润泽流体 RUNZE FLUID

Analysis instrument accessories
Ecological closed loop service provider

V 1.8

SY-08 Syringe Pump Manual

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

Note: This manual applies to RUNZE protocol .If you are not sure of the current pump using the protocol, please check P22 [C query and jump protocol] first

Catalogue

Chapter1 Product Introduction

1.1 Company Overview

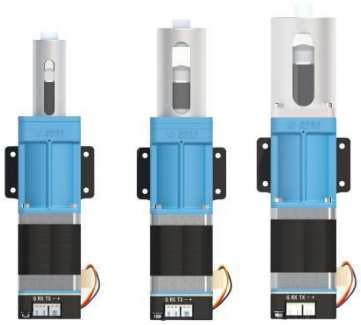
Nanjing Runze Fluid Control Equipment Co., Ltd., established in 2014, is a national high-tech enterprise focusing on R&D and production of fluid accessories for numerous analytical instruments. We engineer, manufacture and market differentiated standard products such as syringe pumps, multiport valves, peristaltic pumps, gastight syringes, plastic fittings, etc. We persevere in providing our customers with best quality and service in the fields of environmental monitoring, biopharmaceuticals, medical equipment, industrial automation and laboratory instruments, etc.

In past years, we have accumulated rich technical and practical experience that bring us honors of ISO9001, National High-tech Enterprise, Jiangsu Province Private Science and Technology Enterprise, 5A Bank Credit Assessment, 44 technical patents and software copyright including 2 invention patents, 27 utility model patents, 13 design patents, 2 software copyright.

1.2 SY-08 Features at-a-Glance

Congratulations on your purchase of the SY-08 Syringe Pump from RUNZE Fluid Tech Company.

SY-08 Syringe Pump is a fully programmable, small compact size, high-precision liquid handling micro industrial pump module with stable performance & long service life, developed by RUNZE Company. Controlled by a host controlling system (external computer, microprocessor, PLC, etc.), the clockwise or counterclockwise circular motion of the stepper motor is converted into linear motion through the trapezoidal screw rod, which makes the syringe pump piston move up and down linearly to achieve aspirating and dispensing functions.



Configuration：5ml, 12.5ml, 25ml

Component：Borosilicate glass syringe, trapezoidal screw, optocoupler, stepper motor, driver

Usage ： SY-08 syringe pump is widely used in liquid transferring system with high-precision and high-stability sampling requirements, such as laboratory instrument, medical analysis equipment, chromatographic analyzer, automatic biochemical analyzer, blood analyzer, trace element analyzer, electrolytic analyzer, food & beverages detection and analysis system, water quality on-line analyzer, petroleum detection equipment and biopharmaceutical extraction devices.

1.3 Product Safety Precautions

1. Please make sure the product is effectively grounded to prevent interference, please refer to 3.3 Port Definition See Grounding Terminal for details.

2. The device needs to be reset with 0x4F for the next command after power on; if any abnormality occurs during the use, please also reset with 0x4F command.

3. Applicable power supply: DC 24V±10%, 3A, when using linear power supply, the voltage and current must be adjusted to the corresponding parameter value

4. When debugging this product by computer, please adopt RUNZE debugging software serialcomm

5. In the debugging process, the liquid must be debugged to avoid dry wear of the piston, affecting the service life of the injector

6. When using this product, please connect the ground wire to reduce the interference caused by environmental factors.

7. When using this product, please do not plug and unplug the power terminals with electricity, so as not to damage the internal components of the product and cause unavoidable damage.

8. When not using this product, clean the inside of the syringe with clean water or alcohol in time to avoid the test residue staying in the syringe for a long time, causing blockage of the channel or damage to the piston.

9. When installing this product, please install it on the existing installation holes, no additional holes are allowed; if you have special needs, please consult sales or technical support

10. Please use the original serial cable of this product to connect with the power supply.

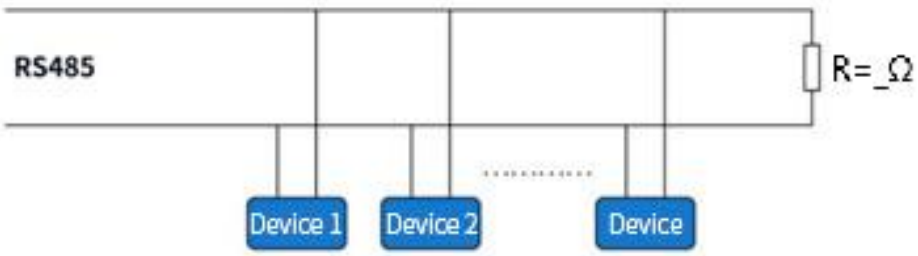
11. The two communication modes of this product (RS232 and RS485 bus) are in non-isolated mode.

12. Do not disassemble the product parts, tamper-proof label torn without warranty.

13. When operating the software, please refer to the software operating instructions and communication protocols, and do not make up data input without permission.

14. Please dispose of the instrument in accordance with the regulations for disposal of instrument and equipment waste. Users should not throw it away at will.

15.When connecting multiple devices with RS485 bus protocol, please refer to the connection method in Figure 1-1 below, but the resistance value should be decided according to the number of devices hooked up by the user.



Chapter 2 Product Introduction

2.1 Product Features

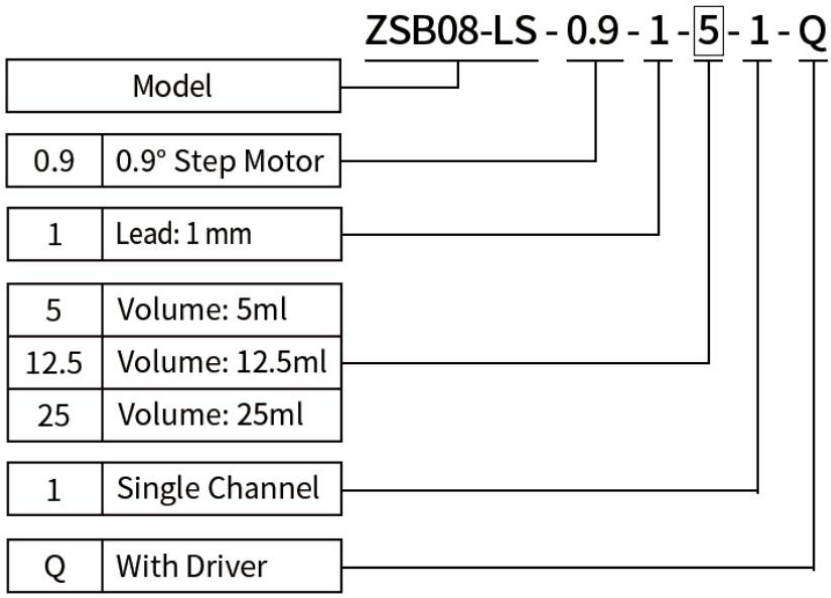
Small size, space-saving installation, high precision, stable performance, long service life of micro industrial syringe pump

The contact material is made of high borosilicate glass and PTFE, which is corrosion resistant and high temperature resistant and suitable for many special media

Widely used in environmental protection equipment, medical analysis equipment, non-standard high-precision sampling equipment and other analyzers

2.2 Naming Rules

Parameters are shown in the model name as below:



For example: the 5ml syringe pump, with 0.9degree stepper motor, single hole, female thread and driver is named ZSB08-LS-0.9-1-5-1-Q.

2.3 Basic Parameters

2.3.1 Product Features

Product Function	Description
Set address	Serial port setting address
Set baud rate	RS232 / RS485
Set speed	5ml, 12.5ml: 1rpm to 600rpm 25ml: 1rpm to 300rpm (Different for gas and liquid, different for different specification models)
Set subdivision	2 to 32 subdivisions can be set
Reset internal data	Restore factory settings
Query parameters	Query device address, speed, subdivision and baud rate
Query version	Check the current firmware version
Motor control direction	Control motor clockwise and counterclockwise rotation
Reset	Return the syringe pump piston to the zero position
Strong stop	Stop the current syringe pump motor operation
Query motor status	Detect the current motor status

2.3.2 Technical Parameters

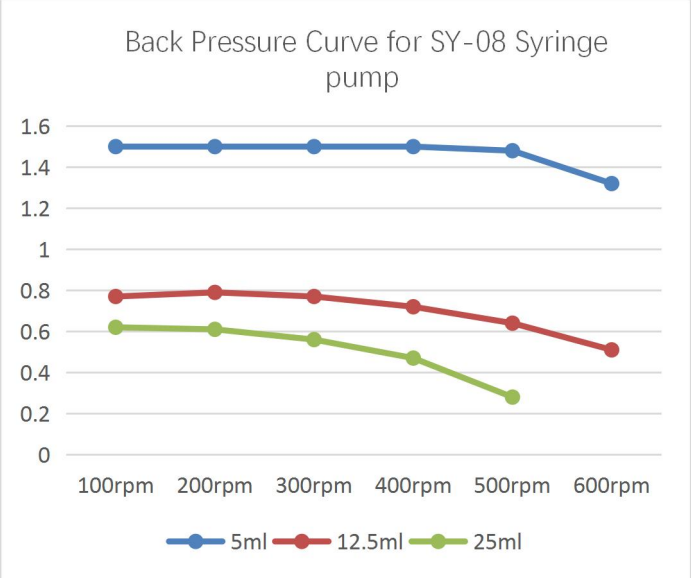
Product Function	Description		
Accuracy	≤1% (rated stroke)		
Precision (Repeatability)	0.3%-0.7% (rated stroke)		
Service life	3 million times no leakage (media: water; 1 rated stroke = one time)		
Back pressure (Mpa) note 1	1.32	0.51	0.28
Volume	**5ml**	**12.5ml**	**25ml**
Rated stroke (Control steps)	30mm (12000 steps)	30mm (12000 steps)	30mm (12000 steps)
Maximum speed	600rpm	600rpm	500rpm
Linear speed	0.017~10mm/s	0.017~10mm/s	0.017~8.33mm/s
Running time (Per rated stroke)	3~1800s	3~1800s	3.6~1800s
Resolution	0.0025mm/0.416μl	0.0025mm/1.042μl	0.0025mm/2.083μl
Syringe ID	14.55mm	23.03mm	32.57mm
Actuator	Trapezoidal screw (Lead 1mm)		
Max. Piston drive	≥100N		
Wetted material	Borosilicate glass, PTFE piston、PVDF		
Max. Pressure	Positive 0~0.8Mpa（retention time based on test） Negative 0~0.06Mpa（retention time based on test）		
Channel	Single channel		
Connection	1/4-28UNF		
Communication interface	RS232/RS485		
Baud rate	RS232/RS485 bus：9600bps, 19200bps, 38400bps, 57600bps,115200bps		

Address & Parameter setting	Via communication		
Power supply	DC24V/3A		
Rated power	15W		
Operating temperature	5 ~ 55C°		
Operating humidity	≤80%（relative humidity, non-condensing）		
Dimension (L*W*H)	42*42*189.8mm	42*42*198.8mm	42*42*198.8mm
Weight	0.56kg	0.62kg	0.66kg

Note 1: Back pressure curve

Experimental conditions: room temperature, atmospheric pressure, pure water

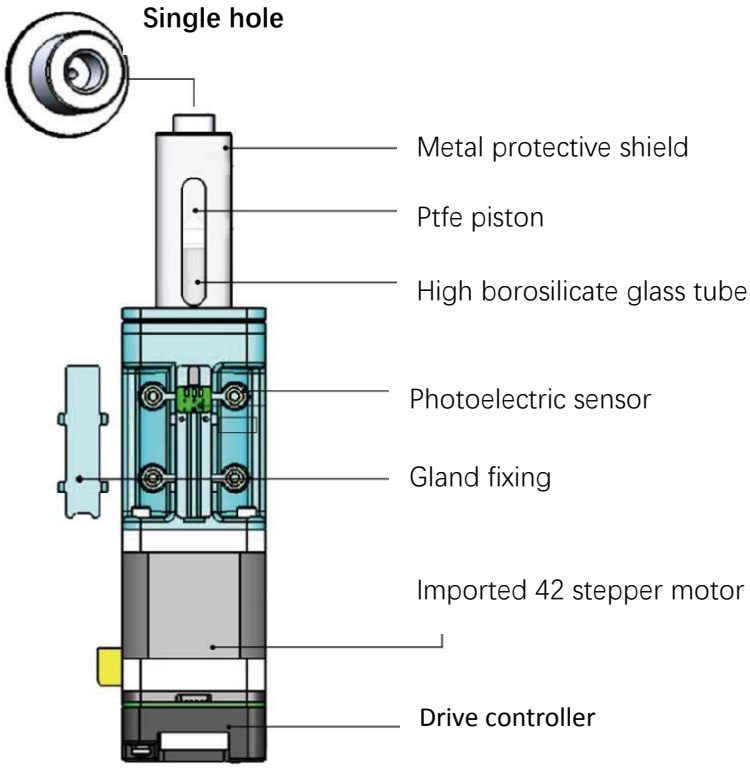
Back Pressure			
RPM	Value（Mpa）		
	5ml	12.5ml	25ml
100rpm	1.5	0.77	0.62
200rpm	1.5	0.79	0.61
300rpm	1.5	0.77	0.56
400rpm	1.5	0.72	0.47
500rpm	1.48	0.64	0.28
600rpm	1.32	0.51	/



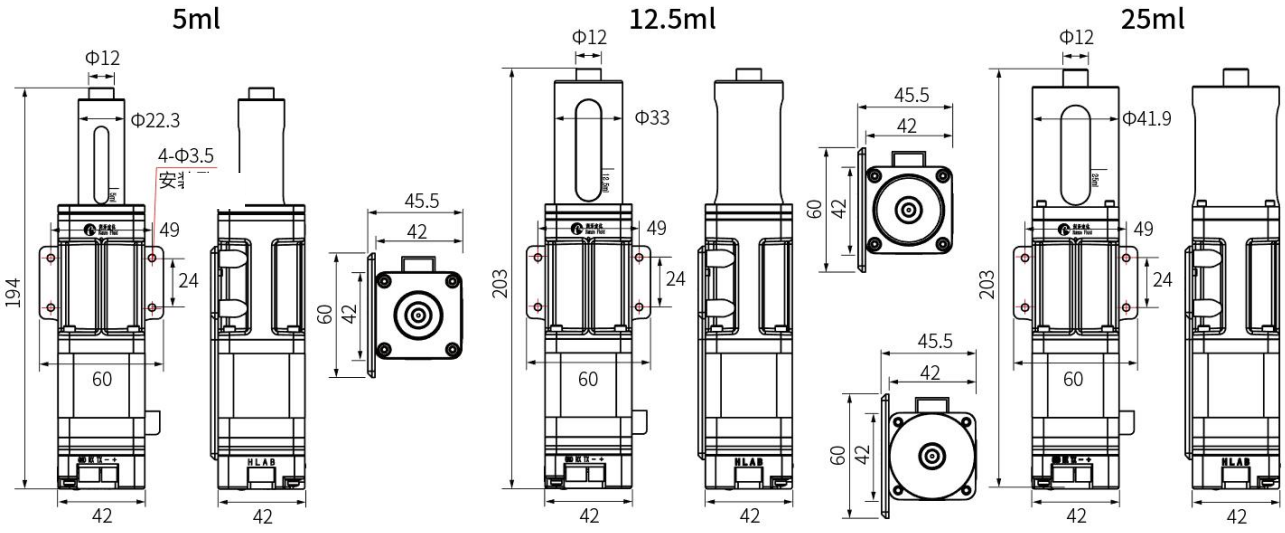
Chapter 3 Hardware Setting

3.1 Component Installation

3.1.1 Structure Diagram



3.1.2 Dimension with Driver（Unit：mm）



3.2 Manual for NMB 42 Stepper Motor

L/W COLOR / STEP	赤 RED	青 BLU	黄 YEL	橙 ORG
1	+	+	−	−
2	−	+	+	−
3	−	−	+	+
4	+	−	−	+

FIG. 2

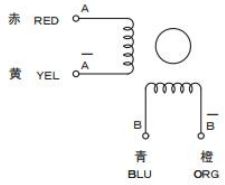


FIG. 1

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ISSUED
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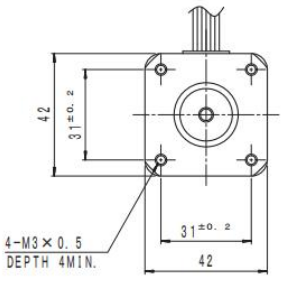
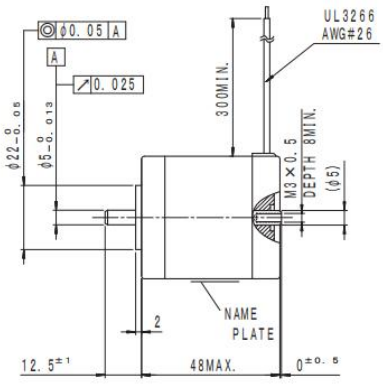
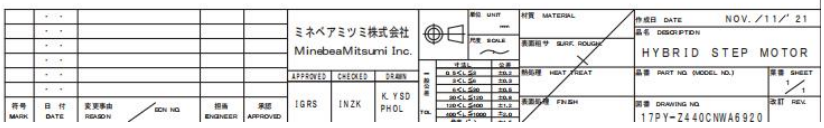
STEPPING MOTOR
MinebeaMitsumi Inc.







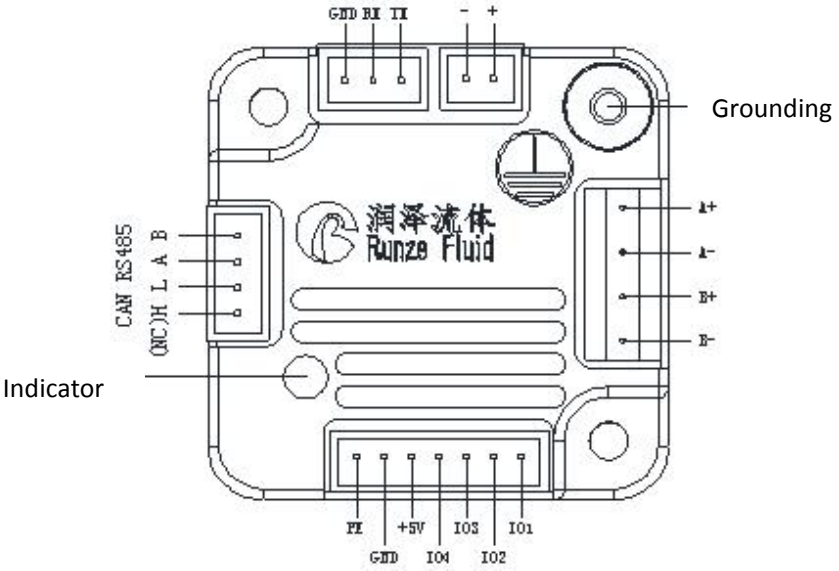
6. 信頼性 Reliability

下記条件で試験後、2項の電気的特性、3項の機械的特性を満足するものとする。
The product to be examined in the following condition and satisfy 2.Electrical characteristics and 3.Mechanical characteristics.

No.	試験項目 Item	試験条件 Test condition	参考規格 Reference standard
1	低温放置 Cold (耐寒性)	温 度 Temperature : -40 ℃ ±3 ℃ 試験時間 Test time :96 h	JIS C 60068-2-1
2	高温放置 Dry heat (耐熱性)	温 度 Temperature : 85 ℃ ±2 ℃ 試験時間 Test time :96 h	JIS C 60068-2-2
3	高温高湿放置 Damp heat (耐湿性)	温 度 Temperature : 60 ℃ ±2 ℃ (40 ℃ ±2 ℃) 湿 度 Humidity : 93 % +2 /−3 % 試験時間 Test time :96 h	JIS C 60068-2-3
4	冷熱衝撃 Thermal shock (温度変化)	温 度 Temperature : 低温側 Cold -40 ℃ ±3 ℃ 1 h ↑↓ (温度移行時間:5 min 以内) (Temperature migration time: 5 min MAX.) 高温側 Dry heat 85 ℃ ±2 ℃ 1 h サイクル数 Number of cycle : 25 cycle	JIS C 60068-2-14
5	振動 Vibration	振動数範囲 Frequency range : 10 Hz ～ 55 Hz ～ 10 Hz 振 幅 Amplitude : 1.5 mm 掃引時間 Time coefficient: 1 min 加振方向 Direction of excitation: X, Y, Z 時 間 Time : 各方向 Each direction 2 h	JIS C 60068-2-6
6	衝撃 Shock	加速度 Acceleration : 981 m/s2 [100 G] 正弦半波 Half-sine 作用時間 Interaction time: 6 ms 落下方向 Drop direction: ±X, ±Y, ±Z 落下回数 Number of drop: 各3回 Each 3 times	JIS C 60068-2-27

3.3 Port Definition

Diagram of the driver controller panel



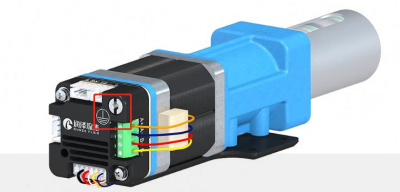
Driver board port description:

Port	Description	Port	Description
+	DC24V Positive	A+、A-	Stepper motor Phase A wiring
-	DC24V Negative	B+、B-	Stepper motor Phase B wiring
TX	RS232 Data input	IO_1	NC
RX	RS232 Data output	IO_2	Encoder Phase A
GND	RS232 Grounding	IO_3	Encoder Phase B
A	RS485 A	GND	GND
B	RS485 B	PE	Grounding

3.4 Grounding method

1. The grounding wire is recommended to use copper wire with a cross-sectional area of not less than 50mm² or galvanized iron wire with a cross-sectional area of not less than 100mm².

2. Position of grounding port of syringe pump



3. After unscrewing the ground screw, screw it in with a round spacer and lock the screw. The other end is connected to the equipotential terminal of the equipment or the metal enclosure of the chassis.

Chapter 4 Control Code Description

4.1 Brief Introduction

The data transmission between the syringe pump and the host controlling system (Computer, MCU, PLC, etc.) adopts serial communication (RS232, RS485, CAN bus). Description of the communication format as following: the communication adopts asynchronous serial communication, and the sum check with two bytes (2Byte) is adopted by the command & data frame. Commands & data in communication must be in hexadecimal. Parameters are stored in little-endian mode.

Communication interface: RS232, RS485, CAN bus;

Communication mode: two-way asynchronous, master-slave mode;

Baud rate: RS232&RS485: 9600bps, 19200bps, 38400bps,57600bps, 115200bps;

CAN : 100K, 200K, 500K, 1M;

Data bits: 8 Bit;

Parity check: no check;

Response time: <1 second after receiving the command

4.2 Installation & Debugging

- Install the debugging tools, please refer to 《Debugging tools instructions》for details
- Instructions for use, please refer to 《SY08 Quick Use Guide》for details

4.3 Communication Protocols

4.3.1 Command format

A: Interior parameters inquiry command ("Inquiry command")

B: Device control command ("Operation command")

C: Device interior parameter command setting ("Factory command")

4.3.1.1 Common command format (Send 8 bytes, return 8 bytes)

Byte send:

B0	B1	B2	B3	B4	B5	B6	B7
FH (frame header)	Address code	Function code	Status Parameter		EOF (End of frame)	CUCUM (Cumulative sum)	
STX	ADDR	FUNC	1-8 Bit	9-16 Bit	ETX	Low byte	High byte

The 1st byte STX : Frame header （0xCC）
The 2nd byte ADDR : Slave address（0x00 ~ 0x7F）
Multicast address（0x80 ~ 0xFE）Broadcast address（0xFF）
The 3rd byte FUNC : Function code
The 4th , 5th byte : Parameters corresponding to the function code
The 6th byte ETX : End of frame （0xDD）
The 7th , 8th byte : Cumulative sum check code from byte 1 to 6

Byte return:

B0	B1	B2	B3	B4	B5	B6	B7
FH (frame header)	Address code	Function code	Status Parameter		EOF (End of frame)	CUCUM (Cumulative sum)	
STX	ADDR	FUNC	1-8 Bit	9-16 Bit	ETX	Low byte	High byte

The 1st byte STX : Frame header （0xCC）
The 2nd byte ADDR : Slave address（0x00 ~ 0x7F）
Multicast address（0x80 ~ 0xFE）Broadcast address（0xFF）
The 3rd byte FUNC : Function code
The 4th, 5th byte : Parameters corresponding to the function code
The 6th byte ETX : End of frame （0xDD）
The 7th, 8th byte : Cumulative sum check code from byte 1 to 6

A: Interior parameters inquiry command (“Inquiry command”) （B2～B4）

Command B2	Specification	Response Parameters B3、B4
0x20	Query address	The value of address is 0x0000 ~ 0x007F and the default is 00.
0x21	Query RS232 baud rate	There are five baud rates: factory default is 9600bps. B3B4=0x0000 Corresponding baud rate is 9600bps. B3B4=0x0001 Corresponding baud rate is 19200bps. B3B4=0x0002 Corresponding baud rate is 38400bps. B3B4=0x0003 Corresponding baud rate is 57600bps. B3B4=0x0004 Corresponding baud rate is 115200bps.
0x22	Query RS485 baud rate	
0x27	Query Max. Speed	Maximum speed range of 5ml and 12.5ml is 0x0000 ~ 0x0258. Maximum speed range of 25ml is 0x0000 ~ 0x01F4.
0x30	Query CAN destination address	B3B4=0x0000
0x4A	Query motor status	B3B4=0x0000
0x68	Query piston position	After the injection pump is running, commands can be used to query the current position of the motor, displaying Display the current distance between the motor and the zero position in steps
0x67	Synchronize piston	B3B4=0x0000

	position	When the syringe pump is suddenly powered off during operation, the pump will continue to run for a short period of time, at which time the number of steps will be out of wrong, the number of steps to reach the reset position is not the home position when the power is turned on again. At this time, we need to run the position reset command 0x67, and then send 0x66 command to query current position, it means current position is the home position when B3=0x00 B4=0x00 received.
0x70	Query multicast channel 1 address	B3B4=0x0000
0x71	Query multicast channel 2 address	B3B4=0x0000
0x72	Query multicast channel 3 address	B3B4=0x0000
0x73	Query multicast channel 4 address	B3B4=0x0000

B: Device control command ("operation command") (B2～B4)

Command (B2)	Specification	Parameters B3、B4	Response Parameters B3、B4
0x42	Run in CW (clockwise)	Operating parameters	The value of B3&B4 ⩾0. When the number of steps corresponding to the B3&B4 parameter is greater than the maximum stroke steps, the motor will not run, and B3=02, B4=00 will return; when the number of steps is less than the Max. stroke steps, the devices will rotate according to the set steps
0x4D	Run in CCW (counterclockwise)	Operating parameters	The value of B3&B4 ⩾0. When the number of steps corresponding to the parameter B3&B4 is greater than the maximum number of stroke steps, the motor will not run and return B3=02, B4=00; when the number of steps corresponding to the parameter B3&B4 is less than the maximum number of stroke steps, the motor will follow the set number of steps.
0x45	Reset	0x0000	B3=0x00 B4=0x00 The action of reset after power on is the same as 0x4F result. The reset will go directly to the home position on other cases. Note: 0x45 reset command, the speed of the first reset on power up defaults to 0x07 (the maximum speed set) and does not recognise the speed set by 0x4B (dynamic speed). To change the 0x45 reset speed, run 0x43 action once to recognize the dynamic speed set by 0x4B.

0x4F	Forced to reset	0x0000	B3=0x00 B4=0x00 When the syringe runs to the home position, the number of locked-rotor steps runs to the top through resetting which causes forced resetting. Then the piston will go back for a certain number of offset steps, leaving a little gap between the top of the piston and the syringe which greatly improve the service life of the piston seal.
0x4B	Set dynamic speed	Operating parameters	It will fail when power-off, and if not set, it will be the default speed. The maximum speed of 5ml and 12.5ml is 600rpm (0x0001 ~ 0x0258). The maximum speed of 25ml is 500rpm (0x0001 ~ 0x01F4). Note: command 0x4F forces a reset and does not recognise the dynamic speed set by 0x4B.
0x4E	Syringe to the absolute position	Operating parameters	The value range of B3&B4 is 0x0000 ~ 0x2EE0, indicates any position between the stroke of the syringe
0x49	Forced to stop	0x0000	B3B4=0x00

Status list

Status (B2)	Description of the response frame (B2) status
0x00	Normal status
0x01	Frame error
0x02	Parameter error
0x03	Optocoupler error
0x04	Motor busy
0x05	Motor stall
0x06	Unknown location
0x07	Command rejected
0x08	Illegal location
0xFE	Task pending
0xFF	Unknown error

Note: The code B2 in the response command indicates the current running status of the motor, only when B2=0x00, the motor runs normally, and the other parameters are as shown in the above table, which means different abnormal status respectively. In principle, the 0X4A command should be sent to query the motor status when the motor finishes operation. Only when the B2=0x00, other commands can be sent and execute correctly.

Caution: In 485 communication, when sending an action command, the B2 byte in the response frame is

FE, indicating that the command is received and is being executed.

4.3.1.2 Factory command format (send 14 bytes, return 8 bytes)

Factory commands need to be used with V0.8 debugging tools when RS232 or RS485 are used separately.

See 《Quick Use Guide》in detail.

Byte send:

B0	B1	B2	B3,B4 B5,B6	B7	B8	B9	B10	B11	B12	B13
FH (frame header)	Address code	Function code	Pass word	Function Parameter				EOF (End of frame)	CUCUM (Cumulative sum)	
STX	ADDR	FUNC	PWD	1-8 bit	9-16 bit	17-24 bit	25-32 bit	ETX	Low byte	High byte

The 1st byte STX : Frame header （0xCC）
The 2nd byte ADDR : Slave address（0x00 ~ 0x7F）
Multicast address（0x80 ~ 0xFE）Broadcast address（0xFF）
The 3rd byte FUNC : Function code
The 4th -7th byte : Factory command format
The 8th -11th byte : Parameters corresponding to the function code
The 12th byte ETX : End of frame（0xDD）
The 13th, 14thbyte : Cumulative sum check code from byte 1 to 12

Byte return:

B0	B1	B2	B3	B4	B5	B6	B7
FH (frame header)	Address code	Status code	Status Parameter		EOF (End of frame)	CUCUM (Cumulative sum)	
STX	ADDR	STATUS	1-8 Bit	9-16 Bit	ETX	Low byte	High byte

The 1st byte STX : Frame header （0xCC）
The 2nd byte ADDR : Slave address（0x00 ~ 0x7F）
Multicast address（0x80 ~ 0xFE）Broadcast address（0xFF）
The 3rd byte FUNC : Function code
The 4th -5th byte : Parameters corresponding to the function code
The 6th byte ETX : End of frame（0xDD）
The 7th, 8th byte : Cumulative sum check code from byte 1 to 6

C: Device interior parameter command setting ("Factory command")

Command B2	Abbreviation	Password B3 B4 B5 B6	Parameter Specification B7 B8 B9 B10
0x00	Set device address	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX (B8=0x00 B9=0x00 B10=0x00) The value range of XX is 00 ~ 7F, default 00
0x01	Set RS232 baud rate	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	Totally 5 baud rates, the factory default is 9600bps B7=0x0000 9600bps B7=0x0001 19200bps B7=0x0002 38400bps B7=0x0003 57600bps B7=0x0004 115200bp
0x02	Set RS485 baud rate	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	
0x05	Set subdivision	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	Totally 5 subdivisions: the factory default is subdivision 8 B7=0x0001 subdivision 2 B7=0x0002 subdivision 4 B7=0x0003 subdivision 8 B7=0x0004 subdivision 16 B7=0x0005 subdivision 32
0x07	Set maximum speed	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX(B8=0x00 B9=0x00 B10=0x00) The value range of XX is 0x01 ~ 0x258 and the default is 12C.
0x50	Set the multicast channel 1 address	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX (B8=0x00 B9=0x00 B10=0x00) The value range of XX is 80 ~ FE, default value is 00
0x51	Set the multicast channel 2 address	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX (B8=0x00 B9=0x00 B10=0x00) The value range of XX is 80 ~ FE, default value is 00
0x52	Set the multicast channel 3 address	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX (B8=0x00 B9=0x00 B10=0x00) The value range of XX is 80 ~ FE, default value is 00
0x53	Set the multicast channel 4 address	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX (B8=0x00 B9=0x00 B10=0x00) The value range of XX is 80 ~ FE, default value is 00

Example: Use the 0x50/51/52/53 command to set the multicast address (this example only uses the three commands 0x50/51/52)

Use three sets SY-08 syringe pumps with the same software version. In the RS485 communication mode, set their addresses to 00, 01, 02 and make a mark. Firstly, Set parameter 0x81 of SY-08 multicast channel 1 address marked as 00 to 81 by the command 0x50, set parameter 0x83 of multicast channel 3 address to 83 by command 0x52; Set parameter 0x81 of the multicast channel 1 address of SY-08 marked as 01 to 81 by command 0x50, and the parameter 0x82 of multicast channel 2 address is set to 82 by command 0x51. Set parameter 0x82 of the multicast channel 2 address of SY-08 marked as 02 to 82 by command 0x51, and the parameter 0x83 of multicast channel 3 address to 83 by command 0x52 (See the table below for details)

Device / Items	Device 1 (Address 0)	Device 2 (Address 1)	Device 3 (Address 2)
multicast address	81	81	
		82	82
	83		83
broadcast address	FF	FF	FF

After the setting is completed, connect the three devices in parallel to the serial port debugging tool, and use our debugging tool MotorTest V0.8 for debugging. In MotorTest V0.8, set the address to 0x81, the command to 0x4D and the parameter to 0xC8, click to send and then the pistons of device 1 and device 2 will have pumping action; Set the address to 0x82 ,the command to 0x4D and the parameter to 0xC8, click to send and then the pistons of device 2 and device 3 will have pumping action; Set the address to 0x83, the command to 0x4D and the parameter to 0xC8, click send and then the pistons of device 1 and device 3 will have pumping action; Set the address to 0xFF, the command to 0x4D, and the parameter to 0xC8 , click to send and then the pistons 1, 2, and 3 will all have pumping action.

The newly added command to set the multicast address meets the needs of customer groups to a great extent and makes it easier for customers to selects the equipment that you want to control, and can complete the work requirements more efficiently and quickly during use.

Note:

All the parameters of all the above commands are set in little-endian mode. In little-endian mode storage, the low bit of data is stored in the low bit of the address, and the high bit of data is stored in the high bit of the addre

Chapter 5 Common Problems & Solutions

Item	Fault	Reason	Troubleshooting method
1	Not working when powered on	The working voltage is not in the acceptable range	Check whether the actual voltage deviates from the rated voltage
		The connection is loose or disconnected	Manually check whether the connection is good, or check the line with a multimeter
2	Unable to aspirate or aspirate properly	The pipe system is not tightly sealed	Check whether the joint is tight
		The aspirating pipe is blocked	Clean and dredge the pipe
		The aspirating valve or the dispensing valve is blocked by debris	Clear the debris
3	Bubbles	Air leakage in aspirating pipe	Find the leak and eliminate it
		The inlet and outlet pipe joints are not tightly sealed	Replace the gasket and tighten the pipe joint
		Gasket broken	Replace the gasket
		Excessive fluid pipe diameter variation	The diameter of the fluid path should be as consistent as possible
4	Pump stuck	Optocoupler is not triggered	Check the optocoupler wiring (refer to the optocoupler wiring method)
		Optocoupler is burned out	Replace optocoupler
		Reverse connection of motor wires	Switch any phase of the motor wires
5	Motor overheated	Drive voltage is too large	Adjust voltage
		Drive current is too large	Adjust current
6	Abnormal sound of pump operation	Motor running speed is too high or too low	Adjust the motor speed to a suitable value
		There are crystals in the pump head	Cleaning steps are required after the machine runs or before it starts
7	Poor sampling accuracy	The pipe system is not tightly sealed	Check whether the joint is tight
		There are bubbles in the pipe	Refer to troubleshooting method of above point 3

Chapter 6 Quick Command

A Quick Commands

Code B2	Abbreviation	Parameter Description B3 B4
0x20	Query address	Address ranging from: 0x0000 ~ 0x007F, default 00
0x27	Query the maximum speed	5ml, 12.5ml maximum speed range is 0x0000 to 0x0258 the maximum speed for 25ml is 0x0000 to 0x01F
0x3F	Query current version	B3=0x01 B4=0x09, above is just an example, if the response parameter is the same as above parameter, it means the current version is V1.9, see the version number on the label for details
0x4A	Query motor status	B3=0x00 B4=0x00
0x4D	Aspirate liquid	When the number of steps corresponding to parameter B3B4 is greater than the maximum number of steps, the motor will not run, and return byte B3=08, B4=00; When the number of steps corresponding to B3B4 parameter is set to be less than the maximum number of steps, the motor rotates according to the set number of steps.
0x42	Discharge liquid	When the number of steps corresponding to parameter B3B4 is greater than the maximum number of steps, the motor will not run, and return byte B3=08, B4=00; When the number of steps corresponding to B3B4 parameter is set to be less than the maximum number of steps, the motor rotates according to the set number of steps.
0x45	Reset of syringe pump	B3=0x00 B4=0x00 The syringe pump runs to the home position and stops
0x4F	Forced reset of syringe pump	B3=0x00 B4=0x00 The switching valve runs to the encoder home position, which overlaps with the position reset by the 0x45 command
0x49	Force Stop	B3=0x00 B4=0x00
0x4B	Set dynamic speed	B3B4 ranges from 0x0001 to 0x01C2. The speed of motor is 1 ~ 450
0x4E	Syringe runs to absolute position	B3B4 ranges from 0x0000 ~ 0x1770, which is optional position in the syringe stroke

B Hexadecimal Quick Reference Table

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
1	1	110	6E	300	12C	1000	3E8
5	5	120	78	325	145	1100	44C
10	A	130	82	350	15E	1200	4B0
15	F	140	8C	375	177	1300	514
20	14	150	96	400	190	1400	578
25	19	160	A0	425	1A9	1500	5DC
30	1E	170	AA	450	1C2	1600	640
35	23	180	B4	475	1DB	1700	6A4
40	28	190	BE	500	1F4	1800	708
45	2D	200	C8	525	20D	1900	76C
50	32	210	D2	550	226	2000	7D0
55	37	220	DC	575	23F	2100	834
60	3C	230	E6	600	258	2200	898
65	41	240	F0	650	28A	2300	8FC
70	46	250	FA	700	2BC	2400	960
75	4B	260	104	750	2EE	2500	9C4
80	50	270	10E	800	320	2600	A28
90	5A	280	118	850	352	2700	A8C
100	64	290	122	900	384	2800	AF0

C Switching Protocol

9. SY08 has two protocols, RUNZE and ASCII protocol. If you need to switch protocols, you can refer to the following steps (both need to be powered off after switching)

9.1 Burn-in Protocol

9.1.1 If the default programmed command is the RUNZE command, it will query the following return code

Send→ 91 EB 07 00 00 00 00 00 00 D5 28 FF F8

Receive← 91 EB 02 01 00 63 D7 F6 AB 00

02 parameter definition: 02 stands for RUZNE

9.1.2 If the default programmed command is the ASC II command, it will query the following return code

Send→ 91 EB 07 00 00 00 00 00 00 D5 28 FF F8

Receive← 91 EB 0A 01 00 02 C4 47 0B 00

0A parameter definition: 0A stands for ASC II

9.2 Switching protocol (must use RS232 port to switch the address, and must be powered off after switching)

9.2.1 If RUNZE command is required, the following code can be used to switch the address

Set the address to 0x0802 (RUNZE)

Send→ 91 EB 03 00 00 02 08 00 00 0C 0A 69 69

Receive← 91 EB 00 01 00 0D 5A 8A 40 00

The values queried after the setting are as follows.

Send→ 91 EB 07 00 00 00 00 00 00 D5 28 FF F8

Receive← 91 EB 02 01 00 63 D7 F6 AB 00

9.2.2 If ASC II command is required, the following code can be used to switch the address

Send→ 91 EB 03 00 00 0A 08 00 00 6D 19 D8 C9

Receive← 91 EB 00 01 00 0D 5A 8A 40 00

The values queried after the setting are as follows.

Send→ 91 EB 07 00 00 00 00 00 00 D5 28 FF F8

Receive← 91 EB 0A 01 00 02 C4 47 0B 00

Chapter 7 Version Description

Version	Description	Release Date
V1.0	Initial Version	2020.12.20
V1.6	Add version description and change technical support contact	2022.6.29
V1.7	Replace the motor manual	2022.7.27
V1.8	Delete CAN communication content Add grounding instructions Add back pressure test data	2023.05.06
V1.9	Modify the command to query the syringe pump	2024.4.2
V2.0	Modify the wetted material	2024.4.11

Chapter8 Technical Services

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