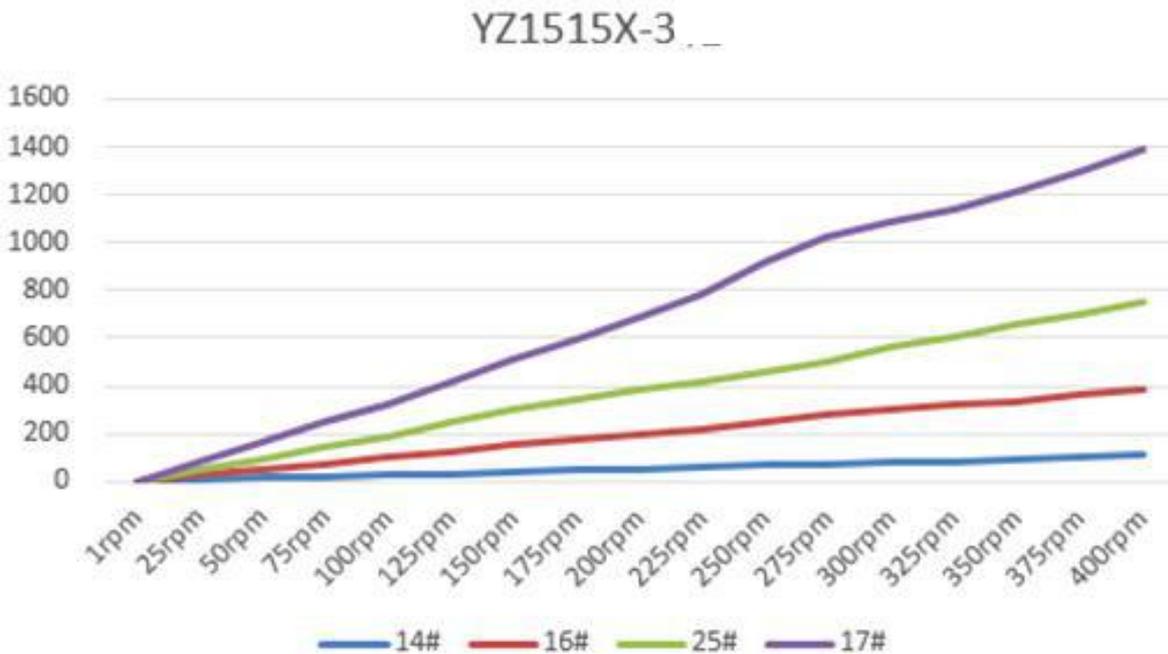
Figure 6-2-1 YZ1515X-3 rollers (LM60A) flow-speed curve

(2) YZ1515X-6 rollers (LM60A) flow-speed curve

Figure 6-2-2 YZ1515X-6 rollers (LM60A) flow-speed curve

(3) YZ2515X-3 rollers (LM60A) flow-speed curve

Figure 6-2-3 YZ2515X-3 rollers (LM60A) flow-speed curve

(4) SN15-3 rollers (LM60A) flow-speed curve
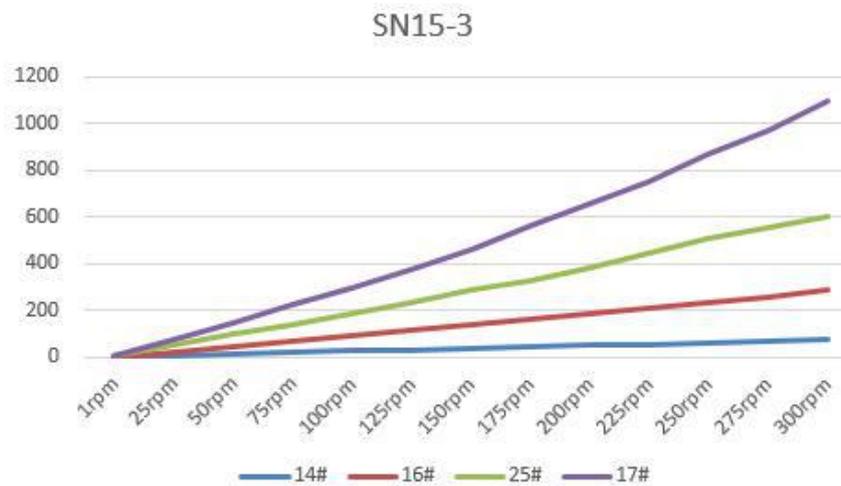
Figure 6-2-4 SN15-3 rollers (LM60A) flow-speed curve

(5) SN15-6 rollers (LM60A) flow-speed curve
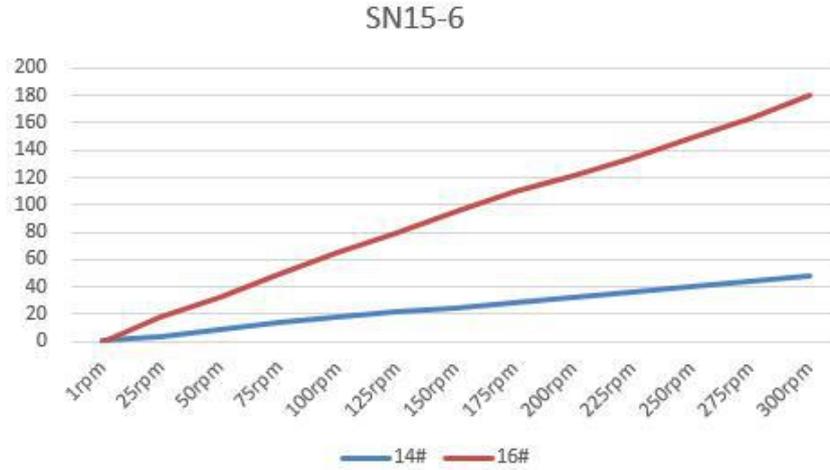
Figure 6-2-5 SN15-6 rollers (LM60A) flow-speed curve

(6) SN25-3 rollers (LM60A) flow-speed curve

Figure 6-2-6 SN25-3 rollers (LM60A) flow-speed curve

Note 1: The above "Flow-Speed" of different pump heads and different tubes is the actual test curve, without any modification, for reference only;

Note 2: The above test liquid is water and the test temperature is 25 C°

Note 3: There are many factors affecting the actual test data, such as the material and elasticity of the tube, the tightness of the tube installation, and the viscosity of the test liquid;

Note 4: The diameter and wall thickness of the pipe will affect the maximum speed that the motor can reach when the pump head runs stably;

Note 5: If high precision of dosing accuracy is required, please choose syringe pump or other high-precision products

Chapter 7 Equipment Maintenance

7.1 Common Equipment Maintenance Process

1. Regular maintenance of tube

When the tube is not used for a long time, please empty the liquid in the tube in time, open the protective lock on the pump head and loosen the pump tube.

2. Check tube connectors regularly

Regularly check whether the tube connector is loose or damaged. If it is abnormal, it must be replaced in time

3. Regular or irregular calibration

Recalibration is necessary after the tube is replaced or loosened.

7.2 Common Problems and Solutions

Problem	Problem description	Solution
The backlight is not on.	The value of "backlight time" in "settings" is set to 0	Increase the value of "backlight time" in "settings".
	Failure of backlight hardware or backlight power control part	The backlight problem does not affect the normal use of the pump, and the backlight function is generally used in a dark environment. If it is a hardware failure, it is recommended to return to the factory for repair.
	Value of "Contrast" in "settings" is set to 1	Increase the value of "Contrast" in "settings"
Burred LCD screen	There are large disturbance sources nearby	When the instrument works, try to keep it away from the disturbance source
	The position of data refreshed to LCD screen is out of order due to unknown reasons	The wrong display of the screen does not affect the normal operation of the motor control. If the motor is running, press the "ON/OFF" to stop the motor. On the standby interface, press the "HOME" for five times to refresh the screen display again.
Fan does not rotate	The fan is too dusty and blocked	After the power is turned off, use a soft brush to remove dust
	The fan is broken or the fan power supply is not in good contact	Return to factory for repair

		Check whether the pump body joint is loose and reliable.
Motor does not rotate	The screen shows that the motor works. In fact, the motor does not rotate.	Check whether the current code in "settings" is too small. Set the current code consistent with the product.
		The motor connecting wire is loose and return to the factory for repair.
		Power wire is loose and return to factory for repair.
Motor stalled	The original pump head / tube can run at a certain speed, but the new pump head / tube cannot run.	The new pump head / tube should be run for one or two minutes at a lower speed.
	The maximum speed of the motor suitable for the pump head / tube is exceeded.	Please refer to the above operation curve to select the reasonable speed corresponding to the pump head / tube.
Inaccurate flow or liquid volume	There is a big difference in the liquid volume or flow rate after replacing the tube.	Recalibrate and input accurate calibrated parameters. You can take the mean value after multiple calibrations, and then enter the mean value.
	The tube has been used for a long time and its resilience has decreased	Replace the tube.
	Accuracy requirement is not appropriate.	The flow rate / speed / tube diameter are inversely proportional to the accuracy. Try to use smaller diameter tube.

Chapter 8 Version Introduction

Version	Description	Release time
V1.0	Initial version	2019-09-27
V1.1	1. Add the corresponding table of current code 2. Correct the maximum speed of the motor corresponding to the tube 3. Modify the expression of "inquiry / setting / continuous mode".	2020-02-28
V1.2	1. Delete commands with asterisk 2. Correct the use of RS232 interface 3. Updated header VI logo	2020-8-26
V1.3	1. The manual of LMA 60A / LM60B is separate. 2. Delete keyboard control mode, LM60B flow curve, weight, diagram, pump tube and other parameters.	2020-10-9

Chapter 9 Technical Service

南京润泽流体控制设备有限公司
Nanjing Runze Fluid Control Equipment Co.,LTD

Tel：025-51197362　　　　Phone：138 5195 4068

Fax：025-51197362　　Technical support：183 5195 5944

Official URL：http://www.runzeflulid.com

Alibaba Store URL：https://runzeliuti.en.alibaba.com

Sales Email：xiaoyan.xiang@runzeliuti.com

Address：NO.9 Tianxing West Road, Dongshan Street, Jiangning District,
Nanjing, Jiangsu, China

Official URL　　Alibaba Store URL　　Aliexpress Store URL